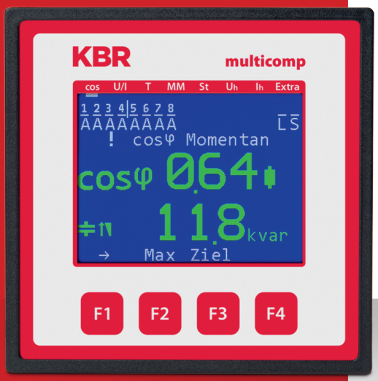
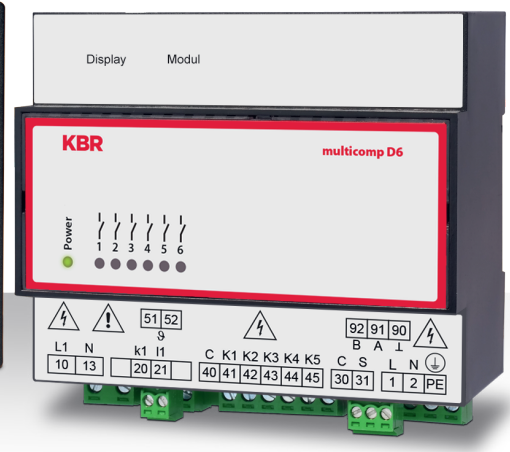
KBR
Energy Management

User Manual
Technical Parameters





multicomp D6-xxx-7

System | English

You can find the instructions for your KBR device at our download center.

https://www.kbr.de/download/

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1 Introduction

Thank you for choosing this KBR quality product.

To become familiar with the operation and programming of the device and to use the full range of functions of this high-quality product at all times, you should read this user manual carefully.

The individual chapters explain the technical details of the device and show how damage can be avoided through proper installation and commissioning.

1.1 User manual

This user manual describes the device version multicomp D6-xxx-7. This user manual must be accessible to the user at all times (e.g. in the switchgear cabinet). Even if the device is resold to third parties, the manual remains an inherent part of the device.

Although the utmost care has been taken in writing this user manual, errors may still occur. We would be very grateful if you would notify us of any errors or unclear descriptions you may notice.

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1.2 Safety keys

This manual contains instructions that you must follow for your personal safety and to avoid material damage. These instructions are identified by a warning sign or information symbol, depending on the degree of hazard they warn about.

DANGEROUS VOLTAGE

"Warning" means that death, major injuries or damage may occur if suitable safety precautions are not taken.

CAUTION

"Caution" means that minor injuries or damage may occur if the appropriate safety precautions are not taken.

NOTE

"Note" is an important piece of information on the product, its operation or the respective part of the operating instructions to which special reference is being made.

Disclaimer

The contents of these operating instructions have been carefully reviewed in terms of the hardware and software described. Nonetheless, deviations cannot be ruled out, and the manufacturer cannot guarantee 100% conformity. The specifications made in these operating instructions are reviewed on a regular basis; any corrections required will be included in the next revision.

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1.3 Safety notes

In order to prevent operating errors, device operation is kept as simple as possible. This will enable you to start your device up quickly.

It is in your own interest to read the following safety instructions carefully. The applicable DIN/VDE regulations must be observed during installation!

Power supply connection, setup and operation of the device must be performed by qualified personnel only. Qualified personnel as defined in the safety notes in this user manual are those authorized to set up, ground and mark devices, systems and circuits in accordance with applicable standards and regulations.

To prevent fire and electric shock, do not expose the device to rain or moisture!

Before connecting the device to the power supply, check whether the local power supply conditions comply with the specifications on the device nameplate.

CAUTION

Incorrectly connecting the device can damage it.

For device connection, the data given in the connection diagram must be complied with (see chapter "Connection diagram") and the connection lines must be voltage-free. When wiring, always ensure that all wiring material used is neither damaged nor defective and that the polarity is correct!

Proper and safe operation of the product requires correct transport, storage, installation and assembly as well as careful operation and maintenance.

If the device has any visible damage it is considered unfit for use and must be disconnected from the power supply!

Troubleshooting, repairs and maintenance work may only be carried out at our plant or after contacting our customer service team. If the device is opened without authorization, any warranty or guarantee claim is forfeited. Correct functioning can no longer be guaranteed!

Opening the device may expose live parts. Capacitors in the device may still be charged, even if the device has been disconnected from all power sources. Do not operate open devices under any circumstances!

Systems that are at risk from lightning strikes must feature lightning protection for all input and output lines.

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1.4 Product liability

You have purchased a high-quality product. Only top-quality components with exceptional reliability are used.

Each device undergoes a long-term test before delivery.

With regard to product liability, please see our general terms and conditions for electronic devices, which you can read at www.kbr.de.

The warranty on device characteristics only applies if the device is operated in accordance with its intended use!

1.5 Disposal

Please dispose of defective, out-of-date or no longer used devices properly.

If required, we will dispose of the device for you.

1.6 Overvoltage and lightning protection

To protect your purchased high-quality devices from damage, we strongly recommend that you take overvoltage protection measures. Protect control voltage inputs, pulse and bus lines.

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2 Connecting the multicomp D6-xxx-7

2.1 Installation and assembly

- The applicable DIN/VDE regulations must be observed for installation.
- Before the device is connected to the power supply, check whether the local power supply conditions comply with the specifications on the nameplate. Incorrect connection may result in the destruction of the device. A different mains frequency can also affect the measurement.
- The device must be connected in accordance with the connection chart.
- Systems that are at risk from lightning strikes must feature lightning protection measures for the power supply input.

CAUTION

The control voltage as well as the applied measuring voltage of the device must be protected using a back-up fuse.

When connecting the current transformer, the energy flow direction and the correct assignment to the voltage path must be observed.

During installation, please also observe our safety instructions to protect against overvoltage and lightning in the "Protective measures" chapter of this manual.

NOTE

The following points must be observed when connecting the device:
- Direction of energy flow
- Assignment of measuring voltage input/current transformer input

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- **Energy flow direction:** When mounting the transformer, observe the current flow or energy flow direction. If the current transformer is mounted the wrong way round, the measured current value will be negative.

  A prerequisite for this is that energy is supplied to the device.

- **Assignment - Measuring voltage input / Current transformer input:**
  The current transformer on terminal 20/21 (k1/l1) must be installed in the phase in which the measuring voltage for terminal 10 (L1) is measured.

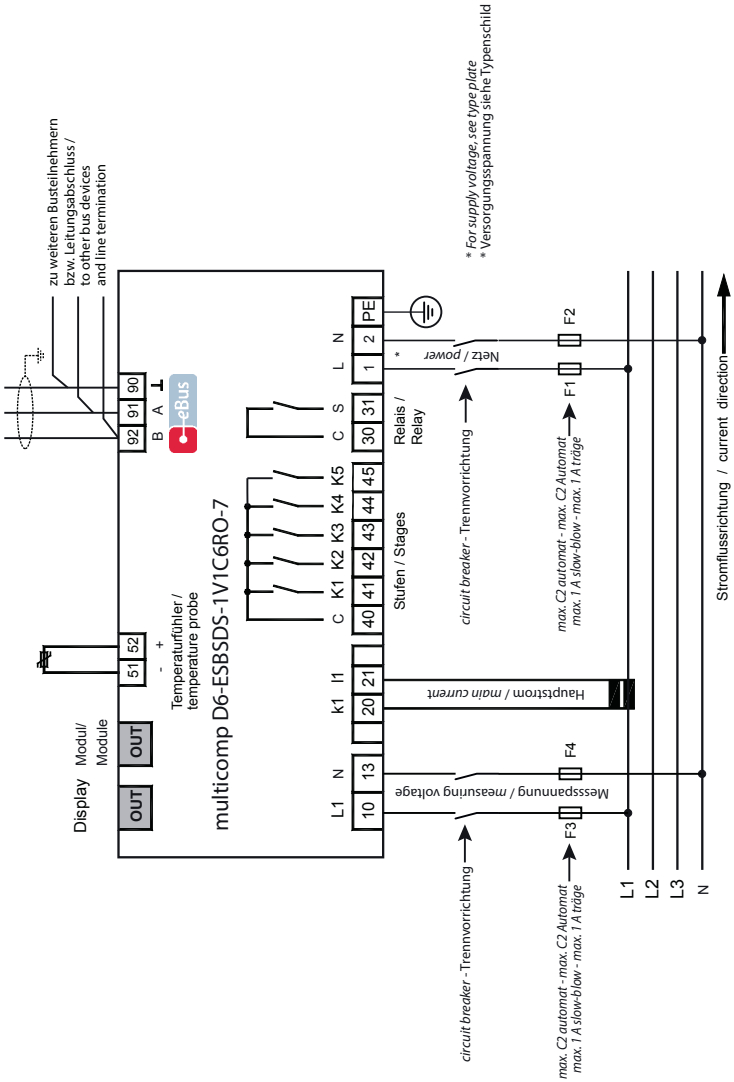
  – The device will display positive current when connection and energy flow direction are correct.

  - If connected incorrectly, the current displayed is negative. Interchange the connections until the display shows correct values.

CAUTION

Before any interchanging, the current transformer must be shorted out!

2.2 Connection diagram



CAUTION

The coil voltage for the capacitor contactors and the measuring voltage must be drawn from the same phase, as only the measuring voltage is monitored (to protect the contactors from direct reset in case of short-term single-phase power failure)

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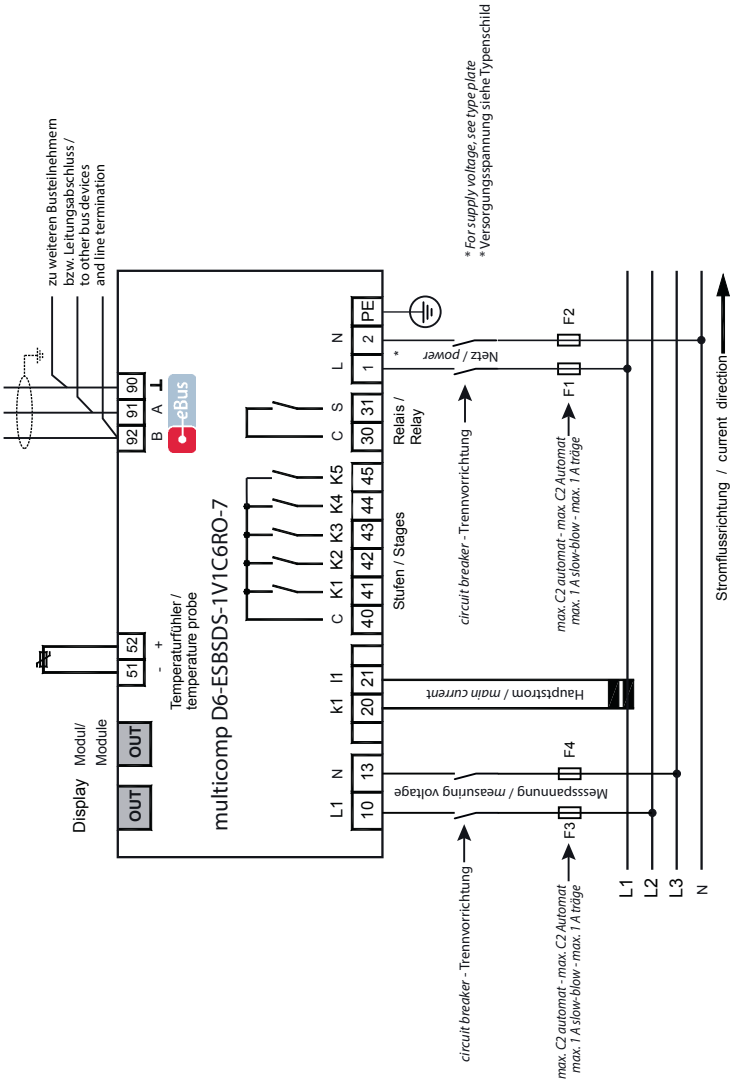

For voltage supply, see nameplate.

2.3 Terminal assignment

Terminal:	
1 (L) and 2 (N):	**Power supply connection** A control voltage is required to supply the device with power. The unit is equipped with a multi-range power supply and may be supplied by voltages of 100 – 240V ± 10 %, DC 50/60 Hz (see nameplate for device voltage).
10 (L1,Lx): **13 (N,Ly):**	**Voltage measuring input** Input voltage both as PH-N and PH-PH measurement. Direct measurement for 100... 500...600V AC. The measuring range is configurable. If the measuring range is exceeded, an error message is displayed. For higher voltages, connection via voltage transformers is necessary (medium voltage measurement x/100 V), measuring range from 500V to 30.0 KV Ph-Ph.
20 (k1) and 21 (l1):	**Current measurement inputs** The measuring input for current must be connected via a current transformer x/1A AC or x/5A AC. When connecting the transformer, pay attention to the energy flow direction and to the correct assignment of measuring voltage input to current transformer.
30 (C) and 31 (S):	**Floating relay contact** This contact serves as a message or alarm output. During operation, an acoustic or visual message can be activated or a consumer switched off using this relay. The contact is open as long as the device is dead as well as when there is an active message. Maximum switching capacity 2A at 250V AC.
40 (C):	**Connection for voltage supply to the relay output terminals 41 to 45** The relays for the control outputs share the same connection to the supply voltage.

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Terminal:	
41 (K1) to 45 (K5):	**Non-floating relay contacts** These contacts are used as control outputs for the capacitor switching contactors. The contacts are open as long as the device is switched off and in stages that are not connected. Maximum switching capacity 2A at 250V AC.
51 (-) and 52 (+):	**Temperature sensor input** A temperature sensor, e.g. PT1000, can be connected to this input to measure the switchgear cabinet temperature. Temperature measuring range of – 20°C to 100°C +/- 2°C.
90 (ground): **91 (A)** **92 (B)**	**Interface connection** For communication via eBus or Modbus

2.3.1 Connection of a remote current measurement

Connection of a remote current measurement
(the following connection diagrams must be observed)

Structure 1:

When setting up a remote measurement via eBus extended
(RS-485 3-wire bus up to 1200 m length).
From multisys BSES to multisys ESBS and multimess D4-0-BS.

Only possible with a current multicomp D6-xxx-7!

Structure 2:

When setting up a remote measurement via module bus extended
(measurement in the immediate vicinity of the compensation, max. length 15 m).
From multicomp D6-xxx-7 directly to multimess D4-0-BS via module bus.

Only possible with a current multicomp D6-xxx-7!

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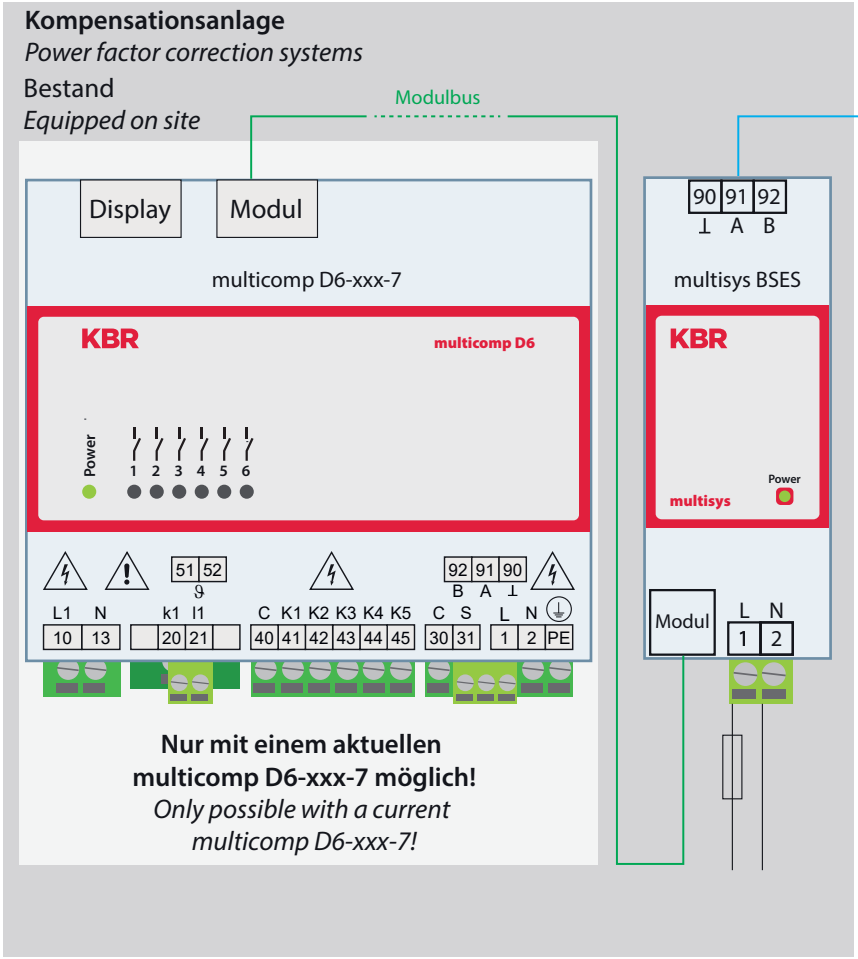
Aufbau einer abgesetzten Messung über Bus verlängert (Busleitung bis 1200 m Länge).

