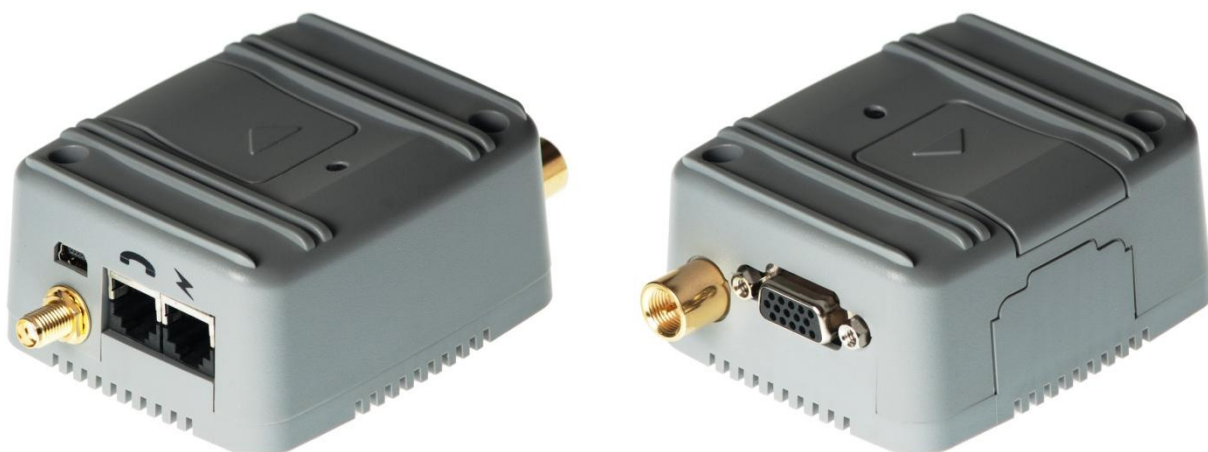


MTX-HSPA-PH8-P+G

User Manual



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Important information

This technical description contains important information for the start up and use of the MTX-HSPA-PH8-P+G Modem.

Read it carefully before you start working with the MTX-HSPA-PH8-P+G Modem.

The warranty will be void should damage occur due to non-compliance with these instructions for use.

We cannot accept any responsibility for consequential loss.

Service and Support

To contact customer support please use the contact details below:

Matrix Electrónica

Alejandro Sánchez, 109

28019 Madrid (SPAIN)

gsm-support@matrix.es

Information about the MTX-HSPA-PH8-P+G product and its accessories is available on the following web site:

www.mtxm2m.com

Or contact your local distributor / sales agent.

Revision information

Revision	Date	Author	Changes
1.3	2014/01	JS	First preliminary release
2.0	2014/11	AEM/TP	New document format General and language revision

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1. Introduction

1.1 Description

When your application needs to receive data up to 3.6 Mbps download or transmit up to 386Kbps, the MTX-HSPA-PH8-P+G modem is the solution based on HSDPA technology.

The HSPA (High Speed Downlink Packet Access) is a transmission standard based on the UMTS network which allows a download speed of up to 3.6 Mbit/s. The technology therefore enables services like broadband internet, e-mail access, high-speed download of large data files and streaming of videos or music.

The MTX-HSPA-PH8-P+G is a complete modem that encapsulates everything you need in one compact plug-and-play unit. The integration is almost not needed because it has its own SIM card reader and a USB port plus an RS232 port which minimize the need for further hardware components.

The MTX-HSPA-PH8-P+G is controlled via AT commands and standard interfaces such as Serial RS232 and USB 2.0 full speed and RIL/NDIS driver.

When the UMTS-HSDPA network operation is not present, the MTX-HSPA-PH8-P+G can operate in EDGE class 12 max. 236.8 kbps (DL), max. 118 kbps (UL) or in GPRS class 12: max. 85.6 kbps (DL), max. 42.8 kbps (UL)

The MTX-HSPA-PH8-P+G can also work in simple CSD data transmission (GSM data rate 14.4 kbps, V.110, UMTS data rate 57.6 kbps V.120) as well Short Messaging (SMS) and FAX specifications. It also has an analog interface and is capable of making voice communication calls.

As a plus feature the MTX-HSPA-PH8-P+G adds a GPS receiver and NMEA protocol in the third multiplex channel (MUX GSM 07.10 protocol is needed).

The MTX-HSPA-PH8-P+G is manufactured with SMD Technologies following the ISO 9001 & ISO 14001 Quality certifications and it is RoHs / WEEE compliant.

A full list of antennas, cables, supplies and accessories are available.

The MTX-HSPA-PH8-P+G modem is powered by an internal SIEMENS Wireless Module PH8

1.2 Ordering information

199801098: MTX-HSPA-PH8+G

Five-Band GSM 800/850/**AWS1700**/1900/2100MHz

1xRS232, USB, receiver

199801308: MTX-HSPA-PH8-P+G

Five-Band GSM 800/850/**900**/1900/2100MHz

1xRS232, USB, GPS receiver

1.3 Highlights

Interfaces

- GSM FME M antenna connector
- SMA F antenna connector for GPS or other RF options (*)
- USB 2.0 High Speed port up to 480Mbps
- SIM card interface 1.8V and 3V
- DB9 female connector: complete 8-wire RS232 modem interface (*)
- Operating status LEDs
- Plug-in power supply (RJ12 connector)

General features

- MTX-HSPA-PH8+G bands
 - UMTS/HSPA+: Five-Band 800/850/AWS1700/1900/2100MHz
 - GSM/GPRS/EDGE: Quad band 850/900/1800/1900MHz
- MTX-HSPA-PH8-P+G bands
 - UMTS/HSPA+: Five-Band 800/850/900/1900/2100MHz
 - GSM/GPRS/EDGE: Quad band 850/900/1800/1900MHz
- EDGE multi-slot class 12
- UMTS/HSPA+ 3GPP Release 6, 7, GSM/GPRS/EDGE 3GPP release 99
- Control via AT commands (Hayes, TS 27.007, TS 27.005)
- TCP/IP stack access via AT commands
- Internet services: TCP, UDP, HTTP, FTP, SMTP, POP3
- Supply voltage range
 - Maximum: 6.5 to 40VDC
 - Recommended: 7 to 35VDC
- Temperature range
 - Operating: -20°C to +85°C
- Dimensions, excluding connectors: 78.1 x 66.8 x 37.2mm
- Weight: < 190 g
- IP30 enclosure
- Powered by Cinterion PHS8 module

Specifications

- HSDPA Cat.10 /HSUPA Cat. 6 data rates
 - DL speed: max 14.4Mbps
 - UL speed: max 5.76Mbps
- EDGE
 - EDGE class 12
 - DL speed: max 237kbps
 - UL speed: max 237kbps
- GPRS
 - GPRS class 12

- DL speed: max 85.6kbps
 - UL speed: max 85.6kbps
 - Mobile station class B
 - Full PBCCH support
 - Coding schemes CS 1-4
- CSD data transmission
 - GSM data rate 14.4kbps V.110
- SMS
 - Point-to-point MO and MT
 - SMS cell broadcast
 - Text and PDU mode
- Voice
 - AMR, EFR, FR, HR codecs
 - DTMF supported
 - CEPT/ANSI supervisory tones supported
 - Handset, Headset, Hands-free modes
 - TTY supported

GPS features

- E911 A-GPS functionality via Control Plane
- Standalone GPS, SUPL prepared
- GPS dedicated AT command
- Protocol: NMEA-0183 V2.3
- GPS active antenna supply: 3.3V
- Tracking sensitivity: better than -158dBm
- No GPS blanking

Drivers

- NDIS, USB, MUX driver for Microsoft® Windows XP™, Vista™, Windows 7™
- RIL, NDIS, USB, MUX driver for Microsoft® Windows Embedded Handheld™ >= 6.x
- USB, MUX driver for Microsoft® Windows Embedded Compact™ >= 5.x
- RIL driver for devices based on Android OS
- USB serial/CDC-ACM driver for Linux

Special features

- USB interfaces support multiple composite modes and a Linux -/Mac- compliant mode
- Firmware update via USB/RS232
- Multiplexer according 3GPP TS 27.010
- Customer IMEI/Netlock as an option
- Integrated FOTA, configurable and royalty free

1.4 Product label

The label fixed to the bottom of a MTX Modem comprises the following information:



No.	Information
1	MTX M2M logo
2	Product name (model)
3	Product ordering number
4	Hardware and Firmware Revisions
5	FCC ID
6	Year/Week of fabrication
7	Barcode (Code 128) (IMEI)
8	Product IMEI
9	RoHS symbol
10	Pb-Free symbol
11	WEEE symbol
12	CE logo
13	PTCRB Certification logo

1.5 Main features and services

The MTX-HSPA-PH8-P+G modem performs a set of telecom services (TS) according to GSM standard phase 2+, ETSI and ITU-T. The services and functions of the MTX-HSPA-PH8-P+G are implemented by issuing customized applications embedded on the device, by AT commands issued internally or over the USB, RS232 or RS485 interface.

1.5.1 Key features at a glance

The MTX-HSPA-PH8-P+G is a UMTS/HSPA and also GSM/GPRS/EDGE band mobile station with the characteristics shown in the table below.

Feature	Implementation
General	
Frequency bands	UMTS/HSPA+: <ul style="list-style-type: none"> PH8: Five band, 800/850/AWS1700/1900/2100MHz PH8-P: Five band, 800/850/900/1900/2100MHz GSM/GPRS/EDGE: Quad band, 850/900/1800/1900MHz
GSM class	Small MS
Output power	Class 4 (+33dBm \pm 2dB) for EGSM850 Class 4 (+33dBm \pm 2dB) for EGSM900 Class 1 (+30dBm \pm 2dB) for GSM1800 Class 1 (+30dBm \pm 2dB) for GSM1900 Class E2 (+27dBm \pm 3dB) for GSM 850 8-PSK Class E2 (+27dBm \pm 3dB) for GSM 900 8-PSK Class E2 (+27dBm +3dB/-4dB) for GSM 1800 8-PSK Class E2 (+27dBm +3/-4dB) for GSM 1900 8-PSK Class E2 (+26dBm +3/-4dB) for GSM 1800 8-PSK Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD Bdl Class 3 (+24dBm +1/-3dB) for UMTS 1900, WCDMA FDD BdlI Class 3 (+24dBm +1/-3dB) for UMTS 900, WCDMA FDD BdlVIII Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdlV Class 3 (+24dBm +1/-3dB) for UMTS 800, WCDMA FDD BdlVI
Power supply	Single supply voltage Maximum: 6.5 to 40V (without damaging the device)* Recommended: 7 to 35V <i>*(Device operation from 6.5 to 7V is not guaranteed over the whole temperature range / Supplies from 35 to 40V may damage the device during an extended use)</i>
Physical	Dimensions: 78,1 x 66,8 x 37,2 mm Weight: approx. 190g
RoHS	All hardware components are fully compliant with the EU RoHS Directive
HSPA features	
3GPP Release 6,7	DL 14.4Mbps, UL 5.7Mbps UE CAT. 1-12 supported Compressed mode (CM) supported according to 3GPP TS25.212
UMTS features	
3GPP Release 8	PS data rate – 384 kbps DL / 384 kbps UL CS data rate – 64kbps DL / 64 kbps UL

GSM / GPRS / EGPRS features	
Data transfer	<p>GPRS</p> <ul style="list-style-type: none"> • Multislot Class 12 • Full PBCCH support • Mobile Station Class B • Coding Scheme 1 – 4 <p>EGPRS</p> <ul style="list-style-type: none"> • 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 • PBCCH support • 1 phase/2 phase access procedures • Link adaptation and IR • NACC, extended UL TBF • Mobile Station Class B <p>CSD</p> <ul style="list-style-type: none"> • V.110, RLP, non-transparent • 14.4kbps • USSD
SMS	<p>Point-to-point MT and MO</p> <p>Cell broadcast</p> <p>Text and PDU mode</p>
Software	
AT commands	<p>Hayes, 3GPP TS 27.007, 27.005, Gemalto M2M</p> <p>AT commands for RIL compatibility</p>
Audio	<p>Audio speech codecs</p> <p>GSM: AMR, EFR, FR, HR</p> <p>3GPP: AMR</p> <p>Speakerphone operation, echo cancellation, noise suppression, 9 ringing tones, TTY support</p>
SIM Application Toolkit	SAT Release 99
Firmware update	Generic update from host application over RS232 or USB.
Interfaces (depending on models)	
USB	Supports a USB 2.0 High Speed (480Mbit/s) device interface, Full Speed (12Mbit/s) compliant
RS232 (8-wire)	<p>Adjustable baud rates: 1200bps to 921600bps</p> <p>Autobauding: 1200 to 230400bps</p> <p>Supports RTS/CTS hardware flow control</p> <p>Multiplex ability according to GSM 07.10 Multiplexer Protocol</p>
Status	Bi-color LED to indicate network connectivity status.
UICC interface	Supported chip cards: UICC/SIM/USIM 3V, 1.8V
Antenna	50 Ohms. GSM/UMTS main antenna
Audio	<p>1 analog microphone balanced input</p> <p>1 analog speaker balanced output</p>

Power on/off, Reset	
Power on/off	Automatic switch-on at power supply Switch off by AT command Switch off by hardware signal TURN_OFF Automatic switch-off in case of critical temperature or voltage conditions
Software Reset	Orderly shutdown and reset by AT command
Hardware Reset	Emergency reset by hardware signal TURN_OFF
Special features	
Antenna	SAIC (Single Antenna Interference Cancellation) / DARP (Downlink Advanced Receiver Performance) Rx Diversity (receiver type 3i – 64-QAM) / MIMO
GNSS features	
Protocol	NMEA
Modes	Standalone GNSS Assisted GNSS <ul style="list-style-type: none">• Control plane – E911• User plane – gpsOneXTRA
General	Power saving modes Power supply for active GNSS antenna supported

1.5.2 Operating modes

The table below briefly summarizes the various operating modes referred to in the following chapters.

