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Summary of changes

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

Changes between issues 21B (2023-10-26) and 21C (2024-01-19)

General changes

A note on the lack of hot insertion and QSFP removal support has been added to the interfaces section of the following units:

- AirScale MAA 64T64R 192 AE B42/n42 200 W (AEQA)
- AirScale MAA 64T64R 128 AE B43 200 W (AEQD)
- AirScale MAA 2T2R 512 AE n257 (AEUF)
- AirScale MAA 2T2R 512 AE n257 (AEUA)
- AirScale MAA 2T2R 512 AE n260 (AEWF)

Commercial names have been added to the functional description sections of the following units:

- AirScale MAA 64T64R 192 AE n78 320 W (AQQE)
- AirScale MAA 64T64R 192 AE n77 320 W (AQQS)
- AirScale MAA 64T64R 192 AE n78 320 W (AQQN)
- AirScale MAA 64T64R 192 AE n40 320 W (AQNA)
- AirScale MAA 64T64R 192 AE n77 320 W (AQQT)
- AirScale MAA 64T64R 192 AE n78 320 W (AQQL)
- AirScale MAA 64T64R 192 AE n77 320 W (AQQK)
- AirScale MAA 64T64R 192 AE n77 480 W (AQQQA)
- AirScale MAA 32T32R 192 AE n78 320 W (AQQA)
- AirScale MAA 32T32R 192 AE n78 320 W (AQQJ)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQC)
- AirScale MAA 32T32R 192 AE n78 200 W (AQQF)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQQ)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQY)
- AirScale MAA 32T32R 192 AE n41 320 W (AQHA)
- AirScale MAA 32T32R 192 AE n41 320 W (AQHC)
- AirScale MAA 32T32R 128 AE n38/B38 200 W (AQHB)

RF scan has been removed from the functional specification table of the following units:

- AirScale MAA 64T64R 192 AE B41/n41 320 W (AEHB)
- AirScale MAA 64T64R 192 AE B41/n41/B38 320 W (AEHC)
- AirScale MAA 64T64R 192 AE n78 200 W eCPRI (AEQE)
- AirScale MAA 64T64R 192 AE B42/n78 200 W eCPRI (AEQB)
- AirScale MAA 64T64R 192 AE n78 200 W eCPRI (AEQI)
- AirScale MAA 64T64R 192 AE n77 200 W eCPRI (AEQK)
- AirScale MAA 64T64R 192 AE n78 200 W eCPRI (AEQP)
- AirScale MAA 64T64R 192 AE n77 200 W eCPRI (AEQU)
- AirScale MAA 64T64R 192 AE B48/n48 32 W eCPRI (AEQM)

Changes between issues 21A (2023-08-10) and 21B (2023-10-26)

General changes

All mentions of AMCB were removed from the document due to the phase out.

AASU Antenna Monitoring Module (476423A) has been added to the related optional items section of the following units:

- AirScale MAA 64T64R 192 AE n78 320 W (AQQE)
- AirScale MAA 64T64R 192 AE n78 320 W (AQQL)
- AirScale MAA 64T64R 192 AE n77 320 W (AQQK)
- AirScale MAA 64T64R 192 AE n78 320 W (AQQN)
- AirScale MAA 64T64R 192 AE n77 320 W (AQQS)
- AirScale MAA 64T64R 192 AE n40 320 W (AQNA)
- AirScale MAA 64T64R 192 AE n77 320 W (AQQT)
- AirScale MAA 64T64R 192 AE n77 480 W (AQQQA)
- AirScale MAA 32T32R 192 AE n78 320 W (AQQA)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQC)
- AirScale MAA 32T32R 192 AE n78 200 W (AQQF)
- AirScale MAA 32T32R 192 AE n78 320 W (AQQJ)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQY)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQQ)
- AirScale MAA 32T32R 192 AE n41 320 W (AQHA)
- AirScale MAA 32T32R 128 AE n38/B38 200 W (AQHB)
- AirScale MAA 32T32R 192 AE n41 320 W (AQHC)
- AirScale MAA 64T64R 192 AE B42/n78 200 W eCPRI (AEQB)

- AirScale MAA 64T64R 192 AE n78 200 W eCPRI (AEQE)
- AirScale MAA 64T64R 192 AE n78 200 W eCPRI (AEQI)
- AirScale MAA 64T64R 192 AE n78 200 W eCPRI (AEQP)
- AirScale MAA 64T64R 192 AE n77 200 W eCPRI (AEQK)
- AirScale MAA 64T64R 192 AE B48/n48 32 W eCPRI (AEQM)
- AirScale MAA 64T64R 192 AE n77 200 W eCPRI (AEQU)

A note regarding maximum optical fiber length has been added to the interfaces section of the following units:

- AirScale MAA 64T64R 192 AE n77 320 W (AQQS)
- AirScale MAA 64T64R 192 AE n40 320 W (AQNA)
- AirScale MAA 32T32R 192 AE n78 320 W (AQQA)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQC)
- AirScale MAA 32T32R 192 AE n78 320 W (AQQJ)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQY)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQQ)
- AirScale MAA 32T32R 192 AE n41 320 W (AQHA)
- AirScale MAA 32T32R 128 AE n38/B38 200 W (AQHB)
- AirScale MAA 32T32R 192 AE n41 320 W (AQHC)
- AirScale MAA 64T64R 192 AE n78 320 W (AQQE)
- AirScale MAA 64T64R 192 AE n77 320 W (AQQK)
- AirScale MAA 64T64R 192 AE n78 320 W (AQQL)
- AirScale MAA 64T64R 192 AE n78 320 W (AQQN)
- AirScale MAA 64T64R 192 AE n77 320 W (AQQT)

Interfaces section has been updated for the optical interfaces description to include information about SFP+ in the following units:

- AirScale MAA 64T64R 192 AE n78 320 W (AQQL)
- AirScale MAA 64T64R 192 AE n78 320 W (AQQE)
- AirScale MAA 64T64R 192 AE n77 320 W (AQQK)
- AirScale MAA 64T64R 192 AE n78 320 W (AQQN)
- AirScale MAA 64T64R 192 AE n77 320 W (AQQS)
- AirScale MAA 64T64R 192 AE n40 320 W (AQNA)
- AirScale MAA 64T64R 192 AE n77 320 W (AQQT)
- AirScale MAA 32T32R 192 AE n78 320 W (AQQA)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQC)
- AirScale MAA 32T32R 192 AE n78 200 W (AQQF)
- AirScale MAA 32T32R 192 AE n78 320 W (AQQJ)

- AirScale MAA 32T32R 128 AE n78 240 W (AQQY)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQQ)
- AirScale MAA 32T32R 192 AE n41 320 W (AQHA)
- AirScale MAA 32T32R 192 AE n41 320 W (AQHC)
- AirScale MAA 32T32R 128 AE n38/B38 200 W (AQHB)

IPAA+ has been added to the installation options of the following units:

- AirScale MAA 64T64R 192 AE n78 320 W (AQQE)
- AirScale MAA 64T64R 192 AE n78 320 W (AQQL)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQQ)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQY)
- AirScale MAA 64T64R 192 AE B41/n41/B38 320 W (AEHC)
- AirScale MAA 32T32R 192 AE n78 320 W (AQQA)

AMMA AirScale IPAA AQQx slide-in frame (476260A) has been added to the related optional items section of the following units:

- AirScale MAA 64T64R 192 AE n78 320 W (AQQE)
- AirScale MAA 64T64R 192 AE n78 320 W (AQQL)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQQ)
- AirScale MAA 32T32R 128 AE n78 240 W (AQQY)

AirScale MAA 64T64R 192 AE n78 200 W eCPRI (AEQE)

- Power consumption values were updated.

AirScale MAA 64T64R 192 AE B41/n41/B38 320 W (AEHC)

- AMMC AirScale IPAA AEHC slide-in frame (476428A) has been added to the related optional items section.

AirScale MAA 32T32R 192 AE n78 320 W (AQQA)

- AMME AirScale IPAA AQQA slide-in frame (476573A) has been added to the related optional items section.

Glossary

- A section explaining terms and abbreviations used in the document was added.

Changes between issues 21 (2023-06-16) and 21A (2023-08-10)

General changes

Power consumption values have been added to the following units:

- AirScale MAA 64T64R 192 AE n77 480 W (AQQQA)
- AirScale MAA 32T32R 192 AE n78 200 W (AQQF)

1. Compliance statements

Compliance statements for MAA units.

Table 1: Compliance statements for MAA units

Feature	Release	ISED	EU/CE	FCC
LTE4529 (AAFIA)	LTE19	Yes	No	Yes
CB006502 (AENB)	5G20B	No	Yes	No
5GC001636 (AEQC)	5G21A	No	Yes	No
5GC002252 (AEQC)	5G19B	No	Yes	No
5GC001635 (AEQQ)	5G21A	No	Yes	No
5GC002253 (AEQQ)	22R1	Yes	Yes	No
5GC000657 (AEHC)	5G21B	No	No	Yes
5GC002548 (AEHC)	5G20A	No	No	Yes
CB007970 (AEHC)	22R1	No	No	Yes
5GC001113 (AEQB)	5G20A/ SRAN20A	No	Yes	No
5GC001783 (AEQB)	5G21B	No	Yes	No
5GC002577 (AEQK)	5G21A	No	No	Yes
5GC000643 (AEQE)	5G21B	No	Yes	No
5GC002116 (AEQE)	5G21B	No	Yes	No
5GC002446 (AEQE)	5G21B	No	Yes	No
5GC001098 (AEQN)	5G20A	No	Yes	No
5GC002273 (AEQN)	5G21B	No	Yes	No
5GC002366 (AEQY)	5G21B	No	Yes	No
5GC002367 (AEQY)	5G21B	No	Yes	No
CB006892 (AQQC)	22R2	No	Yes	No
CB008546 (AQQC)	23R3	No	Yes	No
CB006756 (AQQQ)	22R2	Yes	Yes	No
5GC002433 (AQQY)	22R2	No	Yes	No

Feature	Release	ISED	EU/CE	FCC
CB008546 (AQQY)	23R3	No	Yes	No
CB009217 (AQQY)	23R3	No	Yes	No
CB009125 (AQHC)	23R2	No	Yes	No
CB009217 (AQHC)	23R3	No	Yes	No
CB006059 (AEQM)	SRAN21B	No	No	Yes
CB007600-SR (AEQM)	22R3	No	No	Yes
CB007857-SR (AEQM)	22R3	No	No	Yes
CB008923-SR (AEQM)	23R1	No	No	Yes
CB009153-SR (AEQM)	23R3	No	No	Yes
CB008544 (AEQU)	22R1	No	No	Yes
5GC002117 (AEQP)	5G19B	Yes	Yes	No
5GC002449 (AEQP)	5G20A	No	Yes	No
5GC001437 (AEQP)	5G21A	No	Yes	No
CB006706 (AEQP)	SRAN21B	Yes	No	No
CB007520 (AEQP)	22R1	Yes	No	No
CB006783 (AQQK)	22R2	No	No	Yes
CB009555-SR (AQQT)	23R2	Yes	No	No
CB006277 (AQQL)	22R1	No	Yes	No
CB006880 (AQQQA)	23R2	No	No	Yes
5GC002422 (AQQE)	22R1	Yes	Yes	No
CB007499 (AQQA)	22R2	No	Yes	No
CB009125 (AQQA)	23R2	No	Yes	No
CB008771-5G, SR (AQHB)	23R1	Yes	Yes	No
CB009125 (AQHB)	23R2	No	Yes	No

1.1 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 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/Declaration of Conformities (DoCs)*.

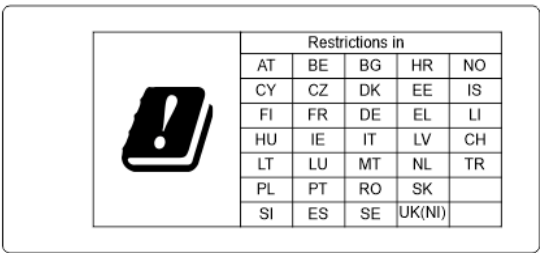
These declarations are only valid for configurations (combinations of software, firmware, and hardware) provided and/or supported by Nokia.

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.

Figure 3: RED Article 10.10-marking



1.2 RSS-102 compliance

The following are example minimum separation distances calculated to meet the limits of 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 2: 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

Table 3: 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 hardware units described in this document.

1.3 FCC Part 15 compliance

i 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.

i Note:

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

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 (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)

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 Apparatus
- ▣ 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; 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 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 hardware units described in this document.

2. Changes in AirScale product naming

Nokia has introduced product names for its new generation AirScale plug-in units and radio units. The names, featuring names of winds and birds, will be used in marketing materials and initial interactions. The use of product-specific identification codes continues in operating and release documentation as well as for ordering purposes.

The new naming convention will:

- simplify discussions.
- make it easier to remember products and names.
- differentiate products when launching new versions.

AirScale plug-in units

Each new type of control or capacity plug-in unit is named after a wind, for example:

- AirScale Chinook – ASIL control plug-in unit
- AirScale Fremantle – ABIO capacity plug-in unit
- AirScale Ostro – ABIN capacity plug-in unit

AirScale radio units

Each new generation of sub-6 GHz radio units or Massive MIMO Adaptive Antennas (MAAs) is named after a bird of prey. The current generation of radio unit products is known as AirScale Osprey:

- AirScale Osprey 4 – 4T4R micro remote radio head (RRH) or macro RRH
For example: AirScale Micro RRH 4T4R n77 80 W AWHQN
- AirScale Osprey 8 – 8T8R RRH
For example: AirScale RRH 8T8R n78 320 W AKQZ
- AirScale Osprey 32 – 32T32R MAA
For example: AirScale MAA 32T32R 128 AE n78 240 W AQQQ
- AirScale Osprey 64 – 64T64R MAA
For example: AirScale MAA 64T64R 192 AE n78 320 W AQQE

3. Massive MIMO adaptive antenna support for BTS

Massive MIMO adaptive antenna (MAA) is a system of independent radio units integrated with a common antenna.

MAA supports enhanced traditional MIMO technology (mMIMO) using more than eight antennas to increase network performance. Massive MIMO adaptive antennas are compatible with Nokia AirScale system module.

Using MAA saves OPEX/CAPEX due to lack of RF jumpers between the radio module and antennas.

4. Massive MIMO adaptive antenna performance

Split and full mode descriptions, RF bandwidth terms, antenna specification terms, mean time between failures (MTBF), nominal and extended input voltage range definitions, where to find information on output power, supported carriers and bandwidths.

Full mode

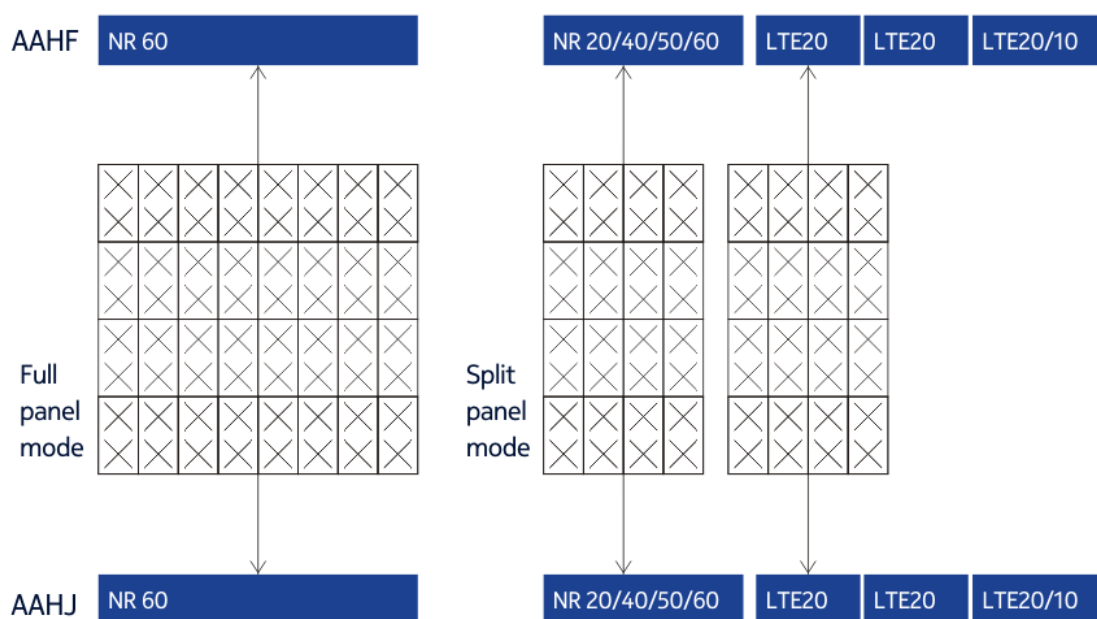
The integrated antenna of massive MIMO adaptive antenna (MAA) can be used in either full mode or split mode. A configuration in which all the antenna elements are utilized as one logical antenna panel for one RAT is called the full mode (or full panel mode). The full panel mode serves one or more carriers with every antenna element.

Split mode

A configuration in which antenna elements are divided into two separate logical antenna panels is called the split mode (or split panel mode). The division is done in vertical dimension, for example, NR is allocated in the left side and LTE in the right side of the antenna panel. The split panel mode serves separate carriers with each half of the antenna elements.

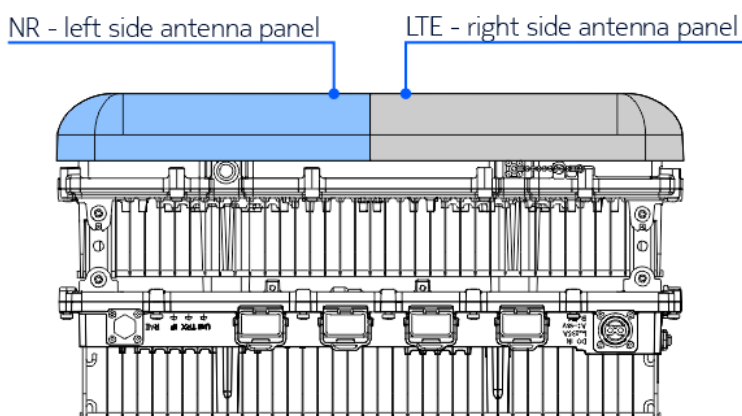
The diagram shows the different carrier configuration for full panel mode and split panel mode:

Figure 4: Example of full and split mode NR-LTE antenna panel division diagram view



In the split panel mode, each half of 64 TRXs is dedicated to a separate radio technology: NR (left) and LTE (right). For this reason initial BTS configuration (before concurrent operation activation) does not follow this restriction, the BTS reconfiguration is needed to keep BTS online once software load supporting NR-LTE (NR-SRAN) concurrent operation is activated.

Figure 5: Example of split mode NR-LTE antenna panel division



In case of TDD MAA CPRI radio variants, the radio software is separate for full panel (non-sharing) and split panel mode (sharing).

Separate radio software packages are needed for full panel mode LTE, full panel mode NR and split panel mode LTE/NR due to flash memory limitation in a radio unit.

RF bandwidth terms

Check the following bandwidth-related terms:

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. iBW is always smaller or equal to RF BW.
Occupied bandwidth (oBW)	The HW-supported maximum sum of the deployed carriers' bandwidth. oBW is always smaller than or equal to iBW. Example: If a radio unit oBW = 40 MHz, there might be a 2 x 20 MHz configuration deployed.

Antenna specification terms

Base Station Antenna Standards (BASTA)	Standard addresses the performance criteria of base station antennas, by making recommendations on standards for electrical and mechanical parameters, by providing guidance on measurement and calculation practices in performance validation and production, and by recommending methods for electronic data exchange.
Effective Isotropic (or Equivalent) Radiated Power (EIRP)	The total power [W] that would have to be radiated by a (theoretical) isotropic antenna to give the same radiation intensity signal strength [W/m ²] as the actual source at a distant receiver located in the direction of the antenna's main lobe.

Mean Time Between Failures

Note:

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

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 surges only.

Note:

When the input voltage level is higher than -57.0 V , an overvoltage alarm is raised.

When the input voltage level is lower than -40.5 V , an undervoltage alarm is raised.

Output power, supported carriers and bandwidths

Note:

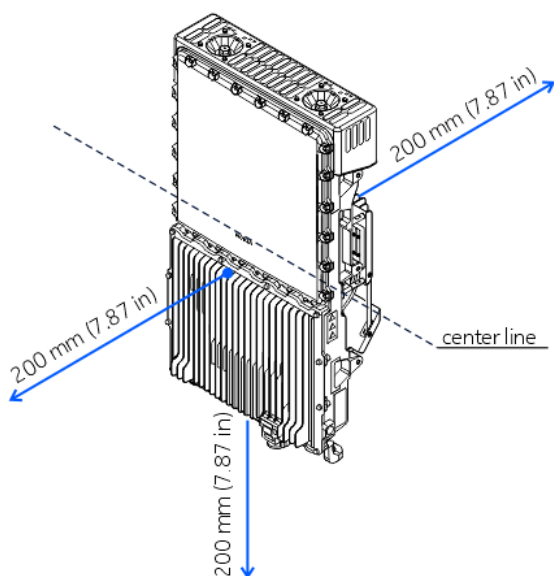
For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Ambient temperature

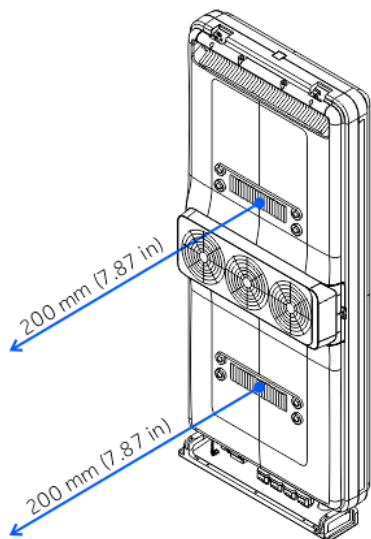
To measure ambient temperature for AirScale MAA radio units without fans, place the thermal sensor 200 mm (7.9 in.) below the radio unit or 200 mm (7.9 in.) below the radio unit center line front or back.

Figure 6: Ambient temperature measurement for an exemplary radio unit without a fan



To measure ambient temperature for fan-cooled AirScale MAA radio units with fans located in the middle of the unit, place the thermal sensor 200 mm (7.9 in.) next to either the bottom or upper air inlet.

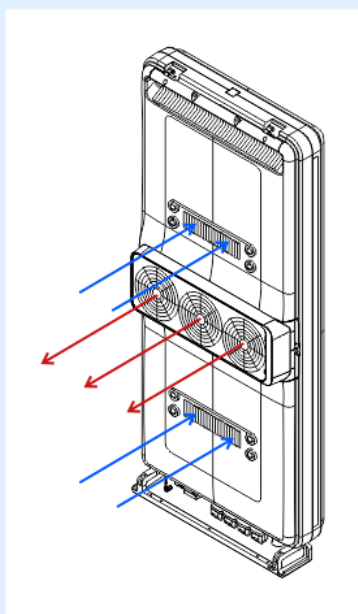
Figure 7: Ambient temperature measurement for an exemplary fan-cooled MAA radio unit with fans located in the middle



Note:

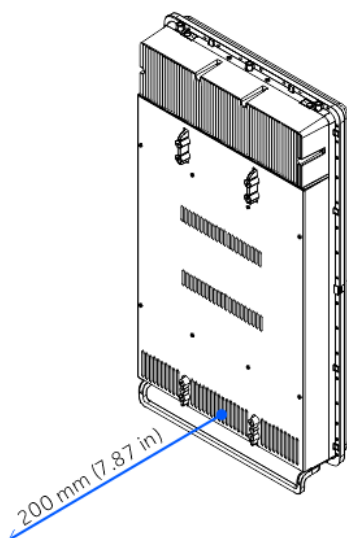
AirScale MAA radio units with fans in the middle of the unit have airflow inlets and outlets on the back of the unit. Airflow inlets are located at the top or bottom, whereas airflow outlets are in the center. The airflow is irreversible.

Figure 8: Location of airflow inlets and outlets on an exemplary fan-cooled MAA radio unit with fans located in the middle



To measure ambient temperature for fan-cooled AirScale MAA radio units with fans located on top of the unit, place the thermal sensor 200 mm (7.9 in.) next to the air inlet on the bottom of the unit.

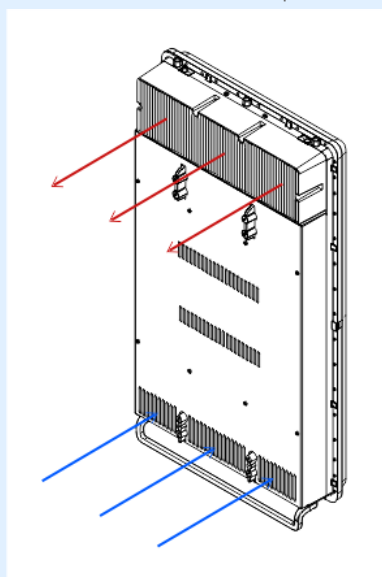
Figure 9: Ambient temperature measurement for an exemplary fan-cooled MAA radio unit with fans located on top



Note:

AirScale MAA radio units with fans on top of the unit have airflow inlets and outlets on the back of the unit. Airflow inlets are located at the bottom, whereas airflow outlets are at the top. The airflow is irreversible.

Figure 10: Location of airflow inlets and outlets on an exemplary fan-cooled MAA radio unit with fans located on top



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 section in *Nokia AirScale BTS Installation Site Requirements*.

5. AirScale FDD macro MAAs

Available AirScale FDD macro MAA units.

5.1 AirScale Dual MAA 16T16R B25/B66 /n25/n66 200 W (AAFIA)

AAFIA (474486A) is introduced by LTE4529 (for LTE) and by 5GC000766 (for NR and LTE-NR concurrent mode).

Functional description

AAFIA is an 8-column dual-band FDD-LTE 16T16R MAA system which has two independent radio units integrated with a common antenna. AAFIA enables to save OPEX/CAPEX by housing two bands in the same equipment and having no RF jumpers between the RF module and antennas.

Figure 11: AAFIA architectural overview

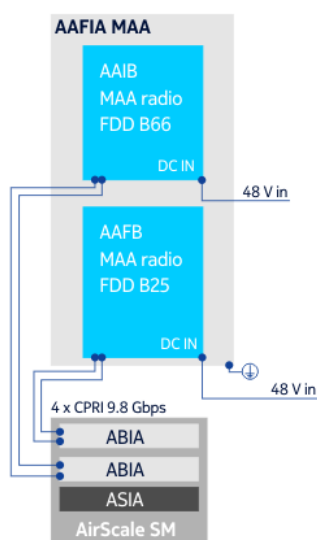


Table 4: AAFIA functional specification

Property	Value
Output power	100 W (16 x 6.25 W) per band
Total output power	200 W
Maximum modulation	256 QAM (DL) LTE: 256 QAM (UL) NR: 64 QAM (UL)
Number of TXRX	16T16R
Outdoor installation	Yes
Beamforming	Horizontal sectorization, azimuth beamforming
Supported technology	LTE, NR
RF sharing/concurrent mode	LTE-NR
TX frequency range	B25: 1930–1995 MHz B66: 2110–2200 MHz n25: 1930–1995 MHz n66: 2110–2200 MHz
RX frequency range	B25: 1850–1915 MHz B66: 1710–1780 MHz n25: 1850–1915 MHz n66: 1710–1780 MHz
DL instantaneous bandwidth (iBW)	B25: 65 MHz B66: 90 MHz n25: 65 MHz n66: 90 MHz
UL instantaneous bandwidth (iBW)	B25: 65 MHz B66: 70 MHz n25: 65 MHz n66: 70 MHz
Occupied bandwidth (oBW)	40 MHz
Number of carriers per pipe	Up to 2
Supported bandwidths	LTE: 5, 10, 15, 20 MHz, 200 kHz standalone NB-IoT NR: 5, 10, 15, 20 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/5G NR and gNB Supported Configurations* and see:

- *5G NR Supported Configurations*
- *5G NR Supported Configurations - Rules and Examples*

The antenna contains eight cross-polarized columns horizontally. The tilt angle of each set of four columns can be adjusted remotely. Bands share the antenna, thus both bands have the same tilt angle.

Antenna specification

Table 5: Antenna specification

Property	Value			
Frequency band	Band 66		Band 25	
	RX	TX	RX	TX
Antenna configuration	4-column antenna		4-column antenna	
Operating frequency	1710–1780 MHz	2110–2200 MHz	1850–1915 MHz	1930–1995 MHz
Beamforming gain [dBi] (S1 beam)	23	24	23	24
Azimuth beamwidth [°] (S1 beam)	17 +/- 4	14 +/- 4	16 +/- 4	16 +/- 4
Beamforming gain [dBi] (S2 beam)	19	20	20	20
Azimuth beamwidth [°] (S2 beam)	35 +/- 4	30 +/- 4	34 +/- 4	33 +/- 4
Beamforming gain [dBi] (B1 beam)	15	17	16	16
Azimuth beamwidth [°] (B1 beam)	60 +/- 5	60 +/- 5	60 +/- 5	60 +/- 5
Elevation beamwidth [°]	5.5 +/- 1	5.5 +/- 1	5.5 +/- 1	5.5 +/- 1
Beam steering range (S1) [°]	+/- 45			
Beam steering range (S2) [°]	+/- 30			

Property	Value
USLS [dB]	> 15
SLS, azimuth [dB]	> 20
Front-to-back Ratio [dB] at 180° +/- 30°	> 25
PIM, 2 x 43 [dBc]	< -150
Antenna Monitor Port Coupling [dB]	-51 +/- 6

Interfaces



Note:

For graphics presenting AAFIA interfaces, see AAFIA radio [sub-modules interfaces](#).

Table 6: AAFIA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	2 (1 per radio sub-module)	High power circular	APPB, APPC
Optical	OPT	4 (2 per radio sub-module)	SFP	9.8 Gbps, CPRI; Nokia IP seal, R2CT
Grounding (GND)		1	2 x M5 screw	-

Antenna line device (ALD) support

Table 7: AAFIA (remote electrical tilt) RET support

RET support	Value
RET	Electric down tilt steering angle of 2° to 12°

Electrical specifications

Table 8: AAFIA 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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three

remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 9: AAFIA power draw

Mode	Configuration	Output power per carrier (W)	Power draw (W), ETSI 202706 average load $P_{RRH, static}$	Power draw (W), ETSI 202706 busy hour load $P_{RRH, static}$	Power draw (W), 100% RF power load $P_{100\% RRH}$
LTE	Dual band 1+1/1+1/1+1 16T16R	100	3266	3676	4562

Related optional items

- AMPC AirScale tilt support for pole kit (474939A)
- APPB AirScale2 55A DC plug 3.3-10 mm² (474282A)
- APPC AirScale 2 55A DC plug 10-16 mm² (474283A/474283B)
- ACPB fiber-protection plug, R2CT (474384A)

Installation options

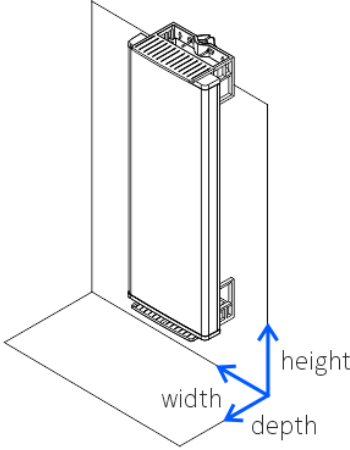
- Pole
- Wall

 Notice:

The unit without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

AAFIA Dimensions and weight

Table 10: AAFIA dimensions and weight

Property	Value	Dimensions orientation
Height	1860 mm (73.23 in.) with antenna protection parts	
Width	650 mm (25.59 in.)	
Depth	374 mm (14.72 in.) wall mount	
Weight	128 kg (282 lb) with brackets	

Environmental specifications

Table 11: AAFIA 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	Natural convection (fanless)
IP rating	IP65



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

Table 12: AAFIA wind conditions

Direction	Drag coefficient for the shape Cd	Wind force F [N] 241 km/h (67 m/s) (150 mph)	Wind force F [N] 200 km/h (55.5 m/s) (125 mph)	Wind force F [N] 150 km/h (42 m/s) (94 mph)
Front	1.27	3922	2691	1517
Rear	1.19	3678	2524	1422
Side	1.26	1807	1240	699

5.2 AirScale MAA 16T16R B25 100 W (AAFB)

AAFB is introduced for by LTE4264 (for LTE).

Functional description

AAFB is the radio sub-assembly integrated with an active antenna. AAFB is used in 16T16R FDD-LTE band 25 MAA solutions.

Table 13: AAFB functional specification

Property	Value
Output power	100 W (16 x 6.3 W)
Minimum configured power	0.5 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
Number of TXRX	16T16R  Note: Only 4T4R cells are allowed. Within one ABIA it is not allowed to have legacy cells and mMIMO cells.
Outdoor installation	Yes
Supported technology	LTE
Duplex mode - supported standard	FDD
TX frequency range	Band 25: 1930–1995 MHz
RX frequency range	Band 25: 1850–1915 MHz
DL instantaneous bandwidth (iBW)	Band 25: 65 MHz
UL instantaneous bandwidth (iBW)	Band 25: 65 MHz
Occupied bandwidth (oBW)	40 MHz
Number of carriers per pipe	Up to 2
Supported bandwidths	5, 10, 15, 20 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/5G NR and gNB Supported Configurations* and see:

- *5G NR Supported Configurations*
- *5G NR Supported Configurations - Rules and Examples*

Interfaces

Figure 12: AAFB interfaces

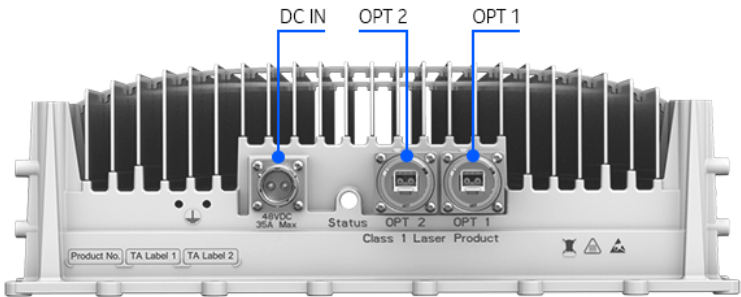


Table 14: AAFB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	High power circular	APPB, APPC
Optical	OPT	2	SFP	CPRI: 9.8 Gbps, R2CT

Electrical specifications

Table 15: AAFB 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
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 system characteristics

Note:

Power draw for sub-assemblies is not measured. Please refer to values of the full MAA system.

Recommended power back-off

Table 16: Recommended power back-off in 256 QAM mode

Single carrier [dB]	Dual /triple carrier [dB]
≤ 0.1	≤ 0.7

Related optional items

- AMPC AirScale tilt support for pole kit (474939A)
- ACPB Fiber-Protection Plug, R2CT (474384A)
- APPB AirScale2 55A DC plug 3.3-10 mm² (474282A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)

Installation options

- AAFB MAA is a radio sub-assembly integrated with a common antenna. For more information, see [AirScale Dual MAA 16T16R B25/B66 /n25/n66 200 W \(AAFIA\)](#).
- AAFIA supports *pole* and *wall* installation.



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.



Notice:

The unit without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

5.3 AirScale MAA 16T16R B66 100 W (AAIB)

AAIB is introduced by LTE4229 (for LTE).

Functional description

AAIB is the radio sub-assembly integrated with an active antenna. AAIB is used in 16T16R FDD-LTE band 66 MAA solutions.

Table 17: AAIB functional specification

Property	Value
Maximum output power	100 W (16x6.25 W)
Minimum configured power	0.5 W
Modulation	Up to 256 QAM (DL) Up to 64 QAM (UL)
Number of TXRX	16T16R
Outdoor installation	Yes
Supported technology	LTE
Duplex mode, supported standard	FDD
TX frequency range	Band 66: 2110–2200 MHz
RX frequency range	Band 66: 1710–1780 MHz
DL instantaneous bandwidth (iBW)	Band 66: 90 MHz
UL instantaneous bandwidth (iBW)	Band 66: 70 MHz
Occupied bandwidth (oBW)	40 MHz
Number of carriers per pipe	Up to 2
Supported bandwidths	5, 10, 15, 20 MHz

i Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Interfaces

Figure 13: AAIB interfaces

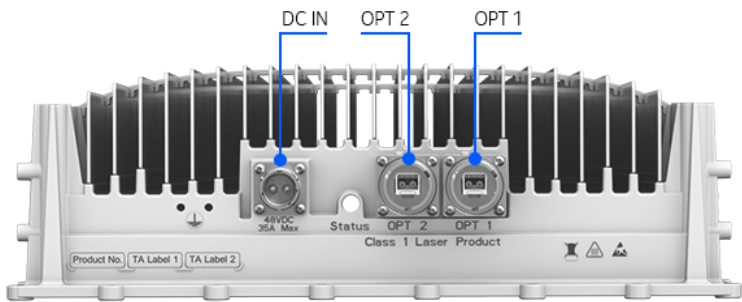


Table 18: AAIB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	High power circular	APPB, APPC
Optical	OPT	2	SFP	CPRI: 9.8 Gbps, R2CT

Electrical specifications

Table 19: AAIB 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
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 system characteristics

Note:

Power draw for sub-assemblies is not measured. Please refer to values of the full MAA system.

Recommended power back-off

Table 20: Recommended power back-off in 256 QAM mode

Single carrier [dB]	Dual /triple carrier [dB]
≤ 0.1	≤ 0.7

Related optional items

- AMPC AirScale tilt support for pole kit (474939A)
- ACPB fiber-protection plug, R2CT (474384A)
- APPB AirScale2 55A DC plug 3.3-10 mm² (474282A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)

Installation options

- AAIB MAA is a radio sub-assembly integrated with a common antenna. For more information, see [AirScale Dual MAA 16T16R B25/B66 /n25/n66 200 W \(AAFIA\)](#).
- AAFIA supports *pole* and *wall* installation.

 Notice:

The unit without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

 WARNING!**Risk of RF exposure.**

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6. AirScale TDD macro MAAs

Available AirScale TD macro MAA units.

6.1 32T32R AirScale TDD single band macro MAAs

6.1.1 AirScale MAA 32T32R 96 AE n78 80 W eCPRI (AEQN)

AEQN (474736A) is introduced by 5GC002273 (for NR).

Functional description

Table 21: AEQN functional specification

Property	Value
Maximum output power	80 W
Modulation	Up to 256 QAM
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital, 32T32R, 6x8 dual polarized phased array (±45° X-polarized)
Supported technology	NR
Duplex mode, supported standard	TDD
Frequency range	n78: 3400–3700 MHz
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	1
MIMO streams	8
Supported bandwidths	60, 80, 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Band n78 antenna specification

Table 22: AEQN antenna characteristics

Property	Value
Antenna configuration	6, 8, 2 ($\pm 45^\circ$ X-polarized), logical 2, 8, 2
Typical antenna gain (defined by BASTA)	22.5 dBi $\pm$ 0.5 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$12^\circ \pm 1.5^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$12^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -8° (upper SLS > 6 dB), from $+14^\circ$ to -8° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 7^\circ/-5^\circ$ (upper SLS > 6 dB); $\pm 5^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+3^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	71.5 dBm

Interfaces

Figure 14: AEQN interfaces

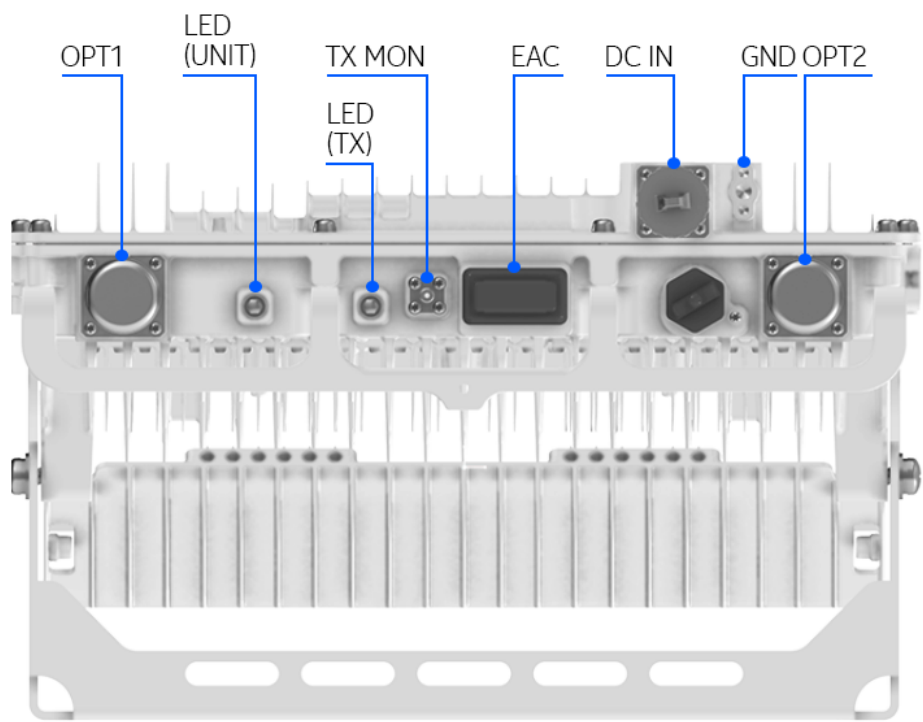


Table 23: AEQN interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole connector	APPB, APPC, 55 A max.
Optical	OPT	2	SFP28	eCPRI: 25 Gbps, R2CT IP seal
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–
External alarm connection	EAC	1	MDR26	EAC
TX monitor	TX MON	1	SMA	–
Operational state visual indication unit and TX status	LED TX/UNIT	2	–	Showing status of a unit and TX/fan

Electrical specifications

Table 24: AEQN 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

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 system characteristics

Note:

Contact Nokia customer team for the latest power draw values.

Related optional items

- FPKA Flexi pole mounting kit (471649A)
- FPKC Flexi pole mounting kit (472821A)
- ACPB AirScale2 fiber connector R2CT (474384A)
- APPB AirScale2 55 A DC plug 3.3–10 mm² 12–8 AWG (474282A)
- APPC AirScale2 55A DC plug 10–16 mm² (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Installation options

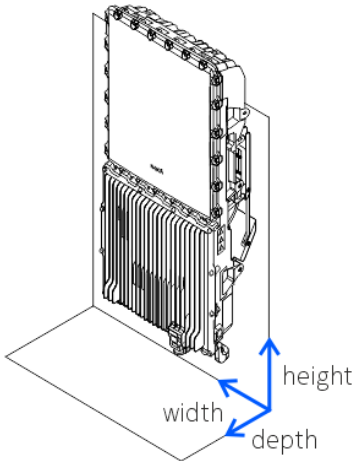
- *Pole*
- *Wall*

Notice:

The radio unit 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 25: AEQN dimensions and weight

Property	Value	Dimensions orientation
Height	700 mm (27.56 in.)	
Width	380 mm (14.96 in.)	
Depth	185 mm (7.28 in.)	
Weight	21.5 kg (47.4 lb)	

Environmental specifications

Table 26: AEQN environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F)
Maximum operational outdoor temperature (in the sun)	50°C (122°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

**WARNING!****Risk of RF exposure.**

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.2 AirScale MAA 32T32R 128 AE B40/n40 240 W eCPRI (AENB)

AENB (475728A) is introduced by *CB006502* (for CPRI), by *CB007408* (for eCPRI in NR only), and by *CB006972* (for LTE-NR concurrent mode and LTE single mode).

Functional description

Table 27: AENB functional specification

Property	Value
Maximum output power	240 W (32 x 7.5 W)
Modulation	1024 QAM (DL) 256 QAM (UL)
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital for multi-user MIMO
Supported technologies	LTE, NR
Concurrent mode	LTE-NR
Duplex mode, supported standard	TDD
Frequency range	B40/n40: 2300-2400 MHz
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	LTE: 80 MHz NR: 100 MHz
MIMO streams	16
Number of carriers per pipe	LTE: up to 4 NR: up to 1
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz LTE: 10, 15, 20 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 28: AENB antenna characteristics

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized), logical 2, 8, 2
Typical antenna gain (defined by BASTA)	22 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$9.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+15^\circ$ to $+1^\circ$ (upper SLS > 6 dB), from $+13^\circ$ to $+3^\circ$ (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 3^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+7.5^\circ \pm 1^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 15 dB (boresight)
Total average EIRP	75.8 dBm

Interfaces

Figure 15: AENB interfaces

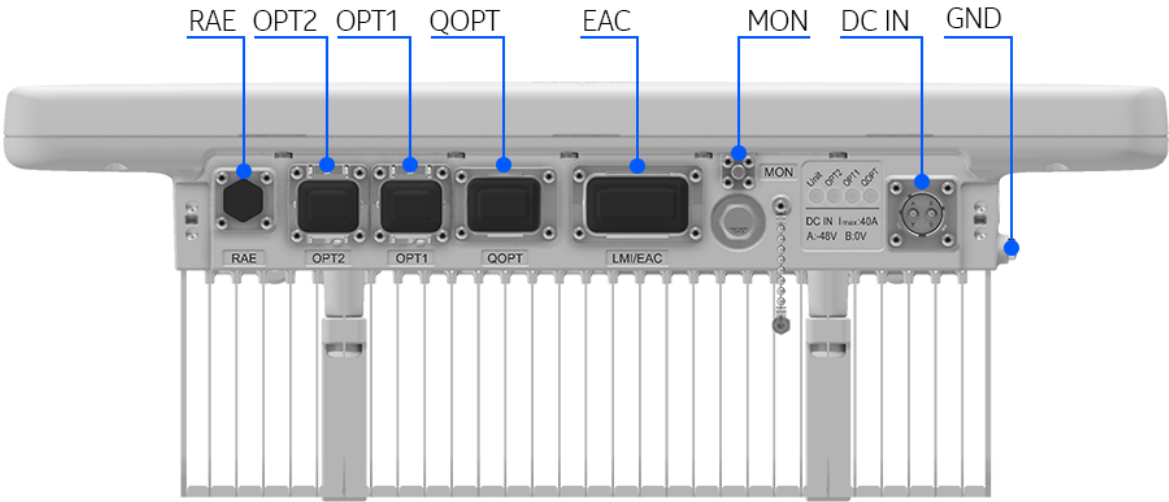


Table 29: AENB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole connector	APPC
Optical	OPT	2	SFP28	CPRI: 9.8 Gbps, 2x R2CT IP seal eCPRI: 10 Gbps or 25 Gbps, NR only

Note:

AENB uses only OPT1 port as the primary port.