Set-up of a remote measurement via bus extended (bus cable up to 1200 m length)



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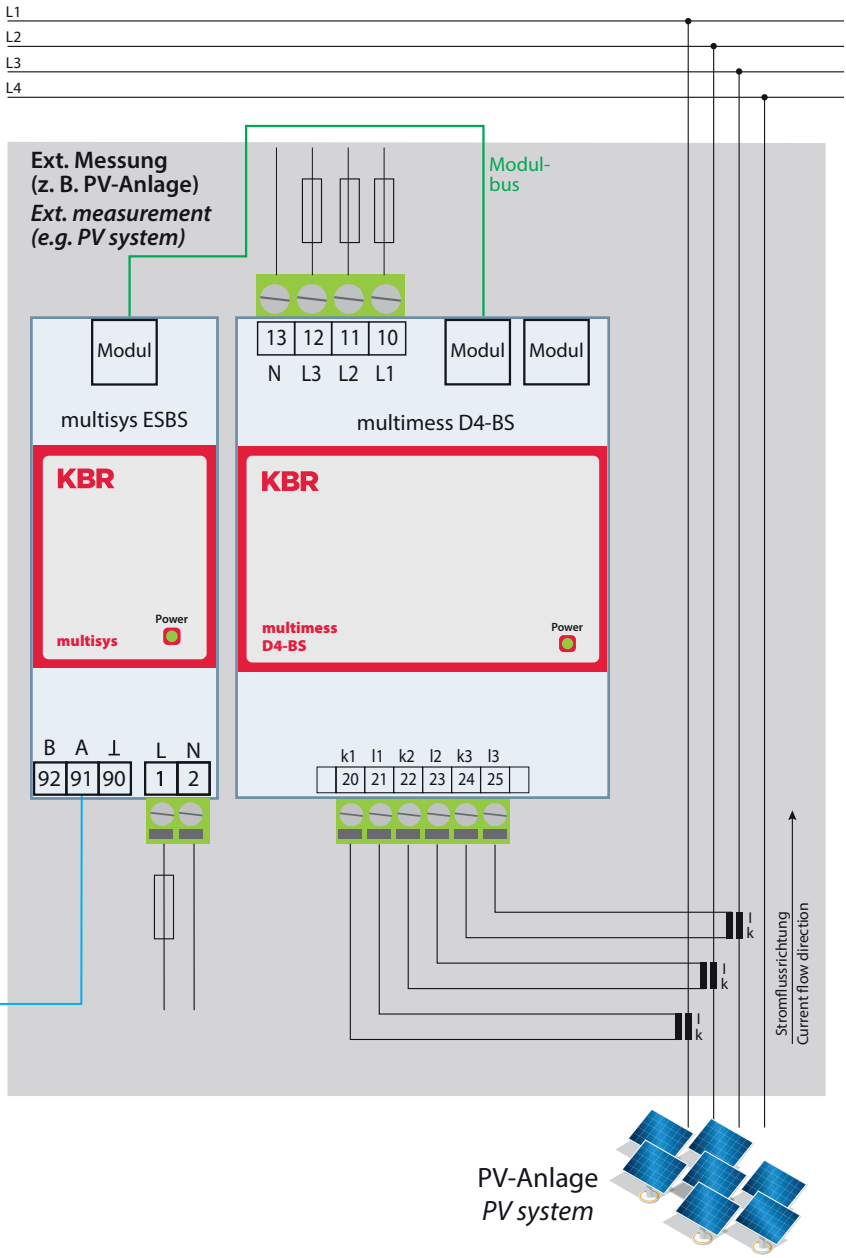

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Aufbau einer abgesetzten Messung über Bus verlängert (Busleitung bis 1200 m Länge).

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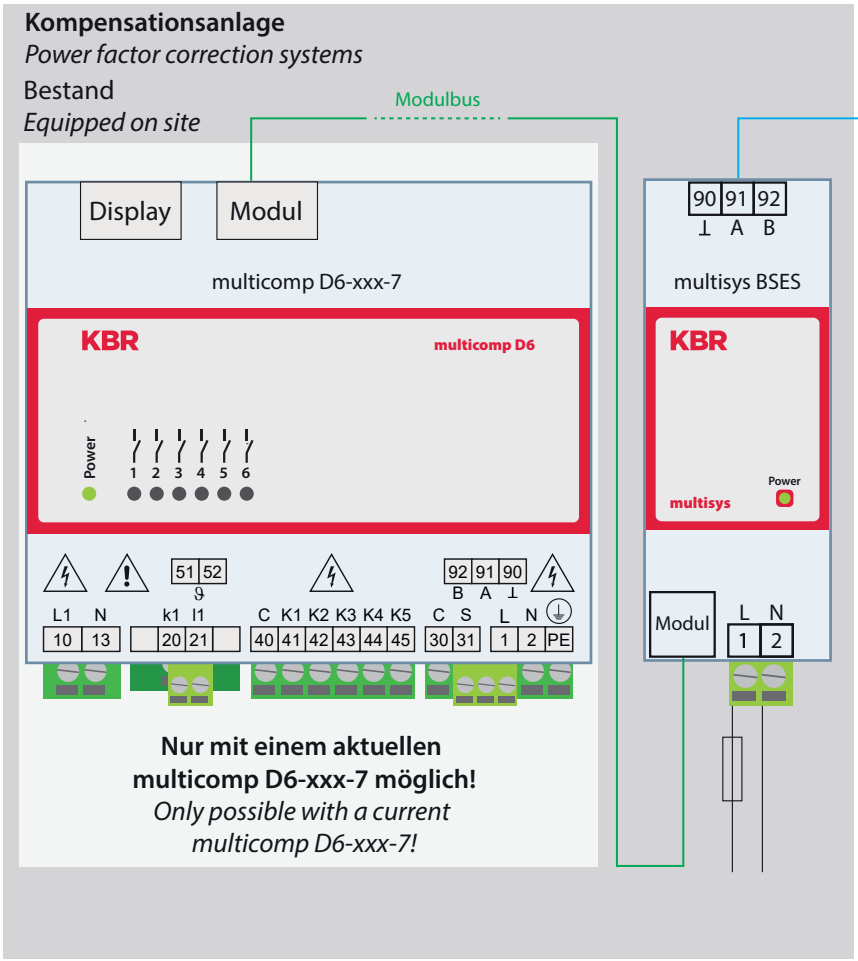

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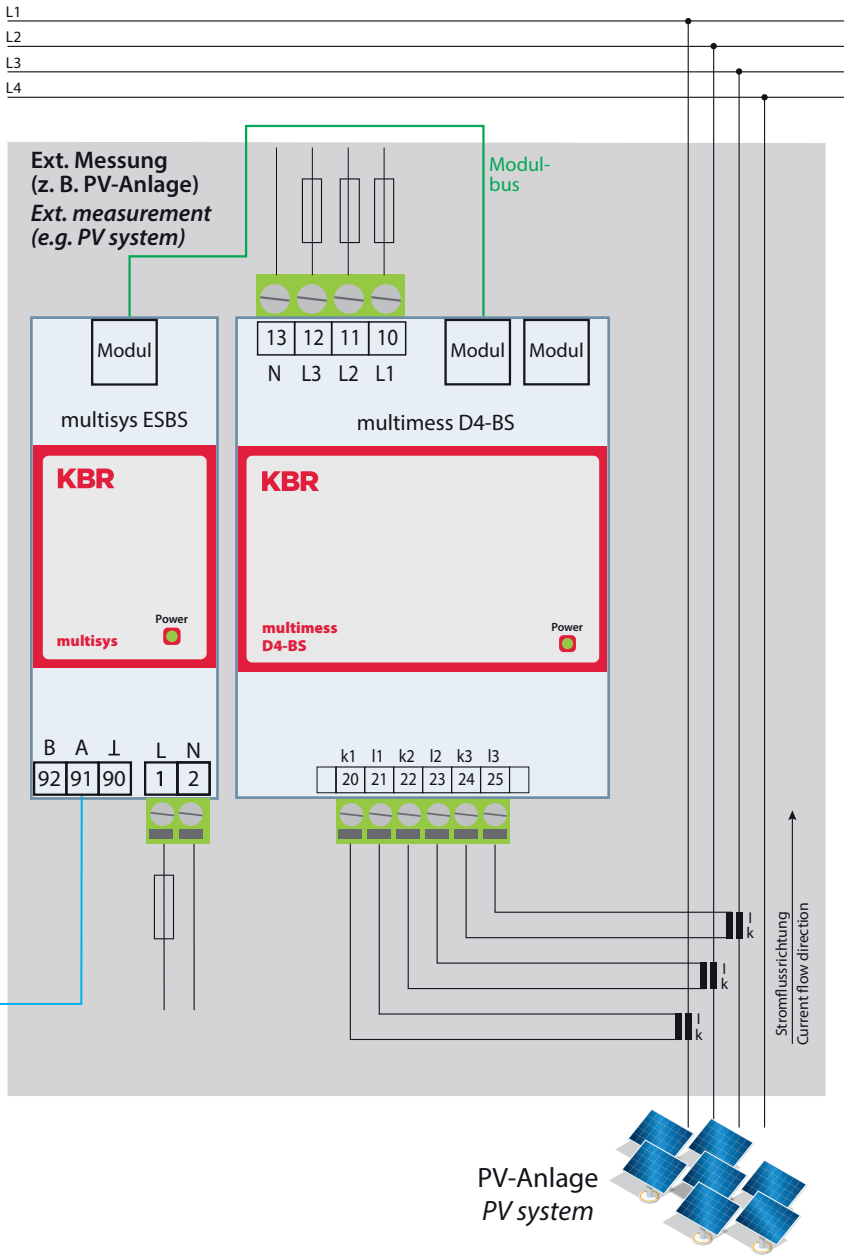

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2.4 Device memory

Non-volatile long-term memory

The device is equipped with an internal, non-volatile memory in which long-term data is stored.

Buffered real-time clock (RTC)

After an uninterrupted charging time (device connected to the supply voltage) of approx. 8 hours, the buffer capacitor will have a sufficient charge to protect the internal clock from failure due to lack of operating voltage for approx. 14 days.

NOTE

If the buffer capacitor is discharged and there is no supply voltage, once the device has been switched on the time settings will be incorrect and must therefore be reset.

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3 Commissioning guideline for the multicomp D6-xxx-7

This guideline helps you to correctly start up the compensation controller **multicomp D6-xxx-7** . It provides you with step by step instructions to help you find the options relevant for you in the operating instructions.

To begin with, there are two cases in which the commissioning procedure for the **multicomp D6-xxx-7** differs.

Case 1: You have bought a complete compensation unit from **KBR**, and the controller is already installed. If this is the case, certain settings are already preconfigured in the controller.

Case 2: You only bought the controller, or the controller with additional modules (**multisio D2-1T2RO, multisio D2-4RO, multisio D4-4RO ISO, multisio D2-4CI** and **multimess D4-0-BS**) and individual capacitor stages, but the device is not assembled. In this case, the controller is delivered with the default settings (refer to chapter Default settings) and has thus not been preconfigured.

IMPORTANT SAFETY INFORMATION

CAUTION

The discharge times are automatically predefined for the following programmed stage powers. However, these must be checked and corrected if they differ from the capacitor specifications.

Capacitor power	Discharge resistance	Discharge time
2.5 kvar – 7.5 kvar	300 kOhm	60 seconds
10 kvar–17.5 kvar	300 kOhm	120 seconds
20 kvar and above	300 kOhm	180 seconds

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3.1 Controller not configured

If a controller which has not been configured is to be started up, the following procedure has to be performed step by step.

1. Configuration additional modules (**multisio D2-1TI2RO, multisio D2-4RO, multisio D4-4RO ISO, multisio D2-4CI** and **multimess D4-0-BS**)

If there are no additional temperature, relay or induced current measuring modules, this step can be skipped. To configure additional modules, connect them and the supplied bus line to the basic module. The additional modules can then be activated individually using a scan mode, which has to be triggered via the basic module's operating panel and the DIP switches or scan buttons on the additional module. If the compensation unit consists of several cabinets, the correct cabinet assignment has to be set up.

Detailed instructions for this step are given in chapter Settings under Modules / Display submenu.

2. Configuring current transformer values

All current transformer parameters need to be configured correctly for the compensation controller to function properly. Primary and secondary current of the transformer have to be set. These parameters can be found on the nameplate of the current transformer. In addition, the phase allocation of the transformer needs to be configured correctly. In the controller, the phase (L1, L2, L3) in which the current transformer is integrated has to be set.

You can find more detailed information on this topic in chapter Start-up under Transformer settings submenu.

3. Setting target cosine

You can ask your electricity supplier for the target cos, which should be set up at this point. By default, the target cos is set to 0.95 inductive (see the "Default settings" chapter).

You can find more detailed information on this topic in chapter Start-up under Target cosine submenu.

NOTE

Summer-CosPhi:

For a specified, adjustable time range, the target cosine can be altered, deviating from the default settings (Menu item DST, Summer-target cosine). The setting range for the time range goes from month 01 to month 12. beginning or ending with the 1st day of the

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month set. The setting range for the target cosine values is the same as the default target cosine values (ind. 0.5 to cap.0.5).

The summer CosPhi cannot be activated in the Systems-Setting Generator (Power generation plants).

Setting under: Commissioning => target cosine => para => DST => CosPhi

4. Configuring the capacitor stages

There are two ways of configuring the capacitor stages. The stages can be configured manually or using the auto configuration mode (a connected current measuring module is required).

The most important setting to pay attention to is the stage power. The stage power can be looked up on the nameplate of the stage or the circuit diagram and then programmed manually. The auto configuration mode then automatically sets this value. However, it has to be checked and confirmed after each time the auto configuration mode is applied.

Detailed instructions for the auto configuration mode are given
in chapter Extra ➔ Commissioning ➔ Stages ➔ Stage ➔ Auto configuration mode.

After the stage power has been configured, you have to set the detuning factor. This factor can be read on the circuit diagram cover sheet or the nameplate of the stage.

If the compensation unit consists of several cabinets, the cabinet assignment should be adjusted accordingly.

Detailed instructions for this step are given in chapter Start-up under Stages submenu.

5. Function test

A function test should be performed after all values have been programmed step by step, by disconnecting the controller from the power supply for a few seconds.

The controller should start automatically after it is reconnected to the power supply. If the cosφ voltage is read in the cosφ act. menu immediately after switching it on, the value for cosφ should be low and inductive. After approx. 180 seconds, the controller starts to switch on the individual capacitor stages.

The cosφ, which can be read in the cosφ act. menu, should have risen in comparison with former values, or it should rise when switching on additional stages. If the compensation system is designed correctly, the controller should compensate to the set target cos phi after a while.

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3.2 Default settings after reset

Primary voltage/secondary voltage	400 V/400 V Ph-Ph
Primary current/secondary current	1000 A/5 A
Cosφ 1 (target cosφ)	inductive 0.95
Cosφ 2 (target cosφ with energy recovery)	inductive 1.00
Cosφ 3 (alarm cosφ for FTS message)	inductive 0.92
Damping coefficient for current and voltage	2
Temperature measurement	Active
Switching threshold fan	28°C, hysteresis 5°C
Operating point alarm	45°C, hysteresis 5°C
Operating point emergency off	48°C, hysteresis 5°C
Idle time	30 sec.
Alarm relay time	1200 sec.
Alarm relay	NC contact
Hysteresis connection	70% of smallest available stage
Hysteresis switch-off	100% of smallest available stage
Switch attenuation (stage interval)	8 sec.
Operating cycle limit	80,000
Stage power	No stage power programmed
Stages	System type standard
	Discharge time 180 sec.
	Detuning 7 %
	Cabinet No. 1
	Stage 5 as fan

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Continued

Harmonics monitoring	Active, THD 8%, error message is displayed
Induced current measurement	Disabled
Password	9999/all functions can be accessed
Limit overvoltage switch-off	Active, 253 V Ph-N, stages switch off, error message is displayed
Analog controlled compensation stage	off
+limit induced current exceeded	150%
Type	positive
Output	Alarm relay and excess current switch off
Limit induced current exceeded	00%
Type	off
Output	off
Switch mode	toff - t - ton
Stage change after 24 hrs.	No

Unaffected by a RESET:
Bus address
Date and time
Language

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4 Functions of the controller in the secureC safety and maintenance concept

CAUTION

These functions are available with the current measuring module multisio D2-4CI and the energy measuring module multimess D4-0-BS!

Information on password protection of secureC can be found in chapter 5.13.2.3 Service submenu.

4.1 Stage resonance frequency monitoring

A stage is only locked from further use if it enters the critical range (resonance frequency) due to loss of capacitance. The stage will be identified in the display by a X.

CAUTION

You can unlock the stage in the Mode submenu of the
Stage administration menu.

If the stage is locked (loss of capacitance), do NOT activate the learning mode but exchange the defective capacitor!

1. Evaluating the resonance frequency:

a) **Detuning 5.5%, 7% or 8% (5th harmonic is critical)** If resonance frequency is below 111% of the 5th harmonic, the **warning threshold** is exceeded.
If resonance frequency is below 107 % of the 5th harmonic, the **alarm threshold** is exceeded.

b) **Detuning 12.5% or 14% (3rd harmonic is critical)** If resonance frequency is below 104% of the 3rd harmonic, the **warning threshold** is exceeded.

If resonance frequency is below 103 % of the 3rd harmonic, the **alarm threshold** is exceeded.

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When the

warning threshold is exceeded, a message (E28 capacitance loss) is displayed (**warning threshold** of induced current approx. 35 % too low)

alarm threshold is exceeded, a message (E28 capacitance loss) is displayed (**alarm threshold** of induced current approx. 45% too low)

If loss of capacitance can still be detected after five more attempts at switching-on a stage, this stage is locked from further connection and the message **E30 stage locked** is displayed.

4.2 Current consumption and performance monitoring of stages

CAUTION

Monitoring is only performed when switching on or off additional stages!

If a stage is detected to be defective (**E26 capacitor current too high or E 28 capacitance loss (capacitor current too low))**, a message is displayed. Limiting condition is the stage pattern of the stages created.

The error message **E27 check fuse** is displayed if the current consumption of the system (the cabinet in which the measurement is performed) does not change when a stage is switched on.

If the value does not change when a stage is switched off, the message E29 Contactor defective (stuck) is displayed.

4.3 Current consumption and performance monitoring of complete cabinets

Current consumption monitoring of individual cabinets is an important safety function.

The current consumption is measured with a **multisio D2-4CI** current-measuring module or a **multimess D4-0-BS** energy measuring module in the cabinet. Each cabinet is monitored individually. Current consumption values which are too high or too low are taken into account.

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Function with too high power consumption:

The cabinet is permanently monitored. The intervals between the measurements vary according to the number of connected modules (measurement intervals: 50 to 500 ms).

If the power consumption in a cabinet is too high, the stages in this cabinet are switched off one after the other until either all stages in the cabinet are switched off or the power consumption is within limits again.

Settings:
The settings can be changed in the menu Extra => Settings => System => Parameters => Limits => Lim-U => Lim +Ie

Possible settings:
Permissible limit violation between 110% and 200% of rated current
Monitoring of limit violation active or off

Action in case of an error:
Only alarm relay switches
Only the compensation stages are switched off
The alarm relay switches and the compensation stages are switched off
No action, just a message via KBR eBus

In case of an error, an additional message is displayed on the LCD.

Example: E31 Lim-Ie violated, cabinet No.: 2

For **3-phase** induced current monitoring, **a current measuring module** multisio is required **for each cabinet**.

Using **1-phase** induced current monitoring, **one current measuring module can be used to monitor 3 cabinets**. In this case, the cabinet assignment of the current measuring module is equivalent to the first input of the current measuring module.

Example:

Current measuring module assigned to **cabinet 1**:
Input 1 = cabinet 1
Input 2 = cabinet 2, etc.

Current measuring module assigned to **cabinet 2**:
Input 1 = cabinet 2
Input 2 = cabinet 3, etc.

