

MC Technologies GmbH

PHS8-P Terminal User Guide



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1.4 Revision history

Version	Date	Description	Status
00.001	2014-06-20	First release	Advance / Confidential
00.003	2014-07-11	Additions	Advance / Confidential
01.001	2014-07-22	Official version	Draft / Confidential

Table 1: Revision history

1.5 Legal information

1.5.1 Definitions

Advance Information	The document contains the design specification for product development. Specifications may change in any manner without notice.
Draft	The document contains the design specifications that are still under internal review and Subject to formal approval, which may result in modifications or additions. The publisher / manufacturer reserves the right to make changes at any time without notice to improve the design.
Preliminary	The document contains preliminary data, supplementary data will be publisher data later date. The publisher / manufacturer reserves the right to make changes at any time without notice to improve the design.
No Identification Needed	The document contains the final specifications. The publisher / manufacturer reserves the right to make changes at any time without notice to improve the design.
Obsolete	The document contains specifications on a product that has been discontinued. the document is printed for reference information only.

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Cinterion Wireless Modules GmbH Munich / Germany
Gemalto M2M Munich / Germany

1.6 Term and abbreviation

Abbreviation	Description
ASC	Asynchronous Controller. Abbreviations used for first and second serial interface
CSD	Circuit Switched Data
CTS	Clear To Send
DCD	Data Carrier Detect
DCE	Data Communication Equipment (typically modem or a terminal)
DSR	Data Set Ready
DTE	Data Terminal Equipment (typically computer, notebooks or GSM application)
DTR	Data Terminal Ready
EIA	Electronic Industries Alliance
FME	Standard Connector for radio frequencies
IDE	Integretated Development Environment
J2ME	Java 2 Platform, Micro Edition
TM JavaME	Java Mobil Edition
GND	Ground
GPIO	General Purpose Input Output
GPRS	General Packet Radio Service
GSM	Global Standard for Mobil communication
HSDPA	High Speed Downlink Packed Access
HSUPA	High Speed Uplink Packed Access
HSPA	High Speed Packed Access
I ² C	Inter-integrated Circuit
IP	Internet Protocol
I/O	Input / Output
JDK	Java Development Kit
LED	Light Emitting Diode
ME	Mobile Equipment
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
NDIS	Network Driver Interface Spezifikation
PBCCH	Packed Broadcast Control Channel
PDP	Packet Data Protocol
PIN	Personal Identification Number
PPP	Point to Point Protocol
RAM	Random Access Memory
RF	Radio Frequency
RI	Ringindicator
RIL	Radio Interface Layer
RLP	Radio Link Protocol
RSA	Remode SIM Access
RTS	Ready To Send
RXD	Receive Data
SIM	Subscriber Identification Module
SPI	Serial Peripheral Interface
SMS	Short Massage Service
tbd	Tobedefined
TCP	Transmission Control Protocol
TXD	Transmit Data
UART	Universal asynchronous Receiver-Transmitter
URC	Unsolicited Result Code
USSD	Unstructured Supplementary Service Data

Table 2: Terms and abbreviation

1.7 Related documents

- [1] phs8-p_hd_v03001.pdf, Gemalto / Cinterion Wireless Modules GmbH
- [2] phs8-p_atc_v03001a.pdf, Gemalto / Cinterion Wireless Modules GmbH
- [3] ph8_an43_customizing_v01.pdf, Gemalto / Cinterion Wireless Modules GmbH
- [4] phx_an16_fw_update_v03.pdf, Gemalto / Cinterion Wireless Modules GmbH
- [5] ph8_ph8-p_mux_guide_v02.pdf, Gemalto / Cinterion Wireless Modules GmbH
- [6] wm01_mux_drv_dev_guide_v017.pdf, Gemalto / Cinterion Wireless Modules GmbH
- [7] phs8-p_startup_ug_v02.pdf, Gemalto / Cinterion Wireless Modules GmbH

1.8 Driver and optional software

- {1} PHS8-P Driver (serial/USB), Gemalto / Cinterion Wireless Modules GmbH
- {2} PHS8-P Connection Manager, Gemalto / Cinterion Wireless Modules GmbH

1.9 Details and additional documents, approvals and information

More details and additional information about the hardware, software, firmware, driver, approval, application notes and so on, please visit the follow contact:

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2. Introduction

The PHS8-P Terminal is a UMTS/HSPA+/GSM/GPRS/EDGE ¹ terminal for control, measurement, security, vending systems and mobile communications.

The PHS8-P T supports UMTS/HSPA+ five band (800, 850, 900, 1900, 2100 MHz) and GSM/GPRS/EDGE quad band (850, 900, 1800,1900 MHz).

