

# Safety Instructions

## Important: Read Before Commissioning

- The user must ensure that all operators are familiar with this operating manual and follow it at all times.
- The operating manual must be read carefully before the instrument is mounted, installed and commissioned.
- All actions taken must follow the operating manual.
- Installation and commissioning may only be carried out by appropriately qualified personnel with due regard for all rules and regulations that are in force.
- When the instrument is connected to mains voltage, it must 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 be **disconnected** from the mains.
- Any further laws, standards, guidelines, etc. relevant to this product must be complied with.

### Additional information on **EML 1101 Maximum Demand Controller**

- Loads **which may cause damage or danger when disconnected by EML1101 must** not be connected to the load channels.
- The responsibility for correct load settings, such that proper operation is guaranteed and no damage or danger arises, remains 100% with the customer.

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# 1 Quick Start

The instrument is commissioned as follows:

- a) **Copy and fill out Form for Basic Settings (page 42) and Form for Load Settings (page 45)** before commissioning.
- b) Remove stoppers from the PG cable glands and connect the **EML 1101** as shown in Figure 1 on **page 47. Please observe the directions in chapter 3 page 8.**
- c) Switch on power supply. The **EML 1101** then performs a self-test.
- d) Check if the inputs are functioning correctly:
  - Active pulse input: The status display for **Active pulse** blinks.
  - Time pulse input: The remaining time is reset and the next measuring period starts when a time pulse is received. **'No time pulse' should not appear in the third line at the end of a measuring period.**
- e) Carry out the settings procedure. This means programming of basic settings and load settings using buttons on the front fascia or over a PC using **OPT-SW** software supplied. The second option makes the configuration easier to understand. For this reason it is recommended to use the PC software when installing for the first time. Refer to online help in OPT-SW if you require further information.

## Installation:

 Start the program **OPT-SW** under Windows® (e.g. Win 95 with the 'Start' button and the menu item 'run', then enter >A:\setup.exe< **A:\SETUP** in the dialog box).

## 1.1 Programming via Front Fascia

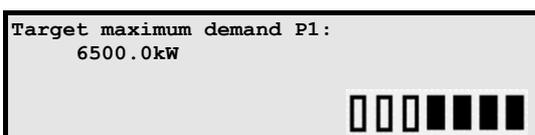
### 1) Fascia keys:

- Use 'arrow' keys to choose menu items/Numbers.
- **'CR'** key confirms menu item choice/Changes to next digit.
- **'Menu'** key changes one menu level back/Accept choices.

### 2) Choose the menu item **Basic settings**.

### 3) The sub-menu item **Target maximum demand P1** is displayed.

Select this by pressing **CR** button.



To prevent unauthorised use or accidental changes to the instrument, a prompt is given for ID number. This is shown only if no data has been entered for more than **1 hour**. The last four characters of the serial number are to be entered as ID number. These are given on the label on the top face of the terminal

compartment. Use the 'arrow' keys to choose numbers. Change to next number with the 'CR' key. When ID is entered (e.g. 0631), press 'Menu key'. **If the ID is correct an underscore appears in the display.**

- 1) Enter values for target maximum demand and peak power according to **Form for Basic Settings**.
- 2) **Peak power is the maximum permissible active power. Enter a peak power value that is high enough to prevent short high active power from causing a shut off.**
- 3) To set measuring period, select menu item **Basic settings | Other settings | Measuring period**. Measuring periods of 10, 15, 30 or 60 minutes can be chosen using cursor buttons.
- 4) List of settings in this sub-menu:
  - Measuring period
  - **Maximum target demand P1,P2,P3, and P4**
  - **[M] current target maximum demand P1,P2,P3, and P4**
  - Current transf. ratio Ip/Is: (P\_act1, Q, **[M] P\_act2**)
  - Voltage transf. ratio Vp/Vs: (P\_act1, Q, **[M] P\_act2**)
  - Counter constant (P\_act1, **[M] P\_act2**)

- Counter constant (Q)
- Average over (P\_act1, Q, M, P\_act2)
- Cosphi alarm when cosphi < XX%
- Bus address
- Auto summer/winter time changeover

**Note:** Settings made are immediately adopted by control system. Please note that when a new **Target maximum** is selected, this value comes in effect immediately.

Load settings listed below can be set **individually** for every load channel and for every profile.

| Load settings    | Values                                | Description                                                   |
|------------------|---------------------------------------|---------------------------------------------------------------|
| Power            | 0 – 6500.0                            | Value in kW or MW                                             |
| Priority         | 0                                     | Load is always switched on                                    |
|                  | 1 – 3                                 | Load is only included in control system during emergency mode |
|                  | 4 – 98                                | Load is included in control system                            |
|                  | 99                                    | Load is always switched off                                   |
| Channel status   | Always ON<br>Always OFF<br>Controlled | Selected state for all profiles                               |
| Output status    | NC<br>NO                              | Inverting of the contact state ON/OFF                         |
| Minimum OFF time | 0 – 999:59                            | Value in minutes:seconds                                      |
| Maximum OFF time | 0 – 999:59                            | Value in minutes:seconds                                      |
| Minimum ON time  | 0 – 999:59                            | Value in minutes:seconds                                      |

## 2 Description

Customers with a power consumption above typical values of about 30 kW are charged not only according to their consumption for energy, but also according to the maximum power they draw.

In this context the term consumption refers to an average that is determined over a measuring period. Usually the average is determined over a period of 10, 15, 30 or 60 minutes. The beginning and the end of a measuring period are sent to the EML1101 by the energy supplier via pulse output on the counter.

If a measuring period of 15 minutes is defined, the energy supplier subdivides every day into  $24 \times 4 = 96$  measuring periods. At the beginning of each measuring period, an energy meter is set to zero. The amount of consumed energy at the end of each measuring period is divided by  $\frac{1}{4}$  of an hour and thus becomes the **mean power** drawn during that particular measuring period.

There are various methods of charging maximum demand, but they all use a monthly basis of calculation. In a 30 day month there are  $96 \times 30 = 2880$  maximums, the highest of these mean power values is charged by the utility. At the end of each month, maximum demand in kW is charged at a certain rate of \$  $x$  / kW.

Example:

|                         |                          |
|-------------------------|--------------------------|
| Monthly maximum demand: | 110 kW                   |
| Rate:                   | \$ 8.00 per kW per month |
| Maximum demand charge:  | \$ 880.00                |

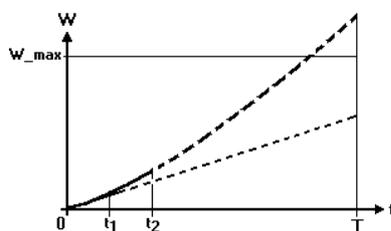
A very frequent example for charging maximum demand on a yearly basis: The 3 highest values over a 12 month period are determined, These 3 values are then averaged and the result is charged with, for example, \$ 102.00/kW/year.

The relay outputs of the EML 1101 can be used to switch loads off. The EML 1101 has 4 switching channels and an emergency channel for shedding loads. Extension stations with 8 switching channels each can be connected over a 2 wire bus connection .

There are further outputs on the EML 1101 which will, however, not be dealt with in this introductory chapter.

The EML 1101 is supplied with all relevant data for automatic maximum demand control over the inputs. A trend is calculated with the current power used and the remaining time in the measuring period. If this trend is higher than the set target maximum demand, channels are switched off, in as much as their min/max times are maintained. If a trend is lower than the set target maximum demand, deactivated channels with appropriate power demand can be switched on again

|                  |                                                                                               |
|------------------|-----------------------------------------------------------------------------------------------|
| Time pulse rate: | 1 per measuring period.                                                                       |
| kWh pulse rate:  | dependent on counter constants, current and voltage transformer ratios<br>Example: 15 Imp/kWh |



$$W_{\max} = P_{\max}/T$$

Prognosis at  $t = t_1$ : No need of action.

Prognosis at  $t = t_2$ : Need of action: Loads are switched off until the trend falls below  $W_{\max}$ .

## 2.1 FRAKO System options S, M and L

The EML 1101 is available in the following system options:

|                                                                                                                                                                                                                                                                                                                 |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| <b>EML 1101 S4/S12/S20</b> <ul style="list-style-type: none"> <li>- Bus prepared</li> <li>- max. 2 EMD ( 4+2•8 = 20 channels)</li> <li>- Output inversion</li> </ul>                                                                                                                                            |  |  |
| <b>EML 1101</b> <span style="border: 1px solid black; padding: 0 2px;">M</span> <b>Additionally:</b> <ul style="list-style-type: none"> <li>- FRAKO Starkstrombus® available</li> <li>- + 2 EMD (Max. 4)</li> <li>- 3 Active pulse inputs with summation</li> <li>- Target maximum demand adjustment</li> </ul> |  |  |
| <b>EML 1101</b> <span style="border: 1px solid black; padding: 0 2px;">L</span> <b>Additionally:</b> <ul style="list-style-type: none"> <li>- + 6 EMD (Max. 10)</li> <li>- Grouping</li> </ul>                                                                                                                  |  |  |

Upgrades to higher system options are carried out with a PC is not necessarily require the assistance of a service technician.

For ease of understanding the FRAKO system options are differentiated in the text as follows:

Function as of FRAKO system option: M

Function as of FRAKO system option L

## 3 Installation

### 3.1 Mounting

The **EML 1101** is vertically screw mounted.

### 3.2 Electrical Connections

All cable connections are connected with plug-in terminal blocks. Connections are as shown in **Figure 1 Connection diagram**. page 47. Stoppers should be left in PG cable glands which are not in use.

#### 3.2.1 Power Supply Voltage

Power supply voltage should be 230 VAC, 50/60 Hz. The device is protected by an internal fine-wire fuse ( 250 mA slow-blow ).

#### Important:



The connections for power supply must be externally protected by a 2 A semi-time lag fuse. When working on **EML 1101**, the unit must be switched off. If the alarm contact is also used to signify power failures, then the alarm circuit must be protected separately otherwise any failure of the 2 A fuse cannot be monitored.

### 3.2.2 Connecting Inputs

The inputs for active pulse, time pulse and profile switching complies to S0 definition. The power supply required is provided by the inputs. **Both potential free contacts and electronic contacts can be connected.**

There are two inputs for profile switching, thus allowing 4 profiles to be selected.

| Status of profile input 1 | Status of profile input 2 | Selected profile | Counter |
|---------------------------|---------------------------|------------------|---------|
| open                      | open                      | P1               | 1       |
| close                     | open                      | P2               | 2       |
| open                      | close                     | P3               | 1       |
| close                     | close                     | P4               | 2       |

As can be seen from the table above, one of the 2 counters is chosen simultaneously with profile input 1. Profile input 2 does not influence the counter.

**Caution:**



No external voltages are to be applied to contacts 7 to 14 as this can destroy the input circuit.

**Important:**



When working on **EML 1101**, ensure that the unit is disconnected from mains. Although the **EML 1101** is disconnected from mains, the circuits leading to switch contacts may still be connected to power voltage.

### 3.2.3 Connecting Load Channels

EML 1101 load channels consist of switching contacts which consist of a normally open (NO) and normally closed (NC) contact.

The NC part of the switching contacts takes on the following states in the listed operation conditions of EML.

Load on: NC of the relay is closed  
 Load off: NC of the relay is open.  
 No power supply: NC of the relay is closed

Every channel of the add-on stations of the EMD1101 have only NC contacts. These can be used either as NO or NC contact in the load settings. The position of the relay in emergency/power off can be set with a DIP switch row on the EMD.

### 3.2.4 Alarm Contact for Hardware Error

The alarm contact for hardware error is a potential-free contact. The relay is open in normal operation and energises if the processor of **EML 1101** fails.

**Important:**



The switching and alarm contacts may only have a maximum rating of 250 V / 4 A.

### 3.2.5 Alarm contact

The contact is a potential free **switching contact**. The relay reacts when one of the following errors occur:

- Target maximum demand exceeded
- Peak power exceeded
- Cospfi exceeded (too small)

- EMD error/add-on bus error
- FRAKO Starkstrombus® defect
- No time pulse
- No pulse in input 1 (only with activated active pulse control)
- No pulse in input 2 (only with activated active pulse control)
- No pulse in input 3 (only with activated active pulse control)
- Mains power off
- Error in clock component
- Error writing to EEPROM

The relay remains in this condition until the error has been corrected. If there is an error, contact 29/30 is closed.

### 3.3 Installing the OPT-SW software

#### 3.3.1 Hardware requirements:

- IBM compatible computer with CPU 80386/33MHz or higher
- 4 MB RAM
- 3½" 1.44 MB floppy disk drive
- Hard disk with at least 40 MB
- Serial communication ports COM1 and COM2 or COM 1 and PS2
- VGA graphics card and mouse
- Modem (optional)

#### 3.3.2 Software requirements:

- Windows 98/NT/2000/XP
- Basic knowledge of Windows

#### 3.3.3 Installation

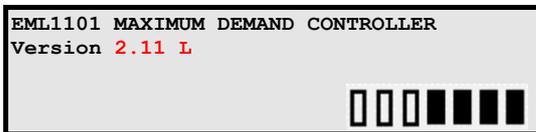
☞ Select **File | Run** in Program Manager

##### Windows 95/98/NT

- ☞ Press **Start** button on the bottom left of the screen
- ☞ Select **Run**
- ☞ Enter **A:\SETUP** to start installation

## 4 Commissioning

- a) Fill in all data in the **basic settings form** and the **load settings form**.
- b) Remove the PG covers from the necessary openings and connect the **EML 1101** as in **Figure 1 Connection diagram**. on page 47:



- c) Switch on the power supply. The **EML 1101** then carries out a self test. The following is dependant on program version and the FRAKO system option.

