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Nokia UltraSite EDGE BTS, Rel. CX5, Product Documentation, v.1

UltraSite EDGE BTS Site Requirements

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Contents

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1 Summary of changes in UltraSite EDGE BTS Site Requirements

The following changes have taken place in the *UltraSite EDGE BTS Site Requirements* document:

- Section *Installation conditions* added
- Sections *Storage conditions* and *Transportation conditions* updated
- The following sections concerning UltraSite EDGE BTS Mini Outdoor added or updated:
  - Operating conditions
  - Acoustic sound parameters
  - Safety distance requirements
  - Cabinet clearances for Mini Outdoor BTS
  - Site requirements for Mini Outdoor BTS
  - Grounding (earthing) requirements for Mini Oudoor BTS
  - Power requirements for Mini Outdoor BTS
  - Torque settings

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2 BTS requirements

2.1 Storage conditions

Before you accept the delivery of the BTS, you must ensure acceptable climatic and mechanical conditions for its storage until installation. The BTS is not operational if these conditions do not apply. This specification applies when the product is packed as delivered from Nokia.

Table 1. Climatic conditions

Condition	Parameter
Temperature range	-25° C to +55° C (-13° F to +131° F)
Relative humidity	10% to 100%
Absolute humidity	0.5 to 29 g/m^3
Rain intensity	No rain
Change rate of temperature	0.5° C/min. maximum (0.9° F/min. maximum)
Air pressure	70 to 106 kPa
Solar radiation	1120 W/m^2 maximum
Movement of surrounding air	30 m/s (67.1 miles/hour)
Low rain temperature	N/A
Water from sources other than rain	Dripping water
Icing and frosting	Yes

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Table 2. Mechanical conditions

Condition	Parameter
Stationary vibration, sinusoidal (peak value of displacement amplitude) at frequency range 9 to 200 Hz	1.5 mm (0.059 in.)
Non-stationary vibration, including shock: peak value of acceleration	40 m/s^2
Static load	5 kPa

2.2 Transportation conditions

Caution

Unprotected equipment may be damaged during transportation. Transport the equipment to the installation site in its original transportation package.

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.

Before transporting the BTS, you must ensure acceptable climatic and mechanical conditions while loading and unloading. The BTS is not operational if these conditions do not apply. This specification applies when the product is packed as delivered from Nokia.

Table 3. Climatic conditions for transportation

Condition	Parameter
Temperature range	-40° C to +70° C (-40° F to +158° F)
Change of temperature:	

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Table 3. Climatic conditions for transportation (cont.)

Condition	Parameter
• air/air	-40° C to +30° C (-40° F to +86° F)
• air/water	+40° C to +5° C (+104° F to +41° F)
Relative humidity, not combined with rapid temperature changes	95% at: +45° C (+113° F)
Relative humidity, combined with rapid temperature changes; air/air at high relative humidity	95% at: -40° C to +30° C (-40° F to +86° F)
Absolute humidity, combined with rapid temperature changes: air/air at high water content	60 g/m^3 at: +70° C to +15° C (+158° F to +59° F)
Low air pressure	70 kPa minimum
Change in air pressure	N/A
Movement of surrounding air	20 m/s maximum
Rain intensity (for short duration only)	6 mm/min. maximum
Solar radiation	1120 W/m^2 maximum
Heat radiation	600 W/m^2 maximum
Conditions of water from sources other than rain	1 m/s maximum
Conditions of wetness	Wet surfaces

Table 4. Mechanical conditions for transportation

Conditions	Parameter
Stationary vibration, sinusoidal (peak value of displacement amplitude) at the following frequency range:	
• 2 to 9 Hz	3.5 mm
• 9 to 200 Hz	10 m/s^2
• 200 to 500 Hz	15 m/s^2

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Table 4. Mechanical conditions for transportation (cont.)

Conditions	Parameter
Stationary vibration, random: acceleration spectral density at the following frequency range:	
• 10 to 200 Hz	1 m^2/s^3
• 200 to 2000 Hz	0.3 m^2/s^3
Peak acceleration for non-stationary vibration, including shock:	
• Duration 11 ms	100 m/s^2
• Duration 6 ms	300 m/s^2
Free fall:	
• Mass < 10 kg	0.75 m
• Mass from 10 to 25 kg	0.6 m
• Mass from 25 to 50 kg	0.525 m
• Mass from 50 to 100 kg	0.45 m
• Mass over 100 kg	0.3 m
Steady state acceleration	20 m/s^2
Toppling:	
• Mass < 20 kg	Around any edges
• Mass from 20 to 100 kg	Around any edges
• • Mass > 100 kg	Not allowed
Rolling, Pitching:	
• Angle	35°
• Period	8 s
Steady state acceleration	20 m/s^2
Static load	10 kPa

2.3 Installation conditions

The conditions for installation are described in this section.

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Caution

Moisture may damage the equipment. Do not expose the cabinet top or interior to rain or snow.

Caution

Risk of damage to the cabinet and the units. Keep the cabinet and units protected until all site work, such as drilling, is completed.

The cabinet interior and the plug-in units are protected against the environment only when installed with the cabinet door shut or in the packaging. Once the units are removed from the packaging, they must remain dry and free from dust. Moisture and dust may damage unprotected areas (for instance, connectors).

When installing an outdoor cabinet in poor weather conditions, the cabinet and the units must be protected with a tent or other temporary covering structure until it is possible to shut the cabinet door.

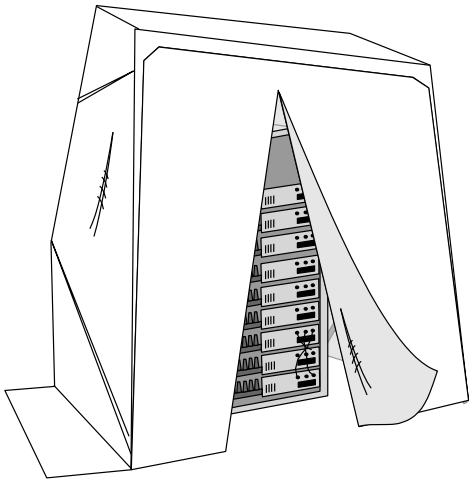

Figure 1. Installation tent

Once the units have been removed from the packaging and installed inside the cabinet, the cabinet should be powered to allow the environmental protection to operate.

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2.4 Operating conditions

This section describes the climatic and mechanical conditions applicable for operation of the indoor and outdoor BTS. The BTS is not for portable use. However, short periods of handling during installation, down time, and maintenance are acceptable. When surveying prospective sites, consider the values presented in this section. Operating conditions are defined as stationary: the equipment is mounted on a structure, on a mounting device, or it is permanently placed at a certain site.

Table 5. Climatic conditions for operation

Condition	Indoor	Outdoor	Mini Outdoor
Temperature range without heater	-5° C to +50° C (+23° F to +122° F)	-10° C to +50° C with ODFA or OEFA installed (14° F to +122° F)	-10° C to +55° C (14° F to +131° F)
Temperature range with heater	Not applicable	-33° C to +50° C (-27.4° F to +122° F)	-33° C to +55° C (-27.4° F to +131° F)
Change rate of temperature	0.5° C/min. (32.9° F) maximum	0.5° C/min. (32.9° F) maximum	0.5° C/min. (32.9° F) maximum
Relative humidity	5% to 95%	15% to 100%	15% to 100%
Absolute humidity	1 g/m^3 to 29 g/m^3	0.26 g/m^3 to 36 g/m^3	0.26 g/m^3 to 36 g/m^3
Air pressure	70 kPa to 106 kPa	70 kPa to 106 kPa	70 kPa to 106 kPa
Movement of surrounding air	5 m/s (9.72 miles/hour) maximum	50 m/s (97.2 miles/hour) maximum	50 m/s (97.2 miles/hour) maximum
Solar radiation	700 W/m^2 maximum	1120 W/m^2 maximum	1120 W/m^2 maximum
Rain intensity	Not applicable	6 mm/min. (0.24 in./min.) maximum	6 mm/min. (0.24 in./min.) maximum
Low rain temperature	Not applicable	5°C minimum (41° F minimum)	5°C minimum (41° F minimum)
Water from sources other than rain	Not applicable	Splashing water	Splashing water
Wind driven rain, snow, or hail	Not applicable	Yes	Yes

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Table 5. Climatic conditions for operation (cont.)

Condition	Indoor	Outdoor	Mini Outdoor
Icing and frosting	Not applicable	Yes	Yes
Condensation	Yes	Yes	Yes
*When started at -33°C, it takes up to 3 hours for the BTS to warm up at heater's nominal voltage of 230 V.			

Table 6. Maximum mechanical conditions for operation

Condition	Indoor	Outdoor
Stationary vibration, sinusoidal (peak value of displacement amplitude) at frequency range:		
• 2 to 9 Hz	3.5 m/s^2	Not Applicable
• 9 to 200 Hz	10 m/s^2	Not Applicable
• 200 to 500 Hz	15 m/s^2	Not Applicable
Peak acceleration for non-stationary vibration, including shock:		
• Duration 22 ms	40 m/s^2	Not Applicable
• Duration 6 ms	Not Applicable	250 m/s^2
Peak values of base acceleration in earthquake conditions at the following frequencies:		
• 0.3 Hz	2 m/s^2	2 m/s^2
• 0.6 Hz	20 m/s^2	20 m/s^2
• 5.0 Hz	20 m/s^2	20 m/s^2
• 15.0 Hz	6 m/s^2	6 m/s^2
• 50.0 Hz	6 m/s^2	6 m/s^2

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Table 7. Mechanical conditions for Mini Outdoor operation

Mechanical condition	Class 4.1E value
Stationary vibration, sinusoidal:	
Peak value of displacement amplitude at frequency range 5 to 9 Hz	1.2 mm
Peak value of displacement amplitude at frequency range 9 to 200 Hz	4 m/s^2
Peak acceleration for non-stationary vibration, including shock	50 m/s^2

2.5 Acoustic sound parameters

The following table provides the maximum acoustic noise emissions for Indoor and Outdoor cabinets:

Acoustic noise	Indoor Cabinet	Outdoor Cabinet	Mini Outdoor Cabinet
+55° C (131° F)	N/A	N/A	67 dB (A)
+50° C (122° F)	69 dB (A)	67 dB (A)	66 dB (A)
+40° C (104° F)	65 dB (A)	64 dB (A)	63 dB (A)
+30° C (86° F)	62 dB (A)	61 dB (A)	60 dB (A)
+20° C (68° F)	59 dB (A)	58 dB (A)	57 dB (A)
0° C (32° F)	59 dB (A)	55 dB (A)	55 dB (A)
-5° C (23° F)	58 dB (A)	55 dB (A)	55 dB (A)
-10° C (14° F)	N/A	55 dB (A)	55 dB (A)

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2.6 Safety distance requirements

Base Station equipment generates Radio Frequency (RF) energy, which has a thermal effect when absorbed by the human body. For this reason, compliance boundaries specific to this equipment have been established. The thermal effects of radio frequency energy can exceed safety levels, when a person is inside the established compliance boundaries. Observing the compliance boundary and eliminating access to areas inside the established boundaries ensures that the general public has no exposure to levels in excess of the safety limits.

Installation engineers must be aware of the potential risk of the thermal effects of radio frequency energy and how to protect themselves against undue risk.

When assessing the applicable compliance boundaries, European standards EN 50383, EN 50384, EN 50385 and Council Recommendation 1999/519/EC for occupational and general public electromagnetic exposure limits, apply the ANNEX A: Council recommendation 1999/519/EC for occupational and general public electromagnetic exposure limits.

2.6.1 Assessment applying SAR measurements

European standards EN 50383, EN 50384, and EN 50385 do not include specifications for whole body SAR measurements. Whole body SAR measurements are not required for transmitters that have maximum output power levels too low to result in exposure levels that can reach the whole body SAR compliance limits under any conditions. Whole body SAR exclusion power levels have been based on worst-case assumptions.

