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**Nokia MetroSite GSM Base
Station, Requirements for
Installation and Operation**

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As stated in the Declaration of Conformity, this product complies with protection requirements of the Council Directive 89/336/EEC relating to electromagnetic compatibility, when installed using EMC-protected installation practices and practices stated in our User Manuals.

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Summary of changes

Version 1, 12th November 1999.

Pilot 3 (Version 1.2), 6th April 2000:

- Added GSM to title and to body text
- Added CE marking
- Changed acoustic noise to 61dB in Chapters 2.3.5, 3.6.2 and Figure 5
- Increased cabinet length to 870mm in Figures 1 and 2.

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About this document

This document introduces the requirements set by the Nokia MetroSite GSM Base Station (BTS) for successful installation and operation. Use this document as the source for the following information needed in the planning of installation:

- Specification on the environmental conditions during transportation, storage and operation
- Space requirements and other site-related installation matters
- Site grounding and power supply to the BTS
- Interface connections
- Installation tools

Read also *Nokia MetroSite GSM Base Station: Warnings and Cautions* in conjunction with this document.


2 Environment

This chapter defines the classes of environmental conditions and their severities to which the Nokia MetroSite GSM BTS can be exposed. The information is organised in the following parts:

- Conditions for Storage
- Conditions for Transportation
- Conditions for Operation

2.1 Storage

This section defines the environmental conditions which the Nokia MetroSite GSM BTS can be exposed to during storage.

 **Caution**

The Nokia MetroSite GSM BTS must be stored in its original package before the installation.

2.1.1 International standard for storage

According to the ETS 300 019-1-1:1992, the class for Nokia MetroSite BTS is Class 1.2: weather-protected, partly temperature-controlled storage locations.

2.1.2 Climatic conditions for storage

The climatic conditions during the storage of the Nokia MetroSite GSM BTS are presented in Table 1 (according to ETS 300 019-1-1:1992).

Table 1. Climatic conditions for storage

Environmental parameter	Value
Low air temperature	- 25 °C - 13 °F
High air temperature	55 °C 131 °F
Low relative humidity	10%
High relative humidity	100%
Low absolute humidity	0.5 g/m ³
High absolute humidity	29 g/m ³
Rain intensity	none
Temperature change rate (average of 5 minutes)	0.5 °C/min 0.9 °F/min
Low air pressure	70 kPa 10.15 psi
High air pressure	106 kPa 15.37 psi
Solar radiation	1120 W/m ²
Surrounding air movement	30 m/s 98 ft/s
Conditions of condensation	yes
Conditions of precipitation (rain, snow, hail, etc.)	yes
Low rain temperature	none
Conditions of water from sources other than rain	dripping water
Conditions of icing and frosting	yes

2.1.3 Mechanical conditions for storage

The Nokia MetroSite GSM BTS complies with ETS 300 019-1-1:1992 class 1.2.

2.2 Transportation

This section defines the environmental conditions which the Nokia MetroSite GSM BTS can be exposed to during transportation.



Caution

The Nokia MetroSiteGSM BTS must be transported in its original package before the installation.

Note

The Nokia MetroSite GSM BTS is delivered to the customer with the ordered plug-in units preinstalled.

2.2.1 International standard for transportation

According to ETS 300 019-1-2:1992, the class for the Nokia MetroSite GSM BTS equipment is Class 2.2. This class applies to those cases of transportation where special care has been taken, e.g. with respect to low temperature and handling.

Note

The typical transportation time is considered to be 30 days or less. When the total transportation time exceeds 30 days, additional storage or packaging precautions must be considered.

2.2.2 Climatic conditions for transportation

The climatic conditions during the transportation are presented in Table 2 (according to ETS 300 019-1-2:1992).

Table 2. Climatic conditions for transportation

Environmental parameter	Value
Low air temperature	-25 °C -13 °F
High temperature, air in unventilated enclosures	70 °C 158 °F
High temperature, air in ventilated enclosures or outdoor air	40 °C 104 °F
Temperature change air/air	-24/+30 °C -11/+86 °F
Temperature change air/water	+40/+5 °C +104/+41 °F
Relative humidity, not combined with rapid temperature changes	95% +40 °C 95% 104 °F
Relative humidity, combined with rapid temperature changes air/air, at high relative humidity	95% -25 /+30 °C 95% -13/+86 °F
Absolute humidity, combined with rapid temperature changes air/air, at high water content	60 g/m ³ +70/+15 °C 60 g/m ³ +158/+59 °F
Low air pressure	70 kPa 10.15 psi
Change of air pressure	none
Surrounding air movement	20 m/s 65.6 ft/s
Precipitation, rain	6 mm/min 0.24 in/min
Radiation, solar	1120 W/m ²
Radiation, heat	600 W/m ²
Water from sources other than rain	1 m/s 3.28 ft/s
Wetness	none

2.2.3 Mechanical conditions for transportation

For mechanical conditions during transportation, the Nokia MetroSite GSM BTS complies with ETS 300 019 1-2:1992 class 2.2.

2.3 Operation

This section defines the environmental conditions during the operation of the Nokia MetroSite GSM BTS at locations which are not protected from direct weather influences.

Note

When surveying the prospective sites, consider the values presented in this section.

Operating conditions are defined as stationary: the equipment is mounted on a structure, or on a mounting device, or it is permanently placed at a certain site. The Nokia MetroSite GSM BTS is not intended for portable use.

2.3.1 International standard for operation

According to ETS 300 019-1-4:1992, the class for the Nokia MetroSite BGSM TS equipment is class 4.1.

2.3.2 Climatic conditions for operation

For climatic conditions during operation, the Nokia MetroSite GSM BTS complies generally with class 4.1 as presented in Table 3. However, for the temperature and humidity values, the table presents extended operational climatic conditions, which differ from class 4.1. The weather shielding of the Nokia MetroSite GSM BTS is valid when the BTS is mounted in the recommended positions.

