Hit U4
LTE modem

powered by CINTERION WIRELESS MODULES

v1.0

Contents

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1. Introduction

This document describes the hardware of HCP LTE terminal Hit U4, with interface specifications, electrical and mechanical characteristics.

Hit U4 terminal is intended to use in variety of M2M application.

1.1 Related documents

[1] PLS8-E AT command set
[2] PLS8-E Hardware interface description

1.2 Safety Precautions

Safety precautions must be observed during all phases of the operation, usage, service or repair of any cellular terminal from HCP d.o.o.

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	When in hospitals or other health care facilities, observe the restrictions on the use of mobiles. Switch off the cellular terminal or mobile if to be instructed to do so by the guidelines posted in sensitive areas. Medical equipment may be sensitive to RF energy. The operation of cardiac pacemakers, other implanted medical equipment and hearing aids can be affected by interference from cellular terminals or mobiles placed close to the device. If in doubt about potential danger, contact the physician or the manufacturer of the device to verify that the equipment is properly shielded. Pacemaker patients are advised to keep their hand-held mobile away from the pacemaker, while it is on. This personal subgroup always should check the distance to the mobile
	Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it cannot be switched on inadvertently. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communications systems. Failure to observe these instructions may lead to the suspension or denial of cellular services to the offender, legal action, or both. Check the local and actual laws about these themes.
	Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.
	Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. Remember that interference can occur if it is used close to TV sets,radios, computers or inadequately shielded equipment. Follow any special regulations and always switch off the cellular terminal or mobile wherever forbidden, or when you suspect that it may cause interference or danger.
	Road safety comes first! Do not use a hand-held cellular terminal or mobile while driving a vehicle unless it is securely mounted in a holder for speakerphone operation. Before making a call with a hand-held terminal or mobile park the vehicle. Speakerphones must be installed by qualified personnel. Faulty installation or operation can constitute a safety hazard. Check the actual and local laws about these themes.
 	**IMPORTANT!** Cellular terminals or mobiles operate using radio signals and cellular networks. In that case connections cannot be guaranteed at all times under all conditions. Therefore, you should never rely solely upon any wireless device for essential communications, for example emergency calls. Remember, in order to make calls or receive calls the cellular terminal or mobile must be switched on in a service area with adequate cellular signal strength. Some networks do not allow for emergency calls if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may need to deactivate those features before you can make an emergency call. Some networks require a valid SIM card to be properly inserted in the cellular terminal or mobile.
	If a power supply unit is used to supply the device it must meet the demands placed on SELV circuits in accordance with EN60950. The maximum permissible connection length between the device and the supply source should not exceed 3m.
	According to the guidelines for human exposure to radio frequency energy, an antenna connected to the FME jack of the device should be placed at least 20cm away from human bodies.

2. Packaging

The package content of the Hit U4 LTE terminal consists of:

- Hit U4
- Holding brackets
- package box with product label

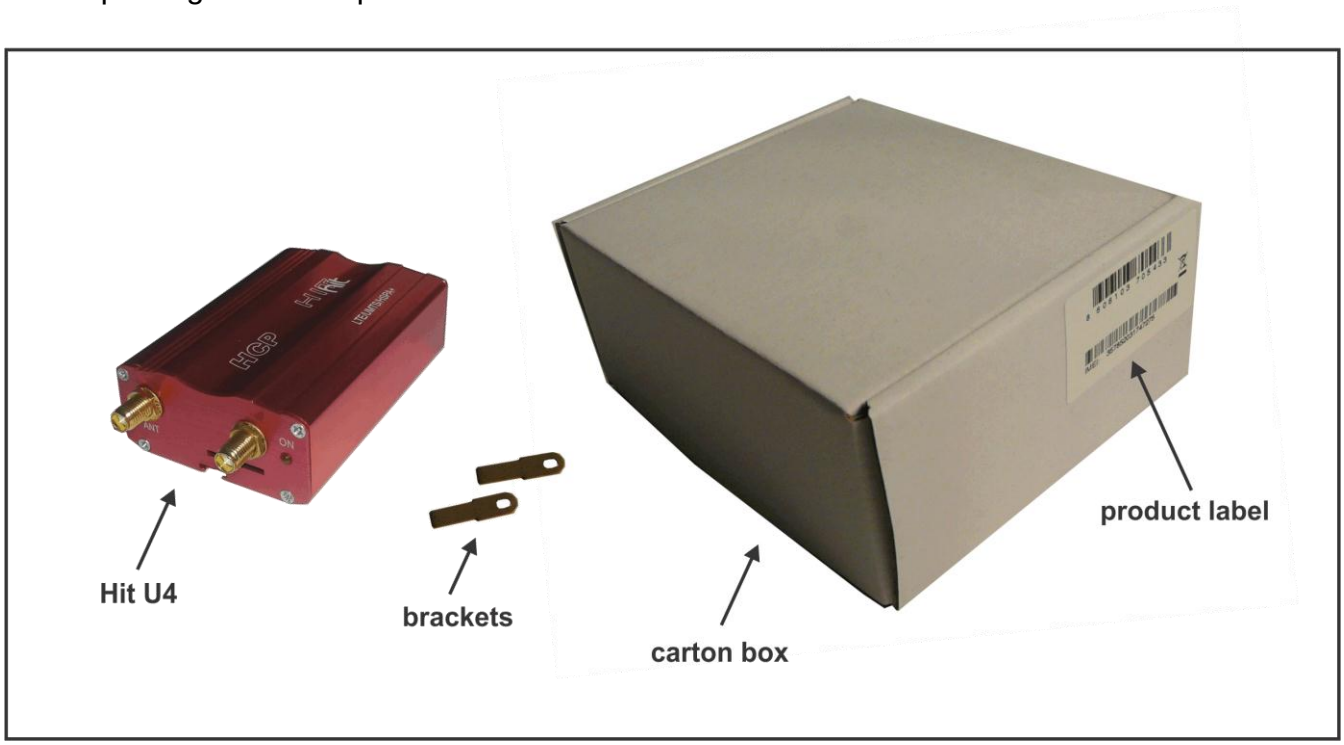


Figure 1. Package contents

Packaging box is a carton box with following dimensions:

- width: 130 mm
- height: 70 mm
- length: 155 mm

Package label is on the carton box and contains information:

- name of the product
- barcode of the product
- IMEI of LTE module

This label with same informations is placed also on the back side of Hit U4 terminal.

