FRAKO

EMIS® 1500 Central Unit

Safety instructions

!!! Important, read before commissioning !!!

- The user must ensure that all operators are familiar with these operating instructions and follow them at all times.

- The operating instructions must be read carefully before the instrument is mounted, installed and commissioned.

- All actions taken must follow the operating manual.

- The installation and commissioning may only be carried out by appropriately qualified personnel with due regard for all rules and regulations that are in force.

- The instrument contains live components at the AC supply voltage and must therefore not be opened.

- If the instrument is visibly damaged, it must not be installed, wired up or commissioned.

- If the instrument does not work after commissioning, it must again be isolated from the mains.

- Any further laws, standards, guidelines, etc. relevant to this product must be complied with.

Contents   Page

1. Quick start

- **Before Installation:**

 Attention:

If it is necessary to connect the instrument to a network, the installation should be planned jointly with the network administrator.

⇒ Preparation of an installation plan with locations and addresses specified.

- **Installation:**

⇒ Mount the instrument at a suitable location.

⇒ The instrument is connected according to the installation instructions in Section 3 on page 7.

 Important:

Before mounting and maintenance the instrument must be disconnected from the mains.

- **Commissioning:**

⇒ After installation the instrument is switched on by plugging in the power cable.

⇒ The required IP settings must be carried out via the keys below the display. (see Section 4.2, on page 12)

 Attention:

The IP settings must also be made in the case of modem or serial connections.

⇒ Install the *System-SW* software onto a PC in order to be able to configure the EMIS® 1500 central unit.

2. Operating principle

The function of the EMIS® 1500 central unit is to acquire and record data from the Energy Management System. It is also responsible for the identification, recording and onward routing of alarms.
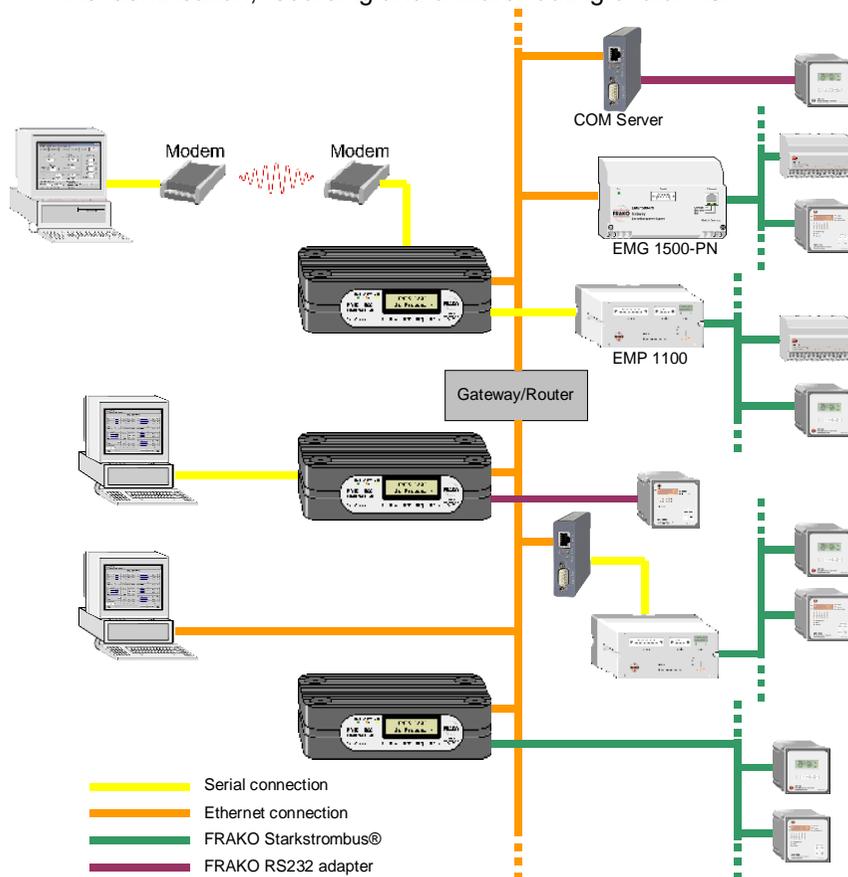

Figure 1: EMIS® 1500 connections

The user has various options for installing the EMIS® 1500:
- Via modem by means of dial-up networking (DUN)
- Direct serial connection by means of dial-up networking
- Connection via the Ethernet

At the other side of the EMIS® 1500 Central Unit there are also various options for linking it to the instruments in the field:

- *EMIS 1500 > FRAKO Starkstrombus®*
- *Ethernet > EMG 1500-PN > FRAKO Starkstrombus®*
- *Ethernet > COM server > FRAKO RS232-Adapter > EM device*
- *Ethernet > COM server > EMP 1100 > FRAKO Starkstrombus®*
- *COM-port > FRAKO RS232-adapter > EM device*
- *COM-port > EMP 1100 > FRAKO Starkstrombus®*

FRAKO can supply the following products as accessories: *FRAKO RS232 adapte*r, *COM serve*r, *EMP 1100* or *EMG 1500-PN. The* EMIS® 1500 can use several types of connection simultaneously.