The control of the PHS8-P terminal operates with AT commands² via the serial interface (EIA/RS-232) or via the USB interface. All AT commands are summarized in the [2] phs8-p_atc.

Additional Hardware information about the implemented module are descript in [1] phs8-p_hd.

¹ Here: EDGE ("Enhanced Data Rates for GSM Evolution") and EGPRS ("Enhanced GPRS") are used as synonyms for each other.

² AT Commands based on the Hayes command set developed in the 1970th; a command-language for modems.










2.1 Features

Feature	Implementation
General - Feature	
Frequencyband	GSM/GPRS/EDGE: Quad band, 850/900/1800/1900MHz UMTS/HSPA+: Five band, 800/850/900/1900/2100MHz
GSM class	Small MS
Output power (according to release 99)	Class 4 (+33dBm ±2dB) for EGSM850 Class 4 (+33dBm ±2dB) for EGSM900 Class 1 (+30dBm ±2dB) for GSM1800 Class 1 (+30dBm ±2dB) for GSM1900 Class E2 (+27dBm ± 3dB) for GSM 850 8-PSK Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK Class E2 (+26dBm + 3 /-4dB) for GSM 1800 8-PSK Class E2 (+26dBm + 3 /-4dB) for GSM 1900 8-PSK Class3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD BdI Class3 (+24dBm +1/-3dB) for UMTS 1900, WCDMA FDD BdII Class3 (+24dBm +1/-3dB) for UMTS 900, WCDMA FDD BdVIII Class3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdV Class3 (+24dBm +1/-3dB) for UMTS 800, WCDMA FDD BdVI
Physical	Dimensions: 74 mm x 68,4 mm x 32,5 mm Weight: approx. 100 g
Operating temperature (board temperature)	Normal operation: -30°C to +85°C Extended operation: -40°C to +95°C
RoHS	All hardware components fully compliant with EU RoHS Directive
HSPA - Feature	
3GPP Release 6,7	DL 14.4 Mbps, UL 5.7 Mbps CUE CAT. 1-12 supported Compressed mode (CM) supported according to 3GPP TS25.212
UMTS - Feature	
3GPP Release 4	PS data rate - 384 kbps DL / 384 kbps UL CS data rate - 64 kbps DL / 64 kbps UL
GSM, GPRS, EGPRS - Feature	
Data transfer	GPRS: * Multislot Class 12 * Full PBCCH support * Mobile Station Class B * Coding Scheme 1-4 EGPRS: * Multislot Class 12 * EDGE E2 power class for 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 * PBCCH support * 1 phase / 2 phase access procedures * Link adaptation and IR * NACC, extended UL TBF * Mobile Station Class B CSD: * V.110, RLP, non -transparent * 14.4 kbps * USSD
SMS	Point-to-Point MT and MO Cell broadcast Text and PDU mode

GNSS - Feature	
Protocol	NMEA
Modes	Standalone GNSS Assisted GNSS * Control plane - E911 * User plane- gpsOneXTRA™
General	Power saving modes
Software	
AT commands	Hayes, 3GPP TS 27.007 and 27.005, and proprietary Cinterion Wireless Modules commands
SIM Application Toolkit	SAT Release 99
Firmware Update	Generic update from host application over ASCO or USB
Interfaces	
Serial Interface	ASCO: * 8-wire modem interface with status and control lines, unbalanced, asynchronous * Adjustable baud rates from 9600 bps up to 115200 bps * Supports RTS0/CTS0 hardware flow control * Multiplex ability according to GSM 07.10 Multiplexer Protocol
USB	USB 2.0 High Speed (480Mbit/s) device interface, Full Speed (121Mbits/s)
SIM Interface	Supported SIM card with 3V and 1.8 V
Antenna (GSM)	50 Ohms. External antenna can be connected via FME - male antenna connector
Antenna (GPS)	GNSS antenna (active/passive) via SMA-female connector
Power on/off, Reset	
Power on/off	Switch-on by hardware signal IGT Switch-off by AT command (at^SMSO) Automatic switch-off in case of critical temperature or Voltage condition
Reset	Orderly shutdown and reset by AT commands
Emergency-off	Emergency-off by hardware signal EMERG_OFF if Ignition not activ
Special Features	
phonebook	SIM and phone
TTY / CTM support	Integrated CTM modem
Always on	It is a special feature only with new firmware / new order of manufacturer (on/off)
Power on initialization	It is a special feature over Firmware of manufacturer