3. Key features

Feature	Implementation
General	
Incorporates Cinterion PLS8-E module	The PLS8-E module handles all processing for signal and data within the Hit U4 Terminal.
Frequency bands	GSM/GPRS/EDGE: Dual band, 900/1800MHz UMTS/HSPA+: Triple band, 900 (BdVIII) / 1800 (BdIII) / 2100MHz (BdI) LTE: Five band, 800 (Bd20) / 900 (Bd8) / 1800 (Bd3) / 2100 (Bd1) / 2600MHz (Bd7)
GSM class	Small MS
Output power (according to Release 99)	Class 4 (+33dBm ±2dB) for EGSM900 Class 1 (+30dBm ±2dB) for GSM1800 Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD BdI Class 3 (+24dBm +1/-3dB) for UMTS 1800, WCDMA FDD BdIII Class 3 (+24dBm +1/-3dB) for UMTS 900, WCDMA FDD BdVIII
Output power (according to Release 8)	Class 3 (+23dBm +-2dB) for LTE 2600, LTE FDD Bd7 Class 3 (+23dBm +-2dB) for LTE 2100, LTE FDD Bd1 Class 3 (+23dBm +-2dB) for LTE 1800, LTE FDD Bd3 Class 3 (+23dBm +-2dB) for LTE 900, LTE FDD Bd8 Class 3 (+23dBm +-2dB) for LTE 800, LTE FDD Bd20
Power supply	Single supply voltage 8V to 24V DC
Operating temperature	Normal operation: -30°C to +80°C
Physical	Dimensions: 78mm x 54 x 26mm Weight: approx. 100 g
RoHS	All hardware components fully compliant with EU RoHS Directive
LTE features	
3GPP Release 9	UE CAT 3 supported **DL 100Mbps, UL 50Mbps** 2x2 MIMO in DL direction
HSPA features	
3GPP Release 8	UE CAT. 14, 24 DC-HSPA+ – DL 42Mbps HSUPA – UL 5.76Mbps Compressed mode (CM) supported according to 3GPP TS25.212
UMTS features	
3GPP Release 8	PS data rate – 384 kbps DL / 384 kbps UL

Feature	Implementation
GSM / GPRS / EGPRS features	
Data transfer	GPRS: • Multislot Class 12 • Mobile Station Class B • Coding Scheme 1 – 4 EGPRS: • Multislot Class 12 • EDGE E2 power class for 8 PSK • Downlink coding schemes – CS 1-4, MCS 1-9 • Uplink coding schemes – CS 1-4, MCS 1-9 • SRB loopback and test mode B • 8-bit, 11-bit RACH • 1 phase/2 phase access procedures • Link adaptation and IR • NACC, extended UL TBF • Mobile Station Class B
SMS	Point-to-point MT and MO Cell broadcast Text and PDU mode
Software	
AT commands	Hayes, 3GPP TS 27.007 and 27.005, and proprietary Gemalto M2M commands
Firmware update	Generic update from host application over USB
U/SIM application toolkit	USAT letter c; with BIP
Interfaces	
USB	USB 2.0 High Speed (480Mbit/s) device interface
SIM interface	Supported SIM cards: 3V, 1.8V
Antenna	Connected via antenna SMA connector 50Ω. GSM/UMTS/LTE main antenna, UMTS/LTE Diversity/MIMO antenna
Power on/off, Reset	
Power on	Automatic switch on when power supply is attached
Power off	• By removing power supply • Automatic switch-off in case of critical temperature and voltage conditions
Reset	Orderly shutdown and reset by AT command
Features	
Always ON	Integrated watchdog monitors power pin and turns on LTE module in case that module shuts down.

Table 1. *Key features of Hit U4 terminal*

4. Interface Description

4.1 Overview

Hit U4 provides the following connectors for power supply, communication interface and antennas:

1. Power Input – DC 2.1 jack
2. Communication interface - USB type B interface
3. Antennas - 2 SMA antenna connector, one for GSM/UMTS/LTE main antenna and one for diversity antenna
4. Status LED
5. SIM card holder

