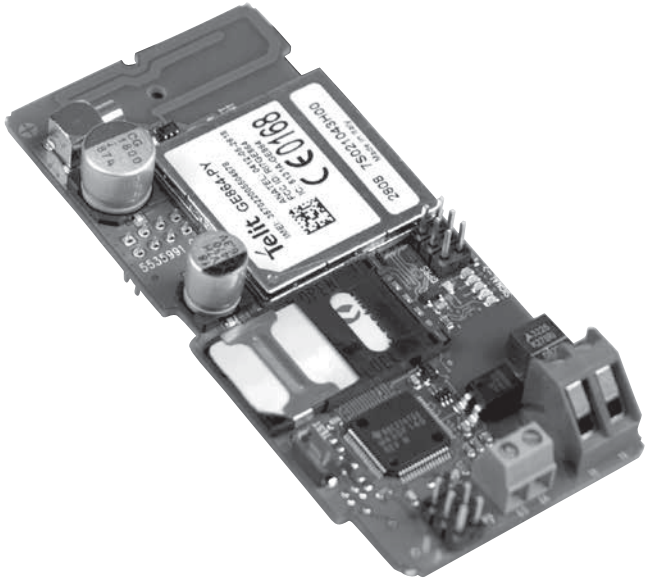
Installation and user manual

GSM7i



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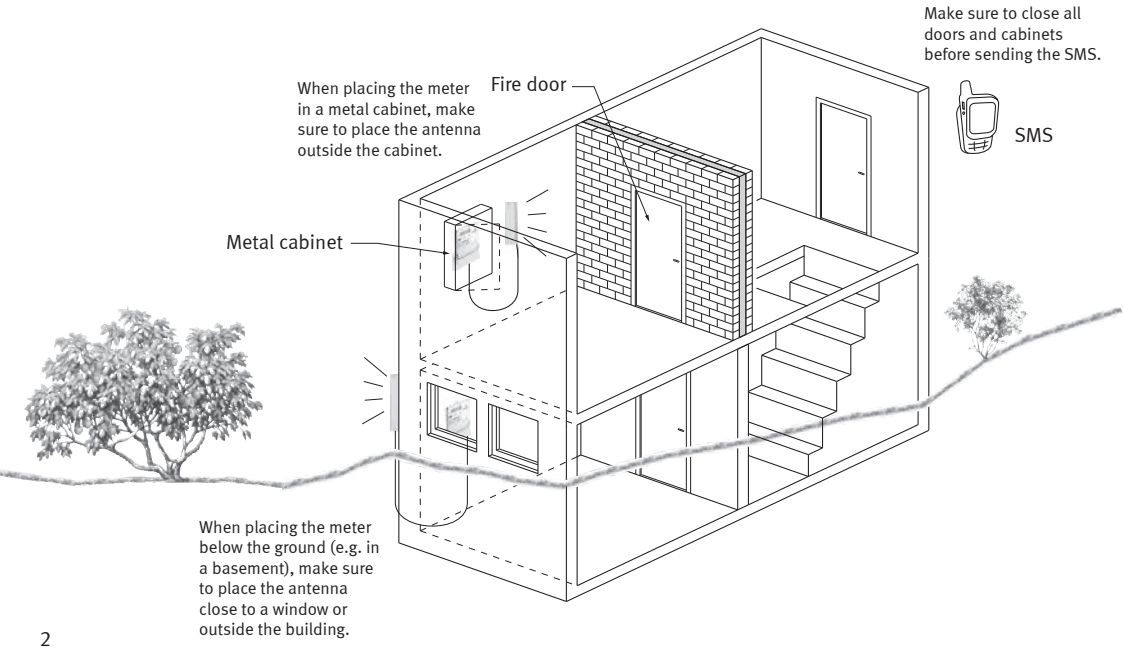
Quick Guide

1. Run a signal test by activating the test button on the modem.
2. If the signal strength is below 12, an external antenna must be installed.
3. The external antenna should be placed in a location that optimises the reception of the signal. Change the position of the external antenna until the best position has been found. Run several signal tests while trying to find the best position.
4. Use, if necessary, NetMonitor or an equivalent tool to help find the best position for the external antenna.
5. Before leaving the installation, test the signal strength by SMS (**`=signal#`**). Make sure that all cabinets and doors are closed before sending the SMS.

Tips

- Always install an external antenna when installing the unit in a metal cabinet. The antenna must be placed outside the cabinet.
- Use dual-band GSM antennas to optimise the performance.
- Note that fire doors, concrete and metal plates disturb and weaken the GSM signal.
- It is possible to order directional antennas for areas with very poor signal conditions (please contact Kamstrup A/S for further information).



CONTENTS

1 Description

1.1 Description of GSM7i

- GSM/GPRS module for a fast and stable reading of the electricity meter
- Innovative solution that future-proofs the metering point via extra module area
- Plug and play installation with clear information about the signal strength
- Status/pulse input
- Relay output for controlling external units (load control)
- SMS reading of meter and GSM signal strength
- Internal antenna.

