SR2MOD04

GPRS Modem
Hardware Manual

05/2012

EIO0000000873.01

www.schneider-electric.com

Schneider Electric

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information that is contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

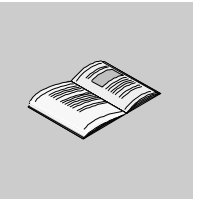
All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

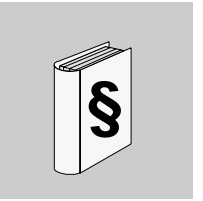
Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Table of Contents



Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a Danger safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

NOTICE

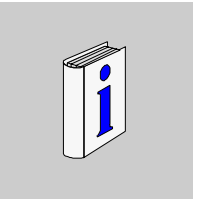
NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

About the Book



At a Glance

Document Scope

This manual describes how to launch and use the SR2MOD04, based on descriptive information and how-to procedures.

This document provides the necessary information about the installation of the modem.

NOTE: Read and understand this document before installing, operating, or maintaining your SR2MOD04.

Validity Note

This document has been updated with the release of OptiM2M V1.1.

Related Documents

Title of Documentation	Reference Number
OptiM2M Portal - Configuration - User Manual	EIO0000000874 (Eng)
OptiM2M Portal - Administration Module - User Manual	EIO0000000876 (Eng)
OptiM2M Portal - Operations Module - Device Management - User Manual	EIO0000000875 (Eng)
SR2MOD04 - GPRS Modem - Instruction Guide	S1A84873

You can download these technical publications and other technical information from our website at www.schneider-electric.com.

Product Related Information

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Only use software approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

⚠ WARNING

LOSS OF CONTROL

- Consider the potential failure modes of control paths and, for certain critical control functions by the designer of any control scheme, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel stop, power outage, and restart.
- Provide separate or redundant control paths for critical control functions.
- Include system control paths communication links. Give consideration to the implications of unanticipated transmission delays or failures of the link.
- Observe all accident prevention regulations and local safety guidelines.[1]
- Test individually and thoroughly each implementation of this equipment for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

[1] For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid-State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems" or their equivalent governing your particular location.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@schneider-electric.com.

Features and Recommendations

1

Overview

This chapter describes the various features and the specific regulations of the SR2MOD04.

What Is in This Chapter?

This chapter contains the following topics:

Features

Modem Features

The table shows the various features of the modem:

Modem	
GSM functions	Quad-bands 900/1800 MHz and 850/1900 MHz
	ETSI GSM phase 2+: ● Class 4 (2 W @ 850/900 MHz) ● Class 1 (1 W @ 1800/1900 MHz)
	SIM toolkit release 99
DATA features	GPRS class 10 (up to 4 Rx/2 Tx)
	Supports PBCCH, coding schemes: CS1 to CS4
	TCP/IP library (PPPRFC, TCP socket, UDP socket, SMTP, POP3, FTP)
	Asynchronous data circuit, transparent, and non-transparent, 9600 bps (standard) up to 14,400 bps (depending on network)
	Compatible fax group 3
	SMS point-to-point MT/MO and SMS CB
Memory type interfaces	Flash 32 megabit and SRAM 4 megabit (32/4)
Interfaces	Antenna GSM: SMA-F connector
	Power supply: 5.5...32 Vdc (micro FIT connector)
	RS 232 via female 9-pin Sub D connector
	AT Commands: GSM 07.05 and 07.07
	SIM reader (SIM 3 V - 1.8 V)
	DIN 35 mm (1.38in) rail mounting clip
Supplied accessories	Mounting brackets (x 2)
	Power supply cable - 2-wire micro FIT
	GSM magnetic antenna: SMA-M connector

Security Recommendations

General

⚠ DANGER

EXPLOSION HAZARD

- Install this equipment only in non-hazardous locations.
- Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

Failure to follow these instructions will result in death or serious injury.

It is important to follow the specific regulations for the use of radio operator equipment. In particular the possible risks of radio frequency interference (RFI). Carefully follow the security advice given.