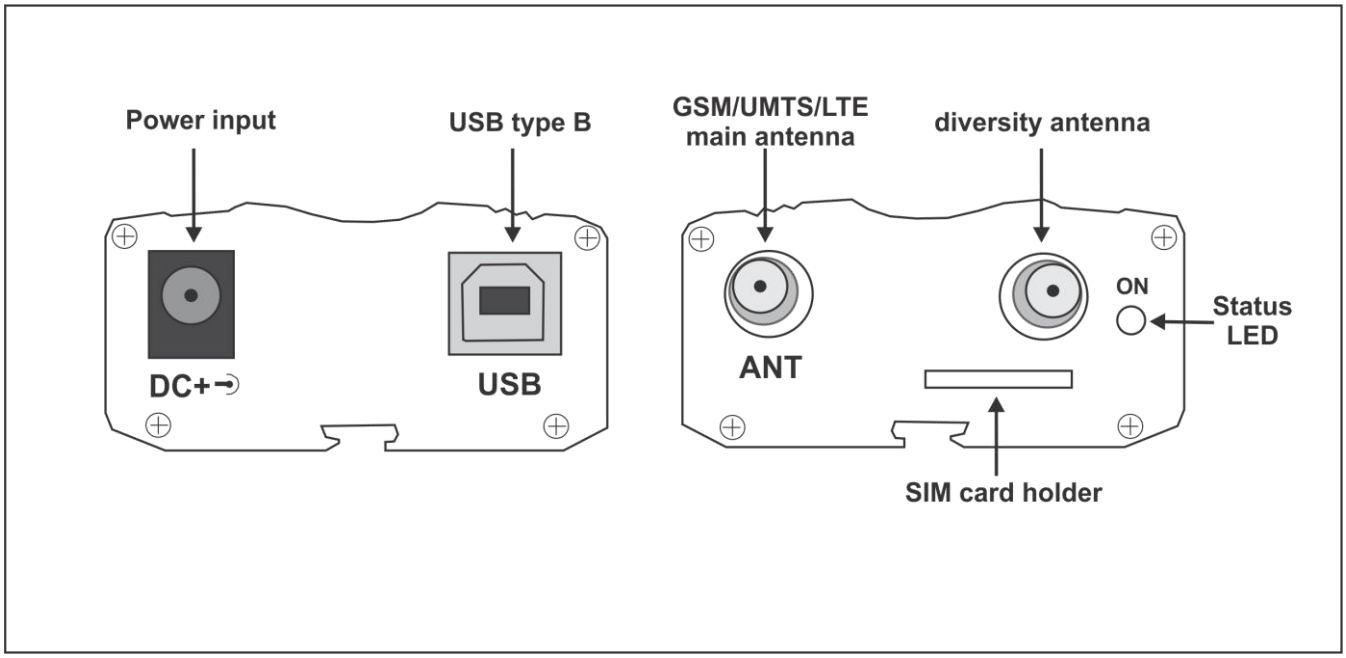


***Figure 2**. Hit U4 interfaces*

4.2 Block diagram

Figure bellow shows a block diagram Hit U4 terminal.

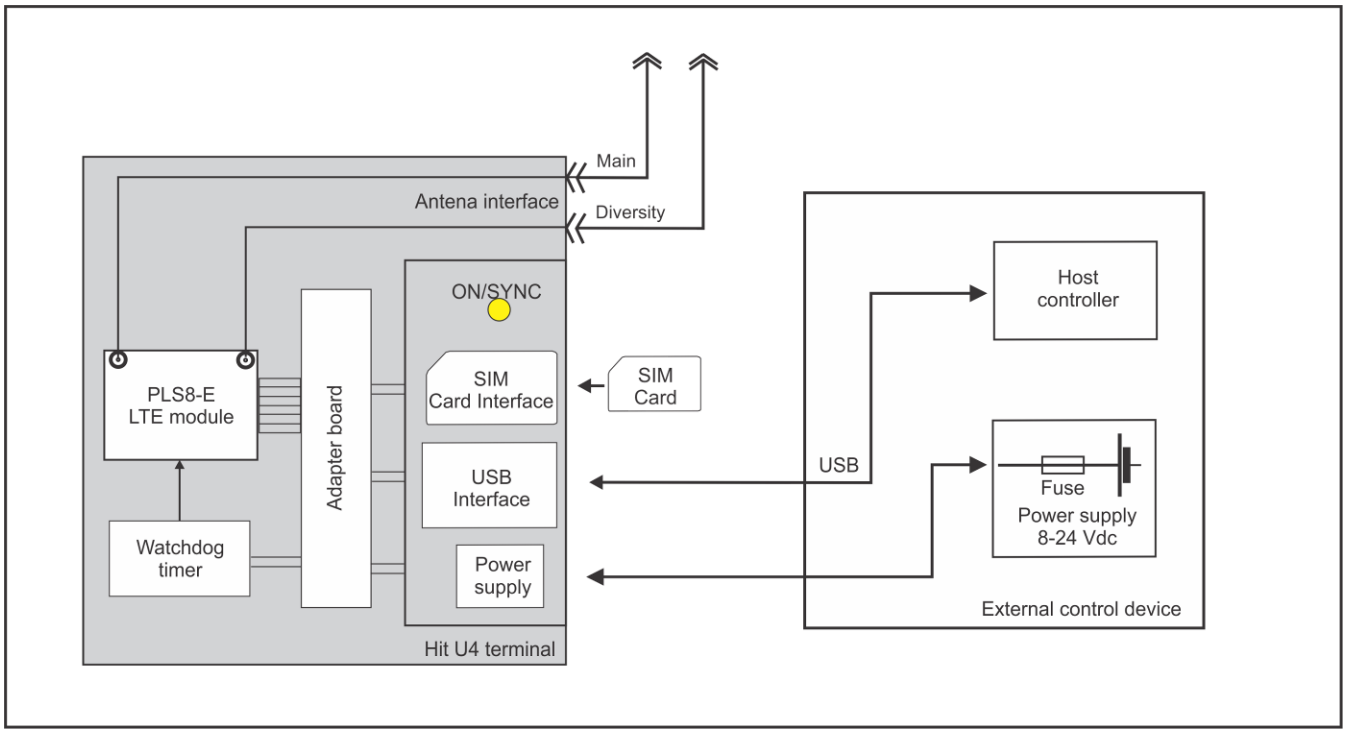


***Figure 3**. Block diagram of Hit U4*

4.3 Operating Modes of GSM module in Hit U4

Mode	Function	
Normal operation	GSM / GPRS / UMTS / HSPA / LTE SLEEP	Power saving set automatically when no call is in progress and the USB connection is detached.
	GSM / GPRS / UMTS / HSPA / LTE IDLE	Power saving disabled or an USB connection active, but no data transfer in progress.
	GPRS DATA	GPRS data transfer in progress. Power consumption depends on network settings (e.g. power control level), uplink / downlink data rates and GPRS configuration (e.g. used multislot settings).
	EGPRS DATA	EGPRS data transfer in progress. Power consumption depends on network settings (e.g. power control level), uplink / downlink data rates and EGPRS configuration (e.g. used multislot settings).
	UMTS DATA	UMTS data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate.
	HSPA DATA	HSPA data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate.
	LTE DATA	LTE data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate.
Airplane mode	Airplane mode shuts down the radio part of the module, causes the module to log off from the GSM/GPRS network and disables all AT commands whose execution requires a radio connection. Airplane mode can be controlled by AT command (see [1]).	

Table 2. *Operating modem of PLS8-E module*

For more information about operating modes of PLS8-E module please refer to [1] and [2].