The GSM7i module differs from earlier GSM modules in that it can only be placed in "J" meters, i.e. the Kamstrup electricity meters that have internal supply for the module.

Application

With the module GSM7i, the metering point is future-proofed since the module supports GSM, GPRS and SMS. In addition, it is possible to mount an extra Add-on module. On this Add-on module, it is possible to add extra features (e.g. load control relays) or an additional communication media (e.g. ZigBee, Z-Wave, Wireless M-Bus or similar).

The module GSM7i is mounted directly in the module area of the electricity meter (162J, 282J, and 382J), which makes it possible to read and configure the meter remotely. The quality of the installation is ensured by means of informative Light Emitting Diodes (LEDs) that indicate the GSM signal strength. Likewise, it is possible to read the signal strength by SMS in order to be able to check installations in closed cabinets.

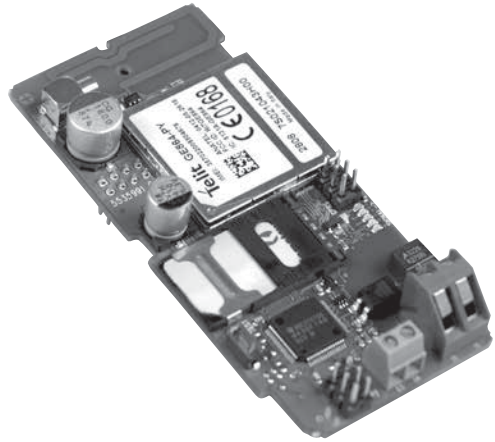
1.2 GSM7i Application

The GSM7i module is used in the following meters:

Article No.	Function	Meter types
6816-Txxxx	Transparent reading of electricity meter (Transparent mode)	Kamstrup 162J (*) Kamstrup 282J (*) Kamstrup 382J (**)
6816-Dxxxx	Communication with GSM7i data logger (Data logger mode)	Kamstrup 162J (*) Kamstrup 282J (*) Kamstrup 382J (**)

(*) Does not apply to 162/282BCDE and 382BCDE meters since they do not have internal supply for the module.

(**) Does not apply to 162/282BCDE, 382BCDE and 382 DIN meters since they do not have internal supply for the module.

