



ASOG/H Core Unit Product Description

DN962730690

Issue 01DRAFT

Revised on 2025-01-20

ASOG/H Core Unit Product Description

Rel. (2025-01-20 11:46:32)

Operating Documentation, Issue: 01DRAFT

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1. ASOG/H compliances

FCC Part 15 and RSS-102 compliances and ISED warning statements for ASOG and ASOH

 Note:

The compliances apply exclusively to the WiFi functionalities of the ASOG and ASOH core units. The cellular frequencies referenced in this document pertain only to the internal capabilities supported by the ASOG and ASOH core units and don't indicate RF transmission features.

1.1 FCC Part 15 compliance

FCC statement

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

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

This equipment must be installed and operated in accordance with provided instructions and the antennal(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation

instructions and transmitter operating conditions for satisfying RF exposure compliance.

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

FCC Supplier's Declaration of Conformity

Unique Identifier (Model Name): 476254A, 476255A (2AD8UASOGHWIFI-01)

Responsible Party - U.S Contact Information

Company name: Nokia Solutions and Networks, OY

Company Address: 2000 W. Lucent Lane Naperville Illinois 60563 United States

Telephone number or internet contact information: lee.klinkenborg@nokia.com

FCC Compliance Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Notice:

Operation in band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

1.2 RSS-102 compliance

The following are separation distances calculated to meet the limits of RSS-102, issue 6 for deployment of Nokia BTS products.

Ci-dessous sont les distances minimales de séparation calculées pour respecter les limites de RSS-102, numéro 6 pour le déploiement de la station de base Nokia.

Table 1: RF exposure exemption limits

Technology/mode	Operating band	Frequency under evaluation (MHz)	Distance (cm)	Time-averaged maximum EIRP (mW)	RF exposure exclusion limit (mW)	Verdict
802.11b/g/n	2.4 GHz	2412-2462	20.00	357.27	2684.03	Pass
802.11a/n/ac	5 GHz	5150-5850	20.00	130.32	4507.34	Pass

ASOG and ASOG are exempt of RF exposure evaluation as maximum EIRP for each supported technology meets the limit exemptions.

 Note:

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

1.3 ISED warning statements

IC statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This transmitter must not be co-located or operating in conjunction with any other antenna or

transmitter. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

Cet émetteur ne doit pas être Co-placé ou ne fonctionnant en même temps qu'aucune autre antenne ou émetteur. Cet équipement devrait être installé et actionné avec une distance minimum de 20 centimètres entre le radiateur et votre corps.

This radio transmitter 109D-ASOGHWIFI01 has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

The concrete contents to check are the following three points.

1. Must use antenna such as rod Antenna with gain not exceeding 3.03 dBi at 2.4 GHz and 4.55 dBi at 5 GHz.
2. Should be installed so that the end user cannot modify the antenna.
3. Feed line should be designed in 50 ohm.

Fine tuning of return loss etc. can be performed using a matching network.

Le présent émetteur radio 109D-ASOGHWIFI01 a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Le contenu concret à vérifier sont les trois points suivants.

1. Doit utiliser une antenne telle qu'une antenne à tige avec un gain ne dépassant pas 3,03 dBi à 2,4 GHz et 4,55 dBi à 5 GHz.
2. Doivent être installés de façon que l'utilisateur final ne peut pas modifier l'antenne.
3. La ligne d'alimentation doit être conçue en 50 ohm.

Le réglage précis de la perte de rendement, etc. peut être effectué en utilisant un réseau correspondant.

Notice:

Operation in band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

2. ASOG/H core unit overview

Core units are low-power consumption, fully integrated, dual-RAT (LTE and NR) AirScale system modules (SMs) with control and capacity functions.

AirScale SM has all the needed control and baseband functions for the supported RATs. The basic features of AirScale SM are:

- Baseband processing and decentralized control
- Transport control, integrated Ethernet ports, and IPv4/IPv6 and IPSec transport
- BTS clock and timing generation and distribution
- BTS operation and maintenance
- Central radio interface control
- OBSAI, CPRI, or eCPRI-compatible interfaces to radio units (RUs)
- WebEM compatibility

ASOG and ASOH

The ASOG and ASOH core units, introduced by the *CB012678: ASOG Core Unit* and *CB012679: ASOH Core Unit* features, are fully integrated SMs. ASOG supports GSM or WCDMA (RF ports 13-15 only¹), LTE, and NR, while ASOH supports LTE and NR. You can use ASOG/H both indoors and outdoors. Outdoor operation requires the AMJJ outdoor cable entry providing IP65 protection.² The compact size and light weight of ASOG/H make them easy to carry, handle, and install.

1) RF13-15 ports work as GSM/WCDMA only.

2) IP65 only with optical fiber cables diameter between 5 ± 0.5 mm, otherwise IP55.

ASOG product code: 476254A

ASOH product code: 476255A

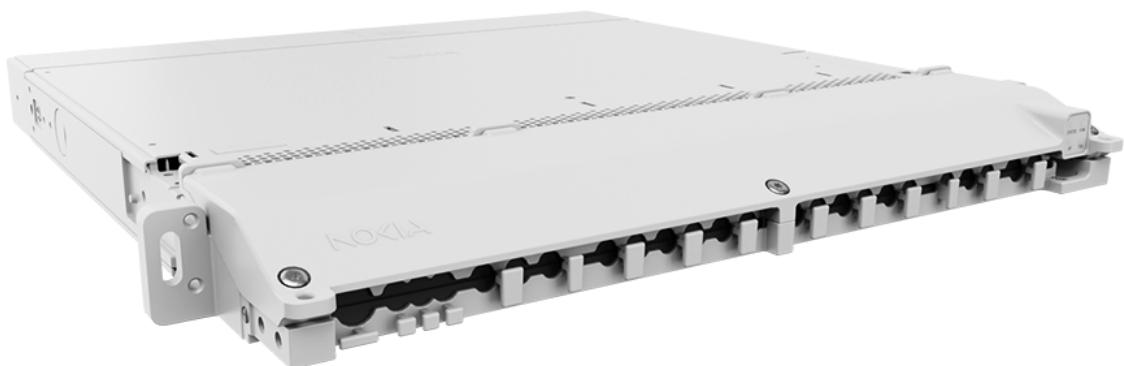
Figure 1: ASOG overview



Figure 2: ASOH overview



Figure 3: ASOG/H with AMJJ



3. ASOG/H core unit technical description

Dimensions and weight, installation options, environment specifications, electrical specifications, and acoustic levels of the ASOG/H core unit