Table 3: Features

3 Safety requirements

	<p>When in a hospital or other health care facility, observe the restrictions on the use of mobiles. Switch the cellular terminal or mobile off, if instructed to do so by the guidelines posted in sensitive areas. Medical equipment may be sensitive to RF energy.</p> <p>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.</p>
	<p>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.</p>
	<p>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.</p>
	<p>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.</p>
	<p>Road safety comes first! Do not use a hand-held cellular terminal or mobile when 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.</p> <p>Speakerphones must be installed by qualified personnel. Faulty installation or operation can constitute a safety hazard.</p>
	<p>IMPORTANT!</p> <p>Cellular terminals or mobiles operate using radio signals and cellular networks. Because of this, connection 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.</p> <p>Remember, in order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength.</p> <p>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.</p> <p>Some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.</p>
	<p>Bear in mind that exposure to excessive levels of noise can cause physical damage to users! With regard to acoustic shock, the cellular application must be designed to avoid unintentional increase of amplification, e.g. for a highly sensitive earpiece. A protection circuit should be implemented in the cellular application.</p>
	<p>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 3 m.</p>
	<p>According to the guidelines for human exposure to radio frequency energy, an antenna connected to the SMA jack of the device should be placed at least 20 cm away from human bodies.</p>

4. Product description

The core of the PHS8-P Terminal is a Cinterion engine PHS8-P and a micro controller.

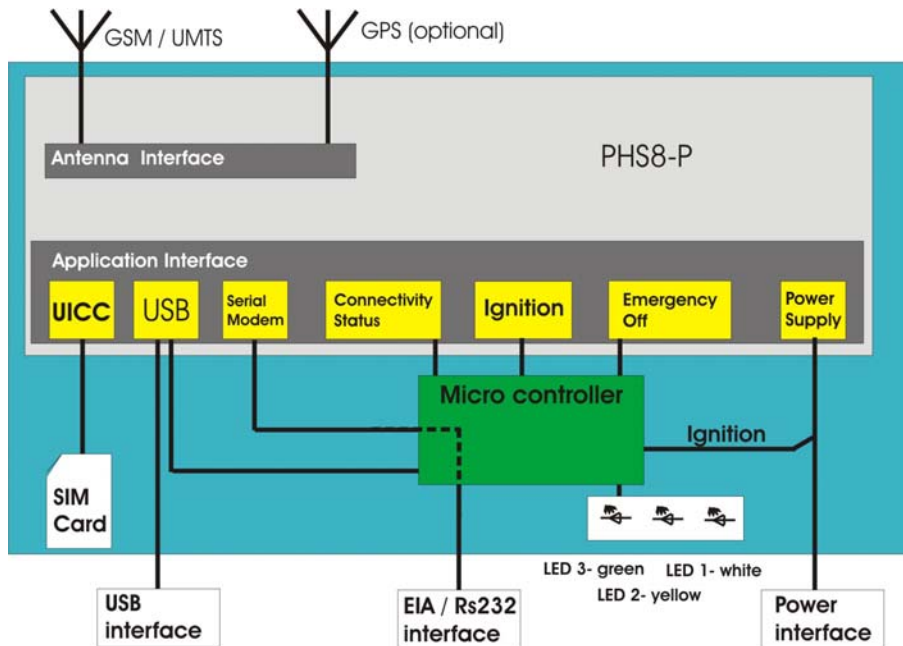


Figure 1: System overview

The micro controller is responsible for the power supply, the interfaces and supervised the operation of the engine PHS8-P.

Detailed descriptions of the of the GSM engine PHS8-P are [1] phs8-p_hd_v03001 and [2] phs8-p_atc_v03001a. Please consider these documents.

5. Interface description

5.1 Overview

The PHS8-P Terminal provide the follow connectors:

- 6 pole Western plug (female) for power supply, ignition and power down signal (Emergency off)
- FME jack (male) for antenna (GSM/UMTS - Radio interface)
- SIM card holder
- 9 pole Sub-D plug (female) for EIA/RS-232 serial interface
- USB receptacle
- Optional: SMA jack (female) for GPS/GNSS active or passive antenna