- d) The standard display is then shown.

| P_act | cosphi | P_acc. | Time rem. |
|-------|--------|--------|-----------|
| 0.0kW | 1.0    | 0.0kW  | 15.00 P1  |

Below the table is a horizontal bar chart with six segments of varying lengths, similar to the one in step d).

- e) Check that all inputs are functioning correctly:
- Input pulse: the status display, **Active pulse1** blinks at the same frequency as the active pulse.
  - Time pulse input: the display of time remaining jumps to the pre-set measuring period as soon as the time pulse is given. **If then "Time pulse missing" is not shown**, the function of time pulse input is correct.
  - Profile switching: The profile identified on the contacts 11 and 12 is shown in the second line. (e.g. P1 for profile 1)

## 5 Response in exceptional conditions

### 5.1 Self Monitoring

The **EML 1101** has an integrated self-monitoring system. It identifies power failures and system errors. These events are then entered in a power failure table that can be printed out.

A power failure is then only registered if power supply is disconnected for more than 2 seconds.

### 5.2 Restarting

The **EML 1101** automatically begins to operate after power supply is restored.

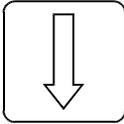
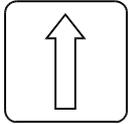
### 5.3 Memory

Data programmed is retained for approximately 10 years in the event of a power failure.

**Note:** The programmed values should be rechecked if the unit is isolated from power supply **for a long** period.

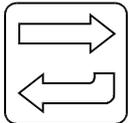
## 6 Operation

### 6.1 Keyboard



#### Cursor buttons

- Navigating in menu structure
- Changing values and settings
- Setting numbers



#### Carriage Return button

- Selecting a menu
- Moves cursor to next position
- Activating stations
- Printing



#### MENU button

- Ascend to the next higher menu level
- Proceed to display mode after reset
- Accepting values and settings

### 6.2 Programming mode

#### 6.2.1 Selecting program items

Use one of the two cursor buttons to call up the settings menu.

#### 6.2.2 Activating programming mode

A prompt is given for the ID number when the appropriate item is seen in the display. The last 4 digits of serial number are to be entered. If the ID number has already been prompted from a previous entry, then it will not be prompted again for **the next** hour.

#### 6.2.3 Setting parameters

If a cursor appears in the display, then the individual numbers can be adjusted by pressing the cursor buttons. Pressing **CR** button moves the cursor to the next position.

#### 6.2.4 Accepting settings

The settings are accepted by pressing **MENU** button. **If an invalid entry (e.g. time/date) has been entered, the old settings will appear. In this case repeat the entry.**

## 6.3 Menu Structure

### Basic settings

- Target maximum demand P1, P2, P3 and P4  current target maximum demand P1,P2,P3 and P4] (section 7.1/7.2)
- Initial value target maximum demand P1, P2, P3, and P4 (section 7.3)
  - Upper limit target maximum demand P1, P2, P3 and P4 (section 7.4)
  - Peak power (section 7.5)
  - Control delay (section 7.6)
  - Control application point at XX% of target maximum demand (section 7.7)
  - Emergency mode activated at XX% of total sheddable load power (section 7.8)
  - Other settings (section 7.9)
    - ◆ Measuring period (section 7.9.1)
    - ◆ Counter constant (P\_act1, Q,  P\_act2) (section 7.9.2, 7.9.6)
    - ◆ Current transf. ratio Ip/Is (P\_act1, Q,  P\_act2) (section 7.9.3)
    - ◆ Voltage transf. ratio Vp/Vs (P\_act1, Q,  P\_act2) (section 7.9.4)
    - ◆ Average over (P\_act1, Q,  P\_act2) (section 7.9.5)
    - ◆ Cosphi alarm at cosphi <XX% (section 7.9.7)
    - ◆ Bus address (section 7.9.8)
    - ◆ Auto summer/winter time changeover (section 7.9.9)
    - ◆ Options (section 7.9.10)
      - Number of profiles used (section 7.9.10.1)
      - Highest EMD address (section 7.9.10.2)
      - Type of profile switching (section 7.9.10.3)
      - Time pulse edge (section 7.9.10.3.1)
      - Self adjusting target maximum demand (section 7.9.10.3.2)
        - Active / non active (section 7.9.10.3.3)
        - Resetting via external signal/ resetting via internal date (section 7.9.10.3.4)
      - Active pulse monitoring alarm (section 7.9.10.4)
      - Allow grouping (section 7.9.10.5)
      - Units (section 7.9.10.6)

### Load settings

- Profile 1..4 (Depends on the number of profiles used) (section 8)
  - ◆ Enter station and channel no.: EML / 1..4, EMD1..EMD10/1..8 (section 8)
    - Name: (section 8.1)
    - Priority: (section 8.2)
    - Channel status (section 8.5)
    - Output (section 8.11)
    - Group (section 8.9)
    - Minimum OFF-time: (section 8.6)
    - Maximum OFF-time: (section 8.7)
    - Minimum ON-time: (section 8.8)
    - Preference (section 8.4)
    - Power: (section 8.3)

### Printer routines

- Printing basic settings (section 9.1)
- Printing load settings (section 9.2)
- Power failures (section 9.3)
- Errors (section 9.4)
  - ◆ Error list (section 9.4.1)
  - ◆ Resetting error counters (section 9.4.2)
- Present day's power curve (section 9.5)

|                                      |                |
|--------------------------------------|----------------|
| • Previous day's power curve         | (section 9.6)  |
| • Power maxima of the last 50 days   | (section 9.7)  |
| • Power maxima of the last 48 months | (section 9.8)  |
| • Event list                         | (section 9.9)  |
| • Delete printer jobs                | (section 9.10) |
| <b>Add-on stations</b>               | (section 10)   |
| • Activate/deactivate stations       | (section 10.1) |
| • Display stations                   | (section 10.2) |
| <b>External synchronisation</b>      | (section 11)   |
| Clock                                | (section 12)   |
| Counters                             | (section 13)   |
| Write protect                        | (section 14)   |
| Instrument info                      | (section 15)   |

## 7 Basic Settings



Select **Basic settings** menu item by using cursor buttons and program this by using **CR** button to enter the setting mode or the next menu level.

### 7.1 Target maximum demand P1, P2, P3 and P4

Target maximum demands for profiles 1 to 4 is entered here. **There is an individual menu item for each profile (e.g. Target maximum demand P3).** Depending on the profile activated, one of the four target maximum demand settings is valid.

The target maximum demand is, the more cost savings is going to be. However, there is danger of loads connected may be switched off too often or for too long due to emergency mode being activated. Therefore, an optimal compromise **should be found**.

**It is advisable to sink the target maximum demand step by step until you have an optimal compromise between load availability and cost saving. Do not forget to take seasonal variations into consideration e.g. additional costs for heating/cooling etc.**

### 7.2 Current target maximum demand P1, P2, P3 and P4

If under basic settings|other settings|options the self adjusting target maximum demand is activated, the current target maximum demand will be displayed instead of the menu item target maximum demand. This is the momentary target maximum demand for the appropriate profile. If the target maximum demand is exceeded, it is automatically set to the new value as long as this is not higher than the set upper limit.

If a value greater than the upper limit is set, the upper limit is automatically set as the current target maximum demand. In this case there is no further target maximum demand correction, as the upper limit has been reached.

### 7.3 Initial value target maximum demand P1, P2, P3 and P4

If under basic settings|other settings|options the self adjusting target maximum demand is activated, the initial value of the self adjusting target maximum demand must be entered here. This is set at the beginning of an electricity company calculation period. The number of initial values depends on the number of profiles used.

If a value is greater than the upper limit (see section 7.4) is set, the upper limit is automatically set as the initial value of the target maximum demand. In this case there is no further target maximum demand correction, as the upper limit has been reached.

### 7.4 Upper limit target maximum demand P1, P2, P3 and P4

If under basic settings|other settings|options the self adjusting target maximum demand is activated, the upper limit of the target maximum demand can be entered here. Every time there is a power excess, it is checked if this limit has been exceeded. If this is the case there is no further target maximum demand correction above this limit. 'Upper limit reached' is then entered in the event list.

If the upper limit is set too low and the initial value and the current target maximum demand are set higher, these values will be set automatically to the set upper limit.

## 7.5 Peak power P1, P2, P3 and P4

The absolute limits for actual power  $P_{act}$  is set here for every profile. This function is an extra function provided by EML1101; not to be confused with the control of maximum demand. Depending on the profile activated one of four peak powers is valid.

As soon as  $P_{act}$  exceeds this peak power limit, an alarm is activated and loads are shut off one **after the other until  $P_{act}$  falls below this limit.**

Loads are shut off according to the following rules:

- Loads with low priority are shut off first.
- The minimal on times and maximum off times are not taken into consideration.
- Loads with priority 0 and loads that are set to ON in the OPT-SW are not shut off.

The peak alarm is not shut off until  $P_{act}$  has dropped lower than 95% of the peak power.

Loads are turned back on according to the following rules:

- Loads remain off at least as long as their set minimum OFF time. Loads where the minimum OFF time expires first are turned back on first. If a number of loads minimum OFF times have expired, the loads with the highest priority are turned on first.
- The individual switching follows according to the set control delay time.
- Before the loads are switched on a check takes place to ensure that this will not cause a new peak power excess.

This function prevents overloading of transformers and generators, blowing of main fuse or tripping of main circuit breaker. All of these may become very costly for e.g. a manufacturing plant.

## 7.6 Control delay

The control delay serves to force pauses between the ON/OFF switching of loads. This avoids over reaction of the controller in form of unnecessary switching of loads.

If a large number of switching channels are used the control delay time should be set low (1-10 seconds) in order to avoid long periods of inactivity.

Control delay is not taken into consideration in emergency mode and in the last 2 minutes of a measuring period, as an especially fast reaction time here is absolutely necessary.

Factory default setting is 10 seconds, it can be set from 1 to 60 seconds.

## 7.7 Control Application Point

Factory default setting is 35% and the range is from 0 to 75%.

Smaller values mean more sensitive control.

## 7.8 Emergency mode activated at XX% of total sheddable load power

If loads switched on reached a specified size, then the EML 1101 can no longer maintain the condition stated and activates the emergency mode. **In the emergency mode channels with priorities 1-3 are normally included (see section 8.2). As a last consequence the emergency channel will be activated.**

The emergency mode is activated when  $P_{corr}$  is higher than the percentage X of the nominal power of all loads included in the regulation.

Factory default setting is 45%, the possible settings range from 10 to 80%.

Smaller values lead to more sensitive control: Emergency mode is activated more readily.

## 7.9 Other settings

You can change to the next menu level with this menu item. Change with the CR button.

### 7.9.1 Measuring period

The measuring period used by electricity company is set here. Possible settings are 10, 15, 30 and 60 minutes.

### 7.9.2 Counter constant ( P\_act1, P\_act2)

Here the number of pulses emitted per kWh by the energy meter is entered.

The parameter **P\_act2** of the 2nd active pulse input can be set for EML 1101 M and L.

### 7.9.3 Current transf. ratio Ip/Is: (P\_act1, Q, P\_act2)

Enter the ratio of the current transformer(CT) in use here. This is printed on the CT. If there is no CT 1 is entered.

### 7.9.4 Voltage transf. ratio Vp/Vs: (P\_act1, Q, P\_act2)

With medium voltage measurement the transformer ratio of the voltage transformer (VT) must be entered. **Enter the ratio of the VT in use here. This is printed on the VT.** If there is no voltage transformer used, i.e. for low voltage measurements (e.g. 400 V), the value 1 is entered.

### 7.9.5 Average over (P\_act1, Q, P\_act2)

This setting serves to calculate an average of the registered number of pulses in nets with high transient power variations. If this function is used, transient power variations are smoothed and unnecessary load switchings can be avoided.

### 7.9.6 Counter constant (Q)

**Enter the pulse values of the pulse counter here.**

### 7.9.7 Cosphi Alarm at cosphi <XX

**This setting sets the threshold value for triggering power factor alarm. If a value of 0 is set, the power factor alarm function is disabled and the standard display shows the correction value P\_corr instead of the cosphi value.**

**If the limit is exceeded the error message  $\cos(\varphi) - \text{error}$  is displayed and the alarm is activated. The error is deleted when the lower limit is exceeded.**

### 7.9.8 Bus address

**This setting assigns an individual address for EML1101 so that the central unit EMIS 1500, the EMG 1500-PN, the communication processor EMP 1100 or the system timer EMT1101 can identify the EML 1101 at the FRAKO Starkstrombus®.**

**Both bus systems, the FRAKO Starkstrombus® and the add-on bus apply to the field bus standard EN 50170.**

**If the EML is not to be run on a bus, ignore this setting.**

**After reset the bus address is set to 0.**

**Be sure when setting the bus address that no other instrument connected to the bus has the same bus address.**

### 7.9.9 Auto summer/winter time changeover

Automatic daylight saving time changeover can be activated in this menu item. The changeover occurs on the last Sunday in March at 2 am and the last Sunday in October at 2 am.