2.1 Recording and alarming

The central unit maintains contact with the devices in the Energy Management System via the routes configured. Data are polled continuously and held in readiness in the EMIS® 1500.

For some of these data the instrument calculates the average value, peak values or differential meter readings. These are then filed and saved at preset intervals.

Many devices in the Energy Management System have an integrated alarm function. This information can be read by the Central Unit. In addition, any desired measured variables can be monitored to check whether they are within settable limits.

If an alarm occurs, this event can be notified by various means, (e.g. printout, SMS, telefax, etc.). It is also possible to record the alarm in protocol files.

2.2 Connections and operation

The EMIS® 1500 has a power supply connection (5VDC or 110V - 240VAC) and several data communications connections:

- one Ethernet RJ-45 jack (LAN 2; LAN 1 is not in use)
- two RS 232 connections (9-pin Sub-D) for various connection options
- three contacts for relaying alarm signals

The EMIS® 1500 has a two-row LCD window and four function keys. In normal operation the window displays the current operating status, but the display window and function keys can also be used to make the basic settings.

3. Installation

3.1 Instrument mounting

3.1.1 EMIS® 1500 (benchtop version)

The EMIS**®** 1500 is placed in an appropriate location protected against moisture and dirt. Adequate ventilation must be ensured. (Power dissipation at power supply about 20W)

If the instrument is mounted in a control cabinet, a suitable instrument mounting must first be prepared into which the EMIS**®** 1500 is then seated.

When appropriate the adhesive pads supplied with the instrument must be affixed to the locations provided underneath the enclosure.

3.1.2 EMIS® 1500-19'' (rack-mountable version)

The EMIS® 1500 19" is designed for mounting in a 19" rack system. The instrument has a height of 1 U and a depth of about 400 mm.

Adequate ventilation must be ensured for this instrument version as well. (Power dissipation about 50W)

3.2 Electrical connections

3.2.1 EMIS® 1500 (benchtop version)

Connect the AC adapter supplied with the EMIS**®** 1500 to the instrument's external power connection ⟨1⟩ .

If the instrument is mounted in a control cabinet, the power supply can also be from an AC adapter mounted on a DIN rail. The instrument requires a 5 V DC power supply.
(Power dissipation about 8W)

⚠ **Important:**

Before mounting and maintenance the instrument must be disconnected from the mains.
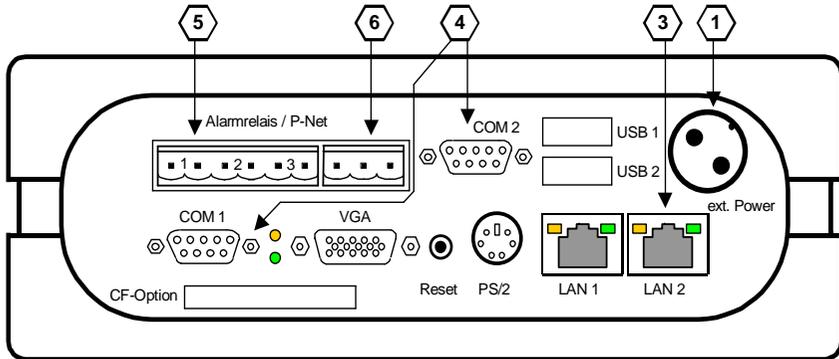
Figure 2: Rear of the EMIS**®** 1500

3.2.2 EMIS**®** 1500-19'' (rack-mountable version)

The power cable supplied with the EMIS**®** 1500 is plugged into the external power connection ⟨2⟩ of the instrument. (Power dissipation about 50W)

⚠ **Important:**
Before mounting and maintenance the instrument must be disconnected from the mains.
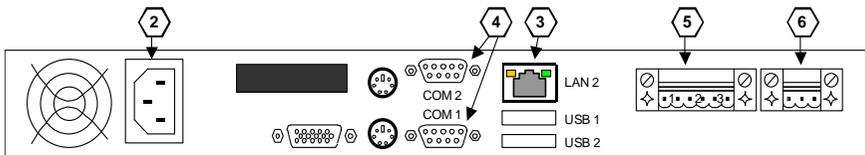
Figure 3: Rear of EMIS**®** 1500

3.3 Ethernet connection

This connection is optional. If the EMIS**®** 1500 does not exchange data via the Ethernet, access to it being via a modem or serial interface, the Ethernet connection can remain unused.
The instrument is connected to a hub or switch via the shielded RJ-45 jack (100BaseTx) ⟨3⟩ at the rear.

⚠ **Caution:**
Only use the LAN 2 jack. (benchtop version).

The pin assignment corresponds to that of an MDI port, so that a 1:1 cable must be used. If connected directly to a PC or to an EMG 1500-PN Gateway, a crossover Ethernet cable must be used.