Limits	Function	
Normal operation	GSM / GPRS / UMTS / HSPA SLEEP	Power saving automatically activated when no calls are in progress, the USB connection is suspended by the host or not present, and there is no active communication via ASCO
	GSM / GPRS / UMTS / HSPA IDLE	Power saving is disabled if a USB connection is not suspended, but no call is in progress.
	GSM TALK / GSM DATA	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 TALK / 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.
Airplane mode	Airplane mode shuts down the radio part of the modem, causes the modem 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.	

1.5.3 Power Consumption

It is recommended to use 12V/1.5A power supply.

	Description	Conditions	Min	Typ	Max	Unit
IIN ¹	OFF State supply current	POWER DOWN		7		mA
	Average GSM / GPRS supply current (GNSS off)	IDLE ² (USB disconnected, UART active) @ DRX=2		13		mA
		IDLE ² (USB active) @ DRX=2		21		mA
		Voice Call GSM850/900; PCL=5		87	109 ³	mA
		GPRS Data transfer GSM850/900; PCL=5; 1Tx/4Rx	ROPR=8 (max. reduction)	87		mA
				87		mA
		GPRS Data transfer GSM850/900; PCL=5; 2Tx/3Rx	ROPR=8 (max. reduction)	111		mA
				150		mA
		GPRS Data transfer GSM850/900; PCL=5; 4Tx/1Rx	ROPR=8 (max. reduction)	144		mA
				245	271 ³	mA
	Average GSM / GPRS supply current (GNSS off)	EDGE Data transfer GSM850/900; PCL=5; 1Tx/4Rx	ROPR=8 (max. reduction)	56		mA
				56		mA
		EDGE Data transfer GSM850/900; PCL=5; 2Tx/3Rx	ROPR=8 (max. reduction)	71		mA
				83		mA
		EDGE Data transfer GSM850/900; PCL=5; 4Tx/1Rx	ROPR=8 (max. reduction)	109		mA
				142		mA
		Voice Call GSM1800/1900; PCL=0		62	76 ³	mA
		GPRS Data transfer GSM1800/1900; PCL=0; 1Tx/4Rx	ROPR=8 (max. reduction)	62		mA
				62		mA

		GPRS Data transfer GSM1800/1900; PCL=0; 2Tx/3Rx	ROPR=8 (max. reduction)		75		mA
			ROPR=4 (no reduction)		94		mA
		GPRS Data transfer GSM1800/1900; PCL=0; 4Tx/1Rx	ROPR=8 (max. reduction)		97		mA
			ROPR=4 (no reduction)		153	181 ³	mA
		EDGE Data transfer GSM1800/1900; PCL=0; 1Tx/4Rx	ROPR=8 (max. reduction)		49		mA
			ROPR=4 (no reduction)		49		mA
		EDGE Data transfer GSM1800/1900; PCL=0; 2Tx/3Rx	ROPR=8 (max. reduction)		62		mA
			ROPR=4 (no reduction)		73		mA
		EDGE Data transfer GSM1800/1900; PCL=0; 4Tx/1Rx	ROPR=8 (max. reduction)		87		mA
			ROPR=4 (no reduction)		112		mA
	Peak current during GSM transmit burst	VOICE Call GSM850/900; PCL=5			0,54	0,75 ³	A
		VOICE Call GSM1800/1900; PCL=0			0,30	0,51 ³	A
	Average GSM / GNSS supply current (GNSS on)	GSM active (UART/USB active); @DRX=2 & GNSS NMEA output off			15		mA
		GSM active (UART/USB active); @DRX=2 & GNSS NMEA output on ⁴			23		mA
	Average WCDMA supply current (GNSS off)	IDLE2 (USB disconnected, UART active) @ DRX=6			9		mA
		IDLE2 (USB active) @ DRX=6			16		mA
		Voice Call Band I; 24dBm			159		mA
		Voice Call Band II; 24dBm			177	214 ³	mA
		Voice Call Band IV; 24dBm ⁵			178		mA
		Voice Call Band V/VI; 24dBm			164		mA
		Voice Call Band VIII; 24dBm ⁶			178	197 ³	mA
		UMTS Data transfer Band I @+24dBm			152		mA
		UMTS Data transfer Band II @+24dBm			174		mA
		UMTS Data transfer Band IV @+24dBm ⁵			177		mA
		UMTS Data transfer Band V/VI @+24dBm			160		mA
		UMTS Data transfer Band VIII @+24dBm ⁶			171		mA
		HSPA Data transfer Band I @+24dBm			164		mA
		HSPA Data transfer Band II @+24dBm			181	222 ³	mA

		HSPA Data transfer Band IV @+24dBm ⁵		188		mA
		HSPA Data transfer Band V/VI @+24dBm		167		mA
		HSPA Data transfer Band VIII @+24dBm ⁶		177	205 ³	mA
	Average WCDMA/ GNSS supply current (GNSS on)	WCDMA active (UART / USB active); @DRX=6 & GNSS NMEA output off		15		mA
		WCDMA active (UART / USB active); @DRX=6 & GNSS NMEA output on ⁴		23		mA

1. With an impedance of $Z_{LOAD}=50\Omega$ at the antenna port.
2. Measurements start 6 minutes after switching ON the modules
Average times: transfer modes – 1.5 minutes
Communication tester settings: no neighbor cells, no cell reselection etc., RMC (reference measurement channel)
3. At total mismatch
4. One fix per second
5. AWS UMTS/HSPA+ band IV supported by MTX-HSPA-PH8+G only
6. 900MHz UMTS/HSPA+ band VII supported by MTX-HSPA-PH8-P+G only

1.5.4 RF antenna interface description

The table below briefly summarizes the RF Antenna interface GSM/UMTS

Parameter		Conditions	Min.	Typical	Max.	Unit
UMTS/HSPA connectivity		Band I, II, IV, V, VI, VIII				
Receiver Input Sensitivity @ ARP		UMTS 800/850 Band VI/V	-104.7/-106.7	-110		dBm
		UMTS 900 Band VIII	-103.7	-110		dBm
		MTS AWS Band IV	-106.7	-110		dBm
		UMTS 1900 Band II	-104.7	-109		dBm
		UMTS 2100 Band I	-106.7	-110		dBm
RF Power @ ARP with 50Ohm Load		UMTS 800/850 Band VI/V	21	24	25	dBm
		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		GSM 850 / E-GSM 900	-102	-109		dBm
		GSM 1800 / GSM 1900	-102	-108		dBm
RF Power @ ARP with 50Ohm Load	GSM	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
RF Power @ ARP with 50Ohm Load, (ROPR = 4, i.e. no reduction)	GPRS, 1 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 1 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
	GPRS, 2 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 2 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
	GPRS, 3 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 3 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
	GPRS, 4 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 4 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
RF Power @ ARP with 50Ohm Load, (ROPR = 5)	GPRS, 1 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 1 TX	GSM 850 / E-GSM 900		27		dBm

		GSM 1800 / GSM 1900		26		dBm
	GPRS, 2 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 2 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
	GPRS, 3 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 3 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
	GPRS, 4 TX	GSM 850 / E-GSM 900		31		dBm
		GSM 1800 / GSM 1900		28		dBm
	EDGE, 4 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
RF Power @ ARP with 500hm Load, (ROPR = 6)	GPRS, 1 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 1 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
	GPRS, 2 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 2 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
	GPRS, 3 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 3 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
RF Power @ ARP with 500hm Load, (ROPR = 7)	GPRS, 1 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 1 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
	GPRS, 2 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 2 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
	GPRS, 3 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 3 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
	GPRS, 4 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		24		dBm
	EDGE, 4 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		24		dBm

RF Power @ ARP with 500hm Load, (ROPR = 8, i.e. maximum reduction)	GPRS, 1 TX	GSM 850 / E-GSM 900		33		dBm
		GSM 1800 / GSM 1900		30		dBm
	EDGE, 1 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		26		dBm
	GPRS, 2 TX	GSM 850 / E-GSM 900		30		dBm
		GSM 1800 / GSM 1900		27		dBm
	EDGE, 2 TX	GSM 850 / E-GSM 900		24		dBm
		GSM 1800 / GSM 1900		23		dBm
	GPRS, 3 TX	GSM 850 / E-GSM 900		28.2		dBm
		GSM 1800 / GSM 1900		25.2		dBm
	EDGE, 3 TX	GSM 850 / E-GSM 900		22.2		dBm
		GSM 1800 / GSM 1900		21.2		dBm
	GPRS, 4 TX	GSM 850 / E-GSM 900		27		dBm
		GSM 1800 / GSM 1900		24		dBm
	EDGE, 4 TX	GSM 850 / E-GSM 900		21		dBm
		GSM 1800 / GSM 1900		20		dBm

1.5.5 SIM Card

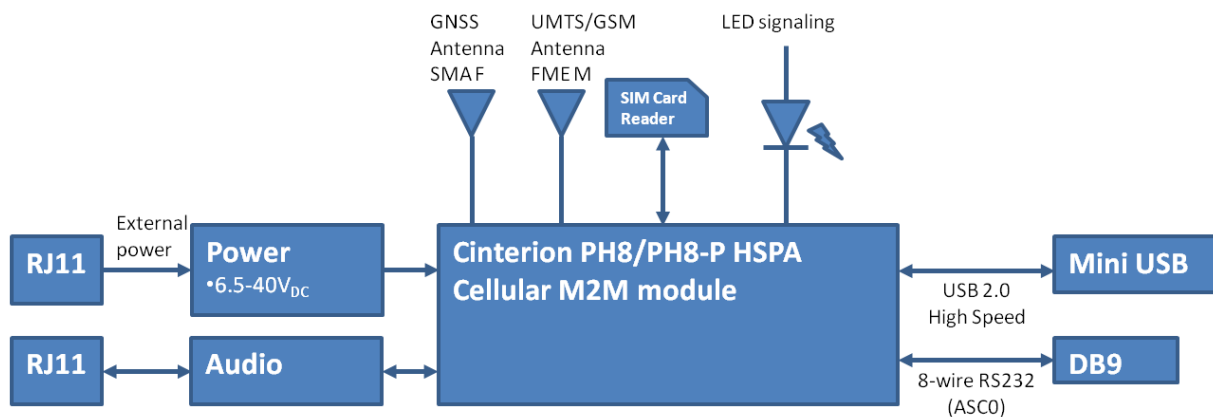
The MTX-HSPA-PH8-P+G supports an external SIM card through the integrated SIM holder. Both 3V and 1.8V SIM technology is supported. Older 5V SIM technology is not supported.