Variants comparison

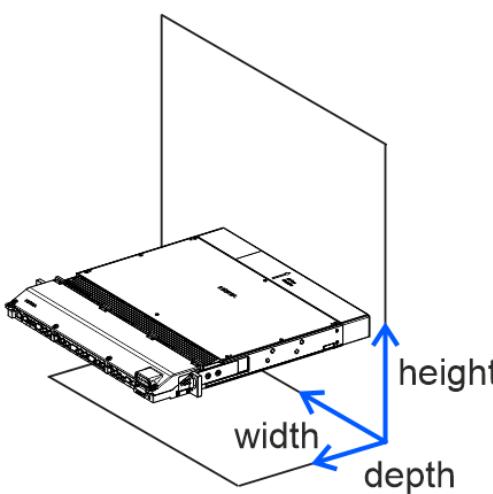
Table 2: Variants comparison

Core unit	Commercial name	RAT standards	Fronthaul interfaces	Interface types
ASOG	Tuuli 26e	GSM ¹ WCDMA ¹ LTE NR	12 x SFP56/SFP28/SFP+ 3 x SFP+	<ul style="list-style-type: none">• OBSAI• CPRI• eCPRI
ASOH	Tuuli 24	LTE NR	12 x SFP56/SFP28/SFP+	<ul style="list-style-type: none">• OBSAI• CPRI• eCPRI

¹ GSM or WCDMA supported only on RF13-15 ports.

Dimensions and weight

Table 3: ASOG/H dimensions

Dimension	Value	Dimension orientation
Height	43.5 mm (1.71 in.) With AMJJ: 50 mm (1.97 in.)	
Width	440 mm (17.32 in.) With 19-inch rack brackets: 482.5 mm (19.00 in.)	
Depth	365 mm (14.37 in.) With AMJJ: 463 mm (18.23 in.)	
Weight	<ul style="list-style-type: none">ASOG: 7.7 kg (17 lb.)ASOG with AMJJ: 9.5 kg (20.9 lb.)ASOH: 7.4 kg (16.3 lb.)ASOH with AMJJ: 9.2 kg (20.3 lb.)	

Installation options

- Standalone:
 - 3U casing
 - 19-inch rack
 - Cabinet
- With AMJJ:
 - 3U casing
 - 19-inch rack
 - Cabinet
 - Book-/rail-mount
 - Pole
 - Wall

Environmental specification

Table 4: Core unit operational temperature range

Property	Value	
	ASOG	ASOH
Operation with solar load	-15°C to 45°C (5°F to 113°F) ²	-40°C to 45°C (-40°F to 113°F)
Operation without solar load	-15°C to 55°C (5°F to 131°F) (front-to-back airflow) ² -15°C to 50°C (5°F to 122°F) (back-to-front airflow) ²	-40°C to 55°C (-40°F to 131°F) (front-to-back airflow) -40°C to 50°C (-40°F to 122°F) (back-to-front airflow)
Cooling method	Forced convection (fan)	
IP rating	Without AMJJ: IP20 With AMJJ: IP55 /IP65 ³	Without AMJJ: IP20 With AMJJ: IP55 /IP65 ³

²ASOG minimum operational temperature is extended to -40°C (-40°F) for certain configuration and installation scenarios. For more information, see the table below:

³ IP65 is only guaranteed by certain cable diameter and tolerance (fiber cable diameter should be 5 ± 0.5 mm). For more information, see *table in the Installing and Cabling Nokia AirScale Core Unit ASOE, ASOG, and ASOH document*.

Table 5: ASOG extended minimum operational temperature range

Installation type	Supported mode	
	-40°C (-40°F)	-15°C (5°F)
Standalone without heater	LTE/NR	GSM/WCDMA/LTE/NR
3U casing without heater	LTE/NR	GSM/WCDMA/LTE/NR
3U casing with heater	GSM/WCDMA/LTE/NR	-

Table 6: Temperature and humidity requirements for the transportation and storage of core units

Activity	Temperature range	Humidity range
Transportation	-40°C to 70°C (-40°F to 158°F)	Up to 95%
Storage	-25°C to 55°C (-13°F to 131°F)	10% to 100%

Electrical specifications and power draw

Table 7: Core unit electrical specifications

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

The unit may shut down when the extended range is exceeded.

ASOG/H power draw will be provided in future releases.

Acoustic levels

Acoustic noise level in typical operating conditions; higher values may be reached in maximum load configurations (with low-noise fan profile up to 55 dBA at 25°C, and up to 63 dBA at 45°C).

ASOG/H acoustic levels will be provided in future releases.