Interface data:
- RJ-45 jack (twisted pair)
- 100 MBit
- full duplex

3.4 Connecting to the COM interfaces

Various functions can be realized by the two COM interfaces ⟨**4**⟩:

a) Dial-up networking (DUN) via modem between PC and EMIS® 1500

b) Direct serial connection between PC and EMIS® 1500

c) Serial data acquisition via the EMP 1100 communications processor

d) Transmission of SMS messages via modem

The functions a) and b) can only be carried out via the *COM 1* port, function c) and d) only via the *COM 2* port.

Note: The DUN dialing and the SMS messages cannot use the same modem.

A modem cable (1:1 connection) must be used for the connection between the EMIS® 1500 and a modem.

A null-modem (crossover) cable must be used for the connection between the EMIS® 1500 and a PC or an EMP 1100 communications processor (see Figure 4).
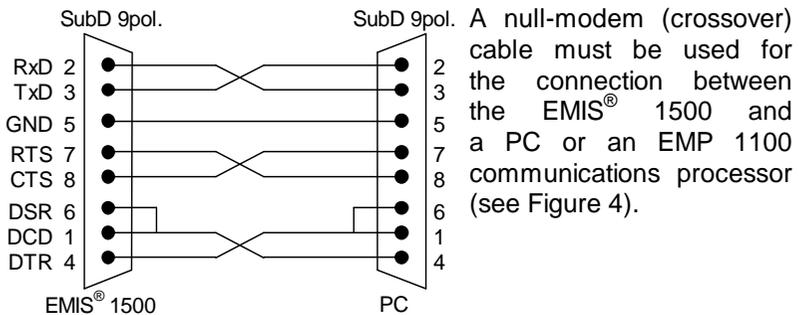
Figure 4: RS-232 crossover cable

3.5 Alarm relay connections

The EMIS® 1500 has 3 volt-free relay contacts ⟨5⟩ . The alarm function can be configured to actuate these contacts independently of each other.

When the EMIS® 1500 is switched off (power off at instrument) the relay contact 1 is closed.
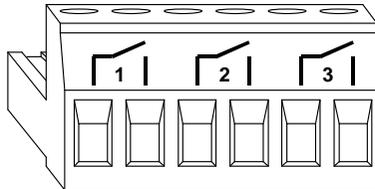
Figure 5: Male connector for alarm relays

Important:

The relay contacts may only switch a maximum voltage of 48 V AC or DC, and the switched current must not exceed 1 A.

3.6 Connection to the FRAKO Starkstrombus®

The FRAKO Starkstrombus® is connected to terminals **„A"**, **„B"** and **„⊥"** ⟨6⟩ at the rear of the instrument.
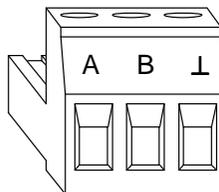
Figure 6: Male connector for the FRAKO Starkstrombus®

Both poles of the two-wire bus are connected to terminals **„A"** and **„B"**, ensuring that the polarity is correct. The shielding is connected to the **„⊥"** terminal.

The **„A"** terminal is thus connected with all the other **„A"** terminals of the bus, and the same applies to the **„B"** and **„⊥"** terminals. (No crossover in the cables!)

⚠ **Important:**

The bus shielding („⊥")must be earthed <u>only at one point</u> in the bus system. If this has not already been arranged at another point, it should be done at the EMIS 1500.

The bus must have a single-segment topology, all instruments being patched in to this segment or connected to it by a drop line up to 2 m in length. Star topologies can be constructed by using a repeater (component EMB 1101).

The total length of the bus should not exceed 1200 m. A repeater (component EMB 1101) must be installed in the line if greater distances are needed.

Terminator resistors must be connected at both ends of a bus segment. A 120 ohm resistor is connected between terminals A and B. In bus systems with less than 4 devices connected a 1 kohm resistor must also be in place between the A and ⊥ terminals. The resistors must have a 250 mW power rating.

Recommended cable types:
Surge impedance 100 - 120Ω; Ø ≥ 0,3mm²; twisted together and shielded;

Types:

Manufacturer	cable-type	order number	cable Ø
	Twinax 105 Ω		
Lapp	Unitronic® Bus CAN 1x2x0,34	2170263	6,8 mm
Helukabel	CAN BUS 1x2x0,34	801572	6,5 mm
Leoni	L-02YSCY 1x2x0.34/2.0-120 VI	L45551-P21-C5	6,8 mm

Note:
Always avoid mixing various cable types.

4. Commissioning

After the instrument has been installed as described in section 3, the EMIS® 1500 can be put into operation.

⚠️ **Caution:**
Do not remove the flash card from the EMIS® 1500 or attempt to operate it in another device or PC.

4.1 Function testing

The „**Run**" LED comes on when the power supply to the instrument has been switched on. After about 30 seconds the EMIS® 1500 is ready to operate and the status messages are shown in a revolving display in the window.

⚠️ **Caution:**
If the EMIS® 1500 does not respond as described above, the power must be switched off again and the installation checked.

4.2 Assigning an IP address

⚠️ **Note:**
Please also coordinate the following settings with your network administrator.

The parameters are entered using the instrument's function keys as described in Section 5.2 page 17.

In order for the EMIS® 1500 central unit to be addressable via the Ethernet, it requires:

- a unique IP address
- a subnet mask
- a valid gateway address

⚠️ **Note:**
Even if the EMIS® 1500 is accessed via the serial interface or a modem, it still requires an IP address.