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Function with too low power consumption:

Settings: The settings can be changed in the menu Extra => Settings => System => Parameters => Limits => Lim-U => Lim +Ie

Possible settings: Permissible limit violation between 0% and 90% of rated current
Monitoring of limit violation active or off

Action in case of an error: Alarm relay switches
No action, just a message via the display and KBR eBus

In case of an error, there is only a message, **no stages are switched off.**

4.4 Temperature monitoring of stages

The overtemperature stage switching behavior is as follows:

1.) Reducing the cabinet temperature when the alarm threshold is exceeded (prerequisite: min. 2 cabinets)

When the alarm temperature is exceeded and a dwell time of 3 minutes has elapsed, the device tries to replace the stage with an equivalent stage (same stage power, detuning and type (thyro/contactor)) from a cabinet with lower temperature. After a dwell time of another 3 minutes, the device tries to replace the next stage.

If the cabinet temperature falls under the alarm temperature (not yet below hysteresis limit), no further stage is replaced. (the hysteresis is not working!)

2.) Temperature as selection criterion when switching stages on or off

If the alarm temperature has been exceeded in a cabinet, the temperature is used as a criterion for selecting the stage to be switched.

If several stages with the same stage power and detuning factor are available, the stage with the higher cabinet temperature is preferred for switching off.

For **switching on**, the stage with the lowest cabinet temperature is preferred.

The temperature is only used as a selection criterion if the alarm temperature is exceeded, as otherwise the stage "circular switching" does not work anymore.

3.) Emergency shut-down

If the switch-off temperature is exceeded, only one stage is switched off at first. The next stage is not switched off until a dwell time of 2 minutes has elapsed.

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If the temperature falls below the switch-off temperature (not yet below hysteresis), no other stages are switched off. On the other hand, no stages of this cabinet are switched on as long as the temperature does not fall below the hysteresis threshold.

As soon as the temperature falls below the hysteresis threshold, the stages in this cabinet are released for compensation.

The default settings are:

Fan switching threshold	= 28 °C/hysteresis = 5 °C
Alarm switching threshold	= 45°C/hysteresis = 5 °C
Overtemperature switching threshold	= 48°C / hysteresis = 5°C

This means that the fan switches on when 28°C is exceeded and switches off again when temperature drops below 23°C. The overtemperature alarm is triggered when 45°C are exceeded and is reset when the temperature drops below 40°C. The overtemperature stage switch-off is activated when 48°C are exceeded. After the temperature has dropped below 43°C.

The overtemperature switch-offs for the individual stages are added together so that it can be determined later on whether, and in which cabinet, there are temperature prob-lems

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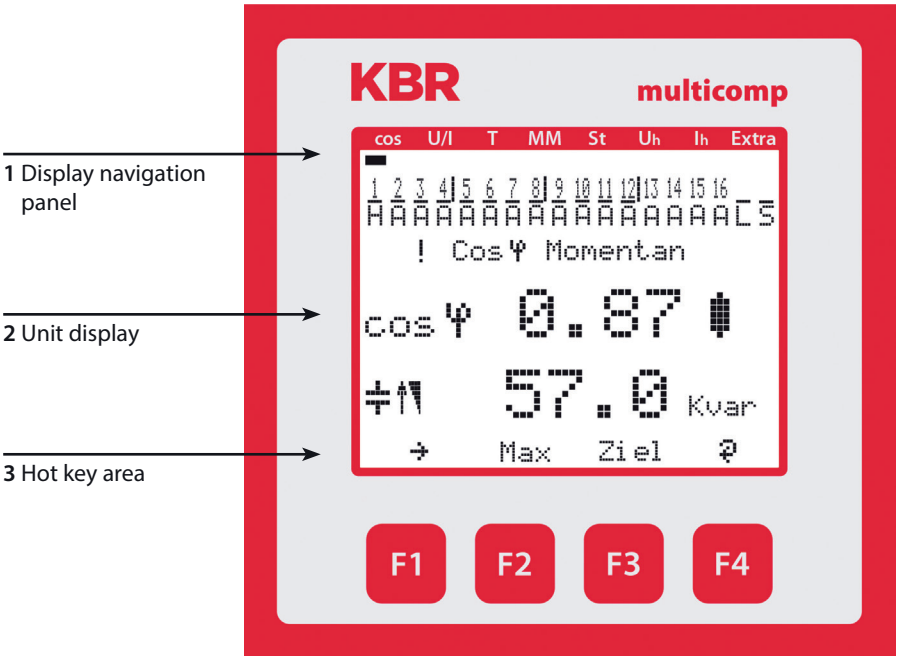
5 Control and display panel



5.1 Description of buttons and displays

1 Display navigation panel

The navigation panel shows the main menu selected, considerably simplifying device operation.
The operator can immediately see what menu he is in.

2 Unit display

The DOT matrix display is normally used to show measured values.
In some submenus, this display area is used to show additional information to assist operation.

3 Hot key area

The text line corresponds to the function keys below it and is used to issue messages and text. The interaction between key and corresponding display ensures user-friendly and self-explanatory operation.

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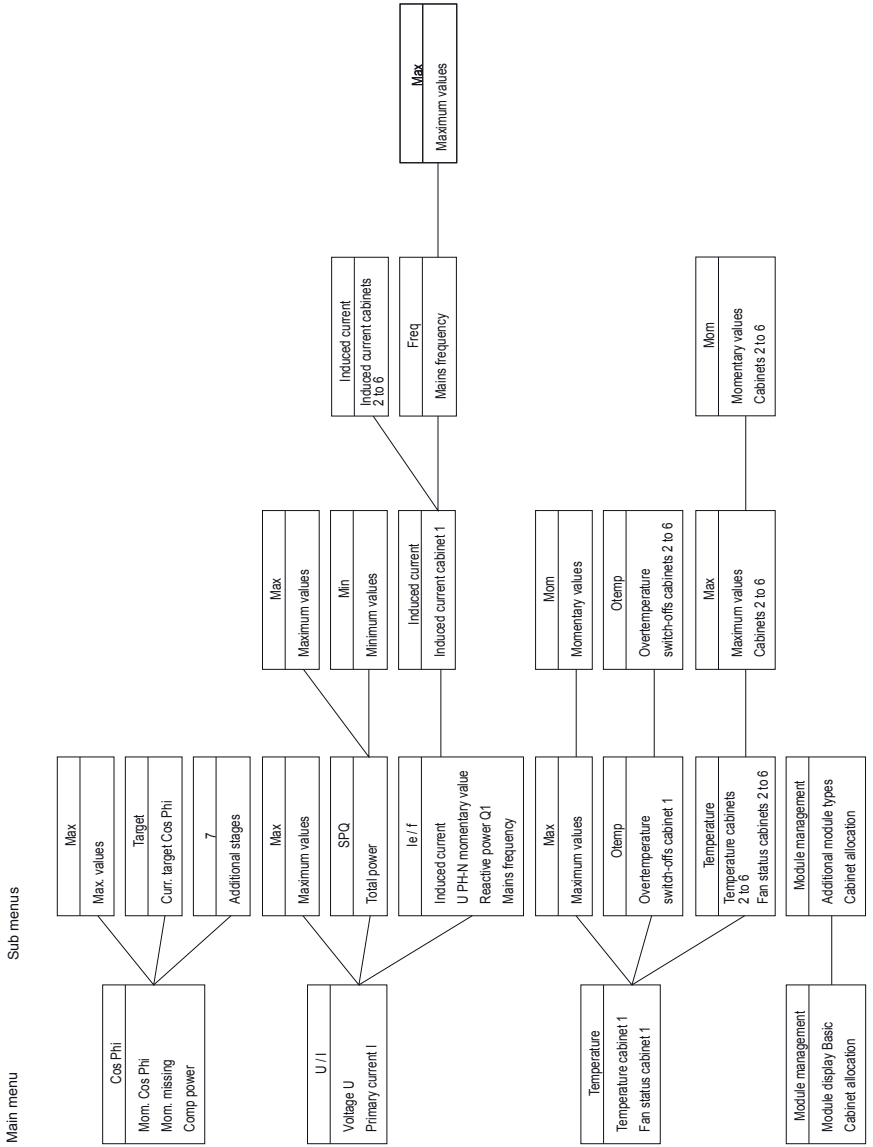
5.2 Navigation and device displays



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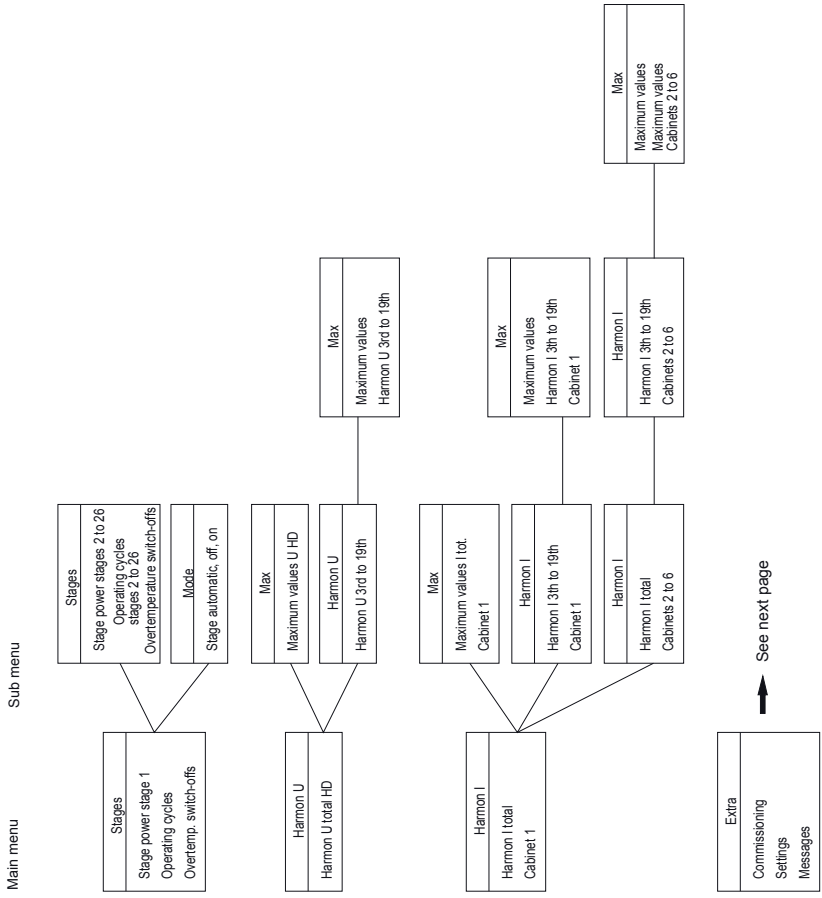
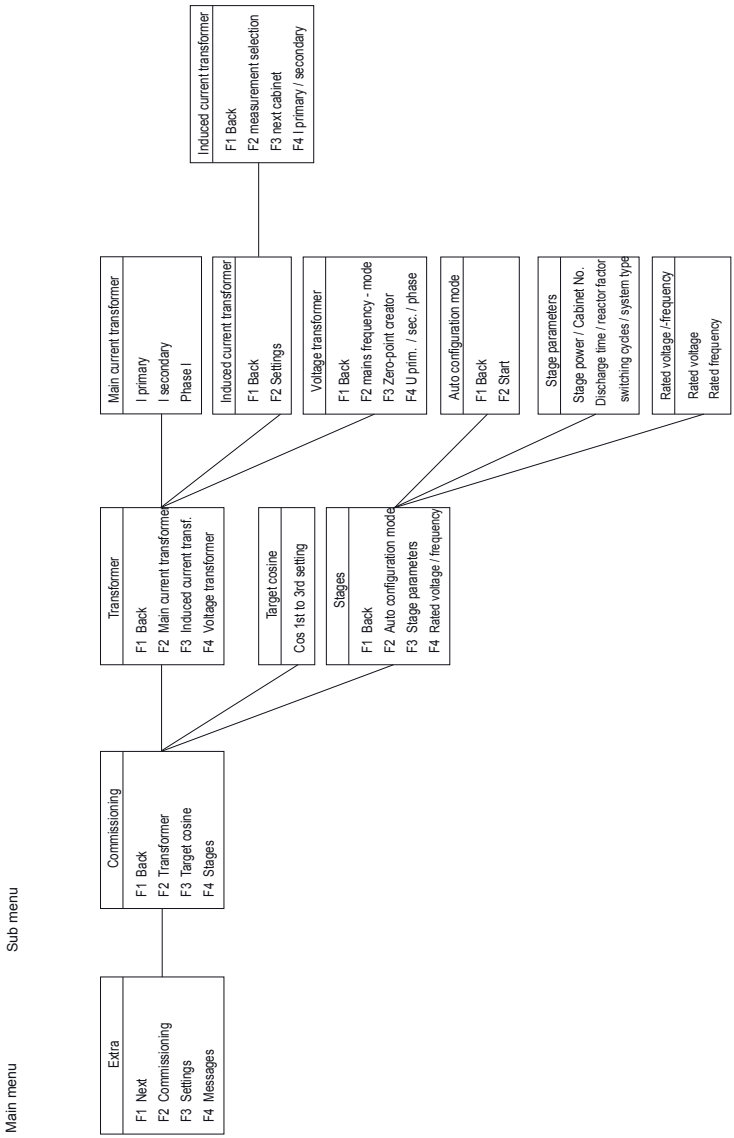

Main menu
Sub menu
Stages
Stage power stage 1
Operating cycles
Overtemp. switch-offs
Stages
Stage power stages 2 to 26
Operating cycles stages 2 to 26
Overtemperature switch-offs
Mode
Stage automatic, off, on
Harmon U
Harmon U total HD
Max
Maximum values U HD
Harmon U
Harmon U 3rd to 19th
Max
Maximum values
Harmon U 3rd to 19th
Harmon I
Harmon I total
Cabinet 1
Max
Maximum values I tot.
Cabinet 1
Harmon I
Harmon I 3th to 19th
Cabinet 1
Max
Maximum values
Harmon I 3th to 19th
Cabinet 1
Harmon I
Harmon I total
Cabinets 2 to 6
Harmon I
Harmon I 3th to 19th
Cabinets 2 to 6
Max
Maximum values
Maximum values
Cabinets 2 to 6
Extra
Commissioning
Settings
Messages
See next page



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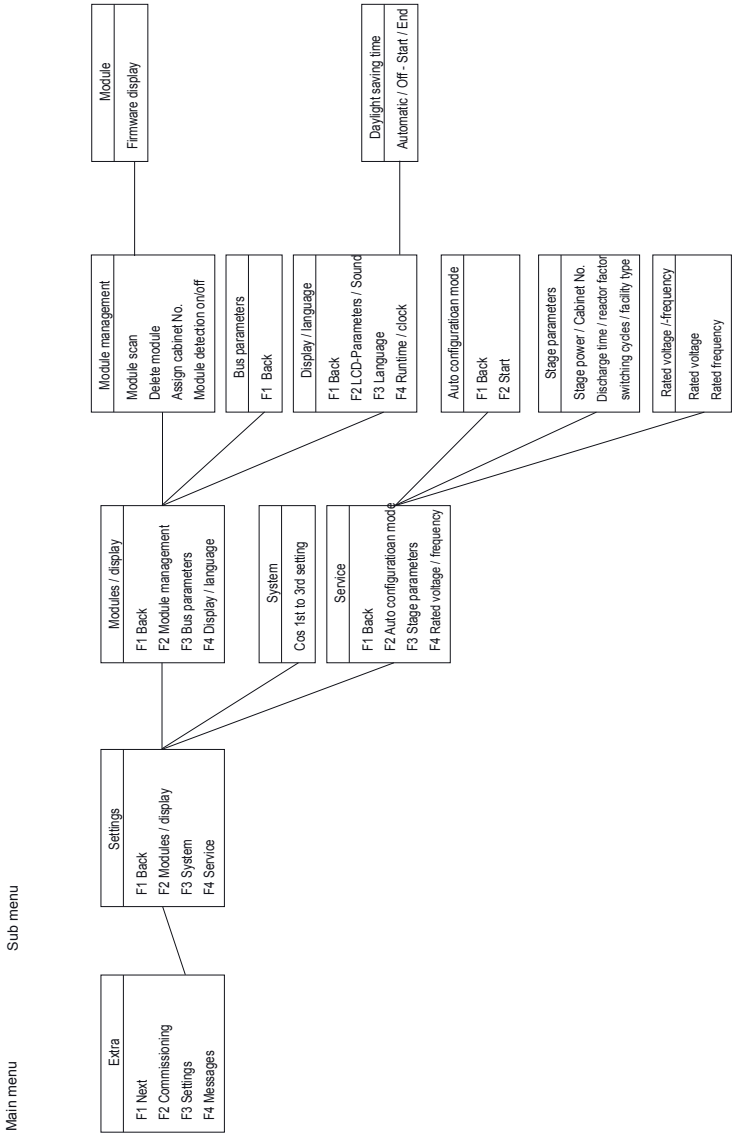
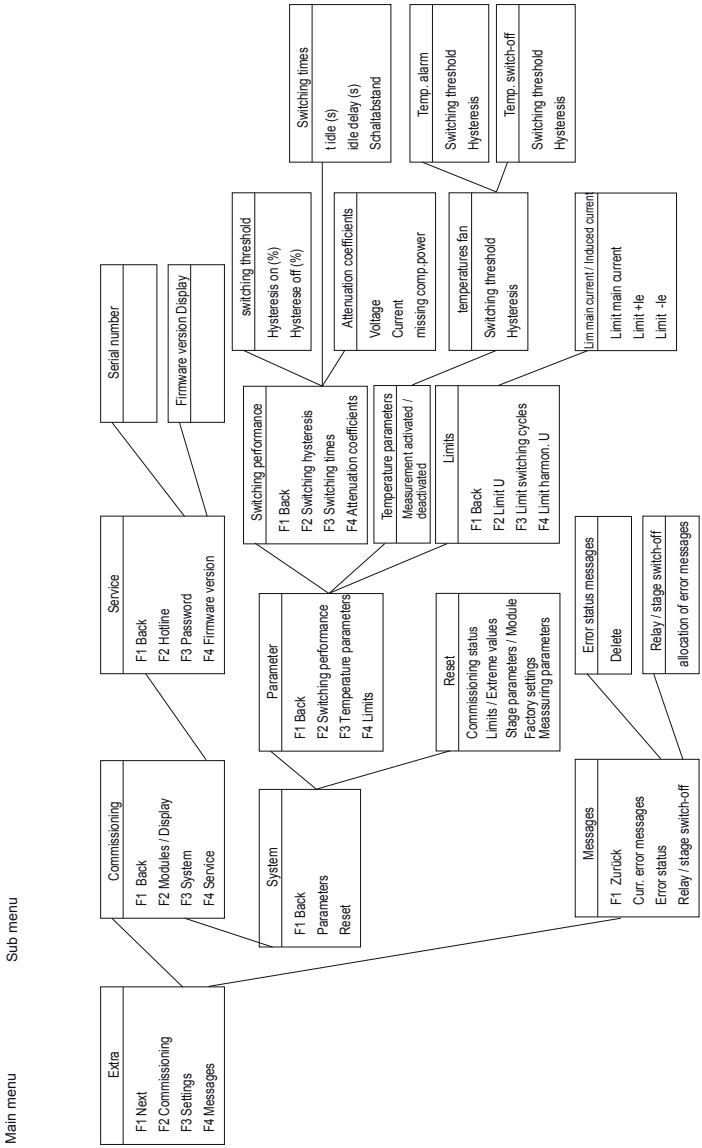

