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NOKIA

5G and Single RAN BTS Site Solutions, Rel. 22R1, Operating Documentation, Issue 07

Nokia AirScale Radio Description

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Issue 40B

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Summary of changes

A list of changes between document issues. You can navigate through the respective changed topics.

Changes between document issues are cumulative. Therefore, the latest document issue contains all changes made to previous issues.

This document is common for various radio access technologies (RATs). You may find here information about solutions that are not available or supported in a specific software release or RAT. For features supported in your software release, see respective feature documentation chapter in the system library.

Note:

For more details on Nokia AirScale compliance, see Nokia AirScale BTS Environmental Product Declaration.

Changes between issues 40A (2022-09-29) and 40B (2023-02-24)

General changes

Power consumption values have been updated for the following radio units:

- AirScale RRH 2T4R B8/n8 120 W (AHDA)
- AirScale Dual RRH 4T4R B1/3 (n1/n3) 400 W (AHEGF)
- AirScale Dual RRH 4T4R B2/B66a (n2/n66a) 320 W (AHFIC)
- AirScale Dual RRH 4T4R B5/B28 (n5/n28) 320 W (AHPCA)
- AirScale Dual RRH 4T4R B12/n71 240 W (AHLOA)
- AirScale Tri RRH 2T4R B8/B20/B28 (n8/20/28) 320 W (AHPMDD)
- AirScale RRH 4T4R B40/n40 160 W (AZNA)
- AirScale RRH 4T4R B41/n41 160 W (AZHA)
- AirScale Micro RRH 4T4R n79 80 W (AWHTA)

Power consumption values have been added for the following radio units:

- AirScale RRH 4T4R n77 320 W (AZQU) (eCPRI)
- AirScale RRH 8T8R n78 320 W (eCPRI) (AZQI)

Power consumption values have been removed for the following radio units:

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- AirScale RRH 8T8R n77 160 W (AZQO) (eCPRI)
- AirScale RRH 8T8R n78 320 W (eCPRI) (AZQJ)

UL 256 QAM support has been added to the functional specification for the following radio units:

- AirScale Micro RRH 4T4R B42/n78 40 W (AWHQE)
- AirScale Micro RRH 4T4R B42/n78 40 W (AWHQG)
- AirScale Micro RRH 4T4R B43/n78 40 W (AWHQF)

Feature interdependencies section has been removed form all the radio units.

Performance

- Measuring ambient temperature information has been added.
- Maximum current draw (I_{max}) definition has been added.

AirScale RRH 8T8R n77 320 W eCPRI (AZQW)

- 2T2R mode has been removed.

AirScale RRH 8T8R n79 192 W eCPRI (AZTA)

- 4x2T2R mode has been removed.
- 40, 50, 60 and 80 MHz have been removed from supported bandwidths.

AirScale RRH 4T4R B28/n28 320 W (AHPB)

- Dimensions and weight values have been updated.

Changes between issues 40 (2022-06-23) and 40A (2022-09-29)

General changes

5GC000433: Embedded Power Meter for Energy Efficiency feature has been added to feature interdependencies section, for the following radio units:

- AirScale Micro 4T4R B66 20 W (AHIB)
- AirScale Micro 4T4R B43/n78 20 W (AZQR)
- AirScale Micro 4T4R B25/n25 20 W (AHFB)
- AirScale Micro 4T4R B7 20 W (AHHA)

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- AirScale Micro 4T4R B5 20 W (AHCE)
- AirScale Micro 4T4R B3 20 W (AHEJ)
- AirScale Micro 4T4R B1 20 W (AHGB)
- AirScale RRH 8T8R B42/n78 320 W eCPRI (AZQS)
- AirScale RRH 8T8R B42/n78 240 W (AZQF)
- AirScale RRH 8T8R B42/n78 160 W CPRI/eCPRI (AZQP)
- AirScale RRH 8T8R n77 320 W eCPRI (AZQW)
- AirScale RRH 8T8R n41 320 W eCPRI (AZHM)
- AirScale RRH 8T8R B41/n41 320 W CPRI/eCPRI (AZHL)
- AirScale RRH 8T8R B38/n38 320 W (AZHN) (CPRI/eCPRI)
- AirScale Tri RRH 2T4R B8/B20/B28 (n8/n20/n28) 240 W (AHPMDB)
- AirScale Tri RRH 2T2R B8/20/28 (n8/n20/n28) 240 W (AHPMDA)
- AirScale Dual RRH 4T4R B25/B66a (n25/n66a) 160 W (AHFIA)
- AirScale Dual RRH 4T4R B25/n25/B66/n66 320 W (AHFIB)
- AirScale Dual RRH 4T4R B12/n71 240 W (AHLOA)
- AirScale Dual RRH 4T4R n5/B29 240 W (AHBCB)
- AirScale Dual RRH 4T4R B5/B13 320 W (AHBCC)
- AirScale Dual RRH 4T4R B5/B13 (n5) 160 W (AHBCA)
- AirScale Dual RRH 4T4R B2/B66a (n2/n66a) 320 W (AHFIC)
- AirScale Dual RRH 4T4R B1/B3 (n1/n3) 320 W (AHEGB)
- AirScale RRH 4T4R B28/n28 320 W (AHPB)
- AirScale RRH 4T4R B28 240 W (AHPF)
- AirScale RRH 4T4R B5/n5 160 W (AHCA)
- AirScale RRH 4T4R B3/n3 160 W (AHEB)
- AirScale RRH 2T4R B28/n28 120 W (AHPD)
- AirScale RRH 2T4R B8/n8 160 W (AHDB)
- AirScale RFM 6T6R B28/n28 360 W (ARPA)
- AirScale RFM 6T6R B3/n3 480 W (AREA)

Power back-off values have been updated for the following radio units:

- AirScale RRH 8T8R B38/n38 320 W (AZHN) (CPRI/eCPRI)
- AirScale RRH 8T8R B42/n78 320 W eCPRI (AZQS)

Rx-sniffing has been added to the feature interdependencies list for the following radio units:

- AirScale Dual RRH 2T4R B1/B3 (n1/n3) 240 W (AHEGA)
- AirScale Tri RRH 2T4R B5/n5/B8/n8/B28/n28 240 W (AHPCDB)
- AirScale Tri RRH 2T4R B8/B20/B28 (n8/n20/n28) 240 W (AHPMDB)
- AirScale Tri RRH 2T4R B8/B20/B28 (n8/20/28) 320 W (AHPMDD)

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AirScale RRH 2T4R B3/n3 160 W (AHEC)

- Note concerning multi-carrier configuration has been removed.

AirScale RRH 8T8R n41 320 W eCPRI (AZHM)

- Power back-off values have been added.

AirScale RRH 8T8R n79 192 W eCPRI (AZTA)

- Power consumption has been added.

AirScale Micro RRH 4T4R B42/n78 40 W (AWHQE)

- 60 MHz and 80 MHz have been added to the supported bandwidths in NR.

Changes between issues 39 (2022-04-28) and 40 (2022-06-23)

General changes

Power back-off values have been updated for the following radio units:

- AirScale RRH 4T4R n77 320 W (AZQU) (eCPRI)
- AirScale RRH 8T8R B41/n41 320 W CPRI/eCPRI (AZHL)
- AirScale RRH 8T8R n77 320 W eCPRI (AZQW)
- AirScale RRH 8T8R B42/n78 160 W CPRI/eCPRI (AZQP)
- AirScale RRH 8T8R n78 320 W (eCPRI) (AZQI)
- AirScale RRH 8T8R n78 320 W (eCPRI) (AZQJ)
- AirScale RRH 8T8R n79 192 W eCPRI (AZTA)

Output power of the cell per TX has been removed from functional specification table for all radio units.

FPKC Flexi Pole Mounting Kit (472821A) has been updated.

AirScale Micro RRH 4T4R n79 80 W (AWHTA)

- Power consumption has been added.

AirScale radio units sound power levels

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- Sound power levels table for Nokia AirScale micro RRH has been added.
- The annotation: Sound power levels can vary between radio units and be ≤45 dBa if maximum capacity is configured. has been added:

AirScale Tri RRH 4T4R B12/B14/B29 370 W (AHLBBA)

- Installation options have been updated.

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1. AirScale radio unit (RU) compliances

RSS-102, EU, FCC, EMC, RF, and safety compliances

Table 1: Compliance statements for Macro FDD-LTE Radio Units

Feature name	Release	ICES-003 compliant	EU RoHS compliant	CE marking compliant	Directive 2014/53/EU (RED) Article 10.10 compliant	FCC Part 15 compliant
CB006578 (ARDB)	5G21B	No	Yes	Yes	Yes	No
CB006587 (ARMA)	5G21B	No	Yes	Yes	Yes	No
CB007083 (AHEGF)	5G21A	No	Yes	Yes	Yes	No
5GC001838 (ARHA)	5G20B	No	Yes	Yes	Yes	No
CB005907 (AHNA)	5G20B	Yes	No	No	No	Yes
CB006008 (AHPMDD)	5G20B	No	Yes	Yes	Yes	No
5GC000729 (AHDB)	5G20A	No	Yes	Yes	Yes	Yes
5GC001099 (AHEB)	5G20A	No	Yes	Yes	Yes	No
5GC001683 (AHPMDB)	5G20A	No	Yes	Yes	Yes	No
5GC001694 (AREA)	5G20A	No	Yes	Yes	Yes	No
5GC001837 (ARGA)	5G20A	No	Yes	Yes	Yes	No

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Feature name	Release	ICES-003 compliant	EU RoHS compliant	CE marking compliant	Directive 2014/53/EU (RED) Article 10.10 compliant	FCC Part 15 compliant
5GC001839 (AHHB)	5G20A	Yes	Yes	Yes	Yes	Yes
5GC002099 (AHFIG)	5G20A	No	No	No	No	Yes
5GC002227 (ARPA)	5G20A	No	Yes	Yes	Yes	No
5GC002304 (AHGA)	5G20A	No	Yes	Yes	Yes	No
5GC002311 (FRIJ)	5G20A	Yes	No	No	No	Yes
5GC002335 (AHEGC)	5G20A	No	Yes	Yes	Yes	No
5GC002424 (AHBOA)	5G20A	Yes	No	No	No	No
5GC002429 (AHEGA)	5G20A	No	Yes	Yes	Yes	No
5GC000930 (AHPB)	5G19B	No	Yes	Yes	Yes	No
5GC000934 (AHFIC)	5G19B	No	No	No	No	Yes
5GC001081 (AHPD)	5G19B	No	Yes	Yes	Yes	No
5GC001151 (AHBCA)	5G19B	Yes	No	No	No	Yes
5GC001441 (AHFIA)	5G19B	Yes	No	No	No	Yes
5GC001688 (AHEGB)	5G19B	No	Yes	Yes	Yes	No

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Feature name	Release	ICES-003 compliant	EU RoHS compliant	CE marking compliant	Directive 2014/53/EU (RED) Article 10.10 compliant	FCC Part 15 compliant
5GC000719 (AHLOA)	5G19A	Yes	No	No	No	Yes
5GC000724 (AHFIB)	5G19A	Yes	No	No	No	Yes
5GC000928 (AHPMDA)	5G19A	No	Yes	Yes	Yes	No
5GC001150 (AHBCC)	5G19A	No	No	No	No	Yes
5GC001152 (AHCA)	5G19A	No	No	No	No	Yes
5GC002028 (AHBCB)	5G19A	No	No	No	No	Yes
CB007153 (AHCG)	SRAN21A	No	Yes	Yes	Yes	No
SR002937 (AHGE)	SRAN21A	No	Yes	Yes	Yes	No
5GC002467 (AHPDA)	SRAN20A	No	Yes	Yes	Yes	No
SR002520 (AHPCDB)	SRAN20A	No	Yes	Yes	Yes	No
SR002611 (ARDA)	SRAN20A	No	Yes	Yes	Yes	No
LTE5359 (AHPE)	SRAN19B	No	Yes	Yes	Yes	No
SR001667 (AHDA)	SRAN18A	No	Yes	Yes	Yes	No

Table 2: Compliance statements for Micro Remote Radio Heads

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Feature name	Release	ICES-003 compliant	EU RoHS compliant	CE marking compliant	Directive 2014/53/EU (RED) Article 10.10 compliant	FCC Part 15 compliant
CB006657 (AWHQV)	5G21B	Yes	No	No	No	No
LTE4828 (AZQD)	5G21B	No	Yes	Yes	Yes	No
5GC001794 (AZQR)	5G20B	Yes	Yes	Yes	Yes	No
5GC001881 (AWHHI)	5G20A	Yes	Yes	Yes	Yes	No
5GC001154 (AHFB)	5G19B	Yes	No	No	No	Yes
5GC001189 (AHIB)	5G19B	Yes	Yes	Yes	Yes	Yes
5GC001483 (AHHA)	5G19B	Yes	Yes	Yes	Yes	No
5GC001484 (AHGB)	5G19B	No	Yes	Yes	Yes	No
5GC001485 (AHEJ)	5G19B	No	Yes	Yes	Yes	No
5GC001486 (AHCE)	5G19B	Yes	No	No	No	Yes
5GC001157 (AWHQE)	5G19A	No	Yes	Yes	Yes	No
5GC001274 (AWHQF)	5G19A	No	Yes	Yes	Yes	No
5GC001278 (AWHQG)	5G19A	No	Yes	Yes	Yes	No
5GC001707 (AWHHF)	5G19A	No	No	No	No	Yes

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Feature name	Release	ICES-003 compliant	EU RoHS compliant	CE marking compliant	Directive 2014/53/EU (RED) Article 10.10 compliant	FCC Part 15 compliant
LTE4872 (AZRC)	SRAN20A	Yes	Yes	Yes	Yes	No
LTE5006 (AHBC)	SRAN19	No	No	No	No	Yes
LTE3655 (AHBB)	SRAN18A	Yes	No	No	No	Yes
LTE3712 (AZRA)	SRAN18A	No	No	No	No	Yes
LTE4253 (AZRB)	SRAN18A	No	No	No	No	Yes
LTE3628 (AZQC)	LTE18SP	No	No	No	No	Yes

Table 3: Compliance statements for Macro TD-LTE Remote Radio Heads

Feature name	Release	ICES-003 compliant	EU RoHS compliant	CE marking compliant	Directive 2014/53/EU (RED) Article 10.10 compliant	FCC Part 15 compliant
5GC002270 (AZHL)	5G21A	No	No	No	No	Yes
CB005852 (AZQP)	5G21A	No	Yes	Yes	Yes	No
5GC002305 (AZHL)	5G20B	No	Yes	Yes	Yes	No
5GC002361 (AZNA)	5G20A	No	Yes	Yes	Yes	No

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Feature name	Release	ICES-003 compliant	EU RoHS compliant	CE marking compliant	Directive 2014/53/EU (RED) Article 10.10 compliant	FCC Part 15 compliant
5GC002400 (AZHA)	5G20A	No	Yes	Yes	Yes	No
SR002746 (AZHN)	SRAN20C	Yes	No	No	No	No
5GC001511 (AZQI)	5G20B	No	Yes	Yes	Yes	No
5GC001512 (AZQJ)	5G20B	No	Yes	Yes	Yes	No
5GC001795 (AZQG)	5G19A	No	Yes	Yes	Yes	No
5GC001810 (AZQH)	5G19A	No	Yes	Yes	Yes	No
5GC001811 (AZQL)	5G19A	No	Yes	Yes	Yes	No

Table 4: Compliance statements for Radio Units for legacy releases

Feature name	Release	ICES-003 compliant	EU RoHS compliant	CE marking compliant	Directive 2014/53/EU (RED) Article 10.10 compliant	FCC Part 15 compliant
SR002531 (ARDB)	FL19B	No	Yes	Yes	Yes	No
LTE4641 (ARHA)	FL19A	No	Yes	Yes	Yes	No
LTE5048 (AHSA)	FL19A	No	Yes	Yes	Yes	No

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Feature name	Release	ICES-003 compliant	EU RoHS compliant	CE marking compliant	Directive 2014/53/EU (RED) Article 10.10 compliant	FCC Part 15 compliant
LTE4260 (AHCC)	FL19	No	No	No	No	Yes
LTE4615 (AHPC)	FL18A	No	Yes	Yes	Yes	No
LTE4637 (AHNA)	FL19	No	No	No	No	Yes
LTE4660 (AHPD)	FL19	No	Yes	Yes	Yes	No
LTE4662 (ARCA)	FL19	No	Yes	Yes	Yes	No
LTE3736 (AZQE)	TL18A	No	Yes	Yes	Yes	No
LTE3678 (AHDA)	FL18A	No	Yes	Yes	Yes	No
LTE2784 (AHEB)	FL18	No	Yes	Yes	Yes	No
LTE3515 (FHDI)	FL18	No	Yes	Yes	Yes	No
LTE4118 (AHMA)	FL18SP	No	Yes	Yes	Yes	No
LTE3181 (FHPD)	FL17A	No	Yes	Yes	Yes	No
LTE2680 (FHEL)	FL16A	No	Yes	Yes	Yes	No

1.1 RSS-102 compliance

The following are example minimum separation distances calculated to meet the limits of

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RSS-102, issue 5 for deployment of Nokia BTS products. These calculated distances assume a typical 16.4 dBi antenna gain. For other antenna gains the compliance boundaries should be recalculated.

Ci-dessous sont par exemple les distances minimales de séparation calculées pour respecter les limites de RSS-102, numéro 5 pour le déploiement de la station de base Nokia. Ces distances calculées supposent une antenne de gain typique 16,4 dBi. Pour d'autres gains d'antenne les limites de conformité doivent être recalculées.

Table 5: RSS-102 issue 5 compliance boundaries (m) for general public levels

Power (W)	Frequency range (MHz)			
	698 - 960		1710 - 2690	
	Limit (W/m^2)	Distance (m)	Limit (W/m^2)	Distance (m)
2	2.30	1.8	4.24	1.3
5	2.30	2.8	4.24	2.1
10	2.30	3.9	4.24	2.9
20	2.30	5.5	4.24	4.1
30	2.30	6.8	4.24	5.0
40	2.30	7.8	4.24	5.8
50	2.30	8.7	4.24	6.4
60	2.30	9.6	4.24	7.1
70	2.30	10.3	4.24	7.6
80	2.30	11.0	4.24	8.1
90	2.30	11.7	4.24	8.6

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Table 6: RSS-102 issue 5 compliance boundaries (m) for occupational levels

Power (W)	Frequency range (MHz)			
	698 - 960		1710 - 2690	
	Limit (W/m^2)	Distance (m)	Limit (W/m^2)	Distance (m)
2	17.05	0.7	26.69	0.6
5	17.05	1.1	26.69	0.9
10	17.05	1.5	26.69	1.2
20	17.05	2.1	26.69	1.7
30	17.05	2.5	26.69	2.0
40	17.05	2.9	26.69	2.3
50	17.05	3.2	26.69	2.6
60	17.05	3.5	26.69	2.8
70	17.05	3.8	26.69	3.1
80	17.05	4.1	26.69	3.3
90	17.05	4.3	26.69	3.5

Note:

This compliance statement is not applicable to all HW units described in this document.

1.2 EU compliance

EU RoHS statement, CE marking, Directive 2014/53/EU (RED) Article 10.10 compliance.

EU RoHS statement

This equipment complies with the European Union RoHS Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment. The directive applies to the use of lead, mercury, cadmium, hexavalent

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chromium, Polybrominated Biphenyls (PBB), and Polybrominated Diphenyl Ethers (PBDE) in electrical and electronic equipment.

CE marking

The equipment described in this document complies with either:

- The relevant provisions of the European Union R&TTE Directive 1999/5/EC for some products shipped prior to June 30, 2017
  Figure 1: CE marking (EU R&TTE Directive 1999/5/EC)

  Hereby, Nokia declares that one or more of these base stations is compliant with the essential requirements and other relevant provisions of Directive: 1999/5/EC.

or

- European Union Radio Equipment Directive (RED) 2014/53/EU for some current products and all products shipped after June 30, 2017.
  Figure 2: CE marking

  Hereby, Nokia declares that radio equipment type Flexi Multiradio 10 BTS and Nokia AirScale BTS is compliant with Directive 2014/53/EC. For the full text of the EU declaration of conformity, see *Single RAN/Reference documentation/Hardware certifications*.

These declarations are only valid for configurations (combinations of software, firmware, and hardware) provided and/or supported by Nokia.

Directive 2014/53/EU (RED) Article 10.10 compliance

The radio frequency usage in EU is restricted and before you use the radio equipment in the commercial network you must apply for the band license from the local regulator.

As an evidence for the restriction, the packaging is to have the RED Article 10.10-marking describing the impacted countries.

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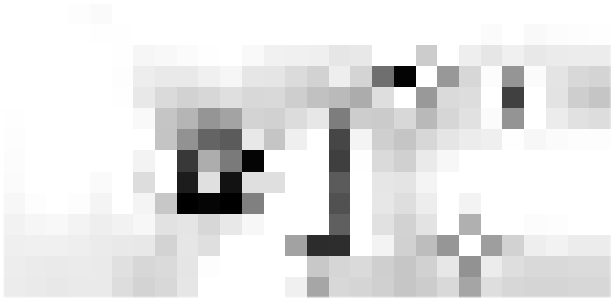
Figure 3: RED Article 10.10-marking



1.3 FCC Part 15 compliance

Note:

This equipment has been tested and is compliant with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off and on, try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from the one to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note:

This compliance statement is not applicable to all hardware units described in this document.

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1.4 Compliance with EMC, RF and safety

EMC emission, EMC immunity, RF, and safety standards for Flexi and AirScale BTS.

In Europe, this means compliance with Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC Text with EEA relevance.

In other market areas additional compliance is fulfilled according to relevant authority requirements.

EMC emission

- Common:
  - ETSI EN 301 489-1: ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU
  - ETSI EN 301 489-50: ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 50: Specific conditions for Cellular Communication Base Station (BS), repeater and ancillary equipment; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
  - EN 55032: Electromagnetic compatibility of multimedia equipment - Emission Requirements
  - ICES-003: Information Technology Equipment (ITE) – Limits and Methods of Measurement
  - FCC Code of Federal Regulations (CFR) 47, Part 15 Radio Frequency Devices
- MSR:
  - 3GPP TS 37.113: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) Electromagnetic Compatibility (EMC)
- GSM/EDGE:
  - 3GPP TS 51.021: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Base Station System (BSS) equipment specification; Radio aspects - Section 8 Radiated Spurious Emissions
- UTRA:
  - 3GPP TS 25.113: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Base Station (BS) and repeater ElectroMagnetic Compatibility

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(EMC)

- E-UTRA:
  - 3GPP TS 36.113: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) and repeater ElectroMagnetic Compatibility (EMC)
- 5G:
  - 3GPP TS 38.113: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Base Station (BS) ElectroMagnetic Compatibility (EMC)

EMC immunity

- Common:
  - ETSI EN 301 489-1: ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU
  - ETSI EN 301 489-50: ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 50: Specific conditions for Cellular Communication Base Station (BS), repeater and ancillary equipment; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
  - IEC 61000-4-8/EN 61000-4-8: Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test
  - IEC 61000-4-9 / EN 61000-4-9: Electromagnetic compatibility (EMC). Part 4-9: Testing and measurement techniques. Pulse magnetic field immunity test
- MSR:
  - 3GPP TS 37.113: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) Electromagnetic Compatibility (EMC)
- UTRA:
  - 3GPP TS 25.113: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Base Station (BS) and repeater ElectroMagnetic Compatibility (EMC)
- E-UTRA:
  - 3GPP TS 36.113: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) and repeater ElectroMagnetic Compatibility (EMC)
- 5G:
  - 3GPP TS 38.113: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; NR; Base Station (BS) ElectroMagnetic Compatibility (EMC)

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RF

- Common:
  - ETSI EN 301 908-1: IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 1: Introduction and common requirements
  - FCC Code of Federal Regulations (CFR) 47, Part 2: Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
  - FCC Code of Federal Regulations (CFR) 47, Part 22: Public mobile Services (2110-2130 MHz and 2160-2180 MHz)
  - FCC Code of Federal Regulations (CFR) 47, Part 24: Personal Communication Services
  - FCC Code of Federal Regulations (CFR) 47, Part 25: Satellite Communications
  - FCC Code of Federal Regulations (CFR) 47, Part 27: Miscellaneous Wireless Communications Services (758-763 MHz and 788-793 MHz) (1710-1755MHz and 2110-2155 MHz)
  - FCC Code of Federal Regulations (CFR), Part 30: Upper microwave flexible use service
  - FCC Code of Federal Regulations (CFR) 47, Part 90: Private Land Mobile Radio Services
  - RSS-Gen: General Requirements and Information for the Certification of Radio Apparaturs
  - RSS-130: Mobile Broadband Services (MBS) Equipment Operating in the Frequency Bands 698-756 MHz and 777-787 MHz
  - RSS-132: Cellular Telephones Employing New Technologies Operating in the Bands 824-849 MHz and 869-894 MHz
  - RSS-133: 2GHz Personal Communications Services
  - RSS-139: Advanced Wireless Services Equipment Operating in the Bands 1710-1755 MHz and 2110-2155 MHz
  - RSS-140: Equipment operating in the Public Safety Broadband Frequency Bands 758-768 MHz and 788-798 MHz
  - RSS-170: Mobile Earth Stations (MESs) and Ancillary Terrestrial Component (ATC) Equipment Operating in the Mobile-Satellite Service (MSS) Bands
  - RSS-195: Wireless Communication Service (WCS) Equipment Operating in the Bands 2305-2320 MHz and 2345-2360 MHz
  - RSS-199: Broadband Radio Service (BRS) Equipment Operating in the Band 2500-2690
- AAS:
  - 37.145-1: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network: Active Antenna System (AAS) Base Station (BS) Conformance testing; Part 1: Conducted conformance testing
  - 37.145-2: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network: Active Antenna System (AAS) Base Station (BS) Conformance testing;

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Part 2: Radiated Conformance testing

- MSR:
  - ETSI EN 301 908-18: IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 18: E-UTRA, UTRA and GSM/EDGE Multi-Standard Radio (MSR) Base Station (BS)
  - 3GPP TS 37.141: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing
- GSM/EDGE:
  - ETSI EN 301 502: Global System for Mobile communications (GSM); Harmonized EN for Base Station Equipment covering the essential requirements of article 3.2 of the R&TTE Directive
  - 3GPP TS 51.021: 3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Base Station System (BSS) equipment specification; Radio aspects
- UTRA:
  - ETSI EN 301 908-3: IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 3: CDMA Direct Spread (UTRA FDD) Base Stations (BS)
  - 3GPP TS 25.141: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Base Station (BS) conformance testing (FDD)
  - Telec-T112
- E-UTRA:
  - ETSI EN 301 908-14: IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 14: Evolved Universal Terrestrial Radio Access (E-UTRA) Base Stations (BS)
  - 3GPP TS 36.141: 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing
  - Telec-T139
  - Telec-T146
  - Telec-T156
- 5G:
  - 3GPP TS 38.141-1: 3rd Generation Partnership Project; Technical Specification Group RAN; NR; Base Station (BS) conformance testing Part 1: Conducted conformance testing
  - 3GPP TS 38.141-2: 3rd Generation Partnership Project; Technical Specification Group RAN; NR; Base Station (BS) conformance testing Part 2: Radiated conformance testing
  - ETSI EN 301 908-24: IMT cellular networks; Harmonised Standard for access to radio

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spectrum; Part 24: New Radio (NR) Base Stations (BS)

Safety

- EN 50385: Product standard to demonstrate the compliances of base station equipment with radio frequency electromagnetic field exposure limits (110 MHz - 100 GHz), when placed on the market
- FCC 47 CFR Part 1.1310
- ISED Canada: Health Canada Safety Code 6
- Australia: ARPANSA Radiation Protection Series No.3
- EN 62232: Determination of RF field strength, power density and SAR in the vicinity of radio communication base stations for the purpose of evaluating human exposure
- either
  - IEC 60950-1/EN 60950-1/UL 60950-1/CSA C22.2 No. 60950-1: Information technology equipment – Safety – Part 1: General requirements

  or
  - IEC 62368-1/EN 62368--1/UL 62368-1/CSA C22.2 No. 62368-1-14: Audio/video, information and communication technology equipment – Part 1: Safety requirements
- IEC 60950-22/EN 60950-22/UL 60950-22/ CSA C22.2 No. 60950-22: Information technology equipment – Safety – Part 22: Equipment to be installed outdoor

> **Note:**
>
> This compliance statement is not applicable to all HW units described in this document.

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2. Performance

The topic describes RF sensitivity, TX output power tolerance, received interference power, RF bandwidth terms, mean time between failures (MTBF), power consumption for RRH and RFM, nominal and extended input voltage range, measuring ambient temperature, and maximum current draw.

RF sensitivity

Nokia AirScale macro radio units have superior field-proven RX sensitivity which ensures a top uplink performance without compromising the uplink coverage.

The uplink performance accuracy tests were made in compliance with 3GPP standard 36.104. The receiver sensitivity have been measured using commercial radio hardware under realistic circumstances. The top results reached –106.6 dBm and the accurate mean is –106.3 dBm.

TX output power tolerance

Nokia AirScale radio units power amplifier design brings benefits to the radio units with wide operating bandwidth and wide instantaneous bandwidth. This design produces a competitive output power tolerance which is less than +/–0.8 dB for single band radio units. Its benefit is a high maximum downlink throughput level in real operating environments.

Received interference power

Nokia AirScale macro radio units reporting accuracy complies with 3GPP standard 36.133. The reported level of Received Interference Power may slightly vary between units and different product variants. It has no impact on radio performance aspects, such as sensitivity or data throughput.

RF bandwidth terms

The descriptions of radio units contain certain BW-related information. The definitions are as follows:

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RF filter bandwidth (RF BW)	The 3GPP frequency range the radio operates in. Example: Filter bandwidth of a radio unit operating in Band 41 (2496 MHz to 2690 MHz) is 194 MHz.
Instantaneous bandwidth (iBW)	A frequency range in which the radio carriers may be deployed in. Is always smaller or equal to RF BW.
Occupied bandwidth (oBW)	The HW-supported maximum sum of the deployed carriers' bandwidth. Is always smaller or equal to iBW. Example: If a radio unit oBW = 40 MHz, there might be a 2 x 20 MHz configuration deployed.

Mean Time Between Failures

> **Note:**
>
> For mean time between failures (MTBF) values, check with your local Nokia support.

Power consumption for RRH and RFM

The power consumption of radio units (RRH, RFM), measured according to the ETSI 202 706-1, is similar for medium, busy and maximum loads in both LTE and NR mode.

Thanks to NR lean carrier benefits, power consumption of radio units operating in NR at low load (0% traffic) is reduced compared to LTE mode.

Nominal input voltage range

Nominal input voltage range from –40.5 V DC to –57 V DC is defined by standard ETSI EN 300 132-2 for Europe. Within the nominal input voltage range telecom equipment should operate with no degradation of service performance.

Extended input voltage

Extended input voltage range from –36.0 V DC to –40.5 V DC and from –57.0 V DC to –60.0 V DC is defined by safety test results. Within the extended input voltage range telecom equipment should operate with no damage to the equipment during unexpected voltage

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surges only.

Output power, supported carriers and bandwidths

> **Note:**
>
> For more information on output power, supported carriers and bandwidths, see the `Reference Documentation ▸ 5G and SRAN Supported Configurations ▸ SBTS and gNB Supported Configurations ▸ SBTS Supported Configurations` document.

Ambient temperature

To measure ambient temperature for AirScale radio units without fans, place the thermal sensor 200 mm (7.9 in.) below the radio unit or 200 mm (7.9 in.) below the radio unit center line front or back.

Figure 4: Ambient temperature measurement for an exemplary radio unit without fans

To measure ambient temperature for fan-cooled AirScale radio units, place the thermal sensor 200 mm (7.9 in.) below the radio unit (at the air inlet).

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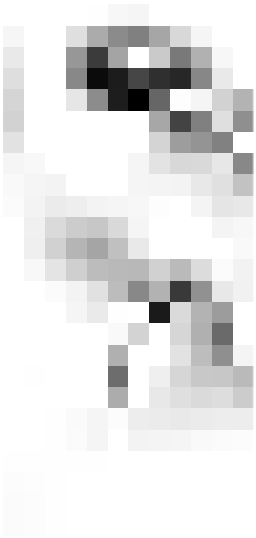
Figure 5: Ambient temperature measurement for an exemplary fan-cooled radio unit



Maximum current draw (I_{max})

I_{max} is the calculated or measured maximum electrical current of a radio unit (RU) at its minimum operating voltage. For more information, see the *Power system dimensioning for radio units* section in *Single RAN BTS Site Solutions/Nokia AirScale BTS/Installing Nokia AirScale System Modules/Nokia AirScale BTS Installation Site Requirements*.

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3. AirScale Radio support for BTS

Supported Nokia System Modules. Related documents.

Nokia AirScale radio units listed in this document are all supported by Nokia AirScale System Module. The units are also supported by either or both:

- Flexi Multiradio 10 Base Station System Module Outdoor (FSMF)
- Flexi Multiradio 10 Base Station System Module Indoor (FSIH)

To check which radio unit is compatible with the respective System Module, see one of the documents:

- *LTE List of Features* (XLS)
- *List of Features Supported in Single RAN*
- *5G and SRAN Compatibility*

For information on Flexi radio units refer to *Flexi Multiradio BTS/Flexi Multiradio BTS Descriptions/Flexi Multiradio BTS RF Module and Remote Radio Head Description*.

For information on supported configurations, see one of the documents:

- *Creating Nokia AirScale BTS TD-LTE Configurations*
- *Creating Nokia AirScale BTS FDD-LTE Configurations*
- *Creating Flexi Multiradio 10 BTS FDD-LTE Configurations*
- *Creating Flexi Multiradio 10 BTS TD-LTE Configurations*
- *SBTS Supported Configurations* (XLS), in Single RAN Reference Documentation

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4. List of Radio Units

List of LTE, SRAN and 5G releases in which the radio modules were introduced; product codes and feature numbers.

Note:

Some radio units are introduced to SRAN in LTE-only mode. They are marked with the relevant feature number:

- SRAN 18 - *SR001695: Support of additional dedicated LTE18 radios in SRAN*
- SRAN 18 SP - *SR002039: Support of dedicated LTE radios in SRAN 18 SP*
- SRAN 18A - *SR001791: Support of additional dedicated LTE 18A radios in SRAN*
- SRAN 19 - *SR002260: Support of dedicated LTE radios in SRAN 19*

Note:

Some radio units support 5G in various releases, see the respective 5G roadmap.

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Table 7: RF Modules

RF Module name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale RFM 6T6R B1 480 W (ARGA)	LTE4640 SR002273 5GC001837	474800A	LTE 19	SRAN 19	5G20A
AirScale RFM 6T6R B3 480 W (AREA)	LTE4208 SR001943 5GC001694	474198A	LTE 18A	SRAN 18A	5G20A
AirScale RFM 6T6R B5 480 W (ARCA)	LTE4662 SR002152 CB006528	474841A	LTE 19	SRAN 19	5G21B
AirScale RFM 6T6R B7 360 W (ARHA)	LTE4641 5GC001838	474801A	LTE 19A	–	5G20B
AirScale RFM 6T6R B8 480 W (ARDA)	SR002611 CB006511	474840A	SRAN 20A		5G21B
AirScale RFM 6T6R B8 480 W (ARDB)	SR002531 CB006578	475122A	–	SRAN 19B	5G21B
AirScale RFM 6T6R B20 360 W (ARMA)	LTE5070 CB006587	474803A	LTE 19A	–	5G21B
AirScale RFM 6T6R B28 360 W (ARPA)	LTE4663 5GC002227	474802A	LTE 19A	–	5G20A

Table 8: Single band Remote Radio Heads

RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale RRH 2T B32/75 120 W (AHSA)	LTE5048	475015A	LTE 19A	–	–

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RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale RRH 2T2R B3 120 W (FHEL)	LTE2680 SR001121 CB006679	473475A	LTE16A	SRAN 16.10	5G21B
AirScale RRH 2T2R 900J 120 W (FHDI)	LTE3516 SR001451	473825A	LTE 18	SRAN 17A	–
AirScale RRH 2T2R B11 120 W (FHKA)	LTE3184 SR001791	473838A	LTE16A	SRAN 18A	–
AirScale RRH 2T2R B28 120 W (FHPD)	LTE3181 CB006680	473821A	LTE 17A	–	5G21B
AirScale RRH 2T2R 700 120 W (FHPG)	LTE4167 SR002260	474407A	LTE 18	SRAN 19	–
AirScale RRH 2T4R B1 120 W (AHGA)	LTE3764 SR001768 5GC002304	474254A	LTE 18A	SRAN 19	5G20A
AirScale RRH 2T4R B1 120 W (AHGC)	LTE4510 SR001791	474586A	LTE 18A	SRAN 18A	–
AirScale RRH 2T4R B3 160 W (AHEC)	LTE3087 SR001389 5GC000734	473806A	LTE 18A	SRAN 18SP	5G21B
AirScale RRH 2T4R B3 160 W (AHED)	LTE3130 SR001415	473807A	LTE 18	SRAN 18SP	–
AirScale RRH 2T4R B5 80 W (AHCG)	CB007153	475816A	–	SRAN 21A	–
AirScale RRH 2T4R B8 120 W (AHDA)	LTE3678 SR001667 CB006609	474739A	LTE 18A	SRAN 18A	5G21B

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RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale RRH 2T4R B8 160 W (AHDB)	LTE3837 SR001753 5GC000729	474257A	LTE 18	SRAN 18SP	5G20A
AirScale RRH 2T4R B18 60 W (AHCH)	CB007568	475906A	–	22R1-SR	22R1-5G
AirScale RRH 2T4R B20 120 W (AHMA)	LTE4118 SR002039 CB006610	474255A	LTE 18SP	SRAN 18SP	5G21B
AirScale RRH 2T4R B28 120 W (AHPC)	LTE4615 SR001791	474649A	LTE 18A	SRAN 18A	–
AirScale RRH 2T4R B28 120 W (AHPD)	LTE4660 SR002080 5GC001081	474712A	LTE 19	SRAN 19	5G19B
AirScale RRH 2T4R B28 120 W (AHPE)	LTE5359 5GC002170	475208A	LTE 19B	SRAN 19B	5G20B
AirScale RRH 4T4R B3 160 W (AHEB)	LTE2784 SR001206 5GC001099	473484A	LTE 18	SRAN 18SP	5G20A
AirScale RRH 4T4R B3 160W (AHEH)	LTE4686 SR002165 5GC002171	474253A	LTE 18A	SRAN 18A	5G20B
AirScale RRH 4T4R B7 160 W (AHHB)	LTE3137 SR002039 5GC001839	474252A	LTE 18	SRAN 18SP	5G20A
AirScale RRH 4T4R B5 160 W (AHCA)	LTE3399 SR002145 5GC001152 CB006640	473966A 473966B	LTE 17A	SRAN 18A	5G21B
AirScale RRH 4T4R B26 200 W (AHCF)	SR002703 5GC002476	475313A	SRAN 20A		5G21B

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RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale RRH 4T4R B26a 100 W (AHCC)	LTE4260 SR002260	474469A	LTE 19	SRAN 19	–
AirScale RRH 4T4R B28 240 W (AHPF)	CB006896	475798A	–	–	5G21A
AirScale RRH 4T4R B28 320 W (AHPB)	LTE3651 SR002039 5GC000930	474119A	LTE 17ASP1	SRAN 18SP	5G19B
AirScale RRH 4T4R B30 100 W (AHNA)	LTE4637 SR002260 CB005907	474861A	LTE 18A	SRAN 19	5G20B
AirScale RRH 4T4R B65 160 W (AHGE)	SR002937 CB006996	475580A	–	SRAN 21A	–
AirScale RRH 4T4R B66 160 W (FRIJ)	LTE2516 SR001361 5GC002311	473368A	LTE 16A	SRAN 18SP	5G20A

Table 9: Dual band Remote Radio Heads

RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale Dual RRH 2T4R B1/3 240 W (AHEGA)	LTE3140 SR001575 5GC002429	473995A	LTE 18	SRAN 18SP	5G20A
AirScale Dual RRH 4T4R B1/3 320 W (AHEGB)	LTE3681 SR001668 5GC001688	474090A	LTE 18	SRAN 18SP	5G19B
AirScale Dual RRH 4T4R B1/3 400 W (AHEGC)	LTE4970 SR002211 5GC002335	474914A	LTE 19A	SRAN 19A	5G20A

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RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale Dual RRH 4T4R B1/3 (n1/n3) 400 W (AHEGF)	CB007083	475825A	–	–	5G21A
AirScale Dual RRH 4T4R B2/66a 320 W (AHFIC)	LTE3845 SR002369 5GC000934	474239A	LTE 18	SRAN 18SP	5G19B
AirScale Dual RRH 4T4R B5/13 160 W (AHBCA)	LTE3848 SR002039 5GC001151	474241A	LTE 18SP	SRAN 18SP	5G19B
AirScale Dual RRH 4T4R B5/13 320 W (AHBCC)	LTE3849 SR002039	474341A	LTE 18	SRAN 18SP	–
AirScale Dual RRH 4T4R B5/28 320W (AHPCA)	SR002545 5GC002593	475075A	–	SRAN 19B	5G20A
AirScale Dual RRH 4T4R B5/29 240 W (AHBCB)	LTE3846 SR001095 5GC002028	474242A	LTE 19A Fast Delivery Mode in LTE 19	–	5G19A
AirScale Dual RRH 4T4R B8/B28 480 W (AHPDA)	SR002869 5GC002467	475550A	SRAN 20A		5G20A
AirScale Dual RRH 4T4R B12/14 320 W (AHLBA)	LTE3847 SR002039	474240A	LTE 18	SRAN 18SP	–
AirScale Dual RRH 4T4R B12/71 240 W(AHLOA)	LTE3899 SR002039 5GC000719	474331A	LTE 18	SRAN 18SP	5G19A
AirScale Dual RRH 4T4R B13/71 240 W(AHBOA)	LTE4988 SR002582 5GC002424	475250A	LTE 19B	SRAN 19B	5G20A
AirScale Dual RRH 4T4R B25/66 320 W (AHFIB)	LTE3789 SR001767 5GC000724	474216A	LTE 17ASP1	SRAN 18SP	5G19A
AirScale Dual RRH 4T4R B25/66 480 W (AHFIG)	LTE5213 SR002418 5GC002099	475125A	LTE 19A	SRAN 19A	5G20A

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RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale Dual RRH 4T4R B25/B66a 160 W (AHFIA)	LTE3421 SR002039 5GC001441	473967A	LTE 18	SRAN 18SP	5G19B

Table 10: Triple band Remote Radio Heads

RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale Tri RRH 2T2R B8/20/28 240 W (AHPMDA)	LTE3142 SR001572 5GC000928	473997A	LTE 18	SRAN 18SP	5G19A
AirScale Tri RRH 2T4R B5/8/28 240W (AHPCDB)	SR002520 5GC002586	475081A	SRAN 20A		5G20A
AirScale Tri RRH 2T4R B8/20/28 240W (AHPMDB)	SR002368 5GC001683	475000A	–	SRAN 19B	5G20A
AirScale Tri RRH 2T4R B8/B20/B28 (n8/20/28) 320 W (AHPMDD)	CB006008	475707A	–	SRAN 20C	5G20B
AirScale Tri RRH 4T4R B12/14/29 370 W (AHLBBA)	LTE5210	475082A	LTE 19B	SRAN 19B	–

Table 11: Micro Remote Radio Heads

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RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale Micro RRH 2T B46 UNII 1+3 1 W (AZRA)	LTE3712 SR001791	474146A	LTE 18	SRAN 18A	–
AirScale Micro RRH 2T B46 UNII 1+2+3 1W (AZRB)	LTE4253 SR001791	474510A	LTE 18	SRAN 18A	–
AirScale Micro RRH 2T B46 UNII 1+2+3 1W (AZRC)	LTE4872	474784A	SRAN 20A		–
AirScale Micro 4T4R B1 20 W (AHGB)	LTE4269 SR002040 5GC001484	474514A	LTE 18SP	SRAN 18A	5G19B
AirScale Micro 4T4R B3 20 W (AHEJ)	LTE4270 SR001791 5GC001485	474513A	LTE 18SP	SRAN 18A	5G19B
AirScale Micro 4T4R B5 20 W (AHCE)	LTE3654 SR001791 5GC001486	474044A	LTE 18SP	SRAN 18A	5G19B
AirScale Micro 4T4R B7 20 W (AHHA)	LTE3713 SR002039 5GC001483	474147A	LTE 18	SRAN 18SP	5G19B
AirScale Micro 4T4R B13 20 W (AHBB)	LTE3655 SR001791	474042A	LTE 18SP	SRAN 18A	–
AirScale Micro 4T4R B14 20 W (AHBC)	LTE5006 SR002260	474948A	LTE 19	SRAN 19	–
Nokia AirScale Micro 4T4R B25 20 W (AHFB)	LTE3429 SR001996 5GC001154	474036A	LTE 17A	SRAN 18A	5G19B

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RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale Micro RRH 2T2R n41 200 W (AWHHG/AWHHH)	5GC001776	475184A 475212A	–	22R1-SR	22R1-5G
AirScale Micro RRH 4T4R B41/n41 80 W (AWHHD)	LTE5161 5GC001541	475068A	LTE 19B MP	SRAN 19B MP	5G19A
AirScale Micro RRH 4T4R B41/n41 80 W (AWHHF)	LTE5304 5GC001707	475181A	LTE 19A	–	5G19A
AirScale Micro RRH 4T4R B42/n78 40 W (AWHQE)	5GC001157	474788A	–	–	5G19A
AirScale Micro RRH 4T4R B42/n78 40 W (AWHQG)	5GC001278	474877A	–	–	5G19A
AirScale Micro 4T4R B42 20 W (AZQD)	LTE4828	474798A	LTE 19	–	5G21B
AirScale Micro 4T4R B43 20 W (AZQR)	LTE5235 5GC001794	475148A	LTE 19A	–	5G20B
AirScale Micro RRH 4T4R B43/n78 40 W (AWHQF)	5GC001274	474877A	–	–	5G19A
AirScale Micro 4T4R B66 20 W (AHIB)	LTE3431 SR002530 5GC001189	474050A	LTE 17A	SRAN 19A	5G19B

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RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale Micro RRH 4T4R n38 80 W (AWHHI)	5GC001881	475263A	–	–	5G20A
AirScale Micro RRH 4T4R n77 20 W (AWHQM)	5GC001832	475246A	–	–	5G19B
AirScale Micro RRH 4T4R n78 40 W (AWHQV)	CB006657	475784A	–	–	5G21B
AirScale Micro RRH 4T4R n79 80 W (AWHTA)	5GC001833	475245A	–	–	5G21B
AirScale Micro 4T4R CBRS 20 W (AZQC)	LTE3628	474156A	LTE 18SP	–	–

Table 12: TD-LTE Remote Radio Heads

RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale RRH 2T2R B40 120 W (AZND/AZNE)	LTE3961	474348A/474350A	LTE 18	–	–
AirScale RRH 4T4R B40 160 W (AZNA)	LTE2810 5GC002361	473914A 473914B	LTE 17A	–	5G20A
AirScale RRH 4T4R B41 160 W (AZHA)	LTE3329 5GC002400	473941A	LTE 17A	–	5G20A
AirScale RRH 4T4R n77 320 W (AZQU) (eCPRI)	CB005708	475665A	–	–	5G21A

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RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale RRH 8T8R B38/n38 320 W (AZHN) (CPRI/eCPRI)	SR002746 CB006131	475547A	–	SRAN 20C	5G21A
AirScale RRH 8T8R B40 240W (AZNB)	LTE3549	474051A	LTE 18SP	–	–
AirScale RRH 8T8R B40 240 W (AZNC)	LTE3550	474052A	LTE 18	–	–
AirScale RRH 8T8R B41/n41 320 W CPRI/eCPRI (AZHL)	5GC002305 SR002812 5GC002270 SR002975	475432A	–	SRAN 20C/SRAN 21A	5G20A/5G21A
AirScale RRH 8T8R n41 320 W eCPRI (AZHM)	5GC002336	475546A	–	–	5G21A
AirScale RRH 8T8R n77 160 W eCPRI (AZQO)	5GC002024	475288A	–	–	5G19B/5G21A
AirScale RRH 8T8R n77 320 W eCPRI (AZQW)	CB006061	475742A	–	–	5G21A
AirScale RRH 8T8R B42 160 W CPRI/eCPRI (AZQP)	LTE5300 CB005852	475198A	LTE 19B MP	–	5G21A
AirScale RRH 8T8R B42 240 W (AZQE)	LTE3736	474717A	LTE 18A	–	–

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RRH name	Feature number	Product code	Introduced in LTE release	Introduced in SRAN release	Introduced in 5G release
AirScale RRH 8T8R B42 240W (AZQF)	LTE3737 CB006118	474188A	LTE 18	–	5G21A
AirScale RRH 8T8R n78 320W (AZQG)	5GC001795	474994A	–	–	5G19A
AirScale RRH 8T8R n78 320W (AZQH)	5GC001810	475074A	–	–	5G19A
AirScale RRH 8T8R n78 320 W eCPRI (AZQI)	5GC001511	475243A	–	–	5G19B/5G21A
AirScale RRH 8T8R n78 320 W eCPRI (AZQJ)	5GC001512 CB007179	475244A	–	22R1-SR	5G19B/5G21A 22R1-5G
AirScale RRH 8T8R n78 320W (AZQL)	5GC001811	475130A	–	–	5G19A
AirScale RRH 8T8R n78 320 W eCPRI (AZQS)	CB005777	475664A	–	–	5G21A
AirScale RRH 8T8R n79 192 W eCPRI (AZTA)	CB006144	475741A	–	22R1-SR	22R1-5G

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5. AirScale macro FDD-LTE radios

Descriptions of RF modules, single band, dual band and triple band remote radio heads.

5.1 Descriptions of RF modules

5.1.1 AirScale RFM 6T6R B1/n1 480 W (ARGA)

ARGA (474800A) is introduced by LTE4640/SR002273/5GC001837.

Functional description

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Table 13: ARGA functional specification

Property	Value
Maximum output power	480 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	6T6R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	WCDMA, FDD-LTE, NR WCDMA-LTE
TX frequency range	B1/n1: 2110–2170 MHz
RX frequency range	B1/n1: 1920–1980 MHz
DL filter bandwidth	60 MHz
UL filter bandwidth	60 MHz
Instantaneous bandwidth (iBW)	60 MHz
Occupied bandwidth) (oBW)	60 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs
Supported bandwidths	5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 6: ARGA interfaces

Table 14: ARGA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: from 10 mm^2 to 35 mm^2 (7 AWG to 2 AWG)
Antenna connector	ANT	6	4.3-10	EMHH required for straight connectors*
Remote Electrical Tilt	RET	1	8-pin circular	RS-485; EMHH required*
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	3	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	2 x M5 screw	-

*EMHH Flexi 3U Casing and High Covers F&B (473187A) are required when connecting either 4.3–10 straight antenna cables or RET cables. For details, see *Single RAN BTS Site Solutions/Nokia AirScale BTS/Nokia AirScale BTS Descriptions/Nokia BTS Optional Items*

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Description.

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 15: ARGA ALD support

ALD support	Value
AISG	ANT1, ANT3, ANT5: AISG 2.0/3.0 ANT2, ANT4, ANT6: AISG 3.0 ping receiver RET: AISG 3.0
Voltage	ANT1, ANT3, ANT5, RET: 14.5 V DC
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

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Figure 7: ARGA functional block diagram

Electrical specifications

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Table 16: ARGA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Table 17: ARGA TX output power tolerance

Property	Value	Description
Typical power tolerance (nominal temperature)	± 0.8 dB	Over full TX RF bandwidth, nominal ambient temperature 25°C (77°F)
Typical power tolerance (extreme temperature)	± 2.0 dB	Over full TX RF bandwidth, extreme ambient temperature 55°C (131°F)

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 18: ARGA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x80	716	940	1510
	1/1/1 2T	2x60	615	786	1210
	1/1/1 2T	2x40	485	600	881
	1/1/1 2T	2x30	440	529	739
	1/1/1 2T	2x20	373	436	582

LTE power back-off

Table 19: Recommended ARGA power back-off in 256 QAM mode

Rated power [W]	Single carrier [dB]	Dual carrier [dB]
80	0.6	1.2
≤60	0	0.6

Related optional items

- AMFN AirScale 2 Casing Adapter RRH 300 (474664A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- EMHA Flexi 3U Mounting Cover (470316A)
- EMHH Flexi 3U High Mounting Cover (473187A)
- FMAA Flexi Mounting Auxiliary Bracket (471657A)
- FMFA Flexi Mounting Kit for Floor, Wall and Pole (470149A)
- FMHA Flexi Side Covers (471524A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- AMRM AirScale one clip kit for RF modules (475018A)
- AMRC AirScale one clip rail 600 mm (474583A)
- FPKC Flexi Pole Mounting Kit (60-300 mm) (472821A)

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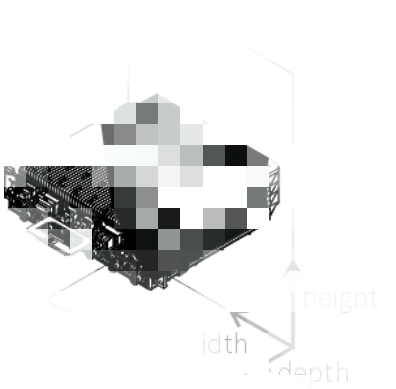
- FSEP Flexi System External OVP (473246A)
- FSES Flexi System External OVP (472285A)

Installation options

- Pole (vertical)
- Wall (vertical)
- Stack
- Inside cabinet
- One-clip rail installation

Dimensions and weight

Table 20: ARGA dimensions and weight

Property	Value	Dimensions orientation
Height	118 mm (4.65 in.)	
Width	441 mm (17.36 in.)	
Depth	402 mm (15.83 in.)	
Weight	23 kg (50.7 lb)	

Environmental specifications

Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

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Table 21: ARGA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

5.1.2 AirScale RFM 6T6R B3/n3 480 W (AREA)

AREA (474198A) is introduced by LTE4208/SR001943/5GC001694.

Functional description

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Table 22: AREA functional specification

Property	Value
Maximum output power	480 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	6T6R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	GSM, FDD-LTE, NR GSM-LTE
TX frequency range	B3/n3: 1805–1880 MHz
RX frequency range	B3/n3: 1710–1785 MHz
DL filter bandwidth	75 MHz
UL filter bandwidth	75 MHz
Instantaneous bandwidth (iBW)	75 MHz
Occupied bandwidth (oBW)	75 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 8: AREA interfaces

Table 23: AREA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 10 mm^2 to 35 mm^2 (7 AWG to 2 AWG)
Antenna connector	ANT	6	4.3-10	EMHH required for straight connectors*
Remote Electrical Tilt	RET	1	8-pin circular	RS-485; EMHH required*
LMI (Local Management Interface and EAC)	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	3	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	2 x M5 screw	–

*EMHH Flexi 3U Casing and High Covers F&B (473187A) are required when connecting either 4.3-10 straight antenna cables or RET cables. For details, see *Single RAN BTS Site*

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Solutions/Nokia AirScale BTS/Nokia AirScale BTS Descriptions/Nokia BTS Optional Items Description.