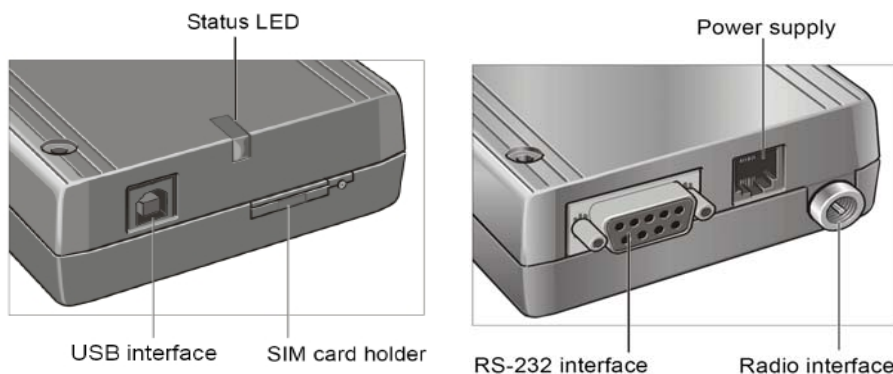


Figure 2: Interfaces

5.2 Supported operating modes

Normal Operation	GSM / GPRS / UMTS / HSPA SLEEP	Power saving set automatically when no call is in progress and the USB connection is suspended by host or not present and no active communication via ASCO.
	GSM / GPRS / UMTS / HSPA IDLE	Power saving disabled (see [1]: AT^SCFG "MEopMode/ PwrSave", <PwrSaveMode>) or an USB connection not suspended, but no call in progress.
	GSM DATA / GSM TALK	Connection between two subscribers is in progress. Power consumption depends on the GSM network coverage and several connection settings (e.g. DTX off/on, FR/EFR/HR, hopping sequences and antenna connection). The following applies when power is to be measured in TALK_GSM mode: DTX off, FR and no frequency hopping.
	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 TALK	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.
Power Down	Normal shutdown after sending the at^SMSO command. Only a voltage regulator is active for powering the RTC. Software is not active. Interface are not accessible. Operating voltage (connected to Batt+) remains applied.	
Airplane Mode	Airplane mode shut 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 commands (see[2])	

Table 4: Overview of operating modes

5.3 Power supply and on / off control

The power supply of the PHS8 has to be a single voltage source of $V_{plus} = 10 - 60V$. The source has to be capable of providing peak currents of about 1.0 A at 12 V during an active transmission.

The power supply must be compliant with the EN60950 guidelines.

PIN	Signal Name	Use	Parameters
1	PLUS	Power supply	10 – 60 V DC
2	PLUS	Power supply	10 – 60 V DC
3	POWER DOWN	Power Down Mode	$U_{IH} > 5V$ for $t > 100ms$ turns the Terminal off.
4	IGNITION	Ignition	$U_{IH} > 5V$ for $t > 100ms$ turns the Terminal on. Ignition is activated only by a rising edge
5	MINUS	Supply Ground	0 V
6	MINUS	Supply Ground	0 V

Table 5: Pin assignment of the 6 pole Western jack for power supply, Ignition and power down

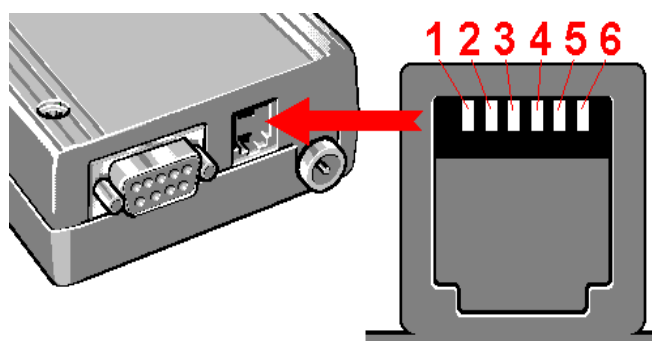


Figure 3: Pin assignment of the 6 pole Western jack for power supply, Ignition and power down

5.4 Turn on

5.4.1 Normal turn on

The terminal is switched on by an activating signal of Ignition (PIN 4 of the 6 pole Western jack) (rising edge) Alternative the terminal can be switched on by an activating DTR signal on the EIA/RS232 interface.

5.4.2 Turn on with “always on” function

For using the “always on” function of the PHS8-P terminal started the terminal without ignition (PIN4) or DTR signal of the EIA/RS232. You can only use PLUS (PIN1/2) and Ground (PIN5/6)

5.5 Turn off

Attention: When using the "always on" - function starts the PHS8 terminal after AT ^ SMSO

5.5.1 Normal shutdown

To turn off the terminal use the at command “AT^SMSO” whether via RS232 or USB!

5.5.2 Emergency shutdown

In the case of hang ups or similar the terminal can be switched off by applying a voltage of 5V to 60 V to the “power down” signal (PIN3 of the 6 pole Western jack).

Use the “Power Down” signal only in the case of serious problems! This procedure is intended only in case of emergency!

5.5.2.1 Disconnecting the power supply

Before disconnecting the power supply, make sure that the terminal is switched off by the “AT^SMSO” command. The best way is to wait 1 second after the “^SHUTDOWN” result code has been indicated.

