Requirements for Installation and Operation

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1 Environmental requirements

1.1 Environmental specifications and requirements for a stand-alone BTS

Nokia Flexi EDGE stand-alone BTS (modules installed without a cabinet) can operate under the environmental specifications defined in the table below.

When choosing the installation location for the stand-alone BTS, note that heat and moisture may damage the equipment. Install the base station preferably away from direct sunlight, and protect the BTS from direct rain, splash water and salt fog.

Table 1. Climatic conditions for operation

Property	Value
Transportation requirements	ETSI 300 019-1-2, class 2.3, climate conditions according to class 2.3 (for a single module, in package)
Storage requirements	ETSI 300 019-1-1, Class 1.2 (for a single module, in package)
Operational requirements	ETSI 300 019-1-3, class 3.2 (indoor site) ETSI 300 019-1-4, class 4.1 (outdoor site)
Wind driven rain	GR-487-CORE MIL-STD 810E method 506.3 for rainfall rate 15 cm (15.9 in.)/hr and wind velocity 33 m (108.3 in.)/s

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Table 1. Climatic conditions for operation (cont.)

Property	Value
Salt fog and dust	IEC 721-2-5 IEC 68-2-52/Kb, stress level 1 with 0.44% salt solution by weight. This corresponds to IEC 721-2-5 humid costal and inland (moderate) environment with < 8mg/(m^2day) salt deposition for outdoor BTS without optional cabinet with air filter. A typical installation location example: 500 m (1640 ft) from the seashore.
Acoustic noise at +15 °C (59 °F)	Sound power level 54 dB(A), for 2+2+2 bypass configuration Sound power level 56 dB(A), for 4+4+4 2:1 configuration
Acoustic noise at +23 °C (73 °F)	Sound power level 58 dB(A), for 2+2+2 bypass configuration Sound power level 60 dB(A), for 4+4+4 2:1 configuration
Acoustic noise at +50 °C (122 °F)	Sound power level 66 dB(A, for 2+2+2 bypass configuration Sound power level 68 dB(A), for 4+4+4 2:1 configuration
Ingress Protection	IP55
Safety	IEC-60950-1
Earthquake Requirements	Bellcore GR-63-CORE, vibrational requirements for earthquake Zone 4: a maximum of five casings (2U [1)] or 3U) in a stack. Bellcore GR-63-CORE, Vibrational requirements for earthquake Zone 2: a maximum of 22 U in a stack.
Installation base flatness requirement	2 mm (0.08 in.)

[1)] 1U = 44.45 mm (1.75 in.)

If the base station site does not meet the above mentioned requirements, it may be necessary to install the modules inside an outdoor cabinet. See Section *Installations with cabinet* for more information.

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1.2 Environmental specifications and requirements for modules in FCIA

Nokia Flexi EDGE BTS modules inside Flexi Cabinet for Indoor (FCIA) can operate in the climatic conditions as defined in the table below.

Table 2. Climatic conditions for operation

Property	Value
Transportation requirements	ETS 300 019-1-2, Class 2.3
Storage requirements	ETS 300 019-1-1, Class 1.3
Operational requirements	ETS 300 019-1-3, Class 3.2 GR-63-CORE
Acoustic noise at +15 °C (59 °F)	Sound power level 54 dB(A), for 2+2+2 by-pass configuration Sound power level 56 dB(A), for 4+4+4 2:1 configuration
Acoustic noise at +23 °C (73 °F)	Sound power level 58 dB(A), for 2+2+2 by-pass configuration Sound power level 60 dB(A), for 4+4+4 2:1 configuration
Acoustic noise at +50 °C (122 °F)	Sound power level 66 dB(A), for 2+2+2 by-pass configuration Sound power level 68 dB(A), for 4+4+4 2:1 configuration
Salt fog and dust	IEC 68-2-60/Ke
Ingress Protection	IP22
Safety	IEC 60950-1
Earthquake Requirements	Telcordia GR-63-CORE, Zone 4

1.3 Environmental specifications and requirements for modules in FCOA without air filter

Nokia Flexi EDGE BTS modules installed inside Flexi Cabinet for Outdoor (FCOA) can operate in the climatic conditions as defined in the table below.

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Table 3. Climatic conditions for operation

Property	Value
Transportation requirements	ETSI 300 019-1-2, class 2.3, climate conditions according to class 2.3
Storage requirements	ETSI 300 019-1-1, class 1.3
Operational requirements	ETSI 300 019-1-4, class 4.1 and IEC class 4M5
Wind driven rain	GR-487-CORE MIL-STD 810E method 506.3 for rainfall rate 15 cm (5.6 in.)/hr. Wind load 67 m (219.8 ft)/s
Salt fog and dust	IEC 721-2-5 IEC 68-2-52/Kb, stress level 1 with 0.44% salt solution by weight. This corresponds to IEC 721-2-5 humid costal and inland (moderate) environment with < 8mg/(m^2day) salt deposition for outdoor BTS without optional cabinet with air filter. Typical installation location example: 500 m (1640.40 ft) from the seashore.
Acoustic noise at +15 °C (59 °F)	Sound power level 54 dB(A), for 2+2+2 by-pass configuration Sound power level 56 dB(A), for 4+4+4 2:1 configuration
Acoustic noise at +23 °C (73 °F)	Sound power level 58 dB(A), for 2+2+2 by-pass configuration Sound power level 60 dB(A), for 4+4+4 2:1 configuration
Acoustic noise at +50 °C (122 °F)	Sound power level 66 dB(A), for 2+2+2 by-pass configuration Sound power level 68 dB(A), for 4+4+4 2:1 configuration
Ingress Protection	IP55
Safety	IEC-60950-1
Earthquake Requirements	Telcordia GR-63-CORE, Zone4

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1.4 Environmental specifications and requirements for modules in FCOA with air filter

Nokia Flexi EDGE BTS modules installed inside Flexi Cabinet for Outdoor (FCOA) with an optional air filter can operate in the climatic conditions as defined in the table below.