Table 8. Whole body SAR exclusion power levels

Exposure category	Maximum output power (rms)
General public	Max power [W] = general public whole body SAR limit 0.08 [W/kg] * 4-year old child mass 12.5 [kg] (27.56 lb) = 1 W
Occupational	Max power [W] = occupational whole body SAR limit 0.4 [W/kg] * 16-year old worker 42 [kg] (92.59 lb) = 16.8 W

Localised SAR measurement can be used only when:

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1. The separation between the phantom and the outer surface of the energy generating element is 40 cm (15.7 in.) or less.
2. The surface area of the energy-generating element is less than 60 cm (23.6 in.) by 30 cm (11.8 in.).
3. The frequency is in the range of 800 to 3000 MHz.

For the reasons above, SAR measurements are not applicable to the UltraSite EDGE Base Station.

2.6.2 Assessment of compliance boundary

The compliance boundary is defined as the area around the antenna. The centre of the antenna is located at the origo. Distances from the antenna are shown in the *Area around the antenna* figure. The top and side views are shown in the *Antenna side and top view* figure.

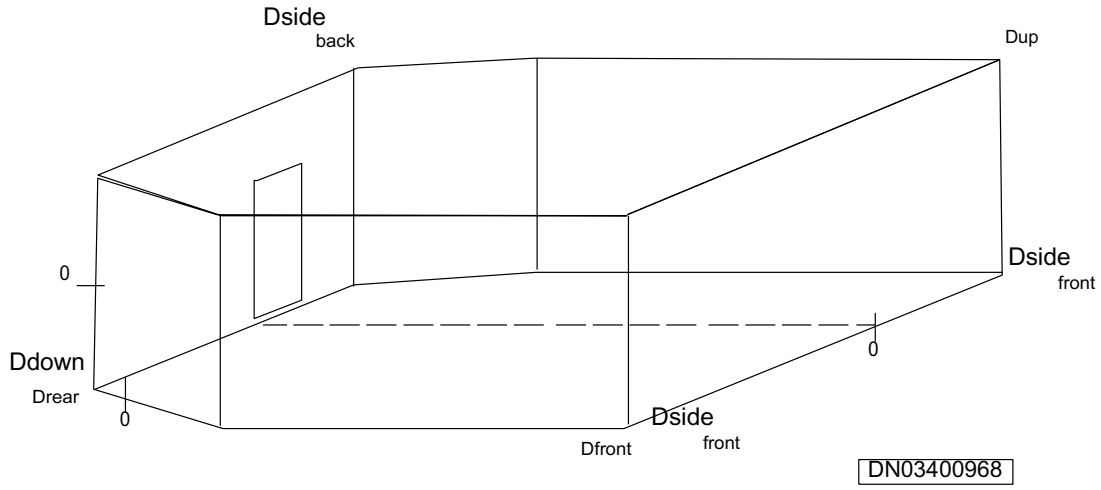

Figure 2. Area around the antenna

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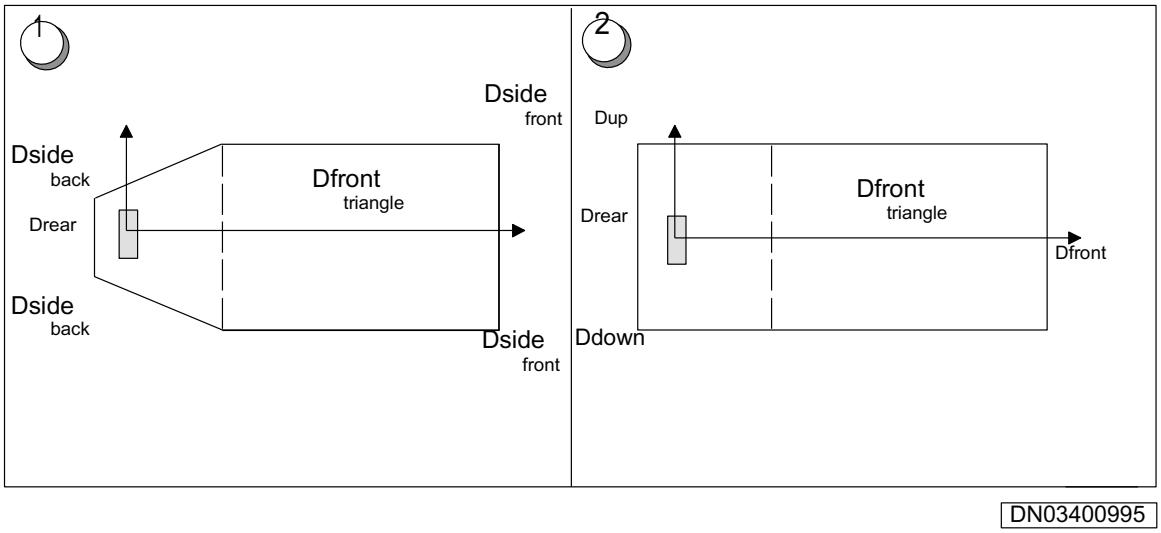

Figure 3. Antenna side and top view

The compliance boundaries for the UltraSite EDGE Base Station are given in the *Dimensions of compliance boundary in metres for UltraSite EDGE BTS* table, for different power levels at the antenna input. Typical and worst-case power level configurations for **general public (GP)** and **occupational (O)** exposure limits are included.

Table 9. Dimensions of compliance boundary in metres for UltraSite EDGE BTS

		Dfront		**Dfront triangle**		**Drear**		**$Dside_{back}$**		**$Dside_{front}$**		**Dup**		**Ddown**	
Freq. (MHz)	Power at antenna input (W)	GP	O	GP	O	GP	O	GP	O	GP	O	GP	O	GP	O
900	16	4.5	0.4	2.4	0	0.2	0.05	0.4	0.2	1.15	0.2	0.9	0.65	0.9	0.65
900	95	10.7	4.9	3.5	2.2	0.4	0.25	0.7	0.3	3.1	1.3	1.3	0.9	1.3	0.9
1800	16	2.95	1.15	1	0	0.14	0	0.2	0.1	0.95	0.15	0.5	0.5	0.5	0.5
1800	95	7.05	3.3	2	1	0.45	0.35	0.7	0.3	2.25	1.05	0.65	0.5	0.65	0.5

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Table 9. Dimensions of compliance boundary in metres for UltraSite EDGE BTS (cont.)

		Dfront		Dfront triangle		Drear		$Dside_{back}$		$Dside_{front}$		Dup		Ddown	
900-1800[1]	32	6.25	2.25	2.4	0	0.3	0.05	0.5	0.35	1.75	0.35	0.95	0.8	0.95	0.8
900-1800[1]	190	14.9	6.95	3.5	1.9	0.45	0.35	0.7	0.3	4.4	1.95	1.55	0.95	1.55	0.95
900-1800-2100[1]	20	4.95	0.55	2.4	0	0.3	0.05	0.5	0.25	1.3	0.25	0.9	0.65	0.9	0.65
900-1800-2100[1]	100	10.9	5.05	3.5	2.2	0.4	0.25	0.7	0.3	3.15	1.35	1.3	0.9	1.3	0.9

[1]For dual and triple mode operation, a conservative approach has been chosen and lower frequency limit-lower limit has been used.

Note

The component specifications for 900 MHz and 1800 MHz also apply to 800 MHz and 1900 MHz products and can be used to demonstrate compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields contained in FCC document *OET Bulletin 65 (August 1997)*.

The compliance boundaries for the UltraSite EDGE Base Station Mini Outdoor are given in the *Dimensions of compliance boundary in metres for UltraSite EDGE Base Station Mini Outdoor* table, for different power levels at the antenna input. Typical and worst-case power level configurations for **general public (GP)** and **occupational (O)** exposure limits are included.

Table 10. Dimensions of compliance boundary in metres for UltraSite EDGE Base Station Mini Outdoor (2000 MHz)

Power at antenna input	Dfront	Dfront triangle	Drear	Dside back	Dside front	Dup	Down
40 W	GB:4.4 O:1.1	GB:1.2 O:1.1	GB:0.1 O:0	GB:0.4 O:0.3	GB:1.5 O:0.3	GB:0.7 O:0.5	GB:0.7 O:0.5
35 W	GB:4.1 O:1	GB:1.5 O:1	GB:0 O:0	GB:0.4 O:0.3	GB:1.3 O:0.3	GB:0.7 O:0.5	GB:0.7 O:0.5

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Table 10. Dimensions of compliance boundary in metres for UltraSite EDGE Base Station Mini Outdoor (2000 MHz) (cont.)

Power at antenna input	Dfront	Dfront triangle	Drear	Dside back	Dside front	Dup	Down
30 W	GB:3.7 O:0.9	GB:1 O:0.9	GB:0 O:0	GB:0.2 O:0.3	GB:1.1 O:0.3	GB:0.7 O:0.5	GB:0.7 O:0.5
25 W	GB:3.4 O:0.7	GB:1 O:0.7	GB:0 O:0	GB:0.2 O:0.2	GB:1.1 O:0.2	GB:0.5 O:0.5	GB:0.5 O:0.5
20 W	GB:2.9 O:0.6	GB:1.2 O:0.6	GB:0 O:0	GB:0.2 O:0.2	GB:0.9 O:0.2	GB:0.5 O:0.5	GB:0.5 O:0.5
15 W	GB:2.3 O:0.5	GB:0.9 O:0.5	GB:0 O:0	GB:0.2 O:0.2	GB:0.7 O:0.2	GB:0.5 O:0.5	GB:0.5 O:0.5
10 W	GB:4.4 O:1.1	GB:4.4 O:1.1	GB:0 O:0	GB:0.2 O:0.2	GB:0.3 O:0.2	GB:0.5 O:0.5	GB:0.5 O:0.5

2.6.3 Typical configuration

The antenna is connected through a connector and cable(s) to the BTS as shown in the *Antenna connection to the BTS* figure.

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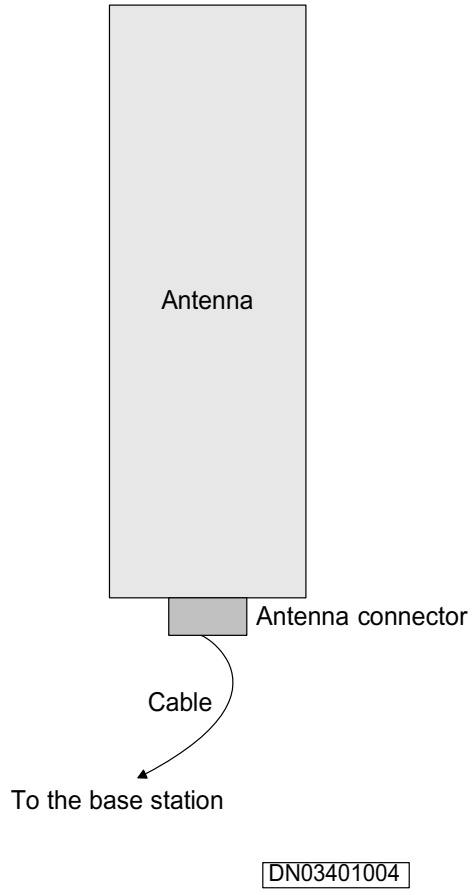

Figure 4. Antenna connection to the BTS

Table 11. Detailed description of components - GSM/EDGE 900

GSM/EDGE 900	**Typical Case** **Full band, 2 way Wideband combining**	**Worst Case** **Full band, 6 carriers**
Power (P_{out})	16.6 W (42.2 dBm)	34.5 W (45.4 dBm)
Total connector loss	0.0 dB	0.0 dB
Total cable loss	2.0 dB	0.0 dB
Total Loss (L) = Total connector loss + Total cable loss	2.0 dB	0.0 dB

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Table 11. Detailed description of components - GSM/EDGE 900 (cont.)