### 7.9.10 Options

This menu item allows access to the next menu level. This is done by pressing **CR** button.

#### 7.9.10.1 Number of Profiles Used

This setting enables **the number of** profiles to be used according to requirements. The number of profiles used determines how many sets of basic and load settings are to be used. A maximum of 4 profiles is possible.

#### 7.9.10.2 Highest EMD Address

The highest possible **EMD** address enables the number of add-on stations activated to be limited. Consequently, only data for the corresponding number of **EMD 1101** can be displayed and changed.

| System option | Max. number of add-on stations | Corresponds with:<br>EML+ EMD  |
|---------------|--------------------------------|--------------------------------|
| S             | 2                              | $4 + 2 \cdot 8 = 20$ Channels  |
| M             | 4                              | $4 + 4 \cdot 8 = 36$ Channels  |
| L             | 10                             | $4 + 10 \cdot 8 = 84$ Channels |

The factory default setting is 0.

### 7.9.10.3 Type of profile switching

Please clarify with your electricity company how invoicing with tariff switching is carried out. There are three settings which can be chosen.

| Setting                                    | Description                                                                                                                |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Immediate switching                        | Immediately after a profile switch, the new settings for the new profile take effect.                                      |
| Immediate switching, $P_{acc} = 0$         | Immediately after a profile switch, the new settings for the new profile take effect. The accumulated value is reset to 0. |
| Switching at the begin of measuring period | Regulation runs with the last set values. The new values take effect at the beginning of the new measuring period          |

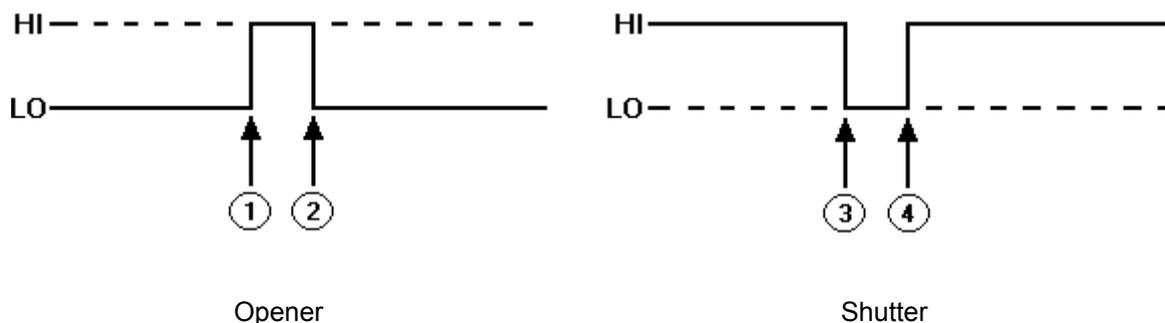
The factory default setting is Immediate switching.

#### 7.9.10.3.1 Time Pulse Edge

This setting tells the **EML 1101** which time pulse edge is used for it to respond. This setting is used to optimise target maximum demand and relays for inverting time pulses **are** not required.

The type of edge used by electricity company counter resulting in an end of a measuring period and the start of the next can be either positive or negative. The four possibilities are shown in diagram below:

HI: Contact open  
LO: Contact closed



- 1 + 4 positive edge
- 2 + 3 negative edge

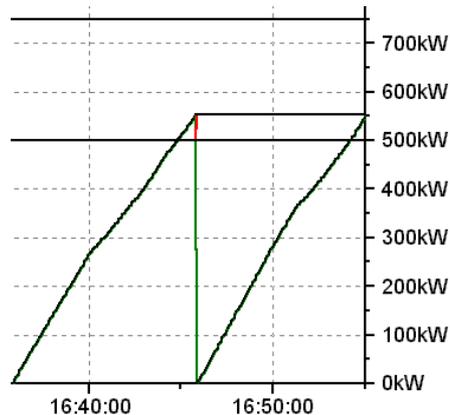
#### 7.9.10.3.2 Self adjusting target maximum demand

If the EML 1101 cannot keep to the set target maximum demand, e.g. because the basic load is too high, an excess occurs. In this case it is sensible to adjust the target maximum demand to the level of the excess, as the electricity company will use the registered value for the current billing period.

In the case of electricity contracts where only the maximum value reached is billed, it is sensible to set the initial value under the lowest annual maximum. In this way it is possible to take advantage of the seasonal variations

The most important channels should be set to 'Time' preference, in order to retain their switching times in emergency mode.

If the current target maximum demand is exceeded the registered value is adopted as the new target maximum demand. The settings for the self adjusting target maximum demand can be set under this menu item.



| Term                                | Description                                                                                                                  |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Initial value target maximum demand | Target maximum demand that is to be set as current target maximum demand at the beginning of a new billing period            |
| Upper limit target maximum demand   | Determines up to which limit self adjusting target maximum demand can be carried out                                         |
| Current target maximum demand       | This is the value to which regulation will be carried out. Changes of this value will be immediately included in regulation! |

The self adjusting target maximum demand resets the target maximum demand after an excess to the level of the excess. The upper level target maximum demand determines the highest level to which target maximum demand can be adjusted. If this is exceeded there will be no adjustment. All adjustment or excesses will be entered in the event list (see chapter 9.9 Event list on page 25).

At the beginning of the adjustment it can occur that the instrument operates in emergency mode for a longer period because the initial value is set too low. The initial value must then be set higher. If you wish to retain the low initial value and some channels should retain their switching times, choose 'Time preference' in the load settings. (8.4 Preference on page 21)

Programming:

- 1) Enter upper limit for the individual profiles.
- 2) Enter initial value target maximum demand for the individual profiles. Choose a lower value than the one that has been set until now. Initial value target maximum demand must be set lower than the upper limit! Initial value target maximum demand is first adopted as the current target maximum demand when a reset via contact or date has taken place. The current target maximum demand should be set to initial value target maximum demand during the first configuration.

### 7.9.10.3.3 Active/inactive

You can choose to activate/deactivate the self adjusting target maximum demand with the cursor buttons.

### 7.9.10.3.4 Resetting via external signal/ resetting via internal date

Choose **reset via contact** if your electricity company gives you a potential free contact for synchronisation of the billing period. Set the type of the reset edge with the front fascia buttons.

Positive/contact opens



negative/contact closes



both/closing and opening



Choose reset via date when the electricity company carries out the counter reading (e.g. at an exact time given every month on the 27<sup>th</sup> day at 4am.) The reset day and time are set with the front fascia buttons.

#### 7.9.10.4 Active Pulse Monitoring Alarm

The maximum time **that may elapse** between two active pulses before an alarm is triggered can be entered here.

If a number of inputs are used (as of FRAKO system option **M**) a time must be entered that is distinctly higher than the maximum time between two pulses. The input with the lowest pulse rate dictates this value. If one of the 3 inputs exceeds this time, an alarm is activated and it is entered in the event list.

The factory default setting is 0. This setting disables this monitoring function.

#### 7.9.10.5 **L** Group

Grouping means that groups can be formed with related loads.

An example for grouping in a sheet metal work.

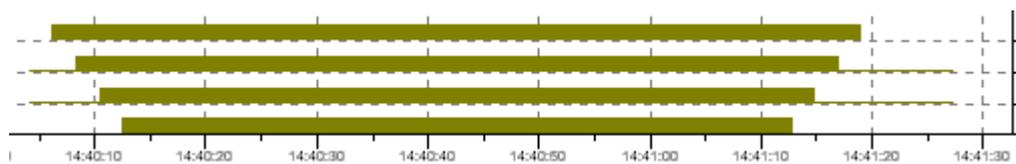
In this case it should be switched as follows:

Turn off

- 1) Stop material supply
- 2) Turn off heat
- 3) Stop roller
- 4) Stop cooler

Turn on

- 1) Turn on cooler
- 2) Start roller
- 3) Turn on heat
- 4) Start material supply



Load 1, priority 10

Load 2, priority 8

Load 3, priority 6

Load 4, priority 4

If the minimal off time is not fulfilled in the above example, the **load** will not be switched on. Loads that do not belong to a group can be switched, between the individual switching of the group. Up to 8 groups are possible. The group numbers serve to differentiate the individual groups. The switching order of the groups themselves, is determined alone by the priority of the individual channels. (See section 8.9 **L** Group).

#### 7.9.10.6 Units

This menu item enables a changeover from kW to MW.

The highest adjustable maximum demand is 6500kW or 6500MW.

## 8 Load settings

Programming load settings can be done through the front fascia of **EML 1101** or through **OPT-SW software (see section 3.3.3 Installation)**.

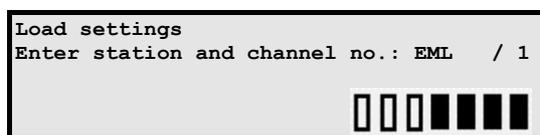
Program the load characteristics for every load channel used. Programming via the front fascia:



Select menu item **Load settings** with cursor buttons and press **CR** button.



Select the profile for which the load settings are to be changed with cursor buttons and press **CR** button.



The **EML 1101** prompts for an entry of the station, whereby station means **EML 1101** or **EMD 1101 Add-on Station** connected. Using cursor buttons, **first** select the station. Then press **CR** button. **Then select the channel in the station. After the CR button is**

**pressed the** channel name is shown and can **only** be changed **with the OPT SW software**. From this menu item, use cursor buttons to proceed to other load settings. If an incorrect value is entered, press **MENU** button to return to previous display and repeat the steps again.

Parameters to be set:

- Power: Entry as four-figure number in kW
- Define channel status
- Minimum ON time: **Up to 999:59** minutes:seconds
- Maximum OFF time: **Up to 999:59** minutes:seconds
- Minimum OFF time: **Up to 999:59** minutes:seconds
- **Output: Opener/closer**
- **Define channel status: On/off/controlled**
- Priority: two-figure number
-  Group

### 8.1 Load name

This can only be changed using the configuration tool **OPT-SW** supplied. As factory settings, load names are set as in the following example:

Channel 3 in EMD 2

Please note that when overwriting the entry with the **OPT-SW**, a unique name must be assigned for every consumer.

The name can have a maximum of 20 characters.

### 8.2 Priority

| Priority | Description                                                                                                                                                                                                                                                                            |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0        | Always on in this profile                                                                                                                                                                                                                                                              |
| 1        | Most important channel                                                                                                                                                                                                                                                                 |
| 1-3      | Channels that are only switched off in emergency mode. It is not possible to set a min. ON time and a max OFF time for priorities 1-3 under 'POWER' preference, as they are only switched in emergency mode. The set time are also observed in emergency mode under 'TIME' preference. |
| 4-98     | These priorities are switched in normal mode and in emergency mode.                                                                                                                                                                                                                    |
| 98       | Least important channel                                                                                                                                                                                                                                                                |

99

Always OFF in this profile

### 8.3 Power

This parameter is used by the **EML 1101** to determine whether if a particular load is suitable to be switched back on after switching off. Hereby each OFF load is controlled if the trend would remain under the target maximum demand after switching. If this is the case, the load can be switched ON (see 7.5 Peak power P1, P2, P3 and P4 and 7.1 Target maximum demand P1, P2, P3 and P4).

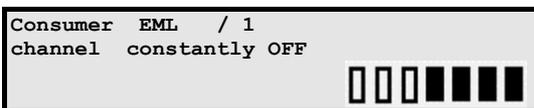
### 8.4 Preference

With the setting preference you can choose whether the set target maximum demand or the channel switching times should be in the forefront for the regulation of this channel.

| Preference       | Description                                                                                                                                                                                         |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power preference | <ul style="list-style-type: none"> <li>- Max. OFF time</li> <li>- Min. ON time</li> <li>- Min. OFF time</li> </ul> Are not observed in emergency mode.<br>Emergency mode activation see section 7.8 |
| Time preference  | The settings: <ul style="list-style-type: none"> <li>- max. OFF time</li> <li>- min. OFF time</li> <li>- min. ON time</li> </ul> are observed in emergency mode.                                    |

It is not possible to set a min ON time and a max. OFF time for the priorities 1-3 with power preference. This menu item is not available for group channels (group set unequal 0 ).

### 8.5 Channel Status



This setting can be used to bring the individual channels to a defined status. Using this setting, one of three of the following status modes can be allocated to status modes.

| Channel Status | Description                                                                                                                     |
|----------------|---------------------------------------------------------------------------------------------------------------------------------|
| Constantly OFF | If a channel is assigned this status, then the consumer is not available to the control system and is continually switched off. |
| Constantly ON  | With this setting the channel is also not available to the control system and is continually switched on.                       |
| Controlled     | If the channel is defined as controlled then it is available for the control system.                                            |

### 8.6 Minimum OFF time

This is the length of time the load must be isolated from the power supply after being switched off. For example, with refrigeration devices, it is necessary to keep the compressor isolated from the mains for suction purposes. This parameter has been included for load protection purposes.