Table 4. Climatic conditions for operation

Property	Value
Transportation requirements	ETSI 300 019-1-2, class 2.3, climate conditions according to class 2.3
Storage requirements	ETSI 300 019-1-1, class 1.3
Operational requirements	ETSI 300 019-1-4, class 4.1 and IEC class 4M5
Wind driven rain	GR-487-CORE MIL-STD 810E method 506.3 for rainfall rate 15 cm (5.6 in.)/hr Wind load 67 m (219.8 ft)/s
Salt fog and dust	IEC 721-2-5 IEC 68-2-52/Kb, stress level 1 with 5% salt solution by weight This corresponds to IEC 721-2-5 oceanic and coastal environment with > 8mg/(m^2day) salt deposition for outdoor BTS with optional air filter. A typical installation location is between 50 - 1000 m (164-3280 ft) from the sea shore.
When installing a cabinet with an air filter on a sea shore, it is recommended that the cabinet is installed with the side wall facing the sea (not the filter or the door).	
Acoustic noise at +15 °C (59 °F)	Sound power level 54 dB(A), for 2+2+2 by-pass configuration Sound power level 56 dB(A), for 4+4+4 2:1 configuration
Acoustic noise at +23 °C (73 °F)	Sound power level 58 dB(A), for 2+2+2 by-pass configuration Sound power level 60 dB(A), for 4+4+4 2:1 configuration
Acoustic noise at +50 °C (122 °F)	Sound power level 66 dB(A), for 2+2+2 by-pass configuration Sound power level 68 dB(A), for 4+4+4 2:1 configuration
Ingress Protection	IP55

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Table 4. Climatic conditions for operation (cont.)

Property	Value
Safety	IEC-60950-1
Earthquake Requirements	Telcordia GR-63-CORE, Zone4

1.5 Installations with cabinet

Modules must be installed in an indoor cabinet or an outdoor cabinet, when:

- You want to install more than nine modules in a stack (total height over 22 U),
- you want to install more than five modules in a stack (total height over 15 U) and still meet the Telcordia GR-63-CORE Zone 4 requirement,
- you want to install the BTS in a separate locked space,
- installation space for site support or integrated battery backup unit (MIBBU) is needed.

BTS outdoor cabinet installation with an air filter must be used when standard based operational environmental conditions presented in *Environmental specifications and requirements for a stand-alone BTS* are exceeded. A cabinet with an optional air filter is needed to provide better environmental conditions for the BTS. Typically, a cabinet with an optional air filter is needed:

- in places where dust is a concern,
- next to a dusty road with heavy traffic,
- in sandy terrain with the possibility of wind-blown sand in the air,
- next to an industrial plant with significant emissions of dust or other particles, such as cement factory, sawmill, and so on,
- nearby a cornfield with heavy straw dust during harvesting,
- in places where salt fog or acid rain caused by air pollution is a concern,
- near sea shore:

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  - with dense salt fog due to breaking waves,
  - with dense salt fog and line of sight to the sea (not behind a large building),
  - where wind-driven salt fog from sea can be identified.
- in site locations where surrounding metal structures show signs of corrosion due to extreme conditions (salt in air),
- in locations with especially heavy rainfall and high humidity combined with air pollution.

1.6 Operating range

The operating ranges of Nokia Flexi EDGE BTS are shown in the table below.

Table 5. Operating range

Property	Temperature
Low air temperature limit	-35 °C (-31 °F)
High ambient air temperature limit (temporary)	+55 °C (131 °F)
High ambient air temperature limit with guaranteed performance	+50 °C (122 °F)

1.7 Compliance with EMC, RF and safety

In Europe, this means compliance with Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

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

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EMC emission

- ETSI EN 301 489-1: Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements.
- ETSI EN 301 489-8: Part 8: Specific conditions for GSM base stations.
- EN55022: "Limits and methods of measurement of radio disturbance characteristics of information technology equipment".
- FCC Code of Federal Regulations (CFR) 47, Part 15 "Radio Frequency Devices".
- ICES-003: Digital Apparatus.

EMC immunity

- ETSI EN 301 489-1: "Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services - Part 1: Common technical requirements".
- ETSI EN 301 489-8: Part 8: Specific conditions for GSM base stations.
- IEC 1000-4-9: Pulse magnetic field immunity test.
- IEC 1000-4-8: "Electromagnetic Compatibility (EMC) Part 4. Testing and measurement techniques Section 8: Power frequency magnetic field immunity test, Basic EMC Publication".

RF

- ETSI EN 301 502: Harmonized EN for Global System for Mobile communications (GSM) - Base Station and Repeater equipment covering essential requirements under article 3.2 of the R&TTE directive.
- FCC Code of Federal Regulations (CFR) 47, Part 22 "Public Mobile Services".
- FCC Code of Federal Regulations (CFR) 47, Part 24 "Personal Communication Services".
- FCC Code of Federal Regulations (CFR) 47, Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations".

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- RSS-132: 800 MHz Cellular Telephones Employing New Technologies.
- RSS-133: 2 GHz Personal Communication Services.

Safety

- IEC 60950-1/ EN 60950-1: "Safety of Information Technology equipment including electrical business equipment".
- EN 50383: Basic standard for the calculation and measurement of the electromagnetic field strength and SAR related to human exposure from radio base stations and fixed terminal stations for wireless telecommunications system (110 MHz - 40 GHz).
- EN 50384: Product standard to demonstrate the compliance of radio base stations and fixed terminal stations for wireless telecommunications systems with the basic restrictions or the reference levels related to human exposure to radio frequency electromagnetic fields (110 MHz - 40 GHz) - Occupational.
- EN 50385: Product standard to demonstrate the compliances of radio base stations and fixed terminal stations for wireless telecommunications systems with the basic restrictions or the reference levels related to human exposure to radio frequency electromagnetic fields (110 MHz - 40 GHz) - General public.
- UL 60950-1: Safety of Information Technology Equipment.
- CSA C22.2 No. 60950-00: Safety of Information Technology Equipment.

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2 Site requirements

2.1 Planning and preparing the site

Purpose

Before installing the BTS, the site must be properly surveyed and prepared, and all required external connections must be correctly installed. Any special requirements for installation must also be identified during the survey.

Steps

1. **Check that the BTS can be installed safely:**
   - The site is accessible, adequately lit and safe for working.
   - Safety distance calculations are made and taken into account.
   - The site is prepared according to drawings.
   - The site survey is complete.
   - The Site Survey Report is available.
   - The site is clean.
   - Product delivery is complete.
   - All wiring is done in accordance with national electric code.
   - Needed equipment is available as defined in the Site Survey Report.
   - Sufficient service clearances are available.

2. **Verify that the following external cabinet connections are available:**
   - Grounding busbar,
   - Mains power (AC or DC, depending on the site),
   - Transmission connection point.

