

GWM400

Product Technical Specification and User Guide

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0 Document History

Preceding document:

"Cinterion® GWM400 Product Technical Specification and User Guide" v02

New document: "Cinterion® GWM400 Product Technical Specification and User Guide" v02

Chapter	What is new
3.4	Updated max. supply power in Table 10
3.5.1	Revised chapter regarding time between power off and power on

Preceding document:

"Cinterion® GWM400 Product Technical Specification and User Guide" v01

New document: "Cinterion® GWM400 Product Technical Specification and User Guide" v02

Chapter	What is new
1 , 1.1 , 2	replaced module name to ELS61-AUS
1.3	Revised to actual certifications
1.4	Updated Figure 1 and Table 7
2.1	Revised "Feature at a Glance" related Operating temperature, Firmware update and antenna
3.1	Revised Figure 2 and Table 8 related to antenna connector
3.4	Updated Figure 4
3.4.2	Updated peak current
3.8	Updated Figure 7 and antenna gain for all supported bands
4.2	Revised Table 13
4.3	Revised Table 14
4.4	Revised Table 15
5.1	Update dimension, Figure 8 and Figure 9
5.2	Revised number of terminals in VP box, added Figure 10
6.3 , 6.4	Revised to Radio Equipment Directive
6.5	Added FCC ID for GWM400

New document: "Cinterion® GWM400 Hardware Interface Description" v01

Chapter	What is new
--	Initial document setup.

1 Introduction

This document¹ describes the hardware of the GWM400. The GWM400 contains a Cinterion® ELS61-AUS module, and has an RS-232 compatible interface with an 8-pin Molex Microfit connector, including power supply, and an RF antenna connector.

The scope of this document includes interface specifications, electrical as well as mechanical characteristics of the GWM400. It specifies standards pertaining to wireless applications and outlines requirements that must be adhered to for successful product design.

The GWM400 is a compact WCDMA/LTE modem to transfer data to/from other devices, such as smart meter, to the mobile network. It is easy to use the GWM400 as a WCDMA/LTE terminal. The GWM400 has an industrial standard serial interface that can be used to transfer data to/from the connected device. The connected device can also send AT commands via this serial interface, to control GWM400. The GWM400 supports triple band WCDMA and quad band LTE. It has an integrated SIM card reader supporting 1.8V and 3V SIM cards.

GWM400 is not intended for use in vehicular environments.

1. The document is effective only if listed in the appropriate Release Notes as part of the technical documentation delivered with your Gemalto M2M product.

1.1 Related Documents

- [1] AT Command Set for the Cinterion® ELS61-AUS module
- [2] Release Notes for the Cinterion® ELS61-AUS module

To visit the Gemalto M2M GmbH Website please use the following link:

<http://m2m.gemalto.com>

1.2 Terms and Abbreviations

Table 1: Terms and abbreviations

Abbreviation	Description
ACMA	Australian Communications and Media Authority
ARP	Antenna Reference Point
ATC	AT Command
BTS	Base Transceiver Station
CB	Cell Broadcast
CE	Communauté Européenne (originally)
CODEC	Coder-Decoder
DAI	Digital Audio Interface
DCE	Data Circuit terminating Equipment
DSR	Data Set Ready
DTR	Data Terminal Ready
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FDMA	Frequency Division Multiple Access
G.C.F.	GSM Conformity Forum
GSM	Global Standard for Mobile Communication
HW	Hardware
IC	Integrated Circuit
IF	Intermediate Frequency
IMEI	International Mobile Equipment Identifier
I/O	Input/ Output
IGT	Ignition
ISO	International Standards Organization

1.2 Terms and Abbreviations

Table 1: Terms and abbreviations

Abbreviation	Description
ITU	International Telecommunications Union
kbps	kbits per second
LVD	Low voltage Directive
Mbps	Mbits per second
MCU	Microprocessor Control Unit
MMI	Machine Machine Interface
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
NC	Not Connected
PA	Power Amplifier
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PCS	Personal Communication System
PD	Power Down
PDU	Protocol Data Unit
R&TTE	Radio and Telecommunication Terminal Equipment
RF	Radio frequency
RI	Ring Indication
RX	Receive direction
SIM	Subscriber Identification Module
SMS	Short Message Service
SW	Software
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
TX	Transmit direction
UART	Universal Asynchronous Receiver and Transmitter

1.3 Regulatory and Type Approval Information

1.3.1 Directives and Standards

GWM400 is 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 the "GWM400 Hardware Interface Description".¹

Table 2: Directives

2014/53/EU	Directive of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.	
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)	

Table 3: Standards of Australian Type Approval

GCF-CC v.3.65.0	Global Certification Forum - Certification Criteria
NAPRD.03 Version 5.30	Overview of PCS Type certification review board Mobile Equipment Type Certification and IMEI control PCS Type Certification Review board (PTCRB)
FCC Certification (CFR 47 Part 15, 22, and 24)	Federal Communication Commission Certification Code of Federal Regulations (CFR) 47 PART 15 - RADIO FREQUENCY DEVICES PART 22 - PUBLIC MOBILE SERVICES PART 24 - PERSONAL COMMUNICATIONS SERVICES
3GPP TS 51.010-1	Digital cellular telecommunications system (Release 9); Mobile Station (MS) conformance specification
PTCRB RFT 077	AT-Command Test Specification Covering PTCRB RFT 77
ETSI EN 301 908-1 V11.1.1 t	IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 1: Introduction and common requirements
ETSI EN 301 908-2 V11.1.1	IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 2: CDMA Direct Spread (UTRA FDD) User Equipment (UE)
ETSI EN 301 908-13 V11.1.1	IMT cellular networks; Harmonized Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 13: Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE)

1. Manufacturers of applications which can be used in the US shall ensure that their applications have a PTCRB approval. For this purpose they can refer to the PTCRB approval of the respective module.