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 24: AREA ALD support

ALD support	Value
AISG	ANT1, ANT3, ANT5: AISG 2.0/3.0 ANT2, ANT4, ANT6: AISG 3.0 ping receiver RET: AISG 3.0
Voltage	ANT1, ANT3, ANT5, RET: 14.5 V DC
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

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Figure 9: AREA functional block diagram

Electrical specifications

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Table 25: AREA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Table 26: AREA TX output power tolerance

Property	Value	Description
Typical power tolerance (nominal temperature)	± 0.8 dB	Over full TX RF bandwidth, nominal ambient temperature 25°C (77°F)
Typical power tolerance (extreme temperature)	± 2.0 dB	Over full TX RF bandwidth, extreme ambient temperature 55°C (131°F)

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 27: AREA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x80	762	971	1481
	1/1/1 2T	2x60	687	846	1216
	1/1/1 2T	2x40	531	636	869
	1/1/1 2T	2x30	491	575	750
	1/1/1 2T	2x20	418	477	593

LTE power back-off

Table 28: Recommended AREA power back-off in 256 QAM

Rated power [W]	Single carrier [dB]	Dual carrier [dB]
80	0.6	1.2
≤60	0	0.6

GSM cell power range

NOTICE:

Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- AMFN AirScale 2 Casing Adapter RRH 300 (474664A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- EMHA Flexi 3U Mounting Cover (470316A)
- EMHH Flexi 3U High Mounting Cover (473187A)

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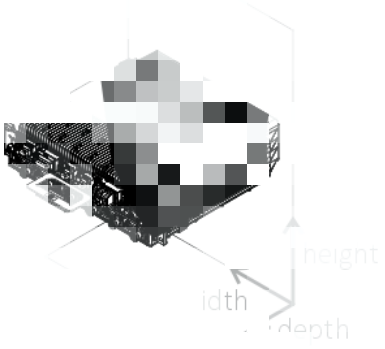
- FMAA Flexi Mounting Auxiliary Bracket (471657A)
- FMFA Flexi Mounting Kit for Floor, Wall and Pole (470149A)
- FMHA Flexi Side Covers (471524A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- AMRM AirScale one clip kit for RF modules (475018A)
- AMRC AirScale one clip rail 600 mm (474583A)
- FPKC Flexi Pole Mounting Kit (60-300 mm) (472821A)
- FSEP Flexi System External OVP (473246A)
- FSES Flexi System External OVP (472285A)

Installation options

- Pole (vertical)
- Wall (vertical)
- Stack
- Inside cabinet
- One-clip rail installation

Dimensions and weight

Table 29: AREA dimensions and weight

Property	Value	Dimensions orientation
Height	118 mm (4.65 in.)	
Width	441 mm (17.36 in.)	
Depth	402 mm (15.83 in.)	
Weight	23 kg (50.7 lb)	

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Environmental specifications

> **Note:**
>
> There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

Table 30: AREA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

5.1.3 AirScale RFM 6T6R B5/n5 480 W (ARCA)

ARCA (474841A) is introduced by LTE4662/SR002152/CB006528.

Functional description

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Table 31: ARCA functional specification

Property	Value
Maximum output power	480 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	6T6R
Outdoor installation	Yes
Supported technologies	GSM, WCDMA, LTE, NR
RF sharing/concurrent mode	Multi-RAT operation NR, LTE, WCDMA, GSM (for concurrent part)
Duplex mode, supported standard	FDD
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B5/n5 : 869–894 MHz
RX frequency range	B5/n5 : 824–849 MHz
DL filter bandwidth	25 MHz
UL filter bandwidth	25 MHz
Instantaneous bandwidth (iBW)	25 MHz
Occupied bandwidth (oBW)	25 MHz
Number of carriers per pipe	Up to 8
Supported bandwidths	LTE: 1.4, 3, 5, 10 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 10: ARCA interfaces

Table 32: ARCA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 10 mm^2 to 35 mm^2 (7 AWG to 2 AWG)
Antenna connector	ANT	6	4.3-10	EMHH required for straight connectors*
Remote Electrical Tilt	RET	1	8-pin circular	RS-485; EMHH required*
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	3	SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6; Nokia IP seal
Grounding (GND)	⏚	1	2 x M5 screw	-

*EMHH Flexi 3U Casing and High Covers F&B (473187A) are required when connecting either 4.3–10 straight antenna cables or RET cables. For details, see *Single RAN BTS Site*

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Solutions/Nokia AirScale BTS/Nokia AirScale BTS Descriptions/Nokia BTS Optional Items Description .

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 33: ARCA ALD support

ALD support	Value
AISG	ANT1, ANT3, ANT5: AISG 2.0/3.0 ANT2, ANT4, ANT6: AISG 3.0 ping receiver RET: AISG 3.0
Voltage	ANT1, ANT3, ANT5, RET: 14.5 V DC
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

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Figure 11: ARCA functional block diagram

Electrical specifications

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Table 34: ARCA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Table 35: ARCA TX output power tolerance

Property	Value	Description
Typical power tolerance (nominal temperature)	± 0.8 dB	Over full TX RF bandwidth, nominal ambient temperature 25°C (77°F)
Typical power tolerance (extreme temperature)	± 2.0 dB	Over full TX RF bandwidth, extreme ambient temperature 55°C (131°F)

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier

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o 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 36: ARCA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x80	724	929	1441
	1/1/1 2T	2x60	643	800	1183
	1/1/1 2T	2x40	515	616	861
	1/1/1 2T	2x30	475	555	739
	1/1/1 2T	2x20	389	444	564

LTE power back-off

Table 37: Recommended ARCA power back-off in 256 QAM mode

Rated power [W]	Single carrier [dB]	Dual carrier [dB]
80	0.6	1.2
≤60	0	0.6

NR power back-off

Recommended value for `dlQam256PowerBackoffSub6` parameter is:

- 1.3 dB for 3GPP performance requirement

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GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- AMFN AirScale 2 Casing Adapter RRH 300 (474664A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- EMHA Flexi 3U Mounting Cover (470316A)
- EMHH Flexi 3U High Mounting Cover (473187A)
- FMAA Flexi Mounting Auxiliary Bracket (471657A)
- FMFA Flexi Mounting Kit for Floor, Wall and Pole (470149A)
- FMHA Flexi Side Covers (471524A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- AMRM AirScale one clip kit for RF modules (475018A)
- AMRC AirScale one clip rail 600 mm (474583A)
- FPKC Flexi Pole Mounting Kit (60-300 mm) (472821A)
- FSEP Flexi System External OVP (473246A)
- FSES Flexi System External OVP (472285A)

Installation options

- Pole (vertical)
- Wall (vertical)
- Stack
- Inside cabinet
- One-clip rail

Dimensions and weight

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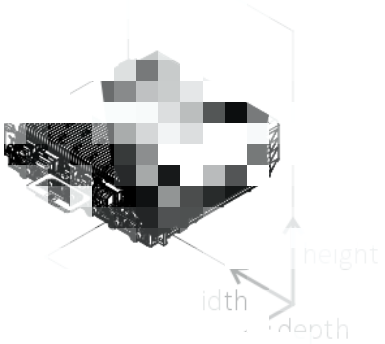
Table 38: ARCA dimensions and weight

Property	Value	Dimensions orientation
Height	118 mm (4.65 in.)	
Width	441 mm (17.36 in.)	
Depth	402 mm (15.83 in.)	
Weight	23 kg (50.7 lb)	

Environmental specifications

Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

Table 39: ARCA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

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5.1.4 AirScale RFM 6T6R B7 360 W (ARHA)

ARHA (474801A) is introduced by LTE4641/5GC001838.

Functional description

Table 40: ARHA functional specification

Property	Value
Maximum output power	360 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	6T6R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	FDD-LTE, NR
TX frequency range	B7: 2620–2690 MHz
RX frequency range	B7: 2500–2570 MHz
DL filter bandwidth	70 MHz
UL filter bandwidth	70 MHz
Instantaneous bandwidth (iBW)	70 MHz
Occupied bandwidth (oBW)	70 MHz
Supported bandwidths	5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 12: ARHA interfaces

Table 41: ARHA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 10 mm^2 to 35 mm^2 (7 AWG to 2 AWG)
Antenna connector	ANT	6	4.3-10	EMHH required for straight cables*
Remote Electrical Tilt	RET	1	8-pin circular	RS-485; EMHH required*
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	3	SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6; Nokia IP seal
Grounding	GND⏚	1	2 x M5 screw	–

*EMHH Flexi 3U Casing and High Covers F&B (473187A) are required when connecting either 4.3-10 straight antenna cables or RET cables. For details, see *Single RAN BTS Site*

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Solutions/Nokia AirScale BTS/Nokia AirScale BTS Descriptions/Nokia BTS Optional Items Description .

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 42: ARHA ALD support

ALD supports	Value
AISG	ANT1, ANT3, ANT5: AISG 2.0/3.0 ANT2, ANT4, ANT6: AISG 3.0 ping receiver RET: AISG 3.0
Voltage	ANT1, ANT3, ANT5, RET: 14.5 V DC
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

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Figure 13: ARHA functional block diagram

Electrical specifications

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Table 43: ARHA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Table 44: ARHA TX output power tolerance

Property	Value	Description
Typical power tolerance (nominal temperature)	± 0.8 dB	Over full TX RF bandwidth, nominal ambient temperature 25°C (77°F)
Typical power tolerance (extreme temperature)	± 2.0 dB	Over full TX RF bandwidth, extreme ambient temperature 55°C (131°F)

Power consumption

Note:

Power consumption values for ARHA are preliminary. Contact Nokia customer team for the latest power consumption values.

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 45: ARHA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x60	686	875	1392
	1/1/1 2T	2x40	549	672	998
	1/1/1 2T	2x30	500	595	830
	1/1/1 2T	2x20	399	466	641

Recommended power back-off

Table 46: Recommended ARHA power back-off in 256 QAM mode

Rated power [W]	Single carrier [dB]	Dual carrier [dB]
60	0	0.6

Related optional items

- AMFN AirScale 2 Casing Adapter RRH 300 (474664A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- EMHA Flexi 3U Mounting Cover (470316A)
- EMHH Flexi 3U High Mounting Cover (473187A)
- FMAA Flexi Mounting Auxiliary Bracket (471657A)
- FMFA Flexi Mounting Kit for Floor, Wall and Pole (470149A)
- FMHA Flexi Side Covers (471524A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- AMRM AirScale one clip kit for RF modules (475018A)
- AMRC AirScale one clip rail 600 mm (474583A)
- FPKC Flexi Pole Mounting Kit (60-300 mm) (472821A)
- FSEP Flexi System External OVP (473246A)
- FSES Flexi System External OVP (472285A)

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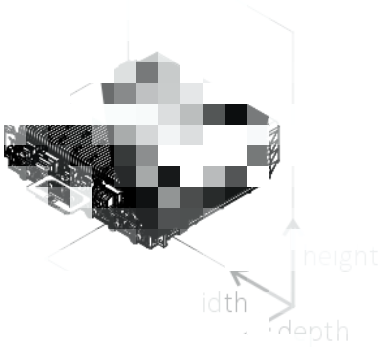
Installation options

- Pole (vertical)
- Wall (vertical)
- Stack
- Inside a cabinet
- One-clip rail installation

Dimensions and weight

Table 47: ARHA dimensions and weight

Property	Value	Dimensions orientation
Height	118 mm (4.65 in.)	
Width	441 mm (17.36 in.)	
Depth	402 mm (15.83 in.)	
Weight	23 kg (50.7 lb)	

Environmental specifications

Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

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Table 48: ARHA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

5.1.5 AirScale RFM 6T6R B8/n8 480 W (ARDA)

ARDA (474840A) is introduced by SR002611/CB006511.

Functional description

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Table 49: ARDA functional specification

Property	Value
Maximum output power	480 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	6T6R
Outdoor installation	Yes
Supported technologies	GSM, WCDMA, FDD-LTE, NR
RF sharing/concurrent mode	Multi-RAT operation NR, LTE, WCDMA, GSM (for concurrent part)
Duplex mode, supported standard	FDD
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B8/n8: 925–960 MHz
RX frequency range	B8/n8: 880–915 MHz
DL filter bandwidth	35 MHz
UL filter bandwidth	35 MHz
Instantaneous bandwidth (iBW)	35 MHz
Occupied bandwidth (oBW)	35 MHz
Number of carriers per pipe	Up to 8
Supported bandwidths	LTE: 1.4, 3, 5, 10 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 14: ARDA interfaces

Table 50: ARDA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 10 mm^2 to 35 mm^2 (7 AWG to 2 AWG)
Antenna connector	ANT	6	4.3-10	EMHH required for straight connectors*
Remote Electrical Tilt	RET	1	8-pin circular	RS-485; EMHH required*
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	3	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	2 x M5 screw	-

*EMHH Flexi 3U Casing and High Covers F&B (473187A) are required when connecting either 4.3–10 straight antenna cables or RET cables. For details, see *Single RAN BTS Site Solutions/Nokia AirScale BTS/Nokia AirScale BTS Descriptions/Nokia BTS Optional Items*

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Description .

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 51: ARDA ALD support

Property	Value
AISG	ANT1, ANT3, ANT5: AISG 2.0/3.0 ANT2, ANT4, ANT6: AISG 3.0 ping receiver RET: AISG 3.0
Voltage	ANT1, ANT3, ANT5, RET: 14.5 V DC
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

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Figure 15: ARDA functional block diagram

Electrical specifications

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Table 52: ARDA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below/beyond the extended limits, the unit might shut down.

Table 53: ARDA TX output power tolerance

Property	Value	Description
Typical power tolerance (nominal temperature)	± 0.8 dB	Over full TX RF bandwidth, nominal ambient temperature 25°C (77°F)
Typical power tolerance (extreme temperature)	± 2.0 dB	Over full TX RF bandwidth, extreme ambient temperature 55°C (131°F)

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 54: ARDA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x80	745	955	1468
	1/1/1 2T	2x60	667	828	1210
	1/1/1 2T	2x40	555	664	898
	1/1/1 2T	2x30	514	603	782
	1/1/1 2T	2x20	448	511	630

LTE power back-off

Table 55: Recommended ARDA power back-off in 256 QAM mode

Rated power [W]	Single carrier [dB]	Dual carrier [dB]
80	0.6	1.2
≤60	0	0.6

NR power back-off

Recommended value for `dlQam256PowerBackoffSub6` parameter is:

- 0.6/1.2 dB for 3GPP performance requirement
- 3.0 dB for high peak UE throughput (4x4 DL MIMO)

GSM cell power range

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NOTICE:

Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- AMFN AirScale 2 Casing Adapter RRH 300 (474664A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- EMHA Flexi 3U Mounting Cover (470316A)
- EMHH Flexi 3U High Mounting Cover (473187A)
- FMAA Flexi Mounting Auxiliary Bracket (471657A)
- FMFA Flexi Mounting Kit for Floor, Wall and Pole (470149A)
- FMHA Flexi Side Covers (471524A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- AMRM AirScale one clip kit for RF modules (475018A)
- AMRC AirScale one clip rail 600 mm (474583A)
- FPKC Flexi Pole Mounting Kit (60-300 mm) (472821A)
- FSEP Flexi System External OVP (473246A)
- FSES Flexi System External OVP (472285A)

Installation options

- Pole (vertical)
- Wall (vertical)
- Stack
- Inside cabinet
- One-clip rail

Dimensions and weight

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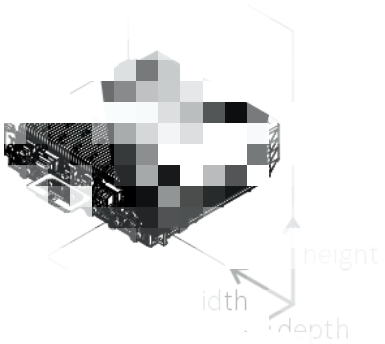
Table 56: ARDA dimensions and weight

Property	Value	Dimensions orientation
Height	118 mm (4.65 in.)	
Width	441 mm (17.36 in.)	
Depth	402 mm (15.83 in.)	
Weight	23 kg (50.7 lb)	

Environmental specifications

Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

Table 57: ARDA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

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5.1.6 AirScale RFM 6T6R B8/n8 480 W (ARDB)

ARDB (475122A) is introduced by SR002531/CB006578.

Functional description

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Table 58: ARDB functional specification

Property	Value
Maximum output power	480 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	6T6R
Outdoor installation	Yes
Supported technologies	GSM, WCDMA, FDD-LTE, NR
RF sharing/concurrent mode	Multi-RAT operation NR, LTE, WCDMA, GSM (for concurrent part)
Duplex mode, supported standard	FDD
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B8/n8 : 935–960 MHz
RX frequency range	B8/n8 : 890–915 MHz
DL filter bandwidth	25 MHz
UL filter bandwidth	25 MHz
Instantaneous bandwidth (iBW)	25 MHz
Occupied bandwidth (oBW)	25 MHz
Number of carriers per pipe	Up to 8
Supported bandwidths	LTE: 1.4, 3, 5, 10 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 16: ARDB interfaces

Table 59: ARDB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 10 mm^2 to 35 mm^2 (7 AWG to 2 AWG)
Antenna connector	ANT	6	4.3-10	EMHH required for straight connectors*
Remote Electrical Tilt	RET	1	8-pin circular	RS-485; EMHH required*
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	3	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	2 x M5 screw	-

*EMHH Flexi 3U Casing and High Covers F&B (473187A) are required when connecting either 4.3–10 straight antenna cables or RET cables. For details, see *Single RAN BTS Site Solutions/Nokia AirScale BTS/Nokia AirScale BTS Descriptions/Nokia BTS Optional Items*

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Description .

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 60: ARDB ALD support

ALD support	Value
AISG	ANT1, ANT3, ANT5: AISG 2.0/3.0 ANT2, ANT4, ANT6: AISG 3.0 ping receiver RET: AISG 3.0
Voltage	ANT1, ANT3, ANT5, RET: 14.5 V DC
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

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Figure 17: ARDB functional block diagram

Electrical specifications

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Table 61: ARDB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Table 62: ARDB TX output power tolerance

Property	Value	Description
Typical power tolerance (nominal temperature)	± 0.8 dB	Over full TX RF bandwidth, nominal ambient temperature 25°C (77°F)
Typical power tolerance (extreme temperature)	± 2.0 dB	Over full TX RF bandwidth, extreme ambient temperature 55°C (131°F)

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 63: ARDB power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x80	748	959	1485
	1/1/1 2T	2x60	669	832	1222
	1/1/1 2T	2x40	558	670	906
	1/1/1 2T	2x30	517	608	787
	1/1/1 2T	2x20	450	514	634

LTE power back-off

Table 64: Recommended ARDB power back-off in 256 QAM mode

Rated power [W]	Single carrier [dB]	Dual carrier [dB]
80	0.6	1.2
≤60	0	0.6

NR power back-off

Recommended value for `dlQam256PowerBackoffSub6` parameter is:

- 0.6/1.2 dB for 3GPP performance requirement
- 3.0 dB for high peak UE throughput (4x4 DL MIMO)

GSM cell power range

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NOTICE:

Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- AMFN AirScale 2 Casing Adapter RRH 300 (474664A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- EMHA Flexi 3U Mounting Cover (470316A)
- EMHH Flexi 3U High Mounting Cover (473187A)
- FMAA Flexi Mounting Auxiliary Bracket (471657A)
- FMFA Flexi Mounting Kit for Floor, Wall and Pole (470149A)
- FMHA Flexi Side Covers (471524A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- AMRM AirScale one clip kit for RF modules (475018A)
- AMRC AirScale one clip rail 600 mm (474583A)
- FPKC Flexi Pole Mounting Kit (60-300 mm) (472821A)
- FSEP Flexi System External OVP (473246A)
- FSES Flexi System External OVP (472285A)

Installation options

- Pole (vertical)
- Wall (vertical)
- Stack
- Inside cabinet
- One-clip rail

Dimensions and weight

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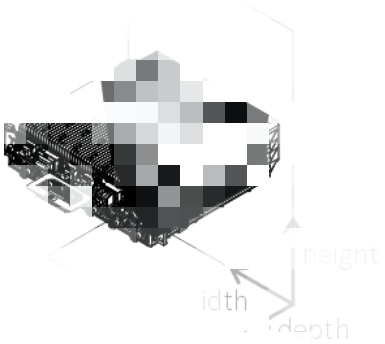
Table 65: ARDB dimensions and weight

Property	Value	Dimensions orientation
Height	118 mm (4.65 in.)	
Width	441 mm (17.36 in.)	
Depth	402 mm (15.83 in.)	
Weight	23 kg (50.7 lb)	

Environmental specifications

Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

Table 66: ARDB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

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5.1.7 AirScale RFM 6T6R B20/n20 360 W (ARMA)

ARMA (474803A) is introduced by LTE5070/CB006587.

Functional description

Table 67: ARMA functional specification

Property	Value
Maximum output power	360 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	6T6R
Outdoor installation	Yes
Supported technologies	FDD-LTE, NR
RF sharing/concurrent mode	Multi-RAT operation NR, LTE (for concurrent part)
Duplex mode, supported standard	FDD
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B20/n20 : 791–821 MHz
RX frequency range	B20/n20 : 832–862 MHz
DL filter bandwidth	30 MHz
UL filter bandwidth	30 MHz
Instantaneous bandwidth (iBW)	30 MHz
Occupied bandwidth (oBW)	30 MHz
Number of carriers per pipe	Up to 8
Supported bandwidths	5, 10, 15, 20 MHz
PIM cancellation	Yes

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Interfaces

Figure 18: ARMA interfaces

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Table 68: ARMA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 10 mm^2 to 35 mm^2 (7 AWG to 2 AWG)
Antenna connector	ANT	6	4.3-10	EMHH required for straight cables*
Remote Electrical Tilt	RET	1	8-pin circular	RS-485; EMHH required*
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	3	SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6; Nokia IP seal
Grounding	GND ⏚	1	2 x M5 screw	-

*EMHH Flexi 3U Casing and High Covers F&B (473187A) are required when connecting either 4.3–10 straight antenna cables or RET cables. For details, see *Single RAN BTS Site Solutions/Nokia AirScale BTS/Nokia AirScale BTS Descriptions/Nokia BTS Optional Items Description* .

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 69: ARMA ALD support

ALD support	Value
AISG	ANT1, ANT3, ANT5: AISG 2.0/3.0 ANT2, ANT4, ANT6: AISG 3.0 ping receiver RET: AISG 3.0
Voltage	ANT1, ANT3, ANT5, RET: 14.5 V DC
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 19: ARMA functional block diagram

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Electrical specifications

Table 70: ARMA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Table 71: ARMA TX output power tolerance

Property	Value	Description
Typical power tolerance (nominal temperature)	± 0.8 dB	Over full TX RF bandwidth, nominal ambient temperature 25°C (77°F)
Typical power tolerance (extreme temperature)	± 2.0 dB	Over full TX RF bandwidth, extreme ambient temperature 55°C (131°F)

Power consumption

Note:

Power consumption values for ARMA are preliminary. Contact Nokia customer team for the latest power consumption values.

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 72: ARMA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x60	613	765	1147
	1/1/1 2T	2x40	492	592	829
	1/1/1 2T	2x30	452	531	711
	1/1/1 2T	2x20	372	426	541

LTE power back-off

Table 73: Recommended ARMA power back-off in 256 QAM mode

Rated power [W]	Single carrier [dB]	Dual carrier [dB]
60	0	0.6

NR power back-off

Recommended value for `dlQam256PowerBackoffSub6` parameter is:

- 0.6 dB for 3GPP performance requirement

Related optional items

- AMFN AirScale 2 Casing Adapter RRH 300 (474664A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- EMHA Flexi 3U Mounting Cover (470316A)
- EMHH Flexi 3U High Mounting Cover (473187A)
- FMAA Flexi Mounting Auxiliary Bracket (471657A)
- FMFA Flexi Mounting Kit for Floor, Wall and Pole (470149A)
- FMHA Flexi Side Covers (471524A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- AMRM AirScale one clip kit for RF modules (475018A)

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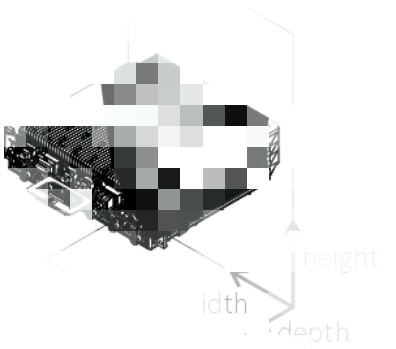
- AMRC AirScale one clip rail 600 mm (474583A)
- FPKC Flexi Pole Mounting Kit (60-300 mm) (472821A)
- FSEP Flexi System External OVP (473246A)
- FSES Flexi System External OVP (472285A)

Installation options

- Pole (vertical)
- Wall (vertical)
- Stack
- Inside cabinet
- One-clip rail

Dimensions and weight

Table 74: ARMA dimensions and weight

Property	Value	Dimensions orientation
Height	118 mm (4.65 in.)	
Width	441 mm (17.36 in.)	
Depth	402 mm (15.83 in.)	
Weight	23 kg (50.7 lb)	

Environmental specifications

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Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

Table 75: ARMA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

5.1.8 AirScale RFM 6T6R B28/n28 360 W (ARPA)

ARPA (474802A) is introduced by LTE4663/5GC002227.

Functional description

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Table 76: ARPA functional specification

Property	Value
Maximum output power	360 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	6T6R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	FDD-LTE, NR
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B28/n28: 758–788 MHz
RX frequency range	B28/n28: 703–733 MHz
DL filter bandwidth	30 MHz
UL filter bandwidth	30 MHz
Instantaneous bandwidth (iBW)	30 MHz
Occupied bandwidth (oBW)	30 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs
Supported bandwidths	LTE: 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 20: ARPA interfaces

Table 77: ARPA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 10 mm^2 to 35 mm^2 (7 AWG to 2 AWG)
Antenna connector	ANT	6	4.3-10	EMHH required for straight cables*
Remote Electrical Tilt	RET	1	8-pin circular	RS-485; EMHH required*
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	3	SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6; Nokia IP seal
Grounding	GND ⏚	1	2 x M5 screw	–

*EMHH Flexi 3U Casing and High Covers F&B (473187A) are required when connecting either 4.3-10 straight antenna cables or RET cables. For details, see *Single RAN BTS Site*

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Solutions/Nokia AirScale BTS/Nokia AirScale BTS Descriptions/Nokia BTS Optional Items Description .

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 78: ARPA ALD support

ALD support	Value
AISG	ANT1, ANT3, ANT5: AISG 2.0/3.0 ANT2, ANT4, ANT6: AISG 3.0 ping receiver RET: AISG 3.0
Voltage	ANT1, ANT3, ANT5, RET: 14.5 V DC
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

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Figure 21: ARPA functional block diagram

Electrical specifications

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Table 79: ARPA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Table 80: ARPA TX output power tolerance

Property	Value	Description
Typical power tolerance (nominal temperature)	± 0.8 dB	Over full TX RF bandwidth, nominal ambient temperature 25°C (77°F)
Typical power tolerance (extreme temperature)	± 2.0 dB	Over full TX RF bandwidth, extreme ambient temperature 55°C (131°F)

Power consumption

Note:

Power consumption values for ARPA are preliminary. Contact Nokia customer team for the latest power consumption values.

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 81: ARPA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x60	576	723	1086
	1/1/1 2T	2x40	450	547	779
	1/1/1 2T	2x30	414	489	659
	1/1/1 2T	2x20	338	389	500

LTE power back-off

Table 82: Recommended ARPA power back-off in 256 QAM mode

Rated power [W]	Single carrier [dB]	Dual carrier [dB]
60	0	0.6

Related optional items

- AMFN AirScale 2 Casing Adapter RRH 300 (474664A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- EMHA Flexi 3U Mounting Cover (470316A)
- EMHH Flexi 3U High Mounting Cover (473187A)
- FMAA Flexi Mounting Auxiliary Bracket (471657A)
- FMFA Flexi Mounting Kit for Floor, Wall and Pole (470149A)
- FMHA Flexi Side Covers (471524A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- AMRM AirScale one clip kit for RF modules (475018A)
- AMRC AirScale one clip rail 600 mm (474583A)
- FPKC Flexi Pole Mounting Kit (60-300 mm) (472821A)
- FSEP Flexi System External OVP (473246A)
- FSES Flexi System External OVP (472285A)

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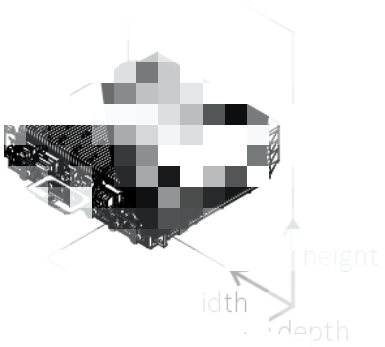
Installation options

- Pole (vertical)
- Wall (vertical)
- Stack
- Inside a cabinet
- One-clip rail installation

Dimensions and weight

Table 83: ARPA dimensions and weight

Property	Value	Dimensions orientation
Height	118 mm (4.65 in.)	
Width	441 mm (17.36 in.)	
Depth	402 mm (15.83 in.)	
Weight	23 kg (50.7 lb)	

Environmental specifications

Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

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Table 84: ARPA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

5.2 Descriptions of single band remote radio heads

5.2.1 AirScale RRH 2T B32/75 120 W (AHSA)

AHSA (475015A) is introduced by LTE5048.

Functional description

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Table 85: AHSA functional specification

Property	Value
Maximum output power	120 W
Modulation	256 QAM (DL)
MIMO mode	2T
Outdoor installation	Yes
Supported technologies	FDD-LTE, NR-ready
TX frequency range	B32: 1452–1496 MHz B75: 1432–1517 MHz
DL filter bandwidth	85 MHz
Instantaneous bandwidth (iBW)	B32: 44 MHz B75: 85 MHz
Occupied bandwidth (oBW)	80 MHz
Number of carriers per pipe	Up to 6
Supported bandwidths	5, 10, 15, 20 MHz

Interfaces

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Figure 22: AHSA interfaces

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Table 86: AHSA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
Optical interface	OPT	2	SFP	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
External Alarm Connection	EAC	1	MDR-26	4 alarm inputs and 1 control output
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 87: AHSA ALD support

ALD support	Value
AISG	RET, ANT1, ANT2: AISG 2.0/3.0
Voltage	RET, ANT1, ANT2: 14.5 V
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 23: AHSA functional block diagram

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Electrical specifications

Table 88: AHSA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 89: AHSA power consumption in LTE mode

Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
1/1/1 2T	2x60	640	784	1137
1/1/1 2T	2x40	526	623	831
1/1/1 2T	2x30	460	533	689
1/1/1 2T	2x20	381	430	533

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGD AirScale 2 cover 300 x 126-150 (474270A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)

Installation options

- Pole:
  - Vertical

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    - One-clip rail
    - Book mounting
- Wall:
    - Vertical
    - Horizontal with an optional fan
    - One-clip rail
    - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 90: AHSA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.25 in.) With mounting brackets: 428 mm (16.87 in.)	
Width	309 mm (12.17 in.)	
Depth	Core RRH: 130 mm (5.12 in.) With mounting brackets: 153 mm (6.02 in.)	
Weight	12.0 kg (26.5 lb)	

Environmental specifications

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Table 91: AHSA environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	55°C (131°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
IP rating	IP65

NOTICE:

You should use a fan when ambient temperature can be higher than 45°C (113°F) and at the same time traffic load often exceeds 70%.

5.2.2 AirScale RRH 2T2R B3/n3 120 W (FHEL)

FHEL (473475A) is introduced by LTE2680/CB006679.

Functional description

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Table 92: FHEL functional specification

Property	Value
Maximum output power	120 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T2R
Outdoor installation	Yes
Supported technologies	GSM, FDD-LTE, NR
RF sharing/concurrent mode	NR, LTE, GSM
Duplex mode, supported standard	FDD
TX frequency range	B3/n3: 1805–1880 MHz
RX frequency range	B3/n3: 1710–1785 MHz
DL filter bandwidth	75 MHz
UL filter bandwidth	75 MHz
Instantaneous bandwidth (iBW) (DL)	75 MHz 37.5 MHz in GSM
Instantaneous bandwidth (iBW) (UL)	75 MHz
Occupied bandwidth (oBW)	40 MHz
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz

Interfaces

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Figure 24: FHEL interfaces

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Table 93: FHEL interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 3.3 mm^2 to 35 mm^2 (12 AWG to 2 AWG)
Antenna connector	ANT	2	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	USB 3.0 Type-A	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	6 Gbps, OBSAI, Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	Fan	1	2-pin Micro-Fit	–

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 94: FHEL ALD support

ALD support	Value
AISG	RET: 2.0
Voltage	RET: 14.5 V
Power on RET port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 25: FHEL functional block diagram

Electrical specifications

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Table 95: FHEL electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 96: FHEL power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption ETSI 202706 average load P_{RRH}, static	Power consumption ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption 100% RF power load $P_{100\%\ RRH}$	Power consumption Typical as 25% TCH load, 60% DTX, 4 dB PC	Power consumption Busy as 50% TCH load, 60% DTX, 4 dB PC	Power consumption Max load (2% GoS), 60% DTX, 4 dB PC
GSM	1/1/1	20	453	453	453	453	453	453
	2/2/2	20	469	489	570	459	463	467
	4/4/4	20	601	725	1015	582	664	694
LTE	1/1/1 2T	20+20	525	609	760	-	-	-
	1/1/1 2T	40+40	637	776	1050	-	-	-
	1/1/1 2T	60+60	742	938	1353	-	-	-
MSR	GSM 2/2/2 LTE 1/1/1 2T 10 MHz	20 20+20	669	754	968	-	-	-
	GSM 4/4/4 LTE 1/1/1 2T 10 MHz	15 20+20	699	821	1059	-	-	-

Recommended power back-off

Table 97: FHEL power back-off in 256 QAM

Single carrier [dB]	Dual carrier [dB]
0.7	1

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GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- Mandatory optional item: FMNG AirScale 1.0 Small Book Mount Kit (473980A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- FMND AirScale Small Fan Kit (473598A)
- AMLA Flat mount adapter bracket (473881A)
- FMNH AirScale Ladder Mount Kit (474091A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)

Installation options

- Wall
  - Flat
  - Vertically
  - Horizontally
- Pole
  - Flat
  - Vertically
  - Horizontally

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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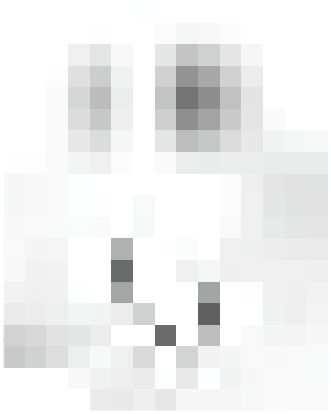
Table 98: FHEL dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 591.6 mm (23.29 in.) With cover, handle, and unit bracket: 600 mm (23.62 in.) With cover, handle, unit bracket, and fan kit: 630.2 mm (24.81 in.)	Dimensions orientation in vertical mount with cover  Dimensions orientation in horizontal mount with cover and fan
Width	Core RRH: 77.5 mm (3.05 in.) With cover, handle, and unit bracket: 80 mm (3.15 in.) With cover, handle, unit bracket, and fan kit: 80 mm (3.15 in.) With cover, handle, unit bracket, and fan kit (unit bracket rotated 90 degrees for horizontal mounting): 143 mm (5.63 in.)	
Depth	Core RRH: 320 mm (12.6 in.) With cover, handle, and unit bracket: 424 mm (16.69 in.) With cover, handle, unit bracket, and fan kit: 424 mm (16.69 in.)	
Weight	Core RRH: 12.5 kg (27.5 lb) With cover, handle and unit mounting bracket: 14.4 kg (31.7 lb) With cover, handle, unit mounting bracket, and fan kit: 15.5 kg (34.2 lb)	

Environmental specifications

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Table 99: FHEL environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	55°C (131°F)
Maximum operational outdoor temperature in the sun, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	50°C (122°F)
Maximum indoor temperature, assuming wind speed is 0 m/s, valid for fanless products (at constant high ambient temperature, maximum output power might be limited)	40°C (104°F)
Minimum operational temperature (including cold start)	-40°C (-40°F)
IP rating	IP65

5.2.3 AirScale RRH 2T2R 900J 120 W (FHDI)

FHDI (473825A) is introduced by LTE3516/SR001451.

Functional description

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Table 100: FHDI functional specification

Property	Value
Maximum output power	120 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T2R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	GSM, WCDMA, FDD-LTE, NR-ready
TX frequency range	B8: 935–960 MHz
RX frequency range	B8: 890–915 MHz
DL filter bandwidth	25 MHz
UL filter bandwidth	25 MHz
Instantaneous bandwidth (iBW)	25 MHz
Occupied bandwidth (oBW)	25 MHz
Number of carriers per pipe	Up to 5
Supported bandwidths	1.4, 3, 5, 10 MHz

Interfaces

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Figure 26: FHDI interfaces

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Table 101: FHDI interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 3.3 mm^2 to 35 mm^2 (12 AWG to 2 AWG)
Antenna connector	ANT	2	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	USB 3.0 Type A	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	6 Gbps, OBSAI, Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	Fan	1	2-pin Micro-Fit	–

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 102: FHDI ALD support

ALD support	Value
AISG	RET: 2.0
Voltage	RET: 14.5 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 27: FHDI functional block diagram

Electrical specifications

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Table 103: FHDI electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, the unit might shut down.

Power consumption

Note:

Contact Nokia customer team for the latest power consumption values.

GSM cell power range

NOTICE:

Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- Mandatory optional item: FMNG AirScale 1.0 Small Book Mount Kit (473980A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- FMND AirScale Small Fan Kit (473598A)
- AMLA Flat mount adapter bracket (473881A)
- FMNH AirScale Ladder Mount Kit (474091A)

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- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)

Installation options

- Wall
  - Flat
  - Vertically
  - Horizontally (secondary bracket rotated 90°)
  - Horizontally (unit bracket rotated 90°)
- Pole
  - Flat
  - Vertically
  - Horizontally

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 104: FHDI dimensions and weight

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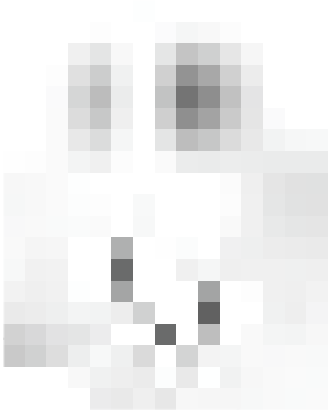
Property	Value	Dimensions orientation
Height	Core RRH: 591.6 mm (23.3 in.) With cover, handle, and unit bracket: 600 mm (23.6 in.) With cover, handle, unit bracket, and fan kit: 630.2 mm (24.8 in.)	Dimensions orientation in vertical mount with cover  Dimensions orientation in horizontal mount with cover and fan
Width	Core RRH: 77.5 mm (3 in.) With cover, handle, and unit bracket: 80 mm (3.1 in.) With cover, handle, unit bracket, and fan kit : 80 mm (3.1 in.) With cover, handle, unit bracket, and fan kit (unit bracket rotated 90 degrees for horizontal mounting) : 143 mm (5.6 in.)	
Depth	320 mm (9.6 in.) With cover, handle, and unit bracket: 424 mm (16.7 in.) With cover, handle, unit bracket, and fan kit: 424 mm (16.7 in.)	
Weight	Core RRH: 12.5 kg (27.5 lb) With cover, handle and unit mounting bracket: 14.4 kg (31.7 lb) With cover, handle, unit mounting bracket, and fan kit: 15.5 kg (34.2 lb	
Volume	Core RRH: 12.5 l With cover, handle, and unit bracket: 20.3 l With cover, handle, unit bracket, and fan kit: 32 l	

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Environmental specifications

Table 105: FHDI environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, assuming wind speed is 3 m/s (at a constant high ambient temperature, maximum output power might be limited)	55°C (131°F)
Maximum operational outdoor temperature in the sun, assuming wind speed is 3 m/s (at a constant high ambient temperature, maximum output power might be limited)	50°C (122°F)
Maximum indoor temperature, assuming wind speed is 0 m/s, valid for fanless products (at a constant high ambient temperature, maximum output power might be limited)	40°C (104°F)
Minimum operational temperature (including cold start)	-40°C (-40°F)
IP rating	IP65

5.2.4 AirScale RRH 2T2R B11 120 W (FHKA)

FHKA (473838A) is introduced by LTE3184.

Functional description

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Table 106: FHKA functional specification

Property	Value
Maximum output power	120 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T2R
Outdoor installation	Yes
Supported technologies	FDD-LTE, NR-ready
TX frequency range	1475.9–1495.9 MHz
RX frequency range	1427.9–1447.9 MHz
DL filter bandwidth	20 MHz
UL filter bandwidth	20 MHz
Instantaneous bandwidth (iBW)	20 MHz
Occupied bandwidth (oBW)	20 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	5, 10 MHz

Interfaces

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Figure 28: FHKA interfaces

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Table 107: FHKA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 3.3 mm^2 to 35 mm^2 (12 AWG to 2 AWG)
Antenna connector	ANT	2	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	USB 3.0 Type-A	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	6 Gbps, OBSAI, Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	Fan	1	2-pin Micro-Fit	–

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 108: FHKA ALD support

ALD support	Value
AISG	RET: 2.0
Proprietary AISG1.1	No
Voltage	RET: 14.5 V
Power on RET port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 29: FHKA functional block diagram

Electrical specifications

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Table 109: FHKA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 110: FHKA power consumption in LTE mode

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average load P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1/1/1 2T	20+20	383	447	581
1/1/1 2T	40+40	508	631	908
1/1/1 2T	60+60	609	790	1218

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Related optional items

- Mandatory optional item: FMNG AirScale 1.0 Small Book Mount Kit (473980A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- FMND AirScale Small Fan Kit (473598A)
- AMLA Flat mount adapter bracket (473881A)
- FMNH AirScale Ladder Mount Kit (474091A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)

Installation options

- Pole:
  - Flat mount
  - Vertical
  - Horizontal
- Wall:
  - Flat mount
  - Vertical
  - Horizontal

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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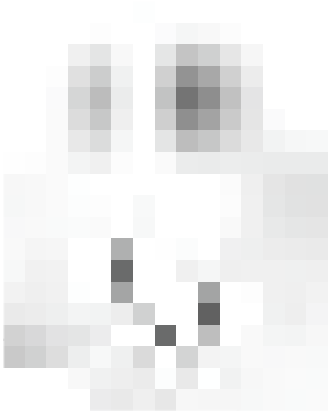
Table 111: FHKA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 591.6 mm (23.29 in.) With cover, handle, and unit bracket: 600 mm (23.62 in.) With cover, handle, unit bracket, and fan kit: 630.2 mm (24.81 in.)	Dimensions orientation in vertical mount with cover 
Width	Core RRH: 77.5 mm (3.05 in.) With cover, handle, and unit bracket: 80 mm (3.15 in.) With cover, handle, unit bracket, and fan kit: 80 mm (3.15 in.) With cover, handle, unit bracket, and fan kit (unit bracket rotated 90 degrees for horizontal mounting): 143 mm (5.63 in.)	
Depth	Core RRH: 320 mm (12.6 in.) With cover, handle, and unit bracket: 424 mm (16.69 in.) With cover, handle, unit bracket, and fan kit: 424 mm (16.69 in.)	Dimensions orientation in horizontal mount with cover and fan
Weight	Core RRH: 12.5 kg (27.5 lb) With cover, handle and unit mounting bracket: 14.4 kg (31.7 lb) With cover, handle, unit mounting bracket, and fan kit: 15.5 kg (34.2 lb)	

Environmental specifications

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Table 112: FHKA environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	55°C (131°F)
Maximum operational outdoor temperature in the sun, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	50°C (122°F)
Maximum indoor temperature, assuming wind speed is 0 m/s, valid for fanless products (at constant high ambient temperature, maximum output power might be limited)	40°C (104°F)
Minimum operational temperature (including cold start)	-40°C (-40°F)
IP rating	IP65

5.2.5 AirScale RRH 2T2R B28/n28 120 W (FHPD)

FHPD (473821A) is introduced by LTE3181/CB006680.

Functional description

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Table 113: FHPD functional specification

Property	Value
Maximum output power	120 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T2R
Outdoor installation	Yes
Supported technologies	NR, FDD-LTE
RF sharing/concurrent mode	NR-LTE
Duplex mode, supported standard	FDD
TX frequency range	B28/n28: 758–803 MHz
RX frequency range	B28/n28: 703–748 MHz
DL filter bandwidth	45 MHz
UL filter bandwidth	45 MHz
Instantaneous bandwidth (iBW)	45 MHz
Occupied bandwidth (oBW)	45 MHz
Supported bandwidths	LTE: 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz

Interfaces

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Figure 30: FHPD interfaces

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Table 114: FHPD interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 3.3 mm^2 to 35 mm^2 (12 AWG to 2 AWG)
Antenna connector	ANT	2	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	USB 3.0 Type-A	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	6 Gbps, OBSAI, Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	Fan	1	2-pin Micro-Fit	–

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 115: FHPD ALD support

ALD support	Value
AISG	RET: 2.0
Voltage	RET: 14.5 V
Power on RET port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 31: FHPD functional block diagram

Electrical specifications

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Table 116: FHPD electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 117: FHPD power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average load P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	20+20	432	499	616
	1/1/1 2T	40+40	567	686	924
	1/1/1 2T	60+60	663	834	1203

LTE power back-off

Table 118: FHPD power back-off in 256 QAM

Single carrier [dB]	Dual carrier [dB]
0.7	0.8

Related optional items

- Mandatory optional item: FMNG AirScale 1.0 Small Book Mount Kit (473980A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- FMND AirScale Small Fan Kit (473598A)
- AMLA Flat mount adapter bracket (473881A)
- FMNH AirScale Ladder Mount Kit (474091A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)

Installation options

- Pole:
  - Flat mount
  - Vertical
  - Horizontal

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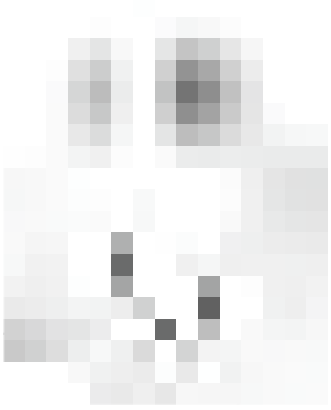
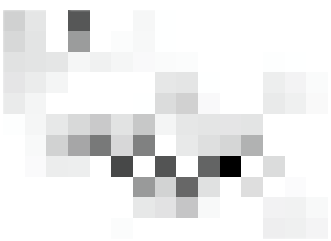
- Wall:
  - Flat mount
  - Vertical
  - Horizontal

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 119: FHPD dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 591.6 mm (23.29 in.) With cover, handle, and unit bracket: 600 mm (23.62 in.) With cover, handle, unit bracket, and fan kit: 630.2 mm (24.81 in.)	Dimensions orientation in vertical mount with cover 
Width	Core RRH: 77.5 mm (3.05 in.) With cover, handle, and unit bracket: 80 mm (3.15 in.) With cover, handle, unit bracket, and fan kit: 80 mm (3.15 in.) With cover, handle, unit bracket, and fan kit (unit bracket rotated 90 degrees for horizontal mounting): 143 mm (5.63 in.)	
Depth	Core RRH: 320 mm (12.6 in.) With cover, handle, and unit bracket: 424 mm (16.69 in.) With cover, handle, unit bracket, and fan kit: 424 mm (16.69 in.)	Dimensions orientation in horizontal mount with cover and fan 
Weight	Core RRH: 13.5 kg (29.8 lb) With cover, handle and unit mounting bracket: 15.4 kg (33.9 lb) With cover, handle, unit mounting bracket, and fan kit: 16.5 kg (36.4 lb)	

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Environmental specifications

Table 120: FHPD environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	55°C (131°F)
Maximum operational outdoor temperature in the sun, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	50°C (122°F)
Maximum indoor temperature, assuming wind speed is 0 m/s, valid for fanless products (at constant high ambient temperature, maximum output power might be limited)	40°C (104°F)
Minimum operational temperature (including cold start)	-40°C (-40°F)
IP rating	IP65

5.2.6 AirScale RRH 2T2R 700 120 W (FHPG)

FHPG (474407A) is introduced by LTE4167.

Functional description

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Table 121: FHPG functional specification

Property	Value
Maximum output power	120 W
Modulation	64 QAM /256 QAM (DL) 64 QAM /256 QAM (UL)
MIMO mode	2T2R
Outdoor installation	Yes
Supported technologies	FDD-LTE, NR-ready
TX frequency range	B28: DL 773–783 MHz
RX frequency range	B28: UL 718–728 MHz
DL filter bandwidth	10 MHz
UL filter bandwidth	10 MHz
Instantaneous bandwidth (iBW)	10 MHz
Occupied bandwidth (oBW)	10 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	3, 5, 10 MHz

Interfaces

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Figure 32: FHPG interfaces

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Table 122: FHPG interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: 3.3 mm^2 to 35 mm^2 (12 AWG to 2 AWG)
Antenna connector	ANT	2	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	USB 3.0 Type-A	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	6 Gbps, OBSAI, Nokia IP seal
Fan	Fan	1	2-pin Micro-Fit	–
Grounding	GND ⏚	1	M8 or dual M5 screws	–

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 123: FHPG ALD support

ALD support	Value
AISG	RET: 2.0
Voltage	RET 14.5V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 33: FHPG functional block diagram

Electrical specifications

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Table 124: FHPG electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 125: FHPG power consumption in LTE mode

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average load P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1/1/1 2T	20+20	432	499	616
1/1/1 2T	40+40	567	686	924
1/1/1 2T	60+60	663	834	1203

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Related optional items

- Mandatory optional item: FMNG AirScale 1.0 Small Book Mount Kit (473980A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- FMND AirScale Small Fan Kit (473598A)
- AMLA Flat mount adapter bracket (473881A)
- FMNH AirScale Ladder Mount Kit (474091A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)

Installation options

- Wall
  - Flat
  - Vertically
  - Horizontally (secondary bracket rotated 90°)
  - Horizontally (unit bracket rotated 90°)
- Pole
  - Flat
  - Vertically
  - Horizontally

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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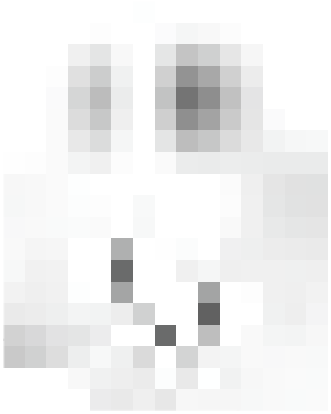
Table 126: FHPG dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 591.6 mm (23.29 in.) With cover, handle, and unit bracket: 600 mm (23.62 in.) With cover, handle, unit bracket, and fan kit: 630.2 mm (24.81 in.)	Dimensions orientation in vertical mount with cover 
Width	Core RRH: 77.5 mm (3.05 in.) With cover, handle, and unit bracket: 80 mm (3.15 in.) With cover, handle, unit bracket, and fan kit: 80 mm (3.15 in.) With cover, handle, unit bracket, and fan kit (unit bracket rotated 90 degrees for horizontal mounting): 143 mm (5.63 in.)	
Depth	Core RRH: 320 mm (12.6 in.) With cover, handle, and unit bracket: 424 mm (16.69 in.) With cover, handle, unit bracket, and fan kit: 424 mm (16.69 in.)	Dimensions orientation in horizontal mount with cover and fan
Weight	Core RRH: 13.5 kg (29.8 lb) With cover, handle and unit mounting bracket: 15.4 kg (33.9 lb) With cover, handle, unit mounting bracket, and fan kit: 16.5 kg (36.4 lb)	

Environmental specifications

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Table 127: FHPG environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	55°C (131°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
IP rating	IP65

5.2.7 AirScale RRH 2T4R B1/n1 120 W (AHGA)

AHGA (474254A) is introduced by LTE3764/SR001768/5GC002304.

Functional description

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Table 128: AHGA functional specification

Property	Value
Maximum output power	120 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	WCDMA, FDD-LTE, NR, NR-SRAN LTE-WCDMA
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B1/n1: 2110–2170 MHz
RX frequency range	B1/n1: 1920–1980 MHz
DL filter bandwidth	60 MHz
UL filter bandwidth	60 MHz
Instantaneous bandwidth (iBW)	60 MHz
Occupied bandwidth (oBW)	60 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs
Supported bandwidths	LTE: B1: 5, 10, 15, 20 MHz NR: n1: 5, 10, 15, 20 MHz WCDMA: B1: 3.8, 4.0, 4.2, 4.4, 4.6, 4.8 MHz
PIM cancellation	Yes

Interfaces

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Figure 34: AHGA interfaces

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Table 129: AHGA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 130: AHGA ALD support

ALD support	Value
AISG	ANT1, ANT3: AISG 2.0/3.0 ANT2, ANT4: AISG 3.0 ping receiver RET: AISG 2.0/3.0
Voltage	ANT1, ANT3, RET: 14.5 V
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 35: AHGA functional block diagram

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Electrical specifications

Table 131: AHGA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 132: AHGA power consumption in LTE mode

Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
1/1/1 2T	2x60	634	784	1150
1/1/1 2T	2x40	537	638	867
1/1/1 2T	2x30	499	581	759
1/1/1 2T	2x20	456	514	625

LTE power back-off

Table 133: Recommended AHGA power back-off in 256 QAM

Single carrier [dB]	Dual carrier [dB]
0.6	1.2

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGC AirScale2 cover 300 x 101-125 (474269A)
- AMBD AirScale bookmount kit 76-100 (474276A) - AHGA v101 (474254A.101) use AMBD (474276A) unit bracket and AMBE (474277A) secondary bracket for bookmount installation
- AMBE AirScale bookmount kit 101-125 (474277A) - AHGA v202 (474254A.202) uses whole AMBE (474277A) bookmount kit for bookmount installation
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)

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- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- ACPA AirScale 2 Fiber Protection (474297A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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Table 134: AHGA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.23 in.) With upper and lower mounting brackets: 427.5 mm (16.83 in.)	
Width	295 mm (11.61 in.)	
Depth	Core RRH: 100 mm (3.94 in.) With mounting brackets: 124 mm (4.88 in.)	
Weight	11 kg (24.3 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 135: AHGA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.8 AirScale RRH 2T4R B1 120 W (AHGC)

AHGC (474586A) is introduced by LTE4510.

Functional description

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Table 136: AHGC functional specification

Property	Value
Maximum output power	120 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies	FDD-LTE, NR-ready
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B1: 2110–2130 MHz
RX frequency range	B1: 1920–1940 MHz
DL filter bandwidth	20 MHz
UL filter bandwidth	20 MHz
Instantaneous bandwidth (iBW)	20 MHz
Occupied bandwidth (oBW)	20 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 36: AHGC interfaces

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Table 137: AHGC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 138: AHGC ALD support

ALD support	Value
AISG	ANT1, ANT3: AISG 2.0/3.0 ANT2, ANT4: AISG 3.0 ping receiver RET: AISG 2.0/3.0
Voltage	ANT1, ANT3, RET: 14.5 V
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 37: AHGC functional block diagram

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Electrical specifications

Table 139: AHGC electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 140: AHGC power consumption in LTE mode

Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
1/1/1 2T	2x60	646	805	1205
1/1/1 2T	2x40	547	654	905
1/1/1 2T	2x30	507	593	786
1/1/1 2T	2x20	459	521	641

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGC AirScale2 cover 300 x 101-125 (474269A)
- AMBP AirScale book mount kit for AHGC (475324A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- ACPA AirScale 2 Fiber Protection (474297A)

Installation options

- Pole:
  - Vertical
  - One-clip rail

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- Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 141: AHGC dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.23 in.) With upper and lower mounting brackets: 427.5 mm (16.8 in.)	
Width	295 mm (11.61 in.)	
Depth	Core RRH: 100 mm (3.94 in.) With mounting brackets: 124 mm (4.88 in.)	
Weight	11 kg (24.2 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 142: AHGC environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.9 AirScale RRH 2T4R B3/n3 160 W (AHEC)

AHEC (473806A) is introduced by LTE3087/SR001389/5GC000734.