Table 3. Climatic conditions for operation (Class 4.1, partly extended)

Environmental parameter	Class 4.1 value	Extended value for Nokia MetroSite BTS
Low air temperature	-33°C -27°F	-40 °C -40 °F
High air temperature	40 °C 104°F	50 °C 122 °F
Low relative humidity	15%	-
High relative humidity	100%	-
Low absolute humidity	0.26 g/m ³	0.03 g/m ³
High absolute humidity	25 g/m ³	36 g/m ³
Rain intensity	6 mm/min 0.24 in/min	-
Temperature change rate (average of 5 minutes)	0.5 °C/min. 0.9 °F/min	-
Low air pressure	70 kPa 10.15 psi	-
High air pressure	106 kPa 15.37 psi	-
Solar radiation	1120 W/m ²	-
Heat radiation	insignificant	-
Surrounding air movement	50 m/s 164 ft./s	-
Conditions of condensation	yes	-
Conditions of precipitation (rain, snow, hail etc.)	yes	-
Low rain temperature	5 °C 41 °F	-
Conditions of water from sources other than rain	splashing water	-
Conditions of icing and frosting	yes	-

2.3.3 Mechanical conditions for operation

For mechanical conditions during operation, the Nokia MetroSite GSM BTS complies with ETS 300 019-1-4:1992 class 4.1.

2.3.4 Ingress protection

The electronic components inside the units of the Nokia MetroSite GSM BTS are protected against the ingress of rain, snow and dust to the minimum level of IP55 of European standard EN 60529, and level 3R of UL standard 50.

2.3.5 Acoustic noise

The maximum acoustic noise generated by the Nokia MetroSite GSM BTS is 61 dB (A) in an outdoor environment and 55 dB (A) for an indoor environment. The acoustic noise is measured according to ISO 3744. The noise is sound power.

2.3.6 EMC shielding

The chassis and the units of the Nokia MetroSite GSM BTS together provide the EMC shielding. The EMC shielding complies to the requirements set by the following standards:

- GSM 11.21
- ETS 300, 342-3
- FCC part 15, class B
- FCC part 24

For more specific information refer to *Nokia MetroSite GSM Base Station: Product Description*.

2.3.7 Safety

The cabinet fulfills the relevant safety requirements: EN 60215, EN 60950 and UL 1950.

For more specific information refer to *Nokia MetroSite GSM Base Station: Product Description*.

3

Installation requirements

This chapter specifies the preparatory requirements for the installation of the Nokia MetroSite GSM BTS.

3.1 Checking the site

The cabinet installation phase requires that the site be properly surveyed and prepared, and that all required external services are correctly installed. The site survey must identify any special requirements for the installation.

The site must meet the following requirements before the installation can be started:

1. The site is accessible and safe for working.
2. The safety distance calculations as presented in *Nokia MetroSite GSM Base Station: Warnings and Cautions* have been made and taken into account.
3. When radio link transmission is used, the line-of-sight to the far end radios has been ensured.
4. External connections for the cabinet are available: site grounding point, mains power (AC or DC according to the site) with appropriate disconnect device, and transmission connection point.
5. All required documentation is available, for example, site-specific installation instructions.
6. The correct BTS delivery has been brought to the site.

3.2 Space requirements

The Nokia MetroSite GSM BTS can be mounted on a wall or pole. This section presents general issues that must be considered when choosing the installation space.

3.2.1 Nokia MetroSite BTS dimensions and weight

Figure 1 presents the dimensions of the Nokia MetroSite GSM BTS.

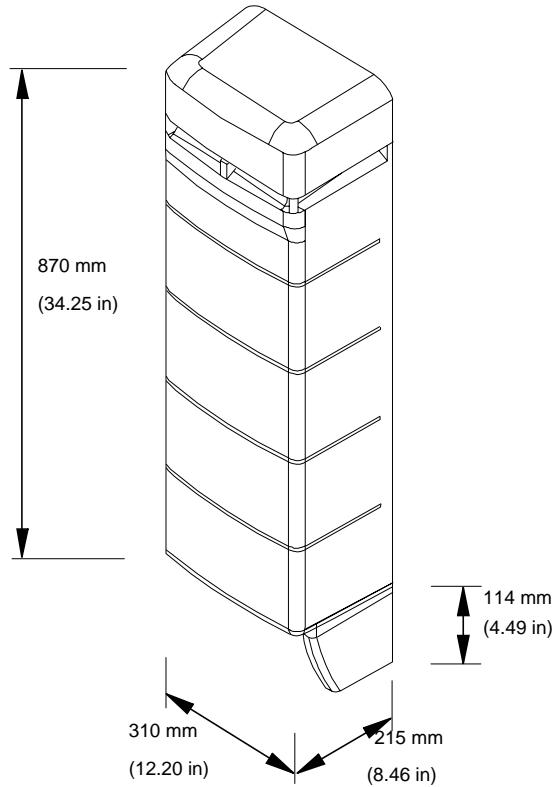


Figure 1. Dimensions of Nokia MetroSite BTS cabinet

The Nokia MetroSite GSM BTS with four TRXs weighs approximately 40 kg (88.4 lb). The mounting rack weighs approximately 2 kg (4.4 lb). The dimensions and weights of the plug-in units can be found in *Nokia MetroSite GSM Base Station: Product Description*.

3.2.2 Clearances around BTS

The required clearances around the Nokia MetroSite GSM BTS are shown in Figure 2.