1.3 Regulatory and Type Approval Information

Draft ETSI EN 301 489-52 V1.1.0	Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 52: Specific conditions for Cellular Communication Mobile and portable (UE) radio and ancillary equipment; Harmonized Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
Draft ETSI EN 301 489-01 V2.2.0	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonized Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU
EN 60950-1: 2006 +A11:2009+A1:2010+A1 2:2011+A2:2013	Safety of information technology equipment
EN 62311:2008	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)

Table 4: Standards of North American type approval

FCC Certification (CFR 47 Part 15, 22, and 24)	Federal Communication Commission Certification Code of Federal Regulations (CFR) 47 PART 15 - RADIO FREQUENCY DEVICES PART 22 - PUBLIC MOBILE SERVICES PART 24 - PERSONAL COMMUNICATIONS SERVICES
OET Bulletin 65 (Edition 97-01)	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields
NAPRD.03 Version 5.30	Overview of PCS Type certification review board Mobile Equipment Type Certification and IMEI control PCS Type Certification Review board (PTCRB)

Table 5: Standards of European type approval

3GPP TS 51.010-1	Digital cellular telecommunications system (Release 9); Mobile Station (MS) conformance specification;
GCF-CC V3.65.0	Global Certification Forum - Certification Criteria
ETSI EN 301 511 V12.5.1	Global System for Mobile communications (GSM); Mobile Stations (MS) equipment; Harmonized Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
ETSI EN 301 908-1 V11.1.1 t	IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 1: Introduction and common requirements
ETSI EN 301 908-2 V11.1.1	IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 2: CDMA Direct Spread (UTRA FDD) User Equipment (UE)
ETSI EN 301 908-13 V11.1.1	IMT cellular networks; Harmonized Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 13: Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE)
Draft ETSI EN 301 489-52 V1.1.0	Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 52: Specific conditions for Cellular Communication Mobile and portable (UE) radio and ancillary equipment; Harmonized Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

1.3 Regulatory and Type Approval Information

Table 5: Standards of European type approval

Draft ETSI EN 301 489-01 V2.2.0	ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonized Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU
EN 60950-1:2006 +A11:2009 +A1:2010 +A12:2011	Information technology equipment - Safety Part 1: General requirements (IEC 60950-1:2005, modified); Amendment A11: 2009; Amendment A1: 2010; Amendment A12: 2011
EN 62311:2008	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz) [Superseded: CENELEC EN 50392]

Table 6: Requirements of quality

IEC 60068	Environmental testing
DIN EN 60529	IP codes

1.3.2 Safety Precautions

The following safety precautions must be observed during all phases of the operation, usage, service or repair of any cellular terminal or mobile incorporating GWM400. Manufacturers of the cellular terminal are advised to convey the following safety information to users and operating personnel and to incorporate these guidelines into all manuals supplied with the product. Failure to comply with these precautions violates safety standards of design, manufacture and intended use of the product. Gemalto M2M assumes no liability for customer's failure to comply with these precautions.

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

1.4 Product Label

The labels fixed to the bottom of a GWM400 comprise the following information.

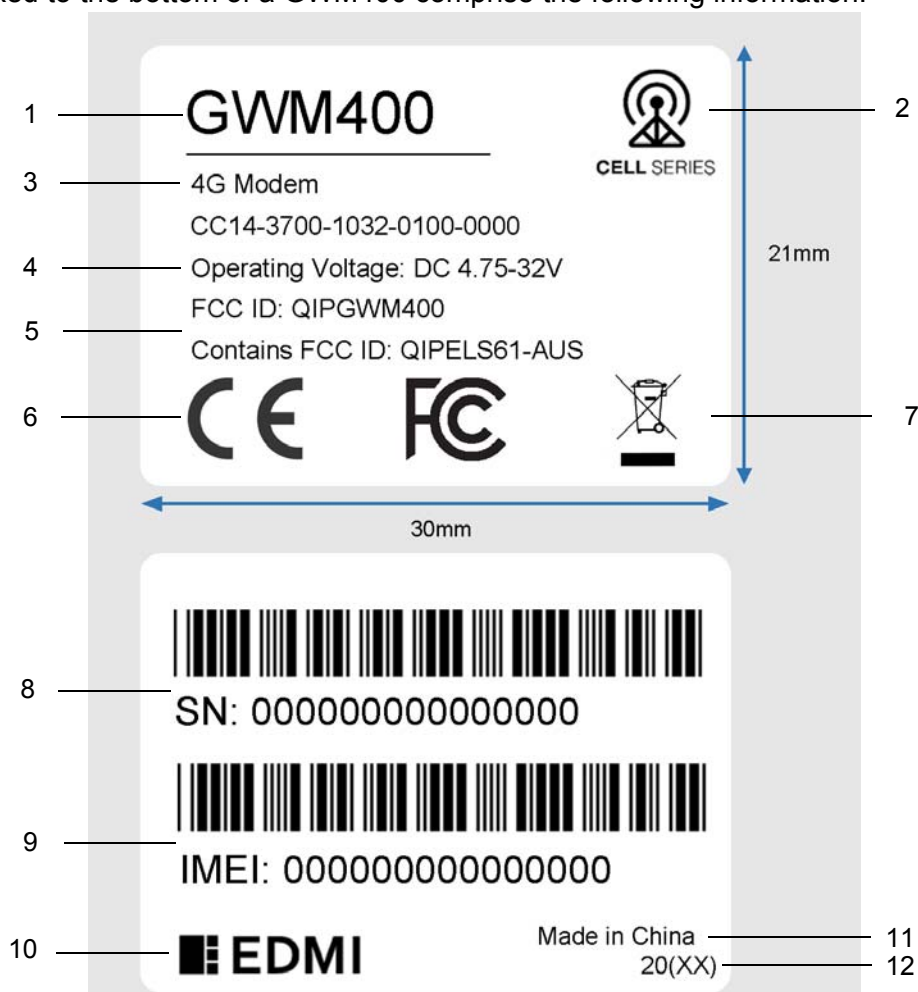


Figure 1: Sample GWM400 labels (This is a label under working, subject to further editing)

Table 7: GWM400 label information

No.	Information
1	Product name
2	Product series/family
3	Product group
4	Operating Voltage
5	FCC IDs
6	CE logo and FCC logo
7	WEEE logo (Waste of Electrical and Electronic Equipment symbol)
8	Product's serial number (also as Barcode 128 type C)
9	Product's IMEI (also as Barcode 128 type C)
10	Company logo
11	Marking "Made in China"
12	Year of manufacture

2 Product Concept

2.1 Key Features at a Glance

Feature	Implementation
General	
Incorporates Cinterion® Java module	The Java module handles all signal and data processing within the GWM400. Internal software runs the application interface and the complete WCDMA/LTE protocol stack.
Frequency bands	GWM400 (with ELS61-AUS module): UMTS/HSPA+: Triple band, 850 (BdV) / 900 (BdVIII) / 2100 MHz (BdI) LTE: Quad band, 700 (Bd28) / 900 (Bd8) / 850 (Bd5) / 1800MHz (Bd3)
Output power (according to Release 99)	Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD BdI Class 3 (+24dBm +1/-3dB) for UMTS 900, WCDMA FDD BdV Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdVIII
Output power (according to Release 8)	Class 3 (+23dBm ±2dB) for LTE 700, LTE FDD Bd28 Class 3 (+23dBm ±2dB) for LTE 900, LTE FDD Bd8 Class 3 (+23dBm ±2dB) for LTE 850, LTE FDD Bd5 Class 3 (+23dBm ±2dB) for LTE 1800, LTE FDD Bd3
Power supply	4.75V to 32V
Operating temperature (ambient temperature)	Normal operation: -30°C to +75°C
Physical	Dimensions: 76.7mm x 51.5mm x 23.5 mm Weight: approx. 60g
LTE features	
3GPP Release 9	UE CAT 1 supported DL 10.2Mbps, UL 5.2Mbps
HSPA features	
3GPP Release 8	DL 7.2Mbps, UL 5.7Mbps HSDPA Cat.8 / HSUPA Cat.6 data rates Compressed mode (CM) supported according to 3GPP TS25.212
UMTS features	
3GPP Release 4	PS data rate – 384 kbps DL / 384 kbps UL CS data rate – 64 kbps DL / 64 kbps UL
SMS	Point-to-point MT and MO Cell broadcast Text and PDU mode Storage: SIM card plus SMS locations in mobile equipment
Software	
AT commands	Hayes 3GPP TS 27.007, TS 27.005, Gemalto M2M AT commands for RIL compatibility