5.5.2.2 Automatic thermal shutdown

There is an on-board temperature measurement inside the terminal. If over- or under-temperature is detected the module is switched off.

5.6 Serial interface

Via the serial interface, the host controller controls the terminal data, either the EIA/RS-232 or the USB interface. The PHS8-P terminal have supported the MUX - mode and the follow operating systems: Windows XP, Vista, Windows 7, Windows 8, Windows CE 7, Android

5.6.1 EIA / RS-232 interface

Attention: The maximum baud rate of the EIA/RS-232 of the phs8 terminal is 115200 bps!

PIN	Name of Sign.	Input/Output	Function
1	DCD	O	Data Carrier Detect
2	RXD	O	Receive Data
3	TXD	I	Transmit Data
4	DTR	I	Data Terminal Ready
5	GND	-	Ground
6	DSR	O	Data Set Ready
7	RTS	I	Request To Send
8	CTS	O	Clear To Send
9	RI	O	Ring Indicator

Table 6: PIN assignment of the EIA / RS-232 plug



Figure 4: EIS/RS-232 interface (D-Sub 9-pole)

The terminal is designed for use as a DCE. Thus based on the convention for DCE-DTE connectors. The signal TXD is an input and RXD is an output

5.6.1.1 DTR – Data terminal Ready

Activation the DTR signal (an edge from “space” to “mark”) is switching on the terminal.

5.6.1.2 RI – Ring indication

The ring indicator indicates incoming CSD- and voice-calls and additionally, Unsolicited Result Codes (URC) (see [2] phs8-p_atc_v03001a.pdf) The supported protocols are explained in [1] phs8-p_hd_v03001.pdf

5.6.2 USB interface (USB Connector Type B)

The USB I/O-Pins are capable of driving the signal at min 3.0V. They are 5V I/O compliant. For using the USB interface of Windows systems we supported with driver {1} and Communication Manager software {2}.



Figure 5:USB interface (USB Connector, Type B)

5.6.2.1 Suspension of the USB Interface

Please regard that the USB interface suspends if the terminal respectively the engine is powered down!

In this case virtual ports (COM and Modem Port) are no more valid for operation systems like Linux, Windows (all: 2000, XP, Vista, 7) etc. to continue the communication the terminal has to be re-started and the connection has to be re-established.

- In user applications (“Windows program”) like Hyper Terminal, ZOC or similar the connection has to be closed and opened again. Depending of the program it maybe has be closed and restarted.
- Developers should observe this fact. In these cases a new handle has to be requested (For Windows please consider the File Management Functions “OpenFile” and “CreateFile”)

5.7 SIM interface

The SIM Interface is intended 1,8 V and 3 V SIM Card,

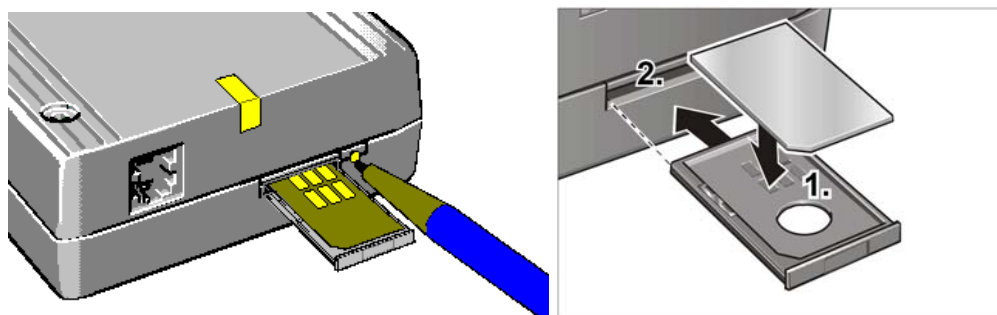


Figure 6: SIM interface

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 the terminal.

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 property initializing any SIM card that the user inserts after having removed a SIM card during operation. In this case, the application must restart the terminal.

5.8 Radio interface

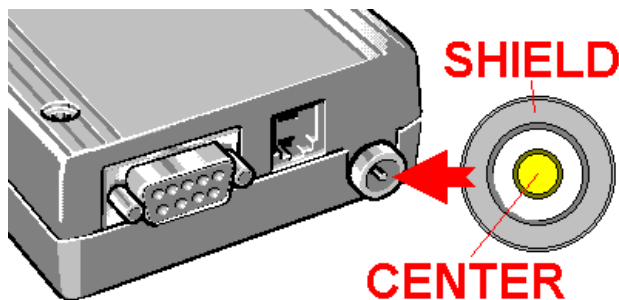


Figure 7: Radio interface

For the application it is recommended to be use only FME (female) connectors.