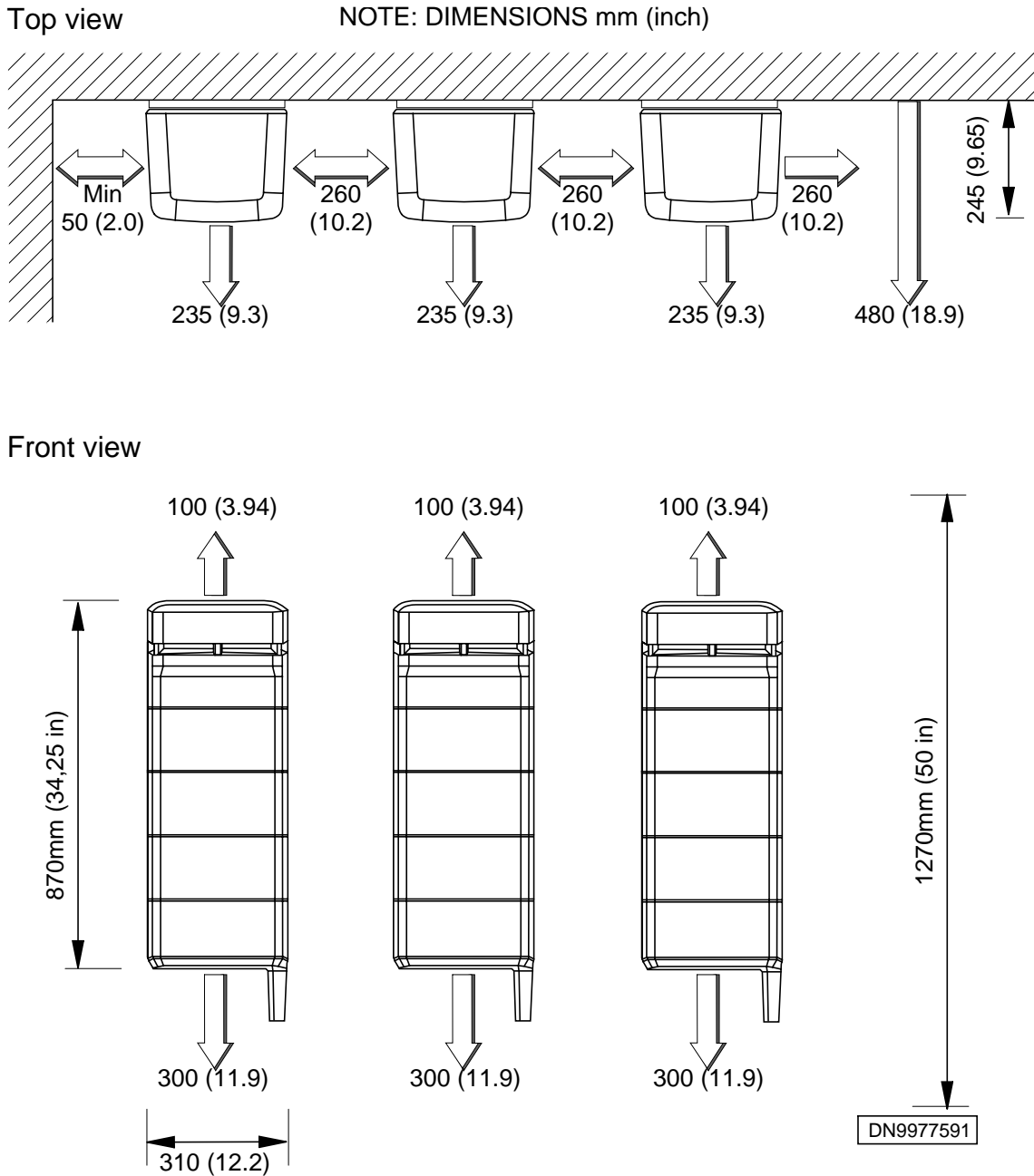


Figure 2. Clearances around Nokia MetroSite BTS

The packing cardboard provides a template for defining the clearances around the BTS and for marking the drilling holes needed for wall mounting. Use the template for defining how much space is required:

- For removing units on the right-hand side of the BTS
 - For removing the cover above the BTS
 - For hanging the cover on the left-hand side of the BTS
 - For cables and for cooling under the BTS
-

Note

In order to hang the cover on the side of the cabinet during installation and maintenance, a clearance of 250 mm (10 in) is required. This space can be dispensed with, if the cover can be placed safely elsewhere (for example, on the floor). In this case, only a clearance of 50 mm (2 in) is required.

Refer to wall mounting instructions in *Nokia MetroSite GSM Base Station: Installation* for more information on how to use the template.

3.3 Mounting locations and positions

The Nokia MetroSite GSM BTS can be mounted on a wall or on a pole. Both indoor and outdoor applications are possible. The Nokia MetroSite GSM BTS can also be mounted horizontally in the position shown in Figure 3. Other horizontal positions are not permitted.

The space in which the Nokia MetroSite GSM BTS is located must have proper ventilation.