Functional description

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Table 143: AHEC functional specification

Property	Value
Maximum output power	160 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies	GSM, FDD-LTE, NR
RF sharing/concurrent mode	Multi-RAT operation NR, LTE, GSM (for concurrent part)
Duplex mode, supported standard	FDD
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B3: 1805–1860 MHz
RX frequency range	B3: 1710–1765 MHz
DL filter bandwidth	55 MHz
UL filter bandwidth	55 MHz
Instantaneous bandwidth (iBW)	55 MHz
Occupied bandwidth (oBW)	55 MHz
Number of carriers per pipe	Up to 6
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 38: AHEC interfaces

Table 144: AHEC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Grounding	GND ⏚	1	M8 or dual M5 screws	-

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WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 145: AHEC ALD support

ALD support through RS485/8-pin circular ports	Value
AISG	RET: AISG 2.0/3.0
Voltage	RET: 14.5 V
Power per port	40 W

Functional block diagram

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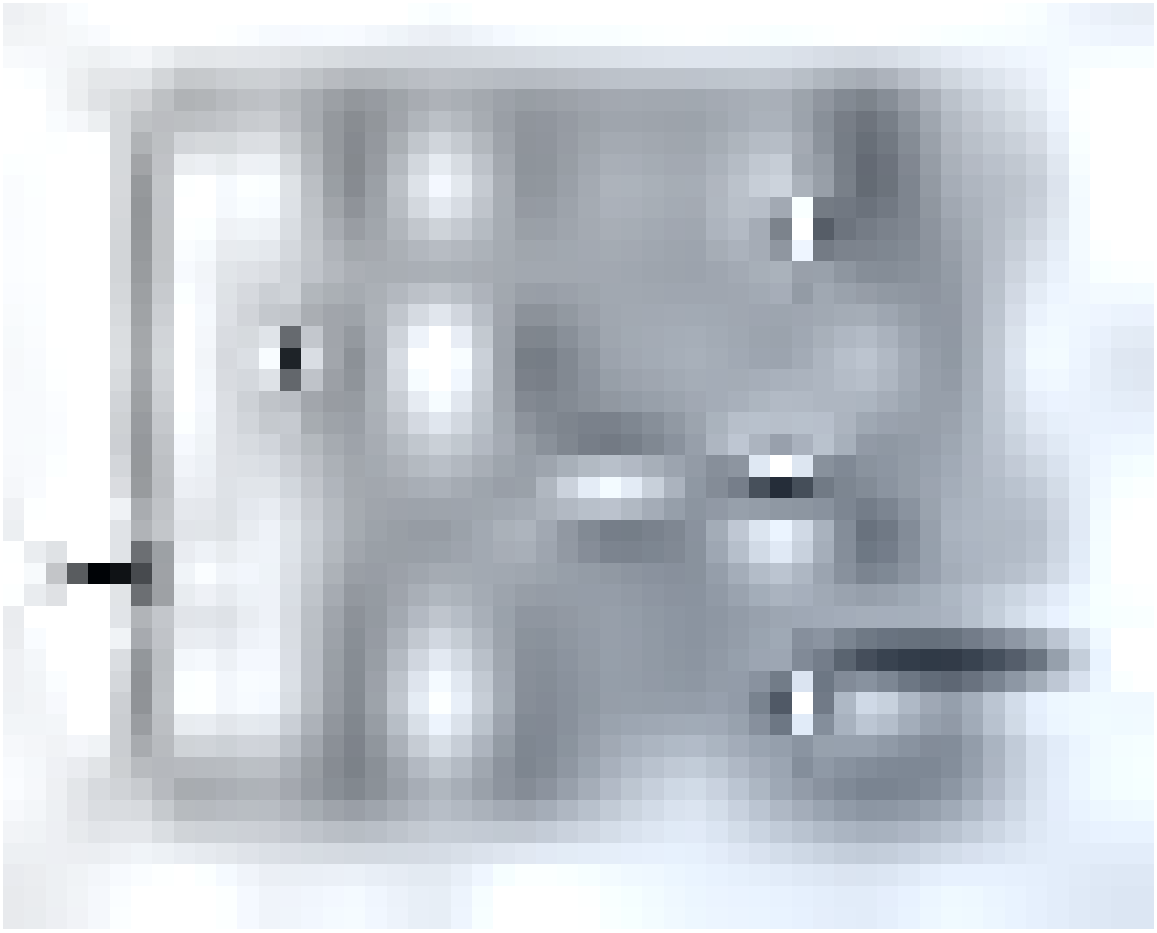
Figure 39: AHEC functional block diagram



Electrical specifications

Table 146: AHEC electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 147: AHEC power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x80	821	1044	1612
	1/1/1 2T	2x60	734	904	1306
	1/1/1 2T	2x40	639	756	1006
	1/1/1 2T	2x30	593	686	878
	1/1/1 2T	2x20	542	609	742

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NR power back-off

Recommended value for `dlQam256PowerBackoffSub6` parameter is:

- 1.5 dB for 3GPP performance requirement
- 2.5 dB for high peak UE throughput (4x4 DL MIMO)

GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- ACPA AirScale 2 Fiber Protection (474297A)
- AMBF AirScale book mount kit 126–150 (474278A)
- AMGC AirScale 2 cover 300 x 101–125 (474269A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMPA Pole Mounting Kit (30–120 mm) (473879A)
- AMRA AirScale one clip bracket 51–125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- APPA AirScale 2 26A DC plug 3.3–10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3–10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10–16 mm^2 (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- FPKA Flexi Pole Mounting Kit (30–120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (v101: 60–295 mm, v202: 60–300 mm) (472821A)

Installation options

- Pole:
  - Vertical

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    - One-clip rail
    - Book mounting
- Wall:
    - Vertical
    - One-clip rail
    - Book mounting

> **NOTICE:**
>
> In vertical installation connector have to be on the bottom so that convection cooling is ensured.
>
> In horizontal installation fans are required.

Dimensions and weight

Table 148: AHEC dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.23 in.) With upper and lower mounting brackets: 427.5 mm (16.8 in.)	
Width	308 mm (12.13 in.)	
Depth	Core RRH: 125 mm (4.92 in.) With mounting brackets: 149 mm (5.87 in.)	
Weight	Max. 12.8 kg (28.2 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 149: AHEC environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.10 AirScale RRH 2T4R B3 160 W (AHED)

AHED (473807A) is introduced by LTE3130/SR001415.

Functional description

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Table 150: AHED functional specification

Property	Value
Maximum output power	160 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies	GSM, FDD-LTE, NR-ready LTE-GSM
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B3: 1825–1880 MHz
RX frequency range	B3: 1730–1785 MHz
DL filter bandwidth	55 MHz
UL filter bandwidth	55 MHz
Instantaneous bandwidth (iBW)	55 MHz
Occupied bandwidth (oBW)	55 MHz
Number of carriers per pipe	Up to 6
Supported bandwidths	1.4, 3, 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 40: AHED interfaces

Table 151: AHED interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Grounding	GND ⏚	1	M8 or dual M5 screws	-

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WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 152: AHED ALD support

ALD support through RS485/8-pin circular ports	Value
AISG	RET: AISG 2.0/3.0
Voltage	RET: 14.5 V
Power per port	45 W

Functional block diagram

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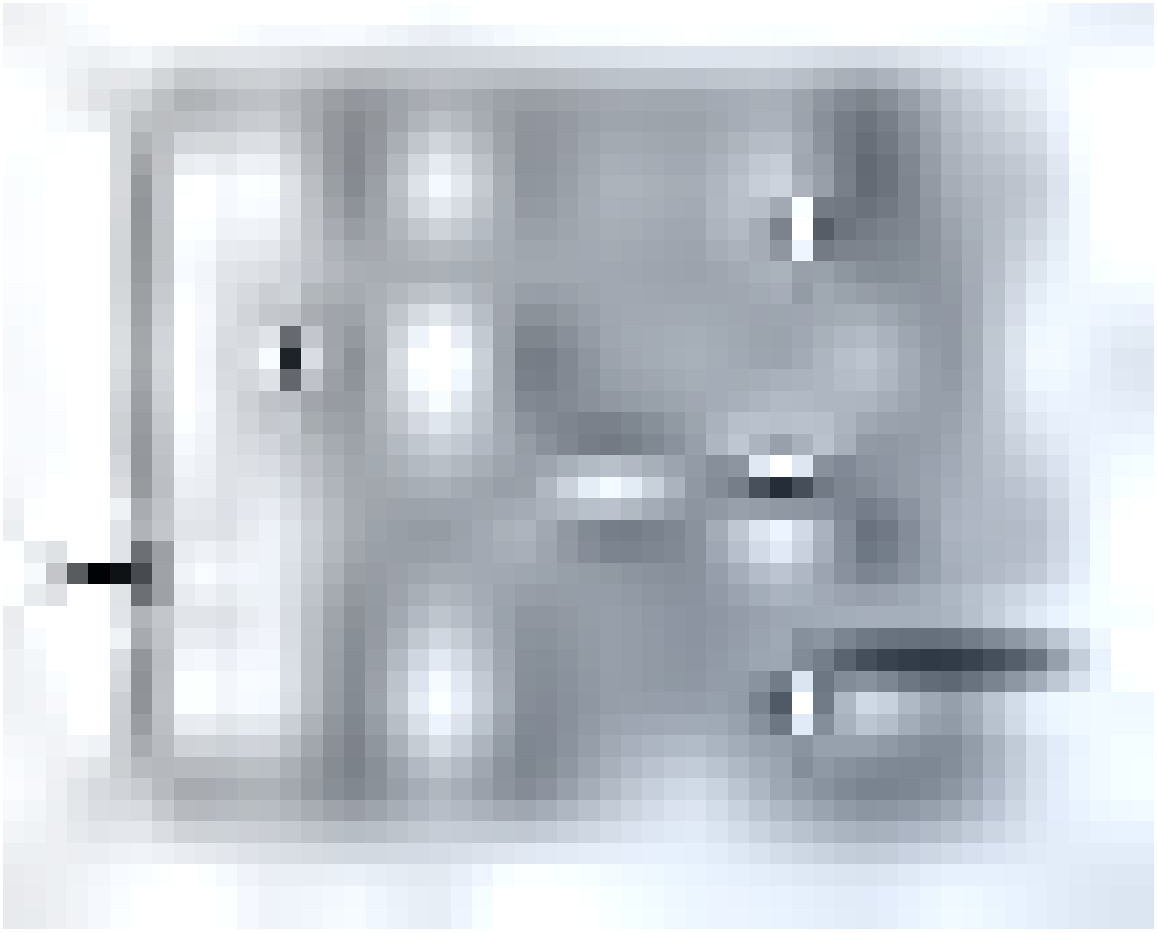
Figure 41: AHED functional block diagram



Electrical specifications

Table 153: AHED electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 154: AHED power consumption in LTE mode

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1/1/1 2T	2x80	830	1066	1654
1/1/1 2T	2x60	744	930	1352
1/1/1 2T	2x40	638	761	1018
1/1/1 2T	2x30	592	692	888
1/1/1 2T	2x20	536	610	746

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LTE power back-off

Table 155: Recommended AHED power back-off in 256 QAM mode (carrier spacing over 100 MHz)

Single carrier [dB]	Dual carrier [dB]
0	0.8

GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- ACPA AirScale 2 Fiber Protection (474297A)
- AMBF AirScale book mount kit 126–150 (474278A)
- AMGC AirScale 2 cover 300 x 101–125 (474269A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMPA Pole Mounting Kit (30–120 mm) (473879A)
- AMRA AirScale one clip bracket 51–125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- APPA AirScale 2 26A DC plug 3.3–10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3–10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10–16 mm^2 (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- FPKA Flexi Pole Mounting Kit (30–120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (v101: 60–295 mm, v202: 60–300 mm) (472821A)

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Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail
  - Book mounting

Dimensions and weight

Table 156: AHED dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.23 in.) With upper and lower mounting brackets: 427.5 mm (16.8 in.)	
Width	308 mm (12.13 in.)	
Depth	Core RRH: 125 mm (4.92 in.) With mounting brackets: 149 mm (5.87 in.)	
Weight	max. 12.8 kg (28.2 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 157: AHED environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.11 AirScale RRH 2T4R B5 80 W (AHCG)

AHCG (475816A) is introduced by CB007153.

Functional description

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Table 158: AHCG functional specification

Property	Value
Maximum output power	80 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	LTE FDD
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	869–888.4 MHz
RX frequency range	824–843.4 MHz
DL filter bandwidth	19.4 MHz
UL filter bandwidth	19.4 MHz
Instantaneous bandwidth (iBW)	19.4 MHz
Occupied bandwidth (oBW)	19.4 MHz
Number of carriers per pipe	Up to 8 (LTE, NB-IoT)
Supported bandwidths	1.4, 3, 5, 10, 15 MHz
PIM cancellation	Yes

Interfaces

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Figure 42: AHCG interfaces

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Table 159: AHCG interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote electrical tilt	RET	1	8-pin circular	RS-485
External alarm connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	9.8 Gbps, CPRI; Nokia IP seal
Grounding	GND ⏚	1	M8 or 2xM5 screws	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 160: AHCG ALD support

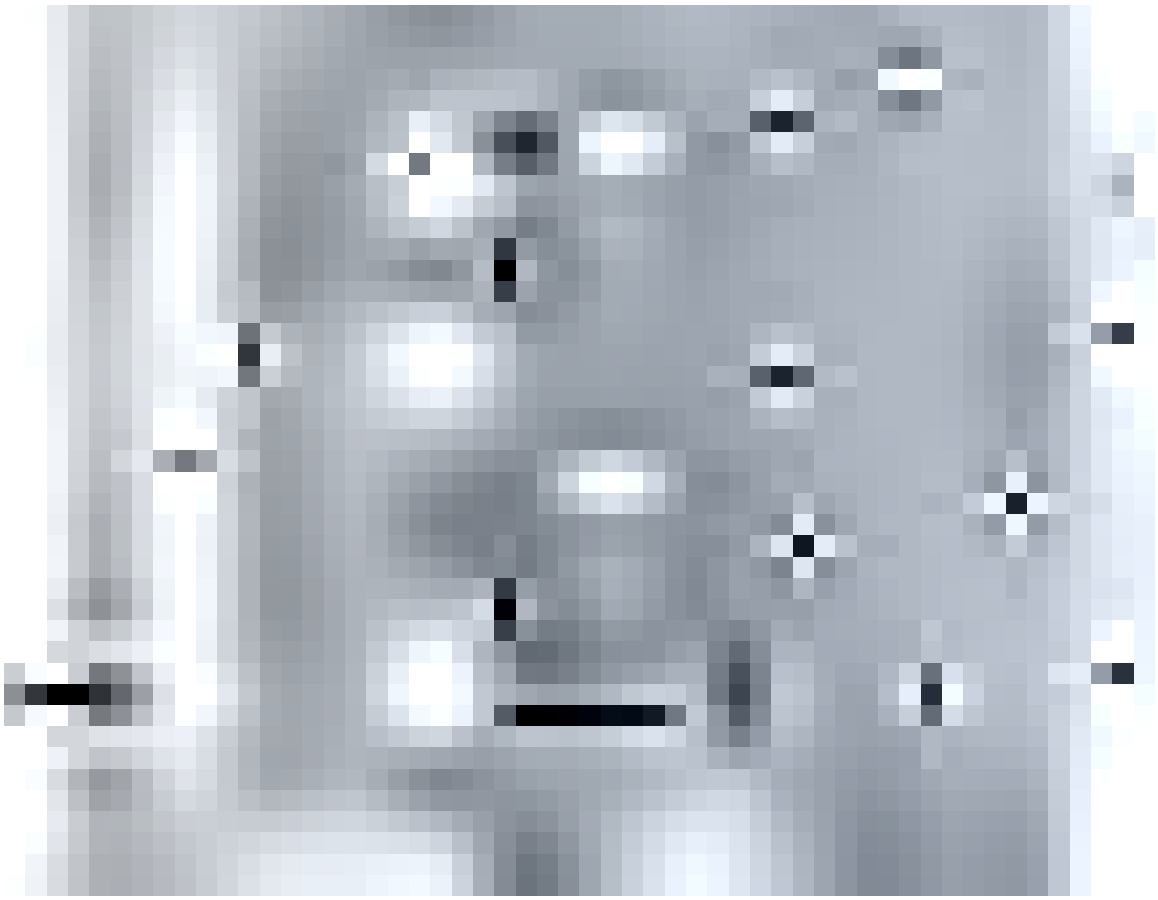
Property	Value
AISG	AISG 2.0/3.0 and power supply: ANT1, ANT3 PING: ANT2, ANT4
Voltage	14.5 V
Power per port	30 W, total 45 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 43: AHCG functional block diagram



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Electrical specifications

Table 161: AHCG electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 162: AHCG power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x40	578	690	941
	1/1/1 2T	2x20	436	494	612

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Recommended power back-off

Recommended value for `dlQam256PowerBackoffSub6` parameter is:

- 1.5 dB for 3GPP performance requirement
- 2.5 dB for high peak UE throughput (4x4 DL MIMO)

Related optional items

Optional elements depending on a configuration:

- ACPA AirScale 2 Fiber Protection (474297A)
- AMBI AirScale book mount kit for AHCA (474279A)
- AMGE AirScale 2 cover 300 x 151–185 (474271A) - factory-installed in AHCF radio variant
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMPA Pole Mounting Kit (30–120 mm) (473879A)
- AMRA AirScale one clip bracket 51–125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAF AirScale AC-DC PSU 100–240VAC/1150 W (474676A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- APPA AirScale 2 26A DC plug 3.3–10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3–10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10–16 mm^2 (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- ASFA AirScale 2 fan unit 300 (473968A)
- FPKA Flexi Pole Mounting Kit (30–120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (v101: 60–295 mm, v202: 60–300 mm) (472821A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical

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- Horizontal with an optional fan
- One-clip rail
- Book mounting

NOTICE:

Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 163: AHCG dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 366 mm (14.41 in.) With upper and lower mounting brackets: 447.5 mm (17.62 in.)	
Width	Core RRH: 306 mm (12.05 in.)	
Depth	Core RRH: 165 mm (6.5 in.) With upper and lower mounting brackets: 186.5 mm (7.34 in.)	
Weight	max. 17.5 kg (38.58 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 164: AHCG environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.12 AirScale RRH 2T4R B8/n8 120 W (AHDA)

AHDA (474739A) is introduced by LTE3678/SR001667/CB006609.

Functional description

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Table 165: AHDA functional specification

Property	Value
Maximum output power	120 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies	NR, FDD-LTE, WCDMA, GSM
RF sharing/concurrent mode	NR-LTE, GSM-WCDMA, WCDMA-LTE, GSM-LTE, GSM-WCDMA-LTE
Duplex mode, supported standard	FDD
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B8/n8: 925–960 MHz
RX frequency range	B8/n8: 880–915 MHz
DL filter bandwidth	35 MHz
UL filter bandwidth	35 MHz
Instantaneous bandwidth (iBW)	35 MHz
Occupied bandwidth (oBW)	35 MHz
Number of carriers per pipe	Up to 8
Supported bandwidths	LTE: 1.4, 3, 5, 10 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 44: AHDA interfaces

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Table 166: AHDA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 167: AHDA ALD support

ALD support	Value
AISG	ANT1, ANT3: AISG 2.0/3.0 ANT2, ANT4: AISG 3.0 ping receiver RET: AISG 2.0/3.0
Voltage	ANT1, ANT3, RET: 14.5 V
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 45: AHDA functional block diagram

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Electrical specifications

Table 168: AHDA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 169: AHDA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x60	738	899	1300
	1/1/1 2T	2x40	643	749	997
	1/1/1 2T	2x20	519	574	697

LTE power back-off

Table 170: AHDA power back-off

Single carrier LTE 256 QAM [dB]	64 QAM LTE + GSM [dB]
0	0.3

GSM cell power range

NOTICE:

Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGD AirScale 2 cover 300 x 126-150 (474270A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)

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- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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Table 171: AHDA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.25 in.) With mounting brackets: 428 mm (16.87 in.)	
Width	309 mm (12.17 in.)	
Depth	Core RRH: 130 mm (5.12 in.) With mounting brackets: 153 mm (6.02 in.)	
Weight	14.0 kg (30.9 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 172: AHDA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.13 AirScale RRH 2T4R B8/n8 160 W (AHDB)

AHDB (474257A) is introduced by LTE3837/SR001753/5GC000729.

Functional description

Table 173: AHDB functional specification

Property	Value
Maximum output power	160 W

Note:

In the United States of America, due to the FCC certification for this product, you should not set the maximum output power per TX port above 40 W. It is the responsibility of the operator to ensure that this requirement is met.

Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies	GSM, WCDMA, FDD-LTE, NR
RF sharing/concurrent mode	GSM-WCDMA, WCDMA-LTE, GSM-LTE, GSM-WCDMA-LTE, NR-SRAN

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Property	Value
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B8/n8: 934–960 MHz
RX frequency range	B8/n8: 889–915 MHz
DL filter bandwidth	26 MHz
UL filter bandwidth	26 MHz
Instantaneous bandwidth (iBW)	26 MHz
Occupied bandwidth (oBW)	26 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs
Supported bandwidths	LTE: 1.4, 3, 5, 10 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

Figure 46: AHDB interfaces

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Table 174: AHDB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Grounding	GND ⏚	1	M8 or dual M5 screws	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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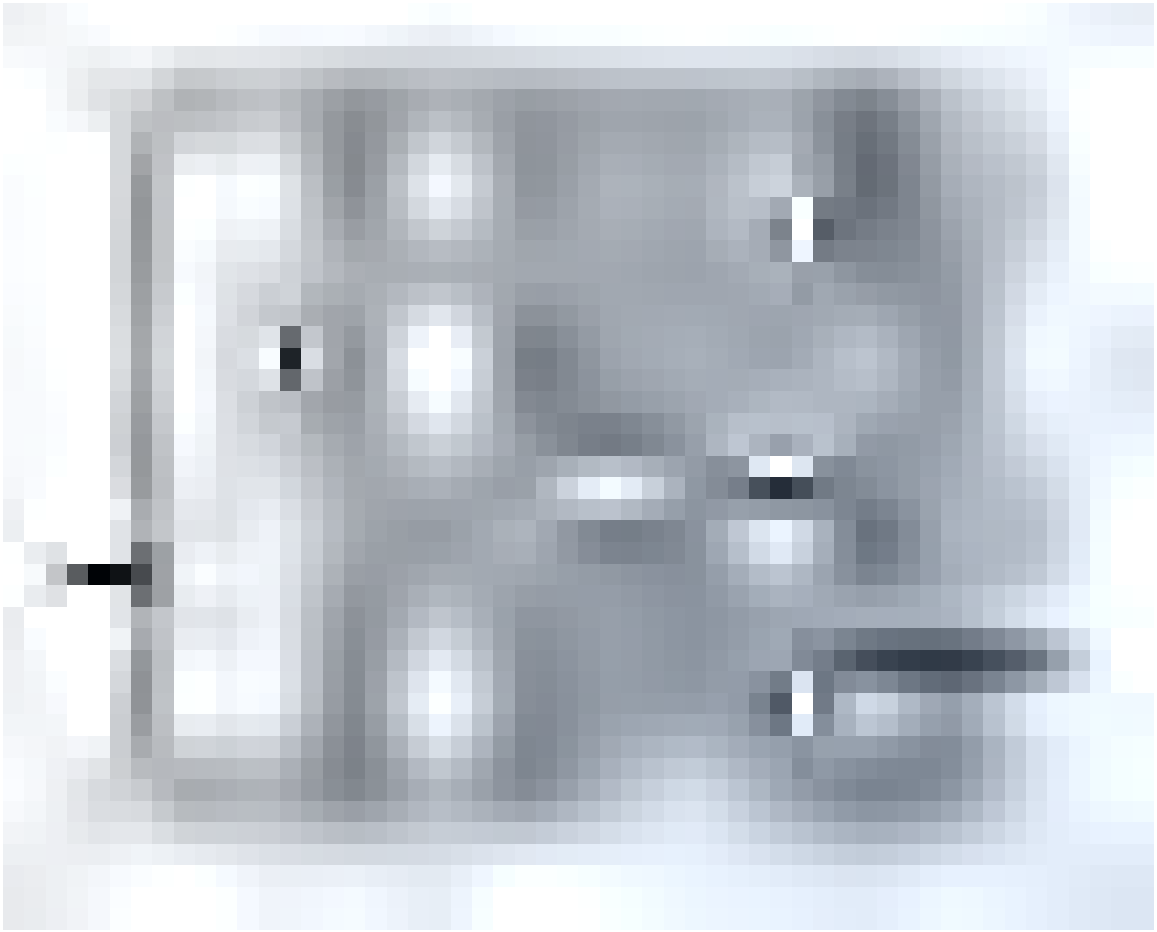
Table 175: AHDB ALD support

ALD support through RS485/8-pin circular ports	Value
AISG	RET: 2.0/3.0
Proprietary AISG1.1	No
Voltage	RET: 14.5 V
Power per port	45 W

Functional block diagram

Figure 47: AHDB functional block diagram



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Electrical specifications

Table 176: AHDB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 177: AHDB power consumption in LTE mode

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average $P_{RRH, static}$	Power consumption [W] ETSI 202706 busy hour load $P_{BH RRH, static}$	Power consumption [W] 100% RF power load $P_{100\% RRH}$
1/1/1 2T	2x80	805	990	1470
1/1/1 2T	2x60	737	882	1223
1/1/1 2T	2x40	656	755	968
1/1/1 2T	2x30	616	695	852
1/1/1 2T	2x20	573	628	735

LTE power back-off

Table 178: Recommended AHDB power back-off in 256 QAM mode (carrier spacing over 100 MHz)

Single carrier [dB]	Dual carrier [dB]
0	0.8

GSM cell power range

NOTICE:

Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- ACPA AirScale 2 Fiber Protection (474297A)
- AMBF AirScale book mount kit 126–150 (474278A)
- AMGC AirScale 2 cover 300 x 101–125 (474269A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)

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- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMPA Pole Mounting Kit (30–120 mm) (473879A)
- AMRA AirScale one clip bracket 51–125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- APPA AirScale 2 26A DC plug 3.3–10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3–10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10–16 mm^2 (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- FPKA Flexi Pole Mounting Kit (30–120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (v101: 60–295 mm, v202: 60–300 mm) (472821A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail
  - Book mounting

Dimensions and weight

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Table 179: AHDB dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.25 in.) With mounting brackets: 428 mm (16.87 in.)	
Width	309 mm (12.17 in.)	
Depth	Core RRH: 125 mm (4.92 in.) With mounting brackets: 149 mm (5.86 in.)	
Weight	max. 12.8 kg (28.2 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 180: AHDB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.14 AirScale RRH 2T4R B18 60 W (AHCH)

AHCH (475906A) is introduced by CB007568.

Functional description

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Table 181: AHCH functional specification

Property	Value
Maximum output power	60 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies	FDD NR, FDD LTE
RF sharing/concurrent mode	NR-LTE
Duplex mode-supported standard	FDD
IoT support	NB-IoT inband, guard band (upper side only)
TX frequency range	B18 (sub band 26): 860–875 MHz
RX frequency range	B18: 815–830 MHz
DL filter bandwidth	15 MHz
UL filter bandwidth	15 MHz
Instantaneous bandwidth (iBW)	15 MHz
Occupied bandwidth (oBW)	15 MHz
Number of carriers per pipe	Up to 3 in total for all supported RATs
Supported bandwidths	NR: 5, 10, 15 MHz LTE: 5, 10, 15 MHz
PIM cancellation	Yes

Interfaces

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Figure 48: AHCH interfaces

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Table 182: AHCH interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	–
Antenna connector	ANT	4	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
Grounding	GND ⏚	1	M8 or 2 x M5 screws	–
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 183: AHCH ALD support

Property	Value
AISG	AISG 2.0 and 3.0: ANT 1, ANT 2, ANT 3, ANT 4 and RET Power supply: ANT 1 and ANT 3
Voltage	14.5 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 49: AHCH functional block diagram

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Electrical specifications

Table 184: AHCH electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended input voltage range, the unit might shut down.

Power consumption

Note:

AHCH power consumption will be provided in future releases.

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGD AirScale 2 cover 300 x 126-150 (474270A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)

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- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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Table 185: AHCH dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.23 in.) With mounting brackets: 428 mm (16.85 in.)	
Width	309 mm (12.17 in.)	
Depth	Core RRH: 140 mm (5.51 in.) With mounting brackets: 163 mm (6.42 in.)	
Weight	max. 15.5 kg (34.2 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 186: AHCH environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.15 AirScale RRH 2T4R B20/n20 120 W (AHMA)

AHMA (474255A) is introduced by LTE4118/CB006610.

Functional description

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Table 187: AHMA functional specification

Property	Value
Maximum output power	120 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies	NR, FDD-LTE
RF sharing/concurrent mode	NR-LTE
Duplex mode, supported standard	FDD
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B20/n20: 791–821 MHz
RX frequency range	B20/n20: 832–862 MHz
DL filter bandwidth	30 MHz
UL filter bandwidth	30 MHz
Instantaneous bandwidth (iBW)	30 MHz
Occupied bandwidth (oBW)	30 MHz
Number of carriers per pipe	Up to 3
Supported bandwidths	5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 50: AHMA interfaces

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Table 188: AHMA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 189: AHMA ALD support

ALD support	Value
AISG	ANT1, ANT3: AISG 2.0/3.0 ANT2, ANT4: AISG 3.0 ping receiver RET: AISG 2.0/3.0
Voltage	ANT1, ANT3, RET: 14.5 V
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 51: AHMA functional block diagram

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Electrical specifications

Table 190: AHMA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 191: AHMA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x60	659	804	1145
	1/1/1 2T	2x40	530	626	850
	1/1/1 2T	2x30	493	568	731
	1/1/1 2T	2x20	436	488	595

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGD AirScale 2 cover 300 x 126-150 (474270A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)

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Installation options

- Pole:
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  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 192: AHMA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.25 in.) With mounting brackets: 428 mm (16.87 in.)	
Width	309 mm (12.17 in.)	
Depth	Core RRH: 130 mm (5.12 in.) With mounting brackets: 153 mm (6.02 in.)	
Weight	14 kg (30.9 lb)	

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Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 193: AHMA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.16 AirScale RRH 2T4R B28 120 W (AHPC)

AHPC (474649A) is introduced by LTE4615.

Functional description

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Table 194: AHPC functional specification

Property	Value
Maximum output power	120 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies	FDD-LTE, NR-ready
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	758–803 MHz
RX frequency range	703–748 MHz
DL filter bandwidth	45 MHz
UL filter bandwidth	45 MHz
Instantaneous bandwidth (iBW)	45 MHz
Occupied bandwidth (oBW)	45 MHz
Number of carriers per pipe	Up to 6
Supported bandwidths	3, 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 52: AHPC interfaces

Table 195: AHPC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Grounding	GND ⏚	1	M8 or dual M5 screws	-

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WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 196: AHPC ALD support

ALD support through RS485/8-pin circular ports	Value
AISG	RET: AISG 2.0/3.0
Voltage	RET: 14.5 V
Power per port	30 W

Functional block diagram

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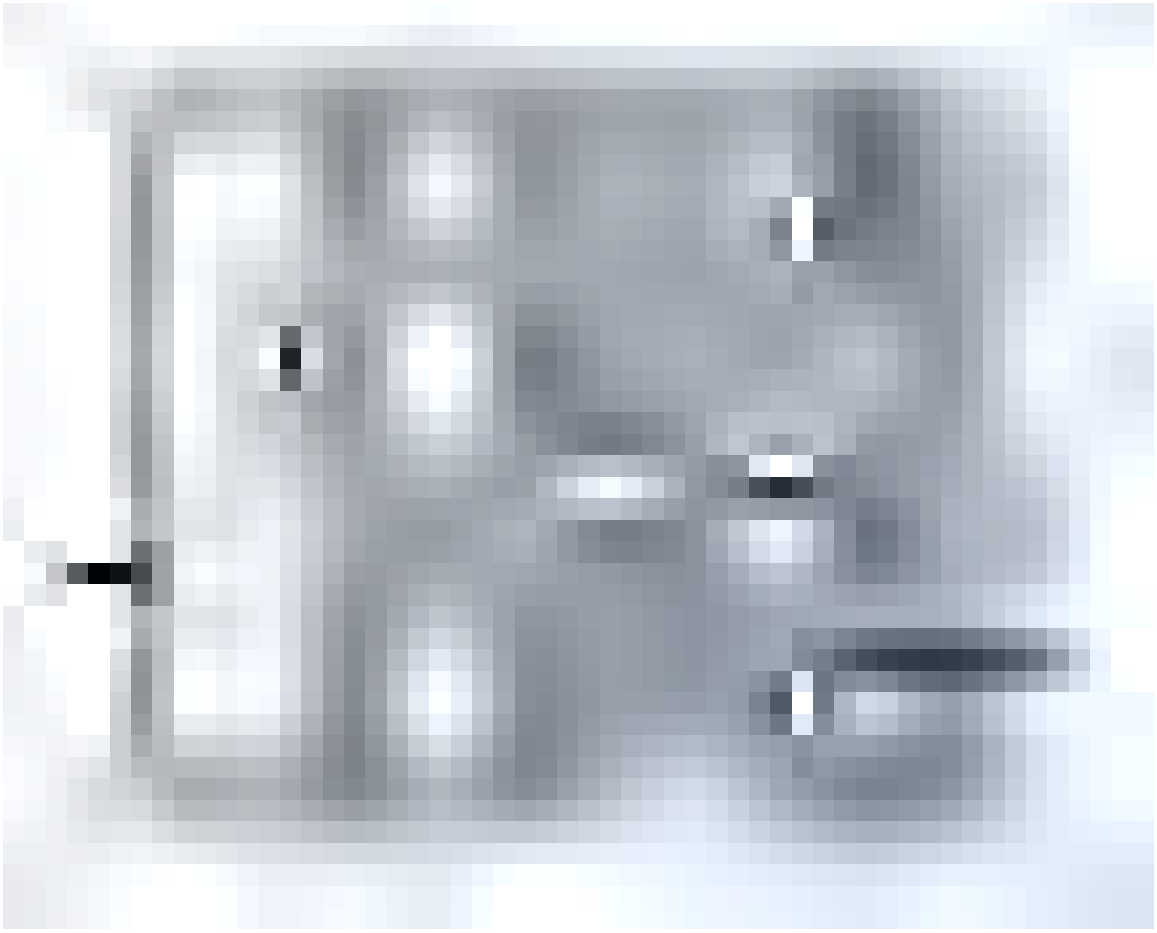
Figure 53: AHPC functional block diagram



Electrical specifications

Table 197: AHPC electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 198: AHPC power consumption in LTE mode

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1/1/1 2T	2x60	713	857	1168
1/1/1 2T	2x40	602	704	891
1/1/1 2T	2x30	533	614	757
1/1/1 2T	2x20	464	521	620

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Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGC AirScale2 cover 300 x 101-125 (474269A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- ACPA AirScale 2 Fiber Protection (474297A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail
  - Book mounting

Dimensions and weight

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Table 199: AHPC dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.25 in.) With mounting brackets: 428 mm (16.87 in.)	
Width	309 mm (12.17 in.)	
Depth	Core RRH: 125 mm (4.92 in.) With mounting brackets: 149 mm (5.86 in.)	
Weight	13.6 kg (30.0 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 200: AHPC environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.17 AirScale RRH 2T4R B28/n28 120 W (AHPD)

AHPD (474712A) is introduced by LTE4660/SR002080/5GC001081.

Functional description

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Table 201: AHPD functional specification

Property	Value
Maximum output power	120 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies	FDD-LTE, NR
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	758–788 MHz
RX frequency range	703–733 MHz
DL filter bandwidth	30 MHz
UL filter bandwidth	30 MHz
Instantaneous bandwidth (iBW)	30 MHz
Occupied bandwidth (oBW)	30 MHz
Number of carriers per pipe	Up to 3 carriers in total for all supported RATs
Supported bandwidths	LTE: 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 54: AHPD interfaces

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Table 202: AHPD interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 203: AHPD ALD support

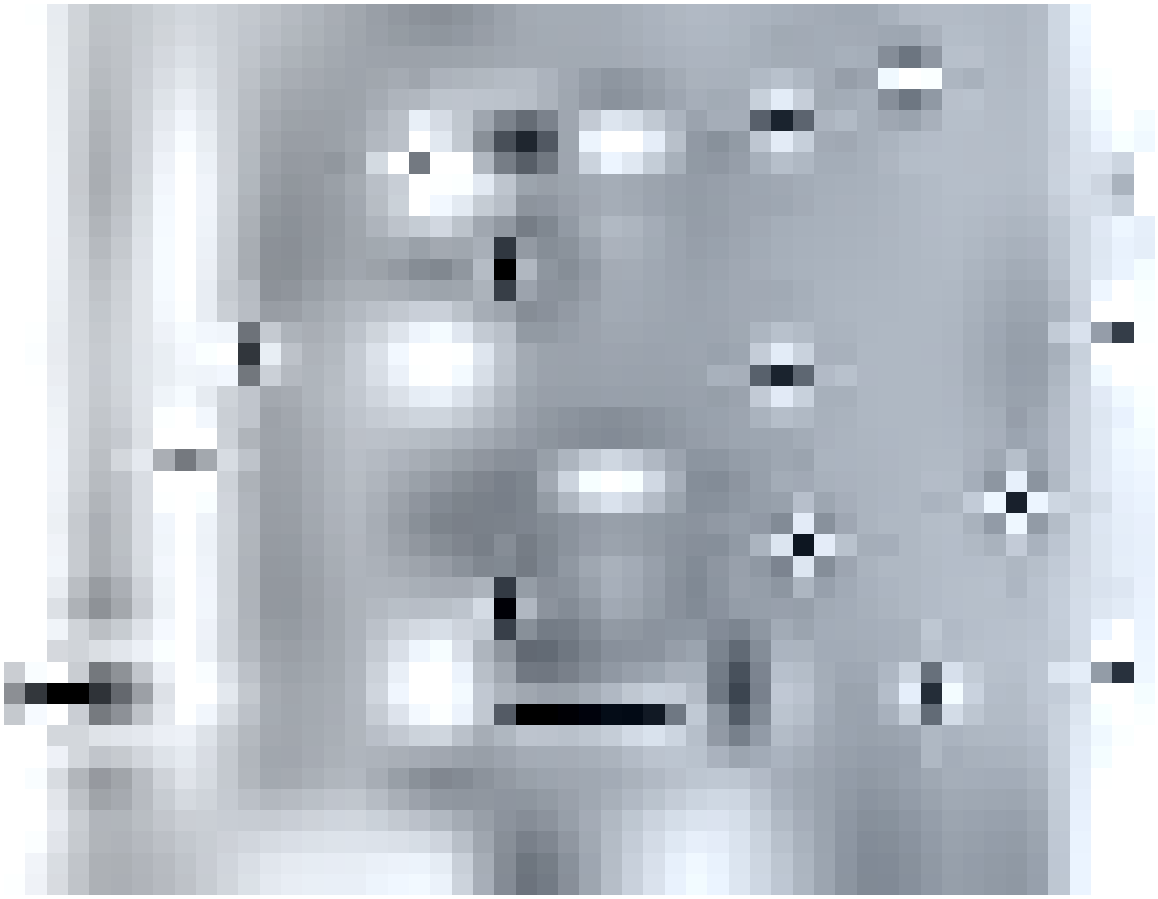
ALD support	Value
AISG	AISG 2.0 and 3.0: ANT 1, ANT 2, ANT 3, ANT 4 and RET Power supply: ANT1 and ANT3
Voltage	14.5 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 55: AHPD functional block diagram



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Electrical specifications

Table 204: AHPD electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 205: AHPD power consumption in LTE mode

Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
1/1/1 2T	2x60	693	846	1180
1/1/1 2T	2x40	578	683	884
1/1/1 2T	2x30	507	589	741
1/1/1 2T	2x20	456	518	620

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGD AirScale 2 cover 300 x 126-150 (474270A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)

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Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 206: AHPD dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.25 in.) With mounting brackets: 428 mm (16.87 in.)	
Width	309 mm (12.17 in.)	
Depth	Core RRH: 130 mm (5.12 in.) With mounting brackets: 153 mm (6.02 in.)	
Weight	14 kg (30.9 lb)	

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Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 207: AHPD environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.18 AirScale RRH 2T4R B28 120 W (AHPE)

AHPE (475208A) is introduced by LTE5359/5GC002170.

Functional description

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Table 208: AHPE functional specification

Property	Value
Maximum output power	120 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes
Supported technologies	FDD-LTE, NR
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B28: 773–803 MHz
RX frequency range	B28: 718–748 MHz
DL filter bandwidth	30 MHz
UL filter bandwidth	30 MHz
Instantaneous bandwidth (iBW)	30 MHz
Occupied bandwidth (oBW)	30 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	3, 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 56: AHPE interfaces

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Table 209: AHPE interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 210: AHPE ALD support

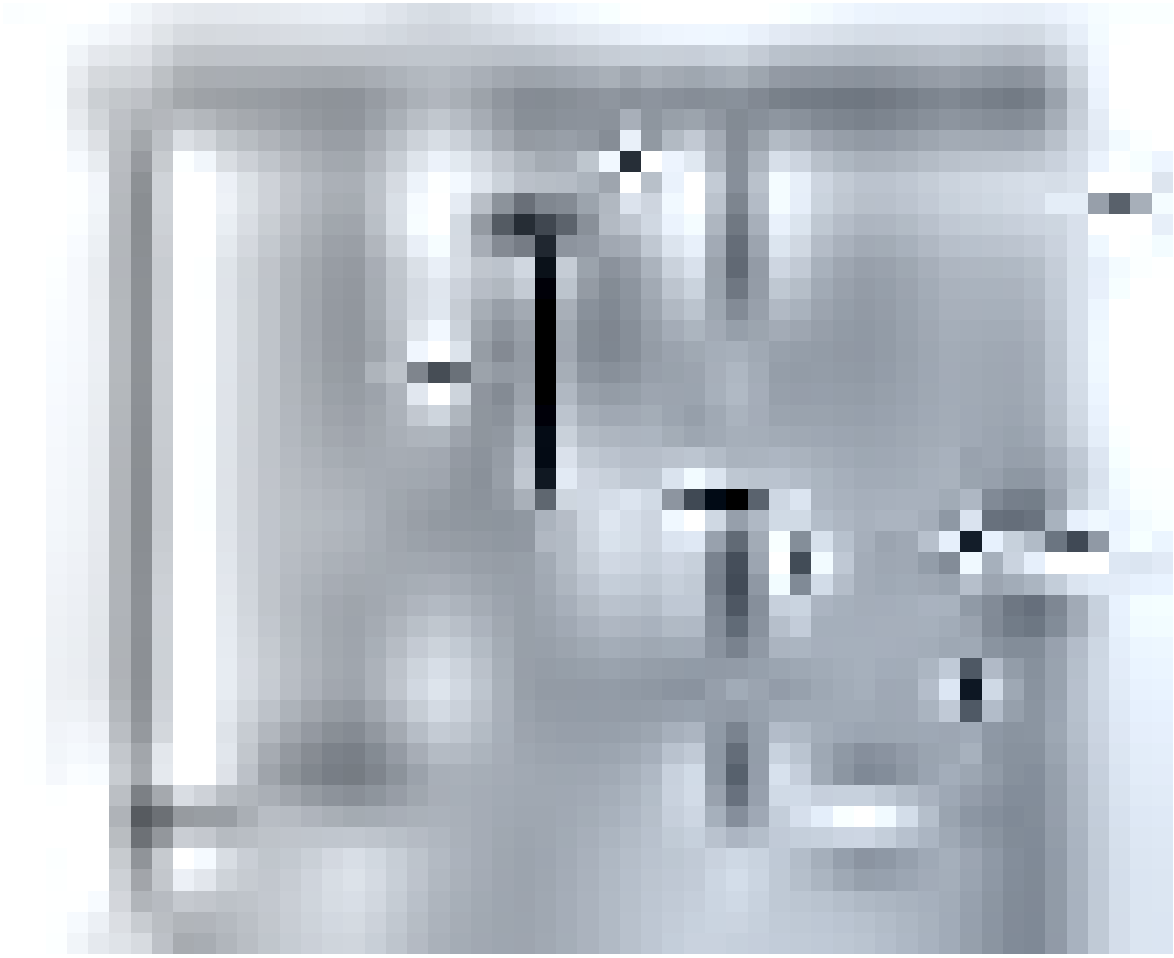
ALD support	Value
AISG	ANT1, ANT3: AISG 2.0/3.0 ANT2, ANT4: AISG 3.0 ping receiver RET: AISG 2.0/3.0
Voltage	ANT1, ANT3, RET: 14.5 V
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 57: AHPE functional block diagram



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Electrical specifications

Table 211: AHPE electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 20 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 212: AHPE power consumption in LTE mode

Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
1/1/1 2T	2x60	688	847	1237
1/1/1 2T	2x40	542	646	887
1/1/1 2T	2x20	423	482	598

Power back-off

Table 213: AHPE power back-off in 256 QAM

Single carrier [dB]	Multi-carrier [dB]
0.6	1.2

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGD AirScale 2 cover 300 x 126-150 (474270A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)

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- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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Table 214: AHPE dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.25 in.) With mounting brackets: 428 mm (16.87 in.)	
Width	309 mm (12.17 in.)	
Depth	Core RRH: 130 mm (5.12 in.) With mounting brackets: 153 mm (6.02 in.)	
Weight	14.0 kg (30.9 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 215: AHPE environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.19 AirScale RRH 4T4R B3/n3 160 W (AHEB)

AHEB (473484A) is introduced by LTE2784/SR001206/5GC001099.

Functional description

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Table 216: AHEB functional specification

Property	Value
Maximum output power	160 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies	GSM, FDD-LTE, NR B3: GSM, GSM-LTE RF sharing
TX frequency range	B3/n3: 1805–1880 MHz
RX frequency range	B3/n3: 1710–1785 MHz
DL filter bandwidth	75 MHz
UL filter bandwidth	75 MHz
Instantaneous bandwidth (iBW)	75 MHz
Occupied bandwidth (oBW)	75 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs (including max 2 GSM TRXs)
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 58: AHEB interfaces

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Table 217: AHEB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	Fan	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 218: AHEB ALD support

ALD support	Value
AISG	ANT1, ANT3, RET: AISG 2.0/3.0 ANT2, ANT4: AISG 3.0 Ping receiver
Voltage	ANT1, ANT3: 14.5 V RET: 14.5 V
Power per port	ANT1, ANT3: 30 W RET: 45 W
Power	45 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 59: AHEB functional block diagram

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Electrical specifications

Table 219: AHEB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 220: AHEB power consumption in LTE mode

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1/1/1 4T	4x40	866	1063	1516
1/1/1 4T	4x30	791	947	1280
1/1/1 4T	4x20	644	745	953
1/1/1 2T	2x40	530	629	853
1/1/1 2T	2x30	492	569	735
1/1/1 2T	2x20	419	470	575

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Recommended power back-off

Table 221: AHEB power back-off in 256 QAM

Single carrier [dB]	Dual carrier [dB]
0	0.8

GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGD AirScale 2 cover 300 x 126-150 (474270A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)

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Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 222: AHEB dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 337 mm (13.27 in.) With upper and lower mounting brackets: 427 mm (16.81 in.)	
Depth	Core RRH: 140 mm (5.51 in.) With mounting brackets: 164.5 mm (6.48 in.) With cover and mounting brackets: 183.5 mm (7.22 in.)	
Width	Core RRH: 295 mm (11.61 in.) With cover and mounting brackets: 322 mm (12.68 in.)	
Weight	15.5 kg (34.2 lb)	

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Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 223: AHEB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.20 AirScale RRH 4T4R B3 160 W (AHEH)

AHEH (474253A) is introduced by LTE4686/SR002165/5GC002171.

Functional description

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Table 224: AHEH functional specification

Property	Value
Maximum output power	160 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies	GSM, FDD-LTE, NR LTE-GSM RF Sharing
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B3: 1805–1860 MHz
RX frequency range	B3: 1710–1765 MHz
DL filter bandwidth	55 MHz
UL filter bandwidth	55 MHz
Instantaneous bandwidth (iBW)	55 MHz
Occupied bandwidth (oBW)	55 MHz
Number of carriers per pipe	Up to 8
Supported bandwidths	5, 10, 15, 20 MHz
PIM Cancellation	Yes

Interfaces

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Figure 60: AHEH interfaces

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Table 225: AHEH interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	Fan	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 226: AHEH ALD support

ALD support	Value
AISG	ANT1, ANT3, RET: AISG 2.0/3.0 ANT2, ANT4: AISG 3.0 Ping receiver
Voltage	ANT1, ANT3: 14.5 V RET: 14.5 V
Power per port	ANT1, ANT3: 30 W RET: 45 W
Power	45 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 61: AHEH functional block diagram

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Electrical specifications

Table 227: AHEH electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 228: AHEH power consumption in LTE mode

Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
1/1/1 4T	4x40	879	1076	1557
1/1/1 4T	4x20	657	755	965
1/1/1 2T	2x40	540	637	874
1/1/1 2T	2x20	430	479	581

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Recommended power back-off

Table 229: AHEH power back-off in 256 QAM

Single carrier [dB]	Dual carrier [dB]
0	0.8

GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGD AirScale 2 cover 300 x 126-150 (474270A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)

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Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 230: AHEH dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 337 mm (13.27 in.) With upper and lower mounting brackets: 427.5 mm (16.83 in.)	
Depth	Core RRH: 140 mm (5.51 in.) With mounting brackets: 164.5 mm (6.48 in.) With cover and mounting brackets: 183.5 mm (7.22 in.)	
Width	Core RRH: 295 mm (11.61 in.) With cover: 322 mm (12.68 in.)	
Weight	15.5 kg (34.2 lb)	

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Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 231: AHEH environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.21 AirScale RRH 4T4R B7/n7 160 W (AHHB)

AHHB (474252A) is introduced by LTE3137/5GC001839.

Functional description

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Table 232: AHHB functional specification

Property	Value
Maximum output power	160 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	FDD-LTE, NR, NR-SRAN
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B7/n7: 2620–2690 MHz
RX frequency range	B7/n7: 2500–2570 MHz
DL filter bandwidth	70 MHz
UL filter bandwidth	70 MHz
Instantaneous bandwidth (iBW)	70 MHz
Occupied bandwidth (oBW)	70 MHz
Number of carriers per pipe	Up to 8
Supported bandwidths	5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 62: AHHB interfaces

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Table 233: AHHB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 234: AHHB ALD support

ALD support	Value
AISG	ANT1, ANT3, RET: AISG 2.0/3.0 ANT2, ANT4: AISG 3.0 Ping receiver
Voltage	ANT1, ANT3: 14.5 V RET: 14.5 V
Power per port	ANT1, ANT3: 30 W RET: 45 W
Power	45 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 63: AHHB functional block diagram

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Electrical specifications

Table 235: AHHB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 236: AHHB power consumption in LTE mode

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1/1/1 4T	4x40	950	1241	1833
1/1/1 4T	4x30	837	1063	1539
1/1/1 4T	4x20	632	777	1053
1/1/1 2T	2x40	571	711	999
1/1/1 2T	2x30	516	624	843
1/1/1 2T	2x20	414	483	621

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LTE power back-off

Table 237: Recommended AHHB power back-off in 256 QAM

Single carrier [dB]	Dual carrier [dB]
0	0.8

NR power back-off

The recommended power back-off (`dlQam256PowerBackoffSub6`) value is 3 dB. Higher power back-off values may decrease the overall 5G coverage area for high modulation/coding scheme configurations.

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGD AirScale 2 cover 300 x 126-150 (474270A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)

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Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 238: AHHB dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 337 mm (13.27 in.) With upper and lower mounting brackets: 427.5 mm (16.83 in.)	
Depth	Core RRH: 140 mm (5.51 in.) With mounting brackets: 164.5 mm (6.48 in.) With cover and mounting brackets: 183.5 mm (7.22 in.)	
Width	Core RRH: 295 mm (11.61 in.) With cover and mounting brackets: 322 mm (12.68 in.)	
Weight	15.7 kg (34.6 lb)	

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Environmental specifications

> **Note:**
>
> Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 239: AHHB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.22 AirScale RRH 4T4R B5/n5 160 W (AHCA)

AHCA (473966A /473966B) is introduced by LTE3399/SR002145/5GC001152 /CB006640.

Functional description

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Table 240: AHCA functional specification

Property	Value
Maximum output power	160 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies	NR, FDD-LTE, WCDMA
RF sharing/concurrent mode	NR-SRAN WCDMA-LTE
TX frequency range	B5/n5: 869–894 MHz
RX frequency range	B5/n5: 824–849 MHz
DL instantaneous bandwidth (iBW)	25 MHz
UL instantaneous bandwidth (iBW)	25 MHz
DL filter bandwidth	25 MHz
UL filter bandwidth	25 MHz
Number of carriers per pipe	Up to 4 carriers (NR, LTE or mixed NR+LTE)
Supported bandwidths	NR: 5, 10, 15, 20 MHz LTE: 1.4, 3, 5, 10 MHz
PIM cancellation	Yes

Interfaces

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Figure 64: AHCA interfaces

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Table 241: AHCA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	ANT1 and ANT3 should be used with 2T4R and 2T2R modes.
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	Variant A (473966A): SFP+, SFP28 Variant B (473966B): SFP+, SFP28	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Variant A (473966A): R2CT IP seal Variant B (473966B): Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 242: AHCA interface for ALD support

ALD support via antenna ports	Value
AISG	ANT1, ANT3, RET: AISG 2.0 (hardware ready to support 3.0) ANT2, ANT4: AISG 2.0 (hardware ready to support 3.0) Ping receiver
Voltage	ANT1, ANT3: 14.5 V RET: 14.5 V
Power per port	ANT1, ANT3: 30 W RET: 45 W
Power	45 W

Note:

Separate software feature is required for ALD support.

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

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Figure 65: AHCA functional block diagram

Electrical specifications

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Table 243: AHCA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -60.0 V DC -57.0 V DC to -60.0 V DC
Calculated maximum input current including tolerances	18.7 A at -36 V DC (673 W) including 45 W power feed for ALD
Surge protection	Class II 5 kA

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 VDC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/–10% margin.

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Table 244: AHCA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average load P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	40+40	540	643	882
	1/1/1 2T	60+60	722	888	1317
	1/1/1 4T	4x20	680	794	1020
	1/1/1 4T	4x40	860	1066	1551

LTE power back-off

Table 245: Recommended AHCA power back-off in 256 QAM mode (carrier spacing over 100 MHz)

Single carrier [dB]	Dual carrier [dB]
0	0.8

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- APAF AirScale AC-DC PSU 100-240VAC/1150 W (474676A)
- AMGE AirScale 2 cover 300 x 151-175 (474271A)
- AMBI AirScale book mount kit for AHCA (474279A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)

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- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- ACPA AirScale 2 Fiber Protection (474297A) - only if R2CT is not used

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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Table 246: AHCA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 386 mm (15.2 in.) With upper and lower mounting brackets: 427.5 mm (16.83 in.)	
Width	309 mm (12.17 in.) With a cover: 324 mm (12.76 in.)	
Depth	Core RRH: 165 mm (6.5 in.) With mounting brackets: 189 mm (7.44 in.) With a cover and mounting brackets: 208 mm (8.19 in.)	
Weight	16.7 kg (36.8 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 247: AHCA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.23 AirScale RRH 4T4R B26/n26 200 W (AHCF)

AHCF (475313A) is introduced by SR002703/5GC002476.

Functional description

Table 248: AHCF functional specification

Property	Value
Maximum output power	200 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies	WCDMA, FDD-LTE, NR
RF sharing/concurrent mode	B26/n26: multi-RAT operation NR, LTE B5/n5: multi-RAT operation NR, LTE, WCDMA
Duplex mode, supported standard	FDD
IoT support	NB-IoT in band, guard band (GB)

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Property	Value
TX frequency range	B26/n26: 859–894 MHz Note: Due to FCC requirements 1 MHz of band 26 (859–860 MHz) is reserved for a guard band. You can allocate a carrier overlapping this area (for example 10 MHz carrier with the center frequency of 864 MHz) but in this case the overlapping PRBs need to be shut down using *LTE3145: Slim Carrier* feature. B5/n5: 869–894 MHz
RX frequency range	B26/n26: 814–849 MHz B5/n5: 824–849 MHz
DL filter bandwidth	35 MHz
UL filter bandwidth	35 MHz
Instantaneous bandwidth (iBW)	35 MHz
Occupied bandwidth (oBW)	35 MHz
Number of carriers per pipe	Up to 3
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 66: AHCF interfaces

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Table 249: AHCF interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote electrical tilt	RET	1	8-pin circular	RS-485
External alarm connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 250: AHCF ALD support

ALD support	Value
AISG	AISG 2.0/3.0 and power supply: ANT1, ANT3 PING: ANT1, ANT2, ANT3, ANT4
Voltage	14.5 V
Power per port	30 W, total 45 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 67: AHCF functional block diagram

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Electrical specifications

Table 251: AHCF electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 252: AHCF power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 4T	2x60+2x40	1056	1316	1996
	1/1/1 4T	4x40	898	1100	1597
	1/1/1 4T	4x20	660	768	982
	1/1/1 2T	2x60	717	868	1229
	1/1/1 2T	2x40	584	683	900
	1/1/1 2T	2x20	460	512	615

NR power back-off

Recommended value for `dlQam256PowerBackoffSub6` parameter is:

- 1 dB for 3GPP performance requirement
- 2 dB for high peak UE throughput (4x4 DL MIMO)

Related optional items

- ACPA AirScale 2 Fiber Protection (474297A)
- AMBI AirScale book mount kit for AHCA (474279A)
- AMGE AirScale 2 cover 300 x 151–185 (474271A) - factory-installed in AHCF radio variant
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMPA Pole Mounting Kit (30–120 mm) (473879A)
- AMRA AirScale one clip bracket 51–125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAF AirScale AC-DC PSU 100–240VAC/1150 W (474676A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- APPA AirScale 2 26A DC plug 3.3–10 mm^2 (474281A)

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- APPB AirScale 2 55A DC plug 3.3–10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10–16 mm^2 (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- ASFA AirScale 2 fan unit 300 (473968A)
- FPKA Flexi Pole Mounting Kit (30–120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (v101: 60–295 mm, v202: 60–300 mm) (472821A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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Table 253: AHCF dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH with ID cover: 372.5 mm (14.67 in) With upper and lower mounting brackets: 447.5 mm (17.62 in)	
Width	Core RRH with ID cover: 317 mm (12.4 in)	
Depth	Core RRH with ID cover: 185 mm (7.28 in) With upper and lower mounting brackets: 198.5 mm (7.81 in)	
Weight	Core RRH with ID cover: 19.2 kg (42.3 lb) With upper and lower mounting brackets: 20.5 kg (45.2 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 254: AHCF environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.24 AirScale RRH 4T4R B26a 100 W (AHCC)

AHCC (474469A) is introduced by LTE4260.