### 8.7 Maximum OFF time

This is the maximum time for which a particular load may remain in off condition. If this time has elapsed, then the load has to be switched back on by the maximum demand controller. This usually means other loads must be switched off. In the case of power preference, this time can be exceeded in emergency mode. (See 8.4 Preference)

## 8.8 Minimum ON time

This is the minimum time a particular load must remain on before the maximum demand controller can switch it off again. **In the case of power preference, this time can be exceeded in emergency mode.** (See 8.4 Preference).

## 8.9 Group

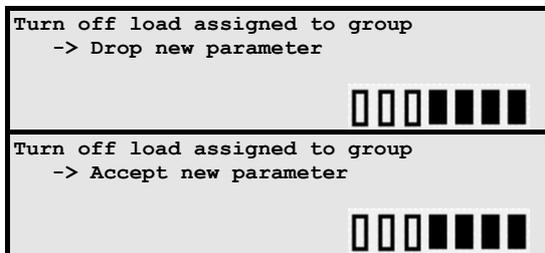
As of the FRAKO system option  it is possible to group channels. This means that the individual channels of a group are switched strictly according to their priority (see section 7.9.10.5  Group). The setting "Group" only appears when power preference is set.

## 8.10 Changing load settings of group channels

**Important:** If group channels are defined, the load (e.g. conveyor belt and roller) which are in the group channels, must be disconnected from the mains. **It is not guaranteed that the group priority will be maintained in the setting phase!**

In the case of changes of the priority or group, the new setting will be adopted for all profiles. All further settings are not relevant for the switching order and can show various values in the individual profiles.

If, however, changes are attempted per front fascia buttons in group settings, a message is displayed.



If the load is disconnected from the mains and you wish to accept the changed settings, choose with the cursor buttons and confirm with the CR button.

## 8.11 Output

Every channel can be configured as normally open or normally close with the output inversion.

## 8.12 Function testing

After the programmed values have been checked, a function check should also be carried out.

The switching response for individual channels can be checked by reducing target maximum demand temporarily so that the controller is forced to switch off channels.

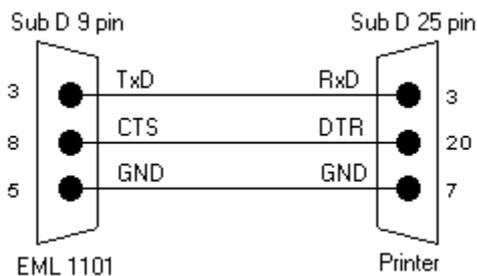
A check of each individual load can be carried out by changing its channel status (see 8.5 Channel Status).

## 9 Printer routines

Either a PC or a serial printer can be connected to **EML 1101** through a built-in RS232 interface. The printer must be configured as follows (EPSON LX300):

|                                  |                              |
|----------------------------------|------------------------------|
| - Character interval             | 10cpi                        |
| - Zero with/without oblique line | 0 (not critical)             |
| - Ignore Page perforation        | Off (not critical)           |
| - Symbol table                   | PC437                        |
| - Auto. line forward             | Off (not critical)           |
| - Page length                    | 12 inch (depending on paper) |
| - Automatic separation           | Off (not critical)           |
| - Tractor                        | Individual                   |
| - Interface                      | Auto. selection (10 sec.)    |
| - Baud rate                      | 9600bps                      |
| - Parity                         | None                         |
| - Word length                    | 8 bit                        |
| - ETX/ACK                        | Off                          |

Assigning the printer cable:



If a printer is connected to **EML 1101**, then the previous day's power curve is printed out daily just after midnight (see section 9.6). **If, during this time, a PC is connected to the serial interface and the program OPT-SW is active, the data will be sent to Windows standard printer.**

If **EML 1101** cannot detect a printer or the printer is not online, then the message "Printer off-line or no printer" is displayed when menu item "Printer routines" is selected. **If a printer is connected the menu items described in sections 9.1 to 9.710 are shown here.**

### 9.1 Printing basic settings

All set values for the menu item *Basic settings* are given over the printer.

### 9.2 Printing load settings

The load settings for each profile are printed out on the printer one after the other. Due to the large amount of data, there may be a long delay from the time **CR** button is pressed and the time printing begins.

### 9.3 Power failures

The last 10 power failures are **printed**.

### 9.4 Errors

After selecting this menu item, you can choose to print or delete the errors in another menu.

### 9.4.1 Error list

Press **CR** button when the display shows "Print Error" when a printout is required. The print out lists the number of errors since last deleted.

The following errors are identified:

- No time pulse
- Error at extension bus
- Error at FRAKO Starkstrombus®
- Power failure
- Target maximum demand exceeded
- Peak power exceeded
- Cosphi exceeded

### 9.4.2 Resetting error counters

To reset the error counter, press the **CR** button. On deletion, all error counters are reset to 0 and the date and time is stored in an internal memory. The date and time of the deleting is then printed out at the next print out under the error list.

## 9.5 Printing present day's power curve

The power curve of the current day until the current time point is printed out. The maximum value of the power maximum is marked with a '\*'. **If this is higher than the set target maximum demand, this is marked with a '+' . Every time the target maximum demand is exceeded, it is marked with a '>' . P1, P2, P3 and P4 marks the active profile of the time.**

```
-----PRESENT DAY'S POWER CURVE-----
Tuesday 25.07.99
   0%           50%           100% => Pset
00:00| Target power = 2600.0kW => 100% |
00:00|=====| | 1260.2kW, P1
00:15|=====| | 1200.0kW, 00:23 P2
00:30|=====| | 1120.6kW, P2
00:45|=====| | 1121.5kW, 00:45 P3, 00:50 P4, 00:53 P3
      | | 00:57 P1
01:00|=====| | 1120.6kW, P1
01:09| Target power = 1300.0kW => 100% |
01:15|=====|=====| + 1250.0kW, P1
```

## 9.6 Printing previous day's power curve

The power curve of the previous day between 0 and 24 hours is printed out under this menu item.

```
-----Previous day's power curve-----
Tuesday 26.07.99
   0%           50%           100% => Pset
00:00| Target power = 2600.0kW => 100% |
00:00|=====| | 1160.2kW, P1
00:15|=====| | 1010.0kW, 00:25 P2
00:30|=====| | 1080.6kW, P2
00:45|=====| = | 1250.5kW, 00:45 P3, 00:50 P4, 00:53 P3
      | | 00:57 P1
01:00|=====| | 940.6kW, P1
01:09| Target power = 1300.0kW => 100% |
01:15|=====|=====| + 1250.0kW, P1
```

### 9.7 Power maxima of the last 50 days

Maximum demand values for the previous 50 days is printed out. In this printout are no indications of highest values. The times of the day's maximum values are only given by the printer when **OPT-SW** configuration software is used.

```

-----MAXIMUM POWER VALUES FOR THE LAST 50 DAYS-----
          0%          50%          100% => Pset
DO 14.02. |=====|=====|      470kW, at 09:45 for P1=600kW
Fr 15.02. |=====|=====|      502kW, at 10:00 for P1=600kW
Sa 16.02. |=====|=====|      170kW, at 11:30 for P2=300kW
So 17.02. |=====|=====|      142kW, at 10:00 for P2=300kW
Mo 18.02. |=====|=====| + 602kW, at 11:30 for P1=600kW
Tu 19.02. |=====|=====|      578kW, at 11:00 for P1=600kW
Do 20.02. |=====|=====|      582kW, at 13:15 for P1=600kW
          .
          .
          .
Do 03.04. |=====|=====|      581kW, at 11:15 for P1=600kW
Printout from Friday, 04.04.99
    
```

### 9.8 Power maxima of the last 48 months

The month's maximum values for the past 48 months is printed out here.

```

-----MAXIMUM POWER FOR THE PAST 48 months-----
          0%          50%          100% => Pset
13 May 99 |=====|=====|      470kW, at 09:45 for P1=600kW
28 Jun 99 |=====|=====|      502kW, at 10:00 for P1=600kW
31 Jul 99 |=====|=====|      170kW, at 11:30 for P2=300kW
07 Aug 99 |=====|=====|      142kW, at 10:00 for P2=300kW
02 Sep 99 |=====|=====| >+ 602kW, at 11:30 for P1=600kW
30 Oct 99 |=====|=====|      578kW, at 11:00 for P1=600kW
18 Nov 99 |=====|=====|      582kW, at 13:15 for P1=600kW
          .
          .
          .
02 Jun 98 |=====|=====|      581kW, at 11:15 for P1=600kW
Printout for Friday, 04.12.99
    
```

### 9.9 Event list

All events are stored here with date and time. Example:

```

-----EVENT LIST-----
17.03.99, 16.45.30 : Time pulse detected!
17.03.99, 17.00.00 : No time pulse!
18.03.99, 09.37.34 : Target power excess ended!
18.03.99, 09.40.20 : Target power exceeded!
    
```

| Event                                      | Event release                             |
|--------------------------------------------|-------------------------------------------|
| Target power exceeded!                     | Target power excess ended!                |
| Peak power exceeded!                       | Peak power excess ended!                  |
| Cos(phi) outside lower range!              | Cos(phi) outside lower range ended!       |
| Emergency mode activated!                  | Emergency mode deactivated                |
| Target power adjusted!                     | No message                                |
| Target power reset per contact!            | No message                                |
| Target power reset per deadline!           | No message                                |
| Target power over limit!                   | No message                                |
| Target power changed via FRAKO bus!        | No message                                |
| Target power changed via keyboard!         | No message                                |
| Add-on bus error!                          | Add-on bus error ended!                   |
| No time pulse !                            | Time pulse detected                       |
| Time pulse before end of measuring period! | No message                                |
| No pulse at input 1!                       | Pulse at input 1 detected!                |
| No pulse at input 2!                       | Pulse at input 2 detected!                |
| No pulse at input 3!                       | Pulse at input 3 detected!                |
| Counter reset                              | No message                                |
| Power supply failure!                      | Power supply switched on again            |
| Reset carried out                          | No message                                |
| External synchronization carried out       | Time pulse after external synchronization |
| Work counter reset                         | No message                                |
| Time set by master XX !                    | No message                                |
| Time set by user!                          | No message                                |
| Error in clock module!                     | Clock module operating correctly!         |
| Error writing to EEPROM!                   | No message                                |

## 9.10 Deleting printer queue

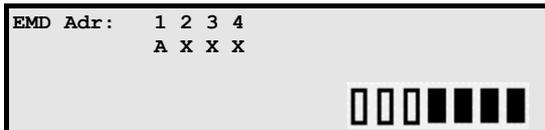
This option allows the cancellation of printing. For example, it may be used to delete unprinted data due to paper jam or other printer errors.

## 10 Add-on stations

In this menu item **EMD 1101 Add-on Station** can be switched on for the control system and displayed.

### 10.1 Activating/deactivating stations

In this menu item the status of **EMD 1101 Add-on Station** is shown.



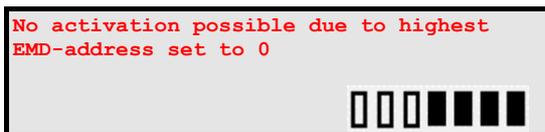
The first **EMD 1101** activated is shown in the first line of the display. Others stations are deactivated.

Status display:

- A** Station activated.
- X** Station deactivated.

Move between the individual stations using the cursor buttons. By pressing **CR** button the status is changed (e.g. deactivated or activated). Pressing **MENU** button will revert back to the standard display.

**Exception:** When the parameter "highest EMD-address" of the EML 1101 is set to 0, the following message is displayed when you change to the 'Add-on stations' or 'Activate/deactivate stations'.



Press the **CR** button to change the "highest EMD-address". You then access the setting for the "highest EMD-address" in in:

Basic Settings|Other Settings|Options. After setting press the 'MENU' button repeatedly until the standard display appears.

If no change is desired press the 'MENU' button.

The factory setting for the "highest EMD-address" is 0 !

### 10.2 Displaying stations

In this menu item, **EMD 1101 Add-on Stations** and load status can be displayed.

Changing between the station display 1..3 to 8..10 is done with cursor buttons.



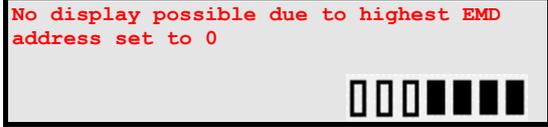
Status display:

- Load switched on by control system
- Load switched off by control system
- X Deactivate station
- Displaying a constantly on channel (relay: closed)
- / Displaying a constantly off channel (relay: open)

**T** Displaying a channel that has been activated by the system timer EMT 1101. (See section 18.5 technical terms/glossary.)

**T** Displaying a channel that has been deactivated by the system timer EMT 1101. (See section 18.5 technical terms/glossary.)

**Exception:** When the parameter "highest EMD-address" of the EML 1101 is set to 0, the following message is then displayed when you change to 'Add-on stations', 'Display stations'.



Factory setting for the parameter "highest END-address is 0.

### 10.3 Virtual add-on units

Add-on units can be defined as virtual channels when the EML 1101 operates in connection with a PLC or BMS. Virtual add-on units are used for switching channels that are not physically present at the FRAKO devices.