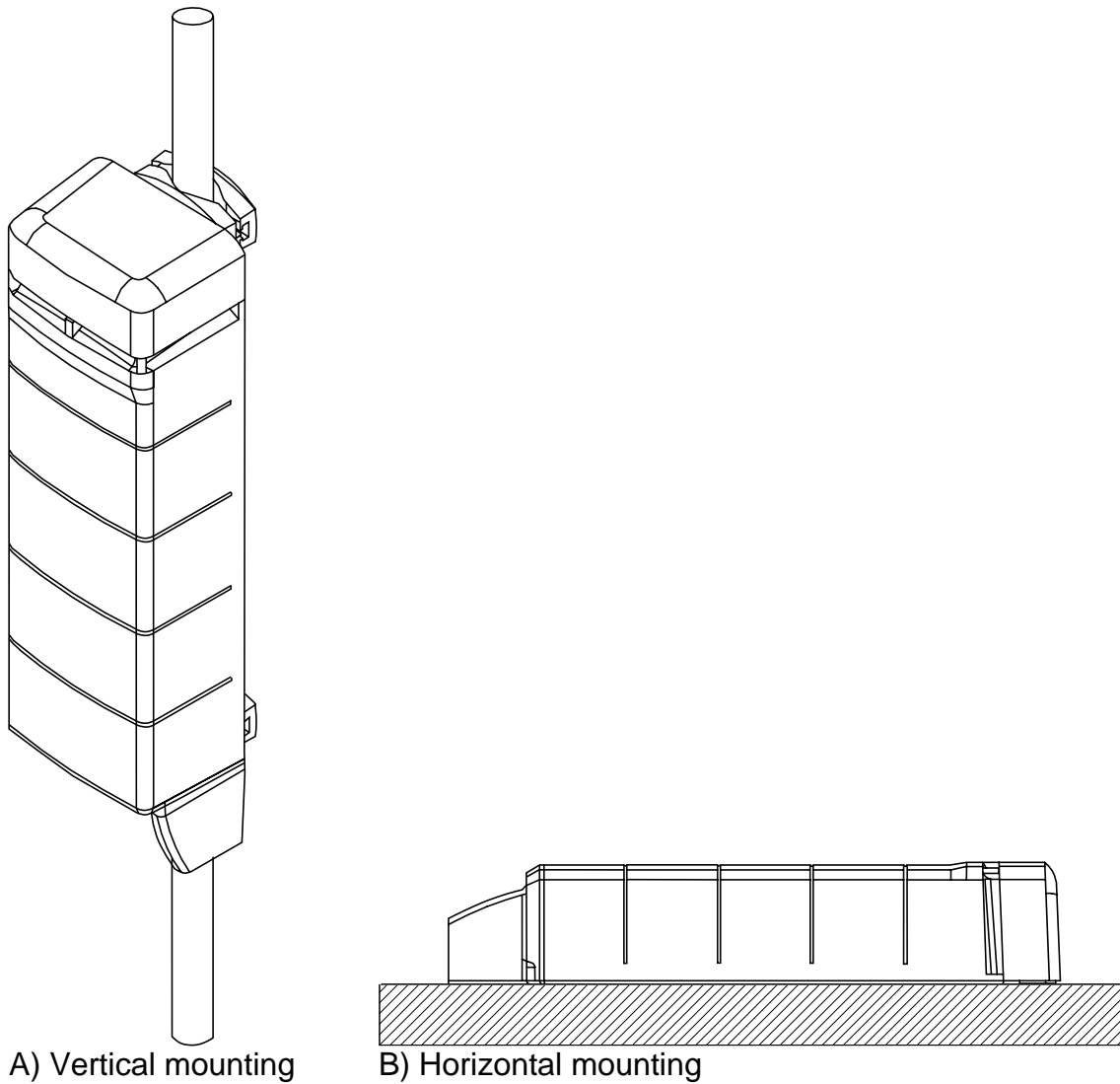


Figure 3. Mounting of Nokia MetroSite BTS

Note

If there is a risk that lumps of snow or pieces of ice can fall onto the BTS (from the antenna or microwave radio pole, for example), an effectual roof must be mounted to shield the BTS.

3.4 Requirements for wall and pole installation

Qualified personnel must inspect the installation wall and/or pole before mounting the BTS. Ensure that the installation wall or pole is strong enough to bear the weight of the BTS (max. 40 kg / 88.4 lb) in any condition.

The optional pole mounting kit can be used when the installation pole diameter is between 60 and 300 mm (2.36 and 11.81 in).

Anchor screws

The anchor screws are used for attaching the Nokia MetroSite GSM BTS to the wall. These screws are not included in the delivery.

The anchor screws must be M6 size, stainless steel with the minimum breaking strength (R_m) of 800 N/mm². An appropriate counterpart for the anchor screw (for example, an anchor plug) must be selected according to the screw and the mounting base material. If the anchor screws are of other standard than the metric standard, they must be selected so that they meet the requirement set to the metric standard screws mentioned above.

Wind load

For pole mounting a pole must be selected which does not break off even in stormy winds. Table 4 shows the load imposed on the pole (with a BTS attached to it) in two wind velocities.

Table 4. Wind load

Wind velocity	Load imposed on the pole
40 m/s 89 mph	410 N
50 m/s 112 mph	640 N

3.5 Grounding

To protect the Nokia MetroSite GSM 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 be designed case-specifically.

A power plug with protective ground connection is not sufficient for Nokia MetroSite BTS. Grounding must have a fixed, non-removable connection.

Note

Regulations issued by local authorities/legislation must be followed when planning the grounding of a BTS site!

In general, grounding is planned as presented in the following:

- The grounding cable is connected with screws or with a nut to the grounding point of the Nokia MetroSite GSM BTS, depending on which of the two grounding point alternatives is chosen. All Nokia MetroSite GSM BTSs are equipped with two grounding point alternatives: a cable clamp and a grounding stud. The selection between the two alternatives must be done according to local regulations. When grounding stud is used, the grounding cable must be fitted with an appropriate lug.
- The minimum cross-section of the copper (Cu) grounding conductor is 16 mm² (5 AWG) in outdoor installations. In indoor installations, the minimum cross-section of the copper grounding conductor is 2.5 mm² (12 AWG)
- The maximum cross-section of the copper grounding conductor is 35 mm² (2 AWG)
- The maximum value of ground resistance is 10 Ω
- The ground cable must be connected to a main grounding busbar
- The routing of the ground cable must be as direct as possible. Unnecessary loops should be avoided
- The external antenna feeders must also be grounded, if the antennas are exposed to lightning

Note

A grounding cable can be ordered from Nokia.

3.6 Mains power



WARNING

The power switch on the power supply unit of the Nokia MetroSite GSM BTS does not disconnect it from the power network (AC or DC), but leaves it in a stand-by mode. The switch has two positions: ON and stand-by. A separate main switch on the site is considered a disconnect device for safety and service purposes.

Follow the national legislation when working with the power supply. The Nokia MetroSite GSM BTS must be permanently wired to a disconnect device (e.g. circuit breaker) in accordance with current local and national wiring standards.

All ground connections must be secure and non-removable.

All power cabling must meet the requirements of the appropriate national standard.

The Nokia MetroSite GSM BTS has three power supply options: 230 VAC, 110 VAC and 36/48/60 VDC. The permitted voltage fluctuation for the different options is presented in Table 5.

Table 5. Permitted operating voltage fluctuation

Nominal operating voltage	Permitted operating voltage fluctuation
230 VAC	±20%
110 VAC	±20%
36/48/60 VDC	±20%

It is recommended that the AC mains be protected with a lightning and transient overvoltage protector (mains wire-in protector). This protection is not included in the Nokia MetroSite GSM BTS.

3.6.1 Power consumption

The power consumption of the Nokia MetroSite GSM BTS is dependent on the following factors:

- BTS configuration
- Ambient temperature
- Direction of the temperature change

The power consumption is higher when the ambient temperature is decreasing and the heating power of the BTS is increasing. When the ambient temperature is rising, the heating power is reducing. Consequently, the power consumption of the Nokia MetroSite GSM BTS in a given temperature varies according to the direction of temperature change. Figure 4 presents the power consumption values in different ambient temperature for three BTS configurations.