Functional description

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Table 255: AHCC functional specification

Property	Value
Maximum output power	100 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	FDD-LTE, NR-ready
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B26a: 862.6–869 MHz
RX frequency range	B26a: 817.6–824 MHz
DL filter bandwidth	6.4 MHz
UL filter bandwidth	6.4 MHz
Instantaneous bandwidth (iBW)	6.4 MHz
Occupied bandwidth (oBW)	6.4 MHz
Number of carriers per pipe	Up to 3
Supported bandwidths	1.4, 3, 5 MHz

Interfaces

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Figure 68: AHCC interfaces

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Table 256: AHCC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Two position circular connector	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10 Plus	AISG & BiasT support on ANT1 and ANT3
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); R2CT IP caps
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 257: AHCC ALD support

ALD support	Value
AISG	ANT1, ANT3: AISG 2.0/3.0 ANT2, ANT4: AISG 3.0 ping receiver RET: AISG 2.0/3.0
Voltage	ANT1, ANT3, RET: 14.5 V
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 69: AHCC functional block diagram

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Electrical specifications

Table 258: AHCC electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Table 259: AHCC TX output power tolerance

Property	Tolerance	Description
Typical power tolerance (nominal temperature)	± 0.8 dB	Over full TX RF bandwidth, nominal ambient temperature 25°C (77°F)
Typical power tolerance (extreme temperature)	± 2.0 dB	Over full TX RF bandwidth, extreme ambient temperature 55°C (131°F)
Typical power tolerance for Standalone NB-IoT (nominal temperature)	± 2.0 dB	Over full TX RF bandwidth, nominal ambient temperature 25°C (77°F)
Typical power tolerance for Standalone NB-IoT (nominal temperature)	± 2.5 dB	Over full TX RF bandwidth, extreme ambient temperature 55°C (131°F)

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Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 260: AHCC power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	40+40	608	703	1014
	1/1/1 4T	4x25	774	894	1280

Recommended power back-off

Table 261: AHCC power back-off in 256 QAM

Rated power [W]	Single Carrier [dB]	Dual Carrier [dB]	Triple Carrier [dB]
40	0	0.4	0.4
25	0	0	0.4

Note:

Final values will be provided in future releases.

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGF AirScale2 cover 300 x 176-200 (474272A)
- AMBH AirScale book mount kit 176-200 (474280A)

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- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- ACPA AirScale 2 Fiber Protection (474297A) - only if R2CT is not used

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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Table 262: AHCC dimensions and weight

Property	Value	Dimensions orientation
Height	337 mm (13.26 in.) With upper and lower mounting bracket: 427.5 mm (16.83 in.)	
Width	295 mm (11.61 in.)	
Depth	190 mm (7.48 in.) With upper and lower mounting bracket: 206.5 mm (8.12 in.)	
Weight	21.5 kg (47.4 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 263: AHCC environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.25 AirScale RRH 4T4R B28 240 W (AHPF)

AHPF (475798A) is introduced by CB006896.

Functional description

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Table 264: AHPF functional specification

Property	Value
Maximum output power	240 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technologies	NR
Duplex mode, supported standard	FDD
TX frequency range	758–788 MHz
RX frequency range	703–733 MHz
DL filter bandwidth	30 MHz
UL filter bandwidth	30 MHz
Instantaneous bandwidth (iBW)	30 MHz
Occupied bandwidth (oBW)	30 MHz
Number of carriers per pipe	Up to 2
Supported bandwidths	10, 20, 30 MHz
PIM cancellation	Yes

Interfaces

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Figure 70: AHPF interfaces

Table 265: AHPF interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	2-pole connector	APPB, APPC
Antenna connector	ANT	4	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	–
Optical interface	OPT	2	SFP+	9.8 Gbit/s CPRI; Nokia IP seal
Grounding	GND ⏚	1	2 x M5 screw	–

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WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 266: AHPF ALD support

Property	Value
AISG	AISG 3.0: ANT 1, ANT 2, ANT 3, ANT 4, and RET Power supply: ANT 1 and ANT 3
Voltage	14.5 V
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

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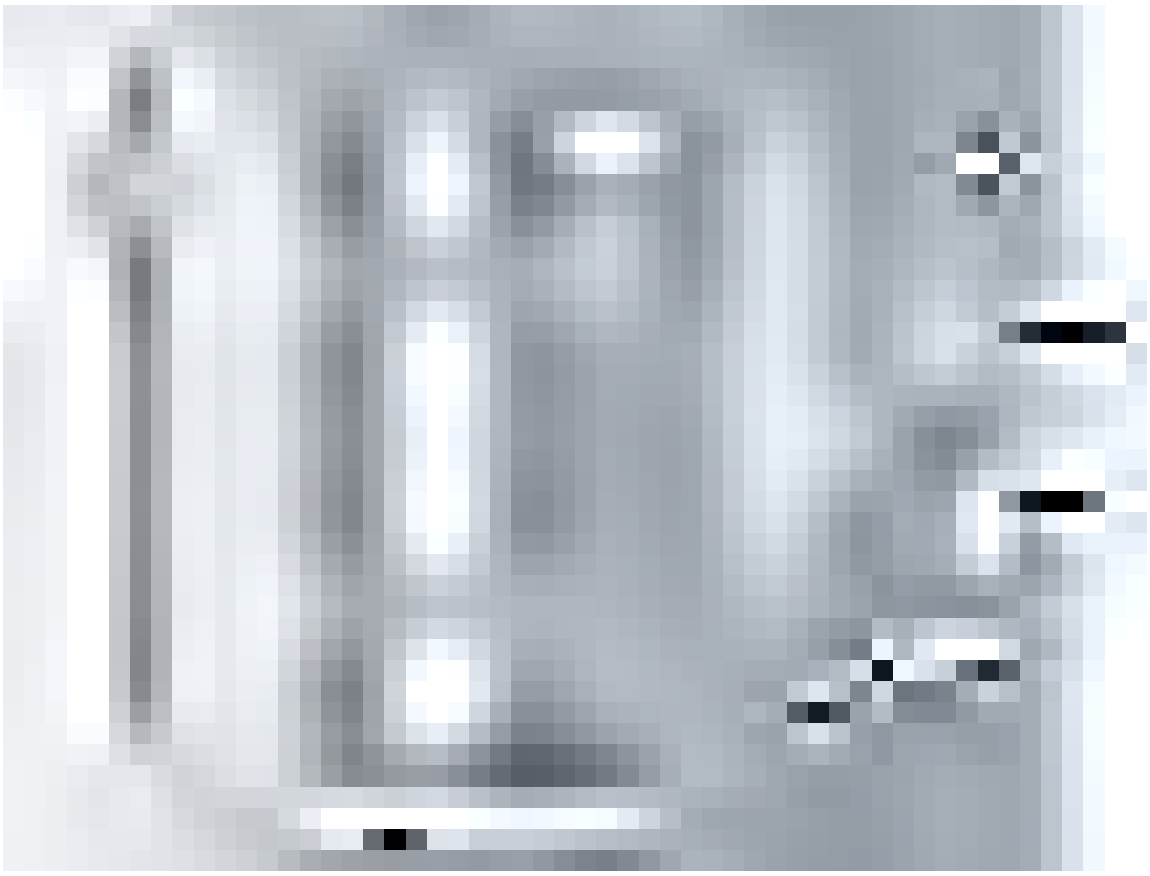
Figure 71: AHPF functional block diagram



Electrical specifications

Table 267: AHPF electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

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Power consumption

> **Note:**
>
> Contact Nokia customer team for the latest power consumption values.

Recommended power back-off

Table 268: AHPF power back-off in 256 QAM

Single Carrier [dB]	Dual Carrier [dB]
0	0

Recommend value for `dlQam256PowerBackoffSub6` parameter is:

- 0 dB for 3GPP performance requirement
- 1.5 dB for high peak UE throughput

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPA AirScale 2 Fiber Protection (474297A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)

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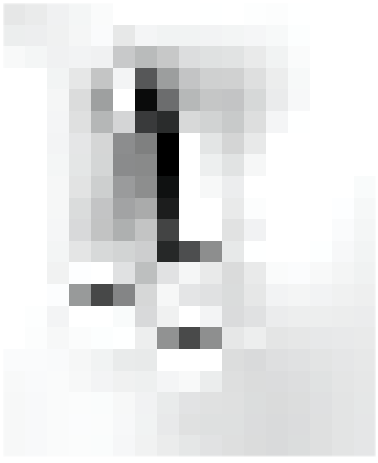
Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 269: AHPF dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 512 mm (20.16 in.) With mounting bracket: 652 mm (25.67 in.)	
Width	Core RRH: 308 mm (12.13 in.) With side mounting bosses: 327 mm (12.87 in.)	
Depth	Core RRH: 130 mm (5.12 in.) With mounting bracket: 140 mm (5.51 in.)	
Weight	22.4 kg (49.38 lb)	

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Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 270: AHPF environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.26 AirScale RRH 4T4R B28/n28 320 W (AHPB)

AHPB (474119A) is introduced by LTE3651/5GC000930.

Functional description

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Table 271: AHPB functional specification

Property	Value
Maximum output power	320 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	FDD-LTE, NR
TX frequency range	758–803 MHz
RX frequency range	703–748 MHz
DL filter bandwidth	45 MHz
UL filter bandwidth	45 MHz
Instantaneous bandwidth (iBW)	45 MHz
Occupied bandwidth (oBW)	45 MHz
Number of carriers per pipe	Up to 4 carriers in total for all supported RATs
Supported bandwidths	LTE: 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 72: AHPB interfaces

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Table 272: AHPB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	high power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 273: AHPB ALD support

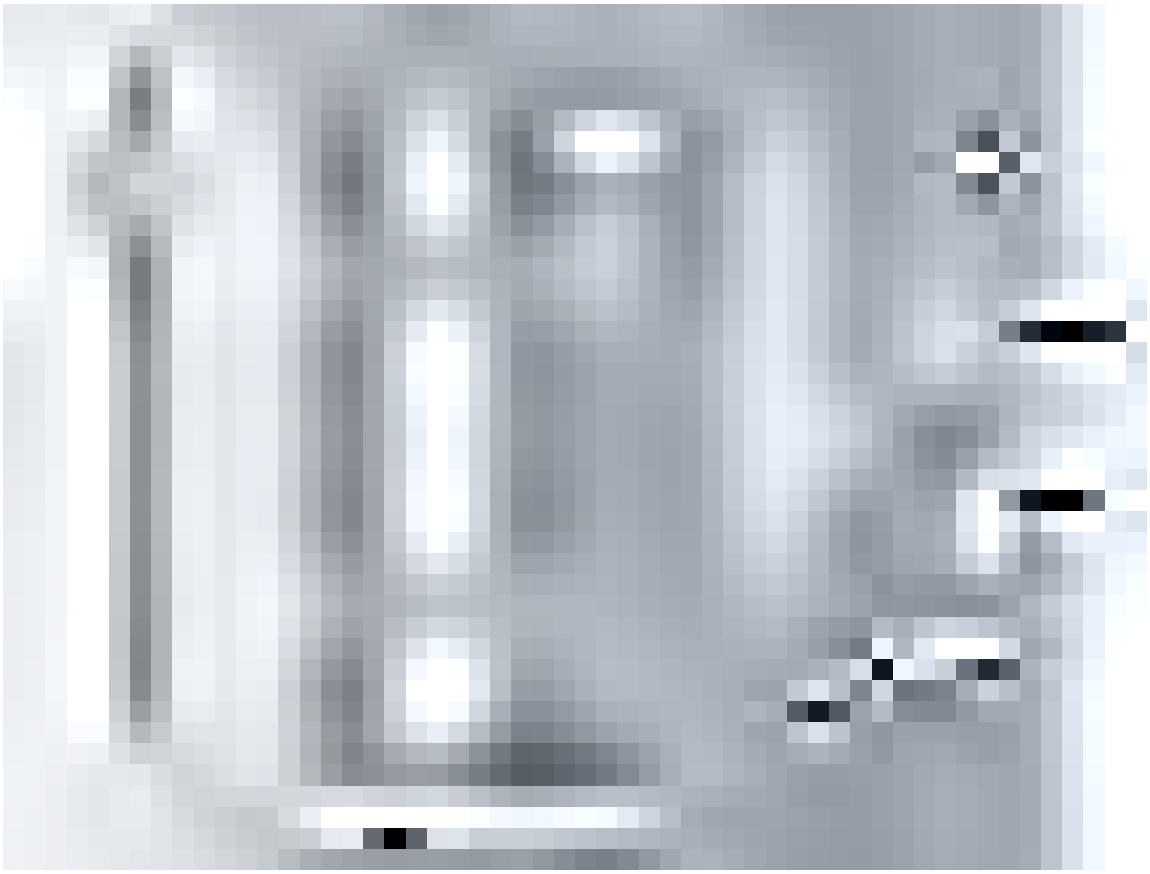
ALD support	Value
AISG	2.0, 3.0
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 73: AHPB functional block diagram



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Electrical specifications

Table 274: AHPB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 275: AHPB power consumption in LTE mode

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1/1/1 4T	4 x 80	1531	1982	3029
1/1/1 4T	4 x 60	1358	1702	2492
1/1/1 4T	4 x 40	1167	1397	1913
1/1/1 4T	4 x 20	980	1104	1368
1/1/1 2T	2 x 80	931	1152	1649
1/1/1 2T	2 x 60	844	1010	1391
1/1/1 2T	2 x 40	752	864	1118
1/1/1 2T	2 x 20	661	720	847

LTE power back-off

Table 276: AHPB power back-off in 256 QAM (carrier spacing over 100 MHz)

Single carrier [dB]	Dual carrier [dB]	Triple [dB]	Quad [dB]
0.8	1.4	1.4	1.6

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A) - factory-installed in AHPB (v102)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

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- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPA AirScale 2 Fiber Protection (474297A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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Table 277: AHPB dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 512 mm (20.16 in.) With upper and lower mounting brackets: 630 mm (24.80 in.) With fan unit: 651 mm (25.62 in.)	
Width	Core RRH: 308 mm (12.13 in.) With side mounting bosses: 327 mm (12.87 in.)	
Depth	Core RRH: 130 mm (5.12 in.) With mounting brackets: 142 mm (5.59 in.) With mounting bracket and heatshield or fan unit: 147 mm (5.78 in.)	
Weight	Core RRH: 24 kg (52.9 lb) With fan unit: 25 kg (55.12 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 278: AHPB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.27 AirScale RRH 4T4R B30 100 W (AHNA)

AHNA (474861A) is introduced by LTE4637/SR002150/CB005907.

Functional description

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Table 279: AHNA functional specification

Property	Value
Maximum output power	100 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies	FDD-LTE, NR
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B30: 2350–2360 MHz
RX frequency range	B30: 2305–2315 MHz
DL filter bandwidth	10 MHz
UL filter bandwidth	10 MHz
Instantaneous bandwidth (iBW)	10 MHz
Occupied bandwidth (oBW)	10 MHz
Number of carriers per pipe	Up to 2
Supported bandwidths	5, 10 MHz
PIM cancellation	Yes

Interfaces

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Figure 74: AHNA interfaces

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Table 280: AHNA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Low power circular	APPA, APPB, APPC
Antenna connector	ANT	4	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR 26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7), except 6.1 Gbps (CPRI6); R2CT IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 281: AHNA ALD support

ALD support	Value
AISG	ANT1, ANT3, RET: AISG 3.0 ANT2, ANT4: AISG 3.0 Ping receiver
Voltage	ANT1, ANT3, RET: 14.5 V
Power per port	ANT1, ANT3: 30 W RET: 45 W
Total maximum power	45 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 75: AHNA functional block diagram

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Electrical specifications

Table 282: AHNA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 283: AHNA power consumption in LTE mode

Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
1/1/1 4T	4x25	783	965	1403
1/1/1 2T	2x25	494	581	785

Recommended power back-off

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Table 284: AHNA power back-off in 256QAM

Single carrier [dB]	Dual carrier [dB]
0.5 dB	1 dB

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- AMGD AirScale 2 cover 300 x 126-150 (474270A)
- AMBF Book Mount Kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- ACPA AirScale 2 Fiber Protection (474297A) - only if R2CT is not used

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

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NOTICE:

Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 285: AHNA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336.5 mm (13.25 in.) With upper and lower mounting brackets 427.5 mm (16.83 in.)	
Width	Core RRH: 306 mm (12.05 in.) With cover: 324 mm (12.76 in.)	
Depth	Core RRH: 140 mm (5.51 in.) With mounting brackets: 164 mm (6.46 in.) With cover and mounting brackets: 183 mm (7.21 in.)	
Weight	Core RRH: 15.5 kg (34.2 lb) Core with brackets and cover: 17.7 kg (39.0 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 286: AHNA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.28 AirScale RRH 4T4R B65 160 W (AHGE)

AHGE (475580A) is introduced by CB006996.

Functional description

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Table 287: AHGE functional specification

Property	Value
Maximum output power	160 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies	FDD-LTE
TX frequency range	B65: 2170–2200 MHz
RX frequency range	B65: 1980–2010 MHz
DL filter bandwidth	30 MHz
UL filter bandwidth	30 MHz
Instantaneous bandwidth (iBW)	30 MHz
Occupied bandwidth (oBW)	30 MHz
Number of carriers per pipe	Up to 3
Supported bandwidths	5, 10, 15, 20 MHz

Interfaces

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Figure 76: AHGE interfaces

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Table 288: AHGE interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	AISG on all ports, BiasT support on ANT1 & ANT3, Has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	2 x M5 screw or 1 x M8	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 289: AHGE ALD support

Property	Value
AISG	ANT1, ANT3, RET: 2.0/3.0 ANT2, ANT4: AISG 2.0/3.0 Ping receiver
Voltage	14.5 V
Power per port	ANT1, ANT3: 40 W RET: 45 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 77: AHGE functional block diagram

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Electrical specifications

Table 290: AHGE electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 291: AHGE power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 4T	4x40	907	1117	1609
	1/1/1 2T	2x40	568	674	897

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Recommended power back-off

Table 292: AHGE power back-off in 256 QAM

Single Carrier [dB]	Dual Carrier [dB]
0	0.7

Related optional items

- ASFA AirScale 2 fan unit 300 (473968A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMGD AirScale 2 cover 300 x 126-150 (474270A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60-300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPA AirScale 2 26A DC plug 3.3-10 mm^2 (474281A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan

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- One-clip rail
- Book mounting

NOTICE:

Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 293: AHGE dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 337 mm (13.27 in.) With upper and lower mounting brackets: 427.5 mm (16.8 in.)	
Width	Core RRH: 295 mm (11.61 in.) With cover and mounting brackets: 322 mm (12.68 in.)	
Depth	Core RRH: 140 mm (5.51 in.) With mounting brackets: 164.5 mm (6.48 in.) With cover and mounting brackets: 183.5 mm (7.22 in.)	
Weight	15.5 kg (34.2 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 294: AHGE environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.2.29 AirScale RRH 4T4R B66/n66 160 W (FRIJ)

FRIJ (473368A) is introduced by LTE2516/SR001361/5GC002311.

Functional description

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Table 295: FRIJ functional specification

Property	Value
Maximum output power	160 W
Modulation	Up to 64 QAM (UL and DL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies	WCDMA, FDD-LTE, NR LTE-WCDMA, NR-LTE/SRAN
TX frequency range	B66/n66: 2110–2200 MHz
RX frequency range	B66/n66: 1710–1780 MHz
DL filter bandwidth	90 MHz
UL filter bandwidth	70 MHz
Instantaneous bandwidth (iBW)	DL: 90 MHz UL: 70 MHz
Occupied bandwidth (oBW)	40 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	LTE, NR: 5, 10, 15, 20 MHz WCDMA: 3.8, 4.2, 5 MHz

Interfaces

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Figure 78: FRIJ interfaces

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Table 296: FRIJ interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	-
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	AISG C485	8-pin circular
External Alarm Connection	EAC	1	USB 3.0 Type-A	4 alarm inputs and 1 control output
Optical interface	OPT	3	SFP+	6 Gbps, OBSAI, Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	Fan	1	2-pin Micro-Fit	Located on the side of the unit.

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 297: FRIJ ALD support

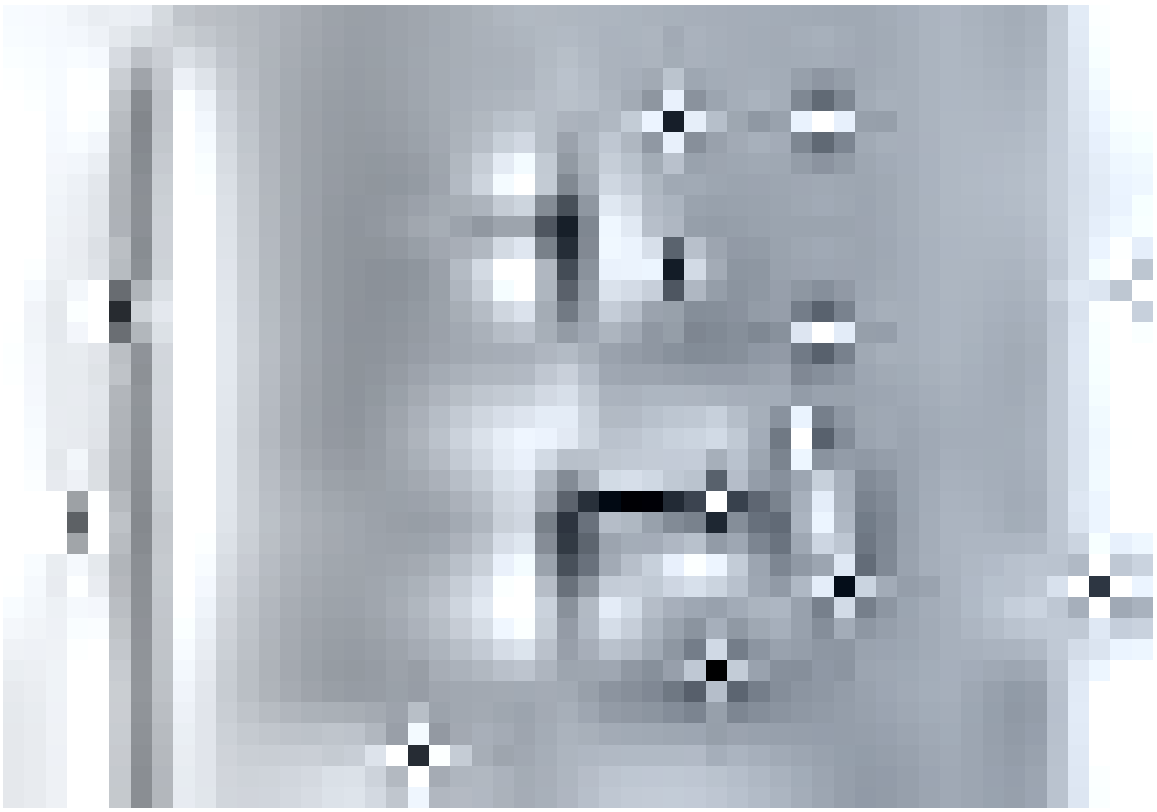
ALD support	Value
AISG	ANT1, ANT3, RET: AISG 2.0
Voltage	ANT1, ANT3: 14.5 V RET: 14.5 V
Power per port	40 W
Power	60 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 79: FRIJ functional block diagram



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Electrical specifications

Table 298: FRIJ electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 299: FRIJ power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average load P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	20+20	634	709	868
	1/1/1 2T	40+40	746	886	1163
	1/1/1 4T	4x20	1005	1155	1473
	1/1/1 4T	4x40	1235	1512	2109
WCDMA	1/1/1	20	446	480	558
	2/2/2	20	500	564	702
	3/3/3	20	690	786	1008
	4/4/4	20	748	873	1149
MSR	WCDMA 2/2/2 LTE 1/1/1 4T 10 MHz	20 (VAM) 4x10	970	1100	1393
	WCDMA 2/2/2 LTE 1/1/1 4T 10 MHz	20 (VAM) 4x20	1070	1249	1641

LTE power back-off

Table 300: FRIJ power back-off in 256 QAM

Single carrier [dB]	Dual carrier [dB]
0.7	0.8

Related optional items

- Mandatory optional item: FMNF AirScale 1.0 Medium Book Mount Kit (473979A)

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- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- FMNC AirScale 1.0 Medium Fan Kit (473597A)
- AMLA Flat mount adapter bracket (473881A)
- FMNH AirScale Ladder Mount Kit (474091A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)

Installation options

- Wall
  - Flat
  - Vertically
  - Horizontally (secondary bracket rotated 90°)
  - Horizontally (unit bracket rotated 90°)
- Pole
  - Flat
  - Vertically
  - Horizontally

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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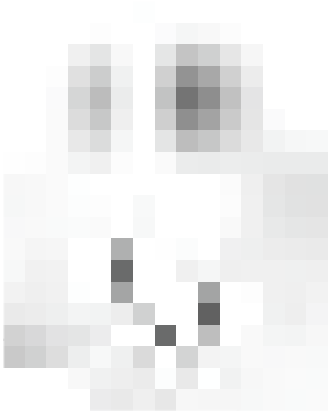
Table 301: FRIJ dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 587.2 mm (23.1 in.) With cover, handle, and unit bracket: 600 mm (23.6 in.) With cover, handle, unit bracket, and fan kit: 630.2 mm (24.8 in.)	Dimensions orientation in vertical mount with cover 
Width	Core RRH: 120 mm (4.7 in.) With cover, handle, and unit bracket: 126 mm (5.0 in.) With cover, handle, unit bracket, and fan kit: 126 mm (5.0 in.) With cover, handle, unit bracket, and fan kit (unit bracket rotated 90 degrees for horizontal mounting): 143 mm (5.6 in.)	
Depth	Core RRH: 320 mm (12.6 in.) With cover, handle, and unit bracket: 424 mm (16.7 in.) With cover, handle, unit bracket, and fan kit: 424 mm (16.7 in.)	Dimensions orientation in horizontal mount with cover and fan
Weight	Core RRH: 18.5 kg (40.8 lb) With cover, handle, and unit bracket: 20.9 kg (46.1 lb) With cover, handle, unit bracket, and fan kit: 22.1 kg (48.7 lb)	

Environmental specifications

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Table 302: FRIJ environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	55°C (131°F)
Maximum operational outdoor temperature in the sun, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	50°C (122°F)
Maximum indoor temperature, assuming wind speed is 0 m/s, valid for fanless products (at constant high ambient temperature, maximum output power might be limited)	40°C (104°F)
Minimum operational temperature (including cold start)	-40°C (-40°F)
IP rating	IP65

5.3 Descriptions of dual band remote radio heads

5.3.1 AirScale Dual RRH 2T4R B1/B3 (n1/n3) 240 W (AHEGA)

AHEGA (473995A) is introduced by LTE3140/SR001575/5GC002429.

Functional description

Table 303: AHEGA functional specification

Property	Value
Maximum output power	240 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)

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Property	Value
MIMO mode	B1/n1: 2T4R B3/n3: 2T4R
Outdoor installation	Yes
Supported technologies	B1: WCDMA, FDD-LTE, WCDMA-LTE B3: GSM, FDD-LTE, GSM-LTE n1/n3: NR, NR-SRAN
TX frequency range	B1/n1: 2110–2170 MHz B3/n3: 1805–1880 MHz
RX frequency range	B1/n1: 1920–1980 MHz B3/n3: 1710–1785MHz
DL filter bandwidth	B1/n1: 60 MHz B3/n3: 75 MHz
UL filter bandwidth	B1/n1: 60 MHz B3/n3: 75 MHz
Instantaneous bandwidth (iBW)	B1/n1: 60 MHz B3/n3: 75 MHz
Occupied bandwidth (oBW)	B1/n1 2T2R: 60 MHz B1/n1 2T4R: 40 MHz (DL only) B3/n3 2T2R: 75 MHz B3/n3 2T4R: 40 MHz (DL only)
Number of carriers per pipe	2T4R mode: up to 4 for both bands for all supported RATs 2T2R mode: up to 8 for both bands (4 per band) for all supported RATs
Supported bandwidths	B1: 5, 10, 15, 20 MHz B3: 1.4, 3, 5, 10, 15, 20 MHz n1/n3: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 80: AHEGA interfaces

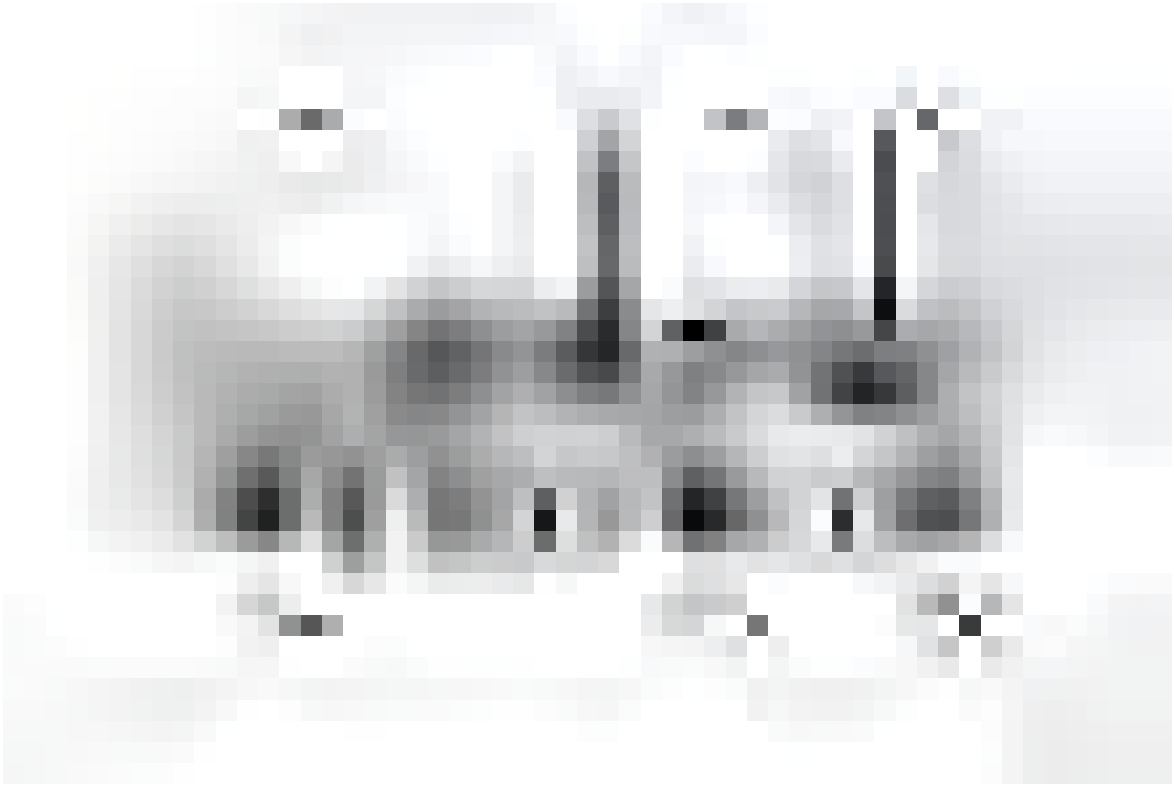

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Table 304: AHEGA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	high power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	AISG on each antenna connector Has features that prevent damage when mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 305: AHEGA ALD support

ALD support	Value
AISG	2.0, 3.0
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 81: AHEGA functional block diagram

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Electrical specifications

Table 306: AHEGA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2TX = three sectors, two carriers per sector, 2TX per carrier
  - 1+1/1+1/1+1 4TX = three dual-band sectors, one carrier per sector per band, 4TX per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 307: AHEGA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 2T	2x80	1079	1326	1925
	Single band 1/1/1 2T	2x60	982	1169	1643
	Single band 1/1/1 2T	2x40	873	992	1294
	Single band 1/1/1 2T	2x20	772	833	972
	Dual band 1+1 /1+1 /1+1 2T	2x60	1577	1958	2919
	Dual band 1+1 /1+1 /1+1 2T	2x40	1371	1625	2243
	Dual band 1+1 /1+1 /1+1 2T	2x20	1166	1297	1588

LTE power back-off

Table 308: Recommended AHEGA power back-off per band, in 256 QAM

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.7	0.7	0.9

GSM cell power range

NOTICE:

Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

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Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBE AirScale book mount kit 101-125 (474277A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- APAF AirScale AC-DC PSU 100-240VAC/1150W (474676A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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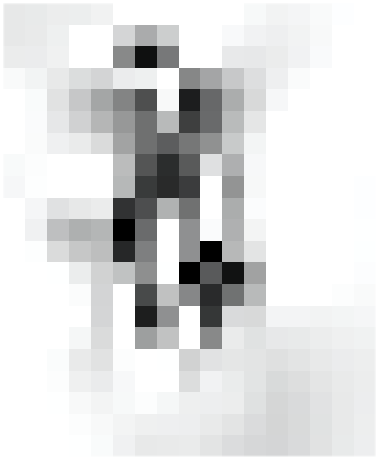
Table 309: AHEGA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 512 mm (20.16 in.) With upper and lower mounting brackets: 630 mm (24.80 in.)	
Width	Core RRH: 308 mm (12.13 in.) With side mounting bosses: 321 mm (12.64 in.)	
Depth	Core RRH: 116.5 mm (4.59 in.) With mounting brackets: 128.5 mm (5.06 in.) With the heat shield: 147 mm (5.79 in.)	
Weight	24 kg (52.9 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 310: AHEGA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.3.2 AirScale Dual RRH 4T4R B1/B3 (n1/n3) 320 W (AHEGB)

AHEGB (474090A) is introduced by LTE3681/SR001668/5GC001688.

Functional description

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Table 311: AHEGB functional specification

Property	Value
Maximum output power	320 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	B1/n1: WCDMA, FDD-LTE, WCDMA-LTE, NR, NR-SRAN B3/n3: GSM, FDD-LTE, GSM-LTE, NR
TX frequency range	B1/n1: 2110–2170 MHz B3/n3: 1805–1880 MHz
RX frequency range	B1/n1: 1920–1980 MHz B3/n3: 1710–1785 MHz
DL filter bandwidth	B1/n1: 60 MHz B3/n3: 75 MHz
UL filter bandwidth	B1/n1: 60 MHz B3/n3: 75 MHz
Instantaneous bandwidth (iBW)	B1/n1: 60 MHz B3/n3: 75 MHz
Occupied bandwidth (oBW)	B1/n1: 60 MHz B3/n3: 75 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs
Supported bandwidths	LTE B1: 5, 10, 15, 20 MHz LTE B3: 1.4, 3, 5, 10, 15, 20 MHz NR n1/n3: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 82: AHEGB interfaces

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Table 312: AHEGB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	AISG on all ports, BiasT support on ANT1 and ANT3 Has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	4	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 313: AHEGB ALD support

ALD support	Value
AISG	2.0, 3.0
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 83: AHEGB functional block diagram

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Electrical specifications

Table 314: AHEGB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 315: AHEGB power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 4T	4x40	1397	1657	2264
	Single band 1/1/1 4T	4x20	1050	1163	1451
	Single band 1/1/1 2T	2x40	977	1103	1403
	Single band 1/1/1 2T	2x20	811	867	1010
	Dual band 1+1 /1+1 /1+1 4T	4x40	2177	2676	3822
	Dual band 1+1 /1+1 /1+1 4T	4x20	1532	1768	2321
	Dual band 1+1 /1+1 /1+1 2T	2x40	1365	1613	2201
	Dual band 1+1 /1+1 /1+1 2T	2x20	1049	1168	1448

LTE power back-off

Table 316: Recommended AHEGB power back-off per band, in 256 QAM

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.7	0.7	0.9

GSM cell power range

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NOTICE:

Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

NOTICE:

Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

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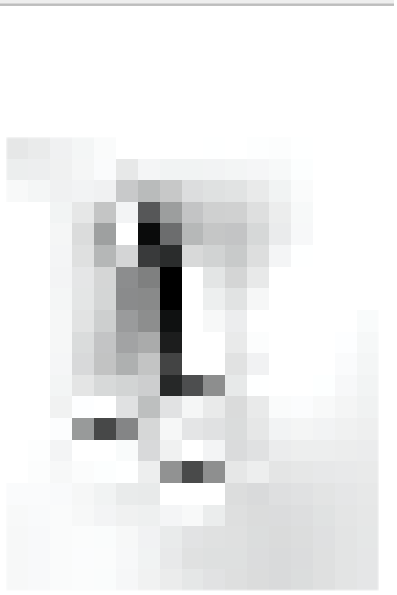
Dimensions and weight

Table 317: AHEGB dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 560 mm (22.05 in.) With upper and lower mounting brackets: 675 mm (26.57 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting brackets: 327 mm (12.87 in.)	
Depth	Core RRH: 149 mm (5.87 in.) With mounting brackets: 160 mm (6.3 in.)	
Weight	30 kg (66.1 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 318: AHEGB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.3.3 AirScale Dual RRH 4T4R B1/B3 (n1/n3) 400 W (AHEGC)

AHEGC (474914A) is introduced by LTE4970/SR002211/5GC002335.

Functional description

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Table 319: AHEGC functional specification

Property	Value
Maximum output power	400 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	B1: WCDMA, FDD-LTE, WCDMA-LTE B3: GSM, FDD-LTE, GSM-LTE n1/n3: NR, NR-SRAN
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B1/n1: 2110–2170 MHz B3/n3: 1805–1880 MHz
RX frequency range	B1/n1: 1920–1980 MHz B3/n3: 1710–1785 MHz
DL filter bandwidth	B1/n1: 60 MHz B3/n3: 75 MHz
UL filter bandwidth	B1/n1: 60 MHz B3/n3: 75 MHz
Instantaneous bandwidth (iBW)	B1/n1: 60 MHz B3/n3: 75 MHz
Occupied bandwidth (oBW)	B1/n1: 60 MHz B3/n3: 75 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs
Supported bandwidths	B1: 5, 10, 15, 20 MHz B3: 1.4, 3, 5, 10, 15, 20 MHz n1/n3: 5, 10, 15, 20 MHz
PIM cancellation	Yes

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Interfaces

Figure 84: AHEGC interfaces

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Table 320: AHEGC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	AISG on all ports, BiasT support on ANT1 & ANT3; has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS485
External Alarm Connection	EAC	4	MDR26	4 inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 321: AHEGC ALD support

Property	Value
AISG	2.0, 3.0
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 85: AHEGC functional block diagram

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Electrical specifications

Table 322: AHEGC electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 323: AHEGC power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 4T	4x60	1642	2028	2910
	Single band 1/1/1 4T	4x40	1385	1635	2167
	Single band 1/1/1 4T	4x20	1135	1272	1531
	Single band 1/1/1 2T	2x60	1112	1299	1727
	Single band 1/1/1 2T	2x40	985	1108	1371
	Single band 1/1/1 2T	2x20	866	935	1067
	Dual band 1+1 /1+1 /1+1 4T	4x50	2462	3114	4633
	Dual band 1+1 /1+1 /1+1 4T	4x40	2172	2690	3815
	Dual band 1+1 /1+1 /1+1 4T	4x20	1664	1946	2489
	Dual band 1+1 /1+1 /1+1 2T	2x50	1505	1821	2563
	Dual band 1+1 /1+1 /1+1 2T	2x40	1370	1624	2176
	Dual band 1+1 /1+1 /1+1 2T	2x20	1123	1262	1529

LTE power back-off

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Table 324: Recommended AHEGC power back-off per band, in 256 QAM

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.7	0.7	0.9

GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- AMBF AirScale book mount kit 126-150 (474278A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal

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- One-clip rail
- Book mounting

Dimensions and weight

Table 325: AHEGC dimensions and weight

Property	Value	Dimensions orientation
Height	With fan unit: 701 mm (27.59 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting bracket: 327 mm (12.87 in.)	
Depth	Core RRH: 149 mm (5.86 in.) With mounting bracket: 160 mm (6.30 in.)	
Weight	Core RRH: 34 kg (75.0 lb)	

Environmental specifications

Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

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Table 326: AHEGC environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

5.3.4 AirScale Dual RRH 4T4R B1/3 (n1/n3) 400 W (AHEGF)

AHEGF (475825A) is introduced by CB007083.

Functional description

Table 327: AHEGF functional specification

Property	Value
Maximum output power	400 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	B1/n1: LTE FDD, WCDMA, NR B3/n3: LTE, NR
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B1/n1: 2110–2170 MHz B3/n3: 1805–1880 MHz
RX frequency range	B1/n1: 1920–1980 MHz B3/n3: 1710–1785 MHz
DL filter bandwidth	B1/n1: 60 MHz B3/n3: 75 MHz

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Property	Value
UL filter bandwidth	B1/n1: 60 MHz B3/n3: 75 MHz
Instantaneous bandwidth (iBW)	B1/n1: 60 MHz B3/n3: 75 MHz
Occupied bandwidth (oBW)	B1/n1: 60 MHz B3/n3: 75 MHz
Number of carriers per pipe	B1/n1: up to 8 carriers per TX/RX path in Multi-RAT case (NR, LTE, WCDMA or mix) B3/n3: up to 8 carriers per TX/RX path in Multi-RAT case (NR, LTE or mix)
Supported bandwidths	LTE: B1: 5, 10, 15, 20 MHz B3: 1.4, 3, 5, 10, 15, 20 MHz NR: n1: 5, 10, 15, 20 MHz n3: 5, 10, 15, 20 MHz WCDMA: B1: 3.8, 4.0, 4.2, 4.4, 4.6, 4.8 MHz
PIM cancellation	Yes

Interfaces

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Figure 86: AHEGF interfaces

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Table 328: AHEGF interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Terminal block	Max wire gauge 4 AWG with max strand diameter 7 mm (max 105 strands)
Antenna connector	ANT	4	4.3-10+	AISG on all ports and BiasT support on ANT1 and ANT3, has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	AISG RS485
External Alarm Connection	EAC	1	MDR-26	4 inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP Seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 329: AHEGF ALD support

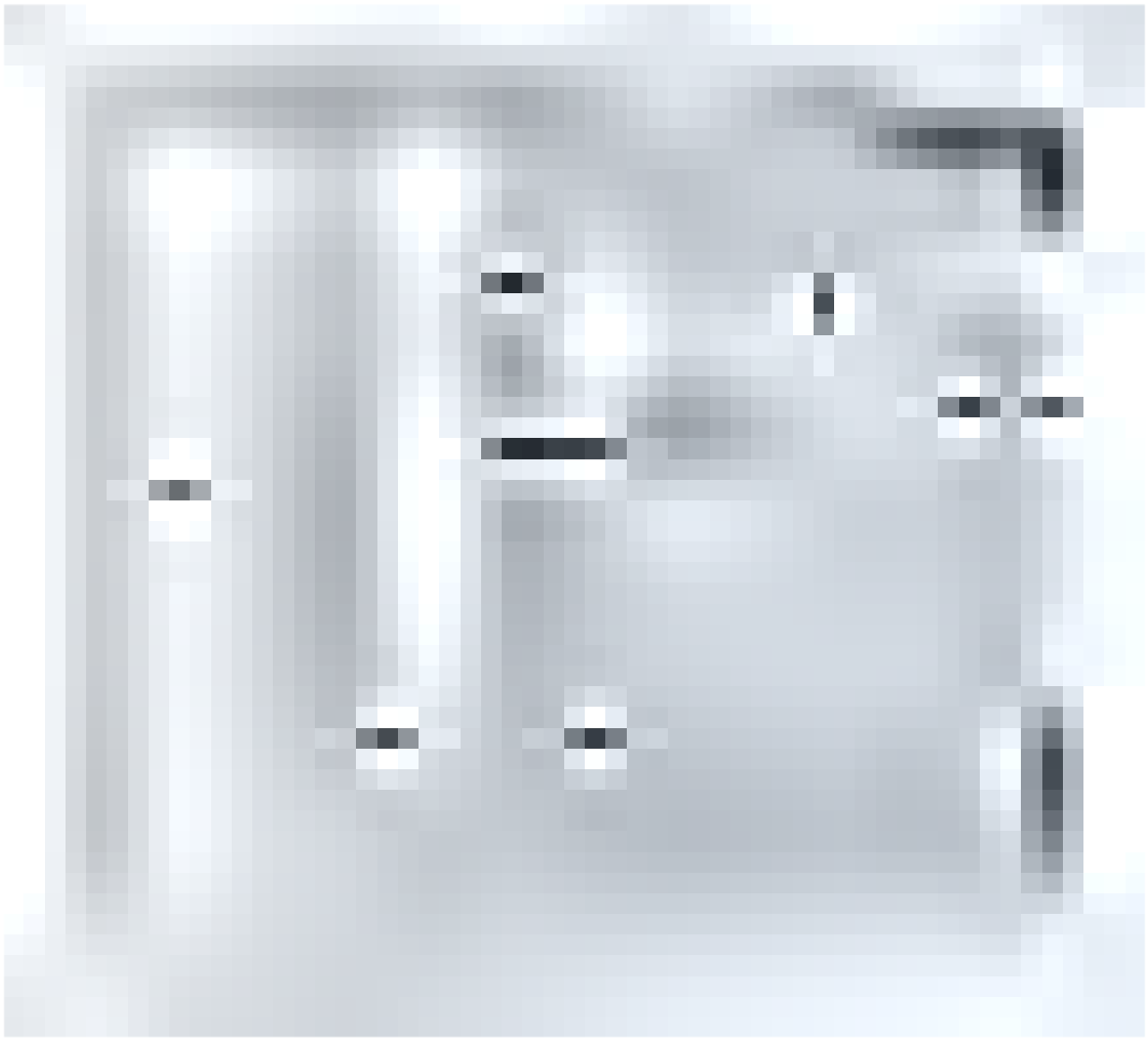
Property	Value
AISG	2.0, 3.0
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 87: AHEGF functional block diagram



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Electrical specifications

Table 330: AHEGF electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -50 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 331: AHEGF power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 4T	4x60	1511	1744	2320
	Single band 1/1/1 4T	4x40	1350	1499	1859
	Single band 1/1/1 4T	4x20	1228	1303	1484
	Single band 1/1/1 2T	2x60	1083	1196	1474
	Single band 1/1/1 2T	2x40	1005	1078	1254
	Single band 1/1/1 2T	2x20	946	982	1072
	Dual band 1+1/1+1/1+1 4T	4x50	2112	2549	3570
	Dual band 1+1/1+1/1+1 4T	4x40	1933	2285	3079
	Dual band 1+1/1+1/1+1 4T	4x20	1660	1842	2254
	Dual band 1+1/1+1/1+1 2T	2x50	1375	1589	2099
	Dual band 1+1/1+1/1+1 2T	2x40	1286	1456	1844
	Dual band 1+1/1+1/1+1 2T	2x20	1153	1241	1440

LTE power back-off

Table 332: Recommended AHEGF power back-off per band, in 256 QAM

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.7	0.7	0.9

Related optional items

- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBF AirScale Book Mount Kit 126-150 (474278A)

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- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60-300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable (474288A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal
  - One-clip rail
  - Book mounting

Dimensions and weight

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Table 333: AHEGF dimensions and weight

Property	Value	Dimensions orientation
Height	With fan unit: 730 mm (28.74 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting bracket: 327 mm (12.87 in.)	
Depth	Core RRH: 131 mm (5.15 in.) With mounting bracket: 142 mm (5.59 in.)	
Weight	Core RRH: 32 kg (70.6 lb)	

Environmental specifications

Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

Table 334: AHEGF environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

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5.3.5 AirScale Dual RRH 4T4R B2/B66a (n2/n66a) 320 W (AHFIC)

AHFIC (474239A) is introduced by LTE3845/SR002039/5GC000934.

Functional description

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Table 335: AHFIC functional specification

Property	Value
Maximum output power	320 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	B2/n2: 4T4R B66a/n66a: 4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	B2/n2: GSM, WCDMA, FDD-LTE, GSM-LTE, GSM-WCDMA, WCDMA-LTE, GSM-WCDMA-LTE, NR, NR-SRAN B66a/n66a: FDD-LTE, NR, NR-SRAN
TX frequency range	B2/n2: 1930–1990 MHz B66a/n66a: 2110–2180 MHz
RX frequency range	B2/n2: 1850–1910 MHz B66a/n66a: 1710–1780 MHz
DL filter bandwidth	B2/n2: 60 MHz B66a/n66a: 70 MHz
UL filter bandwidth	B2/n2: 60 MHz B66a/n66a: 70 MHz
Instantaneous bandwidth (iBW)	B2/n2: 60 MHz B66a/n66a: 70 MHz
Occupied bandwidth (oBW)	B2/n2: 60 MHz B66a/n66a: 70 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 88: AHFIC interfaces

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Table 336: AHFIC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	AISG on all ports, BiasT support on ANT1 and ANT5 Has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR-26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+ (R2CT)	Up to 9.8 Gbps (CPRI7); R2CT IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 337: AHFIC ALD support

ALD support	Value
AISG	ANT1, ANT3, ANT5, ANT7: AISG 2.0/3.0
Voltage	14.5 V (ANT1 and ANT5 only)
Power per port	45 W max per ANT, 30 W max for four MHAs, 75 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 89: AHFIC functional block diagram

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Electrical specifications

Table 338: AHFIC electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 339: AHFIC power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 4T	4x40	1430	1679	2230
	Single band 1/1/1 4T	4x20	1071	1198	1460
	Single band 1/1/1 2T	2x40	995	1118	1395
	Single band 1/1/1 2T	2x20	822	885	1016
	Dual band 1+1 /1+1 /1+1 4T	4x40	2221	2736	3962
	Dual band 1+1 /1+1 /1+1 4T	4x20	1515	1760	2278
	Dual band 1+1 /1+1 /1+1 2T	2x40	1379	1624	2155
	Dual band 1+1 /1+1 /1+1 2T	2x20	1047	1170	1433

LTE power back-off

Table 340: Recommended AHFIC power back-off per band, in 256 QAM

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.7	0.7	0.9

NR power back-off

Recommended value for `dlQam256PowerBackoffSub6` parameter is:

- 1.5 dB for 3GPP performance requirement (< 40 W)
- 3.0 dB for high peak UE throughput (4x4 DL MIMO) (60 W)

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GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBH AirScale book mount kit 176-200 (474280A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

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NOTICE:

Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 341: AHFIC dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 560 mm (22.05 in.) With upper and lower mounting brackets: 675 mm (26.57 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting brackets: 327 mm (12.87 in.)	
Depth	Core RRH: 177 mm (6.97 in.) With mounting brackets: 193 mm (7.6 in.)	
Weight	35 kg (77.2 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 342: AHFIC environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.3.6 AirScale Dual RRH 4T4R B5/B13 (n5) 160 W (AHBCA)

AHBCA (474241A) is introduced by LTE3848/5GC001151.

Functional description

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Table 343: AHBCA functional specification

Property	Value
Maximum output power	160 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	B5/n5: 4T4R B13: 4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	B5, B13: FDD-LTE, n5: NR, NR-SRAN
TX frequency range	B5/n5: 869–894 MHz B13: 746–756 MHz
RX frequency range	B5/n5: 824–849 MHz B13: 777–787 MHz
DL filter bandwidth	B5/n5: 25 MHz B13: 10 MHz
UL filter bandwidth	B5/n5: 25 MHz B13: 10 MHz
Instantaneous bandwidth (iBW)	B5/n5: 25 MHz B13: 10 MHz
Occupied bandwidth (oBW)	B5/n5: 25 MHz B13: 10 MHz
Number of carriers per pipe	Up to 4 carriers in total for all supported RATs
Supported bandwidths	1.4, 3, 5, 10 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 90: AHBCA interfaces

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Table 344: AHBCA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+ (R2CT)	Up to 9.8 Gbps (CPRI7); R2CT IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	4	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 345: AHBCA ALD support

ALD support	Value
AISG	2.0, 3.0
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 91: AHBCA functional block diagram

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Electrical specifications

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Table 346: AHBCA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 347: AHBCA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 4T	4x40	1411	1660	2322
	Single band 1/1/1 4T	4x30	1308	1496	1958
	Single band 1/1/1 4T	4x20	1204	1334	1622
	Dual band 1+1 /1+1 /1+1 4T	4x20	1415	1655	2247
	Dual band 1+1 /1+1 /1+1 4T	4x15	1319	1506	1930
	Dual band 1+1 /1+1 /1+1 4T	4x10	1216	1350	1624

LTE power back-off

Table 348: Recommended AHBCA power back-off in 256 QAM (carrier spacing over 100 MHz)

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.8	0.8	0.8

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBG AirScale book mount kit 151-175 (474467A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)

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- APAF AirScale AC-DC PSU 100-240VAC/1150W (474676A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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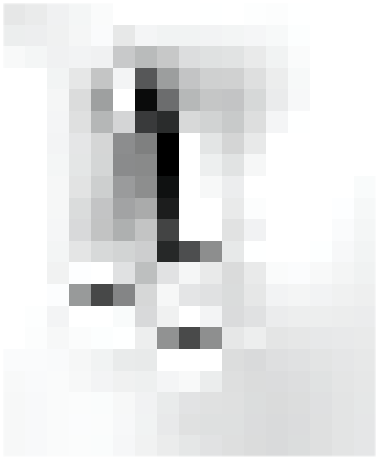
Table 349: AHBCA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 560 mm (22.05 in.) With mounting brackets: 675 mm (26.57 in.)	
Width	308 mm (12.13 in.) With mounting brackets: 327 mm (12.87 in.)	
Depth	Core RRH: 157 mm (6.18 in.) With mounting brackets: 173 mm (6.81 in.)	
Weight	34 kg (74.9 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 350: AHBCA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.3.7 AirScale Dual RRH 4T4R B5/B13 320 W (AHBCC)

AHBCC (474341A) is introduced by LTE3849/5GC001150.

Functional description

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Table 351: AHBCC functional specification

Property	Value
Maximum output power	320 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	B5: 4T4R B13: 4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	B5: WCDMA, LTE, WCDMA-LTE, NR B13: FDD-LTE, NR
IoT support	B5: NB-IoT standalone (SA) B13 NB-IOT in band, guard band (GB), standalone (SA)
TX frequency range	B5: 869–894 MHz B13: 746–756 MHz
RX frequency range	B5: 824–849 MHz B13: 777–787 MHz
DL filter bandwidth	B5: 25 MHz B13: 10 MHz
UL filter bandwidth	B5: 25 MHz B13: 10 MHz
Instantaneous bandwidth (iBW)	B5: 25 MHz B13: 10 MHz
Occupied bandwidth (oBW)	B5: 25 MHz B13: 10 MHz
Number of carriers per pipe	Up to 8
Supported bandwidths	B5: 1.4, 3, 5, 10 MHz B13: 5, 10 MHz
PIM cancellation	Yes

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Interfaces

Figure 92: AHBCC interfaces

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Table 352: AHBCC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	AISG on all ports, BiasT support on ANT1 and ANT3 Has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR-26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+ (R2CT)	Up to 9.8 Gbps (CPRI7); R2CT IP seal
Grounding	GND ⏚	1	M5 or dual M8 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 353: AHBCC ALD support

ALD support	Value
AISG	2.0, 3.0
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 93: AHBCC functional block diagram

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Electrical specifications

Table 354: AHBCC electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 355: AHBCC power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 4T	4x40	1302	1509	1980
	Single band 1/1/1 4T	4x30	1217	1377	1731
	Single band 1/1/1 4T	4x20	1126	1239	1468
	Dual band 1+1 /1+1 /1+1 4T	4x40	2024	2465	3493
	Dual band 1+1 /1+1 /1+1 4T	4x30	1856	2195	2960
	Dual band 1+1 /1+1 /1+1 4T	4x20	1666	1905	2392

Recommended power back-off

Table 356: Recommended AHBCC power back-off per band, in 256 QAM (carrier spacing over 100 MHz)

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.8	0.8	0.8

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBH AirScale book mount kit 176-200 (474280A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)

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- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- AMRC AirScale one clip rail 600 mm (474583A)
- AMRD AirScale one clip bracket over 200 (474582A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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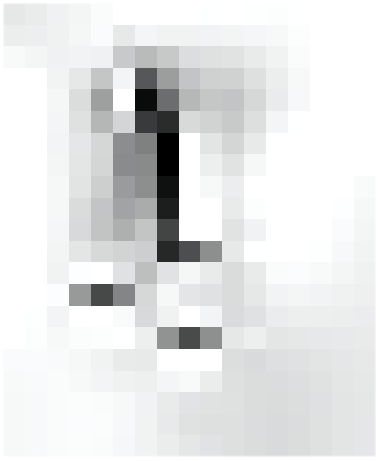
Table 357: AHBCC dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 560 mm (22.0 in.) With upper and lower mounting brackets: 675 mm (26.6 in.)	
Width	Core RRH: 308 mm (12.1 in.) With mounting brackets: 327 mm (12.9 in.)	
Depth	Core RRH: 189 mm (7.4 in.) With mounting brackets: 205 mm (8.1 in.)	
Weight	38 kg (83.8 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 358: AHBCC environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.3.8 AirScale Dual RRH 4T4R B5/B28 (n5/n28) 320 W (AHPCA)

AHPCA (475075A) is introduced by SR002356/5GC002593.