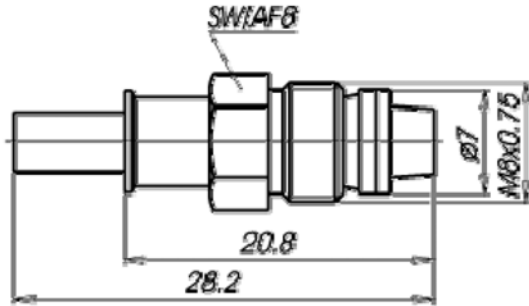


Figure 8: recommended antenna connector

5.9 Status LEDs



Figure 9 : Status LEDs

There are LEDs indicate the status and operation modes of the terminal.

Additional to the following descriptions of the LEDs, the LEDs are flickering during the boot loader operation of the micro controller program (Firmware update).

5.9.1 Yellow LED

The yellow LED indicates the status of the micro controller. The standard firmware of the micro controller initializes the module. During this time the yellow LED lights up.

(about 4 - 7 seconds, depending on the initialization of the engine)

If you are using the USB interface (AT^SDPROT=3), then the yellow LED is lit permanently and the green LED use to be activated by the user over AT commands ("AT^SLED=1").

5.9.2 Green LED

The green LED is driven by a signal of the integrated engine. The signal is configured by the AT Command "AT^SLED". For purpose of the terminal it is recommend to use the AT Command "AT^SLED=1" or "AT^SLED=2" see (2) phs8-p_atc_v03001a.pdf. The standard configuration when working with the RS232 is at ^ sled = 2

AT^SLED=<mode>,<flash_period>

AT^SLED - mode	mode	Flash_period	Definition
AT^SLED=<mode>	0		The LED Feature is disabled
	1		LED lights steadily when the UE is registered to the network and either awake or in power saving state.
	2		LED is flashing when the UE is in Limited Service or registered with a network and either awake or in power saving state. The duration of flashing can be con-figured using the parameter <flash>.
		1...10 ^P ...50	LED flash period (in milliseconds) if <mode>=2. LED off-time between flashing is approximately 4 seconds and is not configu-rable

Table 7: Coding of the green LED

5.9.3 White LED

The white LED is connected to the voltage input of the USB interface, indicating only the presence of USB Voltage.

6. AT commands

All supported AT commands are described in [2] phs8-p_atc_v03001a.pdf.

7. Firmware- / Software- Update

Please differentiate between “Software” and “Firmware”

Firmware	<p>“Firmware” means the program for engine. An update is possible via the serial interface. The actual version can be identified with the AT command “ATI” the response is for example</p> <pre> “ati Cinterion PHS8-P REVISION xx.xxx OK” with the Revision “xx.xxx” </pre> <p>An update is possible with a Windows Application.</p>
Software	<p>“Software” means the program for the micro controller inside the terminal. The Update of the Firmware is only possible by the manufacturer. For customer-specific Firmware please contact the manufacturer of the PHS8-P terminal</p>

Table 8: Definition Firmware & Software

8. Mechanical characteristics and mounting advice

8.1 Mechanical and operation characteristic

characteristic		Min.	Typ.	Max.	Uni
Temperature	Normal operation	- 30	+ 25	+ 85	°C
	Restricted operations ¹⁾	- 40	---	+ 95	°C
	Automatic Shutdown Temperature measured on board ²⁾	< - 40	---	> + 95	°C
	¹⁾ Restricted operation allows normal mode speech calls or or data transmission for limited time until automatic thermal shutdown takes effect. The duration of emergency calls is unlimited because automatic thermal shutdown is deferred until hangup. ²⁾ Due to temperature measurement uncertainty, a tolerance on the stated shutdown thresholds may occur. The possible deviation is in the range of +- 3°C at the over temperature limit and +- 5°C at the under temperature limit.				
Protection Class	IP 40 (Avoid exposing to liquid or moisture, for example do not use in a shower or bath)				
Weight	96g / 101g (with GPS)				
Dimensions (Max)	64 mm x 74 mm x 33 mm (without connectors) 68,4 mm x 74 mm x 33 mm (with connector)				
Material of housing	Cyclopol C1200 HF				
Airhumidity	5 ...80 % (no condensing)				