4.4 Power supply

Power supply for Hit U4 has to be single voltage source from +8V to +24V DC, capable of providing a peak current of 2A at 12V during an active transmission. The uplink burst causes strong ripple (drop) on the power lines. The drop voltage should not exceed 1V, but the absolute minimum voltage during drops must be >7.6V. The Hit U4 is protected from supply voltage reversal connection.

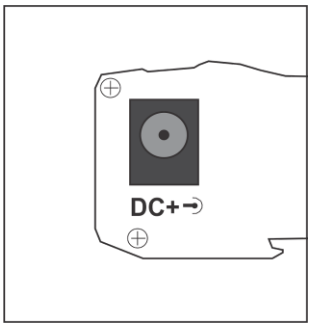


Figure 4. *DC 2.1 jack – power supply connector on Hit U4*

Singal name	Use	Parameters
Vcc	Positive power supply	8V – 24V DC
GND	Ground	0V

Table 3. *Power supply ratings*

4.5 Turn on

Hit U4 switches on automatically when power supply is attached. After start-up, the LTE module enters the net searching state.

Hit U4 has integrated hardware watchdog circuit which controls turn on state of LTE module.For detailed info about watchdog look on the next page.

4.6 Turn off

Turn off state of the LTE module is controlled by the watchdog mode. Please look watchdog mode info regarding turn on/turn off.

4.6 Automatic shutdown

Automatic shutdown takes effect if:

- The PLS8-E module board is exceeding the critical limits of overtemperature or undertemperature
- Undervoltage or overvoltage is detected

The automatic shutdown procedure is equivalent to the power down initiated with the AT^SMSO command, i.e. PLS8-E logs off from the network and the software enters a secure state avoiding loss of data.

Alert messages transmitted before the device switches off are implemented as Unsolicited Result Codes (URCs). The presentation of the temperature URCs can be enabled or disabled with the AT commands AT^SCTM.. For further instructions on AT commands refer to [1].

4.7 Watchdog

Hit U4 has integrated hardware watchdog circuit for ignition control and LTE module power on monitoring.

After power is supplied to Hit U4, ignition impulse is send to LTE module, if LTE module doesn't turn on after few seconds when power supply is attached, watchdog circuit continues to send ignition impulses until LTE module is turned on.

Watchdog has 4 different modes of operation which is selected by soldering WDT jumper resistors (short circuits) on Hit U4 pcb (location of WDT jumper resistor are shown on figures on next page).

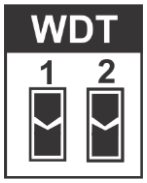
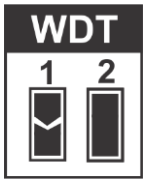
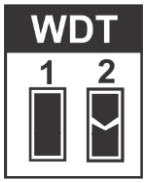
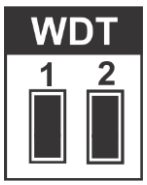
WDT pins	Mode	Info	Comment
	**Mode 1**	**Always ON**	**Factory Default** **WDT pins not soldered**
	Mode 2	Only turn ON	Pin 2 soldered
	Mode 3	1h reset	Pin 1 soldered
	Mode 4	8h reset	Both pins soldered

Table 4. *Watchdog modes*

By default, selected mode is "always ON".

To access Watchdog jumper resistors, you must carefully unscrew 4 screws on one side of Hit U4 terminal.

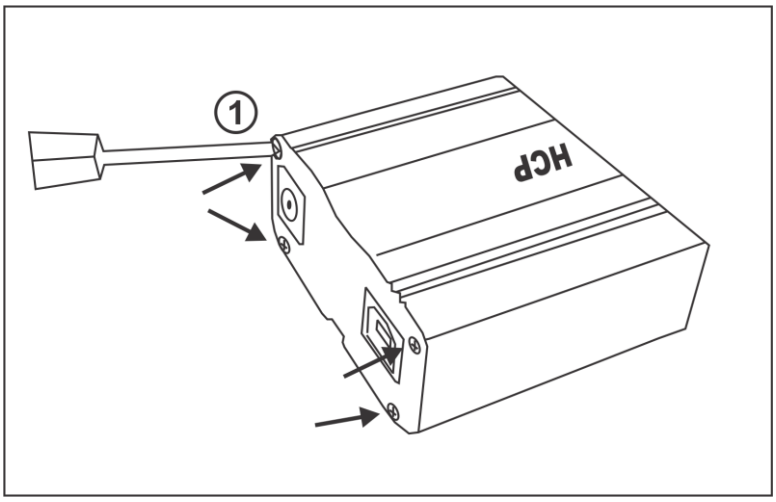


Figure 5. *Unscrewing Hit U4*

After removing one side of Hit U4 terminal (side with USB connector or side with antenna connector) gently pull or push pcb to access WDT jumper resistors. WDT jumper resistor are located behind USB connector.

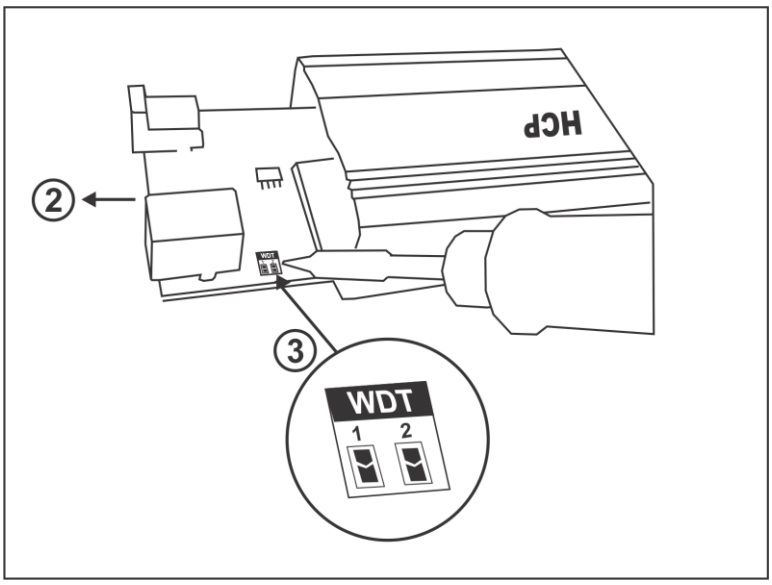


Figure 6. *Soldering WDT jumper resistors for Watchdog mode selection*

With soldering iron create short circuit on WDT pin 1 or pin 2 depending on desired watchdog mode.