4. ASOG/H core unit interfaces

List and description of core unit interfaces

Figure 4: ASOG interfaces

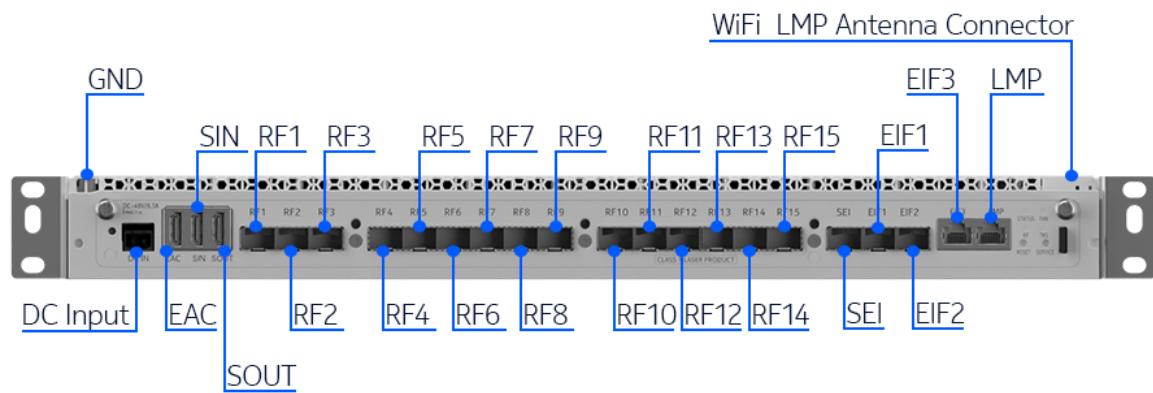


Table 8: ASOG interfaces

Interface	Label	Number of interfaces	Connector type	Additional information
Power	DC-IN	1	2-pole connector	-
Grounding	GND 	1	2 x M5 screw	-
External alarm connection	EAC	1	19PIN	Six alarm signals Six software-assignable signals for either alarm input or control output signals FSEB and FSEE compatible interface for alarm extension
Synchronization input	SIN	1	19PIN	Signals in: • GNSS synchronization • GSM frame flock and frame number • ITU G.703 2.048 MHz or 10 MHz GNSS control and power supply (14.8 V, GND)
Synchronization output	SOUT	1	19PIN	Signals out: • GNSS synchronization • GSM frame flock and frame number • ITU G.703 2.048 MHz or 10 MHz
Fronthaul	RF1-9	9	SFP56/SFP28/SFP+	• OBSAI RP3-01: 3.07 or 6.14 Gbps • CPRI: 4.91 or 9.83 Gbps with IQ compression • eCPRI: 10 Gbps (SFP+, SFP28, or SFP56), 25 Gbps (SFP28 or SFP56), 50 Gbps (SFP56) Support of self-tunable DWDM SFP introduced by the CB006519: SFP Controlled Fronthaul DWDM Auto-tuning feature (from 23R4 release)

Interface	Label	Number of interfaces	Connector type	Additional information
Fronthaul	RF10-12	3	SFP56/SFP28/SFP+	<ul style="list-style-type: none"> • OBSAI RP3-01: 6.14 Gbps • CPRI: 9.83 Gbps with IQ compression • eCPRI: 10 Gbps (SFP+, SFP28, or SFP56), 25 Gbps (SFP28 or SFP56), 50 Gbps (SFP56) <p>Support of self-tunable DWDM SFP introduced by the <i>CB006519: SFP Controlled Fronthaul DWDM Auto-tuning feature</i> (from 23R4 release)</p>
Fronthaul	RF13-15	3	SFP+	<ul style="list-style-type: none"> • OBSAI RP3-01: 3.07 or 6.14 Gbps • CPRI: 4.91, 6.14, or 9.83 Gbps with IQ compression
Extension	SEI ³	1	SFP56/SFP28/SFP+	10/25/50 Gbps, SyncE, ToP (1588 v2)
Backhaul	EIF1-2 ³	2	SFP56/SFP28/SFP+	<p>Supports 1, 10, 25, and 50 Gbps protocols, SyncE, ToP (IEEE 1588v2)</p> <p>EIF1 supports also XGS-PON SFP+ ONT with MAC and NG-PON2 SFP+ ONT with MAC</p> <p>EIF2 usable also for SEI purposes at 25/50 Gbps.</p>
Backhaul	EIF3	1	RJ45	100 Mbps, 1 and 10 Gbps Support for SyncE and ToP (IEEE 1588v2) ⁴
Local management port	LMP	1	RJ45	1 Gbps
WiFi LMP antenna connector	WiFi	1	RP-SMA	2.4/5 GHz WiFi 802.11a/b/g/n/ac Antenna included in the delivery, but not installed by default.

³ The backhaul ports of ASOG and ASOH (EIF1-2 and SEI) support 1 Gbps SFPs with a differential output voltage of < 1200 mV. Before you operate ASOG/H, ensure the installed classic SFPs don't exceed this limit to avoid signal distortion and permanent damage to the backhaul ports. For more details, see TS-BTS-HW-0365.

⁴ To achieve 10 Gbps over a long distances of up to 100 m (328 ft.), a shielded cable with a minimum AWG 23/1 solid bare copper wire and a high-quality connector is required. Nokia has successfully tested the cables listed in the table below.

Table 9: Tested 10 Gbps 100 m (328 ft.) cables

Cable vendor	Cable name	Cable details	Cable length	Connector vendor	Connector name
LAPP Group	ETHERLINE® H PiMF Cat. 6A	4 x 2 x AWG 22/1	100 m (328 ft.)	Telegaertner	MFP8 Cat 6A
EFB Elektronik	UC900 SS23 Cat. 7 S/FTP 4P	4 x 2 x AWG 23/1	100 m (328 ft.)	Telegaertner	MFP8 Cat 6A
Bitner	BiTLAN S/FTP Cat. 6A 500 MHz	4 x 2 x AWG 23/1	100 m (328 ft.)	Solarix	SXRJ45-6A-STP-BK-SA

Note:

Setting the **CABLINK Link** speed (linkSpeed) parameter to **Auto** isn't supported.
Don't leave an empty value for this parameter.

