

INSTALLATION

Kamstrup radio network for electricity meters



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1. Radio Network Features, Electricity Meters

- Collection of meter values, e.g. counts, load profiles and voltage quality from electricity meters, via radio (RF) communication
- Central upload of new features, e.g. new times for tariff change
- Integral Real Time Clock (RTC) in the RadioRouter module
- Load profile (5/15/30/60 minutes), 24-hour/weekly/ monthly logger, event logger
- Tariff switch function
- Relay output for load control (option)
- Status/pulse input (option)
- Integral router functionality

2. Requirements

2.1. System

The radio network is read by central software, e.g. EMS10. This software also updates the times for tariff switch in the RadioRouter modules.

Data is transmitted between EMS10 and the RadioRouter module via an RF Concentrator. The overall radio and network planning is carried out in co-operation with Kamstrup.

2.2. Meter

In order to use the RadioRouter module's tariff control in a network, the electricity meter must be set to "communication control".

For further information on the configuration of the electricity meter we refer to documentation on METERTOOL for 162/382 and METERTOOL for 351 Combi.

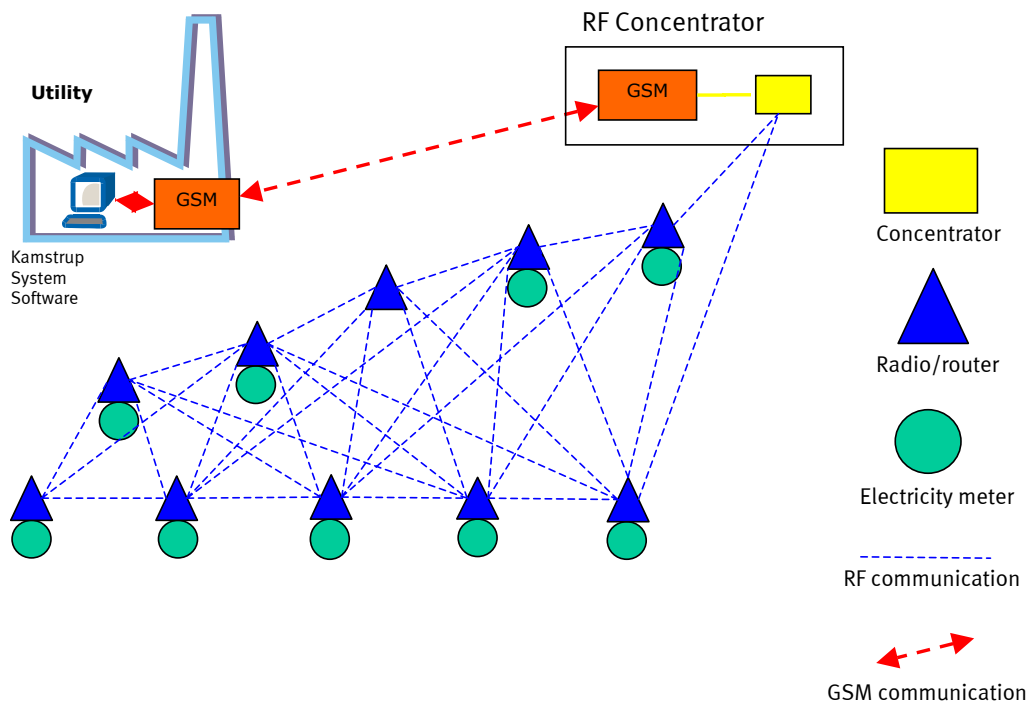
3. System Description

A radio network consists of several components as outlined in the below system overview.

RadioRouter modules are mounted in Kamstrup meters collecting counts, load profiles and events, e.g. voltage cutoffs. These data are transmitted to an RF Concentrator via radio frequency and on to the reading system of the utility, e.g. via GSM/GPRS.

Communication between a RadioRouter module and RF Concentrator takes place within a dedicated frequency band without thereby disturbing other RF receivers. In some cases it can be expedient to intensify the signals by mounting an RF Router.

Metering data from a RadioRouter module which is mounted in a remote area can be transmitted to the RF Concentrator via other RadioRouter modules. Having been mounted, each RadioRouter creates its own local list consisting of signal/noise ratios between the module and the RadioRouter modules within its range. Optimal reading of all RadioRouter modules is determined on the basis of the local lists and gathered in a so-called net list in the RF Concentrator.



System Plan, Radio Network

4. RF Concentrator

4.1. Installation

The RF Concentrator is the central network unit, which includes reading jobs and data of up to 680 RadioRouter modules.

The RF Concentrator is to be mounted indoors or in a weather proof box, preferably with access to a high point (e.g. a mast or a chimney). RF Concentrator is mains supplied by 230 VAC.

The RF Concentrator must always be installed with an external antenna to obtain best radio range.

The external antenna can be mounted outdoors.