2.1 Key Features at a Glance

Feature	Implementation
Java™ Open Platform	Java™ Open Platform with • Java™ profile IMP-NG & CLDC 1.1 HI • Secure data transmission via HTTPS/SSL • Multi-threading programming and multi-application execution Major benefits: seamless integration into Java applications, ease of programming, no need for application microcontroller, extremely cost-efficient hardware and software design – ideal platform for industrial applications. The memory space available for Java programs is 30MB in the flash file system and 18MB RAM. Application code and data share the space in the flash file system and in RAM.
Microsoft™ compatibility	RIL for Pocket PC and Smartphone
SIM Application Toolkit	SAT letter classes b, c, e; with BIP
Firmware update	Generic update from host application over ASC0.
Interfaces	
RS232	RS-232 interface as part of 8-pin Molex Microfit for AT commands and data: • Supports RTS/CTS hardware handshake • Supports software XON/XOFF flow control • Multiplex ability according to GSM 07.10 Multiplexer protocol • Baud rates from 1200bps to 921,600bps, default: 9600bps • Autobauding supported
Power supply	Power supply (BATT+) as part of 8-pin Molex Microfit
SIM card reader	Supported SIM/USIM cards: 3V, 1.8V
Antenna	Antenna connected via SMA connector (jack)
Power on/off, Reset	
Power on	Power supply line at power connector
Power off	Normal switch-off by AT^SMSO Automatic switch-off in case of critical temperature or voltage conditions
Reset	Orderly shutdown and reset by AT command
Special features	
Status indication	LED to indicate operating status.
Real time clock	Timer functions via AT commands

3 Interface Description

3.1 Overview

GWM400 provide the following interfaces for power supply, operating status indication, antenna, SIM card and data transfer:

Table 8: GWM400' interfaces

No.	Description
1	SIM card reader (FF2, rubber cover, no hot plug)
2	LED (green) showing operating status LED
3	8-pin Molex Microfit connector (female) for data transfer (RS-232 interface) and power supply
4	SMA connector (jack) for RF antenna

Front view



Back view



Figure 2: GWM400 interfaces

3.2 Block Diagram

Figure 3 shows a block diagram of a sample configuration that incorporates a GWM400 and typical accessories.