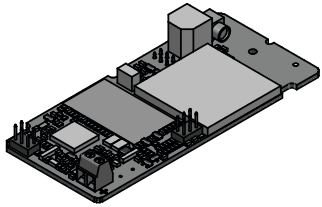


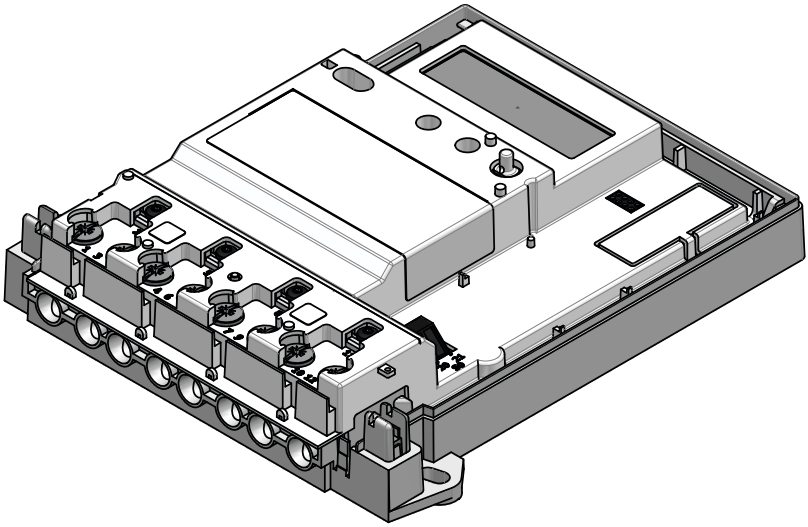
1.3 Tecnical data

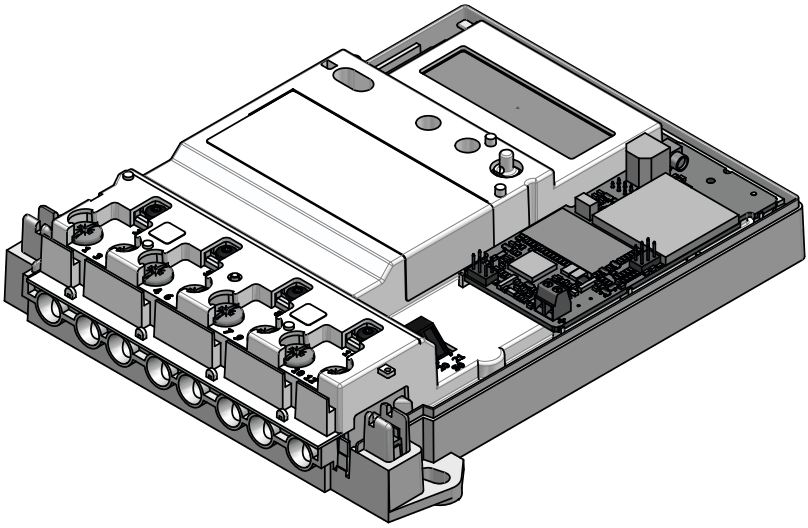
1.3.1 GSM7i, artikel No. 6816-xxxxx

- Dual-band GSM/GPRS module
- To be mounted as a module in the electricity meter
- Data logger for load profile (5, 15, 30, 60 min.), daily/weekly/monthly loggers and event logger
- Tariff and load control
- Central upload of new features, e.g. new tariff switch times
- Built-in real time clock (RTC) with minimum backup for 10 days
- RTC controlled GPRS reset
- Reading of electricity meters via SMS
- Status LED's for GSM/GPRS network and antenna signal
- GSM/GPRS signal indicator
- Possibility of adding extra feature as Add-on module.

NOTE: Installation is to be carried out by authorized personnel only as it can be highly dangerous to touch connections and internal parts.







2 Mounting

GSM7i, article number 6816-xxxxx, is supplied via the module plug and prepared for mounting of an external antenna. See also chapter 7 “GSMxi Variant Structure”, page 28.

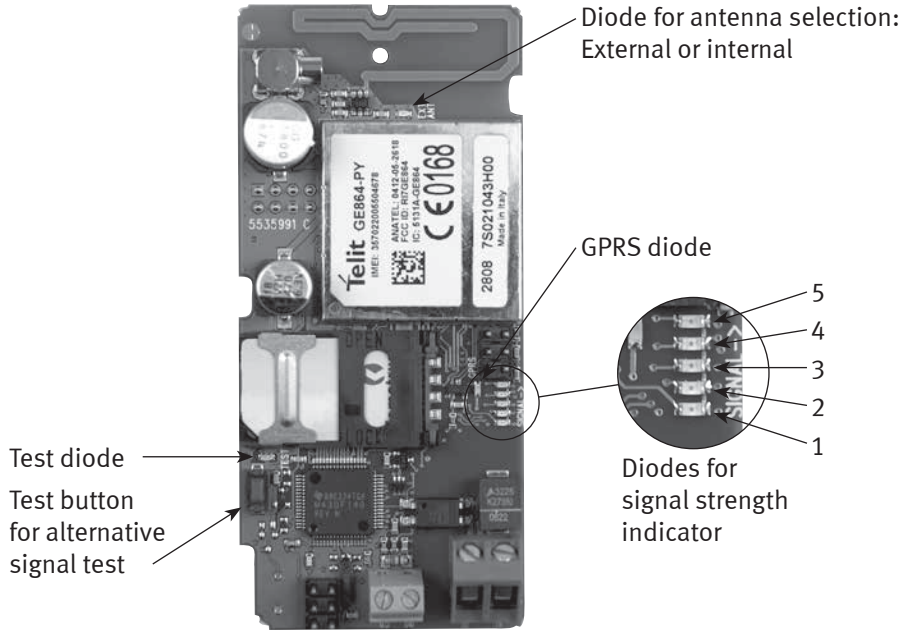
2.1 Mounting order

1. Dismount the top cover of the meter
2. Place the GSM7i module in the meter (please check that the eight module pins are all plugged in)
3. Insert SIM card (see paragraph 2.6.1, page 13)
4. When the diodes on the GSM7i module stop flashing, the signal strength is read on the indicator (see paragraph 2.4, page 11)
5. If the signal strength is acceptable, mount the top cover of the meter. Make sure that the antenna wire is not jammed
6. Before leaving the installation, check the signal strength by sending an SMS (see chapter 6 “SMS commands”, page 26).

If the module does not indicate normal operation conditions (such as sufficient signal strength), see chapter 5 “Error Detection Help”, page 24.

2.2 Start-up sequence

1. Immediately after start-up, all the *Signal indicator* diodes and the test diode switch on briefly (see the following figure).
2. The two *Signal indicator* diodes at the bottom flash until the module has been initialised correctly (approx. 1 min.). When the diode at the bottom stops flashing, the module has been connected to the network (after approx. 5-10 secs.).
3. Now, the signal indicator will show the current signal level.
4. If the module is configured for communication via GPRS, the GPRS diode switches on as soon as the module is connected to the GPRS network (approx. 20 secs. after start-up).
5. All diodes will turn off automatically after 10 min.



2.3 Signal test

Five LED's have been mounted on the GSM7i module to indicate the current GSM signal strength.

Immediately after starting up the module, it will try to connect to the GSM network, and the signal strength indicator will be activated (see paragraph 2.4, page 11).

If a higher resolution of the signal strength is required, it is possible to make a signal test with the test button:

1. Press the button for 2 secs. after which the test diode turns on and lights for approx. 10 secs.
2. The test diode will now indicate the signal strength with flashes.
   One long flash equals 10 and a short flash equals 1.
   E.g.: Two long flashes and three short flashes equal a signal strength of 23.