IP address:
The IP address must be unique within the subnet and must not have already been assigned to other instruments.

Subnet mask:
With the help of the IP address and subnet mask the EMIS® 1500 can decide whether data must be transmitted within the network or via a gateway. Certain rules must be complied with when setting up a subnet mask. The EMIS® 1500 will attempt to correct some of the errors that may be made during entry.

Rule:
A ONE may not follow a ZERO in the sequence of bits in a subnet mask.

11111111.11111111.11000000.00000000 = 255.255.192.0 = correct
11111111.11111111.11111010.00000000 = 255.255.250.0 = incorrect
11111111.11111111.11111111.00000000 = 255.255.255.0 = correct

Gateway address:
This entry is necessary if routing to other networks is to take place. The gateway address must be located within the local subnet.

If no gateway is required, 000.000.000.000 must be entered as the gateway address.

Example 1:
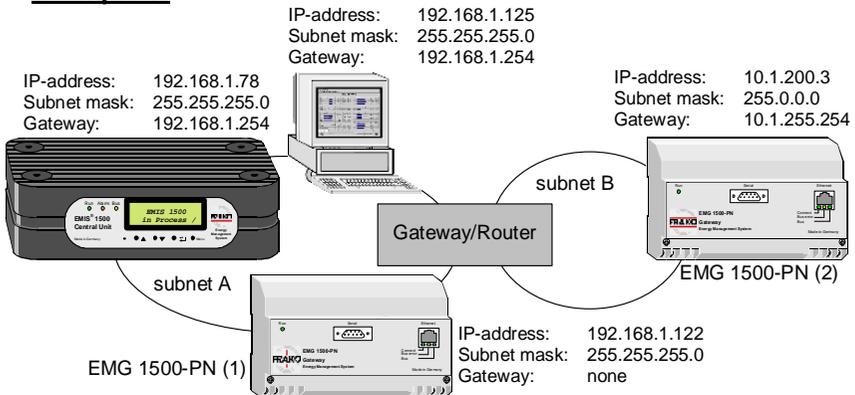
If an EMG 1500-PN or the PC is located in another subnet, a gateway address must be entered at the EMIS® 1500. The PC does not have to be able to access the EMG 1500-PN directly. (In this case the gateway address of the PC is not essential for the functioning of the EM system.)

Figure 7: Assigning addresses in networks with EMG 1500-PN

4.3 DUN connection to EMIS® 1500

⚠ **Note:**

Please also coordinate the following settings with your network administrator.

If the data communication between the PC and the EMIS® 1500 is to take place via a modem, this is done by means of a DUN link.

For this a modem must be connected at the COM 1 port of the EMIS® 1500. In addition, the following settings must be made to the EMIS® 1500:

- Enter an IP address
- Enter a subnet mask
- Select *On* in the DUN - on/off submenu
- Select *Modem* in the modem/direct submenu
- Enter an IP address in the IP return submenu

The parameters are entered using the instrument's function keys as described in Section 5.2 page 17.

When setting up the connection by DUN the PC is assigned a second IP address. This is entered at the EMIS® 1500 in the IP return submenu. It should be selected so that it is not in the same subnet as the PC. If this is not possible, this address should not be assigned in the subnet of the PC.

The IP address of the EMIS® 1500 should also not be in the subnet of the PC if possible.

Setting up the DUN connection at the PC is described in Section 6.3, page 20.

Example 2:
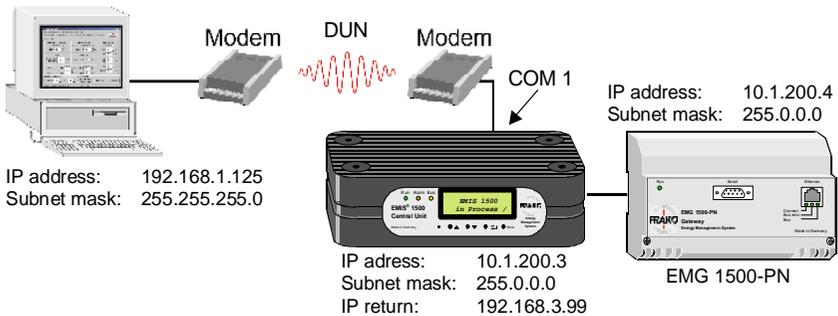
Once the connection has been set up the PC is assigned the additional address 192.168.3.99, but calls to the EMIS® 1500 continue to be via the address 10.1.200.3.

Figure 8: Address assignment for dial-up connections

4.4 Serial connection to the EMIS® 1500

The direct serial connection between an EMIS® 1500 and the PC is also a dial-up connection, the settings at the EMIS® 1500 being identical with those for the DUN link described in Section 4.3. The only difference is that *direct* must be selected in the Modem/direct submenu.

Section 6.4 on page 21 describes how to set up a serial connection at the PC.