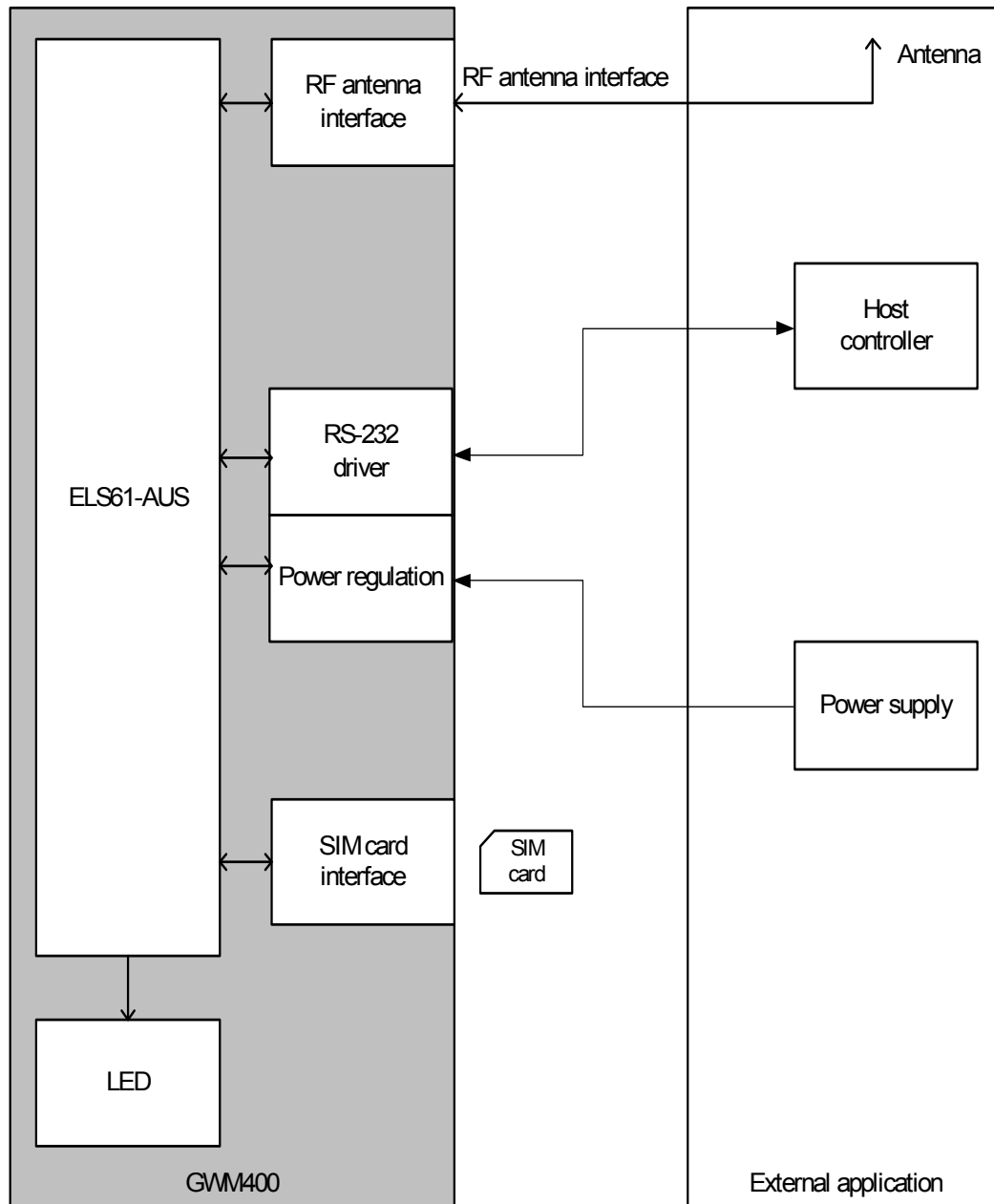


Figure 3: Block diagram

3.3 Operating Modes

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

Table 9: Overview of operating modes

Normal operation	UMTS / HSPA / LTE SLEEP	Power saving set automatically when no call is in progress.
	UMTS / HSPA / LTE IDLE	Power saving disabled, but no call in progress.
	UMTS DATA	UMTS data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate.
	HSPA DATA	HSPA data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate.
	LTE DATA	LTE data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate.
Power Down	Normal shutdown after sending the power down command. Only a voltage regulator is active for powering the RTC. Software is not active. Interfaces are not accessible. Operating voltage remains applied.	
Airplane mode	Airplane mode shuts down the radio part of the module, causes the module to log off from the network and disables all AT commands whose execution requires a radio connection. Airplane mode can be controlled by AT command (see [1]).	

3.4 Molex Microfit Connector

Via the 8-pin Molex Microfit connector, the host application controller controls the GWM400 (including power supply), and transports data.

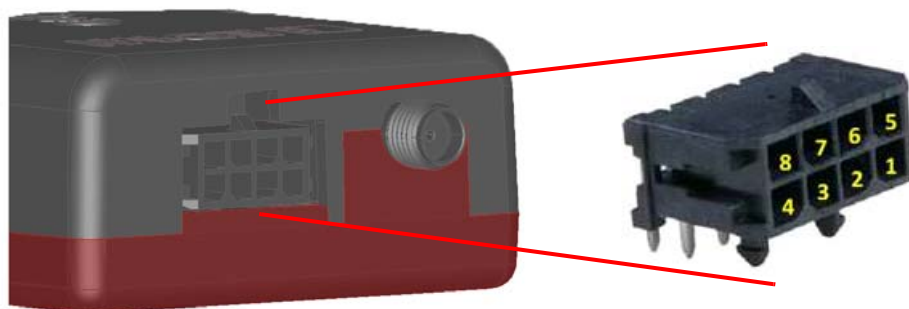


Figure 4: Pin assignment Molex Microfit

Table 10: 8-pin Molex Microfit connector

Pin no.	Signal name	I/O	Function
1	BATT+	I	Power Supply (4.75-32V DC; 3.5W maximum including peaks)
2	DTR0	I	Data Terminal Ready
3	RXD0	O	Receive Data
4	CTS0	O	Clear To Send
5	DCD0	O	Data Carrier Detected
6	GND	-	Ground
7	TXD0	I	Transmit Data
8	RTS0	I	Request To Send

The Molex Microfit connector implements an RS-232 interface (see [Section 3.4.1](#)) as well as the power supply line (see [Section 3.4.2](#)).

The GWM400's Molex Microfit (3.0) connector, i.e., the header (series number: 430450822) mates with the Molex Microfit (3.0) receptacle (series number: 430250800).

3.4.1 RS-232 Interface

The RS-232 interface is implemented as a serial asynchronous transmitter and receiver conforming to ITU-T V.24 Interchange Circuits DCE. Based on the conventions for DCE-DTE connections it communicates with the host application (DTE) using the following signals:

- Port TxD @ application sends data to TXD0 of the GWM400
- Port RxD @ application receives data from RXD0 of the GWM400

The serial interface (also called ASC0) is configured for 8 data bits, no parity and 1 stop bit, and is by default operated at a fixed baud rate of 9600bps, but can be configured for bit rates from 1200bps to 921kbps. Autobauding supports bit rates from 1.2kbps to 230kbps. Hardware handshake using the RTS0 and CTS0 signals and XON/XOFF software flow control are supported. In addition, the modem control signals DTR0 and DCD0 are available. There are different modes of operation that can be set with AT commands.

3.4.2 Power Supply

The power supply of the GWM400 has to be a single voltage source of $V_{PLUS}=4.75V...32V$ capable of providing a peak current of about 368 mA at 15V during an active transmission. The uplink burst causes strong ripple (drop) on the power lines. The absolute minimum voltage during drops must be $>4.75V$.

3.5 Power Up/Power Down Scenarios

In general, be sure not to turn on the GWM400 while it is beyond the safety limits of voltage stated in [Section 4.1](#). GWM400 immediately switches off after having started and detected these inappropriate conditions. In extreme cases this can cause permanent damage to the GWM400.

3.5.1 Turn GWM400 on

GWM400 is automatically turned on and started into normal mode by plugging or by re-plugging an appropriate power supply unit at the power supply line BATT+. Every time before turn on the GWM400, it must be disconnected at least for 2 seconds from power supply to ensure turn on properly.

3.5.2 Reset/Restart GWM400

GWM400 can be reset/restarted by entering the command AT+CFUN=x,1. For details on AT+CFUN please see [\[1\]](#).

3.5.3 Turn GWM400 off

Normal shutdown:

- To turn off the GWM400 use the AT^SMSO command, rather than disconnecting the mains adapter. This switch off procedure lets the GWM400 log off from the network and allows the software to enter a secure state and save data before disconnecting the power supply. After AT^SMSO has been entered the GWM400 returns the following result codes:

```
^SMSO: MS OFF
OK
^SHUTDOWN
```

The "^SHUTDOWN" result code indicates that the GWM400 turns off in less than 1 second. After the shutdown procedure is complete the GWM400 enters the Power Down mode. The RTC is still fed from the voltage regulator in the power supply ASIC.

Only after power off and power on again, i.e., turning off and on the power supply line, can the terminal be switches on again. Apart from the normal shutdown.

3.5.4 Disconnecting Power Supply

Before disconnecting the power supply from the BATT+ pin, make sure that the GWM400 is in a safe condition. The best way is to wait 1s after the "^SHUTDOWN" result code has been indicated.

3.6 SIM Interface

The SIM interface is intended for 1.8V and 3V SIM cards in accordance with 3GPP 31.102. The card holder is a five wire interface according to ETSI 102 221. The SIM card holder is protected by a rubber cover that has to be opened before a SIM can be inserted.