RF Concentrator

The RF Concentrator is available in 2 variants:

6699Dxxx 3xx Used together with
6850- 022/038-3xx

Following frequency codes (3xx) are released for the RF Concentrator for the time being:

6699Kxxx-328:	444,050 MHz
6699Kxxx-339:	444,675 MHz
6699Kxxx-349:	444,450 MHz

4.2. Commissioning

Before commissioning it must be checked that the connection between the communication unit (e.g. GSM/GPRS Modem) and the RF Concentrator is correctly mounted and that voltage is switched on.

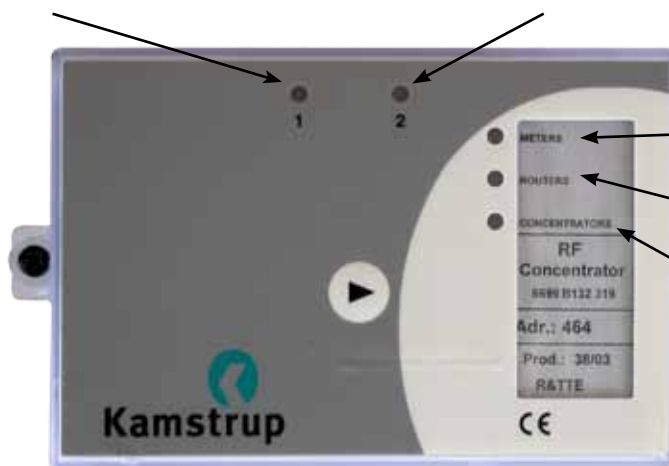
RF Concentrator has a push-button in the middle of its top cover. At the top it has two light-emitting diodes (LED) to indicate data communication to and from the RadioRouter modules. The three LEDs to the right indicate the number of RadioRouters, RF Routers and RF Concentrators within the concentrator's range in the form of a flashing sequence.

Press the push-button and release it when the top LED is lit. The RF Concentrator starts creating the local list.

When all LEDs go out, commissioning (update of the local lists) has been completed.

Data from RF Concentrator (LED 1)

Data to RF Concentrator (LED 2)



Number of radio modules within range. One flash per RadioRouter.

Number of RadioRouters and RF Routers within range. One flash per RadioRouter or RF Router.

Number of RF Concentrators within range. One flash per RF Concentrator.

RF Concentrator

Press the push-button until all three LEDs are lit. The local list will now be displayed as it appears from the above figure.

5. RadioRouter modules

The RadioRouter module is available in the following variants,

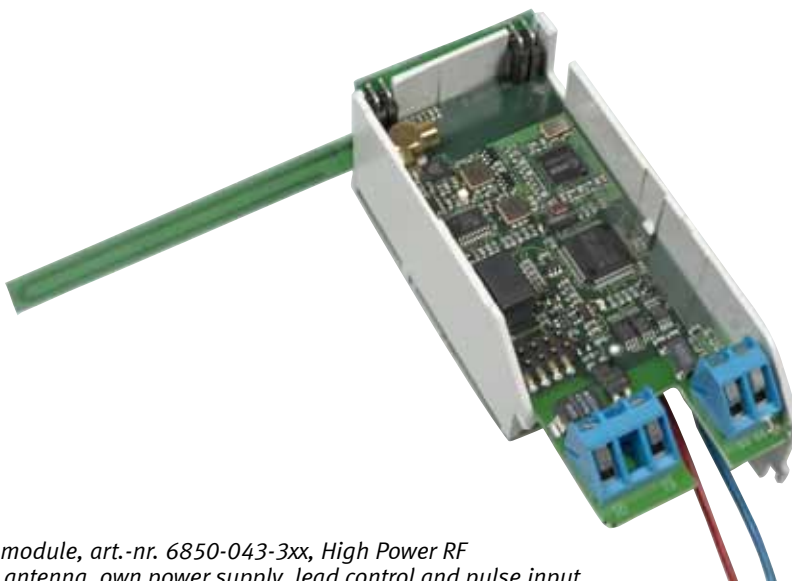
- 6850-022-3xx (load control relay and status/pulse input possible via upper level module)
- 6850-038-3xx (with 230 V connection for two-tariff control)

Following frequency codes (3xx) are released for the RadioRouter for the time being:

6850-022/038-319:	EU frequency
6850-022/038-329:	444,40 MHz
6850-043-328:	444,050 MHz
6850-043-339:	444,675 MHz
6850-043-349:	444,450 MHz



RadioRouter module, art.-no. 6850-022-3xx (to the left), and upper level module with status/pulse input and load control relay, art.-no. 6850-029 (to the right)

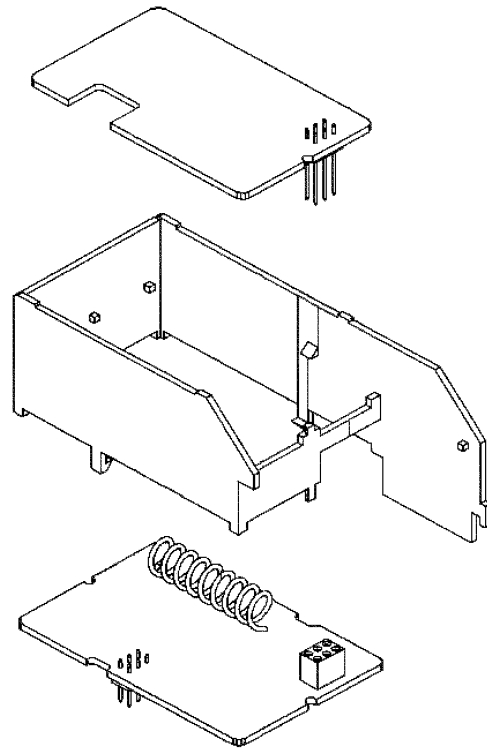


RadioRouter module, art.-nr. 6850-043-3xx, High Power RF incl. internal antenna, own power supply, lead control and pulse input.