LTE mode optical	QOPT	1	QSFP28	LTE mode only
Remote antenna extension	RAE	1	RAE cable assembly, 8-Pin circular	AISG control signal to the antenna line devices, only hardware support
External alarm connection	EAC	1	MDR26	EAC
Monitor	MON	1	SMA	–
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Antenna line device (ALD) support

Table 30: AENB ALD support

Property	Value
AISG	2.0
Voltage	10-30 V
Power per port	-

Electrical specifications

Table 31: AENB 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 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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 32: AENB power draw

Mode	Configuration	Output Power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$	Power draw [W], ETSI 202706 busy hour load $P_{BH, RRH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$
NR	1/1/1 32TR	240	1624	1920	2574

Related optional items

- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- AOPG QSFP weatherproofing boot kit (475791A)
- ASAG plastic IP MDR26-open EAC cable 4A+1C 5 m (475942A)
- AOXA SFP28 1310/1270nm 10km SM E (474906A)
- AOXB SFP28 1270/1310nm 10km SM E (474907A)
- AOXC SFP28 1310/1270nm 30km SM E (474908A)
- AOXD SFP28 1270/1310nm 30km SM E (474909A)
- AOMC SFP28 70 m MM I-temp RS (474900A)
- AOSC SFP28 2 Km SM I-temp RS (474901A)
- AOSD SFP28 10 Km SM E-temp RS (474902A)
- FOCX QSFP+ MPO 4x10 300 m MM (474333A)
- FOCZ QSFP+ 4x10G 10 km SM (474335A)

Installation options

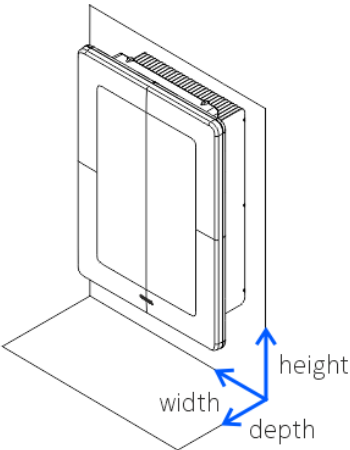
- Pole
- Wall

! Notice:

The unit 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 33: AENB dimensions and weight

Property	Value	Dimensions orientation
Height	730 mm (28.74 in.)	
Width	520 mm (20.47 in.)	
Depth	185 mm (7.28 in.)	
Weight	30 kg (66.1 lb)	

Environmental specifications

i Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 34: AENB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 35: AENB wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	450
Rear	450
Side	168



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.3 AirScale MAA 32T32R 128 AE n38/B38 200 W (AQHB)

AQHB (476120A) is introduced by CB008771 (for NR and LTE) and CB009125 (for LTE–NR concurrent mode).

Functional description

Table 36: AQHB functional specification

Property	Value
Commercial name	Osprey 32
Maximum output power	200 W
Modulation	256 QAM
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital beamforming with 32T32R
Operating mode	Full mode 32T32R
Supported technologies	LTE, NR
RF sharing/concurrent mode	LTE-NR
Duplex mode - supported standard	TDD
Frequency range	B38/n38: 2575–2615 MHz
Instantaneous bandwidth (iBW)	40 MHz
Occupied bandwidth (oBW)	40 MHz
Number of carriers	NR: up to 2 LTE: up to 2
MIMO streams	NR: 16 LTE: 8
Supported bandwidths	NR: 20, 30, 40 MHz LTE: 20 MHz
Passive intermodulation (PIM) cancellation	Yes

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 37: AQHB antenna characteristics

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized), logical 2, 8, 2
Typical antenna gain (defined by BASTA)	23 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$8.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+14^\circ$ to $+0^\circ$ (upper SLS > 6 dB), from $+12^\circ$ to $+2^\circ$ (upper SLS > 10 dB)
Dynamic elevation scanning range	$\pm 3^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+7^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	76 dBm

Interfaces

Figure 16: AQHB interfaces

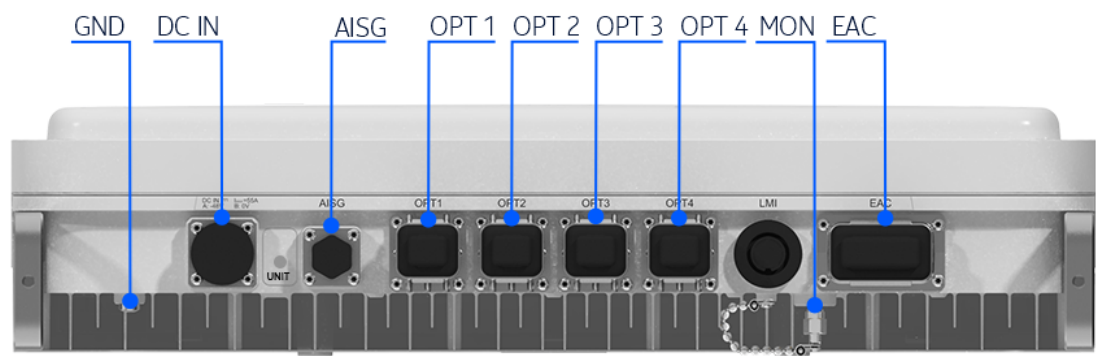


Figure 17: AQHB LED indicators

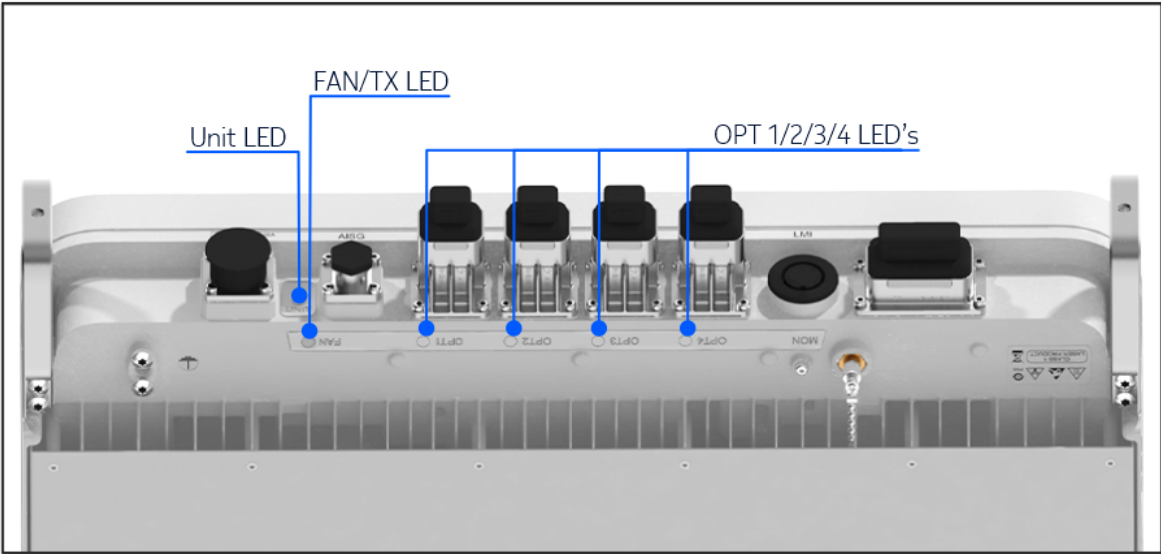


Table 38: AQHB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole circular	APPC
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and so on
Optical	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
External alarm connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
Monitor	MON	1	SMA	–
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LEDs for each optical interfaces	Showing status of the unit and optical interfaces
Grounding	GND 	1	2 x M5 screw 1 x M8 screw	–



Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 39: AQHB ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power per port	Max. 7 W (RMS)

Electrical specifications

Table 40: AQHB 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 V DC
Surge protection	Class II 20 kA
Max current draw (I_{max}) (–36 V)*	55 A

* The I_{max} of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new I_{max} value. Note that the I_{max} given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 41: AQHB power draw

Mode	Configuration	Output Power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH,static}$ (74.3% TX duty cycle)	Power draw [W], 52% RF load $P_{BH,RRH,static}$ (74.3% TX duty cycle)	Power draw [W], 100% RF power load $P_{100\%RRH}$ (74.3% TX duty cycle)
NR	1/1/1 32TR	200	1942	2241	2766

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 42: 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

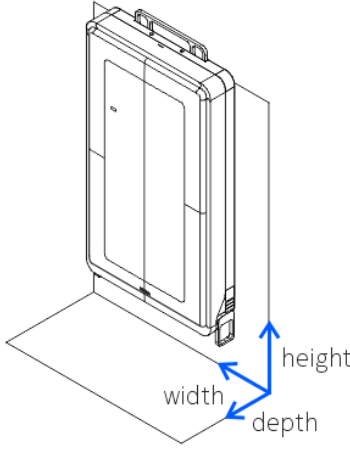
- AASU Antenna Monitoring Module (476423A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30° tilt +90° azimuth (475648A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A)
- AOPC SFP weatherproofing boot kit (475151A)

Installation options

- Pole
- Wall

Dimensions and weight

Table 43: AQHB dimensions and weight

Property	Value	Dimensions orientation
Height	860 mm (33.86 in.) without handles 947 mm (37.28 in.) with handles	
Width	490 mm (19.29 in.)	
Depth	112 mm (4.41 in.)	
Weight	29 kg (63.9 lb)	

Environmental specifications

Note:

There is no need to reduce 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 44: AQHB environmental specifications

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

Table 45: AQHB wind load conditions (EN1991-1-4)

Direction	Wind force F[N]*
Front	560
Rear	560
Side	70

*The wind force is calculated at 150 km/h (42 m/s) (93 mph) wind velocity.



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.4 AirScale MAA 32T32R 128 AE n77 128 W eCPRI (AEQV)

AEQV (475294A) is introduced by 5GC002016 (for NR).

Functional description

Table 46: AEQV functional specification

Property	Value
Maximum output power	128 W (32 x 4 W)
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital, 32T32R, 8x8 antenna array ($\pm 45^\circ$ X-polarized)
Software supported technology	NR
Duplex mode, supported standard	TDD
Frequency range	n77: 3700–4000 MHz (middle part of band)
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	1
MIMO streams	8
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90 (from 5G21B), 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 47: AEQV antenna characteristics

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized), logical 2, 8, 2
Typical antenna gain (defined by BASTA)	23 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$8.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+13^\circ$ to $+1^\circ$ (upper SLS > 6 dB), from $+11^\circ$ to $+1^\circ$ (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 3^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	74 dBm

 Note:

You can reduce Effective Isotropic Radiated Power (EIRP) by up to 20 dB using the *5GC002058: Extended Power Range for AEQV* feature to allow deployment in areas where low EIRP is mandatory.

Interfaces

Figure 18: AEQV interfaces

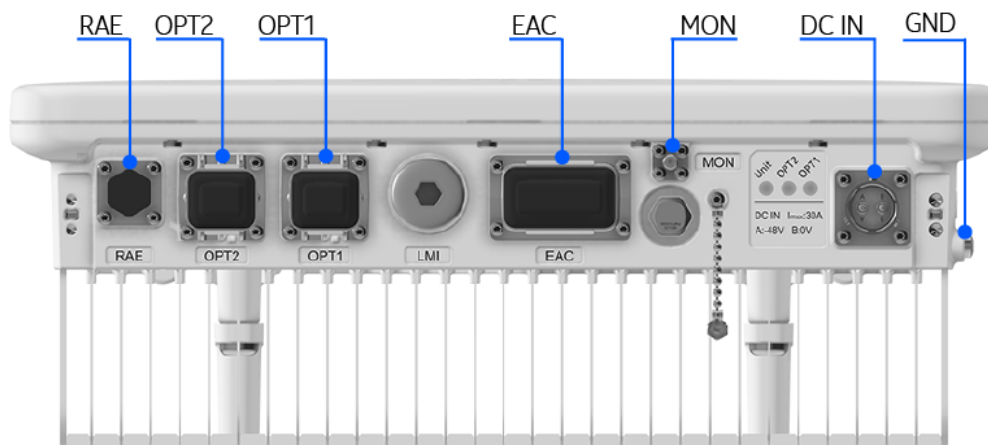


Table 48: AEQV interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole connector	APPB, APPC, max. 55 A
Optical	OPT	2	SFP28	eCPRI: 10 Gbps or 25 Gbps, R2CT IP seal

 **Note:**

AEQV uses only OPT1 port as the primary port.

Remote antenna extension	RAE	1	RAE cable assembly, 8-Pin Circular	AISG control signal to the antenna line devices, only hardware support
External alarm connection	EAC	1	MDR26	EAC
Monitor	MON	1	SMA	–
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Electrical specifications

Table 49: AEQV 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 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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 50: AEQV power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 52% RF load $P_{BH, RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 32TRX	128	1252	1435	1695

Recommended power back-off

The recommended power back-off values are defined as follows. High reduction values may cause radio outages.

Table 51: 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

Related optional items

- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMCA AirScale MAA installation kit (474912A)
- AMCC AirScale MAA installation kit (475127A)
- APPB AirScale 2 55A DC plug 3.3–10 mm² (474282A)
- APPC AirScale2 55A DC plug 10–16 mm² (474283A/474283B)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A)

Installation options

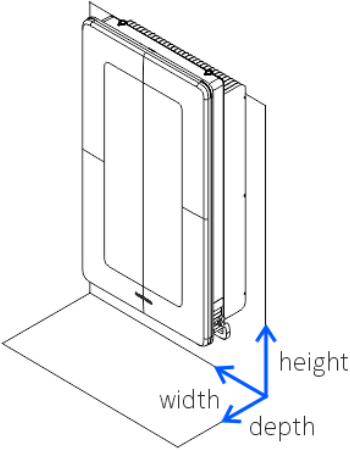
- Pole
- Wall

 Notice:

The radio unit 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 52: AEQV dimensions and weight

Property	Value	Dimensions orientation
Height	730 mm (28.74 in.)	
Width	403 mm (15.87 in.)	
Depth	150 mm (5.91 in.)	
Weight	24.5 kg (54.0 lb)	

Environmental specifications

 Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 53: AEQV environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 54: AEQV wind conditions

Direction	Drag coefficient for the shape C_D	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	1.06	323.4
Rear	1.01	309.1
Side	0.86	98.2

 WARNING!

Risk of RF exposure

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.5 AirScale MAA 32T32R 128 AE n78 128 W eCPRI (AEQY)

AEQY (475538A) is introduced by 5GC002367 (for NR).

Functional description

Table 55: AEQY functional specification

Property	Value
Maximum output power	128 W
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital, 32T32R, 8-column antenna with a total of 128 antenna elements.
Software supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	n78: 3400–3700 MHz (part of 3GPP NR band)
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	2
MIMO streams	8
Supported bandwidths	20, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 56: AEQY antenna characteristics

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized), logical 2, 8, 2
Typical antenna gain (defined by BASTA)	23 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$8.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+13^\circ$ to $+1^\circ$ (upper SLS > 6 dB), from $+11^\circ$ to $+1^\circ$ (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 3^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	74 dBm

Interfaces

Figure 19: AEQY interfaces

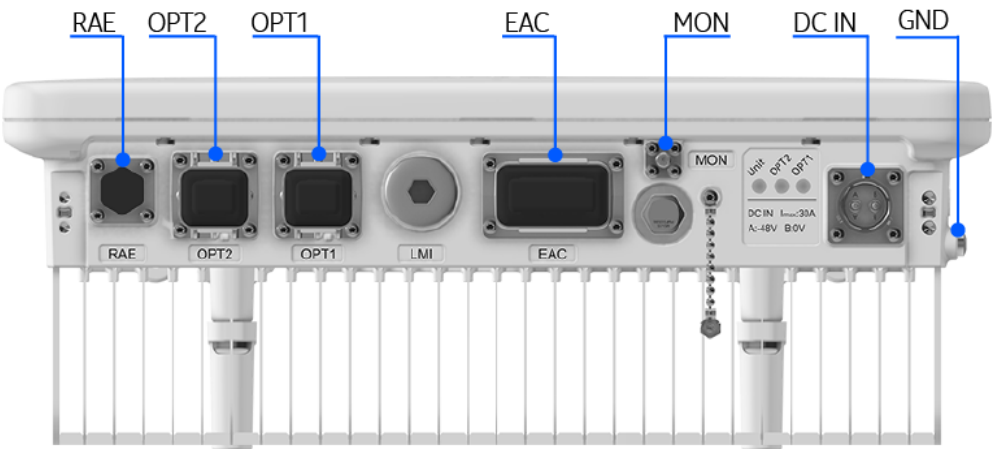


Table 57: AEQY interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole connector	APPC
Optical	OPT	2	SFP28	eCPRI: 10 Gbps or 25 Gbps, Nokia IP seal

 **Note:**
AEQY uses only OPT1 port as the primary port.

Remote antenna extension	RAE	1	RAE cable assembly	AISG control signal to the antenna line devices
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	EAC
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Antenna line device (ALD) support

Table 58: AEQY ALD support

Property	Value
AISG	2.0
Voltage	14 V
Power per port	2 W

Electrical specifications

Table 59: AEQY 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 -60V 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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 60: AEQY power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 52% RF load $P_{BH, RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 32TRX	128	1284	1476	1773

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 61: 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

Related optional items

- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA Bracket 30 tilt +90 azimuth (475648A)
- AMCA AirScale MAA installation kit (474912A)
- AMCC AirScale MAA installation kit (475127A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A)

Installation options

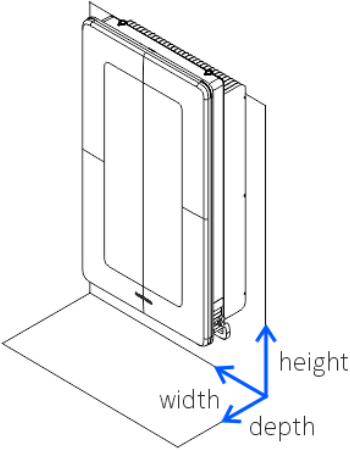
- Pole
- Wall

 Notice:

The radio unit 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 62: AEQY dimensions and weight

Property	Value	Dimensions orientation
Height	730 mm (28.74 in.)	
Width	403 mm (15.87 in.)	
Depth	150 mm (5.91 in.)	
Weight	24.5 kg (54 lb)	

Environmental specifications

 Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 63: AEQY environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 64: AEQY wind load conditions

Direction	Drag coefficient for the shape C_D	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	1.06	323.4
Rear	1.01	309.1
Side	0.86	98.2



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.6 AirScale MAA 32T32R 128 AE n78 240 W (AQQC)

AQQC (475789A) is introduced by *CB006892* (for NR) and by *CB008546* (for additional NR carriers).

Functional description

Table 65: AQQC functional specification

Property	Value
Commercial name	Osprey 32
Maximum output power	240 W
Maximum modulation	256 QAM
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital beamforming with 32T32R
Operating mode	Full mode 32T32R
Supported technologies	NR
Duplex mode - supported standard	TDD
Frequency range	n78: 3410-3800 MHz
Instantaneous bandwidth (iBW)	390 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers	up to 4
MIMO streams	16
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, and 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/5G NR and gNB Supported Configurations* and see:

- *5G NR Supported Configurations*
- *5G NR Supported Configurations - Rules and Examples*

Band n78 antenna specification

Table 66: AQC antenna characteristics

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized), logical (2, 8, 2)
Typical antenna gain (defined by BASTA)	23 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$8.5^\circ \pm 1^\circ$ (boresight)
Envelope elevation beamwidth, HPBW	From $+14^\circ$ to $+1^\circ$ (upper SLS > 6 dB), from $+12^\circ$ to $+3^\circ$ (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 3^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+7.5^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	76.8 dBm

Interfaces

Figure 20: AQQC interfaces

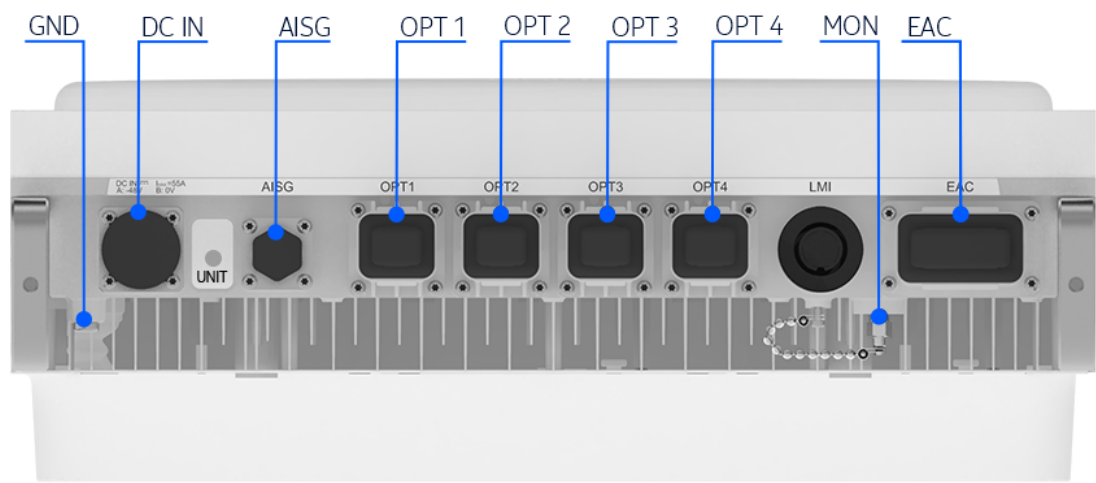


Figure 21: AQQC LED indicators

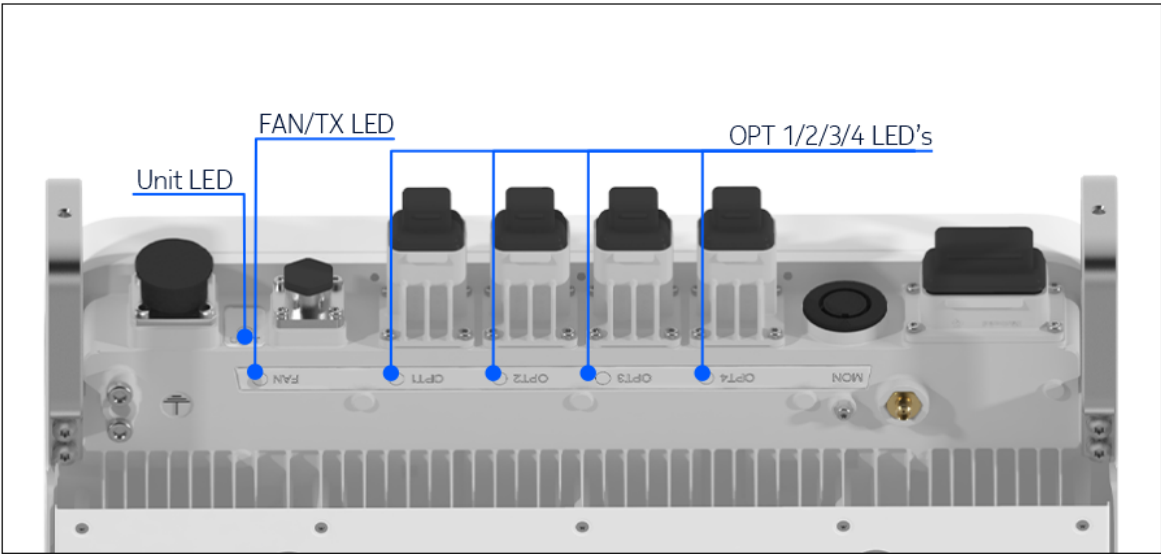


Table 67: AQQC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	2-pole circular	APPC
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and others
Optical interface	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
External Alarm Connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
Monitor	MON	1	SMA	–
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LED for each optical interfaces	Showing status of the unit and optical interfaces
Grounding	GND 	1	2 x M5 screw 1 x M8 screw	–

Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 68: AQQC ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power per port	Max. 7 W (RMS)

Electrical specifications

Table 69: AQQC 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 V DC
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	50 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 70: AQQC power draw

Mode	Configuration	Output Power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$	Power draw [W], ETSI 202706 busy hour load $P_{BH RRH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$
NR	1/1/1 32TR	240	1980	2337	2965

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 71: 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

- AASU Antenna Monitoring Module (476423A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPK up tilting adaptor (475982A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale2 MDR26-open EAC cable 5 m (475570A)
- AOPC SFP weatherproofing boot kit (475151A)

Note:

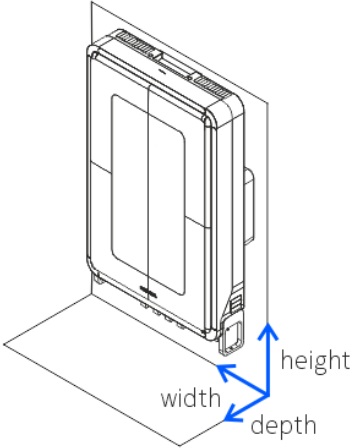
Always use Nokia-approved SFP connectors and cables.

Installation options

- Pole
- Wall

Dimensions and weight

Table 72: AQQC dimensions and weight

Property	Value	Dimensions orientation
Height	607 mm (23.9 in.) without handles 652 mm (25.67 in.) with handles	
Width	395 mm (15.55 in.)	
Depth	95 mm (3.74 in.) 135 mm (5.31 in.) including fan depth	
Weight	17.3 kg (38.1 lb)	

Environmental specifications

Note:

There is no need to reduce 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 73: AQQC environmental specifications

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

Table 74: AQQC wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	329
Rear	329
Side	83



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.7 AirScale MAA 32T32R 128 AE n78 240 W (AQQQ)

AQQQ (475788A) is introduced by CB006756 (for NR).

Functional description

Table 75: AQQQ functional specification

Property	Value
Commercial name	Osprey 32
Maximum output power	240 W
Maximum modulation	256 QAM
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital beamforming with 32T32R
Operating mode	Full mode 32T32R
Supported technologies	NR
Duplex mode - supported standard	TDD
Frequency range	n78: 3420–3800 MHz
Instantaneous bandwidth (iBW)	380 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers	up to 2
MIMO streams	16
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, and 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Band n78 antenna specification

Table 76: AQQQ antenna characteristics

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized), logical (2, 8, 2)
Typical antenna gain (defined by BASTA)	23 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$8.5^\circ \pm 1^\circ$ (boresight)
Envelope elevation beamwidth, HPBW	From $+14^\circ$ to $+1^\circ$ (upper SLS > 6 dB), from $+12^\circ$ to $+3^\circ$ (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 3^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+7.5^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	76.8 dBm

Interfaces

Figure 22: AQQQ interfaces

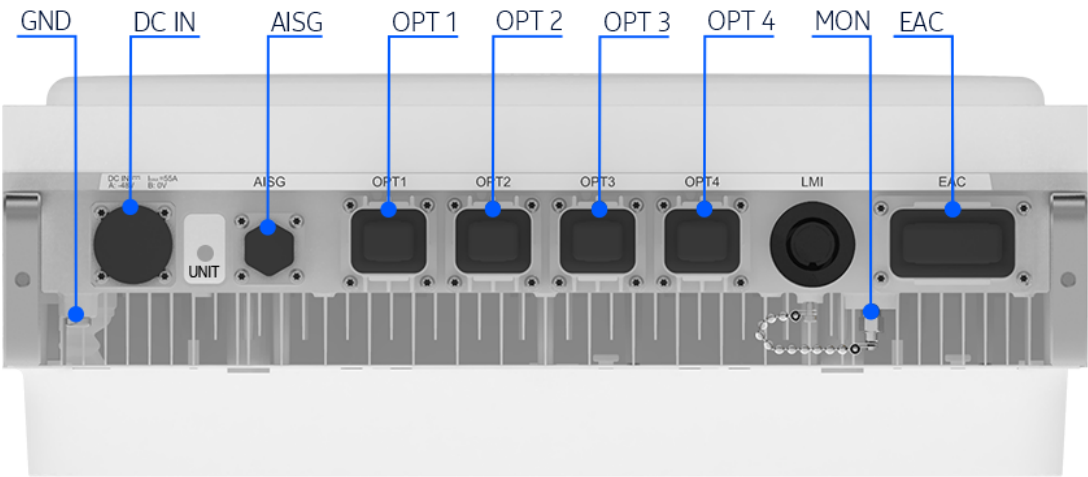


Figure 23: AQQQ LED indicators

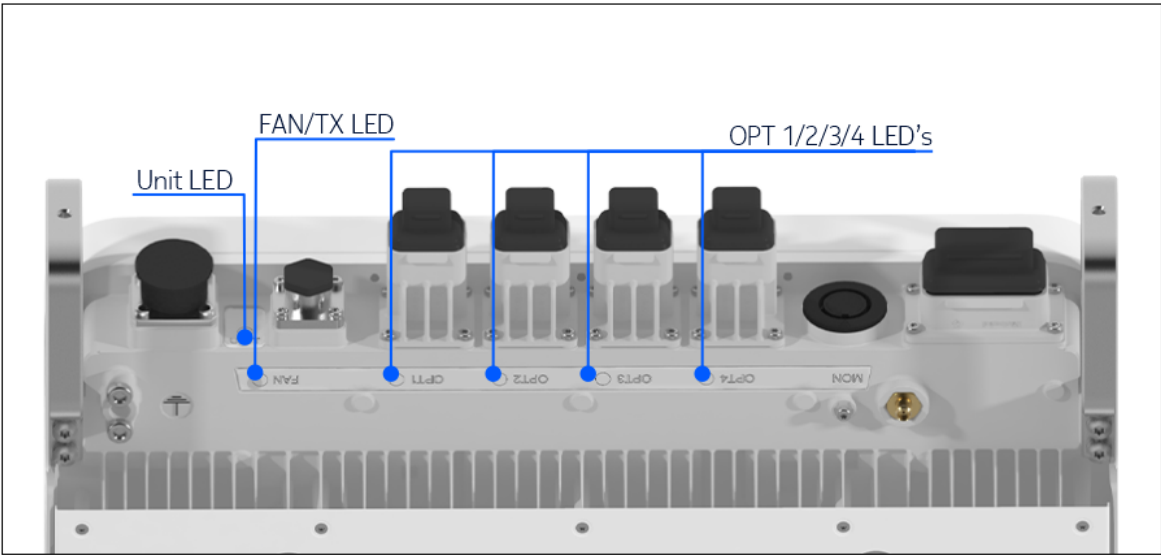


Table 77: AQQQ interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	2-pole circular	APPC
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T or others
Optical interface	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
External Alarm Connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
Monitor	MON	1	SMA	–
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LED for each optical interfaces	Showing status of the unit and optical interfaces
Grounding	GND 	1	2 x M5 screw 1 x M8 screw	–

Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 78: AQQQ ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power per port	Max. 7 W (RMS)

Electrical specifications

Table 79: AQQQ 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 V DC
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	50 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 80: AQQQ power draw

Mode	Configuration	Output Power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$	Power draw [W], ETSI 202706 busy hour load $P_{BH,RRH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$
NR	1/1/1 32TR	240	2029	2382	3072

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 81: The recommended **NRCCELL** 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

Note:

Always use Nokia-approved SFP connectors and cables.

- AASU Antenna Monitoring Module (476423A)
- AMMA Airscale IPAA AQQx slide-in frame C (476260A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPK up tilting adaptor (475982A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale2 MDR26-open EAC cable 5 m (475570A)
- AOPC SFP weatherproofing boot kit (475151A)

Note:

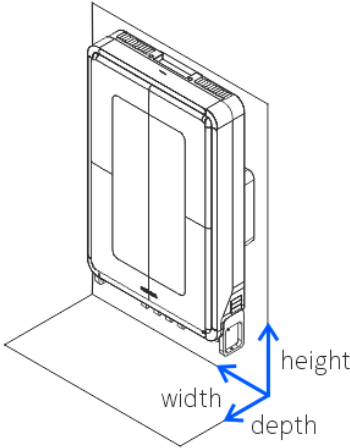
For compatible Platform Antennas (PFA) see *Installing and cabling AirScale IPAA+ - variants and installation options*.

Installation options

- Pole
- Wall
- IPAA+

Dimensions and weight

Table 82: AQQQ dimensions and weight

Property	Value	Dimensions orientation
Height	607 mm (23.9 in.) without handles 651 mm (25.63 in.) with handles	
Width	395 mm (15.55 in.)	
Depth	95 mm (3.74 in.) 135 mm (5.31 in.) including fan depth	
Weight	17.3 kg (38.1 lb)	

Environmental specifications

Note:

There is no need to reduce 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 83: AQQQ environmental specifications

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

Table 84: AQQQ wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	329
Rear	329
Side	83



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.8 AirScale MAA 32T32R 128 AE n78 240 W (AQQY)

AQQY (475573A) is introduced by 5GC002433 (for NR), CB009125 (for LTE and LTE–NR concurrent mode), CB009217 (for additional LTE carriers), and CB008546 (for additional NR carriers). Transmission mode (TM9) isn't supported by the CB009217 feature.

Functional description

Table 85: AQQY functional specification

Property	Value
Commercial name	Osprey 32
Maximum output power	240 W
Modulation	256 QAM
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital beamforming with 32T32R
Operating mode	Full mode 32T32R
Supported technologies	LTE, NR
RF sharing/concurrent mode	LTE-NR
Duplex mode - supported standard	TDD
Frequency range	n78: 3400-3800 MHz
Instantaneous bandwidth (iBW)	400 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers	NR: up to 4 LTE: up to 4
MIMO streams	16
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90, and 100 MHz LTE: 15, 20 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/5G NR and gNB Supported Configurations* and see:

- *5G NR Supported Configurations*
- *5G NR Supported Configurations - Rules and Examples*

Band n78 antenna specification

Table 86: AQY antenna characteristics

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized), logical (2, 8, 2)
Typical antenna gain (defined by BASTA)	23 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$8.5^\circ \pm 1^\circ$ (boresight)
Envelope elevation beamwidth, HPBW	From $+14^\circ$ to $+1^\circ$ (upper SLS > 6 dB), from $+12^\circ$ to $+3^\circ$ (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 3^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+7.5^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	76.8 dBm

Interfaces

Figure 24: AQY interfaces

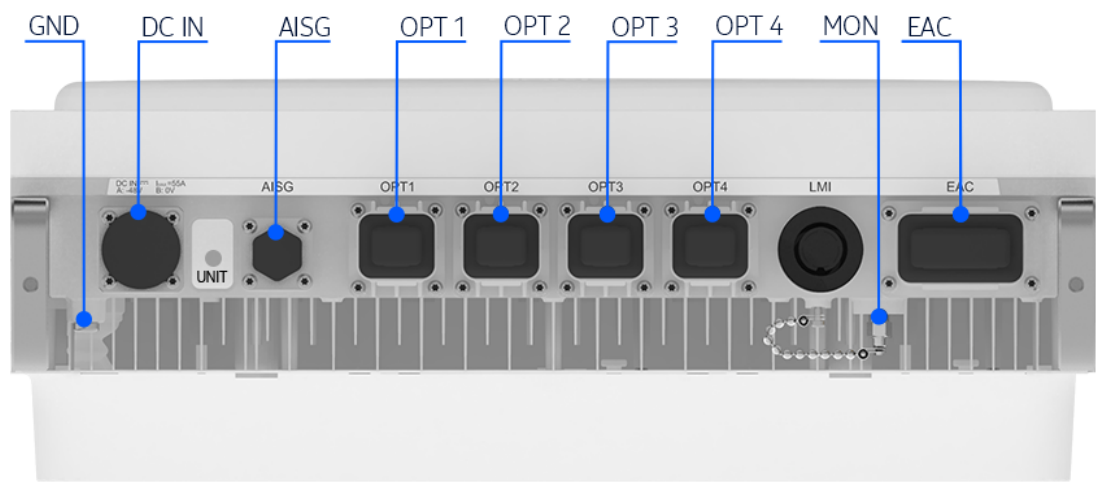


Figure 25: AQY LED indicators

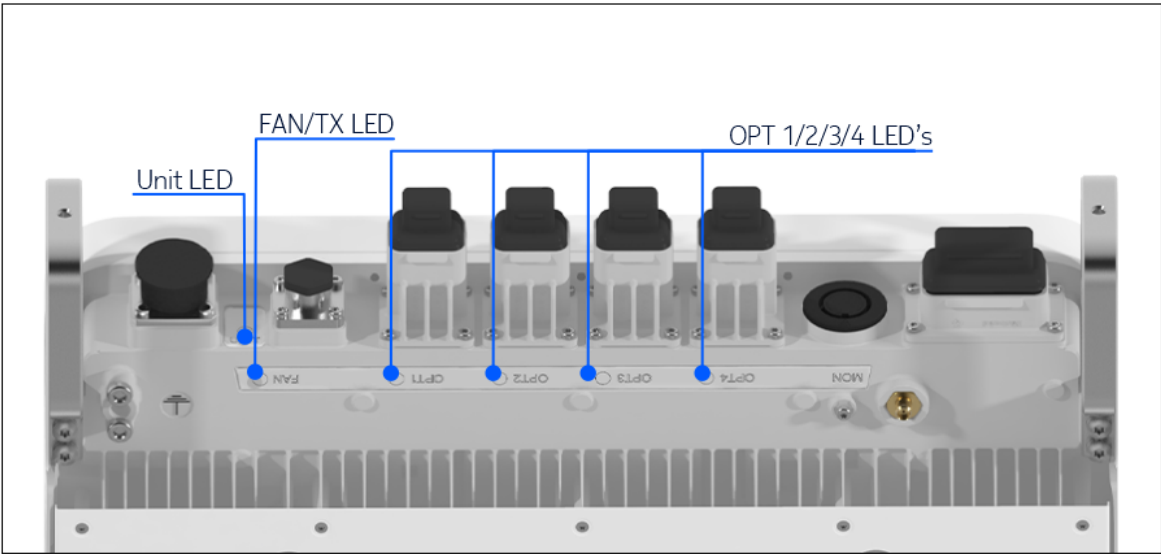


Table 87: AQQY interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	2-pole circular	APPC
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and others
Optical interface	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
External Alarm Connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
Monitor	MON	1	SMA	–
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LED for each optical interfaces	Showing status of the unit and optical interfaces
Grounding	GND 	1	2 x M5 screw 1 x M8 screw	–

Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 88: AQQY ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power per port	Max. 7 W (RMS)

Electrical specifications

Table 89: AQQY 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 V DC
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	50 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 90: AQQY power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load P_{RRH} , static (74.3% TX duty cycle)	Power draw [W], ETSI 202706 busy hour load $P_{BH, RRH}$, static	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 32TRX	240	1933	2387	2837

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 91: 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

Note:

Always use Nokia-approved SFP connectors and cables.

- AASU Antenna Monitoring Module (476423A)
- AMMA Airscale IPAA AQQx slide-in frame C (476260A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPK up tilting adaptor (475982A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale2 MDR26-open EAC cable 5 m (475570A)
- AOPC SFP weatherproofing boot kit (475151A)

Note:

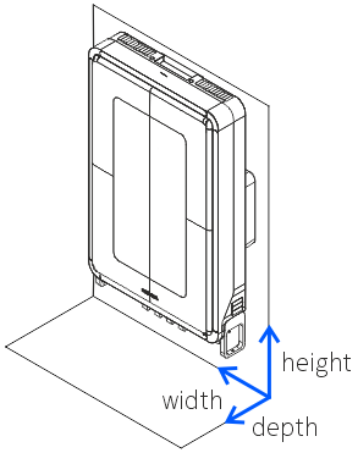
For compatible Platform Antennas (PFA) see *Installing and cabling AirScale IPAA+ - variants and installation options*.

Installation options

- Pole
- Wall
- IPAA+

Dimensions and weight

Table 92: AQQY dimensions and weight

Property	Value	Dimensions orientation
Height	607 mm (23.9 in.) without handles 651 mm (25.63 in.) with handles	
Width	395 mm (15.55 in.)	
Depth	95 mm (3.74 in.) 135 mm (5.31 in.) including fan depth	
Weight	17 kg (37.5 lb)	

Environmental specifications

Note:

There is no need to reduce 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 93: AQQY environmental specifications

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

Table 94: AQQY wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	329
Rear	329
Side	83



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.9 AirScale MAA 32T32R 192 AE n41 320 W (AQHA)

AQHA (475696A) is introduced by CB005822 (for NR) and by CB009125 (for LTE-NR concurrent mode and LTE single mode).

Functional description

Table 95: AQHA functional specification

Property	Value
Commercial name	Osprey 32
Maximum output power	320 W
Modulation	256 QAM
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital beamforming with 32T32R
Operating mode	Full mode 32T32R
Supported technologies	LTE, NR
RF sharing/concurrent mode	LTE-NR
Duplex mode - supported standard	TDD
Frequency range	n41: 2515-2675 MHz
Instantaneous bandwidth (iBW)	160 MHz
Occupied bandwidth (oBW)	160 MHz
Number of carriers	NR: up to 2 LTE: up to 2
MIMO streams	NR: 16 LTE: 8
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 90, 100 MHz LTE: 20 MHz
Passive intermodulation (PIM) cancellation	Yes

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 96: AQHA antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 2, 8, 2
Typical antenna gain (defined by BASTA)	23.7 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$15^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB), $\pm 60^\circ$ (4.5 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$7^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+13.5^\circ$ to $+0.5^\circ$ (upper SLS > 6 dB), from $+11.5^\circ$ to $+2.5^\circ$ (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 5^\circ$ (upper SLS > 0 dB); $\pm 3^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+7^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	78.75 dBm

Interfaces

Figure 26: AQHA interfaces

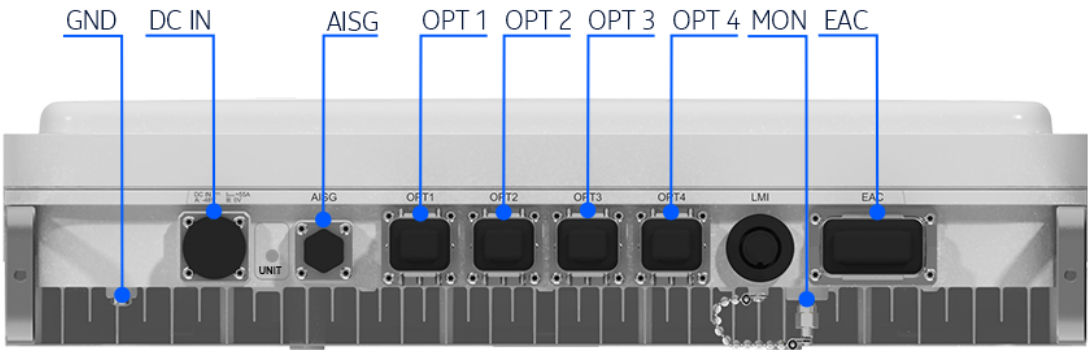


Figure 27: AQHA LED indicators

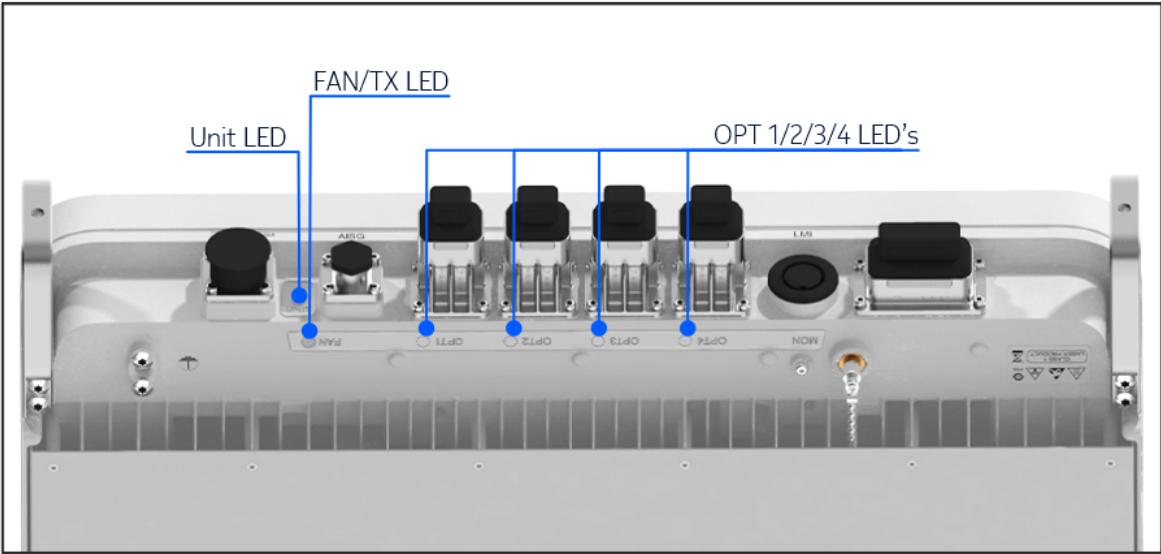


Table 97: AQHA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole circular	APPC
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and others
Optical	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
External alarm connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
Monitor	MON	1	SMA	–
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LED for each optical interfaces	Showing status of the unit and optical interfaces
Grounding	GND 	1	2 x M5 screw 1 x M8 screw	–

Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 98: AQHA ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power per port	Max. 7 W (RMS)

Electrical specifications

Table 99: AQHA 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 V DC
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	55 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Note:

AQHA power draw will be provided in future releases of this document. Contact Nokia customer team for the latest power draw values.