Functional description

Table 359: AHPCA functional specification

Property	Value
Maximum output power	320 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	B5/n5: 4T4R B28/n28: 4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	B5: GSM, WCDMA, FDD-LTE, GSM-WCDMA, GSM-LTE, WCDMA-LTE, GSM-WCDMA-LTE B28: FDD-LTE n5/n28: NR, NR-SRAN
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B5/n5: 869–894 MHz B28/n28: 758–803 MHz

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Property	Value
RX frequency range	B5/n5: 824–849 MHz B28/n28: 703–748 MHz
DL filter bandwidth	B5/n5: 25 MHz B28/n28: 45 MHz
UL filter bandwidth	B5/n5: 25 MHz B28/n28: 45 MHz
Instantaneous bandwidth (iBW)	B5/n5: 25 MHz B28/n28: 45 MHz
Occupied bandwidth (oBW)	B5/n5: 25 MHz B28/n28: 45 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs
Supported bandwidths	B5: 1.4, 3, 5, 10 MHz B28: 3, 5, 10, 15, 20 MHz n5/n28: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 94: AHPCA interfaces

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Table 360: AHPCA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	AISG on all ports and BiasT support on ANT1 and ANT3; has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR-26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 361: AHPCA ALD support

Property	Value
AISG	2.0 (hardware ready to support 3.0)
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 95: AHPCA functional block diagram

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Electrical specifications

Table 362: AHPCA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 363: AHPCA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Dual band 1+1/1+1/1+1 4T	4x40	2151	2585	3558
	Dual band 1+1/1+1/1+1 4T	4x20	1689	1892	2360
	Dual band 1+1/1+1/1+1 2T	2x40	1369	1565	2047
	Dual band 1+1/1+1/1+1 2T	2x20	1153	1249	1477

LTE power back-off

Table 364: Recommended AHPCA power back-off in 256 QAM

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.8	0.8	0.8

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GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMBH AirScale book mount kit 176-200 (474280A)
- AMRC AirScale one clip rail 600 mm (474583A)
- AMRD AirScale one clip bracket over 200 (474582A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- AOPC SFP Weatherproofing Boot Kit (475151A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

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NOTICE:

Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 365: AHPCA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 560 mm (22.04 in.) With upper and lower mounting brackets: 675 mm (26.57 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting brackets: 327 mm (12.87 in.)	
Depth	Core RRH: 189 mm (7.44 in.) With mounting brackets: 205 mm (8.07 in.)	
Weight	Core RRH: 38 kg (83.7 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 366: AHPCA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.3.9 AirScale Dual RRH 4T4R n5/B29 240 W (AHBCB)

AHBCB (474242A) is introduced by 5GC002028/LTE3846/SR001095.

Functional description

Table 367: AHBCB functional specification

Property	Value
Maximum output power	240 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	B5/n5: 4T4R B29: 2T
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	FDD-LTE, NR, NR-SRAN
TX frequency range	B5/n5: 869–894 MHz B29 (LTE only): 717–728 MHz
RX frequency range	B5/n5: 824–849 MHz B29: not supported
DL filter bandwidth	B5/n5: 25 MHz B29 (LTE only): 11 MHz

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Property	Value
UL filter bandwidth	B5/n5: 25 MHz B29: not supported
DL Instantaneous bandwidth (iBW)	B5/n5: 25 MHz B29 (LTE only): 11 MHz
UL Instantaneous bandwidth (iBW)	B5/n5: 25 MHz B29: not supported
DL Occupied bandwidth (oBW)	B5/n5: 25 MHz B29 (LTE only): 11 MHz
UL Occupied bandwidth (oBW)	B5: 25 MHz B29: not supported
Number of carriers per pipe	B5/n5: up to 4 (NR, LTE or NR+LTE) B29 (LTE only): up to 2
Supported bandwidths	LTE B5: 1.4, 3, 5, 10 MHz LTE B29: 5, 10 MHz NR n5: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 96: AHBCB interfaces

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Table 368: AHBCB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC Compatible with optional AC power supply
Antenna connector	ANT	4	4.3-10+	AISG on all ports, BiasT support on ANT1 and ANT3 Has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	4	MDR-26	4 inputs and 1 control output
Optical interface	OPT	2	SFP+ (R2CT)	Up to 9.8 Gbps (CPRI7); R2CT IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

Note:

ANT1 and ANT2 are used for band 29 (B29).

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WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Table 369: AHBCB ALD support

Property	Value
AISG	2.0, (hardware ready to support 3.0)
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

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Figure 97: AHBCB functional block diagram

Electrical specifications

Table 370: AHBCB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Note:

Power consumption values for AHBCB are preliminary. Contact Nokia customer team for the latest power consumption values.

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 371: AHBCB power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Dual band 1/1/1 4T + 1/1/1 2T	4x40W (B5) + 2x40W (B29)	1654	1981	2679
	Dual band 1/1/1 4T + 1/1/1 2T	4x20W (B5) + 2x20W (B29)	1341	1522	1875

NR power back-off

Note:

The maximum power back-off (`dlQam256PowerBackoffSub6`) value is 20 dB. High reduction values may cause radio outages.

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Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBH AirScale book mount kit 176-200 (474280A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- AMRC AirScale one clip rail 600 mm (474583A)
- AMRD AirScale one clip bracket over 200 (474582A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> To ensure convection cooling of RRHs without fans always mount the RHH vertically with the connectors facing down.

Dimensions and weight

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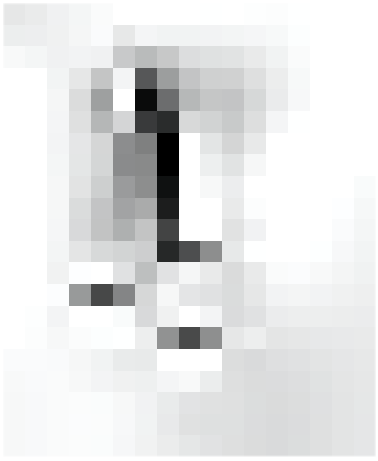
Table 372: AHBCB dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 560 mm (22.05 in.) With upper and lower mounting brackets: 675 mm (26.57 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting brackets: 327 mm (12.87 in.)	
Depth	Core RRH: 189 mm (7.44 in.) With mounting brackets: 205 mm (8.07 in.)	
Weight	Core RRH: 38 kg (83.7 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 373: AHBCB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.3.10 AirScale Dual RRH 4T4R B8/B28 (n8/n28) 480 W (AHPDA)

AHPDA (475550A) is introduced by SR002869/5GC002467.

Functional description

Table 374: AHPDA functional specification

Property	Value
Maximum output power	480 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	B8: FDD-LTE, WCDMA, GSM, WCDMA-LTE, GSM-LTE, LTE-GSM-WCDMA B28: FDD-LTE n8/n28: NR, NR-SRAN
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B8/n8: 935–960 MHz B28/n28: 758–803 MHz

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Property	Value
RX frequency range	B8/n8: 890–915 MHz B28/n28: 703–748 MHz
DL filter bandwidth	B8/n8: 25 MHz B28/n28: 45 MHz
UL filter bandwidth	B8/n8: 25 MHz B28/n28: 45 MHz
Instantaneous bandwidth (iBW)	B8/n8: 25 MHz B28/n28: 45 MHz
Occupied bandwidth (oBW)	B8/n8: 25 MHz B28/n28: 45 MHz
Number of carriers per pipe	B8/n8: up to 8 carriers for all supported RATs B28/n28: up to 4 carriers for all supported RATs
Supported bandwidths	B8: 5, 10 MHz B28: 5, 10, 15, 20 MHz n8/n28: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 98: AHPDA interfaces

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Table 375: AHPDA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	3-pole screw terminal	Allowed wire gauge: from 10 mm2 to 35 mm2 (7 AWG to 2 AW
Antenna connector	ANT	4	4.3-10+	AISG on all ports and BiasT support on ANT1 and ANT3; has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote electrical tilt	RET	1	8-pin circular	AISG RS485
External alarm connection	EAC	1	MDR-26	4 inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 376: AHPDA ALD support

Property	Value
AISG	2.0
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 99: AHPDA functional block diagram

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Electrical specifications

Table 377: AHPDA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Note:

Power consumption values for AHPDA are preliminary. Contact Nokia customer team for the latest power consumption values.

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 378: AHPDA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Dual band 2/2/2 4T	4x80W (B8) + 4x40W (B28)	2617	3343	4942
	Dual band 2/2/2 4T	4x40W (B8) + 4x20W (B28)	2021	2395	3211

LTE power back-off

Table 379: Recommended AHPDA power back-off per band, in 256 QAM

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.7	0.7	0.9

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GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable (474288A)
- AHPDA v102: AMRB AirScale one clip bracket 126-200 (474581A)
- AHPDA v102: AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

Dimensions and weight

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Table 380: AHPDA dimensions and weight

Property	Value	Dimensions orientation
Height	With fan unit: 730 mm (28.74 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting bracket: 327 mm (12.87 in.)	
Depth	Core RRH: 171 mm (6.73 in.) With mounting bracket: 182 mm (7.17 in.)	
Weight	44 kg (97.0 lb)	

Environmental specifications

Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

Table 381: AHPDA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

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5.3.11 AirScale Dual RRH 4T4R B12/B14 320 W (AHLBA)

AHLBA (474240A) is introduced by *LTE3847*.

Functional description

Table 382: AHLBA functional specification

Property	Value
Maximum output power	320 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	B12 : 4T4R B14 : 4T4R
Outdoor installation	Yes
Supported technologies	FDD-LTE,
TX frequency range	B12 : 729–745 MHz B14 : 758–768 MHz
RX frequency range	B12 : 699–715 MHz B14 : 788–798 MHz
DL filter bandwidth	B12 : 16 MHz B14 : 10 MHz
UL filter bandwidth	B12 : 16 MHz B14 : 10 MHz
DL instantaneous bandwidth (iBW)	B12 : 16 MHz B14 : 10 MHz
UL instantaneous bandwidth (iBW)	B12 : 16 MHz B14 : 10 MHz
DL occupied bandwidth (oBW)	B12 : 16 MHz B14 : 10 MHz
UL occupied bandwidth (oBW)	B12 : 16 MHz B14 : 10 MHz

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Property	Value
Number of carriers per pipe	LTE: up to 3
Supported bandwidths	LTE: 5, 10 MHz
PIM cancellation	Yes

Note:

For more information on output power, supported carriers and bandwidths, see the `Reference Documentation ▸ 5G and SRAN Supported Configurations ▸ SBTS and gNB Supported Configurations ▸ SBTS Supported Configurations` document.

Interfaces

Figure 100: AHLBA interfaces

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Table 383: AHLBA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	High power circular	APPB, APPC
Antenna	ANT	4	4.3-10	AISG on all ports, BiasT support on ANT 1 and ANT 3. ANT has features that prevent damage if mating with a 4.1-9.5 connector is attempted.
Remote electrical tilt	RET	1	8-pin circular	RS-485
External alarm connection	EAC	1	MDR-26	4 alarm inputs and 1 control output
Optical	OPT	2	SFP+ (R2CT)	Up to 9.8 Gbps (CPRI7); R2CT IP seal
Grounding	GND ⏚	1	M8 or 2 x M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 384: AHLBA ALD support

ALD support	Value
AISG	Version 2.0 (hardware ready to support 3.0)
Voltage	14.5 V (ANT 1 and ANT 3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 101: AHLBA functional block diagram

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Electrical specifications

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Table 385: AHLBA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. ETSI average power consumption = (6 h low hour load + 10 h medium hour load + 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 386: AHLBA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 4T	4x80	1743	2138	3110
	Single band 1/1/1 4T	4x60	1593	1892	2663
	Single band 1/1/1 4T	4x40	1426	1627	2128
	Single band 1/1/1 2T	2x80	1169	1376	1881
	Single band 1/1/1 2T	2x60	1087	1244	1637
	Single band 1/1/1 2T	2x40	998	1098	1347
	Dual band 1+1 /1+1 /1+1 4T	4x40	1830	2264	3219
	Dual band 1+1 /1+1 /1+1 4T	4x30	1659	1995	2761
	Dual band 1+1 /1+1 /1+1 4T	4x20	1477	1706	2216
	Dual band 1+1 /1+1 /1+1 2T	2x40	1208	1432	1918
	Dual band 1+1 /1+1 /1+1 2T	2x30	1119	1287	1665
	Dual band 1+1 /1+1 /1+1 2T	2x20	1023	1137	1386

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

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Table 387: Recommended AHLBA power back-off in 256 QAM (carrier spacing over 100 MHz)

RAT	Feature/Parameter	Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
LTE	*LTE4054: LTE Dynamic Back-off*	0	0	0	0

Related optional items

- AMBH AirScale book mount kit 176-200 (474280A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- ASFC AirScale 2 fan unit 600 (474484A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

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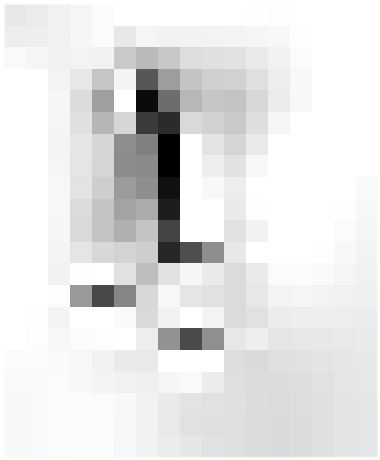
NOTICE:

Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 388: AHLBA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 560 mm (22.0 in.) With upper and lower mounting brackets: 675 mm (26.6 in.)	
Width	Core RRH: 308 mm (12.1 in.) With mounting brackets: 327 mm (12.9 in.)	
Depth	Core RRH: 177 mm (7.0 in.) With mounting brackets: 193 mm (7.6 in.)	
Weight	35 kg (77.2 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 389: AHLBA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.3.12 AirScale Dual RRH 4T4R B12/n71 240 W (AHLOA)

AHLOA (474331A) is introduced by LTE3899/5GC000719.

Functional description

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Table 390: AHLOA functional specification

Property	Value
Maximum output power	240 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Software supported technologies	NR, FDD-LTE
Concurrent operation	Yes
TX frequency range	B71/n71: 617–652 MHz B85 (including B12, LTE only): 728–746 MHz B17 (LTE only): 734–745 MHz
RX frequency range	B71/n71: 663–698 MHz B85 (including B12, LTE only): 698–716 MHz B17 (LTE only): 704–715 MHz
DL instantaneous bandwidth (iBW)	B71/n71: 35 MHz B85 (LTE only): 728–746 MHz
UL instantaneous bandwidth (iBW)	B71: 35 MHz B85 (LTE only): 698–716 MHz
DL filter bandwidth	B71: 35 MHz B85 (including B12, LTE only): 728–746 MHz
UL filter bandwidth	B71: 35 MHz B85 (including B12, LTE only): 698–716 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

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Interfaces

Figure 102: Style A AHLOA interfaces

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Figure 103: Style B AHLOA interfaces

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Table 391: AHLOA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	4-key high power circular connector	APPB, APPC, supports grounding for shielded cables
Antenna connector	ANT	4	4.3-10	AISG on all ports, BiasT support on ANT1 and ANT3 Has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	AISG C485	8-pin circular
External Alarm Connection	EAC	1	MDR-26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+ (R2CT)	Up to 9.8 Gbps (CPRI7); R2CT IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Microfit 2x3	Located on fin side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 392: AHLOA interface for ALD support

Property	Value
AISG	2.0, (hardware ready to support 3.0)
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

Separate software feature is required for ALD support.

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 104: AHLOA functional block diagram

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Electrical specifications

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Table 393: AHLOA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 394: AHLOA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 4T	4x60	1720	2090	2921
	Single band 1/1/1 4T	4x40	1466	1720	2248
	Single band 1/1/1 2T	2x60	1122	1298	1683
	Single band 1/1/1 2T	2x40	998	1118	1371
	Dual band 1+1/1+1/1+1 4T	4x30	1830	2228	3165
	Dual band 1+1/1+1/1+1 4T	4x20	1604	1886	2495
	Dual band 1+1/1+1/1+1 2T	2x30	1171	1363	1792
	Dual band 1+1/1+1/1+1 2T	2x20	1060	1191	1473

LTE power back-off

Table 395: Recommended AHLOA power back-off in 256 QAM (carrier spacing over 100 MHz)

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.8	0.8	0.8

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBH AirScale book mount kit 176-200 (474280A)

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- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- APAF AirScale AC-DC PSU 100-240VAC/1150W (474676A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- AMRC AirScale one clip rail 600 mm (474583A)
- AMRD AirScale one clip bracket over 200 (474582A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> The RRH without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Dimensions and weight

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Table 396: AHLOA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 560 mm (22.05 in.) With upper and lower mounting brackets: 675 mm (26.57 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting brackets: 327 mm (12.87 in.)	
Depth	Core RRH: 189 mm (7.44 in.) With mounting brackets: 205 mm (8.07 in.)	
Weight	38 kg (83.8 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 397: AHLOA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.3.13 AirScale Dual RRH 4T4R B13/B71 (n71) 240 W (AHBOA)

AHBOA (475250A) is introduced by LTE4988/SR002582/5GC002424.

Functional description

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Table 398: AHBOA functional specification

Property	Value
Maximum output power	240 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	FDD-LTE, NR NR-SRAN
TX frequency range	B13: 746–756 MHz B71/n71: 617–652 MHz
RX frequency range	B13: 777–787 MHz B71/n71: 663–698 MHz
DL filter bandwidth	B13: 10 MHz B71/n71: 35 MHz
UL filter bandwidth	B13: 10 MHz B71/n71: 35 MHz
Instantaneous bandwidth (iBW)	B13: 10 MHz B71/n71: 35 MHz
Occupied bandwidth (oBW)	B13: 10 MHz B71/n71: 35 MHz
Number of carriers per pipe	B13: up to 2 B71/n71: up to 4 carriers in total for all supported RATs
Supported bandwidths	B13 (LTE only): 5, 10 MHz B71/n71 (LTE and NR): 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 105: AHBOA interfaces

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Table 399: AHBOA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10+	AISG on all ports, BiasT support on ANT1 and ANT3; has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR-26	4 inputs and 1 control output
Optical interface	OPT	2	SFP+ (R2CT)	Up to 9.8 Gbps (CPRI7); R2CT IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	–
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 400: AHBOA ALD support

Property	Value
AISG	2.0 (hardware ready to support 3.0)
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 106: AHBOA functional block diagram

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Electrical specifications

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Table 401: AHBOA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 402: AHBOA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	Dual band 1+1/1+1/1+1 4T	4x30	1690	2046	2845
	Dual band 1+1/1+1/1+1 4T	4x20	1448	1673	2194

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LTE power back-off

Table 403: Recommended AHBOA power back-off in 256 QAM

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.8	0.8	0.8

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBH AirScale book mount kit 176-200 (474280A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- APAF AirScale AC-DC PSU 100-240VAC/1150W (474676A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- AMRC AirScale one clip rail 600 mm (474583A)
- AMRD AirScale one clip bracket over 200 (474582A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

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NOTICE:

Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 404: AHBOA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 560 mm (22.04 in.) With upper and lower mounting brackets: 675 mm (26.57 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting brackets: 327 mm (12.87 in.)	
Depth	Core RRH: 189 mm (7.44 in.) With mounting brackets: 205 mm (8.07 in.)	
Weight	Core RRH: 38 kg (83.8 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 405: AHBOA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.3.14 AirScale Dual RRH 4T4R B25/n25/B66/n66 320 W (AHFIB)

AHFIB (474216A) is introduced by 5GC000724/LTE3789/SR001767.

Functional description

Table 406: AHFIB functional specification

Property	Value
Maximum output power	320 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Software supported technologies	NR, FDD-LTE, WCDMA, GSM (B25)
RF sharing/concurrent mode	B25: GSM-WCDMA-LTE, GSM-WCDMA, GSM-LTE, WCDMA-LTE B66a: WCDMA-LTE
TX frequency range	B25/n25: 1930–1995 MHz n2: 1930–1990 MHz B66/n66: 2110–2200 MHz

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Property	Value
RX frequency range	B25/n25: 1850–1915 MHz n2: 1850–1910 MHz B66/n66: 1710–1780 MHz
DL instantaneous bandwidth (iBW)	B25/n25: 65 MHz B66/n66: 90 MHz
UL instantaneous bandwidth (iBW)	B25/n25: 65 MHz B66/n66: 70 MHz
DL filter bandwidth	B25/n25: 65 MHz B66/n66: 90 MHz
UL filter bandwidth	B25/n25: 65 MHz B66/n66: 70 MHz
Number of carriers per pipe	Up to 8 carriers, 4 per band, (NR, LTE or mixed NR+LTE)
Supported bandwidths	NR: 5, 10, 15, 20 MHz LTE: 1.4, 3, 5, 10, 15, 20 MHz Note: The 1.4 MHz and 3 MHz bandwidths are not supported in the upper 5 MHz of Band 25.
PIM cancellation	Yes

Interfaces

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Figure 107: AHFIB interfaces

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Table 407: AHFIB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	AISG on all ports, BiasT support on ANT1 and ANT3 Has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR-26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+, SFP28	Up to 9.8 Gbps (CPRI7); R2CT IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 408: AHFIB interface for ALD support

Property	Value
AISG	2.0 (hardware ready for support 3.0)
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

Separate software feature is required for ALD support.

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 108: AHFIB functional block diagram

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Electrical specifications

Table 409: AHFIB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 VDC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/-10% margin.

Table 410: AHFIB power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 4T	4x40	1274	1509	2028
	Single band 1/1/1 4T	4x20	1080	1209	1476
	Single band 1/1/1 2T	2x40	920	1038	1305
	Single band 1/1/1 2T	2x20	821	885	1014
	Dual band 1+1/1+1/1+1 4T	4x40	1937	2375	3045
	Dual band 1+1/1+1/1+1 4T	4x20	1568	1826	2336
	Dual band 1+1/1+1/1+1 2T	2x40	1261	1503	2024
	Dual band 1+1/1+1/1+1 2T	2x20	1064	1193	1471

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LTE power back-off

Table 411: Recommended AHFIB power back-off in 256 QAM mode (carrier spacing over 100 MHz)

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.7	0.7	0.9

GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC

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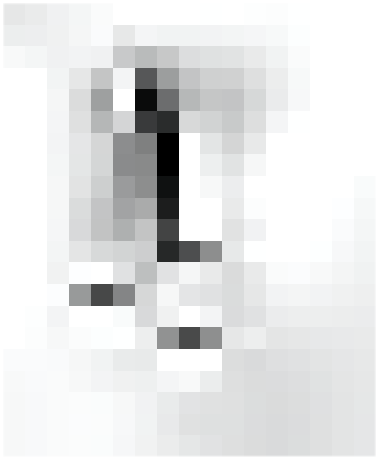
- Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 412: AHFIB dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 560 mm (22.05 in.) With mounting brackets: 675 mm (26.57 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting brackets: 327 mm (12.87 in.)	
Depth	Core RRH: 149 mm (5.87 in.) With mounting brackets: 165 mm (6.5 in.)	
Weight	30 kg (66.1 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 413: AHFIB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.3.15 AirScale Dual RRH 4T4R B25/B66 (n25/n66) 480 W (AHFIG)

AHFIG (475125A) is introduced by LTE5213/SR002418/5GC002099.

Functional description

Table 414: AHFIG functional specification

Property	Value
Maximum output power	480 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes

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Property	Value
Supported technologies (standalone and MSR/concurrent operation)	B25: GSM, WCDMA, FDD-LTE, GSM-WCDMA, GSM-LTE, WCDMA-LTE, GSM-WCDMA-LTE B66: WCDMA (B4/B10), FDD-LTE, WCDMA-LTE n25/n66: NR, NR-SRAN
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B25/n25: 1930–1995 MHz B66/n66: 2110–2200 MHz
RX frequency range	B25/n25: 1850–1915 MHz B66/n66: 1710–1780 MHz
DL filter bandwidth	B25/n25: 65 MHz B66/n66: 80 MHz
UL filter bandwidth	B25/n25: 65 MHz B66/n66: 80 MHz
Instantaneous bandwidth (iBW)	B25/n25: 65 MHz B66/n66: 80 MHz
Occupied bandwidth (oBW)	B25/n25: 65 MHz B66/n66: 80 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 109: AHFIG interfaces

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Table 415: AHFIG interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	Terminal block	Max wire gauge 4 AWG with max strand diameter 7 mm (max 105 strands)
Antenna connector	ANT	4	4.3-10+	AISG on all ports and BiasT support on ANT1 & ANT3; has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	AISG RS485
External Alarm Connection	EAC	1	MDR-26	4 inputs and 1 control output
Optical interface	OPT	2	SFP+ (R2CT)	Up to 9.8 Gbps (CPRI7); R2CT IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 416: AHFIG ALD support

Property	Value
AISG	2.0, 3.0
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 110: AHFIG functional block diagram

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Electrical specifications

Table 417: AHFIG electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -50 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 418: AHFIG power consumption

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Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 4T	4x80	2113	2586	3831
	Single band 1/1/1 4T	4x40	1720	1967	2553
	Single band 1/1/1 2T	2x80	1388	1622	2208
	Single band 1/1/1 2T	2x40	1195	1313	1597
	Dual band 1+1 /1+1 /1+1 4T	4x80 + 4x40	2869	3626	5175
	Dual band 1+1 /1+1 /1+1 4T	4x40	2474	2992	4235
	Dual band 1+1 /1+1 /1+1 2T	2x80 + 2x40	1757	2123	2890
	Dual band 1+1 /1+1 /1+1 2T	2x40	1572	1830	2432

LTE power back-off

Table 419: Recommended AHFIG power back-off per band, in 256 QAM

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.7	0.7	0.9

GSM cell power range

NOTICE:

Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

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Related optional items

- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBF AirScale Book Mount Kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable (474288A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- ACPB AirScale 2 Fiber connector R2CT (474384A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal
  - One-clip rail
  - Book mounting

Dimensions and weight

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Table 420: AHFIG dimensions and weight

Property	Value	Dimensions orientation
Height	With fan unit: 730 mm (28.74 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting bracket: 327 mm (12.87 in.)	
Depth	Core RRH: 131 mm (5.15 in.) With mounting bracket: 142 mm (5.59 in.)	
Weight	Core RRH: 32 kg (70.6 lb)	

Environmental specifications

Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

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Table 421: AHFIG environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	45°C (113°F)
Maximum indoor temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

5.3.16 AirScale Dual RRH 4T4R B25/B66a (n25/n66a) 160 W (AHFIA)

AHFIA (473967A) is introduced by LTE3421/5GC001441.

Functional description

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Table 422: AHFIA functional specification

Property	Value
Maximum output power	160 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	B25/n25: 4T4R B66a/n66a: 4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	FDD-LTE, NR, NR-SRAN
TX frequency range	B25/n25: 1930–1995 MHz B66a/n66a: 2110–2180 MHz
RX frequency range	B25/n25: 1850–1915 MHz B66a/n66a: 1710–1780 MHz
DL filter bandwidth	B25/n25: 65 MHz B66a/n66a: 70 MHz
UL filter bandwidth	B25/n25: 65 MHz B66a/n66a: 70 MHz
Instantaneous bandwidth (iBW)	B25/n25: 65 MHz B66a/n66a: 70 MHz
Occupied bandwidth (oBW)	B25/n25: 65 MHz B66a/n66a: 70 MHz
Number of carriers per pipe	Up to 8 carriers in total for all supported RATs
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 111: AHFIA interfaces

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Table 423: AHFIA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	AISG on all ports, BiasT support on ANT1 and ANT3 Has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR-26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+ (R2CT)	Up to 9.8 Gbps (CPRI7); R2CT IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 424: AHFIA ALD support

ALD support	Value
AISG	2.0, 3.0
Voltage	14.5 V (ANT1 and ANT3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 112: AHFIA functional block diagram

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Electrical specifications

Table 425: AHFIA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 426: AHFIA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	Single band 1/1/1 4T	4x40	1341	1583	2104
	Single band 1/1/1 4T	4x20	1142	1277	1558
	Single band 1/1/1 2T	2x40	982	1106	1371
	Single band 1/1/1 2T	2x20	878	948	1088
	Dual band 1+1 /1+1 /1+1 4T	4x20	1644	1900	2449
	Dual band 1+1 /1+1 /1+1 4T	4x10	1428	1574	1864
	Dual band 1+1 /1+1 /1+1 2T	2x40	1330	1569	2110
	Dual band 1+1 /1+1 /1+1 2T	2x20	1135	1266	1540

LTE power back-off

Table 427: Recommended AHFIA power back-off per band, in 256 QAM

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	0.7	0.7	0.9

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBF AirScale book mount kit 126-150 (474278A)

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- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- FPAE Flexi Power AC/DC Submodule 230V (472953A)
- APAF AirScale AC-DC PSU 100-240VAC/1150W (474676A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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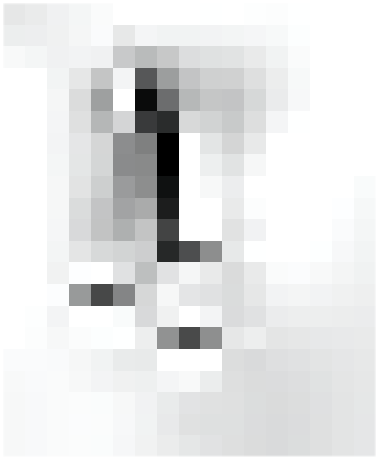
Table 428: AHFIA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 560 mm (22.05 in.) With upper and lower mounting brackets: 675 mm (26.57 in.)	
Width	Core RRH: 308 mm (12.13 in.) With mounting brackets: 327 mm (12.87 in.)	
Depth	Core RRH: 129 mm (5.08 in.) With mounting brackets: 145 mm (5.71 in.)	
Weight	27 kg (59.5 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 429: AHFIA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.4 Description of triple band remote radio heads

5.4.1 AirScale Tri RRH 2T2R B8/20/28 (n8/n20/n28) 240 W (AHPMDA)

AHPMDA (473997A) is introduced by LTE3142/SR001572/5GC000928.

Functional description

Table 430: AHPMDA functional specification

Property	Value
Maximum output power	240 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	B28/n28: 2T2R B20/n20: 2T2R B8/n8: 2T2R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	B20/B28 (n20/n28): LTE, NR B8/n8: GSM (MSR, no GSM single RAT), WCDMA, LTE, NR

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Property	Value
RF sharing/concurrent mode	B20/B28 (n20/n28): NR-LTE B8/n8: GSM-WCDMA, WCDMA-LTE, GSM-LTE, GSM-WCDMA-LTE, NR-SRAN
TX frequency range	B28/n28: 758–788 MHz B20/n20: 791–821 MHz B8/n8: 925–960 MHz
RX frequency range	B28/n28: 703–733 MHz B20/n20: 832–862 MHz B8/n8: 880–915 MHz
DL filter bandwidth	B28/n28: 30 MHz B20/n20: 30 MHz B8/n8: 35 MHz
UL filter bandwidth	B28/n28: 30 MHz B20/n20: 30 MHz B8/n8: 35 MHz
Instantaneous bandwidth (iBW)	B28/n28: 30 MHz B20/n20: 30 MHz B8/n8: 35 MHz
Occupied bandwidth (oBW)	B28/n28: 30 MHz B20/n20: 30 MHz B8/n8: 35 MHz
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 113: AHPMDA interfaces

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Table 431: AHPMDA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	Supports grounding for shielded cables; APPB, APPC
Antenna connector	ANT	4	4.3-10	AISG on each antenna connector Has features that prevent damage when mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Note:

Ping receiver option enables the automatic discovery of RF cable connections between ALDs and base station radios. It also enables the operators to identify RF cables that are incorrectly connected or missing. Ping receiver ports do not provide 14.5 V DC power to ALDs.

Table 432: AHPMDA ALD support

ALD support	Value
AISG	ANT1, ANT2: AISG 2.0/3.0 ANT3, ANT4: AISG 3.0 ping receiver
Voltage	14.5 V (ANT1 and ANT2 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

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Figure 114: AHPMDA functional block diagram

Electrical specifications

Table 433: AHPMDA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 434: AHPMDA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Triple band 1+1+1 /1+1+1 /1+1+1 2Tx	2x30 + 2x30 + 2x60	1624	2025	2918
	Triple band 1+1+1 /1+1+1 /1+1+1 2Tx	2x20 + 2x20 + 2x40	1458	1762	2412
	Triple band 1+1+1 /1+1+1 /1+1+1 2Tx	2x15 + 2x15 + 2x30	1343	1582	2075
	Dual band (800/900) 1+1 /1+1 /1+1 2Tx	2x20 + 2x20	1202	1384	1716

Recommended power back-off

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Table 435: Recommended AHPMDA power back-off in 256 QAM (carrier spacing over 100 MHz)

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	1.5	1.5	1.5

GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBF AirScale book mount kit 126-150 (474278A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- APAF AirScale AC-DC PSU 100-240VAC/1150W (474676A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- AFPA Rejection Filter B28 703-789MHz (474704A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC

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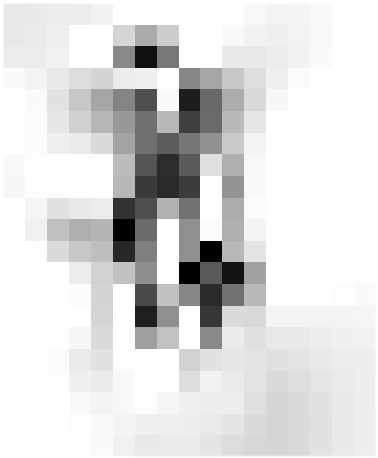
- Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 436: AHPMDA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 512 mm (20.16 in.) With upper and lower mounting brackets: 630 mm (24.80 in.)	
Width	Core RRH: 308 mm (12.13 in.) With side mounting bosses: 327 mm (12.87 in.)	
Depth	Core RRH: 130 mm (5.12 in.) With mounting brackets: 142 mm (5.59 in.) With mounting bracket and heat shield: 147 mm (5.78 in.)	
Weight	24 kg (52.9 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 437: AHPMDA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.4.2 AirScale Tri RRH 2T4R B5/n5/B8/n8/B28/n28 240 W (AHPCDB)

AHPCDB (475081A) is introduced by SR002520/5GC002586.

Functional description

Table 438: AHPCDB functional specification

Property	Value
Maximum output power	240 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	2T4R
Outdoor installation	Yes

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Property	Value
Supported technologies (standalone and MSR)	B5, B28: FDD-LTE B8: WCDMA, LTE, WCDMA-LTE n5/n8/n28: NR
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B5/n5: 869–880 MHz B8/n8: 940–960 MHz B28/n28: 788–803 MHz
RX frequency range	B5/n5: 824–835 MHz B8/n8: 895–915 MHz B28/n28: 733–748 MHz
DL filter bandwidth	B5/n5: 11 MHz B8/n8: 20 MHz B28/n28: 15 MHz
UL filter bandwidth	B5/n5: 11 MHz B8/n8: 20 MHz B28/n28: 15 MHz
Instantaneous bandwidth (iBW)	B5/n5: 11 MHz B8/n8: 20 MHz B28/n28: 15 MHz
Occupied bandwidth (oBW)	B5/n5: 11 MHz B8/n8: 20 MHz B28/n28: 15 MHz
Number of carriers per pipe	Up to 16 carriers in total for all supported RATs
Supported bandwidths	LTE B5/B8: 1.4, 3, 5, 10 MHz LTE B28: 3, 5, 10, 15 MHz NR n5/n8: 5, 10 MHz NR n28: 5, 10, 15 MHz

Interfaces

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Figure 115: AHPCDB interfaces

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Table 439: AHPCDB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	Supports grounding for shielded cables; APPB, APPC
Antenna connector	ANT	4	4.3-10+	AISG on each antenna connector Has features that prevent damage when mating with a 4.1-9.5 connector is attempted
Remote electrical tilt	RET	1	8-pin circular	RS-485
External alarm connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	M8 or 2 x M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 440: AHPCDB ALD support

ALD support	Value
AISG	2.0 (hardware ready to support 3.0)
Voltage	14.5 V (ANT1 and ANT2 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 116: AHPCDB functional block diagram

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Electrical specifications

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Table 441: AHPCDB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 VDC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/-10% margin.

Table 442: AHPCDB power consumption

Mode	Configuration	Output Power [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Triple band 1+1+1 /1+1+1 /1+1+1 2Tx	2x40 + 2x40 + 2x40	1666	2058	3030
	Triple band 1+1+1 /1+1+1 /1+1+1 2Tx	2x20 + 2x20 + 2x40	1269	1458	1929

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Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBG AirScale book mount kit 151-175 (474467A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- APAF AirScale AC-DC PSU 100-240VAC/1150W (474676A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPA AirScale 2 Fiber Protection (474297A)
- AFPA Rejection Filter B28 703-789MHz (474704A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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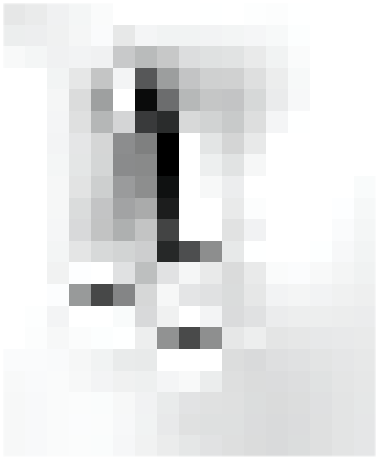
Table 443: AHPCDB dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 512 mm (20.15 in.) With mounting bracket: 675 mm (26.57 in.)	
Width	Core RRH: 308 mm (12.13 in.) With side mounting bosses: 327 mm (12.87 in.)	
Depth	Core RRH: 165 mm (6.49 in.) With mounting bracket: 181 mm (7.13 in.)	
Weight	31 kg (68.3 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 444: AHPCDB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

NOTICE:

You should use a fan when ambient temperature can be higher than 45°C (113°F) and at the same time traffic load often exceeds 70%.

5.4.3 AirScale Tri RRH 2T4R B8/B20/B28 (n8/n20/n28) 240 W (AHPMDB)

AHPMDB (475000A) is introduced by SR002368/5GC001683.

Functional description

Table 445: AHPMDB functional specification

Property	Value
Maximum output power	240 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	B8/n8: 2T4R B20/n20: 2T4R B28/n28: 2T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	FDD-LTE, B8/n8: GSM, WCDMA, FDD-LTE, GSM-WCDMA, WCDMA-LTE, GSM-LTE, GSM-WCDMA-LTE, NR, NR-SRAN

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Property	Value
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B8/n8: 925–960 MHz B20/n20: 791–821 MHz B28/n28: 758–788 MHz
RX frequency range	B8/n8: 880–915 MHz B20/n20: 832–862 MHz B28/n28: 703–733 MHz
DL filter bandwidth	B8/n8: 35 MHz B20/n20: 30 MHz B28/n28: 30 MHz
UL filter bandwidth	B8/n8: 35 MHz B20/n20: 30 MHz B28/n28: 30 MHz
Instantaneous bandwidth (iBW)	B8/n8: 35 MHz B20/n20: 30 MHz B28/n28: 30 MHz
Occupied bandwidth (oBW)	B8/n8: 35 MHz B20/n20: 30 MHz B28/n28: 30 MHz
Number of carriers per pipe	2T2R: Up to 16 (across all bands) for all supported RATs 2T4R: Up to 8 (across all bands) for all supported RATs
Supported bandwidths	LTE B8: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz LTE B20: 5 MHz, 10 MHz, 15 MHz, 20 MHz LTE B28: 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes

Interfaces

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Figure 117: AHPMDB interfaces

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Table 446: AHPMDB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	Supports grounding for shielded cables; APPB, APPC
Antenna connector	ANT	4	4.3-10+	AISG on each antenna connector Has features that prevent damage when mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	M8 or 2 x M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Table 447: AHPMDB ALD support

ALD support	Value
AISG	3.0
Voltage	14.5 V (RET, ANT1, ANT2 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 118: AHPMDB functional block diagram

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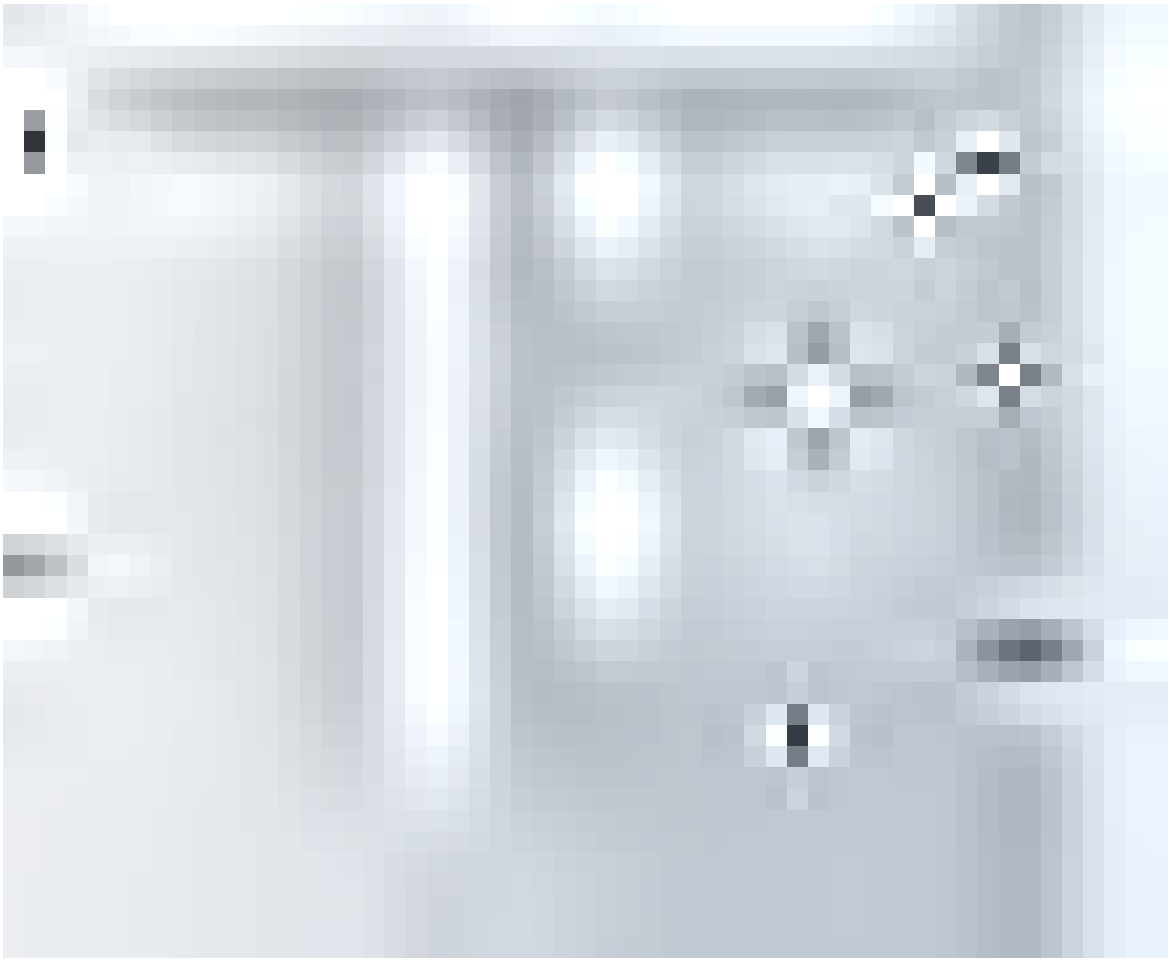

Electrical specifications

Table 448: AHPMDB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 449: AHPMDB power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Triple band 1+1+1/1+1+1/1+1+1 2T	2x30+2x30+2x60	1780	2222	3334
	Triple band 1+1+1/1+1+1/1+1+1 2T	2x20+2x20+2x40	1534	1841	2543
	Triple band 1+1+1/1+1+1/1+1+1 2T	2x15+2x15+2x30	1409	1658	2200
	Dual band (800/900) 1+1/1+1/1+1 2T	2x20+2x20	1027	1173	1502

LTE power back-off

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Table 450: Recommended AHPMDB power back-off per band, in 256 QAM (carrier spacing over 100 MHz)

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0	1.5	1.5	1.5

GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- ASFC AirScale 2 fan unit 600 (474484A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBG AirScale book mount kit 151-175 (474467A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60-300 mm) (472821A)
- APAF AirScale AC-DC PSU 100-240VAC/1150W (474676A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPA AirScale 2 Fiber Protection (474297A)
- AFPA Rejection Filter B28 703-789MHz (474704A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC

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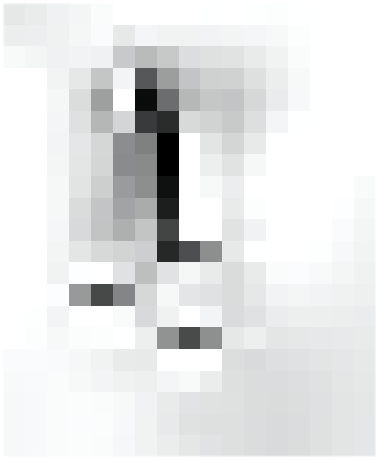
- Book mounting
- Wall:
  - Vertical
  - Horizontal (fan is required)
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 451: AHPMDB dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 512 mm (20.15 in.) With mounting bracket: 652 mm (25.66 in.)	
Width	Core RRH: 308 mm (12.13 in.) With side mounting bosses: 327 mm (12.87 in.)	
Depth	Core RRH: 169 mm (6.65 in.) With mounting bracket: 185 mm (7.28 in.)	
Weight	31 kg (68.3 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 452: AHPMDB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

5.4.4 AirScale Tri RRH 2T4R B8/B20/B28 (n8/20/28) 320 W (AHPMDD)

AHPMDD (475707A) is introduced by CB006008.

Functional description

Table 453: AHPMDD functional specification

Property	Value
Maximum output power	320 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	B8/n8: 2T4R B20/n20: 2T4R B28/n28: 2T4R

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Property	Value
Outdoor installation	Yes
Supported technologies (standalone and MSR)	B8/n8: GSM (MSR, no GSM single RAT), WCDMA, LTE, NR B20/B28 (n20/n28): LTE, NR
RF sharing/concurrent mode	B8/n8: NR-LTE-WCDMA-GSM, NR-LTE-WCDMA, NR-LTE-GSM, NR-WCDMA-GSM, LTE-WCDMA-GSM, NR-LTE, NR-WCDMA, NR-GSM, LTE-WCDMA, LTE-GSM, WCDMA-GSM B20/B28 (n20/n28): NR-LTE
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	B8/n8: 925–960 MHz B20/n20: 791–821 MHz B28/n28: 758–788 MHz
RX frequency range	B8/n8: 880–915 MHz B20/n20: 832–862 MHz B28/n28: 703–733 MHz
DL filter bandwidth	B8/n8: 35 MHz B20/n20: 30 MHz B28/n28: 30 MHz
UL filter bandwidth	B8/n8: 35 MHz B20/n20: 30 MHz B28/n28: 30 MHz
Instantaneous bandwidth (iBW)	B8/n8: 35 MHz B20/n20: 30 MHz B28/n28: 30 MHz
Occupied bandwidth (oBW)	B8/n8: 35 MHz B20/n20: 30 MHz B28/n28: 30 MHz
Number of carriers per pipe	B8/n8: up to 2 B20/n20: up to 3 B28/n28: up to 3

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Property	Value
Supported bandwidths	LTE B8: 1.4, 3, 5, 10 MHz, NB-IoT LTE B20: 5, 10, 15, 20 MHz, NB-IoT LTE B28: 3, 5, 10, 15, 20 MHz, NB-IoT NR: 5, 10, 15, 20 MHz
PIM cancellation	Yes, only on ANT1 and ANT3

Interfaces

Figure 119: AHPMDD interfaces

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Table 454: AHPMDD interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	Supports grounding for shielded cables; APPB, APPC
Antenna connector	ANT	4	4.3-10+	AISG on each antenna connector Has features that prevent damage when mating with a 4.1-9.5 connector is attempted
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	M8 or 2 x M5 screws	-
Fan	FAN	1	Nokia fan	Located on the heat sink side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate the RF port from the environment, and thus provide electric shock security in case RF power is accidentally turned on.

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Antenna line device (ALD) support

Table 455: AHPMDD ALD support

ALD support	Value
AISG	3.0
Voltage	14.5 V (RET, ANT1, ANT2 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 120: AHPMDD functional block diagram

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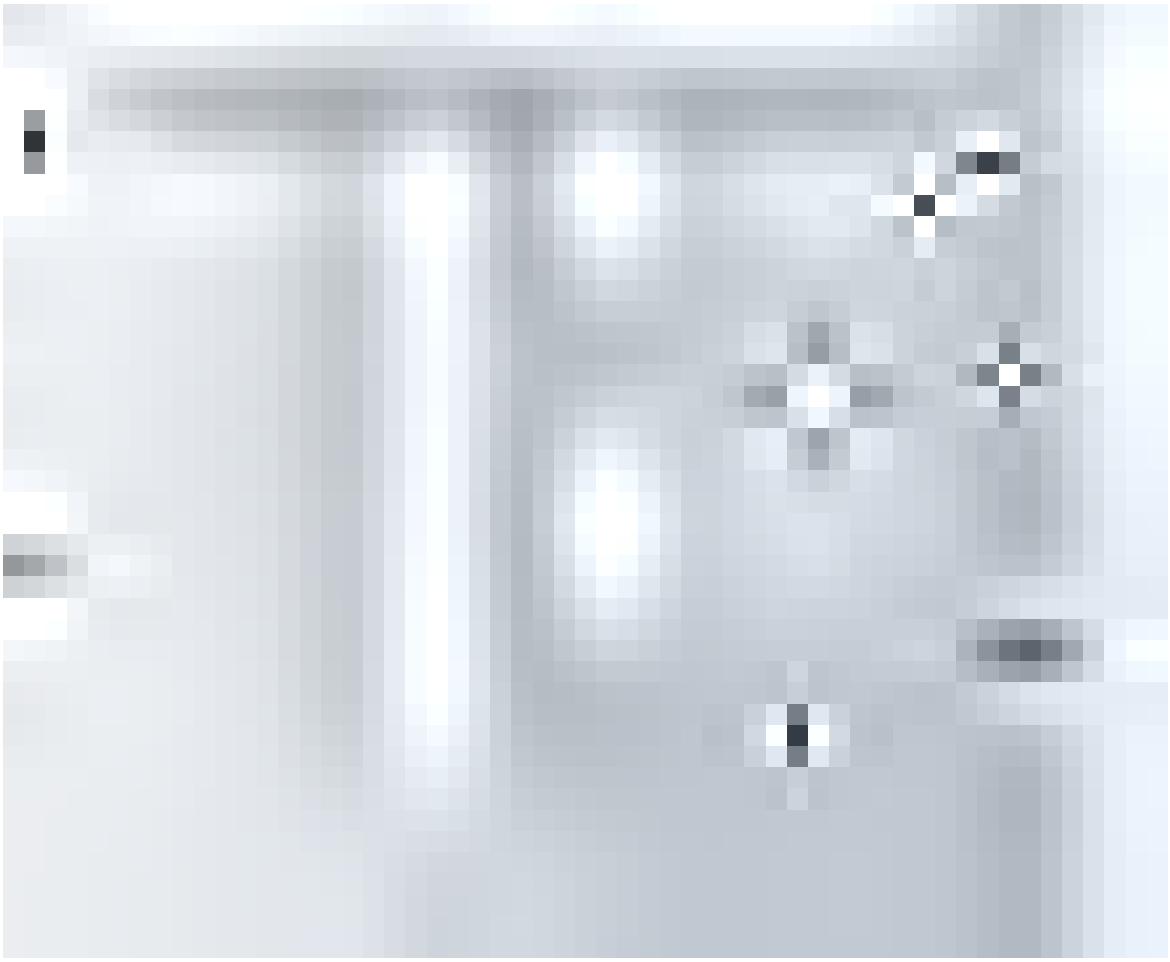

Electrical specifications

Table 456: AHPMDD electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 457: AHPMDD power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Triple band 1+1+1/1+1+1/1+1+1 2T	2x80+2x40+2x40	1310	1700	2583
	Triple band 1+1+1/1+1+1/1+1+1 2T	2x80+2x40+2x40	930	1123	1559
	Dual band (800/900) 1+1/1+1/1+1 2T	2x80+2x80	1317	1711	2594
	Dual band (800/900) 1+1/1+1/1+1 2T	2x40+2x40	933	1128	1573
	Dual band (800/900) 1+1/1+1/1+1 2T	2x20+2x20	773	876	1095

Recommended power back-off

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Table 458: Recommended AHPMDD power back-off per band, in 256 QAM (carrier spacing over 100 MHz)

Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
0.8	1.4	1.4	1.6

GSM cell power range

> **NOTICE:**
>
> Do not configure the GSM cell power below 30 dB total dynamic range from the max. rated power. It might make the system unstable.

Related optional items

- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AMBG AirScale book mount kit 151-175 (474467A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- APAF AirScale AC-DC PSU 100-240VAC/1150W (474676A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ACPA AirScale 2 Fiber Protection (474297A)
- AFPA Rejection Filter B28 703-789MHz (474704A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)

Installation options

- Pole:
  - Vertical using FPKA or FPKC
  - One-clip rail with FPKA or FPKC
  - Book mounting

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- Wall:
  - Vertical
  - Horizontal
  - One-clip rail
  - Book mounting

Dimensions and weight

Table 459: AHPMDD dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 592 mm (23.31 in.) With mounting bracket: 645 mm (25.39 in.)	
Width	Core RRH: 308 mm (12.13 in.) With side mounting bosses: 327 mm (12.87 in.)	
Depth	Core RRH: 170 mm (6.69 in.) With mounting bracket: 186 mm (7.32 in.)	
Weight	34 kg (75 lb)	

Environmental specifications

Note:

There is no need to derate power or limit the carried traffic load if you follow site installation guidelines. Only when operating at a constant high traffic load in very high ambient temperature conditions may this become temporarily necessary to protect the unit from overheating.

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Table 460: AHPMDD environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced cooling (FAN)
IP rating	IP65

5.4.5 AirScale Tri RRH 4T4R B12/B14/B29 370 W (AHLBBA)

AHLBBA (475082A) is introduced by *LTE5210*.

Functional description

Table 461: AHLBBA functional specification

Property	Value
Maximum output power	370 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	B12 : 4T4R B14 : 4T4R B29 : 2T
Outdoor installation	Yes
Supported technologies	FDD-LTE,

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Property	Value
TX frequency range	B12 (incl. B17): 729–745 MHz B14 : 758–768 MHz B29 : 717–728 MHz[1] Note: [1]If the B29 carrier is located at the bottom edge of the band (meaning it includes down to 717 MHz), then the 3 PRBs on the far left of the spectrum should be muted.
RX frequency range	B12 (incl. B17): 699–715 MHz B14 : 788–798 MHz
DL filter bandwidth	B12 : 16 MHz B14 : 10 MHz B29 : 11 MHz
UL filter bandwidth	B12 : 16 MHz B14 : 10 MHz
Instantaneous bandwidth (iBW)	B12 : 16 MHz B14 : 10 MHz B29 : 11 MHz (DL only)
Occupied bandwidth (oBW)	B12 : 16 MHz B14 : 10 MHz B29 : 11 MHz (DL only)
Number of carriers per pipe	LTE: up to 3
Supported bandwidths	LTE: 5, 10 MHz
PIM cancellation	Yes

Note:

For more information on output power, supported carriers and bandwidths, see the `Reference Documentation ▸ 5G and SRAN Supported Configurations ▸ SBTS and gNB Supported Configurations ▸ SBTS Supported Configurations` document.