GSM/EDGE 900	**Typical Case** **Full band, 2 way Wideband combining**	**Worst Case** **Full band, 6 carriers**
Number of transmitter units (*N*)	2	6
Power at antenna input = $P_{out}N10^{-L/10}$	20.1 W (43.2 dBm)	207 W (53.1 dBm)

Table 12. Detailed description of components - GSM/EDGE 1800

GSM/EDGE 1800	**Typical Case** **Full band, 2 way Wideband combining**	**Worst Case** **Full band, 6 carriers**
Power (P_{out})	15.8 W (42.0 dBm)	30.9 W (44.9 dBm)
Total connector loss	0.0 dB	0.0 dB
Total cable loss	2.0 dB	0.0 dB
Total Loss (*L*) = Total connector loss + Total cable loss	2.0 dB	0.0 dB
Number of transmitter units (*N*)	2	6
Power at antenna input = $P_{out}N10^{-L/10}$	20 W (43.0 dBm)	185.4 W (52.7 dBm)

Table 13. Detailed description of components - GSM/EDGE Dual Band 900/1800

GSM/EDGE Dual Band 900/1800	**Typical Case** **Full band, 2 way Wideband combining**	**Worst Case** **Full band, 6 carriers**
Power 900/1800 (P_{out})	15.7 W / 15.0 W (41.95 dBm / 41.75 dBm)	33.7 W / 30.2 W (45.3 dBm / 44.8 dBm)
Total connector loss	0.0 dB	0.0 dB
Total cable loss	2.0 dB/band	0.0 dB
Total Loss (*L*) = Total connector loss + Total cable loss	2.0 dB/band	0.0 dB

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Table 13. Detailed description of components - GSM/EDGE Dual Band 900/ 1800 (cont.)

GSM/EDGE Dual Band 900/1800	**Typical Case** **Full band, 2 way Wideband combining**	**Worst Case** **Full band, 6 carriers**
Number of transmitter units (*N*)	2/band (4 total)	6/band (12 total)
Power at antenna input = $P_{out}N10^{-L/10}$	38.7 W (45.9 dBm)	383 W (55.8 dBm)

Note

The component specifications for 900 MHz and 1800 MHz also apply to 800 MHz and 1900 MHz products and can be used to demonstrate compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields contained in FCC document *OET Bulletin 65 (August 1997)*.

Table 14. Detailed description of components - GSM/EDGE WCDMA

GSM/EDGE WCDMA	**Typical Case** **Full band, 2 way Wideband combining**	**Worst Case** **Full band, 6 carriers**
Power 1800/WCDMA [1] (P_{out})	15 W / 5 W (41.75 dBm / 37.0 dBm)	30.2 W / 4.9 W (44.8 dBm / 36.9 dBm)
Total connector loss	0.0 dB	0.0 dB
Total cable loss	2.0 dB/band	0.0 dB
Total Loss (*L*) = Total connector loss + Total cable loss	2.0 dB	0.0 dB
Number of transmitter units (*N*)	2 (GSM/EDGE), 1 (WCDMA)	6 (GSM/EDGE), 1 (WCDMA)
Power at antenna input = $P_{out}N10^{-L/10}$	219.0 W (43.4 dBm)	186.1 W (52.7 dBm)

1 WCDMA power equals 5 W minus Duplexer loss.

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Table 15. Detailed description of components (2000 MHz)

Power (Pout)	**40 W**
Total connector loss	0.0 dB
Total cable loss	0.0 dB
Total Loss (*L*) = Total connector loss + Total cable loss	0.0 dB
Number of transmitter units (*N*)	1
Power at antenna input = $P_{out}N10^{-L/10}$	40 W

Table 16. Typical antenna configuration

	900 MHz	**1800-2100 MHz**	**900-1800-2100 MHz**
Gain	18 dBi	17.2 dBi	18 dBi
Half-power beam width	H-plane: 60 deg.	H-plane: 68 deg.	H-plane: 60 deg.
	E-plane: 8 deg.	E-plane: 10 deg.	E-plane: 8 deg.
Electrical downtilt	0 deg	0 deg	0 deg
Height/width/depth	2300 / 500 / 200 mm 102 / 10.2 / 4.7in.	1000 / 200 / 100 mm 51 / 6.3 / 2.8 in.	2300 / 400 / 200 mm 98.4 / 10.6 / 5.5 in.

Table 17. Typical antenna configuration for 2000 MHz

	External antenna
Gain	18 dB
Half-power beam width	H-plane: 60 deg.
	H-plane: 8 deg.
Electrical downtilt	0 deg.
Height/width/depth	1100/200/100 mm

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When using different configurations

In the *Dimensions of compliance boundary in metres* table, the compliance boundaries are given for different power levels, including the typical and worst-case levels. If an exposure limit, antenna and/or configuration is used that does not correspond to the levels or frequencies given in the *Dimensions of compliance boundary in metres table*, the compliance boundary must be recalculated according to EN 50383.

The formula for calculating the compliance boundary using the far-field model, which is referenced in EN 50383, is given in the ANNEX B: Far-field calculation method.

2.6.4 ANNEX A: Council recommendation 1999/519/EC for occupational and general public electromagnetic exposure limits

Table 18. Basic restrictions

Exposure characteristics	Frequency range	Whole body average SAR (W kg^{-1}	Localised SAR (head and trunk) W kg^{-1}	Localised SAR (limbs) W kg^{-1}
Occupational exposure	10 MHz - 10 GHz	0.4	10	20
General public exposure	10 MHz - 10 GHz	0.08	2	4

Note

All SAR values are to be averaged over any period of 6 minutes.

Note

Localised SAR averaging mass is any 10g (0.02 lb) of contiguous tissue. The maximum SAR obtained should be the value that is used for the estimation of exposure.

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Note

Basic restrictions between 10 GHz and 300 GHz are given in power densities. For occupational exposure, it is 50 Wm^{-2} and for general public exposure, it is 10 Wm^{-2}.

Table 19. Reference values calculated from basic restrictions

Exposure characteristics	Frequency range	Electric field strength V/m	Equivalent plane wave power density S ($W m^{-2}$)
Occupational exposure	10 - 400 MHz	61	10
	400 - 2000 MHz	$3f^{1/2}$	f/40
	2 - 300 GHz	137	50
General public exposure	10 - 400 MHz	28	2
	400 - 2000 MHz	$1.375f^{1/2}$	f/200
	2 - 300 GHz	61	10

f = frequency in MHz

Note

For frequencies between 100 KHz and 10 GHz, S is to be averaged over any period of 6 minutes.

Note

For frequencies exceeding 10 GHz, S is to be averaged over any period of $68/f^{1.05}$ minutes (f in GHz).

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2.6.5 ANNEX B: Far-field calculation method

This model is applicable for calculating the compliance boundary for the far-field region and over-estimates the compliance boundary for the radiating near-field region. It is not applicable for calculating the compliance boundary for the reactive near-field region where the distance from the antenna is less than or equal to λ /4, which is 3.75 cm at 2000 MHz. Therefore, all the calculations are valid when the compliance boundary is greater than or equal to the antenna dimensions plus λ /4.

The compliance boundary in metres from an antenna, or r_{min}, is calculated according to the Formula for safety distances.

$$r_{min} = \sqrt{\frac{N 10^{(G - L)/10} P_{out}}{4\pi S}}$$

DN02152589

Figure 5. Formula for safety distances

The meaning of each formula component is as follows:

- N is the number of transmitters per one antenna
- G is the antenna gain (dBi)
- L is the minimum cable losses (dB)
- P_{out} is the maximum power of one transmitter unit (W)
- S is the power density limit (W/m^2)

Note

In the far-field, the field calculation does not take into account the antenna size, which is assumed to be a point source. Therefore, when calculating the compliance boundary, the far-field data, antenna size, and reactive field criteria must be taken into account.

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2.7 Cabinet clearances for the indoor BTS

Note

There can be additional clearance requirements for co-siting with other BTS families.

Indoor cabinet

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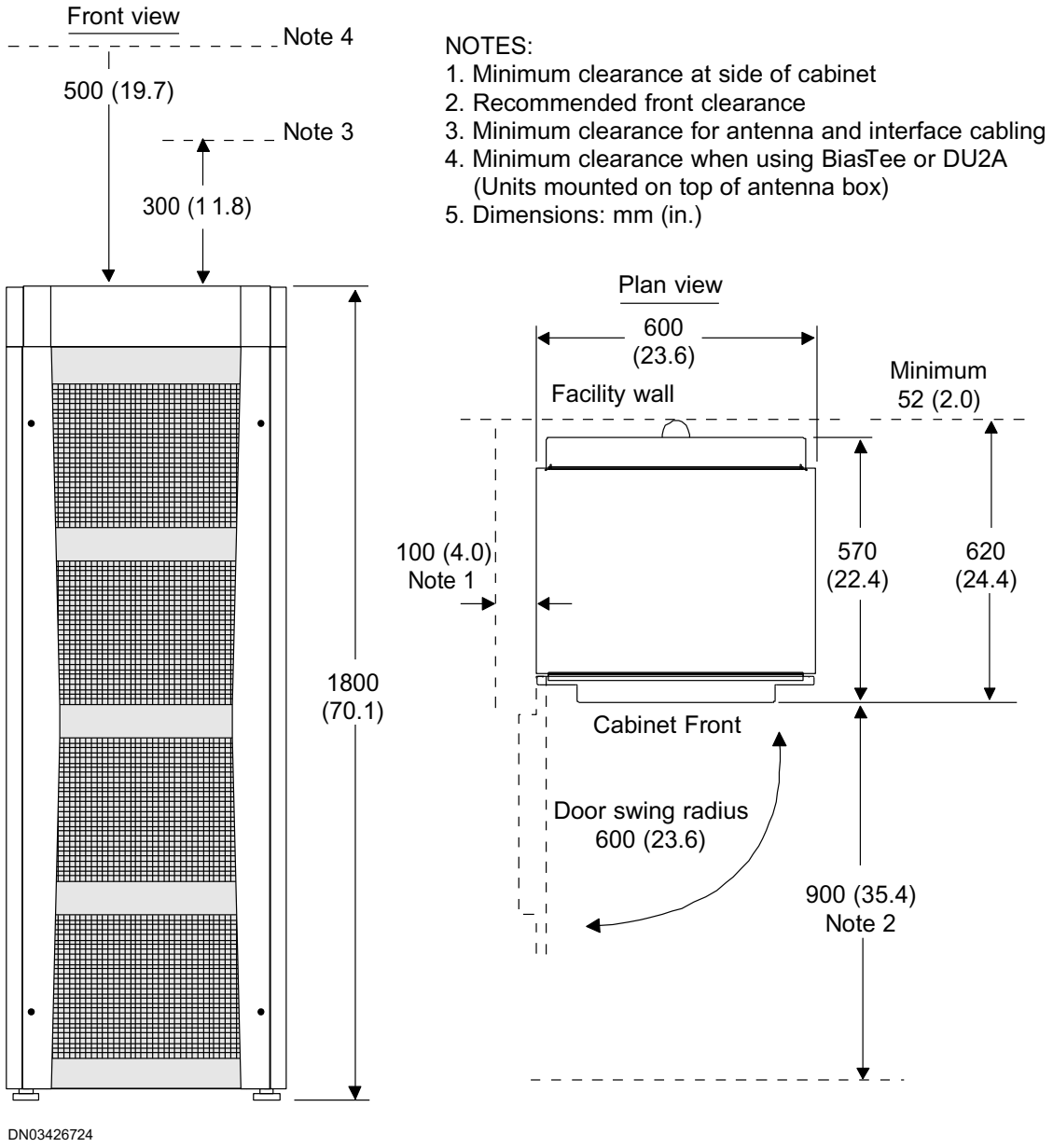

Figure 6. Clearance recommendations for indoor cabinet installation

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Midi indoor cabinet

NOTES:
1. Minimum clearance at side of cabinet
2. Recommended front clearance
3. Minimum clearance for antenna and interface cabling
4. Minimum clearance when using Bias Tee or DU2A
   (Units mounted on top of antenna box)
5. Dimensions: mm (in.)