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

Turn off your GSM modem:

- On an aircraft. The use of cellular telephones can endanger the operations of the plane, disturb the cellular network and is illegal. The non-observance of this instruction can lead to the suspension of cellular telephone services as well as a fine.
- At a refueling station.
- In any area with a potentially explosive atmosphere which could lead to an explosion or a fire.
- In hospitals and similar places where medical equipment can be in use.

Failure to follow these instructions will result in death or serious injury.

Restrictions of use for radio operator equipment in:

- Fuel depots.
- Chemical factories.
- Locations where demolition is under way.
- Other places where signs indicate that the use of cellular telephones is prohibited or dangerous.
- Other places where you can normally turn off the engine of your vehicle.

There can be a hazard associated with the use of your GSM modem close to insufficiently protected medical devices such as acoustic apparatus and pacemakers. Consult the manufacturers of medical equipment to determine if they are adequately protected. If the equipment is insufficiently protected then the use of your GSM modem in close proximity to other electronic equipment can also cause interference. Observe all recommendations for the equipment from the manufacturer.

The modem is used with **fixed** and **mobile** applications:

- **Fixed application**: The GSM modem is physically connected to a site and it is not possible to be easily moved to another site.
- **Mobile application**: The GSM modem is used in various places (other than fixed) and is intended for use in portable applications.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Install this equipment only in non-hazardous locations.
- Do not disassemble, repair, or modify the products.
- This equipment is designed for use in a properly rated enclosure.
- Do not connect this equipment directly to line voltage.
- Use only isolating PELV or SELV power supplies to supply power to this equipment.
- For power supply line, use a 2.5 A, 250 V fuse designed to Type F standards per IEC 60127 that are UL recognized and CSA approved.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Security in a Vehicle

NOTICE

UNINTENDED EQUIPMENT OPERATION

Do not use your GSM modem while driving a vehicle, unless equipped with a correctly installed ear-piece/hands-free kit.

Failure to follow these instructions can result in equipment damage.

Respect the national regulations based on the country of usage for the use of cellular telephones in vehicles. Road safety is always a priority. An incorrect installation of a GSM modem in a vehicle could cause incorrect operation of the electronics of the vehicle. Ensure that a qualified person carries out the installation to avoid such anomalies. At the time of the installation, verify the electronic protection system of the vehicle. The use of an apparatus to activate the headlights or the horn of a vehicle on a public highway is not authorized and may be punishable by state and local fines.

Care and Maintenance

NOTICE

UNINTENDED MAINTENANCE EQUIPMENT

- Do not expose the modem to the extreme environments such as a high temperature or a high humidity content.
- Do not use or store the modem in dusty or dirty places.
- Do not open or disassemble the modem. All warranties are void if the product is opened, altered and /or damaged.
- Do not expose the modem to liquids. It is not impermeable.
- Avoid dropping, striking, or shaking the modem violently.
- Do not place the modem near computer disks, credit, or voyage cards or other magnetic media. The modem can affect the information contained on the discs or the cards.
- The use of third-party equipment or accessories, not made or authorized by the manufacturer can cancel the guarantee.

Failure to follow these instructions can result in equipment damage.

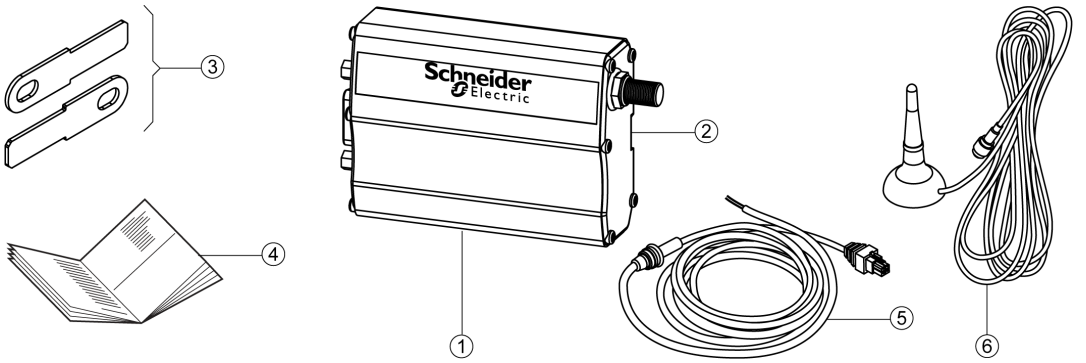
Package Contents and Labels

2

Package Contents

Overview

Make sure all applicable items listed here are included in the modem package:



1 The modem with embedded SIM card
2 DIN 35 mm (1.38 in) rail mounting clip
3 2 mounting brackets
4 Instruction guide
5 2-wire cable (red/black) with in-line fuse
6 GSM magnetic antenna (SMA-M)

Packing Case

An identification label is displayed on the top of the packing case. It contains:

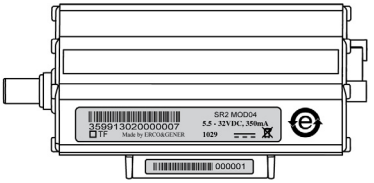
- The Schneider Electric logo
- The product reference and information
- CE mark

Modem Labels

Two labels are attached to the underside of the modem:

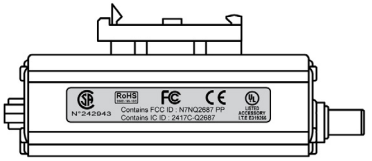
A production label provides the following information:

- The product reference
- Crossed wheelie-bin mark (DEEE standard)
- Current, Voltage DC supply (Vdc)
- The IMEI 15-digit bar code
- Made by ERCO & GENER



Additional marking

- ROHS (2002/95/CE)
- CE mark
- CSA
- UL
- FCC



General Presentation

3

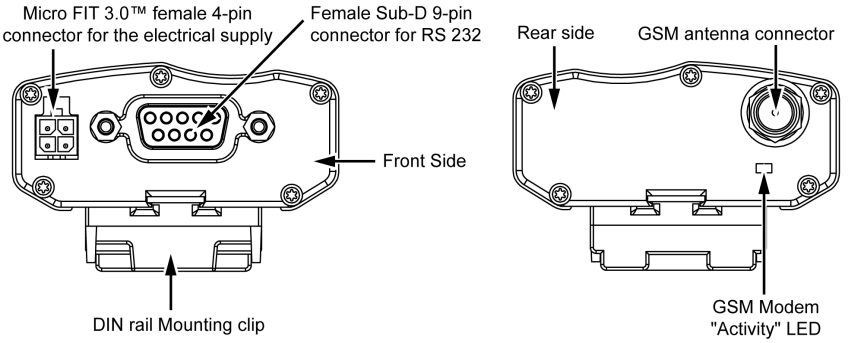
What Is in This Chapter?

This chapter contains the following topics:

Modem Description

Physical Description

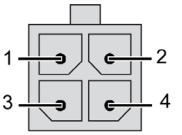
The graphic image shows the description of the modem:



GSM Antenna Connector

The GSM antenna connector is a 50-Ωimpedance female SMA type, 4-pin Micro FIT female connector. This connector allows the connection of an external DC supply.

The table shows the connector pin assignment:

Pin assignment	Pin number	Signal
	1	5.5...32 Vdc
	2	0 Vdc
	3	NC
	4	NC

⚠ CAUTION

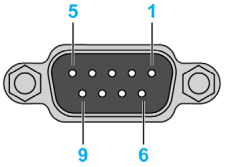
EQUIPMENT DAMAGE

- Do not connect a supply voltage to pins 3 and 4.
- Do not use pins 3 and 4.

Failure to follow these instructions can result in injury or equipment damage.

