REFU Elektronik

REFU Power Quality
REFU*PMU* – Power Management Unit

Operating Instructions DOK-RE*SOL*-BA04-EN-PMU____-NN-P.doc

Title	REFU*PMU* – Power Management Unit
	REFU*PMU*® is a registered trademark of REFU Elektronik GmbH
Documentation type	Operating instructions
Documentation purpose	This documentation describes how to connect a photovoltaic plant featuring REFU*SOL* inverters to the public power supply network and to the power reduction unit.
	It provides information • about the connection of the REFU*PMU* to the ripple control receiver, the internet, the REFU*SOL* inverters, and the surge protector.
	This description takes effect in 10. 2009.

Revisions

Version code	Version	Remarks
DOK-RESOL-BA04-EN-PMU____-NN-P	04.2010	Cap.1.3; 1.4; 4.1; 4.2; 4.3; 5 new

Obligation: The data specified is for product description purposes only and may not be deemed to be guaranteed in a legal sense. We reserve the right to modify the contents of the documentation and supplies of the products.

Editor: REFU Elektronik GmbH
Marktstr. 185 • D-72793 Pfullingen / Germany

Phone +49 (0) 7121.4332-102 • Fax +49 (0) 7121.4332-140

http://www.refu-elektronik.de

Internal file reference: N:\VERTRIEB\VID\002 REFUSOL\300 Dokumentation\REFU*PMU*\DOK-RESOL-BA04-DE-PMU____-NN-P.doc

Table of Contents

1. Safety-Related Guidelines for REFU*PMU*®

1.1 Protection against Touching Electrical Parts

Note: This section only relates to units and unit components that are under voltages greater than 50 volts.

Any contact with live parts being under voltages greater than 50 V may result in potentially lethal shock currents. Dangerous voltages are applied to certain components of electrical equipment in operation.

WARNING

High voltage! Risk of death or severe personal injury by electric shock!

⇒ The REFU*PMU* may only be installed by qualified specialists. Furthermore, the installer must be licensed by responsible power suppliers.

⇒ Only trained and qualified personnel specialized in electrical equipment is allowed to operate, maintain and/or repair the REFU*PMU*®.

⇒ Before it is switched on, the power plug of the unit must be checked to verify that it is tightly seated (locked in place).

⇒ The operator must observe all of the above regulations at all times.

1.2 Protection against Magnetic and Electromagnetic Fields during Operation and Assembly

Magnetic and electromagnetic fields exist in the immediate vicinity of power-carrying conductors and can be a serious danger to people with cardiac pacemakers, metallic implants, or hearing aids.

WARNING

Health risk for persons with cardiac pacemakers, metallic implants, or hearing aids in the immediate vicinity of electrical equipment!

⇒ People with cardiac pacemakers and metallic implants are forbidden to access the following areas:

- Areas in which electrical equipment and parts are assembled, operated, or set up.

⇒ If persons with cardiac pacemaker must access these areas, a physician must be consulted beforehand. The interference immunity of present or future implanted cardiac pacemakers differs greatly, so that no general rules can be given.

⇒ People with metal implants or metal fragments, or persons wearing hearing aids must consult their physicians before accessing such areas, as a risk to their health must be assumed.

1.3 Disposal

Dispose of the packaging and replaced parts according to the rules applicable in the country where the device is installed.

Do not dispose of the REFU*PMU*® with normal domestic waste.

Note: The REFU*PMU*® complies with the RoHS Directive. That means that the device can be delivered to local sites for the disposal of household appliances.
REFU Elektronik GmbH takes the REFU*PMU*® completely back. Please contact the Service!