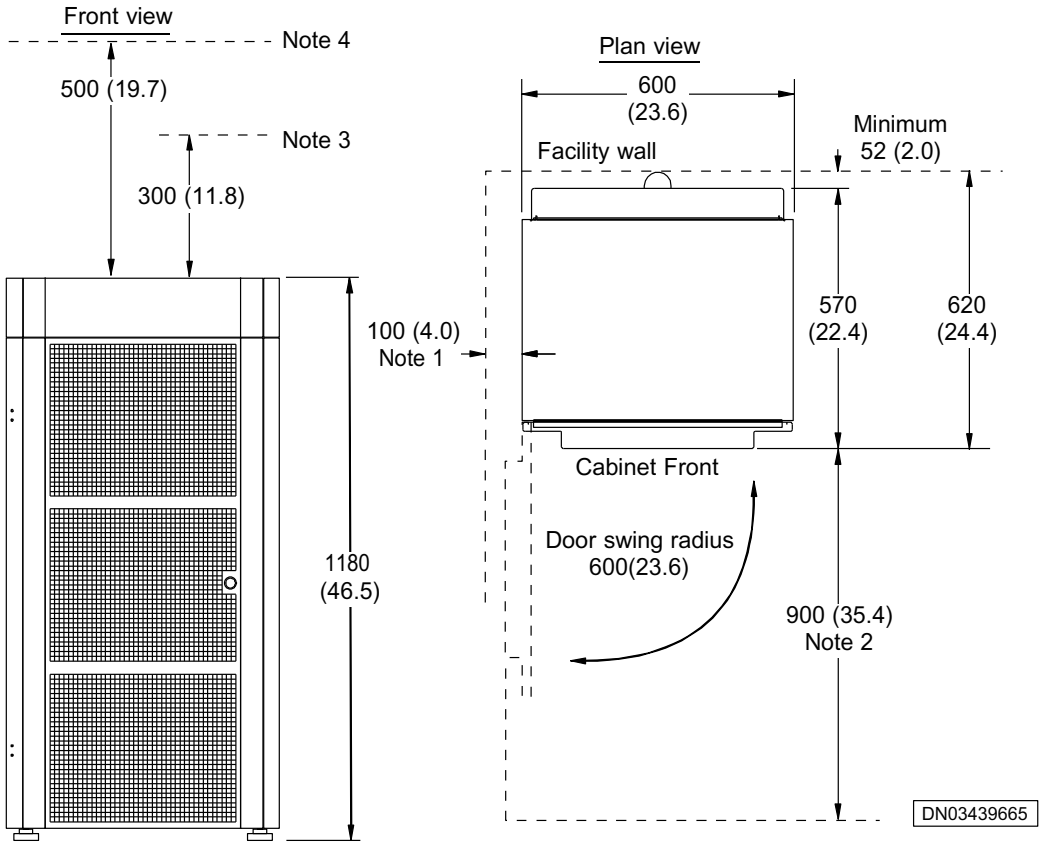

Figure 7. Clearance recommendations for Midi indoor cabinet installation

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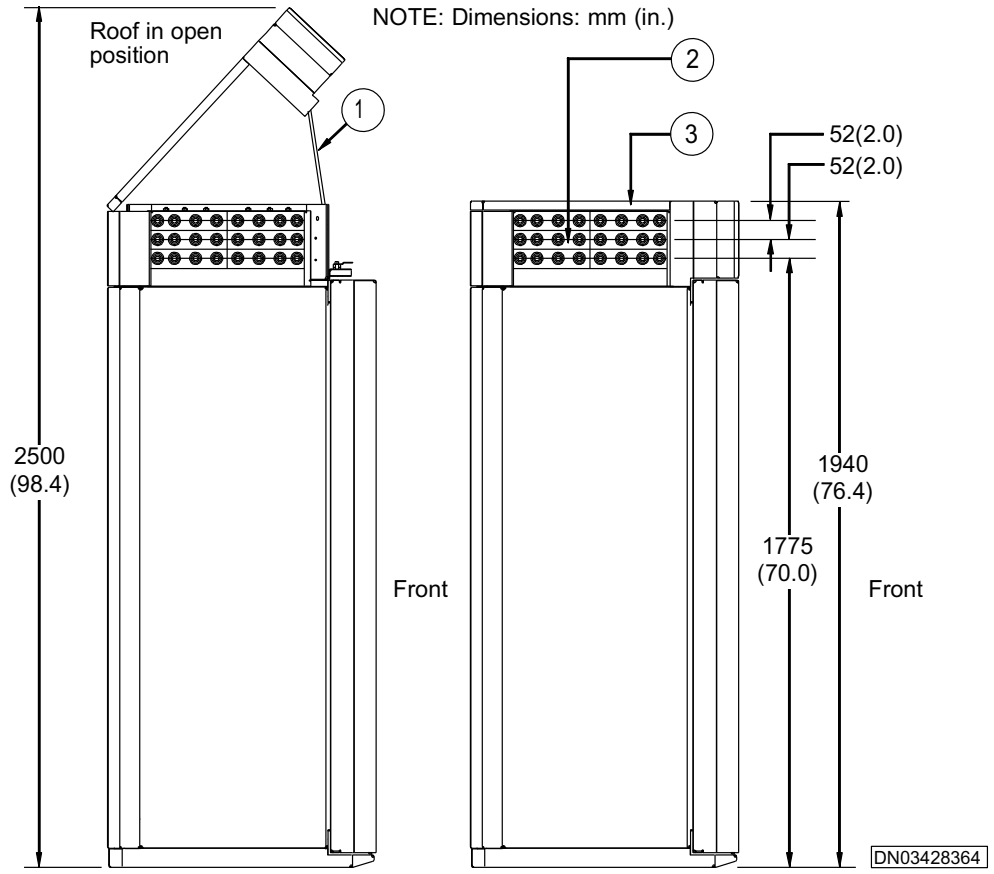
2.8 Cabinet clearances for the outdoor BTS

Note

If space is limited for an outdoor cabinet installation, it is recommended to install the Outdoor Application Kit (OAKx) to the cabinet core first. Installation personnel can then lift, mount, and anchor the cabinet to the plinth.

Outdoor cabinet



1	Roof stay
2	Cable Entry Block (In optional side position)
3	Roof

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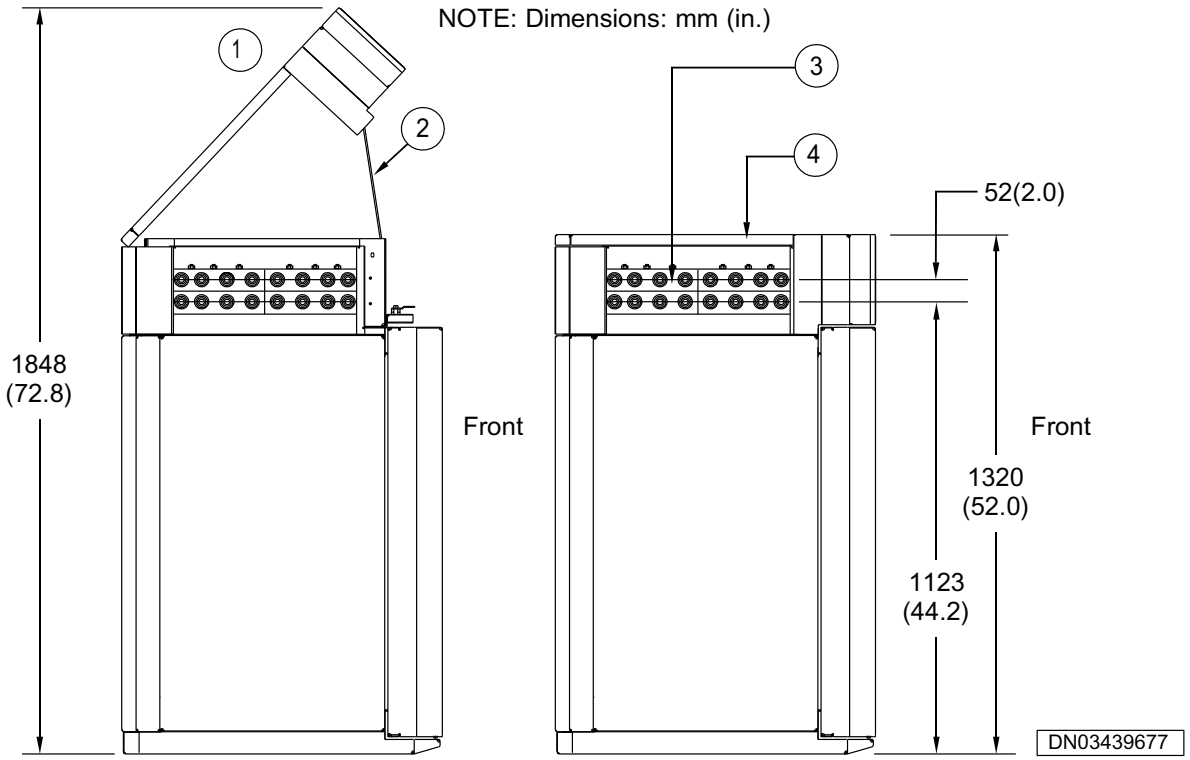
Figure 8. Top clearance recommendations for outdoor cabinet

Note

The maximum clearance for a completely open roof on the Outdoor cabinet is 2690 mm (106 in.).

Midi Outdoor cabinet



1	Roof in open position
2	Roof stay
3	Cable Entry Block (in optional side position)
4	Roof

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Figure 9. Top clearance recommendations for Midi Outdoor cabinet

Note

The maximum clearance for a completely open roof on the Midi Outdoor cabinet is 2038 mm (80.2 in.).

Clearance recommendations for outdoor cabinets

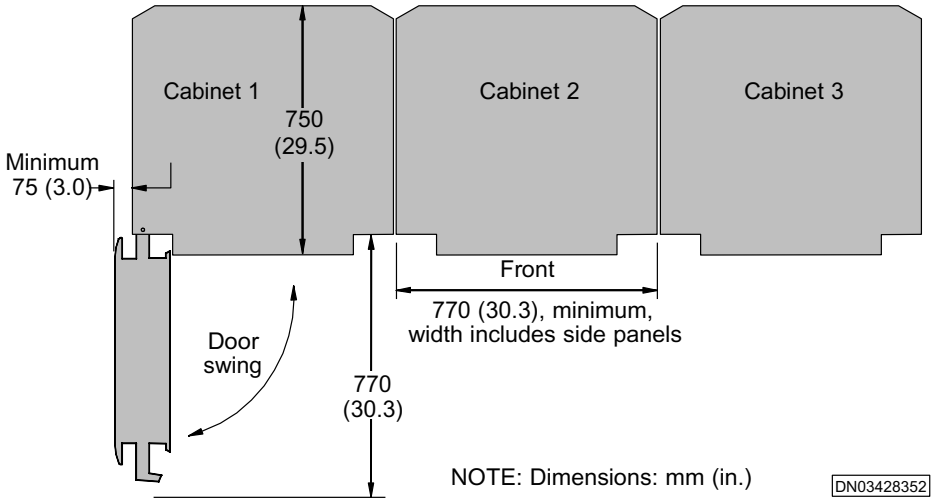

Figure 10. Clearance recommendations for outdoor cabinets

Note

The ODCF cabinet filter requires a 500 mm maintenance space on the back of the cabinet.

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2.9 Cabinet clearances for Mini Outdoor BTS

Caution

Risk of overheating. Secure adequate ventilation around the base transceiver station (BTS). The ambient temperature must not exceed 55°C (131°F).

Cabinet clearances in floor mounting

When the cabinet is installed on a plinth, the available installation space under the cabinet is 175 mm. The figure below presents the required minimum clearances when the Mini Outdoor cabinet is mounted on floor.

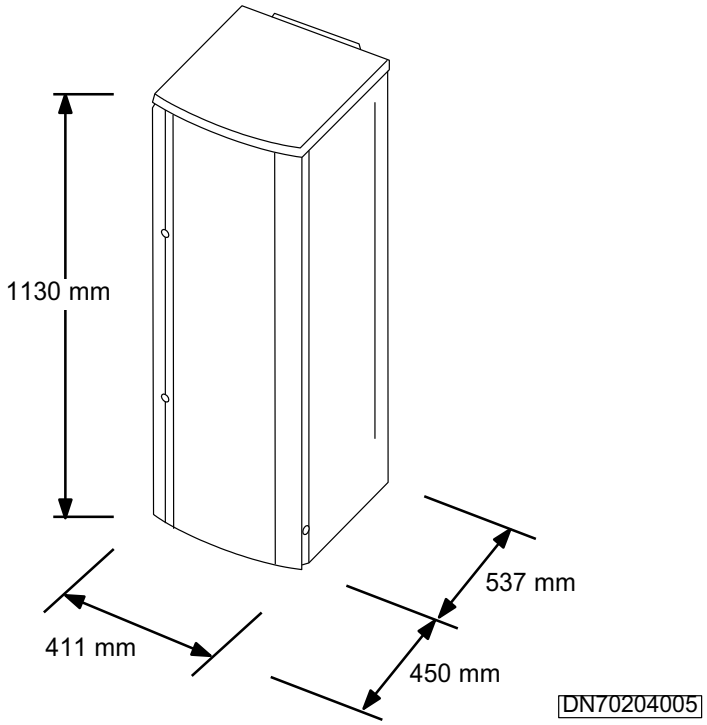

Figure 11. Cabinet clearances for Mini Outdoor floor mounting

Cabinet clearances in wall mounting

The figure below presents the required minimum clearances when the Mini Outdoor cabinet is mounted on a wall.