1.6 Precautions

MTX-HSPA-PH8-P+G as a standalone item is designed for indoor use only. For outdoor use it must be integrated into a weatherproof enclosure. Do not exceed the environmental and electrical limits as specified in Technical Data

1.7 Block diagram

The base MTX-HSPA-PH8-P+G modem's block diagram is shown in the following figure:



1.8 Hardware revisions

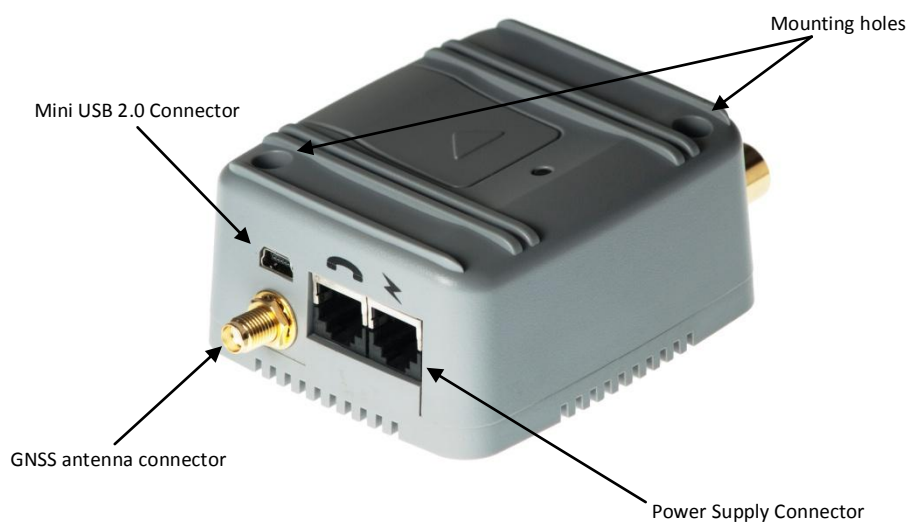
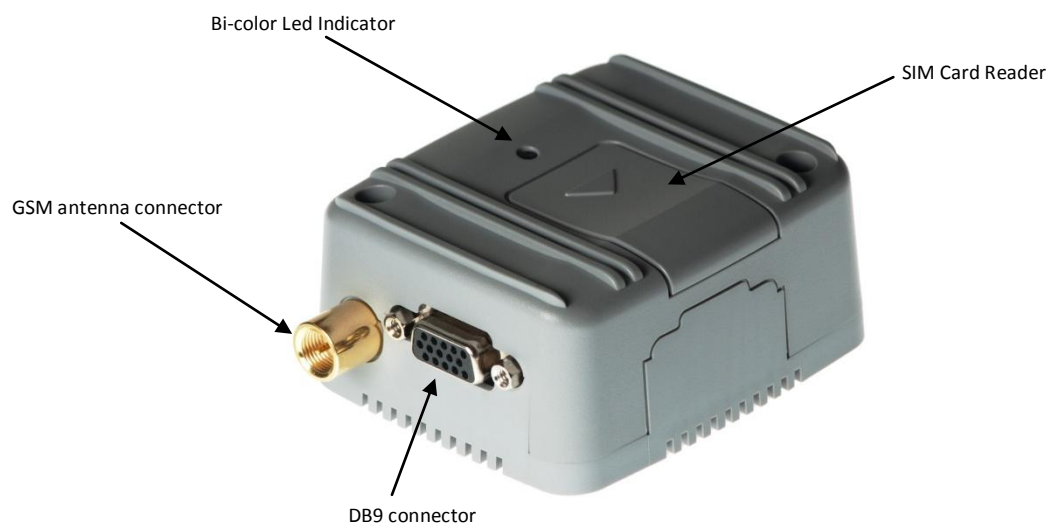
Base MTX-HSPA-PH8-P+G and MTX-HSPA-PH8-P+G models

Hardware Revision	Starting production date	Changes
2.03	01/2014	Initial version

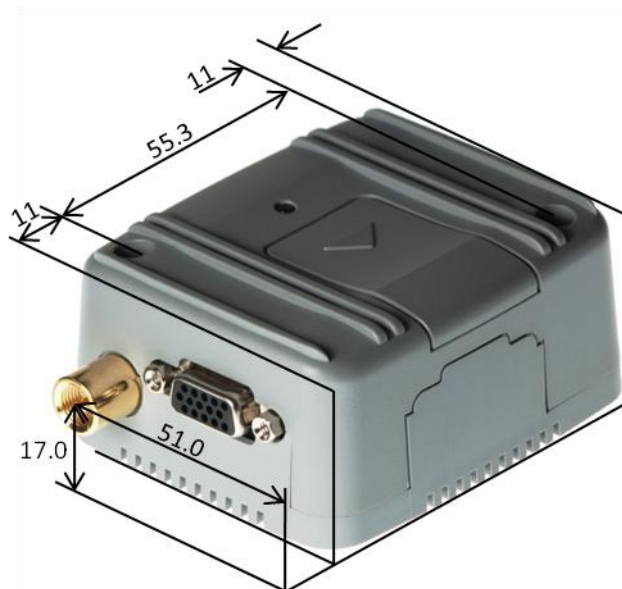
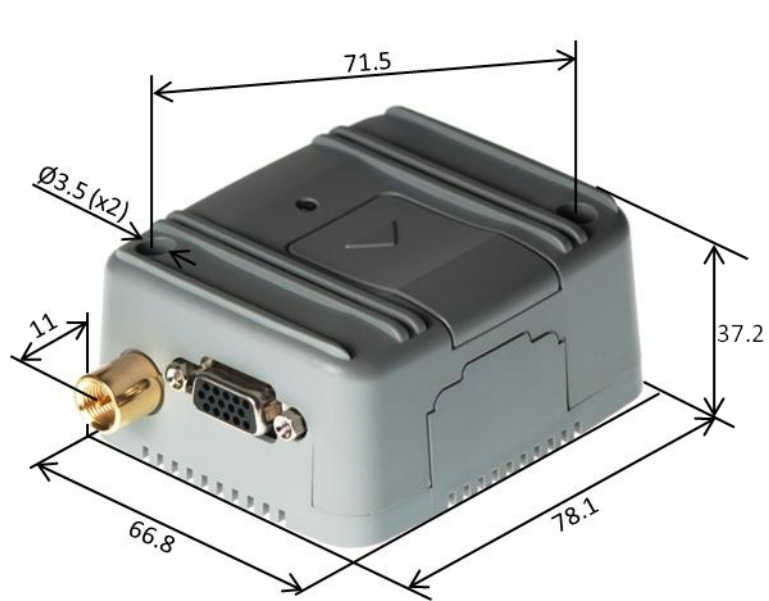
2. Mechanical description

2.1 Overview

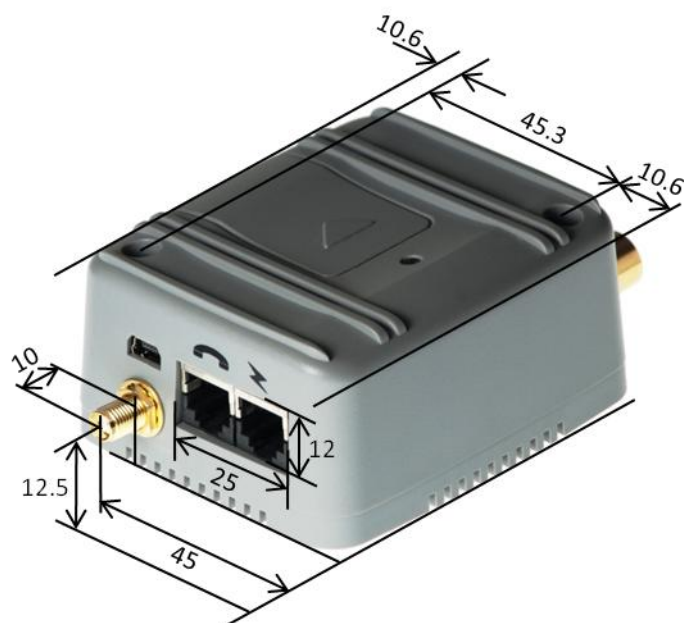
The pictures below show the mechanical design of the modem along with the positions of the different connectors and mounting holes. The modem case is made of durable PC/ABS plastic.



2.2 Dimensions



All dimensions are in millimeters



All dimensions are in millimeters

3. Electrical and environmental characteristics

3.1 Electrical specifications

3.1.1 Power supply

ABSOLUTE MAXIMUM RATINGS					
Symbol	Parameter	Conditions	Min.	Max.	Unit
V _{IN}	Supply voltage		0	45	V

CHARACTERISTICS						
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{IN}	Supply voltage	Maximum	6.5		40	V
		Recommended	7		35	V
I _{IN}	Supply current		-	*	-	A
η	Efficiency	V _{IN} =12V, I _{IN} =2A, 25°C		80		%
f _o	Switching Frequency		127	150	173	kHz

* See [section 1.6.3](#)

3.1.2 RS232 interface

ABSOLUTE MAXIMUM RATINGS					
Symbol	Parameter	Conditions	Min.	Max.	Unit
V _I	Input voltage range	Drivers	-0.3	6	V
		Receivers	-25	25	V
V _O	Output voltage range	Drivers	-13.2	13.2	V
		Receivers	-0.3	5	V
	Electrostatic discharge	Human body model		2	kV

CHARACTERISTICS						
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V _{OH}	Driver high-level output voltage	R _L =3k Ω to GND	5	5.4		V
V _{OL}	Driver low-level output voltage	R _L =3k Ω to GND	-5	-5.4		V
r _o	Driver output resistance	V _{IN} = 0V	300	10M		Ω
V _{IT+}	Receiver positive-going input threshold voltage			1.5	2.4	V
V _{IT-}	Receiver negative-going input threshold voltage		0.6	1.2		V
V _{hys}	Receiver input hysteresis (V _{IT+} - V _{IT-})			0.3		V
r _i	Receiver input resistance	Input voltage ± 3 to ± 25 V	3	5	7	k Ω

3.1.3 Audio interface

ABSOLUTE MAXIMUM RATINGS					
Symbol	Parameter	Conditions	Min.	Max.	Unit
V_I	Input voltage		-0.3	3.5	V

CHARACTERISTICS						
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Output						
V _{OD}	Audio output differential voltage	Audio mode 5, Outstep 4, no load, minimum differential load 7.5Ω		4.2	6	Vpp
R _o	Differential output load resistance		7.5	8		kΩ
G _E	Absolute output gain error	outBbcGain=2	-0.1		0.1	dB
N	Idle output channel noise	outBbcGain=2		-83	-75	dBm
SNR	Output Signal to Noise and Distortion	outBbcGain=2	47			dB
	Output Frequency response	0-100Hz			-34	dB
		200Hz		-1.1		dB
		300-3350Hz	-0.2		0.1	dB
		3400Hz		-0.7		dB
		4000Hz		-39		dB
		≥4400Hz			-75	dB
Input						
V _{ID}	Full scale input voltage	Audio mode 5		1.6		Vpp
	Input amplifier gain in 6dB steps		0		42	dB
N	Idle input channel noise			-82	-76	dBm
SNR	Input Signal to Noise and Distortion			70	77	dB
	Input Frequency response	0-100Hz			-34	dB
		200Hz		-1.1		dB
		300-3350Hz	-0.2		0.1	dB
		3400Hz		-0.7		dB
		4000Hz		-39		dB
		≥4400Hz			-75	dB

3.2 Operating temperatures

Please note that the modem's lifetime, i.e., the MTTF (mean time to failure) may be reduced if operated outside the extended temperature range.

Parameter	Min	Typ	Max	Unit
Normal operation	-30	+25	+85	°C
Extended operation ¹	-40		+90	°C
Automatic shutdown ²	<-40		>+90	°C

1. Extended operation allows normal mode speech calls or data transmissions for a limited time until the automatic thermal shutdown mode takes effect. Within the extended temperature range (outside the operating temperature range) the specified electrical characteristics may be increased or decreased.
2. Due to uncertainty in temperature measurement, a tolerance of $\pm 3^{\circ}\text{C}$ on the stated shutdown thresholds may occur.

Note that within the specified operating temperature ranges the modem temperature may vary to a great extent depending on the operating mode, used frequency band, radio output power and current supply voltage.

3.3 Storage conditions

The conditions stated below are only valid for modems in their original packed state in weather protected, non-temperature-controlled storage locations. Normal storage time under these conditions is a maximum of 12 months. The modems will be delivered in a packaging that meets the requirements according "IPD/JEDEC J-STD-033B.1" for Low Temperature Carriers.

Type	Condition	Unit	Reference
Air temperature: Low	-30	°C	ETS 300 019-2-1: T1.2, IEC 60068-2-1 Ab
High	+75		ETS 300 019-2-1: T1.2, IEC 60068-2-2 Db
Relative humidity: Low	10	%	---
High	90 at 30°C		ETS 300 019-2-1: T1.2, IEC 60068-2-56 Cb
Condensation	90-100 at 30°C		ETS 300 019-2-1: T1.2, IEC 60068-2-30 Db
Air pressure: Low	70	kPa	IEC TR 60271-3-1:1K4
High	106		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	1120	W/m2	ETS 300 019-2-1: T1.2, IEC 60068-2-2Bb
Heat	600		ETS 300 019-2-1: T1.2, IEC 60068-2-2Bb
Chemically active substances	Not recommended		IEC TR 60271-3-1:1C1L
Mechanically active substances	Not recommended		IEC TR 60271-3-1:1S1
Sinusoidal vibration:			IEC TR 60271-3-1:1M2
Displacement	1.5	mm	
Acceleration	5	m/s2	
Frequency range	2-9 9-200	Hz	
Shocks:			IEC 60068-2-27 Ea
Shock spectrum	semi-sinusoidal		
Duration	1	ms	
Acceleration	50	m/s2	

4. Interface description

All electrical connections to the modem are protected in compliance with the standard air and contact Electrostatic Discharge (ESD).