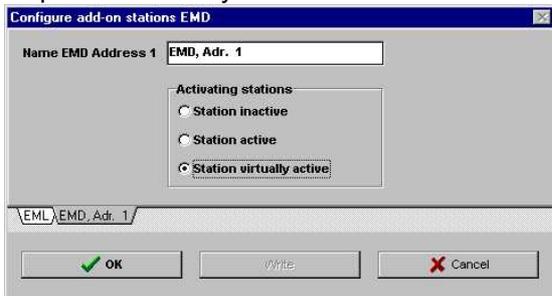
The information is accessible to a PLC or BMS with the help of the Communication Processor EMP1100 (18.5 Technical terms/glossary). The switching is then carried out by the PLC or BMS as suggested by the EML 1101.

**Caution:** The configuration of virtual add-on stations can only be carried out using the **OPT-SW** software supplied.

### 10.4 Activating virtual EMD

Activation can only be done using the **OPT-SW** software. The item 'Configure Add-on Stations' can be selected in the menu **EML configuration**.

It is possible to give the individual **EMD** its own name and to activate it according to your requirements. Only that number of add-on units are shown under this menu item as for under:



Basic settings|Other settings|Option|Highest EMD-address (see section 7.9.10.2)

In order to configure an **EMD** as a virtual device, the item **EMD** must be active and activated by mouse click to be virtual. In order to make the settings active in this window the 'Write' button must then be pressed in order to inform **EML 1101**.

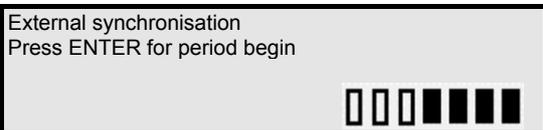
When this is done then the status values can be read out via **EMP 1100** and processed with a **PLC OR BMS**.

**Important:**

For virtual stations no error message is given with poor communication of **PLC** with **EML 1101**.

## 11 External synchronisation

If the **CR** button is pressed then a new measuring period starts. Normally the start begins with the time pulse of the electricity company.



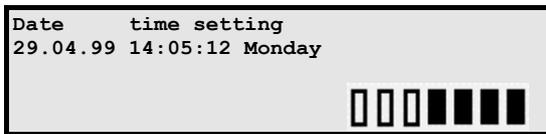
**Caution:** A peak power value may occur after a forced time synchronisation. If

synchronisation is executed towards the end of measuring period and loads are in off condition, then load channels are activated due to new start of measuring period. As the measuring period of electricity company has not ended, a peak value may occur.

If a temporary profile switching should take place immediately, that is usually carried out with the electricity company pulse, a forced synchronisation can occur.

## 12 Setting time

The date and the time can be set here.



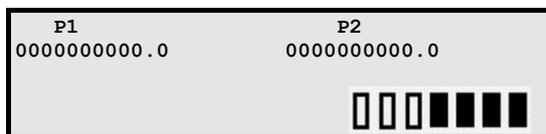
**Important:** If the time or date is incorrectly set, then

there are breaks in the data listed.

- Set the digits with the cursor buttons.
- Change from places with the 'CR' button.
- Accept the settings with the 'MENU' button.

If a value is set outside the limits, (e.g. 31.02.99 12:14:26) the new setting will be dropped. The day is automatically calculated and set by the instrument after the set values have been adopted.

## 13 Counters



This menu item shows the counter status P1 for profiles 1/3 and P2 for profiles 2/4. To reset the counter status the **CR** button must be pressed but

**Caution:** the cumulative counter values up to this time point are permanently deleted when **CR** button is pressed.

If profile 1 or 3 is active then this is counted on counter P1, active profile 2 or 4 is counted on counter P2.

A **reactive work** counter is not available.

## 14 Write protect

If this menu item is activated, then a data entry with identification numbers only is possible. Independent of this entry, the **EML 1101** Maximum Demand Controller automatically switches to write protect if no button is pressed within **1 hour**.

The last 4 numbers of the serial number are used as the ID number to be entered.

## 15 Info device

All data relating to the EML 1101 can be accessed under this menu item. No changes are possible here.

## 16 Technical Data

### EML1101 Maximum Demand Controller:

#### Power supply

|                    |                      |
|--------------------|----------------------|
| Voltage:           | 230 VAC, -15 to +10% |
| Frequency:         | 45 to 65 Hz          |
| Power consumption: | 26 VA                |

#### Inputs

|                                                                                         |                                                                                                                                                        |
|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| General:                                                                                | S0 interfaces to connect to potential-free contacts<br>Voltage for open contact: 24 V<br>Max. resistance: 800 $\Omega$<br>Short-circuit current: 15 mA |
| 2 active pulse inputs<br>(one of which can be used for resetting target maximum demand) | 0.1 to 20 Hz                                                                                                                                           |
| 1 reactive pulse input:                                                                 | 0.1 to 20 Hz                                                                                                                                           |
| 1 time pulse input:                                                                     | 10, 15, 30, 60 minutes                                                                                                                                 |
| 2 profile inputs:                                                                       | For selecting 4 profiles                                                                                                                               |

#### Outputs

|                                           |                                                                                             |
|-------------------------------------------|---------------------------------------------------------------------------------------------|
| 4 relay contacts(Switching channel):      | 4 changeover contacts 250V / 4A                                                             |
| 1 relay contact (emergency load shedder): | 1 changeover contact 250V / 4A                                                              |
| 1 operating fault contact:                | 1 changeover contact 250V / 4A                                                              |
| 1 hardware fault contact:                 | 1 NC contact 250V / 4A                                                                      |
| 1 serial interface:                       | 9-pole Sub-D jack RS232 for connecting a PC or printer (9600 baud, 1 start bit, 1 stop bit) |
| 1 add-on interface:                       | For connecting 2/4/10 EMD1101                                                               |
| 1 FRAKO Starkstrombus® interface          | For connecting to FRAKO Energy Management System.                                           |

#### Operating elements

##### Display element

Four row [illuminated LCD](#)

##### Connections

7x PG cable gland entry to removable contact blocks in housing, 1x sub-D connector

##### Cable diameter

Max. 2.5 mm<sup>2</sup>

##### Fuse

Max. 2A external as required

#### Mechanical construction

|                     |                                                                      |
|---------------------|----------------------------------------------------------------------|
| Dimensions:         | 296 x 260 x 133 mm (W x H x D)<br>see Figure 2: Enclosure on page 48 |
| Ingress protection: | IP53                                                                 |
| Weight:             | Approx. 3.6 kg                                                       |
| Protection class:   | 1                                                                    |
| Housing:            | Flammability UL94-HB/1,4 <sup>1</sup>                                |
| Mounting:           | With screws                                                          |

#### Operating conditions

|                      |                |
|----------------------|----------------|
| Ambient temperature: | 0°C to +45°C   |
| Storage temperature: | -20°C to +60°C |

#### OPT-SW Software

#### Hardware-requirements

|     |                                             |
|-----|---------------------------------------------|
| PC: | 80386 40MHz CPU, 4MB RAM, VGA graphics card |
|-----|---------------------------------------------|

#### Software requirements

|                                 |                                                 |
|---------------------------------|-------------------------------------------------|
| Operating system <sup>2</sup> : | Windows 95, Windows 98, Windows NT, Windows2000 |
|---------------------------------|-------------------------------------------------|

<sup>1</sup> The entry entered is a standard value which is determined by the standardized check devices. The scaling concerns the raw material. Variations may occur due to the effects of processing and other material thicknesses

<sup>2</sup> Windows is a registered trademark of the Microsoft Corp.

## 17 Troubleshooting

### 17.1 Checking programmed values

### 17.2 Control on the instrument

**First** check all the settings entered. The individual measuring points, as with the settings, are to be checked thoroughly and their values shown on the display and compared with their entries.

### 17.3 Printout from a directly connected printer

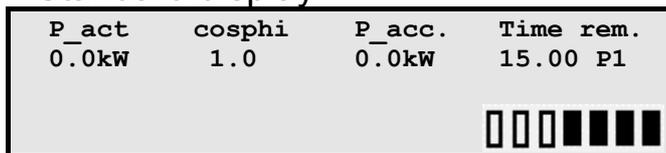
Select the 'Printer routines' sub-menu on the EML. Jump to the menu item 'Basic settings' with cursor buttons and initiate printout by pressing **CR** button. Jump to 'Load settings' menu item and confirm by pressing **CR** button. This is only possible if there is a printer connected to the serial interface. To check the previous measuring periods, print out the event protocol as well as the daily power curves and the maximum curves under 'Printer routines'.

### 17.4 Checking the system when running

The **EML 1101** Maximum Demand Controller can be checked during operation. To do this, the **EML 1101** has power displays to enable the actual status to be determined and observed.

#### 17.4.1 Standard display

| P_act | cosphi | P_acc. | Time rem. |
|-------|--------|--------|-----------|
| 0.0kW | 1.0    | 0.0kW  | 15.00 P1  |



|            |                                            |
|------------|--------------------------------------------|
| P_act :    | Current value of active power              |
| cosphi:    | Current power factor value                 |
| P_acc.:    | Total accumulated power                    |
| Time rem.: | Time remaining in current measuring period |
| P1:        | Current active profile                     |

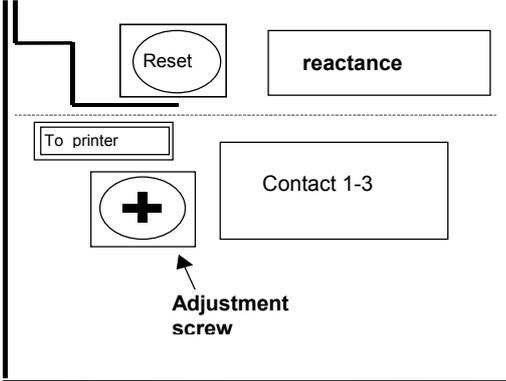
#### 17.4.2 Display of switching channels

The current status of the switching channels is shown in the bottom line of the display.

- Channel is switched on by the control system
- Channel is switched off by the control system
- X Station deaktiviert
- Channel is constantly switched on (NC contact is closed)
- / Channel is constantly switched off (NC contact is opened)
- T Channel is switched on by system timer EMT 1101(NC contact is closed)
- T Channel is switched **off** by system timer EMT 1101(NC contact is opened)

**Note:** In the emergency mode, loads with constantly ON/OFF status and switches ON/OFF by EMT1101 are not included in the control system.

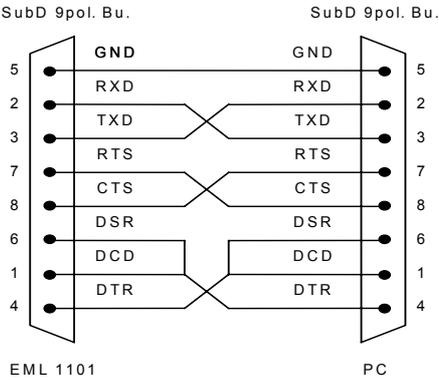
## 17.5 Sources of error

| Error                                        | Possible causes                                                                                                                                                                                                                                                              |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No bus access possible                       | a) Correct bus setting?<br>b) Channel A, B interchanged?<br>c) Screening on the master (EMIS 1500,...) and EML grounded. The screening should be grounded at one point only.                                                                                                 |
| No modem connection possible                 | a) EML- Modem has not been configured with a terminal program with <b>baud rate set to 9600</b> .<br>b) Incorrect command order during the configuration                                                                                                                     |
| Individual bus faults                        | a) Are the FRAKO Starkstrombus ® and the Add-on bus connected ? (Contacts 1-3 and 4-6)<br>Solution: Disconnect buses. There should be no connection between the two.                                                                                                         |
| EMD X not active                             | a) EMD set to wrong bus address<br>b) Channel A, B confused<br>c) No power on EMD                                                                                                                                                                                            |
| Display is difficult to read                 | There is an adjustment screw for the display contrast in the contact compartment. Turn this until the display can be read<br>                                                            |
| Channels are not switched by control         | a) Always OFF/Always ON instead of controlled<br>b) They are switched 'time controlled' by the EMT1101                                                                                                                                                                       |
| All channels are OFF                         | a) Peak power set too low<br><b>Solution:</b> Enter a value that is so high that the present peak does not lead to deactivation (see 18.5 Technical terms/Glossary).<br>b) Peak power and target maximum demand confused during setting (See 18.5 Technical terms/Glossary). |
| Time gaps in the days power curve            | Was the clock changed in the time period in question?<br>Check: Printout of the event list (see section 9.9)                                                                                                                                                                 |
| It is not possible to set the min. Off time. | max. OFF times < desired setting<br><b>Solution:</b> First enlarge max. OFF time                                                                                                                                                                                             |
| A group does not appear in load settings.    | Preference must be set to power<br><b>Solution:</b> First set power preference                                                                                                                                                                                               |
| Preference does not appear in load settings  | Group of this load must be entered as 0<br><b>Solution:</b> First set group =0                                                                                                                                                                                               |

**Error**

**Possible causes**

|  |  |
|--|--|
|  |  |
|--|--|

| Error                                                | Possible causes                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Self adjusting target maximum demand does not work   | a) Self adjusting target maximum demand is not active under Basic settings Other settings Options                                                                                                                                                                                                               |
| Changed initial value, self adjusting maximum demand | a) 'Upper limit self adjusting target maximum demand' has been changed on the front fascia buttons on the EML 1101 to a value lower than the initial value self adjusting target maximum demand.                                                                                                                |
| Changed current target maximum demand                | a) Target maximum demand was exceeded in a previous measuring period<br>b) Upper limit target maximum demand has been changed on the front fascia buttons of the EML 1101 or via OPT-SW to a value lower than the current target maximum demand                                                                 |
| No access possible via serial interface              | a) Correct COM port selected under menu item 'Connections'.<br>b) Max. length of 15m exceeded.<br>c) Wrong cable. <div style="text-align: center;">  <p style="text-align: center;">Correct connections of cable.</p> </div> |

## 18 Application instructions

### 18.1 Bus cable longer than 1 km

To extend the bus cable length, a Starkstrombus® repeater EMB1101 can be used for the FRAKO Starkstrombus® and the add-on bus.