5.1. Installation of 6850-022-3xx

If the module is mounted in the electricity meter from the factory you can go to the paragraph on commissioning. If not, please follow the instructions below.

1. Switch off the supply voltage to the electricity meter.
2. Dismount the top cover and mount the module (please make sure that all six pins obtain contact).
3. Switch on the supply voltage to the electricity meter.
4. Mount the top cover (eventually after commissioning, see section 5.2).



Mounting of RadioRouter module (at the bottom) as well as module for load control (at the top), which are both fixed with the plastic frame (in the middle).

Below table shows the different combinations of RadioRouters with and without load control module. All combinations can be used for Kamstrup 162, Kamstrup 382 and Kamstrup 351 Combi.

	RadioRouter	RadioRouter with frame	RadioRouter load	Load control module
Article no.	6850-022-3xx	6850-026-3xx	6850-027-3xx	6850-029
Daily/weekly/ monthly log	✓	✓	✓	**
Load profile	✓	✓	✓	**
Event logger	✓	✓	✓	**
Tariff control	✓	✓	✓	**
Load control	-	*	✓	**
Standard top cover	✓	-	-	**
High top cover	-	✓	✓	✓

* Presupposes load control module (article no. 6850-029)

** Module and frame for already mounted RadioRouter modules.

5.2. Commissioning of 6850-022-3xx

There is a push-button in the middle of the RadioRouter module and at the top of the module there are three light-emitting diodes (LED). You start initialization by pressing the push-button until one of the below functions is attained. If all LEDs have gone out when the push-button is released none of the below functions will be carried out.

Sign up for the network:

Press the push-button until LED1 is lit

The module initializes itself and communicates with the meter. If OK, LED1 is lit and the module creates a local list

- If it detects another router with S/N=15 dB, the second LED will be lit
- If it detects another router with S/N=35 dB, the third LED will be lit

Press the push-button until LED1 and LED2 are lit
(So far this function is not supported)

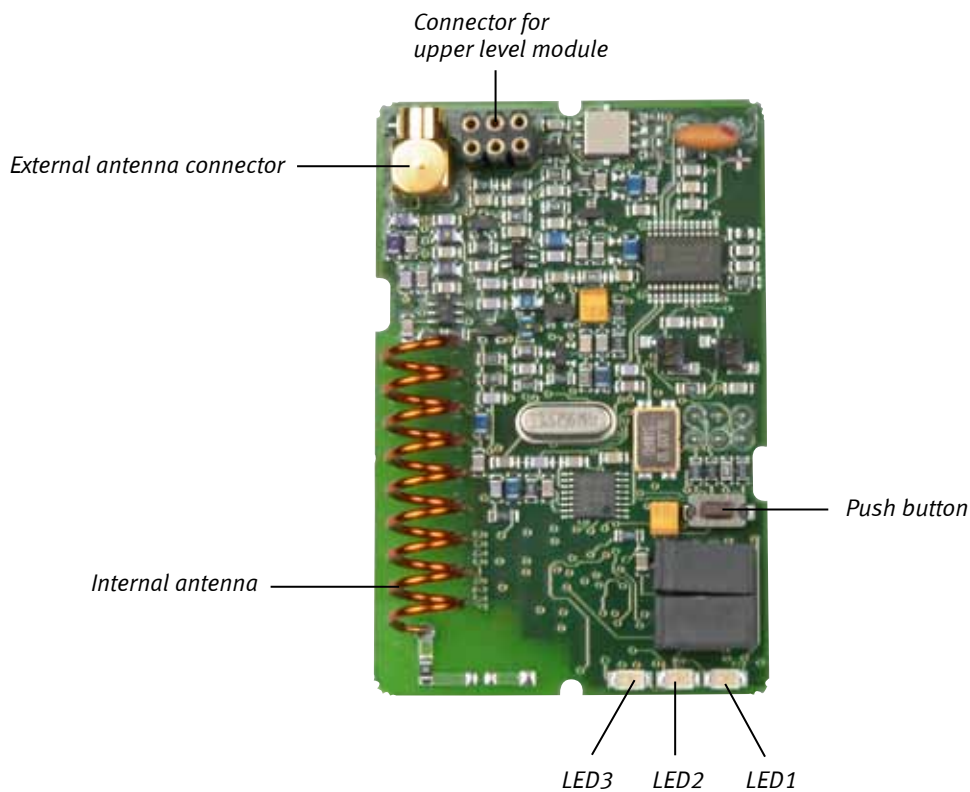
Press the push-button until all three LEDs are lit

The module's local list is indicated in the form of a "flash code"

- a long flash means 10
- a short flash means 1

I.e. one long and two short flashes mean that the module's local list consists of 12 units.