Table 9: Mechanical and operation Characteristics

8.2 Design drawing

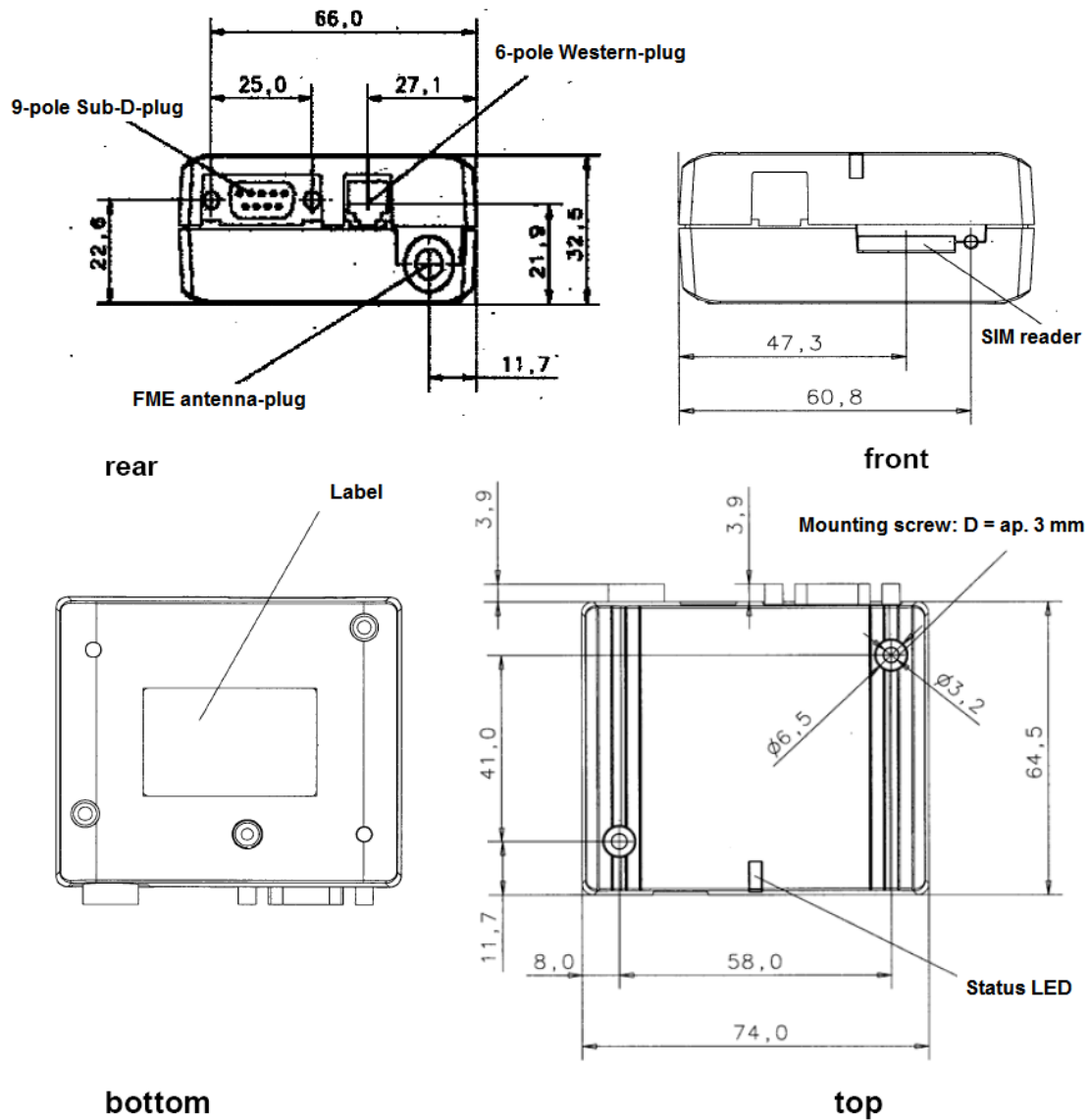


Figure 10: Design drawing

8.3 Mounting example

The terminal can be attached using two M3 x 50 mm screw.

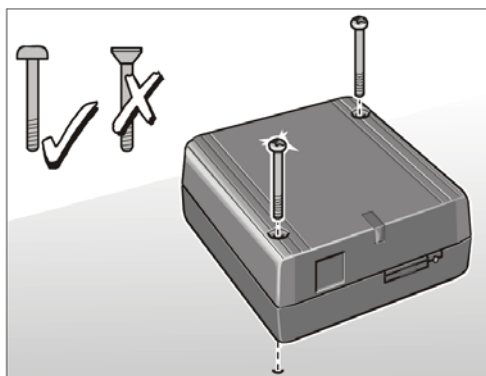


Figure 11: Recommend screws

9 Electrical and environmental characteristics

9.1 Absolute maximum ratings

Parameter	Port / Description	Min.	Max.	Unit
Supply voltage	PLUS	0	60	V
Input voltage for on / off control lines	IGNITION, POWER DOWN	0	60	V
EIA/RS232 input voltage range	/TXD, /DTR, /RTS	- 25	+ 25	V
	/RXD, /CTS, /DSR, /DCD, /RING			
Immunity against discharge of static electricity	PLUS, IGNITION, POWERDOWN	- 8	+ 8	kV
	ESD - Protection: /TXD, /DTR, /RTS, /RXD, /CTS, /DSR, /DCD, RING	-15	+15	kV
Protection Class	IP40 (Avoid exposing to liquid or moisture, for example do not use in a shower or bath)		IP40	