### 18.2 Shielding

The shieldings of FRAKO Starkstrombus® and extension bus have to be isolated galvanically, from each other.

If a bus cable is used in which both bus cores are laid and the shielding on **EMIS 1500 or EMG 1500-PN** is grounded, then the shielding at **EML 1101** is not to be grounded. Do not connect the shielding to the metal cable gland, **it should only be connected to the GND terminal 3.**

If this is not done, then errors can occur in FRAKO Starkstrombus® and result in **EML 1101** not being recognised on the bus.

### 18.3 Target Maximum Demand

This entry is limited to 6,500 MW or 6500 kW depending on the setting of unit.

Changing unit on the EML from kW to MW. Can be done using **OPT-SW** software or with the front fascia buttons of the EML 1101 as follows:

Basic settings|Other settings|Option|Units

## 18.4 Operating OPT-SW via modem

The EML modem is configured **via a terminal program**.

**Important:** Be sure that the baud rate of the terminal program is set to **9600 baud!**

The baud rate set in the terminal program is adopted by the modem. If the wrong baud rate is set, no connection can be made.

| Command          | Meaning                                                                                                                  |
|------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>AT&amp;F</b>  | Reset modem to manufacturer's configuration                                                                              |
| <b>AT&amp;D0</b> | Modem ignores DTR signal                                                                                                 |
| <b>ATS0=1</b>    | Automatic pick-up after ringing once                                                                                     |
| <b>ATQ1</b>      | Switch off register codes                                                                                                |
| <b>ATE0</b>      | Switch off echo<br>(Caution: All commands will no longer be shown if the terminal program "local echo" is switched off.) |
| <b>AT&amp;W0</b> | Saving the configuration as configuration profile 0                                                                      |

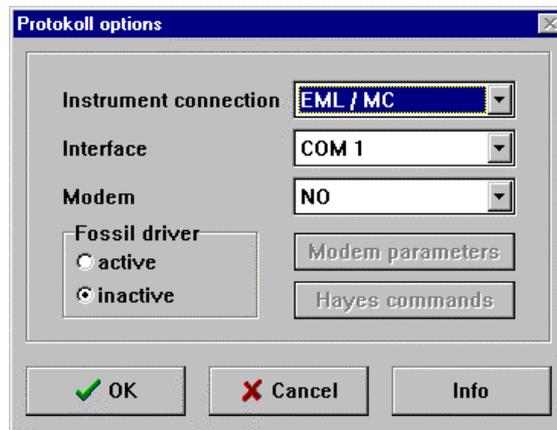
The following settings must be set on the PC modem in this order:

| Command          | Meaning                                           |
|------------------|---------------------------------------------------|
| <b>AT&amp;F</b>  | Reset modem to manufacturers configuration        |
| <b>AT&amp;D0</b> | Modem ignores DTR-Signal                          |
| <b>ATX3</b>      | Turn off dialing tone recognition                 |
| <b>AT&amp;W0</b> | Save the configuration as configuration profile 0 |

The maximum baud rate of the modem must be at least 14400 baud.

Only use a modem cable to connect the modem to the PC or the EMIS 1500.

The modem configuration can be carried out over any common terminal program. In **OPT-SW** the following settings must be carried out when connected.



The instrument to which the modem is connected must be selected under the item instrument connection.

The prompt above configures access from **OPT-SW** software via a modem connected to **EML**, **EMP** or **EMIS 1500**.

## 18.5 Technical terms/Glossary

| Term                             | Meaning                                                                                                                |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Accumulated power P_acc          | Amount of energy measured since the beginning of current measuring period divided by the duration of measuring period. |
| Communication processor EMP 1100 | Interface module which enables data exchange with a PLC or BMS according to the Protocol 3964R/RK512.                  |

| Term                                 | Meaning                                                                                                                                                                                                                                                         |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Correction power P_corr              | $P\_corr = (P\_max - P\_trend) \cdot \frac{T}{T-t}$ <p>Control detects the necessary switching on the basis of the correction power. Negative value means switching off.</p>                                                                                    |
| Emergency load shedder channel       | This channel is switched off last.                                                                                                                                                                                                                              |
| Emergency mode                       | When P_corr > set % of total sheddable load, the emergency mode is activated. The priorities 1-3 are included in control and channels with power preference can be switched off longer than their max. OFF times, and switched on for less then their ON times. |
| Load groups                          | A group of channels that are switched strictly according to the priorities of the channels within the group.                                                                                                                                                    |
| Measuring period                     | The length of the measuring period is dictated per time pulse provided by the electricity company. It's duration typically is 15 min.                                                                                                                           |
| Normally close (NC)                  | Channel off: Contact opens                                                                                                                                                                                                                                      |
| Normally open (NO)                   | Channel OFF: Contact closed.                                                                                                                                                                                                                                    |
| Peak power                           | Peak power is the maximum active power allowed. When exceeded loads are shedded very quickly by EML. This function, however, is supplementary.                                                                                                                  |
| Priority                             | Switching order when all temporal conditions (e.g. min ON time) are met.                                                                                                                                                                                        |
| Profile                              | 4 profiles are possible that can be changed per input or EMT 1101 (via FRAKO Starkstrombus®).                                                                                                                                                                   |
| Remaining time                       | Time to the end of the measuring period.                                                                                                                                                                                                                        |
| Self adjusting target maximum demand | Automatic adjustment of the target maximum demand after an current target demand has been exceeded (see section 7.9.10.5).                                                                                                                                      |
| Status display                       | Symbols in the 4th Line of the EML display . The same symbols are used under the menu item 'Show add-on stations' for the condition of the individual channels of the add-on stations.                                                                          |
| System Timer<br>EMT1101              | The System Timer carry out time switching of individual channels of the EML1101 or the EMD1101. In this way channels can be cut out of control for an certain time period and during which time switching can be applied.                                       |
| Target maximum demand                | Maximum allowed average power at the end of a measuring period.                                                                                                                                                                                                 |
| Trend power P_trend                  | Forecast average power for the current measuring period.                                                                                                                                                                                                        |

## 19 Annex

### 19.1 Instrument software

#### 19.1.1 EML software update

The program update can be carried out over the serial interface of the EML 1101.

To update the EML 1101 to a new software version you must first order an update. You will be sent two 3.5" disks. Install the software OPT-SW on your PC (see section 3.3.3 Installation page 10). You can carry out the update over the serial interface with the help of the OPT-SW configuration software.

Carry out an instrument upgrade to the FRAKO system option **M** or **L** in the same order.



First read this section carefully. If a prompt in the PC software or the instrument is not understandable, first consult the handbook before you confirm anything. You must not confirm anything inside a particular period.

#### 19.1.2 Update preparation

Save all settings of the EML 1101 with the old version of the OPT-SW, by choosing 'Read from EML' under the menu item 'EML configuration'. Now choose 'Save as' under 'EML configuration' and name the file (e.g. with the current date 090799.EML).

Please note that saved data from instruments with a software version lower than 1.20, cannot be opened in the new version. In this case you should make a printout of the basic settings and load settings, in order to enter them manually later. Use the old configuration software EML SW for this. Deinstall the old OPT-SW or EML-SW from your PC. Install the newest OPT-SW version before the update. This is on the update disk set. For this start the file manager/Windows explorer, insert disk 1 in the drive, change to drive A: and click on '**Setup.exe**'. After this follow the prompts of the installation program. You must start the update manually. For this choose **EML-software update** in the menu item '**Settings**'.



**Important:**

**Carry out the update only with the software delivered. Do not switch the instrument off during the transfer. Do not interrupt the connection to the PC during the procedure.** All of the items described above can cause a loss of programming in unfavourable conditions so that the instrument can only be put in order by FRAKO service personnel. For this reason please take great care and follow the instructions exactly.

To avoid mistakes please read the prompts carefully and follow the instructions.

After choosing the menu item '**Settings/EML-software-update**', the authorisation code is prompted. This can be found on the **product activation certificate**.



OPTSW: Authorisation of an instrument update

Authorisation code

Run update

After the authorisation code has been entered the following warning appears:



Attention

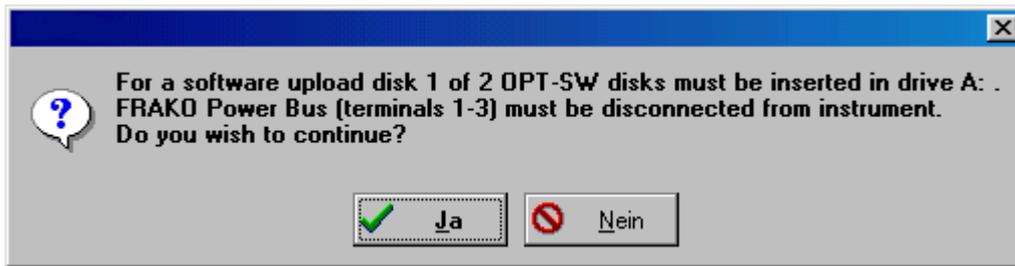
Please read the following instructions completely! If the instructions are not followed correctly, the instrument may require service.



!!!ATTENTION!!!

- Control does not function during the update process!
- All recorded data will be lost!
- Do you still wish to continue?

Yes No



**Important!** Disconnect the instrument from the FRAKO Starkstrombus® by pulling the left connection (contact 1-3) in the contact compartment. If this is not disconnected the update will be interrupted after the transfer of the boot loader. If this should have happened follow the following instructions:

1. Disconnect the EML from the mains for ca. 10 seconds
2. Turn the EML on again. The display remains empty.
3. Press the reset button for ca. 5 seconds. (see 19.1 factory settings) in the contact compartment of the EML.
4. After ca. 30 seconds the EML should start with the old software version.
5. You can now start the software update again.

In order to carry out a software update OPT-SW disk 1 must be inserted in drive a:  
The FRAKO bus connection (contact 1-3) may not be connected!

Do you wish to continue?

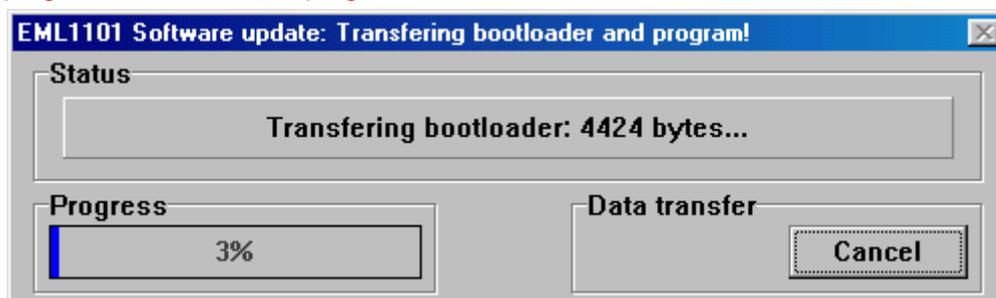
Yes No

After confirmation of this prompt the settings and the historical data will be saved.

The data transfer is carried out over the serial interface after the settings are saved. The progress of data transfer is displayed in the form of a status bar.

If problems should arise a message will appear in the dialog window.

Loading progress is shown in two progress windows.



EML Software-update: Transfer from boot loader and program!

Status

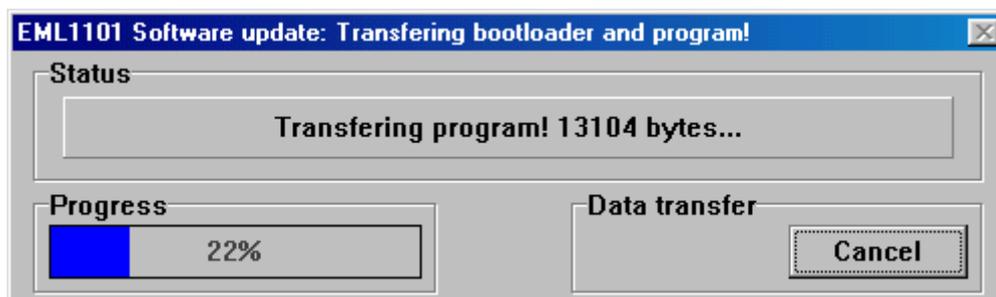
Transferring boot loader! 728 bytes

Progress

1%

Data transfer

Cancel



EML Software-update: Transfer from boot loader and program!

Status

Transferring program! 1232 bytes

Progress  
15%

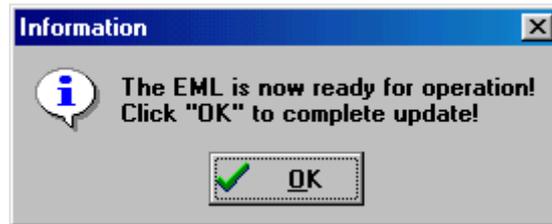
Data transfer  
Stop

The display does not change on the EML during the update. The LCD display does not change until the data has been copied into the FLASH EPROM:

Please wait...