   See paragraph 2.4 "Diagram of signal conversion", page 11 for more details.

2.4 Diagram of signal conversion

Signal indicated in dBm	Signal with button test	Signal indicator	
-113	*0*	*0*	
-111	*1*	*0*	
-109	*2*	*0*	
-107	*3*	*0*	
-105	*4*	*0*	
-103	*5*	*0*	
-101	*6*	*0*	
-99	*7*	*0*	
-97	*8*	*0*	
-95	*9*	*1*	
-93	*10*	*1*	
-91	*11*	*1*	
-89	**12**	**2**	GSM minimum
-87	**13**	**2**	
-85	**14**	**2**	
-83	**15**	**3**	
-81	**16**	**3**	
-79	**17**	**3**	
-77	**18**	**4**	
-75	**19**	**4**	
-73	**20**	**4**	
-71	**21**	**5**	
-69	**22**	**5**	
-67	**23**	**5**	
-65	**24**	**5**	
-63	**25**	**5**	
-61	**26**	**5**	
-59	**27**	**5**	
-57	**28**	**5**	
-55	**29**	**5**	
-53	**30**	**5**	
-51	**31**	**5**	

- *Note: At a signal strength below 12, a stable connection to the unit cannot be guaranteed.*
- *The installation must not be handed over before the signal strength is 12 or more. In some cases it might be necessary to mount an external antenna.*
- *If an external antenna is mounted, this must be positioned in a place where it is not shielded, covered, or moved. Nor must it be mounted in closed metal cabinets.*
- *Only use dual-band GSM antennas.*
- *Always complete the installation by sending an SMS (**=signal#**) to control the signal strength when all doors and cabinets are closed.*

2.5 Light Emitting Diodes (LED's)

Signal indicator (Green)	Indicates the current GSM/GPRS signal strength
LED 1 flashes	Poor signal
LED 2 flashes	Is connecting to the GSM network
LED 3 flashes	SIM card error
LEDs 1 to 5 emit light	Indicate the current signal strength

GPRS (Orange)	Indicates the current GPRS status
LED switched on	GPRS connection

Test (Orange)	Is used for alternative signal test
LED emits light constantly	Emits light constantly for approx. 10 secs. during signal test
LED flashes constantly	The module cannot communicate with the electricity meter
Off	Normal condition

Ext Ant (Orange)	Indicates the current choice of antenna
LED turned off	The module uses the internal antenna
LED switched on	The module uses the external antenna

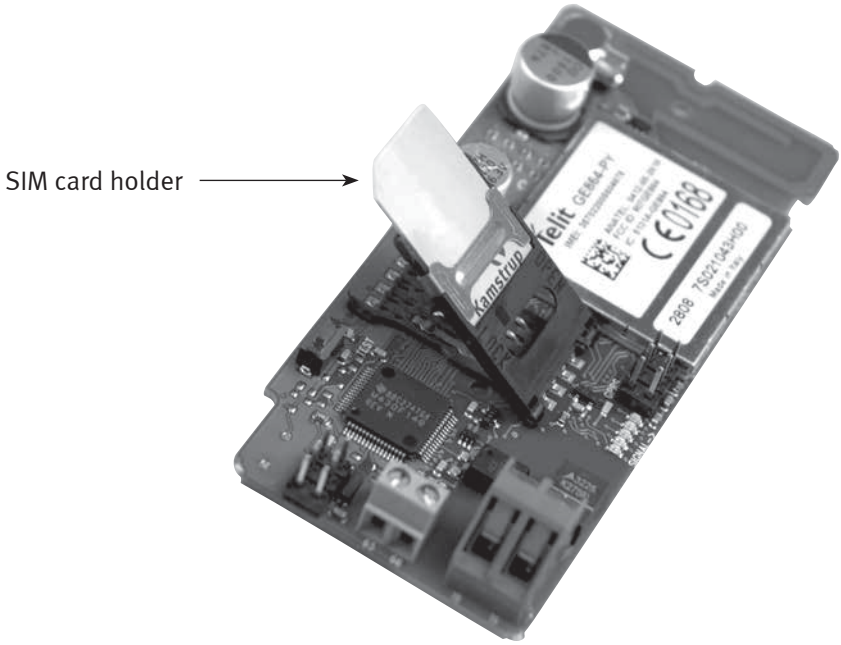
Note: All diodes will turn off after 10 mins.
They can be activated again by pushing down the test button for 2 secs.

2.6 SIM card

2.6.1 Mounting the SIM card

The unit can be ordered with the SIM card mounted from the factory. Please check that the card has been inserted. The telephone number of the card appears from a label on the GSM/GPRS module. Kamstrup A/S cannot be held responsible for theft and misuse of SIM cards from GSM7i units.

**When the SIM card holder is opened,
the connection to the SIM card is disrupted.
When the SIM card has been inserted correctly and the
holder is closed, the module will restart automatically.**



If the unit is supplied without a SIM card, make sure that to insert one before using the unit.