Main menu
Sub menu
Extra
F1 Next
F2 Commissioning
F3 Settings
F4 Messages
Settings
F1 Back
F2 Modules / display
F3 System
F4 Service
Modules / display
F1 Back
F2 Module management
F3 Bus parameters
F4 Display / language
System
Cos 1st to 3rd setting
Service
F1 Back
F2 Auto configuratioan mode
F3 Stage parameters
F4 Rated voltage / frequency
Module management
Module scan
Delete module
Assign cabinet No.
Module detection on/off
Bus parameters
F1 Back
Display / language
F1 Back
F2 LCD-Parameters / Sound
F3 Language
F4 Runtime / clock
Module
Firmware display
Daylight saving time
Automatic / Off - Start / End
Auto configuratioan mode
F1 Back
F2 Start
Stage parameters
Stage power / Cabinet No.
Discharge time / reactor factor
switching cycles / facility type
Rated voltage /-frequency
Rated voltage
Rated frequency



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Definition of terms:

The following signs and abbreviations will be used in the display:

⅄	Star voltage
⅃	Delta voltage
▮	Inductive
≑	Capacitive
↑	Switch on
↓	Switch off
→	Scroll through main menu or submenu
↰	Return
↓	Submenu or parameter selection
+	Value input
?	Selection
◎	Energy recovery (generator operation)
!	Attention message
✎	Edit
⅄	Switching (make or break)
▲	Maximum value
▼	Minimum value
Max	Display and processing of maximum values
Mom	Display for momentary values
Para	Return for configuration
EDIT	Perform configuration
cosΨ	Fundamental power factor
cosPhi	Fundamental power factor
Target	Currently set target cosine phi
U ph-n	Voltage phase / neutral conductor
I ph-n	Current phase / neutral conductor
Ie	Induced current of the compensation unit
Freq	Network frequency
PΣ	Active power – total (3-phase)

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SPQ Σ	Apparent power / active power / reactive power - total (3-phase)
harm. U	Voltage harmonics (distortion factor)
harm. I	Current harmonics (distortion current strength)
Lim	Limit
AC	Attenuation coefficient
Module	Module management
YES	Confirmation to save configuration
NO	Discard configuration
SCAN	Scan mode (search mode) for module search and eBus address assignment
Mode	Switching mode of stages
Firmware	Operating system software of basic device or of display module
Setup	Device configuration
Message	Error messages and error state
Displ.	Operating system of display module
1ph	single-phase (with induced current measurement)
3ph	3-phase (with induced current measurement)
Basic para	Basic parameters (submenus)
S→	Expansion cabinet 2 to 6
⅀ⅡEU	Measuring voltage transformer prim./sec.
⅀ⅡEI	Series transformer prim./sec.
Learn	Learning function stage power
Bus	Bus parameters
LCD	LCD parameters (display module)
Dfact	Attenuation coefficient (switching interval stages)
Lan.	Language of text display (display module)
code	Password protection
Reset	Reset function extreme values and configuration
Temp	Enable temperature measurement
Serv	Customer service address

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Operating messages for individual switching stages:


= switching stage number
= stage is switched off
= in automatic operation mode


= switching stage number
= stage is switched off
= and no stage power programmed


= switching stage number
= stage is switched on
= in automatic operation mode


= no compensation stage (other mode)
= switched off
= fan


= switching stage number
= stage is switched off
= in manual operation


= no compensation stage (other mode)
= switched on
= fan


= switching stage number
= stage is switched on
= in manual operation


= no compensation stage (other mode)
= not switched (no fault)
= alarm relay


= switching stage number
= stage is switched off
= and not available


= no compensation stage (other mode)
= switched, i.e. fault exists
= alarm relay

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Settings:

Attenuation (DF)	=	Reduction of the display fluctuations, the measuring cycle of the controller is not influenced.
Idle time (t-idle)	=	Starts at compensation. After the idle time has expired, the next switching operation follows
Alarm delay (t-alarm)	=	Concerns the FTS message (facility too small), i.e. all stages are hooked up, and the set alarm CosPhi is not reached. After the set time has expired an alarm message is issued
Hysteresis (hyst.)	=	Refers to the smallest available stage power and the overcompensation or undercompensation, i.e. the hooking up or switching off starts at the percentage set
Switch attenuation	=	The time set defines the interval between two switching operations
Operating cycle limit	=	When the set value is reached, a message is issued. The value is based on the specification of the contactor manufacturer.
Switch-off threshold Lim U	=	Overvoltage switch-off to protect the system, i.e. switching off the stages starts when the set limit is exceeded (hysteresis = 1% of the measuring voltage)
Switch-off threshold Lim Ie +	=	Overcurrent value in induced current measurement
Switch-off threshold Lim Ie -	=	Undercurrent value in induced current measurement

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5.3 Setting range of the configurable parameters:

primary voltage	1 V to 9999 kV Ph-Ph
Secondary voltage	100 V to 500 V Ph-Ph
Primary current	1 A to 99.99 kA
Secondary current	1 and 5 A
Rot.field U	L1N, L2N, L3N, L12, L23, L31
Rot.field I	L1, L2, L3, -L1, -L2, -L3
Consumption target cosφ	ind. 0.80 to cap. 0.80
Recovery target cosφ	ind. 0.80 to cap. 0.80
FTS alarm cosφ	ind. 0.50 to cap. 0.50
Attenuation coefficient for current	0 to 6
Attenuation coefficient for voltage	0 to 6
Attenuation coefficient Q_{miss}	0 to 6
Idle time	0 to 300 sec.
Alarm relay time	0 to 3000 sec.
Hysteresis connection	70 to 150%
Hysteresis switch-off	70 to 150%
Switching interval	0 to 480 sec.
Operating cycle limit	0 to 99990
Cabinet No.	1 to 6
Stage power	0 to 999.9 kvar inductive or capacitive
Discharge time	0 to 900 sec.
Detuning	0, 5.5, 7, 8, 12.5, 14%
Stage switching mode	Automatic, manual off, manual on
Harmonics monitoring	0 to 99%, deactivatable
Overvoltage switch-off	Dependent on primary voltage
Excess current switch-off	110% to 200%
Undercurrent switch-off	0 to 90%
Limit THD	0 to 10%
Switching threshold fan	0 to 70°C / hysteresis = 0°C to 25°C
Operating point alarm	0 to 70°C / hysteresis = 0°C to 25°C
Operating point overtemperature	0 to 70°C / hysteresis = 0°C to 25°C
Scanning frequency	Automatic, fixed 50 Hz, fixed 60 Hz
Password	No password (9999, meaning all functions are accessible)
Language display	German, English, French
Contrast setting	60% to 100%

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5.4 Device programming

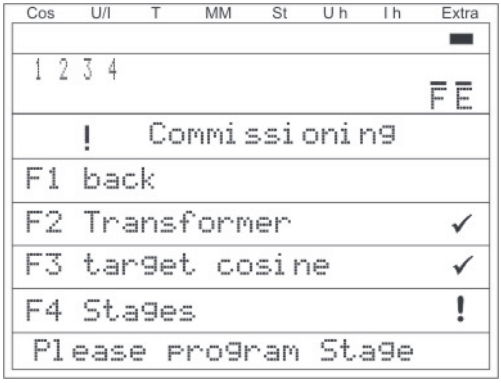
The menu guidance of the **multicomp D6-xxx-7** is self-explanatory.

The operator is guided and supported by the device through operating instructions displayed for the respective situation. The following terms are available for programming:

Para	Return for configuration
EDIT	Perform configuration
≙	Submenu or parameter selection
+	Value input
?	Selection
YES	Confirmation to save configuration
NO	Discard configuration
↰	Return

5.5 Start menu Commissioning

If the **multicomp D6-xxx-7** is being commissioned for the first time, the menu Extra/ Commissioning is displayed as the start screen (after the initialization phase) after setting up the **multicomp D6-xxx-7** supply voltage:



This display is used for **initial startup** of the controller, where all necessary settings can be made.

NOTE

These settings are described in detail under the menu item Extras/Commissioning

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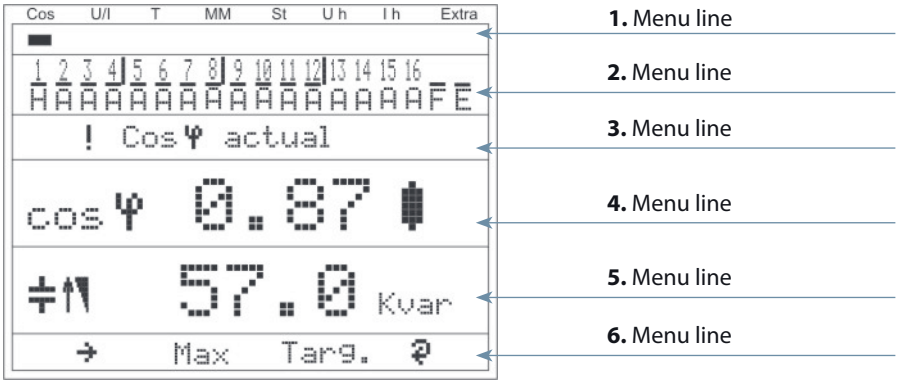
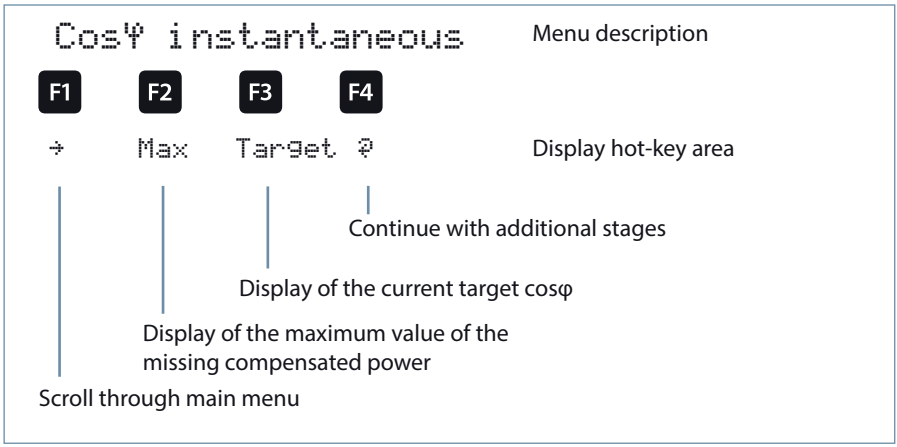
5.6 Main menu cos φ



The display is divided into various menu lines. The number of lines depends on which main or submenu item is selected:

1. Menu line: Shows which of the eight main menus is being displayed
2. Menu line: Status display of the output lines, modules are marked with vertical dividing lines
3. Menu line: Description of the menu and messages currently displayed
4.+**5.** Menu line: Display of values of the current menu
6. Menu line: Navigation in the menu displayed



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Display as example:

Main menu:	= cosφ actual (instantaneous)
Stage mode:	= Stage 1 Manual switching On Stages 2 to 12 Automatic mode On Stages 13 to 16 Automatic mode Off
Fan:	= On
Alarm relay:	= On
Alarm message:	= exists (!)
Menu description:	= cosφ actual (instantaneous)
Measured cosφ:	= 0.87 inductive
Switching on/off:	= Switch on, since capacitor power is missing
Missing compensation power	= 57.0 kvar
Additional modules	= exists (⚙)

By pressing the button F2 , you can display the **maximum value of the missing compensation power**.

The value is displayed in kvar, with time and date stamp. The value is only displayed if all available stages are switched on and the configured alarm CosPhi is not reached when the set alarm delay time has elapsed.

The respective value is a maximum value (maximum indicator function) accumulated during the alarm delay time.

As soon as the value is entered,
the status message **E12 "facility too small"** is displayed in the Messages submenu with a **time stamp and kvar specification.**

NOTE

The value displayed here is an **average value of the set alarm delay time.** I.e. **this** value and the **maximum value of the missing compensation power** can be different.

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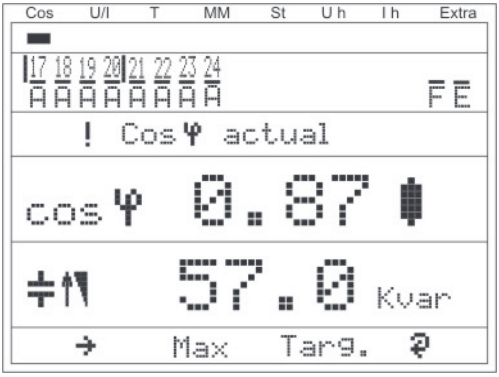
After pressing the F4 (⚙) button, the following appears in the display:



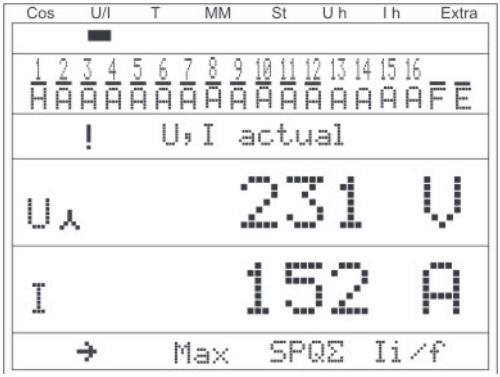
Display as example:

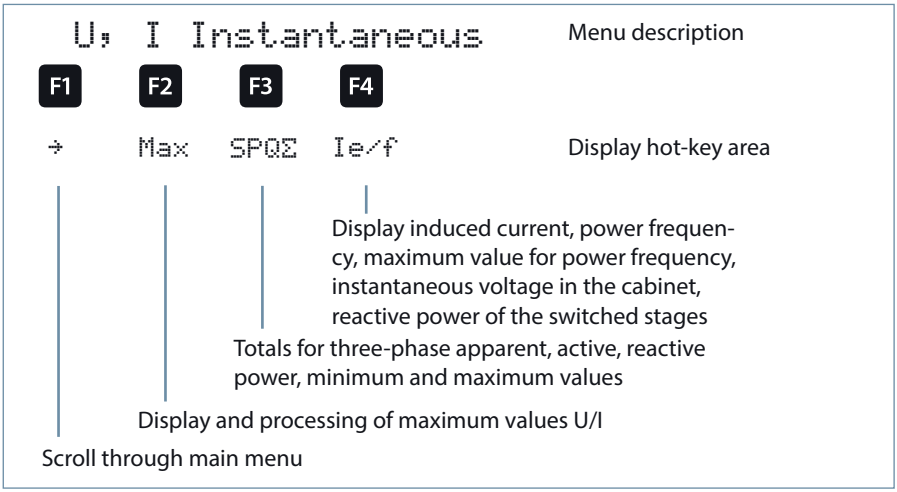
Main menu:	= cosφ actual (instantaneous)
Stage mode:	= Stages 17 to 24 Automatic mode On
Fan:	= On
Alarm relay:	= On
Alarm message:	= exists (!)
Menu description:	= cosφ actual (instantaneous)
Measured cosφ:	= 0.87 inductive
Switching on/off:	= Switch on, since capacitor power is missing
Missing compensation power	= 57.0 kvar

NOTE

This window is only displayed if more than three additional relay modules are scanned (which can be seen from the button designation ⚙ over F4)

5.7 Main menu Voltage / Current





Display as example:

Phase voltage	= 231 V
Apparent current, single-phase	= 152 A

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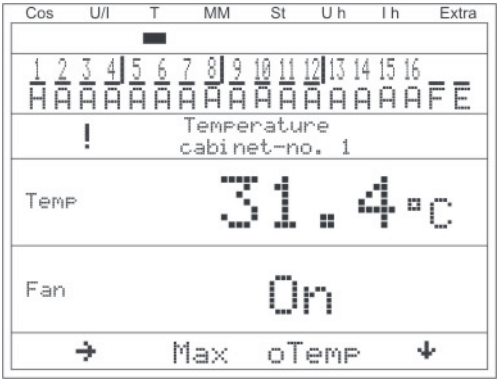
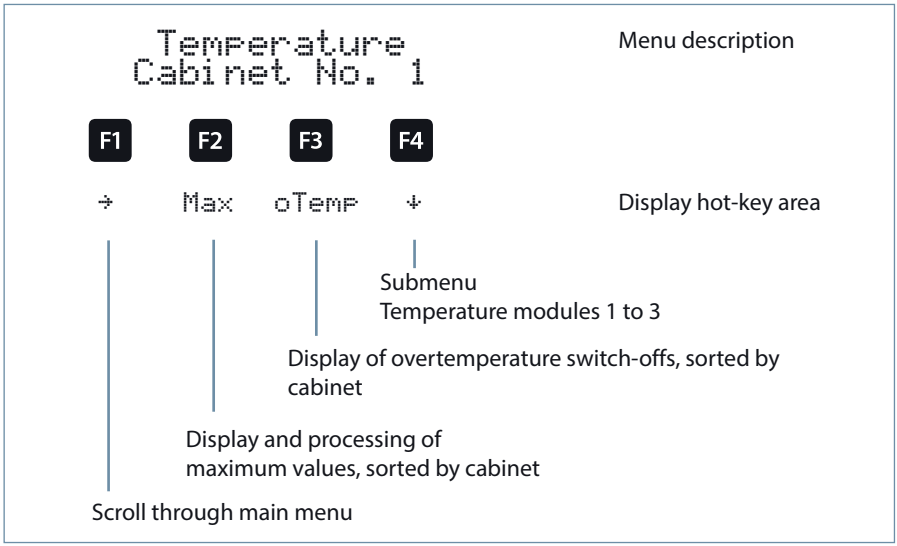
5.8 Main menu Temperature





Display as example:

Cabinet No.:	= 1
Measured temperature	= 31.4°C
Fan status:	= switched on

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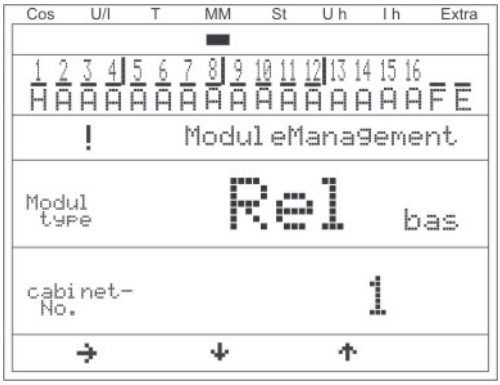
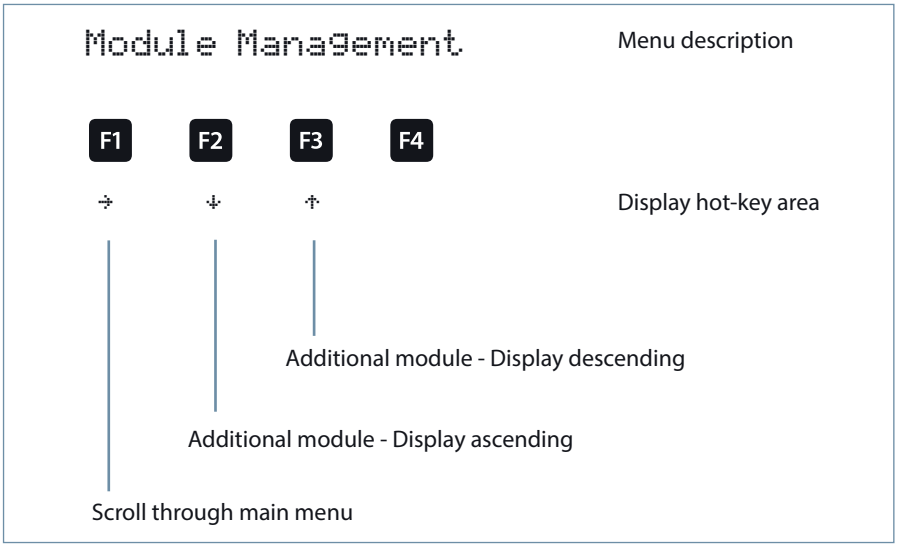
5.9 Main menu Module management





Display as example:

Module:	= Temperature module controller (basic module)
Cabinet allocation:	= fitted in cabinet No. 1

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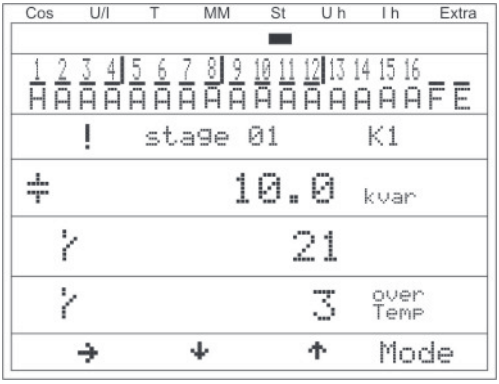
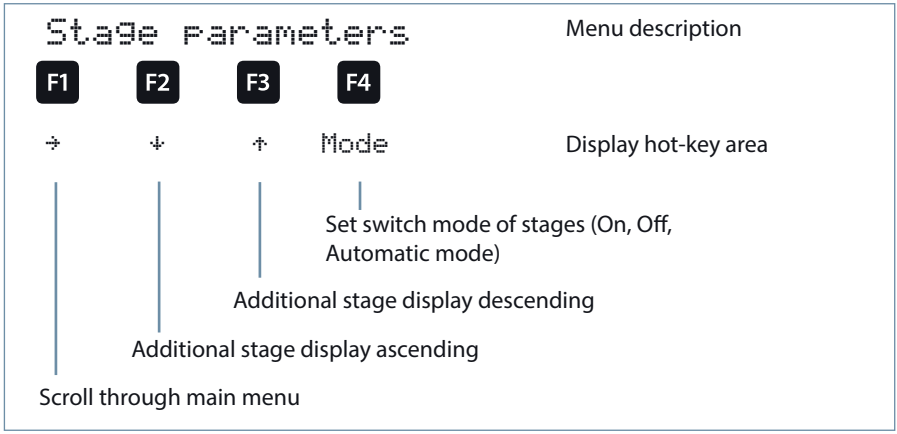
5.10 Main menu Stages





Display as example:

Stage No. and connection terminal:	= Stage 01, terminal K1 at the basic module (for the 1st additional module, the description would be terminal M1K1)
Stage type:	= capacitor stage
Stage power:	= 10 kVar
Operating cycles:	= 21
Overtemperature switch-off:	= 3

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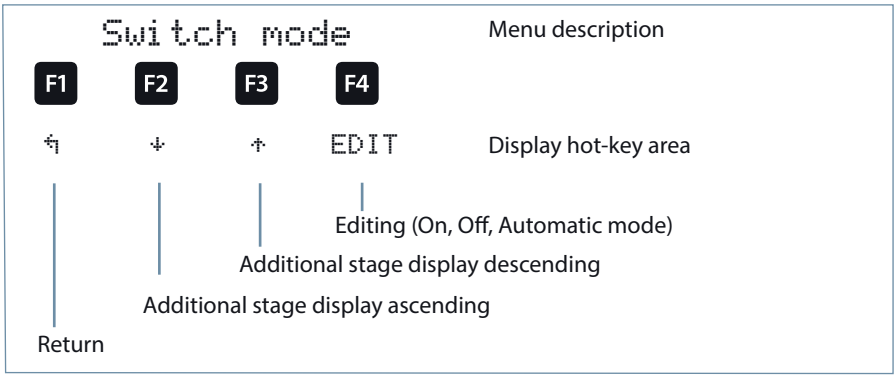
5.10.1 Sub menus Mode



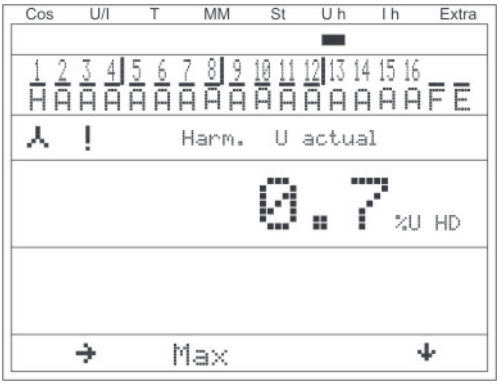
NOTE

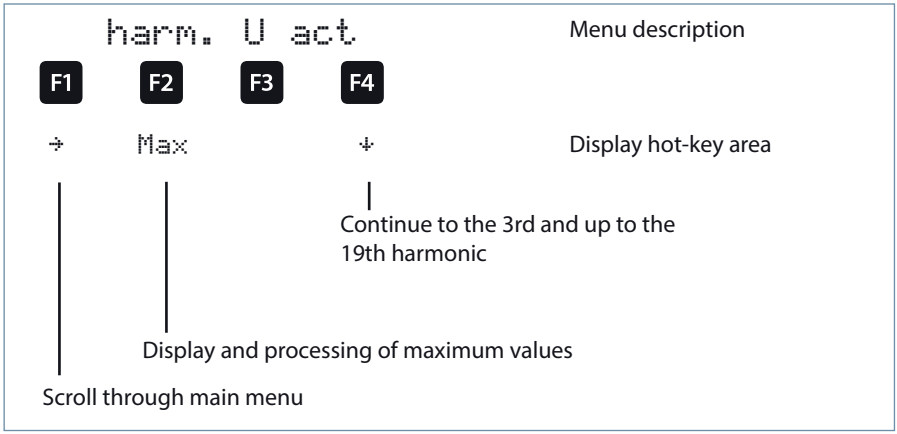
Due to the monitoring of the stage resonance frequency, it is possible to use the Locking mode.

In the first stage, now all stages can be switched at the same time to either „AUTO“ or „MANUAL OFF“.

The circuits take place in switch times (switching interval).

5.11 Main menu U h voltage distortion factor





Display as example:

Total - harmonics of measuring voltage:	= 0.7%

5.12 Main menu I h distortion current

NOTE

This menu is only available for induced current measurement (has to be activated in the menu Commissioning, Transformer, Induced current transformer, Para). Please check whether the induced current measurement module has already been scanned.

In the window: Extras => commissioning => transformer => induced current transformer for each cabinet it can be specified whether the multimess D4-0-BS-1 additional module measures main current or induced current.

This means that a separate main current measurement (using the multimess D4-0-BS-1 additional module) incl. the totals formation of several measuring points to a total CosPhi is possible.

The displayed Cos Phi is then the calculated total Cos Phi

Only the power measured from the main module will be displayed in the U,I instantaneous main menu window => SPQ-total.

Power from the separate multimess D4-0-BS-1 additional module will be displayed in the U,I instantaneous main menu window => Ie/f => U PN => SPQ-total.

Activation through: Extras => commissioning => transformer => induced current transformer => Para => ext.main current (3-Ph).

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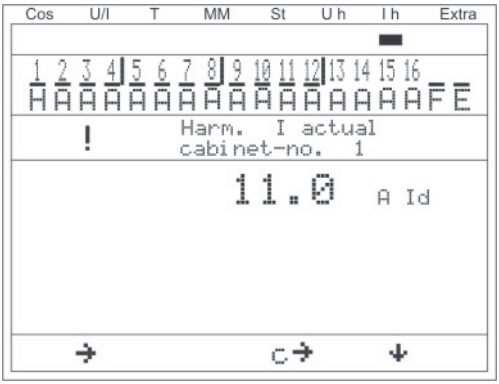
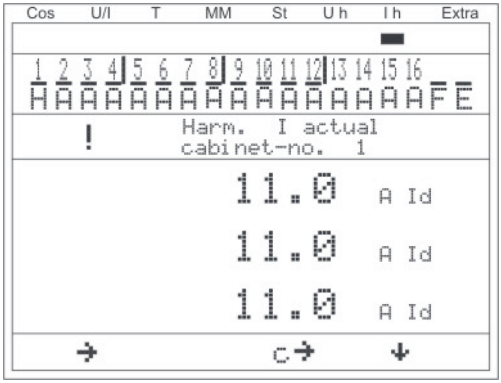
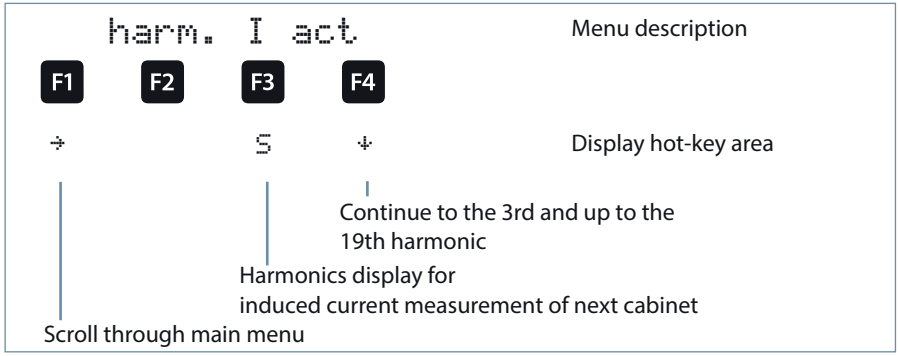
If an induced current measurement is activated (e.g. **single-phase** induced current measurement), the following window appears:



In the case of a **three-phase** induced current measurement, the following window is displayed:





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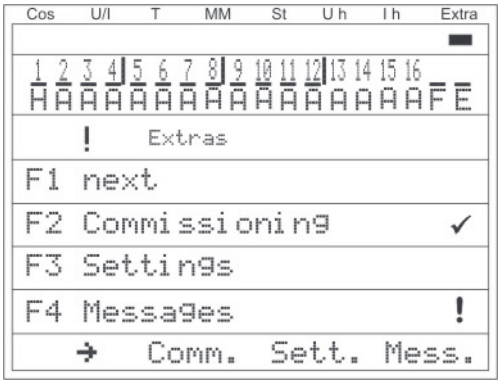
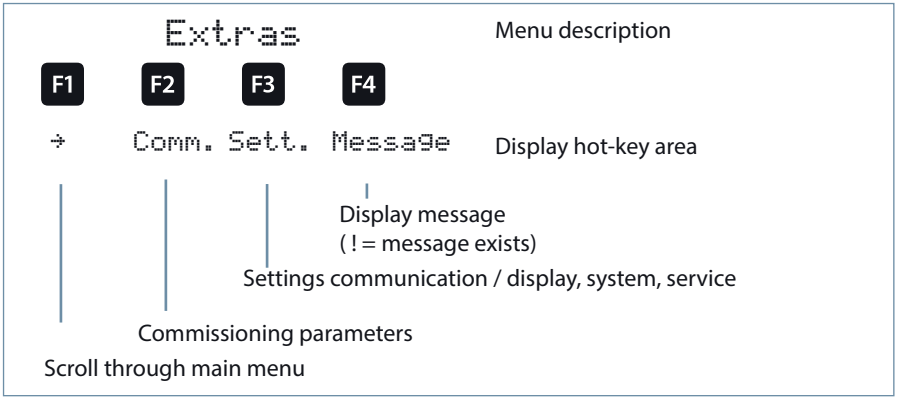
Display as example:

Cabinet No.:	= S1
Induced current measurement:	= 3-phase
harmonic	= total Id
Harmonic current L1:	= 11 A
Harmonic current L2:	= 11 A
Harmonic current L3:	= 11 A

5.13 Main menu Extras





NOTE

Before commissioning is performed it has to be ensured that all available additional modules have been scanned.

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The Commissioning submenu contains the following items:

1. **Transformer settings (current, induced current, voltage)**
   - a. Series transformer
     - i. Primary current
     - ii. Secondary current
     - iii. Phase allocation
   - b. Induced current transformer, external main current transformer
     - i. Activate, single-phase or three-phase
     - ii. Primary current cabinet 1
     - iii. Secondary current cabinet 1
     - iv. Primary voltage for energy measuring module in cabinet 1
     - v. Secondary voltage for energy measuring module in cabinet 1
     - vi. Continue with cabinets 2 to 6
   - c. Voltage transformer
     - i. Primary voltage
     - ii. Secondary voltage
     - iii. Phase allocation
     - iv. Zero-point creator
2. **Target cosine - settings**
   - a. Target cosφ for power consumption
   - b. Target cosφ for power recovery
   - c. Alarm cosφ for FTS message (facility too small)
3. **Stages - Settings**
   - a. Auto configuration mode
   - b. Stage parameter
     - i. Stage selection
     - ii. Stage power
     - iii. Cabinet No.
     - iv. Discharge time
     - v. Detuning
     - vi. Operating cycles
     - vii. Overtemperature switch-off
     - viii. System type
     - ix. Special outputs (fans / alarm relays)
   - c. Rated value (rated voltage Ph-Ph, power frequency)

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The Settings submenu contains the following items:

1. Module management / bus parameters / display
2. System
3. Service

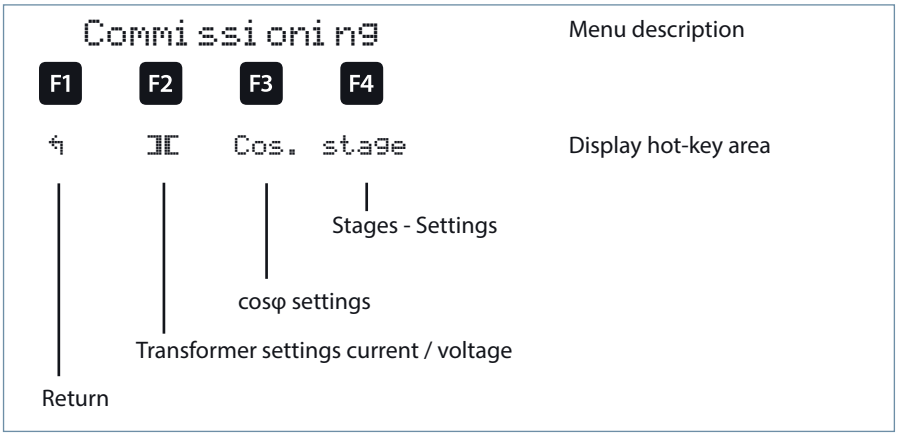
The Messages submenu contains the following items:

1. Active error messages
2. Error state messages
3. Allocation for message

   a. message only, alarm relay and message, off (function deactivated)

   b. Stage switch-off

5.13.1 Commissioning



5.13.2 Submenu Transformer settings

The Transformer settings submenu contains the following items:

1. Main current transformer
2. Induced current transformer
3. Voltage transformer

Under the item **Main current transformer**, the primary and secondary current, as well as phase allocation must be specified.

Under the item **Induced current transformer**, the primary and secondary current of the induced current transformer must be specified. These settings have to be made for each cabinet individually! For operating an energy measuring module, the primary and secondary voltages of the energy measuring model can still be set here.

Under the item Voltage transformer the primary and secondary current, as well as phase allocation of the measuring voltage must be specified. The zero-point creator can also be activated here.

The series transformer submenu contains the following items:

1. Primary current
2. Secondary current
3. Phase allocation of principal current

For the items **Primary current** and Secondary current, the respective parameter for the current transformer must be given, e.g. transformer 1000/5A means a primary current of 1000A and a secondary current of 5A.

The input field ranges from 1A to 99.99 kA for a primary current and 1A or 5A for the secondary current.

For the **Phase allocation of the series transformer** the phase must be specified that is measured in the principal current, e.g. phase I = L1.
For a false polarity transformer connection the input can be given as phase I = -L1 (the minus sign means k and l are exchanged).

5.13.3 The voltage transformer submenu contains the following items:

1. primary voltage
2. Secondary voltage
3. Phase allocation of measuring voltage
4. Zero-point creator

For the items **primary voltage and secondary voltage**, the respective parameter for the voltage transformer must be given, e.g. transformer 10,000/100 V

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means a primary voltage of 10,000 V and a secondary voltage of 100 V. The input field ranges from 1V to 9,999kV for the primary voltage and 100V or 500V for the secondary voltage.

For the item **Phase allocation of measuring voltage**, the phase that is taken from the measuring voltage must be given, e.g. phase U = L1N.
For a phase/phase measurement the entry would be L23, for instance.

Using the item **Zero-point creator**, the controller can be activated via a zero-point creator.

For energy supply networks with outer conductor connected to the earth potential, suitable control gear with

electrical isolation (e.g. voltage transformer) must be used.

These transducer adaptors (zero-point creator) are suitable for creating a virtual low-impedance neutral point for the device in a three-phase network without neutral conductor.

In the 700 V variant, this also serves to adapt the measuring voltage to the device.

Make sure that the device is configured for the operation with a zero-point creator.

Transformers are available in the following variants:

Type 400/100:	Primary:	400 V phase-phase voltage
	Secondary:	100 V phase-phase voltage
Type 700/100	Primary:	700 V phase-phase voltage
	Secondary:	100 V phase-phase voltage

5.13.4 Target cosine and freeze mode submenu

The target cosine submenu contains the following items:

1. Target cosφ for power consumption
2. Target cosφ for power recovery
3. Alarm cosφ (message when alarm cosφ is not reached after set alarm delay time has elapsed)

For the items Target cosφ for power consumption and Target cosφ for power output, a value from inductive 0.80 to capacitive 0.80 can be entered.