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2.2 General site requirements

Ensure that the following BTS site requirements are met:

1. All required documentation is available, for example, site-specific installation instructions.
2. When radio link transmission is used, the line-of-sight to the far end radios has been ensured.
3. External connections for the cabinet are available: site grounding point, mains power (AC or DC according to the site), and transmission connection point. Furthermore, AC or DC distribution panel and AC electric are available for power tools.
4. Main grounding (earthing) is installed and tested.
5. Floor or wall surface is even (installation base flatness requirement is 2 mm (0.08 in.).
6. Wall or pole at the BTS site is strong enough to withstand the weight of the BTS.
7. Wall or pole at the BTS site is strong enough to meet earthquake requirement Telcordia GR-63-CORE Zone 4 (only applicable in earthquake areas).
8. Pole at the BTS site is strong enough to withstand the wind load.
9. The BTS is not taken out of its delivery package until the site construction work is finished and the site is clean and dry.
10. Site security is established so the BTS and other units can remain undisturbed at the site.
11. Make sure you can take the BTS to the installation site. For example, in roof top installations, the hole through which you take the BTS to the roof must be large enough.

2.2.1 Indoor site requirements

If installing the BTS to an indoor site, ensure that the following indoor BTS site requirements are met:

- Door and lock to site room are properly installed and operational (recommended).
- Access to the site is secure.
- The site is adequately lit.

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- Feeder entry hole and cable rack for feeder and power cables are ready, if needed.
- Heater, or air conditioner, is installed and operational, if needed. This depends on the heat emission and the environment.

2.3 Antenna Jumper Cable Requirements

Antenna jumper cables are not included in the Flexi EDGE BTS product delivery. Follow these guidelines when selecting antenna jumper cables:

- 1/2" or 3/8" antenna jumper cables can be used.

  1/2" antenna cable connectors can be connected directly to the module if a right angle connector is used.
- The length should be determined based on the Flexi EDGE BTS installation option (for example pole, wall, cabinet, 3rd party cabinet) and the distance of the BTS from the antenna feeder line.
- Antenna jumper cables must be IP54-rated or better.

2.4 Pole installation requirements

The optional pole mounting kit enables Nokia Flexi EDGE BTS installation on a pole 60-300 mm in diameter. Up to four modules can be fitted in one pole mounting kit.

Note

Only two modules can be installed per plinth.

When installing modules on a pole, make sure that the pole at the BTS site is strong enough to withstand the weight of the BTS, to meet earthquake requirement Telcordia GR-63 core Zone 4, and the wind load requirement.

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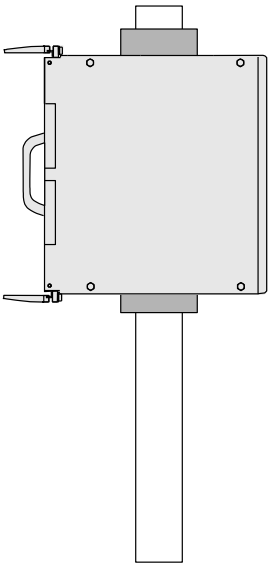

Figure 1. Wind load calculations, side view

When the wind area is as in the *Wind load calculations, side view* figure, the area used for wind load calculations is 0.33 m^2.

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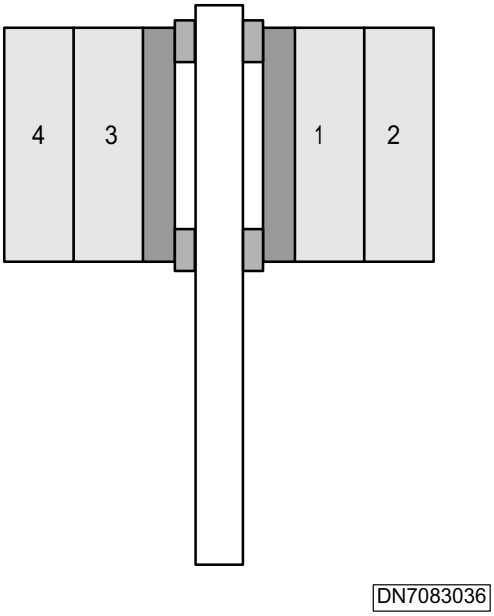

Figure 2. Wind load calculations, front view

When the wind area is as in the *Wind load calculations, front view* figure, the area for wind load calculations depends on the number of installed modules. See the table below for more information.

Table 6. The area for wind load calculations

Number of modules	Area
1	0.12 m^2
2	0.18 m^2
3	0.30 m^2
4	0.36 m^2

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Flexi mounting shields (FMSA and FMSB)

Table 7. The area for wind load calculations (FMSA and FMSB)

Mounting shield	Area
FMSA	0.45 m^2
FMSB	0.78 m^2

2.5 Wall installation requirements

The optional mounting kit for floor, wall and pole (FMFA) enables Nokia Flexi EDGE BTS installation on a wall.

The following requirements must be filled when modules are installed on the wall:

- Qualified personnel must inspect the installation wall before mounting the BTS.
- It must be ensured that the installation wall is strong enough to bear the weight of the BTS in any condition.
- The wall must meet the earthquake requirement Telcordia GR-63 CORE (only applicable in earthquake areas).
- The module fixing screws (4 pcs) and module casing must be tightened to 5 Nm to meet the earthquake requirement Telcordia GR-63 CORE, Vibrational requirements for earthquake Zone 4.
- The maximum number of modules per plinth is two.
- The maximum number of plinths that can be used for one configuration is five.
- Modules must be installed in horizontal alignment, cabling direction up and down.
- Module bottoms must be installed facing the wall.

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2.6 Module clearances

The following table and figure show the minimum clearances around the modules.

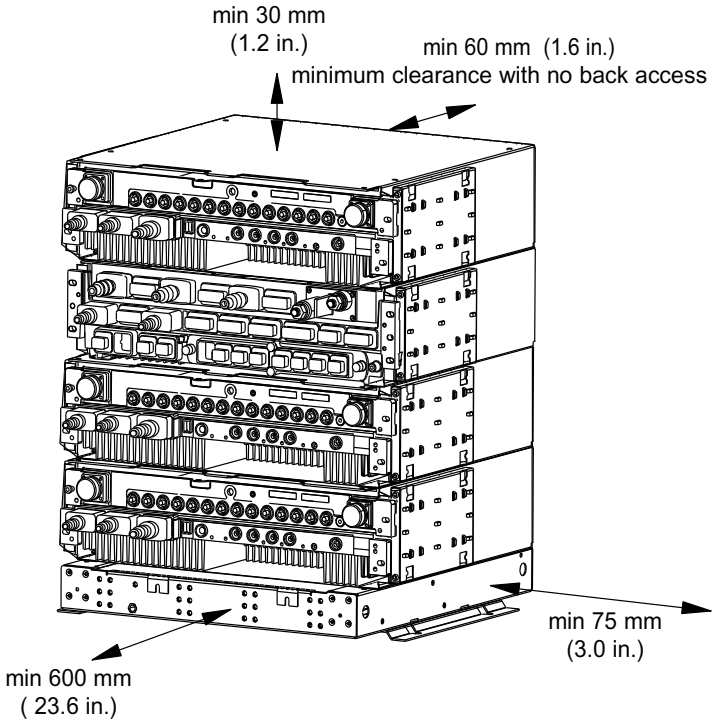

Figure 3. Module clearances

Table 8. Required minimum clearances

Property	Value
Front space (for maintenance)	600 mm (23.6 in.)
Back space	80 mm (3.2 in.) measured from the back of plinth[1)]
Back space (for maintenance) [2)]	200 mm (7.9 in.), in a stack with five modules or less 500 mm (19.7 in.), in a stack with more than five modules [3)]

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Table 8. Required minimum clearances (cont.)