The EML is ready when the normal power display is shown.

After the EML is initialised the settings and historical data are automatically written back to the EML. The end of this process is confirmed by the following message:



The EML is now ready!

Click OK to conclude the update!

OK

Program update error.

Check if the FRAKO bus is disconnected and that the instrument is switched on. Should one of these be the case remedy it and restart the update.

Upgrade to **M** or **L**

An upgrade to a higher FRAKO system option can only be carried out with EML software version 1.70 or higher. If this is not the case a software update is necessary.

The upgrade is started over the same menu item (Settings/EML software update) as a software update. The activation code tells OPT-SW to which version or system option the EML is to be updated/upgraded.

No data is lost in the case of an upgrade to a higher FRAKO system option.

## 19.2 Table of settings

| Item                  | Designation                                                       | Description                                                                                                 | Units | Value range |
|-----------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|-------|-------------|
| <b>Basic settings</b> |                                                                   |                                                                                                             |       |             |
| 1                     | Target maximum demand P1, P2, P3, P4                              | Set target maximum demand Profiles 1, 2, 3, 4                                                               | kW/MW | 0-6500      |
| 2                     | <b>M</b> Current target maximum demand P1, P2, P3, P4             | Current target maximum demand Profiles 1, 2, 3, 4 with activated self adjusting target maximum demand       | kW/MW | 0-6500      |
| 3                     | <b>M</b> Initial value target maximum demand P1, P2, P3, P4       | Initial value target maximum demand Profiles 1, 2, 3, 4 with activated self adjusting target maximum demand | kW/MW | 0-6500      |
| 4                     | <b>M</b> Upper limit target maximum demand P1, P2, P3, P4         | Upper limit target maximum demand Profiles 1, 2, 3, 4 with activated self adjusting target maximum demand   | kW/MW | 0-6500      |
| 5                     | Peak power P1, P2, P3, P4                                         | Set peak power Profile 1, 2, 3, 4                                                                           | kW/MW | 0-6500      |
| 6                     | Control delay                                                     | Pause between individual switchings                                                                         | s     | 1-60        |
| 7                     | Control application point                                         | As of how many % $\Sigma P$ of the set target maximum demand control is to become fully effective.          | %     | 0-75        |
| 8                     | Emergency mode active at X%                                       | Application pint of the emergency mode.                                                                     | %     | 10-80       |
| <b>Other settings</b> |                                                                   |                                                                                                             |       |             |
| 1                     | Measuring period                                                  | Pre-set time by electricity company                                                                         |       | 10,15,30,60 |
| 2                     | Counter constant.<br><b>P_act1</b> , <b>M</b> <b>P_act2</b>       | Counter constant referenced to 1kWh                                                                         |       | 1-99999     |
| 3                     | Voltage transfer<br><b>P_act1</b> , <b>M</b> <b>P_act2</b> ,<br>Q | Voltage transformer ratio<br>U_primary/U_secondary                                                          |       | 1-9999      |
| 4                     | Current transfer<br><b>P_act1</b> , <b>M</b> <b>P_act2</b> ,<br>Q | Current transformer ratio<br>I_primary/I_secondary                                                          |       | 1-9999      |
| 5                     | Counter constant.<br>Q                                            | Counter constant referenced to 1kWh                                                                         |       | 1-99999     |
| 6                     | Average over<br>( <b>P_act1</b> ,<br><b>M</b> <b>P_act2</b> , Q)  | Number of active pulses for mean value.<br>Only affects display.                                            |       | 1-99        |
| 7                     | Cosphi Alarm at<br>Cosphi < XX %                                  | Limiting value for cosphi alarm.                                                                            |       | 0.00 - 0.99 |
| 8                     | Bus Address                                                       | Address of EML at FRAKO<br>Starkstrombus®                                                                   |       | 9-125       |
| 9                     | Auto<br>winter/summer<br>time changeover                          | Activates / deactivates automatic setting of<br>summer and winter time                                      |       | Yes/ No     |

| Pos.           | Designation                                                   | Description                                                                  | Units | Value range                                                                                                         |
|----------------|---------------------------------------------------------------|------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------|
| <b>Options</b> |                                                               |                                                                              |       |                                                                                                                     |
| 1              | Number of profiles used.                                      | Limits profile dependant entries in the basic and load settings.             |       | 1-4                                                                                                                 |
| 2              | Highest add-on address                                        | Limits the add-on stations to the set value.                                 |       | 0-2, M 0-4, L 0-10                                                                                                  |
| 3              | Type of profile switching                                     | Determines how the profile switching affects the control system.             |       | 1) Immediate switching<br>2) Immediate switching.<br>P_acc= 0<br>3) Switching at beginning of next measuring period |
| 4              | Reset pulse edge                                              | Determines the edge of the reset pulse                                       |       | positive/negative                                                                                                   |
| 5              | <input type="checkbox"/> Self adjusting target maximum demand | Menu for setting the self adjusting target maximum demand.                   |       |                                                                                                                     |
| 5a             | <input type="checkbox"/> Activation                           | Determines if the self adjusting target maximum demand is to be carried out. |       | active/ inactive                                                                                                    |
| 5b             | <input type="checkbox"/> Reset by date                        | Reset takes place at a particular date.                                      |       | Day: 1-31<br>Hour: 0-24<br>Minute: 0-59                                                                             |
| 5c             | <input type="checkbox"/> Reset by contact                     | Reset takes place over contact 8.<br>Grouping function                       |       | positive / negative / both                                                                                          |
| 6              | Active pulse monitoring                                       | Monitors if this time period between 2 active pulses is exceeded.            | s     | 0-9999<br>0 = OFF                                                                                                   |
| 7              | <input type="checkbox"/> Grouping function                    | Activates / deactivates the grouping function.                               |       | Yes/No                                                                                                              |
| 8              | Units                                                         | Determines whether the power settings are in kW or MW.                       |       | kW/MW                                                                                                               |

| <b>Load related programming</b> |                                |                                                                  |         |                                    |
|---------------------------------|--------------------------------|------------------------------------------------------------------|---------|------------------------------------|
| 1                               | Priority                       | Importance of load.<br>Cyclic switching: equal importance        |         | 0-99                               |
| 2                               | Channel inversion              | Determines the switching polarity.                               |         | NC/NO contact                      |
| 3                               | <input type="checkbox"/> Group | Identifies to which group the load is assigned.                  |         | 0-8<br>0 = No groups assigned      |
| 2                               | Power                          | Maximum power drawn by load                                      | kW      | 0-6500                             |
| 3                               | Min. ON                        | Minimum ON time.                                                 | min:sec | 0-999:59                           |
| 4                               | Max. OFF                       | Maximum OFF time                                                 | min:sec | 0-999:59                           |
| 5                               | Min. OFF                       | Minimum OFF time                                                 | min:sec | 0-999:59                           |
| 6                               | Preference                     | Determines if the switching times are kept to in emergency mode. |         | Time preference / Power preference |

| <b>Time/ Date</b> |      |              |  |          |
|-------------------|------|--------------|--|----------|
| 1                 | Date | Current date |  | TT.MM.YY |
| 2                 | Time | Current time |  | HH.MM.SS |

### 19.3 Form for Basic Settings

|                 |                |
|-----------------|----------------|
| Customer: _____ | Date: _____    |
| Plant: _____    | Station: _____ |
| ID: _____       | Remarks: _____ |

|                                                                          |   |    |                                                                |
|--------------------------------------------------------------------------|---|----|----------------------------------------------------------------|
| Target maximum demand P1 (Self adjusting target maximum demand inactive) | , | kW | Target maximum demand for profile 1                            |
| <input type="checkbox"/> Current target maximum demand P1                | , | kW | Current Target maximum demand for Profile 1                    |
| <input type="checkbox"/> Initial value target maximum demand P1          | , | kW | Initial value Target maximum demand for Profile1               |
| <input type="checkbox"/> Upper limit target maximum demand P1            | , | kW | Upper limit self adjusting target maximum demand for Profile 1 |
| Peak power P1                                                            | , | kW | Peak power for profile 1                                       |
| Target maximum demand P2 (self adjusting target maximum demand inactive) | , | kW | Target maximum demand for profile 2                            |
| <input type="checkbox"/> Current target maximum demand P2                | , | kW | Current target maximum demand for profile 2                    |
| <input type="checkbox"/> Initial value target maximum demand P2          | , | kW | Initial value target maximum demand for profile 2              |
| <input type="checkbox"/> Upper limit target maximum demand P2            | , | kW | Upper limit self adjusting target maximum demand for profile 2 |
| Peak power P2                                                            | , | kW | Peak power for profile 2                                       |
| Target maximum demand P3 (Self adjusting target maximum demand inactive) | , | kW | Target maximum demand for profile 3                            |
| <input type="checkbox"/> Current target maximum demand P3                | , | kW | Current Target maximum demand for profile 3                    |
| <input type="checkbox"/> Initial value target maximum demand P3          | , | kW | Initial value target maximum demand for Profile 3              |
| <input type="checkbox"/> Upper limit target maximum demand P3            | , | kW | Upper limit self adjusting target maximum demand for Profile 3 |
| Peak power P3                                                            | , | kW | Peak power for Profile 3                                       |
| Target maximum demand P4 (self adjusting target maximum demand inactive) | , | kW | Target maximum demand for Profile 4                            |
| <input type="checkbox"/> Current target maximum demand P4                | , | kW | Current target maximum demand for Profile 4                    |
| <input type="checkbox"/> Initial value target maximum demand P4          | , | kW | Initial value target maximum demand for Profile 4              |
| <input type="checkbox"/> Upper limit target maximum demand P4            | , | kW | Upper limit self adjusting target maximum demand for Profile 4 |
| Peak power P4                                                            | , | kW | Peak power for Profile 4                                       |

**Counter and transformer data**

|                              |                                                                     |                          |
|------------------------------|---------------------------------------------------------------------|--------------------------|
| Counter constant (P_act1)    | <input type="checkbox"/> Imp/kWh<br><input type="checkbox"/> Imp/Wh | Printed on counter       |
| Voltage transformer (P_act1) | Ratio Up/Us                                                         | Printed on U-transformer |
| Current transformer (P_act1) | Ratio Ip/Is                                                         | Printed on I-transformer |
| Average over (P_act1)        | Number of<br>Pulses                                                 | Standard settings = 1    |
| Voltage transformer (P_act2) | Ratio Up/Us                                                         | Printed on U-transformer |
| Current transformer (P_act2) | Ratio Ip/Is                                                         | Printed on I-transformer |
| Counter constant (P_act2)    | <input type="checkbox"/> Imp/kWh<br><input type="checkbox"/> Imp/Wh | Printed on counter       |
| (P_act2)                     | Number of<br>pulses                                                 | Standard setting = 1     |
| Voltage transformer (Q)      | Ratio Up/Us                                                         | Printed on U-transformer |
| Current transformer (Q)      | Ratio Ip/Is                                                         | Printed on I-transformer |
| Counter label (Q)            | <input type="checkbox"/> Imp/kVarh                                  | Printed on counter       |
| Average over (Q)             | Number of<br>pulses                                                 | Standard setting = 1     |

**Calculating Counter and Transformer Constants**

If the counter print out is given in Wh then the counter constant evaluated must be multiplied by 1000.

$$\text{Transformer} = \frac{X_{\text{primary}}}{X_{\text{secondary}}}$$

Note that both values are in the same units.