If active power recovery is detected, this is signaled by the symbol  in the display.

Under the item Alarm cosφ a value of inductive 0.50 to capacitive 0.50 can be entered.

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NOTE

The Q-rule and cosine-phi adjustment can only be activated if the following is selected in the menu: Extras => commissioning => stage => stage => para => discharge time => operating cycle => system type => special -EZA.

The energy recovery display (generator symbol) is not used for the Special-EZA system type, as CosPhi2 is not active here.

It is not only possible to program a fixed target cosφ on the device; it can also be switched over by means of a digital input or changed by means of an analog input. There is also an option to change the target cosφ through a voltage curve or an active power curve.

In the menu Commissioning, submenu Target cosφ, after pressing the F2 key (Para), it is possible to select how the target cosφ should be adjusted. After the mode has been changed, all parameters must be checked and corrected if required.

The following modes can be selected:

DI	► φ	(change by digital input)
AI	► φ	(change by analog input)
U	► φ	(change by voltage curve)
P	► φ	(change by active power curve)
off		The function is deactivated, i.e. the device is working with the value programmed as target cosine1

NOTE

In addition, in the Commissioning menu, submenu Target cosφ, (Q) can be activated by pressing the F3 key, so that a target reactive power value (in relation to Prated, rated active power of the power plant) must be reached instead of the target cos-phi (**Q-control**). After the mode has been changed, all parameters must be checked and corrected if required.

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5.13.6 Q-Control:

The following modes can be selected:

DI	►	Q/P rated (change by digital input)
AI	►	Q/P rated (change by analog input)
U	►	Q/P rated (change by voltage curve)
P	►	Q/P rated (change by active power curve)
off		The function is deactivated, i.e. the device is working with the value programmed as target cosine1

Parameters:

Q parameters	
Q-Control	Yes/No
P rated	100.0 kW
Target Q	
Q/Pn1 power consumption	0.75 capacitive to 0.75 inductive
Q/Pn2 energy recovery	0.75 capacitive to 0.75 inductive
Q/Pn3 Alarm	0.00 to 1.73 inductive
Mode	DI ► Q
t-delay	000 Seconds
Q/Pn A	0.50 ind.
Q/Pn B	0.33 ind.
Q/Pn C	0.33 cap.
Q/Pn D	0.50 cap.
Mode	AI ► Q
t-delay	000 Seconds
Q/Pn A	0.90 ind.
Q/Pn B	1
% A	0%
% B	100%
AI 4–20 mA	YES

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Mode	U ► Q
t-delay	000 Seconds
Q/Pn A (bottom)	0.95 cap.
from	90%
to	95%
Q/Pn B (top) 0.95 ind.	
from	105%
to	110%
U rated 400V Ph-Ph	
Hysteresis	2.50% (=10V Ph-Ph)

Mode	P ►Q
t-delay	000 Seconds
cosφ A	(bottom) 0.95 cap.
from	90%
to	95%
cosφ B (top) 0.95 ind.	
from	105%
to	110%
P rated	100kW
Hysteresis	2.5% (= 2.5kW)

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5.13.7 Dynamic Adaption of the target cosine-phi (target Q/P_{rated})

Mode DI ► φ (change by digital input):

When DI ► φ (change by digital input) is set, there are a maximum of 16 available values (A to P), which can be activated through the digital input module multisio 2D2 4DI. If an input from a module is selected, the corresponding target cosφ will be active after the set delay time t-delay (0–250 seconds) has elapsed.
Cos-phi2 (power recovery) has no function in this mode.

Different target values can be activated depending on the setting of the number of available inputs (4, 8 or 16 digital
inputs, corresponding to 1, 2 or 4 additional modules).

Example settings 4 DI:

Mode	DI ►φ
t-delay	000 seconds
cosφ A	0.90 ind.
cosφ B	0.95 ind.
cosφ C	1.0
cosφ D	0.95 cap.

Example settings 16 cd:

Mode	DI ►φ
t-delay	000 seconds
cosφ A	1.00
cosφ B	0.90 ind.
cosφ C	0.85 ind.
etc up to cosφ P.	

If Freeze mode is also set in the settings menu cosφ Adaption 7, in which the number of digital inputs is set, the number of cosφ values which can be activated is reduced by one value.

In addition, Freeze mode can be activated in this settings window. This means that the device does not perform any more actions (switching on or off the compensation stages). The measuring and monitoring functions, however, remain unaffected.

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Target cosφ binary coded (setting 16cd):

For this setting a DI additional module is sufficient to activate one of 16 different cosφ values, as the on/off statuses of the digital inputs here are evaluated according to the following table:

	Input 1	Input 2	Input 3	Input 4	enter value where applicable
Target Cosine φ A	off	off	off	off	
Target Cosine φ B	on	off	off	off	
Target Cosine φ C	off	on	off	off	
Target Cosine φ D	on	on	off	off	
Target Cosine φ E	off	off	on	off	
Target Cosine φ F	on	off	on	off	
Target Cosine φ G	off	on	on	off	
Target Cosine φ H	on	on	on	off	
Target Cosine φ I	off	off	off	on	
Target Cosine φ J	on	off	off	on	
Target Cosine φ K	off	on	off	on	
Target Cosine φ L	on	on	off	on	
Target Cosine φ M	off	off	on	on	
Target Cosine φ N	on	off	on	on	
Target Cosine φ O	off	on	on	on	
Target Cosine φ P	on	on	on	on	

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Mode AI ► φ (change by analog input):

With the setting AI ► φ (change by analog input), the target cos-phi is determined by means of a configurable curve. The parameters refer to 100% of the analog input (10V or 20 mA). At the AI module, the channel can be set to voltage input (0–10 V) or current input (0–20 mA) with DIL switches. The range adaption is made using the parameter "AI 2-10V." When "AI 2-10 NO" is set, the range is 0–20 mA or 0–10 V.

Cos-phi2 (power recovery) has no function in this mode.

The cos-phi1 (power consumption) is used for the baseline between the adaption ramps.

A hysteresis can be programmed using the "hyst." parameter.

The transition to the new target cos-phi can be attenuated using the "t-delay" parameter.

Cosphi1	1.00
Mode	AI ►φ
t-delay	000 seconds
Q-Control	No
cosφ A	0.90 ind.
from (%)	0%
to (%)	50%
cosφ B	0.90 cap.
from (%)	50%
to (%)	100%
AI 2-10 V	NO
Hysteresis	9.00%

Function:

With an input voltage of 0V (= 0%) the instantaneous target-cosφ would be 0.95 ind.
With an input voltage of 5V (= 50%) the instantaneous target-cosφ would be 1.0.
With an input voltage of 10V (= 50%) the instantaneous target-cosφ would be 0.95 cap.

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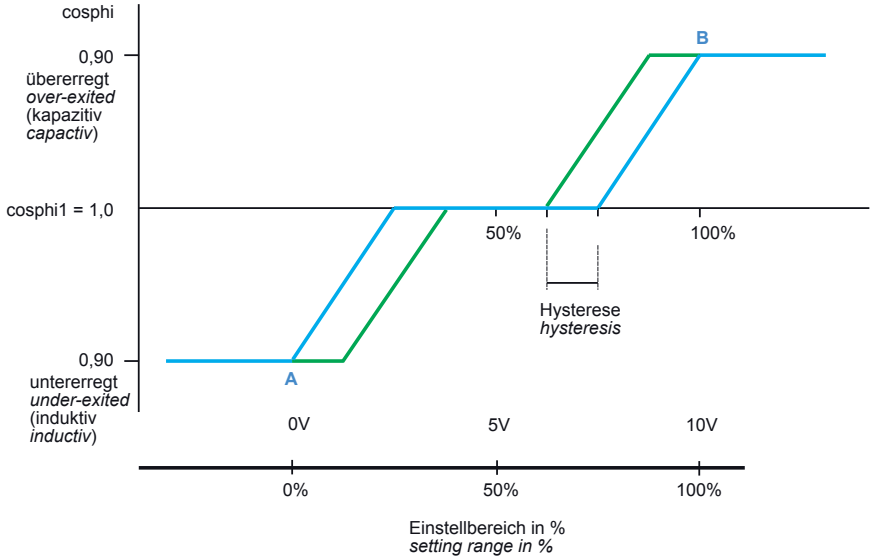
Example schematic diagram Example 1:



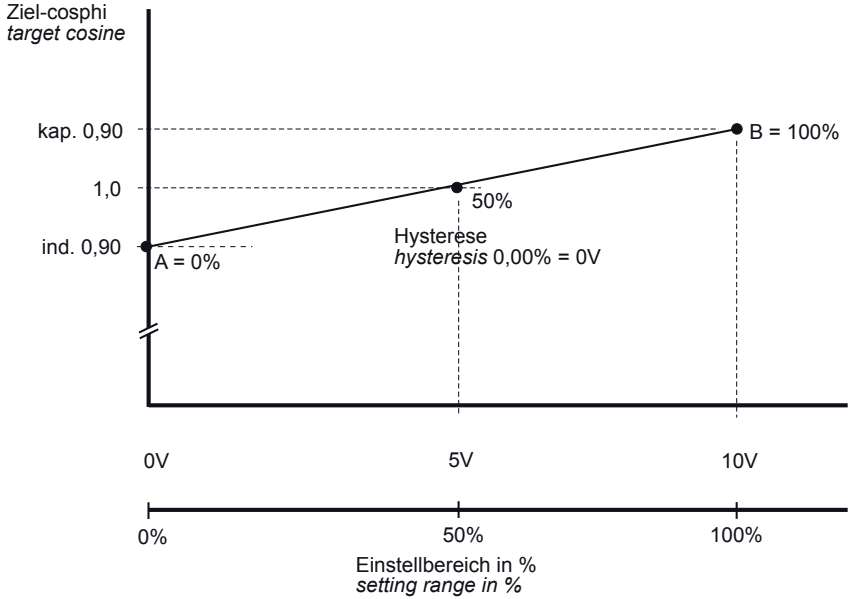
Example settings:

Cosphi1	1.00
Mode	AI ► φ
t-delay	000 seconds
Q-Control	No
cosφ A	0.90 ind.
from (%)	0%
to (%)	50%
cosφ B	0.90 cap.
from (%)	50%
to (%)	100%
AI 2-10 V	No
Hysteresis	0.00%

Function:

With an input voltage of 0V (= 0%) the instantaneous target-cosφ would be 0.95 ind.
With an input voltage of 5V (= 50%) the instantaneous target-cosφ would be 1.0.
With an input voltage of 10V (= 50%) the instantaneous target-cosφ would be 0.95 cap.

Example schematic diagram Example 2:



Mode U ▸ φ (change by voltage curve):

With the setting U ▸ φ (change by voltage curve), the target cos-phi is determined by means of a configurable curve. The voltage is measured either at the basic module or at the multimess 1D4 additional module. The parameters refer to Un (rated voltage). With a measured input to the basic module of UPh-N = 230 V, the measured voltage is projected to a rated voltage (Un) of 400 V Ph-Ph.

Cos-phi2 (power recovery) has no function in this mode.

The cos-phi1 (power consumption) is used for the baseline between the adaption ramps.

A hysteresis can be programmed using the “hyst.” parameter.

The transition to the new target cos-phi can be attenuated using the “t-delay” parameter.

New values are adopted once per second.

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NOTE

When connecting a multimess D4-0-BS additional module, the measuring voltage of this module is automatically evaluated (three-phase measurement). The crucial factor is the greatest measured voltage U_{Ph-Ph}.

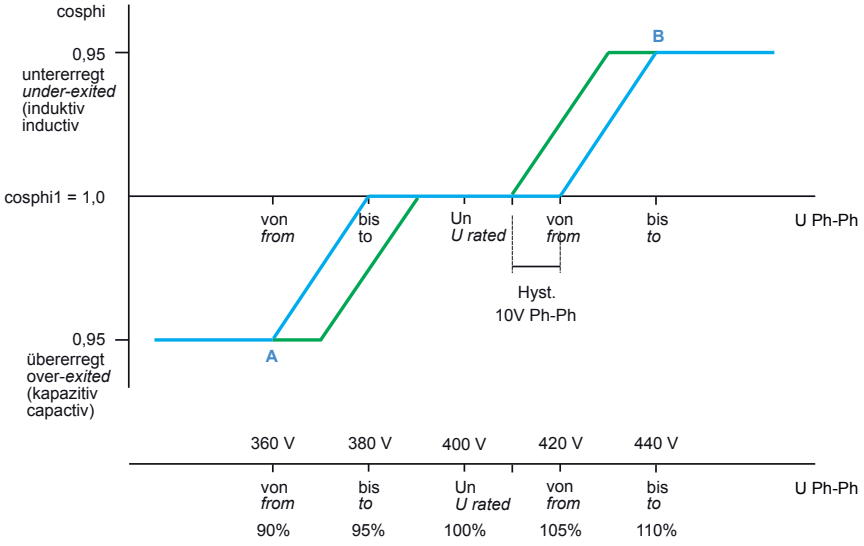
Example settings:

Cosphi1	1.0	
Power consumption		
Mode	U ▶φ	
t-delay	000 seconds	
cosφ A	(bottom)	0.95 cap.
from	90%	
to	95%	
cosφ B (top) 0.95 ind.		
from	105%	
to	110%	
U rated 400V Ph-Ph		
Hysteresis	2.50% (=10V Ph-Ph)	

Function:

In the event of a change in the measuring voltage in the 360 V to 440 V Ph-Ph range, the target cos-phi will change from 0.95 capacitive to 0.95 inductive.

Example schematic diagram:



Mode P ▸φ (change by active power curve):

With the setting P ▸ φ (change by active power curve), the target cos-phi is determined by means of 10 configurable control points (total active power determined through the main current transformer by three-phase projection). The parameters refer to Pn (rated or maximum active power).

Cos-phi2 (power recovery) has no function in this mode.

A hysteresis can be programmed using the "hyst." parameter.

The transition to the new target cos-phi can be attenuated using the "t-delay" parameter.

New values are adopted once per second.

Example 1: Settings:

Mode	P ▸φ
Cosphi1	1.0
Power consumption	
P rated=Pmax.	150kW (=100%)/for power recovery systems -150kW
t-delay	000 seconds
Hysteresis	8% (= 12kW, +/- 6kW)
Point 1	P= 46% cosφ = 0.95 cap.
Point 2	P= 66% cosφ = 1.0.
Point 3	P= 86% cosφ = 0.95 ind.
Point 4	P= 100% cosφ = 0.95 ind.

NOTE

Points 5 to Point 10 are no longer taken into account
since point 4 already has the maximum of 100%.

Function:

In the event of a change in the active power in the 69 kW to 129 kW range, the target cos-phi will change from 0.95 capacitive to 0.95 inductive. In the event of instantaneous power of approx. 100 kW, the target cos-phi is 1.0.

Outside the curve (e.g. below 10% P+ or over 100% P+) the target cos-phi 1.0.

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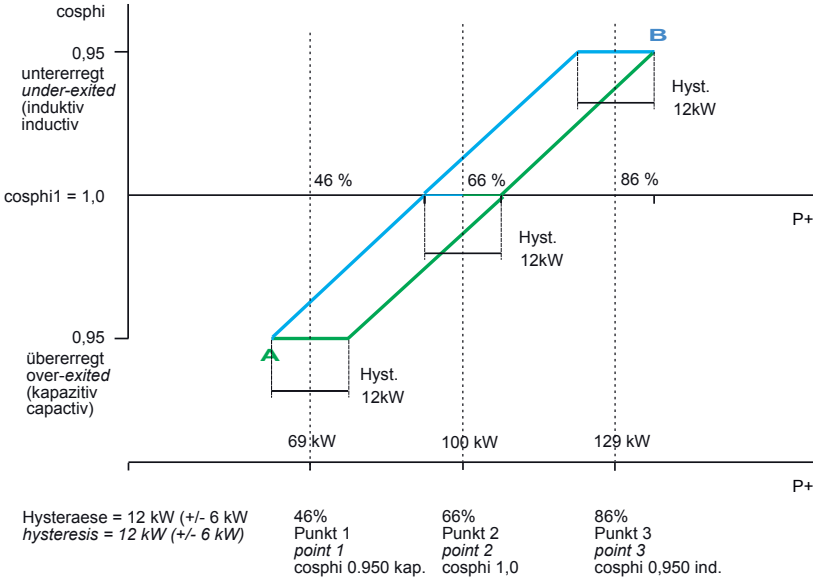

NOTE

In the event of negative active power, the curve behaves in the same way.

Example 2: Settings:

Mode	P ► φ
Cosphi1	1.0
Power consumption	
P rated=Pmax.	150kW (=100%)/for power recovery systems -150kW
t-delay	000 seconds
Hysteresis	0%
Point 1	P= 0.0% cosφ = 1.0.
Point 2	P= 50% (= 75 kW) cosφ = 1.0.
Point 3	P= 55% (= 82.5 kW) cosφ = 0.984 ind.
Point 4	P= 85% (= 127.5 kW) cosφ = 0.900 ind.
Point 5	P= 100% (= 150 kW) cosφ = 0.900 ind.

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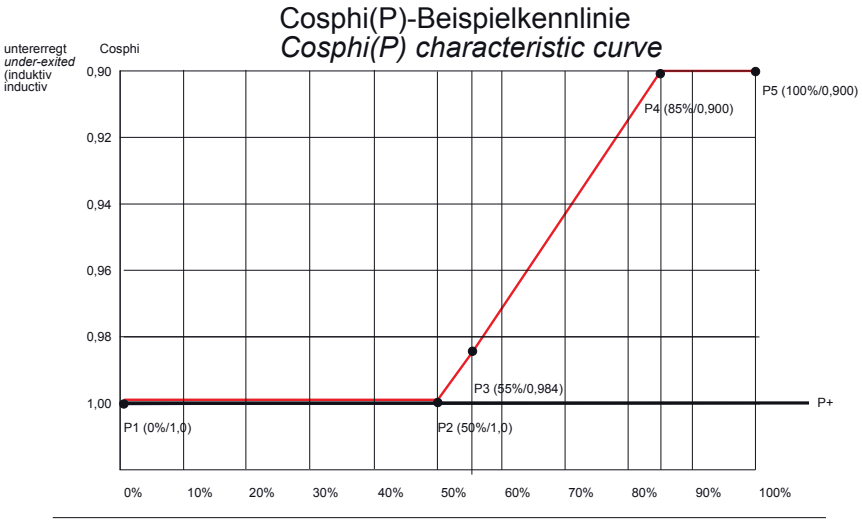
Cos-phi curve as a function of cos-phi (P) (VDE)



Q-Control:

The following modes can be selected:

DI ► Q/P_{rated} (change by digital input)
AI ► Q/P_{rated} (change by analog input)
U ► Q/P_{rated} (change by voltage curve)
P ► Q/P_{rated} (change by active power curve)
off The function is deactivated, i.e. the device is working with the value programmed as target cosine1

Parameters:

Q parameters	
Q-Control	Yes/No
P rated	100.0 kW

Target Q

Q/Pn1 power consumption	0.00 capacitive/inductive
Q/Pn2 energy recovery	0.00 capacitive/inductive
Q/Pn3 Alarm	0.00 capacitive/inductive

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Mode	DI ► Q
t-delay	000 seconds
Q/Pn A	0.50 ind.
Q/Pn B	0.33 ind.
Q/Pn C	0.33 cap.
Q/Pn D	0.50 cap.