1.4 General Information

- REFU*PMU*® is a low-voltage device and is supplied by a CE-tested AC adaptor.
- REFU*PMU*® does not cause any direct danger to persons.
- Incorrect REFU*PMU*® readjustments may lead to changes in the external power supply system, which may result in risks for transformers and cables!
- REFU Elektronik GmbH does not assume any liability for damage caused by failure to observe the warnings given in these operating instructions.
- The operating and maintenance instructions as well as safety-related guidelines must be read before commissioning.
- Proper and correct transport, storage, assembly and installation, as well as care in operation and maintenance, are prerequisites for optimal and safe operation of the unit.
- Only assign trained and qualified personnel to work with electrical installations.
  Only persons who are trained and qualified for the use and operation of this unit may work on or near the unit. Such persons are qualified if they have sufficient knowledge of the assembly, installation and operation of the product, as well as an understanding of all warnings and precautionary measures contained in these operating instructions. Furthermore, such persons must be trained, instructed or authorized to switch electric circuits and devices on and off in accordance with technical safety regulations, to ground such circuits and devices and to identify them appropriately according to the requirements of safe work practices. These persons must also have adequate safety equipment and be trained in first aid.
- Always replace the complete AC adaptor (incl. plug) if it is damaged or defective.
- Only use spare parts and accessories approved by the manufacturer.
- Follow all safety regulations and requirements for the specific application as practiced in the country of use.
- The ambient conditions given in the product documentation must be observed.
- You may commission the unit only after having verified that the machine or installation in which the products are installed complies with the national regulations, safety specifications and standards of the application.
- Operation is only permitted if the national EMC regulations for the application are met.

- The machine or installation manufacturer is responsible for compliance with the limit values as prescribed in the national regulations.

  European countries: EC Directive 2004/108/EC (EMC Directive).

- Technical data as well as connection and installation conditions are specified in the product documentation and must be followed at all times.

2. REFU PowerManagementUnit REFU*PMU*®

2.1 Description of the Unit

According to the current amended EEC version, photovoltaic plants having a connected load of more than 100 kWp have to take part in the management of power supply and network safety as of 01. 2009.
The new guideline entitled "Generating Plants Connected to the Medium-Voltage Network" issued by the BDEW (Bundesverband der Energie- und Wasserwirtschaft, German Federal Association of the Energy and Water Industry) defines this requirement for all installations feeding in on medium-voltage level. Primarily, this allows the network operator to limit the power of the installation by remote control according to Para. 6 EEC 2009.

REFU*PMU*® offers the following advantages:

- The **REFU*PowerManagementUnit*** – in short REFU*PMU*® – features this function according to the directive.
- REFU*PMU*® allows communication with 2 x 31 REFU*SOL*® inverters.
- In addition to the power limitation and the reactive power, it is also possible to intermediately store the actual feed-in power of all connected REFU*SOL*® inverters including the limitation.
- REFU*PMU*® allows communication with 2 x 31 REFU*SOL* inverters and makes the data available to REFU*LOG*®.
- The power limitation of all connected REFU*SOL*® inverters are stored in the REFU*PMU*® .

2.2 Storage

The unit must be intermediately stored in dry rooms.

2.3 Conditions for Installing

When installing, the following points must be observed:

- Protection class IP 20, climatic category 3K3, no dewing.
- Adherence to admissible ambient temperatures through appropriate ventilation (take cooling air quality into account, if necessary).
- Adherence to the minimum passage widths in case of installation in electrical operation rooms and control rooms. See **DIN VDE 0100 Parts 729 and 731**.
- In order to avoid accidents during installation and service work, free and secure access to the devices must be ensured.
- The application of additional measures (protected area) allows outdoor installation.

3. Mounting the REFU*PMU*® and Dimensions

3.1 Requirements for the Assembly Site

REFU*PMU*® is provided with pure convection ventilation and therefore designed for being mounted to a vertical wall.

- To allow the required heat dissipation, always keep the following minimum distances from the ceiling and wall and/or neighboring devices.

Minimum distance	Side	100 mm	Top	500 mm	Bottom	500 mm

CAUTION

Be absolutely sure not to mount a REFU*PMU*® device above or below a REFU*SOL*® device!

The REFU*PMU*® is available in two mounting variants:

- Mounting to walls, see Fig no. 2
- Mounting in a control cabinet, see Fig no. 3