Property	Value
Top space	30 mm (1.2 in.)
Space on both sides	75 mm (3.0 in.), with front covers
Space on both sides (with optional cable tunnels in stack installation)	150 mm (5.9 in.)
Side clearance in wall installation (for maintenance)	400 mm (15.8 in.)
Vertical space required for wall and pole installation	600 mm (23.6 in.)
Vertical space between modules on separate plinths in wall installation	100 mm (3.9 in.)

[1)] Only 40 mm (1.6 in.) back space is required for cooling. An 80 mm (3.2 in.) clearance behind the plinth will give the required minimum clearance for cooling. Note that the plinth has an 80 mm (3.2 in.) backstop.

[2)] Fans can also be changed without minimum clearances, with no back access, but this requires removing the module from the casing or the cabinet.

[3)] If there are more than five modules in a stack, side access 500 mm (19.7 in.) is also needed for fan maintenance.

2.7 FCIA clearances and anchoring holes

See the following table and figures for required clearances around Nokia Flexi Cabinet for Indoor (FCIA).

Table 9. Cabinet clearances

Property	Required clearance
Front of the cabinet	900 mm (35.4 in.)
Behind the cabinet	50 mm (2.0 in.)
Behind the cabinet (with maintenance space in the back) [1)]	500 mm (19.7 in.)

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Table 9. Cabinet clearances (cont.)

Property	Required clearance
Space on the door hinges side of the cabinet	50 mm (2.0 in.)
Door swing radius	600 mm (23.6 in.)
Above the cabinet	300 mm (11.8 in.)

[1)] For maintenance space in the back, side access of 500 mm (19.7 in.) is also needed.

The floor must be level. The level tolerance is ± 5 mm (0.19 in.) for the base area immediately under the cabinet.

A 50 mm (2.0 in.) backstop is included in the cabinet delivery. The clearance behind the cabinet is measured from the back wall of the cabinet.

When installing 3rd party 19" rack equipment in the FCIA, the distance from the rack fixing space to the inner surface of the door must be 102.5 mm (4.0 in.).

For the dimensions of the FCIA cabinet, see FCIA dimensions and weight.

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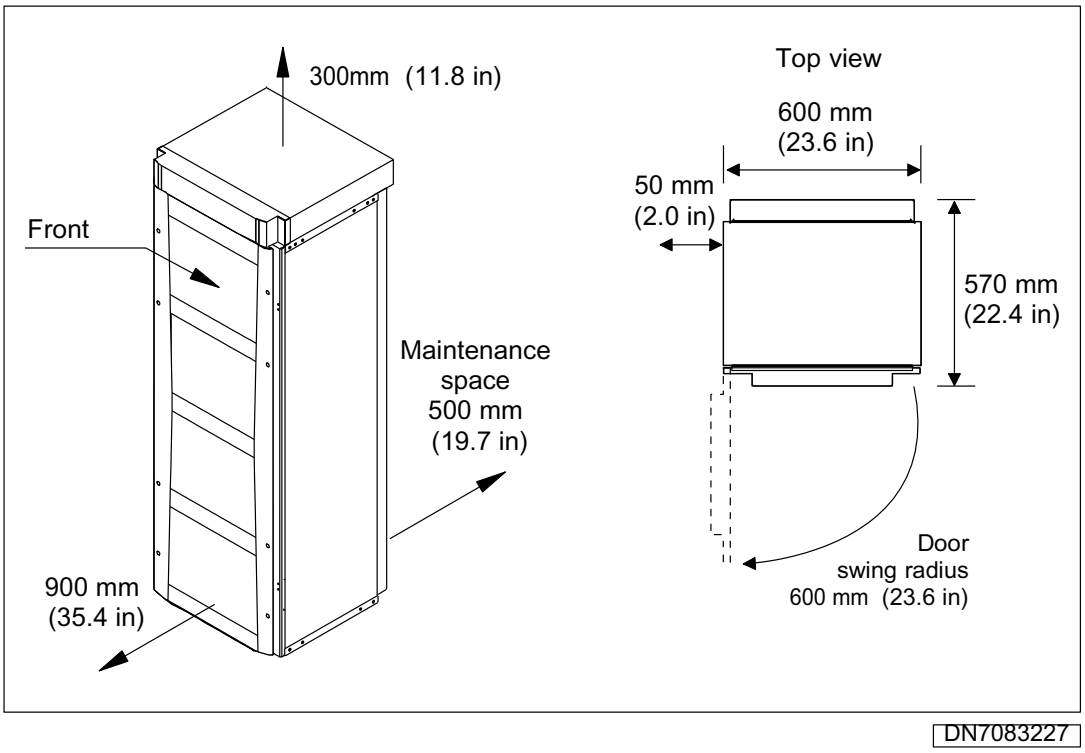

Figure 4. Clearances around FCIA

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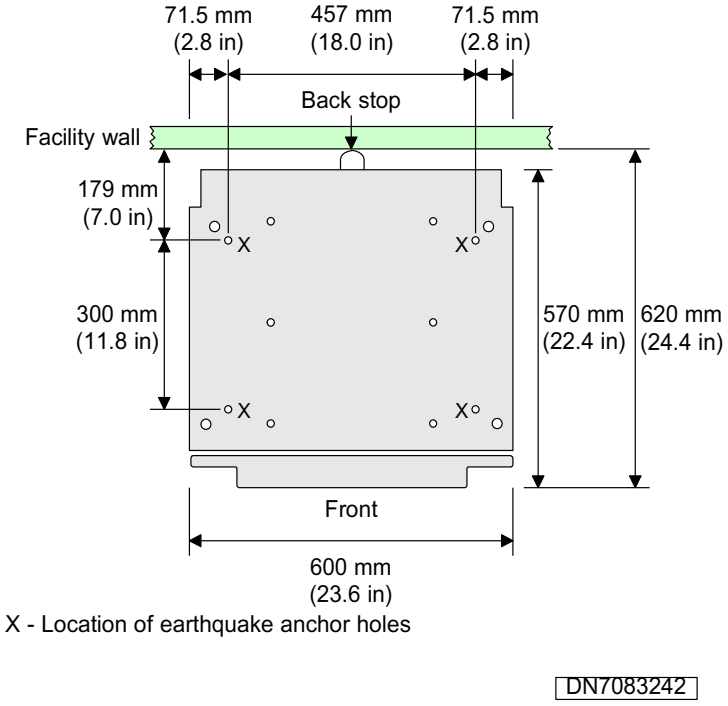