Table 10: Absolute maximum ratings

9.2 Operation supply specification

Parameter	Description	Conditions	Min.	Typ. ³	Max	Unit	
V_{PLUS}	Supply voltage PLUS to Minus Measure at 6 pole western jack plug (PIN 1/2 to 5/6)		10	12	60	V	
I_{PLUS}	Burst current				>1	A	
I_{PLUS}	Average supply current	Power Down Mode	10 V	10.0	10.5	15.0	mA
			12 V	7.0	8.4	12,9	
			30 V	3.4	3.6	5.0	
			60 V	3.0	3.2	3.4	

Table 11. Operation supply specification

9.3 On-board operating temperature of build in GSM engine

Parameter	Min.	Typ.	Max.	Unit
Normal operation	- 30	+ 25	+ 85	°C
Restricted operation	- 40	----	+ 95	°C
Automatic thermal shutdown	<- 40	----	>+ 95	°C

Table 12: On – board operating temperature of build in GSM engine

9.4 EIA / RS-232 interface specification

Parameter	Description	Conditions (T _A =+25°C)	Min.	Typ.	Max.	Unit
V_{OUT}	Transmitter output voltage for /RXD, /CTS, /DSR, /DCD, /RING	All transmitter outputs Loaded with 3kΩ to ground	± 5	± 5,4	± 7	V
R_{OUT}	Transmitter output resistance /RXD, /CTS, /DSR, /DCD, /RING		300			Ω
R_{IN}	Receiver input resistor for /TXD, /RTS, /DTR		3	5	7	kΩ
V_{IN}	Input Voltage Range		- 25		+ 25	V
V_{IN, LOW}	Input threshold low		0,6	1,2		V
V_{IN, HIGH}	Input threshold high			1,5	2,4	V
V_{IN, hysteresis}	Input hysteresis			0,3		V
Baud rate ⁵		R _L =3kΩ, C _L =250pF	9600	115200	115200	kbps

Table 13: EIA/RS-232 interface specification

9.5 USB interface specification

The PHS8-P Terminal supports a USB 2.0 High Speed (480 Mbits/s) device interface that is FULL Speed (12Mbits/s) compliant. The USB interface is primarily intended for use as command and data interface and downloading firmware. A USB host to support at least 6 “message Pipes” (See USB Specification Revision 2.0, Section 10.2.7, p.282 for a definition of the term “Message Pipe”) to works with the PHS8-P Terminal USB interface. The USB I/O – pins are capable of driving the signal at min 3.0 V. They are 5 I/O compliant.

10 Power supplies

If you do not use the special power supply for the terminal, for example an alternative wall adapter please verifies the Conditions and the necessary parameters.

- A voltage of 12 VDC is recommended.
- The minimum output current should be 1.2 Ampere or more.
- The GSM burst transmissions are causing pulse currents at the power supply input.
- The power supply has to be protected against short circuit.
- Additional low-ESR Capacitors could be necessary.

11 Over temperature

Data transmission for a long time can cause higher temperature of the GSM/GPRS / UMTS engine. If the on board temperature rises above the limited rating, the engine switches off automatically.

- Do not cover the terminal.
- Take care for suitable ambient temperature.
- Use only recommended antennas
- Use power supplies with an optimal output voltage (12 VDC and 15 VDC)

12 Regulatory and type approval information

12.1 Directives and standards

The GSM/GPRS/EDGE/UMTS engine has been approved to comply with the directives and standards listed in [1] phs8-p_hd_v03001.pdf

It is the responsibility of the application manufacturer to ensure compliance of the final product with all provisions of the application directives and standards as well as with the technical specifications provided in [1] phs8-p_hd_v03001.pdf

12.2 SAR requirements specific to portable devices

The mobile phones, PDAs or other portable transmitters and receivers incorporating a GSM modul must be in accordance with the guidelines for human exposure to radio frequency energy. This requires the Specific Absorption Rate (SAR) of portable GSM / GPRS / UMTS applications to be evaluated and approved for compliance with national and / or international regulations.

⁵⁾ The maximum RS-232 baud rate of this Terminal is 115200 bps.