Mode	AI ► Q
t-delay	000 seconds
Q/Pn A	0.90 ind.
Q/Pn B	1
% A	0%
% B	100%
AI 4–20 mA	YES

Mode	U ► Q
t-delay	000 seconds
Q/Pn A	(bottom) 0.95 cap.
from	90%
to	95%
Q/Pn B (top)	0.95 ind.
from	105%
to	110%
U_{rated}	400V Ph-Ph
Hysteresis	2.50% (=10V Ph-Ph)

Mode	P ► Q
t-delay	000 seconds
cosφ A	(bottom) 0.95 cap.
from	90%
to	95%
cosφ B (top) 0.95 ind.	
from	105%
to	110%
P_{rated}	100kW
Hysteresis	2.5% (= 2.5kW)

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Q-Control examples:

Mode DI ► Q/P_{rated} (change by digital input):

When DI ► Q (change by digital input) is set, there are 4 available values (A, B, C and D), which can be activated through the digital input module multisio D2-4DI. If an input from this module is selected, the corresponding Q/Pn mode will be active after the set delay time t-delay (0–250 seconds) has elapsed. The Q/Pn2 mode (power recovery) has no function here.

Example settings:

Mode	DI ► Q
t-delay	000 seconds
Q/Pn A	0.50 ind.
Q/Pn B	0.33 ind.
Q/Pn C	0.33 cap.
Q/Pn D	0.50 cap.

NOTE

If no input from the DI module is selected, then Q/Pn is 0.000.

Mode AI ► Q/P rated (change by analog input):

When AI ► Q (change by analog input) is set, the Q/Pn value can be preset through an analog input. Configuration is performed through 2 control points (A and B). At the AI module, the channel can be set to voltage input (0–10 V) or current input (0–20 mA) with DIL switches. The range adaption is made using the parameter "AI 4-20." When "AI 4-20 NO" is set, the range is 0–20 mA or 0–10 V. The Q/Pn2 value (power recovery) has no function in this mode.

Only the first channel of the AI module is used.

If the input from this module is connected accordingly, the corresponding Q/Pn value will change in the range from A to B after the set delay time t-delay (0–250 seconds) has elapsed.

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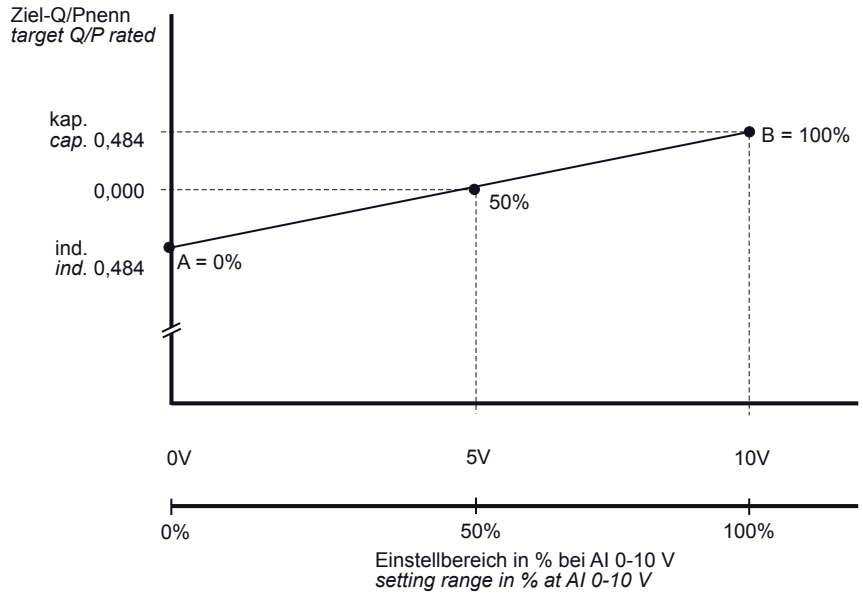
Example 1: Settings:

Mode	AI ▶ Q
t-delay	000 seconds
Q/Pn A	(bottom) 0.484 ind.
from (%)	0%
to (%)	50%
Q/Pn B(top)	0.484 cap.
from (%)	50%
to (%)	100%
AI 4-20 mA	No
Hysteresis (%)	0%

Function:

With an input voltage of 0V (= 0%) the target value of Q/P rated would be 0.484 ind.
With an input voltage of 5V (= 50%) the target value of Q/P rated would be 0.000.
With an input voltage of 10V (= 50%) the target value of Q/P rated would be 0.95 cap

Example schematic diagram:

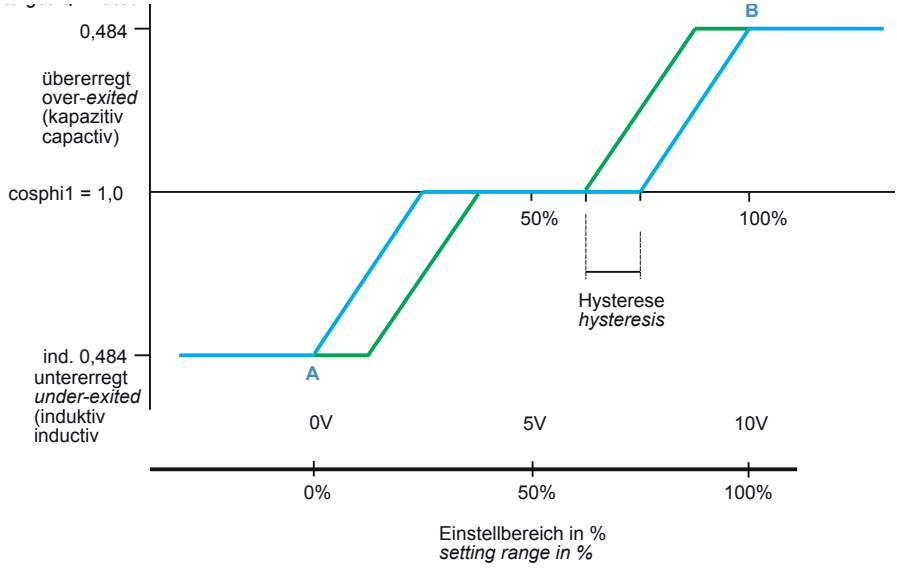


Example 2: Settings:

Mode	AI ► Q
t-delay	000
Q/Pn A (bottom)	0.484 ind.
from (%)	0%
to (%)	50%
Q/Pn B (top)	0.484 cap.
from (%)	50%
to (%)	100%
AI 4-20 mA	No
Hysteresis (%)	9%

Function:
With an input voltage of 0V (= 0%) the target value of Q/P rated would be 0.484 ind.
With an input voltage of 5V (= 50%) the target value of Q/P rated would be 0.000.
With an input voltage of 10V (= 50%) the target value of Q/P rated would be 0.95 cap

Example schematic diagram:



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Mode U ▶ Q/P rated (change by voltage curve):

With the setting U ▶ Q (change by voltage curve), the Q/Pn value is determined by means of a configurable curve. The voltage is measured either at the basic module or at the multimess D4-0-BS additional module. The parameters refer to P rated (rated active power of the power plant). With a measured input to the basic module of UPh-N = 230 V, the measured voltage is projected to a rated voltage (Un) of 400 V Ph-Ph.

The Q/Pn2 value (power recovery) has no function in this mode.

The Q/Pn1 value (power consumption) is used for the baseline between the adaption ramps.

A hysteresis can be programmed using the "hyst." parameter.

The transition to the new Q/Pn value can be attenuated using the "t-delay" parameter.

New values are adopted once per second.

NOTE

When connecting a multimess D4-0-BS additional module, the measuring voltage of this module is automatically evaluated (three-phase measurement). The crucial factor is the greatest measured voltage UPh-Ph.

Example settings:

Q/Pn1	0.00
Power consumption	
P rated	150kW
Mode	U ▶ Q
t-delay	000 seconds
Q/Pn A (bottom)	0.33 cap.
from	90%
to	95%
Q/Pn B (top)	0.33 ind.
from	105%
to	110%
U rated 400V Ph-Ph	
Hysteresis	2.50% (=10V Ph-Ph)

Function:

In the event of a change in the measuring voltage in the 360 V to 440 V Ph-Ph range, the Q/Pn value will change from 0.33 capacitive to 0.33 inductive.

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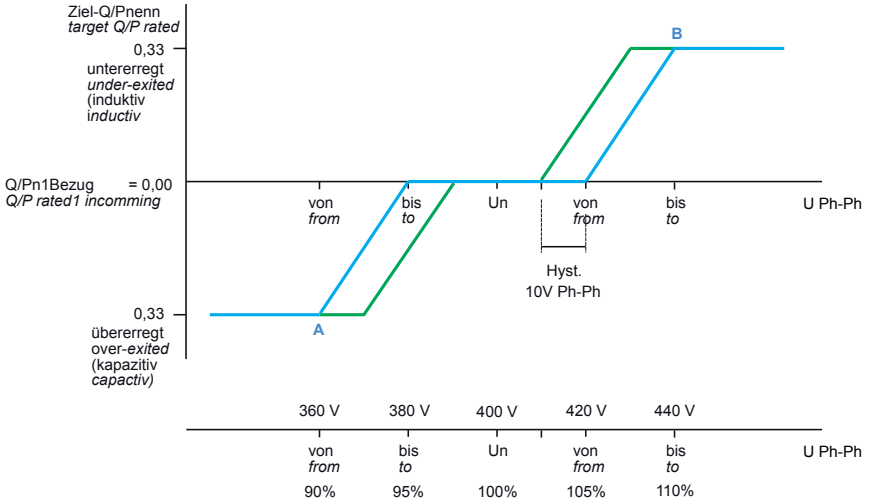
Example schematic diagram:



Mode P ► Q/P rated (change by active power curve):

With the setting P ► Q (change by active power curve), the Q/Pn value is determined by means of a configurable curve. The P value (total active power) is determined through the main current transformer by three-phase projection. The parameters refer to Pn (rated active power of the power plant).

The Q/Pn2 value (power recovery) has no function in this mode.

The Q/Pn1 value (power consumption) is used for the baseline between the adaption ramps. A hysteresis can be programmed using the "hyst." parameter.

The transition to the new Q/Pn value can be attenuated using the "t-delay" parameter.

New values are adopted once per second.

Example 1: Reactive power curve as a function of performance Q (P)

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Example settings:

Mode	P ► Q/Pn
Q/Pn1	0.0
Power consumption	
P rated=Pmax.	150kW (=100%)/**for power recovery systems -150 kW**
t-delay	000 seconds
Hysteresis	8% (= 12kW, +/- 6kW)
Point 1	P= 46% Q/Pn = 0.151 cap.
Point 2	P= 66% Q/Pn = 0.000.
Point 3	P= 86% Q/Pn = 0.283 ind.
Point 4	P= 100% Q/Pn = 0.283 ind.

NOTE

Points 5 to Point 10 are no longer taken into account since point 4 already has the maximum of 100%.

The P rated value needs to be configured in two places:

Under the point P rated during commissioning => F3 Q/Pn => F2 Para => F2 => F2 => Pn (value with sign) and
under the point P rated during commissioning => F3 Q/Pn => F2 Q P rated (unsigned value)

These values must be identical.

Exception:

In the case of energy production facilities, the value during commissioning must be => F3 Q/Pn => F2 Para => F2 => F2 => Pn negative (for power recovery).

Function

In the event of a change in the active power in the 69 kW to 129 kW range, the Q/Pn value will change from 0.151 capacitive to 0.283 inductive.

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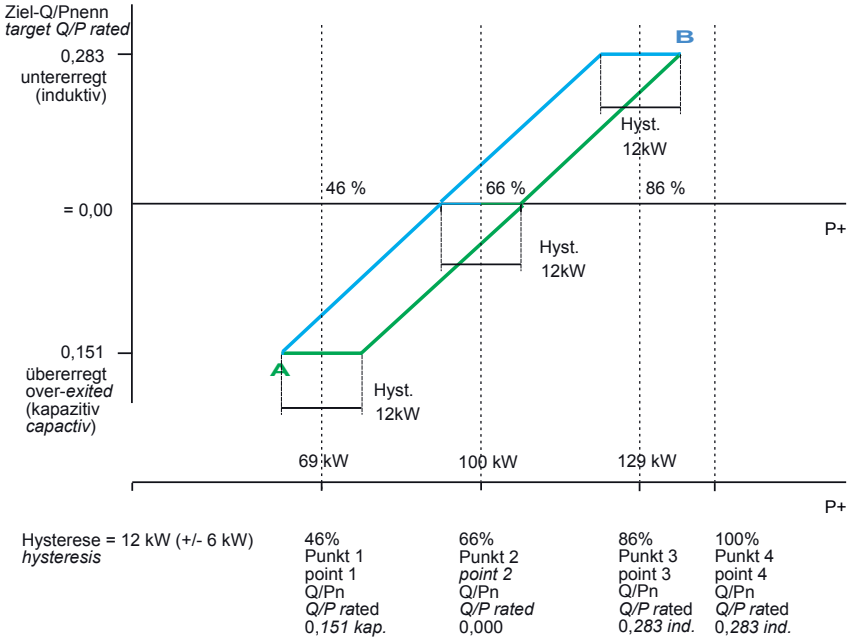
Example schematic diagram:



Example 2: Reactive power curve as a function of performance Q (P) (VDE)

Example settings:

Q/Pn1	0.00
Power consumption	
P rated=Pmax.	150kW (=100%)/**for power recovery systems -150kW**
t-delay	000 seconds
Hysteresis	0%
Point 1	P= 0.0% Q/Pn = 0.0.
Point 2	P= 50% (= 75 kW) Q/Pn = 0.0.
Point 3	P= 55% (= 82.5 kW) Q/Pn = 0.09 ind.
Point 4	P= 85% (= 127.5 kW) Q/Pn = 0.41 ind.
Point 5	P= 100% (= 150 kW) Q/Pn = 0.48 ind.

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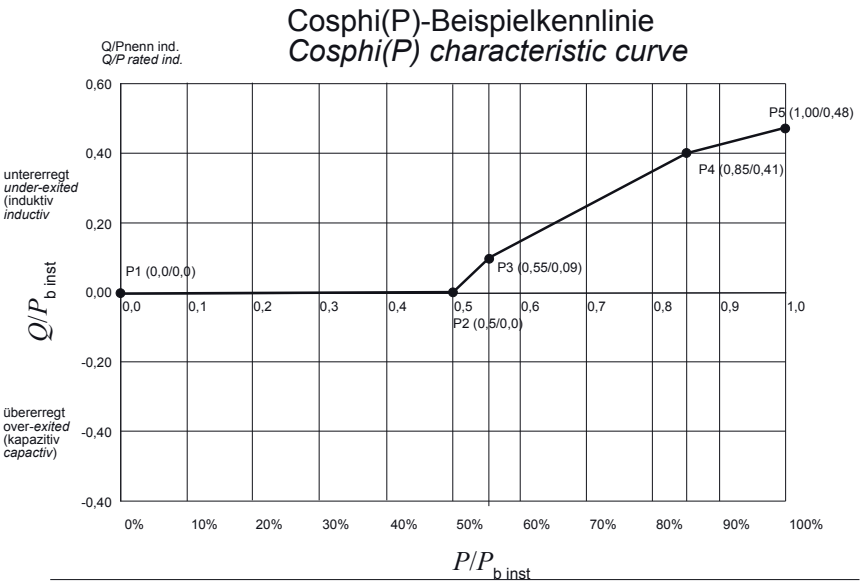
Example 2: Reactive power curve as a function of performance Q (P) (VDE)

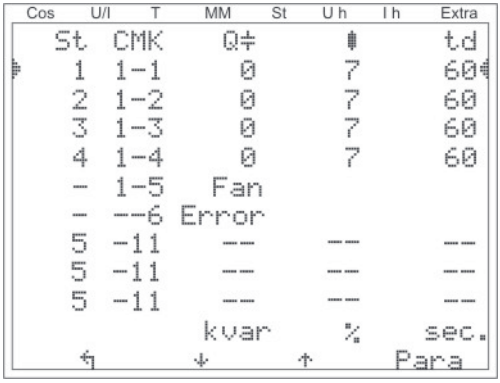


5.13.7.3 Submenu Stages

The **Stages** submenu contains the following items:

1. Auto configuration mode (only when using an induced current measuring module or an energy measuring module.
2. Stage parameters direct input
3. Rated values

At initial commissioning,
the following window is displayed in the stage overview (item 2.Stage parameters direct input):



Under the item Auto configuration mode, you can start automatic monitoring of the connected capacitor stages under the menu item
Extra ➔ Commissioning ➔ Stages ➔ Auto configuration mode ➔ Start.

First, the configured parameters are displayed.
If needed, these can be corrected here or, if they are already correct, confirmed with F3 (OK). After the last confirmation, all capacitor stages are switched off, and the auto configuration mode can be started. During the procedure, the stages are switched on individually, and the stage power is determined. This can be interrupted by pressing F2 (Stop) at any time. The progress is illustrated in the status display. Along with this, the connected capacitor stages are hooked up, one after the other. From the current consumption measured, the **multicomp D6-xxx-7** determines the corresponding stage power. After successfully determining the stage power, the result is displayed and can be saved by confirming it (press button F4 (Return) repeatedly, until the prompt **Save parameters Yes/No** appears). If measurement errors have occurred, they can be discarded, and the mode be restarted.

A prerequisite for performing the auto configuration mode is, however:

1. Measurement via induced current transformer and current measuring module **multisio D2/4CI** or energy measuring module **multimess D4-0-BS**

2. Correct programming of the primary and secondary voltage

3. Correct programming of the primary and secondary current of the induced current transformer

4. Correct programming of the primary and secondary voltage of the energy measuring module

5. Possible additionally connected modules must be detected and stored with the help of the Settings ➔ Module / Display ➔ Module management menu item

6. The capacitive or inductive stages must be connected

If all these prerequisites are met, the auto configuration mode of the stage powers can be started.

Under the item **Stage parameters direct input**, all stage parameters can also be entered manually.