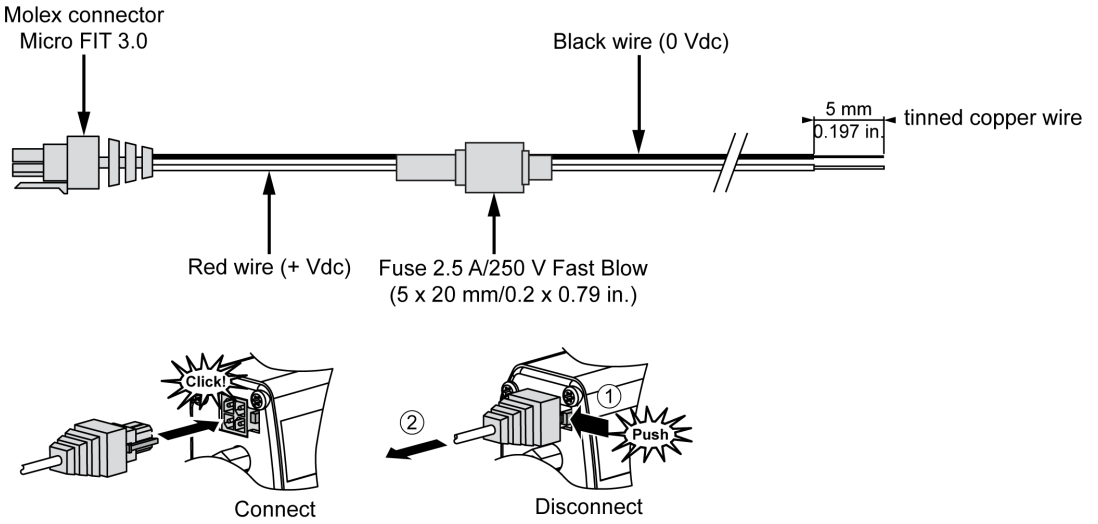
9-Pin Sub D Female Connector

The table shows the connector pin assignment:

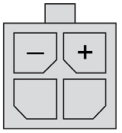
View	Pin number	Pin name	Circuit (V24 – RS 232C)	I/O
	1	signal detection	109-DS-DCD	O
	2	data reception	104-RD-RxD	O
	3	data transmission	103-ED-TxD	I
	4	data terminal ready	108/2-TDP-DTR	I
	5	PE protective ground	102-TS-GND	–
	6	data set ready	107-PDP-DSR	O
	7	request to send	105-DPE-RTS	I
	8	clear to send	106-PAE-TS	O
	9	ring indicator	125-IA-RI	O

2-Wires Micro FIT Supply Cable

The graphic image shows the cable supplied with the modem:



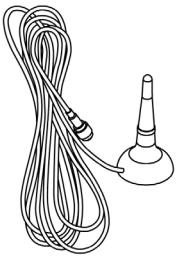
The table shows the connector from cable side:

View	Component	Characteristics
	4-pin Micro FIT connector	type: Molex
	Cable length	1500 mm (59.05 in)
	Wire	tinned copper 24x0.2 mm (0.94x0.01 in)
		section: 0.75 mm² (AWG 18)

GSM Magnetic Antenna (SMA-M)

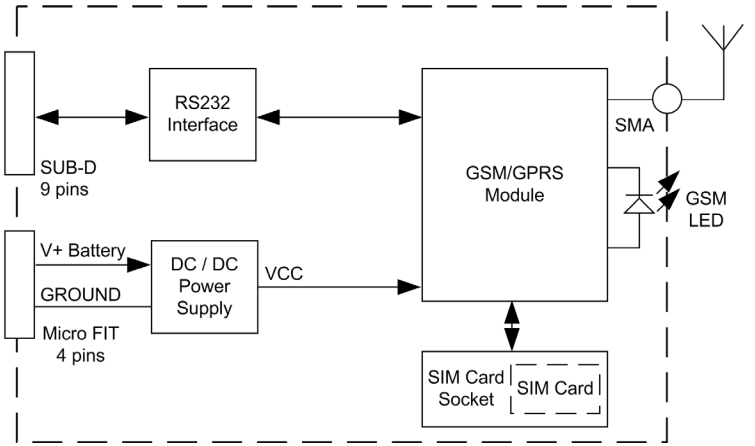
The GSM magnetic antenna is designed for vertical use and put on a metallic support. Its SMA Male connection allows it to be directly connected to the modem.