Figure 5: ASOH interfaces

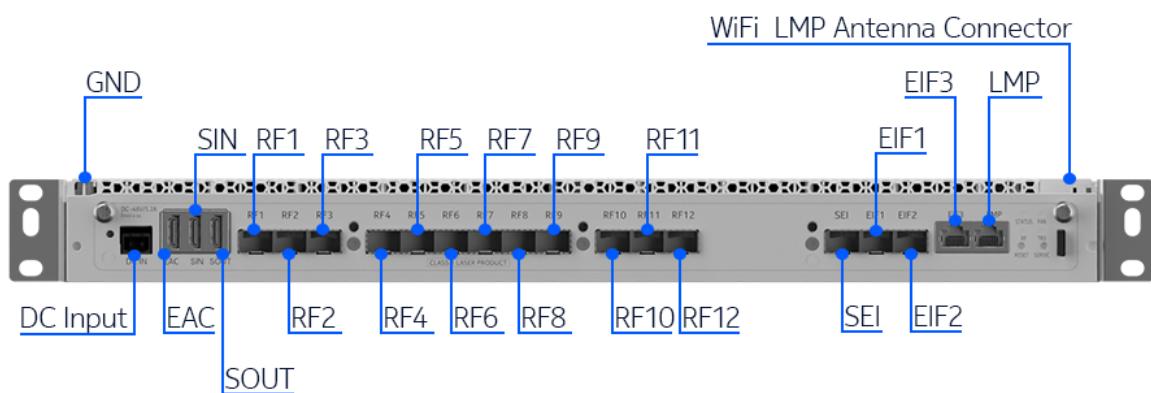


Table 10: ASOH interfaces

Interface	Label	Number of interfaces	Connector type	Additional information
Power	DC-IN	1	2-pole connector	-
Grounding	GND 	1	2 x M5 screw	-
External alarm connection	EAC	1	19PIN	Six alarm signals Six software-assignable signals for either alarm input or control output signals FSEB and FSEE compatible interface for alarm extension
Synchronization input	SIN	1	19PIN	Signals in: • GNSS synchronization • GSM frame flock and frame number • ITU G.703 2.048 MHz or 10 MHz GNSS control and power supply (14.8 V, GND)
Synchronization output	SOUT	1	19PIN	Signals out: • GNSS synchronization • GSM frame flock and frame number • ITU G.703 2.048 MHz or 10 MHz
Fronthaul	RF1-12	12	SFP56/SFP28/SFP+	• OBSAI RP3-01: 3.07 or 6.14 Gbps • CPRI: 4.91 or 9.83 Gbps with IQ compression • eCPRI: 10 Gbps (SFP+, SFP28, or SFP56), 25 Gbps (SFP28 or SFP56), 50 Gbps (SFP56) Support of self-tunable DWDM SFP introduced by the CB006519: SFP Controlled Fronthaul DWDM Auto-tuning feature (from 23R4 release)

Interface	Label	Number of interfaces	Connector type	Additional information
Extension	SEI ⁵	1	SFP56/SFP28/SFP+	10/25/50 Gbps, SyncE, ToP (1588 v2)
Backhaul	EIF1-2 ⁵	2	SFP56/SFP28/SFP+	Supports 1, 10, 25, and 50 Gbps protocols, SyncE, ToP (IEEE 1588v2) EIF1 supports also XGS-PON SFP+ ONT with MAC and NG-PON2 SFP+ ONT with MAC EIF2 usable also for SEI purposes at 25/50 Gbps.
Backhaul	EIF3	1	RJ45	100 Mbps, 1 and 10 Gbps Support for SyncE and ToP (IEEE 1588v2)
Local management port	LMP	1	RJ45	1 Gbps
WiFi LMP antenna connector	WiFi	1	RP-SMA	2.4/5 GHz WiFi 802.11a/b/g/n/ac Antenna included in the delivery, but not installed by default.

⁵ The backhaul ports of ASOG and ASOH (EIF1-2 and SEI) support 1 Gbps SFPs with a differential output voltage of < 1200 mV. Before you operate ASOG/H, ensure the installed classic SFPs don't exceed this limit to avoid signal distortion and permanent damage to the backhaul ports. For more details, see TS-BTS-HW-0365.

5. ASOG/H core unit LED indicators

List and description of core unit LED indicators

All LEDs are three-color (red, green, and yellow) and have three possible states when lit:

- Stable
- Blinking
- Alternating colors

Figure 6: ASOG and ASOH LED indicators



Table 11: Core unit LED description

LED name	Color	Status	Description
Status	Red	Stable	Hardware resetting or failed
		Blinking	Hardware degraded
	Green	Stable	Hardware online or commissioning configured
		Blinking	Software download or commissioning configuration in progress (in runtime phase)
	Yellow	Stable	Commissioning data not uploaded
		Blinking	Software downloading or commissioning configuring (in start-up phase)
	Red/Yellow	Alternating	Autoconnection state: rejected or registered NOK
	Green/Red	Alternating	Autoconnection state: registered
	Green/Yellow	Alternating	Autoconnection state: completed
	Green	Stable	PfOE enabled and working
VDC (PfOE ¹) (ASOF and ASOFA only) ²	Red	Stable	PfOE enabled but not working
	Off	-	PfOE disabled and not working
	Red	Stable	Fans not working
	Green	Stable	Fans working
Fan status	Yellow	Stable	All other cases
	Off	-	Fans not in use