Following frequency codes (3xx) are released for the:
6850-022-319: EU frequency



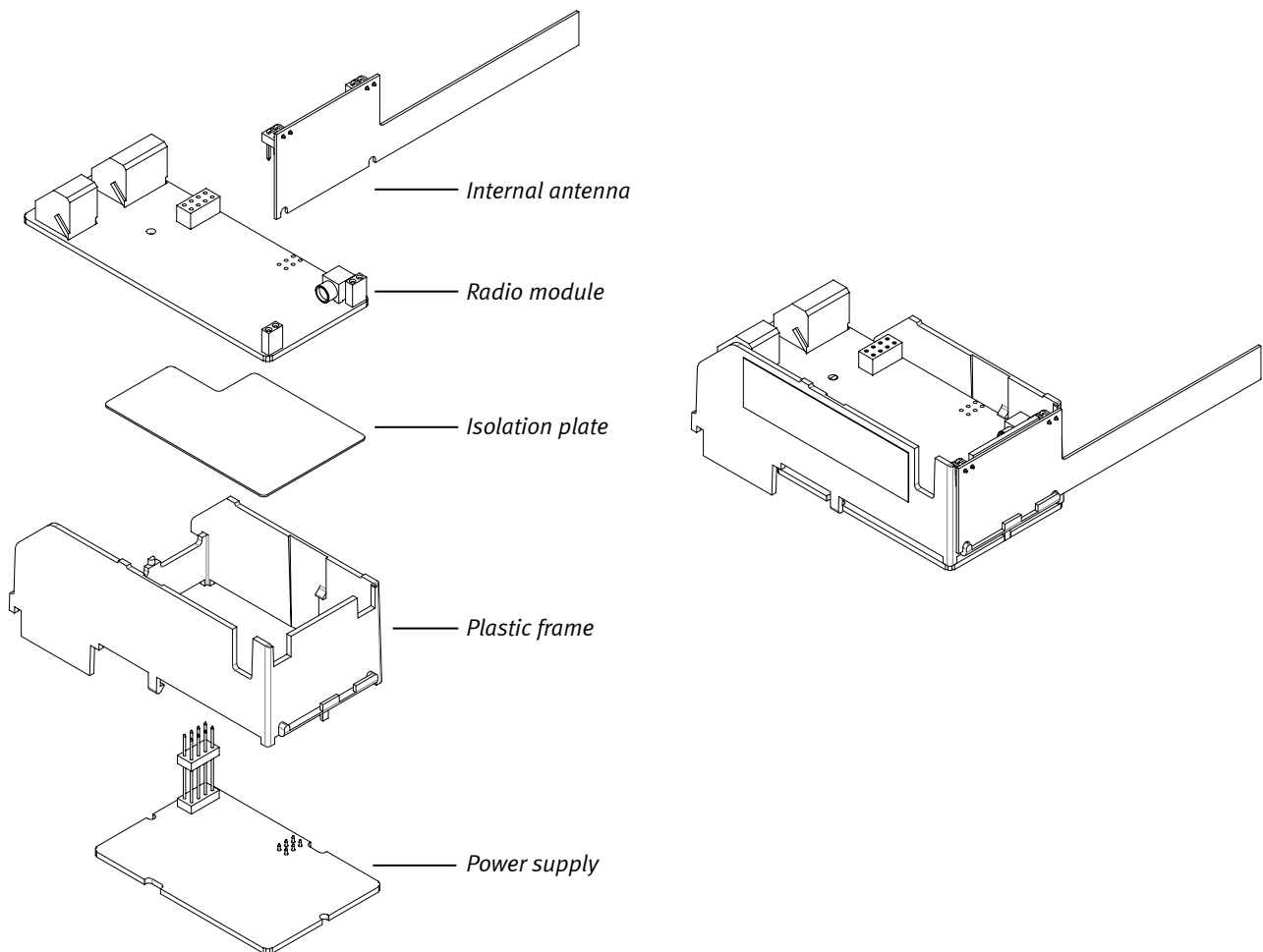
RadioRouter module 6850-022-3xx

5.3. Commissioning of 6850-043-3xx

If the module is mounted in the electricity meter from the factory please go to the paragraph on commissioning. If not, please follow the instructions below.

The radio module can be used with Kamstrup 162, Kamstrup 382 and Kamstrup 351 Combi.

1. Switch off the supply voltage to the electricity meter
2. Dismount the top cover and mount the module (please make sure that all six pins obtain contact).
3. Mount the internal antenna – is always supplied together with the module.
4. Connect the supply mains of the radio router module.
5. Switch on the supply voltage to the electricity meter.
6. Mount the top cover (eventually after commissioning, *see section 5.8*).



5.4. Commissioning of 6850-043-3xx

The radio module has a push button and one light-emitting diode (LED) – see below.