The SIM card holder is opened by pushing the bright holder towards the right and carefully tipping up the holder. Next, place the SIM card with the “cut-off” corner in the bottom left side and with the contacts facing the print. Finally, push the bright holder to the left to close the holder.

2.6.2 SIM card requirements

The SIM card must fulfil the following requirements:

GSM/GPRS, DATA/SMS-9.6. kb V110, PIN code must be disabled, no voice and no pre-paid card can be used.

2.7 Mounting of external antenna (to be ordered separately)

Connect the external antenna to the connector on the module. Be careful to hear a “click” before the two connectors are connected correctly. Lead the antenna out, down through the cable channel at the bottom of the electricity meter (see the picture in paragraph 2.7.1 “Activating the external antenna”, page 15).

2.7.1 Activating the external antenna

External antennas with DC resistance between the inner and outer conductors of 10K ohms or less are detected automatically. This applies to the following antennas:

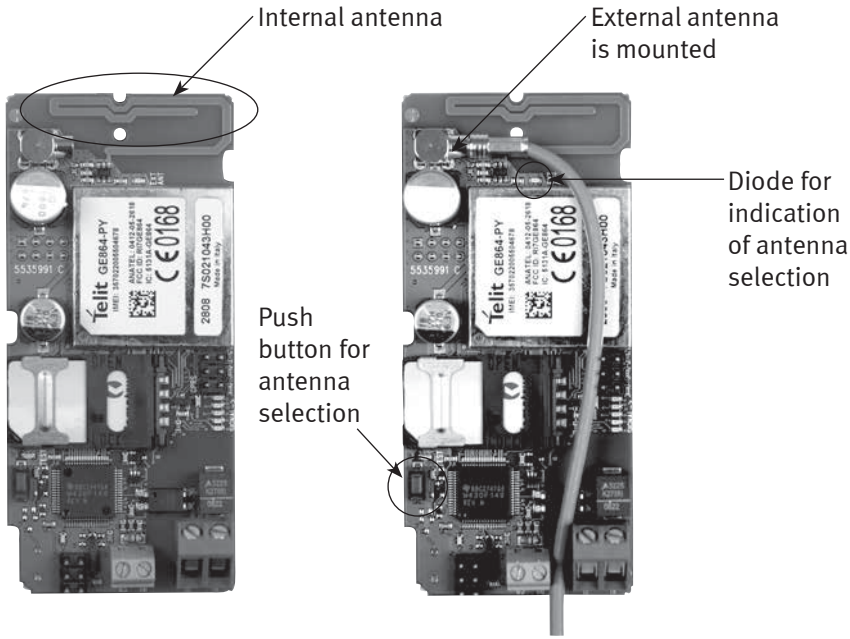
- Mini Triangle antenna (order no. 6699448)
- Triangle antenna (order no. 6699407 or 6699408)
- Directional antenna (order no. 6699456)

When using other antennas, the external antenna is selected manually in the following way:

By default, the internal antenna has been selected:

EXT ANT light emitting diode is switched off

Antenna selection	Button push	EXT ANT light emitting diode
Select external antenna	Push twice	On
Deselect external antenna	Push three times	Off



2.7.2 Positioning of external antenna

- Always mount the antenna on the outside of metal cabinets
- Place the antenna as high as possible
- Mount the antenna in an isolated position where it is not covered
- Make sure that the antenna is facing the right direction
- When mounting the antenna outdoors, we recommend using Kamstrup's antennas since they are vandal-proof
- Select a position where the antenna is not shielded by an open door or the like
- Place the antenna near windows, ventilation gaps, or cable entries in the installations where it is difficult to find a good GSM signal
- Place the antenna at least 50 cm from other antennas.

Do not mount the external antenna inside cabinets made of metal or other materials that disturb the signal.

2.8 Mounting status/pulse input

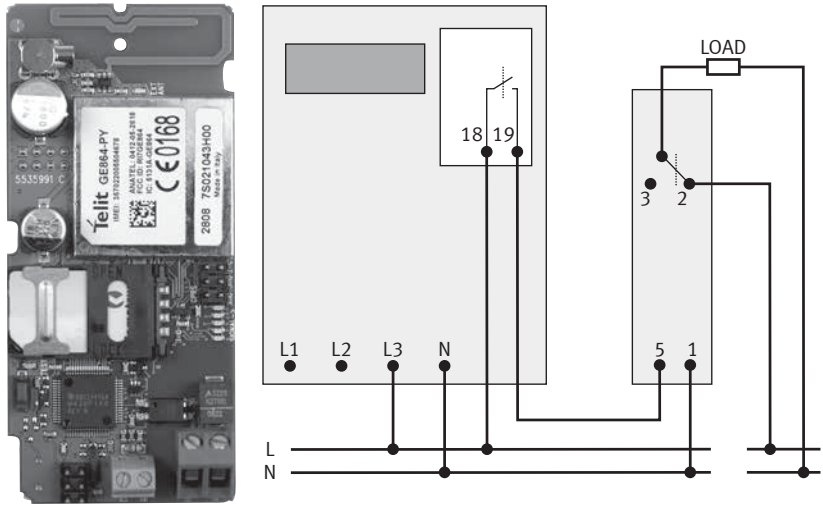
The status/pulse input can be used to read the status of a potential-free contact or as pulse input from e.g. a water meter. If it is used as pulse input, the pulses will be counted in the pulse register of the electricity meter.