LED name	Color	Status	Description
Common status for all the RF interfaces	Green	Stable	At least one link active
	Green	Blinking	Optical link self-tuning (ASOE only)
	Yellow	Stable	Faulty/non-compliant or missing SFP module in one of RF ports
	Red	Stable	One of the optical links failed
	Red	Blinking	One of the optical links degraded
	Off	-	Links not active
Common status for all the TRS interfaces	Off	-	EIF ports not in use
	Green	Stable	Both EIF ports in use, both links active
			One EIF port in use, link active. The other EIF port not in use
	Yellow	Stable	Both EIF ports in use, but SFP modules missing, non-compliant or faulty
			One EIF port in use, SFP module missing, non-compliant or faulty. The other EIF port not in use
	Red	Stable	Both EIF ports in use, SFP module present, no signal detected
			One EIF port in use, SFP module present, but no link detected. The other EIF port not in use
	Green/Yellow	Alternating	Both EIF ports in use, but link active on only one of them. In the other EIF slot, the SFP module missing, non-compliant or faulty
	Red/Green	Alternating	Both EIF ports in use, but link active only on one of them
	Red/Yellow	Alternating	Both EIF ports in use. In one slot the SFP module missing, non-compliant or faulty. On the other EIF port the link not detected

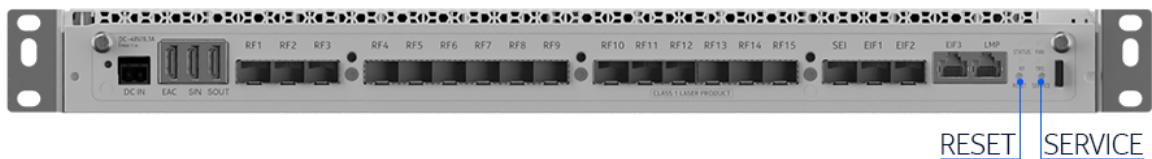
¹ Nokia proprietary version of PoE

² VDC (PfoE) LED can't indicate the correct PfoE status during ASOF reconfiguration reset.

6. ASOG/H reset and service buttons

Functionality of reset and service buttons

Figure 7: ASOG and ASOH reset and service buttons

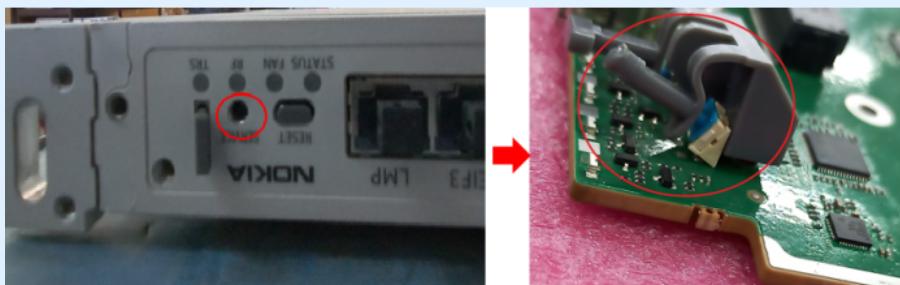


Reset button

! Notice:

Lightly press the reset button with a pen or screwdriver until you see the LED status change. Do not press too hard as it may damage the unit.

Figure 8: Damaged button example



Pressing the reset button for less than five seconds resets the core unit and, therefore, the BTS. The unit reboots into the active software (the same as the running software in the nominal scenario before the reset button was pressed).

Pressing the reset button for more than five seconds resets the core unit and, therefore, the BTS. The unit reboots into the active software (the same as the running software in the nominal scenario before the reset button was pressed). The commissioning data is cleared, but security parameters are kept. The BTS must be recommissioned.

A reset is required to apply new commissioning information.

Service button

 **Note:**

Support of this button is subject to software support. Please check the corresponding software release documentation for information on any specific handling instructions and restrictions regarding the service button.

Pressing the service button resets the core unit and, therefore, the BTS. The unit reboots to fail-safe software (fail-safe boot). Fail-safe boot mode enables the unit to boot when the nominal software is corrupted.

7. ASOG/H auxiliary items

List of supported auxiliary items for core units

Table 12: ASOG/H auxiliary items

Product code	Name
474923A	AMEB AirScale mmWave pole mount kit
475736A	AMED 20 degree tilt mmWave pole mount kit
476445A	AMHC external heater for ASOG
476407A	AMJJ outdoor cable entry
475880A	AMJB rack installation kit
475881A	AMJC wall mount kit
475882A	AMJD rail mount kit
476408A	AMJK piggyback mounting kit
474580A	AMRA AirScale one-clip bracket 51-125
474583A	AMRC AirScale one-clip rail 600 mm
470316A	EMHA Flexi module casing
473187A	EMHH Flexi 3U casing
471649A	FPKA Flexi pole mounting kit
472821A	FPKC Flexi pole mounting kit
475984A	AMJF fiber adapter
475985A	AMJG power cable adapter
475883A	AMJP power cable, 2 m
475879A	ATBT SFP28 to SFP28 OD DAC cable, 1 m

8. ASOG/H water indicator sticker

Description of the water indicator sticker on core units

AirScale ASOG/H core units have a water indicator sticker located on the front panel.

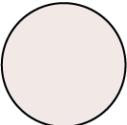
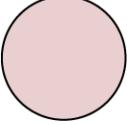
Water indicator stickers change color from white to red in contact with water or high humidity when the system module is used outside of nominal operation conditions. For environmental requirements, see .

The figure below shows ASOG as an example, but the location for ASOH is the same.

Figure 9: ASOG and ASOH water indicator sticker location



Table 13: Water indicator sticker color meaning

Color	Description
White 	Relative humidity conditions meet the Nokia requirements after 30 or more days of environmental exposure.
Pink 	Relative humidity conditions may be elevated after 30 or more days of environmental exposure. Verify the site and enclosure conditions to meet the Nokia requirements.
Red or partially red  	The Nokia requirements for relative humidity conditions aren't met. Take an immediate action to improve the site and enclosure conditions to meet the Nokia requirements and prevent further damage to core units.

Nokia recommends checking the water indicator stickers during routine site visits, not only when replacing a damaged unit.