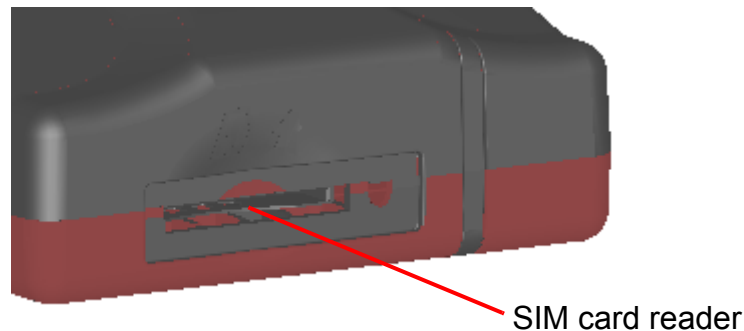


Figure 5: SIM interface

The SIM - with the circuit side facing upwards - is inserted by gently pushing it into the SIM card holder until it snaps hold. It is now protected from accidental removal. The SIM can be removed from the card holder by using a flat object such as a screwdriver to carefully press the inserted SIM until it snaps out again.

All signals of the SIM interface are protected from electrostatic discharge.

Removing and inserting the SIM card during operation requires is not supported by GWM400.

Note: No guarantee can be given, nor any liability accepted, if loss of data is encountered after removing the SIM card during operation. Also, no guarantee can be given for properly initializing any SIM card that the user inserts after having removed a SIM card during operation. In this case, the application must restart the GWM400.

3.7 Status LED

GWM400 has a green LED to indicate its operating status.

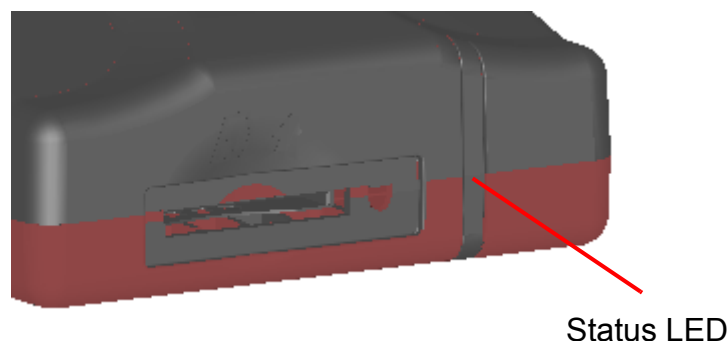


Figure 6: Status LED

The LED is enabled by default, but can be configured by AT command `AT^SLED`. For more information on the `AT^SLED` command please refer to [\[1\]](#).

3.8 RF Antenna Interface

An external RF antenna is connected via the GWM400's SMA connector (jack) that is also the antenna reference point (ARP).

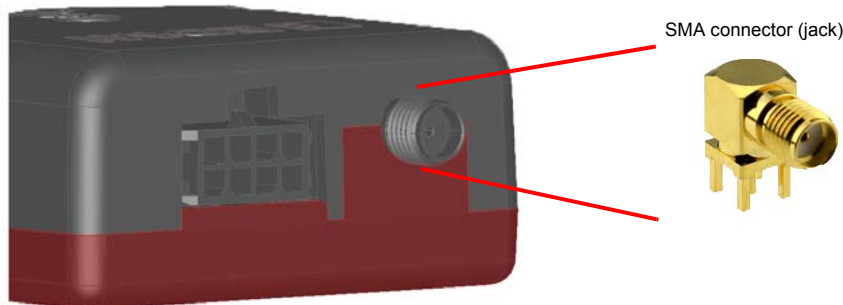


Figure 7: Antenna connector

The system impedance is 50Ω . In any case, for good RF performance, the return loss of the customer application's antenna should be better than 10dB ($VSWR < 2$). GWM400 withstand a total mismatch at this connector when transmitting with maximum RF power.

Additional ESD protection to the antenna connector is provided. DC voltage must not be applied to the antenna circuit to protect it from damage.

Please note that the terminal should be installed and operated with a minimum distance of 20cm between the antenna connected to the terminal and any human bodies. Also, the transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. For mobile and fixed operation configurations the antenna gain, including cable loss, must not exceed the limit 2.51 dBi for all the supported bands.

The antenna's character impedance should be 50Ω . It is recommended that the antenna should have $VSWR \leq 2:1$, within the working band frequency range.

4 Electrical and Environmental Characteristics

4.1 Absolute Maximum Ratings

Table 11: Absolute maximum ratings

Parameter	Port / Description	Min.	Max.	Unit
Supply voltage	BATT+	-0.3	+45	V
RS-232 input voltage range	TXD0, DTR0, RTS0	-25	+25	V
RS-232 output voltage range	RXD0, CTS0, DCD0	-13.2	+13.2	V
Immunity against discharge of static electricity	All interfaces (lines) Contact discharge Air discharge	-4 -8	+4 +8	kV kV

Table 12: Operating supply voltage for GWM400

Parameter	Min	Typ	Max	Unit
Supply voltage BATT+ measured at Molex Microfit	4.75	15	32	V

4.2 Power Supply Ratings

Table 13: Power supply specification

	Description	Conditions	Typical rating	Unit
I _{BATT+} ¹ (i.e., sum of BATT _{BB} and BATT _{RF})	OFF State supply current	Power Down	13.6	mA
	Peak current	UMTS Max output power	254	mA
		LTE Max output power	368	mA
	Average UMTS supply current	IDLE @ DRX=6 (UART active, but no communication)	16.5	mA
	Data transfer @ maximum Pout	UMTS Data transfer Band I; +23dBm	214	mA
		UMTS Data transfer Band V; +23dBm	163	mA
		UMTS Data transfer Band VIII; +23dBm	195	mA
		HSPA Data transfer Band I; +23dBm	210	mA
		HSPA Data transfer Band V; +23dBm	163	mA
		HSPA Data transfer Band VIII; +23dBm	194	mA
	Average LTE supply current	IDLE ² (UART active, but no communication)	18.6	mA
	Data transfer @ maximum Pout	LTE Data transfer Band 3 ³ ; +23dBm	238	mA
		LTE Data transfer Band 5 ³ ; +23dBm	168	mA
		LTE Data transfer Band 8 ³ ; +23dBm	206	mA
		LTE Data transfer Band 28 ³ ; +23dBm	196	mA

1. With an impedance of Z_{LOAD}=50Ω at the antenna pad.
All measurements have been done with BATT+ = 15V.
2. The power save mode is disabled via AT command AT^SCFG="MEopMode/PwrSave","disabled"
3. Communication tester settings:
 - Channel Bandwidth: 5MHz
 - Number of Resource Blocks: 25 (DL), 1 (UL), RB position: Low
 - Modulation: QPSK

4.3 Operating Temperatures

Table 14: Temperature characteristics

Parameter	Min	Typical	Max	Unit
Normal operation (ambient temperature)	-30		+75	°C

Note: Within the specified normal operating temperature range the board temperature may vary to a great extent depending on operating mode, used frequency band, radio output power and current supply voltage. Note also the differences and dependencies that usually exist between board (PCB) temperature of the GWM400 and its ambient temperature.

4.4 Antenna Interface

Table 15 lists RF antenna interface specifications for the GWM400. Please note that the specified conditions may not apply to or be supported by all terminals.