The table shows the GSM magnetic antenna:

View	Component	Characteristics
	Magnetic SMA-M Antenna	quad-band 850/900/1800/1900 MHz
	Cable length	$2500^{\pm 100}$ mm ($98.43^{\pm 3.94}$ in)
	Coaxial	RG174 – ∅ 2.54 mm (0.10 in)
	Dimensions	base: ∅ 30 mm (1.18 in) total height: 70 mm (2.76 in)

Functional Description

Architecture



Power Supply

Use an external regulated DC power supply of Safety Extra Low Voltage (SELV) between 5.5 Vdc to 32 Vdc to supply the modem. An internal DC/DC converter provides the modem various internal DC voltages. If the input voltage (V+BATTERY) falls below 5.5 Vdc, the correct functioning of the modem cannot be assured.

NOTE: An in-line 2.5 A / 250-V fast blow fuse in the power supply cable supplied with the modem protects the modem.

It also has internal protection against power supply spikes of more than 32 Vdc.

Filter specifications:

- Input/output EMI/RFI protection
- Signal smoothing

RS 232 Serial Link

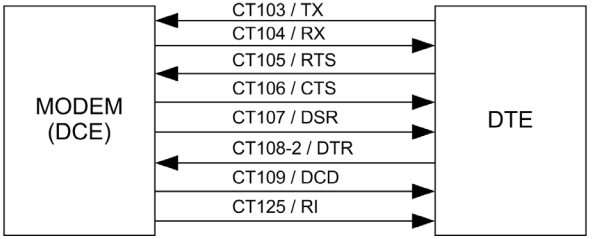
The RS 232 interface provides a level translation between the Wavecom GSM/GPRS Module (DCE) and the PC COM port (DTE). The RS 232 interface is protected internally (ESD protection) against external electrostatic spikes.

Filter specifications:

- Input/output EMI/RFI protection
- Signal smoothing

The following signals are available:

- Tx data (CT103/Tx)
- Rx data (CT104/Rx)
- Request to send (CT105/RTS)
- Clear to send (CT106/CTS)
- Data set ready (CT107/DSR)
- Data terminal ready (CT108-2/DTR)
- Data carrier detect (CT109/DCD)
- Ring indicator (CT125/RI)



NOTE: The RS 232 interface allows a certain amount of flexibility in the use of its signals. For example, the modem operates in the 3-wire mode using only the Tx, Rx and GND signals. However, the CTS and RTS signals are also required for GPRS applications and X-Modem upgrade.

Mode auto-baud

The auto-baud mode allows the modem to automatically detect the transmission speed used by the DTE. Only the following speeds are detected: 2400, 4800, 9600, 19,200, 38,400 and 57,600 bps. Auto-baud detection cannot be guaranteed for speeds below or above these speeds. The AT commands control the auto-baud mode. This function is explained in detail in the Wavecom *AT Commands Interface Guide.*

This table shows the pins description:

Signal	Pin number	I/O	RS 232 standard	Description
CTXD/CT103	2	I	TX	transmit serial data
CRXD/CT104	3	O	RX	receive serial data
CRTS/CT105	7	I	RTS	request to send
CCTS/CT106	8	O	CTS	clear to send
CDSR/CT107	6	O	DSR	data set ready
CDTR/CT108-2	4	I	DTR	data terminal ready
CDCD/CT109	1	O	DCD	data carrier detect
CRI/CT125	9	O	RI	ring indicator
CT102/GND	5	–	–	ground

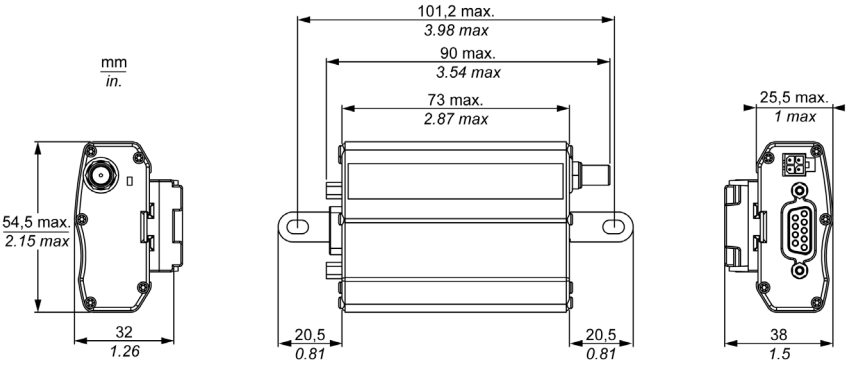
Technical Characteristics

Mechanical Characteristics

The table shows the mechanical characteristics of the modem:

Dimensions	73x54.5x25.5 mm (2.87x2.14x1 in) (without connector)
Overall dimensions	90x54.5x25.5 mm (3.54x2.14x1 in)
Weight	88 g (modem only) < 335 g (modem + accessories)
Volume	101.5 cm^3 (39.96 in^3)
Case	extruded aluminum
Ingress Protection	IP31

The graphic image shows the dimensions of the modem showing the clearances necessary for installation:



Electrical Characteristics Power Supply

The operating voltage range is between 5.5 Vdc and 32 Vdc.

NOTE: The modem is permanently powered once the power supply is connected.

The table shows the consequences of over and under voltages to the modem:

If the voltage	**Then**
< 5.5 Vdc	GSM communication cannot operate properly.
> 32 Vdc (transient peaks)	The modem has built-in protection.
> 32 Vdc (continuous over-voltage)	The modem is protected against voltages over 32 Vdc. To protect the internal electronic components against the over-voltage when the supply voltage exceeds 32 Vdc the power supply is cut.

Power Supply Consumption

The table shows the power supply consumption (1) of the modem without the RS 232 connected:

CONDITIONS T=25 °C (77 °F) and 3 Vdc SIM card		850/900 MHz		1800/1900 MHz	
		I nominal (mA)	I maximal (mA)	I nominal (mA)	I maximal (mA)
Idle mode (2)	5.5 V	17.5	23	17.5	23
	12 V	11.7	16.5	11.7	16.5
	24 V	10	14	10	14
	32 V	8.6	11.5	8.6	11.5
Idle mode 32 K (3)	5.5 V	12	14.5	12	14.5
	12 V	9.2	11.3	9.2	11.3
	24 V	8	10.5	8	10.5
	32 V	7.7	9.7	7.7	9.7
In communication GSM 1Rx/1Tx Power (2W/1W)	5.5 V	182.5	195.5	135	145
	12 V	96	103.5	71.75	78
	24 V	50	54	37	40
	32 V	40	44.5	31	34.75
In communication GPRS CL10 3Rx/2Tx Power (2W/1W)	5.5 V	320	341	230	242
	12 V	165	177	120	127.5
	24 V	87	93	64	68
	32 V	67	72	50	53.5
During Tx burst Power (2W/1W)	5.5 V	1178	1400	670	780
	12 V	600	712	342	400
	24 V	320	375	180	220
	32 V	230	274	132	156

(1) The power consumption can vary by 5 % over the whole operating temperature range –20...55 °C (-4...131° F).
(2) Idle mode: The modem is registered on the network but not in communication.
(3) Idle mode 32 K: The low-power mode controlled by an external application via the DTR CTS signals.

Electrical Characteristics of the SIM Interface

The characteristic of the SIM card is 1.8 Vdc or 3 Vdc.

GSM/DCS Frequency Bands

The table shows the frequency ranges:

Parameter	GSM 850	E-GSM 900	DCS 1800	PCS 1900
Transmission	824...849 MHz	880...915 MHz	1710...1785 MHz	1850...1910 MHz
Reception	869...894 MHz	925...960 MHz	1805...1880 MHz	1930...1990 MHz

RF Performances

The RF performances are compliant with the ETSI GSM 05.05 recommendation.

The table shows the RF performances for receiver and transmitter:

Receiver	
E-GSM900/GSM850 Reference sensitivity	–104 dBm
DCS1800/PCS1900 Reference sensitivity	–102 dBm
Selectivity 200 kHz	> 9 dBc
Selectivity 400 kHz	> 41 dBc
Linear dynamic range	63 dB
Co-channel rejection	≥ 9 dBc

Transmitter at ambient temperature	
Maximum output power (E-GSM900/GSM850)	33 dBm ± 2 dB
Maximum output power (DCS1800/PCS1900)	30 dBm ± 2 dB
Minimum output power (E-GSM900/GSM850)	5 dBm ± 5dB
Minimum output power (DCS1800/PCS1900)	0 dBm ± 5dB