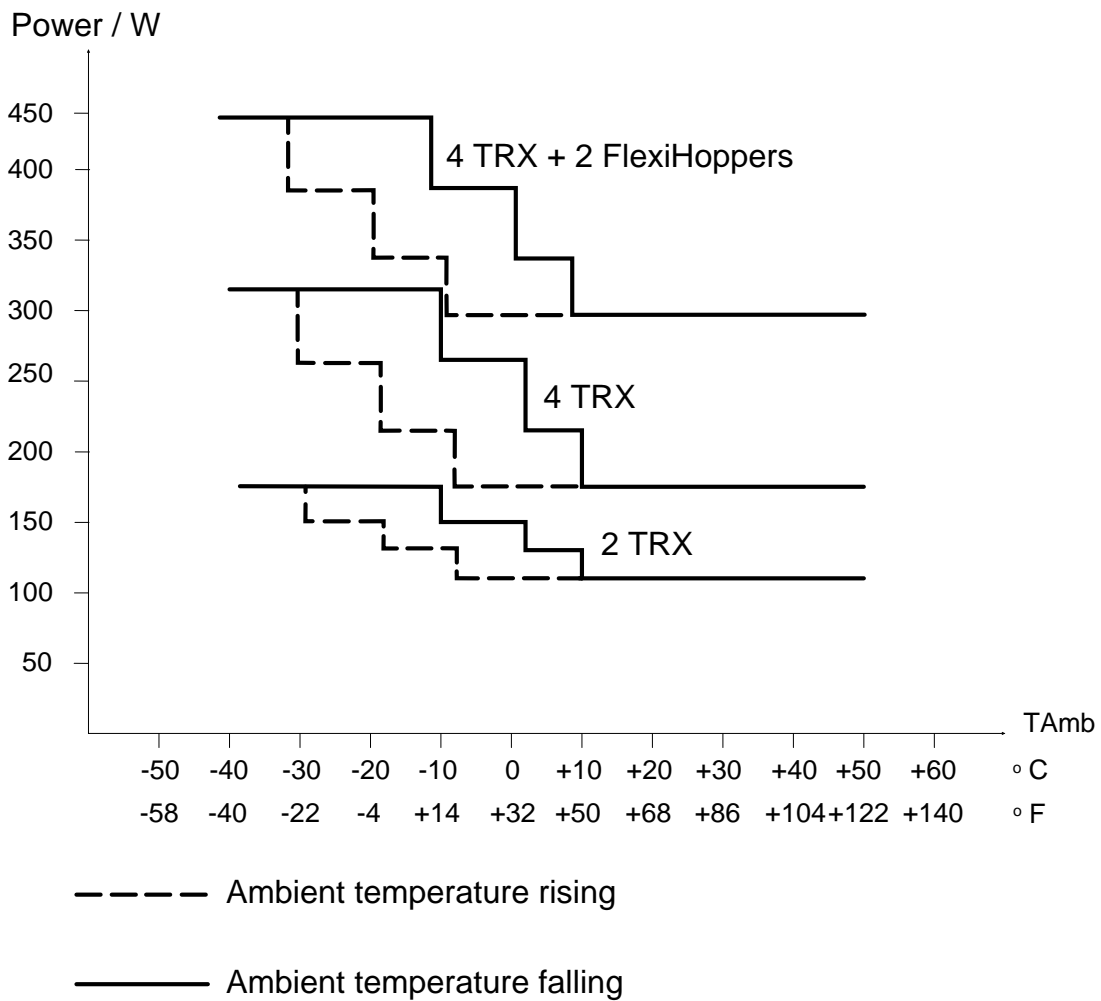


Figure 4. Power consumption of Nokia MetroSite BTS

3.6.2 Acoustic sound power

The fan unit of the Nokia MetroSite GSM BTS generates acoustic noise. The level of acoustic sound power is dependent on the following factors:

- Ambient temperature
- Rate of the temperature change
- Output power

The acoustic sound power level is higher when the ambient temperature is changing rapidly. Refer to Figure 5 for the range of acoustic sound power level in different ambient temperatures.

Acoustic sound power

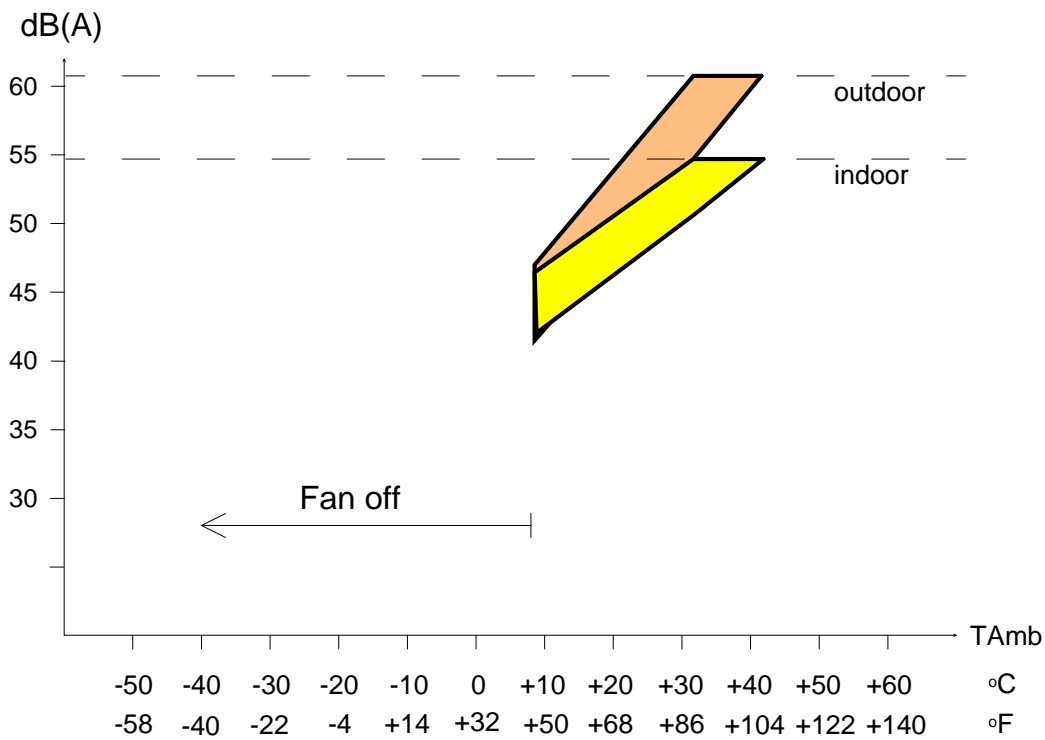


Figure 5. Range of acoustic sound power generated by Nokia MetroSite GSM BTS

3.6.3 Connectors, cables and fuses for cable protection

Note

Prefabricated mains power cables can be ordered from Nokia.