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Interfaces

Figure 121: AHLBBA interfaces

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Table 462: AHLBBA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	High power circular	APPB, APPC
Antenna	ANT	4	4.3-10	AISG on all ports, BiasT support on ANT 1 and ANT 3. ANT has features that prevent damage if mating with a 4.1-9.5 connector is attempted
Remote electrical tilt	RET	1	8-pin circular	RS-485
External alarm connection	EAC	1	MDR-26	4 alarm inputs and 1 control output
Optical	OPT	2	SFP+ (R2CT)	Up to 9.8 Gbps (CPRI7); R2CT IP seal
Grounding	GND ⏚	1	M8 or 2 x M5 screws	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 463: AHLBBA ALD support

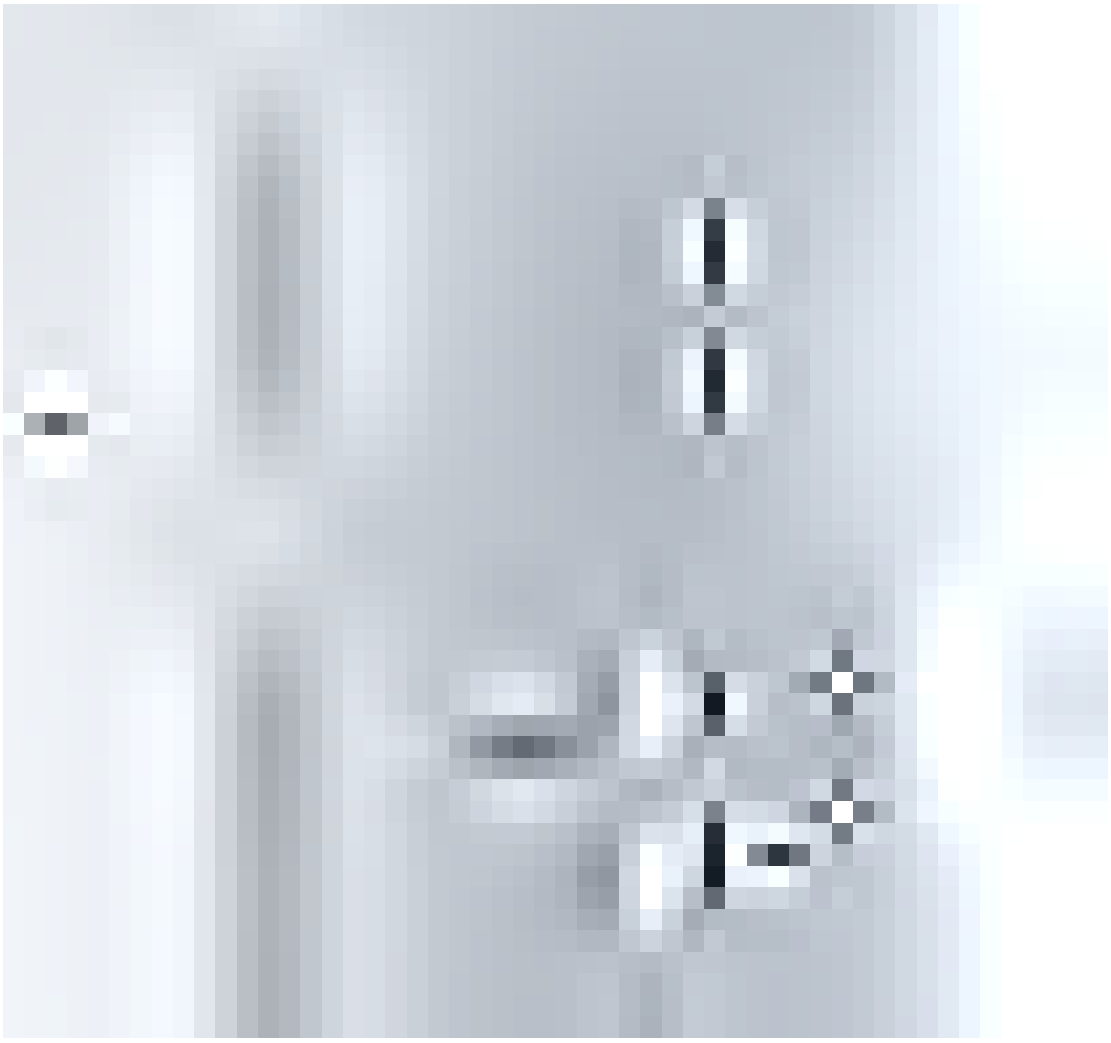
ALD support	Value
AISG	Version 2.0 (hardware ready to support 3.0)
Voltage	14.5 V (ANT 1 and ANT 3 only)
Power per port	30 W, 45 W total

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 122: AHLBBA functional block diagram



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Electrical specifications

Table 464: AHLBBA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Note:

Power consumption values for AHLBBA are preliminary. Contact Nokia customer team for the latest power consumption values.

Typical power consumption [W] for 48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. ETSI average power consumption = (6 h low hour load + 10 h medium hour load + 8 h busy hour load) /24 h.

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Table 465: AHLBBA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Triple band 1/1/1 4T +1/1/1 4T +1/1/1 2T	4x40 W (B12) + 4x40 W (B14) + 2x25 W (B29)	2327	2947	4390

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 466: Recommended AHLBBA power back-off in 256 QAM (carrier spacing over 100 MHz)

RAT	Feature/Parameter	Single carrier [dB]	Dual carrier [dB]	Triple carrier [dB]	Quad carrier [dB]
LTE	*LTE4054: LTE Dynamic Back-off*	0	1.5	1.5	1.5

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- APAM AirScale AC-DC Power Unit 2300 W (475766A)
- ACPB AirScale 2 Fiber connector R2CT V2 (474384A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)

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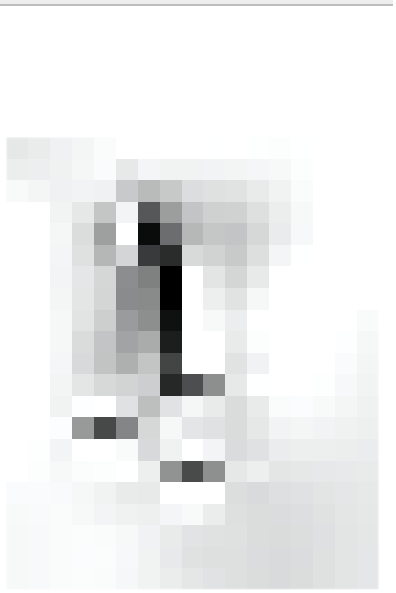
Installation options

- Pole:
  - Vertical using FPKA or FPKC
- Wall:
  - Vertical

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

Table 467: AHLBBA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 610 mm (24.01 in.) With mounting bracket: 725 mm (28.54 in.)	
Width	Core RRH: 358 mm (14.09 in.) With mounting bracket: 377 mm (14.84 in.)	
Depth	Core RRH: 199 mm (7.83 in.) With mounting bracket: 215 mm (8.46 in.)	
Weight	46 kg (101.4 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 468: AHLBBA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

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6. AirScale macro TD-LTE remote radio heads

6.1 AirScale RRH 2T2R B40 120 W (AZND/AZNE)

AZND (474348A) and AZNE (474350A) are introduced by LTE3961.

Functional description

Table 469: AZND/AZNE functional specification

Property	Value
Maximum output power	120 W
Modulation	256 QAM (DL)
MIMO mode	2T2R
Outdoor installation	Yes
Beamforming	No
Supported technologies	TD-LTE
Frequency range	2320–2370 MHz
Filter bandwidth	50 MHz
Instantaneous bandwidth (iBW)	50 MHz
Occupied bandwidth (oBW)	50 MHz
Number of carriers per pipe	Up to 3
Supported bandwidths	10, 20 MHz

Interfaces

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Figure 123: AZND interfaces

Figure 124: AZNE interfaces

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Table 470: AZND/AZNE interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	AC IN (AZND) DC IN (AZNE)	1	Circular Connector	APPF for AZND APPB for ANZE
Antenna connector	ANT	2	4.3-10	-
External Alarm Connection	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	2 x M5 screw or 1 x M8 screw	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Note:

There is no antenna line device support for AZND/AZNE.

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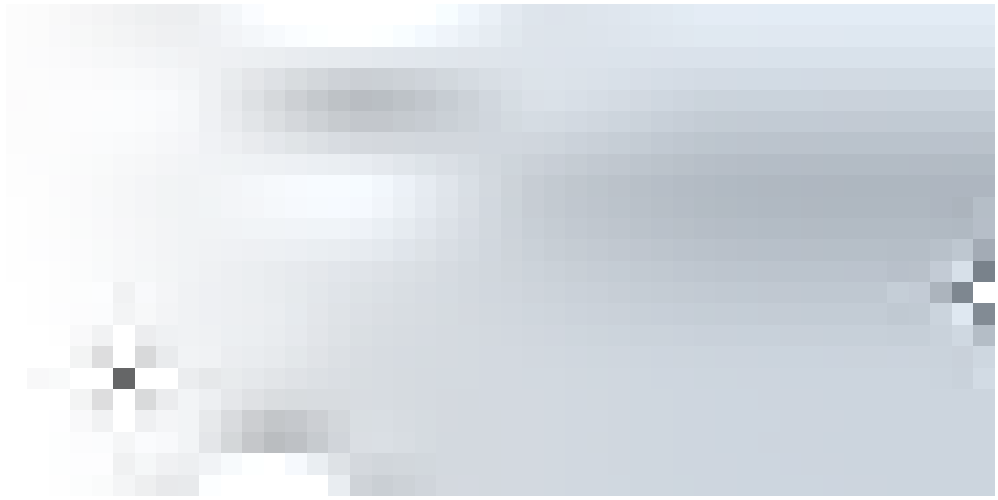
Functional block diagram

Figure 125: AZND/AZNE functional block diagram



Electrical specifications

Table 471: AZND/AZNE electrical specifications

Property	Value
Nominal supply voltage	AZND: 220 V AC AZNE: -48.0 V DC
Nominal input voltage range	AZND: 200 V AC to 240 V AC AZNE: -40.0 V DC to -57.0 V DC
Extended input voltage range	AZND: 140 V AC to 300 V AC AZNE: -36.0 V DC to -40.0 V DC AZNE: -57.0 V DC to -60.0 V DC

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration,

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environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 472: AZND power consumption in LTE mode

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1/1/1 2T	2x60	518	669	998
1/1/1 2T	2x40	436	533	750
1/1/1 2T	2x30	397	469	634
1/1/1 2T	2x20	357	405	509

Table 473: AZNE power consumption

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1/1/1 2T	2x60	530	683	1021
1/1/1 2T	2x40	444	542	769
1/1/1 2T	2x30	406	480	649
1/1/1 2T	2x20	366	416	521

Note:

Power consumption values are measured according to ETSI 202 706-1 v1.5 assumptions (subframe #2 and special subframe #7), leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power consumption.

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Recommended power back-off

Table 474: Recommended AZND/AZNE power back-off in 256 QAM

Carrier configuration	Power reduction [dB]
Multiple carriers, continuous	0.5
Multiple carriers, non-continuous	0.5
Single carrier	0.5

Related optional items

- AMBE AirScale book mount kit 101–125 (474277A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFN AirScale 2 casing adapter RRH 300 (474664A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMRA AirScale one clip bracket 51–125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- AZNE: APAA AirScale AC-DC Power Unit 760 W (473936A)
- AZNE: APAM AirScale AC-DC Power Unit 2300 W (475766A)
- AZNE: APPB AirScale 2 55A DC plug 3.3–10mm^2 (474282A)
- AZND: APPF Conn 3 Pole Female Plug AC (474893A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- FPKA Flexi Pole Mounting Kit (30–120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (v101: 60–295 mm, v202: 60–300 mm) (472821A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

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Note:

In case of mounting three modules on a wall (rail) and in bookshelf mounting, AZND/AZNE cannot be mounted as the middle unit.

NOTICE:

Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 475: AZND/AZNE dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.23 in.) With upper and lower mounting brackets: 430.5 mm (16.95 in.)	
Width	300 mm (11.81 in.)	
Depth	Core RRH: 110 mm (4.33 in.) With mounting brackets: 134 mm (5.28 in.)	
Weight	max. 11 kg (24.3 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 476: AZND/AZNE environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.2 AirScale RRH 4T4R B40/n40 160 W (AZNA)

AZNA (473914A) is introduced by LTE2810/5GC002361.

Functional description

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Table 477: AZNA functional specification

Property	Value
Maximum output power	160 W 40 W support for 5 MHz single carrier introduced by CB007543
Modulation	Up to 256 QAM (DL) Up too 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technologies	TD-LTE, NR
RF sharing/concurrent mode	NR-SRAN
Frequency range	2300–2400 MHz
Filter bandwidth	100 MHz
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	80 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	5, 10, 15, 20 MHz

Interfaces

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Figure 126: AZNA interfaces

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Table 478: AZNA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	-
AISG Connector	RET	1	8-pin circular	RS-485
External Alarm Connection /Local Management Interface	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	3	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	2 x M5 screw or 1 x M8 screw	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 479: AZNA ALD support

ALD support	Value
AISG	ANT1, ANT3: AISG2.0/3.0* RET: AISG 2.0/3.0
Voltage	ANT1, ANT3: 14.5 V* RET: 14.5 V
Power per port	ANT1, ANT3: 45 W* RET port: 45 W

*ALDs are supported on ANT ports only in versions A.101, A.102, and B.

Functional block diagram

AZNA has two variants, for various ALD functions:

- Versions A.101, A.102, and all B-versions support ALD through both RET and ANT ports
- Versions A.203 and later support ALD only through RET ports

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Figure 127: AZNA (with MHA) variants A.101, A.102, all B-variants; functional block diagram

Figure 128: AZNA (without MHA) variants A.203 onwards; functional block diagram

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Electrical specifications

Table 480: AZNA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 20 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 481: AZNA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average load P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x20	311	347	429
	1/1/1 2T	2x40	383	452	618
	1/1/1 4T	4x20	430	501	674
	1/1/1 4T	4x40	567	708	1067

Note:

Power consumption values are measured according to ETSI 202 706-1 v1.5 assumptions (subframe #2 and special subframe #7), leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power consumption.

Recommended power back-off

Table 482: Recommended AZNA power back-off in 256 QAM

Carrier configuration	Power back-off [dB]
Multiple carriers, continuous	1.2
Multiple carriers, non-continuous	1.5
Single carrier	0.9

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Table 483: AZNA power back-off in 5G

	Single carrier		Multi carrier (non contiguous)		
Pmax (dBm)	Pmax=35-43	Pmax=46	Pmax <43	Pmax=43	Pmax=46
Recommended back-off (dB)	1.9	2.6	2.4	3.4	Setting not allowed for single PA

Related optional items

- ASFB AirScale 2 TD RRH 4-pipe fan unit (474483A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- AMGC AirScale 2 cover 300 x 101-125 (474269A)
- AMBE AirScale book mount kit 101-125 (474277A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMRA AirScale one clip bracket 51-125 (474580A)
- AMRC AirScale one clip rail 600 mm (474583A)
- AAFGHC AirScale 4-pipe integrated antenna (474724A) or (474724B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

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NOTICE:

Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 484: AZNA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.23 in.) With upper and lower mounting brackets: 427.5 mm (16.83 in.)	
Width	300 mm (11.81 in.)	
Depth	Core RRH: 120 mm (4.72 in.) With mounting brackets: 144 mm (5.67 in.)	
Weight	11 kg (24.3 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 485: AZNA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.3 AirScale RRH 4T4R B41/n41 160 W (AZHA)

AZHA (473941A) is introduced by LTE3329/5GC002400.

Functional description

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Table 486: AZHA functional specification

Property	Value
Maximum output power	160 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technologies	TD-LTE, NR
RF sharing/concurrent mode	NR-SRAN
Frequency range	2496–2690 MHz
Filter bandwidth	194 MHz
Instantaneous bandwidth (iBW)	194 MHz
Occupied bandwidth (oBW)	80 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	5, 10, 15, 20 MHz

Interfaces

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Figure 129: AZHA interfaces

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Table 487: AZHA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	4	4.3-10	-
AISG Connector	RET	1	8-pin circular	-
External Alarm Connection /Local Management Interface	EAC	1	MDR26	4 alarm inputs and 1 control output
Optical interface	OPT	3	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Grounding	GND ⏚	1	2 x M5 screw or 1 x M8 screw	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 488: AZHA ALD support

ALD support through RS-485 port	Value
AISG	ANT1, ANT3, RET: AISG 2.0/3.0 ANT2, ANT4: AISG 3.0 Ping Receiver
Voltage	14.5 V
Power per port	40 W RET port: 30 W

Functional block diagram

Figure 130: AZHA functional block diagram

Electrical specifications

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Table 489: AZHA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 20 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 490: AZHA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average load P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 2T	2x20	370	421	525
	1/1/1 2T	2x40	458	551	764
	1/1/1 4T	4x20	539	642	865
	1/1/1 4T	4x40	723	925	1427

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Note:

Power consumption values are measured according to ETSI 202 706-1 v1.5 assumptions (subframe #2 and special subframe #7), leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power consumption.

Recommended power back-off

Table 491: AZHA power back-off in NR

	Single carrier		Multi carrier (non contiguous)		
Pmax (dBm)	Pmax=35-43	Pmax=46	Pmax <43	Pmax=43	Pmax=46
Recommended backoff (dB): `dlQam256PowerBackoffSub6`	1.9	2.6	2.4	3.4	Setting not allowed for single PA

Related optional items

- ASFB AirScale 2 TD RRH 4-pipe fan unit (474483A)
- APAA AirScale AC-DC Power Unit 760 W (473936A)
- AMGE AirScale 2 cover 300 x 151-175 (474271A)
- AMBG AirScale book mount kit 151-175 (474467A)
- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMFC AirScale 2 19” rack fixing 300 (474291A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)
- AAFGHC AirScale 4-pipe integrated antenna (474724A) or (474724B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A/474283B)

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Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 492: AZHA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 336 mm (13.23 in.) With upper and lower mounting brackets: 427.5 mm (16.83 in.)	
Width	300 mm (11.81 in.)	
Depth	Core RRH: 155 mm (6.1 in.) With mounting brackets: 178.7 mm (7.04 in.)	
Weight	13 kg (28.7 lb)	

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Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 493: AZHA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.4 AirScale RRH 4T4R n77 320 W (AZQU) (eCPRI)

AZQU (475665A) is introduced by CB005708.

Functional description

Table 494: AZQU functional specification

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Property	Value
Maximum output power	320 W Note: • 4 x 40 W for 3700–3800 MHz range • 4 x 40 W for 3900–4100 MHz range
Modulation	256 QAM
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Operating modes	Non-BF mode: 4T4R for one 4-port passive antenna 2x2T2R for two 2-port passive antenna
Supported technologies	NR
Duplex mode, supported standard	TDD
TX frequency range	3700–3800 MHz and 3900–4100 MHz
RX frequency range	3700–3800 MHz and 3900–4100 MHz
DL filter bandwidth	100 + 200 MHz
UL filter bandwidth	100 + 200 MHz
Instantaneous bandwidth (iBW)	100 MHz + 200 MHz
Occupied bandwidth (oBW)	100 MHz + 200 MHz
Number of carriers per pipe	Up to 3
Maximum number of UL/DL MIMO streams	8 (4+4) • one eCPRI link: 4x200 MHz, carriers: 3700–3800 MHz and 4000–4100 MHz • one eCPRI link 4x100 MHz, carrier: 3900–4000 MHz
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

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Interfaces

Figure 131: AZQU interfaces

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Table 495: AZQU interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	2-pole circular	APPB/APPC
Antenna connector	ANT	4	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	–
Optical interface	OPT	2	SFP28	eCPRI: 10 or 25 Gbps; Nokia IP seal
Beamforming	BF	1	4.3-10	AISG + Bias-T only
Grounding	GND ⏚	1	2 x M5 screw	–

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Note:

There is no AISG support on the antenna lines. AISG + DC for RETs is only available through the RET (RS-485) port.

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Table 496: AZQU ALD support

ALD support through RS-485 port	Value
AISG	2.0, 3.0
Voltage	14.5 V
Power per port	15 W total per unit (2 W ALD modem + 13 W RET)

Functional block diagram

Figure 132: AZQU functional block diagram

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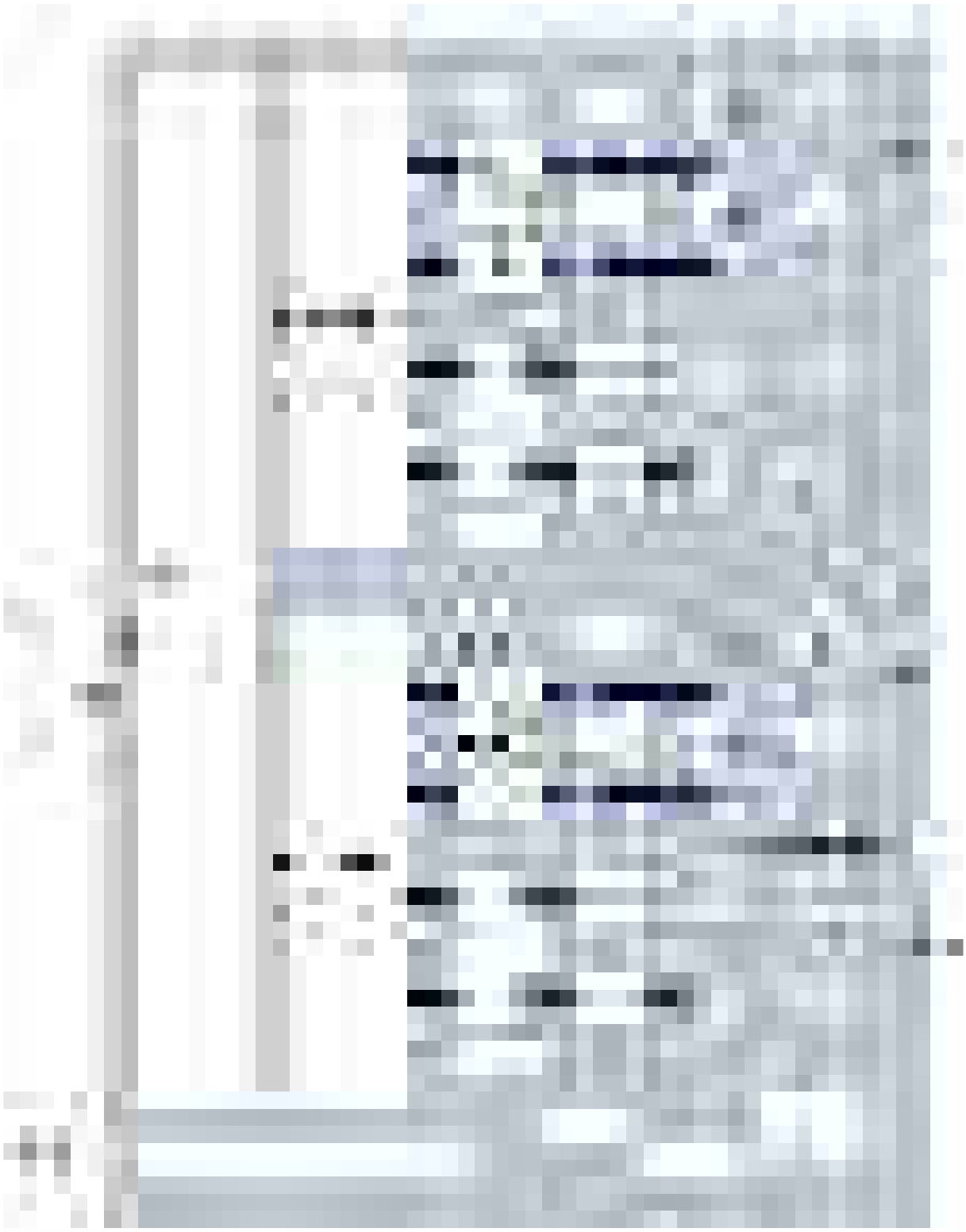

Electrical specifications

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Table 497: AZQU electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 498: AZQU power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
NR	Dual band 1+1/1+1/1+1 4T	4x20	1736	2272	3295
	Dual band 1+1/1+1/1+1 4T	4x10	1386	1704	2315

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Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 499: The recommended `NRCELL PDSCH Power Back-off for 256QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

> **Note:**
>
> You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- ASFG AirScale 8T8R TD RRH 395 mm fan unit (475796A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- AMBQ Book Mounting Kit (475591A)
- AMRB AirScale one clip bracket 126-200 (474581A) - version 102
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- ASAD AirScale MDR26-open EAC cable 5m (475570A)

Installation options

- Pole:
  - Vertical
  - One-clip rail

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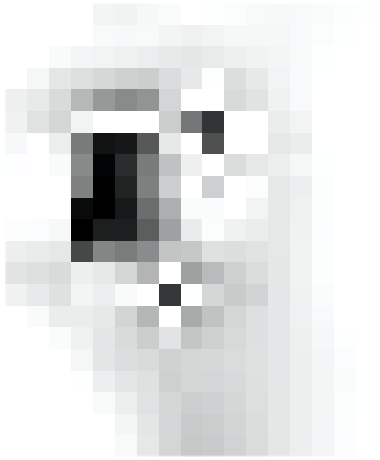
- Book mounting
- Wall:
  - Vertical
  - One-clip rail
  - Book mounting

Dimensions and weight

Table 500: AZQU dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 350 mm (13.78 in.)	
Width	Core RRH: 395 mm (15.55 in.)	
Depth	Core RRH: 190 mm (7.48 in.)	
Weight	Core RRH: 24.8 kg (52.0 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 501: AZQU environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.5 AirScale RRH 8T8R B38/n38 320 W (AZHN) (CPRI/eCPRI)

AZHN (475547A) is introduced for CPRI by SR002746 and for eCPRI by CB006131 .

Functional description

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Table 502: AZHN functional specification

Property	Value
Maximum output power	320 W
Modulation	256 QAM (DL) LTE: 64 QAM (UL) NR: 256 QAM (UL)
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes
Supported technologies (standalone and MSR)	NR TDD, TD-LTE
Frequency range	n38 (n41*): 2575–2615 MHz *AZHN supports full band n38 and sub-band n41.
Instantaneous bandwidth (iBW)	40 MHz
Occupied bandwidth (oBW)	40 MHz
Number of carriers per pipe	NR: up to 2
Supported bandwidths	LTE: 20 MHz NR: 20, 30, 40 MHz

Interfaces

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Figure 133: AZHN interfaces

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Table 503: AZHN interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	2-pole connector	APPB, APPC
Antenna connector	ANT	8	4.3-10	–
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	–
Optical interface	OPT	2	SFP28	• CPRI: 9.8 Gbps • eCPRI: 10 or 25 Gbps • Nokia IP seal
Beamforming	BF	1	4.3-10	–
Grounding	GND ⏚	1	2 x M5 screw	–
Fan	FAN	1	Nokia fan	Located in fins behind the BF connector

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Note:

There is no AISG support on the antenna lines. AISG+DC for RETs is only available through the beamforming calibration port and the RET (RS-485) port.

Table 504: AZHN ALD support

ALD support through RS-485 port	Value
AISG	2.0, 3.0
Voltage	14.5 V
Power per port	15 W total per unit (2 W ALD modem + 13 W RET)

Functional block diagram

Figure 134: AZHN functional block diagram

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Electrical specifications

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Table 505: AZHN electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 506: AZHN power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
NR	1/1/1 8TR	8x40	1482	1890	2927

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

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Table 507: The recommended `NRCELL PDSCH Power Back-off for 256 QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- ASFG AirScale 8T8R TD RRH 395 mm fan unit (475796A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- AMBQ Book Mounting Kit (475591A)
- AMRB AirScale one clip bracket 126-200 (474581A) - version 102
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- ASAD AirScale MDR26-open EAC cable 5m (475570A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail

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- Book mounting

Dimensions and weight

Table 508: AZHN dimensions and weight

Property	Value	Dimensions orientation
Height	350 mm (13.77 in.)	
Width	395 mm (15.55 in.)	
Depth	190 mm (7.48 in.)	
Weight	max. 24.5 kg (54.0 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 509: AZHN environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.6 AirScale RRH 8T8R B40 240 W (AZNB)

AZNB (474051A) is introduced by LTE3549.

Functional description

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Table 510: AZNB functional specification

Property	Value
Maximum output power	240 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes
Supported technologies (standalone and MSR)	TD-LTE
Frequency range	2300–2400 MHz
Filter bandwidth	100 MHz
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	80 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	10, 15, 20 MHz

Interfaces

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Figure 135: AZNB interfaces

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Table 511: AZNB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	2 x M5 screw	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 512: AZNB ALD support

ALD support through RS-485 port	Value
AISG	3.0 Main only
Voltage	14.5 V Main only
Power per port	30 W

Functional block diagram

Figure 136: AZNB functional block diagram

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Electrical specifications

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Table 513: AZNB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 514: AZNB power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 8T	8x30	1031	1274	1824
	1/1/1 4T	4x30	653	770	1018
	1/1/1 8T	8x20	895	1046	1400
	1/1/1 4T	4x20	589	664	834

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Note:

Power consumption values are measured according to ETSI 202 706-1 v1.5 assumptions (subframe #2 and special subframe #7), leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power consumption.

Recommended power back-off

Table 515: Recommended AZNB power back-off in 256 QAM

Carrier configuration	Power reduction [dB]
Multiple carriers, continuous	1.5
Multiple carriers, non-continuous	2
Single carrier	1

Related optional items

- AMBG AirScale book mount kit 151–175 (474467A)
- AMGN AirScale 2 cover 395 x 150–175 (474535A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMRB AirScale one clip bracket 126–200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3–10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10–16 mm^2 (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- ASFD AirScale 2 TD RRH 8-pipe fan unit (474485A)
- FPKA Flexi Pole Mounting Kit (30–120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (v101: 60–295 mm, v202: 60–300 mm) (472821A)

Installation options

- Pole:
  - Vertical
  - One-clip rail

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  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 516: AZNB dimensions and weight

Property	Value	Dimensions orientation
Height	385 mm (15.16 in.) With upper and lower mounting brackets: 469 mm (18.46 in.)	
Width	395 mm (15.55 in.)	
Depth	160 mm (6.3 in.) With mounting brackets: 185.5 mm (7.3 in.)	
Weight	22 kg (48.5 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 517: AZNB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.7 AirScale RRH 8T8R B40/n40 240 W (AZNC)

AZNC (474052A) is introduced by LTE3550/CB006968.

Functional description

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Table 518: AZNC functional specification

Property	Value
Maximum output power	240 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes
Supported technologies	NR, TD-LTE
RF sharing/concurrent mode	NR-LTE
Duplex mode, supported standard	TDD
Frequency range	B40/n40: 2350–2390 MHz
Filter bandwidth	40 MHz
Instantaneous bandwidth (iBW)	40 MHz
Occupied bandwidth (oBW)	40 MHz
Number of carriers per pipe	Up to 2
Supported bandwidths	LTE: 10, 15, 20 MHz NR: 20 MHz

Interfaces

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Figure 137: AZNC interfaces

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Table 519: AZNC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	2 x M5 screw	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 520: AZNC ALD support

ALD support through RS-485 port	Value
AISG	2.0
Voltage	14.5 V
Power per port	30 W

Functional block diagram

Figure 138: AZNC functional block diagram

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Electrical specifications

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Table 521: AZNC electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 522: AZNC power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 102706 average P_{RRH}, static	Power consumption [W] ETSI 102706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 8T	8 x 30	1029	1280	1820
	1/1/1 4T	4 x 30	653	775	1030
	1/1/1 8T	8 x 20	897	1058	1419
	1/1/1 4T	4 x 20	591	671	847

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Note:

Power consumption values are measured according to ETSI 202 706-1 v1.5 assumptions (subframe #2 and special subframe #7), leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power consumption.

Recommended power back-off

Table 523: Recommended AZNC power back-off in 256 QAM

Carrier configuration	Power reduction [dB]
Continuous	1.5
Non-continuous	2

Table 524: AZNC power back-off in 5G

	Single carrier		Multi carrier (non contiguous)	
Pmax (dBm)	Pmax <43	Pmax=44.8	Pmax <41.8	Pmax=41.8
Recommended backoff (dB): `dlQam256PowerBackoffSub6`	1.5	1.7	1.5	2.1

Note:

Values in the table are valid only when the `actDlLowPAPRoptimizedPrecoding` parameter is set to `true`.

Related optional items

- AMBG AirScale book mount kit 151–175 (474467A)
- AMGN AirScale 2 cover 395 x 150–175 (474535A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMRB AirScale one clip bracket 126–200 (474581A)

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- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3–10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10–16 mm^2 (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- ASFD AirScale 2 TD RRH 8-pipe fan unit (474485A)
- FPKA Flexi Pole Mounting Kit (30–120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (v101: 60–295 mm, v202: 60–300 mm) (472821A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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Table 525: AZNC dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 385 mm (15.16 in.) With upper and lower mounting brackets: 469 mm (18.46 in.)	
Width	395 mm (15.55 in.)	
Depth	Core RRH: 160 mm (6.3 in.) With mounting brackets: 185.5 mm (7.3 in.)	
Weight	max. 22 kg (48.5 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 526: AZNC environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.8 AirScale RRH 8T8R B41/n41 320 W CPRI/eCPRI (AZHL)

AZHL (475432A) is introduced for CPRI by SR002812/5GC002305 and for eCPRI by SR002975/5GC002270.

Functional description

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Table 527: AZHL functional specification

Property	Value
Maximum output power	320 W
Modulation	Up to 256 QAM
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes
Operating modes	• 8T8R • 2 x 4T4R • 4 x 2T2R Note: Beamforming (BF) is available only in 8T8R mode. NR-LTE concurrent mode (eCPRI only)
Supported technologies	NR, LTE
Duplex mode, supported standard	TDD
Frequency range	2496-2690 MHz
Instantaneous bandwidth (iBW)	194 MHz
Occupied bandwidth (oBW)	190 MHz
Number of carriers per pipe	NR: Up to 2 LTE: Up to 4
Maximum number of UL/DL MIMO streams	8
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz LTE: 10, 15, 20 MHz

Interfaces

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Figure 139: AZHL interfaces

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Table 528: AZHL interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP28	CPRI: 9.8 Gbps, eCPRI: 10 or 25 Gbps; OCTIS universal
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	2 x M5 screw	-
Fan	FAN	1	Nokia fan	Located in the fins behind the BF connector

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Note:

Recommended value for VSWR major and minor alarm threshold is 3.5.

Table 529: AZHL ALD support

ALD support through RS-485 port	Value
AISG	2.0, 3.0
Voltage	14.5 V
Power per port	15 W total per unit (2 W ALD modem + 13 W RET)

Functional block diagram

Figure 140: AZHL functional block diagram

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Electrical specifications

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Table 530: AZHL electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/–10% margin.

Table 531: AZHL power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static (74.3% TX duty cycle)	Power consumption [W], 52% RF load $P_{BH\ RRH}$, static (74.3% TX duty cycle)	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$ (74.3% TX duty cycle)
NR	1/1/1 8TRX	8x40	1533	1938	2742

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

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Table 532: The recommended `NRCELL PDSCH Power Back-off for 256 QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- ASFG AirScale 8T8R TD RRH 395 mm fan unit (475796A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- AMBQ Book Mounting Kit (475591A)
- AMRB AirScale one clip bracket 126-200 (474581A) - version 102
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- AOPE OCTIS Universal Plug Kit (475153A)
- ASAD AirScale MDR26-open EAC cable 5m (475570A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail

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- Book mounting

Dimensions and weight

Table 533: AZHL dimensions and weight

Property	Value	Dimensions orientation
Height	350 mm (13.77 in.)	
Width	395 mm (15.55 in.)	
Depth	190 mm (7.48 in.)	
Weight	max. 23.7 kg (52.2 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 534: AZHL environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.9 AirScale RRH 8T8R n41 320 W eCPRI (AZHM)

AZHM (475546A) is introduced by 5GC002336 /CB006124 .

Functional description

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Table 535: AZHM functional specification

Property	Value
Maximum output power	320 W
Modulation	Up to 256 QAM
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes
Operating modes	Beamforming mode: • One or two cells 8T8R with 8-port calibrated BF antenna Non beamforming mode: • Up to four cells 2T2R or two cells 4T4R with uncalibrated TRX antenna
Concurrent mode	NR-LTE
Supported technologies	NR, LTE
Duplex mode, supported standard	TDD
Frequency range	2515–2675 MHz
Instantaneous bandwidth (iBW)	NR: 160 MHz LTE: 160 MHz
Occupied bandwidth (oBW)	NR: 160 MHz LTE: 80 MHz
Number of carriers per pipe	NR: Up to 2 LTE: Up to 4
Maximum number of UL/DL MIMO streams	Up to 8
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz LTE: 10, 15, 20 MHz

Interfaces

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Figure 141: AZHM interfaces

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Table 536: AZHM interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP28	eCPRI: 10 Gbps and 25 Gbps; Nokia IP seal
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	2 x M5 screw	-
RF monitor	-	8	SMA, female	Located under each antenna connector

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 537: AZHM ALD support

Property	Value
AISG	2.0, (hardware ready to support 3.0)
Voltage	14.5 V
Power per port	30 W, 45 W total

Functional block diagram

Figure 142: AZHM functional block diagram

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Electrical specifications

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Table 538: AZHM electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 20 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 539: AZHM power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
NR	1/1/1 8TR	8x40	1431	1755	2472

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

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Table 540: The recommended `NRCELL PDSCH Power Back-off for 256QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- ASFG AirScale 8T8R TD RRH 395 mm fan unit (475796A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- AMBQ Book Mounting Kit (475591A)
- AMRB AirScale one clip bracket 126-200 (474581A) - version 102
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- ASAD AirScale MDR26-open EAC cable 5m (475570A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail

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- Book mounting

Dimensions and weight

Table 541: AZHM dimensions and weight

Property	Value	Dimensions orientation
Height	350 mm (13.78 in.)	
Width	395 mm (15.55 in.)	
Depth	190 mm (7.48 in.)	
Weight	max. 23.0 kg (50.7 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 542: AZHM environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.10 AirScale RRH 8T8R n77 160 W (AZQO) (eCPRI)

AZQO (475288A) is introduced for eCPRI by 5GC002024.

Functional description

Table 543: AZQO functional specification

Property	Value
Maximum output power	160 W
Modulation	Up to 256 QAM
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes

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Property	Value
Operating modes	BF mode: • One cell 8T8R with 8-port calibrated BF antenna (one sector, one carrier, 4 antennas/ports per polarization) Non BF mode: • 2T2R for 2-port passive antennas (up to two sectors, one carrier) • 4T4R for 4-port passive antennas (one sector, one carrier) • 2x4T4R sub-sectors for 4-port passive antennas (one sector, one carrier) • 4x2T2R sub-sectors for 2-port passive antennas (one sector, one carrier)
Software supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	n77: 3900–4100 MHz
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	Up to 1
Maximum number of UL/DL MIMO streams	8 (with 1x25 GE or 2x10 GE)
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, and 100 MHz

Interfaces

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Figure 143: AZQO interfaces

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Table 544: AZQO interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP28	eCPRI: 10 or 25 Gbps; Nokia IP seal
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	2 x M5 screw	-
Fan	FAN	1	Nokia fan	Located on the opposite side
RF Monitor	-	8	SMA, female	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Note:

There is no AISG support on the antenna lines. AISG+DC for RETs is only available through the beamforming calibration port and the RET (RS-485) port.

Note:

Recommended value for VSWR major and minor alarm threshold is 3.5.

Table 545: AZQO ALD support

ALD support through RS-485 port	Value
AISG	2.0, 3.0
Voltage	14.5 V
Power per port	15 W total per unit (2 W ALD modem + 13 W RET)

Functional block diagram

Figure 144: AZQO functional block diagram

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Electrical specifications

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Table 546: AZQO electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, the unit might shut down.

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 547: The recommended `NRCELL PDSCH power back-off for 256 QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)

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- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- AMBQ Book Mounting Kit (475591A)
- AMRB AirScale one clip bracket 126-200 (474581A) - version 102
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- ASAD AirScale MDR26-open EAC cable 5m (475570A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> To ensure convection cooling of RRHs without fans always mount the RRH vertically with the connectors facing down.

Dimensions and weight

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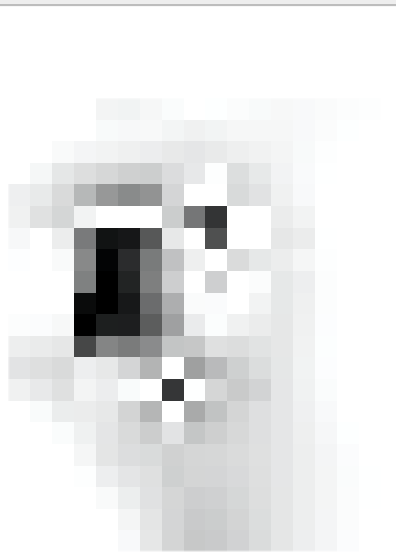
Table 548: AZQO dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 350 mm (13.78 in.)	
Width	Core RRH: 395 mm (15.55 in.)	
Depth	Core RRH: 165 mm (6.50 in.)	
Weight	Core RRH: 23 kg (50.7 lb)	

Note:

Dimensions and weight provided for core RRH, without heat shield, fan and mounting brackets.

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 549: AZQO environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.11 AirScale RRH 8T8R n77 320 W eCPRI (AZQW)

AZQW (475742A) is introduced by CB006061.

Functional description

Table 550: AZQW functional specification

Property	Value
Maximum output power	320 W
Modulation	UL: Up to 64 QAM DL: Up to 256 QAM
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes

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Property	Value
Operating modes	• 8T8R Note: Beamforming (BF) is available only in 8T8R mode. • 2 x 4T4R Note: AZQW supports dual sub-band mode in 2 x 4T4R – ANT1, 2, 5, 6 transmit on one set of frequencies and ANT 3, 4,7, 8 transmit on another set of frequencies.
Supported technology	NR
Duplex mode, supported standard	TDD
Frequency range	3700–3980 MHz
Instantaneous bandwidth (iBW)	140 MHz with contiguous and non-contiguous carriers (frequency gap cannot exceed 80 MHz)
Occupied bandwidth (oBW)	140 MHz in 8T8R mode 280 MHz in 2 x 4T4R split mode
Number of carriers per pipe	One
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

Interfaces

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Figure 145: AZQW interfaces

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Table 551: AZQW interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP28	10 or 25 Gbps eCPRI; OCTIS universal
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	2 x M5 screw or 1 x M8 screw	-
Fan	FAN	1	Nokia fan	Located in the fins behind the BF connector

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Note:

Recommended value for VSWR major and minor alarm threshold is 3.5.

Table 552: AZQW ALD support

Property	Value
AISG	2.0/3.0
Voltage	14.5 V
Power per port	15 W total per unit (2 W ALD modem + 13 W RET)

Functional block diagram

Figure 146: AZQW functional block diagram

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Electrical specifications

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Table 553: AZQW electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 554: AZQW power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
NR	1/1/1 8TR	8x40	1985	2610	3510

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

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Table 555: The recommended `NRCELL PDSCH Power Back-off for 256QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- ASFG AirScale 8T8R TD RRH 395 mm fan unit (475796A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- AMBQ Book Mounting Kit (475591A)
- AMRB AirScale one clip bracket 126-200 (474581A) - version 102
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- AOPE OCTIS Universal Plug Kit (475153A)
- ASAD AirScale MDR26-open EAC cable 5m (475570A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail

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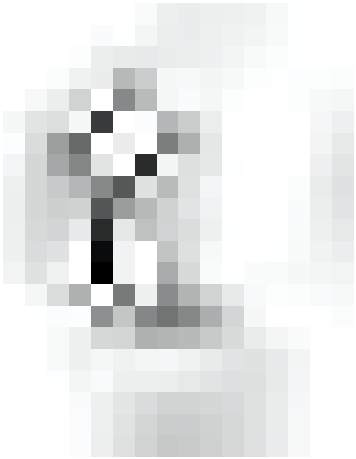
- Book mounting

Dimensions and weight

Table 556: AZQW dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 354.2 mm (13.94 in.)	
Width	Core RRH: 406.3 mm (16 in.)	
Depth	Core RRH: 193 mm (7.6 in.)	
Weight	Core RRH: 24 kg (52.9 lb)	

Note:

Dimensions and weight provided for core RRH, without heat shield, fan and mounting brackets.

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 557: AZQW environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.12 AirScale RRH 8T8R B42/n78 160 W CPRI/eCPRI (AZQP)

AZQP (475198A) is introduced for CPRI by LTE5300 and for eCPRI by CB005852.

Functional description

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Table 558: AZQP functional specification

Property	Value
Maximum output power	160 W
Modulation	UL: Up to 64 QAM DL: Up to 256 QAM
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes
Operating modes	• 8T8R • 2 x 4T4R • 4 x 2T2R Note: Beamforming (BF) is available only in 8T8R mode.
Supported technologies (standalone and MSR)	LTE, NR
Concurrent mode	NR-LTE (eCPRI only)
Duplex mode, supported standard	TDD
Frequency range	3400–3600 MHz
Instantaneous bandwidth (iBW)	NR/LTE: 200 MHz
Occupied bandwidth (oBW)	LTE: 80 MHz (CPRI), 160 MHz (eCPRI) NR: 200 MHz (eCPRI)
Number of carriers per pipe	LTE: up to 4 NR: up to 2
Supported bandwidths	LTE: 10, 15, 20 MHz NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

Interfaces

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Figure 147: AZQP interfaces

Note:

AZQP has SMA Rx monitoring ports.

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Table 559: AZQP interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP28	CPRI: 9.8 Gbps, eCPRI: 10 or 25 Gbps; Nokia IP seal
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	2 x M5 screw	-
Fan	FAN	1	Nokia fan	Located in the fins behind the BF connector
RF monitor	-	8	SMA, female	Located under each antenna connector

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Note:

There is no AISG support on the antenna lines. AISG+DC for RETs is only available through the beamforming calibration port and the RET (RS-485) port.

Note:

Recommended value for SRAN 20C AZQP VSWR major and minor alarm threshold is 3.5.

Table 560: AZQP ALD support

ALD support through RS-485 port	Value
AISG	2.0, 3.0
Voltage	14.5 V
Power per port	15 W total per unit (2 W ALD modem + 13 W RET)

Functional block diagram

Figure 148: AZQP functional block diagram

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Electrical specifications

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Table 561: AZQP electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/–10% margin.

Table 562: AZQP power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static (74.3% TX duty cycle)	Power consumption [W], 52% RF load $P_{BH\ RRH}$, static (74.3% TX duty cycle)	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$ (74.3% TX duty cycle)
LTE	1/1/1 8TRX	8x20	1077	1309	1790

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

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Table 563: The recommended `NRCELL PDSCH Power Back-off for 256QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- AMBQ Book Mounting Kit (475591A)
- AMRB AirScale one clip bracket 126-200 (474581A) - version 102
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- ASAD AirScale MDR26-open EAC cable 5m (475570A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail
  - Book mounting

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NOTICE:

Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

Table 564: AZQP dimensions and weight

Property	Value	Dimensions orientation
Height	350 mm (13.78 in.)	
Width	395 mm (15.55 in.)	
Depth	165 mm (6.50 in.)	
Weight	Core RRH: 23 kg (50.7 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 565: AZQP environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.13 AirScale RRH 8T8R B42 240 W (AZQE)

AZQE (474717A) is introduced by LTE3736.

Functional description

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Table 566: AZQE functional specification

Property	Value
Maximum output power	240 W
Modulation	64 QAM /256 QAM (DL) 64 QAM (UL)
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes
Supported technologies (standalone and MSR)	TD-LTE
Frequency range	3400–3600 MHz
Filter bandwidth	200 MHz
Instantaneous bandwidth (iBW)	140 MHz*
Occupied bandwidth (oBW)	80 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	10, 15, 20 MHz

*Carrier configuration depends on the iBW used:

- For iBW up to 110 MHz - any carrier configuration
- For iBW over 110 MHz and up to 140 MHz the following requirements for carrier blocks must be fulfilled. A carrier block is a set of consecutive carriers.
  - The frequency distance between the lower edge of the lowest carrier block and the lower edge of the highest carrier block must be max 100 MHz
  - The frequency distance between the lower edge of the lowest carrier block and the lower edge of the highest carrier block must be max 100 MHz

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Figure 149: AZQE carrier configuration for iBW from over 110 MHz to 140 MHz

Interfaces

Figure 150: AZQE interfaces

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Table 567: AZQE interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	LMP/EAC	1	MDR26	-
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Fan	FAN	1	Nokia fan	Located on the opposite side

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 568: AZQE ALD support

ALD support through RS-485 port	Value
AISG	2.0, 3.0
Voltage	14.5 V
Power per port	30 W

Functional block diagram

Figure 151: AZQE functional block diagram

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Electrical specifications

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Table 569: AZQE electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8h busy hour load) /24 h.

Table 570: AZQE power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average load P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 8T	8x30	1098	1415	2182
	1/1/1 4T	4x30	698	847	1187
	1/1/1 8T	8x20	932	1137	1590
	1/1/1 4T	4x20	619	722	929

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Note:

Power consumption values are measured according to ETSI 202 706-1 v1.5 assumptions (subframe #2 and special subframe #7), leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power consumption.

Recommended power back-off

Table 571: Recommended AZQE power back-off in 256 QAM

Carrier configuration	Power back-off [dB]
Multiple carriers, continuous	1
Multiple carriers, non-continuous	1.4
Single carrier	1

Related optional items

- AMBG AirScale book mount kit 151–175 (474467A)
- AMGN AirScale 2 cover 395 x 150–175 (474535A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMRB AirScale one clip bracket 126–200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3–10 mm^2 (474282A/474282B)
- APPC AirScale 2 55A DC plug 10–16 mm^2 (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- ASFD AirScale 2 TD RRH 8-pipe fan unit (474485A)
- FPKA Flexi Pole Mounting Kit (30–120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (v101: 60–295 mm, v202: 60–300 mm) (472821A)

Installation options

- Pole:
  - Vertical
  - One-clip rail

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- Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

Table 572: AZQE dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 385 mm (15.16 in.) With upper and lower mounting brackets: 469 mm (18.46 in.)	
Width	395 mm (15.55 in.)	
Depth	Core RRH: 170 mm (6.69 in.) With mounting brackets: 190.5 mm (7.5 in.)	
Weight	24.0 kg (52.0 lb)	

Environmental specifications

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Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

Table 573: AZQE environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.14 AirScale RRH 8T8R B42/n78 240 W (AZQF)

AZQF (474188A) is introduced by LTE3737 and CB006118.

Functional description

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Table 574: AZQF functional specification

Property	Value
Maximum output power	240 W
Modulation	Up to 256 QAM (DL) LTE: up to 64 QAM (UL) NR: up to 256 QAM (UL)
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes (LTE only)
Supported technologies (standalone and MSR/concurrent operation)	NR, TD-LTE, NR-TD-LTE
Frequency range	3410–3590 MHz
Filter bandwidth	180 MHz
Instantaneous bandwidth (iBW)	140 MHz *
Occupied bandwidth (oBW)	80 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	LTE: 10, 20 MHz NR: 20 MHz

* Carrier configuration depends on the iBW used:

- For iBW up to 110 MHz - any carrier configuration
- For iBW over 110 MHz and up to 140 MHz it is required that the frequency distance between the lower edge of the lowest carrier block (set of consecutive carriers) and the lower edge of the highest carrier block be max 100 MHz

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Figure 152: AZQF carrier configuration for iBW from over 110 MHz to 140 MHz

Interfaces

Figure 153: AZQF interfaces

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Table 575: AZQF interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP+	Up to 9.8 Gbps (CPRI7); Nokia IP seal
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	2 x M5 screw	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 576: AZQF ALD support

ALD support through RS-485 port	Value
AISG	2.0, 3.0
Voltage	14.5 V
Power per port	30 W

Functional block diagram

Figure 154: AZQF functional block diagram

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Electrical specifications

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Table 577: AZQF electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 578: AZQF power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W], ETSI 202706 average P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	1/1/1 8T	8x30	1118	1439	2137
	1/1/1 4T	4x30	710	863	1186
	1/1/1 8T	8x20	950	1160	1587
	1/1/1 4T	4x20	629	734	938

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Note:

Power consumption values are measured according to ETSI 202 706-1 v1.5 assumptions (subframe #2 and special subframe #7), leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power consumption.

Recommended LTE power back-off

Table 579: Recommended AZQF power back-off in 256 QAM at maximum TX power

Carrier configuration	Power back-off [dB]
Multiple carriers, continuous	1.3
Multiple carriers, non-continuous	1.7
Single carrier	1

Recommended NR power back-off

Table 580: The recommended `NRCELL PDSCH Power Back-off for 256 QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

Related optional items

- AMBG AirScale book mount kit 151–175 (474467A)
- AMGN AirScale 2 cover 395 x 150–175 (474535A)
- AMFA AirScale 2 FPKx fixing adapter (474289A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMRB AirScale one clip bracket 126–200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3–10 mm^2 (474282A/474282B)

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- APPC AirScale 2 55A DC plug 10–16 mm^2 (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- ASFD AirScale 2 TD RRH 8-pipe fan unit (474485A)
- FPKA Flexi Pole Mounting Kit (30–120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (v101: 60–295 mm, v202: 60–300 mm) (472821A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - Horizontal with an optional fan
  - One-clip rail
  - Book mounting

> **NOTICE:**
>
> Install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling. For horizontal installation fans are required.

Dimensions and weight

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Table 581: AZQF dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 385 mm (15.16 in.) With upper and lower mounting brackets: 469 mm (18.46 in.)	
Width	395 mm (15.55 in.)	
Depth	Core RRH: 170 mm (6.69 in.) With mounting brackets: 190.5 mm (7.5 in.)	
Weight	22.5 kg (49.6 lb)	

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 582: AZQF environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.15 AirScale RRH 8T8R n78 320W (AZQG)

AZQG (474994A) is introduced by 5GC001795.

Functional description

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Table 583: AZQG functional specification

Property	Value
Maximum output power	320 W
Output power of the cell per TX	39–46 dBm
Modulation	Up to 256 QAM
Number of TXRX	8T8R
Outdoor installation	Yes
Beamforming	1 sector, 1 carriers, 8T8R with 8 port calibrated antenna. Supported antenna types defined by 5GC001849 and 5GC001866. For more information see: 5GC002142 and 5GC001849.
Operating mode[1]	One cell 4T2R for one or two 4-port passive antennas[1)] One or two cells 2T2R for one or two 2-port passive antennas
Software supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	3400–3600 MHz, 3GPP band 78
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	1
Maximum number of UL/DL MIMO streams	4
Supported bandwidths	20, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

[1]You can select only one operating mode for one radio unit. All cells must have the same carrier bandwidth and carrier frequency.

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Interfaces

Figure 155: AZQG interfaces

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Table 584: AZQG interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	OBTS	APPB or APPC plug
Optical interface	OPT 1-2	2	SFP28	CPRI 9.8 Gbps, Nokia IP seal AOPC
External Alarm and Control	EAC	1	MDR26	6 alarm inputs and 1 control output
Remote Electrical Tilt	RET	1	AISG C485	-
Antenna Connector	ANT 1-8	8	4.3-10 Female	-
Calibration	CAL	1	4.3-10 Female	-
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 585: AZQG interface for ALD support

Property	Value
AISG	RAE: 2.0
Voltage	10–30 V
Power per port	–

Electrical specifications

Table 586: AZQG electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/–10% margin.

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Table 587: AZQG power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static (74.3% TX duty cycle)	Power consumption [W], 52% RF load $P_{BH\ RRH}$, static (74.3% TX duty cycle)	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$ (74.3% TX duty cycle)
NR	1/1/1 8TR	8x40	1404	1800	2522

Recommended parameter values

Recommend value for `dlQam256PowerBackoffSub6` parameter is:

- 1.5 dB for 3GPP performance requirement.
- 3 dB for high peak UE throughput (4x4 DL MIMO).