The modem family uses the following industry standard connectors:

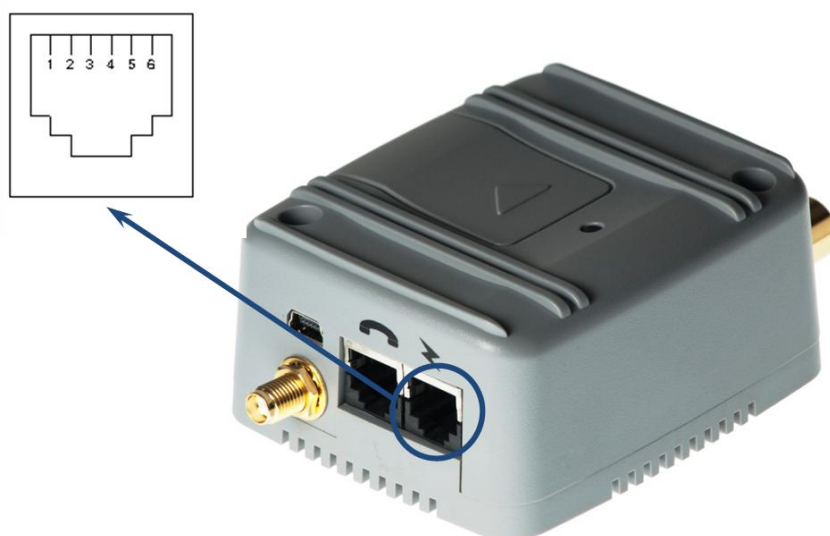
- USB mini connector
- DB9 female (main RS232 port)
- RJ11 6-way (power supply connector)
- RJ11 6-way (audio handset connector)
- SIM card reader
- FME male coaxial jack (GSM antenna connector)
- SMA female coaxial jack (GPS antenna connector)

4.1 Power supply connector

An RJ11 6-way connector, as shown and described below, serves as a means of supplying and controlling DC power to the modem.

The power supply voltage (VCC) required by the modem is in the range of 6.5 to 40VDC. We recommend a 12V DC power supply. The power supply has to be a single voltage source capable of providing a current peak during an active transmission. The uplink burst causes strong ripples (drop) on the power lines.

By default, the MTX-HSPA-PH8-P+G will automatically switch on when power supply is applied at PIN 1 and PIN 6.



Pin	Signal	Direction	Limits	Description
1	VIN	Input	6.5-40VDC	Positive power input
2	Not connected			Reserved for future uses
3	TURN_OFF	Input	Vmax: VIN	Active high control line used to switch off or reset the modem VIH>5V, VIL<2V Power off: t >10ms
4	Not connected			Reserved for future uses
5	Not connected			Reserved for future uses
6	GND	Input		Negative power (ground)

4.2 Mini USB connector

The MTX-HSPA-PH8-P+G supports a USB 2.0 High Speed (480Mbit/s) device interface. The USB interface is primarily intended for use as a command and data interface and for downloading firmware. The USB I/O pins are capable of driving the signal at a minimum of 3.0V. They are 5V I/O compliant.

The USB port has different functions depending on whether Java is running or not. With Java, the lines may be used for debugging purposes. If Java is not used, the USB interface is available as a command and data interface and for downloading firmware.

To properly connect the module's USB interface to the host, a USB 2.0 compatible connector is required. Furthermore, the USB modem driver which is delivered with MTX-HSPA-PH8-P+G must be installed as described below.

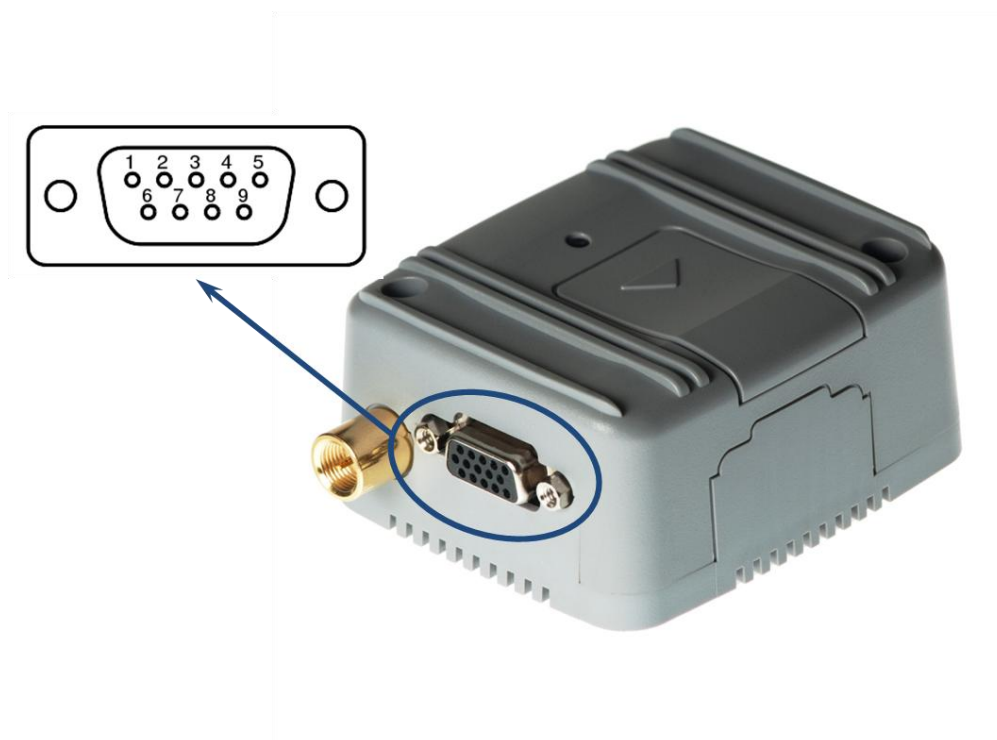
The USB host is responsible for supplying power across the VUSB_IN line to the module's USB interface. This is because MTX-HSPA-PH8-P+G is designed as a self powered device compliant with the *"Universal Serial Bus Specification Revision 2.0"*.

The MTX-HSPA-PH8-P+G cannot be powered by a USB port. If you need this feature, contact gsm-support@matrix.es. Only modems that have a mounted internal Li-Po battery (-BAT) can operate with USB power voltage.

There are drivers available for Windows and Linux environment applications. Visit the MTX-HSPA-PH8-P+G web page at www.mtxm2m.com

4.3 DB9 connector: RS232 port

The modem supports a standard RS232 8-wire serial interface (EIA/TIA 574) via its 9 pin Sub-D connector, shown below. It is connected to the modem's ASC0 main port using a level shifter converter.



The MTX-HSPA-PH8-P+G modem is designed to be used as a DCE (data circuit-terminating equipment). Based on the conventions for DCE-DTE connections, it communicates with the customer application (DTE- data terminating equipment) using the following signals:

- Port TxD @ application sends data to TXD of MTX-HSPA-PH8-P+G Modem
- Port RxD @ application receives data from RXD of MTX-HSPA-PH8-P+G Modem

The RS-232 interface is implemented as a serial asynchronous transmitter and receiver conforming to ITU-T V.24 Interchange Circuits DCE. It is configured for 8 data bits, no parity and 1 stop bit and can be operated at fixed bit rates from 1200bps to 921600bps.

Autobauding supports bit rates from 1200bps to 230400bps. Autobauding is not compatible with multiplex mode. Hardware handshake using the /RTS and /CTS signals and XON/XOFF software flow control are supported.

In addition, the modem control signals DTR, DSR, DCD and RING are available. The MODEM control RING signal (Ring Indication) can be used to indicate, to the cellular device application, that an incoming call or Unsolicited Result Code (URC) is received. It can also be used to send pulses to the host application; for example, to wake the application up from the power saving mode.

The DB9 connector pinout is shown in the table below:

Pin	Signal	Direction	Description
1	DCD	Output	Data carrier detected
2	RD 0	Output	Received data
3	TD 0	Input	Transmitted data
4	DTR	Input	Data terminal ready
5	GND	-	Ground connection
6	DSR	Output	Data set ready
7	RTS	Input	Request to send
8	CTS	Output	Clear to send
9	RI	Output	Ring indicator

Features

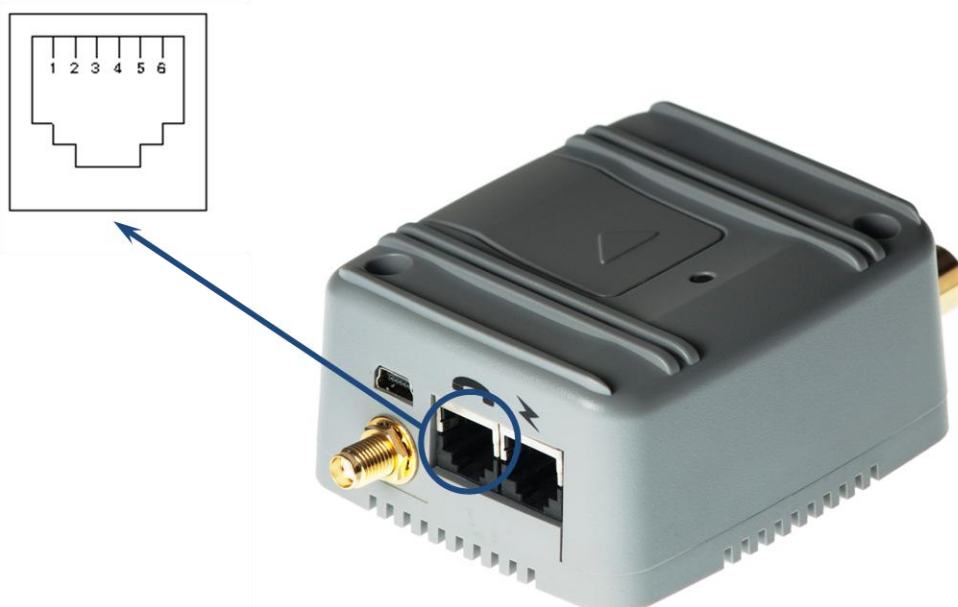
- Includes the data lines TXD0 and RXD0, the status lines RTS0 and CTS0 and also the modem control lines DTR0, DSR0, DCD0 and RING0.
- ASC0 is primarily designed for controlling voice calls, transferring CSD, fax and GPRS data and for controlling the GSM engine with AT commands.
- Full Multiplex capability allows the interface to be partitioned into three virtual channels, but with CSD and fax services only available on the first logical channel. Please note that when the ASC0 interface runs in Multiplex mode, ASC1 cannot be used.
- The DTR0 signal will only be polled once per second from the internal firmware of MTX-HSPA-PH8-P+G.
- The RING0 signal serves to indicate incoming calls and other types of URCs (Unsolicited Result Code). It can also be used to send pulses to the host application; for example, to wake the application up from the power saving mode. To configure the RING0 line, use the following AT Command: AT^SCFG.
- The default configuration is 8 data bits, no parity and 1 stop bit. The setting can be changed using the AT command AT+ICF and, if required, AT^STPB.
- ASC0 can be operated at fixed bit rates from 1200bps to 921600bps.
- **The default serial speed for MTX-HSPA-PH8-P+G is 115200bps.**

4.4 Audio connector

A 6-way 4-pole RJ connector, as shown below, allows a telephone handset to be plugged into the modem, giving access to the microphone and earpiece signals. The connector may also be used to drive other analog audio sub-systems or devices.

The audio interface provides one analog input for a microphone and one analog output for an earpiece.

- The microphone input and the earpiece output are balanced
- For electret microphones a supply source is implemented
- The MTX-HSPA-PH8-P+G is pre-configured to work with a range of handsets, the audio interface is flexible and its performance can be configured, using AT commands, to match a particular handset or audio subsystem
- Earpiece outputs are short-circuit protected



Pin	Signal	Direction	Description
1	Not connected		
2	MICN	Input	Microphone negative input
3	EPN	Output	Earpiece negative output
4	EPP	Output	Earpiece positive output
5	MICP	Input	Microphone positive input
6	Not connected		

To suit the different types of accessories, the audio interfaces can be configured for different audio modes via the AT^SNFS command. The electrical characteristics of the voiceband part vary with the audio mode. For example, sending and receiving amplification, sidetone paths, noise suppression etc. depend on the selected mode and can be altered with AT commands (except for mode 1).

Both analog audio interfaces can be used to connect headsets with microphones or speakerphones. Headsets can be operated in audio mode 3 and speakerphones in audio mode 2. Audio mode 5 can be used for direct access to the speech coder without signal pre- or post-processing.

When shipped from the factory, all audio parameters of MTX-HSPA-PH8-P+G are set to interface 1 and audio mode 1. This is the default configuration optimized for the Votronic HH-SI-30.3/V1.1/0 handset and used for type approving the MTX Modems' reference configuration. Audio mode 1 has fixed parameters which cannot be modified. To adjust the settings of the Votronic handset simply change to another audio mode.