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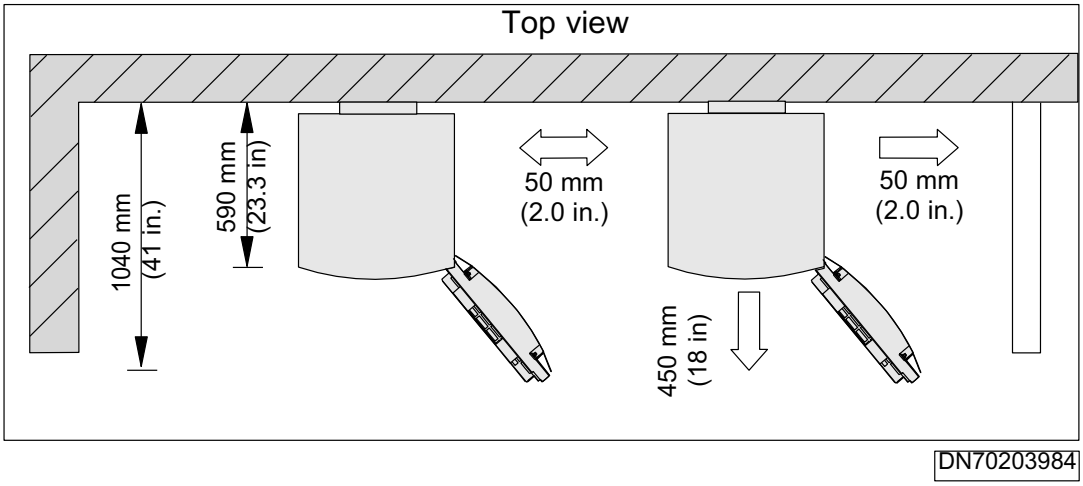

Figure 12. Cabinet clearances for Mini Outdoor wall mounting

Cabinet clearances in pole mounting

The Mini outdoor cabinet can be installed on a pole with a pole mounting kit. The cabinet must be mounted on a pole sideways. The kit is designed for poles between 60 - 300 mm in diameter.

The following figure presents the required minimum cabinet clearances for Mini outdoor cabinet when it is mounted on a pole.

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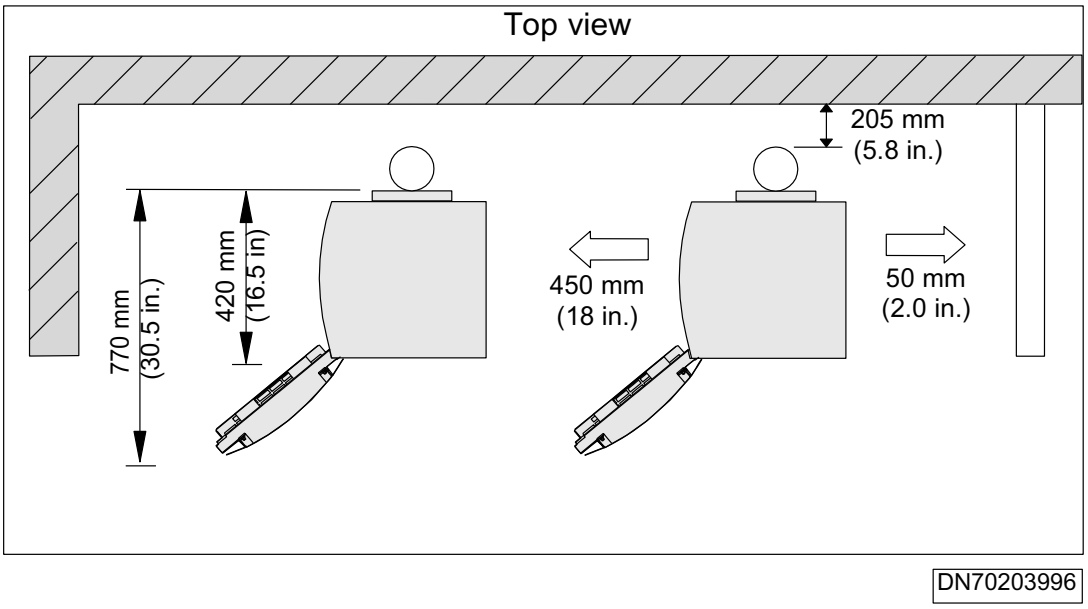

Figure 13. Cabinet clearances for Mini Outdoor pole mounting

2.10 Site requirements for Mini Outdoor BTS

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. Also AC or DC distribution panel and AC electric are available for power tools.
4. Main grounding (earthing) is installed and tested.
5. Minimum recommended clearance of 450 mm is available in front of the BTS to open and close the front door.

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All the external interface connectors are located on the bottom of the Nokia UltraSite EDGE Mini Outdoor BTS. The BTS does not require back or side access. The BTS can be installed on a pole or on a wall. All maintenance can be performed from the front of the BTS.

6. Wall or pole at the BTS site is strong enough to withstand the weight of the BTS (max. 120 kg for full cabinet with pole brackets). For more detailed information on Nokia UltraSite EDGE Mini Outdoor BTS cabinet weights, see *Cabinet dimensions and weights*.
7. Wall or pole at the BTS site is strong enough to meet earthquake requirement Bellcore GR-63 core Zone 4.
8. The BTS is not taken out of its delivery package until the site construction work is finished and the site is clean and dry.
9. Site security is established so the BTS and other units can remain undisturbed at the site.
10. 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. For detailed information on Nokia UltraSite EDGE Mini Outdoor BTS cabinet dimensions, see *Cabinet dimensions and weights*.

Wind load

For pole mounting, the selected pole must not break off even in stormy winds. The table below shows the load imposed on the pole by the BTS in two wind velocities.

Table 20. Wind load

Wind velocity	Load imposed on the pole by the BTS
40 m/s	780 N
50 m/s	1210 N

2.11 Cabinet base requirements for the indoor BTS

Note

Ensure that the backstop is oriented toward the rear wall for proper airflow.

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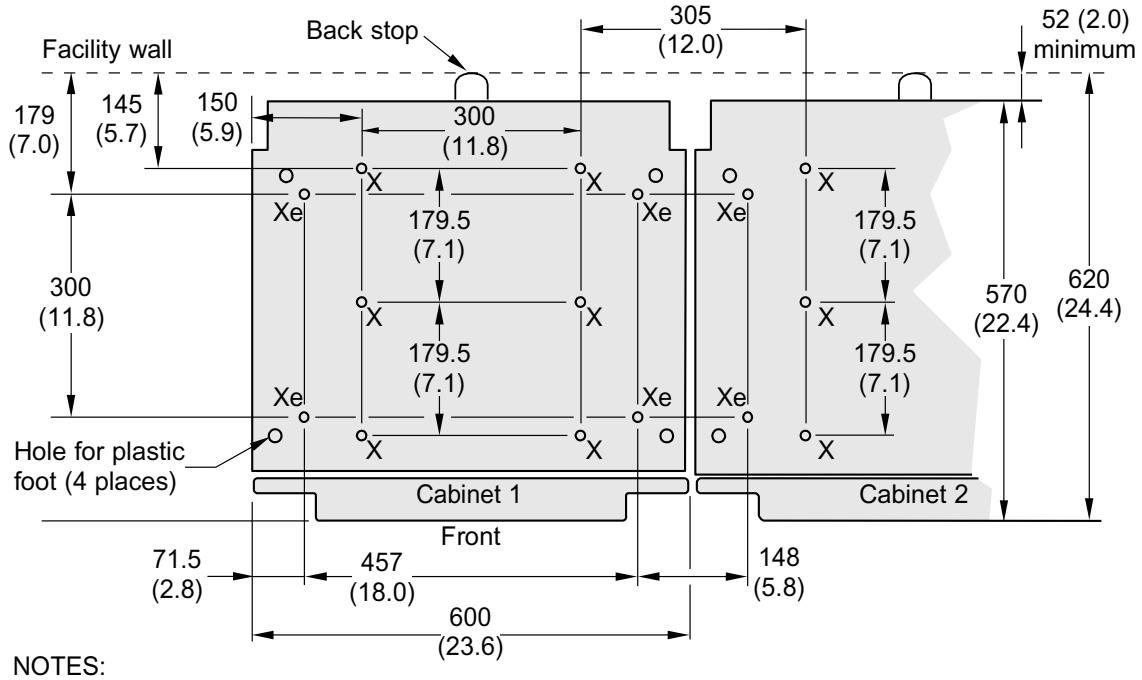

NOTES:
1. Xe - Location of earthquake anchor holes
2. X - Location of additional anchor holes
3. Dimensions: mm (in.)

Figure 14. Cabinet base measurements for multiple Indoor cabinets

2.12 Cabinet base requirements for the outdoor BTS

Note

The anchor holes used for mounting outdoor cabinets comply with requirements for earthquake zone installation.

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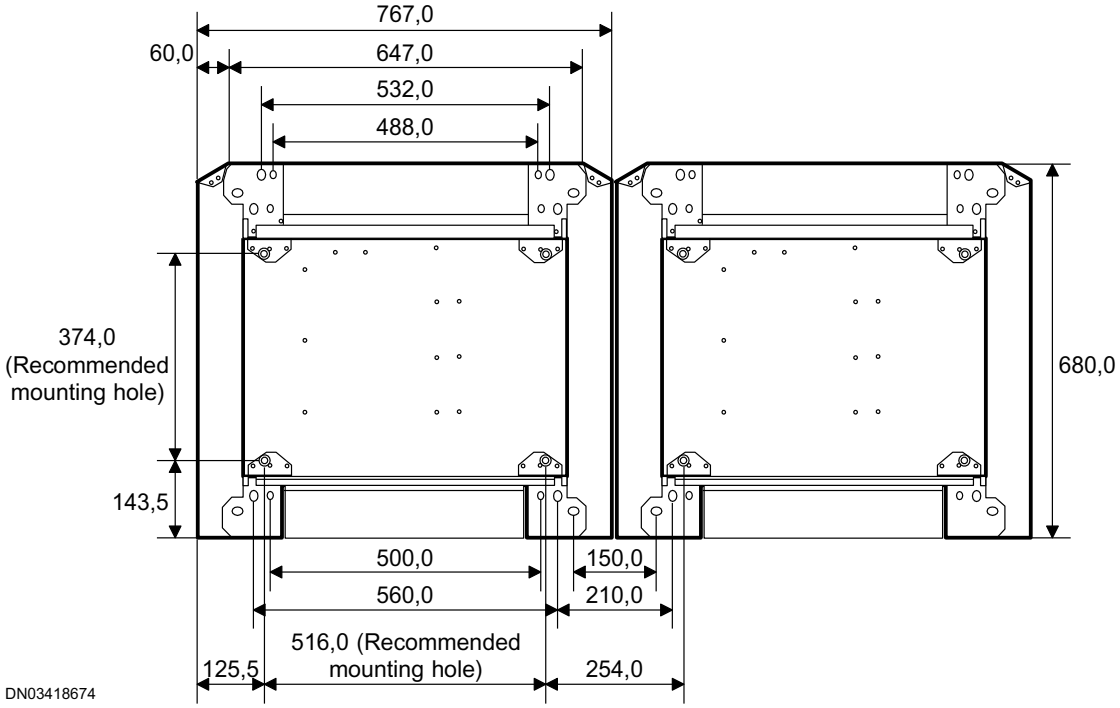

Figure 15. Plinth measurements for multiple outdoor cabinets

2.13 Cabinet base requirements for the Mini Outdoor BTS

The figure below illustrates the base requirements for Mini Outdoor floor mounting.