Note that the electricity meter must be configured to receive pulses before the incoming pulses are registered.

Status / pulse input
(potential-free contact)

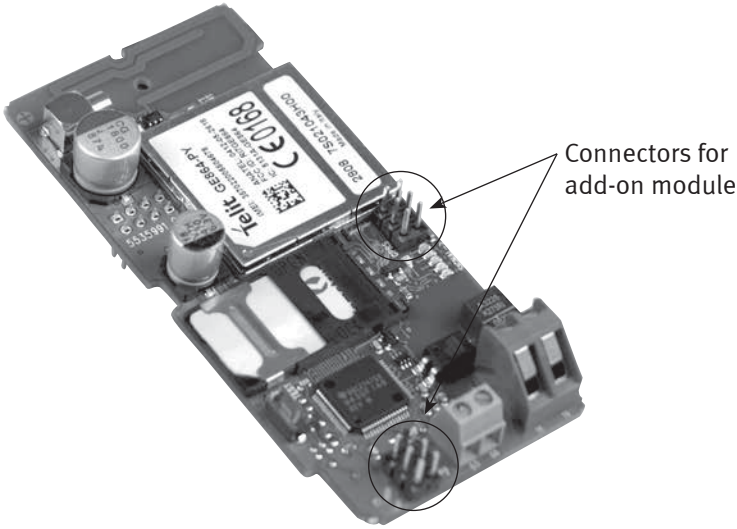
2.9 Mounting of load control

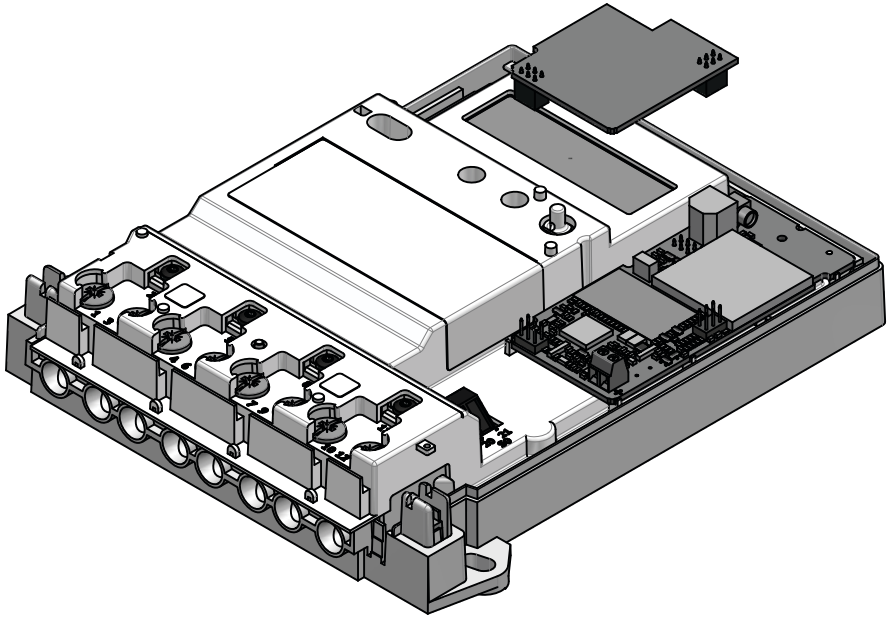
The control output is connected in series with the load. The control output must be charged with a maximum of 230 VAC, 100 mA. An example of a connection between electricity meter and recommended relay (type G2RS, OMRON) is shown below.

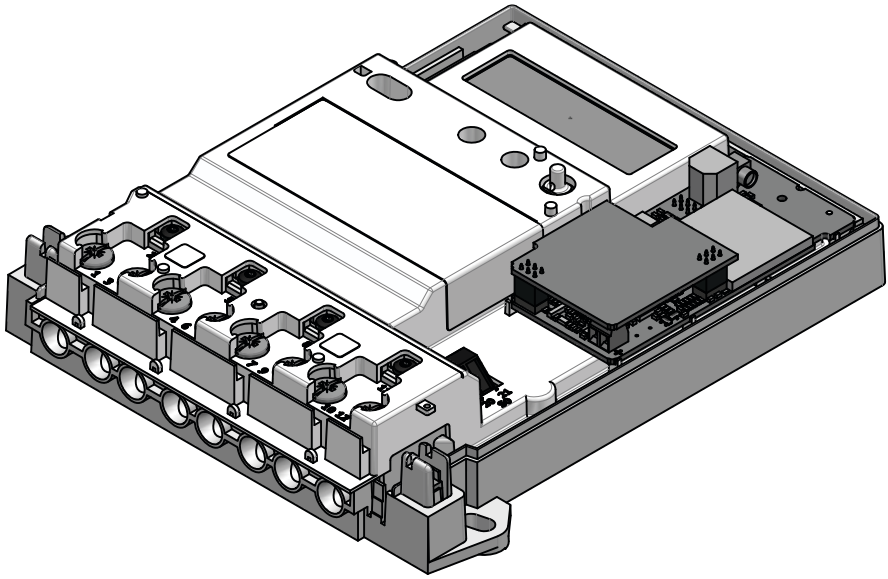


2.10 Mounting of add-on module

The module is prepared for connection of an add-on module in order to make it possible to add an additional communication media or an extra feature. Please contact Kamstrup A/S for further information.