When the supply power is switched on the module automatically starts an initialization routine, during which the LED is constantly lit for approx. 10 seconds. When the LED goes out initialization is complete (i.e. connection has been established to the electricity meter among other things). The same routine runs after voltage cutoff. Failing to obtain contact with the meter, (e.g. due to a meter error or wrong meter type cf. section 5.3) the LED on the module will flash continuously for approx. an hour and then automatically start a new initialization attempt.

Sign up for the network:

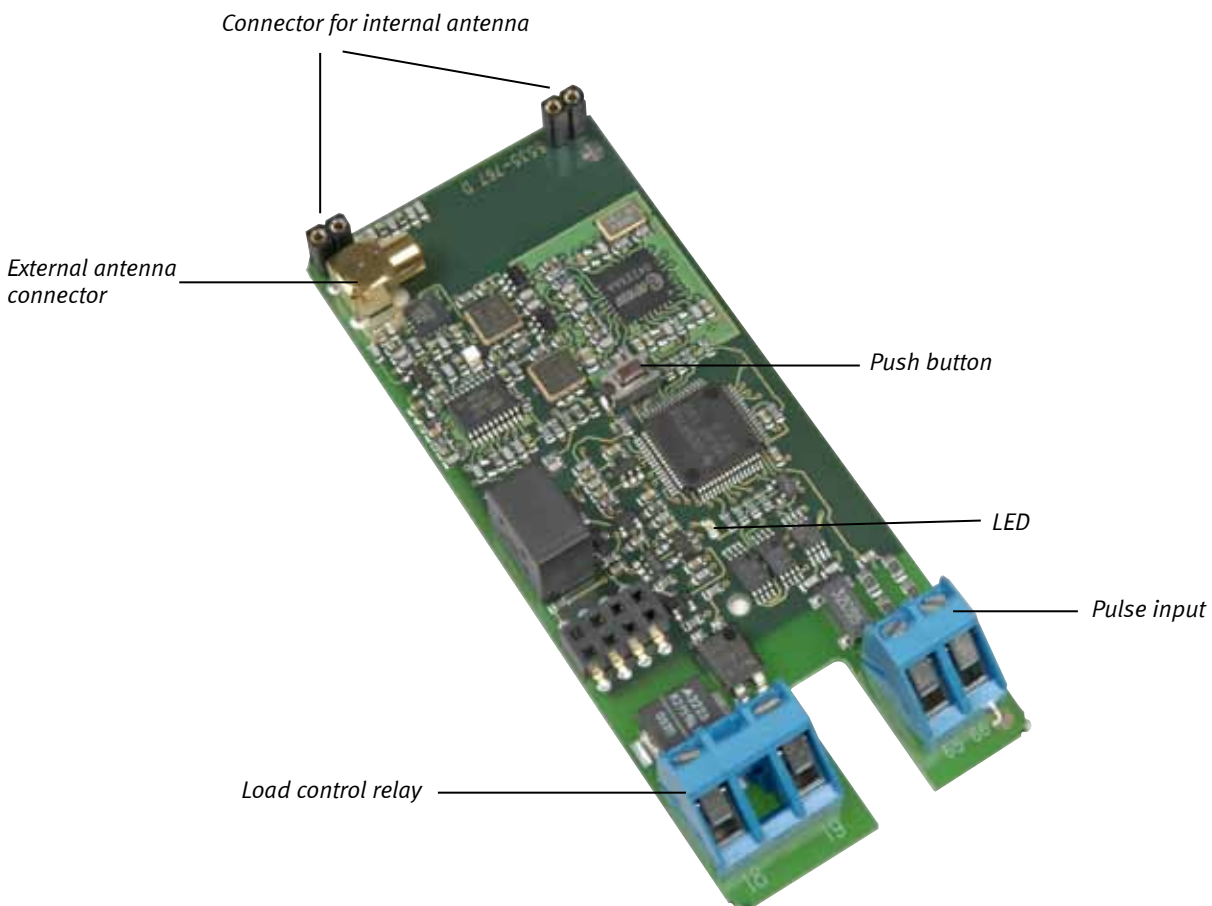
You sign up for the network by pressing the push-button until the LED is lit. The module now creates its local list. When the LED turns off the module is signed up for the network.

If the LED flashes, no local list has been created.

Please note that either an internal antenna 6699-xxx or external antenna must be mounted before the module is put into operation. If not, the radio signal will be reduced by approx. 40 dB, and the module will not be able to communicate with other radio units.