Note

If you use the prefabricated mains power cable supplied by Nokia, make sure that the power distribution box (mains power supply) is located no further than 10 metres from the BTS's power supply unit.

Table 6 presents the requirements for power supply cables and the recommended mains fuses.

Table 6. Connectors, cables and recommended fuses

Power supply type	Connector type at the end of cable	Cable	Recommended fuse for cable protection
AC supply 230 V	IEC 320 (female)	Multicore cable 3 x 0.75 to 1.5 mm ² (18 ¹ / ₂ to 15 ¹ / ₂ AWG)	10A for 1.5 mm ² (15 ¹ / ₂ AWG) 6A for 0.75 mm ² (18 ¹ / ₂ AWG)
AC supply 110 V	IEC 320 (female) with notch	Multicore cable 3 x 1.5 mm ² (15 ¹ / ₂ AWG)	10 A
DC supply 36/48/60 V	Anderson Power Pole	Multicore cable 3 x 2.5 mm ² or 3 single wires 2.5 to 4.0 mm ² (13 to 11 AWG)	No recommendation, refer to local regulations

Note

In general, the fuses for cable protection have to be rated according to the national electrical safety regulations.

The pin configurations for the different BTS power supply connector types can be found in *Nokia MetroSite GSM Base Station: Product Description*.

3.7 Painting the BTS cover

If desired, the BTS cover can be painted to make it better blend into the surrounding environment.

Nokia recommends that for painting the cover a primer-topcoat combination of Beckers TD 130 primer (for priming) and Beckers TH 141 paint (for surface painting) be used. Other paints suitable for polycarbonate surfaces may also be used.



Caution

Do not use any paint that contains alkalis, esters, ketones, aromatic, chlorinated, or fluorinated hydrocarbons, since these may damage the cover. Paint containing these chemicals can only be used if approved by the manufacturer for painting polycarbonate objects.

The selected paint must be UV and weather-resistant and suitable for temperatures ranging from -40 °C to +50 °C (-40 °F to 122 °F). For environmental conditions, refer to ETS 300 019-1-4:1992 class 4.1.



To paint the BTS cover:

1. Remove the BTS cover as instructed in *Nokia MetroSite GSM BTS: Maintenance*.
2. Before painting, detach the cable cover and the cable cover support from each other to prevent them from sticking to each other by paint and to ensure that paint is applied evenly. The cover top can also be detached from the cover by unscrewing the Torx T20 screws (see Figure 6).

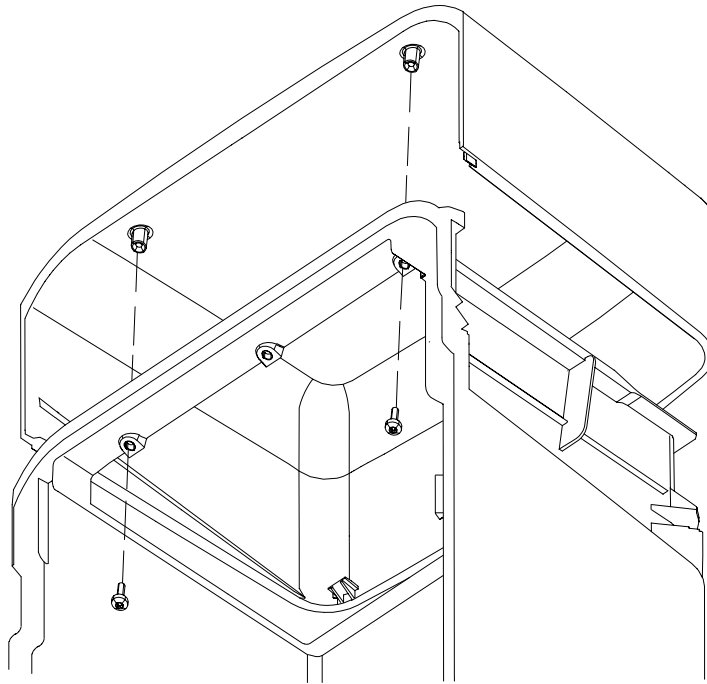


Figure 6. Removing the cover top

3. Remove stains and dust from the surface of the cover with an alcoholic or acidic wash, or wipe it clean with a piece of cloth moistened with water and mild washing agent. Do not use washing agents that contain alkalis, aromatic, chlorinated, or fluorinated hydrocarbons, esters or ketones.
4. Rinse with water to remove residuals of cleaning chemicals.
5. Dry the cover parts by blowing ionized air on them to remove electrostatic charges and dust particles.
6. Place a support under the cover and the cover top so that you do not have to touch the parts during painting.
7. Use a clamp or hook for holding the cable cover and the cable cover support during painting. See Figure 7 for areas on which to place the clamp.