3 Data in the GSM7i Module, Article No. 6816-Dxxxx

3.1 Data logger

The data logger stores daily/weekly/monthly values, load profiles, and events.

All registers and data are reset when the module detects a new electricity meter (e.g. in connection with a new installation or replacement of a meter).

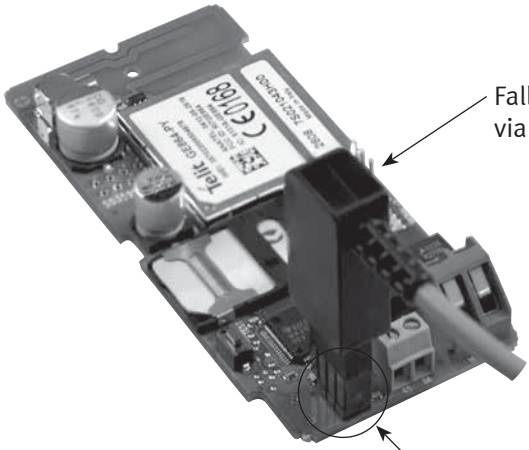
3.2 Backup

In case of power failure, the real time clock has a minimum of 10 days' backup in order to enable the module to continue data logging once the power is re-established.

Logged data are stored in the EEPROM of the module, and therefore they are not lost in connection with power failure.

> **NOTE**: As a precaution, logged data will be deleted if the module is moved from one meter to another.

On the GSM7i module itself, a 6-pole plug can be used for fall-back reading of the module's data logger in case of errors on the GSM network. Please contact Kamstrup A/S for further information.



3.3 Daily/weekly/monthly loggers

The daily/weekly/monthly loggers consist of e.g. readings including tariffs and status information concerning the real time clock.

The daily logger stores values every day (at 00:00), the weekly logger on the night of Sunday to Monday (at 00:00), and the monthly logger at the turn of the month (at 00.00).

The logging depth is 45 days, 45 weeks, and 45 months, respectively.

Please note that the daily, weekly, and monthly loggers cannot be activated at the same time.

Register structures of the daily/weekly/monthly loggers:

Time stamp	Register 1	Register 2	Register 3	Register 4	Control

Time stamp				
Year	Month	Day	Hour	Minute

	Register 1	Register 2	Register 3	Register 4
Kamstrup 162J	Primary energy, kWh	0	Tariff 1, kWh	Tariff 2, kWh
Kamstrup 382J	Primary energy, kWh	0	Tariff 1, kWh	Tariff 2, kWh

Control							
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Phase 1	Phase 2	Phase 3	Clock adjusted	Clock adj. 7-15 secs.	Clock adj. 15-60 secs.	Clock not valid	Periodic error

3.4 Load profile (minute logger)

The load profile is composed of 5, 15, 30, or 60 minutes' values and the logging depth is 1080.

The logging depth for 60 minutes' values is 45 days.

The register structure of the load profile:

Time stamp	Register 1	Register 2	Control

Time stamp				
Year	Month	Day	Hour	Minute

	Register 1	Register 2
Kamstrup 162J	Primary energy, kWh*	0
Kamstrup 382J	Primary energy, kWh*	0

Control							
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Phase 1	Phase 2	Phase 3	Clock adjusted	Clock adj. 7-15 secs.	Clock adj. 15-60 secs.	Clock not valid	Periodic error

**: The energy is registered with two decimals.*

3.5 Event logger

The event logger contains e.g. status information on the real time clock. The status information is stored with each change, e.g. time adjustment. The time adjustment is used for e.g. determining the duration of a voltage cut-off, two minutes being the minimum duration to register.

The logging depth is 64 events.

The register structure of the event logger:

Time stamp					**Control**
Year	Month	Day	Hour	Minute	

Control							
Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Phase 1	Phase 2	Phase 3	Clock adjusted	Clock adj. 7-15 secs.	Clock adj. 15-60 secs.	Clock not valid	Periodic error

4 Tariff shifting Function

The tariff shifting function allows two tariff shiftings on weekdays and two tariff shiftings during weekends as illustrated in the table below.

Furthermore, low tariff can be active on 30 optional days.

	Shift into T1	**Shift into T2**
Monday – Friday	1 shift/day	1 shift/day
Saturday – Sunday	1 shift/day	1 shift/day

It is possible to have two shiftings within 60 mins.