Following frequency codes (6850-043-3xx) are released:

310	EU frekvens	Senea
311	EU frekvens	Senea
312	EU frekvens	Senea
318	EU frekvens	Kamstrup
319	EU frekvens	Kamstrup
320	444, 000 MHz	Senea
321	444, 050 MHz	Senea
322	444, 400 MHz	Senea
330	444, 700 MHz	Senea
339	444, 675 MHz	Kamstrup
340	444, 550 MHz	Senea
349	444, 450 MHz	Kamstrup



RadioRouter module, 6850-043-3xx

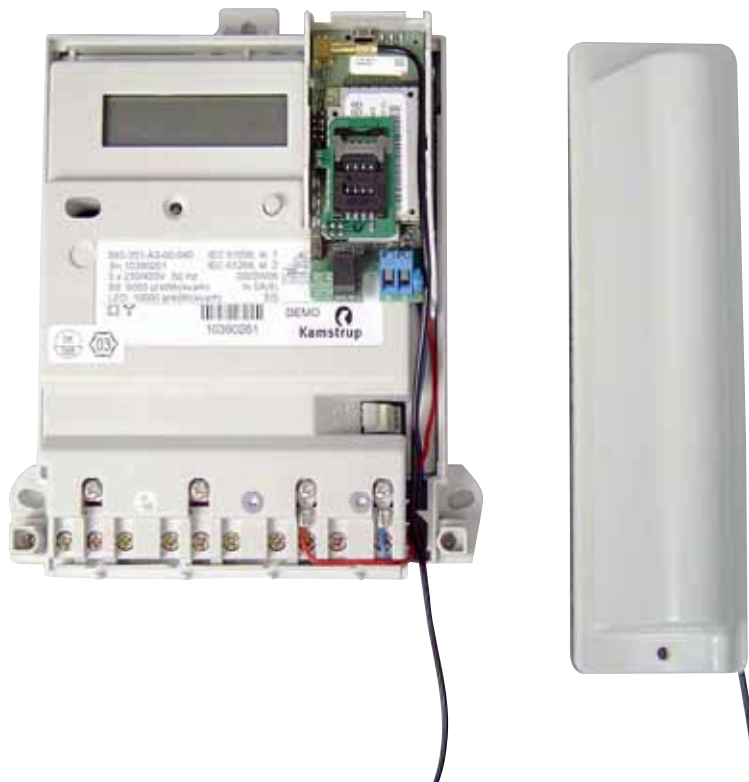
6. Antennas

6.1. External antenna, type Triangle 6699-407

This external antenna with 1.5 metre RG174 antenna cable is used for the RadioRouter. The antenna cable is mounted in the RadioRouter module and the MCX plug is mounted on the PCB without using tools. In order to obtain the best possible radio range the antenna itself must be mounted vertically. Remember to mount the antenna cable in the wire-arrester. The antenna cable is not jammed between meter and top cover.

In this way the best strain relief is obtained.

The antenna itself must be mounted vertically to obtain the best possible radio range. *For further information, please refer to the installation guide for the Triangle antenna (5512-064).*



External antenna, Triangle type 6699-407

6.2. External antenna, Triangle type 6699-408

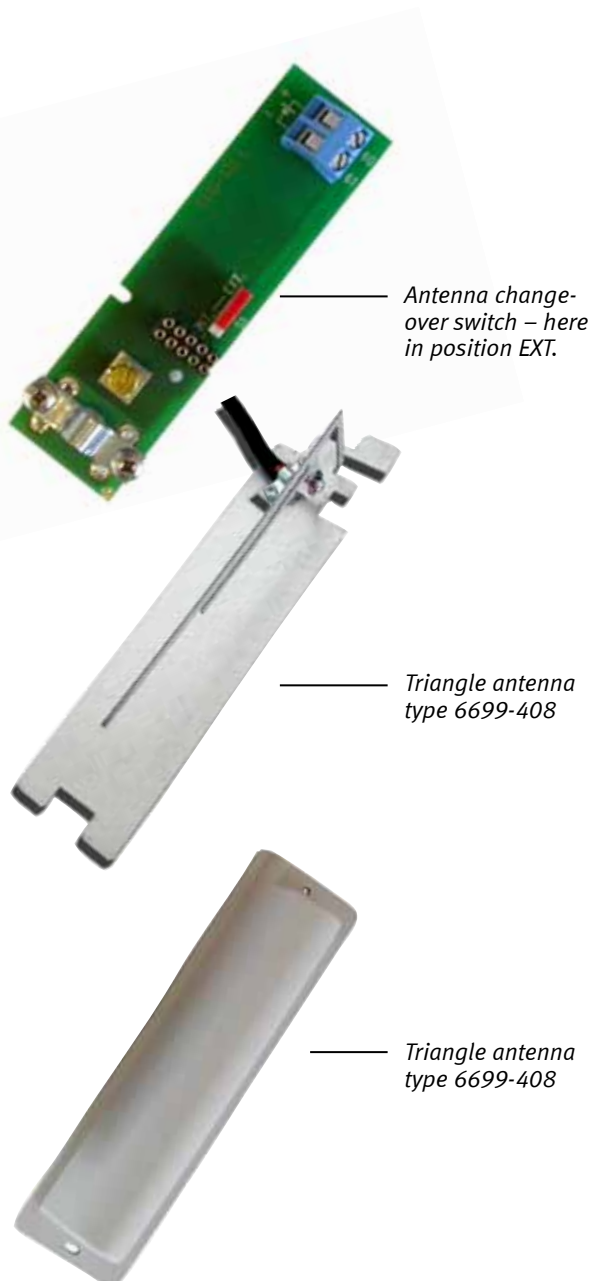
This external antenna with up to 20 metres 50 Ohm antenna cable (supplied by Kamstrup A/S) can be used for RadioRouter and RF Concentrator.