Figure 5. FCIA fixing points, minimum clearances

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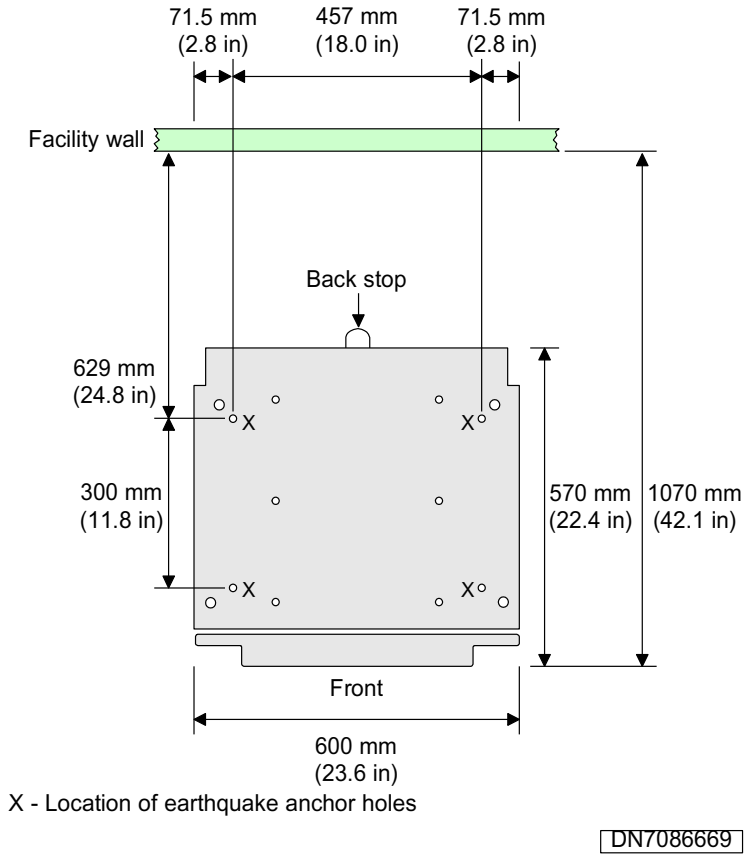

Figure 6. FCIA fixing points with maintenance space in the back

Anchoring holes

The cabinet is anchored to the ground using four M10 or M12 bolts.

2.8 FCOA clearances and anchoring holes

See the following table and figure for required clearances around Flexi Cabinet for Outdoor (FCOA).

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Table 10. Cabinet clearances

Property	Required clearance
Front of the cabinet	800 mm (31.5 in.)
Behind the cabinet (one cabinet installed)	0 mm/in.
Behind the cabinet (several cabinet installed in a row)	100 mm (4 in.)
Behind the cabinet (with back access)	500 mm (19.7 in.)
Behind the cabinet (with air filter and cables routed via back)	1000 mm (39.3 in.)
Behind the cabinet (with air filter and cables routed via side or via bottom)	450 mm (17.7 in.)
Door opening direction	50 mm (2 in.)
Door opening with wind breaker	80 mm (3.2 in.)
Above the cabinet	500 mm (19.7 in.)

The floor must be level. Requirements for the base are as follows:

- Aberration for plane = 1 mm (0.04 in.)
- Maximum inclination = 2 mm/metre

When installing 3rd party 19" rack equipment in the FCOA, the distance from the rack fixing space to the inner surface of the door must be 135 mm (5.3 in.).

For the dimensions of the FCOA cabinet, see FCOA dimensions and weight.

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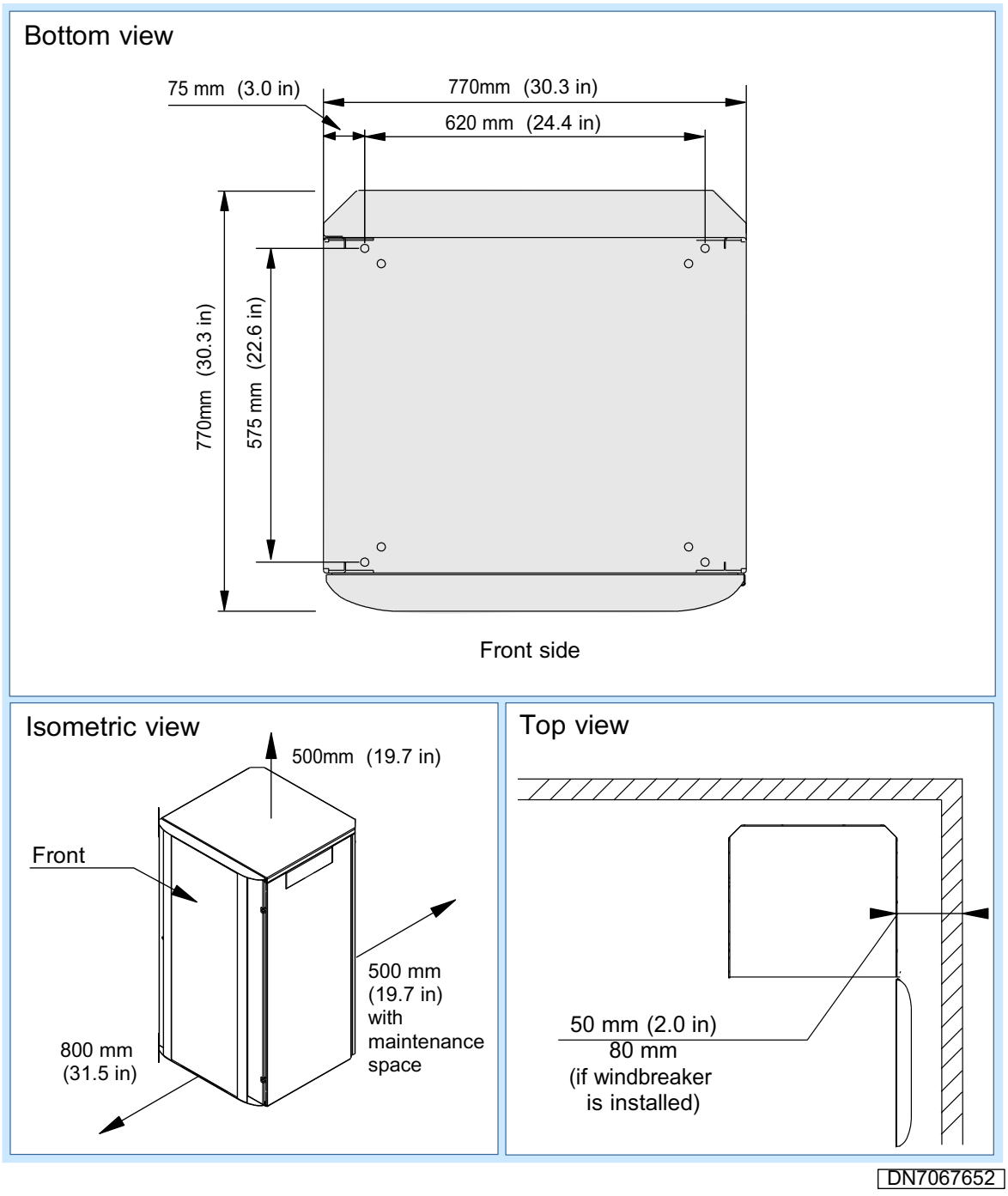