Related optional items

- FPKA Flexi Pole Mounting Kit (471649A)
- FPKC Flexi Pole Mounting Kit (472821A)
- AMGV AirScale 417mm 19 rack/stack fixing (475397A)
- AMBO AirScale Book Mount Kit 201-225 (475396A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)
- AMFD AirScale 2 FPKx fixing adapter 600 (474293A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- ASFF AirScale 8T8R fan unit (475567A)
- APPB AirScale2 55A DC plug 3.3–10 mm^2 (474282A)
- APPC AirScale2 55A DC plug 10–16 mm^2 (474283A)
- ACPA AirScale 2 fiber protection kit (474297A)

Installation options

- Pole
- Wall

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- One-clip mounting with AMRC (on wall, pole with FPKA or FPKC)
- Stack with AMGV (ASFF fan required)
- 19'' rack with AMGV (ASFF fan required)

> **NOTICE:**
>
> The RRH without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Dimensions and weight

Table 588: AZQG dimensions and weight

Parameter	Details	Dimension orientation
Height	435 mm (17.13 in.) With mounting brackets: 561 mm (22.09 in.)	
Width	400 mm (15.74 in.)	
Depth	192 mm (7.56 in.) With mounting brackets: 217 mm (8.54 in.)	
Weight	25.5 kg (56.2 lb)	

Environmental specifications

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Table 589: AZQG environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade) with fan or 10.8 km/h (6.7 mph) wind	55°C (131°F)
Maximum operational outdoor temperature (in the sun) with fan or 10.8 km/h (6.7 mph) wind	50°C (122°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

NOTICE:

You should use a fan when ambient temperature can be higher than 45°C (113°F) and at the same time traffic load often exceeds 70%.

[1)]Two antennas supported via super-cell (DL data duplication and UL data summing).

6.16 AirScale RRH 8T8R n78 320W (AZQH)

AZQH (475074A) is introduced by 5GC001810.

Functional description

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Table 590: AZQH functional specification

Property	Value
Maximum output power	320 W
Output power of the cell per TX	39–46 dBm
Modulation	Up to 256 QAM
Number of TXRX	8T8R
Outdoor installation	Yes
Beamforming	1 sector, 1 carriers, 8T8R with 8 port calibrated antenna. Supported antenna types defined by 5GC001849 and 5GC001866. For more information see: 5GC002142 and 5GC001849.
Operating mode[1]	One cell 4T2R for one or two 4-port passive antennas[2)] One or two cells 2T2R for one or two 2-port passive antennas
Software supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	B43: 3600–3800 MHz, 3GPP band 78
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	1
Maximum number of UL/DL MIMO streams	4
Supported bandwidths	20, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

[1]You can select only one operating mode for one radio unit. All cells must have the same carrier bandwidth and carrier frequency.

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Interfaces

Figure 156: AZQH interfaces

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Table 591: AZQH interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	OBTS	APPB or APPC plug
Optical interface	OPT 1-2	2	SFP28	CPRI 9.8 Gbps, Nokia IP seal AOPC
External Alarm and Control	EAC	1	MDR26	6 alarm inputs and 1 control output
Remote Electrical Tilt	RET	1	AISG C485	-
Antenna Connector	ANT 1-8	8	4.3-10 Female	-
Calibration	CAL	1	4.3-10 Female	-
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 592: AZQH interface for ALD support

Property	Value
AISG	RAE: 2.0
Voltage	10–30 V
Power per port	–

Electrical specifications

Table 593: AZQH electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/–10% margin.

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Table 594: AZQH power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static (74.3% TX duty cycle)	Power consumption [W], 52% RF load $P_{BH\ RRH}$, static (74.3% TX duty cycle)	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$ (74.3% TX duty cycle)
NR	1/1/1 8TRX	8x40	1526	1950	2720

Recommended parameter values

Recommend value for `dlQam256PowerBackoffSub6` parameter is:

- 1.5 dB for 3GPP performance requirement.
- 3 dB for high peak UE throughput (4x4 DL MIMO).

Related optional items

- FPKA Flexi Pole Mounting Kit (471649A)
- FPKC Flexi Pole Mounting Kit (472821A)
- AMGV AirScale 417mm 19 rack/stack fixing (475397A)
- AMBO AirScale Book Mount Kit 201-225 (475396A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)
- AMFD AirScale 2 FPKx fixing adapter 600 (474293A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- ASFF AirScale 8T8R fan unit (475567A)
- APPB AirScale2 55A DC plug 3.3–10 mm^2 (474282A)
- APPC AirScale2 55A DC plug 10–16 mm^2 (474283A)
- ACPA AirScale 2 fiber protection kit (474297A)

Installation options

- Pole
- Wall

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- One-clip mounting with AMRC (on wall, pole with FPKA or FPKC)
- Stack with AMGV (ASFF fan required)
- 19'' rack with AMGV (ASFF fan required)

> **NOTICE:**
>
> The RRH without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Dimensions and weight

Table 595: AZQH dimensions and weight

Parameter	Details	Dimension orientation
Height	435 mm (17.13 in.) With mounting brackets: 561 mm (22.09 in.)	
Width	400 mm (15.74 in.)	
Depth	192 mm (7.56 in.) With mounting brackets: 217 mm (8.54 in.)	
Weight	25.5 kg (56.2 lb)	

Environmental specifications

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Table 596: AZQH environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade) with fan or 10.8 km/h (6.7 mph) wind	55°C (131°F)
Maximum operational outdoor temperature (in the sun) with fan or 10.8 km/h (6.7 mph) wind	50°C (122°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

NOTICE:

You should use a fan when ambient temperature can be higher than 45°C (113°F) and at the same time traffic load often exceeds 70%.

[2)] Two antennas supported via super-cell (DL data duplication and UL data summing).

6.17 AirScale RRH 8T8R n78 320 W (eCPRI) (AZQI)

AZQI (475243A) is introduced for eCPRI by *5GC001511*.

Functional description

Table 597: AZQI functional specification

Property	Value
Maximum output power	320 W
Modulation	256 QAM
MIMO mode	8T8R
Outdoor installation	Yes

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Property	Value
Beamforming	Yes
Operating modes	BF mode (one sector, up to two NR carriers): • One cell 8T8R with 8-port calibrated BF antenna (4 antennas/ports per polarization) Non BF mode: • 2T2R for 2-port passive antennas (up to two sectors, up to two NR carriers) • 4T4R for 4-port passive antennas (one sector, up to two NR carriers) • 2x4T4R sub-sectors for 4-port passive antennas (one sector, up to two NR carriers) • 4x2T2R sub-sectors for 2-port passive antennas (one sector, up to two NR carriers) Note: There can be only one carrier configuration, i.e. all sectors and sub-sectors in one radio shall have the same (single or dual) carrier bandwidth and the same carrier frequency (or frequencies).
Software supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	n78: 3410–3700 MHz
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	200 MHz (160 MHz for TD-CPRI)
Number of carriers per pipe	Up to 2
Maximum number of UL/DL MIMO streams	Up to 8 (with 2x25 GE)
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90 and 100 MHz single carriers (20 MHz and 40 MHz with optimized sampling rates) *20, 60, 80 MHz supported from 5G20A

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Interfaces

Figure 157: AZQI interfaces

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Table 598: AZQI interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP28	eCPRI: 10/25 Gbps; Nokia IP seal
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	2 x M5 screw	-
Fan	FAN	1	Nokia fan	Located in fins behind the BF connector

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Note:

There is no AISG support on the antenna lines. AISG + DC for RETs is only available through the beamforming calibration port and the RET (RS-485) port.

Note:

Recommended value for VSWR major and minor alarm threshold is 3.5.

Table 599: AZQI ALD support

ALD support through RS-485 port	Value
AISG	2.0 (hardware ready to support 3.0)
Voltage	14.5 V
Power per port	15 W total per unit (2 W ALD modem + 13 W RET)

Functional block diagram

Figure 158: AZQI functional block diagram

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Electrical specifications

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Table 600: AZQI electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 601: AZQI power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
NR	1/1/1 8TR	8x40	1797	2400	3606

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

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Table 602: The recommended `NRCELL PDSCH Power Back-off for 256QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- ASFG AirScale 8T8R TD RRH 395 mm fan unit (475796A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- AMBQ Book Mounting Kit (475591A)
- AMRB AirScale one clip bracket 126-200 (474581A) - version 102
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- ASAD AirScale MDR26-open EAC cable 5m (475570A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail

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- Book mounting

Dimensions and weight

Table 603: AZQI dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 350 mm (13.78 in.)	
Width	Core RRH: 395 mm (15.55 in.)	
Depth	Core RRH: 190 mm (7.48 in.)	
Weight	Core RRH: 24 kg (52.9 lb)	

Note:

Dimensions and weight provided for core RRH, without heat shield, fan and mounting brackets.

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 604: AZQI environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.18 AirScale RRH 8T8R n78 320 W (eCPRI) (AZQJ)

AZQJ (475244A) is introduced for eCPRI by *5GC001512* /CB007179 .

Functional description

Table 605: AZQJ functional specification

Property	Value
Maximum output power	320 W
Modulation	256 QAM
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes

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Property	Value
Operating modes	BF mode (one sector, up to two NR carriers): • One cell 8T8R with 8-port calibrated BF antenna (4 antennas/ports per polarization) Non BF mode: • 2T2R for 2-port passive antennas (up to two sectors, up to two NR carriers) • 4T4R for 4-port passive antennas (one sector, up to two NR carriers) • 2x4T4R sub-sectors for 4-port passive antennas (one sector, up to two NR carriers) • 4x2T2R sub-sectors for 2-port passive antennas (one sector, up to two NR carriers) Note: There can be only one carrier configuration, i.e. all sectors and sub-sectors in one radio shall have the same (single or dual) carrier bandwidth and the same carrier frequency (or frequencies).
Software supported technologies	NR, LTE
Concurrent mode	NR-LTE (eCPRI only)
Duplex mode, supported standard	TDD
Frequency range	n78: 3480–3800 MHz
Instantaneous bandwidth (iBW)	NR/LTE: 200 MHz
Occupied bandwidth (oBW)	NR: 200 MHz (160 MHz for TD-CPRI) LTE: 80 MHz
Number of carriers per pipe	NR: up to 2 LTE: up to 4
Maximum number of UL/DL MIMO streams	8 (with 2x25 GE)
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90 and 100 MHz single carriers (20 MHz and 40 MHz with optimized sampling rates) *20, 60, 80 MHz supported from 5G20A LTE: 10, 15, 20 MHz

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Interfaces

Figure 159: AZQJ interfaces

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Table 606: AZQJ interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP28	eCPRI: 10/25 Gbps; Nokia IP seal
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	2 x M5 screw	-
Fan	FAN	1	Nokia fan	Located in fins behind the BF connector

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Note:

There is no AISG support on the antenna lines. AISG + DC for RETs is only available through the beamforming calibration port and the RET (RS-485) port.

Note:

Recommended value for VSWR major and minor alarm threshold is 3.5.

Table 607: AZQJ ALD support

ALD support through RS-485 port	Value
AISG	2.0 (hardware ready to support 3.0)
Voltage	14.5 V
Power per port	15 W total per unit (2 W ALD modem + 13 W RET)

Functional block diagram

Figure 160: AZQJ functional block diagram

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Electrical specifications

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Table 608: AZQJ electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, the unit might shut down.

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outrages.

Table 609: The recommended `NRCELL PDSCH Power Back-off for 256QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- ASFG AirScale 8T8R TD RRH 395 mm fan unit (475796A)

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- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- AMBQ Book Mounting Kit (475591A)
- AMRB AirScale one clip bracket 126-200 (474581A) - version 102
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- ASAD AirScale MDR26-open EAC cable 5m (475570A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail
  - Book mounting

Dimensions and weight

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Table 610: AZQJ dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 350 mm (13.78 in.)	
Width	Core RRH: 395 mm (15.55 in.)	
Depth	Core RRH: 190 mm (7.48 in.)	
Weight	Core RRH: 24 kg (52.9 lb)	

Note:

Dimensions and weight provided for core RRH, without heat shield, fan and mounting brackets.

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 611: AZQJ environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.19 AirScale RRH 8T8R n78 320W (AZQL)

AZQL (475130A) is introduced by 5GC001811.

Functional description

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Table 612: AZQL functional specification

Property	Value
Maximum output power	320 W
Modulation	Up to 256 QAM
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	1 sector, 1 carriers, 8T8R with 8 port calibrated antenna. Supported antenna types defined by 5GC001849 and 5GC001866. For more information see: 5GC002142 and 5GC001849.
Operating mode[1]	One cell 4T2R for one or two 4-port passive antennas[3)] One or two cells 2T2R for one or two 2-port passive antennas
Software supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	3480–3700 MHz, 3GPP band 78
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	1
Maximum number of UL/DL MIMO streams	4
Supported bandwidths	20, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

[1]You can select only one operating mode for one radio unit. All cells must have the same carrier bandwidth and carrier frequency.

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Interfaces

Figure 161: AZQL interfaces

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Table 613: AZQL interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	OBTS	APPB or APPC plug
Optical interface	OPT 1-2	2	SFP28	CPRI 9.8 Gbps, Nokia IP seal AOPC
External Alarm and Control	EAC	1	MDR26	6 alarm inputs and 1 control output
Remote Electrical Tilt	RET	1	AISG C485	-
Antenna Connector	ANT 1-8	8	4.3-10 Female	-
Calibration	CAL	1	4.3-10 Female	-
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF power from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 614: AZQL interface for ALD support

Property	Value
AISG	RAE: 2.0
Voltage	10–30 V
Power per port	–

Electrical specifications

Table 615: AZQL electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum startup voltage is –40.5 V DC. If the input voltage is below or beyond extended limits, unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/–10% margin.

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Table 616: AZQL power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static (74.3% TX duty cycle)	Power consumption [W], 52% RF load $P_{BH\ RRH}$, static (74.3% TX duty cycle)	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$ (74.3% TX duty cycle)
NR	1/1/1 8TR	8x40	1505	1920	2746

Recommended parameter values

Recommend value for `dlQam256PowerBackoffSub6` parameter is:

- 1.5 dB for 3GPP performance requirement.
- 3 dB for high peak UE throughput (4x4 DL MIMO).

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60-295 mm) (472821A)
- AMGV AirScale 417mm 19 rack/stack fixing (475397A)
- AMBO AirScale Book Mount Kit 201-225 (475396A)
- AMRB AirScale one clip bracket 126-200 (474581A)
- AMRC AirScale one clip rail 600 mm (474583A)
- AMFD AirScale 2 FPKx fixing adapter 600 (474293A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- ASFF AirScale 8T8R fan unit (475567A)
- APPB AirScale2 55A DC plug 3.3–10 mm^2 (474282A)
- APPC AirScale2 55A DC plug 10–16 mm^2 (474283A)
- ACPA AirScale 2 fiber protection kit (474297A)

Installation options

- Pole
- Wall

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- One-clip mounting with AMRC (on wall, pole with FPKA or FPKC)
- Stack with AMGV (ASFF fan required)
- 19'' rack with AMGV (ASFF fan required)

> **NOTICE:**
>
> The RRH without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Dimensions and weight

Table 617: AZQL dimensions and weight

Parameter	Details	Dimension orientation
Height	435 mm (17.13 in.) With mounting brackets: 561 mm (22.09 in.)	
Width	400 mm (15.74 in.)	
Depth	192 mm (7.56 in.) With mounting brackets: 217 mm (8.54 in.)	
Weight	25.5 kg (56.2 lb)	

Environmental specifications

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Table 618: AZQL environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade) with fan or 10.8 km/h (6.7 mph) wind	55°C (131°F)
Maximum operational outdoor temperature (in the sun) with fan or 10.8 km/h (6.7 mph) wind	50°C (122°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

NOTICE:

You should use a fan when ambient temperature can be higher than 45°C (113°F) and at the same time traffic load often exceeds 70%.

[3)] Two antennas supported via super-cell (DL data duplication and UL data summing).

6.20 AirScale RRH 8T8R B42/n78 320 W eCPRI (AZQS)

AZQS (475664A) is introduced by CB005777.

Functional description

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Table 619: AZQS functional specification

Property	Value
Maximum output power	320 W
Modulation	UL: Up to 64 QAM DL: Up to 256 QAM
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes (in 8T8R mode only)
Operating modes	• 8T8R • 2 x 4T4R • 4 x 2T2R
Supported technologies (standalone and MSR)	NR, LTE
Concurrent mode	NR-LTE
Duplex mode, supported standard	TDD
Frequency range	3400–3600 MHz
Instantaneous bandwidth (iBW)	NR/LTE: 200 MHz
Occupied bandwidth (oBW)	NR: 200 MHz LTE: 80 MHz
Number of carriers per pipe	NR: up to 3 LTE: up to 4
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz LTE: 10, 15, 20 MHz

Interfaces

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Figure 162: AZQS interfaces

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Table 620: AZQS interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	RF monitor SMA female connectors located under each antenna connector.
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	–
Optical interface	OPT	2	SFP28, SFP+	eCPRI: 10 or 25 Gbps; Nokia IP seal
Beamforming	BF	1	4.3-10	–
Grounding	GND ⏚	1	2 x M5 screw or M8 screw	–
Fan	FAN	1	Nokia fan	Located in the fins behind the BF connector

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

> **Note:**
>
> There is no antenna interface standards group (AISG) support on the antenna lines. AISG+DC for RETs is only available through the beamforming calibration port and the RET (RS-485) port.

Table 621: AZQS ALD support

ALD support through RS-485 port	Value
AISG	2.0, 3.0
Voltage	14.5 V
Power per port	15 W total per unit (2 W ALD modem + 13 W RET)

Functional block diagram

Figure 163: AZQS functional block diagram

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Electrical specifications

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Table 622: AZQS electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or beyond the extended limits, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 623: AZQS power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
NR	1/1/1 8TR	8x40	1640	2130	3056

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

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Table 624: The recommended `NRCELL PDSCH Power Back-off for 256QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- ASFG AirScale 8T8R TD RRH 395 mm fan unit (475796A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- AMBQ Book Mounting Kit (475591A)
- AMRB AirScale one clip bracket 126-200 (474581A) - version 102
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- ASAD AirScale MDR26-open EAC cable 5m (475570A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail

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- Book mounting

Dimensions and weight

Table 625: AZQS dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 350 mm (13.78 in.)	
Width	Core RRH: 395 mm (15.55 in.)	
Depth	Core RRH: 190 mm (7.48 in.)	
Weight	Core RRH: 24.8 kg (54.7 lb)	

Note:

Dimensions and weight provided for core RRH, without heat shield, fan, and mounting brackets.

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 626: AZQS environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

6.21 AirScale RRH 8T8R n79 192 W eCPRI (AZTA)

AZTA (475741A) is introduced by CB006144.

Functional description

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Table 627: AZTA functional specification

Property	Value
Maximum output power	192 W
Modulation	UL: Up to 64 QAM DL: Up to 256 QAM
MIMO mode	8T8R
Outdoor installation	Yes
Beamforming	Yes
Operating modes	• 8T8R • 2 x 4T4R Note: Beamforming (BF) is available only in 8T8R mode.
Supported technologies	NR
Duplex mode - supported standard	TDD
Frequency range	n79: 4500–4600 MHz
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	NR: Up to 2
Maximum number of UL/DL MIMO streams	Up to 8
Supported bandwidths	NR: 100 MHz

Interfaces

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Figure 164: AZTA interfaces

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Table 628: AZTA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	High power circular	APPB, APPC
Antenna connector	ANT	8	4.3-10	-
Remote Electrical Tilt	RET	1	8-pin circular	RS-485
External Alarm Connection	EAC	1	MDR26	-
Optical interface	OPT	2	SFP28	eCPRI: 10 or 25 Gbps; Nokia IP seal AOPC
Beamforming	BF	1	4.3-10	-
Grounding	GND ⏚	1	2 x M5 screw or 1 x M8 screw	-
Fan	FAN	1	Nokia fan	Located in fins behind the BF connector
RF monitor	-	8	SMA, female	Located under each antenna connector

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF ports from the environment, and thus provide electric shock security in case RF power is accidentally on.

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Antenna line device (ALD) support

Note:

There is no AISG support on the antenna lines. AISG + DC for RETs is only available through the beamforming calibration port and the RET (RS-485) port.

Table 629: AZTA ALD support

ALD support through RS-485 port	Value
Antenna Interface Standards Group (AISG)	Version 2.0 (hardware ready to support 3.0)
Voltage	14.5 V
Power per port	15 W total per unit (2 W ALD modem + 13 W RET)

Functional block diagram

Figure 165: AZTA functional block diagram

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Electrical specifications

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Table 630: AZTA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 20 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended input voltage range, the unit might shut down.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 631: AZTA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
NR	1/1/1 8TR	8x24	1867	2378	3350

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

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Table 632: The recommended `NRCELL PDSCH Power Back-off for 256QAM` (`dlQam256PowerBackoffSub6`) parameter value in 256 QAM

DL MIMO configuration	`dlQam256PowerBackoffSub6` value [dB]
Open loop MIMO	1.5
Close loop MIMO	3

Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

- FPKA Flexi Pole Mounting Kit (30-120 mm) (471649A)
- FPKC Flexi Pole Mounting Kit (60- 300 mm) (472821A)
- ASFG AirScale 8T8R TD RRH 395 mm fan unit (475796A)
- AMPA Pole Mounting Kit (30-120 mm) (473879A)
- AMFD AirScale 2 FPKx Fixing Adapter 600 (474293A)
- AMBQ Book Mounting Kit (475591A)
- AMRB AirScale one clip bracket 126-200 (474581A) - version 102
- AMRC AirScale one clip rail 600 mm (474583A)
- APPB AirScale 2 55A DC plug 3.3-10 mm^2 (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm^2 (474283A)
- ACPA AirScale 2 Fiber Protection (474297A)
- ASAD AirScale MDR26-open EAC cable 5m (475570A)

Installation options

- Pole:
  - Vertical
  - One-clip rail
  - Book mounting
- Wall:
  - Vertical
  - One-clip rail

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- Book mounting

Dimensions and weight

Table 633: AZTA dimensions and weight

Property	Value	Dimensions orientation
Height	Core RRH: 350 mm (13.78 in.) With heat shield: 354 mm (13.94 in.)	
Width	Core RRH: 395 mm (15.55 in.) With heat shield: 406 mm (15.98 in.)	
Depth	Core RRH: 190 mm (7.48 in.) With heat shield: 193 mm (7.6 in.)	
Weight	Core RRH: 24.0 kg (52.9 lb) With heat shield: 24.8 kg (54.7 lb)	

Note:

Dimensions and weight are provided without fan and mounting brackets.

Environmental specifications

Note:

Depending on the ambient conditions, such as solar radiation and the presence of natural airflow, as well as the actual installation configuration and location, the maximum power output might be affected. When operating with constant high traffic load at high temperatures, it may be temporarily necessary to derate power, or limit the carried traffic load, to protect the unit from overheating. If the ambient temperature regularly exceeds 45°C (113°F) with high traffic loads (above 70%), Nokia recommends using an optional fan.

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Table 634: AZTA environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Convection, optional fan
IP rating	IP65

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7. AirScale micro remote radio heads

7.1 AirScale Micro RRH 2T B46 UNII 1+3 1 W (AZRA)

AZRA (474146A) is introduced by LTE3712.

Functional description

Table 635: AZRA functional specification

Property	Value
Maximum output power	1 W*
Modulation	256 QAM (DL)
MIMO mode	2T
Outdoor installation	Yes
Beamforming	No
Supported technologies (standalone and MSR)	LAA in FDD-LTE
Frequency range	UNII-1: 5170–5250 MHz UNII-3: 5735–5835 MHz
Filter bandwidth	UNII-1: 80 MHz UNII-3: 100 MHz
Instantaneous bandwidth (iBW)	80 MHz
Occupied bandwidth (oBW)	60 (80 MHz with LTE4224)
Number of carriers per pipe	Up to 3
Supported bandwidths	20 MHz

*Due to low power and high-quality antenna connectors, AZRA doesn't support VSWR alarm reporting.

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Interfaces

Figure 166: AZRA interfaces

Table 636: AZRA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	OCTIS Plug Kit DC Power	Hot insert not supported
Antenna connector	ANT	2	NEX 10	-
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6;
Grounding	GND ⏚	1	M8 or dual M5	-

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WARNING!

Risk of electric shock

Before turning the RF power on, terminate all RF ports with a nominal 50 Ω load (for example, a feeder with an antenna). If you can't do it, do not remove the plastic caps from the unused RF ports. The plastic caps isolate the RF ports from the environment and protect from electric shock in case the RF power is accidentally turned on.

Antenna line device (ALD) support

Note:

AZRA doesn't support ALD systems.

Functional block diagram

Figure 167: AZRA functional block diagram

Electrical specifications

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Table 637: AZRA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36 V to -40.5 V and -57 V to -60 V (DC)
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 638: AZRA power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average load P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1 sector 2T	2x0.5	53	54	56

Related optional items

- APAB AirScale Micro AC PSU (474130A)
- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- AARC AirScale Micro Integrated Antenna (474618A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBM AirScale Micro Horizontal Strand Mount Bracket (474956A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

Note:

Refer to Cabling Nokia AirScale Micro Remote Radio Heads section in the *Single RAN BTS Site Solutions/Nokia AirScale BTS/Installing Nokia AirScale Radio Units/Installing and Cabling Nokia AirScale Micro Remote Radio Heads* document for a list of currently approved antennas for AZRA and AZRBB46 equipment.

Installation options

- Pole:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:

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  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Enclosure
- Strand

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

Table 639: AZRA dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	245 mm (9.65 in.)	
Depth	45 mm (1.77 in.)	
Weight	max. 5 kg (11.0 lb)	

Environmental specifications

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Table 640: AZRA environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	55°C (131°F)
Maximum operational outdoor temperature in the sun, assuming wind speed is 0.5 m/s (at constant high ambient temperature, maximum output power might be limited)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature (including cold start)	-35°C (-31°F) Cold start from -40°C (-40°F)
IP rating	IP65

Warnings, cautions or notes related to the product

Note:

In accordance with KDB 353028 D01 Antennas Part 15 Transmitters and KDB 178919 D01 Permissive Change Policy v06, for B46 unlicensed band antennas, AZRA and AZRB may not be substituted for models used during the type approval process without prior consultation with your local Nokia account team. Additional regulatory approvals may be required.

7.2 AirScale Micro RRH 2T B46 UNII 1+2+3 1 W (AZRB)

AZRB (474510A) is introduced by LTE4253.

Functional description

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Table 641: AZRB functional specification

Property	Value
Maximum output power	1 W[1]
Modulation	256 QAM (DL)
MIMO mode	2T
Outdoor installation	Yes
Supported technologies (standalone and MSR)	FDD-LTE
TX frequency range	UNII-1: 5170–5250 MHz UNII-2: 5250–5330 MHz[2] UNII-2: 5490–5725 MHz UNII-3: 5735–5835 MHz
Filter bandwidth	UNII-1: 80 MHz UNII-2: 80 MHz (not permitted yet) UNII-2: 235 MHz (not permitted yet) UNII-3: 100 MHz
Instantaneous bandwidth (iBW)	80 MHz
Occupied bandwidth (oBW)	60 (80 MHz with LTE4224)
Number of carriers per pipe	Up to 3
Supported bandwidths	20 MHz
PIM cancellation	No

[1]Due to low power and high-quality antenna connectors, AZRB doesn't support VSWR alarm reporting.

[2]Due to the type approval of the *LTE4216: DFS Support for LAA* feature, using UNII-2 channels with AZRB is available from SW version FL18A 3.0 onward.

Interfaces

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Figure 168: AZRB interfaces

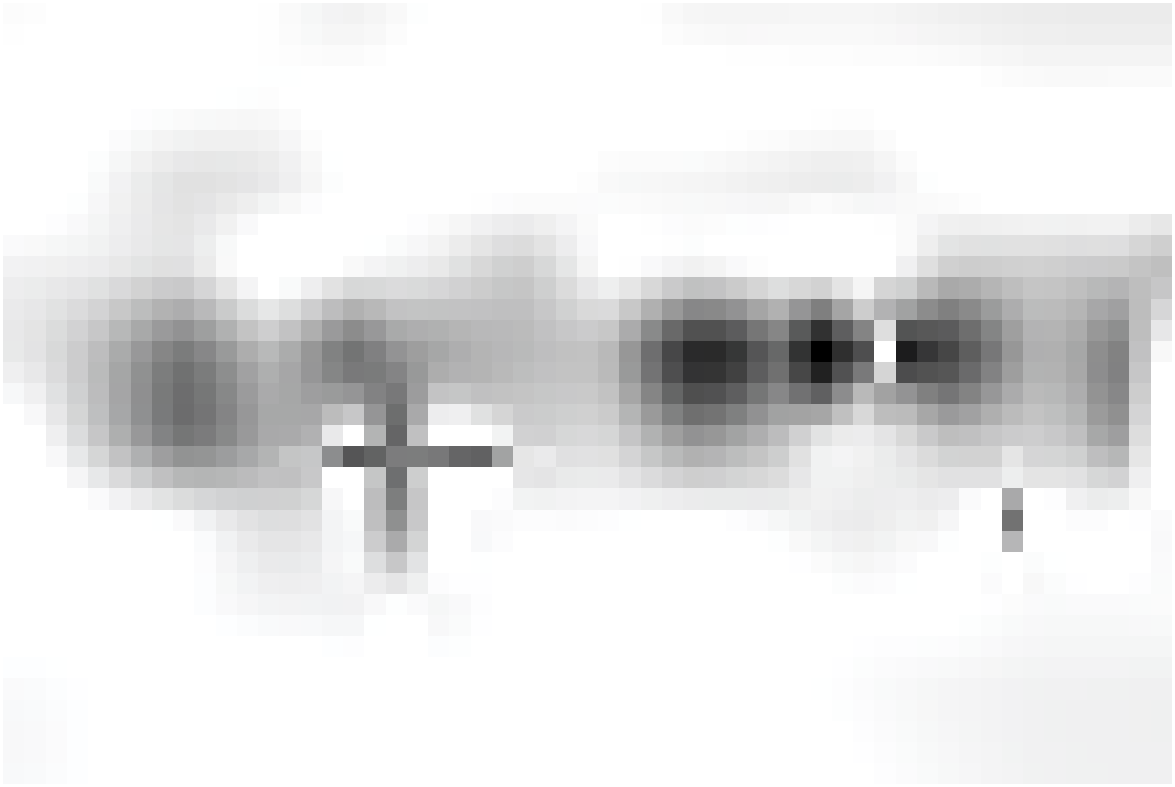

Table 642: AZRB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	OCTIS Plug Kit DC Power	Hot insert not supported
Antenna connector	ANT	2	NEX 10	-
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6;
Grounding	GND ⏚	1	M8 or dual M5 screws	-

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WARNING!

Risk of electric shock

Before turning the RF power on, terminate all RF ports with a nominal 50 Ω load (for example, a feeder with an antenna). If you can't do it, do not remove the plastic caps from the unused RF ports. The plastic caps isolate the RF ports from the environment and protect from electric shock in case the RF power is accidentally turned on.

Antenna line device (ALD) support

Note:

AZRB doesn't support ALD systems.

Functional block diagram

Figure 169: AZRB functional block diagram

Electrical specifications

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Table 643: AZRB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36 V to -40.5 V and -57 V to -60 V (DC)

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 644: AZRB power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average load P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1 sector 2T	2x0.5	53	54	56

Related optional items

- APAB AirScale Micro AC PSU (474130A)
- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- AARC AirScale Micro Integrated Antenna (474618A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBM AirScale Micro Horizontal Strand Mount Bracket (474956A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

Note:

Refer to Cabling Nokia AirScale Micro Remote Radio Heads section in the *Single RAN BTS Site Solutions/Nokia AirScale BTS/Installing Nokia AirScale Radio Units/Installing and Cabling Nokia AirScale Micro Remote Radio Heads* document for a list of currently approved antennas for AZRA and AZRB B46 equipment.

Installation options

- Pole:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:

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  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Enclosure FMWM or FMWV
- Strand

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

Table 645: AZRB dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	245 mm (9.65 in.) core unit (DC version) 270 mm (10.63 in.) with AC adapter (AC version)	
Depth	45 mm (1.77 in.) core unit (DC version) 55 mm (2.17 in.) with AC adapter (AC version)	
Weight	5.0 kg (11.0 lb) core unit (DC version) 5.8 kg (12.8 lb) with AC adapter (AC version)	

Environmental specifications

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Table 646: AZRB environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	55°C (131°F)
Maximum operational outdoor temperature in the sun, assuming wind speed is 0.5 m/s (at constant high ambient temperature, maximum output power might be limited)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature (including cold start)	-35°C (-31°F) Cold start from -40°C (-40°F)
IP rating	IP65

Warnings, cautions or notes related to the product

Note:

In accordance with KDB 353028 D01 Antennas Part 15 Transmitters and KDB 178919 D01 Permissive Change Policy v06, for B46 unlicensed band antennas, AZRA and AZRB may not be substituted for models used during the type approval process without prior consultation with your local Nokia account team. Additional regulatory approvals may be required.

7.3 AirScale Micro RRH 2T B46 UNII 1+2+3 1 W (AZRC)

AZRC (474784A) is introduced by LTE4872.

Functional description

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Table 647: AZRC functional specification

Property	Value
Maximum output power	1 W
Modulation	256 QAM (DL)
MIMO mode	2T
Outdoor installation	Yes
Supported technologies (standalone and MSR)	FDD-LTE
TX frequency range	UNII-1: 5170–5250 MHz UNII-2A: 5250–5330 MHz[1] UNII-2C: 5490–5725 MHz[2] UNII-3: 5735–5835 MHz[3]
Filter bandwidth	UNII-1: 80 MHz UNII-2A: 80 MHz UNII-2C: 235 MHz UNII-3: 100 MHz
Instantaneous bandwidth (iBW)	80 MHz
Occupied bandwidth (oBW)	60 (80 MHz with LTE4224)
Number of carriers per pipe	Up to 3
Supported bandwidths	20 MHz
PIM cancellation	No

[1]UNII-2 channels can't be used until full type approval for the *LTE4788: ETSI and IC DFS Support for LAA* feature is available.

[2]UNII-2C channels are supported by IC and ETSI regulatory domains.

[3]UNII-3 channels are supported by IC regulatory domain only.

Interfaces

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Figure 170: AZRC interfaces

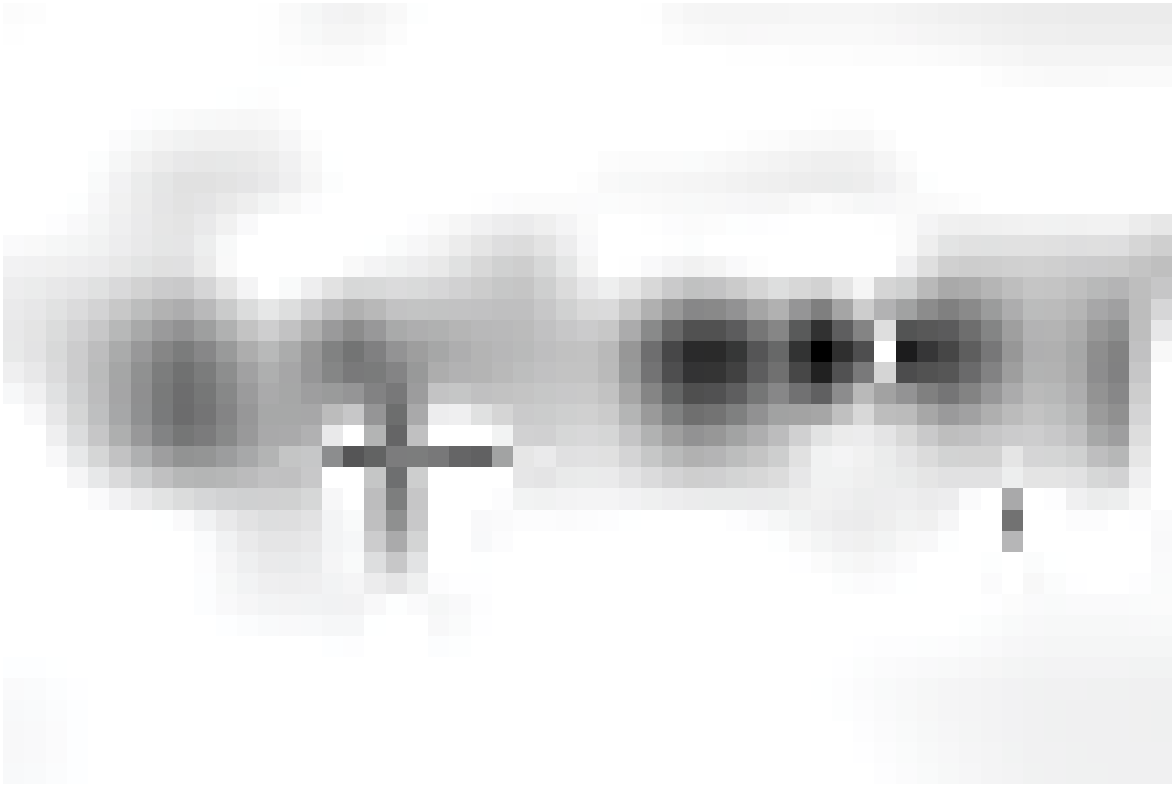

Table 648: AZRC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	OCTIS Plug Kit DC Power	Hot insert not supported
Antenna connector	ANT	2	NEX 10	-
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6;
Grounding	GND ⏚	1	M8 or dual M5 screws	-

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WARNING!

Risk of electric shock

Before turning the RF power on, terminate all RF ports with a nominal 50 Ω load (for example, a feeder with an antenna). If you can't do it, do not remove the plastic caps from the unused RF ports. The plastic caps isolate the RF ports from the environment and protect from electric shock in case the RF power is accidentally turned on.

Antenna line device (ALD) support

Note:

AZRC doesn't support ALD systems.

Functional block diagram

Figure 171: AZRC functional block diagram

Electrical specifications

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Table 649: AZRC electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  - 2/2/2 2T = three sectors, two carriers per sector, 2T per carrier
  - 1+1/1+1/1+1 4T = three dual-band sectors, one carrier per sector per band, 4T per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

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Table 650: AZRC power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average load P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1 sector 2T	2x0.5	53	54	56

Related optional items

- APAB AirScale Micro AC PSU (474130A)
- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- AARC AirScale Micro Integrated Antenna (474618A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBM AirScale Micro Horizontal Strand Mount Bracket (474956A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

Installation options

- Pole:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Strand

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NOTICE:

Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

Table 651: AZRC dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	Core RRH (DC version): 245 mm (9.65 in.) RRH with an AC adapter (AC version): 270 mm (10.63 in.)	
Depth	Core RRH (DC version): 45 mm (1.77 in.) RRH with an AC adapter (AC version): 55 mm (2.17 in.)	
Weight	Core RRH (DC version): 5.0 kg (11.0 lb) RRH with an AC adapter (AC version): 5.8 kg (12.8 lb)	

Environmental specifications

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Table 652: AZRC environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	55°C (131°F)
Maximum operational outdoor temperature in the sun, assuming wind speed is 0.5 m/s (at constant high ambient temperature, maximum output power might be limited)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature (including cold start)	-35°C (-31°F) Cold start from -40°C (-40°F)
IP rating	IP65

7.4 AirScale Micro 4T4R B1 20 W (AHGB)

AHGB (474514A) is introduced by LTE4269/SR002040/5GC001484.

Functional description

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Table 653: AHGB functional specification

Property	Value
Maximum output power	20 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	WCDMA, FDD-LTE, WCDMA-LTE, NR, LTE-NR
TX frequency range	2110–2170 MHz
RX frequency range	1920–1980 MHz
DL filter bandwidth	60 MHz
UL filter bandwidth	60 MHz
Instantaneous bandwidth (iBW)	60 MHz
Occupied bandwidth (oBW)	60 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	LTE: 5, 10, 15, 20 MHz WCDMA: 3.8, 4.0, 4.2, 4.4, 4.6, 4.8, 5 MHz NR: 20 MHz

Interfaces

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Figure 172: AHGB interfaces

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Table 654: AHGB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC Octis Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
External Alarm Connection/Fan	EAC/FAN	1	CIRC 8F IP67 Flange	-
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6;
Ethernet	RJ	1	RJ45	Separate feature required to enable this interface
Grounding	GND ⏚	1	M8 or dual M5 screws	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Note:

There is no Antenna Line Device support for AHGB.

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Functional block diagram

Figure 173: AHGB functional block diagram

Electrical specifications

Table 655: AHGB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36 V to -40.5 V and -57 V to -60 V (DC)

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

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NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 656: AHGB power consumption

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1 sector 2T	2x5	70	76	89
1 sector 4T	4x5	95	109	136

Related optional items

- APAB AirScale Micro AC PSU (474130A)
- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AAFA AirScale Micro Integrated Antenna (474185A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBK AirScale Micro Horizontal Strand Mount Bracket (474630A)
- AMBL AirScale Micro Horizontal Strand Mount Bracket (474849A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

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Installation options

- Pole:
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  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Enclosure
- Strand

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

Table 657: AHGB dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.6 in.)	
Width	245 mm (9.6 in.)	
Depth	55 mm (2.2 in.)	
Weight	5.4 kg (11.7 lb) core unit (DC version) 6.1 kg (13.4 lb) with AC adapter (AC version)	

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Environmental specifications

Table 658: AHGB environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature (including cold start)	-35°C (-31°F) Cold start from -40°C (-40°F)
IP rating	IP65

7.5 AirScale Micro 4T4R B3 20 W (AHEJ)

AHEJ (474513A) is introduced by LTE4270/5GC001485.

Functional description

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Table 659: AHEJ functional specification

Property	Value
Maximum output power	20 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	FDD-LTE, NR, LTE-NR
TX frequency range	1805–1880 MHz
RX frequency range	1710–1785 MHz
DL filter bandwidth	75 MHz
UL filter bandwidth	75 MHz
Instantaneous bandwidth (iBW)	75 MHz
Occupied bandwidth (oBW)	75 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz NR: 20 MHz

Interfaces

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Figure 174: AHEJ interfaces

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Table 660: AHEJ interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC Octis Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
External Alarm Connection/Fan	EAC/FAN	1	CIRC 8F IP67 Flange	-
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6;
Ethernet	RJ	1	RJ45	Separate feature required to enable this interface
Grounding	GND ⏚	1	M8 or dual M5 screws	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Note:

There is no Antenna Line Device support for AHEJ.

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Functional block diagram

Figure 175: AHEJ functional block diagram

Electrical specifications

Table 661: AHEJ electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36 V to -40.5 V and -57 V to -60 V (DC)

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

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NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Configurations explained on examples:

- GSM/WCDMA: 2/2/2 = three sectors, two carriers/TRXs per sector
- LTE:
  o 2/2/2 2Tx = three sectors, two carriers per sector, 2Tx per carrier
  o 1+1/1+1/1+1 4Tx = three dual-band sectors, one carrier per sector per band, 4Tx per carrier

Some radio units are capable of providing only one sector coverage. Then the power values in the table consider deployment of three radio units.

Table 662: AHEJ power consumption

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1 sector 2T	2x5	70	76	89
1 sector 4T	4x5	95	109	136

Related optional items

- APAB AirScale Micro AC PSU (474130A)
- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)

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- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AAFA AirScale Micro Integrated Antenna (474185A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBK AirScale Micro Horizontal Strand Mount Bracket (474630A)
- AMBL AirScale Micro Horizontal Strand Mount Bracket (474849A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

Installation options

- Pole:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Enclosure
- Strand

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

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Table 663: AHEJ dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	245 mm (9.65 in.)	
Depth	55 mm (2.17 in.)	
Weight	5.4 kg (11.7 lb) core unit (DC version) 6.1 kg (13.4 lb) with AC adapter (AC version)	

Environmental specifications

Table 664: AHEJ environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature (including cold start)	-35°C (-31°F) Cold start from -40°C (-40°F)
IP rating	IP65

7.6 AirScale Micro 4T4R B5 20 W (AHCE)

AHCE (474044A) is introduced by LTE3654/5GC001486.

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Functional description

Table 665: AHCE functional specification

Property	Value
Maximum output power	20 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	FDD-LTE, NR, LTE-NR
IoT support	NB-IoT in band, guard band (GB), standalone (SA)
TX frequency range	869–894 MHz
RX frequency range	824–849 MHz
DL filter bandwidth	25 MHz
UL filter bandwidth	25 MHz
Instantaneous bandwidth (iBW)	25 MHz
Occupied bandwidth (oBW)	25 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	LTE: 1.4, 3, 5, 10 MHz including NB-IoT (in band and GB) NR: 5, 10, 15, 20 MHz

Interfaces

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Figure 176: AHCE interfaces

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Table 666: AHCE interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
External Alarm Connection	FAN/EAC	1	CIRC 8F IP67 Flange	-
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6;
Ethernet	RJ	1	RJ45	Separate feature required to enable this interface
Grounding	GND ⏚	1	M8 or dual M5 screws	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Note:

There is no Antenna Line Device support for AHCE.

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Functional block diagram

Figure 177: AHCE functional block diagram

Electrical specifications

Table 667: AHCE electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36 V DC to -40.5 V DC -57 V DC to -60 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

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NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 668: AHCE power consumption

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1 sector 2T	2x5	68	75	89
1 sector 4T	4x5	92	106	135

Related optional items

- APAB AirScale Micro AC PSU (474130A)
- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AACA AirScale Micro Integrated Antenna (474227A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBK AirScale Micro Horizontal Strand Mount Bracket (474630A)
- AMBL AirScale Micro Horizontal Strand Mount Bracket (474849A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

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Installation options

- Pole:
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  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Strand

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

Table 669: AHCE dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	245 mm (9.55 in.)	
Depth	95 mm (3.74 in.)	
Weight	8.0 kg (17.6 lb) core unit (DC version) 8.7 kg (19.2 lb) with AC adapter (AC version)	

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Environmental specifications

Table 670: AHCE environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	55°C (131°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
IP rating	IP65

7.7 AirScale Micro 4T4R B7 20 W (AHHA)

AHHA (474147A) is introduced by LTE3713/5GC001483.

Functional description

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Table 671: AHHA functional specification

Property	Value
Maximum output power	20 W
Modulation	Up to 256 QAM
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	FDD-LTE, NR, LTE-NR
TX frequency range	2620–2690 MHz
RX frequency range	2500–2570 MHz
DL filter bandwidth	70 MHz
UL filter bandwidth	70 MHz
Instantaneous bandwidth (iBW)	70 MHz
Occupied bandwidth (oBW)	70 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	LTE: 5, 10, 15, 20 MHz NR: 20 MHz

Interfaces

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Figure 178: AHHA interfaces

Table 672: AHHA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC Octis Plug Kit	-
Antenna connector	ANT	4	Nex10	-
External Alarm Connection/Fan	FAN/EAC	1	CIRC 8F IP67 Flange	-
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6;
Grounding	GND ⏚	1	M8 or dual M5 screws	-

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WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Note:

There is no Antenna Line Device support for AHHA

Functional block diagram

Figure 179: AHHA functional block diagram

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Electrical specifications

Table 673: AHHA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36 V DC to -40.5 V DC -57 V DC to -60 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Note:

Power consumption values for AHHA are preliminary. Contact Nokia customer team for the latest power consumption values.

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 674: AHHA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
LTE	Single sector 4T	4x5	102	116	149

Related optional items

- APAE AirScale Micro AC PSU (474518A)
- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AAHG AirScale Micro Integrated Antenna (474584A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBK AirScale Micro Horizontal Strand Mount Bracket (474630A)
- AMBL AirScale Micro Horizontal Strand Mount Bracket (474849A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

Installation options

- Pole:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Enclosure FMWM or FMWV
- Strand

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NOTICE:

Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

Table 675: AHHA dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.1 in.)	
Width	245 mm (9.6 in) core unit (DC version) 270 mm (10.6 in.) with AC adapter (AC version)	
Depth	65 mm (2.6 in.) core unit (DC version) 65 mm (2.6 in.) with AC adapter (AC version)	
Weight	max. 5.0 kg (11.0 lb) core unit (DC version) 5.8 kg (12.8 lb) with AC adapter (AC version)	

Environmental specifications

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Table 676: AHHA environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	55°C (131°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
IP rating	IP65

7.8 AirScale Micro 4T4R B13 20 W (AHBB)

AHBB (474042A) is introduced by LTE3655.

Functional description

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Table 677: AHBB functional specification

Property	Value
Maximum output power	20 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	FDD-LTE, NR-ready
IoT support	NB-IoT in band, guard band (GB)
TX frequency range	746–756 MHz
RX frequency range	777–787 MHz
DL filter bandwidth	10 MHz
UL filter bandwidth	10 MHz
Instantaneous bandwidth (iBW)	10 MHz
Occupied bandwidth (oBW)	10 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	5, 10 MHz including NB-IoT (in band and GB)

Interfaces

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Figure 180: AHBB interfaces

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Table 678: AHBB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC Octis Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
External Alarm Connection/Fan	EAC/FAN	1	CIRC 8F IP67 Flange	-
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6;
Ethernet	RJ	1	RJ45	Separate feature required to enable this interface
Grounding	GND ⏚	1	M8 or dual M5 screws	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Note:

There is no Antenna Line Device support for AHBB.

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Functional block diagram

Figure 181: AHBB functional block diagram

Electrical specifications

Table 679: AHBB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36 V to -40.5 V and -57 V to -60 V (DC)

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

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NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 680: AHBB power consumption

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1 sector 2T	2x5	68	75	89
1 sector 4T	4x5	92	106	135

Related optional items

- APAB AirScale Micro AC PSU (474130A)
- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AABA AirScale Micro Integrated Antenna (474230A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBK AirScale Micro Horizontal Strand Mount Bracket (474630A)
- AMBL AirScale Micro Horizontal Strand Mount Bracket (474849A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

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Installation options

- Pole:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Enclosure
- Strand

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

Table 681: AHBB dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.6 in.)	
Width	245 mm (9.6 in.)	
Depth	95 mm (3.74 in.)	
Weight	7.8 kg (17.2 lb) core unit (DC version) 8.5 kg (18.7 lb) with AC adapter (AC version)	

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Environmental specifications

Table 682: AHBB environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature (including cold start)	-35°C (-31°F) Cold start from -40°C (-40°F)
IP rating	IP65

7.9 AirScale Micro 4T4R B14 20 W (AHBC)

AHBC (474948A) is introduced by LTE5006.

Functional description

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Table 683: AHBC functional specification

Property	Value
Maximum output power	20 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR)	FDD-LTE, NR-ready
TX frequency range	758–768 MHz
RX frequency range	788–798 MHz
DL filter bandwidth	10 MHz
UL filter bandwidth	10 MHz
Instantaneous bandwidth (iBW)	10 MHz
Occupied bandwidth (oBW)	10 MHz
Number of carriers per pipe	Up to 2
Supported bandwidths	5, 10 MHz

Interfaces

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Figure 182: AHBC interfaces

Table 684: AHBC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
External Alarm Connection/Fan	EAC/FAN	1	CIRC 8F IP67 Flange	-
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6;
Ethernet	RJ	1	RJ45	-
Grounding	GND ⏚	1	M8 or two M5 screws	-

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WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Note:

There is no Antenna Line Device support for AHBC.

Functional block diagram

Figure 183: AHBC functional block diagram

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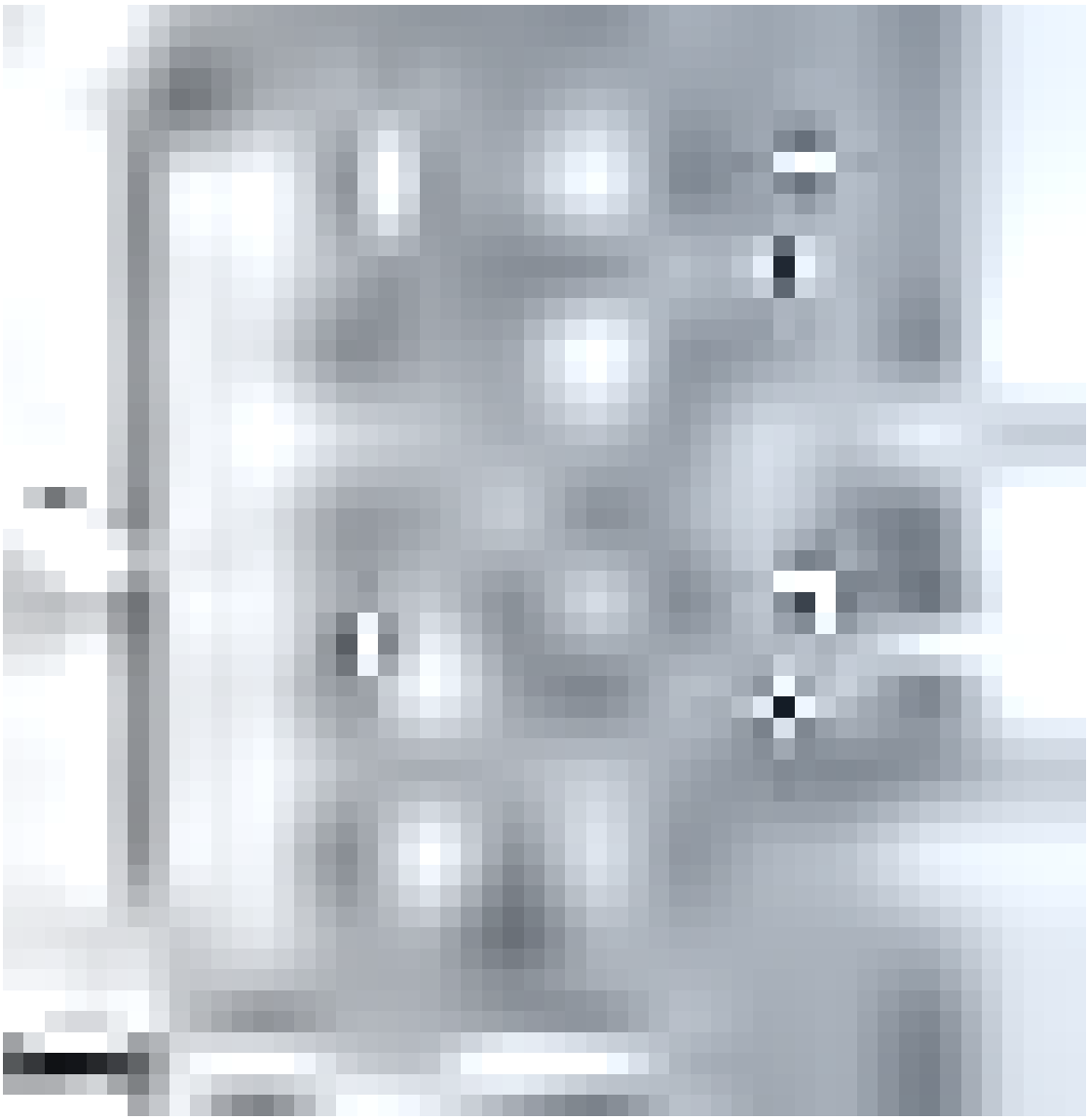

Electrical specifications

Table 685: AHBC electrical specifications

Property	Value
Nominal supply voltage	-48 V DC
Nominal input voltage range	-40.5 V DC to -57 V DC AC: 80 V to 288 V (through external AC/DC converter)
Extended input voltage range	-36 V DC to -40.5 V DC -57 V DC to -60 V DC

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 686: AHBC power consumption

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1 sector 2T	2x5	68	75	89
1 sector 4T	4x5	92	106	135

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- APAB AirScale Micro AC PSU (474130A)
- AABA AirScale Micro Integrated Antenna (474230A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBK AirScale Micro Horizontal Strand Mount Bracket (474630A)

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- AMBL AirScale Micro Horizontal Strand Mount Bracket (474849A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

Installation options

- Pole:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Strand

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

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Table 687: AHBC dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Depth	95 mm (3.74 in.)	
Width	245 mm (9.65 in.) core unit (DC version) 270 mm (10.63 in.) with AC adapter (AC version)	
Weight	8.1 kg (17.9 lb) core unit (DC version) 8.8 kg (19.4 lb) with AC adapter (AC version)	

Environmental specifications

Table 688: AHBC environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature (including cold start)	-35°C (-31°F) Cold start from -40°C (-40°F)
IP rating	IP65

7.10 AirScale Micro 4T4R B25/n25 20 W (AHFB)

AHFB (474036A) is introduced by LTE3429/SR001996/5GC001154.

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Functional description

Table 689: AHFB functional specification

Property	Value
Maximum output power	20 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	WCDMA, FDD-LTE, WCDMA-LTE*, NR, NR-SRAN
TX frequency range	1930–1995 MHz
RX frequency range	1850–1915 MHz
DL filter bandwidth	65 MHz
UL filter bandwidth	65 MHz
Instantaneous bandwidth (iBW)	65 MHz
Occupied bandwidth (oBW)	65 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz WCDMA: 3.8, 4.0, 4.2, 4.4, 4.6, 4.8, 5 MHz NR: 5, 10, 15, 20 MHz

*WCDMA and LTE can be transmitted simultaneously with any number of carriers, but the combined bandwidth cannot exceed 55 MHz.