Audio mode no. AT^SNFS=	1	2	3	4	5	6
Name	Default Handset	Router	User Handset	Headset	Speaker phone	Transparent
Purpose	DSB with Votronic handset	Analog phone interface		Mono Headset	Handheld speakerphone	Direct access to speech coder
TX-Filters	Adjusted	Flat	Adjusted	Flat	Flat	Flat
RX-Filters	Adjusted to fit artificial ear type 3.2 low leakage	Flat	Adjusted to fit artificial ear type 3.2 low leakage	800Hz HP	800Hz HP	Flat
Default SNFI Parameters <micAmp1> <micAmp2> <micTxVol>	0 (0dB) 63 (+35.25dB) 16384 (0dB)	0 (0dB) 18 (+1.5dB) 16384 (0dB)	0 (0dB) 63 (+35.25dB) 16384 (0dB)	1 (+20dB) 37 (+15.75dB) 16384 (0dB)	1 (+20dB) 48 (+24dB) 16384 (0dB)	0 (0dB) 21 (+3.75dB) 16384 (0dB)
Default SNFO Parameters <cdcRxGain> <rxVol> <stGain>	61 (+4dB) 33 (0dB) 5514 (-21.5dB)	50 (-7dB) 33 (0dB) 0 (Mute)	61 (+4dB) 33 (0dB) 5514 (-21.5dB)	49 (-8dB) 33 (0dB) 12288 (-15dB)	61 (+4dB) 33 (0dB) 0 (Mute)	58 (+1dB) 33 (0dB) 0 (Mute)
Echo canceller Behaviour optimized for	ON low echo	ON low echo	ON low echo	ON moderate echo	ON high echo	OFF
Residual echo suppression with comfort noise generator	ON	ON	ON	ON	ON	OFF
Noise Reduction (Tx)	OFF	OFF	-12dB	-12dB	-12dB	OFF
MIC input signal for 0dBm0, f = 1024 Hz	15mV	650mV	15mV	12mV	5mV	420mV
EP output signal in mV rms. @ 0dBm0, 1024 Hz, no load (default gain) / @ 3.14 dBm0	465mV 2.1Vpp	512mV 2.1Vpp	465mV 2.1Vpp	370mV 1.6Vpp	1485mV 5.7Vpp	1290mV 5.5Vpp
Sidetone gain at default settings	20.8dB	-∞ dB	20.8dB	17.0dB	-∞ dB	-∞ dB

4.5 GSM/GPRS/UMTS antenna connector

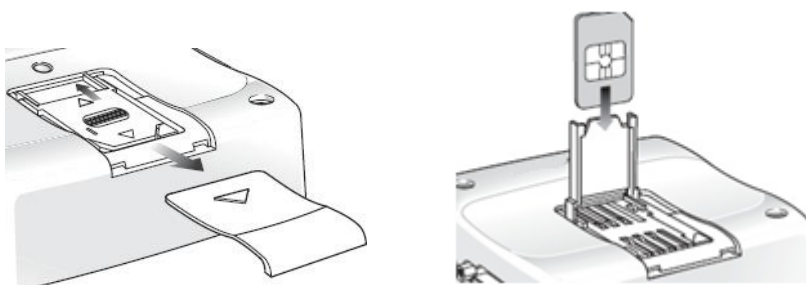
The antenna connector allows radio frequency (RF) transmission signals between the modem and an external customer-supplied antenna. The modem is fitted with a 50Ω, FME male coaxial jack.



The external antenna must be matched properly to achieve the best performance regarding radiated power, DC-power consumption, modulation accuracy and harmonic suppression.

4.6 SIM card reader

The MTX-HSPA-PH8-P+G modem is fitted with a SIM card reader designed for 1.8V and 3V SIM cards. It is the flip-up type which is lockable in the horizontal position and is accessed through a removable panel as shown below.



The card holder is a five wire interface according to GSM 11.11. It has a SIM card detector switch to detect whether or not the SIM card drawer is inserted.

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 MTX-HSPA-PH8-P+G modem.

The full operation of the MTX-HSPA-PH8-P+G relies on a SIM card being inserted. Some MTX-HSPA-PH8-P+G functionality may be lost if you try to operate the control modem without a SIM card.

4.7 GPS

The MTX-HSPA-PH8-P+G integrates a GNSS receiver that offers the full performance of GPS/GLONASS technology. The GNSS receiver is able to continuously track all GPS/GLONASS satellites in view, thus providing accurate satellite position data.

The integrated GNSS receiver supports the NMEA protocol via USB or RS232 interfaces. 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 the 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 still has access to valid ephemeris data and the precise time. For more information see Section 6.9.

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 command AT^SGPSC see the AT Command Set manual.

4.7.1 GPS antenna connector

The antenna connector allows for the transmission of radio frequency (RF) signals between the modem and an external customer-supplied antenna. The modem is fitted with a 50Ω, SMA F coaxial jack.

It is possible to connect active or passive GPS antennas. In either case they must have 50 Ohm impedance.



4.8 Firmware updates

It is possible and sometimes necessary to update the MTX-HSPA-PH8-P+G firmware.

Updates must be carried out by an approved technician.

Please contact gsmsupport@matrix.es for details regarding Service/Programming.

5. Operation

5.1 Switching on the modem. New “Automatic restart after shutdown” feature

There is no special way to turn the modem on: just apply power to the VIN terminal via a power connector (see [Section 4.1](#)). The modem will be fully operational after 4 to 9 seconds. Logging onto a network may take longer than this and is out of the modem’s control.

The *Automatic Restart after Shutdown* feature is enabled as part of the default factory settings. This means that if/when the modem has to be switched off, due to a critical power supply, the modem will restart itself within a few seconds. This feature allows an application to be switched on all the time and also allows it to restart itself.

The *Automatic Restart after Shutdown* feature cannot be disabled.

5.2 Switching off the modem

There are several ways to switch off (power down) the modem:

- Using the TURN_OFF pin (see [section 4.1](#) to see the modems that use it). Continuously pressing the TURN_OFF pin (for at least 1 second) causes the modem to enter power down mode. Its use is not recommended except in an emergency. A delay of up to 10 seconds is experienced until the modem logs out of the network. The RTC stays active.
- AT^SMSO command: this allows the modem to log out of from the network and allows the software to enter into a secure state and save data before disconnecting the power supply. A delay of up to 10 seconds is experienced until the modem logs out of the network. The RTC stays active.

5.3 Status LEDs

The MTX-HSPA-PH8-P+G modem family has a bicolor status LED (green and red).

The green color LED is handled automatically by the modem and indicates its different operating modes, as shown in table below. The LED mode configuration is set by the AT^SLED command.

Modem status	<mode>=1	<mode>=2 <flash>=default	<mode>=2 <flash>=user defined
<ul style="list-style-type: none"> GSM CS data call in progress or established GSM voice call in progress or established UMTS voice call in progress or established UMTS CS data call in progress 	Permanently ON	10ms ON 990ms OFF	<flash> ms ON 990 ms OFF
<ul style="list-style-type: none"> GSM PS data transfer UMTS data transfer 	Permanently ON	10ms ON 1990ms OFF	<flash> ms ON 1990 ms OFF
<ul style="list-style-type: none"> ME registered to a network. No call, no data transfer 	Permanently ON	10ms ON 1990ms OFF	<flash> ms ON 3990 ms OFF
<ul style="list-style-type: none"> Limited Network Service (e.g. no SIM, no PIN or during network search) 	500ms ON 500ms OFF	10ms ON 990ms OFF	<flash> ms ON 990 ms OFF

The red color LED is connected to the GPIO5 in the MTX-HSPA-PH8-P+G. This allows the user to define the functionality of this LED by issuing AT commands.

6. AT command interpreter

After a successful installation of the PH8-P driver package, the physical USB interface of the modem is represented in the operating system by two virtual interfaces, each assigned to a virtual COM port of its own:

- **Modem interface:**

This interface is referred to as "Modem" if queried using the AT^SQPORT command. In the quick reference tables it is named USB0-MDM.

The Modem interface is intended particularly for data transmission (UMTS or GPRS).

All URCs are normally issued on the Application interface. URCs related to data calls (RING, NO CARRIER) as well as the "^SYSSTART" URC are issued on the Modem interface.

- **Application interface:**

This interface is referred to as "Application" if queried using the AT^SQPORT command. In the quick reference tables it is named USB0-APP.

The Application interface is designed especially for controlling the MTX-HSPA-PH8-P+G, i.e. for entering AT commands, receiving URCs, or sending and receiving short messages. It cannot be used as a data interface for UMTS, or GPRS.

Please note that URCs are normally indicated only on this interface, no matter whether the Modem interface or the Application interface was used to send the AT commands to activate their presentation. This URC management scheme is the default configuration recommended for a typical MTX-HSPA-PH8-P+G application.

Bear in mind that the Modem interface and the Application interface are handled by the same AT command interpreter.

As a result, AT commands entered on both interfaces are not executed in parallel but sequentially, one after the other. So, an AT command issued on one interface will be buffered on this interface to be executed after the other interface has completed processing earlier AT commands.

When a data connection is established over the Modem interface, the Application interface can be used simultaneously for any control functions. This eliminates the need for the user to enter AT commands, such as +++ and ATO, as well as switching back and forth between command and online mode when working on one interface only.

See the MTX-HSPA-PH8-P+G Quick Start guide for a complete step by step installation process.

7. Safety and product care

Please read the information in this section and the information in “Installation of the Modem”, before starting your integration work!

7.1 Safety instructions

PLEASE READ THESE SAFETY INSTRUCTIONS AND KEEP A COPY OF THEM

- Always ensure that use of the modem is permitted. The modem may present a hazard if used in proximity to personal electronic medical devices. As a rule, the modem must not be used in hospitals, airports or planes.
- Never use the modem at a gas station, refuelling point, blasting area or in any other environment where explosives may be present.
- Operating the modem close to other electronic devices, such as antennas, television sets, and radios may cause electromagnetic interference.
- This product is intended to be used with the antenna or other radiating element at least 20cm away from any part of the human body. In applications where this rule cannot be applied, the application designer is responsible for providing the SAR measurement test report and declaration.
- You are responsible for observing your country's safety standards, and where applicable, the relevant wiring rules.

7.2 General precautions

The MTX-HSPA-PH8-P+G Modem as a standalone item is designed for indoor use only. For outdoor use it must be integrated into a weatherproof enclosure. Do not exceed the environmental and electrical limits as specified in “Technical Data”.

- Avoid exposing the modem to lighted cigarettes, naked flames or to extreme hot or cold temperatures.
- Never try to dismantle the modem yourself. There are no components inside the modem that can be serviced by the user. If you attempt to dismantle the modem, you may invalidate the warranty.
- The MTX-HSPA-PH8-P+G Modem must not be installed nor located in areas where the surface temperature of the plastic case could exceed 85°C.

- In order to provide strain relief and to avoid transmitting excessive vibration to the modem during installation, all cables connected to the MTX-HSPA-PH8-P+G Modem must be secured or clamped immediately adjacent to the modem's connectors.
- To protect the power supply cables, and in order to comply with fire safety requirements, when the unit is powered from a battery or a high current supply, a fast 1.25A fuse should be connected in line with the positive supply.
- Any incompatible components or products must not be connected to the MTX-HSPA-PH8-P+G modem.

Note! MTX-HSPA-PH8-P+G distributors and sales offices may refuse warranty claims where evidence of product misuse is found.

7.3 SIM card precautions

Before handling the SIM card in your application, ensure that you are not charged with static electricity. Use proper precautions to avoid electrostatic discharges.

- When the SIM card hatch is opened, the SIM card connectors lie exposed under the SIM card holder.

Caution! Do not touch these connectors! If you do, you may release an electrical discharge that could damage the modem or the SIM card.

- When designing your application, the SIM card's accessibility should be taken into account. We always recommend that you have the SIM card protected by a PIN code. This will ensure that the SIM card cannot be used by an unauthorized person.

7.4 Antenna precautions

If the antenna is to be mounted outside, consider the risk of lightning. Follow the instructions provided by the antenna manufacturer.

- Never connect more than one modem to a single antenna. The modem can be damaged by radio frequency energy from the transmitter of another modem.
- Like any mobile station, the antenna of the modem emits radio frequency energy. To avoid EMI (electromagnetic interference), you must determine whether the application itself, or equipment in the application's proximity, needs further protection against radio emission and the disturbances it might cause. Protection is secured either by shielding the surrounding electronics or by moving the antenna away from the electronics and the external signal cable.

- The modem and antenna may be damaged if either come into contact with ground potentials other than the one in your application. Beware: ground potentials are not always what they appear to be.

7.5 Radio Frequency (RF) exposure and SAR

Your wireless modem device is a low-power radio transmitter and receiver (transceiver). When it is turned on, it emits low levels of radio frequency energy (also known as radio waves or radio frequency fields).

Governments around the world have adopted comprehensive international safety guidelines, developed by scientific organizations such as ICNIRP (International Commission on Non-Ionizing Radiation Protection) and IEEE (The Institute of Electrical and Electronics Engineers Inc.), through periodic and thorough evaluation of scientific studies. These guidelines establish permitted levels of radio wave exposure for the general population. The levels include a safety margin designed to assure the safety of all persons, regardless of age and health, and to account for any variations in measurements.

Specific Absorption Rate (SAR) is the unit of measurement for the amount of radio frequency energy absorbed by the body when using a transceiver. The SAR value is determined at the highest certified power level in laboratory conditions, but the actual SAR level of the transceiver while operating can be well below this value. This is because the transceiver is designed to use the minimum power required to reach the network.

The MTX-HSPA-PH8-P+G wireless modem device has been approved for applications where the antenna is located more than 20cm from the body. In all other configurations **the user** is responsible for meeting the local SAR regulations.