3.2 Unit Dimensions

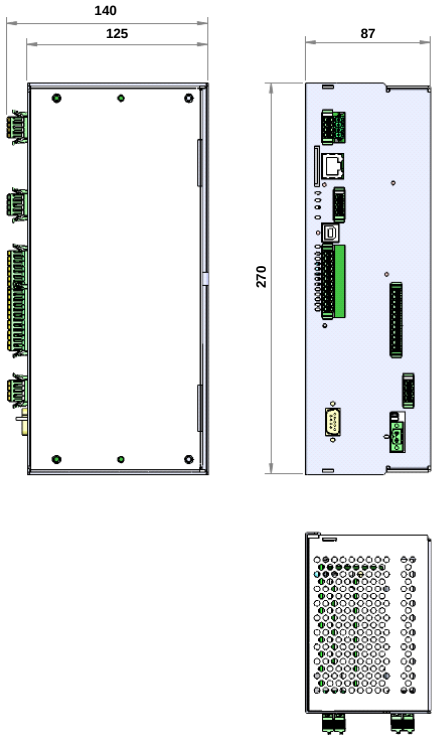


Fig no. 1 Dimensions of the REFU*PMU*

3.3 Mounting to Walls

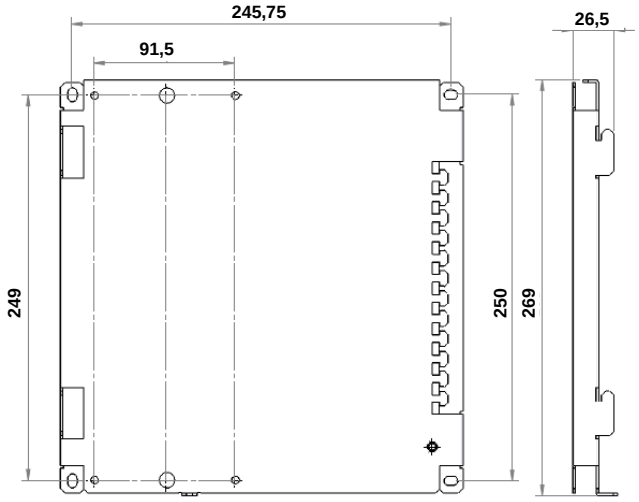
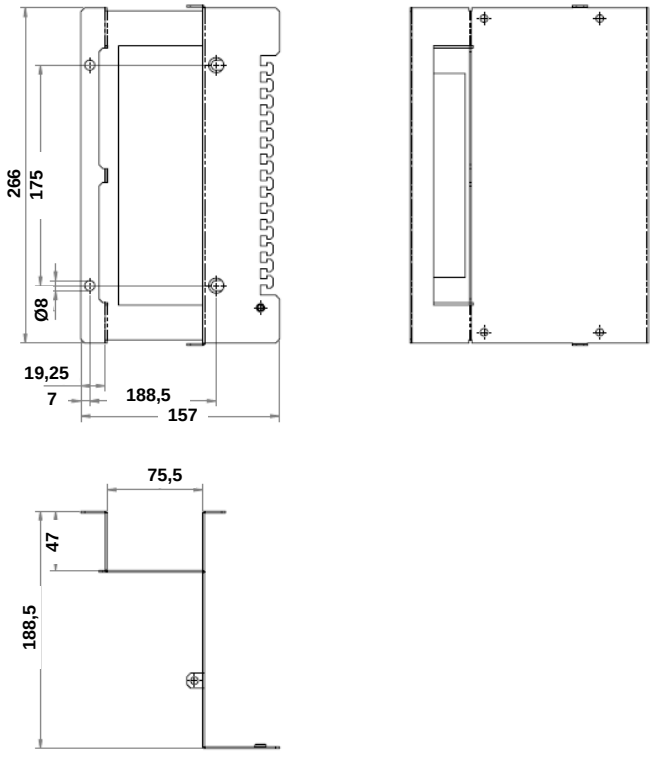


Fig no. 2 Dimensions of the REFU*PMU*® Mounting plate for attachment to walls

3.4 Mounting in a Control Cabinet



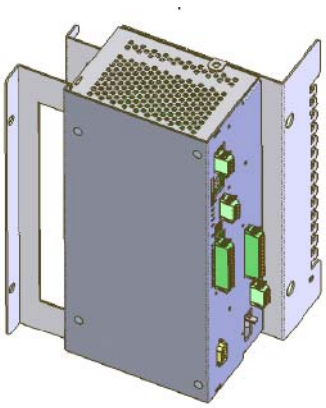


Fig no. 3 Dimensions of the REFU*PMU*® Control cabinet holder

4. Brief Startup Instructions

The following brief instructions provide a description of how to install the hardware and how to integrate a photovoltaic plant in the REFU*LOG*® monitoring portal.