Example:
Definition of tariff 2: 1 January – 31 December, Monday – Friday 08:00-16:00

	Shift into T1	**Shift into T2**
Monday – Friday	16:00	8:00
Saturday – Sunday	T1 (no shift)	T1 (no shift)

5 Error Detection Help

NOTE: SMS commands must be sent in **either** capital letters **or** small letters.

The test diode flashes	The module has no contact with the meter. Check that the module has been mounted correctly.
LED 1 flashes	Very poor signal. Mount an external antenna. If an external antenna has already been mounted, it should be repositioned to improve the signal quality.
LED 2 flashes	The modem is not registered in the GSM network. The SIM card might not be activated by the telecom supplier. Replace the SIM card or contact your telecom supplier in order to activate it.
LED 3 flashes	SIM card is defect. Replace SIM card.
The GPRS diode does not emit light after start-up	Check the order to see if the unit has been ordered with GPRS activated. Ask the telecom supplier if there is a GPRS subscription for the SIM card. Read the APN name via SMS and check if it is correct. See chapter 6, page 26.
Has the SIM card been inserted correctly?	See paragraph 2.6.1, page 13
Is the SIM card correct?	Check the telephone number and make sure that it is a data subscription, see paragraph 2.6.2, page 14.
	Call the unit. A “modem/fax” sound can be heard provided there is no Voice SIM card in the unit.

Weak GSM signal	Mount an external antenna and try to improve the signal by placing the antenna in different positions.
	Send an SMS to the modem, e.g. **=SIGNAL#**. The unit must respond with the signal strength of the module.
	See paragraph 2.7.2 “Positioning of external antenna”, page 16.
	Mount a directional GSM antenna. Please contact Kamstrup A/S for further details.
	Insert a SIM card from another telecom supplier since there might be difference in GSM coverage between the suppliers.
Does the installation work?	Execute an SMS reading of the meter by sending the following SMS: ***=READ_EL_METER#***. The unit must correspond to the current meter reading value.
Defective modem	Enclose a precise description of the error and return the modem to Kamstrup A/S.

6 SMS commands

NOTE: SMS commands must be sent in **either** capital letters **or** small letters. Capital letters and small letters must not be mixed in the same SMS command.

READ_METER - for reading a direct meter (e.g. Kamstrup 382 or 162)	
Syntax	`=READ_EL_METER#`
Example	`=READ_EL_METER#`

Return reply, correct
Meter No. 10101010 is read, the meter reading value is 32432 kWh, the power is 343 W, and the meter has operated for 2452 hours.
	`32432 kWh,`
	`343 W,`
	`2452 Hours,`
	`Meter No.: 10101010`

Return reply, error	`NO ANSWER`

SIGNAL - for reading the signal strength	
Syntax, command	`=SIGNAL#`
Example	`=SIGNAL#`
Return reply, correct Displays the current signal strength of the modem on a scale of 0 to 31 where 31 is best. The signal strength must be minimum 12.	`Signal: 16(0-31)`
Return reply, error	`NO ANSWER`

IOSTATUS - for reading of status of relay output and status/pulse input *(Note that there is only one input ‹input1› on this module, and the relay outputs are an option.)*	
Syntax	`=IOSTATUS#`
Example	`=IOSTATUS#`
Return reply, correct	`Relay1: 1 Relay2: 0` `Input1: 1 Input2: 0`
Return reply, error	`NO ANSWER`

CONTROL_OUTPUT - for controlling the relay output *(Note that there is only one relay output on this module)*	
Syntax	**=CONTROL_OUTPUT <out1> <out2>#**
Example Switch on relay 1 immediately	**=CONTROL_OUTPUT 1 0#**
Example Switch off relay 1 immediately	**=CONTROL_OUTPUT 0 0#**
Return reply, error	**NO ANSWER**

Read APN – for controlling the APN name in connection with GPRS	
Syntax	**=READ_APN#**
Example	**=READ_APN#**
Return reply, correct (example)	**Billingcom.dk**
Return reply, error	**NO ANSWER**

7 GSMxi Variant Structure

681 – □-□-□-□ □ □

GSM7i	6
GSM Module SW	
Transparent	T
Data logger	D
Add-on module	
None	0
Features	
No option	0
Earth fault	A
Country	
Denmark	10
Norway	40
Sweden	90
Others	00
Frequency code	
None	000

Additional options:

SIM card

None	0
BillingCom SIM card – Danish	1
BillingCom SIM card – Swedish	2
SIM card supplied by customer	3

Delivery

Module	1
Kit - Kamstrup 162 (module and top cover)	3
Kit - Kamstrup 382 (module and top cover)	3

Antenne

Without external antenna	A
Antenna adapter, MCX to FME, 0.3 m	B
Antenna adapter, MCX to SMA, 0.3 m	C
Triangle antenna, 1.5 m cable, (6699407)	E
Triangle antenna, x m cable, (6699408)	F
Mini Triangle antenna with 1.5 m cable	G
Discos antenna 1 m	H

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