Table 15: RF Antenna interface UMTS/LTE

Parameter	Conditions	Min.	Typical	Max.	Unit
UMTS/HSPA connectivity	Band I,V,VIII				
Receiver Input Sensitivity@ARP	UMTS 2100 Band I	-106.7			dBm
	UMTS 850 Band V	-106.7			dBm
	UMTS 900 Band VIII	-103.7			dBm
UMTS Maximum TX Power ¹	UMTS 2100 Band I	21	23	-	dBm
	UMTS 850 Band V	21	23	-	dBm
	UMTS 900 Band VIII	21	23	-	dBm
LTE connectivity	Band 3, 5, 8, 28				
LTE Receiver Input Sensitivity (5 MHz@ ARP, single antenna)	LTE FDD 1800 Band 3	-96.3	-98		dBm
	LTE FDD 850 Band 5	-97.3	-100		dBm
	LTE FDD 900 Band 8	-96.3	-100		dBm
	LTE FDD 700 Band 28	-97.8	-98		dBm
LTE Maximum TX Power ²	LTE FDD 1800 Band 3	+21	+22.5		dBm
	LTE FDD 850 Band 5	+21	+22.5		dBm
	LTE FDD 900 Band 8	+21	+22.5		dBm
	LTE FDD 700 Band 28	+21	+22.5		dBm

1. RF Power@ ARP with 50 Ohm Load, ambient temperature 25°C

2. Power @ ARP with 50Ohm Load ambient temperature 25°C, 5MHz BW, 1R, Position Low

4.5 Storage Conditions

4.5 Storage Conditions

Table 16: Storage conditions

Type	Condition	Unit	Reference
Air temperature: Low High	-25 +40	°C	IPC/JEDEC J-STD-033A
Humidity relative: Low High	10 90 at 40°C	%	--- IPC/JEDEC J-STD-033A
Air pressure: Low High	70 106	kPa	IEC TR 60271-3-1: 1K4 IEC TR 60271-3-1: 1K4
Movement of surrounding air	1.0	m/s	IEC TR 60271-3-1: 1K4
Water: rain, dripping, icing and frosting	Not allowed	---	---
Radiation: Solar Heat	1120 600	W/m ²	ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb ETS 300 019-2-1: T1.2, IEC 60068-2-2 Bb
Chemically active substances	Not recommended		IEC TR 60271-3-1: 1C1L
Mechanically active substances	Not recommended		IEC TR 60271-3-1: 1S1
Vibration sinusoidal: Displacement Acceleration Frequency range	1.5 5 2-9 9-200	mm m/s ² Hz	IEC TR 60271-3-1: 1M2
Shocks: Shock spectrum Duration Acceleration	semi-sinusoidal 1 50	ms m/s ²	IEC 60068-2-27 Ea

The conditions stated above are only valid for devices in their original packed state in weather protected, non-temperature-controlled storage locations. Normal storage time under these conditions is 12 months maximum.

5 Mechanics, Mounting and Packaging

5.1 Mechanical Dimensions

Figure 8 shows a 3D view of the GWM400 and provides an overview of the mechanical dimensions of the terminal. For further details and an exploded view see Figure 9.

Length: 71.3mm (excluding SMA antenna connector)
76.7mm (including SMA antenna connector)
Width: 51.5mm
Height: 23.5mm