4.1 Hardware Installation

- Since the REFU*PMU*® transfers its data to the REFU*LOG*® monitoring portal or activates the solar inverters according to the data received from the ripple control transmitter, all REFU*SOL*® inverters (up to a maximum of 2 x 31 units) and the REFU*PMU*® must be connected to each other via the RS-485 interfaces X77 and/or X15 (requires external surge protection type 2).
- Connect the external ripple control transmitter to terminal strip X18:1 – (+24VDC) of the power supply unit using a 7-core cable (Ölflex) and the signals to terminal strip X17:1-4 (IN 1-4) of the REFU*PMU*®.

  It is absolutely necessary that the noise radiation limit values specified in EN61000-6-4 be observed!
  Connect all cable shields to ground. Additionally mount the ring magnets which are included in the scope of delivery upstream of the –X17/18 connectors.

  Apply the 0% signal to terminal X17:1 (IN1), the 30% signal to terminal X17:2 (IN2), the 60% signal to terminal X17:3 (IN3), and the 100% (rated AC output) signal to terminal X17:4 (IN4) (see Fig. no. 5). All signals are power specification signals.

- Use a patch cable CAT.5 inserted in socket X13 (connector type RJ45) for connection to the internet, either via an external switch (if there are more users than one) or directly via the modem.

  Make absolutely sure that you apply the Ethernet cable shield to the PE bar in an electrically conducting manner!

- The USB service interface (X16) allows service personnel to configure the unit on site (see Fig no. 4).
- Terminal strip X11 can be used to connect an operator panel, a display or an external monitoring unit [(1)].
- Connect the supplied AC-adaptor (230 VAC/24 VDC, 15 W) to socket X78. A plug-in jumper S1 which provides for disconnection of the system ground of the REFU*PMU*® from the protective conductor is arranged above this socket. The two unassigned pins are provided for safely keeping the plug-in jumper.