If the Triangle antenna type 6699-408 is to be used for the RadioRouter module, the converter box type 6699-417 must be used.

The same procedure is used for mounting the antenna cable in the radio network units and in the external antenna.

Strip the antenna cable, bend the screen back over the insulation and mount it in the bow in order to secure a good frame connection for the antenna cable. Strip the inner conductor and mount it in the screw terminal. In order to obtain the best possible radio range the antenna itself must be mounted vertically.

If an external antenna is used, the change-over switch must be set to position EXT.



6.3. Converter box type 6699-417

This converter box is used when an antenna cable of more 1.5 meter should be used for the RadioRouter module.

Is delivered with 1.5 m RG174 antenna cable terminated with an MXC plug in both ends. Mount the antenna cable between module and converter box without using tools.

Remember to mount the antenna cable in the wire-arrester.

- The antenna cable is not jammed between the meter and top cover
- The best possible strain relief is obtained

Antenna cable type 6699-460 is mounted in the following way:

Strip the antenna cable, bend the shield backwards onto the isolated part of the wire. The shield should now be mounted in the wire-arrester to ensure good and proper shield on the antenna cable. Strip the inner core and place this in the screw terminal.



6.4. External antenna, type Discus 6699-416/6699-450

This external antenna with 1.5 metre RG174 antenna cable with MCX plug at both ends is used for Radio/-router and network units.

The antenna cable is mounted in RadioRouter and the MCX plug is mounted on the print without using tools.

Remember to mount the antenna cable in the wire arrester.

- The antenna cable is not jammed between meter and top cover
- In this way the best strain relief is obtained

The antenna is available in 2 variants:

6699-416	EU frequency range
6699-450	444,40 MHz

In order to obtain the best possible radio range the antenna itself must be mounted according to the installation guide for the antenna (5512-128).



External antenna, Discus

6.5. External antenna, type Cavity wall 6699-452

This external antenna with 1.5 metre RG174 antenna cable is used for RadioRouter.

Connect the antenna cable to the RadioRouter module and mount the MCX plug on the PCB without using tools.

Remember to mount the antenna cable in the wire arrester.

- The antenna cable is not jammed between meter and top cover
- In this way the best strain relief is obtained

In order to obtain the best possible radio range the antenna itself must be mounted vertically.



External antenna, cavity wall type 6699-452

7. Installation in general

Note: Installation and commissioning involves 230 V shock hazard. Therefore, installation and commissioning must be carried out by authorized personnel only.

7.1. Basic rules

The following basic rules must be observed when installing energy meters and radio network components:

- In basements without windows the antenna cabling must be carried to the outside and mounted on the footing of the house or as high as possible.
- All meters mounted in a steel cabinet or closed unit need an external antenna outside the steel cabinet.
- All meters liable to become covered up or enclosed must be fitted with an external antenna.
- If several meters are mounted in one room, an external antenna is mounted per 10 meters, however, minimum two external antennas.
- The RF Concentrator must be fitted with an external antenna.

7.2. Troubleshooting

- Radio module: If the radio module itself is defective, data from the energy meter cannot be transferred to the network. A simple functional control is to carry out a signal/noise measurement with the hand-held terminal MULTITERM Pro. For further information on troubleshooting regarding the radio module, *please see the manual for MULTITERM Pro.*
- External antenna: Check the position of the antenna change-over switch. If the RF Router or the RF Concentrator is fitted with an external antenna, the antenna change-over switch must be set to position EXT.
- RF Router: If none of the light-emitting diodes start flashing upon a "Installation test", please check that the supply has been connected correctly. Red to terminal 60, black to terminal 61.
- RF Concentrator: If none of the light-emitting diodes start flashing upon a "Installation test", please check that the supply has been connected correctly. Red to terminal 60, black to terminal 61
- GSM/GPRS Modem: For further troubleshooting, *please see the manual for Kamstrup GSM/GPRS Modem.*

8. Data from the RadioRouter Module

The RadioRouter module is fitted with a data logger, in which daily weekly and monthly values, load profiles and events are stored.

All registers and data are reset when the module detects a new electricity meter (e.g. due to new installation or meter replacement).

8.1. Daily logger/weekly logger/monthly logger

The daily/weekly/monthly logger consists of counts including tariffs as well as status information on the Real Time Clock among other things.

As far as the daily logger is concerned values are saved daily at midnight (00:00), the weekly logger saves data at midnight (00:00) on Sundays and the monthly logger at midnight (00:00) on the last day of the month.

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

Please note that daily weekly and monthly logger cannot be activated at one time.