Figure 7. Cabinet clearances and anchoring holes

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Anchoring holes

The cabinet is anchored to the ground using four M12 bolts. Additional four holes are available for backup purposes, in case the actual holes cannot be used for some reason.

Cable entry

For the location and dimensions of the FCOA cabinet bottom cable entry, see the following figure.

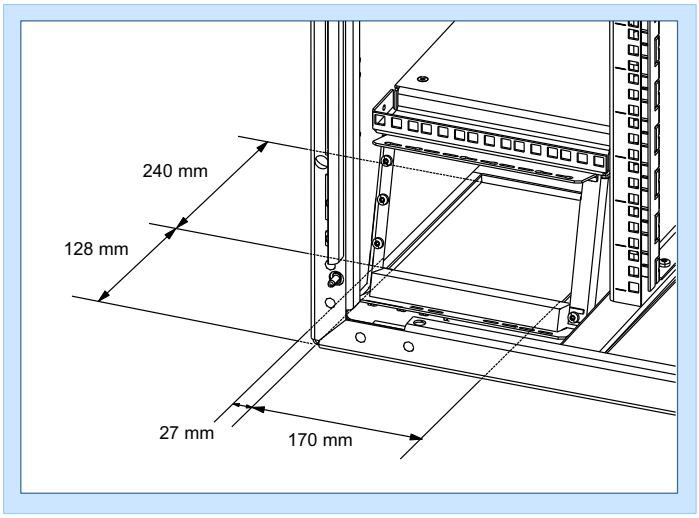

Figure 8. FCOA cabinet bottom cable entry

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3 Power requirements

3.1 Site earth and BTS grounding requirements

BTS site grounding is divided into two contexts: site earthing and site equipment grounding.

To protect the BTS from damaging overvoltages through antenna equipment, communication cables, or power supply lines, grounding cabling must be planned and installed before the installation of the base station. To avoid interference, it is recommended that large grounding systems are designed case-specifically.

The function of the site earth is to convoy the lethal and hazardous voltages and electric currents from the site main grounding point (main grounding busbar) to the earth.

The impedance of the earth connection shall be as low as possible:

- The earthing (grounding) resistance target of the BTS site is ≤10 Ω. If it is not possible to reach this target due to difficult conditions, for instance in areas such as solid rocks or dry desert, the earthing (grounding) resistance can be max. 150 Ω.
- The cross-sectional area of the Main Earthing Conductor shall not be less than live and neutral conductors nor less than 6 mm^2, recommented size is 16 mm^2.

Site equipment grounding is required to ensure personnel safety and to avoid electrostatic discharge which can damage the equipment.

An AC power plug with a protective earth (PE) connection is not sufficient for Nokia BTS use. Grounding must have a fixed, non-removable connection.

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Note

Follow local requirements for earthing (grounding). The principles and requirements vary in different countries.

Observe the following recommendations when planning the BTS grounding:

- Grounding cable cross-section has to be more than any of AC or DC power feeding cable cross-section.
- The grounding cable is connected with screws to the BTS grounding point.
- The grounding cable must be connected to a main grounding busbar with a minimum of 6 mm^2 grounding cable.
- Route the grounding cables as directly as possible from the equipment to the grounding point. Avoid unnecessary loops and sharp bending of the grounding cable. The grounding cables should not be run parallel with power cables.
- The external antenna feeders must also be grounded according to the local legislation if the antennas are exposed to lightning.

3.2 AC mains power requirements

Warning

Danger of lethal voltages! Make sure that the mains power breaker is off, and that the cabinet is properly earthed (grounded), before connecting or removing any mains power supply cables from the BTS cabinet.

At the site there must be a main switch for disconnecting the BTS mains power. The disconnecting device must disconnect both input supply poles simultaneously.

The minimum cross-section of the mains power copper (Cu) conductor is the following:

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- When 220-240 VAC is used, power cables must be 1.5 - 2.5 mm^2 (15...13 AWG)
- When 100-110 VAC is used (split phase), power cables must be 1.5 - 2.5 mm^2 (15...13 AWG)
- When 48 VDC is used, power cables must be 25...35 mm^2 (4...2 AWG)

Table 11. Permitted operating voltage

Property	Nominal operating voltage	Permitted operating voltage
DC voltage	48 VDC	40.5 to 57 VDC
AC voltage with optional AC Module	200 - 240 VAC	184 to 276 VAC (45 - 66 Hz)
DC voltage with optional DC Module	24 VDC	18 to 32 VDC

3.3 BTS power consumption

Table 12. Power consumption of Nokia Flexi EDGE BTS with 2-way uplink diversity

Site configuration	Combining method	Power consumption (W)	
		Frequency band	
		800 and 900	1800 and 1900
1+1	By-pass	480	520
2+2+2	By-pass	1055	1160
2+2+2 and 2+2+2	By-pass	1055 + 3*368 = 2160	1055 + 3*368 = 2160
8+8+8	4-way	3795	4215

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3.4 Overvoltage protection requirements

The requirements for overvoltage protection are described in the tables below.