Warranty

If the water indicator sticker shows that the core unit has been used outside of the specified environmental conditions (the red or partially red color of the sticker), a product warranty for such unit is potentially void.

When a field-replaced core unit is returned to the Nokia repair center for a repair:

- Check the color of the water indicator sticker on the returned unit.
- Write the water indicator color status (white, pink, red, or partially red) in the Nokia failure report.

9. AirScale naming conventions

Explanation of abbreviations in AirScale hardware product names

Abbreviated product names

Table 14: AirScale naming convention

Letter	Description
First letter A _ _	AirScale product family
First letter F _ _	Flexi Multiradio 10 BTS product family, first generation of AirScale remote radio heads (RRHs), or ASMR extension modules
First letter P _ _	IPAA+ Platform Antennas (PFAs)
Second letter _ A _ _	Antenna equipment, band combiner, or macro massive MIMO adaptive antennas (MAAs)
Second letter _ B _ _	Capacity plug-in units
Second letter _ C _ _	Cabinet or cabinet accessories
Second letter _ D _ _	Diplexers or fronthaul switches
Second letter _ E _ _	Macro or small cells TDD MAAs
Second letter _ F _ _	Interference cancellation or IPAA+ PFAs
Second letter _ H _ _	Macro or micro FDD RRHs or repeater interface units (RIUs)
Second letter _ J _ _	NR radio access points (RAPs)
Second letter _ K _ _	Macro TDD RRHs
Second letter _ L _ _	Low-noise mast head amplifiers (MHAs)
Second letter _ M _ _	Subracks or mounting kits

Letter	Description
Second letter _ N _ _	Compact active antenna (CAA) solution
Second letter _ O _ _	Small form-factor pluggables (SFPs)
Second letter _ P _ _	Power supply units (PSUs)
Second letter _ Q _ _	Macro TDD MAAs
Second letter _ R _ _	Macro FDD radio units (RUs)
Second letter _ S _ _	Control plug-in units, core units, fan units, or external alarm modules
Second letter _ T _ _	Transport modules, submodules, or cables
Second letter _ V _ _	Macro TDD MAAs
Second letter _ W _ _	AirScale mmWave Radios (ASMRs) or micro or pico RRHs
Second letter _ Y _ _	GNSS equipment and accessories
Second letter _ Z _ _	Macro or micro RRHs
Third letter _ _ I _	Indoor usage (system module or cabinet)
Third letter _ _ O _	Outdoor usage (system module or cabinet)
Third (and consecutive) letter _ _ X _	<p>In the case of single-band RUs, it's the number of the supported band. In the case of multi-band RUs, there may be more letters, depending on the number of supported bands (for example, _ _ xx_). For the letter corresponding to the supported band, see Table: Radio bands naming convention.</p>

Letter	Description
Fifth letter ____A	In some special cases, the fifth letter in system modules may be added to denote a market- or customer-specific variant. For example, ASIAA is the same as ASIA but it has a different DC input connector.
Fifth letter ____I	Specific for AEQx: IPAA version of MAA with interleaved mMIMO and passive low-band antenna arrays shown with "I", for example, AEQE_I.
Fifth letter AB __ L AM __ L AS __ L	Liquid-cooled variant of system module (capacity plug-in unit/subrack/control plug-in unit)
Last letter (fourth or higher) ___ A	Hardware variant: A - the first, B - the second, and so on

For the following RUs, the second letter indicates the unit type:

- AA - AirScale FDD/TDD MAAs
- AE - AirScale TDD MAAs
- AH - AirScale FDD RRHs or RIUs
- AK - AirScale TDD RRHs
- AQ - AirScale TDD MAAs
- AR - AirScale FDD RUs
- AV - AirScale TDD MAAs
- AW - AirScale ASMR or FDD/TDD micro/pico RRHs
- AZ - AirScale TDD RRHs or FDD/TDD micro RRHs
- FH, FR - Flexi and AirScale RRHs

The third letter for single-band RUs, the third and consecutive letters for multi-band RUs (except the last one), and the fourth letter for AWHxx micro RRHs indicate the operating 3GPP band for the respective technology (LTE or NR), as in the table below. If an RU supports more than one frequency band, the respective letters are given one after another. For example, AHPMDA is a triple-band RRH for NR and LTE, where the letters PMD describe the bands it supports—LTE B8/B20/B28 and NR n8/n20/n28.

Table 15: Radio bands naming convention

Letter	Band
A	400 MHz
B	B13, B14, n14 (above 700 MHz)
C	B5, B18, B26, n5, n18, n26 (850 MHz)
D	B8, n8 (900 MHz)
E	B3, n3 (1700 MHz and 1800 MHz)
F	B2, B25, n2, n25 (1900 MHz)
G	B1, B65, n1, n65 (2100 MHz)
H	B7, B38, B41, n7, n38, n41 (2600 MHz)
I	B66, n66 (1700 and 2100 MHz)
J	(2000 MHz)
K	B11, B24, B50, B54, n24, n50 (1500 MHz)
L	B12, B17, B29, B85, n12, n29 (below 700 MHz)
M	B20, n20 (800 MHz EU)
N	B30, B40, n30, n40 (2300 MHz)
O	B71, n71 (600 MHz US)
P	B28, B68, n28 (700 MHz)
Q	B42, B43, B48, n42, n48, n77, n78 (3500 MHz – 4200 MHz)
R	B46 (5000 MHz – 6000 MHz)
S	B32, B75 (SDL* 1400 MHz)
T	n79 (4400 MHz – 5000 MHz)
U	n257, n258, n261 (24 GHz – 28 GHz)
W	n260 (39 GHz)

*SDL - supplemental downlink

Commercial product names

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

Control and capacity plug-in units are named after a wind, for example:

- Chinook – ASIL control plug-in unit
- Fremantle – ABIO capacity plug-in unit
- Levante – ABIP capacity plug-in unit
- Lodos – ABIQ capacity plug-in unit
- Ostro – ABIN capacity plug-in unit
- Ponente – ASIM control plug-in unit

Core units are named after a wind, for example:

- Tuuli 12 – ASOE
- Tuuli 6 – ASOF

Radio units (RUs) and Massive MIMO Adaptive Antennas (MAAs) are named after a bird of prey, for example:

- Osprey 8 – 8T8R RRH
For example: AirScale RRH 8T8R n78 320 W AKQZ
- Osprey 32 – 32T32R MAA
For example: AirScale MAA 32T32R 128 AE n78 240 W AQQQ
- Osprey 64 – 64T64R MAA
For example: AirScale MAA 64T64R 192 AE n78 320 W AQQE
- Pandion 4 – 4T4R FDD RRH
For example: AirScale Dual RRH 4T4R B25/66 480 W AHFII
- Habrok 64 – 64T64R MAA
For example: AirScale MAA 64T64R 192 AE n78 320 W AVQL

Note:

- RUs from release 5.1 are renamed to AirScale 2 RUs.
- Release 6.1 refers to RUs based on Reefshark 6601 SoC.

10. Appendix: Core unit connectors pin maps

Pin maps of Nokia-specific connectors

10.1 ASOG and ASOH DC input connector pin map

Use a cable with diameter ranging from $2 \times 2.5 \text{ mm}^2$ (13 AWG) to $2 \times 4 \text{ mm}^2$ (11 AWG).

Figure 10: ASOG/H DC input

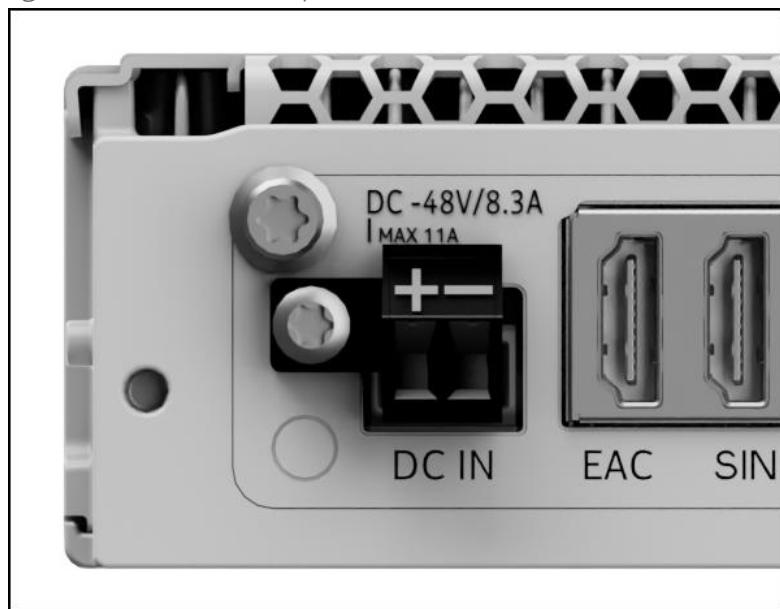


Table 16: ASOG/H DC input connector

Pin	Signal (-48 V DC)	Cable diameter
Left (+)	V48RTN (+)	From $2 \times 2.5 \text{ mm}^2$ (13 AWG) to $2 \times 4 \text{ mm}^2$ (11 AWG)
Right (-)	V48N (-)	

10.2 ASOG and ASOH grounding connector

You can connect the grounding to ASOG/H or AMJJ.

Figure 11: Top ASOG/H grounding connector



Figure 12: AMJJ left-side grounding connector

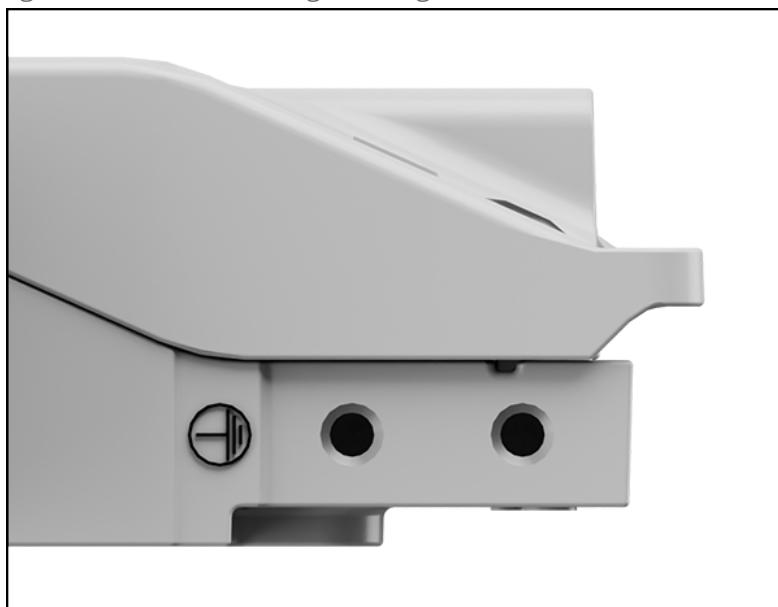


Figure 13: AMJJ right-side grounding connector



Table 17: ASOG/H grounding connector

Core unit	Grounding connector
ASOG/H (with or without AMJJ)	2 x M5 screw hole

10.3 External alarm connection connector pin map

External alarm connection (EAC) uses a 19PIN connector port. The connector is marked EAC on the unit.