Users of the MTX-HSPA-PH8-P+G wireless modem device are responsible for ensuring that they meet the SAR regulatory requirements of the countries in which they intend to operate the device and that their documentation contains the relevant SAR declaration, certification information and user guidance as appropriate.

7.6 Personal medical devices

Wireless modem devices may affect the operation of cardiac pacemakers, hearing aids and certain other implanted equipment. If a minimum distance of 15 cm (6 inches) is maintained between the MTX-HSPA-PH8-P+G modem radiating antenna and a pacemaker, the risk of interference is limited. If the user's application is likely to be situated in the vicinity of personnel, a suitable warning should be contained in the equipment manual to this effect.

8. Modem installation

This chapter gives you advice and helpful hints on how to integrate the MTX-HSPA-PH8-P+G Modem into your application from a hardware perspective.

8.1 Where to install the modem

There are several conditions which need to be taken into consideration when designing your application as they might affect the modem and its function. They are:

8.1.1 Environmental conditions

The modem must be installed so that the environmental conditions stated in the Technical Data chapter such as temperature, humidity and vibration are satisfied.

Additionally, the electrical specifications in the Technical Data section must not be exceeded.

8.1.2 Signal strength

The modem has to be placed in a way that ensures sufficient signal strength. To improve signal strength, the antenna can be moved to another position. Signal strength may depend on how close the modem is to a radio base station. You must ensure that where you intend to use the modem is within the network coverage area. Degradation in signal strength can be the result of disturbance from another source; for example, an electronic device in the immediate vicinity. More information about possible communication disturbances can be found in [section 9.3.5](#).

When an application is completed, you can verify the signal strength by issuing the AT command AT+CSQ.

Tip! Before installing the modem, use an ordinary mobile telephone to check a possible location for it. In determining the location for the modem and antenna, you should consider signal strength as well as cable length.

8.1.3 Connections of components to MTX-HSPA-PH8-P+G Modem

The user is responsible for the final integrated system. If not correctly designed or installed, external components may cause radiation limits to be exceeded. For instance, improperly made connections or improperly installed antennas can disturb the network and lead to malfunctions in the modem or equipment.

8.1.4 Network and subscription

Before your application is used, you must ensure that your chosen network provides the necessary telecommunication services. Contact your service provider to obtain the necessary information.

- If you intend to use SMS in the application, ensure this is included in your (voice) subscription.
- Consider the choice of supplementary services

8.2 How to install the modem

8.2.1 Power supply

Use a high-quality power supply cable with low resistance. This ensures that the voltages at the connector pins are within the allowed range, even during the maximum peak current.

When the unit is powered from a battery or a high current supply, connect a fast 1.25A fuse in line with the positive supply. This protects the power cabling and modem.

8.2.2 Securing the modem

Before securing the modem take into account the amount of additional space required for the mating connectors and cables that will be used in the application.

- Where access is restricted, it may be easier to connect all the cables to the modem prior to securing it in the application.
- Securely attach the MTX-HSPA-PH8-P+G Modem modem to the host application using two 3mm diameter pan-head screws

8.3 Antenna

8.3.1 General

The antenna is the component in your system that maintains the radio link between the network and the modem. Since the antenna transmits and receives electromagnetic energy, its efficient function will depend on:

- The type of antenna (for example, circular or directional);
- The placement of the antenna;
- Communication disturbances in the vicinity in which the antenna operates.

In the sections below, issues concerning antenna type, antenna placement, antenna cable, and possible communication disturbances are addressed. In any event, you should contact your local antenna manufacturer for additional information concerning antenna type, cables, connectors, antenna placement, and the surrounding area.

You should also determine whether the antenna needs to be grounded or not. Your local antenna manufacturer might be able to design a special antenna suitable for your application.

8.3.2 Antenna type

Make sure that you choose the right type of antenna for the modem. Consider the following requirements:

- The antenna must be designed for one of the frequency bands in use; please ask your network provider for more information:
 - UMTS 800/850/900/1900/2100 MHz
 - GSM 850/900/1800/1900 MHz
- The impedance of the antenna and antenna cable must be 50Ω;
- The antenna output-power handling must be a minimum of 2W

8.3.3 Antenna placement

The antenna should be placed away from electronic devices and other antennas. The recommended minimum distance between adjacent antennas, operating in a similar radio frequency band, is at least 50cm. If the signal strength is weak, it is useful to face a directional antenna towards the closest radio base station. This can increase the strength of the signal received by the modem. The modem's peak output power can reach 2W.

RF field strength varies with antenna type and distance. At 10cm from the antenna the field strength may be up to 70V/m and at 1m it will have reduced to 7V/m. In general, CE-marked products for residential /commercial areas and the light industry can withstand a minimum of 3V/m.

8.3.4 The antenna cable

Use 50Ω impedance low-loss cable and high-quality 50Ω impedance connectors (frequency range up to 3GHz) to avoid RF losses. Ensure that the antenna cable is as short as possible. The Voltage Standing-Wave Ratio (VSWR) may depend on the effectiveness of the antenna, cable and connectors. In addition, if you use an adaptor between the antenna cable and the antenna connector, it is crucial that the antenna cable is a high-quality, low-loss cable. Minimize the use of extension cables, connectors and adapters. Each additional cable, connector or adapter causes a loss of signal power.

8.3.5 Possible communications disturbances

Possible communication disturbances include the following:

- **Noise** can be caused by electronic devices and radio transmitters.
- **Path-loss** occurs as the strength of the received signal steadily decreases in proportion to the distance from the transmitter.
- **Shadowing** is a form of environmental attenuation of radio signals caused by hills, buildings, trees or even vehicles. This can be a particular problem inside buildings, especially if the walls are thick and reinforced.
- **Multi-path fading** is a sudden decrease or increase in the signal strength. This is the result of interference which is caused when direct and reflected signals reach the antenna simultaneously. Surfaces such as buildings, streets, vehicles, etc., can reflect signals.
- **Hand-over** occurs as you move from one cell to another in the GSM network. Your mobile application call is transferred from one cell to the next. Hand-over can briefly interfere with communication and may cause a delay, or at worst, disruption.

9. Conformity assessment

MATRIX ELECTRONICA S.L.U.
C/ Alejandro Sanchez 109
28019 Madrid
Spain

9.1 Standards of European Type Approval

We declare under our sole responsibility that the products MTX-HSPA-PH8-P+G Modem 0 containing Cellular Engine Cinterion engine PH8 (Type S30960-N1055-A200), to which this declaration relates, are labeled with the CE conformity mark.

DIRECTIVE 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC.

DIRECTIVE 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006 on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits.

ETSI EN 301 511 V9.0.2: Global System for Mobile communications (GSM); Harmonized standard for mobile stations in the GSM 900 and DCS 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC) (GSM 13.11 version 7.0.1 Release 1998).

ETSI EN 301 489-1 V1.9.2: Electro Magnetic Compatibility and Radio spectrum Matters (ERM); Electro Magnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common Technical Requirements

ETSI EN 301 489-7 V1.3.1: Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS).

ETSI EN 301 489-24 V1.5.1: Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) for Mobile and portable (UE) radio and ancillary equipment.

ETSI EN 301 908-01 V5.2.1: Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 1: Harmonized EN for IMT-2000, introduction and common requirements of article 3.2 of the R&TTE Directive.


ETSI EN 301 908-02 V5.2.1: Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 2: Harmonized EN for IMT-2000, CDMA Direct Spread (UTRA FDD) (UE) covering essential requirements of article 3.2 of the R&TTE Directive

IEC/EN 60950-1:2005 / EN 60950-1:2006+A11:2009: Health and Safety

The technical documentation relevant to the above equipment will be held at
MATRIX ELECTRONICA S.L.U.

Alejandro Sanchez 109
28019 Madrid
Spain

Madrid, 20/05/2013.
Mr. J. Vicente
Managing Board



9.2 FCC Compliant

MTX-HSPA-PH8-P+G and any variants contain FCC ID: QIPPH8. The FCC Equipment Authorization Certification for the PH8 Module is listed under the FCC identifier QIPPH8
Industry Canada Certification Number: 7830A-PH8 granted to Gemalto M2M GmbH.

The Cinterion reference application of the PH8 Module registered under the above identifier is certified to be in accordance with the following Rules and Regulations of the Federal Communications Commission (FCC). Power listed is ERP for Part 22 and EIRP for Part 24. It is compliant with FCC regulations.

9.2.1 SAR information

Cinterion Wireless Modules models: PH8 is marketed without a defined antenna.

The Maximum Antenna Gain when using indoor antennas depends on the distance from the antenna to any nearby persons when in normal operation. It should not exceed the values shown on the table below.

According to the limit in 47 CFR 1.1310, we get the value of the maximum antenna gain as follows:

The maximum measured power output in the 850 MHz band is 1866.38 mW (32.71 dBm, see 7layers test report MDE_Siem_0714_FCCb).

The maximum permissible exposure is defined as 47 CFR 1.1310 with 0.55773 mW/cm².

The maximum measured power output in the 1900 MHz band is 974.99 mW (29.89 dBm, see 7layers test report MDE_Siem_0714_FCCc).

The maximum permissible exposure is defined as 47 CFR 1.1310 with 1 mW/cm².

According to the limit in 47 CFR 1.1310, we get the value of the maximum antenna gain as follows:

$$S = P \cdot G / 4\pi R^2$$

$$S = 0.55773 \text{ mW/cm}^2 \text{ or } 1 \text{ mW/cm}^2$$

$$P = 1866.38 \text{ mW or } 974.99 \text{ mW}$$

$$R = 20 \text{ cm or } 100 \text{ cm}$$

$$\pi = 3.1416$$

$$G(\text{dBi}) = 10 \cdot \log_{10}(G)$$

Solving for G; the maximum antenna gain is

Band	Distance	Maximum Gain in dBi
850MHz	20cm	1.7669
850MHz	50cm	9.7257
1900MHz	20cm	7.1227
1900MHz	50cm	15.0815

10. Declaración de conformidad (Spanish)

MATRIX ELECTRONICA S.L.U.

C/ Alejandro Sanchez 109

28019 Madrid

Spain

10.1 Estándares de homologación europea

Declaramos bajo nuestra responsabilidad que los productos MTX-HSPA-PH8-P+G que contienen un modulo celular Cinterion PH8 (Tipo S30960-N1055-A200), al cual se refiere esta declaración, están etiquetados con el marcado CE de conformidad.

DIRECTIVA 2004/108/EC DEL PARLAMENTO EUROPEO Y DEL CONSEJO del 15 de Diciembre de 2004 sobre la aproximación de las leyes de los Estados Miembros correspondientes a la compatibilidad electromagnética y que deroga la Directiva 89/336/EEC.

DIRECTIVA 2006/95/EC DEL PARLAMENTO EUROPEO Y DEL CONSEJO del 12 de Diciembre de 2006 sobre la armonización de las leyes de los estados miembros relacionadas con los equipos eléctricos diseñados para su uso bajo ciertos límites de voltaje.

ETSI EN 301 511 V9.0.2: Sistema Global de Comunicaciones Móviles (GSM); estándar unificado para estaciones móviles en las bandas GSM 900 y DCS 1800, que cubren los requisitos esenciales del artículos 3.2 de la directiva R&TTE (1999/5/EC) (GSM 13.11 versión 7.0.1 Release 1998).

ETSI EN 301 489-1 V1.9.2: Cuestiones sobre Compatibilidad Electromagnética y espectro Radioeléctricos (ERM); estándar de compatibilidad electromagnética (EMC) para equipos y sistema de radio; Parte 1: Requisitos Técnicos Comunes

ETSI EN 301 489-7 V1.3.1: Cuestiones sobre Compatibilidad Electromagnética y espectro Radioeléctricos (ERM); estándar de compatibilidad electromagnética (EMC) para equipos y sistema de radio; Parte 7: Condiciones específicas para equipos de radio móviles y portátiles y equipos auxiliares de sistemas de radiocomunicaciones móviles digitales (GSM y DCS).

ETSI EN 301 489-24 V1.5.1: Cuestiones sobre Compatibilidad Electromagnética y espectro Radioeléctricos (ERM); estándar de compatibilidad electromagnética (EMC) para equipos y sistema de radio; Parte 24: Condiciones específicas para IMT-2000 CDMA Direct Spread (UTRA) para radios móviles y portátiles (UE) y equipamiento auxiliar.

ETSI EN 301 908-01 V5.2.1: Cuestiones sobre Compatibilidad Electromagnética y espectro Radioeléctricos (ERM); estaciones base (BS) y equipamiento de usuario (UE) para redes celulares IMT-2000 de tercera generación; Parte 1: Normativa europea armonizada para IMT-2000, introducción y requisitos comunes del artículo 3.2 de la directiva R&TTE.

ETSI EN 301 908-02 V5.2.1: Cuestiones sobre Compatibilidad Electromagnética y espectro Radioeléctricos (ERM); estaciones base (BS) y equipamiento de usuario (UE) para redes celulares IMT-2000 de tercera generación; Parte 2: Normativa europea armonizada para IMT-2000, CDMA Direct Spread (UTRA FDD) (UE) que cubre los requisitos esenciales del artículo 3.2 de la directiva R&TTE

IEC/EN 60950-1:2005 / EN 60950-1:2006+A11:2009: Salud y Seguridad

La documentación técnica referente al equipo anterior está disponible en:

MATRIX ELECTRONICA S.L.U.