[(1)] Available in the third quarter of 2010

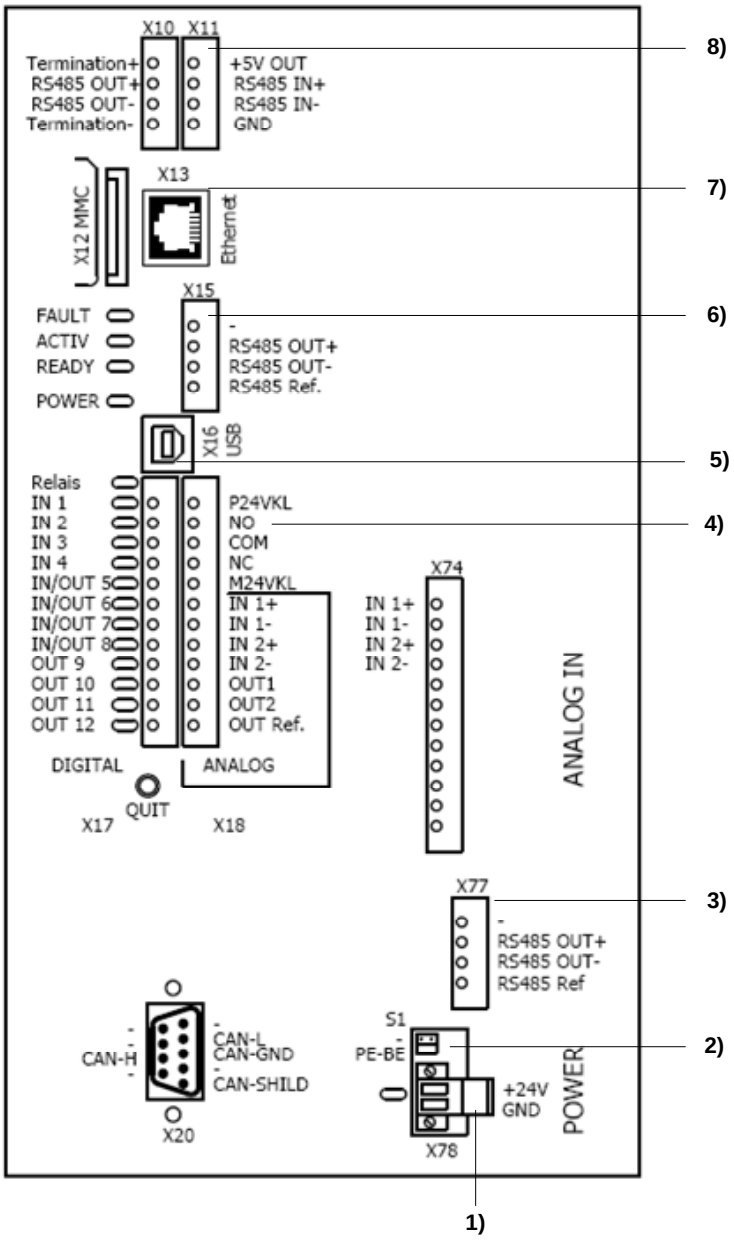


Fig no. 4 Layout of connectors and terminal strips

1) X78 Power supply connector 24VDC 15W

2) S1 Plug-in jumper across the system ground and the protective conductor; 2 pins for keeping the plug-in jumper

3) X77 RS-485 master terminal strip (with internal surge protection EN- type D1)

4) X17/18 Terminal strip for digital inputs and outputs

5) X16 USB interface (for service purposes)

6) X15 RS-485 master terminal strip (requires external surge protection EN type D1)

7) X13 Ethernet interface (RJ45 connector)

X12 MMC memory card slot

8) X10 RS-485 slave terminal strip, large-size display or monitoring unit

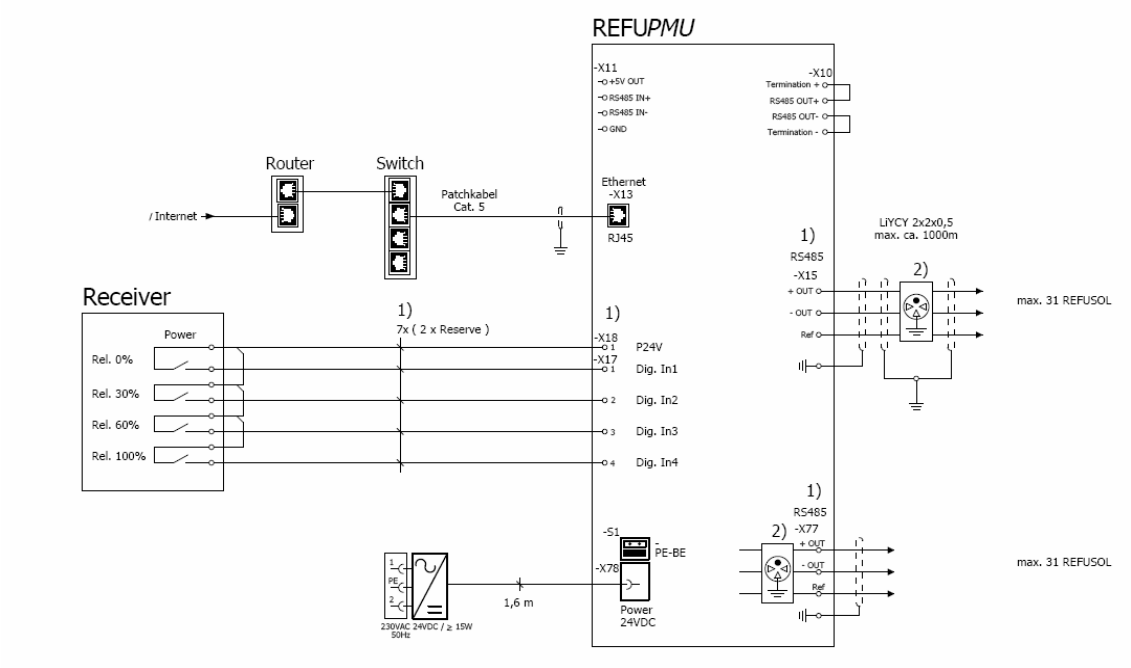


Fig no. 5 Wiring diagram

1) Connector: flexible with wire end ferrule, without plastic sheathing 0.2 – 1.5 mm²
flexible with wire end ferrule, with plastic sheathing 0.2 – 0.75 mm²

2) EN type D1

Note: Fig no. 5 shows the state on delivery!
Digital inputs Dig. In1 to 4 can be parameterized as desired for each combination of relays. Please contact the Service.

4.2 Configuration

Configuration of the REFU*PMU* is not necessary!
However, each REFU*SOL* inverter can be configured as follows:

- Configuration of the REFU*SOL* solar inverters is possible with firmware version RFP-24-4-S and higher.
- Password P2000 = 72555
- P420.3 = check 57600 → corresponds to default setting.
- P406.3 = addresses assigned from 1 up to max. 31; 0 = no address!!