Example 3:
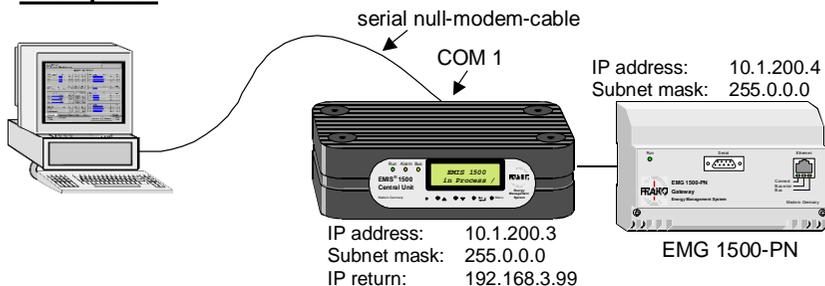

The PC does not have to be interconnected in a network. Once the connection has been set up the PC is assigned the additional address 192.168.3.99, but calls to the EMIS® 1500 continue to be via the address 10.1.200.3.

Figure 9: Serial connection

The assignment of the null-modem cable (crossover serial cable) is shown in Figure 4 on page 9.

5. Instrument operation

Once the instrument has been installed (see Section 3) and commissioned (see Section 4) no further adjustments are necessary.

5.1 User interface

The EMIS® 1500 central unit has three LED annunciators, an LCD window and four function keys.

Run LED:
This LED lights up to indicate that the instrument power supply is on.

Alarm LED:
Lighting up of this LED indicates, that one or more instruments can not be contacted. Active alarms of measured values are indicated by this LED flashing up (provided all instruments can be contacted).

Bus LED:
If the EMIS® 1500 has a connection to the FRAKO-Starkstrombus®, the bus LED indicates that the bus is being accessed. If bus errors occur, this LED flashes quickly.

LCD window:
In normal operation various status messages appear in rotation in the display window.

```
FRAKO EMIS-1500
 in process  /
```
MENU key
```
-- Setup menu --
 >Language
  IP parameters
  DUN parameters
```

```
Date:2006-08-15
Time: 09:15:30
```

```
Instrument name
 FRAKO Plant 1
```

```
   Version
   1.09.26
```

```
 History since
2006-04-17  88%
```

```
Instrument size
  350 points
```

With the ▲ and ▼ keys you can display the messages in sequence. The display last selected then remains permanently in the window. Pressing the *MENU* key displays the first status message again, followed by the displays being rotated in sequence.

While the first status message *(FRAKO EMIS-1500)* is displayed in the window, the *Menu* key can be pressed to display the setup menu. This is described in the following section.

5.2 The Setup menu

The connection parts to the EMIS® 1500 can be configured in the Setup menu. All other settings are carried out using the software *System-SW.*

```
-- Setup menu --          --Set language--          IP address
 >Language                >Deutsch                192.168.001.078
  IP parameters            English
  DUN parameters                                   Subnet mask
                          --IP parameters-        255.255.255.000
                           >IP address
                            Subnet mask            Gateway
                            Gateway               192.168.001.254

                          -DUN parameters-         DUN - On/Off
                           >DUN- on/off              On    *Off
                            Modem/direct
                            IP return              Modem/direct
                                                   *Modem   RS232

                                                     IP return
                                                   192.168.003.099
```
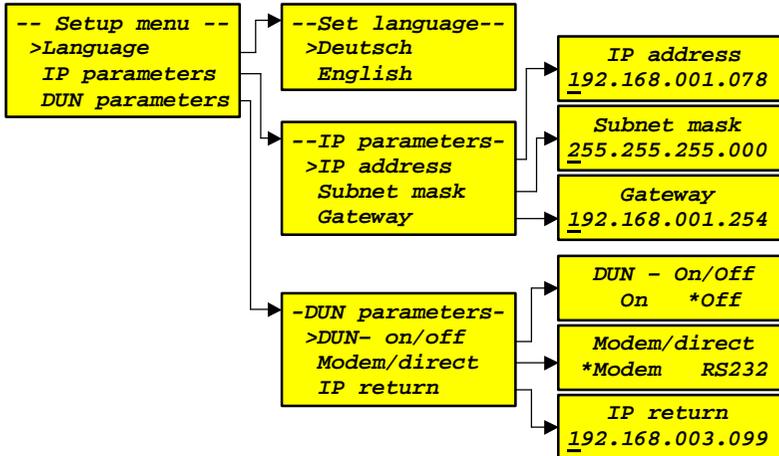
The function keys ▲ and ▼ can be used in the setup menu to select a menu item, which is then opened with the ► key. Pressing the *Menu* key takes you back to the next highest submenu level or out of the setup menu altogether.

When entering IP addresses, the selected numeral can be changed by means of the ▲ and ▼ keys. The ► key is used to select the next numeral while the *Menu* key displays the sequence of numbers entered again. Press the *Menu* key again to adopt the new setting.

In menus offering a selection of items the ▲ and ▼ keys can be used to change the selected item (marked with a '*'). Pressing the *Menu* key causes the selected to be adopted.

If changes have been made in the setup area, you are prompted on leaving the setup menu whether the changes are to be adopted.

```
Accept setup?
  Yes   *No
```

The selected item can be changed with the ▲ and ▼ keys. Pressing the *Menu* key causes the selected to be adopted.