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 100: 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

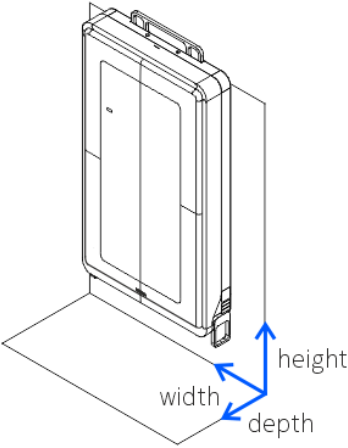
- AASU Antenna Monitoring Module (476423A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale2 MDR26-open EAC cable 5 m (475570A)
- AOPC SFP weatherproofing boot kit (475151A)

Installation options

- Pole
- Wall

Dimensions and weight

Table 101: AQHA dimensions and weight

Property	Value	Dimensions orientation
Height	860 mm (33.86 in.) without handles 947 mm (37.28 in.) with handles	
Width	490 mm (19.29 in.)	
Depth	112 mm (4.41 in.)	
Weight	26 kg (57.3 lb)	

Environmental specifications

Note:

There is no need to reduce 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 102: AQHA environmental specifications

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

Table 103: AQHA wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	560
Rear	560
Side	70



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.10 AirScale MAA 32T32R 192 AE n41 320 W (AQHC)

AQHC (476108A) is introduced by *CB008784* (for NR), *CB007499* (LTE single mode), *CB009125* (LTE-NR concurrent mode), and *CB009217* (for additional LTE carriers). Transmission mode 9 (TM9) isn't supported by the *CB007499* and *CB009125* features.

Functional description

Table 104: AQHC functional specification

Property	Value
Commercial name	Osprey 32
Maximum output power	320 W
Modulation	256 QAM
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital beamforming with 32T32R
Operating mode	Full mode 32T32R
Supported technologies	LTE, NR
RF sharing/concurrent mode	LTE-NR
Duplex mode - supported standard	TDD
Frequency range	n41: 2496-2690 MHz
Instantaneous bandwidth (iBW)	194 MHz
Occupied bandwidth (oBW)	190 MHz
Number of carriers	NR: up to 2 LTE: up to 4
MIMO streams	16
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90 and 100 MHz LTE: 15, 20 MHz
Passive intermodulation (PIM) cancellation	Yes

i Note:

AQHC is available for selected configurations. For more information, contact Nokia support team.

i Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 105: AQHC antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 2, 8, 2
Typical antenna gain (defined by BASTA)	23.7 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$15^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$7^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+13.5^\circ$ to $+0.5^\circ$ (upper SLS > 6 dB), from $+11.5^\circ$ to $+2.5^\circ$ (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 5^\circ$ (upper SLS > 0 dB); $\pm 3^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+7^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	78.75 dBm

Interfaces

Figure 28: AQHC interfaces

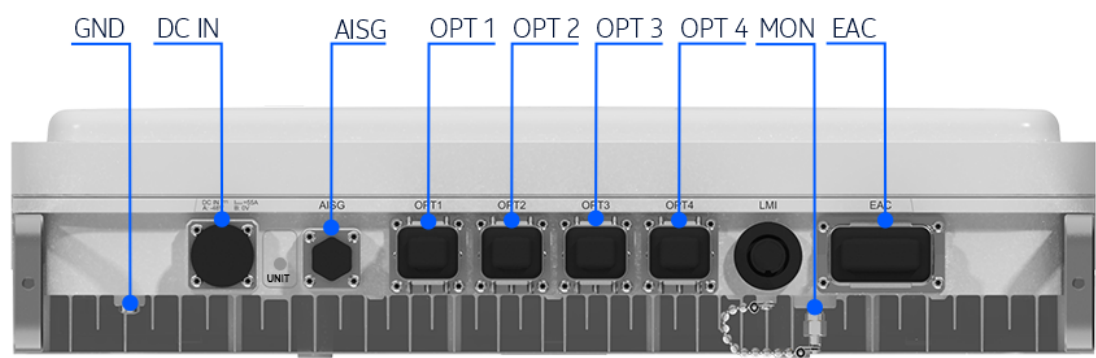


Figure 29: AQHC LED indicators

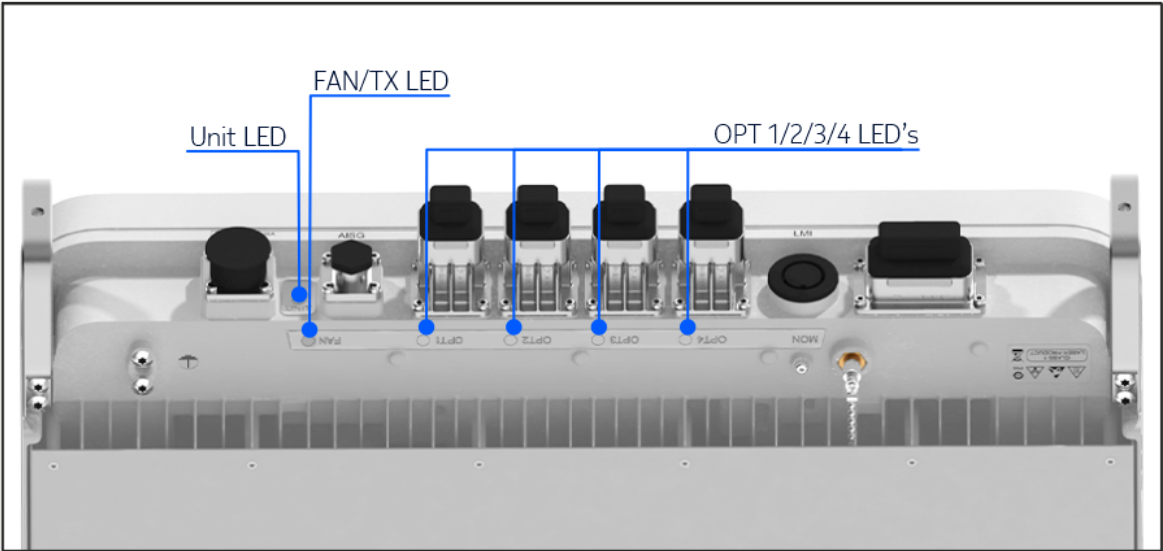


Table 106: AQHC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole circular	APPC
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and others
Optical	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
External alarm connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
Monitor	MON	1	SMA	–
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LED for each optical interfaces	Showing status of the unit and optical interfaces
Grounding	GND 	1	2 x M5 screw 1 x M8 screw	–

Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 107: AQHC ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power per port	Max. 7 W (RMS)

Electrical specifications

Table 108: AQHC 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 V DC
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	55 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 109: AQHC power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], ETSI 202706 busy hour load $P_{BH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 32TRX	230	2103	2448	3150

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 110: 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

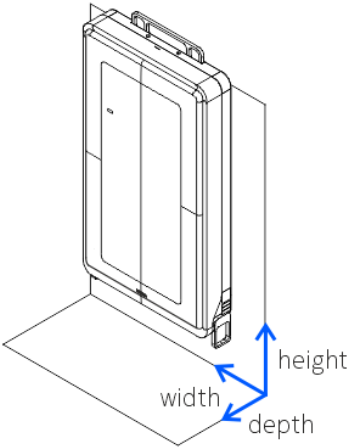
- AASU Antenna Monitoring Module (476423A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale2 MDR26-open EAC cable 5 m (475570A)
- AOPC SFP weatherproofing boot kit (475151A)

Installation options

- Pole
- Wall

Dimensions and weight

Table 111: AQHC dimensions and weight

Property	Value	Dimensions orientation
Height	860 mm (33.86 in.) without handles 947 mm (37.28 in.) with handles	
Width	490 mm (19.29 in.)	
Depth	112 mm (4.41 in.)	
Weight	26 kg (57.3 lb)	

Environmental specifications

Note:

There is no need to reduce 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 112: AQHC environmental specifications

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

Table 113: AQHC wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	560
Rear	560
Side	70



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.11 AirScale MAA 32T32R 192 AE n78 200 W (AQQF)

AQQF (475922A) is introduced by CB008194 (for NR).

Functional description

Table 114: AQQF functional specification

Property	Value
Commercial name	Osprey 32
Maximum output power	200 W
Modulation	256 QAM
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital beamforming with 32T32R
Operating mode	Full mode 32T32R
Supported technologies	NR
Duplex mode - supported standard	TDD
Frequency range	n78: 3300–3670 MHz
Instantaneous bandwidth (iBW)	300 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers	Up to 2
MIMO streams	16
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 115: AQQF antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical (2, 8, 2)
Typical antenna gain (defined by BASTA)	24 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$ (boresight)
Envelope elevation beamwidth, HPBW	From $+12^\circ$ to $+2^\circ$ (upper SLS > 6 dB), from $+11^\circ$ to $+3^\circ$ (upper SLS > 10 dB)
Dynamic elevation scanning range	$\pm 2^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+7^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	77 dBm

Interfaces

Figure 30: AQQF interfaces

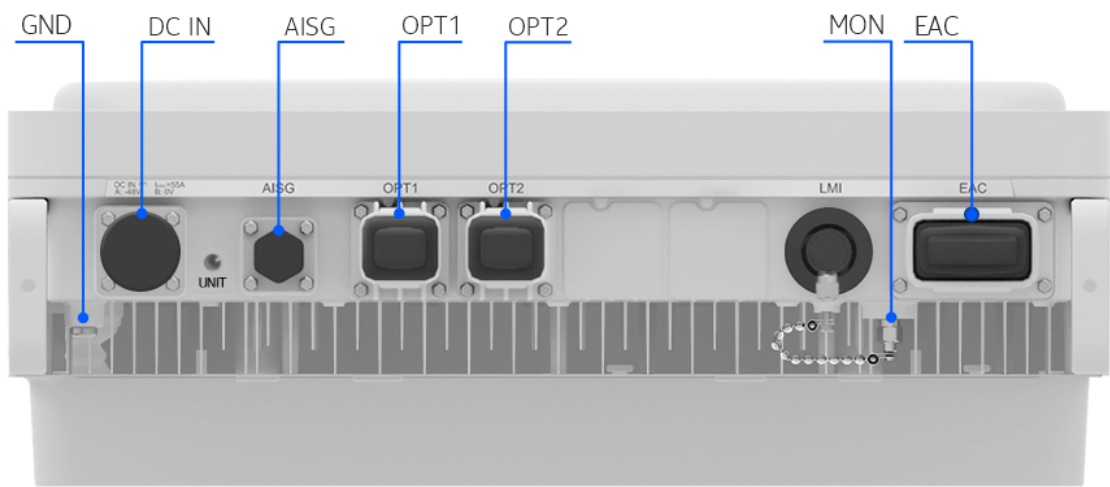


Figure 31: AQQF LED indicators

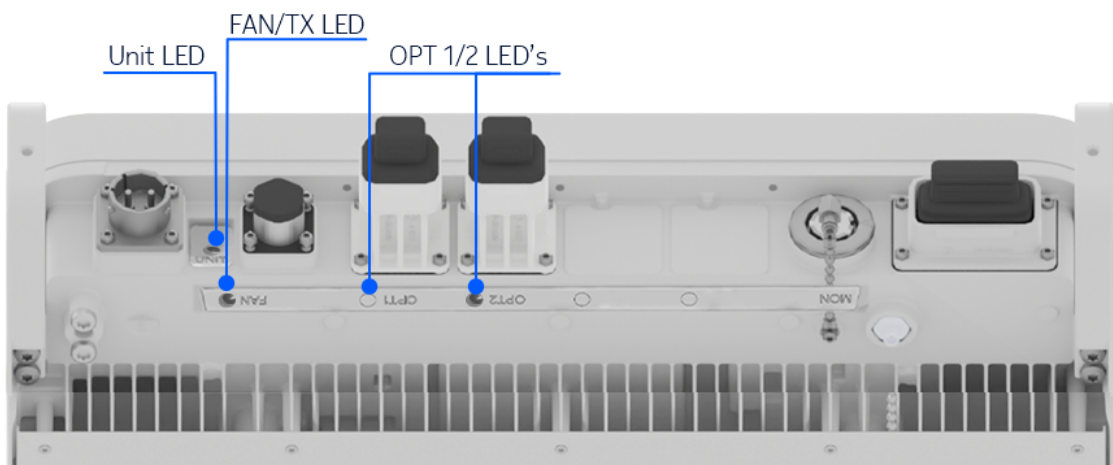


Table 116: AQQF interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole circular	APPC
Antenna Interface Standard Groups	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T
Optical	OPT	2	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
External alarm connection	EAC	1	MDR26	–
Monitor	MON	1	SMA	–
LED	• UNIT • FAN_TX • OPT1 • OPT2	4	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan and RF-transmission state • Two tri-color LEDs for each optical interfaces	LEDs show the status of the unit and its optical interfaces.
Grounding	GND 	1	2 x M5 screw or 1 x M8 screw	–

Antenna line device (ALD) support

Table 117: AQQF ALD support

Property	Value
AISG	Version 2.0
Voltage	10-30 V
Power per port	Max. 7 W (RMS)

Electrical specifications

Table 118: AQQF 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 V DC
Surge protection	Class II 20 kA
Max current draw (I_{max}) (-36 V)*	45 A

* The I_{max} of the RU is given at an operating voltage of -36 V. For higher input voltages, you need to calculate a new I_{max} value. Note that the I_{max} given in the table might not be reached in actual use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 119: AQQF power draw

Mode	Configuration	Output Power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH,static}$ (74.3% TX duty cycle)	Power draw [W], 52% RF load $P_{BH,RRH,static}$ (74.3% TX duty cycle)	Power draw [W], 100% RF power load $P_{100\%RRH}$ (74.3% TX duty cycle)
NR	1/1/1 32TRX	200	1472	1763	2215

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 120: 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

i Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

i Note:

Always use Nokia-approved SFP connectors and cables.

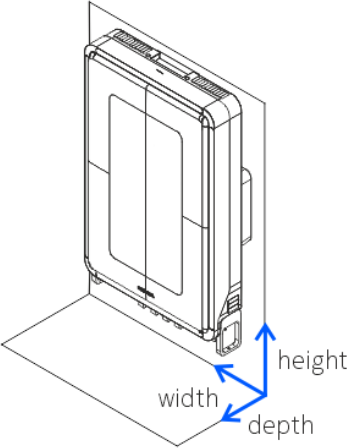
- AASU Antenna Monitoring Module (476423A)
- AMPF AirScale mounting bracket (475188A)
- AMPL AirScale mounting bracket (476272A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPK up tilting adaptor (475982A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale2 MDR26-open EAC cable 5 m (475570A)
- AOPC SFP weatherproofing boot kit (475151A)

Installation options

- *Pole*
- *Wall*

Dimensions and weight

Table 121: AQQF dimensions and weight

Property	Value	Dimensions orientation
Height	707 mm (27.83 in.) 752 mm (29.61 in.) with handles	
Width	395 mm (15.55 in.)	
Depth	106 mm (4.17 in.) 146 mm (5.75 in.) with fan	
Weight	19 kg (41.9 lb) with handles	

Environmental specifications

Note:

There is no need to reduce 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 122: AQQF environmental specifications

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

Table 123: AQQF wind load conditions (EN1991-1-4)

Direction	Wind force F [N]*
Front	389
Rear	389
Side	113

*The wind force is calculated at 150 km/h (42 m/s) (93 mph) wind velocity.



WARNING!

Risk of RF exposure.

To prevent RF exposure, place an RF absorber or blanket in front of the radome surface or keep the distance specified in the RF exposure requirements. For MAA-specific RF exposure requirements, see the respective installation document.

6.1.12 AirScale MAA 32T32R 192 AE n78 200 W eCPRI (AEQC)

AEQC (475431A) is introduced by 5GC001636 (for NR).

Functional description

Table 124: AEQC functional specification

Property	Value
Maximum output power	200 W
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital, 32T32R, 8-column antenna with a total of 192 antenna elements
Operating mode	Full mode 32T32R
Software supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	n78: 3410–3800 MHz
Instantaneous bandwidth (iBW)	300 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	2
MIMO streams	8
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*



Note:

Commissioning the vertical electrical tilt (VET) is mandatory to enable the tilt function on the AEQC Massive MIMO Adaptive Antenna.

Antenna specification

Table 125: AEQC antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 2, 8, 2
Typical antenna gain (defined by BASTA)	24 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+11^\circ$ to $+1^\circ$ (upper SLS > 6 dB), from $+10^\circ$ to $+2^\circ$ (upper SLS > 10 dB)
Envelope elevation beamwidth, HPBW with VET	From $+15^\circ$ to -3° (upper SLS > 6 dB), from $+14^\circ$ to -2° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 2^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Elevation scanning range with VET	$\pm 6^\circ$ (upper SLS > 6 dB); $\pm 5^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ \pm 1^\circ$
Electrical Downtilt Angle (VET)	$\pm 5^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 20 dB (boresight)
Total average EIRP	77 dBm

Interfaces

Figure 32: AEQC interfaces

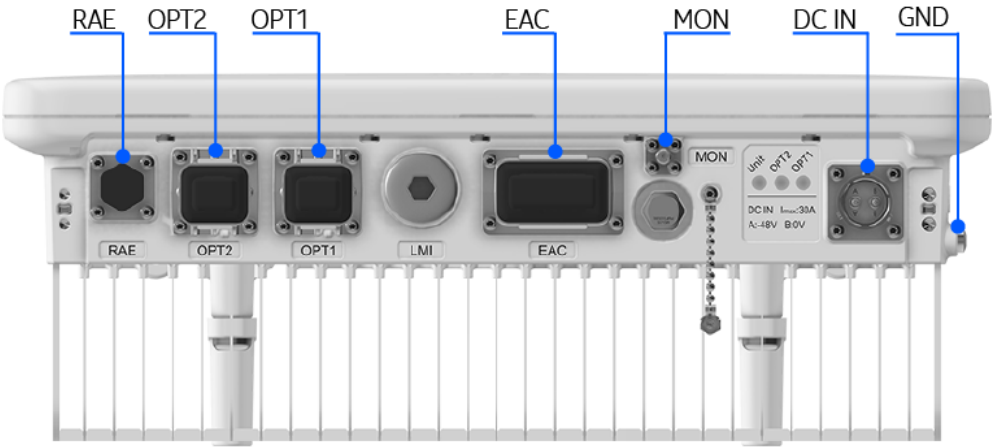


Table 126: AEQC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole connector	APPB, APPC
Optical	OPT	2	SFP28	eCPRI: 10 Gbps or 25 Gbps, Nokia IP seal

 **Note:**
AEQC uses only OPT1 port as the primary port.

Remote antenna extension	RAE	1	RAE cable assembly	AISG control signal to the antenna line devices
External alarm connection	EAC	1	MDR26	–
Monitor	MON	1	SMA	–
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Antenna line device (ALD) support

Table 127: AEQC ALD support

Property	Value
AISG	2.0
Voltage	14 V
Power per port	2 W

Electrical specifications

Table 128: AEQC electrical specifications

Property	Value
Nominal supply voltage	-48 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
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 system characteristics

Note:

Contact Nokia customer team for the latest power draw values.

Recommended power back-off

The recommended power back-off values are defined as follows. High reduction values may cause radio outages.

Table 129: 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

Related optional items

- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMCA AirScale MAA installation kit (474912A)
- AMCC AirScale MAA installation kit (475127A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A)

Installation options

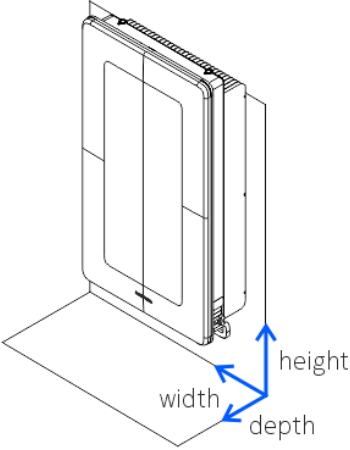
- Pole
- Wall

 Notice:

The radio unit 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 130: AEQC dimensions and weight

Property	Value	Dimensions orientation
Height	730 mm (28.74 in.)	
Width	403 mm (15.87 in.)	
Depth	185 mm (7.28 in.)	
Weight	30.0 kg (66.1 lb)	

Environmental specifications

Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 131: AEQC environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 132: AEQC wind load conditions

Direction	Drag coefficient for the shape C_D	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	1.14	347
Rear	1.14	347
Side	1.2	166



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.13 AirScale MAA 32T32R 192 AE n78 200 W eCPRI (AEQQ)

AEQQ (475252A) is introduced by 5GC001635 (for NR).

Functional description

Table 133: AEQQ functional specification

Property	Value
Maximum output power	200 W
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital, 32T32R, 8-column antenna with a total of 192 antenna elements
Operating mode	Full mode 32T32R
Software supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	n78: 3420–3800 MHz
Instantaneous bandwidth (iBW)	300 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	2
MIMO streams	8
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Note:

Commissioning the vertical electrical tilt (VET) is mandatory to enable the tilt function on the AEQQ Massive MIMO Adaptive Antenna.

Antenna specification

Table 134: AEQQ antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 2, 8, 2
Typical antenna gain (defined by BASTA)	24 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+11^\circ$ to $+1^\circ$ (upper SLS > 6 dB), $+10^\circ$ to $+2^\circ$ (upper SLS > 10 dB)
Envelope elevation beamwidth, HPBW with VET	From $+15^\circ$ to -3° (upper SLS > 6 dB), $+14^\circ$ to -2° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 2^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Elevation scanning range with VET	$\pm 6^\circ$ (upper SLS > 6 dB); $\pm 5^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ \pm 1^\circ$
Electrical Downtilt Angle (VET)	$\pm 5^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 20 dB (boresight)
Total average EIRP	77 dBm

Interfaces

Figure 33: AEQQ interfaces

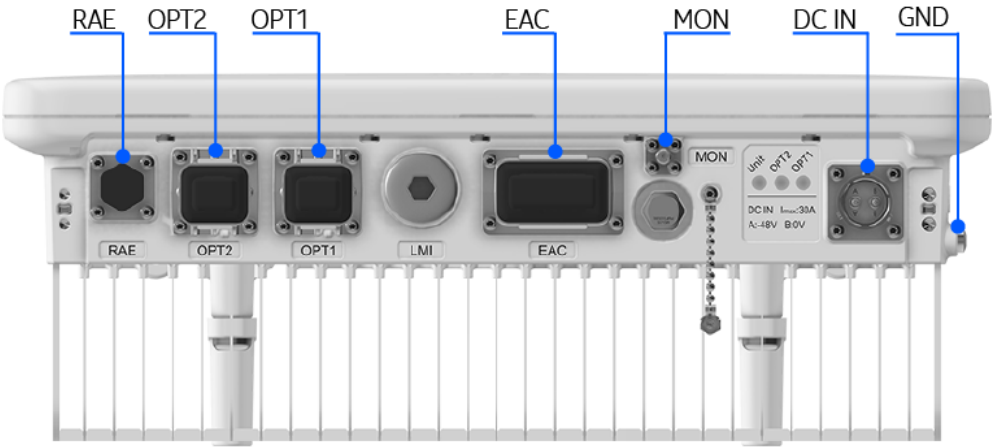


Table 135: AEQQ interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole connector	APPB, APPC
Optical	OPT	2	SFP28	eCPRI: 10 Gbps or 25 Gbps, Nokia IP seal

 **Note:**
AEQQ uses only OPT1 port as the primary port.

Remote antenna extension	RAE	1	RAE cable assembly	AISG control signal to the antenna line devices
External alarm connection	EAC	1	MDR26	EAC
Monitor	MON	1	SMA	–
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Antenna line device (ALD) support

Table 136: AEQQ ALD support

Property	Value
AISG	2.0
Voltage	14 V
Power per port	2 W

Electrical specifications

Table 137: AEQQ electrical specifications

Property	Value
Nominal supply voltage	-48 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
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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 138: AEQQ power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load P_{RRH} , static (74.3% TX duty cycle)	Power draw [W], 52% RF load $P_{BH\ RRH}$, static (74.3% TX duty cycle)	Power draw [W], 100% RF power load $P_{100\% \ RRH}$ (74.3% TX duty cycle)
NR	1/1/1 32TRX	200	1464	1740	2111

Recommended power back-off

The recommended power back-off values are defined as follows. High reduction values may cause radio outages.

Table 139: 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

Related optional items

- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMCA AirScale MAA installation kit (474912A)
- AMCC AirScale MAA installation kit (475127A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)

Installation options

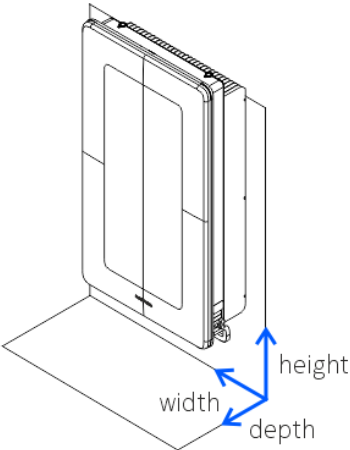
- Pole
- Wall
- IPAA

 Notice:

The radio unit 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 140: AEQQ dimensions and weight

Property	Value	Dimensions orientation
Height	730 mm (28.74 in.)	
Width	403 mm (15.87 in.)	
Depth	185 mm (7.28 in.)	
Weight	30.0 kg (66.1 lb)	

Environmental specifications

 Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 141: AEQQ environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 142: AEQQ wind load conditions

Direction	Drag coefficient for the shape C_D	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	1.14	347
Rear	1.14	347
Side	1.2	166



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.14 AirScale MAA 32T32R 192 AE n78 200 W (AEQW)

AEQW (476277A) is introduced by CB009321 (for NR).

Functional description

Table 143: AEQW functional specification

Property	Value
Maximum output power	200 W
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital, 32T32R, 8-column antenna with a total of 192 antenna elements
Operating mode	Full mode 32T32R
Supported technologies	NR
Duplex mode - supported standard	TDD
Frequency range	n78: 3300-3670 MHz
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers	2
MIMO streams	Up to 8 (DL) Up to 4 (UL)
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 144: AEQW antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 2, 8, 2
Typical antenna gain (defined by BASTA)	24 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+11^\circ$ to $+1^\circ$ (upper SLS > 6 dB), from $+10^\circ$ to $+2^\circ$ (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 2^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 20 dB (boresight)
Total average EIRP	77 dBm

Interfaces

Figure 34: AEQW interfaces

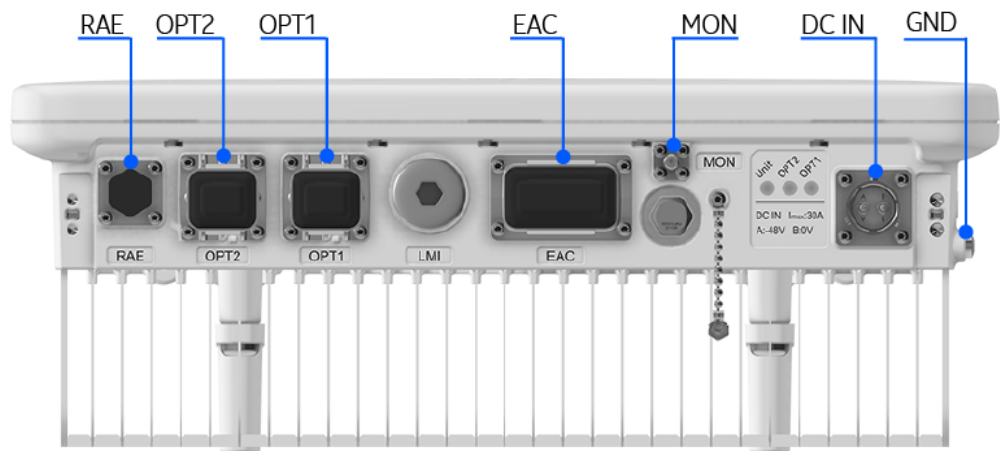


Table 145: AEQW interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole connector	APPC
Optical	OPT ¹	2	SFP28	eCPRI: 10 Gbps or 25 Gbps, Nokia IP seal
Remote antenna extension	RAE	1	RAE cable assembly	AISG control signal to the antenna line devices
External alarm connection	EAC	1	MDR26	EAC
Monitor	MON	1	SMA	–
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Note:

¹AEQW uses only OPT1 port as the primary port.

Antenna line device (ALD) support

Table 146: AEQW ALD support

Property	Value
AISG	2.0
Voltage	14 V
Power per port	2 W

Electrical specifications

Table 147: AEQW 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 -60 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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 148: AEQW power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 52% RF load $P_{BH RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 32TRX	200	1584	1885	2367

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 149: 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

- AMPB pole mounting kit (474688A)
- AMPD AirScale tilt mounting kit (475543A)
- AMPF AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMCA AirScale MAA installation kit (474912A)
- AMCC AirScale MAA installation kit (475127A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A)

Installation options

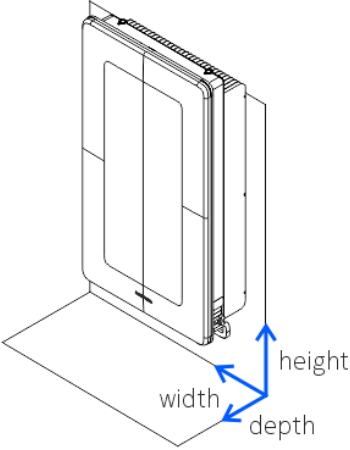
- *Pole*
- *Wall*

Notice:

Always install this RRH in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Dimensions and weight

Table 150: AEQW dimensions and weight

Property	Value	Dimensions orientation
Height	730 mm (28.74 in.)	
Width	403 mm (15.87 in.)	
Depth	185 mm (7.28 in.)	
Weight	28.5 kg (62.8 lb)	

Environmental specifications

Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 151: AEQW environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 152: AEQW wind load conditions

Direction	Drag coefficient for the shape C_D	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	1.14	347
Rear	1.14	347
Side	1.2	166



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.15 AirScale MAA 32T32R 192 AE n78 200 W eCPRI (AEQZ)

AEQZ (475444A) is introduced by 5GC002303 (for NR).

Functional description

Table 153: AEQZ functional specification

Property	Value
Maximum output power	200 W
Modulation	256 QAM (DL) QAM (UL)
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital, 32T32R, 8-column antenna with a total of 192 antenna elements
Operating mode	Full mode 32T32R
Software supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	n78: 3300–3600 MHz
Instantaneous bandwidth (iBW)	300 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	2
MIMO streams	8
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 154: AEQZ antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 2, 8, 2
Typical antenna gain (defined by BASTA)	24 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+11^\circ$ to $+1^\circ$ (upper SLS > 6 dB), from $+10^\circ$ to $+2^\circ$ (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 2^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ \pm 1^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 20 dB (boresight)
Total average EIRP	77 dBm

Interfaces

Figure 35: AEQZ interfaces

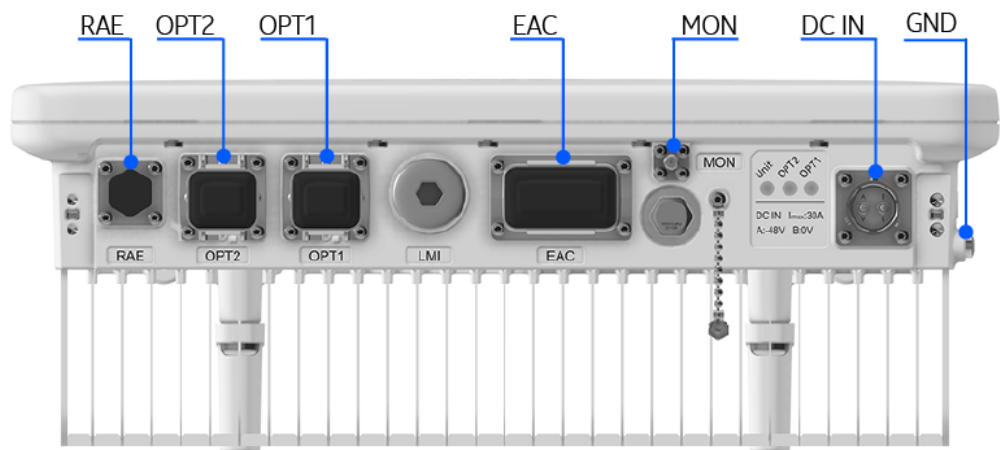


Table 155: AEQZ interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole connector	APPC
Optical	OPT	2	SFP28	eCPRI: 10 Gbps or 25 Gbps, Nokia IP seal

 **Note:**
AEQZ uses only OPT1 port as the primary port.

Remote antenna extension	RAE	1	RAE cable assembly	AISG control signal to the antenna line devices
External alarm connection	EAC	1	MDR26	EAC
Monitor	MON	1	SMA	–
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Antenna line device (ALD) support

Table 156: AEQZ ALD support

Property	Value
AISG	2.0
Voltage	14 V
Power per port	2 W

Electrical specifications

Table 157: AEQZ 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 -60V 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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at

low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 158: AEQZ power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 52% RF load $P_{BH RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 32TRX	200	1494	1755	2178

Recommended power back-off

The recommended power reduction values are defined as follows. High reduction values may cause radio outages.

Table 159: 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

Related optional items

- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMCA AirScale MAA installation kit (474912A)
- AMCC AirScale MAA installation kit (475127A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)

- ASAD AirScale MDR26-open EAC cable 5 m (475570A)

Installation options

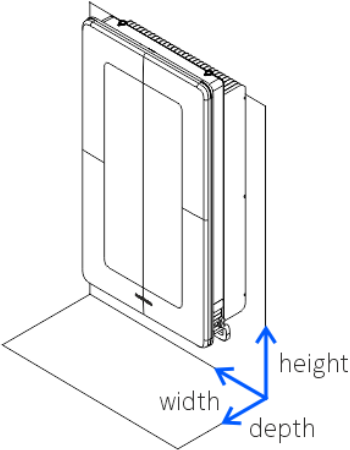
- Pole
- Wall

 Notice:

The radio unit 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 160: AEQZ dimensions and weight

Property	Value	Dimensions orientation
Height	730 mm (28.74 in.)	
Width	403 mm (15.87 in.)	
Depth	185 mm (7.28 in.)	
Weight	28.5 kg (62.8 lb)	

Environmental specifications

Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 161: AEQZ environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 162: AEQZ wind load conditions

Direction	Drag coefficient for the shape C_D	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	1.14	347
Rear	1.14	347
Side	1.2	166



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.16 AirScale MAA 32T32R 192 AE n78 320 W (AQQA)

AQQA (475695A) is introduced by CB006545 (for NR), *CB007499* (for LTE single mode), and *CB009125* (for LTE-NR concurrent mode). Transmission mode 9 (TM9) isn't supported by *CB007499*.

Functional description

Table 163: AQQA functional specification

Property	Value
Commercial name	Osprey 32
Maximum output power	320 W, when $F_{highest}^1 \leq 3600$ MHz 240 W, when $F_{highest}^1 > 3600$ MHz
Maximum modulation	256 QAM
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital beamforming with 32T32R
Operating mode	Full mode
Supported technologies	LTE, NR
RF sharing/concurrent mode	LTE-NR
Duplex mode - supported standard	TDD
Frequency range	n78: 3300–3700 MHz
Instantaneous bandwidth (iBW)	400 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers	NR: up to 2 LTE: up to 2
MIMO streams	NR: 16 LTE: 8
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90 and 100 MHz LTE: 20 MHz

¹ $F_{highest}$: the highest frequency point of carriers

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Band n78 antenna specification

Table 164: AQQA antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical (2, 8, 2)
Typical antenna gain (defined by BASTA)	24 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB), $\pm 60^\circ$ (4.5 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$ (boresight)
Envelope elevation beamwidth, HPBW	$+12^\circ \dots +2^\circ$ (upper SLS > 6 dB), $+11^\circ \dots +3^\circ$ (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 2^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+7^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	79.05 dBm

Interfaces

Figure 36: AQQA interfaces

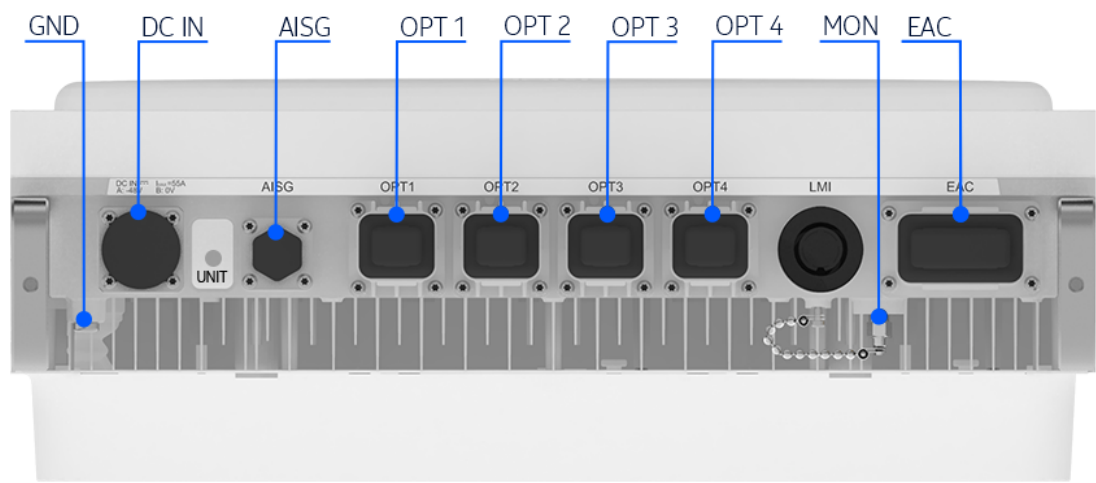


Figure 37: AQQA LED indicators

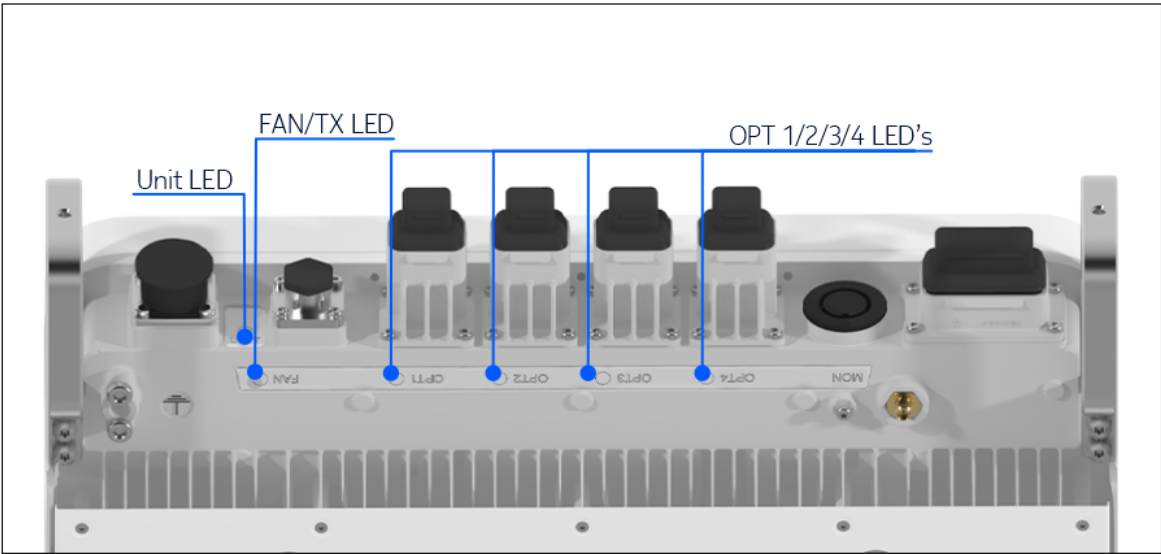


Table 165: AQQA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	2-pole circular	APPC
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and others
Optical interface	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
External Alarm Connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
Monitor	MON	1	SMA	–
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LED for each optical interfaces	Showing status of the unit and optical interfaces
Grounding	GND 	1	2 x M5 screw 1 x M8 screw	–



Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 166: AQQA ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power per port	Max. 7 W (RMS)

Electrical specifications

Table 167: AQQA 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 V DC
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	55 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need

to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 168: AQQA power draw

Mode	Configuration	Output Power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$	Power draw [W], ETSI 202706 busy hour load $P_{BH RRH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$
NR	1/1/1 32TR	320	2095	2530	3343

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 169: 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

Note:

Always use Nokia-approved SFP connectors and cables.

- AASU Antenna Monitoring Module (476423A)
- AMME Airscale IPAA AQQA slide-in frame C (476573A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPK up tilting adaptor (475982A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale2 MDR26-open EAC cable 5 m (475570A)
- AOPC SFP weatherproofing boot kit (475151A)

Note:

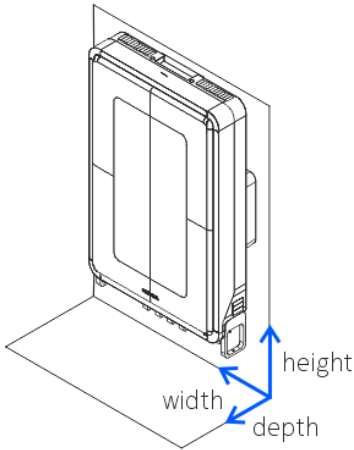
For compatible Platform Antennas (PFA) see *Installing and cabling AirScale IPAA+ - variants and installation options*.

Installation options

- Pole
- Wall
- IPAA+

Dimensions and weight

Table 170: AQQA dimensions and weight

Property	Value	Dimensions orientation
Height	707 mm (27.83 in.) without handles 752 mm (29.61 in.) with handles	
Width	395 mm (15.55 in.)	
Depth	106 mm (4.17 in.) 146 mm (5.75 in.) including fan depth	
Weight	19 kg (41.9 lb)	

Environmental specifications

Note:

There is no need to reduce 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 171: AQQA environmental specifications

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

Table 172: AQQA wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	389
Rear	389
Side	113



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.1.17 AirScale MAA 32T32R 192 AE n78 320 W (AQQJ)

AQQJ (476383A) is introduced by CB010304 (for NR).

Functional description

Table 173: AQQJ functional specification

Property	Value
Commercial name	Osprey 32
Maximum output power	320 W, when $F_{\text{highest}}^1 \leq 3600$ MHz or when $F_{\text{highest}}^1 > 3600$ and contiguous carrier configuration 240 W, when $F_{\text{highest}}^1 > 3600$ MHz and non-contiguous carrier configuration
Modulation	256 QAM (DL)
Number of TXRX	32T32R
Outdoor installation	Yes
Beamforming	Digital beamforming with 32T32R
Operating mode	Full mode 32T32R
Supported technologies	NR
Duplex mode - supported standard	TDD
Frequency range	n78: 3300–3670 MHz
Instantaneous bandwidth (iBW)	370 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers	up to 2
MIMO streams	16
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, and 100 MHz

¹ F_{highest} : the highest frequency point of carriers.

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 174: AQQJ antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical (2, 8, 2)
Typical antenna gain (defined by BASTA)	24 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$ (boresight)
Envelope elevation beamwidth, HPBW	From $+12^\circ$ to $+2^\circ$ (upper SLS > 6 dB), from $+11^\circ$ to $+3^\circ$ (upper SLS > 10 dB)
Dynamic elevation scanning range	$\pm 2^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+7^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	79 dBm

Interfaces

Figure 38: AQQJ interfaces

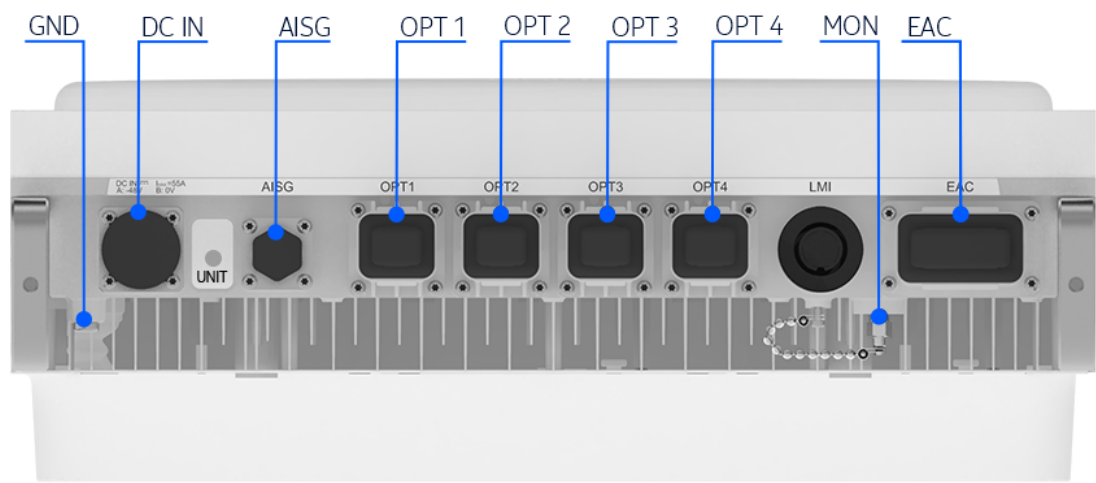


Figure 39: AQQJ LED indicators

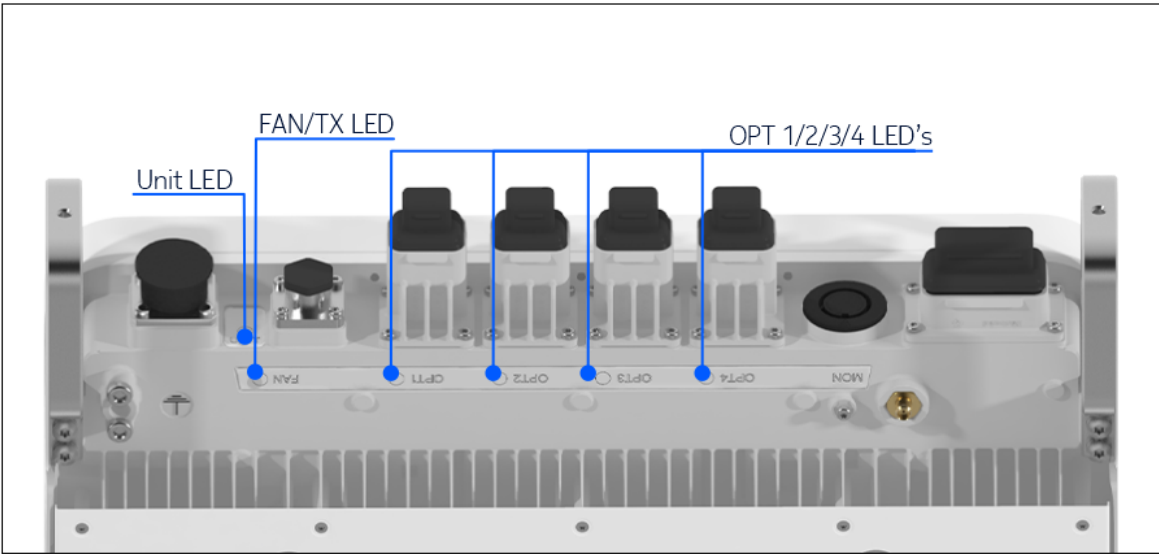


Table 175: AQQJ interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC IN	1	2-pole circular	APPC
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and so on
Optical interface	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
External Alarm Connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
Monitor	MON	1	SMA	–
LED	UNIT/FAN_TX/OPT1/OPT2/OPT3/OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LED for each optical interfaces	Showing status of the unit and optical interfaces
Grounding	GND 	1	2 x M5 screw 1 x M8 screw	–

i Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 176: AQQJ ALD support

Property	Value
AISG	Version 2.0
Voltage	10-30 V
Power per port	Max. 7 W (RMS)

Electrical specifications

Table 177: AQQJ 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 V DC
Surge protection	Class II 20 kA
Max current draw (I_{max}) (-36 V)*	55 A

* The I_{max} of the RU is given at an operating voltage of -36 V. For higher input voltages, you need to calculate a new I_{max} value. Note that the I_{max} given in the table might not be reached in actual use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 178: AQQJ power draw

Mode	Configuration	Output Power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH,static}$ (74.3% TX duty cycle)	Power draw [W], ETSI 202706 busy hour load $P_{BH,static}$	Power draw [W], 100% RF power load $P_{100\%RRH}$ (74.3% TX duty cycle)
NR	1/1/1 32TR	320	2097	2551	3353

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 179: 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

i Note:

You can further optimize the power back-off value by enabling the *CB007657: Low PAPR Optimized Precoding* feature.