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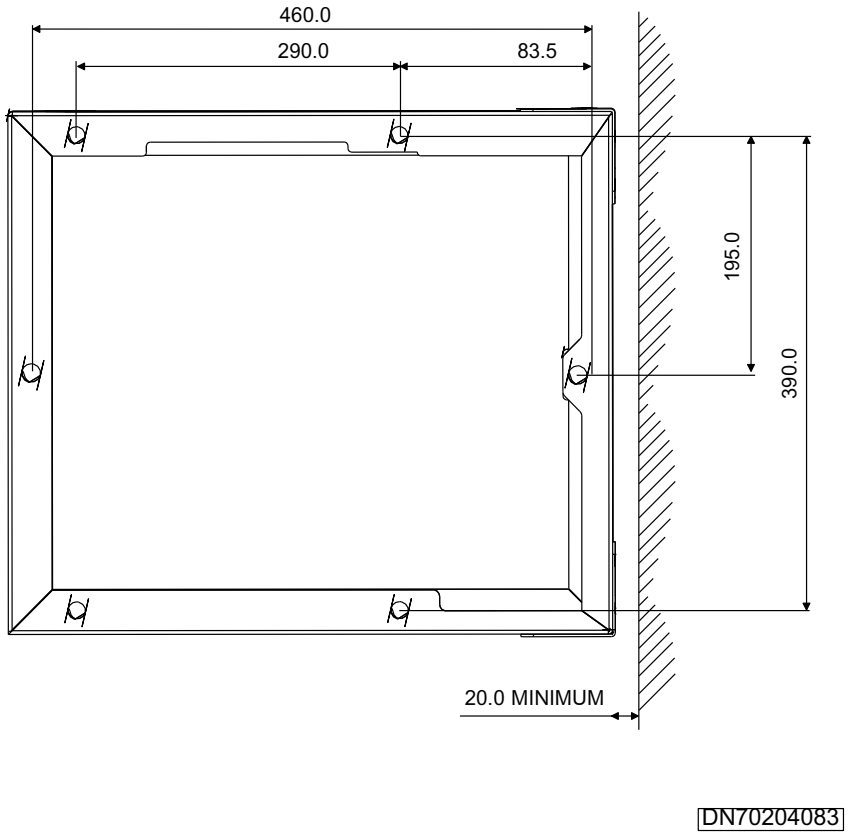

Figure 16. Dimensions for floor mounting holes

The figure below illustrates the base requirements for Mini Outdoor wall mounting.

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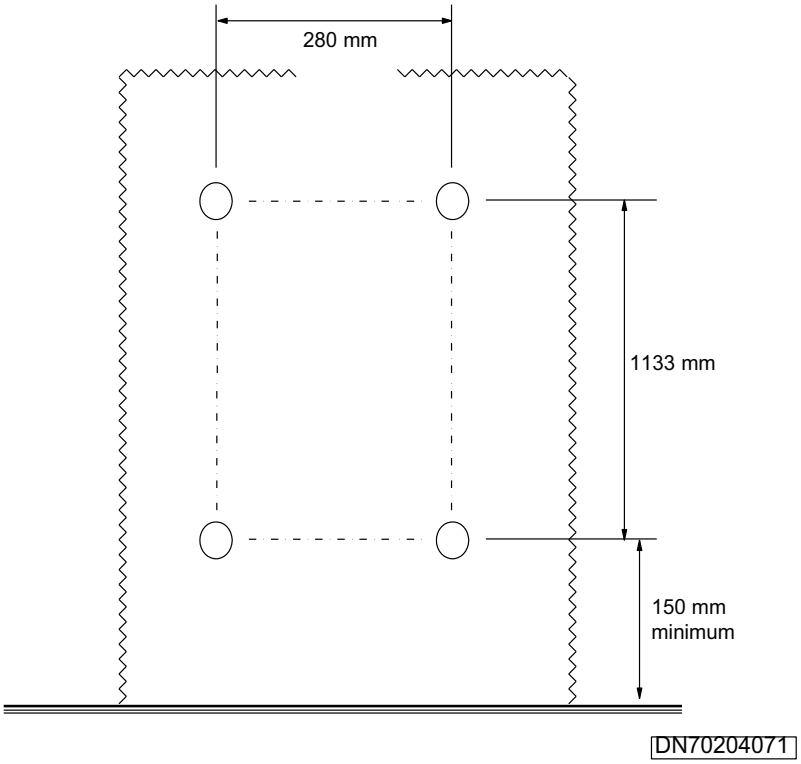

Figure 17. Dimensions for wall mounting bracket fixing

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3 Dimensions and weights

3.1 Cabinet dimensions and weights

Table 21. Cabinet dimensions and weights

Parameter	Outdoor	Midi Outdoor	Indoor	Midi Indoor	Mini Outdoor
Height	1940 mm (76.4 in.)	1320 mm (52.0 in.)	1800 mm (70.9 in.)	1180 mm (46.5 in.)	1130 mm (44.5 in.)
Depth	750 mm (29.5 in.)	750 mm (29.5 in.)	620 mm[1] (24.4 in.)	620 mm [1] (24.4 in.)	537 mm (21.1 in.)
Width	770 mm (30.0 in.)	770 mm (30.0 in.)	600 mm (23.6 in.)	600 mm (23.6 in.)	411 mm (16.2 in.)
Maximum cabinet weight (with units)	342 kg (755 lb)	233 kg (513.7 lb)	281 kg (629 lb)		110 kg (243 lb)
Maximum cabinet weight (without units)	152 kg (335 lb)	125.1 kg (275.7 lb)	95 kg (210 lb)	62.4 kg (137.5 lb)	38 kg (84 lb)

[1] Includes 52 mm (2.05 in.) behind the cabinet for the spacer part, which is required for cabinet cooling.

3.2 Unit weights

Table 22. Unit weights

Unit	Value (metric)	Value (imperial)
Base Operations and Interfaces (BOIx)	1.6 kg	3.6 lb

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Table 22. Unit weights (cont.)

Unit	Value (metric)	Value (imperial)
Dual Band Diplex Filter Unit (DU2A)	2.0 kg	4.42 lb
Transceiver Baseband Unit (BB2x)	1.2 kg	2.7 lb
Dual Variable Gain Duplex Filter (DVxx)	13 kg	28.7 lb
Masthead Amplifier (MNxx)	8.5 kg (900 MHz) 5.6 kg (1800/1900 MHz)	18.7 lb 12.4 lb
Bias Tee (BPxx)	0.4 kg	0.88 lb
Receiver Multicoupler:		
• M2xA (2-way)	0.7 kg	1.5 lb
• M6xA (6-way)	2.0 kg	4.4 lb
Power Supply:		
• PWSA	11 kg	24 lb
• PWSB	7 kg	15.4 lb
• PWSC	11 kg	24 lb
Remote Tune Combiner (RTxx)	20 kg	44.09 lb
Temperature Control System (TCS):		
• Unit Cooling Fans	0.36 kg	0.8 lb
• Heater Unit (HETA)	3.0 kg	6.6 lb
• Cabinet Cooling Fan	2.6 kg	5.8 lb
Transceiver (TSxx)	5.5 kg	12.1 lb
FC E1/T1	1.4 kg	3.0 lb
FXC E1 and FXC E1/T1	1.4 kg	3.0 lb
FXC RRI	1.4 kg	3.0 lb
Wideband Combiner (WCxx)	3.5 kg	7.7 lb

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4 Grounding and power requirements

4.1 Grounding (earthing) requirements

To avoid interference, Nokia recommends planning large Protective Earthing (PE) systems on a case-specific basis.

To protect the cabinet against overvoltage through antenna equipment, communication cables or power supply lines, install the grounding cables before you install BTS.

Note

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

Guidelines for grounding the BTS

- Route the grounding cables as directly as possible from the equipment to the grounding point.
- Select one of two BTS grounding point alternatives according to local regulations. For instructions on connecting grounding cables for a standard or Network Equipment Building Systems (NEBS) installation, see *Connecting the grounding cable for a standard installation*.
- Connect the grounding cable to the cabinet grounding points depending on which grounding point alternative you select.
- Connect all cabinets, Main Distribution Frame (MDF) cable ladders, and DC supply frames to the main grounding busbar at the site.
- Conductor sizes for earthing cables must be in accordance with all national, state, and local regulations.

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Note

For recommended fuse ratings, see *Power requirements for AC*, *Power requirements for +24 VDC*, *Power requirements for -48 VDC*, and *Power requirements for Mini Outdoor BTS*.

- Do not exceed a resistance of 0.1 Ω for the connection between the grounding point and the earthing contact and parts.
- Use an 8 mm (0.31 in.) single-hole lug, a 5 mm (0.2 in.) or a 6 mm (0.24 in.) two-hole lug (NEBS) PE connector.
- Ground antenna feeders as required by climatic condition and in accordance with local regulations.

4.2 Grounding (earthing) requirements for Mini Oudoor BTS

To protect the Nokia UltraSite Mini Outdoor 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 a protective ground connection is not sufficient for Nokia UltraSite Mini Outdoor BTS. Grounding must have a fixed, non-removable connection.

Note

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

Observe the following recommendations when planning the cabinet grounding:

- The grounding cable is connected with screws to the grounding point of the Nokia UltraSite Mini Outdoor BTS.
- Earthing resistance of the BTS site is ≤ 10 Ω.
- The ground cable must be connected to a main grounding busbar.

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- Route the ground cables as directly as possible from the equipment to the grounding point. Avoid unnecessary loops and sharp bending of the grounding cable. The ground 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.

The minimum cross-sections of the copper (Cu) grounding conductor are the following:

- AC System (Rated 208 to 240 VAC, 20 A):
  - Minimum phase conductor size 2.5 mm^2
  - Minimum earth conductor size 2.5 mm^2
  - Minimum protective earth conductor size 10 mm^2
- 24 VDC System (Rated 24 VDC, 60 A)
  - Minimum power conductor size 10 mm^2
  - Minimum protective earth conductor size 10 mm^2
- 48 VDC System (Rated 48 VDC, 45 A)
  - Minimum power conductor size 10 mm^2
  - Minimum protective earth conductor size 10 mm^2

Note

The values mentioned above are the minimum cable sizes required to guarantee safe operation. Thicker cables may be needed to minimise voltage drop on long cable runs.

4.3 Power requirements for -48 VDC

Mains power

It is recommended to protect the DC mains with a lightning and transient overvoltage protector (mains wire-in protector).

Note

The protector for the DC mains does not come with the BTS delivery. To order a mains protector, contact your local Nokia representative.

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Note

If optional HETA is used in outdoor configurations, a separate AC supply cable for the HETA needs to be routed..

Table 23. Minimum wire size for power conductors

Configuration	Power Conductor Wire Size[1]
PWSB (-48 VDC)	33.6 mm^2 (2 AWG)

[1] Reference NFPA-70, 1999, Article 310

Table 24. Fuse rates for different configurations with -48 VDC nominal voltage

Configuration	Fuse rate[1]
PWSB	125A / cabinet
PWSB with Heater unit	125A / cabinet 16A/ HETA

[1] Fuse rating for lowest input voltage and maximum power consumption at 25% derating

Operating ranges and power consumption

This section provides operating ranges and power consumption calculations that indicate the actual power input from the electrical network and include the operating efficiency of the power supply unit.

The power consumption of the BTS is defined by the following conditions:

- nominal input voltage
- nominal temperature at 25 °C (77° F)

Determine the total power consumption for specific BTS configurations by combining the power consumption of the installed cabinet and all associated units.

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The typical and maximum power consumption figures are for some common configurations, based on TSxx's average power consumption when measured in production with full GMSK- modulated RF power in all time slots. Variations due to operational and component variations are covered by the tolerances quoted for the figures.

Note

The following assumptions apply to the maximum and typical power demand figures in the *Electrical properties for the BTS* table:

- GSM TRXs are TSxA, GSM/EDGE TRXs are TSxB
- Full GMSK - modulated RF power in all time slots. Dynamic power control used with typical figures.
- 3 DVxxs and wideband combining in 12 TRX configuration and 3 DVxxs in 6 TRX configuration.
- Transmission is one FXC unit in all cases
- No external units supplied by BTS (for example, masthead amplifiers, microwave radios)
- If optional HETA is used in outdoor configurations, a separate AC supply cable for the HETA needs to be routed..