Note*:*
Take care when unscrewing, removing pcb and using soldering iron in order not to hurt yourself. In case on any failure (scratched housing, terminal won't work, physical damage,) after intervention on WDT jumper resistors on Hit U4 pcb, HCP d.o.o. cannot accept any warranty.

4.7.1. Mode 1 – Always ON

Watchdog circuit monitors LTE module “power on” line, if LTE module shuts down (power supply failure, over or under temperature …) watchdog circuit will send ignition impulses until LTE module is turned on.

To shut down LTE module, you must disconnect power supply.

If you try to turn of module by at command AT^ SMSO, watchdog will detect that module is turned off and it will turn it on after few seconds.

4.7.2. Mode 2 – One time turn on

After power up, Watchdog checks is LTE module turned on, if the module is turned on, watchdog have no function.
If, after power up LTE module is not turned on, watchdog will send ignition impulses until module is turned on, when it detects that module is turned on, watchdog have no function.

To shut down LTE module in this mode, you can do it:

- by disconnecting power supply.
- By sending AT command AT^ SMSO

If module is turned off by AT command and power supply is not removed, in order to turn it on again you can do it by:

- unplug/plug USB connector
- disconnect/connect power supply

4.7.3. Mode 3 – 1h reset

After power up, Watchdog checks is LTE module turned on, if it is, it starts 1h timer and when 1h time elapses, watchdog resets LTE module (shuts down LTE module with EMERG_OFF line, and turns it on again).

In 1h timer, watchdog checks every ~30s is module on, if module gets shutdown, watchdog circuit will perform ignition sequence.

If module is turned off by AT command or there were power failure, watchdog will try to turn it on again.

4.7.4. Mode 4 – 8h reset

After power up, Watchdog checks is LTE module turned on, if it is, it starts 8h timer and when ~8h time elapses, watchdog resets LTE module (shuts down LTE module with EMERG_OFF line, and turns it on again).

In 8h timer, watchdog checks every ~30s is module on, if module gets shutdown, watchdog circuit will perform ignition sequence.

If module is turned off by AT command or there were power failure, watchdog will try to turn it on again.

4.8 SIM interface

The UICC/SIM/USIM interfaces support 3V and 1.8V SIM cards.

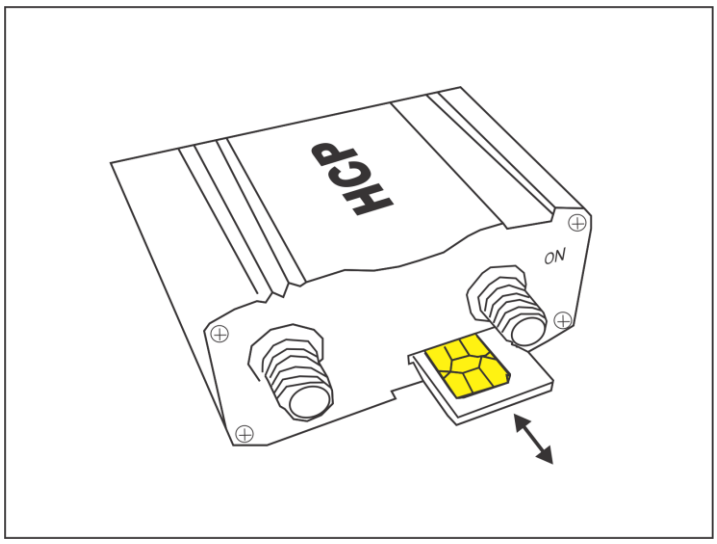


Figure 7. *SIM interface.*

Removing and inserting the SIM card during operation requires the software to be reinitialized. Therefore, after reinserting the SIM card it is necessary to restart Hit U4.

Note*: No guarantee can be given, nor any liability accepted, if loss of data is encountered after removing the SIM card during operation. Also, no guarantee can be given for properly initializing any SIM card that the user inserts after having removed a SIM card during operation. In this case, the application must restart Hit U4.*

4.9 Antenna interface LTE and diversity antenna

The external antennas are connected via the Hit U4 SMA jacks (female), look at figure bellow.

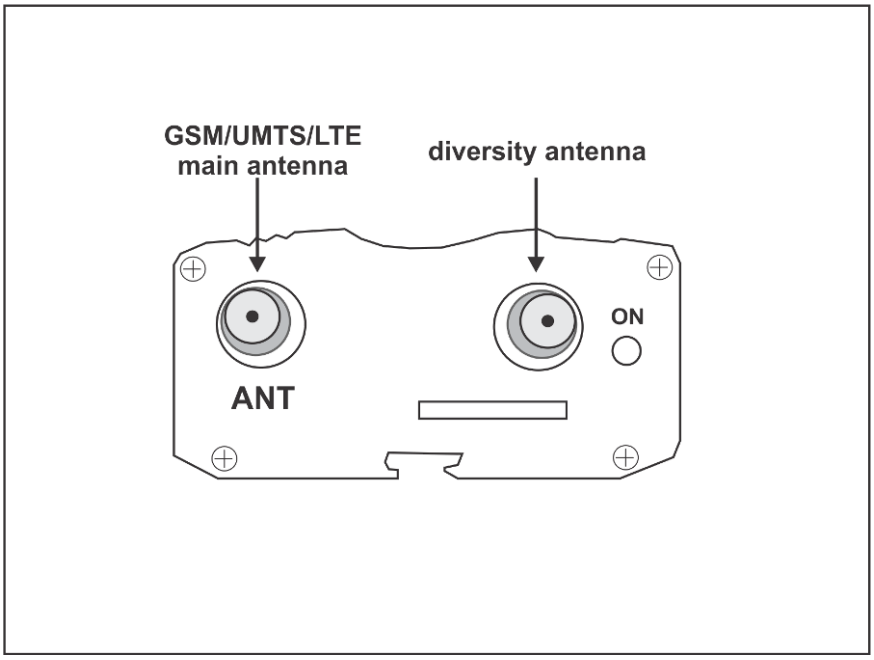


Figure 8. *Antenna interface - SMA*

The Hit U4 (PLS8-E) GSM/UMTS/LTE antenna interface comprises a GSM/UMTS/LTE main antenna as well as a UMTS/LTE Rx diversity/MIMO antenna to improve signal reliability and quality[1].
The interface has an impedance of 50Ω. PLS8-E is capable of sustaining a total mismatch at the antenna interface without any damage, even when transmitting at maximum RF power.