Note: After having entered the data in the REFU*SOL* solar inverter, switch the inverter off and on again to apply the input data to the RAM.

4.1 Ethernet Setting

The factory setting of REFU*PMU*® (on delivery) is as follows:

- IP address: 192.168.0.123
- Subnet mask: 255.255.255.0
- Standard gateway: 192.168.0.1

4.3 AC-Adapter for REFU*PMU*®

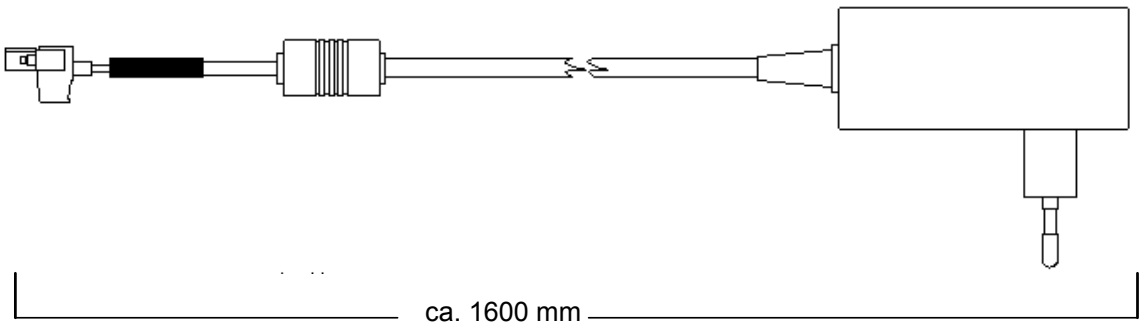


Fig no. 6 AC-adapter

5. Technical Data

Typ	REFU*PMU*
AC adaptor	
Supply voltage	AC 230 V, 50Hz
Voltage range	115 - 230 V
Frequency range	50 / 60 Hz
Output voltage	DC: 21 V – 24 V
Power consumption	18 W
Current consumption	500 mA
Basic device	
Supply voltage	DC: 21 V – 24 V
Power consumption	12 W
Current consumption max.	500 mA
Interfaces	
USB interface	1
USB interface type	Typ 2 (Device)
Ethernet interface	1
Ethernet interface type	RJ45 port
RS485 interface	3
Digital inputs (terminal strip X17)	
Digital input	4
Input voltage	DC: -1 V – +33 V
Input current	8 mA – 9 mA
Potential isolation	RJ45 port
RS485 interface	Ja
Signal level input 0 1	 -1 V - +5 V +13 V - +33 V
With open input	0 level
Cooling, ambient conditions, EMC	
Cooling	Natural convection
Ambient temperature	-25 °C bis + 55 °C
Setup height	Up to 2000 m above MSL
Noise radiation	EN61000-6-4
Certificate	CE
Radio immunity	EN 61000-6-2
Environment classes	3K3H acc. to DIN IEC 60721-3-3

Typ	REFU*PMU*
Mechanics	
Degree of protection	IP20 acc. to EN 60529
Dimensions of basic unit Width / height / depth	130 mm / 280 mm / 87 mm (without plug)
Dimensions of basic unit with Mpl. Width / Height / Depth	245 mm / 280 mm / 114 mm (without plug)
Weight	Ca. 1.6 kg

6. Contact

Please address any questions on the configuration of your REFU*SOL* to:

REFU Elektronik GmbH
Marktstr. 185
D-72793 Pfullingen, Germany
Phone: +49 (0) 7121.4332-102
Fax: +49 (0) 7121.4332-140
Refusol@refu-elektronik.de
www.refu-elektronik.de

Please address any questions on failures or technical problems to:

Service hotline: +49 (0)7123 / 969 – 202 (from 8:00 a.m. to 5:00 p.m. on workdays)
Fax: +49 (0)7123 / 969 – 220
Email: service@refu-elektronik.de

7. Notes

REFU Elektronik GmbH
Marktstr. 185
D-72793 Pfullingen / Germany

Phone: +49 (0) 7121.4332-102
Fax: +49 (0) 7121.4332-140
mail@refu-elektronik.de
www.refu-elektronik.de
Part no: 0030707