Related optional items

i Note:

Always use Nokia-approved SFP connectors and cables.

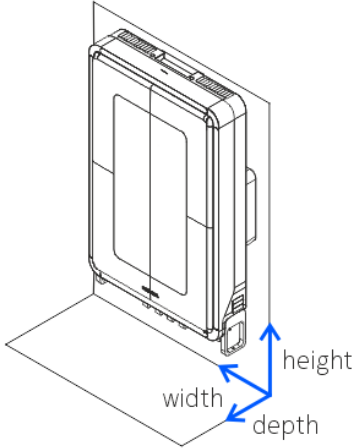
- AASU Antenna Monitoring Module (476423A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPK up tilting adaptor (475982A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD AirScale2 MDR26-open EAC cable 5 m (475570A)
- AOPC SFP weatherproofing boot kit (475151A)

Installation options

- *Pole*
- *Wall*

Dimensions and weight

Table 180: AQQJ dimensions and weight

Property	Value	Dimensions orientation
Height	707 mm (27.83 in.) without handles 752 mm (29.61 in.) with handles	
Width	395 mm (15.55 in.)	
Depth	106 mm (4.17 in.) 146 mm (5.75 in.) including fan depth	
Weight	19 kg (41.9 lb)	

Environmental specifications

Note:

There is no need to reduce 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 181: AQQJ environmental specifications

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

Table 182: AQQJ wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	389
Rear	389
Side	113



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2 64T64R AirScale TDD single band macro MAAs

6.2.1 AirScale MAA 64T64R 128 AE B40 120 W (AANB)

AANB (474517A) is introduced by *LTE4084* (for LTE).

Functional description

Table 183: AANB functional specification

Property	Value
Maximum output power	120 W, 3x40 W or 2x60 W, max. carrier power is 80 W
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Yes
MIMO streams	16
Supported technology	LTE
Frequency range	B40: 2300-2400 MHz
Instantaneous bandwidth (iBW)	60 MHz
Occupied bandwidth (oBW)	60 MHz
Number of carriers	Up to 3
Supported bandwidths	10, 20 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 184: AANB antenna characteristics

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized), logical 4, 8, 2
Typical antenna gain (defined by BASTA)	22.5 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$9^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+19.5^\circ$ to $+13.5^\circ$ (upper SLS > 6 dB), from $+16.5^\circ$ to -10.5° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 12^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+3^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	74.8 dBm

Interfaces

Figure 40: AANB interfaces

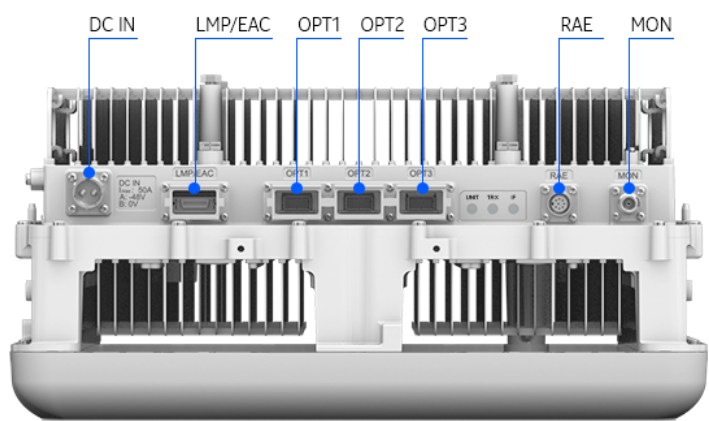


Table 185: AANB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	High power circular	APPB, APPC
Remote antenna extension	RAE	1	RAE cable assembly	AISG interface control signal to the antenna line devices
Local management port/external alarm connection	LMP/EAC	1	MDR-26	LMP+EAC
Optical	OPT	3	QSFP	CPRI: 9.8 Gbps, AOPB and AOPA OCTIS
Grounding (GND)	⏏	1	2 x M5 screw	-
Monitor	MON	1	N type, female	Provides diagnostic function

Antenna line devices (ALD) support

Table 186: AANB ALD support

Property	Value
AISG	Version 2.0
Voltage	10-30 V
Power per port	-

Electrical specifications

Table 187: AANB electrical specifications

Property	Value
Nominal supply voltage	-48 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
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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 188: AANB power draw

Mode	Configuration	Output power per carrier [W]	Power draw ETSI 102706 average $P_{RRH,static}$	Power draw ETSI 102706 busy hour load $P_{BH,RRH,static}$	Power draw 100% RF power load $P_{100\%RRH}$
LTE	3/3/3 64TRX	40	2802	3023	3414

Recommended power back-off

Note:

The recommended power back-off in 256 QAM mode is 1 dB.

Related optional items

- FPKA Flexi pole mounting kit (471649A)
- FPKB Flexi pole mounting kit (472804A)
- FPKC Flexi pole mounting kit (472821A)
- ASAB AirScale MDR26-open EAC cable 5 m (474621A)
- AOPA AirScale OCTIS plug kit QSFP (474686A)
- AOPB AirScale OCTIS artic. ext kit QSFP (474697A)
- FOCZ QSFP+ 4x10G 10 km SM (474335A)
- APPB AirScale2 55A DC plug 3.3–10 mm² (474282A)
- APPC AirScale2 55A DC plug 10–16 mm² (474283A/474283B)

Installation options

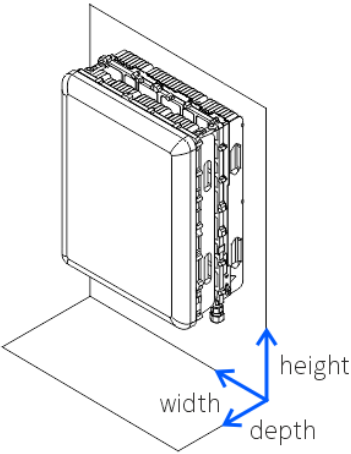
- Pole
- Wall

! Notice:

The unit should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Dimensions and weight

Table 189: AANB dimensions and weight

Property	Value	Dimensions orientation
Height	With front covers: 651 mm (25.6 in.)	
Width	With front covers: 501 mm (19.7 in.)	
Depth	With front covers: 245 mm (9.6 in.)	
Weight	47 kg (103.6 lb)	

Environmental specifications

Table 190: AANB 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	Natural convection (fanless)
IP rating	IP65

Table 191: AANB wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	439
Rear	503
Side	190



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.2 AirScale MAA 64T64R 128 AE B41 120 W (AAHB)

AAHB (474011A) is introduced by *LTE3452* (for LTE).

Functional description

Table 192: AAHB functional specification

Property	Value
Maximum output power	120 W (3x40 W or 2x60 W)
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Yes
MIMO streams	16
Supported technology	LTE
Frequency range	B41: 2575–2635 MHz
Instantaneous bandwidth (iBW)	60 MHz
Occupied bandwidth (oBW)	60 MHz
Number of carriers	Up to 3
Supported bandwidth	20 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 193: AAHB antenna characteristics

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized)
Max. antenna gain	24 dBi
Horizontal beamwidth	12.5° (boresight)
Vertical beamwidth	9° (boresight)
Horizontal coverage angle	$\pm 43^\circ$ (3 dB), $\pm 60^\circ$ (4.2 dB)
Vertical steering angle	$\pm 10^\circ$
Total average EIRP	74.8 dBm

Interfaces

Figure 41: AAHB interfaces

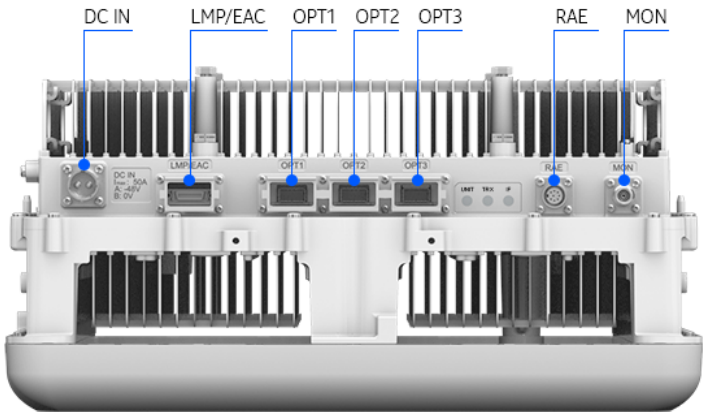


Table 194: AAHB interfaces

Interface	Label on the hardware	Function	Connector type	Additional info
Power	DC IN	1	High power circular	APPB, APPC
Remote antenna extension	RAE	1	RAE cable assembly	AISG interface control signal to the antenna line devices
Local management port/external alarm connection	LMP/EAC	1	MDR-26	LMP+EAC
Optical	OPT	3	QSFP	CPRI: 9.8 Gbps,AOPB and AOPA OCTIS
Grounding (GDN)		1	2 x M5 screw	–
Monitor	MON	1	N type, female	Provides diagnostic function

Antenna line device (ALD) support

Table 195: AAHB ALD support

Property	Value
AISG	2.0
Voltage	10–30 V
Power per port	–

Electrical specifications

Table 196: AAHB electrical specifications

Property	Value
Nominal supply voltage	-48 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
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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 197: AAHB power draw

Mode	Configuration	Output power per carrier [W]	Power draw ETSI 102706 average $P_{RRH,static}$	Power draw ETSI 102706 busy hour load $P_{BH\ RRH,static}$	Power draw 100% RF power load $P_{100\%\ RRH}$
LTE	3/3/3 64T64R	40	2842	3059	3465

Recommended power back-off

Note:

The recommended power back-off in 256 QAM mode is 1 dB.

Related optional items

- FPKA Flexi pole mounting kit (471649A)
- FPKB Flexi pole mounting kit (472804A)
- FPKC Flexi pole mounting kit (472821A)
- AOPA AirScale OCTIS plug kit QSFP (474686A)
- AOPB AirScale OCTIS Artic. ext kit QSFP (474697A)
- APPB AirScale2 55A DC plug 3.3–10 mm² (474282A)
- APPC AirScale2 55A DC plug 10–16 mm² (474283A/474283B)
- ASAB AirScale MDR26-open EAC cable 5 m (474621A)
- FOCZ QSFP+ 4x10G 10 km SM (474335A)

Installation options

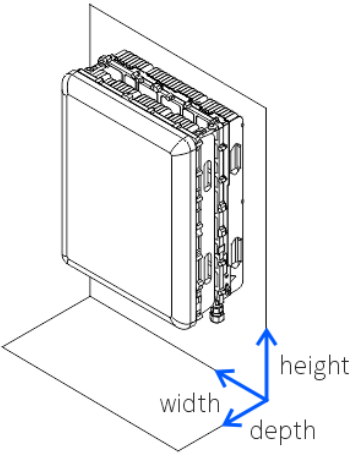
- Pole
- Wall

! Notice:

The unit should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Dimensions and weight

Table 198: AAHB dimensions and weight

Property	Value	Dimensions orientation
Height	With front covers: 651 mm (25.6 in.)	
Width	With front covers: 501 mm (19.7 in.)	
Depth	With front covers: 245 mm (9.6 in.)	
Weight	47 kg (103.6 lb)	

Environmental specifications

Table 199: AAHB 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	Natural convection (fanless)
IP rating	IP65

Table 200: AAHB wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	439
Rear	503
Side	190



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.3 AirScale MAA 64T64R 128 AE B41 120 W (AAHC)

AAHC (474155A) is introduced by *LTE3738* (for LTE).

Functional description

Table 201: AAHC functional specification

Property	Value
Maximum output power	120 W (3x40 W or 2x60 W; max. carrier power is 80 W)
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Yes
MIMO streams	16
Supported technology	LTE
Frequency range	B41: 2496–2690 MHz
Instantaneous bandwidth (iBW)	60 MHz
Occupied bandwidth (oBW)	60 MHz
Number of carriers	Up to 3
Supported bandwidths	10, 20 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/5G NR and gNB Supported Configurations* and see:

- *5G NR Supported Configurations*
- *5G NR Supported Configurations - Rules and Examples*

Antenna specification

Table 202: AAHC antenna characteristics

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized)
Max. antenna gain	24 dBi
Horizontal beamwidth	12.5° (boresight)
Vertical beamwidth	9° (boresight)
Horizontal coverage angle	$\pm 43^\circ$ (3 dB), $\pm 60^\circ$ (4.2 dB)
Vertical steering angle	$\pm 10^\circ$
Total average EIRP	74.8 dBm

Interfaces

Figure 42: AAHC interfaces

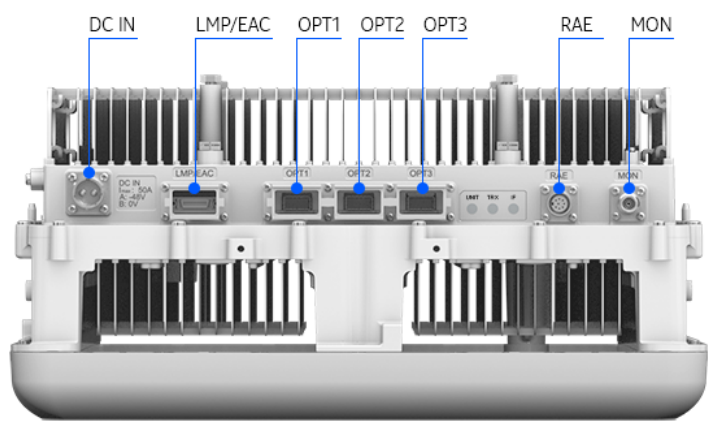


Table 203: AAHC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	High power circular	APPB, APPC
Remote antenna extension	RAE	1	RAE cable assembly	AISG interface control signal to the antenna line devices
Local management port/external alarm connection	LMP/EAC	1	MDR-26	LMP+EAC
Optical	OPT	3	QSFP	CPRI: 9.8 Gbps, AOPB and AOPA OCTIS
Grounding (GND)	⏏	1	2 x M5 screw	–
Monitor	MON	1	N type, female	Provides diagnostic function

Antenna line device (ALD) support

Table 204: AAHC ALD support

Property	Value
AISG	2.0
Voltage	10-30 V
Power per port	-

Electrical specifications

Table 205: AAHC electrical specifications

Property	Value
Nominal supply voltage	-48 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
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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 206: AAHC power draw

Mode	Configuration	Output power per carrier [W]	Power draw ETSI 102706 average $P_{RRH, static}$	Power draw ETSI 102706 busy hour load $P_{BH RRH, static}$	Power draw 100% RF power load $P_{100\% RRH}$
LTE	3/3/3 64T64R	40	2842	3031	3428

Recommended power back-off

Note:

The recommended power back-off in 256 QAM mode is 1 dB.

Related optional items

- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- FPKA Flexi pole mounting kit (471649A)
- FPKB Flexi pole mounting kit (472804A)
- FPKC Flexi pole mounting kit (472821A)
- AOPA AirScale OCTIS plug kit QSFP (474686A)
- AOPB AirScale OCTIS Artic. ext kit QSFP (474697A)
- APPB AirScale2 55A DC plug 3.3-10 mm² (474282A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAB AirScale MDR26-open EAC cable 5 m (474621A)
- FOCZ QSFP+ 4x10G 10 km SM (474335A)

Installation options

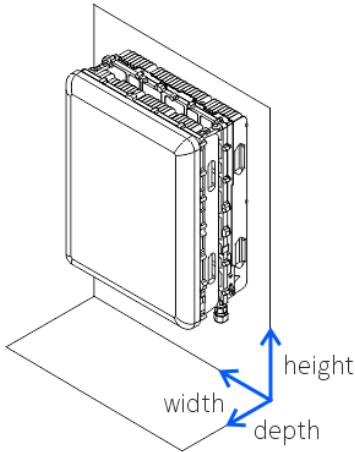
- Pole
- Wall

! Notice:

The unit should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Dimensions and weight

Table 207: AAHC dimensions and weight

Property	Value	Dimensions orientation
Height	With front covers: 651 mm (25.63 in.)	
Width	With front covers: 501 mm (19.72 in.)	
Depth	With front covers: 245 mm (9.65 in.)	
Weight	47 kg (103.6 lb)	

Environmental specifications

Table 208: AAHC environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	45°C (113°F)
Maximum operational outdoor temperature (in the sun)	45°C (113°F)
Maximum indoor temperature	45°C (113°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 209: AAHC wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	439
Rear	503
Side	190

 WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.4 AirScale MAA 64T64R 128 AE B41/n41/B38 120 W (AAHF)

AAHF (474715A) is introduced by *LTE4672* (for LTE) and *5GC001138* (for NR and LTE-NR concurrent mode).

Functional description

Table 210: AAHF functional specification

Property	Value
Maximum output power	LTE: 120 W (3x40 W, 2x60 W (excludes FCC region) NR: 120 W
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital, 64T64R, 4x8 dual polarized phased array
Operating modes	Full mode 64T64R Split mode 2x 32T32R
Supported technologies	LTE, NR
Concurrent mode	LTE-NR
Duplex mode, supported standard	TDD
Frequency range	B41/n41: 2496-2690 MHz B38: 2580-2600 MHz (LTE only)
Instantaneous bandwidth (iBW)	Full mode: 60 MHz Split mode: 60 MHz per each sub-panel
Occupied bandwidth (oBW)	Full mode: 60 MHz Split mode: 120 MHz
Number of carriers	LTE: up to 3 NR: 1
MIMO streams	16
Supported bandwidths	LTE: 10, 20 MHz NR: 20, 40, 60 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 211: AAHF antenna characteristics for full mode 64T64R

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized), logical 4, 8, 2
Typical antenna gain (defined by BASTA)	23.5 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$12^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$8^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+19^\circ$ to -13° (upper SLS > 6 dB), from $+16^\circ$ to -10° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 12^\circ$ (upper SLS > 6 dB); $\pm 9^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+3^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	74.8 dBm

Table 212: AAHF antenna characteristics for split mode 2x 32T32R

Property	Value
Antenna configuration	8, 4, 2 ($\pm 45^\circ$ X-polarized), logical 4, 4, 2
Typical antenna gain (defined by BASTA)	20.5 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, HPBW	$24^\circ \pm 2^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$8^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+19^\circ$ to -13° (upper SLS > 6 dB), from $+16^\circ$ to -10° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 12^\circ$ (upper SLS > 6 dB); $\pm 9^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+3^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	74.8 dBm

Interfaces

Figure 43: AAHF interfaces

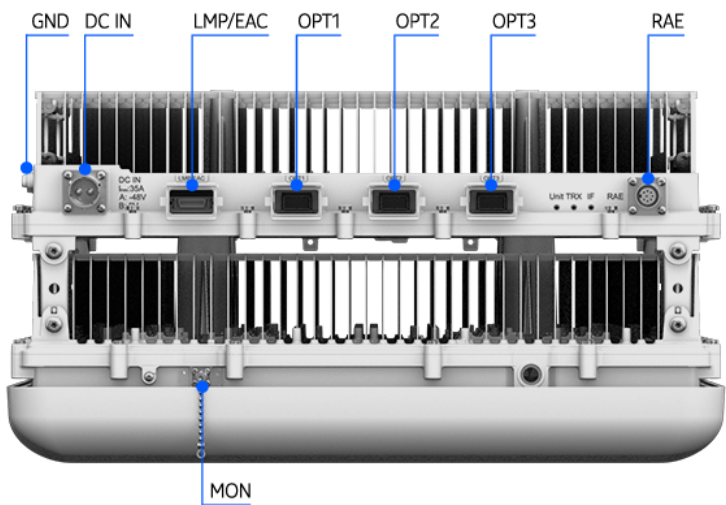


Table 213: AAHF interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole connector	APPB, APPC, 55 A max.
Optical	OPT	3	QSFP	3xQSFP (4x9.8 Gbps each), AOPB and AOPA OCTIS IP seal
Remote antenna extension	RAE	1	RAE cable assembly	AISG control signal to the antenna line devices
Local management port/external alarm connection	LMP/EAC	1	MDR-26	LMP+EAC
Monitor	MON	1	SMA	–
Grounding (GND)	⏏	1	2 x M5 screw	–

Antenna line device (ALD) support

Table 214: AAHF ALD support

Property	Value
AISG	2.0
Voltage	10-30 V
Power per port	-

 Note:

Separate software feature is required for ALD control.

Electrical specifications

Table 215: AAHF 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
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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product

performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with $\pm 10\%$ margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) / 24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 216: AAHF power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W] ETSI 102706 average $P_{RRH, static}$	Power draw [W] ETSI 102706 busy hour load $P_{BH RRH, static}$	Power draw [W] 100% RF power load $P_{100\% RRH}$
LTE	3/3/3 64T64R	40	2550	2765	3157

Recommended power back-off in LTE mode

Note:

The recommended power back-off in 256 QAM mode is 1 dB.

Related optional items

- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- FPKA Flexi pole mounting kit (471649A)
- FPKB Flexi pole mounting kit (472804A)
- FPKC Flexi pole mounting kit (472821A)
- AOPA AirScale OCTIS plug kit QSFP (474686A)
- AOPB AirScale OCTIS artic. ext kit QSFP (474697A)
- APPB AirScale2 55A DC plug 3.3-10 mm² (474282A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAB AirScale MDR26-open EAC cable 5 m (474621A)

- FOCZ QSFP+ 4x10G 10 km SM (474335A)

Installation options

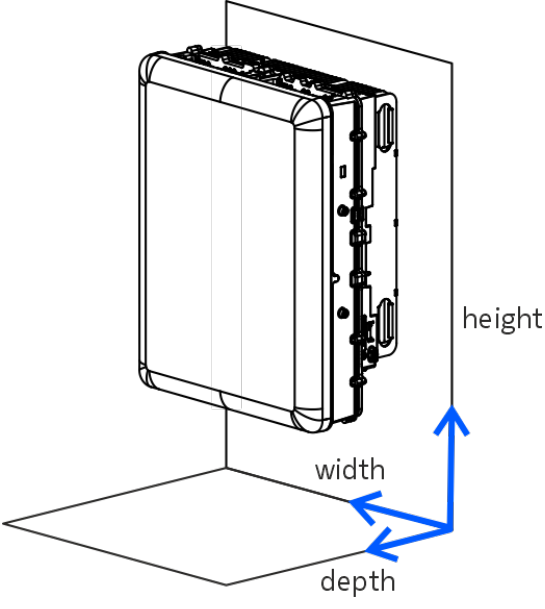
- Pole
- Wall

 Notice:

The unit 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 217: AAHF dimensions and weight

Property	Value	Dimensions orientation
Height	With front covers: 651 mm (25.63 in.)	
Width	With front covers: 501 mm (19.72 in.)	
Depth	With front covers: 260 mm (10.24 in.)	
Weight	47 kg (103.6 lb)	

Environmental specifications

Table 218: AAHF 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	Natural convection (fanless)
IP rating	IP65

Table 219: AAHF wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	442
Rear	506
Side	206

 WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.5 AirScale MAA 64T64R 128 AE B43 200 W (AEQD)

AEQD (474473A) is introduced by 5GC000664 (for NR).

Functional description

Table 220: AEQD functional specification

Property	Value
Maximum output power	200 W
Modulation	256 QAM
Number of TXX	64T64R
Outdoor installation	Yes
Beamforming	Digital, 64T64R, 4x12 dual polarized phased array
Supported technology	NR
Duplex mode, supported standard	TDD
Frequency range	n78: 3600–3800 MHz
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	100 MHz
MIMO streams	16
Supported bandwidths	60, 80, 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 221: AEQD antenna characteristics

Property	Value
Antenna configuration	8, 8, 2 ($\pm 45^\circ$ X-polarized)
Max. antenna gain	24 dBi (boresight)
Horizontal beamwidth	12.5° (boresight)
Vertical beamwidth	9° (boresight)
Horizontal coverage angle	$\pm 45^\circ$ (3 dB), $\pm 60^\circ$ (6 dB)
Vertical steering angle	$-10 \sim +10^\circ$ (- means up, + means down)
Vertical pre-steering angle	0°
Total average EIRP	76 dBm

Interfaces

Figure 44: AEQD interfaces

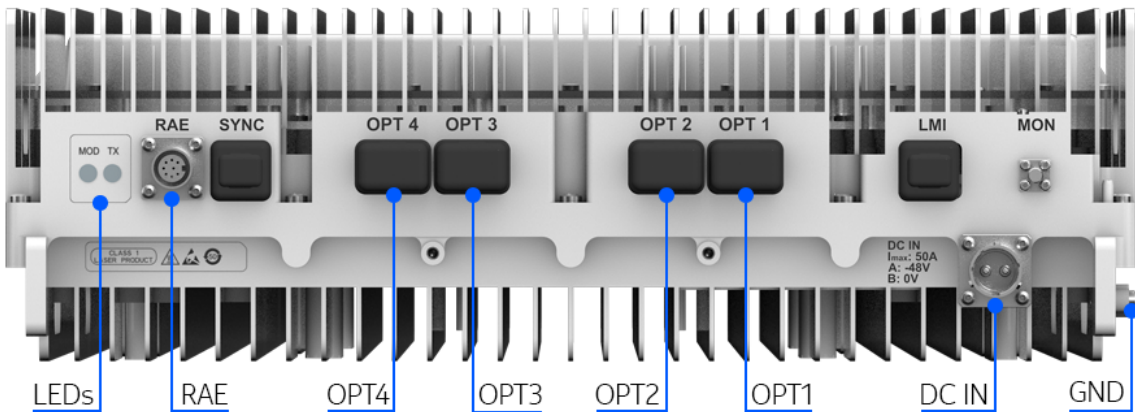


Table 222: AEQD interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole connector	APPB, APPC, 50 A max.
Optical	OPT	4	QSFP+ CONN 38F SINGLE ANG PO.8 10G	CPRI: 4 x 9.8 Gbps, Nokia IP seal

Note:

AEQD uses OPT2 port as primary port, and OPT1 and OPT3 can be used as capacity ports.

Grounding (GND)		1	M8 screw	–
Remote antenna extension	RAE	1	RAE cable assembly	AISG control signal to the antenna line devices
LEDs	LED MOD, TX	2	–	MOD LED indicates unit work state TX LED indicates TX power emission state

Note:

Hot insertion or removal of QSFPs isn't supported.

Antenna line device (ALD) support

Table 223: AEQD ALD support

Property	Value
AISG	2.0
Voltage	10-30 V
Power per port	-

Electrical specifications

Table 224: AEQD 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
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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 225: AEQD power draw in NR mode

Configuration	Output power per carrier [W]	Power draw [W] ETSI 202706 average load $P_{RRH, static}$	Power draw [W] 52% RF load P_{BH} $_{RRH, static}$	Power draw [W] 100% RF power load $P_{100\% RRH}$
1/1/1 64T64R	200	3070	3390	4062

Note:

Power draw values are measured according to ETSI 202 706-1 v1.5 RF load assumptions and to 3GPP 38.141 NR TM1.1 assumptions, leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power draw.

Recommended power back-off

The recommended NRCELL PDSCH Power Back-off for 256QAM (dlQam256PowerBackoffSub6) parameter 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

- FPKA Flexi pole mounting kit (471649A)
- FPKC Flexi pole mounting kit (472821A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- APPB AirScale2 55A DC plug 3.3-10 mm² (474282A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Installation options

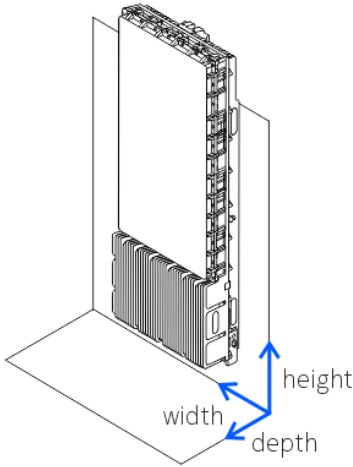
- Pole
- Wall

 Notice:

The radio unit 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 226: AEQD dimensions and weight

Property	Value	Dimensions orientation
Height	900 mm (35.43 in.)	
Width	480 mm (18.9 in.)	
Depth	185 mm (7.28 in.)	
Weight	45 kg (99.2 lb)	

Environmental specifications

Table 227: AEQD 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	Natural convection (fanless)
IP rating	IP65

Table 228: AEQD wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	647
Rear	447
Side	216

 WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.6 AirScale MAA 64T64R 192 AE B41/n41 320 W (AEHB)

AEHB (474698A) is introduced by 5GC001507 (for NR) and by LTE4223 (for LTE).

Functional description

Table 229: AEHB functional specification

Property	Value
Maximum output power	320 W
Modulation	256 QAM
Number of TXX	64T64R
Outdoor installation	Yes
Beamforming	Digital, 64T64R, 8x12 dual polarized phased array
Supported technologies	LTE, NR
Duplex mode, supported standard	TDD
Frequency range	B41/n41: 2515-2675 MHz
Instantaneous bandwidth (iBW)	160 MHz
Occupied bandwidth (oBW)	160 MHz
Number of carriers per pipe	LTE: up to 4 NR: up to 2
MIMO streams	16
Supported bandwidths	LTE: 10, 15, 20 MHz NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 230: AEHB antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), Logical (4,8,2)
Typical antenna gain (defined by BASTA)	24 dBi ± 1 dB (boresight)
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 1^\circ$
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 0.5^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS) > 6 dB; from $+14^\circ$ to -2° (upper SLS >10 dB)
Dynamic Elevation Scanning Range	$\pm 7^\circ$ (upper SLS > 6 dB); $\pm 5^\circ$ (upper SLS >10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	79 dBm

Interfaces

Figure 45: AEHB interfaces

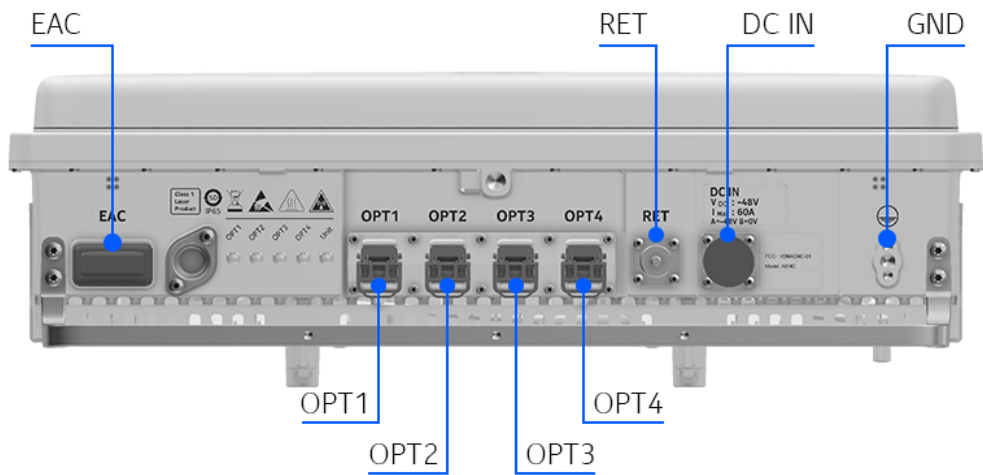


Table 231: AEHB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	Circular plug	APPG
Remote electrical tilt	RET	1	8-pin circular	RS-485
External alarm connection	EAC	1	MDR26	–
Optical	OPT	4	SFP28	eCPRI: 10 and 25 Gbps, OCTIS IP seal
Grounding (GND)		1	2 x M5 screw	–

Two LEDs are used to indicate the two optical ports status.

LEDs for optical ports

Table 232: AEHB OPT LEDs indications

LED status	Description
Steady green	Fiber link works properly
Steady red	The optical module fails to transmit or receive signals, caused by faulty optical module or broken optical fiber
Blinking red	eCPRI link is out of lock (for example: clock lock between radio and system module not ok, data rate mismatch)
Steady yellow	Optical module is not in use (powered off)
Steady off	Optical module can not be detected (not inserted to the port)

Electrical specifications

Table 233: AEHB 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
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 system characteristics

Note:

Contact Nokia customer team for the latest power draw values.

Related optional items

- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- ACPC optical connection kit OCTIS (474696A)
- Multimode link:
 - AOMC SFP28 70m I-temp RS (474900A)
 - ATBN OD OM3 LC OD-LC ID dual 10 m (475009A)
- Singlemode link:
 - AOSC SFP28 2 km SM I RS (474901A)
 - FUFBG SM OD fiber LC OD-LC OD dual 10 m (473309A)
- APPG AirScale2 70A DC plug 10-16 mm² (475401A)

Installation options

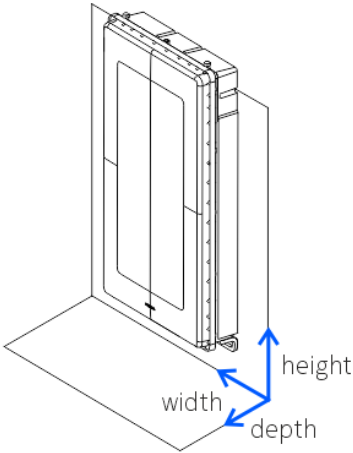
- *Pole*
- *Wall*

Notice:

The unit 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 234: AEHB dimensions and weight

Property	Value	Dimensions orientation
Height	964 mm (37.95 in.)	
Width	544 mm (21.42 in.)	
Depth	150 mm (5.91 in.)	
Weight	49 kg (108.0 lb)	

Environmental specifications

Table 235: AEHB environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F) ¹
Maximum operational outdoor temperature (in the sun)	55°C (131°F) ¹
Maximum indoor temperature	55°C (131°F) ¹
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced convection (fan)
IP rating	IP65

 Note:

¹Site installation conditions such as sun radiation, installation configuration and location, and so on may affect power output. Operating at highest ambient temperatures (over 45°C (113°F)) and at constant high traffic load might temporarily reduce output power to protect the unit from overheating.

Table 236: AEHB wind load conditions

Direction	Drag coefficient for the shape C_D	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	1.25	704
Rear	1.31	738
Side	0.89	138



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.7 AirScale MAA 64T64R 192 AE B41/n41/B38 320 W (AEHC)

AEHC (475124A) is introduced by *LTE4225* (for LTE) and *5GC000657* (for NR and LTE-NR concurrent mode).

Functional description

Table 237: AEHC functional specification

Property	Value
Maximum output power	320 W
Modulation	256 QAM
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital, 64 TRX, 8x12 dual polarized phased array
Supported technologies	LTE, NR
Concurrent mode	LTE-NR
Duplex mode, supported standard	TDD
Frequency range	LTE/NR: B41/n41: 2496-2690 MHz LTE: B38: 2580-2600 MHz
Instantaneous bandwidth (iBW)	194 MHz
Occupied bandwidth (oBW)	190 MHz
Numbers of carriers	LTE: up to 4 NR: up to 3
MIMO streams	16
Supported bandwidths	LTE: 10, 15, 20 MHz NR: 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 238: AEHC antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), Logical (4,8,2)
Typical antenna gain (defined by BASTA)	24 dBi $\pm$ 1 dB (boresight)
Minimum azimuth beamwidth, HPBW	$13^\circ \pm 1^\circ$
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 0.5^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS > 6 dB); from $+14^\circ$ to -2° (upper SLS >10 dB)
Dynamic Elevation Scanning Range	$\pm 7^\circ$ (upper SLS > 6 dB); $\pm 5^\circ$ (upper SLS >10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	79 dBm

Interfaces

Figure 46: AEHC interfaces

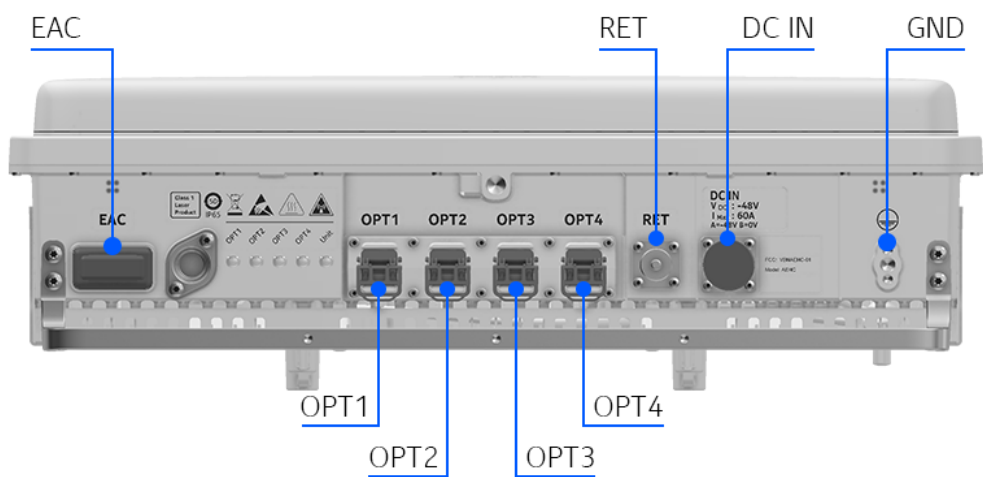


Table 239: AEHC interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	Circular plug	APPG
Remote electrical tilt	RET	1	8-pin circular	RS-485
External alarm connection	EAC	1	MDR26	-
Optical	OPT	4	SFP28 (OCTIS)	eCPRI: 10 and 25 Gbps, OCTIS IP seal
Grounding (GND)		1	1 x M8 screw 2 x M5 screw	-

Two LEDs are used to indicate the two optical ports status.

LEDs for optical ports

Table 240: AEHC OPT LEDs indications

LED status	Description
Steady green	Fiber link works properly
Steady red	The optical module fails to transmit or receive signals, caused by faulty optical module or broken optical fiber
Blinking red	CPRI/eCPRI link is out of lock (for example: clock lock between radio and system module not ok, data rate mismatch)
Steady yellow	Optical module is not in use (powered off)
Steady off	Optical module can not be detected (not inserted to the port)

Electrical specifications

Table 241: AEHC 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
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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 242: AEHC power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 52% RF load $P_{BH RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
LTE	1/1/1 64T64R	320	3219	3719	4821

Recommended power back-off for LTE mode

Note:

The recommended power back-off in Closed Loop MIMO (8x4) mode with TM9 is 1 dB for LTE 20 MHz P_{max} greater than 28 dBm or LTE 10 MHz P_{max} greater than 25 dBm. In case of lower values of P_{max} the power reduction is not needed.

Related optional items

- AMMC Airscale IPAA AEHC slide-in frame C (476428A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)

- ACPC optical connection kit OCTIS (474696A)
- Multimode link:
 - AOMC SFP28 70m I-temp RS (474900A)
 - ATBN OD OM3 LC OD-LC ID dual 10 m (475009A)
- Singlemode link:
 - AOSC SFP28 2 km SM I RS (474901A)
 - FUFBG SM OD fiber LC OD-LC OD dual 10 m (473309A)
- APPG AirScale2 70A DC plug 10-16 mm² (475401A)

Note:

For compatible Platform Antennas (PFA) see *Installing and cabling AirScale IPAA+ - variants and installation options*.

Installation options

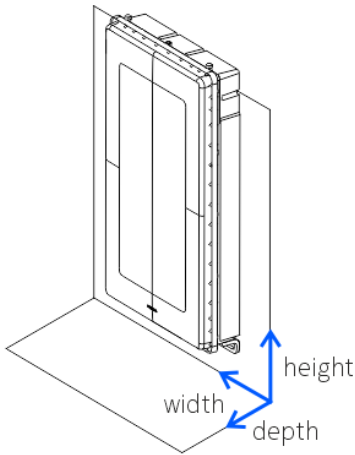
- Pole
- Wall
- IPAA+

Notice:

The unit 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 243: AEHC dimensions and weight

Property	Value	Dimensions orientation
Height	964 mm (37.95 in.)	
Width	544 mm (21.42 in.)	
Depth	150 mm (5.91 in.)	
Weight	49 kg (108 lb)	

Environmental specifications

Table 244: AEHC environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade)	55°C (131°F) ¹
Maximum operational outdoor temperature (in the sun)	55°C (131°F) ¹
Maximum indoor temperature	55°C (131°F) ¹
Minimum operational temperature	-40°C (-40°F)
Cooling method	Forced convection (fan)
IP rating	IP65

Note:

¹Site installation conditions such as sun radiation, installation configuration and location, and so on may affect power output. Operating at highest ambient temperatures (over 45°C (113°F)) and at constant high traffic load might temporarily reduce output power to protect the unit from overheating.

Table 245: AEHC wind load conditions

Direction	Drag coefficient for the shape C_D	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	1.25	704
Rear	1.31	738
Side	0.89	138



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.8 AirScale MAA 64T64R 192 AE B42/n42 200 W (AEQA)

AEQA (474212A) is introduced by 5GC000562 (for NR).

Functional description

Table 246: AEQA functional specification

Property	Value
Maximum output power	200 W
Modulation	256 QAM
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital, 64TR, 4x12 dual polarized phased array
Supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	B42/n42: 3400–3600 MHz
Instantaneous bandwidth (iBW)	NR: 100 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	NR: 1
MIMO streams	16
Supported bandwidths	NR: 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 247: Antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized)
Max. antenna gain	25 dBi
Horizontal beamwidth	$\leq 15^\circ$ (boresight)
Vertical beamwidth	$\leq 6^\circ$ (boresight)
Horizontal coverage angle	$\pm 45^\circ$ (3 dB), $\pm 60^\circ$ (6 dB)
Vertical steering angle	0° to +12° (+ means down)
Vertical pre-steering angle	+6°
Total average EIRP	77.5 dBm

Interfaces

Figure 47: AEQA interfaces

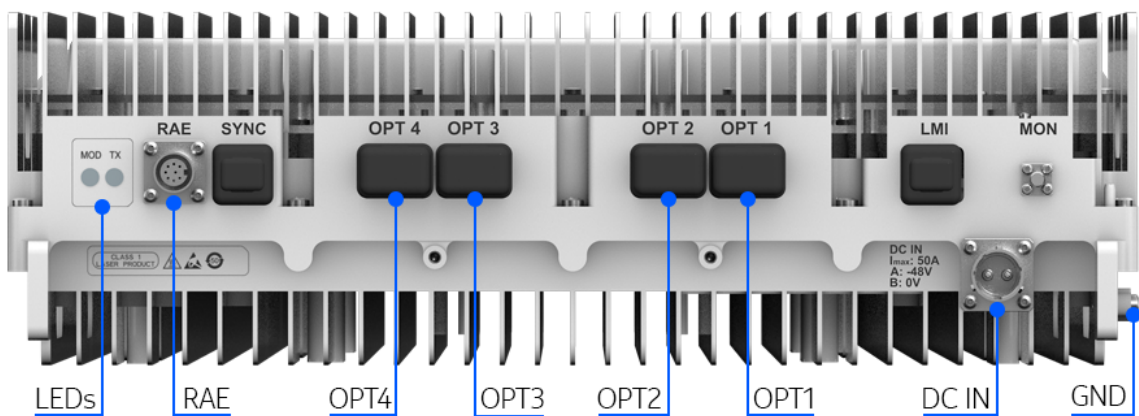


Table 248: AEQA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	High power circular	APPB, APPC, 50 A max.
Optical	OPT	4	QSFP	CPRI: 9.8 Gbps, Nokia IP seal

Note:
AEQA uses OPT2 port as primary port, and OPT1 and OPT3 can be used as capacity ports.