- Supply voltage Nominal 48 V DC according to ETSI 300-132
- Protection level U_p (differential, i.e. Line – Line) < 500 V (at I_n, 8 / 20 us)
- Protection level U_p (common, i.e. Line – Ground) < 1000 V (at I_n, 8 / 20 us)

Table 13. Overvoltage protection level in differential (Line – Line) mode

	OVP Class II (C/T2) requirements for differential (Line – Line) mode
Voltage protection level, Up	<0.5 kV
Nominal discharge current, In	15 kA
Max. discharge current, Imax	40 kA
Response time, tA	<25 ns

Table 14. Overvoltage protection level in common (Line – Ground) mode

	OVP Class II (C/T2) requirements for common mode
Voltage protection level, Up	<1 kV
Nominal discharge current, In	20 kA
Max. discharge current, Imax	40 kA
Response time, tA	<100 ns

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4 Dimensions and weights

4.1 Module dimensions and weight

Table *Dimensions and weights of Nokia Flexi EDGE BTS modules* summarises module dimensions in casings. Nokia Flexi EDGE BTS modules are installed in cabinets or 19” racks without casings and covers. The maximum dimensions of modules without casings or covers are:

- front panel width 483 mm (19.0 in.), module width less than 447 mm (17.6 in.)
- module depth less than 432 mm (17.0 in.), Site Support module FCSA 523 mm (20.6 in.)
- vertical space requirement in cabinets (height) as shown in the table.

Table 15. Dimensions and weights of Nokia Flexi EDGE BTS modules

Module	Width[1)]	Height	Depth[2)]	Weight
System Module (ESMA)	447/492 mm (17.6/19.4 in.)	133 mm/3 U (5.2 in.)	422/560 mm (16.6/22.1 in.)	8.6 kg (19.0 lbs)
• transmission sub-modules	262 mm (10.3 in.)	40 mm (1.6 in.)	165 mm (6.5 in.)	0.7 kg (1.6 lbs)
Dual TRX Module (EXxA)	447/492 mm (17.6/19.4 in.)	90 mm/2 U (3.5 in.)	422/560 mm (16.6/22.1 in.)	10.2 kg (22.5 lbs)
• Wideband Combiner Sub-module (EWxA)	78 mm (3.1 in.)	48 mm (1.9 in.)	124 mm (4.9 in.)	1 kg (2.2 lbs)
Dual Duplexer Module (ERxA)	447/492 mm (17.6/19.4 in.)	44 mm/1 U (1.7 in.)	422/560 mm (16.6/22.1 in.)	10.8 kg (23.9 lbs)
System Extension Module (ESEA)	447/492 (17.6/19.4 in.)	133 mm/3 U (5.2 in.)	422/560 mm (16.6/22.1 in.)	9.1 kg (20.1 lbs)

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Table 15. Dimensions and weights of Nokia Flexi EDGE BTS modules (cont.)

Module	Width[1)]	Height	Depth[2)]	Weight
Remote Tune Combiner Module (ECxA)	447/492 mm (17.6/19.4 in.)	178 mm/4 U (7.0 in.)	422/560 mm (16.6/22.1 in.)	28.5 kg (63.0 lbs)
Power Module (FPMA)	447/492 mm (17.6/19.4 in.)	133 mm/3 U (5.2 in.)	422/560 mm (16.6/22.1 in.)	< 11/28 kg (<24.3/ 61.9 lbs) [3)]
• Power AC/DC 230 V Sub-module (FPAA)	72 mm (2.8 in.)	100 mm (3.9 in.)	380 mm (15.0 in.)	3.2 kg 7.1 lbs)
• Battery Sub-module (FPBA)	72 mm (2.8 in.)	100 mm (3.9 in.)	380 mm (15.0 in.)	3.8 kg (8.4 lbs)
Power DC/DC 24 V Module (FPDA)	447/492 mm (17.6/19.4 in.)	90 mm/2 U (3.5 in.)	422/560 mm (16.6/22.1 in.)	< 15 kg (< 33.1 lbs)
Site Support module (FCSA)	668 mm (26.3 in.)	Max. 367 mm/ 7.5 U (14.5 in.)	523 mm (20.1 in.)	< 20 kg (< 44.2 lbs)

[1)] Width of the casing without front covers/with front covers

[2)] Depth of the casing without front covers/with front covers

[3)] Weight of empty FPMA/weight of FPMA fully equipped with one AC/DC sub-module and batteries

4.2 FCIA dimensions and weight

See the following table for the dimensions and weight of the Flexi Cabinet for Indoor (FCIA).

Table 16. Dimensions and weight of Flexi Cabinet for Indoor (FCIA).

Property	Value
Height	1800 mm (70.87 in.)

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Table 16. Dimensions and weight of Flexi Cabinet for Indoor (FCIA). (cont.)

Property	Value
Width	600 mm (23.62 in.)
Depth	600 mm (23.62 in.)
Weight (empty cabinet)	62 kg (136 lbs.)
Free space for modules	36 U

4.3 FCOA dimensions and weight

See the following table for the dimensions and weight of the Flexi Cabinet for Outdoor (FCOA).

Table 17. Dimensions and weight of the Flexi Cabinet for Outdoor (FCOA)

Property	Value
Height	1550 mm (61 in.)
Width	770 mm (30.3 in.)
Depth	770 mm (30.3 in.)
Depth with air filter	930 mm (36.6 in.)
Depth with air filter and wind breaker	1020 mm (40.2 in.)
Weight (empty cabinet)	Max. 80 kg (177 lbs)
Weight (with air filter)	104 kg (230 lbs)
Weight (with air filter and wind breaker)	110 kg (243 lbs)

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Table 17. Dimensions and weight of the Flexi Cabinet for Outdoor (FCOA) (cont.)

Property	Value
Total weight (Fully equipped with batteries)	365 kg (807 lbs)
Free space for modules	40 U (30 U horizontally + 5 U + 5 U vertically
Free space for modules (site support and batteries installed)	21 U (16 U horizontally + 5 U vertically)

4.4 Weights for typical configurations

Table 18. Weight for different Flexi EDGE BTS configurations

Installation type	Weight of 2+2+2 configuration	Weight of 4+4+4 configuration	Weight of 8+8+8 configuration	Weight of 6+6+6 configuration
Stack	106 kg (234 lbs.)	156 kg (345 lbs.)	-	-
Wall/pole	112 kg (248 lbs.)	174 kg (385 lbs.)	-	-
FCIA	138 kg (305 lbs.)	171 kg (378 lbs.)	247 kg (546 lbs.)	256 kg (566 lbs.)
FCOA	146 kg (323 lbs.)	179 kg (396 lbs.)	255 kg (563 lbs.)	264 kg (583 lbs.)