Figure 14: EAC pins order

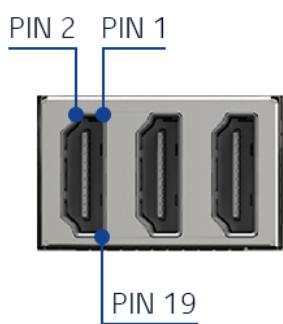


Table 18: EAC pin map

Pin	Signal
case	ground / chassis ground
1	EXT_AL0
2	EXT_AL1
3	EXT_AL2
4	EXT_AL3
5	EXT_AL4
6	EXT_AL5
7	EXT_CTRL0_EXT_AL6
8	EXT_CTRL1_EXT_AL7
9	EXT_CTRL2_EXT_AL8
10	EXT_CTRL3_EXT_AL9
11	EXT_CTRL4_EXT_AL10
12	EXT_CTRL5_EXT_AL11
13	P5V_EAC
14	P5V_EAC
15	PROT_CAN_H_P5V_EAC
16	GND
17	PROT_CAN_L_P5V_EAC
18	GND
19	GND

10.4 External synchronization input connector pin map

Synchronization input uses a 19PIN connector port. The connector is marked as SIN on the plug-in unit.

Figure 15: SIN pins order

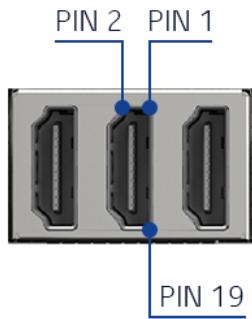


Table 19: External synchronization input connector pin map

Pin	Signal	Pin	Signal
1	GPS_TIME_IN_H GSM_FC_IN_H	2	SingleEndedIn
3	GPS_TIME_IN_L GSM_FC_IN_L	4	GND
5	NC	6	GND
7	GPS_PPS_IN_H GSM_FN_IN_H	8	NC
9	GPS_PPS_IN_L GSM_FN_IN_L	10	GPS_CONTROL_H
11	GND	12	GPS_CONTROL_L
13	GND	14	NC
15	GPS_PWR_RET	16	GND
17	GND	18	GPS_PWR
19	NC	-	-

Signal descriptions:

- GPS_TIME_IN_H, GSM_FC_IN_H, GPS_TIME_IN_L, GSM_FC_IN_L: Serial data from GPS to CPU or GSM Frame Clock input; RS422/485 differential.
- SingleEndedIn: REF2M_IN REF10M_IN Accepts TTL/CMOS and SINE from -6 to +13 dBm. Input impedance is approximately 75 Ohm.
- NC: No connection.
- GPS_PPS_IN_H, GSM_FN_IN_H, GPS_PPS_IN_L, GSM_FN_IN_L: PPS pulse from GPS or GSM Frame Number input; RS422/485 differential.
- GPS_CONTROL_H, GPS_CONTROL_L: Serial data from CPU to GPS; RS422/485 differential.
- GPS_PWR, GPS_PWR_RET: GPS power supply: 50 mA at 15 to >35 V.

10.5 External synchronization output connector pin map

Synchronization output uses a 19PIN connector port. The connector is marked as SOUT on the plug-in unit.

Figure 16: SOUT pins order

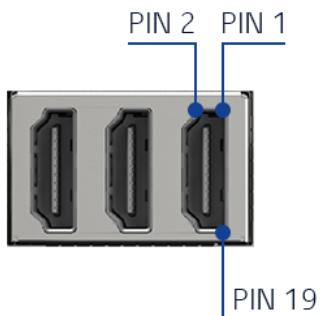


Table 20: External synchronization output connector pin map

Pin	Signal	Pin	Signal
1	GPS_TIME_OUT_H GSM_FC_OUT_H	2	SingleEndedClockOut1
3	GPS_TIME_OUT_L GSM_FC_OUT_L	4	GND
5	NC	6	GND
7	PPS_OUT_H	8	SingleEndedClockOut2
9	PPS_OUT_L	10	DiffClockOut_H or GSM_FN_OUT_H
11	GND	12	DiffClockOut_L or GSM_FN_OUT_L
13	GND	14	NC
15	-	16	GND
17	GND	18	NC
19	TESTCLK_GSM_FN_OUT_H	-	-

Signal descriptions:

- GPS_TIME_OUT_H, GSM_FC_OUT_H, GPS_TIME_OUT_L, GSM_FC_OUT_L: Copy of the serial data from GPS to CPU. The collocated BTS is only interested in the NMEA contents of this data stream or GSM Frame Clock output; RS422/485 differential or frame clock out.
- SingleEndedClockOut1: LVTTL, which can have 11 sources: 2.048 MHz (from SingleEndedIn), 10 MHz (from SingleEndedIn), 10 MHz (FPGA internally generated), FCLK_IN 250 Hz, SYNC_WFCLK 30.72 MHz, SYNC_SFCLK 100 Hz, SYNC_SFCLK/2 50 Hz, SYNC_SFCLK/4 25 Hz, SYNC_SFCLK/8 12.5 Hz, SFNO 30.72 MHz pulse per 10 ms, Internal PPS_int 1 Hz.
- PPS_OUT_H, PPS_OUT_L: PPS_OUT RS422/485 differential.
- SingleEndedClockOut2: LVTTL, which can have two sources: 2.048 MHz (from SingleEndedIn), 10 MHz (from SingleEndedIn).
- DiffClockOut_H or GSM_FN_OUT_H, DiffClockOut_L or GSM_FN_OUT_L: Has 12 potential clock sources: 2.048 MHz (from SingleEndedIn), 10 MHz (from SingleEndedIn), 10 MHz (FPGA internally generated), FCLK_IN 250 Hz, SYNC_WFCLK 30.72 MHz, SYNC_SFCLK 100 Hz, SYNC_SFCLK/2 50 Hz, SYNC_SFCLK/4 25 Hz, SYNC_SFCLK/8 12.5 Hz, SFNO 30.72 MHz pulse per 10 ms, Internal PPS_int 1 Hz, GSM FRAME number.

- TESTCLK_GSM_FN_OUT_H: Single ended copy of pins 10/12.