Remote antenna extension	RAE	1	RAE cable assembly	AISG interface control signal to the antenna line devices
LEDs	MOD/TX	2	–	MOD LED indicates unit work state
Grounding (GND)		1	2 x M5 screw	–

Note:
Hot insertion or removal of QSFPs isn't supported.

Antenna line devices (ALD) support

Table 249: AEQA ALD support

Property	Value
AISG	2.0
Voltage	10-30 V
Power per port	-

Electrical specifications

Table 250: AEQA electrical specifications

Property	Value
Nominal supply voltage	-48 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
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 system characteristics in NR mode

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 251: AEQA preliminary power draw in NR mode

Configuration	Output power per carrier [W]	Power draw [W] ETSI 202706 average load $P_{RRH, static}$	Power draw [W] 52% RF load P_{BH} $_{RRH, static}$	Power draw [W] 100% RF power load $P_{100\% RRH}$
1/1/1 64T64R	200	3070	3390	4062

Note:

Power draw values are measured according to ETSI 202 706-1 v1.5 RF load assumptions and to 3GPP 38.141 NR TM1.1 assumptions, leading to 74.3% TX duty cycle. Higher TX duty cycle causes higher power draw.

Recommended power back-off in LTE mode

Note:

The recommended power back-off in 256 QAM mode is 1 dB.

Related optional items

- FPKA Flexi pole mounting kit (471649A)
- FPKB Flexi pole mounting kit (472804A)
- FPKC Flexi pole mounting kit (472821A)
- ASAB AirScale MDR26-open EAC cable 5 m (474621A)
- FOCZ QSFP 4x10G 10 km SM (474335A)
- FOCX QSFP MPO 4x10 300m MM (474333A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)

Installation options

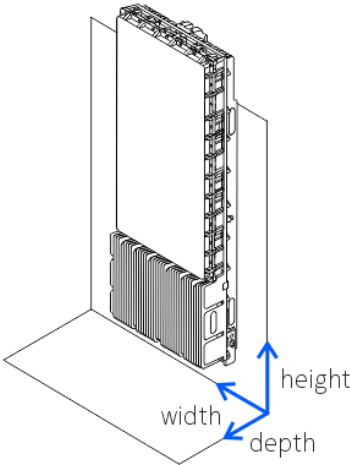
- Pole
- Wall

 Notice:

The radio unit 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 252: AEQA dimensions and weight

Property	Value	Dimensions orientation
Height	1110 mm (43.70 in.)	
Width	480 mm (18.90 in.)	
Depth	185 mm (7.28 in.)	
Weight	47 kg (103.6 lb)	

Environmental specifications

Table 253: AEQA 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	Natural convection (fanless)
IP rating	IP65

Table 254: AEQA wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	809
Rear	603
Side	269



WARNING!

Risk of RF exposure

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.9 AirScale MAA 64T64R 192 AE B42/n78 200 W eCPRI (AEQB)

AEQB (474413A) is introduced by 5GC001113 (for NR).

Functional description

Table 255: AEQB functional specification

Property	Value
Output power	200 W (64 x 3.125 W)
Modulation	Up to 64 QAM (UL) Up to 256 QAM (DL)
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital, 64T64R, 12x8 antenna array ($\pm 45^\circ$ X-polarized)
Operating modes	• Full mode 64T64R • Full split mode 2x 32T32R
Supported technology	NR
Duplex mode, supported standard	TDD
Frequency range	B42: 3400–3600 MHz (part of n78 band)
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	Up to 2
MIMO streams	8
Supported bandwidths	eCPRI: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/5G NR and gNB Supported Configurations* and see:

- *5G NR Supported Configurations*
- *5G NR Supported Configurations - Rules and Examples*

Antenna specification

Table 256: AEQB antenna characteristics for full panel mode 64T64R

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), Logical (4, 8, 2)
Typical antenna gain (defined by BASTA)	24.5 dBi ± 1 dB (boresight)
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+15^\circ$ to -3° (upper SLS ≥ 6 dB); from $+12.5^\circ$ to -0.5° (upper SLS ≥ 10 dB)
Elevation scanning range	$\pm 6^\circ$ (upper SLS ≥ 6 dB); $\pm 3.5^\circ$ (upper SLS ≥ 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	>28 dB
Cross-polar discrimination	>18 dB (boresight)
Total average EIRP	77.5 dBm

Table 257: AEQB antenna characteristics for split panel mode 2x 32T32R

Property	Value
Antenna configuration	6, 8, 2 ($\pm 45^\circ$ X-polarized), Logical (2, 8, 2)
Typical antenna gain (defined by BASTA)	21.5 dBi ± 1 dB (boresight)
Minimum azimuth beamwidth, HPBW	$13^\circ \pm 2^\circ$
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$12^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+15^\circ$ to -3° (upper SLS ≥ 6 dB); from $+13^\circ$ to -1° (upper SLS ≥ 10 dB)
Elevation scanning range	$\pm 3^\circ$ (upper SLS ≥ 6 dB); $\pm 1^\circ$ (upper SLS ≥ 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front to back ratio	>28 dB
Cross-polar discrimination	>18 dB (boresight)
Total average EIRP	77.5 dBm

Interfaces

Figure 48: AEQB interfaces

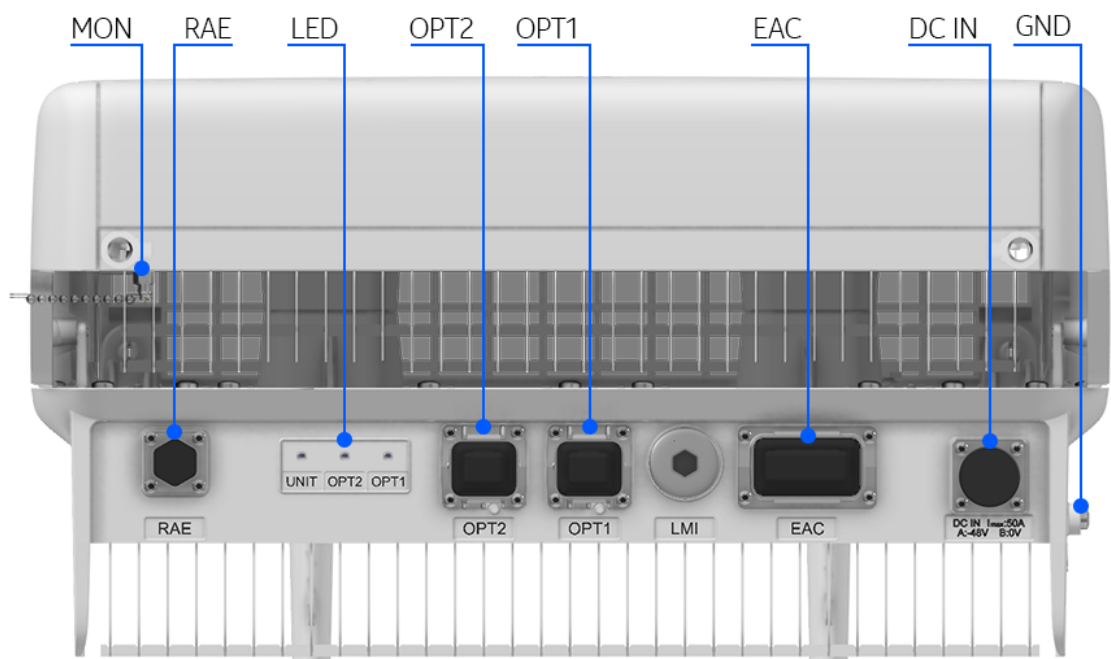


Table 258: AEQB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC	1	2-pole connector	APPC
Optical	OPT	2	SFP28	eCPRI: 10 Gbps or 25 Gbps, Nokia IP seal

 **Note:**
AEQB uses only OPT1 port as the primary port.

Remote antenna extension	RAE	1	8-pin circular	AISG control signal to the antenna line devices
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	–
LED	UNIT/OPT1/OPT2	3	–	Showing status of a unit and optical interfaces
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Antenna line device (ALD) support

Table 259: AEQB ALD support

Property	Value
AISG	2.0
Voltage	14.5 V ± 1 V
Power per port	2 W

Electrical specifications

Table 260: AEQB 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
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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 261: AEQB power draw

Mode	Configuration	Output Power per carrier [W]	Power draw [W], ETSI 202706 average load P_{RRH} , static (74.3% TX duty cycle)	Power draw [W], 52% RF load $P_{BH\ RRH}$, static (74.3% TX duty cycle)	Power draw [W], 100% RF power load $P_{100\%\ RRH}$ (74.3% TX duty cycle)
NR	1/1/1 64TR	200	2048	2344	2898

Recommended power back-off

The recommended power back-off values are defined as follows. High reduction values may cause radio outages.

Table 262: 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

Related optional items

- AASU Antenna Monitoring Module (476423A)
- AMCA Nokia AirScale MAA installation kit (MIK) (474912A)
- AMCC Nokia AirScale MAA installation kit (MIK) (475127A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMSA mounting kit for AASU (476533A)
- APPC AirScale2 55A DC plug 10–16 mm² (474283A)
- AOPC SFP weatherproofing boot kit (475151A)

- ASAD plastic boot MDR26-open EAC cable 5 m (475570A)

Installation options

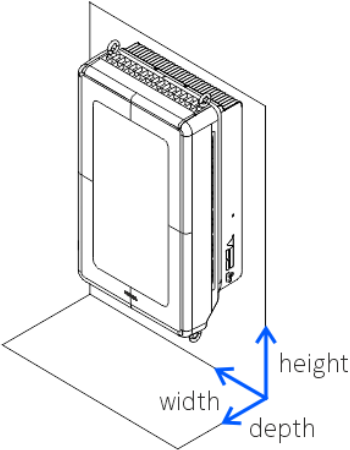
- Pole
- Wall

 Notice:

The radio unit 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 263: AEQB dimensions and weight

Property	Value	Dimensions orientation
Height	750 mm (29.53 in.)	
Width	450 mm (17.72 in.)	
Depth	240 mm (9.45 in.)	
Weight	42 kg (92.6 lb)	

Environmental specifications



Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 264: AEQB environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 265: AEQB wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	472
Rear	527
Side	234



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.10 AirScale MAA 64T64R 192 AE B48/n48 32 W eCPRI (AEQM)

AEQM (474842A) is introduced by *CB007600* (for LTE), *CB007857* (for NR), and *CB008923* (for LTE-NR concurrent mode).

Functional description

Table 266: AEQM functional specification

Property	Value
Maximum output power	32 W
Modulation	256 QAM (DL) 256 QAM (UL)
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital in azimuth and elevation
Operating mode	Full mode 64T64R
Supported technologies	LTE, NR
Duplex mode-supported standard	TDD
RF sharing/concurrent mode	LTE-NR
Frequency range	B48/n48: 3550–3700 MHz (upper part of 3GPP LTE n48)
Instantaneous bandwidth (iBW)	150 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers	LTE: up to 4 NR: up to 2
MIMO streams	8
Supported bandwidths	LTE: 10, 20 MHz NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 267: AEQM antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical (4, 8, 2)
Typical antenna gain (defined by BASTA)	24.5 dBi ± 1 dB (boresight)
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$15^\circ \pm 2^\circ$
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLL ≥ 6 dB), from $+13^\circ$ to -1° (upper SLL ≥ 10 dB)
Elevation scanning range	$\pm 10^\circ$ (upper SLL ≥ 6 dB), $\pm 7^\circ$ (upper SLL ≥ 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ \pm 1^\circ$
Front-to-back ratio	≥ 28 dB
Cross-polar discrimination	≥ 18 dB (boresight)
Total average EIRP	63 dBm

Interfaces

Figure 49: AEQM interfaces

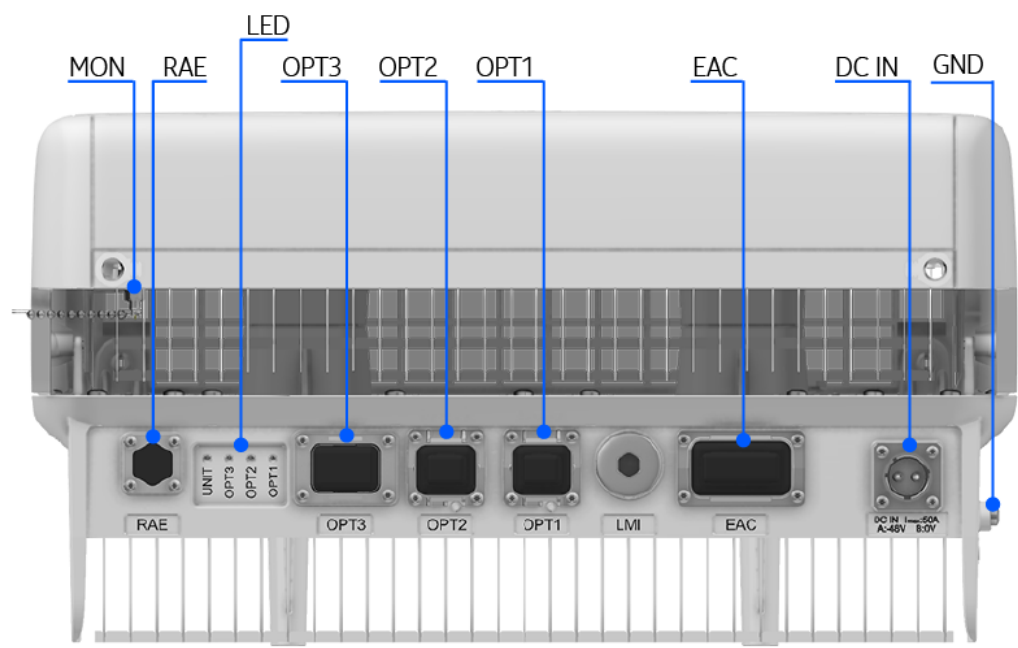


Table 268: AEQM interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole connector	APPC
Optical	OPT	3	OPT1, OPT2: SFP28 OPT3: QSFP+	eCPRI: OPT1, OPT2: 10 or 25 Gbps, Nokia IP seal AOPC

 **Note:**

AEQM uses only OPT1 port as the primary port.

Remote antenna extension	RAE	1	8-pin circular	AISG control signal to the antenna line devices
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	–
LED	UNIT/OPT1/OPT2/OPT3	4	–	Showing status of a unit and optical interfaces
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Antenna line devices(ALD) support

Table 269: AEQM ALD support

Property	Value
AISG	Version 2.0
Voltage	10-30 V
Power per port	–

Electrical specifications

Table 270: AEQM 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

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 system characteristics

Note:

AEQM power draw values will be provided in future releases of this document. Contact Nokia customer team for the latest power draw values.

Related optional items

- AASU Antenna Monitoring Module (476423A)
- AMCA Nokia AirScale MAA installation kit (MIK) (474912A)
- AMCC Nokia AirScale MAA installation kit (MIK) (475127A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMSA mounting kit for AASU (476533A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD plastic boot MDR26-open EAC cable 5 m (475570A)

Installation options

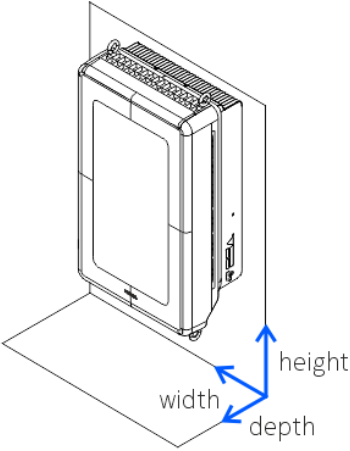
- Pole
- Wall

 Notice:

The radio unit 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 271: AEQM dimensions and weight

Property	Value	Dimensions orientation
Height	750 mm (29.53 in.)	
Width	450 mm (17.72 in.)	
Depth	242 mm (9.53 in.)	
Weight	45 kg (99.2 lb)	

Environmental specifications

Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 272: AEQM environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 273: AEQM wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	472
Rear	527
Side	234



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.11 AirScale MAA 64T64R 192 AE n40 320 W (AQNA)

AQNA (475953A) is introduced by CB007287 (for NR only) and CB009217 (for LTE-NR concurrent mode, LTE single mode, and additional LTE carriers). Transmission mode 9 (TM9) isn't supported by the CB009217.

Functional description

Table 274: AQNA functional specification

Property	Value
Commercial name	Osprey 64
Maximum output power	320 W (55 dBm)
Modulation	256 QAM
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital beamforming with 64T64R
Operating mode	Full mode 64T64R
Supported technologies	LTE, NR
RF sharing/concurrent mode	LTE-NR
Duplex mode - supported standard	TDD
Frequency range	n40: 2300-2400 MHz
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers	NR: up to 2 LTE: up to 4
MIMO streams	16
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz LTE: 15, 20 MHz

 Note:

AQNA in concurrent mode (NR-LTE) doesn't support multi-RAT power (pMax) check through WebEM in the current SRAN release. This means that no warning or error will be raised in the case of unsupported configuration. You have to calculate pMax manually.

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 275: AQNA antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 4, 8, 2
Typical antenna gain (defined by BASTA)	23.5 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 1.5^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$7^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS > 6 dB), from $+14^\circ$ to -2° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 7^\circ$ (upper SLS > 6 dB); $\pm 5^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	78.5 dBm

Interfaces

Figure 50: AQNA interfaces

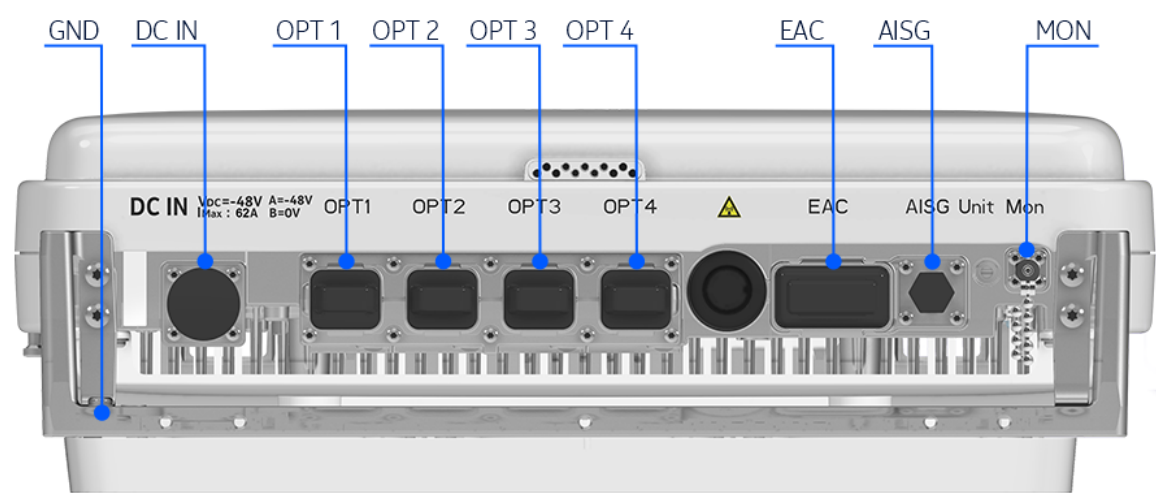


Figure 51: AQNA LED indicators

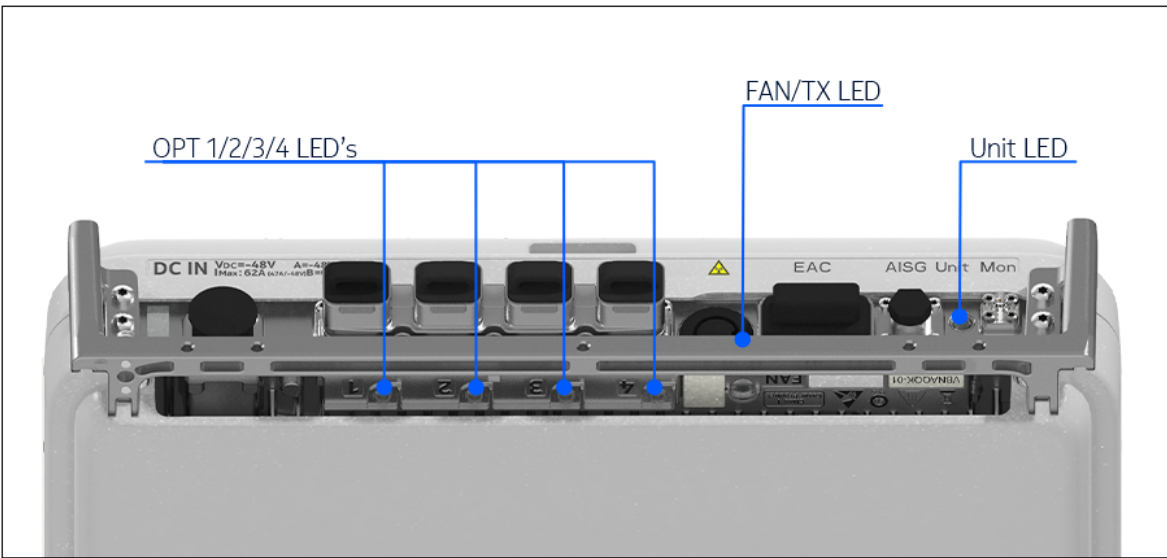


Table 276: AQNA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole circular	APPG
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and so on
Optical	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
Monitor	MON	1	SMA	-
External alarm connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
LED	UNIT/FAN_TX/OPT1/OPT2/OPT3/OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LED for each optical interfaces	Showing status of the unit and optical interfaces.
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	-

Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 277: AQNA ALD support

Property	Value
AISG	Version 2.0
Voltage	10-30 V
Power	Max. 7 W (RMS)

Electrical specifications

Table 278: AQNA 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
Surge protection	Class II 20 kA
Max current draw (I_{max}) (-36 V)*	57 A

* The I_{max} of the RU is given at an operating voltage of -36 V. For higher input voltages, you need to calculate a new I_{max} value. Note that the I_{max} given in the table might not be reached in actual use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 279: AQNA power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], ETSI 202706 busy hour load $P_{BH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 64TRX	320	3281	3743	4680

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 280: 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

Note:

Always use Nokia-approved SFP connectors and cables.

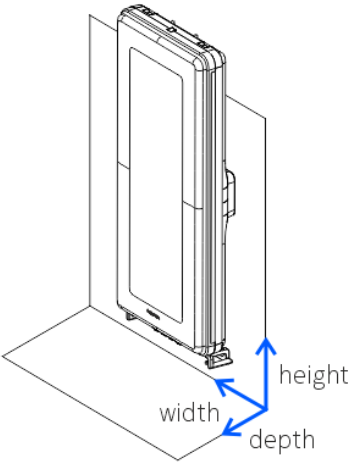
- AASU Antenna Monitoring Module (476423A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPC AirScale tilt support for pole kit (474939A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- AOPC SFP weatherproofing boot kit (475151A)
- APPG AirScale2 70A DC plug 10-16 mm² (475401A)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A) (recommended)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Installation options

- *Pole*
- *Wall*

Dimensions and weight

Table 281: AQNA dimensions and weight

Property	Value	Dimensions orientation
Height	1005 mm (39.57 in.) without handles 1051 mm (41.38 in.) with handles	
Width	540 mm (21.26 in.)	
Depth	128 mm (5.04 in.) 167 mm (6.57 in.) including fan	
Weight	45 kg (99.2 lb)	

Environmental specifications

Note:

There is no need to reduce 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 282: AQNA environmental specifications

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

Table 283: AQNA wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	744
Rear	744
Side	158



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.12 AirScale MAA 64T64R 192 AE n77 200 W eCPRI (AEQK)

AEQK (475589A) is introduced by 5GC002577 (for NR).

Functional description

Table 284: AEQK functional specification

Property	Value
Maximum output power	200 W (64 x 3.125 W)
Modulation	64 QAM (UL) 256 QAM (DL)
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital, 64T64R, 12x8 antenna array ($\pm 45^\circ$)
Supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	n77: 3700–3980 MHz (upper part of band)
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	Up to 4
MIMO streams	8
Supported bandwidths	eCPRI: 20, 40, 50, 60, 80, 90, 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 285: AEQK antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical (4, 8, 2)
Typical antenna gain (defined by BASTA)	24.5 dBi ± 1 dB (boresight)
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS ≥ 6 dB), from $+13^\circ$ to -1° (upper SLS ≥ 10 dB)
Elevation Scanning Range	$\pm 7^\circ$ (upper SLS ≥ 6 dB), $\pm 4^\circ$ (upper SLS ≥ 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	≥ 28 dB
Cross-polar discrimination	≥ 18 dB (boresight)
Total average EIRP	77.5 dBm

Interfaces

Figure 52: AEQK interfaces

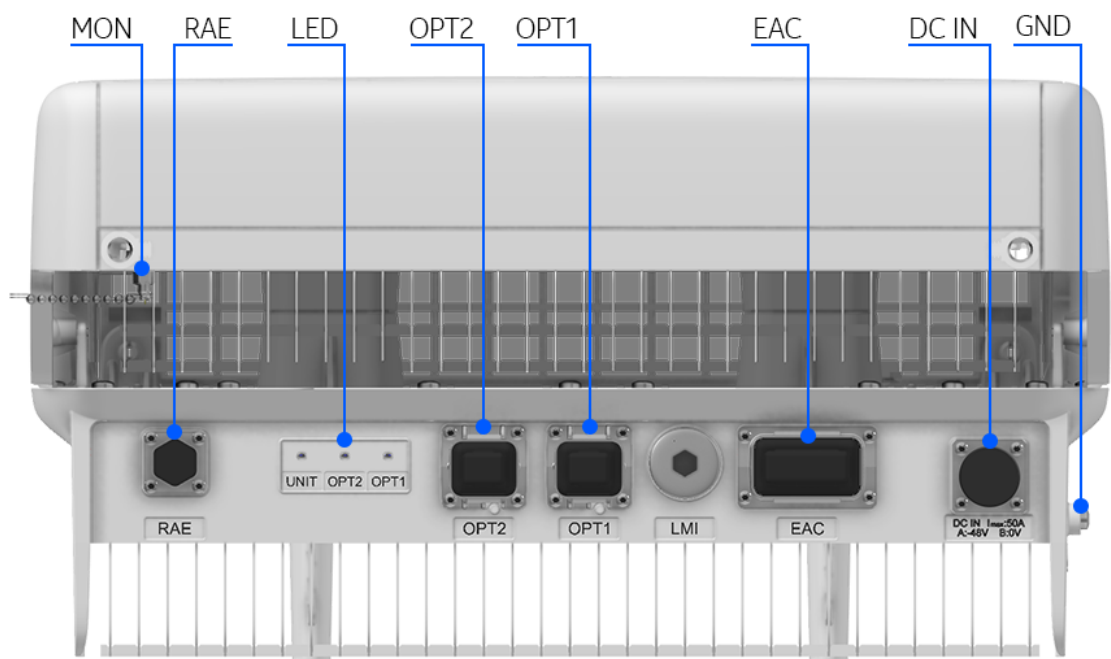


Table 286: AEQK interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC	1	2-pole connector	APPC
Optical	OPT	2	SFP28	eCPRI: 10 Gbps or 25 Gbps, Nokia IP seal

 **Note:**
AEQK uses only OPT1 port as the primary port.

Remote antenna extension	RAE	1	8-pin circular	AISG control signal to the antenna line devices
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	–
LED	UNIT/OPT1/OPT2	3	–	Showing status of the unit and optical interfaces
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Antenna line device (ALD) support

Table 287: AEQK ALD support

Property	Value
AISG	Version 2.0
Voltage	14.5 V ± 1 V
Power per port	2 W

Electrical specifications

Table 288: AEQK 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
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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 289: AEQK power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 52% RF load $P_{BH, RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 64TRX	200	2054	2385	3096

Recommended power back-off

The recommended power back-off values are defined as follows. High reduction values may cause radio outages.

Table 290: 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

Related optional items

- AASU Antenna Monitoring Module (476423A)
- AMCA Nokia AirScale MAA installation kit (MIK) (474912A)
- AMCC Nokia AirScale MAA installation kit (MIK) (475127A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMSA mounting kit for AASU (476533A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)

- AOPC SFP weatherproofing boot kit (475151A)
- ASAD plastic boot MDR26-open EAC cable 5 m (475570A)

Installation options

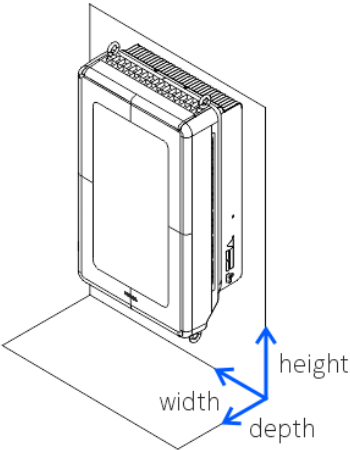
- Pole
- Wall

 Notice:

The radio unit 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 291: AEQK dimensions and weight

Property	Value	Dimensions orientation
Height	750 mm (29.53 in.)	
Width	450 mm (17.72 in.)	
Depth	242 mm (9.53 in.)	
Weight	45 kg (99.2 lb)	

Environmental specifications

 Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 292: AEQK environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 293: AEQK wind load conditions

Direction	Drag coefficient for the shape C_D	Wind force F [N] 150 km/h (42 m/s) (93 mph)
Front	1.28	472
Rear	1.42	527
Side	1.17	234



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.13 AirScale MAA 64T64R 192 AE n77 200 W eCPRI (AEQU)

AEQU (476085A) is introduced by CB008544 (for NR).

Functional description

Table 294: AEQU functional specification

Property	Value
Maximum output power	200 W (64 x 3.125 W)
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXX	64T64R
Outdoor installation	Yes
Beamforming	Digital, 64TRX, 8x12 dual polarized phased array
Operation mode	Full mode 64T64R
Number of streams/beams	Up to 8
Supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	n77: 3450–3550 MHz
Instantaneous bandwidth (iBW)	100 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	1
Supported bandwidths	20, 30, 40 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna Specification

Table 295: AEQU antenna characteristics in full mode 64T64R

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical (4,8,2)
Typical antenna gain (as defined by BASTA)	24.5 dBi ± 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS > 6 dB), from $+13^\circ$ to -1° (upper SLS > 10 dB)
Elevation scanning range	$\pm 7^\circ$ (upper SLS > 6 dB), $\pm 4^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	≥ 28 dB
Cross-polar discrimination	≥ 18 dB (boresight)

Interfaces

Figure 53: AEQU interfaces

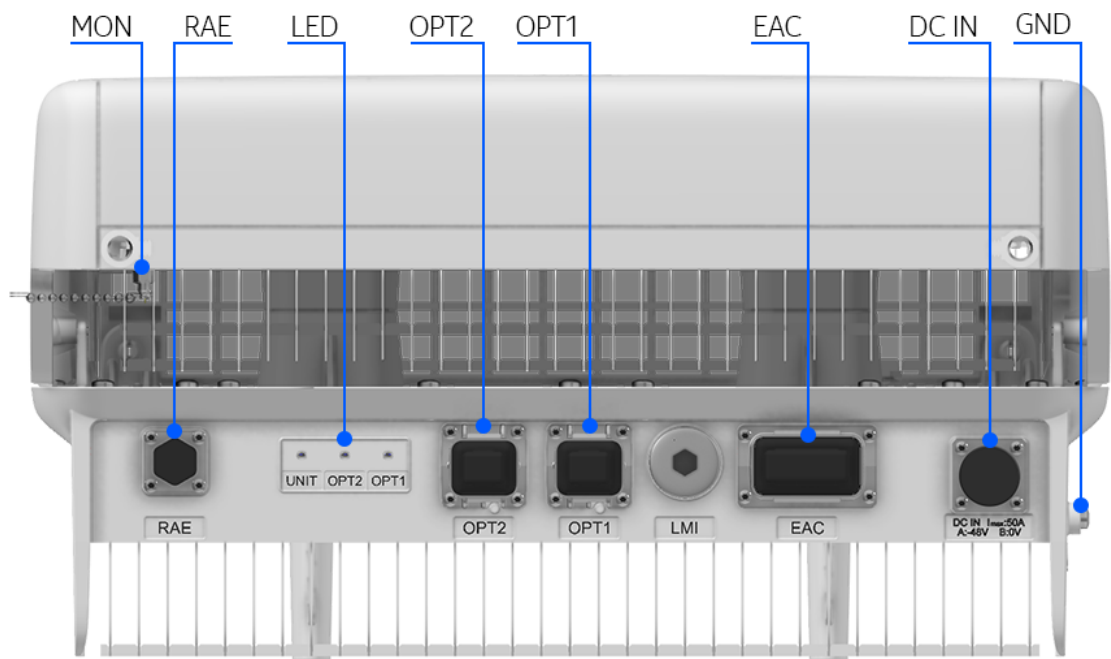


Table 296: AEQU interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC	1	2-pole connector	APPC
Optical	OPT	2	SFP28	eCPRI: 10 or 25 Gbps, Nokia IP seal
Remote antenna extension	RAE	1	8-pin circular	AISG control signal to the antenna line devices
Monitor	MON	1	SMA female	–
External alarm connection	EAC	1	MDR26	–
LED	UNIT/OPT1/OPT2	3	–	Showing status of the unit and optical interfaces
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

LEDs for optical ports

Two LEDs indicate the status of two optical ports.

Table 297: LEDs for primary link (OPT1)

LED status	Priority	Description	Trigger condition
Green, stable	4	Fiber link works properly	CPRI link is at F or G state, no alarm is triggered
Red, stable	3	The optical module fails to transmit or receive signals, caused by faulty optical module or broken optical fiber	TX fault, main link Loss of SFP RX signal
Red, blinking	2	CPRI link is out of lock	Loss of CPRI RX sync, main link
Off	1	Optical module is not detected after power on	SFP removed

Table 298: LEDs for secondary link (OPT2)

LED status	Priority	Description	Trigger condition
Green, stable	4	Fiber link works properly	CPRI link is at F or G state, no alarm is triggered
Red, stable	3	The optical module fails to transmit or receive signals, caused by faulty optical module or broken optical fiber	TX fault, capacity link Loss of SFP RX signal
Red, blinking	2	CPRI link is out of lock	Loss of RX sync, secondary link
Off	1	Optical module is not detected after power on	SFP removed

Antenna line device (ALD) support

Table 299: AEQU ALD support

Property	Value
AISG	Version 2.0
Voltage	10-30 V
Power per port	-

Electrical specifications

Table 300: AEQU 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
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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at

low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 301: AEQU power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load P_{RRH} , static (74.3% TX duty cycle)	Power draw [W], ETSI 202706 busy hour load P_{BH} , static	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 64TRX	200	2242	2577	3194

Related optional items

- AASU Antenna Monitoring Module (476423A)
- AMCA Nokia AirScale MAA installation kit (MIK) (474912A)
- AMCC Nokia AirScale MAA installation kit (MIK) (475127A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMSA mounting kit for AASU (476533A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- AOPC SFP weatherproofing boot kit (475151A)
- ASAD Plastic Boot MDR26-open EAC cable 5 m (475570A)

Installation options

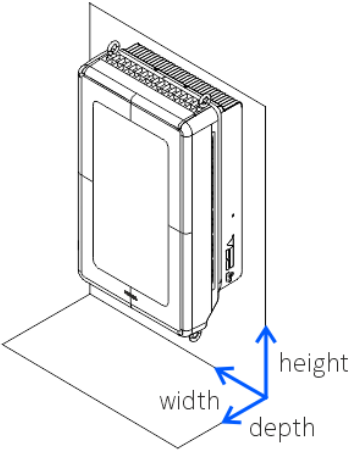
- *Pole*
- *Wall*

! Notice:

The radio unit 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 302: AEQU dimensions and weight

Property	Value	Dimensions orientation
Height	750 mm (29.53 in.)	
Width	450 mm (17.72 in.)	
Depth	240 mm (9.45 in.)	
Weight	45 kg (99.2 lb)	

Environmental specifications

i Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 303: AEQU environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 304: AEQU wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	472
Rear	527
Side	234



WARNING!

Risk of RF exposure.

To prevent RF exposure, place an RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.14 AirScale MAA 64T64R 192 AE n77 320 W (AQQK)

AQQK (475795A) is introduced by CB006783 (for NR).

Functional description

Table 305: AQQK functional specification

Property	Value
Commercial name	Osprey 64
Maximum output power	320 W (55 dBm)
Modulation	256 QAM
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital beamforming with 64T64R
Operating mode	Full mode 64T64R
Software supported technologies	NR
Duplex mode - supported standard	TDD
Frequency range	Sub-band n77: 3700-3980 MHz
Instantaneous bandwidth (iBW)	280 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers	up to 2
MIMO streams	16
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 306: AQQK antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 4, 8, 2
Typical antenna gain (defined by BASTA)	24.5 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$12.5^\circ \pm 1.5^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS > 6 dB), from $+14^\circ$ to -2° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 7^\circ$ (upper SLS > 6 dB); $\pm 5^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	79.5 dBm

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Interfaces

Figure 54: AQQK interfaces

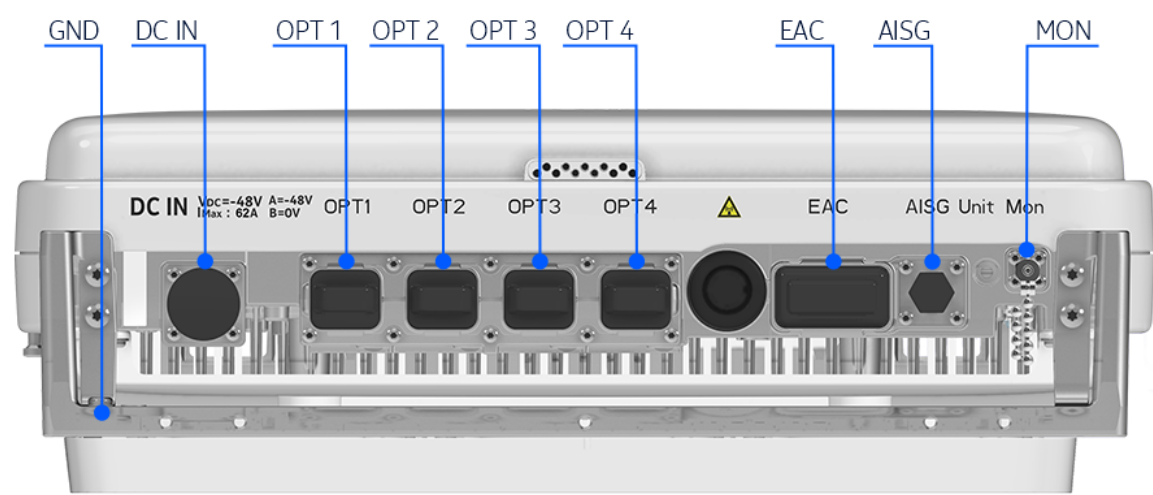


Figure 55: AQQK LED indicators

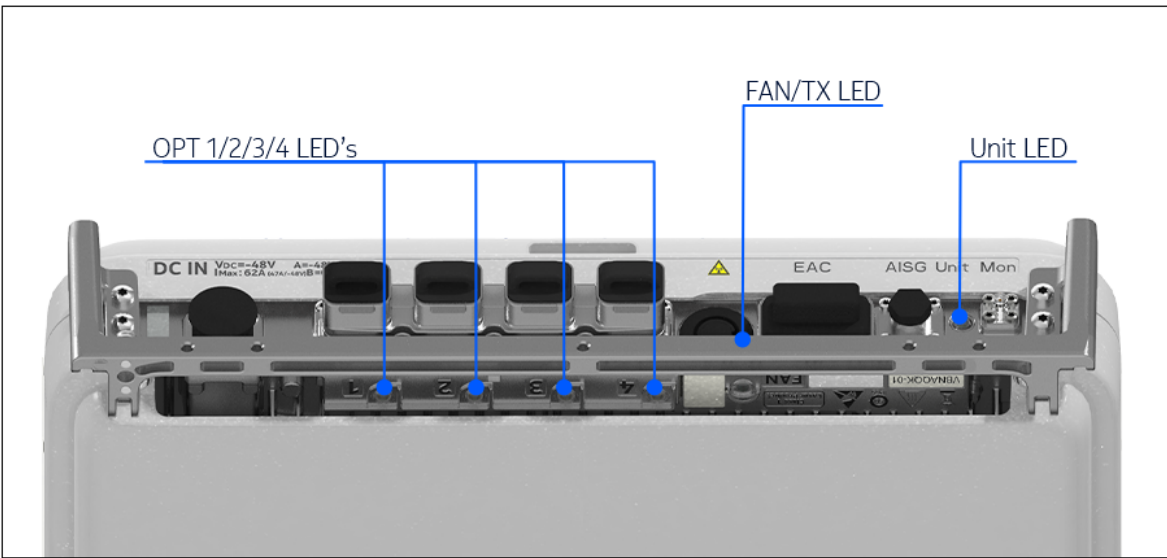


Table 307: AQQK interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole circular	APPG
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and others
Optical	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LEDs for each optical interfaces	Showing status of the unit and optical interfaces.
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line devices (ALDs) support

Table 308: AQQK ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power	Max. 7 W (RMS)

Electrical specifications

Table 309: AQQK 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
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	62 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 310: AQK power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], ETSI 202706 busy hour load $P_{BH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 64TRX	320	3567	4173	5389

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 311: 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

Note:

Always use Nokia-approved SFP connectors and cables.

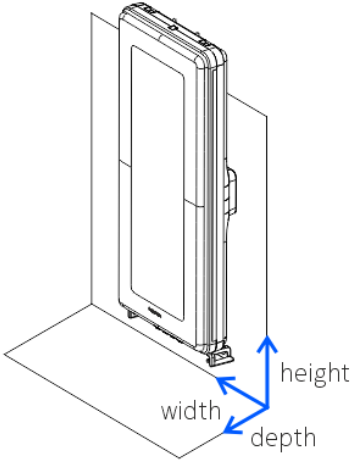
- AASU Antenna Monitoring Module (476423A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPC AirScale tilt support for pole kit (474939A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPG AirScale2 70A DC plug 10-16 mm² (475401A)
- AOPC SFP weatherproofing boot kit (475151A)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A) (recommended)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Installation options

- Pole
- Wall

Dimensions and weight

Table 312: AQQK dimensions and weight

Property	Value	Dimensions orientation
Height	1001 mm (39.41 in.) without handles 1047 mm (41.22 in.) with handles	
Width	448 mm (17.64 in.)	
Depth	113 mm (4.45 in.) 152 mm (5.98 in.) including fan depth	
Weight	36 kg (79.4 lb)	

Environmental specifications

Note:

There is no need to reduce 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 313: AQQK environmental specifications

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

Table 314: AQQK wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	587
Rear	592
Side	124



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.15 AirScale MAA 64T64R 192 AE n77 320 W (AQQS)

AQQS (475989A) is introduced by CB008578 (for NR).

Functional description

Table 315: AQQS functional specification

Property	Value
Commercial name	Osprey 64
Maximum output power	320 W
Modulation	256 QAM
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital beamforming with 64T64R
Operating mode	Full mode 64T64R
Supported technologies	NR
Duplex mode - supported standard	TDD
Frequency range	Sub-band n77: 3600-4000 MHz
Instantaneous bandwidth (iBW)	400 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers	up to 2
MIMO streams	16
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 316: AQQS antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 4, 8, 2
Typical antenna gain (defined by BASTA)	24 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13.5^\circ \pm 1.5^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS > 6 dB), from $+13.5^\circ$ to -1.5° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 6.5^\circ$ (upper SLS > 6 dB); $\pm 4^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	79 dBm

Interfaces

Figure 56: AQQS interfaces

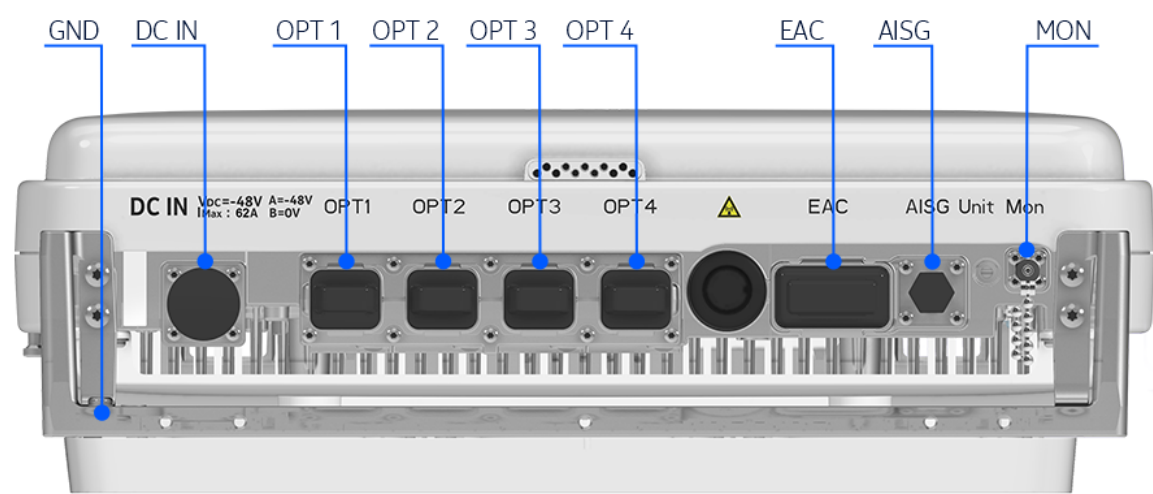


Figure 57: AQQS LED indicators

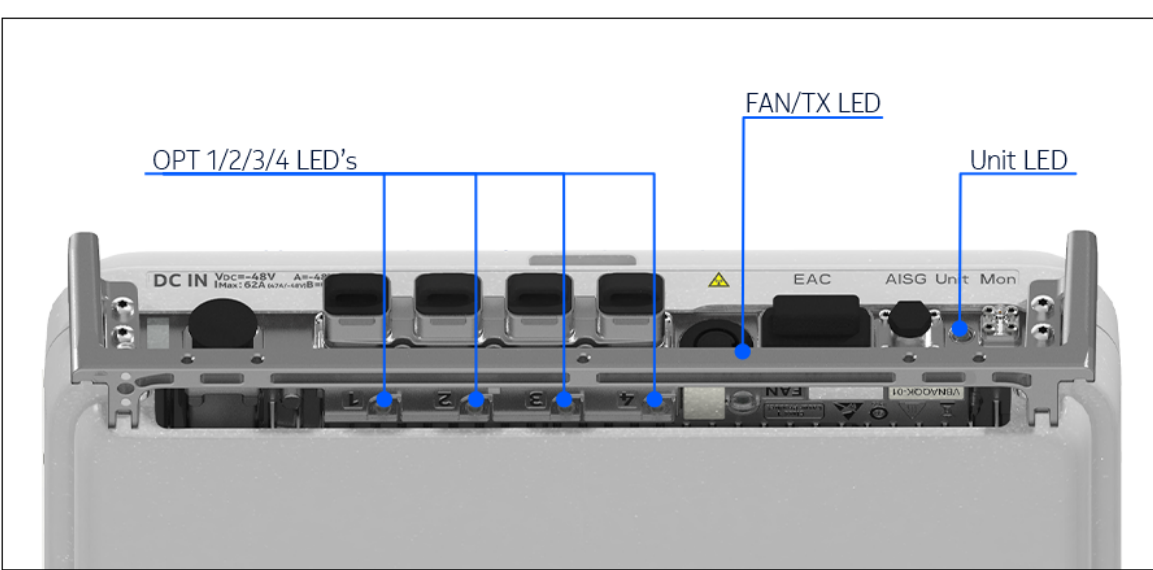


Table 317: AQQS interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole circular	APPG
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and others
Optical	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LEDs for each optical interfaces	Showing status of the unit and optical interfaces.
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–



Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 318: AQQS ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power	Max. 7 W root mean square (RMS)

Electrical specifications

Table 319: AQQS 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
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	60 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 320: AQQS power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], ETSI 202706 busy hour load $P_{BH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 64TRX	320	3438	4029	5315

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 321: The recommended NRCELL PDSCH Power Back-off for 256QAM (dlQam256PowerBackoffSub6) parameter value

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

Note:

Always use Nokia-approved SFP connectors and cables.