Register structure of the daily/weekly/monthly logger:

Hour stamp	Register 1	Register 2	Register 3	Register 4	Control		
Hour stamp							
Year	Month	Day	Hour	Minute			
	Register 1	Register 2	Register 3	Register 4			
Kamstrup 162*	True energy, kWh	0	Tariff 1, kWh	Tariff 2, kWh			
Kamstrup 382*	True energy, kWh	0	Tariff 1, kWh	Tariff 2, kWh			
Kamstrup 351 Combi	True energy, kWh	True energy, kvarh	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 adjusted 7–15 sec.	Clock adjusted 15–60 sec.	Time stamp invalid	Discontinuity

8.2. Load profile (minute logger)

The load profile is based on 5, 15, 30 or 60 minute values. The logging depth of 60 minute values is 45 days.

Register structure of load profile:

Hour stamp	Register 1	Register 2	Control
Hour stamp			
Year	Month	Day	Hour
	Register 1	Register 2	
Kamstrup 162	True energy, kWh*	0	
Kamstrup 382	True energy, kWh*	0	
Kamstrup 351 Combi	True energy, kWh**	True energy, kvarh	
Control			
Bit 0	Bit 1	Bit 2	Bit 3
Phase 1	Phase 2	Phase 3	Clock adjusted
			Clock adjusted 7–15 sec.
			Clock adjusted 15–60 sec.
			Time stamp invalid
			Discontinuity

* : Energy is registered with two decimals

** : Energy is registered without decimals, or as verified energy with two decimals

8.3. Event logger

Among other things the event logger consists of status information on the Real Time Clock. Status information is saved after each change, e.g. time adjustment. Among other things time adjustment is used to determine the duration of voltage cut-offs. Cut-offs of less than two minutes' duration are not registered.

The logging depth is 64 events.

Register structure of the event logger:

Hour 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 adjusted 7–15 sec.	Clock adjusted 15–60 sec.	Time stamp invalid	

8.4. Tariff switch function

The tariff switch function allows two tariff changes per day. In practice tariff 2 is controlled by a given period, weekday and time of day.

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

Example of tariff switch:

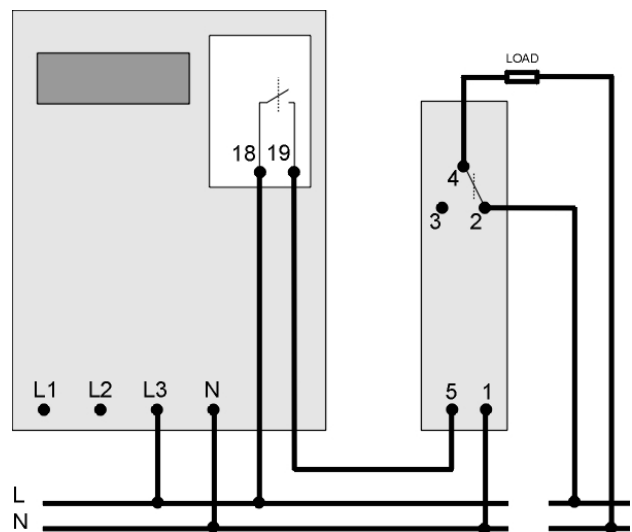
	Change to T1	Change to T2
Monday – Friday	4 p.m.	8 a.m.
Saturday - Sunday	No change (T1)	No change (T1)

The above-mentioned tariff switch table is based on the following definition:

Tariff 2 is active during the period 1. January to 31 December, Monday-Friday, 8 a.m. to 4 p.m.

8.5. Load control

We recommend the connection of a change-over relay to control the load. An example of the connection between an electricity meter and the recommended relay (type G2RS, OMRON) appears from the shown sketch:



Example of a connection between electricity meter and relay, OMRON type G2R-1-SN1 change-over relay.

9. Technical specifications

	RF Concentrator	RadioRouter module	RadioRouter module
Article-no.	6699ZZZZZZ	6850-022-3xx	6850-043-3xx
Dim. (wxhxd mm)	145 x 100 x 45	41 x 64 x 21	41 x 64 x 21
Storage temperature	-40°C - +70°C	-40°C - +70°C	-40°C - +70°C
Operating temperature	-40°C - +60°C	-40°C - +60°C	-40°C - +60°C
Relative humidity	< 95%, no condens	< 95%, no condens	< 95%, no condens
RTC accuracy	Better than 7 s./day	Better than 7 s./day	Better than 7 s./day
RTC backup		min. 5 hours	min. 10 days
Load profile		5/15/30/60 minutes	5/15/30/60 minutes
Logging depth		3/11/22/45 days	3/11/22/45 days
24-hour logger, depths		45 days	45 days
Weekly logger, depths		45 weeks	45 weeks
Monthly logger, depth		45 months	45 months
Event logger		64 events	64 events

10. Ordering details

Product

RadioRouter module	6850-022-3xx
RadioRouter w/frame	6850-026-3xx
RadioRouter w/load control module	6850-027-3xx
Load control module	6850-029
Load control module w/frame	6850-030
RadioRouter, high power	6850-043-3xx
RF Concentrator	6699ZZZZZZ
RF Concentrator, High Power	6699YYYYYY
GSM/GPRS Modem	68Gxxxxxxx
External antenna, Triangle	6699-407/6699-408
External antenna, Discus	6699-416/6699-450
External antenna, Cavity Wall	6699-452

EMS10

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PcBase III

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