Table 25. Electrical properties for BTS 800, 900, 1800, and 1900

Property	**Voltage**	**12 TRX Indoor**	**12 TRX Outdoor**
Nominal input voltage	-48 V DC	-48 VDC	
Operating voltage range	-48 V DC	-38 to -60 VDC	
Maximum power demand GSM HW	-48V DC, kW	2.7	2.8
Typical power demand GSM HW	-48V DC, kW	1.7	1.8

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Table 25. Electrical properties for BTS 800, 900, 1800, and 1900 (cont.)

Property	Voltage	12 TRX Indoor	12 TRX Outdoor
Maximum power demand GSM/EDGE HW	-48V DC, kW	3.0	3.1
Typical power demand GSM/ EDGE HW	-48V DC, kW	1.7	1.8

Table 26. Typical cabinet/unit power consumption

Cabinet/Unit power consumption	Value
Cabinet with 11 unit fans	121 W
BOIA	6 W
TSxA	195 W
TSxB	225 W
BB2A	8 W
BB2E	17 W
BB2F	12 W
DVxx	15 W
RTxx	35 W
MNxx	11 W
E1/T1 Transmission unit	3 W
Radio Transmission	38 W

Table 27. Voltage, power consumption, and operating range of HETA unit (optional in Outdoor BTS)

Heater unit	Value
Voltage	230 VAC (184 to 276 VAC)
Power consumption	1500 W
Operating range	
• Cold start - heater only	-33° C to -5° C (-27.4° F to +23° F)

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Table 27. Voltage, power consumption, and operating range of HETA unit (optional in Outdoor BTS) (cont.)

Heater unit	Value
• Heater and BTS on	-10° C to +5° C (+14° F to + 41° F)

Table 28. Voltage, power consumption, and operating range of HETA unit (optional in Outdoor BTS)

Heater unit	Value
Voltage	230 VAC (184 to 276 VAC)
Power consumption	1500 W
Operating range	
• Cold start - heater only	-33° C to -5° C (-27.4° F to +23° F)
• Heater and BTS on	-10° C to +5° C (+14° F to + 41° F)

Table 29. Indoor power consumption figures for different configuration under -48 VDC voltage

Configuration	Filter type	Typical power	Maximum power
1	DVxx	0.3 kW	0.3 kW
3	DVxx	0.4 kW	0.7 kW
11	DVxx	0.5 kW	0.5 kW
22	DVxx	0.6 kW	0.9 kW
66	RTC	1.3 kW	2.4 kW
111	DVxx	0.7 kW	0.7 kW
222	DVxx	0.8 kW	1.2 kW
333	DVxx	1.1 kW	1.8 kW
444	DVxx	1.3 kW	2.4 kW
666	RTC	1.9 kW	3.6 kW

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Table 30. Midi indoor power consumption figures for different configuration under -48 VDC voltage

Configuration	Filter type	Typical power	Maximum power
1	DVxx	0.3 kW	0.3 kW
3	DVxx	0.4 kW	0.7 kW
6	RTC	0.7 kW	1.2 kW
11	DVxx	0.5 kW	0.5 kW
22	DVxx	0.6 kW	0.8 kW
111	DVxx	0.7 kW	0.7 kW
222	DVxx	0.8 kW	1.2 kW

Table 31. Mini outdoor power consumption figures for different configuration under -48 VDC voltage

Configuration	Filter type	Typical power	Maximum power
1	DVxx	0.3 kW	0.3 kW
22	DVxx	0.6 kW	0.8 kW
111	DVxx	0.5 kW	0.5 kW

The conditions for power consumption figures are the flollowing:

- Circumstances of typical power values: 2% GoS with interference rejection techniques activated. The tolerance of typical power consumption values is +/- 10%.
- Circumstances of maximum power values: all TRXs are on full power, all time slots are in use with TSxBs operating in GMSK mode. The tolerance of maximum power consumption values is +/- 10%.
- MHA and external units are excluded.
- One DVxx or RTC unit per sector.
- The power consumption of the Outdoor cabinet is approximately 100 W, max.130 W.

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4.4 Power requirements for +24 VDC

Mains power

Nokia recommends that you protect the DC mains with a lightning and transient overvoltage protector (mains wire-in protector).

Note

The protector for the DC mains does not come with the BTS delivery. To order a mains protector, contact your local Nokia representative.

Note

If optional HETA is used in outdoor configurations, a separate AC supply cable for the HETA needs to be routed. For the electrical properties of the AC supply, see *Voltage, power consumption, and operating range of HETA unit (optional in Outdoor BTS)*.

Table 32. Minimum wire size for power conductors

Configuration	Power Conductor Wire Size[1]
PWSC (+24 VDC)	95 mm^2 (3/0 AWG)

[1] Reference NFPA-70, 1999, Article 310

Table 33. Fuse rates for different configurations with +24 VDC nominal voltage

Configuration	Fuse rate[1]
PWSC	250A / cabinet
PWSC with Heater unit	250A / cabinet 16A / HETA

[1] Fuse rating for lowest input voltage and maximum power consumption at 25% derating

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Operating ranges and power consumption

This section provides operating ranges and power consumption calculations that indicate the actual power input from the electrical network and include the operating efficiency of the power supply unit.

The power consumption of the BTS is defined by the following conditions:

- nominal input voltage
- nominal temperature at 25° C (77° F)

Determine the total power consumption for specific BTS configurations by combining the power consumption of the installed cabinet and all associated units.

The typical and maximum power consumption figures are for some common configurations, based on TSxx's average power consumption when measured in production with full GMSK- modulated RF power in all time slots. Variations due to operational and component variations are covered by the tolerances quoted for the figures.

The following assumptions apply to the maximum and typical power demand figures in the *Electrical properties for the BTS* table:

- GSM TRXs are TSxA, GSM/EDGE TRXs are TSxB.
- Full GMSK - modulated RF power in all time slots. Dynamic power control used with typical figures.
- 3 DVxxs and wideband combining in 12 TRX configuration and 3 DVxxs in 6 TRX configuration.
- Transmission is one FXC unit in all cases
- No external units supplied by BTS (for example, masthead amplifiers, microwave radios)
- If optional HETA is used in outdoor configurations, a separate AC supply cable for the HETA needs to be routed. For the electrical properties of the AC supply, see *Voltage, power consumption, and operating range of HETA unit (optional in Outdoor BTS)*.

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Table 34. Electrical properties for BTS 800, 900, 1800, and 1900

Property	Voltage	12 TRX Indoor	12 TRX Outdoor
Nominal input voltage	+24 V DC	+24 VDC	
Operating voltage range	+24 V DC	+20 to +32 VDC	
Maximum power demand GSM HW	+24V DC, kW	3.0	3.1
Typical power demand GSM HW	+24V DC, kW	1.8	1.9
Maximum power demand GSM/EDGE HW	+24V DC, kW	3.3	3.4
Typical power demand GSM/ EDGE HW	+24V DC, kW	1.8	1.9

Table 35. Typical cabinet/unit power consumption

Cabinet/Unit power consumption	Value
Cabinet with 11 unit fans	110 W
BOIA	10 W
TSxA	195 W
TSxB	165 W
BB2A	8 W
BB2E	17 W
BB2F	15 W
DVxx	25 W
RTxx	35 W
MNxx	15 W
E1/T1 Transmission unit	10 W
Radio Transmission	60 W (One indoor FXC RRI, or other and two outdoor units)

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Table 36. Voltage, power consumption, and operating range of HETA unit (optional in Outdoor BTS)

Heater unit	Value
Voltage	230 VAC (184 to 276 VAC)
Power consumption	1500 W
Operating range	
• Cold start - heater only	-33° C to -5° C (-27.4° F to +23° F)
• Heater and BTS on	-10° C to +5° C (+14° F to + 41° F)

Table 37. Indoor power consumption figures for different configurations under 24 VDC voltage

Configuration	Filter type	Typical power	Maximum power
1	DVxx	0.3 kW	0.3 kW
3	DVxx	0.5 kW	0.7 kW
11	DVxx	0.5 kW	0.5 kW
22	DVxx	0.6 kW	0.9 kW
66	RTC	1.3 kW	2.6 kW
111	DVxx	0.8 kW	0.8 kW
222	DVxx	0.9 kW	1.3 kW
333	DVxx	1.2 kW	2.0 kW
444	DVxx	1.4 kW	2.5 kW
666	RTC	2.0 kW	3.9 kW

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Table 38. Midi indoor power consumption figures for different configurations under 24 VDC voltage

Configuration	Filter type	Typical power	Maximum power
1	DVxx	0.3 kW	0.3 kW
3	DVxx	0.5 kW	0.7 kW
6	RTC	0.7 kW	1.3 kW
11	DVxx	0.5 kW	0.5 kW
22	DVxx	0.6 kW	0.9 kW
111	DVxx	0.8 kW	0.8 kW
666	DVxx	0.9 kW	1.3 kW

Table 39. Mini outdoor power consumption figures for different configurations under 24 VDC voltage

Configuration	Filter type	Typical power	Maximum power
1	DVxx	0.3 kW	0.3 kW
22	DVxx	0.6 kW	0.9 kW
111	DVxx	0.5 kW	0.5 kW

The conditions for the power consumption figures are:

- Circumstances of typical power values: 2% GoS with interference rejection techniques activated. The tolerance of typical power consumption values is +/- 10%.
- Circumstances of maximum power values: all TRXs are on full power, all time slots are in use with TSxBs operating in GMSK mode. The tolerance of maximum power consumption values is +/- 10%.
- MHA and external units are excluded.
- One DVxx or RTC unit per sector.
- The power consumption of the Outdoor cabinet is approximately 100 W, or more.

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4.5 Power requirements for AC

Mains power

Nokia recommends that you protect the AC mains with a lightning and transient overvoltage protector (mains wire-in protector).

Note

The protector for the AC mains does not come with the BTS delivery. To order a mains protector, contact your local Nokia representative.

Table 40. Minimum wire size for power conductors

Configuration	Power Conductor Wire Size[1]
PWSA (AC)	13.3 mm^2 (6 AWG)

[1] Reference NFPA-70, 1999, Article 310

Table 41. Fuse rates for different configurations with AC 230V nominal voltage

Configuration	Fuse rate[1]
PWSA	3 x 16A (3-phase, not triple pole) 1 x 32A (single-phase)
PWSA with Heater unit	3 x 16A (3-phase, not triple pole) 1 x 32A (single-phase)
PWSB with Heater unit	1 x 10A (single-phase)
PWSC with Heater unit	1 x 10A (single-phase)

[1] Fuse rating for lowest input voltage and maximum power consumption at 25% derating

Operating ranges and power consumption

This section provides operating ranges and power consumption calculations that indicate the actual power input from the electrical network and include the operating efficiency of the power supply unit.

The power consumption for the BTS is defined by the following conditions:

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- nominal input voltage
- nominal temperature at 25 °C (77° F)

Determine total power consumption for specific BTS configurations by combining the power consumption of the installed cabinet and all associated units.

The typical and maximum power consumption figures are for some common configurations, based on TSxx's average power consumption when measured in production with full GMSK- modulated RF power in all time slots. Variations due to operational and component variations are covered by the tolerances quoted for the figures.

The following assumptions apply to the maximum and typical power demand figures in the *Electrical properties for BTS* table:

- GSM TRXs are TSxA, GSM/EDGE TRXs are TSxB
- Full GMSK - modulated RF power in all time slots. Dynamic power control used with typical figures.
- 3 DVxxs and wideband combining in 12 TRX configuration and 3 DVxxs in 6 TRX configuration.
- Transmission is one FXC unit in all cases
- No external units supplied by BTS (for example, masthead amplifiers, microwave radios)
- If optional HETA is used in outdoor configurations, then 1.5 kW load must be added to the figures.

Table 42. Electrical properties for BTS 800, 900, 1800, and 1900

Property	**Voltage**	**12 TRX Indoor**	**12 TRX Outdoor**
Nominal input voltage	AC	230 VAC, 50/60 Hz	
Operating voltage range	AC	184 to 276 VAC, 45-66 Hz	
Maximum power demand GSM HW	230V AC, kW	3.0	3.1
Typical power demand GSM HW	230V AC, kW	1.8	1.9

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Table 42. Electrical properties for BTS 800, 900, 1800, and 1900 (cont.)