Yes: The EMIS® 1500 accepts the new settings.

No: The EMIS® 1500 continues to work with the old settings.

6. Settings on the PC

The software *System-SW* is used in order to be able to make additional settings in the EMIS® 1500. This software is installed on the PC with the *FRAKO-NET* software packet.

6.1 System architecture

An Energy Management System can be divided into several projects at the highest level in the system architecture, with one or more data collectors being assigned to each project. Each project has its own database for data management.

⚠ **Note:**

The EMIS® 1500 is referred to as a data collector in the terminology used in the software *System-SW*.
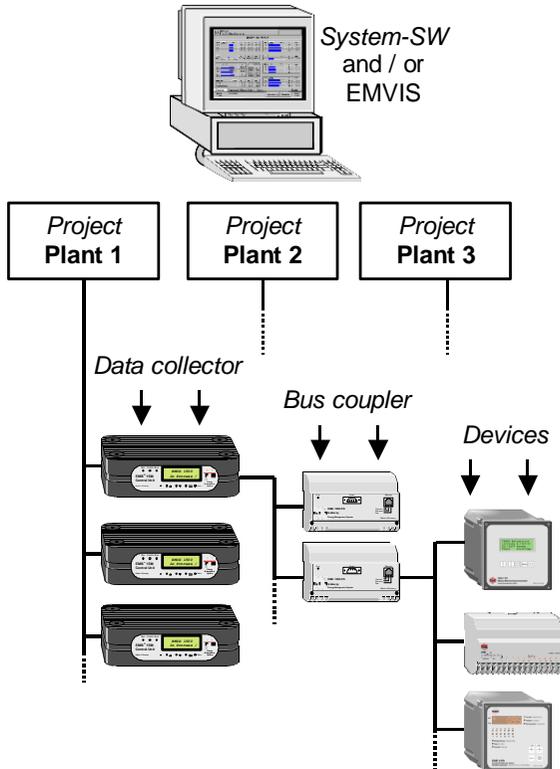

**Figure 10:** Architecture of the Energy Management System

The grouping of data collectors in individual projects is entirely at will, i.e. the paths to the data collectors of a project can vary (various Ethernet, DUN or serial connections). It is important only that the PC in which the project has been filed can achieve a connection with all data collectors (EMIS® 1500). Several options for the physical system architecture are shown in Figure 1 on page 5.

6.2 Registering the EMIS® 1500

After the software *System-SW* has been started, the user is prompted to create a new project or select an existing one. Data collectors (EMIS® 1500 instruments) can then be assigned to the project.

Once the data collector has been selected, it can be configured. The following settings are made:

- Name of the data collector

- What is the connection path to this EMIS® 1500?

- Do you want the software *EMVIS-NET* to access this data collector automatically?
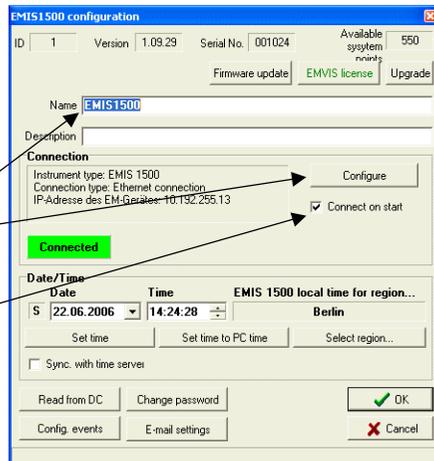
The connection path to the EMIS® 1500 must then be configured. The following modes of connection are available for this:

- Connection via the Ethernet
- Connection by DUN (modem)
- Serial connection

The setting *DUN network* must also be selected for serial connections. In both cases, however, a connection path must have been defined in Windows. (see Section 6.3 and Section 6.4)

19
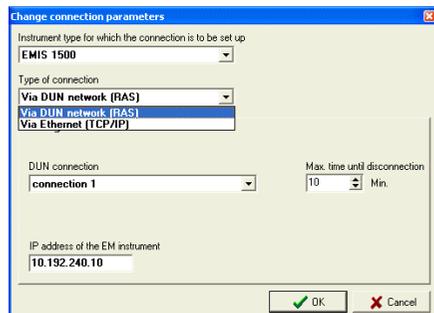
The list *"DUN connection"* shows all DUN connection paths set up using this PC (including serial connections with no modem).

It is also important that in every case the IP address of the data collector (EMIS® 1500) must be entered. After having entered the connection parameters an attempt can be made in the configuration window to set up a connection to the data collector.

The online help facility of the software *System*-SW gives further information on the possible settings.

6.3 Setting up a DUN connection

A program's IP requests (IP packets) (e.g. a website display in Internet Explorer) are directed to a router in the user's PC, where various IP connection paths are registered (e.g. the PC´s Ethernet card, DUN modem, etc.). The routing table is used to decide which path is used to transmit the IP packet concerned.

When a dial-up connection is opened, a new path for the IP packets is specified to the router.