Alejandro Sanchez 109

28019 Madrid

España

Madrid, 20/05/2013.

Sr. J. Vicente

Managing Board



10.2 Conformidad FCC

MTX-HSPA-PH8-P+G y todas sus variantes contienen el FCC ID: QIPPH8. El Certificado de Autorización de Equipo de la FCC para el módulo EHS6 está listado con el identificador FCC QIPPH8 Número de Certificación de Industria en Canadá: 7830A-PH8 asignado a Gemalto M2M GmbH.

El formulario de referencia del módulo PH8 registrado bajo el anterior identificador está conforme con las siguientes Reglas y Regulaciones de la Comisión Federal de Comunicaciones (FCC). La potencia listada como ERP para la parte 22 y como EIRP para la parte 24 cumple con las regulaciones de la FCC.

10.2.1 Tasa de absorción específica (SAR)

El modulo Cinterion PH8 es comercializado sin una antena definida. La ganancia máxima de antena usando antenas de interior depende de la distancia de esta a las personas cercanas y en condiciones normales no debe sobrepasar los límites mostrados en la tabla siguiente.

La máxima potencia de salida medida en la banda de 850MHz es 1866.38 mW (32.71 dBm, ver el reporte de test de 7layers MDE_Siem_0714_FCCb).

La máxima exposición permisible se define en 47 CFR 1.1310 con un valor de 0.55773 mW/cm².

La máxima potencia de salida medida en la banda de 1900 MHz es 974.99 mW (29.89 dBm, ver el reporte de test de 7layers MDE_Siem_0714_FCCc).

La máxima exposición permisible se define en 47 CFR 1.1310 con un valor de 1 mW/cm².

De acuerdo al límite en 47 CFR 1.1310, obtenemos el valor de la máxima ganancia de antena como sigue:

$$S = P \cdot G / 4\pi R^2$$

$$S = 0.55773 \text{ mW/cm}^2 \text{ o } 1 \text{ mW/cm}^2$$

$$P = 1866.38 \text{ mW o } 974.99 \text{ mW}$$

$$R = 20 \text{ cm o } 100\text{cm}$$

$$\pi = 3.1416$$

$$G(\text{dBi}) = 10 \cdot \log_{10}(G)$$

Despejando G; la máxima ganancia de antena es:

Banda	Distancia	Ganancia Máxima en dBi
850MHz	20cm	1.7669
850MHz	50cm	9.7257
1900MHz	20cm	7.1227
1900MHz	50cm	15.0815

11. Regulatory and type approval information

11.1 Directives and standards

The MTX-HSPA-PH8-P+G modem has been designed to comply with the directives and standards listed below.

It is the responsibility of the application manufacturer to ensure compliance of the final product with all provisions of the applicable directives and standards, as well as with the technical specifications provided in this document.

Directives	
1999/05/EC	Directive of the European Parliament and of the council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (in short referred to as R&TTE Directive 1999/5/EC). The product is labeled with the CE conformity mark
2002/95/EC (RoHS 1) 2011/65/EC (RoHS 2)	Directive of the European Parliament and of the Council of 27 January 2003 (and revised on 8 June 2011) on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

Standards of North American type approval	
CFR Title 47	Code of Federal Regulations, Part 22 and Part 24 (Telecommunications, PCS); US Equipment Authorization FCC
OET Bulletin 65 (Edition 97-01)	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
UL 60 950-1	Product Safety Certification (Safety requirements)
NAPRD.03 V5.15	Overview of PCS Type certification review board Mobile Equipment Type Certification and IMEI control PCS Type Certification Review board (PTCRB)
RSS132, RSS133, RSS139	Canadian Standard

Standards of European type approval	
3GPP TS 51.010-1	Digital cellular telecommunications system (Release 7); Mobile Station (MS) conformance specification;
ETSI EN 301 511 V9.0.2	Global System for Mobile communications (GSM); Harmonized standard for mobile stations in the GSM 900 and DCS 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC)
GCF-CC V3.49	Global Certification Forum - Certification Criteria
ETSI EN 301 489-01 V1.8.1	Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common Technical Requirements
ETSI EN 301 489-03 V1.4.1	Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions of Short-Range Devices (SRD) operating on frequencies between 9kHz and 40GHz
ETSI EN 301 489-07 V1.3.1	Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunications systems (GSM and DCS)
ETSI EN 301 489-24 V1.4.1	Electromagnetic Compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) for Mobile and portable (UE) radio and ancillary equipment

EN 301 908-01 V3.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 1: Harmonized EN for IMT-2000, introduction and common requirements of article 3.2 of the R&TTE Directive
EN 301 908-02 V3.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000 Third Generation cellular networks; Part 2: Harmonized EN for IMT-2000, CDMA Direct Spread (UTRA FDD) (UE) covering essential requirements of article 3.2 of the R&TTE Directive
EN 300 440-02 V1.3.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 2: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive
EN 62311:2008	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)
IEC/EN 60950-1:2006	Safety of information technology equipment

Requirements of quality

IEC 60068	Environmental testing
DIN EN 60529	IP codes

Standards of the Ministry of Information Industry of the People's Republic of China

SJ/T 11363-2006	"Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products" (2006-06).
SJ/T 11364-2006	<p>"Marking for Control of Pollution Caused by Electronic Information Products" (2006-06).</p> <p>According to the "Chinese Administration on the Control of Pollution caused by Electronic Information Products" (ACPEIP) the EPUP, i.e., Environmental Protection Use Period, of this product is 20 years as per the symbol shown here, unless otherwise marked. The EPUP is valid only as long as the product is operated within the operating limits described in the Gemalto M2M Hardware Interface Description.</p> <p>Please see next table for an overview of toxic or hazardous substances or elements that might be contained in product parts in concentrations above the limits defined by SJ/T 11363-2006.</p>

部件名称 Name of the part	有毒有害物质或元素 Hazardous substances					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
金属部件 (Metal Parts)	O	O	O	O	O	O
电路模块 (Circuit Modules)	X	O	O	O	O	O
电缆及电缆组件 (Cables and Cable Assemblies)	O	O	O	O	O	O
塑料和聚合物部件 (Plastic and Polymeric parts)	O	O	O	O	O	O
<p>O: 表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006标准规定的限量要求以下。 Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.</p> <p>X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006标准规定的限量要求。 Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part <i>might exceed</i> the limit requirement in SJ/T11363-2006.</p>						

11.2 SAR requirements specific to portable mobiles

Mobile phones, PDAs or other portable transmitters and receivers incorporating a GSM module must be in accordance with the guidelines for human exposure to radio frequency energy. This requires the Specific Absorption Rate (SAR) of portable EHS6 based applications to be evaluated and approved for compliance with national and/or international regulations.

Since the SAR value varies significantly with the individual product design, manufacturers are advised to submit their product for approval if designed for portable use. For European markets the relevant directives are mentioned below. It is the responsibility of the manufacturer of the final product to verify whether or not further standards, recommendations or directives are in force outside these areas.

Products intended for sale in US markets

EN 59005/ANSI C95.1: Considerations for evaluation of human exposure to Electromagnetic Fields (EMFs) from Mobile Telecommunication Equipment (MTE) in the frequency range 30MHz – 6GHz

Products intended for sale in European markets

EN 50360: Product standard to demonstrate the compliance of mobile phones with the basic restrictions related to human exposure to electromagnetic fields (300MHz - 3GHz)

Please note that SAR requirements are specific only for portable devices and not for mobile devices as defined below:

- Portable device:
A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the user's body.
- Mobile device:
A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the user's body or that of nearby persons. In this context, the term "fixed location" means that the device is physically secured at one location and cannot be easily moved to another location.

11.3 SELV requirements

The power supply connected to the MTX-HSPA-PH8-P+G modem shall be in compliance with the SELV requirements defined in EN 60950-1.

12. RoHS Statement

The MTX-HSPA-PH8-P+G modem is compliant with the 2002/95/EC Directive of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).



13. Disposal of old electrical & electronic equipment



This symbol, applied on our products and/or on its packaging, indicates that this product should not be treated as household waste when you wish to dispose of it. Instead, it should be handed over to an applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences to the environment and human health, which could otherwise be caused by inappropriate disposal of this product. The recycling of materials will help to conserve natural resources. For more detailed information about the recycling of this product, please contact your local city office, household waste disposal service or the retail store where you purchased this product.

14. Abbreviations

Abbreviation	Description
ADC	Analog-to-digital converter
AGC	Automatic Gain Control
ANSI	American National Standards Institute
ARFCN	Absolute Radio Frequency Channel Number
ARP	Antenna Reference Point
ASC0/ASC1	Asynchronous Controller. Abbreviations used for first and second serial interface of EHS6
B	Thermistor Constant
BER	Bit Error Rate
BTS	Base Transceiver Station
CB or CBM	Cell Broadcast Message
CE	Conformité Européene (European Conformity)
CHAP	Challenge Handshake Authentication Protocol
CPU	Central Processing Unit
CS	Coding Scheme
CSD	Circuit Switched Data
CTS	Clear to Send
DAC	Digital-to-Analog Converter
DAI	Digital Audio Interface
dBm0	Digital level, 3.14dBm0 corresponds to full scale, see ITU G.711, A-law
DCE	Data Communication Equipment (typically modems, e.g. Gemalto M2M module)
DCS 1800	Digital Cellular System, also referred to as PCN
DL	Download
dnu	Do not use
DRX	Discontinuous Reception
DSB	Development Support Box
DSP	Digital Signal Processor
DSR	Data Set Ready
DTE	Data Terminal Equipment (typically a computer, terminal, printer or, for example, a GSM application)
DTR	Data Terminal Ready
DTX	Discontinuous Transmission
EDGE	Enhanced Data rates for GSM Evolution
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EIRP	Equivalent Isotropic Radiated Power
EMC	Electromagnetic Compatibility
ERP	Effective Radiated Power
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
ETSI	European Telecommunications Standards Institute
FCC	Federal Communications Commission (U.S.)
FDD	Frequency Division Duplex
FDMA	Frequency Division Multiple Access

FR	Full Rate
GMSK	Gaussian Minimum Shift Keying
GPIO	General Purpose Input/Output
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HiZ	High Impedance
HR	Half Rate
HSDPA	High Speed Downlink Packet Access
I/O	Input/Output
IC	Integrated Circuit
IMEI	International Mobile Equipment Identity
ISO	International Standards Organization
ITU	International Telecommunications Union
kbps	kbits per second
LED	Light Emitting Diode
Li-Ion/Li+	Lithium-Ion
Li battery	Rechargeable Lithium Ion or Lithium Polymer battery
LPM	Link Power Management
MBB	Moisture barrier bag
Mbps	Mbits per second
MCS	Modulation and Coding Scheme
MMI	Man Machine Interface
MO	Mobile Originated
MS	Mobile Station (GSM module), also referred to as TE
MSISDN	Mobile Station International ISDN number
MSL	Moisture Sensitivity Level
MT	Mobile Terminated
nc	Not connected
NTC	Negative Temperature Coefficient
OEM	Original Equipment Manufacturer
PA	Power Amplifier
PAP	Password Authentication Protocol
PBCCH	Packet Switched Broadcast Control Channel
PCB	Printed Circuit Board
PCL	Power Control Level
PCM	Pulse Code Modulation
PCN	Personal Communications Network, also referred to as DCS 1800
PCS	Personal Communication System, also referred to as GSM 1900
PD	Pull Down resistor (appr. 100k)
PDU	Protocol Data Unit
PLL	Phase Locked Loop
PPP	Point-to-point protocol
PS	Packet Switched
PSK	Phase Shift Keying
PSU	Power Supply Unit

PU	Pull Up resistor (appr. 100k)
PWM	Pulse Width Modulation
QAM	Quadrature Amplitude Modulation
R&TTE	Radio and Telecommunication Terminal Equipment
RAM	Random Access Memory
RF	Radio Frequency
RLS	Radio Link Stability
RMS	Root Mean Square (value)
RoHS	Restriction of the use of certain hazardous substances in electrical and electronic equipment.
ROM	Read-only Memory
RTC	Real Time Clock
RTS	Request to Send
Rx	Receive Direction
SAR	Specific Absorption Rate
SAW	Surface Acoustic Wave
SELV	Safety Extra Low Voltage
SIM	Subscriber Identification Module
SMD	Surface Mount Device
SMS	Short Message Service
SMT	Surface Mount Technology
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory
SRB	Signalling Radio Bearer
TA	Terminal adapter (e.g. GSM module)
TDMA	Time Division Multiple Access
TE	Terminal Equipment, also referred to as DTE
TLS	Transport Layer Security
TPC	Transmit Power Control
TS	Technical Specification
Tx	Transmit Direction
UART	Universal asynchronous receiver-transmitter
UICC	USIM Integrated Circuit Card
UL	Upload
UMTS	Universal Mobile Telecommunications System
URC	Unsolicited Result Code
USB	Universal Serial Bus
USIM	UMTS Subscriber Identification Module
USSD	Unstructured Supplementary Service Data
VSWR	Voltage Standing Wave Ratio
WCDMA	Wideband Code Division Multiple Access

15. AT command summary

The AT standard is a line-oriented command language. AT is an abbreviation of ATtention and it is always used to send a command line from the terminal equipment (TE) to the terminal adaptor (TA). The command line consists of a string of alphanumeric characters. It is sent to the MTX-HSPA-PH8-P+G to instruct it to perform the commands specified by the characters.