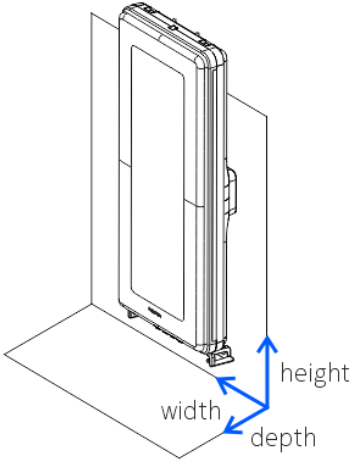
- AASU Antenna Monitoring Module (476423A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPC AirScale tilt support for pole kit (474939A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPG AirScale2 70 A DC plug 10–16 mm² (475401A)
- AOPC SFP weatherproofing boot kit (475151A)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A) (recommended)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Installation options

- Pole
- Wall

Dimensions and weight

Table 322: AQQS dimensions and weight

Property	Value	Dimensions orientation
Height	1001 mm (39.41 in.) without handles 1047 mm (41.22 in.) with handles	
Width	448 mm (17.64 in.)	
Depth	113 mm (4.45 in.) 152 mm (5.98 in.) including fan depth	
Weight	36 kg (79.37 lb)	

Environmental specifications

Note:

There is no need to reduce 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 323: AQQS environmental specifications

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

Table 324: AQQS wind load conditions (EN1991-1-4)

Direction	Wind force F [N] 150 km/h (42 m/s) (93 mph)
Front	587
Rear	592
Side	124



WARNING!

Risk of RF exposure.

To prevent an RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA-specific RF exposure requirements, see the respective installation document.

6.2.16 AirScale MAA 64T64R 192 AE n77 320 W (AQQT)

AQQT (476339A) is introduced by CB009555 (for NR).

Functional description

Table 325: AQQT functional specification

Property	Value
Commercial name	Osprey 64
Maximum output power	320 W
Modulation	256 QAM
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital beamforming with 64T64R
Operating mode	Full mode 64T64R
Supported technologies	NR
Duplex mode - supported standard	TDD
Frequency range	n77: 3500–3900 MHz
Instantaneous bandwidth (iBW)	400 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers	up to 2
MIMO streams	16
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

 Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 326: AQQT antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 4, 8, 2
Typical antenna gain (defined by BASTA)	24.5 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$12.5^\circ \pm 1.5^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS > 6 dB), from $+14^\circ$ to -2° (upper SLS > 10 dB)
Dynamic elevation scanning range	$\pm 7^\circ$ (upper SLS > 6 dB); $\pm 5^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	79.5 dBm

Interfaces

Figure 58: AQQT interfaces

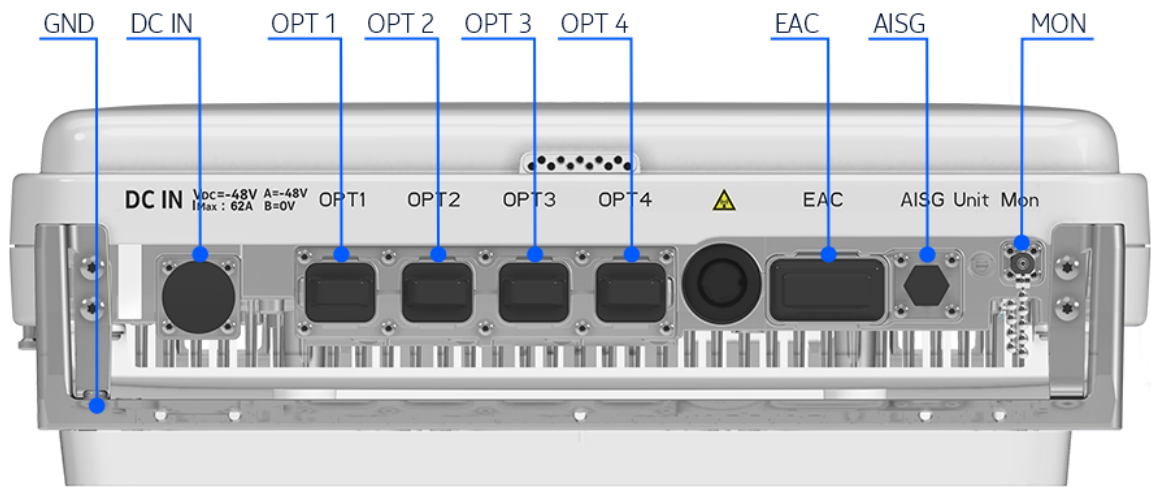


Figure 59: AQQT LED indicators

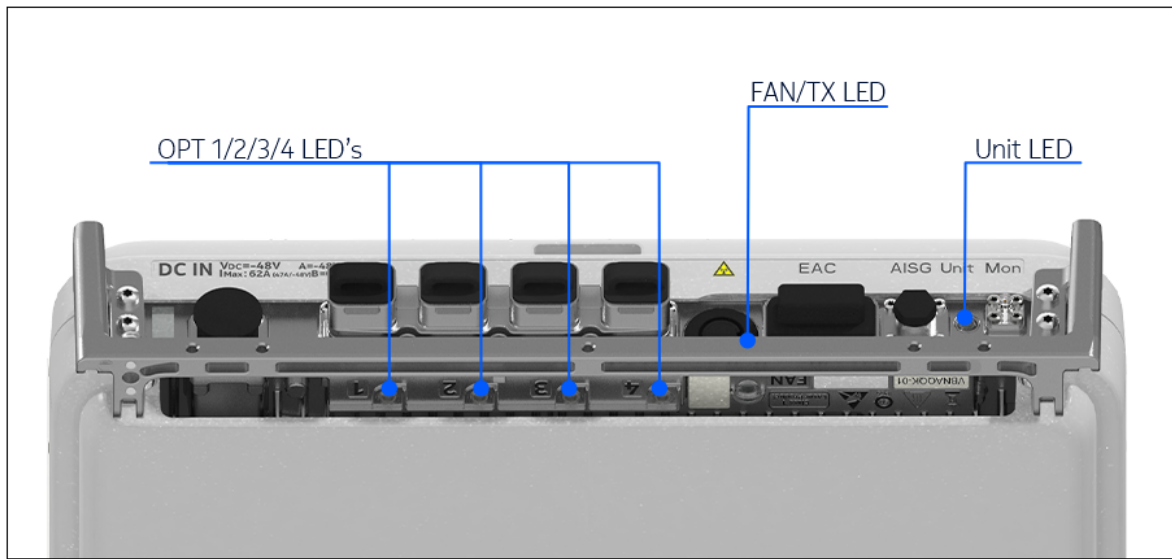


Table 327: AQQT interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole circular	APPG
Antenna Interface Standards Groups	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T
Optical	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
Monitor	MON	1	SMA	-
External alarm connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan and RF-transmission state • Four tri-color LEDs for each optical interface	Showing status of the unit and optical interfaces.
Grounding (GND)		1	2 x M5 screw or 1 x M8 screw	-

Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 328: AQQT ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power per port	Max. 7 W (RMS)

Electrical specifications

Table 329: AQQT 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
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	57 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements*.

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 330: AQQT power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], ETSI 202706 busy hour load $P_{BH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 64TRX	320	3296	3865	4891

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 331: 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

Note:

Always use Nokia-approved SFP connectors and cables.

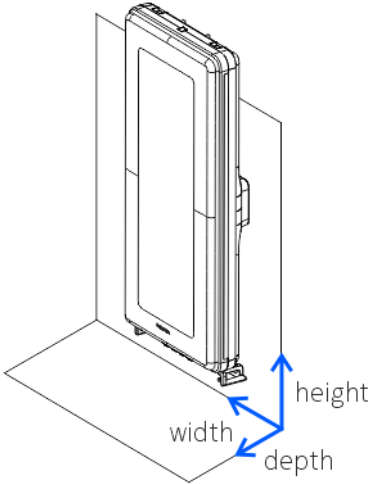
- AASU Antenna Monitoring Module (476423A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPC AirScale tilt support for pole kit (474939A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPG AirScale2 70A DC plug 10-16 mm² (475401A)
- AOPC SFP weatherproofing boot kit (475151A)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A) (recommended)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Installation options

- Pole
- Wall

Dimensions and weight

Table 332: AQQT dimensions and weight

Property	Value	Dimensions orientation
Height	1001 mm (39.41 in.) without handles 1047 mm (41.22 in.) with handles	
Width	448 mm (17.64 in.)	
Depth	152 mm (5.98 in.) including fan depth	
Weight	36 kg (79.4 lb)	

Environmental specifications

Note:

There is no need to reduce 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 333: AQQT environmental specifications

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

Table 334: AQQT wind load conditions (EN1991-1-4)

Direction	Wind force F [N]*
Front	587
Rear	592
Side	124

*The wind force is calculated at 150 km/h (42 m/s) (93 mph) wind velocity.



WARNING!

Risk of RF exposure.

To prevent RF exposure, place an RF absorber or blanket in front of the radome surface or keep the distance specified in the RF exposure requirements. For MAA-specific RF exposure requirements, see the respective installation document.

6.2.17 AirScale MAA 64T64R 192 AE n78 200 W eCPRI (AEQE)

AEQE (474750A) is introduced by 5GC000643 (for NR).

Functional description

Table 335: AEQE functional specification

Property	Value
Maximum output power	200 W (64 x 3.125 W)
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital, 64TRX, 8x12 dual polarized phased array
Operation modes	• Full mode 64T64R • Full split mode 2x 32T32R with horizontal cut of antenna panel • Half split mode 1x 32T32R with horizontal cut of antenna panel
Supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	n78: 3480–3800 MHz
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	Up to 2
Number of streams/beams	Up to 8
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 336: AEQE antenna characteristics for full panel mode 64T64R

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical (4,8,2)
Typical antenna gain (defined by BASTA)	24.5 dBi ± 1 dB (boresight)
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS > 6 dB), from $+13^\circ$ to -1° (upper SLS > 10 dB)
Elevation scanning range	± 7 (upper SLS > 6 dB), ± 4 (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 22 dB (boresight)
Total average EIRP	77.5 dBm

Table 337: AEQE antenna characteristics for split mode 1x 32T32R or 2x 32T32R with horizontal cut of antenna panel

Property	Value
Antenna configuration	6, 8, 2 ($\pm 45^\circ$ X-polarized), logical (2,8,2)
Typical antenna gain (defined by BASTA)	21.5 dBi $\pm$ 1 dB (boresight)
Minimum azimuth beamwidth, HPBW	$13^\circ \pm 2^\circ$
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$12^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+15^\circ$ to -3° (upper SLS > 6 dB); from $+13^\circ$ to -1° (upper SLS > 10 dB)
Elevation scanning range/Static Electrical Tilt Range	$\pm 3^\circ$ (upper SLS > 6 dB); $\pm 1^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front to back ratio	≥ 28 dB
Cross-polar discrimination	≥ 18 dB (boresight)
Total average EIRP	77.5 dBm

Interfaces

Figure 60: AEQE interfaces

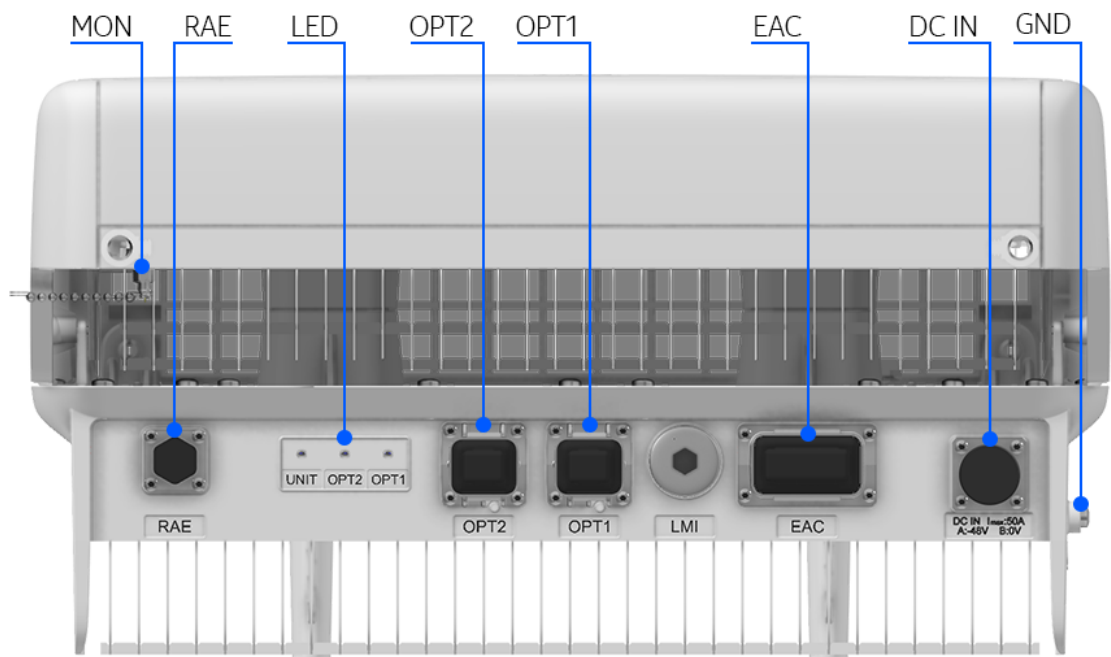


Table 338: AEQE interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC	1	2-pole connector	APPC
Optical	OPT	2	SFP28	eCPRI: 10 or 25 Gbps, Nokia IP seal

 **Note:**

AEQE uses only OPT1 port as the primary port.

Remote antenna extension	RAE	1	8-pin circular	AISG control signal to the antenna line devices
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	–
LED	UNIT/OPT1/OPT2	3	–	Showing status of a unit and optical interfaces
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Antenna line device (ALD) support

Table 339: AEQE ALD support

Property	Value
AISG	Version 2.0
Voltage	14.5 V ± 1 V
Power per port	2 W

Electrical specifications

Table 340: AEQE 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
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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 341: AEQE power draw

Mode	Configuration	Output power per carrier (W)	Power draw (W), ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw (W), ETSI 202706 busy hour $P_{BH, RRH, static}$	Power draw (W), 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 64TRX	200	2221	2541	3166

Recommended power back-off

The recommended power back-off values are defined as follows. High reduction values may cause radio outages.

Table 342: 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

Related optional items

- AASU Antenna Monitoring Module (476423A)
- AMCA Nokia AirScale MAA installation kit (MIK) (474912A)
- AMCC Nokia AirScale MAA installation kit (MIK) (475127A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMSA mounting kit for AASU (476533A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)

- ASAD plastic boot MDR26-open EAC cable 5 m (475570A)

Installation options

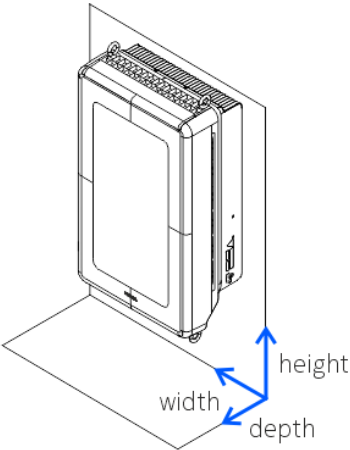
- Pole
- Wall
- IPAA

 Notice:

The radio unit 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 343: AEQE dimensions and weight

Property	Value	Dimensions orientation
Height	750 mm (29.53 in.)	
Width	450 mm (17.72 in.)	
Depth	242 mm (9.53 in.)	
Weight	45 kg (99.2 lb)	

Environmental specifications

Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 344: AEQE environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	−40°C (−40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 345: AEQE wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	472
Rear	527
Side	234



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.18 AirScale MAA 64T64R 192 AE n78 200 W eCPRI (AEQI)

AEQI (475440A) is introduced by 5GC002471 (for NR).

Functional description

Table 346: AEQI functional specification

Property	Value
Maximum output power	200 W (64 x 3.125 W)
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital, 64T64R, 12x8 antenna array ($\pm 45^\circ$ X-polarized)
Supported technologies	NR
Duplex mode, supported standard	TDD
Frequency range	n78: 3300–3600 MHz
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	Up to 2
MIMO streams	8
Supported bandwidths	eCPRI: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 347: AEQI antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical (4, 8, 2)
Typical antenna gain (defined by BASTA)	24.5 dBi ± 1 dB (boresight)
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+15^\circ$ to -3° (upper SLS ≥ 6 dB); from $+12.5^\circ$ to -0.5° (upper SLS ≥ 10 dB)
Elevation scanning range	$\pm 6^\circ$ (upper SLS ≥ 6 dB); $\pm 3.5^\circ$ (upper SLS ≥ 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	>28 dB
Cross-polar discrimination	>18 dB (boresight)
Total average EIRP	77.5 dBm

Interfaces

Figure 61: AEQI interfaces

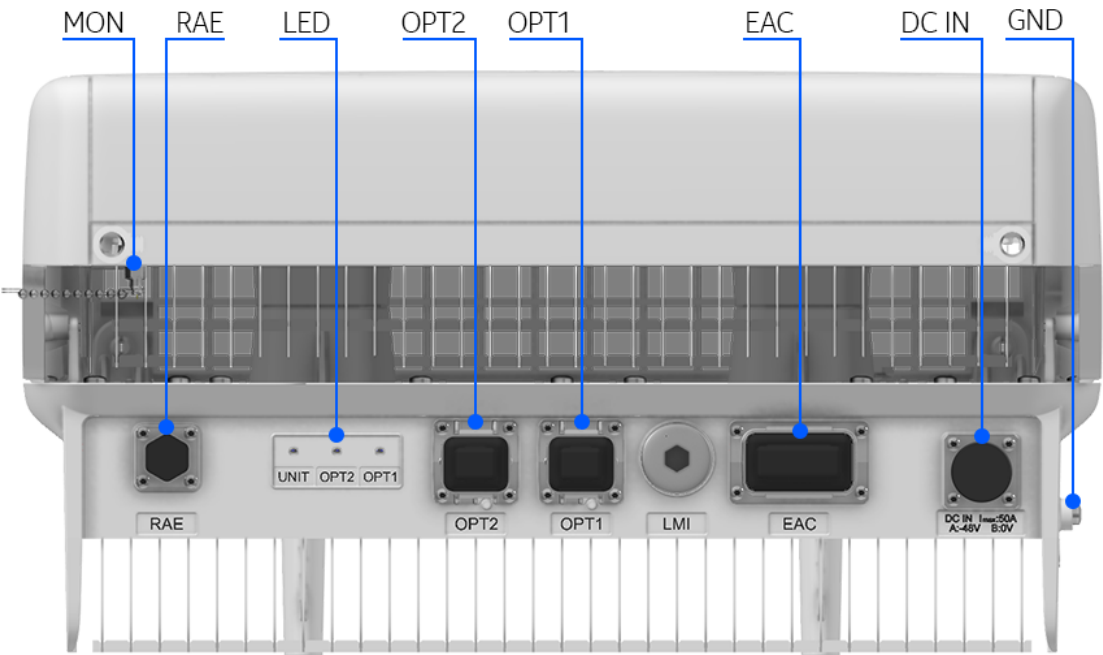


Table 348: AEQI interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC	1	2-pole connector	APPC
Optical	OPT	2	SFP28	eCPRI: 10 Gbps or 25 Gbps, Nokia IP seal

 **Note:**
AEQI uses only OPT1 port as the primary port.

Remote antenna extension	RAE	1	8-pin circular	AISG control signal to the antenna line devices
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	–
LED	UNIT/OPT1/OPT2	3	–	Showing status of a unit and optical interfaces
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

LEDs for optical ports

Two LEDs are used to indicate the two optical ports status.

Table 349: LEDs for primary link (OPT1)

LED status	Priority	Description	Trigger condition
Green, stable	4	Fiber link works properly	eCPRI link is at F or G state, no alarm is triggered
Red, stable	3	The optical module fails to transmit or receive signals, caused by faulty optical module or broken optical fiber	TX fault, main link Loss of SFP RX signal
Red, blinking	2	eCPRI link is out of lock	Loss of eCPRI RX sync, main link
Off	1	Optical module is not detected after power on	SFP removed

Table 350: LEDs for secondary link (OPT2)

LED status	Priority	Description	Trigger condition
Green, stable	4	Fiber link works properly	eCPRI link is at F or G state, no alarm is triggered
Red, stable	3	The optical module fails to transmit or receive signals, caused by faulty optical module or broken optical fiber	TX fault, capacity link Loss of SFP RX signal
Red, blinking	2	eCPRI link is out of lock	Loss of RX sync, secondary link
Off	1	Optical module is not detected after power on	SFP removed

Antenna line devices (ALD) support

Table 351: AEQI ALD support

Property	Value
AISG	Version 2.0
Voltage	14.5 V ± 1 V
Power per port	2 W

Electrical specifications

Table 352: AEQI 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
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 system characteristics

Note:

Contact Nokia customer team for the latest power draw values.

Recommended power back-off

The recommended power back-off values are defined as follows. High reduction values may cause radio outages.

Table 353: 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

Related optional items

- AASU Antenna Monitoring Module (476423A)
- AMCA Nokia AirScale MAA installation kit (MIK) (474912A)
- AMCC Nokia AirScale MAA installation kit (MIK) (475127A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMSA mounting kit for AASU (476533A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)
- ASAD plastic boot MDR26-open EAC cable 5 m (475570A)
- AOPC SFP weatherproofing boot kit (475151A)

Installation options

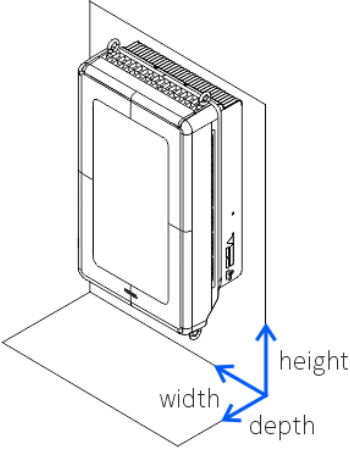
- Pole
- Wall

 Notice:

The radio unit 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 354: AEQI dimensions and weight

Property	Value	Dimensions orientation
Height	750 mm (29.53 in.)	
Width	450 mm (17.72 in.)	
Depth	240 mm (9.45 in.)	
Weight	42 kg (92.6 lb)	

Environmental specifications

Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 355: AEQI environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 356: AEQI wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	472
Rear	527
Side	234



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.19 AirScale MAA 64T64R 192 AE n78 200 W eCPRI (AEQP)

AEQP (475238A) is introduced by 5GC001437 (for NR) and CB006706 (for LTE).

Functional description

Table 357: AEQP functional specification

Property	Value
Maximum output power	200 W (64 x 3.125 W)
Modulation	256 QAM (DL) 64 QAM (UL)
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital, 64T64R, 4x12 dual polarized phased array
Supported technologies	LTE, NR
Concurrent mode	LTE-NR
Duplex mode, supported standard	TDD
Frequency range	n78: 3410-3700 MHz (upper part of band)
Instantaneous bandwidth (iBW)	200 MHz
Occupied bandwidth (oBW)	100 MHz
Number of carriers per pipe	NR: up to 2 LTE: up to 2 Concurrent mode: up to 1 NR + 1 LTE
MIMO streams	8
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz LTE: 20 MHz Concurrent mode: NR up to 50 MHz + LTE 1x20 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 358: AEQP antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical (4, 8, 2)
Typical antenna gain (defined by BASTA)	24.5 dBi ± 1 dB (boresight)
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$13^\circ \pm 2^\circ$
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS ≥ 6 dB); from $+13^\circ$ to -1° (upper SLS ≥ 10 dB)
Elevation scanning range	$\pm 7^\circ$ (upper SLS ≥ 6 dB); $\pm 4^\circ$ (upper SLS ≥ 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	77.5 dBm

Interfaces

Figure 62: AEQP interfaces

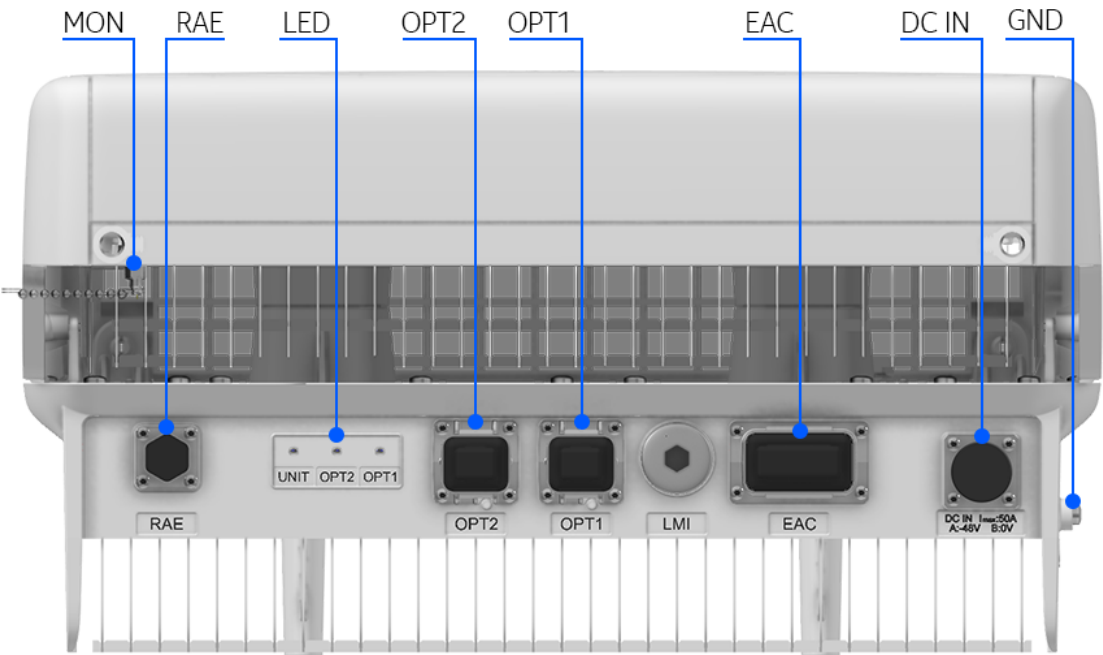


Table 359: AEQP interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC	1	2-pole connector	APPC
Optical	OPT	2	SFP28	NR eCPRI: 10 Gbps or 25 Gbps, Nokia IP seal LTE eCPRI: 25 Gbps, Nokia IP seal

Note:

AEQP uses only OPT1 port as the primary port.

Remote antenna extension	RAE	1	8-pin circular	AIISG control signal to the antenna line devices
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	–
LED	UNIT/OPT1/OPT2	3	–	Showing status of a unit and optical interfaces
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Antenna line device (ALD) support

Table 360: AEQP ALD support

Property	Value
AISG	Version 2.0
Voltage	14.5 V ± 1 V
Power per port	2 W

Electrical specifications

Table 361: AEQP 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
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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 362: AEQP power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 52% RF load $P_{BH, RRH, static}$ (74.3% TX duty cycle)	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	1/1/1 64TRX	200	2130	2465	3118

Recommended power back-off

The recommended power back-off values are defined as follows. High reduction values may cause radio outages.

Table 363: 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

Related optional items

- AASU Antenna Monitoring Module (476423A)
- AMCA Nokia AirScale MAA installation kit (MIK) (474912A)
- AMCC Nokia AirScale MAA installation kit (MIK) (475127A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMSA mounting kit for AASU (476533A)
- APPC AirScale2 55A DC plug 10-16 mm² (474283A/474283B)

- AOPC SFP weatherproofing boot kit (475151A)
- ASAD plastic boot MDR26-open EAC cable 5 m (475570A)

Installation options

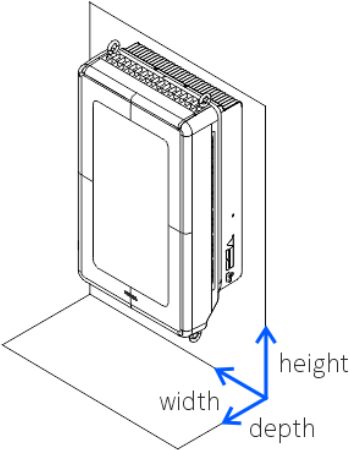
- Pole
- Wall
- IPAA

 Notice:

The radio unit 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 364: AEQP dimensions and weight

Property	Value	Dimensions orientation
Height	750 mm (29.53 in.)	
Width	450 mm (17.72 in.)	
Depth	242 mm (9.53 in.)	
Weight	45 kg (99.2 lb)	

Environmental specifications

Note:

Ambient conditions, such as solar radiation and natural airflow, as well as the configuration and location of the installation, might affect the maximum power output. When operating with a constant high traffic load at high temperatures, you might have to temporarily reduce power or limit the carrier traffic load to protect the unit from overheating.

Table 365: AEQP environmental specifications

Property	Value
Maximum operational temperature	55°C (131°F)
Minimum operational temperature	-40°C (-40°F)
Cooling method	Natural convection (fanless)
IP rating	IP65

Table 366: AEQP wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	472
Rear	527
Side	234



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.20 AirScale MAA 64T64R 192 AE n78 320 W (AQQE)

AQQE (475544A) is introduced by 5GC002422 (for NR) and CB008546 (for additional NR carriers).

Functional description

Table 367: AQQE functional specification

Property	Value
Commercial name	Osprey 64
Maximum output power	320 W (55 dBm)
Modulation	256 QAM
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital beamforming with 64T64R
Operating mode	Full mode 64T64R
Supported technologies	NR
Duplex mode - supported standard	TDD
Frequency range	Sub-band n78: 3420-3800 MHz
Instantaneous bandwidth (iBW)	380 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers	up to 4
MIMO streams	16
Supported bandwidths	20, 30, 40, 50, 60, 70, 80, 90, 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 368: AQQE antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 4, 8, 2
Typical antenna gain (defined by BASTA)	24.5 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$12.5^\circ \pm 1.5^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS > 6 dB), from $+14^\circ$ to -2° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 7^\circ$ (upper SLS > 6 dB); $\pm 5^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	79.5 dBm

Interfaces

Figure 63: AQQE interfaces

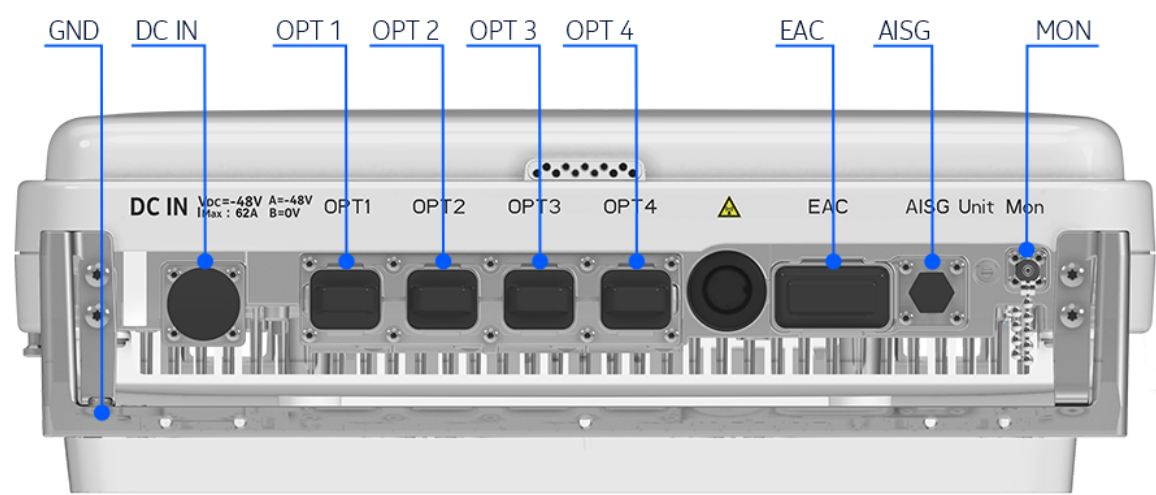


Figure 64: AQQE LED indicators

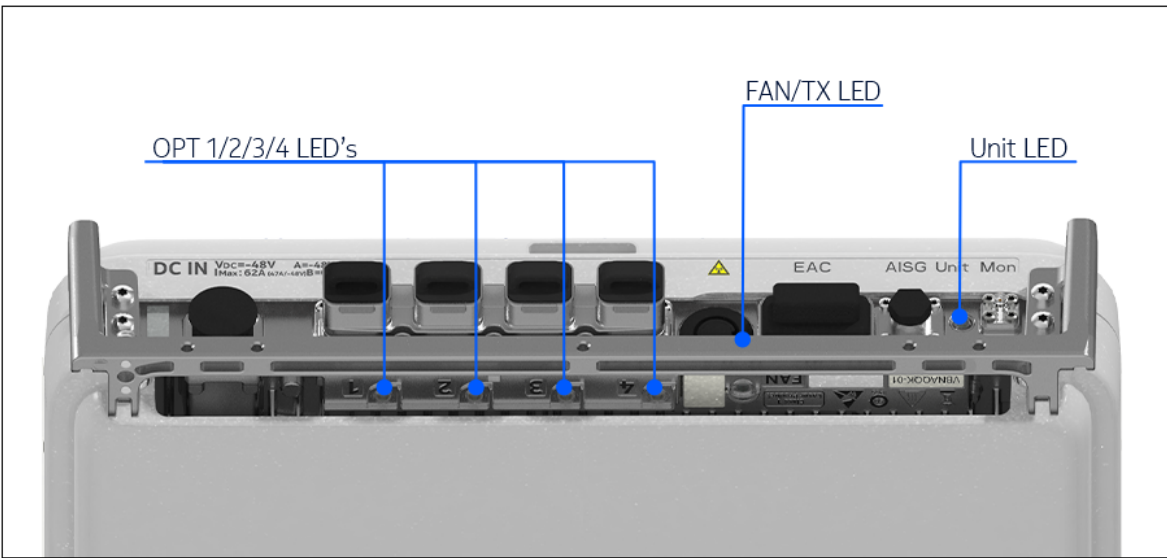


Table 369: AQQE interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole circular	APPG
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and others
Optical	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LEDs for each optical interfaces	Showing status of the unit and optical interfaces.
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line devices (ALDs) support

Table 370: AQQE ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power	Max. 7 W (RMS)

Electrical specifications

Table 371: AQQE 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
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	58 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 372: AQQE power draw

Mode	Configuration	Output Power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$	Power draw [W], ETSI 202706 busy hour load $P_{BH, RRH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$
NR	1/1/1 64TR	320	3306	3848	4908

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 373: 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

Note:

Always use Nokia-approved SFP connectors and cables.

- AASU Antenna Monitoring Module (476423A)
- AMMA Airscale IPAA AQQx slide-in frame C (476260A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPC AirScale tilt support for pole kit (474939A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPG AirScale2 70A DC plug 10-16 mm² (475401A)
- AOPC SFP weatherproofing boot kit (475151A)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A) (recommended)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Note:

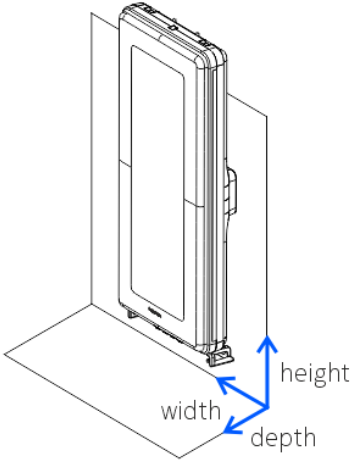
For compatible Platform Antennas (PFA) see *Installing and cabling AirScale IPAA+ - variants and installation options*.

Installation options

- Pole
- Wall
- IPAA+

Dimensions and weight

Table 374: AQQE dimensions and weight

Property	Value	Dimensions orientation
Height	1001 mm (39.41 in.) without handles 1047 mm (41.22 in.) with handles	
Width	448 mm (17.64 in.)	
Depth	113 mm (4.45 in.) 152 mm (5.98 in.) including fan depth	
Weight	36 kg (79.4 lb)	

Environmental specifications

Note:

There is no need to reduce 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 375: AQQE environmental specifications

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

Table 376: AQQE wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	587
Rear	592
Side	124



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.21 AirScale MAA 64T64R 192 AE n78 320 W (AQQL)

AQQL (475732A) is introduced by CB006277 (for NR only), CB009217 (for LTE-NR concurrent mode, LTE single mode, and additional LTE carriers), and CB008546 (for additional NR carriers). Transmission mode 9 (TM9) isn't supported by the CB009217 feature.

Functional description

Table 377: AQQLE functional specification

Property	Value
Commercial name	Osprey 64
Maximum output power	320 W (55 dBm)
Modulation	256 QAM
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital beamforming with 64T64R
Operating mode	Full mode 64T64R
Supported technologies	LTE, NR
RF sharing/concurrent mode	LTE-NR
Duplex mode - supported standard	TDD
Frequency range	n78: 3400–3800 MHz
Instantaneous bandwidth (iBW)	400 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers	NR: up to 4 LTE: up to 4
MIMO streams	16
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz LTE: 15, 20 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/SRAN Supported Configurations/SBTS and gNB Supported Configurations* and see:

- *SBTS Supported Configurations*
- *SBTS Supported Configurations - Rules and Examples*

Antenna specification

Table 378: AQL antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 4, 8, 2
Typical antenna gain (defined by BASTA)	24.5 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$12.5^\circ \pm 1.5^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS > 6 dB), from $+14^\circ$ to -2° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 7^\circ$ (upper SLS > 6 dB); $\pm 5^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	79.5 dBm

Interfaces

Figure 65: AQQI interfaces

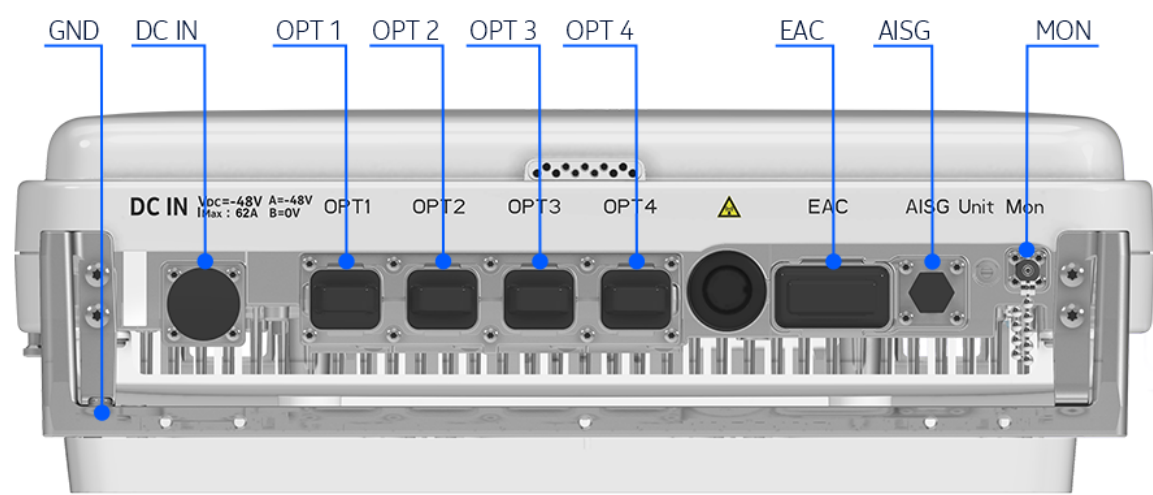


Figure 66: AQQI LED indicators

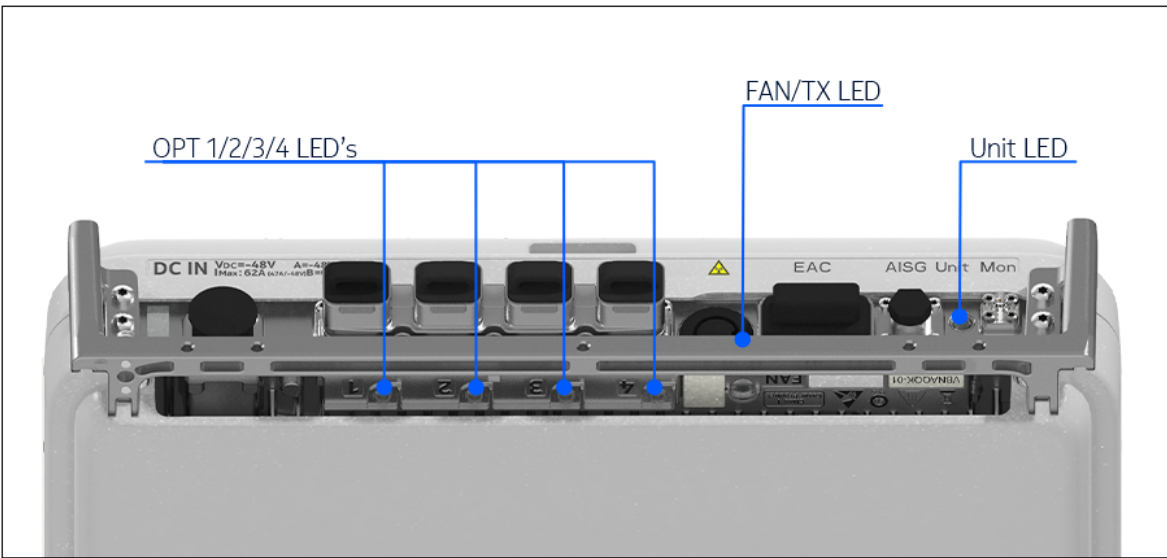


Table 379: AQL interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole circular	APPG
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and others
Optical	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LEDs for each optical interfaces	Showing status of the unit and optical interfaces.
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–

Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line devices (ALDs) support

Table 380: AQQL ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power	Max. 7 W (RMS)

Electrical specifications

Table 381: AQQL 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
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	57 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 382: AQQL power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load P_{RRH} , static (74.3% TX duty cycle)	Power draw [W], ETSI 202706 busy hour load $P_{BH,RRH}$, static	Power draw [W], 100% RF power load $P_{100\%RRH}$ (74.3% TX duty cycle)
NR	1/1/1 64TRX	320	3462	4001	4988

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 383: 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

Note:

Always use Nokia-approved SFP connectors and cables.

- AASU Antenna Monitoring Module (476423A)
- AMMA Airscale IPAA AQQx slide-in frame C (476260A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPC AirScale tilt support for pole kit (474939A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPG AirScale2 70A DC plug 10-16 mm² (475401A)
- AOPC SFP weatherproofing boot kit (475151A)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A) (recommended)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Note:

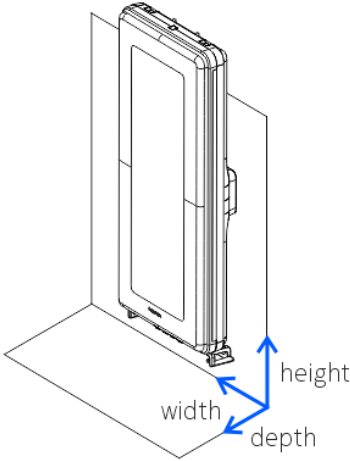
For compatible Platform Antennas (PFA) see *Installing and cabling AirScale IPAA+ - variants and installation options*.

Installation options

- Pole
- Wall
- IPAA+

Dimensions and weight

Table 384: AQQL dimensions and weight

Property	Value	Dimensions orientation
Height	1001 mm (39.41 in.) without handles 1047 mm (41.22 in.) with handles	
Width	448 mm (17.64 in.)	
Depth	113 mm (4.45 in.) 152 mm (5.98 in.) including fan depth	
Weight	36 kg (79.4 lb)	

Environmental specifications

Note:

There is no need to reduce 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 385: AQQL environmental specifications

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

Table 386: AQQL wind load conditions (EN1991-1-4)

Direction	Wind force F[N] 150 km/h (42 m/s) (93 mph)
Front	587
Rear	592
Side	124



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

6.2.22 AirScale MAA 64T64R 192 AE n78 320 W (AQQN)

AQQN (475937A) is introduced by CB007907 (NR only) and CB009217 (LTE-NR concurrent mode and LTE single mode). Transmission mode 9 (TM9) isn't supported by CB009217 .