The modem must be already installed on the PC in order to configure a new connection. The menu item *Start > Connect To > Show all connections* is selected, then the *New Connection Wizard* must be started. During this process the settings must be made:

- *Connect to the Internet*
- *Setup my connection manually*
- *Connect using a dial-up modem*

This dial-up connection is then assigned a unique name. If necessary, the modem to use for this connection must then be selected. Following this the phone number to dial is entered.

The parameters for accessing the EMIS® 1500 must be entered in the final dialog box.

Username: **frako**

Password: **emis-ip**

The option *Make this the default Internet connection* must be deselected. This means that only the IP packet for the EMIS® 1500 is transmitted via this connection path.

The configuration is then finished and can be selected as a dial-up connection by the software *System-SW*.

6.4 Setting up a serial connection

A serial connection is also used like a dial-up connection.

The menu item *Start > Connect To > Show all Connections* is selected, then the *New Connection Wizard* started. During this process the settings must be made:

- *Set up an advanced connection*
- *Connect directly to another computer*
- *Guest*

This dial-up connection is then assigned a unique name. Following this the appropriate communications port at the user's PC is selected.

Once configuration is completed, the access parameters for the EMIS® 1500 can be entered:

User name: **frako**

Password: **emis-ip**

Before setting up the connection, however, several properties must be set.

A data transfer rate of 115200 bit/s must be set after clicking *Properties > General > Configure.*

Click *Properties > Networking* to display the dialog box on the right. Deselect all the items offered except for Internet Protocol. The select *Internet Protocol (TCP/IP)* and click the *Properties* button to display the next submenu, where no changes are necessary.

Click the *Advanced…* button to display the dialog box shown on the right. Deselect the option *Use default gateway on remote network* by removing the check from the checkbox. This means that only the IP packets intended for the EMIS® 1500 are transmitted by this path.
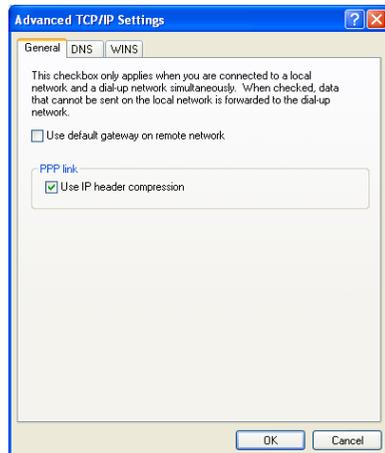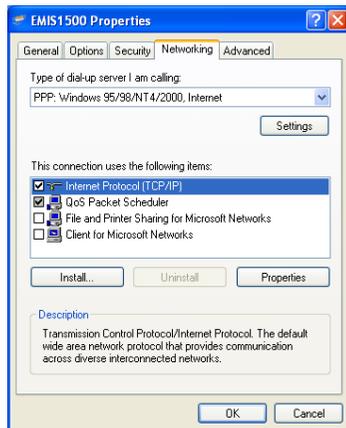
7. Notes on commissioning and troubleshooting

Malfunction	Possible cause	Remedy
On start-up the **Run** LED does not come on	No power supply or incorrect voltage	Check power connections (see Figure 2 on page 8)
The EMIS® 1500 cannot be accessed despite having the correct IP address.	Incorrect LAN interface used.	Only use LAN 2.
	Incorrect entry of subnet mask or gateway address.	Check entries and if appropriate consult network administrator.

8. Technical data

Power supply to EMIS® 1500 (benchtop version):
AC power supply to adapter:	100V - 240V AC
Frequency:	50/60Hz
Power draw:	max. 20 W
Output voltage to instrument:	5V DC
Instrument power draw:	ca. 8 W

Power supply to EMIS® 1500 19" (rack mountable version):
AC power supply:	110V - 240V AC
Frequency:	50/60Hz
Power draw:	ca. 50 W

Serial interfaces:
Serial:	2x RS232 V.24
Data transfer rate:	up to 115200 Baud

Ethernet port (LAN 2):
Connector:	RJ45
Data transfer rate:	100BaseTx, full duplex

Alarm contacts:
Contacts:	3 x relay contacts
Rating:	max. 48V AC/DC, max. 1 A

Connection to FRAKO Starkstrombus®:
Electrical connection:	as per EIA RS 485
Transmission rate:	76,8 kbit/Sec
Protocol:	FRAKO Starkstrombus®

Enclosure:
Dimensions:	220 x 60 x 149 mm (W x H x D) / 484 x 44 x 395 mm see Figure 11
Weight:	ca. 0.90 kg
Orientation:	horizontal or upright
Ingress protection enclosure / terminals:	IP 40 / IP 20