Interfaces

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Figure 184: AHFB interfaces

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Table 690: AHFB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
External Alarm Connection/Fan	FAN/EAC	1	CIRC 8F IP67 Flange	Hot insert not supported
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6;
Ethernet	RJ	1	RJ45	Separate feature required to enable this interface
Grounding	GND ⏚	1	M8 or dual M5 screws	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Note:

There is no Antenna Line Device support for AHFB.

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Functional block diagram

Figure 185: AHFB functional block diagram

Electrical specifications

Table 691: AHFB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36 V DC to -40.5 V DC -57 V DC to -60 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 692: AHFB power consumption

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1 sector 2T	2x5	68	75	89
1 sector 4T	4x5	92	106	135

Related optional items

- APAB AirScale Micro AC PSU (474130A)
- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AAFA AirScale Micro Integrated Antenna (474185A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBK AirScale Micro Horizontal Strand Mount Bracket (474630A)

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- AMBL AirScale Micro Horizontal Strand Mount Bracket (474849A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

Installation options

- Pole:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Enclosure FMWM or FMWV
- Strand

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

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Table 693: AHFB dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	245 mm (9.65 in.) core unit (DC version) 270 mm (10.63 in.) with AC adapter (AC version)	
Depth	55 mm (2.17 in.)	
Weight	5.4 kg (11.9 lb) core unit (DC version) 6.1 kg (13.4 lb) with AC adapter (AC version)	

Environmental specifications

Table 694: AHFB environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	55°C (131°F)
Maximum operational outdoor temperature in the sun, assuming wind speed is 0.5 m/s (at constant high ambient temperature, maximum output power might be limited)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature (including cold start)	-35°C (-31°F) Cold start from -40°C (-40°F)
IP rating	IP65

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7.11 AirScale Micro RRH 2T2R n41 200 W (AWHHG and AWHHH)

AWHHG (475184A) and AWHHH (475212A) are introduced by 5GC001776. AWHHH is an AC powered variant of AWHHG, which is natively DC powered.

Functional description

Table 695: AWHHG and AWHHH functional specification

Property	Value
Maximum output power	200 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	2T2R
Outdoor installation	Yes
Beamforming	No
Supported technology	NR
Duplex mode - supported standard	TDD, 3GPP
Frequency range	n41: 2515–2675 MHz
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	100 MHz

Interfaces

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Figure 186: AWHHG and AWHHH interfaces

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Table 696: AWHHG and AWHHH interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	-	1	DC version: 2-pin circular connector AC version: 3-pin circular connector	Hot insert not supported
Antenna connector	ANT	2	N-type	-
External Alarm Connection	ALARM	1	CIRC 8F IP67 Flange	Two external alarms supported
Optical interface	OPT	3	OCTIS Plug Kit SFP/SFP+	CPRI: 9.8 Gbps, Octis IP seal
Grounding	GND⏚	1	M8 or 2 x M5 screw	-
AISG connector	AISG	1	8-pin circular	-
Local Management Port (LMP)	-	1	2x20-pin female header	Located on the heat sink

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 697: AWHHG and AWHHH ALD support

Property	Value
AISG	2.0
Voltage	24 V
Power per port	30 W

Functional block diagram

Figure 187: AWHHG and AWHHH functional block diagram

Electrical specifications

Table 698: AWHHG and AWHHH electrical specifications

Property	Value
Nominal supply voltage	DC version: -48 V DC AC version: 220 V AC
Nominal input voltage range	DC version: -40.5 to -57 V DC
Extended input voltage range	DC version: -36 to -40.5 V and -57 to -60 V DC AC version: 140 to 300 V AC

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended input voltage range, the unit might shut down.

Power consumption

Note:

AWHHG/AWHHH power consumption will be provided in future releases.

Recommended power back-off

Table 699: The recommended power back-off

RAT	Feature/Parameter	Single carrier [dB]	Multi carrier (non-contiguous) [dB]
NR	`NRCELL PDSCH power back-off for 256 QAM` (`dlQam256PowerBackoffSub6`)	1.5	1.5

Related optional items

- AMEB AirScale Strap Mount Pole Kit (474923A)
- OCTIS Plug Kit SFP (475756A)
- APPB AirScale 2 55 A DC plug 3.3-10 mm² – OD 8-15 mm (474282A)
- APPF Connector 3 Pole Female AC Plug 1.5-6 mm² – OD 8-15 mm (474893A)

Installation options

- Pole
- Wall

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Dimensions and weight

Table 700: AWHHG and AWHHH dimensions and weight

Property	Value	Dimensions orientation
Height	270 mm (10.63 in.)	
Width	410 mm (16.14 in.)	
Depth	225 mm (8.86 in.)	
Weight	21.0 kg (46.3 lb)	

Environmental specifications

Table 701: AWHHG and AWHHH environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, with 3.0 m/s airflow (in the direction where the airflow has at least effect) and 70% traffic load at temperatures above 45°C	55°C (131°F) for altitude from -100 m to 1800 m 45°C (113°F) for altitude from 1800 m to 4000 m
Maximum operational outdoor temperature in the sun, with 0.5 m/s airflow	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
IP rating	IP65

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7.12 AirScale Micro RRH 4T4R B41/n41 80 W (AWHHD)

AWHHD (475184A) is introduced by LTE5161/5GC001541.

Functional description

Table 702: AWHHD functional specification

Property	Value
Maximum output power	80 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technologies (standalone and MSR)	TD-LTE, NR
Frequency range	2515–2675 MHz
Filter bandwidth	160 MHz
Instantaneous bandwidth (iBW)	160 MHz
Occupied bandwidth (oBW)	160 MHz
Number of carriers per pipe	3 x LTE + 1 x NR
Supported bandwidths	LTE: 20 MHz NR: 100 MHz

Interfaces

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Figure 188: AWHHD interfaces

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Table 703: AWHHD interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
Fan/External Alarm Connection	FAN/EAC	1	CIRC 8F IP67 Flange	Two external alarms supported
Optical interface	OPT	3	OCTIS Plug Kit SFP/SFP+	9.8 Gbps, CPRI
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-
AISG connector	AISG	1	8-pin circular	-
Local Management Port (LMP)	-	1	2x20-pin female header	Located on the heat sink

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 704: AWHHD ALD support

Property	Value
AISG	2.0
Voltage	24 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 189: AWHHD functional block diagram

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Electrical specifications

Table 705: AWHHD electrical specifications

Property	Value
Nominal supply voltage	-48 V DC
Nominal input voltage range	-40.5 to -57 V DC 85 to 288 V AC (through an external AC/DC converter)
Extended input voltage range	-36 to -40.5 V and -57 to -60 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Note:

Contact Nokia customer team for the latest power consumption values.

Recommended power back-off

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Table 706: The recommended power back-off

RAT	Feature/Parameter	Single carrier [dB]	Multi carrier (non-contiguous) [dB]
LTE	*LTE4054: LTE Dynamic Back-off*	1.5	1.5
NR	`NRCELL PDSCH power back-off for 256 QAM` (`dlQam256PowerBackoffSub6`)	1.5	1.5

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP 2 (475756A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- AAHL AirScale Micro Integrated Antenna (475160A)
- APAH AirScale Micro AC PSU (475043A)

Installation options

- Pole:
  - On the back of the unit
  - Sideways
  - Tilt mounting
- Wall:
  - On the back of the unit
  - Sideways
  - Tilt mounting

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

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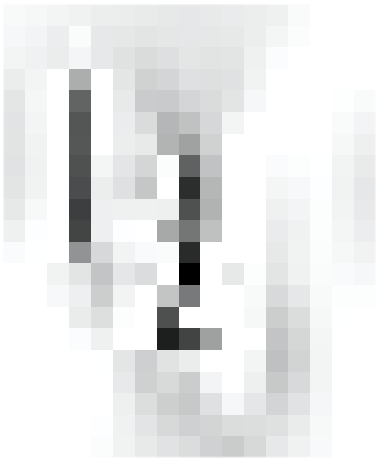
Dimensions and weight

Table 707: AWHHD dimensions and weight

Property	Value	Dimensions orientation
Height	345 mm (13.58 in.)	
Width	Core RRH (DC version): 245 mm (9.65 in.) RRH with an AC adapter (AC version): 270 mm (10.63 in.)	
Depth	130 mm (5.12 in.)	
Weight	Core RRH (DC version): 11.0 kg (24.3 lb) RRH with an AC adapter (AC version): 12.8 kg (28.2 lb)	

Environmental specifications

Table 708: AWHHD environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, with 3.0 m/s airflow (in the direction where the airflow has at least effect) and 70% traffic load at temperatures above 45°C	55°C (131°F) for altitude from -100 m to 1800 m 45°C (113°F) for altitude from 1800 m to 4000 m
Maximum operational outdoor temperature in the sun, with 0.5 m/s airflow	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
IP rating	IP65

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7.13 AirScale Micro RRH 4T4R B41/n41 80 W (AWHHF)

AWHHF (475181A) is introduced by LTE5304 and 5GC001707.

Functional description

Table 709: AWHHF functional specification

Property	Value
Maximum output power	80 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technologies (standalone and MSR)	TD-LTE, NR
Frequency range	2496–2690 MHz
Filter bandwidth	194 MHz
Instantaneous bandwidth (iBW)	194 MHz
Occupied bandwidth (oBW)	160 MHz
Number of carriers per pipe	3 x LTE + 1 x NR
Supported bandwidths	LTE: 10, 20 MHz NR: 20, 40, 50, 60, 80, 90, 100 MHz

Interfaces

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Figure 190: AWHHF interfaces

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Table 710: AWHHF interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
Fan/External Alarm Connection	FAN/EAC	1	CIRC 8F IP67 Flange	Two external alarms supported
Optical interface	OPT	3	OCTIS Plug Kit SFP/SFP+	9.8 Gbps, CPRI
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-
AISG connector	AISG	1	8-pin circular	-
Local Management Port (LMP)	-	1	2x20-pin female header	Located on the heat sink

WARNING!

Risk of electric shock

Before turning the RF power on, terminate all RF ports with a nominal 50 Ω load (for example, a feeder with an antenna). If you can't do it, do not remove the plastic caps from the unused RF ports. The plastic caps isolate the RF ports from the environment and protect from electric shock in case the RF power is accidentally turned on.

Antenna line device (ALD) support

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Table 711: AWHHF ALD support

Property	Value
AISG	2.0
Voltage	24 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 191: AWHHF functional block diagram

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Electrical specifications

Table 712: AWHHF electrical specifications

Property	Value
Nominal supply voltage	-48 V DC
Nominal input voltage range	-40.5 to -57 V DC 85 to 288 V AC (through an external AC/DC converter)
Extended input voltage range	-36 to -40.5 V and -57 to -60 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Note:

AWHHF power consumption will be provided in future releases.

Recommended power back-off

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Table 713: The recommended power back-off

RAT	Feature/Parameter	Single carrier [dB]	Multi carrier (non-contiguous) [dB]
LTE	*LTE4054: LTE Dynamic Back-off*	1.5	1.5
NR	`NRCELL` `PDSCH power back-off for 256 QAM` (`dlQam256PowerBackoffSub6`)	1.5	1.5

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP 2 (475756A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- AAHM AirScale Micro Integrated Antenna (475211A)
- APAH AirScale Micro AC PSU (475043A)

Installation options

- Pole:
  - On the back of the unit
  - Sideways
  - Tilt mounting
- Wall:
  - On the back of the unit
  - Sideways
  - Tilt mounting
- Inside enclosure

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side to ensure convection cooling.

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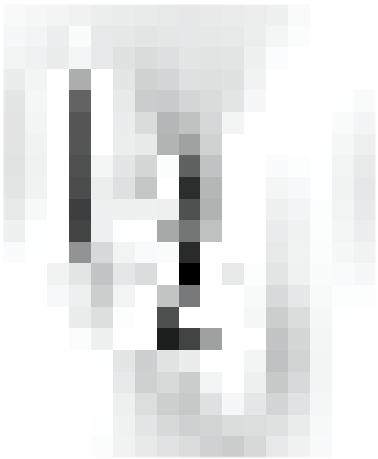
Dimensions and weight

Table 714: AWHHF dimensions and weight

Property	Value	Dimensions orientation
Height	345 mm (13.58 in.)	
Width	Core RRH (DC version): 245 mm (9.65 in.) RRH with an AC adapter (AC version): 270 mm (10.63 in.)	
Depth	130 mm (5.12 in.)	
Weight	Core RRH (DC version): 11.0 kg (24.3 lb) RRH with an AC adapter (AC version): 12.8 kg (28.2 lb)	

Environmental specifications

Table 715: AWHHF environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, with 3.0 m/s airflow (in the direction where the airflow has at least effect) and 70% traffic load at temperatures above 45°C	55°C (131°F) for altitude from -100 m to 1800 m 45°C (113°F) for altitude from 1800 m to 4000 m
Maximum operational outdoor temperature in the sun, with 0.5 m/s airflow	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
IP rating	IP65

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7.14 AirScale Micro RRH 4T4R B42/n78 40 W (AWHQE)

AWHQE (474788A) is introduced by 5GC001157.

Functional description

Table 716: AWHQE functional specification

Property	Value
Maximum output power	40 W
Modulation	Up to 256 QAM (DL and UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technology	NR
Duplex mode, supported standard	TDD
Frequency range	3400–3600 MHz
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	20, , 40, 50, 60, 80, 90, 100 MHz

Interfaces

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Figure 192: AWHQE interfaces

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Table 717: AWHQE interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
Fan/External Alarm Connection	FAN/EAC	1	CIRC 8F IP67 Flange	Two external alarms supported
Optical interface	OPT	3	OCTIS Plug Kit SFP/SFP+	9.8 Gbps, CPRI
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-
AISG connector	AISG	1	8-pin circular	-
Local Management Port (LMP)	-	1	2x20-pin female header	Located on the heat sink

WARNING!

Risk of electric shock

Before turning the RF power on, terminate all RF ports with a nominal 50 Ω load (for example, a feeder with an antenna). If you can't do it, do not remove the plastic caps from the unused RF ports. The plastic caps isolate the RF ports from the environment and protect from electric shock in case the RF power is accidentally turned on.

Antenna line device (ALD) support

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Table 718: AWHQE ALD support

Property	Value
AISG	2.0
Voltage	24 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 193: AWHQE functional block diagram

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Electrical specifications

Table 719: AWHQE electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC 76 V AC to 288 V AC (through an external AC/DC converter)
Extended input voltage range	-36 V DC to -40.5 V DC -57 V DC to -60 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Note:

AWHQE power consumption will be provided in future releases.

Recommended power back-off

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Table 720: The recommended power back-off

RAT	Feature/Parameter	Single carrier [dB]	Multi carrier (non-contiguous) [dB]
NR	`NRCELL PDSCH power back-off for 256 QAM` (`dlQam256PowerBackoffSub6`)	1.5	1.5

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP 2 (475756A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- AAQA AirScale Micro Integrated Antenna (474520A)
- APAG AirScale Micro AC PSU (474866A)

Installation options

- Pole:
  - On the back of the unit
  - Sideways
  - Tilt mounting
- Wall:
  - On the back of the unit
  - Sideways
  - Tilt mounting

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Dimensions and weight

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Table 721: AWHQE dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	Core RRH (DC version): 245 mm (9.65 in.) RRH with an AC adapter (AC version): 270 mm (10.63 in.)	
Depth	110 mm (4.33 in.)	
Weight	Core RRH (DC version): 9.0 kg (19.8 lb) RRH with an AC adapter (AC version): 10.2 kg (22.5 lb)	

Environmental specifications

Table 722: AWHQE environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, with 3.0 m/s airflow (in the direction where the airflow has at least effect) and 70% traffic load at temperatures above 45°C	55°C (131°F) for altitude from –100 m to 1800 m 45°C (113°F) for altitude from 1800 m to 4000 m
Maximum operational outdoor temperature in the sun, with 0.5 m/s airflow	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	–40°C (–40°F)
IP rating	IP65

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7.15 AirScale Micro RRH 4T4R B42/n78 40 W (AWHQG)

AWHQG (474877A) is introduced by 5GC001278.

Functional description

Table 723: AWHQG functional specification

Property	Value
Maximum output power	40 W
Output power of the cell per TX	NR: 27–40 dBm with 0.1 dB steps
Modulation	Up to 256 QAM (DL and UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Software supported technology	NR
NR: duplex mode, supported standard	TDD, 3GPP
Frequency range	3460–3580 MHz
Instantaneous bandwidth (iBW)	120 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	NR: up to 4
Supported bandwidths	NR: 40 MHz

Interfaces

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Figure 194: AWHQG interfaces

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Table 724: AWHQG interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
Fan/External Alarm Connection	FAN/EAC	1	CIRC 8F IP67 Flange	Two external alarms supported
Optical interface	OPT	3	OCTIS Plug Kit SFP/SFP+	9.8 Gbps, CPRI
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-
AISG connector	AISG	1	8-pin circular	-
Local Management Port (LMP)	-	1	2x20-pin female header	Located on the heat sink

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 725: AWHQG ALD support

Property	Value
AISG	2.0
Voltage	24 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 195: AWHQG functional block diagram

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Electrical specifications

Table 726: AWHQG electrical specifications

Property	Value
Nominal supply voltage	DC: -48 V
Nominal input voltage range	DC: -40.5 V to -57 V AC: 76 V to 288 V (through an external AC/DC converter)
Extended input voltage range	-36 V to -40.5 V DC -57 V to -60 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Note:

Contact Nokia customer team for the latest power consumption values.

Recommended power back-off

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Table 727: The recommended power back-off

RAT	Feature/Parameter	Single carrier [dB]	Multi carrier (non-contiguous) [dB]
NR	`NRCELL PDSCH power back-off for 256 QAM` (`dlQam256PowerBackoffSub6`)	1.5	1.5

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP 2 (475756A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- AAQA AirScale Micro Integrated Antenna (474520A)
- APAG AirScale Micro AC PSU (474866A)

Installation options

- Pole:
  - On the back of the unit
  - Sideways
  - Tilt mounting
- Wall:
  - On the back of the unit
  - Sideways
  - Tilt mounting

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

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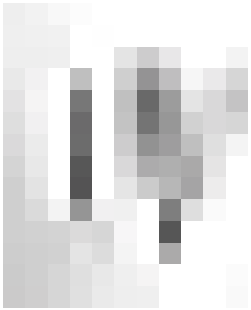
Table 728: AWHQG dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	Core RRH (DC version): 245 mm (9.65 in.) RRH with an AC adapter (AC version): 270 mm (10.63 in.)	
Depth	110 mm (4.33 in.)	
Weight	Core RRH (DC version): 9.0 kg (19.8 lb) RRH with an AC adapter (AC version): 10.5 kg (23.2 lb)	

Environmental specifications

Table 729: AWHQG environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, with 3.0 m/s airflow (in the direction where the airflow has at least effect) and 70% traffic load at temperatures above 45°C	55°C (131°F) for altitude from –100 m to 1800 m 45°C (113°F) for altitude from 1800 m to 4000 m
Maximum operational outdoor temperature in the sun, with 0.5 m/s airflow	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
IP rating	IP65

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7.16 AirScale Micro 4T4R B42/n78 20 W (AZQD)

AZQD (474798A) is introduced by LTE4828/5GC001489.

Functional description

Table 730: AZQD functional specification

Property	Value
Maximum output power	20 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Operating modes	• LTE mode: - Up to four 10, 15 or 20 MHz LTE carriers • NR mode: - Up to two 20 MHz NR carriers • Concurrent mode: - One NR 20 MHz carrier with one LTE 10/20 MHz carrier or three 20 MHz carriers - Two NR 20 MHz carriers with two LTE 20 MHz carriers • Concurrent split mode LTE+NR: - One NR 2T2R 20 MHz carrier with one LTE 2T2R 10/20 MHz carrier or three 20 MHz carriers - Two NR 2T2R 20 MHz carriers with two LTE 2T2R 20 MHz carriers - One NR 2T2R 20 MHz carrier with one LTE 2T2R 20 MHz carrier
Supported technologies	TD-LTE, NR
RF sharing/concurrent mode	NR-LTE
Duplex mode, supported standard	TDD
Filter bandwidth	200 MHz

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Property	Value
Frequency range	3400–3600 MHz
Instantaneous bandwidth (iBW)	80 MHz
Occupied bandwidth (oBW)	80 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	LTE: 10, 15, 20 MHz NR: 20 MHz

Note:

Limitation! For any adjacent two carriers, the distance from the center of the first carrier to the second carrier's farther edge cannot exceed 110 MHz.

Interfaces

Figure 196: AZQD interfaces

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Table 731: AZQD interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
External Alarm Connection/Fan	EAC/FAN	1	CIRC 8F IP67 Flange	Hot insert not supported
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7)
Ethernet	RJ	1	RJ45	-
Grounding	GND ⏚	1	M8 or two M5 screws	-
Local Management Port (LMP)	-	1	2x20-pin female header	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

There is no ALD support for AZQD.

Functional block diagram

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Figure 197: AZQD functional block diagram

Electrical specifications

Table 732: AZQD electrical specifications

Property	Value
Nominal supply voltage	DC: -48 V AC: 220 V
Nominal input voltage range	DC: -40.5 V to -57.0 V AC: 80 V to 276 V (through external AC/DC converter), 45 Hz to 65 Hz
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 733: AZQD power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1 sector 4T	4x5	122	136	158
	1 sector 4T	4x2	108	115	128

Note:

Power consumption values are measured according to ETSI 202 706-1 v1.5 assumptions (subframe #2 and special subframe #7), leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power consumption.

5G power back-off

To reach maximum 256 QAM DL throughput it might be necessary to adjust

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`dlQam256PowerBackoffSub6` value. Optimal value depends on used P_{max} value and radio unit variant. As an example, `dlQam256PowerBackoffSub6` value 2-2.5 dB gives the best DL throughput with AZQD radio when P_{max} is set to 37 dBm.

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- APAE AirScale Micro AC PSU (474518A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBK AirScale Micro Horizontal Strand Mount Bracket (474630A)
- AMBL AirScale Micro Horizontal Strand Mount Bracket (474849A)
- AAQA AirScale Micro Integrated Antenna (474520A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

Installation options

- Pole
- Wall
- Tilt mounting
- Bookshelf mounting
- Strand

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

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Table 734: AZQD dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	245 mm (9.65 in.) core unit (DC version) 270 mm (10.63 in.) with AC adapter (AC version)	
Depth	75 mm (2.95 in.)	
Weight	6.5 kg (14.3 lb) core unit (DC version) 7.4 kg (16.3 lb) with AC adapter (AC version)	

Environmental specifications

Table 735: AZQD environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-35°C (-31°F) Cold start from -40°C (-40°F)
IP rating	IP65

7.17 AirScale Micro 4T4R B43/n78 20 W (AZQR)

AZQR (475148A) is introduced by LTE5235/5GC001794.

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Functional description

Table 736: AZQR functional specification

Property	Value
Maximum output power	20 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technologies (standalone and MSR)	TD-LTE, NR
Frequency range	3600–3800 MHz
Filter bandwidth	200 MHz
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	80 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	LTE: 10, 15, 20 MHz NR: 20 MHz

Note:

Limitation! For any adjacent two carriers, the distance from the center of the first carrier to the second carrier's farther edge cannot exceed 110 MHz.

Interfaces

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Figure 198: AZQR interfaces

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Table 737: AZQR interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
External Alarm Connection/Fan	EAC/FAN	1	CIRC 8F IP67 Flange	Hot insert not supported
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7);
Ethernet	RJ	1	RJ45	-
Grounding	GND ⏚	1	M8 or two M5 screws	-
Local Management Port (LMP)	-	1	2x20-pin female header	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Note:

There is no Antenna Line Device support for AZQR.

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Functional block diagram

Figure 199: AZQR functional block diagram

Electrical specifications

Table 738: AZQR electrical specifications

Property	Value
Nominal supply voltage	DC: -48 V AC: 220 V
Nominal input voltage range	DC: -40.5 V to -57 V AC: 80 V to 276 V (through external AC/DC converter), 45 Hz to 65 Hz
Extended input voltage range	DC: -36 V to -40.5 V DC: -57 V to -60 V

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 739: AZQR power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1 sector 4T	4x5	122	136	158
	1 sector 4T	4x2	108	115	128

Note:

Power consumption values are measured according to ETSI 202 706-1 v1.5 assumptions (subframe #2 and special subframe #7), leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power consumption.

NR power back-off

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> **Note:**
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> To reach maximum 256 QAM DL throughput it might be necessary to adjust `dlQam256PowerBackoffSub6` value. Optimal value depends on used P_{max} value and radio unit variant. As an example, `dlQam256PowerBackoffSub6` value 2-2.5 dB gives the best DL throughput with AZQR radio when P_{max} is set to 37 dBm.

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- APAE AirScale Micro AC PSU (474518A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBK AirScale Micro Horizontal Strand Mount Bracket (474630A)
- AMBL AirScale Micro Horizontal Strand Mount Bracket (474849A)
- AAQA AirScale Micro Integrated Antenna (474520A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

Installation options

- Pole:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Strand

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NOTICE:

Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

Table 740: AZQR dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	Core RRH (DC version): 245 mm (9.65 in.) RRH with an AC adapter (AC version): 270 mm (10.63 in.)	
Depth	75 mm (2.95 in.)	
Weight	Core RRH (DC version): 6.5 kg (14.3 lb) RRH with an AC adapter (AC version): 7.4 kg (16.3 lb)	

Environmental specifications

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Table 741: AZQR environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	–35°C (–31°F) Cold start from –40°C (–40°F)
IP rating	IP65

7.18 AirScale Micro RRH 4T4R B43/n78 40 W (AWHQF)

AWHQF (474877A) is introduced by 5GC001274.

Functional description

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Table 742: AWHQF functional specification

Property	Value
Maximum output power	40 W
Modulation	Up to 256 QAM (DL and UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Software supported technology	NR
Duplex mode, supported standard	TDD
Frequency range	3600–3800 MHz
Instantaneous bandwidth (iBW)	200 MHz
Number of carriers per pipe	NR: up to 4
Supported bandwidths	NR: 20, 40, 60, 80, 100 MHz

Interfaces

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Figure 200: AWHQF interfaces

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Table 743: AWHQF interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
Fan/External Alarm Connection	FAN/EAC	1	CIRC 8F IP67 Flange	Two external alarms supported
Optical interface	OPT	3	OCTIS Plug Kit SFP/SFP+	9.8 Gbps, CPRI
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-
AISG connector	AISG	1	8-pin circular	-
Local Management Port (LMP)	-	1	2x20-pin female header	Located on the heat sink

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 744: AWHQF ALD support

Property	Value
AISG	2.0
Voltage	24 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 201: AWHQF functional block diagram

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Electrical specifications

Table 745: AWHQF electrical specifications

Property	Value
Nominal supply voltage	DC: -48 V
Nominal input voltage range	DC: -40.5 V to -57 V AC: 76 V to 288 V (through an external AC/DC converter)
Extended input voltage range	-36 V to -40.5 V DC -57 V to -60 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Note:

Contact Nokia customer team for the latest power consumption values.

Recommended power back-off

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Table 746: The recommended power back-off

RAT	Feature/Parameter	Single carrier [dB]	Multi carrier (non-contiguous) [dB]
NR	`NRCELL` `PDSCH power back-off for 256 QAM` (`dlQam256PowerBackoffSub6`)	1.5	1.5

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP 2 (475756A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- AAQA AirScale Micro Integrated Antenna (474520A)
- APAG AirScale Micro AC PSU (474866A)

Installation options

- Pole:
  - On the back of the unit
  - Sideways
  - Tilt mounting
- Wall:
  - On the back of the unit
  - Sideways
  - Tilt mounting

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

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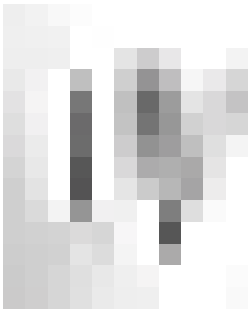
Table 747: AWHQF dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	Core RRH (DC version): 245 mm (9.65 in.) RRH with an AC adapter (AC version): 270 mm (10.63 in.)	
Depth	110 mm (4.33 in.)	
Weight	Core RRH (DC version): 9.0 kg (19.8 lb) RRH with an AC adapter (AC version): 10.2 kg (22.5 lb)	

Environmental specifications

Table 748: AWHQF environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, with 3.0 m/s airflow (in the direction where the airflow has at least effect) and 70% traffic load at temperatures above 45°C	55°C (131°F) for altitude from -100 m to 1800 m 45°C (113°F) for altitude from 1800 m to 4000 m
Maximum operational outdoor temperature in the sun, with 0.5 m/s airflow	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
IP rating	IP65

7.19 AirScale Micro 4T4R B66 20 W (AHIB)

AHIB (474050A) is introduced by LTE3431/SR002530/5GC001189.

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Functional description

Table 749: AHIB functional specification

Property	Value
Maximum output power	20 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Supported technologies (standalone and MSR/concurrent operation)	FDD-LTE, WCDMA-LTE, NR, NR-SRAN
TX frequency range	2110–2200 MHz
RX frequency range	1710–1780 MHz
DL filter bandwidth	90 MHz
UL filter bandwidth	70 MHz
Instantaneous bandwidth (iBW)	70 MHz
Occupied bandwidth (oBW)	70 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	LTE: 1.4, 3, 5, 10, 15, 20 MHz WCDMA: 3.8, 4.0, 4.2, 4.4, 4.6, 4.8, 5 MHz NR: 5, 10, 15, 20 MHz

Interfaces

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Figure 202: AHIB interfaces

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Table 750: AHIB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX10	-
External Alarm Connection /Fan	FAN/EAC	1	CIRC 8F IP67 Flange	Hot insert not supported
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7), except CPRI6;
Ethernet	RJ	1	RJ45	Separate feature required to enable this interface
Grounding	GND ⏚	1	M8 or dual M5 screws	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

Note:

There is no Antenna Line Device support for AHIB.

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Functional block diagram

Figure 203: AHIB functional block diagram

Electrical specifications

Table 751: AHIB electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36 V DC to -40.5 V DC -57 V DC to -60 V DC
Surge protection	Class II 5 kA

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 752: AHIB power consumption

Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
1 sector 2T	2x5	70	76	89
1 sector 4T	4x5	95	109	136

Related optional items

- APAB AirScale Micro AC PSU (474130A)
- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AAFA AirScale Micro Integrated Antenna (474185A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- AMBK AirScale Micro Horizontal Strand Mount Bracket (474630A)

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- AMBL AirScale Micro Horizontal Strand Mount Bracket (474849A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)

Installation options

- Pole:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Enclosure FMWM or FMWV
- Strand

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

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Table 753: AHIB dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	245 mm (9.65 in.) core unit (DC version) 270 mm (10.63 in.) with AC adapter (AC version)	
Depth	55 mm (2.17 in.)	
Weight	5.4 kg (11.9 lb) core unit (DC version) 6.1 kg (13.4 lb) with AC adapter (AC version)	

Environmental specifications

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Table 754: AHIB environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, assuming wind speed is 3 m/s (at constant high ambient temperature, maximum output power might be limited)	55°C (131°F)
Maximum operational outdoor temperature in the sun, assuming wind speed is 0.5 m/s (at constant high ambient temperature, maximum output power might be limited)	45°C (113°F)
Maximum indoor temperature, assuming wind speed is 0 m/s, valid for fanless products (at constant high ambient temperature, maximum output power might be limited)	45°C (113°F)
Minimum operational temperature (including cold start)	-35°C (-31°F) Cold start from -40°C (-40°F)
IP rating	IP65

7.20 AirScale Micro RRH 4T4R n38 80 W (AWHHI)

AWHHI (475263A) is introduced by 5GC001881.

Functional description

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Table 755: AWHHI functional specification

Property	Value
Maximum output power	80 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technologies (standalone and MSR)	NR
Duplex mode, supported standard	TDD
Frequency range	n38 (n41*): 2575–2615 MHz *AWHHI supports full band n38 and sub-band n41.
Filter bandwidth	40 MHz
Instantaneous bandwidth (iBW)	40 MHz
Occupied bandwidth (oBW)	40 MHz
Number of carriers per pipe	One carrier
Supported bandwidths	NR: 20, 40 MHz

Interfaces

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Figure 204: AWHHI interfaces

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Table 756: AWHHI interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
Fan/External Alarm Connection	FAN/EAC	1	CIRC 8F IP67 Flange	Two external alarms supported
Optical interface	OPT	3	OCTIS Plug Kit SFP/SFP+	9.8 Gbps, CPRI
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-
AISG connector	AISG	1	8-pin circular	-
Local Management Port (LMP)	-	1	2x20-pin female header	Located on the heat sink

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 757: AWHHI ALD support

Property	Value
AISG	2.0
Voltage	24 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 205: AWHHI functional block diagram

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Electrical specifications

Table 758: AWHHI electrical specifications

Property	Value
Nominal supply voltage	-48 V DC
Nominal input voltage range	-40.5 to -57 V DC 85 to 288 V AC (through an external AC/DC converter)
Extended input voltage range	-36 to -40.5 V and -57 to -60 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Note:

Contact Nokia customer team for the latest power consumption values.

Recommended power back-off

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Table 759: The recommended power back-off

RAT	Feature/Parameter	Single carrier [dB]	Multi carrier (non-contiguous) [dB]
NR	`NRCELL PDSCH power back-off for 256 QAM (dlQam256PowerBackoffSub6)`	1.5	1.5

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP 2 (475756A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- AAHM AirScale Micro Integrated Antenna (475211A)
- APAH AirScale Micro AC PSU (475043A)

Installation options

- Wall:
  - On the back of the unit
  - Sideways
  - Tilt mounting
- Pole:
  - On the back of the unit
  - Sideways
  - Tilt mounting

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

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Table 760: AWHHI dimensions and weight

Property	Value	Dimensions orientation
Height	345 mm (13.58 in.)	
Width	Core RRH (DC version): 245 mm (9.65 in.) RRH with an AC adapter (AC version): 270 mm (10.63 in.)	
Depth	130 mm (5.12 in.)	
Weight	Core RRH (DC version): 11.0 kg (24.3 lb) RRH with an AC adapter (AC version): 12.8 kg (28.2 lb)	

Environmental specifications

Table 761: AWHHI environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, with 3.0 m/s airflow (in the direction where the airflow has at least effect) and 70% traffic load at temperatures above 45°C	55°C (131°F) for altitude from -100 m to 1800 m 45°C (113°F) for altitude from 1800 m to 4000 m
Maximum operational outdoor temperature in the sun, with 0.5 m/s airflow	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
IP rating	IP65

7.21 AirScale Micro RRH 4T4R n77 20 W (AWHQM)

AWHQM (475246A) is introduced by 5GC001832.

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Functional description

Table 762: AWHQM functional specification

Property	Value
Maximum output power	20 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technologies (standalone and MSR)	NR
Duplex mode, supported standard	TDD
Frequency range	3800–4100 MHz
Filter bandwidth	300 MHz
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	Up to 5
Supported bandwidths	20, 40, 60, 80, 100 MHz

Interfaces

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Figure 206: AWHQM interfaces

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Table 763: AWHQM interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
Fan/External Alarm Connection	FAN/EAC	1	CIRC 8F IP67 Flange	Two external alarms supported
Optical interface	OPT	3	OCTIS Plug Kit SFP/SFP+	9.8 Gbps, CPRI
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-
AISG connector	AISG	1	8-pin circular	-
Local Management Port (LMP)	-	1	2x20-pin female header	Located on the heat sink

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 764: AWHQM ALD support

Property	Value
AISG	2.0
Voltage	24 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 207: AWHQM functional block diagram

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Electrical specifications

Table 765: AWHQM electrical specifications

Property	Value
Nominal supply voltage	DC: -48 V
Nominal input voltage range	DC: -40.5 V to -57 V AC: 76 V to 288 V (through an external AC/DC converter)
Extended input voltage range	-36 V to -40.5 V DC -57 V to -60 V DC

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Note:

AWHQM power consumption will be provided in future releases.

Recommended power back-off

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Table 766: The recommended power back-off

RAT	Feature/Parameter	Single carrier [dB]	Multi carrier (non-contiguous) [dB]
NR	`NRCELL` `PDSCH power back-off for 256 QAM` (`dlQam256PowerBackoffSub6`)	1.5	1.5

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP 2 (475756A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- AAHN AirScale Micro Integrated Antenna (475539A)
- APAG AirScale Micro AC PSU (474866A)

Installation options

- Pole:
  - On the back of the unit
  - Sideways
  - Tilt mounting
- Wall:
  - On the back of the unit
  - Sideways
  - Tilt mounting

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

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Table 767: AWHQM dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	Core RRH (DC version): 245 mm (9.65 in.) RRH with an AC adapter (AC version): 270 mm (10.63 in.)	
Depth	110 mm (4.33 in.)	
Weight	Core RRH (DC version): 9.0 kg (19.8 lb) RRH with an AC adapter (AC version): 10.2 kg (22.5 lb)	

Environmental specifications

Table 768: AWHQM environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, with 3.0 m/s airflow (in the direction where the airflow has at least effect) and 70% traffic load at temperatures above 45°C	55°C (131°F) for altitude from -100 m to 1800 m 45°C (113°F) for altitude from 1800 m to 4000 m
Maximum operational outdoor temperature in the sun, with 0.5 m/s airflow	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
IP rating	IP65

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7.22 AirScale Micro RRH 4T4R n78 40 W (AWHQV)

AWHQV (475784A) is introduced by CB006657.

Functional description

Table 769: AWHQV functional specification

Property	Value
Maximum output power	40 W
Output power of the cell per TX	27–40 dBm with 0.1 dB step
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technologies	NR
Duplex mode, supported standard	TDD, 3GPP
Frequency range	3450–3650 MHz
Filter bandwidth	200 MHz
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	60 MHz
Number of carriers per pipe	1
Supported bandwidths	60 MHz

Interfaces

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Figure 208: AWHQV interfaces

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Table 770: AWHQV interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
Fan/External Alarm Connection	FAN/EAC	1	CIRC 8F IP67 Flange	Two external alarms supported
Optical interface	OPT	3	OCTIS Plug Kit SFP/SFP+	9.8 Gbps, CPRI
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-
AISG connector	AISG	1	8-pin circular	-
Local Management Port (LMP)	-	1	2x20-pin female header	Located on the heat sink

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 771: AWHQV ALD support

Property	Value
AISG version	2.0
Voltage	24 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 209: AWHQV functional block diagram

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Electrical specifications

Table 772: AWHQV electrical specifications

Property	Value
Nominal supply voltage	DC: -48 V
Nominal input voltage range	DC: -40.5 V to -57 V AC: 76 V to 288 V (through an external AC/DC converter)
Extended input voltage range	-36 V to -40.5 V DC -57 V to -60 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above extended limits, the unit might shut down.

NOTICE:

Do not connect an energized power cable to the RRH. Always connect de-energized power cables to the RRH and turn the power supply on afterward. Connecting energized power cables can damage the RRH.

Power consumption

Note:

AWHQV power consumption will be provided in future releases.

Recommended power back-off

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Table 773: The recommended power back-off

RAT	Feature/Parameter	Single carrier [dB]	Multi carrier (non-contiguous) [dB]
NR	`NRCELL PDSCH power back-off for 256 QAM` (`dlQam256PowerBackoffSub6`)	1.5	1.5

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP 2 (475756A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- AAQA AirScale Micro Integrated Antenna (474520A)
- APAG AirScale Micro AC PSU (474866A)

Installation options

- Pole:
  - On the back of the unit
  - Sideways
  - Tilt mounting
- Wall
  - On the back of the unit
  - Sideways
  - Tilt mounting

> **NOTICE:**
>
> Always install the RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

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Table 774: AWHQV dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	Core RRH (DC version): 245 mm (9.65 in.) RRH with an AC adapter (AC version): 270 mm (10.63 in.)	
Depth	110 mm (4.33 in.)	
Weight	Core RRH (DC version): 9.0 kg (19.8 lb) RRH with an AC adapter (AC version): 10.2 kg (22.5 lb)	

Environmental specifications

Table 775: AWHQV environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, with 3.0 m/s airflow (in the direction where the airflow has the least effect) and 70% traffic load at temperatures above 45°C (113°F)	55°C (131°F) for altitude from –100 m (–328 ft) to 1800 m (5905 ft) 45°C (113°F) for altitude from 1800 m (5905 ft) to 4000 m (13123 ft)
Maximum operational outdoor temperature in the sun, with 0.5 m/s airflow	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	–40°C (–40°F)
IP rating	IP65

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7.23 AirScale Micro RRH 4T4R n79 80 W (AWHTA)

AWHTA (475245A) is introduced by 5GC001833.

Functional description

Table 776: AWHTA functional specification

Property	Value
Maximum output power	80 W
Modulation	256 QAM (DL) 64 QAM (UL)
MIMO mode	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	4600–4900 MHz
Filter bandwidth	300 MHz
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers per pipe	1
Supported bandwidths	100 MHz

Interfaces

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Figure 210: AWHTA interfaces

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Table 777: AWHTA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC OCTIS Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
Fan/External Alarm Connection	FAN/EAC	1	CIRC 8F IP67 Flange	Two external alarms supported
Optical interface	OPT	3	OCTIS Plug Kit SFP/SFP+	9.8 Gbps, CPRI
Grounding	GND ⏚	1	M8 or 2 x M5 screw	-
AISG connector	AISG	1	8-pin circular	-
Local Management Port (LMP)	-	1	2x20-pin female header	Located on the heat sink

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Table 778: AWHTA ALD support

Property	Value
AISG version	2.0
Voltage	24 V
Power per port	30 W

Note:

AirScale radio units support masthead amplifiers (MHAs) with 12 dB gain only.

Functional block diagram

Figure 211: AWHTA functional block diagram

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Electrical specifications

Table 779: AWHTA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC 85 V AC to 288 V AC (through an external AC/DC converter)
Extended input voltage range	-36.0 V DC to -40.5 V DC -57.0 V DC to -60.0 V DC
Surge protection	Class II 5 kA

Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterward. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

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Table 780: AWHTA power consumption

Mode	Configuration	Output Power per carrier [W]	Power consumption [W], ETSI 202706 average load P_{RRH}, static	Power consumption [W], ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W], 100% RF power load $P_{100\%\ RRH}$
NR	Single sector 4T	4x5	132	180	279

Recommended power back-off

Table 781: The recommended power back-off

RAT	Feature/Parameter	Single carrier [dB]	Multi carrier (non-contiguous) [dB]
NR	`NRCELL PDSCH power back-off for 256 QAM (dlQam256PowerBackoffSub6)`	1.5	1.5

Related optional items

- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP 2 (475756A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- AAHO AirScale Micro Integrated Antenna (475920A)
- APAH AirScale Micro AC PSU (475043A)

Installation options

- Pole:
  - On the back of the unit
  - Sideways
  - Tilt mounting
- Wall

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- On the back of the unit
- Sideways
- Tilt mounting

> **NOTICE:**
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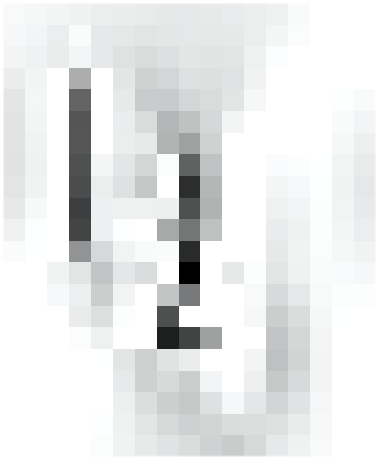
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

Dimensions and weight

Table 782: AWHTA dimensions and weight

Property	Value	Dimensions orientation
Height	345 mm (13.58 in.)	
Width	Core RRH (DC version): 245 mm (9.65 in.) RRH with an AC adapter (AC version): 270 mm (10.63 in.)	
Depth	130 mm (5.12 in.)	
Weight	Core RRH (DC version): 11.0 kg (24.3 lb) RRH with an AC adapter (AC version): 12.8 kg (28.2 lb)	

Environmental specifications

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Table 783: AWHTA environmental specifications

Property	Value
Maximum operational outdoor temperature in the shade, with 3.0 m/s airflow (in the direction where the airflow has the least effect) and 70% traffic load at temperatures above 45°C (113°F)	55°C (131°F) for altitude from –100 m (–328 ft) to 1800 m (5905 ft) 45°C (113°F) for altitude from 1800 m (5905 ft) to 4000 m (13123 ft)
Maximum operational outdoor temperature in the sun, with 0.5 m/s airflow	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	–40°C (–40°F)
IP rating	IP65

7.24 AirScale Micro 4T4R CBRS 20 W (AZQC)

AZQC (474156A) is introduced by LTE3628.

Functional description

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Table 784: AZQC functional specification

Property	Value
Maximum output power	20 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
Number of TXRX	4T4R
Outdoor installation	Yes
Beamforming	No
Supported technologies (standalone and MSR)	TD-LTE, NR-ready
Frequency range	3550–3700 MHz
Filter bandwidth	150 MHz
Instantaneous bandwidth (iBW)	150 MHz Note: 150 MHz is conditionally supported. It is limited by any adjacent two carriers. The distance from the first carrier's center to the second carrier's farther edge cannot be larger than 110 MHz.
Occupied bandwidth (oBW)	80 MHz
Number of carriers per pipe	Up to 4
Supported bandwidths	10, 20 MHz

Interfaces

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Figure 212: AZQC interfaces

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Table 785: AZQC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	DC Octis Plug Kit	Hot insert not supported
Antenna connector	ANT	4	NEX 10	-
External Alarm Connection/Fan	EAC/FAN	1	CIRC 8F IP67 Flange	Hot insert not support
LED	UNIT	1	-	-
Optical interface	OPT	2	OCTIS Plug Kit SFP/SFP+	Up to 9.8 Gbps (CPRI7);
Ethernet	RJ	1	RJ45	Separate feature required to enable this interface
Grounding	GND ⏚	1	M8 or dual M5 screws	-
Local Management Port	-	1	2x20-pin female header	-

WARNING!

Risk of electric shock

Before turning RF power on, RF ports have to be terminated by nominal 50 Ω load (for example, feeder with antenna). If these conditions are not met, do not remove the plastic caps that are delivered within the unused RF ports. The plastic caps isolate RF port from the environment, and thus provide electric shock security in case RF power is accidentally on.

Antenna line device (ALD) support

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Note:

There is no Antenna Line Device support for the AZQC.

Functional block diagram

Figure 213: AZQC functional block diagram

Electrical specifications

Table 786: AZQC electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -57.0 V DC
Extended input voltage range	-36 V to -40.5 V and -57 V to -60 V (DC)

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Note:

The minimum start-up voltage is –40.5 V DC. If the input voltage is below or above the extended limits, the unit might shut down.

NOTICE:

Always connect de-energized power cables to the RRH and turn the power supply on afterwards. Connecting energized power cables can damage the RRH.

Power consumption

Typical power consumption [W] for 48 V DC input, at 25°C, representative of typical product performance under the same conditions (hardware variant, software version, configuration, environment, and so on) with +/– 10% margin. Average = (6 h low hour load, 10 h medium hour load and 8 h busy hour load) /24 h.

Table 787: AZQC power consumption

Mode	Configuration	Output power per carrier [W]	Power consumption [W] ETSI 202706 average P_{RRH}, static	Power consumption [W] ETSI 202706 busy hour load $P_{BH\ RRH}$, static	Power consumption [W] 100% RF power load $P_{100\%\ RRH}$
LTE	1 sector 4T	4x5	122	136	158
	1 sector 4T	4x2	108	115	128

Note:

Power consumption values are measured according to ETSI 202 706-1 v1.5 assumptions (subframe #2 and special subframe #7), leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power consumption.

Power reduction

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> **Note:**
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> The maximum power reduction (`dlCellPwrRed`) value is 20 dB. High power reduction values may cause radio outages.

Related optional items

- APAE AirScale Micro 210 W AC PSU (474518A)
- OCTIS Plug Kit AC Power (474244A)
- OCTIS Plug Kit DC Power (474184A)
- OCTIS Plug Kit SFP (474183A)
- AMBA AirScale Micro Bracket Assembly Kit (474182A)
- AAQA AirScale Micro Integrated Antenna 3.5G (474520A)
- AMBC AirScale Micro Tilt Mount Kit (474332A)
- FMWG AirScale Micro Wall/Pole Mount Kit for Single Radio (474013A)
- FMWH AirScale Micro Wall/Pole Mount Kit for Dual Radios (474312A)
- AMGP AirScale Micro cover 245 x 288 (474705A)

Installation options

- Pole:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Wall:
  - Fixed orientation
  - Tilt mounting
  - Multi-directional tilt mounting
  - Bookshelf mounting
- Enclosure
- Strand

> **NOTICE:**
>
> Always install this RRH in a vertical orientation with connectors on the bottom side, to ensure convection cooling.

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Dimensions and weight

Table 788: AZQC dimensions and weight

Property	Value	Dimensions orientation
Height	295 mm (11.61 in.)	
Width	245 mm (9.65 in.) core unit (DC version) 270 mm (10.63 in.) with AC adapter (AC version)	
Depth	75 mm (2.95 in.)	
Weight	6.5 kg (14.3 lb) core unit (DC version) 7.4 kg (16.3 lb) with AC adapter (AC version)	

Environmental specifications

Table 789: AZQC environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature (including cold start)	-35°C (-31°F) Cold start from -40°C (-40°F)

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8. AirScale radio units sound power levels

Sound power levels measured according to ISO 3744 or ISO 3745

Table 790: Nokia AirScale 2 300 RRH sound power levels (measured according to ISO 3744 or ISO 3745)

Configuration	Typical without optional fans*	With optional fans
Single module at 15°C (59°F)	≤ 35 dBA	≤ 54 dBA
Single module at 23°C (73.4°F)	≤ 35 dBA	≤ 58 dBA
Single module at 45°C (113°F)	≤ 35 dBA	≤ 63 dBA

*Sound power levels can vary between radio units and be ≤45 dBa if maximum capacity is configured.

Table 791: Nokia AirScale 2 600 RRH sound power levels (measured according to ISO 3744 or ISO 3745)

Configuration	Typical without optional fans*	With optional fans
Single module at 15°C (59°F)	≤ 35 dBA	≤ 57 dBA for 160 W radios
	≤ 35 dBA	≤ 59 dBA for 240 W radios
	≤ 35 dBA	≤ 60 dBA for 320 W and 480 W radios
Single module at 23°C (73.4°F)	≤ 35 dBA	≤ 61 dBA for all radios
Single module at 50°C (122°F)	≤ 35 dBA	≤ 66 dBA for 160 W radios
	≤ 35 dBA	≤ 67 dBA for 240 W, 320 W and 480 W radios

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*Sound power levels can vary between radio units and be ≤45 dBa if maximum capacity is configured.

Table 792: Nokia AirScale RF modules sound power levels (measured according to ISO 3744)

Configuration	Maximum
Single module at 15°C (59°F)	58 dBA
Single module at 23°C (73.4°F)	61 dBA
Single module at 50°C (122°F)	71 dBA

Table 793: Nokia AirScale micro RRH sound power levels (measured according to ISO 3744)

Configuration	Without fans
Single module at 15°C (59°F)	≤ 35 dBA
Single module at 23°C (73.4°F)	≤ 35 dBA
Single module at 50°C (122°F)	≤ 35 dBA

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9. AirScale radios LED indicators

You can control LED indicators 180 seconds after powering on the radio unit.

Note:

Due to component variances the color of yellow may have an orange or green tone.

Table 794: LEDs for RF Modules

LED color	Description	Alarm
Red, stable	Critical alarm affecting the whole RF module or all antenna carriers	Fault
Red, blinking	Operation degraded • Major alarm affecting the whole RF Module • Major alarm affecting the whole RF Module • Major/Critical alarm affecting a module subcomponent or antenna carrier	Major/critical alarm
Yellow, stable	• Until software download begins • The carriers are blocked from BTS • There is no connection to any System Module	No alarm
Yellow, blinking	• Software download in progress • Configuration in progress: RF resources are being setup, but not yet activated	No alarm
Green, stable	• Software configuration is complete or supervisory: RF resources activated and transmission is possible • Working normally, no alarm on the RF Module	No alarm

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LED color	Description	Alarm
Green, blinking	Software downloading and updating	No alarm
Stable Red for less than 5 seconds and changes to Stable Yellow	Switched ON, but the next conditions are not reached yet	No alarm
Stable Red for less than 5 seconds	The module is in the process of resetting	No alarm
Periodic Red and Green	Antenna line faulty/degraded due to external factors (for example, VSWR minor/major values exceeded, Antenna line device faulty/degraded)	Alarm
Blinking Colors (Red, Yellow, and Green), each color stable for 0.5 second	Module highlighting (Flexi BTS SM functionality that can help identifying faulty module)	No alarm
RF Module fan/TX status LED: Red	At least one fan is faulty or degraded	No alarm
RF Module fan/TX status LED: Green	All fans are working	No alarm
RF Module fan/TX status LED: Color set according to fan status, stable	RF transmission is ON	No alarm
RF Module fan/TX status LED: Color set according to fan status, blinking	RF transmission is OFF	No alarm

Table 795: LEDs for RRHs

LED color	Description	Alarm
Red, stable	Critical alarm affecting the whole RF module or all antenna carriers	Fault

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LED color	Description	Alarm
Red, blinking	Operation degraded • Major alarm affecting the whole RF Module • Critical alarm affecting fans • Major/Critical alarm affecting a module subcomponent or antenna carrier	Major/critical alarm
Yellow, stable	• Until software download begins • The carriers are blocked from BTS • There is no connection to any System Module	No alarm
Yellow, blinking	• Software download in progress • Configuration in progress: RF resources are being setup, but not yet activated	No alarm
Green, stable	• Software configuration is complete or supervisory: RF resources activated and transmission is possible • Working normally, no alarm on the RF Module	No alarm
Green, blinking	Software downloading and updating	No alarm
Stable Red for less than 5 seconds and changes to Stable Yellow	Switched ON, but the next conditions are not reached yet	No alarm
Stable Red for less than 5 seconds	The module is in the process of resetting	No alarm
Periodic Red and Green	Antenna line faulty/degraded due to external factors (for example, VSWR minor/major values exceeded, Antenna line device faulty/degraded)	Alarm

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LED color	Description	Alarm
Blinking Colors (Red, Yellow, and Green), each color stable for 0.5 second	Module highlighting (Flexi BTS SM functionality that can help identifying faulty module)	No alarm

Note:

FHEL, FRIJ, FHDI, FHPD and FHKA radios do not support critical alarm affecting fans LED.

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10. Avoiding Passive Intermodulation during RF Module and RRH operation

In wideband frequencies, when several transmitting and receiving signals are sharing the same hardware, passive intermodulation (PIM) Interference could be noted.

Using RF Modules might cause a potential risk of generating third-order intermodulation that results in distortions in the receiver (RX) channel. Antenna line devices (ALD) have an important role in preventing Passive Intermodulation generation, even if the used RF Module and RRH performance at the antenna connector complies with 3GPP requirements.

Poor PIM performance of ALD might degrade significantly the reference sensitivity. ALDs, like MHAs, provided by Nokia have high PIM requirements.

The risk might be high in the following cases:

- Maximum bandwidth (BW) used for the carriers is more than 0.5 x duplex separation of the band
- Carriers in configuration are wideband in nature (for example WCDMA or LTE), or combination of wideband and narrow band carriers (for example RF sharing GSM-WCDMA or GSM-LTE).
- Antenna line PIM performance is poor, or not on the required level for the configuration.

Table 796: Typical reference sensitivity degradation with different Antenna line PIM performance.

PIM performance	Typical degradation	Note
-140 dBc at 2x43 dBm	~10 dB	High degradation, carrier configuration unusable in many cases
-153 dBc at 2x43 dBm	~2 dB	Modest degradation, tolerable in many cases
-161 dBc at 2x43 dBm	~0.2 dB	Minimal degradation, however, difficult to reach on the typical site environment.

When using wideband carrier configurations where PIM products fall into own receiver band, it is recommended that antenna line PIM performance is at least –153 dBc measured with 2 x 43 dB test signals.

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However, this kind of performance might be very difficult to achieve and maintain over time in outdoor environment due to mechanisms behind the PIM including corrosion, oxidation, material imperfections, and defects in workmanship. Some of these parameters might change, and can degrade performance during operation. Taking that into consideration, it is highly recommended not to use carrier configurations which are generating intermodulation results in landing in own receiver channels.

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