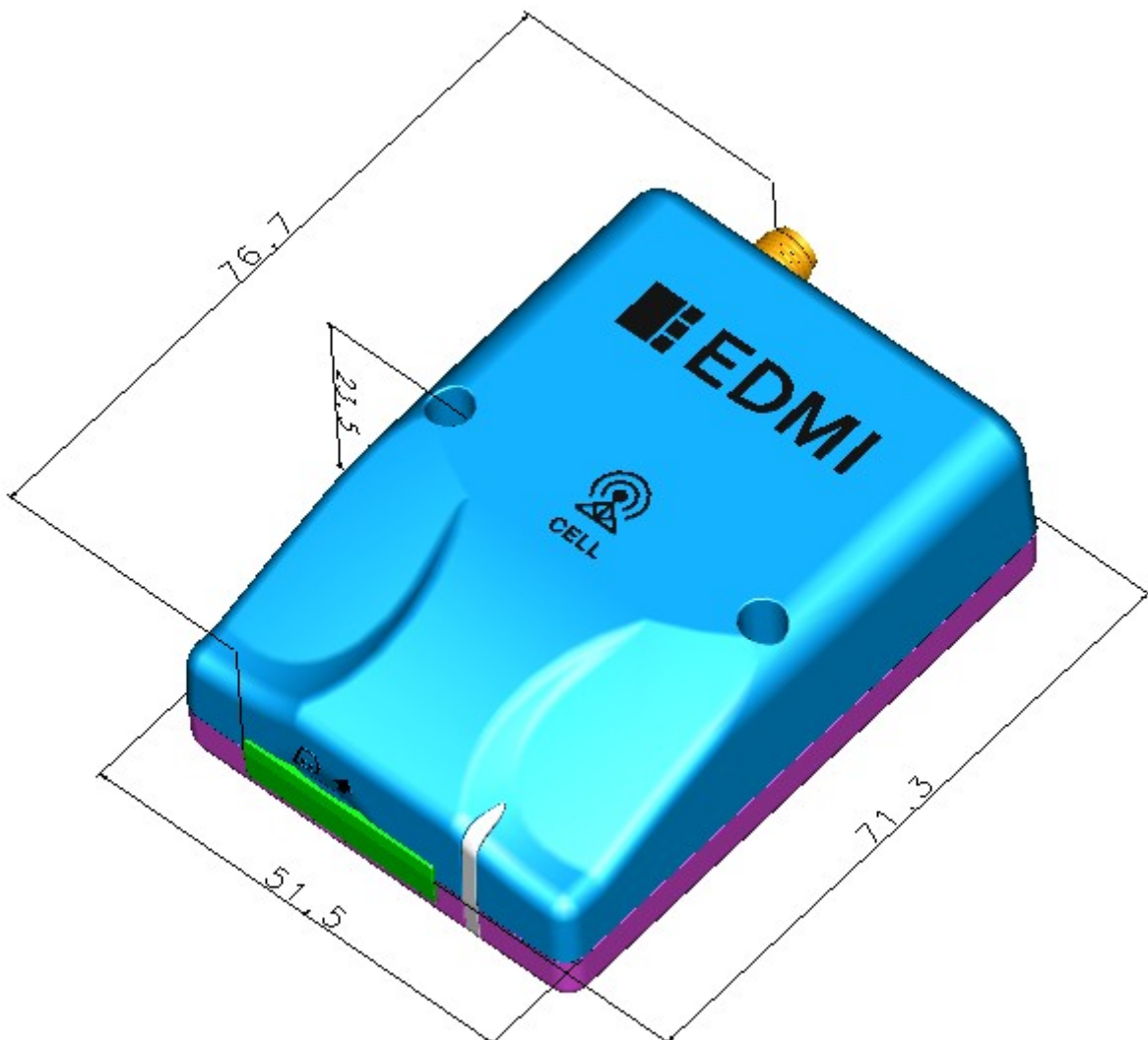


Figure 8: GWM400 3D overview

5.1 Mechanical Dimensions

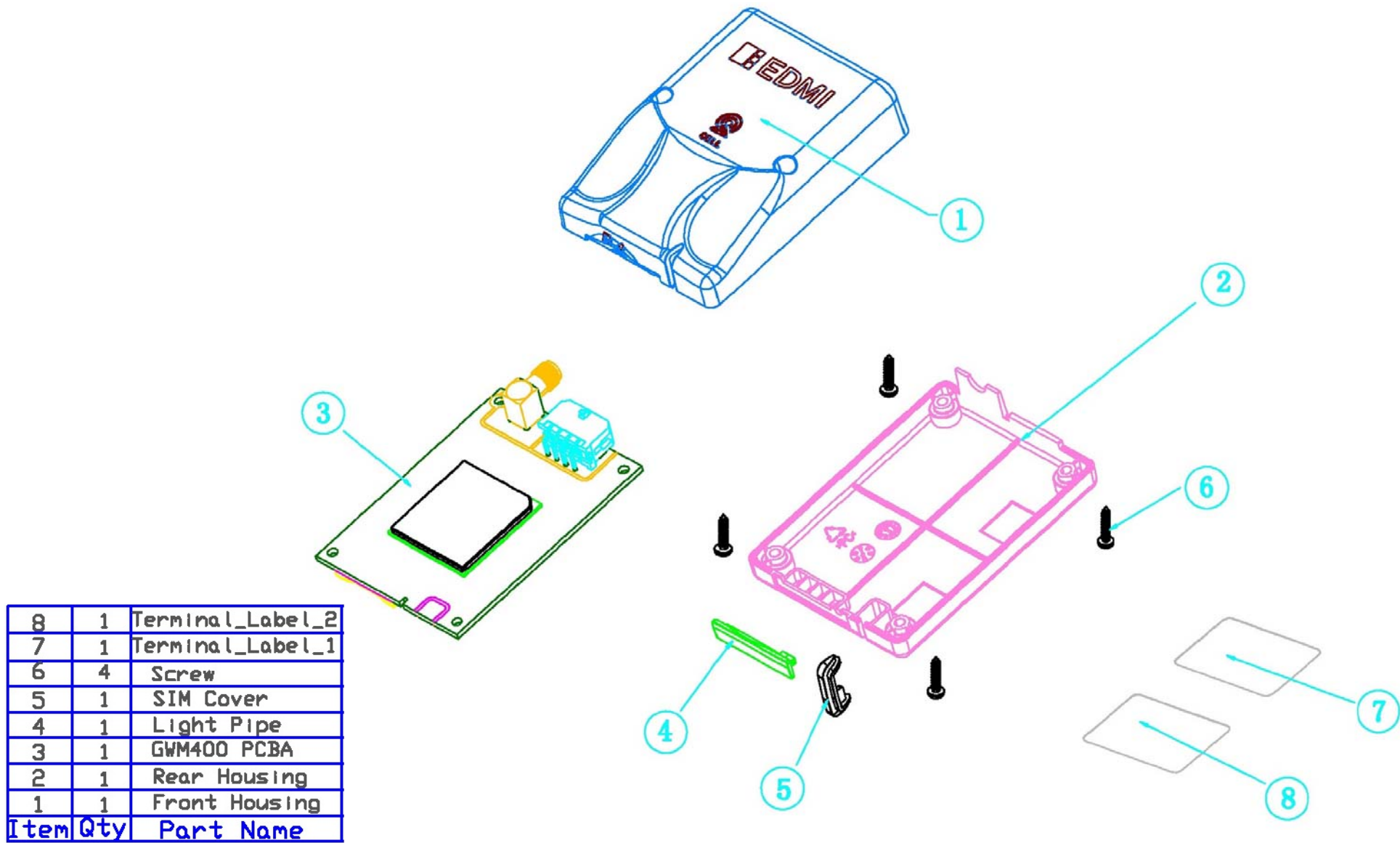


Figure 9: GWM400 exploded view

5.2 Packaging

5.2 Packaging

GWM400 terminal units come in bubble bags stashed into VP boxes made out of corrugated fiberboard:

- VP box size: 370mm x 350mm x 155mm

A VP box contains up to 60 terminal units, stashed into two layers of up to 30 units. Terminal layers are separated by foam layers for protective purposes.