Operating conditions:
Ambient temperature:	0°C to 50C°

60

220

148,5
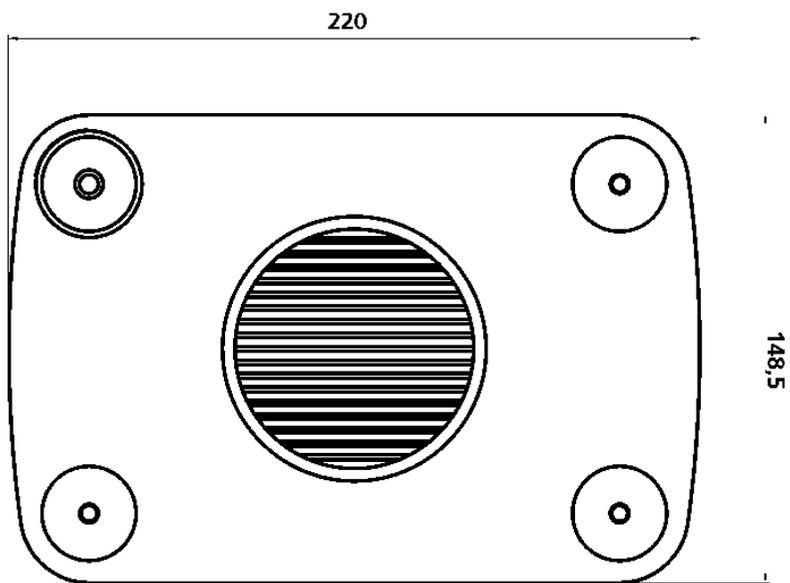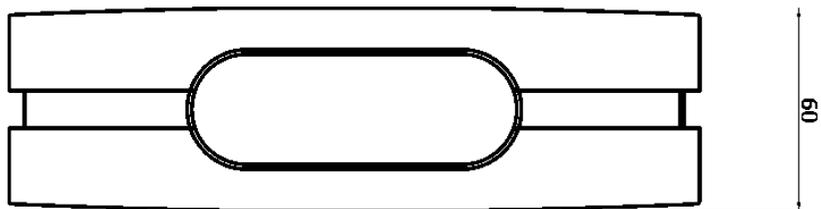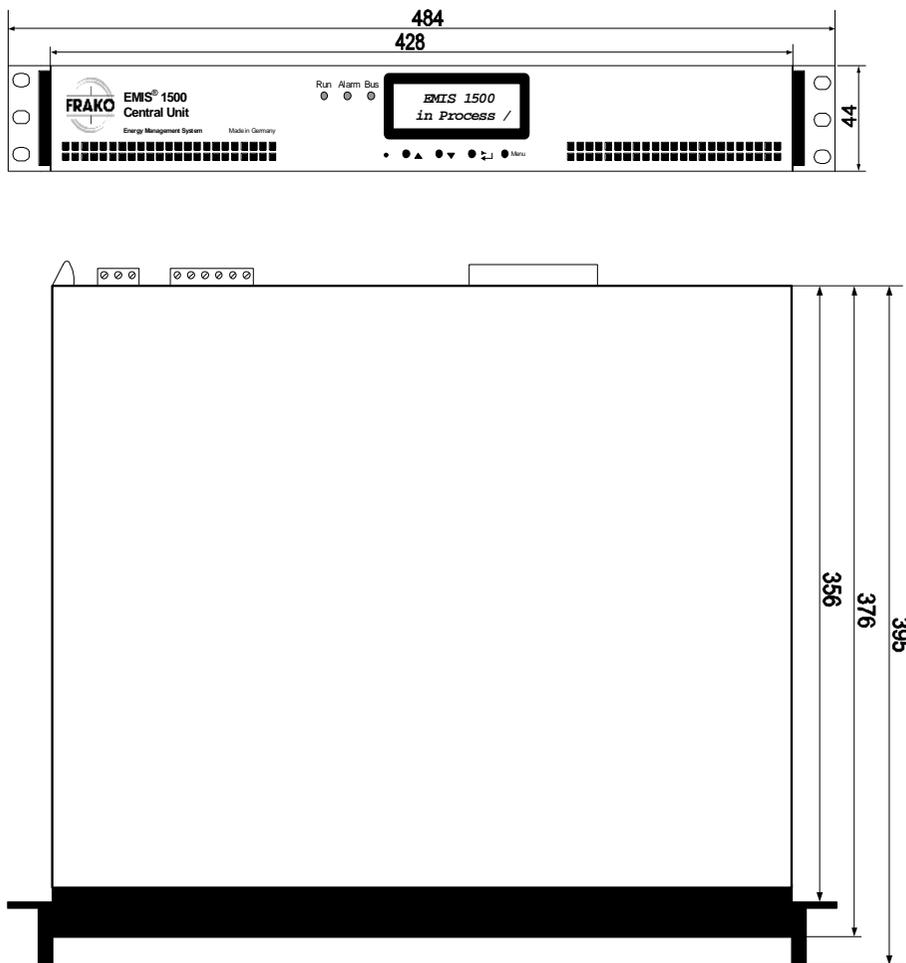
**Figure 11:** Instrument dimensions

User notes:

EMIS® 1500

Sales programme

Power capacitors for low voltage

Power factor correction systems

Power factor correction systems with reactors

Modules for power factor correction systems

Active filters

Dynamic compensation of harmonics

Reactive power control relays

Maximum demand control systems

Mains monitoring instruments

Cost allocation

Energy management systems

Reliable energy solutions.

Quality is our Motto
Quality has a Name
**We are certified for
ISO 9001 and ISO 14001**