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5 Citytalk cabinet requirements

Nokia Flexi EDGE BTS modules can be installed into Nokia Citytalk cabinet by using the Talk Conversion Kit (EMIA). The inner parts of the Citytalk cabinet must be stripped out before Flexi EDGE BTS modules are installed, and certain parts of the Citytalk cabinet will be replaced with new parts belonging to the Talk Conversion Kit. Standard Citytalk installation tools can be used for stripping out the cabinet.

The Citytalk cabinet will retain its outline dimensions and the mechanical shape when modified with the Talk Conversion Kit. The Flexi EDGE BTS within the modified cabinet will fulfill the Flexi EDGE BTS temperature and environmental requirements.

Citytalk cabinet with the Talk Conversion Kit supports up to 4+4+4 single band or 2+2+2 dual band configurations.

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6 3rd party cabinet or rack requirements

Basic requirements for a 3rd party cabinet/rack

The basic requirements for a 3rd party cabinet are the following:

- 19-inch rack
- Minimum depth 600 mm (23.6 in.)
- Back air intake
- Front exhaust
- Temperature resistance between -35...+55°C (-31 ... 131°F)

  Nokia Flexi EDGE BTS performance is guaranteed in temperatures from -35 to +50°C (-31 to 122°F). Ambient temperature is allowed to exceed +50°C (122°F) up to +55°C, for a maximum of 24 hours continuously, or 8 hours in consecutive days up to a total of 360 hours per year.
- 3rd party 19-inch racks must provide adequate grounding contact for modules. If the rack is rusty, dirty, or painted, then module ground cables must be used.
- Make sure the 19-inch rack is made of material strong enough to support the weight of the modules (for example sheet metal steel, aluminium extrusion). Check with the manufacturer for weight limitations.
- If the installation is a stand-alone rack (and no cabinet), Nokia recommends that module casings and covers are used for safety purposes. Also make sure the rack is securely mounted to the floor according to the manufacturer's instructions.

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- If 3rd party screws are used for mounting the modules (for example, the rack requires M6 screws), the screws must be at least 25 mm (1.0 in.) long.
- If Flexi EDGE BTS modules are installed in an outdoor 3rd party cabinet, it must meet the environmental specifications of Flexi Cabinet for Outdoor (FCOA) without air filter.

Cooling requirements for Flexi EDGE BTS module in a 3rd party cabinet

A Nokia Flexi EDGE BTS module is installed in the cabinet without the rear side and front side plastic covers. All modules must receive cool ambient air, and circulation from the front to the rear side of the module must be prevented. The following table shows the air volume flow for each Nokia Flexi EDGE BTS module.

Table 19. Air volume flow of Nokia Flexi EDGE BTS modules

Module	*Air volume flow (m^3/h)*
System Module (ESMA)	50 (m^3/h) (1766 cu.ft)
Remote Tune Combiner Module (ECxA)	50 (m^3/h) (1766 cu.ft)
Dual TRX Module (EXxA)	100 (m^3/h) (3531 cu.ft)
Dual Duplexer Module, ERxA (no fans)	0

The pressure drop caused by the rear wall and front door (wall) for one module fan assembly can be a maximum of 25 Pa (including the pressure drop for both walls). Nokia Flexi EDGE BTS cooling fans' minimum distance to any obstacle in the rear side of the cabinet is 40 mm (1.6 in.).

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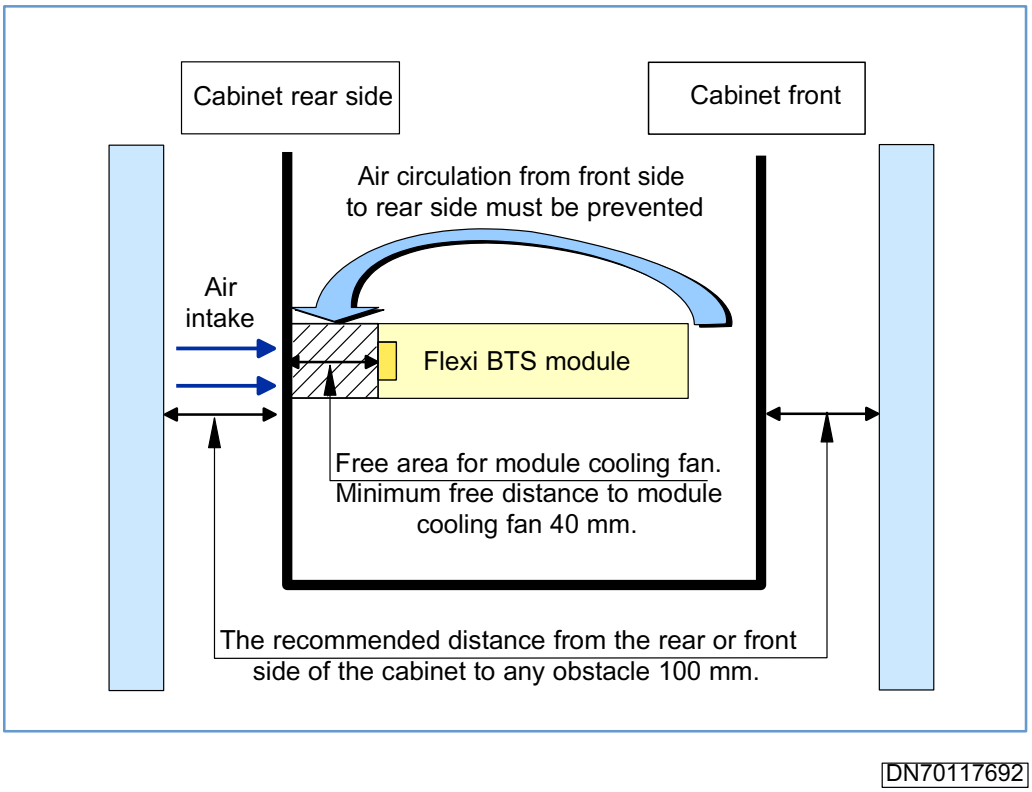

Figure 9. Module level cooling in a 3rd party cabinet

The entire cabinet volume flow is dependent on the number of modules and configuration. The following table shows cabinet flow volume for common configurations.

Table 20. Cabinet flow volume for typical Nokia Flexi EDGE BTS configurations

Configuration	*ESMA (m^3/h)*	*EXxA (m^3/h)*	*Total (m^3/h)*
2+2+2 bypass	1 x 50	3 x 100	350
4+4+4 2-way WBC	1 x 50	6 x 100	650
2+2+2 and 2+2+2 dual band	1 x 50	6 x 100	650

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A minimum of 100 mm (3.9 in.) is recommended from the rear side of the cabinet to the wall (or any obstacle) to allow the required airflow rate to be reached for each module. It is recommended that cables be routed on the module sides to prevent the obstruction of airflow from the BTS.

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