Functional description

Table 387: AQQN functional specification

Property	Value
Commercial name	Osprey 64
Maximum output power	320 W
Modulation	256 QAM
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital beamforming with 64T64R
Operating mode	Full mode 64T64R
Supported technologies	LTE, NR
RF sharing/concurrent mode	LTE-NR
Duplex mode - supported standard	TDD
Frequency range	Sub-band n78: 3300-3700 MHz
Instantaneous bandwidth (iBW)	400 MHz
Occupied bandwidth (oBW)	200 MHz
Number of carriers	NR: up to 2 LTE: up to 2
MIMO streams	16
Supported bandwidths	NR: 20, 30, 40, 50, 60, 70, 80, 90, 100 MHz LTE: 20 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/5G NR and gNB Supported Configurations* and see:

- *5G NR Supported Configurations*
- *5G NR Supported Configurations - Rules and Examples*

Antenna specification

Table 388: AQQN antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 4, 8, 2
Typical antenna gain (defined by BASTA)	24.5 dBi $\pm$ 1 dB
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$12.5^\circ \pm 1.5^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (7 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS > 6 dB), from $+14^\circ$ to -2° (upper SLS > 10 dB)
Dynamic Elevation Scanning range	$\pm 7^\circ$ (upper SLS > 6 dB); $\pm 5^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 25 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	79.5 dBm

Interfaces

Figure 67: AQQN interfaces

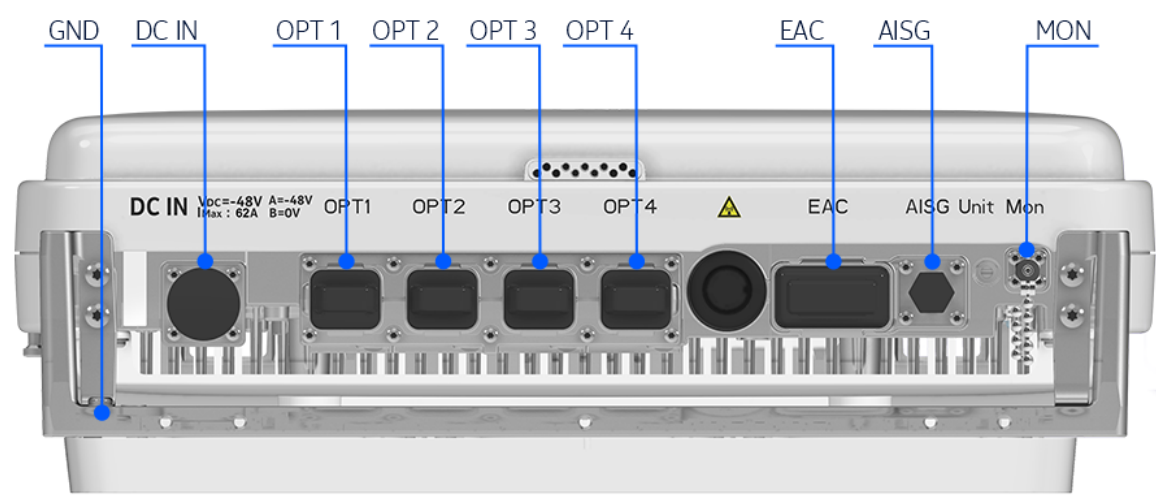


Figure 68: AQQN LED indicators

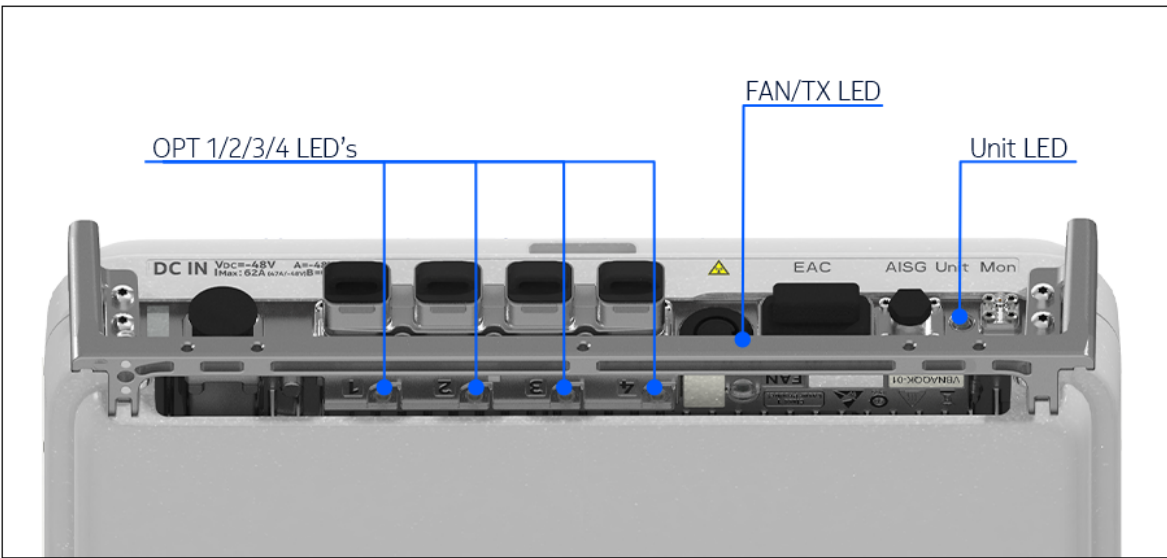


Table 389: AQQN interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	1	2-pole circular	APPG
Antenna Interface Standards Group	AISG	1	AISG C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T and others
Optical	OPT	4	SFP28, SFP+	eCPRI: 10 Gbps (SFP+) or 25 Gbps (SFP28); Nokia IP seal
Monitor	MON	1	SMA	–
External alarm connection	EAC	1	MDR26	ASAD (six alarm input and one control output) or ASAA (four alarm input and one control output)
LED	• UNIT • FAN_TX • OPT1 • OPT2 • OPT3 • OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan /RF-transmission state • Four tri-color LEDs for each optical interfaces	Showing status of the unit and optical interfaces.
Grounding (GND)		1	2 x M5 screw 1 x M8 screw	–



Note:

By default, the maximum optical fiber length is 30 km (18.6 mi). When a radio unit (RU) is upgraded to multiple carrier and 100/90 MHz configured with 16DL streams, the maximal optical fiber length changes to 4 km (2.5 mi). To use a longer fiber, change the Minimum DL delay value from SFP at DU to reception at RU (t12Min) parameter according to the fiber length for RUs connected to the same capacity plug-in unit. Any two RUs connected to the same capacity plug-in unit must be within a 4 km (2.5 mi) range.

Antenna line device (ALD) support

Table 390: AQQN ALD support

Property	Value
AISG	Version 2.0
Voltage	10–30 V
Power	Max. 7 W root mean square (RMS)

Electrical specifications

Table 391: AQQN 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
Surge protection	Class II 20 kA
Max current draw ($I_{\max}$) (–36 V)*	59 A

* The $I_{\max}$ of the RU is given at an operating voltage of –36 V. For higher input voltages, you need to calculate a new $I_{\max}$ value. Note that the $I_{\max}$ given in the table might not be reached in actual

use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for –48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 392: AQQN power draw

Mode	Configuration	Output Power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$	Power draw [W], ETSI 202706 busy hour load $P_{BH RRH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$
NR	1/1/1 64TR	320	3446	4010	5061

Recommended power back-off

The recommended power back-off values are defined as follows. High back-off values may cause radio outages.

Table 393: 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

Note:

Always use Nokia-approved SFP connectors and cables.

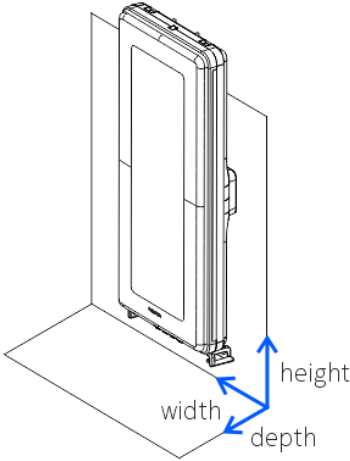
- AASU Antenna Monitoring Module (476423A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPC AirScale tilt support for pole kit (474939A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPG AirScale2 70 A DC plug 10–16 mm² (475401A)
- AOPC SFP weatherproofing boot kit (475151A)
- ASAD AirScale MDR26-open EAC cable 5 m (475570A) (recommended)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Installation options

- Pole
- Wall

Dimensions and weight

Table 394: AQQN dimensions and weight

Property	Value	Dimensions orientation
Height	1001 mm (39.41 in.) without handles 1047 mm (41.22 in.) with handles	
Width	448 mm (17.64 in.)	
Depth	113 mm (4.45 in.) 152 mm (5.98 in.) including fan depth	
Weight	36 kg (79.4 lb)	

Environmental specifications

Note:

There is no need to reduce 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 395: AQQN environmental specifications

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

Table 396: AQQN wind load conditions (EN1991-1-4)

Direction	Wind force F [N] 150 km/h (42 m/s) (93 mph)
Front	587
Rear	592
Side	124



WARNING!

Risk of RF exposure.

To prevent RF exposure, place an RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA-specific RF exposure requirements, see the respective installation document.

6.3 64T64R AirScale TDD dual band macro MAAs

6.3.1 AirScale MAA 64T64R 192 AE n77 480 W (AQQQA)

AQQQA (476090A) is introduced by *CB008680* (for NR).

Functional description

Table 397: AQQQA functional specification

Property	Value
Commercial name	Osprey 64
Maximum output power	480 W
Modulation	Up to 256 QAM (DL and UL)
Number of TXRX	64T64R
Outdoor installation	Yes
Beamforming	Digital beamforming with 64T64R
Operating mode	Full mode 64T64R
Supported technologies	NR
Duplex mode - supported standard	TDD
Frequency range	n77: 3450-3550 MHz (3.45 GHz band) and 3700-3980 MHz (C-band)
Instantaneous bandwidth (iBW)	100 MHz (C-band) and 100 MHz (3.45 GHz band)
Occupied bandwidth (oBW)	100 MHz per band
Number of carriers	Up to 2 carriers (1 carrier in 3.45 GHz band and 1 carrier in C-band)
MIMO streams	16
Supported bandwidths	3.45 GHz band: 20, 30, 40 MHz (hardware ready to support 10 MHz in later releases) C-band: 20, 40, 60, 80, 100 MHz

Note:

For more information on output power, supported carriers and bandwidths, and supported configurations, go to *Reference Documentation/5G NR Supported Configurations/5G NR and gNB Supported Configurations* and see:

- *5G NR Supported Configurations*
- *5G NR Supported Configurations - Rules and Examples*

Antenna specification

Table 398: AQQQA antenna characteristics

Property	Value
Antenna configuration	12, 8, 2 ($\pm 45^\circ$ X-polarized), logical 4, 8, 2
Typical antenna gain (defined by BASTA)	24.5 dBi $\pm$ 1 dB at both C-band and 3.45 band
Minimum azimuth beamwidth, Half Power Beam Width (HPBW)	$12.5^\circ \pm 1.5^\circ$ (boresight)
Azimuth scanning range	$\pm 45^\circ$ (3 dB), $\pm 50^\circ$ (4 dB)
Envelope azimuthal beamwidth	$\pm 60^\circ$ (8 dB)
Minimum elevation beamwidth, HPBW	$6.5^\circ \pm 1^\circ$
Envelope elevation beamwidth, HPBW	From $+16^\circ$ to -4° (upper SLS > 6 dB), from $+13^\circ$ to -1° (upper SLS > 10 dB)
Dynamic elevation scanning range	$\pm 7^\circ$ (upper SLS > 6 dB); $\pm 4^\circ$ (upper SLS > 10 dB)
Vertical tilt (pre-tilt) angle	$+6^\circ$
Front-to-back ratio	> 28 dB
Cross-polar discrimination	> 18 dB (boresight)
Total average EIRP	81.3 dBm

Interfaces

Figure 69: AQQQA interfaces

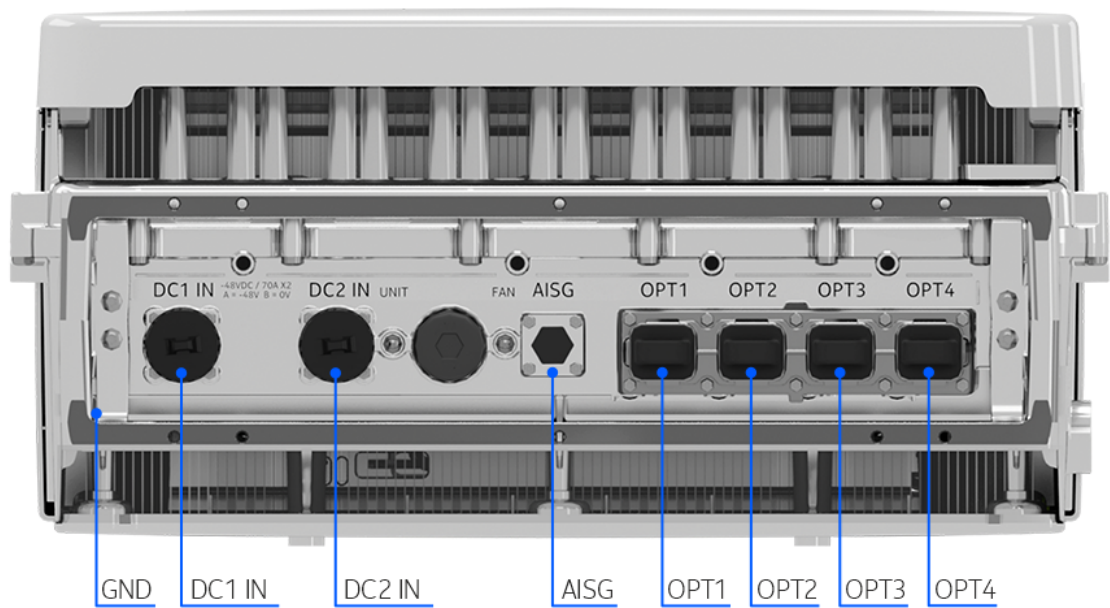
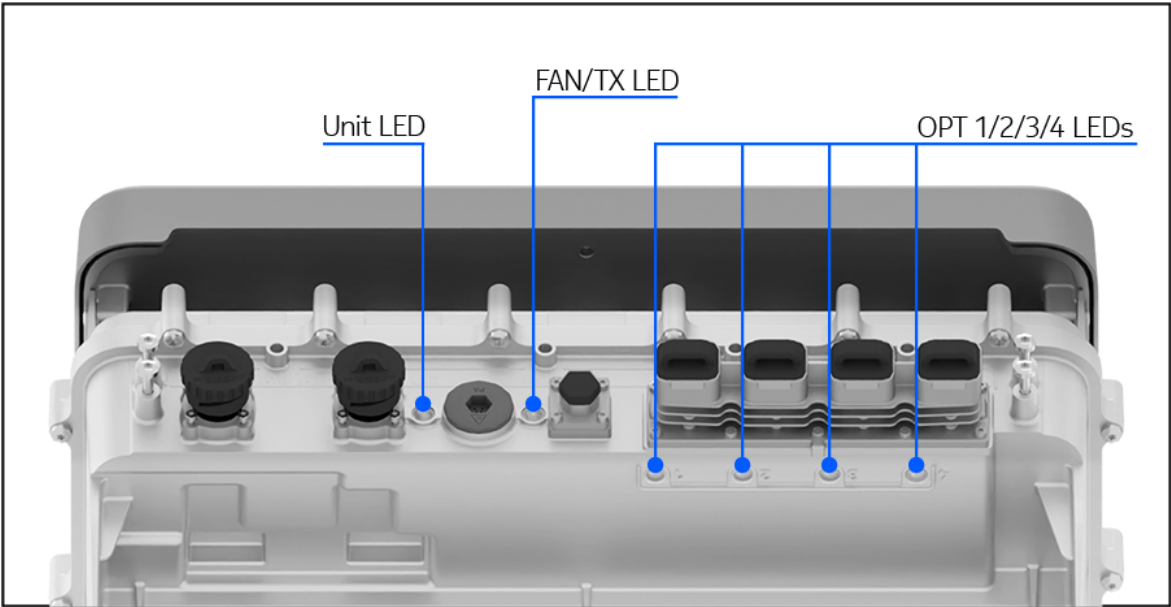


Figure 70: AQQQA LED indicators



Note:

The lower handle is not shown for clarity.

Table 399: AQQQA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power	DC IN	2	Circular plug	APPG Always connect both DC IN cables. Installation with only one DC IN cable is not supported. Maximum current draw (I_{max}) is 50A on DC1 and 30A on DC2.
Antenna Interface Standards Groups	AISG	1	C485 (8-pin circular)	AISG interface for external devices such as external RAE unit /T, and so on
Optical	OPT	4	SFP28 and SFP+	eCPRI: 10 or 25 Gbps, Nokia IP seal AOPC
LED	UNIT/FAN_TX/ OPT1/OPT2/O PT3/OPT4	6	• One tri-color status LED for the RF core functional block • One tri-color LED for combined fan and RF-transmission state • Four tri-color LEDs, one for each optical interface	Shows the status of the unit and optical interfaces. For more information on MAA LED indicators see: MAA LEDs description .
Grounding (GND)		1	2 x M5 screw or 1 x M8 screw	-

Antenna line device (ALD) support

Table 400: AQQQA ALD support

Property	Value
AISG	Version 2.0
Voltage	10-30 V
Power per port	Max. 7 W (RMS)

Electrical specifications

Table 401: AQQQA electrical specifications

Property	Value
Nominal supply voltage	-48.0 V DC
Nominal input voltage range	-40.5 V DC to -54.0 V DC
Extended input voltage range	-36.0 V DC to -60.0 V DC
Surge protection	Class II 20 kA
Max current draw (I_{max}) (-36 V)*	50 A on DC1 and 30 A on DC2

* The I_{max} of the RU is given at an operating voltage of -36 V. For higher input voltages, you need to calculate a new I_{max} value. Note that the I_{max} given in the table might not be reached in actual use cases. For more information, see the guidance for power system dimensioning in *Nokia AirScale BTS Installation Site Requirements* .

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 system characteristics

Typical power draw for -48 V DC input, at 25°C (77°F), representative of typical product performance under the same conditions (hardware variant, software version, product configuration, environment, and so on) with +/- 10% margin at different load, with constant traffic profile, without any energy-saving features activated. These values in the below tables give no information on typical power draw during normal operation. Average power draw = (6 h x Power at low load + 10 h x Power at medium load + 8 h x Power at busy load) /24 h.

In the case of macro radio units (RUs), power draw values are provided for three sectors: three remote radio heads (RRHs), three Massive MIMO Adaptive Antennas (MAAs), or a single RFM.

Table 402: AQQA power draw

Mode	Configuration	Output power per carrier [W]	Power draw [W], ETSI 202706 average load $P_{RRH, static}$ (74.3% TX duty cycle)	Power draw [W], ETSI 202706 busy hour load $P_{BH, RRH, static}$	Power draw [W], 100% RF power load $P_{100\% RRH}$ (74.3% TX duty cycle)
NR	Dual band 1+1/1+1/1+1 64TRX	320+160	4806	5614	7350

Recommended power back-off

The recommended power back-off values are defined as follows. NRCELL PDSCH Power Back-off for 256QAM (dlQam256PowerBackoffSub6) parameter value for non-contiguous NR carrier per band in 256 QAM is 0.2 dB. High back-off values may cause radio outages.

 Note:

You can further optimize the power back-off value by enabling the CB007657: Low PAPR Optimized Precoding feature.

Related optional items

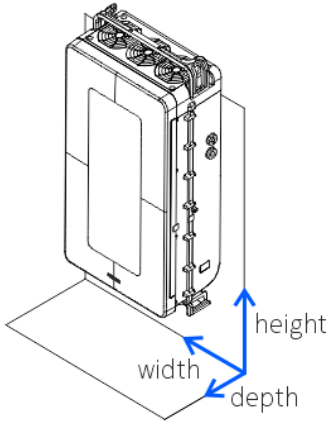
- AASU Antenna Monitoring Module (476423A)
- AMPF Nokia AirScale mounting bracket (475188A)
- AMPI MAA bracket 30 tilt +90 azimuth (475648A)
- AMPC AirScale tilt support for pole kit (474939A)
- AMSA mounting kit for AASU (476533A)
- External RAE unit /T (475534A)
- APPG AirScale2 70A DC plug 10-16 mm² (475401A)
- AOPC SFP weatherproofing boot kit (475151A)

Installation options

- Pole
- Wall

Dimensions and weight

Table 403: AQQQA dimensions and weight

Property	Value	Dimensions orientation
Height	803 mm (31.61 in.) without handles 911 mm (35.87 in.) with handles	
Width	450 mm (17.71 in.) (core)	
Depth	229 mm (9.01 in.)	
Weight	48 kg (106 lb)	

Environmental specifications

Note:

There is no need to reduce 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 404: AQQQA environmental specifications

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

Table 405: AQQQA wind load conditions (EN1991-1-4)

Direction	Wind force F [N]*
Front	500
Rear	475
Side	305

*The wind force is calculated at 150 km/h (42 m/s) (93 mph) wind velocity.



WARNING!

Risk of RF exposure.

To prevent RF exposure, place an RF absorber or blanket in front of the radome surface or keep the distance specified in the RF exposure requirements. For MAA-specific RF exposure requirements, see the respective installation document.

7. AirScale Small Cells MAAs

Available AirScale Small Cells MAA units.

7.1 AirScale MAA 2*2T2R 256 AE (AEUD)

AEUD (474611A) is introduced by 5GC000855.

Functional description

Table 406: AEUD functional specification

Property	Value
Total TX RF output power per carrier	1cc: 25 dBm 2cc: 22 dBm 4cc: 19 dBm 8cc: 16 dBm
Modulation	Up to 64 QAM
Number of TXRX	2*2T2R
Outdoor installation	Yes
Beamforming	Analog, 2TX and 64 antenna elements for each 2 antenna panels
Number of MIMO streams/beams	2
Supported technology	NR
Duplex mode, supported standard	TDD, 3GPP
Frequency range	27.50–28.35 GHz, 3GPP band n261
Instantaneous bandwidth (iBW)	850 MHz
Occupied bandwidth (oBW)	800 MHz
Carrier configurations	Up to 8x 50/100/200/400 MHz (in the limit of oBW)

Band n261 antenna specification

Table 407: AEUD antenna characteristics

Property	Value
Antenna gain	26 dB (boresight)
Total average EIRP	51 dBm
Noise figure	7.5 dB
Horizontal steering range	180° (3 dB)
Horizontal beamwidth	12° (3 dB)
Vertical steering range	90° (3 dB)
Vertical beamwidth	12° (3 dB)
Side lobe suppression	More or equal to 20 dB with tapering, 10 dB without
Main lobe accuracy and granularity	Less than 2°

Interfaces

Figure 71: AEUD interfaces

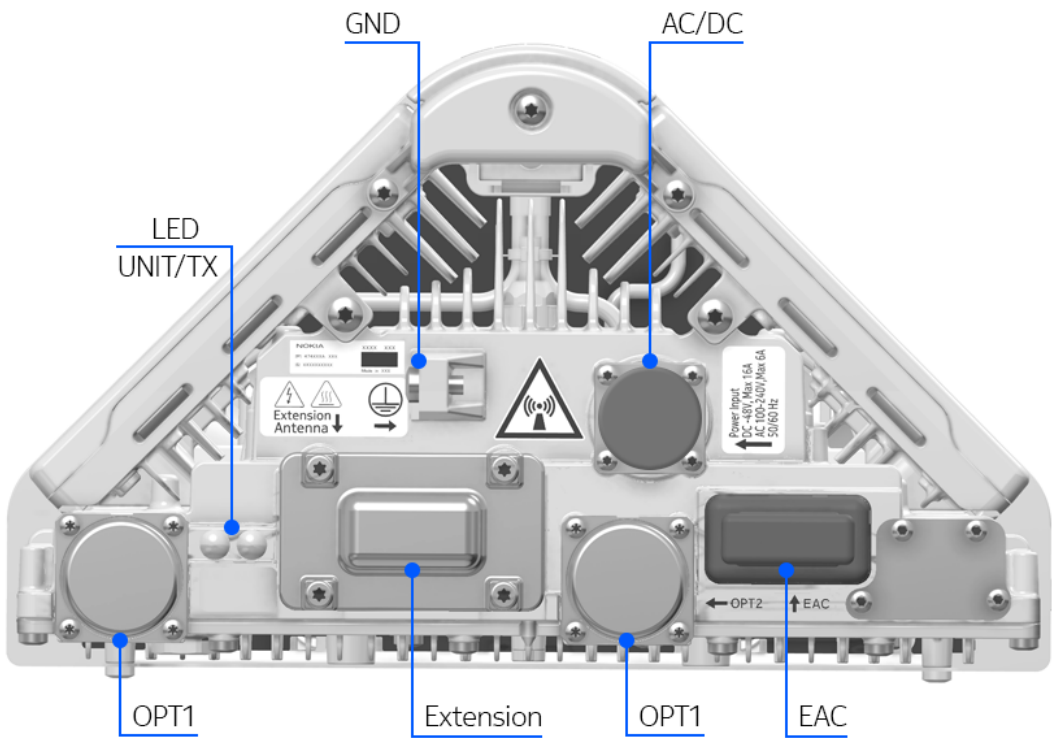


Table 408: AEUD interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	AC/DC	1	2-pole connector	AC in connector (100 to 140 V) or one in connector (-40.5 to -57 V)*. Maximum circuit breaker size is 20 A for DC and 10 A for AC.
Optical interface	OPT	2	SFP+/SFP28	ACPB (R2CT) optical boot
Grounding (GND)		1	1 x M8 screw or 2 x M5 screw	-
External Alarm Control	EAC	1	MDR26	6 alarm inputs and 1 control output
Operational state visual indication (2 pcs) Unit and TX	LED	2	-	Showing status of a unit and TX/Fan
Extension connector	-	-	1	Interface for additional 180° extension unit (AEUE)

*Single connector supporting AC or DC.

Electrical specifications

Table 409: AEUD electrical specifications for AC power supply

Property	Value
Nominal input voltage range	100-130 V AC
Extended input voltage range	90-140 V AC

 Note:

Operating at 220 V AC requires an APAF converter.

Table 410: AEUD electrical specifications for DC power supply

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

Power system characteristics

 Note:

Contact Nokia customer team for the latest power draw values.

Information on the estimated power draw [W] at 48 V DC input in 23°C, RF output power per TX, 100% DL traffic load. Non-committed estimated values depend on the final product hardware and software optimization with +/- 10% margin.

Table 411: AEUD power draw

Property	Value [W]
Typical power draw	260
Typical power draw with AEUE extension unit	320

Related optional items

- AMEB AirScale strap mount pole kit (474923A)
- AMCD AirScale mmWave radio strand mount (475264A)
- ACPB AirScale2 fiber connector R2CT (474384A)
- AOMC SFP28 70m MM I-temp RS (474900A)
- AOSC SFP28 2Km SM I-temp RS (474901A)
- AOSD SFP28 10Km SM E-temp RS (474902A)
- APPF conn 3 pole female plug AC/DC (474893A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)
- AUFD optical cables 2 m (474461A)
- AUFE optical cables 5 m (474462A)

Installation options

- Pole
- Wall

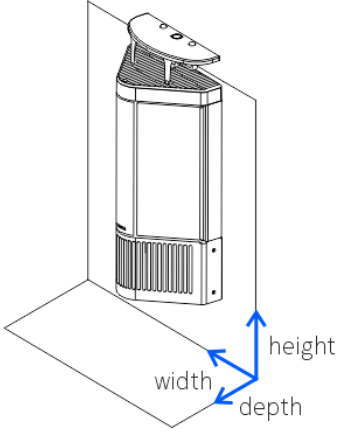


Note:

It is recommended to use a surge protection device in an outdoor environment.

Dimensions and weight

Table 412: AEUD dimensions and weight

Parameter	Details	Dimension orientation
Height	363 mm (14.29 in.)	
Width	283 mm (11.14 in.)	
Depth (without handle)	173 mm (6.81 in.)	
Weight (without mounting brackets)	12 kg (26.4 lb)	

Environmental specifications

Table 413: AEUD 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	Forced convection (fan)
IP rating	IP65

**WARNING!****Risk of RF exposure.**

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

7.2 AirScale MAA 2*2T2R 256 AE (AEUE)

AEUE (474690A) extension unit is introduced by 5GC000958.

Functional description

Table 414: AEUE functional specification

Property	Value
Total TX RF output power per carrier	1cc: 25 dBm 2cc: 22 dBm 4cc: 19 dBm 8cc: 16 dBm
Modulation	Up to 64 QAM
Number of TXRX	2*2T2R
Outdoor installation	Yes
Beamforming	Analog, 2T2R and 64 antenna elements for each 2 antenna panels
Number of MIMO streams/beams	2
Supported technology	NR
Duplex mode, supported standard	TDD, 3GPP
Frequency range	27.50–28.35 GHz, 3GPP band n261
Instantaneous bandwidth (iBW)	850 MHz
Occupied bandwidth (oBW)	800 MHz
Carrier configurations	Up to 8x 50/100/200/400 MHz (in the limit of oBW)

Band n261 antenna specification

Table 415: AEUE antenna characteristics

Property	Value
Antenna gain	26 dB (boresight)
Total average EIRP	51 dBm
Noise figure	7.5 dB
Horizontal steering range	180° (3 dBm)
Horizontal beamwidth	15° (3 dB)
Vertical steering range	90° (3 dB)
Vertical beamwidth	9.5° (3 dB)
Side lobe suppression	More or equal to 20 dB with tapering, 10 dB without
Main lobe accuracy and granularity	Less than 2°

Interfaces

Figure 72: AEUE interfaces

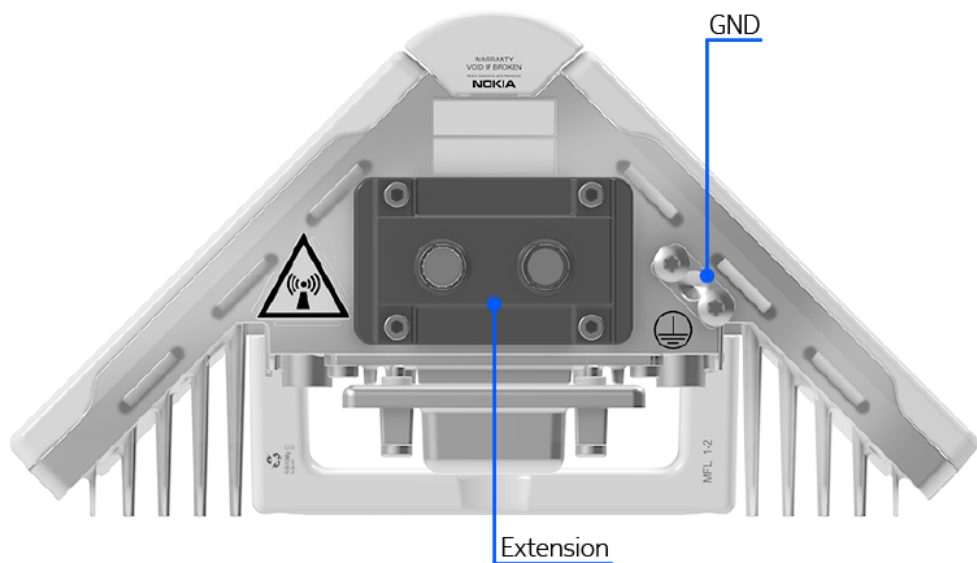


Table 416: AEUE interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Grounding (GND)		1	2 x M5 screw or 1 x M8 screw	-
Extension connector	-	-	1	Interface for AEUD unit

Power system characteristics

Note:

Contact Nokia customer team for the latest power draw values.

Information on the estimated power draw [W] at 48 V DC input in 23°C, RF output power per TX, 100% DL traffic load. Non-committed estimated values depend on the final product hardware and software optimization with +/- 10% margin.

Table 417: AEUE power draw

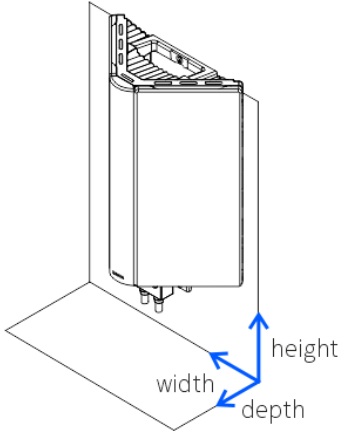
Property	Value [W]
Typical power draw with AEUE extension unit (2 panel)	320

Installation options

- Top of a pole or around a pole for the 360° omni solution (AEUD with AEUE)

Dimensions and weight

Table 418: AEUE dimensions and weight

Parameter	Details	Dimensions orientation
Height	325 mm (12.80 in.)	
Width	245 mm (9.65 in.)	
Depth	130 mm (5.12 in.)	
Weight (without mounting brackets)	6 kg (13.2 lb)*	

*Including extension cable

Environmental specifications

Table 419: AEUE environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade) with 10.8 km/h (6.7 mph) wind	55°C (131°F)
Maximum operational outdoor temperature (in the sun) with 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	Natural convection (fanless)
IP rating	IP65



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

7.3 AirScale MAA 2*2T2R 256 AE n260 (AEWD)

AEWD (474612A) is introduced by 5GC000856.

Functional description

Table 420: AEWD functional specification

Property	Value
Total TX RF output power per carrier	1cc: 25 dBm 2cc: 22 dBm 4cc: 19 dBm 8cc: 16 dBm
Modulation	Up to 64 QAM
Number of TXRX	2*2T2R
Outdoor installation	Yes
Beamforming	Analog, 2T2R for each 2 antenna panels, 64 antenna elements per polarization
Number of MIMO streams/beams	2
Supported technology	NR
Duplex mode, supported standard	TDD, 3GPP
Frequency range	37-40 GHz, 3GPP band n260
Instantaneous bandwidth (iBW)	1000 MHz
Occupied bandwidth (oBW)	800 MHz
Carrier configurations	Up to 8x 50/100/200/400 MHz (in the limit of oBW)

Band n260 antenna specification

Table 421: AEWD antenna characteristics

Property	Value
Antenna gain	26 dB (boresight)
Total average EIRP	51 dBm
Noise figure	7.5 dB
Horizontal steering range	180° (3 dB)
Horizontal beamwidth	11.5° (3 dB)
Vertical steering range	60° (3 dB)
Vertical beamwidth	9° (3 dB)
Side lobe suppression	More or equal to 20 dB with tapering
Main lobe accuracy and granularity	Less than 2°

Interfaces

Figure 73: AEWD interfaces

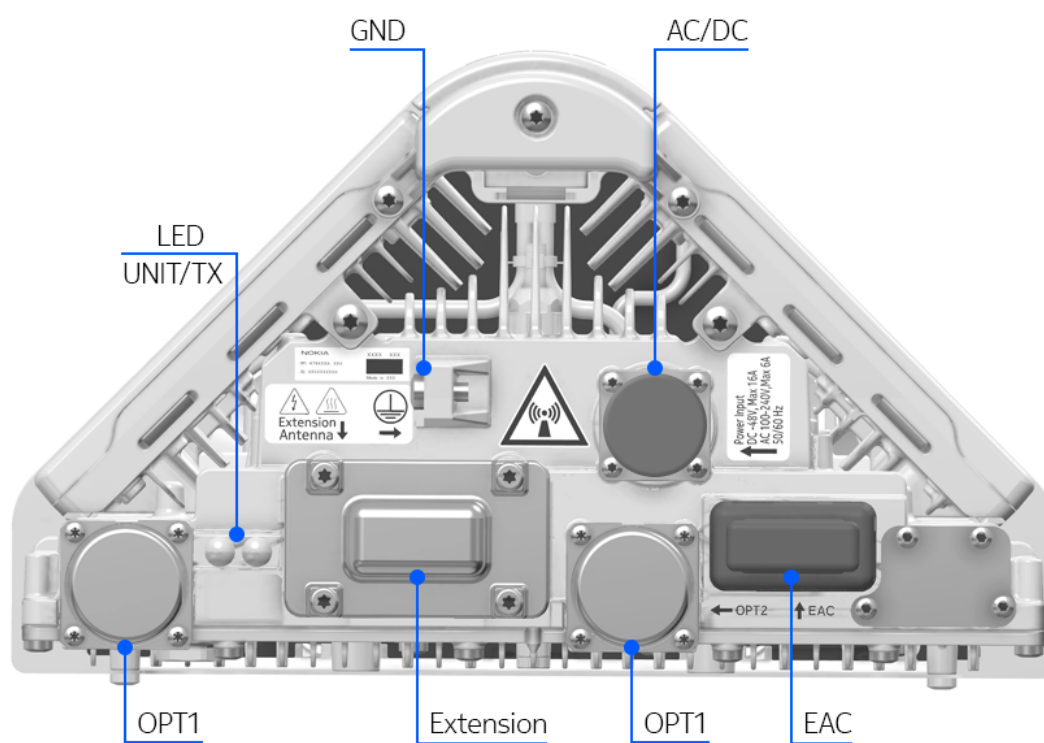


Table 422: AEWD interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	AC/DC	1	2-pole connector	AC in connector (90 to 140 V) or one in connector (-36 to -60 V)*. Maximum circuit breaker size is 20 A for DC and 10 A for AC.
Optical interface	OPT	2	SFP+/SFP28	ACPB (R2CT) optical boot
Grounding (GND)		1	1 x M8 screw or 2 x M5 screw	-
External Alarm Control	EAC	1	MDR26	6 alarm inputs and 1 control output
Operational state visual indication (2 pcs) Unit and TX	LED	2	-	Showing status of a unit and TX/Fan
Extension connector	-	-	1	Interface for additional 180° extension unit (AEWE)

*Single connector supporting AC or DC

Electrical specifications

Table 423: AEWD electrical specifications for AC power supply

Property	Value
Nominal input voltage range	100-130 V AC
Extended input voltage range	90-140 V AC

Note:

Operating at 220 V AC requires an APAF converter.

Table 424: AEWD electrical specifications for DC power supply

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

Power system characteristics

Note:

Contact Nokia customer team for the latest power draw values.

Information on the estimated power draw [W] at 48 V DC input in 23°C, RF output power per TX, 100% DL traffic load. Non-committed estimated values depend on the final product hardware and software optimization with +/- 10% margin.

Table 425: AEWD power draw

Property	Value [W]
Typical power draw	260
Typical power draw with AEWE extension unit	320

Related optional items

- AMEB AirScale strap mount pole kit (474923A)
- AMCD AirScale mmWave radio strand mount
- ACPB AirScale2 fiber connector R2CT (474384A)
- AOMC SFP28 70m MM I-temp RS (474900A)
- AOSC SFP28 2Km SM I-temp RS (474901A)
- AOSD SFP28 10Km SM I-temp RS (474902A)
- APPF conn 3 pole female plug AC/DC (474893A)
- AUFD optical cables 2 m (474461A)
- AUFE optical cables 5 m (474462A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Installation options

- Pole
- Wall

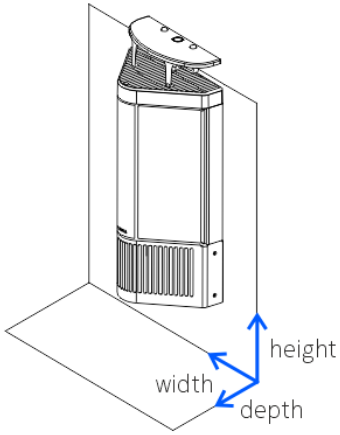


Note:

It is recommended to use a surge protection device in an outdoor environment.

Dimensions and weight

Table 426: AEWD dimensions and weight

Parameter	Details	Dimension orientation
Height	363 mm (14.29 in.)	
Width	283 mm (11.14 in.)	
Depth (without handle)	173 mm (6.81 in.)	
Weight (without mounting brackets)	12 kg (26.5 lb)	

Environmental specifications

Table 427: AEWD 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	Forced convection (fan)
IP rating	IP65

**WARNING!****Risk of RF exposure.**

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

7.4 AirScale MAA 2*2T2R 256 AE n260 (AEWE)

AEWE (474691A) extension unit is introduced by 5GC000959.

Functional description

Table 428: AEWE functional specification

Property	Value
Total TX RF output power per carrier	1cc: 25 dBm 2cc: 22 dBm 4cc: 19 dBm 8cc: 16 dBm
Modulation	Up to 64 QAM
Number of TXRX	2*2T2R
Outdoor installation	Yes
Beamforming	Analog, 2T2R and 64 antenna elements for each 2 antenna panels
Number of MIMO sterams/beams	2
Supported technology	NR
Duplex mode, supported standard	TDD, 3GPP
Frequency range	37-40 GHz, 3GPP band n260
Instantaneous bandwidth (iBW)	1000 MHz
Occupied bandwidth (oBW)	800 MHz
Carrier configurations	Up to 8x 50/100/200/400 MHz (in the limit of oBW)

Band n260 antenna specification

Table 429: AEWE antenna characteristics

Property	Value
Antenna gain	26 dB (boresight)
Total average EIRP	51 dBm
Noise figure	7.5 dB
Horizontal steering range	180° (3 dB)
Horizontal beamwidth	11.5° (3 dB)
Vertical steering range	60° (3 dB)
Vertical beamwidth	9° (3 dB)
Side lobe suppression	More or equal to 20 dB with tapering, 10 dB without
Main lobe accuracy and granularity	Less than 2°

Interfaces

Figure 74: AEWE interfaces

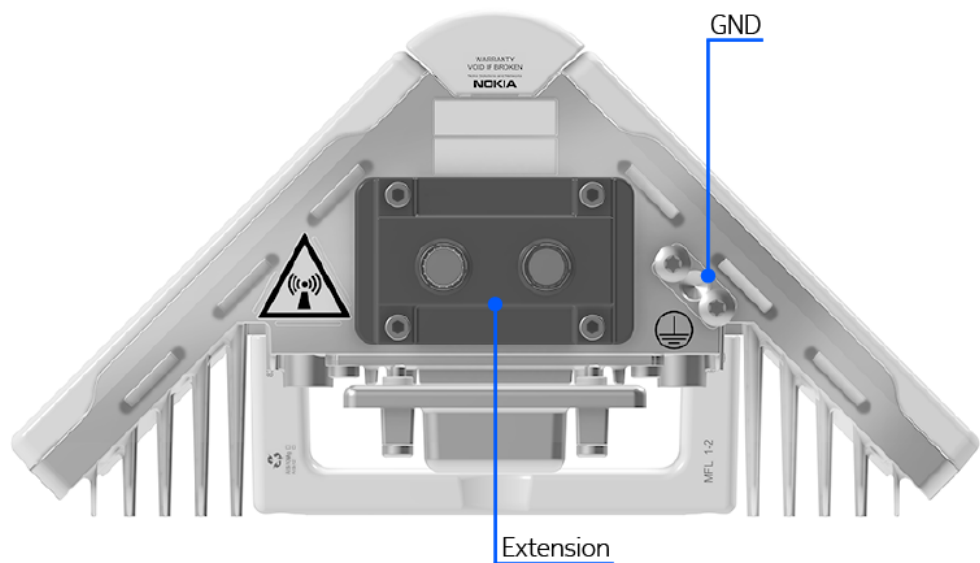


Table 430: AEWE interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Grounding (GND)		1	2 x M5 screw or 1 x M8 screw	–
Extension connector	–	–	1	Interface for AEWD unit

Power system characteristics

Note:

Contact Nokia customer team for the latest power draw values.

Information on the estimated power draw [W] at 48 V DC input in 23°C, RF output power per TX, 100% DL traffic load. Non-committed estimated values depend on the final product hardware and software optimization with +/- 10% margin.

Table 431: AEWE power draw

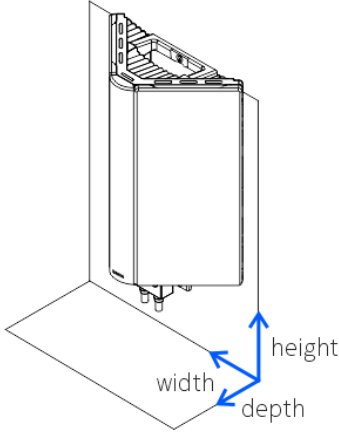
Property	Value [W]
Typical power draw with AEWE extension unit (2 panel)	320

Installation options

- Pole
- Wall
- Top of a pole or around a pole for the 360° omni solution (AEWD with AEWE)

Dimensions and weight

Table 432: AEWE dimensions and weight

Parameter	Details	Dimensions orientation
Height	325 mm (12.80 in.)	
Width	245 mm (9.65 in.)	
Depth	130 mm (5.12 in.)	
Weight (without mounting brackets)	6 kg (13.2 lb) ¹⁾	

Environmental specifications

Table 433: AEWE environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade) with 10.8 km/h (6.7 mph) wind	55°C (131°F)
Maximum operational outdoor temperature (in the sun) with 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	Natural convection (fanless)
IP rating	IP65



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

¹⁾Including extension cable.

7.5 AirScale MAA 2T2R 512 AE n257 (AEUA)

AEUA (474214A) is introduced by 5GC000515.