The AT commands listed below are supported from within the MTX-HSPA-PH8-P+G. The AT Command Set manual can be downloaded from the MTX-HSPA-PH8-P+G web page at www.mtxm2m.com.

AT Command	Description
+++	Escape from Data Mode to AT Command Mode
A/	Repeat Previous Command Line
AT&C	Set Data Carrier Detect (DCD) line mode
AT&D	Set Data Terminal Ready (DTR) line mode
AT&F	Reset AT Command Settings to Factory Default Values
AT&S	Set Data Set Ready (DSR) line mode
AT&V	Display current Configuration
AT&W	Store AT Command Settings to User Defined Profile
AT+CACM	Accumulated call meter (ACM) reset or query
AT+CAMM	Accumulated call meter maximum (ACMmax) set or query
AT+CAOC	Advice of Charge Information
AT+CBST	Select Bearer Service Type
AT+CCFC	Call forwarding number and conditions control
AT+CCLK	Real Time Clock
AT+CCUG	Closed User Group
AT+CCWA	Call Waiting
AT+CEER	Extended Error Report
AT+CFUN	PH8-P Functionality Level
AT+CGACT	PDP Context Activate or Deactivate
AT+CGATT	PS Attach or Detach
AT+CGCMOD	PDP Context Modify
AT+CGDATA	Enter Data State
AT+CGDCONT	Define PDP Context
AT+CGEQMIN	3G Quality of Service Profile (Minimum acceptable)
AT+CGEQREQ	3G Quality of Service Profile (Requested)
AT+CGMI	Request manufacturer identification
AT+CGMM	Request model identification
AT+CGMR	Request revision identification of software status
AT+CGPADDR	Show PDP Address
AT+CGQMIN	Quality of Service Profile (Minimum acceptable)
AT+CGQREQ	Quality of Service Profile (Requested)
AT+CGREG	Packet Domain Network Registration Status
AT+CGSMS	Select Service for MO Short Messages
AT+CGSN	Request International Mobile Equipment Identity (IMEI)

AT+CHLD	Call Hold and Multiparty
AT+CHUP	Hang up call
AT+CIMI	Request International Mobile Subscriber Identity (IMSI)
AT+CLCC	List of current calls
AT+CLCK	Facility Lock
AT+CLIP	Calling Line Identification Presentation
AT+CLIR	Calling Line Identification Restriction
AT+CMEE	Error Message Format
AT+CMGC	Send an SMS command
AT+CMGD	Delete short message
AT+CMGF	Select SMS message format
AT+CMGL	List SMS messages from preferred store
AT+CMGR	Read SMS messages
AT+CMGS	Send Short Message
AT+CMGW	Write Short Messages to Memory
AT+CMMS	More Messages to Send
AT+CMSS	Send short messages from storage
AT+CMUT	Mute control
AT+CMUX	Multiplex mode
AT+CNMA	New Message Acknowledgement to UE/TE
AT+CNMI	SMS Event Reporting Configuration
AT+CNUM	Read own numbers
AT+COLP	Connected Line Identification Presentation
AT+COPN	Read operator names
AT+COPS	Operator Selection
AT+CPAS	Activity Status
AT+CPBF	Find phonebook entries
AT+CPBR	Read from phonebook
AT+CPBS	Select phonebook memory storage
AT+CPBW	Write into phonebook
AT+CPIN	PIN Authentication
AT+CPLS	Selection of preferred Operator list
AT+CPMS	Preferred SMS message storage
AT+CPOL	Preferred Operator List
AT+CPUC	Price per unit and currency table
AT+CPWD	Change Password
AT+CR	Service reporting control
AT+CRC	Set Cellular Result Codes for incoming call indication
AT+CREG	Network Registration Status
AT+CRLP	Configure RLP Parameters for Outgoing Non-Transparent Data Calls
AT+CRSM	Restricted USIM Access
AT+CSCA	SMS Service Center Address
AT+CSCB	Select Cell Broadcast Message Indication
AT+CSCS	Character Set
AT+CSDH	Show SMS text mode parameters
AT+CSIM	Generic USIM Access

AT+CSMP	Set SMS Text Mode Parameters
AT+CSMS	Select Message Service
AT+CSQ	Signal quality
AT+CSSN	Supplementary service notifications
AT+CSTA	Select type of address
AT+CUSD	Unstructured Supplementary Service Data
AT+ES	Synchronous Data Mode Configuration
AT+ESA	Synchronous Access Mode Configuration
AT+GCAP	Capabilities List
AT+GMI	Request manufacturer identification
AT+GMM	Request model identification
AT+GMR	Request revision identification of software status
AT+GSN	Request International Mobile Equipment Identity (IMEI)
AT+IPR	Bit Rate
AT+VTS	DTMF and tone generation
AT+WS46	Select wireless network
AT\Q	Flow Control
AT^SAD	Antenna Configuration
AT^SAIC	Audio Interface Configuration
AT^SBNW	Binary Write
AT^SBV	Battery/Supply Voltage
AT^SCFG	Extended Configuration Settings
AT^SCID	USIM Identification Number
AT^SCKS	Query USIM and Chip Card Holder Status
AT^SCML	List Concatenated Short Messages from preferred store
AT^SCMR	Read Concatenated Short Messages
AT^SCMS	Send Concatenated Short Messages
AT^SCMW	Write Concatenated Short Messages to Memory
AT^SCSL	Customer SIM Lock
AT^SCTM	Critical Operating Temperature Monitoring
AT^SDPORT	Configure Interface Allocation
AT^SFDL	Enter Firmware Download Mode
AT^SGAUTH	Set Type of Authentication for PDP-IP Connections
AT^SGCONF	Configuration of GPRS related Parameters
AT^SGPSC	GPS Configuration
AT^SGPSS	GPS Switch
AT^SHUP	Hang up call(s) indicating a specific 3GPP TS 24.008 release cause
AT^SICS	Internet Connection Settings
AT^SIND	Extended Indicator Control
AT^SISC	Internet Service Close
AT^SISE	Internet Service Error Report
AT^SISO	Internet Service Open
AT^SISR	Internet Service Read Data
AT^SISS	Internet Service Setup Profile
AT^SIST	Transparent Access Mode
AT^SISW	Internet Service Write Data

AT^SISX	Internet Service Execution
AT^SLCC	Extended list of current calls
AT^SLED	LED Feature
AT^SMGL	List Short Messages from preferred store without setting status to REC READ
AT^SMONI	Monitor the serving cell
AT^SMONP	Monitor neighbour cells
AT^SMSO	Switch Off PH8-P
AT^SNFI	Set microphone path parameters
AT^SNFO	Set audio output parameter (loudspeaker path)
AT^SNFS	Select audio hardware set
AT^SNFTTY	Signal TTY/CTM audio mode capability
AT^SOPS	Extended Operator Selection
AT^SPIC	Display PIN Counter
AT^SQPORT	Query Port Type
AT^SRTC	Ringtone configuration
AT^SSET	USIM Data Ready Indication
AT^SSTA	Remote-SAT Interface Activation
AT^SSTGI	SAT Get Information
AT^SSTGI	SAT Get Information - Refresh (1)
AT^SSTGI	SAT Get Information - Set Up Event List (5)
AT^SSTGI	SAT Get Information - Set Up Call (16)
AT^SSTGI	SAT Get Information - Send SS (17)
AT^SSTGI	SAT Get Information - Send USSD (18)
AT^SSTGI	SAT Get Information - Send Short Message (19)
AT^SSTGI	SAT Get Information - Send DTMF (20)
AT^SSTGI	SAT Get Information - Launch Browser (21)
AT^SSTGI	SAT Get Information - Play Tone (32)
AT^SSTGI	SAT Get Information - Display Text (33)
AT^SSTGI	SAT Get Information - Get Inkey (34)
AT^SSTGI	SAT Get Information - Get Input (35)
AT^SSTGI	SAT Get Information - Select Item (36)
AT^SSTGI	SAT Get Information - Set up Menu (37)
AT^SSTGI	SAT Get Information - Set up Idle Mode Text (40)
AT^SSTGI	SAT Get Information - Language Notification (53)
AT^SSTR	SAT Response
AT^SSTR	SAT Response - Refresh (1)
AT^SSTR	SAT Response - Set Up Event List (5)
AT^SSTR	SAT Response - Set Up Call (16)
AT^SSTR	SAT Response - Send SS (17)
AT^SSTR	SAT Response - Send USSD (18)
AT^SSTR	SAT Response - Send Short Message (19)
AT^SSTR	SAT Response - Send DTMF (20)
AT^SSTR	SAT Response - Launch Browser (21)
AT^SSTR	SAT Response - Play Tone (32)
AT^SSTR	SAT Response - Display Text (33)
AT^SSTR	SAT Response - Get Inkey (34)

AT^SSTR	SAT Response - Get Input (35)
AT^SSTR	SAT Response - Select Item (36)
AT^SSTR	SAT Response - Setup Menu (37)
AT^SSTR	SAT Response - Set Up Idle Mode Text (40)
AT^SSTR	SAT Response - Language Notification (53)
AT^SSTR	SAT Event - Menu Selection (211)
AT^SSTR	SAT Event - User Activity (232)
AT^SSTR	SAT Event - Idle Screen Available (233)
AT^SSTR	SAT Event - Language Selection (235)
AT^SSTR	SAT Event - Browser Termination (236)
AT^SSTR	SAT Event - Terminate Command (254)
ATA	Connect to Incoming Call
ATD	Mobile originated call to specified number
ATD*99#	Request Packet Domain service
ATD><index>	Mobile originated call from active memory using index number
ATD><mem><index>	Mobile originated call using specific memory and index number
ATD><str>	Mobile originated call from memory using corresponding string
ATE	AT Command Echo
ATH	Disconnect existing data connection
ATI	Display product identification information
ATL	Set monitor speaker loudness
ATM	Set monitor speaker mode
ATO	Switch from command mode to data mode
ATP	Select pulse dialing
ATQ	Result Code Presentation Mode
ATS0	Automatic Answer
ATS10	Set disconnect delay after indicating the absence of data carrier
ATS3	Command Line Termination
ATS4	Response Formatting
ATS5	Command Line Editing
ATS6	Set pause before blind dialing
ATS7	Set number of seconds to wait for connection completion
ATS8	Comma Dial Pause Time
ATT	Select tone dialing
ATV	Result code format mode
ATX	CONNECT Result Code Format
ATZ	Restore AT Command Settings from User Defined Profile

16. Accessories

The MTX-HSPA-PH8-P+G has a wide range of available accessories, including:

- Power supplies
- All type of antennas (indoor, outdoor, high gain, etc...)
- Cables and DIN adapters

The MTX-HSPA-PH8-P+G is shipped without any accessories.

Please visit the following web sites to see the full range of accessories:

- www.mtxm2m.com

17. Sales contact

www.mtxm2m.com

Matrix Madrid	Matrix Barcelona	Matrix Bilbao	Matrix Valencia
Matrix Electrónica S.L. C/ Alejandro Sánchez, 109 28019 Madrid (SPAIN) Phone 1: 902 19 81 46 Phone 2: +34915602737 Fax 1: 902 99 54 14 Fax 2: +34915652865	Matrix Electrónica S.L. Ctra. Rubí a Sabadell Km 13 Nave 109, Oficinas 6-9 08191 Rubí, Barcelona (SPAIN) Phone 1: 902 19 81 46 Fax 1: 902 99 54 14	Matrix Electrónica S.L. Pol. Aliendalde, 11 Oficina 2G 48200 - Durango, Vizcaya (SPAIN) Phone 1: 902 19 81 46 Fax 1: 902 99 54 14	Matrix Electrónica S.L. Valencia (SPAIN) Phone 1: 902 19 81 46 Fax 1: 902 99 54 14
Matrix Sevilla	Matrix Lisboa	Matrix Santiago de Chile	
Matrix Electrónica S.L. Sevilla (SPAIN) Phone: 902 19 81 46 Fax: 902 99 54 14 Phone 1: 902 19 81 46 Fax 1: 902 99 54 14	LusoMatrix Lda. Av. Coronel Eduardo Galhardo, 7 1ºC 1170-105 - Lisboa (PORTUGAL) Phone 1: +351218162625 Fax 1: +351218149482	Matrix Electrónica S.L. Calle Badajoz, 100 Oficina 1305 Santiago de Chile (CHILE) Phone 1: +56(9)53369943 Phone 2: +56(9)74822647	