The external antennas must be matched properly to achieve best performance regarding radiated power, modulation accuracy and harmonic suppression.

Regarding the return loss PLS8-E provides the following values in the active band:

State of module	Return loss of module	Recommended return loss of application
Receive	> 8dB	> 12dB
Transmit	not applicable	> 12dB
Idle	< 5dB	not applicable

Table 5. *Antenna characteristics*

[1] By delivery default the UMTS/LTE Rx diversity/MIMO antenna is configured as available for the module since its usage is mandatory for LTE. Please refer to [1] for details on how to configure antenna settings.

4.10 Status LED

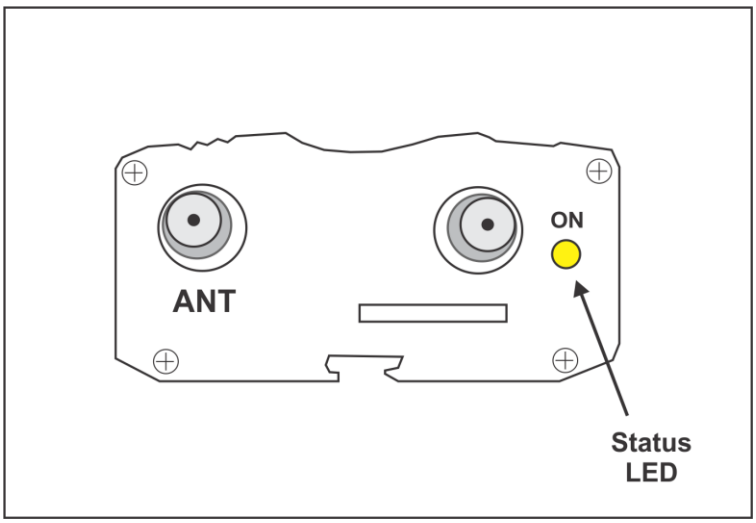


Figure 10. *Status LED*

PLS8-E Status	<mode>=1	<mode>=2 <flash>= default	<mode>=2 <flash>= user defined	<mode>=3
- GSM voice call in progress or established - UMTS voice call in progress or established	Permanently on	10 ms on / 990 ms off	on + off (interval) = 1000 ms (fixed) □ on = ((<flash> * 1000) / 1000) ms (variable)	
- GSM PS data transfer - UMTS/LTE data transfer	Permanently on	10 ms on / 1990 ms off	on + off (interval) = 2000 ms (fixed) □ on = ((<flash> * 2000) / 1000)	
UE registered to a network. No call, no data transfer	Permanently on	10 ms on / 3990 ms off	on + off (interval) = 4000 ms (fixed) □ on = ((<flash> * 4000) / 1000) ms (variable)	
Limited Network Service (e.g. because no SIM/ USIM, no PIN or during network search)	500 ms on / 500 ms off	500 ms on/ 500 ms off	on + off (interval) = 1000 ms (fixed) □ on = 500 ms (fixed)	
- UMTS/LTE operation mode				Permanently on
- GSM operation mode				Permanently on

Table 6. *Status LED behavior*

4.11 GPS (option)

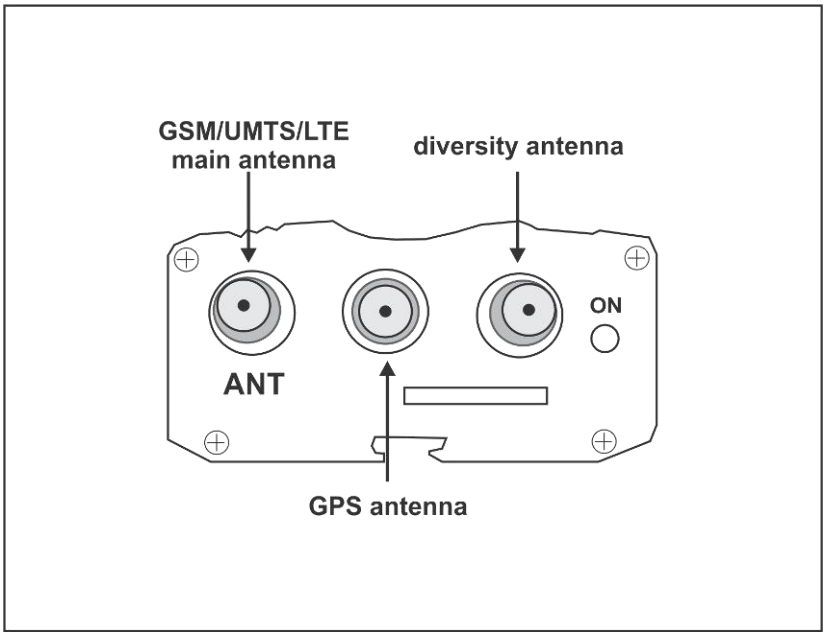


Figure 9. *Antenna interface - SMA*

Hit U4 **as option** integrates SMA connector for **passive antenna** for GNSS receiver that offers the full performance of GPS/GLONASS technology

The GNSS receiver is able to continuously track all satellites in view, thus providing accurate satellite position data.

The integrated GNSS receiver supports the NMEA protocol via USB interface. NMEA is a combined electrical and data specification for communication between various (marine) electronic devices including GNSS receivers. It has been defined and controlled by the US based National Marine Electronics Association.