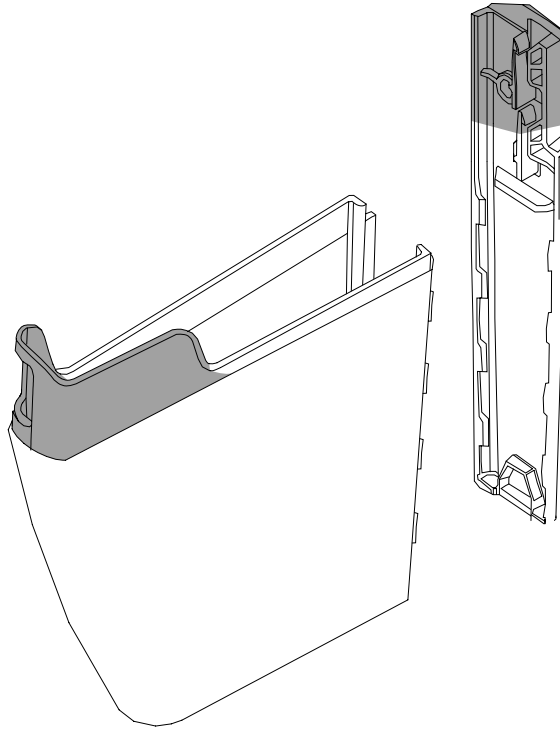


Figure 7. Areas used for holding the cable cover parts during painting

8. Spray paint over the outside surface of the cover. Spraying should be done at room temperature with relative air humidity of 50-65%.

Note

The maximum thickness of the paint should not exceed 100 μm .

9. Dry the parts either in an oven or let the paint dry at room temperature according to the paint manufacturer's drying instructions.

Note

The temperature of the drying oven must not exceed 90 °C (194 °F).

10. After the paint is dry, attach the cover top to the cover. Tighten the screws to 1.6 Nm (1.18 ft-lb).

4 Cabinet interfaces and cables

This chapter describes the external interfaces and interconnecting cables (excluding the grounding and power supply cables) for the Nokia MetroSite GSM BTS. Pin configurations for the relevant connectors can be found in *Nokia MetroSite GSM Base Station: Product Description*.

Note

Antenna line cables, LMP cable, Abis cables and Flexbus cables can be ordered from Nokia.

The MetroSite BTS interface connectors and cables are described in Tables 7 and 8.

Table 7. MetroSite BTS connectors

Interface connector	Number of connectors	Connector type	Cable type/diameter
Antenna connector	1 for each TRX	N-type	1/4" or 3/8" RF cable
External Alarms and Controls	1 (10 alarm inputs, 4 control outputs)	26-pin mini D (female)	13-pair 28 AWG, 106 Ω Flexible SCSI-2 Cable type CL2/FT1
Extension connectors (not used)	2	50-pin mini D (female)	N/A
Q1 interface	1	TQ	2-pair telecom cable, max. 6 mm
Local Management Port	1	BQ, RS-232 (at the BTS end) D9 female (at the PC end)	2-pair telecom cable. For more information, refer to <i>Nokia MetroSite GSM Base Station: Commissioning</i> .

Table 8. Transmission connectors of Nokia MetroSite BTS

Transmission unit type	Number of connectors	Connector type	Cable
FC RRI	1	TNC 50 Ω	Flexbus RG-223 (max length 140 m), Flexbus RG- 214 (max. length 300 m) For more information, refer to <i>Nokia MetroSite GSM Base Station: Product Description</i> .
FC E1/T1	3	Two coaxial BT43 connectors (75 Ω) one balanced TQ connector (100/120 Ω)	Coaxial for 75 Ω connector twisted pair for 100/120 Ω connector. Max. allowed attenuation for E1 20 dB; for T1 26 dB
FXC RRI	2	TNC 50 Ω	Coaxial Flexbus RG-223 (max. length 140 m), coaxial Flexbus RG-214 (max. length 300 m). For more information, refer to <i>Nokia MetroSite GSM Base Station: Product Description</i> .
FXC E1 75 Ω	8	Coaxial BT43 connectors	Coaxial Max. allowed attenuation 20 dB
FXC E1/T1 120/100 Ω version	4	Balanced TQ connectors	Twisted pair Max. allowed attenuation for E1 20 dB, for T1 26 dB

4.1 Cable entry block

The size of the cable entry holes must be considered when planning the cabling of the Nokia MetroSite GSM BTS. The cable entry block is made of elastic material. The holes can accommodate varying cable diameters as shown in Figure 8.