External GSM Antenna Characteristics

The table shows the characteristics:

Antenna frequency range	quad-band 850/900/1800/1900 MHz
Impedance	50 Ω nominal
DC Impedance	0 Ω
Gain (antenna + cable)	0 dBi (in a minimum direction)
VSWR (Rx max Tx max)	1.5:1
Polarization	linear

NOTE: Recommended GSM Antenna *(see page 20)* by ERCO & GENER

The table shows the environmental characteristics for correct operation of the modem:

Operating temperature	–20...55 °C (-4...131° F)
Storage temperature	–40...70 °C (-40...158° F)
Operating humidity without condensation	HR < 95 % at 55 °C (131 °F)
Atmospheric pressure	normal

Standards/Conformities

The product conforms to the following requirements:
- R&TTE 1999/5/EC Directive
- Regulations of standard ETSI EN 301 489-7, EN 301 419-1, and EN 301 511
- 2002/96/CE DEEE (crossed out wheelie bin)

The modem conforms to the 2002/95/CE - ROHS requirements. Furthermore, the modem conforms to standards described in the Declaration of Conformity available in last page of this document.

The modem withstands ESD on all accessible parts of the modem (except for the RF part) according to the IEC 61000-4-2 requirements:
- 8-kV air discharge
- 4-kV contact discharge

Filter specifications:
- Input/Output EMI/RFI protection
- Signal smoothing

Using the Modem

4

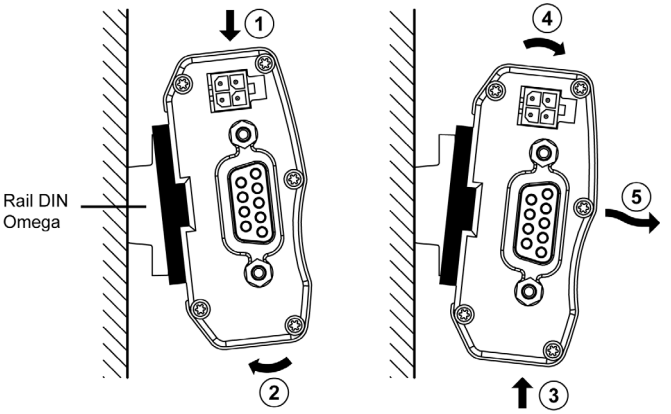
Starting the Modem

Mounting and Removal

Mounting using DIN rail mounting clip.

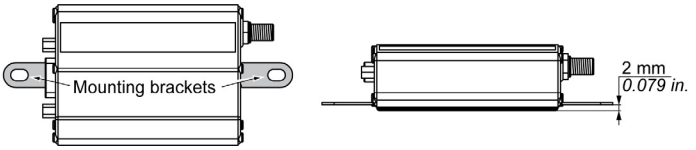
The modem is supplied with a DIN rail mounting clip mounted on the case. The DIN rail mounting clip allows mounting/removal on an omega DIN rail IEC/EN 60715 / DIN 35x7.5 mm (1.38x0.3 in):

- Execute step 1 (pressure) to mount the modem on DIN rail, then step 2 (pivot).
- Execute step 3 (pressure) to remove the modem from the DIN rail, then steps 4 and 5 (pivot and remove).

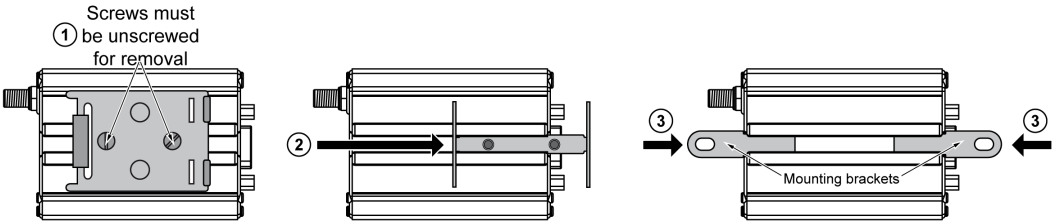


Mounting procedure using 2 mounting brackets.