For more information on the NMEA Standard please refer to http://www.nmea.org.

Depending on the receiver's knowledge of last position, current time and ephemeris data, the receiver's startup time (i.e., TTFF = Time-To-First-Fix) may vary: If the receiver has no knowledge of its last position or time, a startup takes considerably longer than if the receiver has still knowledge of its last position, time and almanac or has still access to valid ephimeris data and the precise time. For more information see table 7. in next page.

By default, the GNSS receiver is switched off. It has to be switched on and configured using AT commands. For more information on how to control the GNSS interface via the AT commands see [1].

The following tables list general characteristics of the GNSS interface.

Parameter	Conditions	Min.	Typical	Max.	Unit
Frequency	GPS GLONASS	1597.551	1575.42	1605.886	MHz
Tracking Sensitivity	Open sky Passive antenna		-156		dBm
Acquisition Sensitivity	Open sky Passive antenna		-145		dBm
Cold Start sensitivity[1]			-145		dBm
Time-to-First-Fix (TTFF)2	Cold		25	32	s
	Warm		10	29	s

Table 7. *Recommended operating conditions*

[1] Test condition: Assumes 300 seconds timeout, QoS=1000m, and 50% yield.

[2] Test condition: TTFF is defined for an open sky environment, i.e., with a clear view to the sky and a minimum signal level of -130dBm at the antenna for at least 3…4 satellites. This signal level represents C/No=42dB in an NMEA $GPGSV message.

5. Electrical and Environmental Characteristics

5.1 Apsolute Maximum Ratings

Parameter	Pin / Parameter	Min.	Max.	Unit
Supply voltage	Vcc	7.5	27	V
Supply current	Ic*		2	A
Protection Class	IP50 (avoid exposing Hit U4 to liquid or moisture)		IP50	
USB	Vusb, USB +, USB -	-0.3	5.75	V

Table 8. *Apsolute maximum ratings*

5.2 Recommended Operating conditions

Parameter	Pin / Parameter	Min.	Typ.	Max.	Unit
Supply voltage	Vcc		12		V
Supply current	Ic *		50		mA
Operating temperature	Hit U4 (PLS8-E)	-30	+25	+80	°C

Table 9. *Recommended operating conditions*

*Ic – power supply must be able to provide 2A peak during an active transmissions.

5.3 USB interface recommended ratings

Parameter	Min.	Max.	Unit
Vusb	3.0	5.25	V
USB +, USB -	All electrical characteristics according to USB Implementers' Forum, USB 2.0 High Speed Specification.		

5.4 RF Antenna interface characteristics

Parameter	Conditions	Min.	Typical	Max.	Unit
LTE connectivity[2]	Band 1, 3, 7, 8, 20				
Receiver Input Sensitivity @ ARP (ch. bandwidth 5MHz)	LTE 800 Band 20	-97	-103		dBm
	LTE 900 Band 8	-97	-104		dBm
	LTE 1800 Band 3	-97	-103		dBm
	LTE 2100 Band 1	-100	-103		dBm
	LTE 2600 Band 7	-98	-102		dBm
RF Power @ ARP with 50Ω Load	LTE 800 Band 20	+21	+23	+25	dBm
	LTE 900 Band 8	+21	+23	+25	dBm
	LTE 1800 Band 3	+21	+23	+25	dBm
	LTE 2100 Band 1	+21	+23	+25	dBm
	LTE 2600 Band 7	+21	+23	+25	dBm
UMTS/HSPA connectivity[2]	Band I, III, VIII				
Receiver Input Sensitivity @ ARP	UMTS 900 Band VIII	-103.7	-111		dBm
	UMTS 1800 Band III	-103.7	-110		dBm
	UMTS 2100 Band I	-106.7	-110		dBm
RF Power @ ARP with 50Ω Load	UMTS 900 Band VIII	+21	+24	+25	dBm
	UMTS 1800 Band III	+21	+24	+25	dBm
	UMTS 2100 Band I	+21	+24	+25	dBm
Tx noise @ ARP with max. RF power for UMTS: Band 1 channel 9777 Band 2 channel 9477	GNSS band		-170		dBm/Hz
GPRS coding schemes	Class 12, CS1 to CS4				
EGPRS	Class 12, MCS1 to MCS9				
GSM Class	Small MS				
Static Receiver input Sensitivity @ ARP	E-GSM 900	-102	-111		dBm
	GSM 1800	-102	-110		dBm
RF Power @ ARP with 50Ω Load GSM	E-GSM 900		33		dBm
	GSM 1800		30		dBm

Parameter		Conditions	Min.	Typical	Max.	Unit
RF Power @ ARP with 50Ω Load (**ROPR=4**, i.e., no reduction)	GPRS, 1 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 1 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 2 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 2 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 3 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 3 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 4 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 4 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
RF Power @ ARP with 50Ω Load (**ROPR=5**)	GPRS, 1 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 1 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 2 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 2 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 3 TX	E-GSM 900		32.2		dBm
		GSM 1800		29.2		dBm
	EDGE, 3 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 4 TX	E-GSM 900		31		dBm
		GSM 1800		28		dBm
	EDGE, 4 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm

Parameter		Conditions	Min.	Typical	Max.	Unit
RF Power @ ARP with 50Ω Load (**ROPR=6**)	GPRS, 1 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 1 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 2 TX	E-GSM 900		31		dBm
		GSM 1800		28		dBm
	EDGE, 2 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 3 TX	E-GSM 900		30.2		dBm
		GSM 1800		27.2		dBm
	EDGE, 3 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 4 TX	E-GSM 900		29		dBm
		GSM 1800		26		dBm
	EDGE, 4 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
RF Power @ ARP with 50Ω Load (**ROPR=7**)	GPRS, 1 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 1 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 2 TX	E-GSM 900		30		dBm
		GSM 1800		27		dBm
	EDGE, 2 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 3 TX	E-GSM 900		28.2		dBm
		GSM 1800		25.2		dBm
	EDGE, 3 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 4 TX	E-GSM 900		27		dBm
		GSM 1800		24		dBm
	EDGE, 4 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm

Parameter		Conditions	Min.	Typical	Max.	Unit
RF Power @ ARP with 50Ω Load (**ROPR=8**, i.e., max. reduction)	GPRS, 1 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 1 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 2 TX	E-GSM 900		30		dBm
		GSM 1800		27		dBm
	EDGE, 2 TX	E-GSM 900		24		dBm
		GSM 1800		23		dBm
	GPRS, 3 TX	E-GSM 900		28.2		dBm
		GSM 1800		25.2		dBm
	EDGE, 3 TX	E-GSM 900		22.2		dBm
		GSM 1800		21.2		dBm
	GPRS, 4 TX	E-GSM 900		27		dBm
		GSM 1800		24		dBm
	EDGE, 4 TX	E-GSM 900		21		dBm
		GSM 1800		20		dBm

Table 10. RF Antenna interface GSM / UMTS/LTE (at operating temperature range[1])

[1] At extended temperature range no active power reduction is implemented - any deviations are hardware related.
[2] Applies also to UMTS/LTE Rx diversity/MIMO antenna.

5.5 Storage Conditions

Type	Condition	Unit	Reference
Humidity relative: Low High	10 90 at 40°C	%	CbIPC/JEDEC J-STD-033A
Air pressure: Low High	70 106	kPa	IEC TR 60271-3-1: 1K4 IEC TR 60271-3-1: 1K4
Movement of surrounding air	1.0	m/s	IEC TR 60271-3-1: 1K4
Water: rain, dripping, icing and frosting	Not allowed	---	---
Radiation: Solar Heat	1120 600	W/m^2	ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb
Chemically active substances	Not recommended		IEC TR 60271-3-1: 1C1L
Mechanically active substances	Not recommended		IEC TR 60271-3-1: 1S1
Vibration sinusoidal: Displacement Acceleration Frequency range	 1.5 5 2-9 9-200	 mm m/s^2 Hz	IEC TR 60271-3-1: 1M2
Shocks: Shock spectrum Duration Acceleration	 Semi-sinusoidal 1 50	 ms m/s^2	IEC 60068-2-27 Ea

Table 11. Storage conditions

6. Mechanical Characteristics

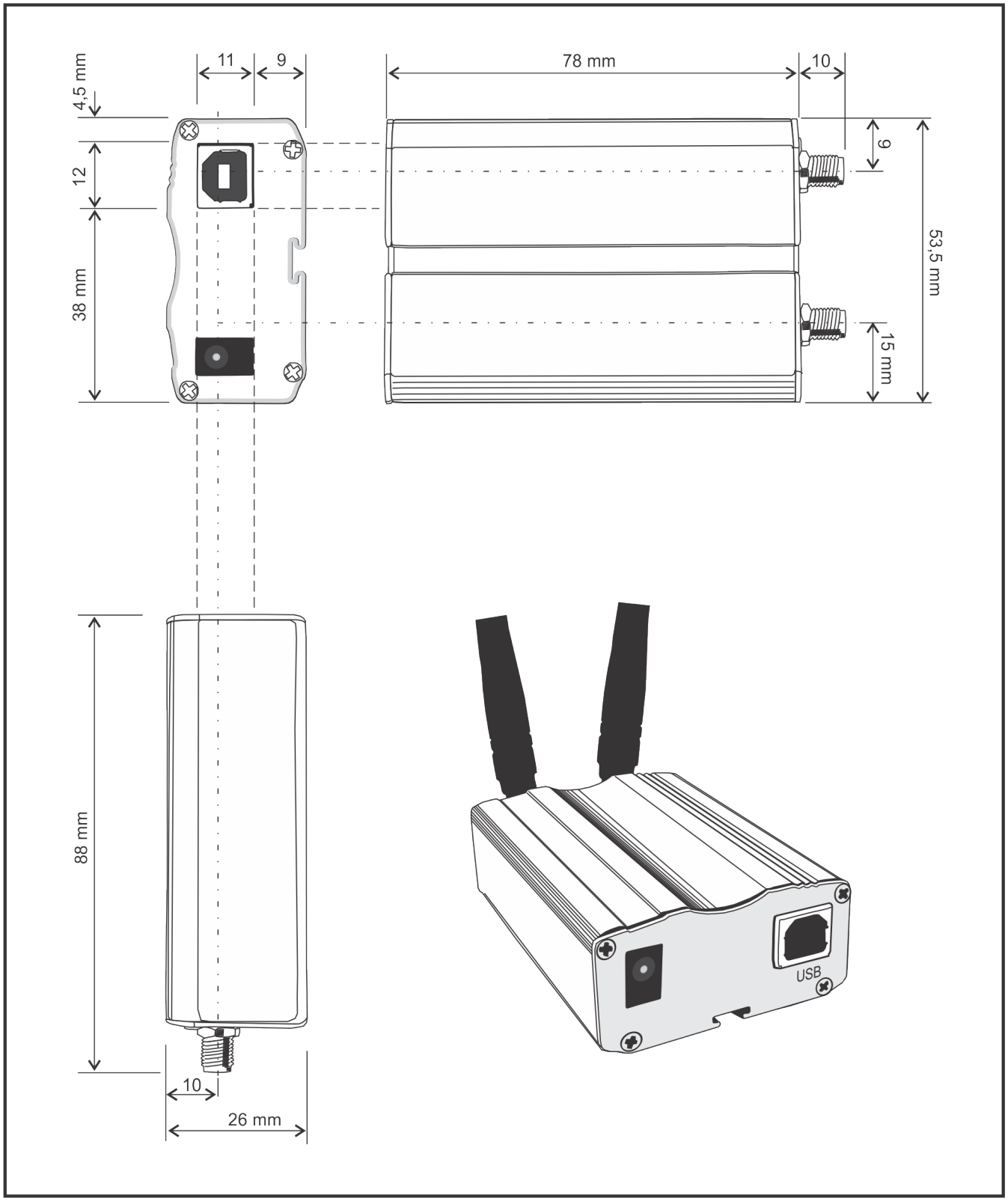


Figure 11. *Mechanical dimensions*

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