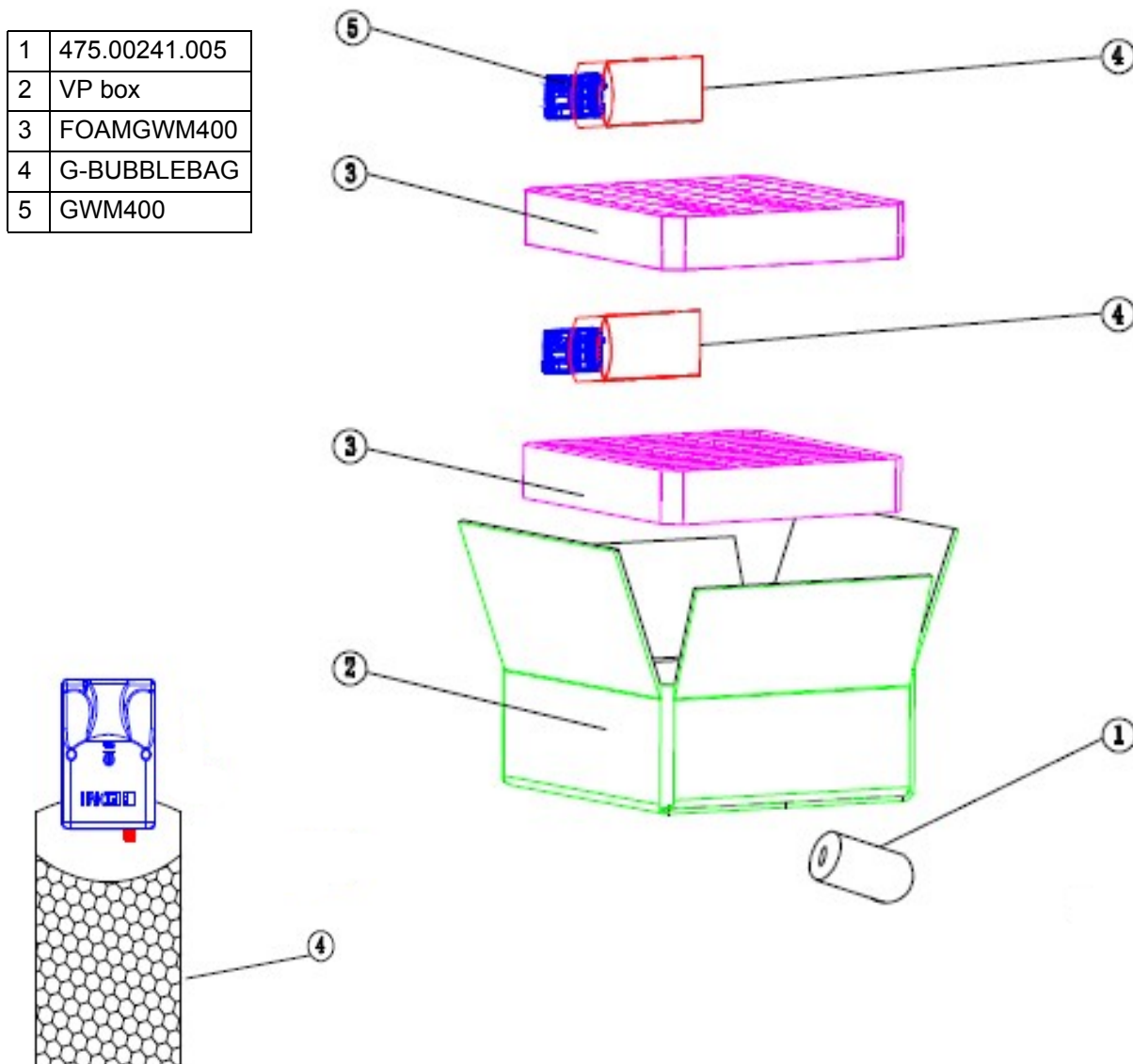


Figure 10: Packaging of GWM400

6 Full Type Approval

6.1 Gemalto M2M Reference Setup

The Gemalto M2M reference setup submitted to type approve GWM400 consists of the following components:

- GWM400 with approved Java module
- PC as MMI
- Power Supply
- RS-232/power supply cable (modified from DB9-RJ45 connector adapter)

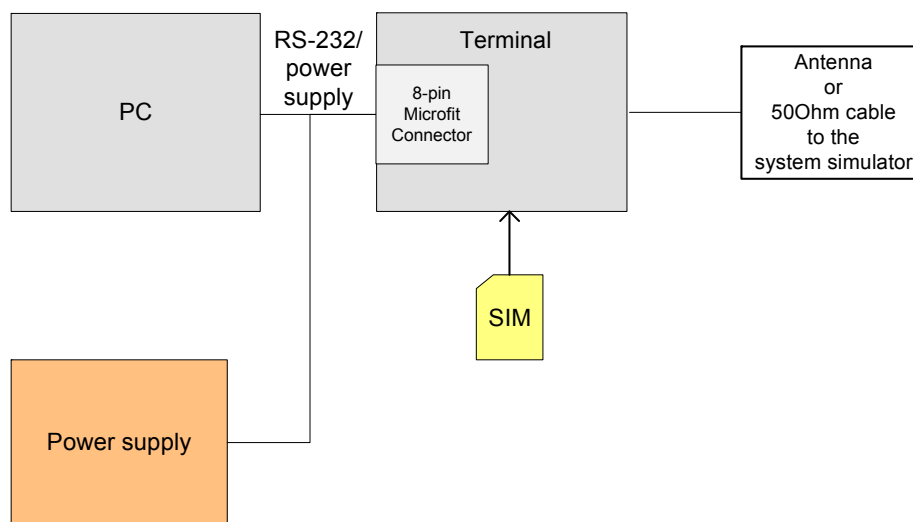


Figure 11: Reference equipment for approval

For ordering information please refer to [Chapter 7](#).

6.2 Restrictions

Later enhancements and modifications beyond the certified configuration require extra approvals. Each supplementary approval process includes submittal of the technical documentation as well as testing of the changes made.

- No further approvals are required for customer applications that comply with the approved GWM400 configuration.
- Extra approval must be obtained for applications using other accessories than those included in the approved GWM400 configuration (power supply, MMI implementation supported by AT commands).

6.3 CE Conformity

GWM400 meets the requirements of the EU directives listed below:

- Radio Equipment Directive (RED) 2014/53/EU

GWM400 is marked with the CE conformity mark.

6.4 EMC

GWM400 complies with the equipment requirements specified in EN 301489-1 and -52 are covered by the Radio Equipment Directive. For details see [Section 1.3](#).

6.5 Compliance with FCC Rules and Regulations

As an integrated product, GWM400 is fully compliant with the grant of the FCC Equipment Authorization for the built-in Java modules, and therefore, bears the labels “Contains FCC ID: QIPELS61-AUS”.

The Equipment Authorization Certification for GWM400 is listed under the following identifiers:

*FCC Identifier: QIPGGWM400
Granted to Gemalto M2M GmbH*

Notes (FCC):

Radio frequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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

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

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

Changes or modifications made to this equipment not expressly approved by Gemalto M2M may void the FCC authorization to operate this equipment.

Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance: For more information on the RF antenna interface please refer to [Section 3.8](#) and [Section 4.4](#).

7 List of Parts and Accessories

Table 17: List of parts and accessories

Description	Supplier	Ordering information
GWM400	Gemalto	Ordering number L30960-N4300-A200
8-pin receptacle Molex Microfit (3.0)	Molex	Ordering number 43025-0800

About Gemalto

Gemalto (Euronext NL0000400653 GTO) is the world leader in digital security with 2015 annual revenues of €3.1 billion and blue-chip customers in over 180 countries. Our 14,000+ employees operate out of 118 offices, 45 personalization and data centers, and 27 research and software development centers located in 49 countries.

We are at the heart of the rapidly evolving digital society. Billions of people worldwide increasingly want the freedom to communicate, travel, shop, bank, entertain and work - anytime, everywhere - in ways that are enjoyable and safe. Gemalto delivers on their expanding needs for personal mobile services, payment security, authenticated cloud access, identity and privacy protection, eHealthcare and eGovernment efficiency, convenient ticketing and dependable machine-to-machine (M2M) applications.

Gemalto develops secure embedded software and secure products which we design and personalize. Our platforms and services manage these secure products, the confidential data they contain and the trusted end-user services they enable. Our innovations enable our clients to offer trusted and convenient digital services to billions of individuals.

Gemalto thrives with the growing number of people using its solutions to interact with the digital and wireless world.

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