To mount the modem on a support, use the mounting brackets. Refer also to drilling dimensions *(see page 24)*:



It is necessary to remove the 2 DIN rail mounting clip screws to remove the DIN rail clip. Then the 2 mounting brackets can be inserted.



Modem Installation

- Connect the GSM antenna to the SMA connector.
- Plug the 9-pin Sub D connector of modem to the device by using the RS 232 cable.
- Connect the supply cable to an external regulated DC source.
- Connect the supply cable to the modem and turn on the power supply. The modem controls the network bands and the GSM LED lights up.
- The modem is now ready.

Network Bands Scanning

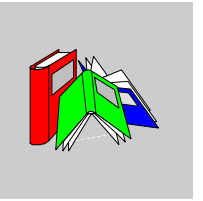
By default, the modem is configured to first automatically check the European network bands. After insertion of the SIM card, the device is switched on. An embedded application automatically checks the presence of a network. If absent, it switches to the US network bands and continues its search. This cycle is repeated until a valid network is found. After detection of a GSM network, this one is saved in the modem.

GSM Status LED

The table shows the meaning of the different states of the GSM LED *(see page 18)*:

GSM LED	LED activity	Modem state
ON	LED on fixed	The modem is powered, it is ready to function but not yet recognized by the network; the PIN code has not yet been entered or the antenna is not connected.
	LED flashing (once every 2 sec.)	The modem is powered, the PIN code is active, the network recognizes the modem, and is ready to make or receive a call (Idle mode).
	LED flashing (once a sec.)	The modem is powered and currently in communication (Voice, Data or Fax).
OFF	LED off	The modem is not powered or is in the RESET phase.

Glossary



A

AC

alternative current

ACM

accumulated call meter

AT

attention (prefix for modem commands)

B

BTS

base transceiver station

C

CLK

clock

CMOS

complementary metal oxide semiconductor

CS

coding scheme

CTS

clear to send

D

dB

decibel

dBc

decibel relative to the carrier power

dBi

decibel relative to an isotropic radiator

dBm

decibel relative to one milli-watt

DC

direct current

DCD

data carrier detect

DCE

data communication equipment

DCS

digital cellular system

DSR

data set ready

DTE

data terminal equipment

DTMF

dual tone multi-frequency

DTR

data terminal ready

E

E-GSM

extended GSM

EEPROM

electrically erasable programmable read-only memory

EFR

enhanced full rate

EMC

electromagnetic compatibility

EMI

electromagnetic interference

ESD

electrostatic discharges

ETSI

European telecommunications standards institute

F

FIT

series of connectors (micro-FIT)

FR

full rate

FTA

full type approval

G

GCF

global certification forum

GND

protective ground

GPIO

general-purpose input output

GPRS

general packet radio service

GSM

global system for mobile communications

H

HR

half rate

I

I

input

I/O

input / output

IEC

international electrical commission

IMEI

international mobile equipment identification

L

LED

light emitting diode

Little-endian

low-order byte of the number is stored in memory at the lowest address, and the high-order byte at the highest address.

M

MAX

maximum

ME

mobile equipment

MIC

microphone

MICRO FIT

family of connectors from Molex

MIN

minimum

MNP

Microcom networking protocol

MO

mobile originated

MS

mobile station

MT

mobile terminated

N

NOM

nominal

O

O

output

P

Pa

pascal (for speaker sound pressure measurements)

PBCCH

packet broadcast control channel

PC

personal computer

PCL

power control level

PDP

packet data protocol

PIN

personal identity number

PLMN

public land mobile network

PUK

personal unblocking key

R

RF

radio frequency

RFI

radio frequency interference

RI

ring indicator

RMS

root mean square

RTS

request to send

RX

receive

S

SIM

subscriber identification module

SMA

subminiature version A RF connector

SMS

short message service

SNR

signal-to-noise ratio

SPI

serial peripheral interface

SPK

speaker

SPL

sound pressure level

SRAM

static RAM

T

TDMA

time division multiple access

TPC/IP

transmission control protocol / Internet protocol

TU

typical urban fading profile

TUHigh

typical urban, high speed fading profile

TX

transmit

TYP

typical

U

UTC

universal time clock

V

VSWR

voltage stationary wave ratio