Property	Voltage	12 TRX Indoor	12 TRX Outdoor
Maximum power demand GSM/EDGE HW	230V AC, kW	3.2	3.3
Typical power demand GSM/ EDGE HW	230V AC, kW	1.8	1.9

Table 43. Typical cabinet/unit power consumption

Cabinet/unit power consumption	Value
Cabinet with 11 unit fans	110 W
BOIA	10 W
TSxA	195 W
TSxB	165 W
BB2A	8 W
BB2E	17 W
BB2F	15 W
DVxx	25 W
RTxx	40 W
MNxx	15 W
E1/T1 Transmission unit	10 W
Radio Transmission	60 W (One indoor FXC RRI, or other and two outdoor units)

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Table 44. Voltage, power consumption, and operating range of HETA unit (optional in Outdoor BTS)

Heater unit	Value
Voltage	230 VAC (184 to 276 VAC)
Power consumption	1500 W
Operating range	
• Cold start - heater only	-33° C to -5° C (-27.4° F to +23° F)
• Heater and BTS on	-10° C to +5° C (+14° F to + 41° F)

Table 45. Indoor power consumption figures for different configurations under 230V AC voltage

Configuration	Filter type	Typical power	Maximum power
1	DVxx	0.3 kW	0.3 kW
3	DVxx	0.5 kW	0.7 kW
11	DVxx	0.6 kW	0.6 kW
22	DVxx	0.6 kW	0.9 kW
66	RTC	1.4 kW	2.6 kW
111	DVxx	0.8 kW	0.8 kW
222	DVxx	0.9 kW	1.3 kW
333	DVxx	1.2 kW	2.0 kW
444	DVxx	1.4 kW	2.5 kW
666	RTC	2.1 kW	3.9 kW

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Table 46. Midi indoor power consumption figures for different configurations under 230V AC voltage

Configuration	Filter type	Typical power	Maximum power
1	DVxx	0.3 kW	0.3 kW
3	DVxx	0.5 kW	0.7 kW
6	RTC	0.7 kW	1.3 kW
11	DVxx	0.6 kW	0.6 kW
22	DVxx	0.6 kW	0.9 kW
111	DVxx	0.8 kW	0.8 kW
222	DVxx	0.9 kW	1.3 kW

Configuration	Filter type	Typical power	Maximum power
1	DVxx	0.3 kW	0.3 kW
22	DVxx	0.6 kW	0.9 kW
111	DVxx	0.5 kW	0.5 kW
1111	DVxx	0.9 kW	0.9 kW

The conditions for the tables above are:

- Circumstances of typical power values: 2% GoS with interference rejection techniques activated. The tolerance of typical power consumption values is +/- 10%.
- Circumstances of maximum power values: all TRXs are on full power, all time slots are in use with TSxBs operating in GMSK mode. The tolerance of maximum power consumption values is +/- 10%.
- MHA and external units are excluded.
- One DVxx or RTC unit per sector.
- The power consumption of the Outdoor cabinet is approximately 100 W, or more.

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4.6 Power requirements for Mini Outdoor BTS

4.6.1 Mains power requirements

Warning

Risk of electric shock. Disconnect the base transceiver station (BTS) from the mains power network with a dedicated switch. Turning off the BTS using the BTS power supply (PWSx) switch leaves it in standby mode.

Warning

Risk of electric shock. The UltraSite EDGE Base Station must be permanently wired to a disconnect device such as a circuit breaker. Follow local and national wiring standards.

The Nokia UltraSite EGDE Mini Outdoor BTS has three power supply options: 230 VAC and -48 VDC, and +48 VDC. The permitted voltage for the different options is presented in the table below.

Table 47. Permitted operating voltage

Nominal operating voltage	Permitted operating voltage
230 VAC (50/60 Hz)	Normal operation: 184 to 276 VAC (45 - 66 Hz) Extended operation: 150 to 183 VAC and 277 to 315 VAC
-48 VDC	-38 to -56 VDC
+24 VDC	Normal operation: +20 to +32 VDC Extended operation: +18 to +20 VDC

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Table 48. Fuse rates

Configuration	Input voltage	Fuse rate
External DC supply	48 VDC	50 A
External AC supply	230 VAC	25 A
External DC supply	+24 VDC	100 A

Nokia recommends that the AC mains is protected with a lightning and transient overvoltage protector (mains wire-in protector).

Note

The protection for the AC and DC mains does not come with the BTS delivery. To order mains protection, contact your local Nokia representative.

4.6.2 BTS power consumption

Table 49. Mini outdoor BTS maximum power consumption values

Current	Power consumption
AC with heater	1850 W
AC	1100 W
-48 VDC	1000 W
-48 VDC with AC heater	1750 W
+24 VDC	1100 W
+24 VDC with AC heater	1850 W

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Table 50. Mini outdoor BTS typical power consumption values

Configuration	Typical power consumption AC or +24 VDC	Typical power consumption -48 VDC
1-omni	300 W	300 W
2+2	900 W	800 W
1+1+1	500 W	500 W
Typical values are defined as Full Load: (2% GOs; DTX and DPC enabled).		

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5 Tools requirements

5.1 Tools requirements

Nokia recommends the tools and equipment listed below for installing the components, cables, and plug-in units of the BTS.

Note

Nokia does not include installation tools and equipment in the delivery package.

Table 51. Standard installation tools

European	*U.S.*
Antistatic wrist strap and cable	
Automatic puncher to mark hole locations	
Cable cutters, 2.5 to 50 mm[^{2}]	8” electricians cable cutters
Cable stripper, 0.25 and 0.4 wire	Standard electricians wire strippers
Cable stripper, 2.5 to 50 mm[^{2}]	Cable stripping knife
Cable ties for securing cables	
Calliper square, 160 mm	Generic calliper - 6” square, adjustable
Coaxial cable stripper for 75 ohm transmission cables	
Concrete drill bit, 12 mm	Concrete drill bit, 1/2”
Crimping tool for grounding cable shoes and -48 VDC cables	
Drill with screwdriver bit set	
Drill bit set, 1 to 13 mm	
Extension cord	
Flashlight, pocket lamp, or torch	Flashlight

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Table 51. Standard installation tools (cont.)

Hammer	
Hammer drill	
Hexagon keys, 8 mm	
Indelible marker	
Insulated wrench for installing batteries	
Insulated side cutters	
Ladder	
Level	Basic level
Lifting eye bolts, four pieces, M12 (not included)	
Pliers: • Insulated needle nose pliers, 115 mm • Insulated flat nose pliers, 210 mm • Multigrip pliers, 250 mm	Pliers: • Insulated needle nose pliers, 4.5" • Insulated standard pliers, 8" • Vise-grips, 10"
Right angle	
RJ modular plug crimp tool	
Safety glasses	
Scissors	
Screwdriver sets: • Flathead • Phillips • TORX, T10 through T25	
SMA torque wrench 1 Nm (0.74 ft lb) and 0.45 Nm (0.33 ft lb)	
Torque wrench 25 Nm, 27/32 mm	
Socket wrench (10 to 19 mm) and extension socket	Socket sets, metric (1/4” and 3/8”) drive and extension socket
Tape measure, 5 M	Tape measure, 16 ft
Torque 38” driver 6.7 - 101.7 Nm (15 - 75 ft lb)	
Utility knife	
Wrench, adjustable 8"	
Wrench set, metric combo, 7 to 19 mm	

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Table 52. Electronic instruments

Instrument	Required Capabilities
Frequency counter Example: HP 53132A	• Digital readout with accuracy better than 0.1 Hz • Capable of at least 14 MHz clock signal with needed accuracy
Power meter Example: Gigatronic 8652A	• Digital readout with accuracy to at least one decimal place • Capable of TX measurement of 50W / +47 dBm or less • Optional: TX in and TX out (external terminator/attenuator) for troubleshooting

Table 53. Installation tools for external transmission cables

Tool	Cable
Radial crimping tool R282.281.000 and positioner R282.967.034	Radial connectors BQ (100/120 Ω)
Rosenberger crimping tool: • 11W150-000 • 11W150-7R9 for cable TWC-124-1A • 11W150-7W2 for cable Belden 8132	Rosenberger connectors BQ (100/ 120 Ω)
Crimping tool: • AGK 2353 with crimp inserts for cables RG 179 B/U, RG 187 A/U: AGK 2709 • AKG 2365 with crimp inserts for cables RG 179 B/U, RG 187 A/U: AGK 2727	SMB/BT43 (75 Ω) with cable RG 179 B/U, RG 187 A/U

5.2 Torque settings

Nokia recommends the following torque values for various fasteners that are used in the BTS.

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Caution

Over-tightening causes stress on the connectors. For the TSxx, BB2x, and BOIx units, ensure a gap of 1.0 to 3.0 mm exists between the front flange of the unit and the cabinet when tightened to 1.0 Nm (maximum).

These are basic torque values. Any exceptions to these values are provided in the installation procedures.

Table 54. Cabinet installation torque recommendations

Bolt/screw type	DIN	Size	Torque
Plastic connector finger screws			0.2 - 0.3 Nm (0.15 - 0.22 ft lb)
Slotted head, phillips head, or Torx head screw		M3	0.7 - 1.0 Nm (0.52 - 0.74 ft lb)
Slotted head, phillips head, or Torx head screw		M4	1.2 - 1.6 Nm (0.88 - 1.18 ft lb)
Slotted head, phillips head, or Torx head screw		M5	2.0 - 2.6 Nm (1.47 - 1.92 ft lb)
Hexagon socket head screw	933-A2	M6	4.2 - 5.5 Nm (3.1 - 4.05 ft lb
Nut	934-A2	M6	4.2 - 5.5 Nm (3.1 - 4.05 ft lb)
Hexagon socket head screw	912-A2	M8	8.0 - 10.0 Nm (5.9 - 7.37 ft lb)
3/8 hexagon head bolt	933-A2	M10	24 Nm (17.69 ft lb)
Lifting eye bolt (not included)	580	M12	39 Nm (28.74 ft lb)
Torx socket head cylinder head	934-A2	M3	0.7 Nm (0.52 ft lb)
Torx socket head cylinder head	934-A2	M4	1.2 Nm (0.89 ft lb)
Torx socket head cylinder head	934-A2	M5	2.5 Nm (1.84 ft lb)

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The following table provides the torque measurements that Nokia recommends for installing the GSM/EDGE BTS units.

Table 55. Unit installation torque recommendations

Bolt/screw type	DIN	Size	Torque
Antenna flange mount connector 7/16 in. (4 each)	934-A2	M3	0.7 - 1.0 Nm (0.52 - 0.74 ft lb)
Antenna flange nut	7-16		10-14 Nm (7.0 ft lb - 9.8 ft lb)
Thumb screw	934-A2	M4	1 Nm (74 ft lb)
Ground lug nut	934-A2	M5	2.0 - 2.6 Nm (1.47 - 1.92 ft lb)
Ground lug nut		M8	8.0 - 10.0 Nm (5.9 - 7.37 ft lb)
Battery terminal screws		Not available	6.78 Nm (5.0 lb ft)
Antenna connector		7/16 in.	25 Nm (18.5 ft lb)
SMA connector		Not available	1.0 Nm (0.7 ft lb)
PWSC terminals		M8	8.0 - 10.0 Nm (5.9 - 7.37 ft lb)
-48 VDC Filter Output Terminal nuts		M10	10 - 14 Nm (7.0 ft lb - 9.8 ft lb)
-48 VDC Filter Input Terminal nuts		M10	10 - 14 Nm (7.0 ft lb - 9.8 ft lb)

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6 System requirements

6.1 System requirements for Nokia SiteWizard

Table 56. System requirements for Nokia SiteWizard

Item	Specification
Computer	Intel Pentium compatible PC
Operating system	Microsoft Windows XP (English version) Microsoft Windows 2000 (English version, Service Pack 3) Microsoft Windows 98 (English version)
System memory	Windows 2000: 64 MB (128 MB recommended) Windows 98: 32 MB (64 MB recommended)
Monitor	SVGA, 800 x 600 resolution minimum SVGA, 1024 x 768 resolution recommended
Disk space	50 MB minimum 200 MB recommended for full SiteWizard CD-ROM installation
Accessories	CD-ROM drive Windows compatible mouse or pointing device Free 9-pin serial port and LMP cable (PC −BTS/Node) Windows compatible printer (optional)

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