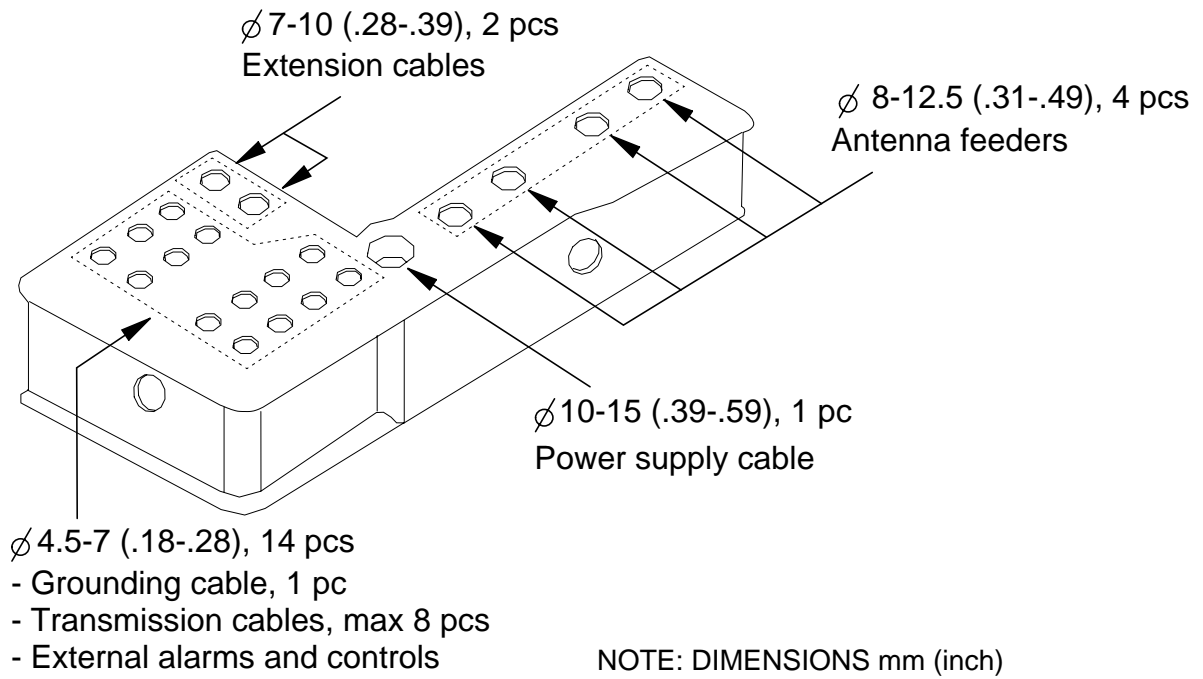
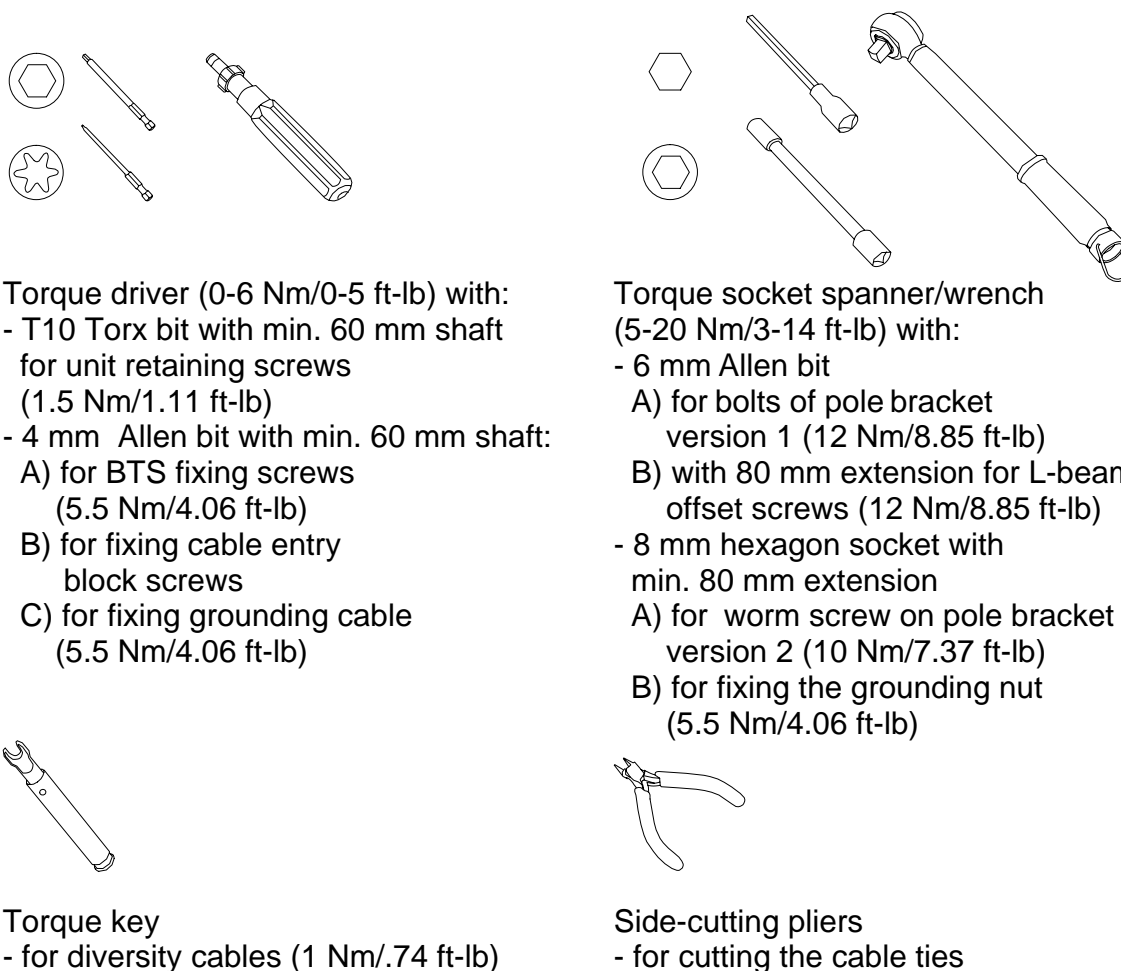


Figure 8. Cable entry block: cable diameters

5 Installation equipment

This section specifies the equipment that is recommended for the installation of the Nokia MetroSite GSM BTS, but not included in the BTS delivery.



- Torque driver (0-6 Nm/0-5 ft-lb) with:
- T10 Torx bit with min. 60 mm shaft for unit retaining screws (1.5 Nm/1.11 ft-lb)
 - 4 mm Allen bit with min. 60 mm shaft:
 - A) for BTS fixing screws (5.5 Nm/4.06 ft-lb)
 - B) for fixing cable entry block screws
 - C) for fixing grounding cable (5.5 Nm/4.06 ft-lb)

- Torque socket spanner/wrench (5-20 Nm/3-14 ft-lb) with:
- 6 mm Allen bit
 - A) for bolts of pole bracket version 1 (12 Nm/8.85 ft-lb)
 - B) with 80 mm extension for L-beam offset screws (12 Nm/8.85 ft-lb)
 - 8 mm hexagon socket with min. 80 mm extension
 - A) for worm screw on pole bracket version 2 (10 Nm/7.37 ft-lb)
 - B) for fixing the grounding nut (5.5 Nm/4.06 ft-lb)

- Torque key
- for diversity cables (1 Nm/.74 ft-lb)

- Side-cutting pliers
- for cutting the cable ties

Figure 9. Recommended tools for installing the BTS

Additional equipment includes:

- LMP cable for connecting the manager PC to the BTS
- Antistatic wrist strap
- Spirit level for checking the horizontal level of the BTS
- Tape measure
- Cable ties for routing the cables
- Crimping tool for assembling the power supply cable connector (AC and DC)

Note

A set of tools needed for assembling the cable connectors is available at Nokia.

- Cable stripper for assembling the power supply cable (AC and DC) connector
- Screwdriver for assembling the AC cable connector
- Ladder (depending on circumstances on site)
- 10 mm spanner for removing the grounding bridge on the transmission unit (optional)
- T20 Torx torque driver for removing and tightening the BTS cover top retaining screws (optional)
- Centre punch for marking drilling hole locations in wall mounting (optional)

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