**Other settings**

|                                    |                                                             |        |                                                                                                                   |
|------------------------------------|-------------------------------------------------------------|--------|-------------------------------------------------------------------------------------------------------------------|
| Measuring period                   |                                                             | min    | 10, 15, 30 or 60 min                                                                                              |
| Average over (P_act1, M P_act2, Q) |                                                             | pulses | Counter compatibility standard setting = 1                                                                        |
| Cosphi-Alarm at Cosphi < XX%       |                                                             |        | Only when the pulse output of a reactive work counter is connected. Setting according to profile usually 0.9 ind. |
| Bus-Address                        |                                                             |        | 1-125                                                                                                             |
| Winter-/Sommer time Changeover     | <input type="checkbox"/> Yes<br><input type="checkbox"/> No |        | Yes = automatic changeover                                                                                        |

**Options**

|                           |                                                                                                                                                                                             |  |                                       |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------|
| Number of profiles used   |                                                                                                                                                                                             |  | Number of profiles actually necessary |
| Highest EMD-address       |                                                                                                                                                                                             |  |                                       |
| Type of profile switching | <input type="checkbox"/> Switch over immediately<br><input type="checkbox"/> Switch over immediately Pacc = 0<br><input type="checkbox"/> Switch over at beginning of next measuring period |  |                                       |
| Time pulse edge           | <input type="checkbox"/> positive<br><input type="checkbox"/> negative                                                                                                                      |  |                                       |

|                                                                          |                                                                                                                                                                                                                                                                                 |                                    |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| <input checked="" type="checkbox"/> Self adjusting target maximum demand | <input type="checkbox"/> active<br><input type="checkbox"/> inactive<br><input type="checkbox"/> over external signal<br><input type="checkbox"/> positive<br><input type="checkbox"/> negative<br><input type="checkbox"/> both<br><input type="checkbox"/> over internal date |                                    |
| Active pulse monitoring                                                  |                                                                                                                                                                                                                                                                                 | Min                                |
| <input type="checkbox"/> Allow grouping                                  | <input type="checkbox"/> Yes<br><input type="checkbox"/> No                                                                                                                                                                                                                     |                                    |
| Units                                                                    | <input type="checkbox"/> kW<br><input type="checkbox"/> MW                                                                                                                                                                                                                      | Determines units of power entries. |



## 19.5 Terminal assignments

| Terminal No. | Description                                                            | Notes                                                           |
|--------------|------------------------------------------------------------------------|-----------------------------------------------------------------|
| 1            | FRAKO Starkstrombus® channel A                                         |                                                                 |
| 2            | FRAKO Starkstrombus® channel B                                         |                                                                 |
| 3            | FRAKO Starkstrombus® GND                                               |                                                                 |
| 4            | Add-on bus channel A                                                   |                                                                 |
| 5            | Add-on bus channel B                                                   |                                                                 |
| 6            | Add-on bus GND                                                         | Can be connected to ground via jumper                           |
| 7            | Active pulse input1                                                    | + (For connection to a potential-free contact against ground)   |
| 8            | Active pulse input2 / Reset input self adjusting target maximum demand | + (For connection to a potential-free contact against ground)   |
| 9            | <b>Reactive pulse input</b>                                            | + (For connection to a potential-free contact against ground)   |
| 10           | Time pulse input                                                       | + (For connection to a potential-free contact against ground)   |
| 11           | Profile input 1                                                        | + (for connection a potential-free contact against ground)      |
| 12           | Profile input 2                                                        | + (For connection a potential-free contact against ground)      |
| 13           | Ground                                                                 | - (Ground connection for all inputs)                            |
| 14           | Ground                                                                 | - (Ground connection for all inputs)                            |
| 15           | Load 1                                                                 | Common                                                          |
| 16           | Load connection                                                        | NC contact                                                      |
| 17           | Load connection                                                        | NO contact                                                      |
| 18           | Load 2                                                                 | Common                                                          |
| 19           | Load connection                                                        | NC contact                                                      |
| 20           | Load connection                                                        | NO contact                                                      |
| 21           | Load 3                                                                 | Common                                                          |
| 22           | Load connection                                                        | NC contact                                                      |
| 23           | Load connection                                                        | NO contact                                                      |
| 24           | Load 4                                                                 | Common                                                          |
| 25           | Load connection                                                        | NC contact                                                      |
| 26           | Load connection                                                        | NO contact                                                      |
| 27           | Hardware alarm indication contact                                      | Common with hardware version 1.3 upwards.                       |
| 28           | Hardware alarm indication contact                                      | NO contact (closed on alarm) with hardware version 1.3 upwards. |
| 29           | Alarm contact                                                          | Common                                                          |
| 30           | Alarm contact                                                          | NC contact (open on alarm)                                      |
| 31           | Alarm contact                                                          | NO contact (close on alarm)                                     |
| 32           | Emergency load shedder power supply                                    | Pole                                                            |
| 33           | Emergency load shedder connection                                      | NO contact                                                      |
| 34           | Emergency load shedder connection                                      | NC contact                                                      |
| 35           |                                                                        |                                                                 |
| 36           |                                                                        |                                                                 |
| 37           | Power connection L                                                     | 230VAC                                                          |
| 38           | Power connection N                                                     |                                                                 |
| 39           | Power connection PE                                                    |                                                                 |

### 19.6 Connection diagram



**Important:** When working on **EML 1101**, ensure that the unit is disconnected from mains. Although the **EML 1101** is disconnected from mains, the circuits leading to switch contacts may still be connected to power voltage.

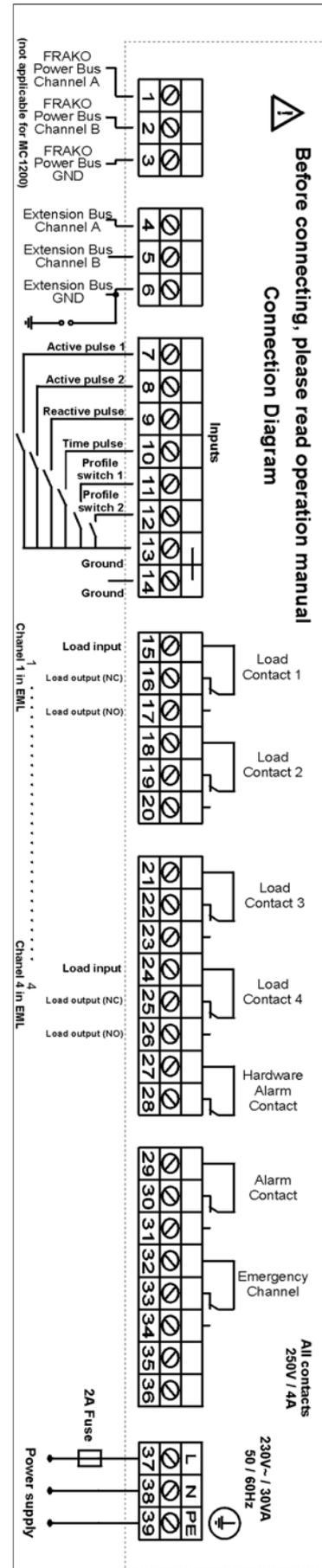
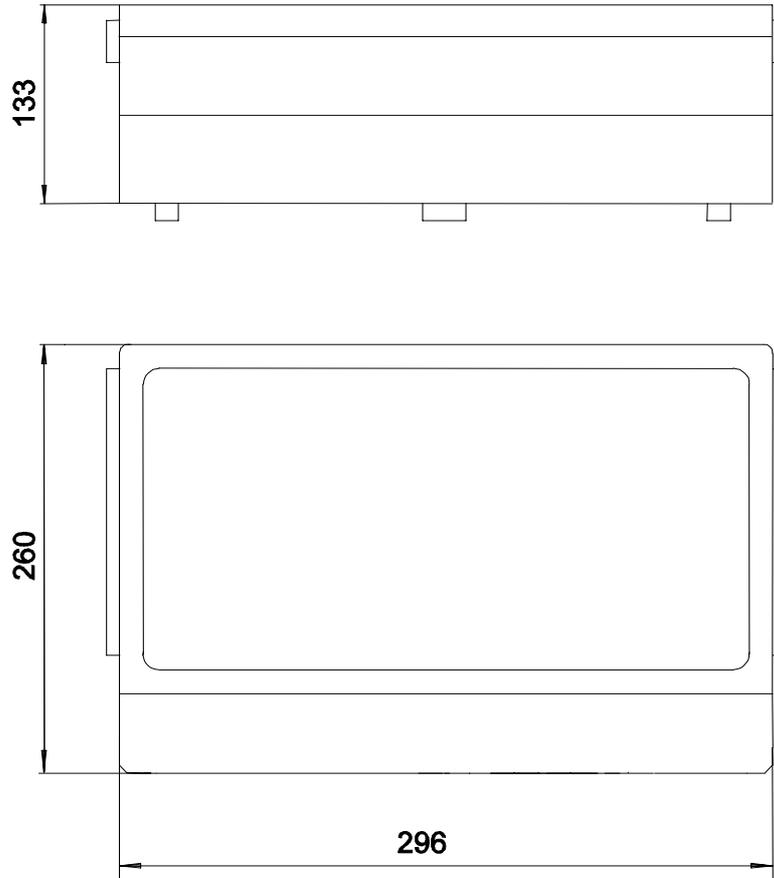


Figure 1 Connection diagram.

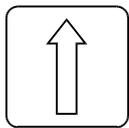
If a load is switched off the relay opens.  
(If the EML is switched off or in the case of a power failure the relays are closed).

## 19.7 Dimensions

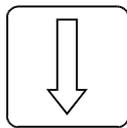


All Dimensions are in millimeter Units.

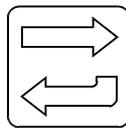
**Figure 2: Enclosure**



Up cursor button



Down cursor button



CR button



MENU button

**Figure 3: Buttons**

## 20 Appendix

### 20.1 Glossary of Terms

**Maximum demand** – The maximum amount of power drawn, measured in kW, during a measuring period.

**Measuring period** – The time period which **EML 1101** limits **maximum demand** to **target maximum demand** for different profiles. Normally electricity companies provide time pulses that indicate the start and end of a **measuring period**. An internal reset for measuring period will occur if the **EML 1101** does not receive a time pulse that indicates the end of a measuring period. Also, time pulse edge determines which edge of the time pulse is used to indicate the start of a new **measuring period**.

**Remaining time** – Time required to reach the end of current **measuring period**.

**Target maximum demand** – an arbitrary limit used by **EML 1101** control system so that average powers do not exceed this limit.

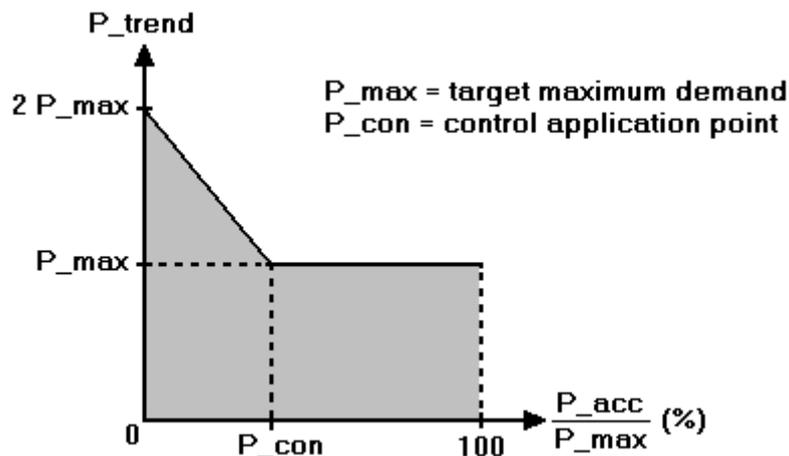
**Accumulated power** – Amount of energy measured since the beginning of current measuring period divided by the duration of measuring period. It is abbreviated by **P\_acc**.

**Trend power** – The extrapolated accumulated power based on energy consumption trends when end of current measuring period is reached. It is abbreviated by **P\_trend**.

**Profiles** – This feature enables different settings to be used by **EML 1101** to cater for the following conditions:

- Tariff switching triggered by electricity companies.
- Different production requirements.
- Time dependent loads.

**Control application point** – Sets **P\_acc** level for **EML 1101** to start limiting **P\_trend** to **target maximum demand**. Monitoring and control is immediately active at the start of a measuring period (see figure below). **P\_trend** is allowed up to twice the **target maximum demand** value initially. Then, it is reduced linearly with **P\_acc** until **control application point**. **P\_trend** is limited to **target maximum demand** after **control application point**.



**Emergency mode** – A condition activated when the control characteristics can no longer be maintained under pre-set conditions. The following characteristics are valid during emergency mode:

- Minimum ON time and maximum OFF time are ignored. Minimum OFF time, however, is still taken into account.
- Loads with priorities 1 to 3 are included in the control system.
- The emergency load shedder channel is activated if **EML 1101** cannot reduce **P\_trend** within limits during this mode.

**Emergency load shedder channel** – An additional load channel which is activated last during emergency mode.

**Correction power** – As difference between **target maximum demand**  $P_{max}$  and **P\_trend** multiplied by measuring period divided by the remaining Time in the actual measuring period. It is abbreviated by **P\_corr**. If **P\_corr** is positive, then extra power is available to switch on loads without **P\_trend** exceeding **target maximum demand**. If **P\_corr** is negative, then loads will be switched off intelligently to prevent  $P_{trend}$  from becoming too high. The switching off of loads is performed according to priorities and other criterions.

$$P_{corr} = (P_{trend} - P_{max}) \cdot \frac{T}{T-t}$$

**Status displays** – Symbols appearing at the bottom left of dot matrix display of **EML 1101**. It shows the statuses of channel/instrument.

**Virtual add-on units** – These are switching channels not physically present but only to provide information using an **EMP 1100** of a PLC control system. The switching procedures are then carried out by the PLC according to settings of **EML 1101**.

**Stations** – Refers to either **EML 1101** or **EMD 1101 Add-on Station**.

**Channels** – Individual load channels that can switch on or off loads. On the hardware side, there is one relay for each channel.

## 20.2 Preference

With software version 1.52 of EML 1101 and software version 2.21 of Opt-SW it is possible to set the value „preference“ in load settings. This setting is only possible by means of the configuration software Opt-SW.

### 20.2.1 Power preference

In case of power preference the maximum demand is more important than the time settings of the single loads.

If the emergency mode is active, the loads will be switched off even if the minimum on-time is not reached. For the loads which are already switched off, it is possible to extend the off time against the setting of maximum off time.

### 20.2.2 Time preference

If the time settings are more important than the maximum demand, set this load to time preference. In this case the time settings are sure in any working condition of EML1101. For example in the emergency mode this load would be switched on, even if there is an exceeding power demand. If the emergency mode occurs and the minimum on-time is not reached, the load would not be switched off.