Functional description

Table 434: AEUA functional specification

Property	Value
Total TX RF output power	28 dBm (2 beams), 31 dBm with an optional fan unit
Modulation	Up to 64 QAM
Number of TXRX	2T2R
Outdoor installation	Yes
Beamforming	Analog, 2T2R, 256 antenna elements per polarization with the optional fan unit (128 antenna elements without fan)
Number of streams/beams	2
Supported technology	NR
Duplex mode, supported standard	TDD, 3GPP
Frequency range	26.5–29.5 GHz, 3GPP band n257 27.50–28.35 GHz, 3GPP band n261
Instantaneous bandwidth (iBW)	800 MHz
Occupied bandwidth (oBW)	800 MHz
Carrier configurations	Up to 8x 100 MHz (in the limit of oBW)

Band n257 Antenna Specification

Table 435: AEUA antenna characteristics

Property	Value
Antenna gain	26 dBi (boresight), 29 dBi with an optional fan unit
Total average EIRP	54 dBm, 60 dBm with an optional fan unit
Noise figure	10 dB
Horizontal steering range	90° (3 dB), 120° (8 dB)
Horizontal beamwidth	6.5° (3 dB, boresight)
Vertical steering range	22.5° (1 dB), 45° (2 dB)
Vertical beamwidth	8.6° (3 dB), 4.3° with an optional fan unit
Side lobe suppression	More or equal to 20 dB with tapering
Main lobe accuracy and granularity	Less than 2°

Interfaces

Figure 75: AEUA interfaces

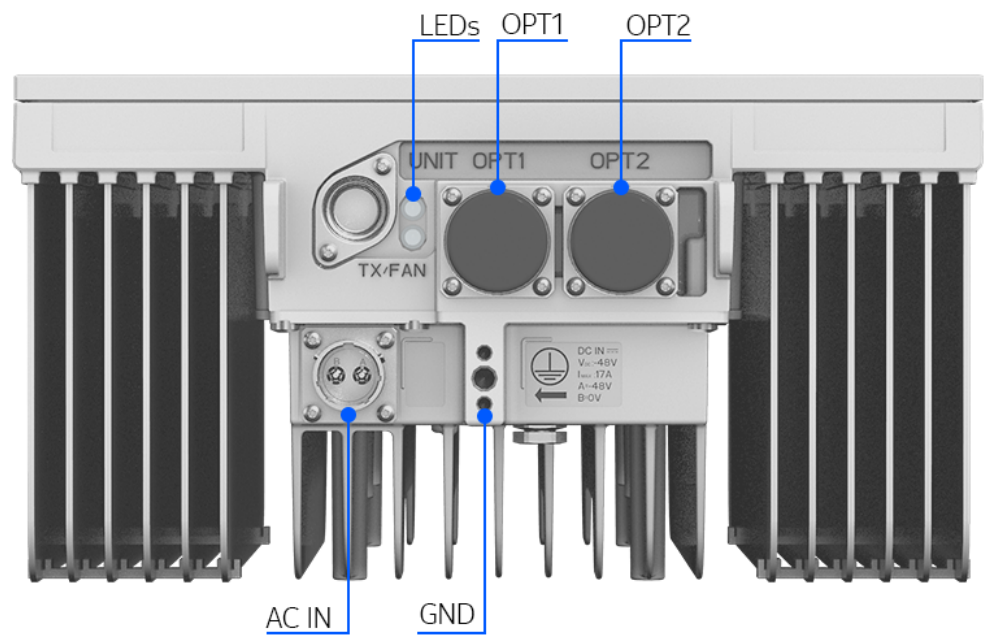


Table 436: AEUA interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	AC	1	2-pole connector	AC 100 V to 230 V
Optical interface	OPT	2	QSFP+ CONN 38F SINGLE ANG P0.8 10G	2 x QSFP+ (8 x 9.8 Gbps each), R2CT IP seal
Grounding (GND)		1	2 x M5 screw	-
Operational state visual indication (2 pcs) unit and TX/fan status	LED	2	-	Showing status of a unit and TX/fan

Note:

Hot insertion or removal of QSFPs isn't supported.

Electrical specifications

Table 437: AEUA electrical specifications

Property	Value
Nominal supply voltage	–
Nominal input voltage range	100-250 V AC
Extended input voltage range	90-264 V AC

Power system characteristics



Note:

Contact Nokia customer team for the latest power draw values.

Related optional items

- AMPB pole mounting kit (474688A)
- AMPD AirScale tilt mounting kit (475543A)
- AFMA Aircscale fan MAA unit (474443A)
- ACPB fiber-protection plug, R2CT (474384A)
- APPF conn 3 pole female AC plug 1.0–3.3 mm² 18-12 AWG (474893A)
- FOCX QSFP+ MPO 4x10 300 m MM (474333A)
- FOCZ QSFP+ 4x10G 10 km SM (474335A)

Installation options

- Pole
- Wall

! Notice:

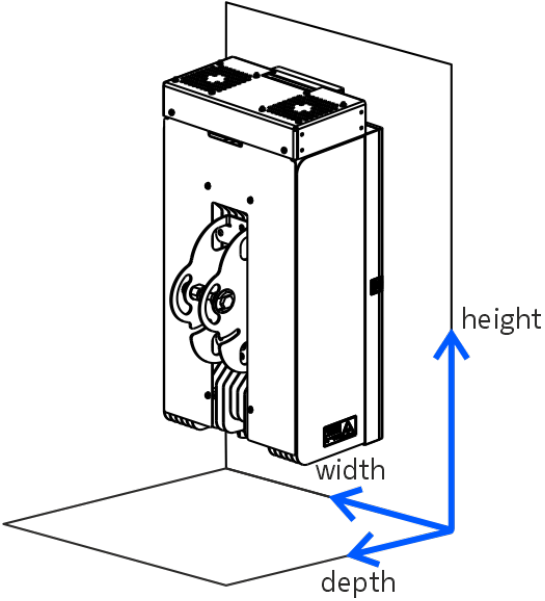
The radio unit without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Tilt options

- Mechanical (horizontal $\pm 30^\circ$, vertical $\pm 15^\circ$)

Dimensions and weight

Table 438: AEUA dimensions and weight

Property	Value	Dimensions orientation
Height	475 mm (18.70 in.) With optional fan: 522 mm (20.55 in.)	
Width	305 mm (12.00 in.) With optional fan: 305 mm (11.97 in.)	
Depth (without bracket)	159 mm (6.26 in.) With optional fan: 160 mm (6.30 in.)	
Depth	239 mm (9.41 in.) With optional fan: 241 mm (9.49 in.)	
Weight	22 kg (48.5 lb) With optional fan: 24 kg (52.9 lb)	

Environmental specifications

Table 439: AEUA 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	Natural convection (fanless) or optional fan
IP rating	IP65



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

Warnings, cautions or notes related to the product



Note:

AEUA can be installed as a part of a Common Bonding Network (CBN), an Isolated Bonding Network (IBN), or both.

7.6 AirScale MAA 2T2R 512 AE n257 (AEUB)

AEUB (474608A) is introduced by 5GC000585.

Functional description

Table 440: AEUB functional specification

Property	Value
Total TX RF output power per carrier	1cc: 28 dBm 2cc: 25 dBm 4cc: 22 dBm 8cc: 19 dBm
Modulation	Up to 64 QAM
Number of TXRX	2T2R (SU-MIMO software mode)
Outdoor installation	Yes
Beamforming	Analog, 2T2R, 256 antenna elements per polarization
Number of streams/beams	2
Supported technology	NR
Duplex mode, supported standard	TDD, 3GPP
Frequency range	26.5–29.5 GHz, 3GPP band n257 27.50–28.35 GHz, 3GPP band n261
Instantaneous bandwidth (iBW)	1000 MHz
Occupied bandwidth (oBW)	800 MHz
Carrier configurations	Up to 8x 50/100/200/400 MHz (in the limit of oBW)

Band n257 antenna specification

Table 441: AEUB antenna characteristics

Property	Value
Antenna gain	29 dBi
Total average EIRP	60 dBm
Noise figure	7.5 dB
Horizontal steering range	90° (3 dB), 120° (8 dB)
Horizontal beamwidth	6° (boresight)
Vertical steering range	90° (3 dB)
Vertical beamwidth	6° (boresight)
Side lobe suppression	More or equal to 20 dB with tapering, 10 dB without
Main lobe accuracy and granularity	Less than 2°

Interfaces

Figure 76: AEUB interfaces

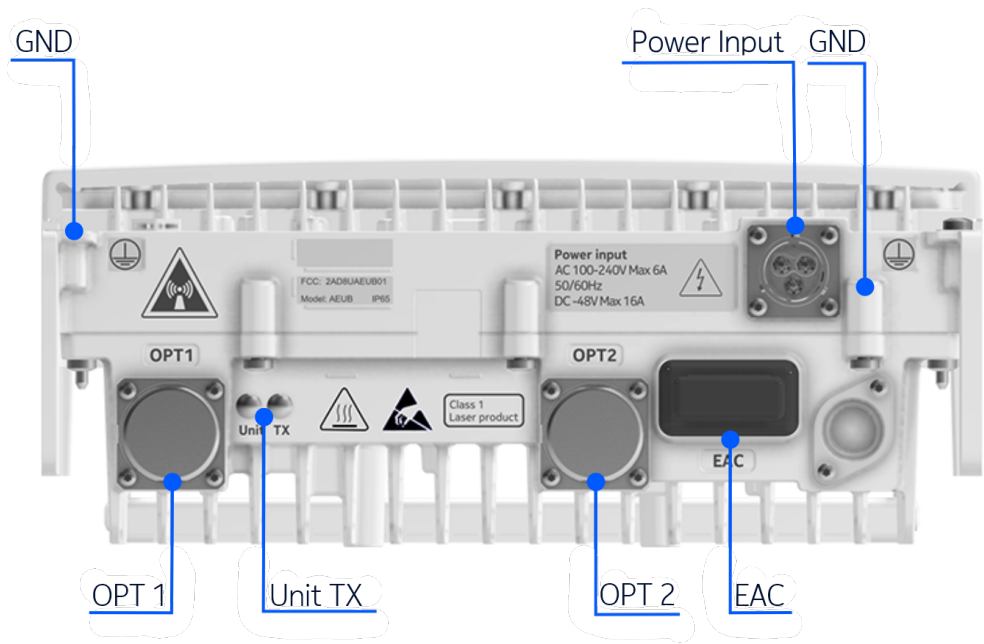


Table 442: AEUB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	Power Input	1	2-pole connector	AC in connector (100 to 140 V) or DC in connector (-40.5 to -57 V)*
Optical interface	OPT	2	SFP+/SFP28	eCPRI, 25 Gbps, R2CT IP seal
External Alarm Interface	EAC	1	MDR26	6 alarm inputs and 1 control output
Grounding (GND)		1	2 x M5 screw or 1 x M8 screw	-
Operational state visual indication (2 pcs) unit and TX status	LED	2	-	Showing status of a unit and TX

*Single connector supporting AC or DC

Electrical specifications

Table 443: AEUB electrical specifications for AC power supply

Property	Value
Nominal input voltage range	100-130 V AC
Extended input voltage range	90-140 V AC

 Note:

Operating at 220 V AC requires an APAF converter.

Table 444: AEUB electrical specifications for DC power supply

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

Power system characteristics

Note:

Contact Nokia customer team for the latest power draw values.

Information on the estimated power draw [W] at 48 V DC input in 23°C, RF output power per TX, 100% DL traffic load. Non-committed estimated values depend on the final product hardware and software optimization with +/- 10% margin.

Table 445: AEUB power draw

Property	Value [W]
Typical power draw	430

Recommended parameter values

The recommended NRCELL PDSCH Power Back-off for 256QAM (dlQam256PowerBackoffSub6) parameter 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

- AMEB AirScale strap mount pole kit (474923A)
- ACPB AirScale2 fiber connector R2CT (474384A)
- AOMC SFP28 70m MM I-temp RS (474900A)

- AOSC SFP28 2Km SM I-temp RS (474901A)
- AOSD SFP28 10Km SM E-temp RS (474902A)
- APPF conn 3 pole female plug AC/DC (474893A)
- AUFD optical cables 2 m (474461A)
- AUFE optical cables 5 m (474462A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Installation options

- *Pole*
- *Wall*

Notice:

The radio unit without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Note:

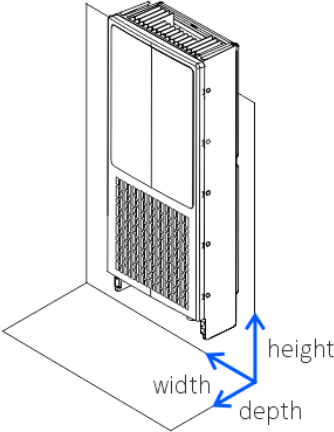
It is recommended to use a surge protection device in an outdoor environment.

Tilt options

Mechanical (horizontal $\pm 30^\circ$, vertical $\pm 15^\circ$)

Dimensions and weight

Table 446: AEUB dimensions and weight

Parameter	Details	Dimensions orientation
Height	603 mm (23.74 in.)	
Width	304 mm (11.97 in.)	
Depth	124 mm (4.88 in.)	
Weight	20 kg (44.1 lb)	

Environmental specifications

Table 447: AEUB environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade) 10.8 km/h (6.7 mph) wind	55°C (131°F)
Maximum operational outdoor temperature (in the sun) with 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	Natural convection (fanless)
IP rating	IP65

**WARNING!****Risk of RF exposure.**

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

7.7 AirScale MAA 2T2R 512 AE n257 (AEUF)

AEUF (474864A) is introduced by 5GC001269.

Functional description

Table 448: AEUF functional specification

Property	Value
Total TX RF output power	28 dBm (2 beams), 31 dBm with an optional fan unit
Modulation	Up to 64 QAM
Number of TXRX	2T2R
Outdoor installation	Yes
Beamforming	Analog, 2T2R, 256 antenna elements per polarization with the optional fan unit (128 antenna elements without fan)
Number of MIMO streams/beams	2
Supported technology	NR
Duplex mode, supported standard	TDD, 3GPP
Frequency range	26.5–29.5 GHz, 3GPP band n257 27.50–28.35 GHz, 3GPP band n261
Instantaneous bandwidth (iBW)	800 MHz
Occupied bandwidth (oBW)	800 MHz
Carrier configurations	Up to 8x 100 MHz (in the limit of oBW)

Band n257 Antenna Specification

Table 449: AEUF antenna characteristics

Property	Value
Antenna gain	26 dBi (boresight), 29 dBi with an optional fan unit
Total average EIRP	54 dBm, 60 dBm with an optional fan unit
Noise figure	10 dB
Horizontal sector width	90° (3 dB), 120° (8 dB)
Horizontal beamwidth	6.5° (3 dB)
Vertical sector width	22.5° (1 dB) , 45° (2 dB)
Vertical beamwidth	8.6° (3 dB), 4.3° with an optional fan unit
Side lobe suppression	More or equal to 20 dB with tapering
Main lobe accuracy and granularity	Less than 2°

Interfaces

Figure 77: AEUF interfaces

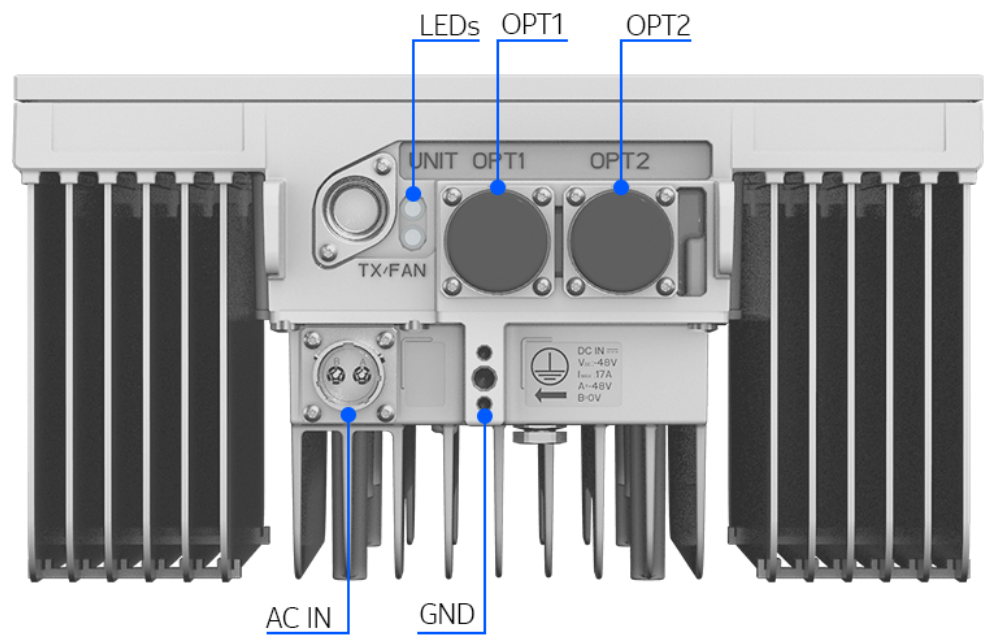


Table 450: AEUF interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC	1	2-pole connector	17 A max.
Optical interface	OPT	2	QSFP+ CONN 38F SINGLE ANG P0.8 10G	2 x QSFP+ (8 x 9.8 Gbps each), R2CT IP seal
Grounding (GND)		1	1 x M8 screw or 2 x M5 screw	–
Operational state visual indication (2 pcs) Unit and TX/fan status	LED	2	–	Showing status of a unit and TX/fan

Note:

Hot insertion or removal of QSFPs isn't supported.

Electrical specifications

Table 451: AEUF 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

Power system characteristics



Note:

Contact Nokia customer team for the latest power draw values.

Related optional items

- AMPB pole mounting kit (474688A)
- AMPD AirScale tilt mounting kit (475543A)
- AFMA Airscale fan MAA unit (474443A)
- ACPB fiber-protection plug, R2CT (474384A)
- APPA AirScale 2 26 A DC plug 3.3-10 mm² (474281A)
- ASAB AirScale MDR26-open EAC cable 5 m (474621A)
- FOCX QSFP+ MPO 4x10 300 m MM (474333A)
- FOCZ QSFP+ 4x10G 10 km SM (474335A)

Installation options

- Pole
- Wall

! Notice:

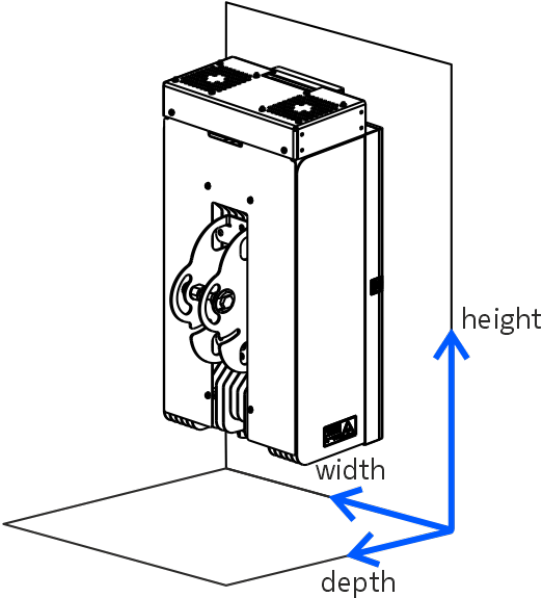
The radio unit without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Tilt options

- Mechanical (horizontal $\pm 30^\circ$, vertical $\pm 15^\circ$)

Dimensions and weight

Table 452: AEUF dimensions and weight

Property	Value	Dimensions orientation
Height	475 mm (18.70 in.) With optional fan: 522 mm (20.55 in.)	
Width	305 mm (12.00 in.)	
Depth (without bracket)	159 mm (6.26 in.) With optional fan: 160 mm (6.30 in.)	
Depth	239 mm (9.41 in.)	
Weight	22 kg (48.5 lb) With optional fan: 24 kg (52.9 lb)	

Environmental specifications

Table 453: AEUF 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	Natural convection (fanless) or optional fan
IP rating	IP65



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

7.8 AirScale MAA 2T2R 512 AE n260 (AEWB)

AEWB (474609A) is introduced by 5GC000586.

Functional description

Table 454: AEWB functional specification

Property	Value
Total TX RF output power per carrier	1cc: 28 dBm 2cc: 25 dBm 4cc: 22 dBm 8cc: 19 dBm
Modulation	Up to 64 QAM
Number of TXRX	2T2R (SU-MIMO software mode)
Outdoor installation	Yes
Beamforming	Analog, 256 antenna elements per polarization
Number of streams/beams	2
Supported technology	NR
Duplex mode, supported standard	TDD, 3GPP
Frequency range	37-40 GHz, 3GPP band n260
Instantaneous bandwidth (iBW)	1000 MHz
Occupied bandwidth (oBW)	800 MHz
Carrier configurations	Up to 8x 50/100/200/400 MHz (in the limit of oBW)

Band n260 antenna specification

Table 455: AEWB antenna characteristics

Property	Value
Antenna gain	29 dBi
Total average EIRP	60 dBm
Noise figure	7.5 dB
Horizontal steering range	90° (3 dB), 120° (8 dB)
Horizontal beamwidth	5.3° (boresight)
Vertical steering range	60° (3 dB)
Vertical beamwidth	4° (boresight)
Side lobe suppression	More or equal to 20 dB with tapering, 10 dB without
Main lobe accuracy and granularity	Less than 2°

Interfaces

Figure 78: AEWB interfaces

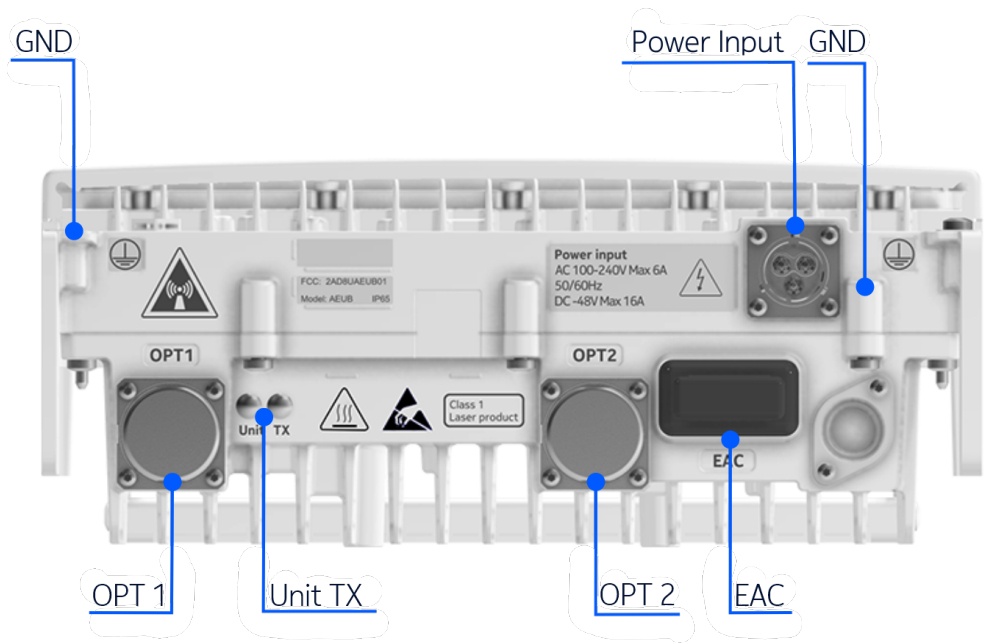


Table 456: AEWB interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	Power Input	1	2-pole connector	AC in connector (100 to 140 V) or DC in connector (-40.5 to -57 V) ²⁾
Optical interface	OPT	2	SFP+/SFP28	ACPB optical boot, eCPRI, 25 Gbps, R2CT IP seal
External Alarm Interface	EAC	1	MDR26	6 alarm inputs and 1 control output
Grounding (GND)		1	2 x M5 screw or 1 x M8 screw	-
Operational state visual indication (2 pcs) unit and TX status	LED	2	-	Showing status of a unit and TX

Electrical specifications

Table 457: AEWB electrical specifications for AC power supply

Property	Value
Nominal input voltage range	100-130 V AC
Extended input voltage range	90-140 V AC

 Note:

Operating at 220 V AC requires an APAF converter.

Table 458: AEWB electrical specifications for DC power supply

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

Power system characteristics

Note:

Contact Nokia customer team for the latest power draw values.

Information on the estimated power draw [W] at 48 V DC input in 23°C, RF output power per TX, 100% DL traffic load. Non-committed estimated values depend on the final product hardware and software optimization with +/- 10% margin.

Table 459: AEWB power draw

Property	Value [W]
Typical power draw	430

Related optional items

- AMEB AirScale strap mount pole kit (474923A)
- ACPB AirScale2 fiber connector R2CT (474384A)
- AOMC SFP28 70m MM I-temp RS (474900A)
- AOSC SFP28 2Km SM I-temp RS (474901A)
- AOSD SFP28 10Km SM I-temp RS (474902A)
- APPF conn 3 pole female plug AC/DC (474893A)
- AUFD optical cables 2 m (474461A)
- AUFE optical cables 5 m (474462A)
- ASAA AirScale 2 MDR26-open EAC cable 5 m (474288A)

Installation options

- *Pole*
- *Wall*

Note:

It is recommended to use a surge protection device in an outdoor environment.

Notice:

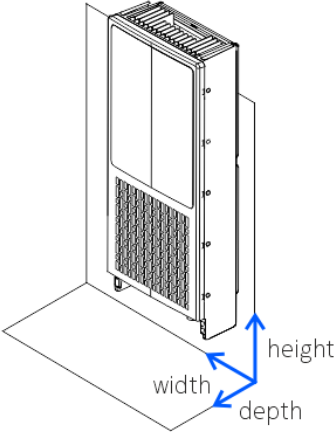
The radio unit without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Tilt options

- Mechanical (horizontal $\pm 30^\circ$, vertical $\pm 15^\circ$)

Dimensions and weight

Table 460: AEWB dimensions and weight

Parameter	Details	Dimensions orientation
Height	603 mm (23.74 in.)	
Width	304 mm (11.97 in.)	
Depth	124 mm (4.88 in.)	
Weight	20 kg (44.09 lb)	

Environmental specifications

Table 461: AEWB environmental specifications

Property	Value
Maximum operational outdoor temperature (in the shade) 10.8 km/h (6.7 mph) wind	55°C (131°F)
Maximum operational outdoor temperature (in the sun) with 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	Natural convection (fanless)
IP rating	IP65

**WARNING!****Risk of RF exposure.**

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

²⁾Single connector supporting AC or DC

7.9 AirScale MAA 2T2R 512 AE n260 (AEWF)

AEWF (474870A) is introduced by 5GC001267.

Functional description

Table 462: AEFW functional specification

Property	Value
Total TX RF output power	25 dBm (2 beams), 28 dBm with an optional fan unit
Modulation	Up to 64 QAM
Number of TXRX	2T2R
Outdoor installation	Yes
Beamforming	Analog, 2T2R, 256 antenna elements per polarization with the optional fan unit (128 antenna elements without fan)
Number of streams/beams	2
Supported technology	NR
Duplex mode, supported standard	TDD, 3GPP
Frequency range	37.0-40.0 GHz, 3GPP band n260
Instantaneous bandwidth (iBW)	800 MHz
Occupied bandwidth (oBW)	800 MHz
Carrier configurations	Up to 8x 100 MHz (in the limit of oBW)

Band n260 antenna specification

Table 463: AEWf antenna characteristics

Property	Value
Antenna gain	26 dBi (boresight), 29 dBi with an optional fan unit
Total average EIRP	51 dBm, 57 dBm with an optional fan unit
Noise figure	7.5 dB
Horizontal steering range	90° (3 dB), 120° (8 dB)
Horizontal beamwidth	5.5° (3 dB, boresight, middle frequency)
Vertical steering range	22.5° (1.5 dB), 45° (2 dB)
Vertical beamwidth	8° without fan, 4° with optional fan unit
Side lobe suppression	More or equal to 20 dB with tapering, 10 dB without
Main lobe accuracy and granularity	Less than 2°

Interfaces

Figure 79: AEWf interfaces

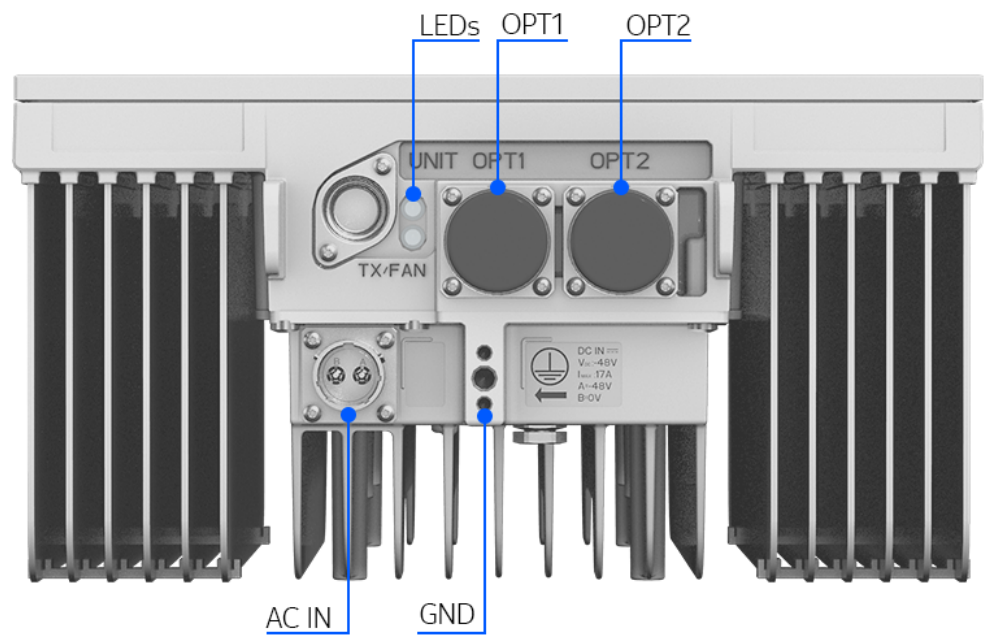


Table 464: AEWf interfaces

Interface	Label on the hardware	Number of interfaces	Connector type	Additional info
Power connector	DC	1	2-pole connector	17 A max
Optical interface	OPT	2	QSFP+ CONN 38F SINGLE ANG P0.8 10G	2 x QSFP+ (8 x 9.8 Gbps each), R2CT IP seal
Grounding (GND)		1	2 x M5 screw or 1 x M8 screw	–
Operational state visual indication (2 pcs) unit and TX/fan status	LED	2	–	Showing status of a unit and TX/fan

Note:

Hot insertion or removal of QSFPs isn't supported.

Electrical specifications

Table 465: AEWf 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

Power system characteristics



Note:

Contact Nokia customer team for the latest power draw values.

Related optional items

- AMPB pole mounting kit (474688A)
- AMPD AirScale tilt mounting kit (475543A)
- AFMA Airscale fan MAA unit (474443A)
- ACPB fiber-protection plug, R2CT (474384A)
- APPA AirScale 2 26 A DC plug 3.3–10 mm² (474281A)
- ASAB AirScale MDR26-open EAC cable 5 m (474621A)
- FOCX QSFP+ MPO 4x10 300 m MM (474333A)
- FOCZ QSFP+ 4x10G 10 km SM (474335A)

Installation options

- Pole
- Wall

! Notice:

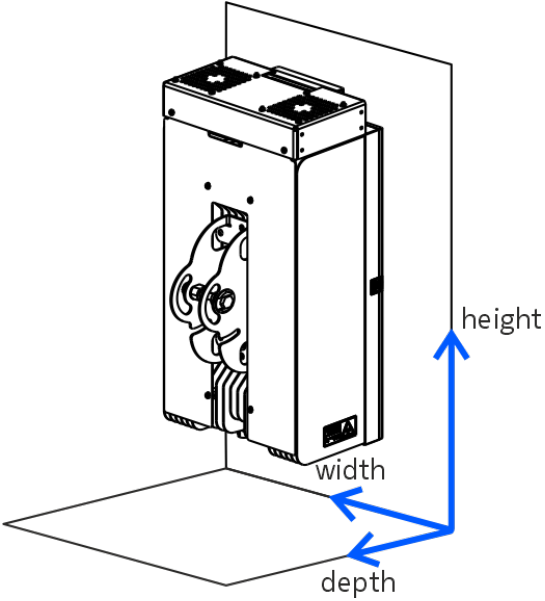
The radio unit without a fan should always be mounted in a vertical orientation with connectors on the bottom side to ensure convection cooling.

Tilt options

- Mechanical (horizontal $\pm 30^\circ$, vertical $\pm 15^\circ$)

Dimensions and weight

Table 466: AEFW dimensions and weight

Property	Value	Dimensions orientation
Height	475 mm (18.70 in.) With optional fan: 522 mm (20.55 in.)	
Width	305 mm (12.00 in.)	
Depth	159 mm (6.26 in.) With optional fan: 160 mm (6.30 in.)	
Weight	22 kg (48.5 lb) With optional fan: 24 kg (52.9 lb)	

Environmental specifications

Table 467: AEFW 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	Natural convection (fanless) or optional fan
IP rating	IP65



WARNING!

Risk of RF exposure.

To prevent RF exposure, place RF absorber or blanket in front of radome surface or keep a distance complied with RF exposure requirements. For MAA specific RF exposure requirements, see the respective installation document.

8. MAA LEDs description

LED indicators are fully controlled approximately 180 seconds after powering on the radio unit (RU).

i Note:

Due to component variances, the color yellow may have an orange or green tone.

LEDs

Table 468: MAA LEDs

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 • 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 (SM)	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

LED color	Description	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

9. AirScale MAA units sound pressure levels

Sound pressure levels measured according to ISO 3744 and scaled to 3 m distance.

Sound pressure levels for Osprey 64 units

Table 469: Nokia MAA sound pressure levels for products with forced cooling (AQQL, AQQE, AQQN, AQQT)

AQQL, AQQE, AQQN, AQQT	Maximum sound pressure level at 3 m
Single module at 15°C (59°F)	≤ 25 dBA
Single module at 25°C (77°F)	≤ 33 dBA
Single module at 45°C (113°F)	≤ 43 dBA

Table 470: Nokia MAA sound pressure levels for products with forced cooling (AQQK, AQQS)

AQQK, AQQS	Maximum sound pressure level at 3 m
Single module at 15°C (59°F)	≤ 30 dBA
Single module at 25°C (77°F)	≤ 36 dBA
Single module at 45°C (113°F)	≤ 47 dBA

Table 471: Nokia MAA sound pressure levels for products with forced cooling (AQNA)

AQNA	Maximum sound pressure level at 3 m
Single module at 15°C (59°F)	≤ 31 dBA
Single module at 25°C (77°F)	≤ 35 dBA
Single module at 45°C (113°F)	≤ 46 dBA

Sound pressure levels for Osprey 32 units

Table 472: Nokia MAA sound pressure levels for products with forced cooling (AQQY, AQQQ, AQQC)

AQQY, AQQQ, AQQC	Maximum sound pressure level at 3 m
Single module at 15°C (59°F)	≤ 23.5 dBA
Single module at 25°C (77°F)	≤ 30 dBA
Single module at 45°C (113°F)	≤ 40.5 dBA

Table 473: Nokia MAA sound pressure levels for products with forced cooling (AQQA, AQQJ)

AQQA, AQQJ	Maximum sound pressure level at 3 m
Single module at 15°C (59°F)	≤ 28.5 dBA
Single module at 25°C (77°F)	≤ 35 dBA
Single module at 45°C (113°F)	≤ 43 dBA

Table 474: Nokia MAA sound pressure levels for products with forced cooling (AQHA, AQHC)

AQHA, AQHC	Maximum sound pressure level at 3 m
Single module at 15°C (59°F)	≤ 28.5 dBA
Single module at 25°C (77°F)	≤ 35 dBA
Single module at 45°C (113°F)	≤ 43 dBA

10. Glossary

List of terms appearing in the Massive MIMO Adaptive Antenna Product Description document.

ambient temperature	temperature of the air surrounding a particular piece of equipment
American wire gauge (AWG)	standard classification for measuring non-ferrous wire conductor sizes Note: The higher the gauge number, the smaller the diameter and the thinner the wire. Telephone wire is usually 22, 24, or 26 AWG. Since thicker wires have less electrical resistance and carry more current, they're better for longer distances.
antenna gain	ratio of the maximum radiation intensity in a given direction to the maximum radiation intensity produced in the same direction from a reference antenna with the same power input
Antenna Interface Standards Group (AISG)	standards group that has been established to create an open specification for the control interface of third-generation antenna line products. In some MAA (Massive MIMO Adaptive Antenna) units, AISG and external alarm connection (EAC) ports are combined into a single port
Antenna Line Device (ALD)	variety of tower-top equipment that may be connected to the radio unit (RU), for example, remote electrical tilt (RET) or masthead amplifier (MHA)
azimuth scanning range	measured in degrees, the range that an antenna can scan horizontally
Base Station Antenna Standards (BASTA)	standard that addresses the performance criteria of BTS antennas by making recommendations on standards for electrical and mechanical parameters, providing guidance on measurement and calculation practices in performance validation and production, and recommending methods for electronic data exchange

bandwidth (BW)	quantitative difference between the limiting frequencies of a frequency band that indicates the width of a communication channel

beamforming (BF)	energy-efficient signal processing technique which shapes radio frequency beams to transmit a directional signal to users

beamwidth (BW)	of an antenna, the angle between the half-power (3-dB) points of the main lobe

capital expenditure (CAPEX)	expenditure that consists of the costs of all items purchased or otherwise acquired and entered into the fixed asset register of the entity, or the acquisitions of shareholdings in another entity

i Note:

From a network operator's point of view, the network elements and their features belong to capital expenditure.

common bonding network (CBN)	set of metallic components that are intentionally or incidentally interconnected to form the principal bonding and grounding inside a telecommunication building

i Note:

These components include, for example, structural steel or reinforcing rods, metallic plumbing, AC power conduit, protective grounding (PE) conductors, cable racks, and bonding conductors. The CBN always has a mesh topology and is connected to the grounding network.

Common Public Radio Interface (CPRI)	standard defining the interface between the radio unit (RU) and radio access unit (RAU)

concurrent mode	operational mode of a software-defined radio unit (RU) in which it can operate on two or more radio technologies simultaneously

cross-polar discrimination (XPD)	antenna performance criterion describing the ability of an antenna to radiate and receive electromagnetic waves of a specified polarization

dynamic elevation scanning range	measured in degrees, the range that an antenna can scan vertically

effective isotropic radiated power (EIRP)	transmitted power multiplied by the antenna gain referenced to an ideal isotropic radiator
Enhanced Common Public Radio Interface (eCPRI)	standard that defines the connection between eCPRI Radio Equipment Control (eREC) and eCPRI Radio Equipment (eRE) through the fronthaul transport network. It's used in NR systems, LTE-Advanced, and LTE-Advanced Pro
envelope azimuthal beamwidth	measured in degrees horizontal angular width of an antenna at which the amplitude drops to a certain level
envelope elevation beamwidth	measured in degrees vertical angular width of an antenna at which the amplitude drops to a certain level
extended input voltage	voltage range from -36.0 V DC to -40.5 V DC and from -57.0 V DC to -60.0 V DC, defined by safety test results. As long as the equipment is operating within the extended input voltage range, it shouldn't be damaged during unexpected voltage surges. When the input voltage level is too high or too low, an over-voltage or under-voltage alarm is raised, respectively
external alarm connection (EAC)	connection for external alarms from any equipment that's external to the BTS. In some Massive MIMO Adaptive Antenna (MAA) units, Antenna Interface Standards Group (AISG) and EAC ports are combined into a single port
finite impulse response (FIR)	digital filter of finite duration used for signal processing
frequency division duplex (FDD)	duplex mode where uplink and downlink transmissions use two separate radio frequencies
full mode (or full panel mode)	configuration in which all the antenna elements are utilized as one logical antenna panel for one RAT
front-to-back ratio	for a directional antenna, the ratio of field strength in front of the antenna to field strength behind the antenna (180 degrees + -40 degrees)

grounding (GND)	electrical connection between a given point in the equipment and the ground
Half Power Beam Width (HPBW)	measured in degrees, angular width of the major lobe of an antenna at which the amplitude drops to half of the peak value (-3 dB)
Hybrid Beamforming (HBF)	type of beamforming that uses both analog and digital beamforming to send a signal
ingress protection (IP)	protection of electronic components inside a network element against the ingress of rain, snow, and dust. The IP rating is a standard used to describe the level of protection of electrical equipment, which uses a two-digit code. The first digit describes the level of protection against solid particles, whereas the second digit refers to the level of protection against liquid ingress. The higher the number, the better the protection
instantaneous bandwidth (iBW)	frequency range in which the radio carriers may be deployed; iBW is always smaller or equal to RF bandwidth
isolated bonding network (IBN)	bonding network that has a single point connection (SPC) to either the common bonding network (CBN) or another isolated bonding network Note: An isolated bonding network, taken as a conductive unit with all of its metallic surfaces and grounding conductors bonded together, is insulated from contact with any other grounded metalwork in the building.
Local Management Port (LMP)	dedicated Ethernet port in the BTS used for connecting to the management interface of the equipment
Massive MIMO (mMIMO)	enhanced MIMO technology that uses antenna arrays that have more than eight antenna elements to increase network performance
Maximum current draw ($I_{\max}$)	calculated or measured maximum electrical current of a radio unit (RU) at its minimum operating voltage

mean time between failures (MTBF)	expected operating time between two consecutive system failures of a unit
Multiple Input Multiple Output (MIMO)	antenna technology for wireless communications in which multiple antennas are used at both the source (transmitter) and the destination (receiver). It's a key ingredient of the LTE air interface, supporting requirements for throughput and spectral efficiency. The MIMO technology provides an increase in the radio link capacity by using more than one transmitting and receiving antenna working on the same frequency. Data sent with this technology is divided into separate streams and transmitted simultaneously by a number of antennas over the same air interfaces
minimum azimuth beamwidth	minimum horizontal angular width of an antenna at a specified amplitude
minimum elevation beamwidth	minimum vertical angular width of an antenna at a specified amplitude
narrowband Internet of Things (NB-IoT)	implementation of IoT in LTE network, which uses a 200 kHz carrier (either in-band, standalone, or LTE guard band), suitable for stationary devices requiring very little data (tens of kb)
nominal input voltage range	voltage range from -40.5 V DC to -57 V DC, defined by standard ETSI EN 300 132-2 for Europe. Within the nominal input voltage range, the equipment should operate with no degradation of service performance
non-standalone (NSA)	type of a network configuration which uses LTE infrastructure for NR deployment
occupied bandwidth (oBW)	hardware-supported maximum sum of the bandwidths of the deployed carriers. It's always smaller or equal to iBW. For example: If a radio unit oBW = 40 MHz, there might be a 2x20 MHz configuration deployed

operating expenditure (OPEX)

expenditure that consists of all the costs involved in operating a system

Note:

Typical OPEX costs include wages, site rental, leased line fees, maintenance fees, sales and marketing, energy consumption, insurance, training, and customer care.

optical interface (OPT)

in fiber-optic communication, an interface over which an optical signal passes from one equipment or medium to another, without being converted to an electrical signal

passive intermodulation (PIM)

unwanted signal generated in a passive (or non-linear) device, such as a connector or a cable. It's generated by the non-linear mixing of two or more frequencies

quad small form-factor pluggable (QSFP)

four channel physically compact connector design that consists of a housing fitted on a host board and a pluggable transceiver. It's developed for use in high-speed data transfer, including both copper-based and fiber-optic systems. QSFP28 is an industry format of transceivers, allowing the highest data rate of 4x25 Gbps used for 100 Gbps links

quadrature amplitude modulation (QAM)

modulation system which increases the amount of information that can be carried within a given bandwidth. It provides an increased number of bits per symbol: For 16 QAM - 4 bits/symbol; For 64 QAM - 6 bits/symbol; For 256 QAM - 8 bits/symbol

radio access technology (RAT)

connection method used to connect different terminals and applications to telecommunication networks by using RF signals

radio unit (RU)

radio part of a radio access point (RAP) hosting the RF functionality and beamforming processing of the BTS

remote electrical tilt (RET) system that allows the operator to adjust the down tilt of each antenna remotely

Note:

RET can be used locally at the BTS, or remotely at a regional operation and maintenance center or network operations center. It reduces the cost of the downtime of the BTS.

remote radio head (RRH) radio unit (RU) that is separated from the BTS and connected to it through a fiber optic cable. It's usually mounted on a tower or rooftop to provide optimal coverage

RF filter bandwidth (RF BW) 3GPP frequency range the radio operates in. For example, filter bandwidth of a radio unit (RU) operating in Band 41 (2496 MHz to 2690 MHz) is 194 MHz.

sidelobe suppression (SLS) the gap between main-lobe peak value and side-lobe peak value

single-user MIMO (SU-MIMO) multiple input multiple output (MIMO) in which the UEs with multiple antennas is served by one BTS that has multiple transmitters

small form-factor pluggable (SFP) physically compact connector design that consists of a housing fitted on a host board and a pluggable transceiver, developed for use in high-speed data transfers including both copper-based and fiber-optic systems. SFP+ supports 10 Gbps; SFP28 supports 25 Gbps; SFP56 supports 56 Gbps

sniffing recording the traffic flowing through the network

Note:

Sniffing can be used to attack the IP network. If data or commands are sent unencrypted, sniffing can be used for eavesdropping. It can also be used for stealing user identities and passwords, which can be used for the impersonation.

split mode	configuration in which antenna elements are divided into two separate logical antenna panels. The division is done in vertical dimension, for example, NR is allocated in the left side and LTE in the right side of the antenna panel. The split panel mode serves separate carriers with each half of the antenna elements
standalone (SA)	in NR, a configuration independent from LTE, which uses NR core network and NR radio network
time division duplex (TDD)	duplex mode in which several signals are interleaved in time for transmission over a common frequency channel Note: In TDD, the same frequency channel can be used for transmission in both directions. Both ends of a bidirectional connection alternate between transmitting and receiving bursts of data.
voltage standing wave ratio (VSWR)	ratio of maximum to minimum voltage in the standing wave pattern that appears along a transmission line. It's used as a measure of impedance mismatch between the transmission line and its load