The following parameters are available:

1. Stage power from 0.00 to 999.9 kvar

2. Capacitive or inductive stages

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3. Cabinet No. 1 to 6

4. Discharge time 0 to 900 sec.

5. Detuning 0, 5.5, 7, 8, 12.5, 14%

6. Operating cycle reset

7. Overtemperature switch-off reset

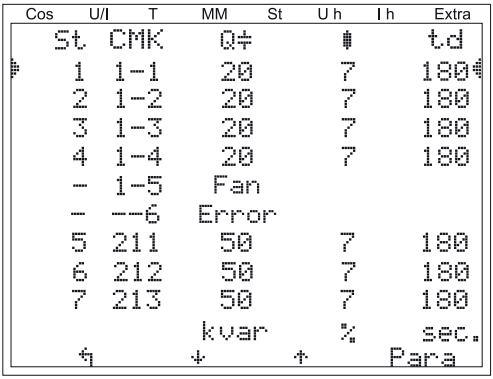
8. System type standard, combination filter, special

9. Special outputs fans/alarm relays programmable for terminals K5 (45) and C/S (30, 31). These outputs are by default assigned to fan and alarm relay, can however also be used as capacitor stages.

NOTE

The alarm relay output is set as an NC contact by default, but can be reprogrammed as an NO contact through visual energy in the stage configuration.

For a completely configured controller, the following window appears:



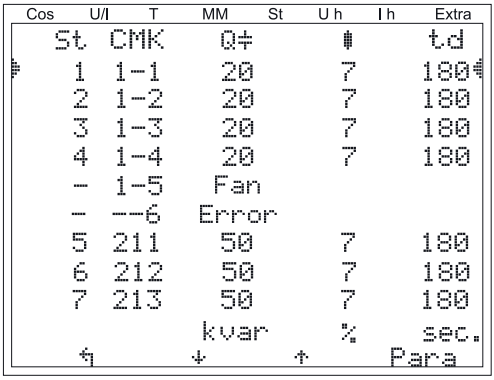
The following abbreviations apply:

St.	stage
CMK	C = Cabinet No. M = Module No. (module MULTI-RO) K = Capacitor stage output
Q≒	Compensation power of stage, in kvar
≢	Stage detuning in % or indication of the inductive compensation stages (in the stage overview window)
td	Stage discharge time in seconds
⊧ ⊧	Cursor for stage selection with ↑ or ↓

Description of special outputs (K5, S) configuration as capacitor stage:

Menu Extras ➔ Commissioning ➔ Stages ➔ Stage parameters:

After pressing button F3 (stage), the following display appears in the hot-key area of the display:



With the F2 (↓) button, select the item Fan or Alarm and start the entry by pressing F4 (Para) and EDIT. You can only choose between fan and stage or alarm relay, stage and fan. Subsequently, leave the configuration menu by pressing F1 repeatedly and accept the changes by pressing F3 (Yes).

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Analogue compensation stage

In addition, an analogue adjustable stage can be programmed.

Activation of the analogue stage takes places in the menu: Extras => commissioning => stage => stage => para => discharge time => operating cycle => facility type => special => special outputs:

Parameters "Ana" (Analogue stage): OFF/CAN/2A0 (analogue stage deactivated / via CAN-interface / via 2AO-module)

NOTE

After re-parameterisation the controller should be rebooted (Menu extras => settings => system => reset => boot (F3)), otherwise the analogue stage here will not operate correctly.

You can specify in the Module Management of the 2AO module whether

Module 0–10 V or 4–20 mA should output (applies to both outputs - only

the 1st output is used instantaneously)

The menu: Extras => commissioning => stage => stage => para displays the support of an analogue stage (Administration as the final stage (Stage 25)).

Instead of the discharge time, this stage indicates how much power is available in the opposite direction (ind./cap.). Example:

Stage power	= 10 kvar capacitive
Parameter "Q inverse"	= 50% the result is the following: The analogue stage can also compensate 5 kvar inductive.
Parameter "Q inverse"	= 0% the result is the following: The analogue stage can only compensate capacitive.

If an analogue stage is activated then the controller tries to equalize the missing compensation power with this stage as far as possible. The instantaneous missing compensation power for the analogue stage is only changed in switch times.

The menu Extras => commissioning => stage => stage = para => discharge time => operating cycle displays the instantaneous requested power (var) instead of the operating cycle in the analogue stage (Stage 25).

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When an analogue stage is activated, then you can configure the switching hysteresis [%] and the target [%] of the analogue stage in the menu extras => settings => system => parameters => switching hysteresis => Ana.=> analogue parameters.

Example:

Stage power	= 50 kvar
Switching hysteresis	5% (of 50 kVAR)
Target	50% (of 50 kVAR)

the result is the following:

The switching hysteresis is 2.5 kVAR, from this missing compensation power, the analogue stage begins to compensate.

The target is 25 kVar, i.e. where a large amount of compensation power is missing, a preprogrammed stage is activated and the analogue stage takes over the residual compensation.

The target is relevant if a further switching stage is accessed (the analogue stage must then be able to work in both directions (capacitive and inductive) to balance out possible under or overcompensation).

NOTE

SecureC does not work if an analogue stage is activated.

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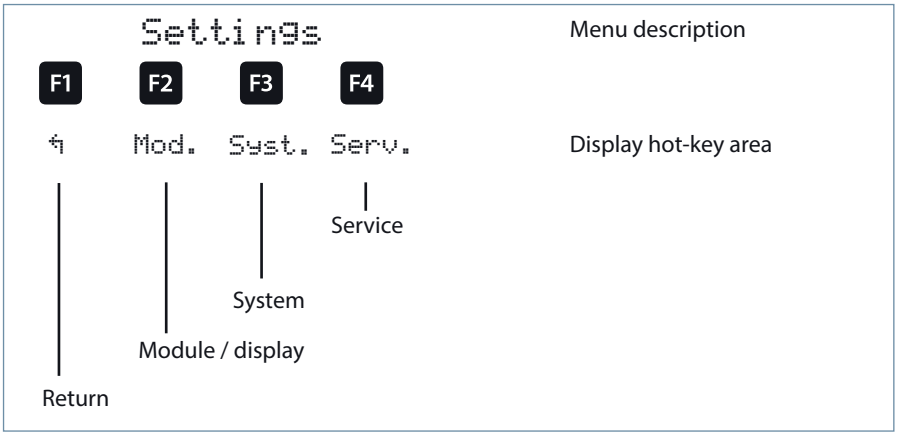
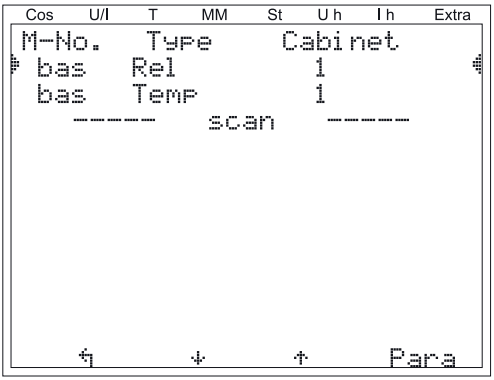
5.13.8 Settings





5.13.8.1 Submenu Modules/display

The Modules/display submenu contains the following items:

1. Module administration

2. Bus parameters

3. Display / Language

For the item **Module management**, the additionally connected modules (relay module **multisio D4-4RO ISO**, temperature module **multisio D2-1TI2RO**, current measurement module **multisio D2-4CI** and energy measuring module **multimess D4-0-BS**) are scanned, deleted and configured.

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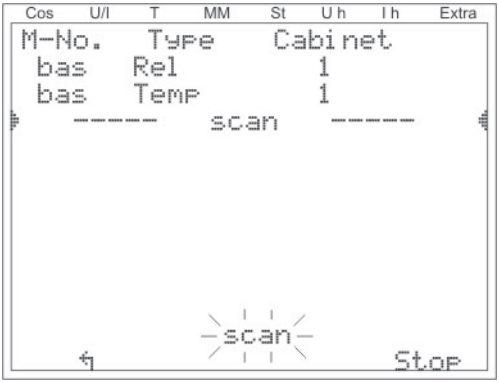
Description of the module scan:

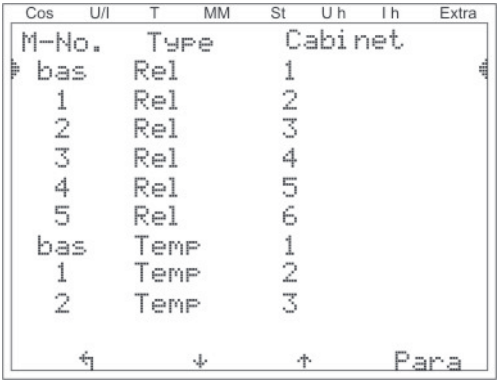


Press the F2 (↓) button to select the entry scan and start scanning by pressing F4 (SCAN).

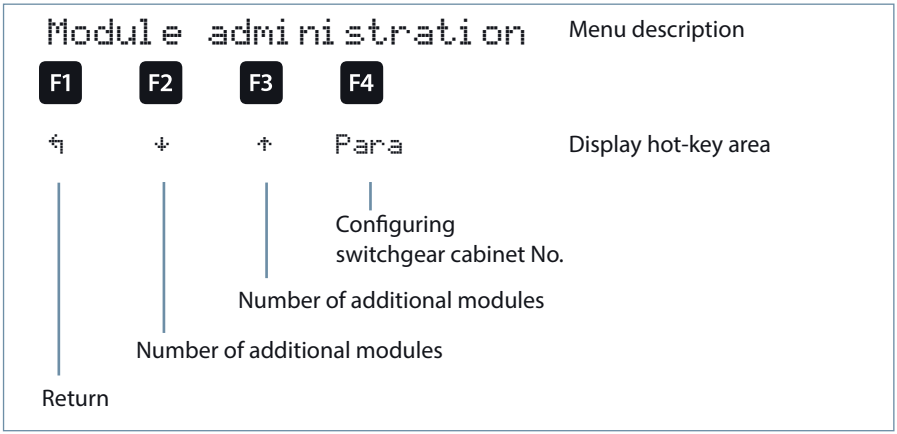
As long as scan is flashing, you can set the first module (and all subsequent modules to be scanned) into scanning mode using the Scan button on the modules (**see Appendix/ Additional modules**). The module is then detected by the controller and allocated to the relevant cabinet.

As soon as all additional modules are read, the scanning mode is to be stopped by pressing F4 . The list of modules can now be checked for completeness by pressing the buttons F2 (↓) and F3 (↑). The cabinet allocation can be changed with F4 (Para).

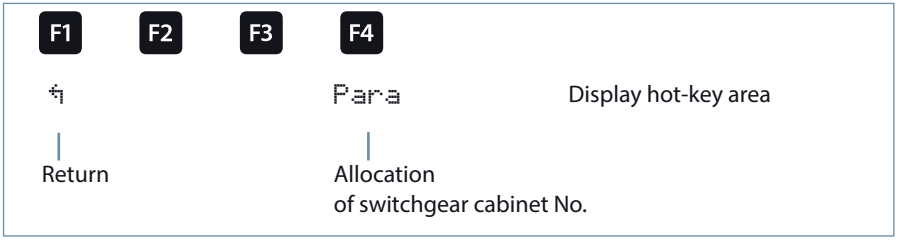
Display example after module scan:



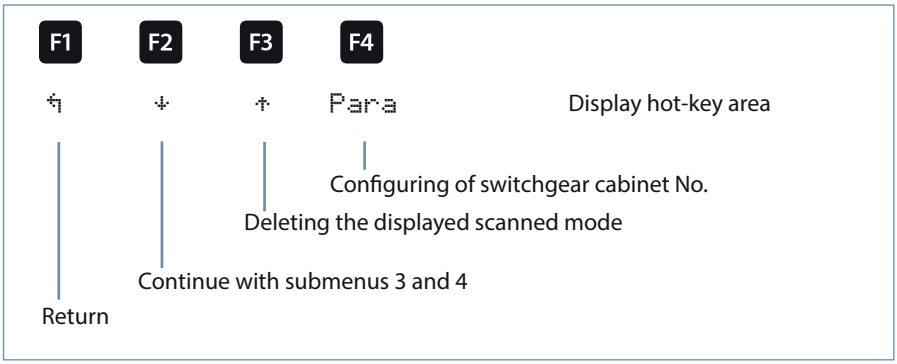
For previously set modules, the switchgear cabinet allocation can be changed by pressing F4 . Further modules can be displayed and configured using F2 (↓) and F3 (↑).



After pressing the F4 (Para) button, the following is displayed in the hot key area:



After pressing the F4 (EDIT) button, the following is displayed in the hot key area:



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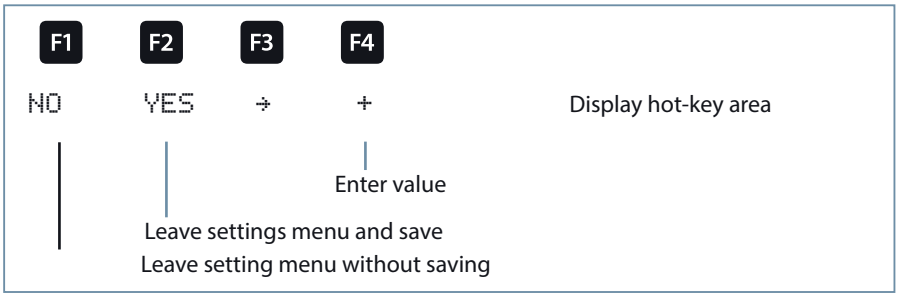
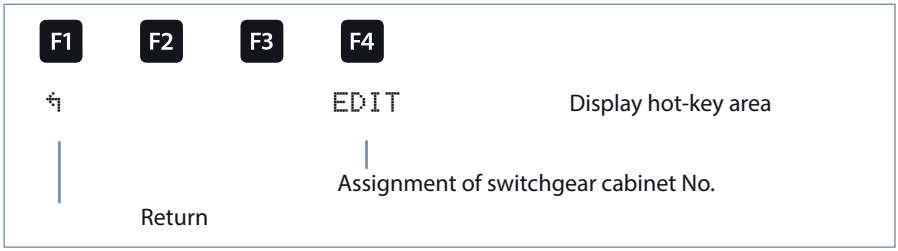
Submenu 3: Module detection (flashing on and off). Here the corresponding module can be set to a flashing mode, so it can be uniquely allocated.

Submenu 4: Module type – Display and current firmware version of the module. For example, `Temp` is entered here for the temperature input module, `2.00` as the firmware version and `r007` as the release of the firmware version.

After pressing the F4 (+) button, the following appears in the display:



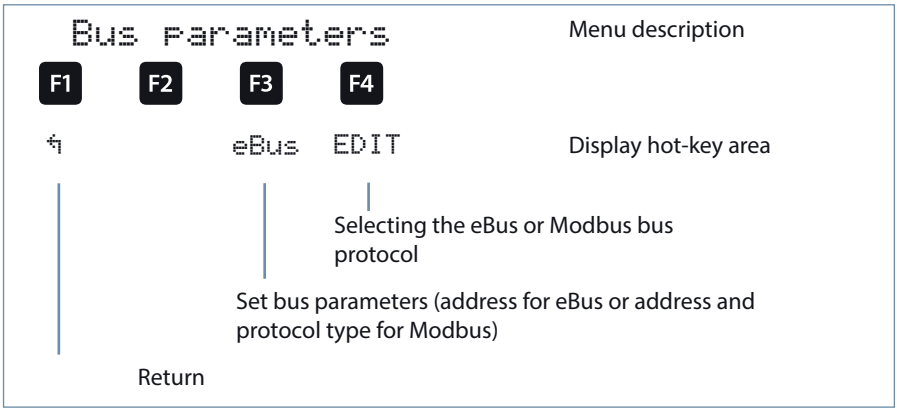
After pressing the F4 or F2 button, the following appears in the display:



NOTE

Additional modules - function of the module DIP switches and module scan buttons, see Appendix!

For the item **Bus parameters** the bus operation is configured (KBR eBus and Modbus). Here the bus address for the KBR eBus and the bus address and protocol type for the Modbus can be set.



Parameters	
Bus	= eBus or Modbus

Bus address 0 to 9999 for KBR eBus

Bus address 1 to 247 for Modbus

Baud rate and bus protocol on Modbus:

ASCII or RTU
4800, 9600 or 19200 baud
even, odd or no parity

NOTE

After adjusting the bus type (KBR eBus or Modbus) the controller is restarted, i.e. all hooked up capacitor stages are discarded and hooked up again.

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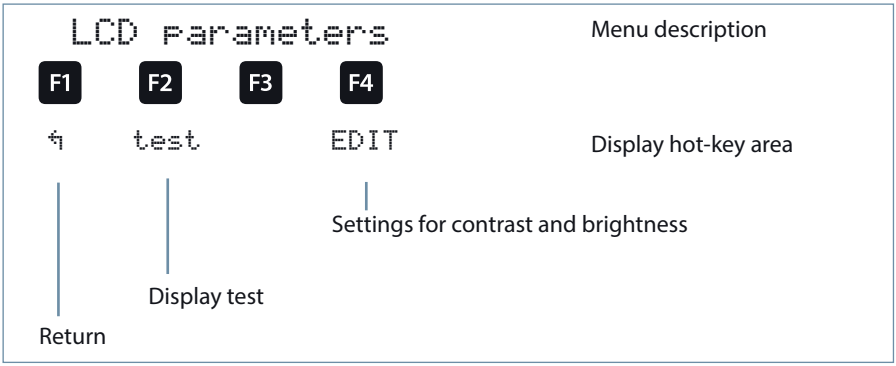
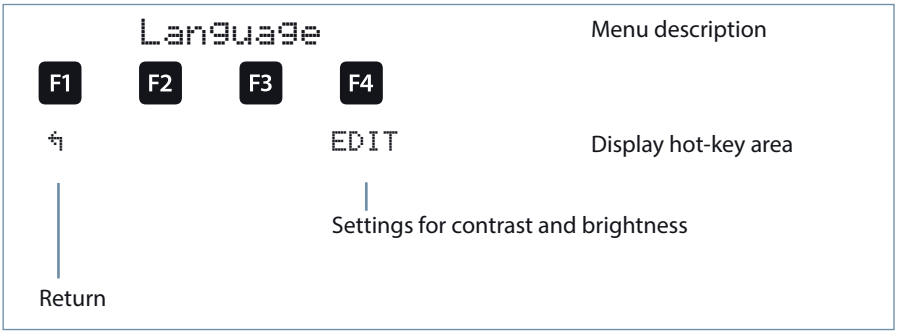
With the item Display/Language, the settings for the external LCD display and the user language German/English/French can be selected. In addition, the time setting can be made here and the total operating time for the controller can be queried. The setting to switch daylight saving time / standard time can be made here



Parameters	
LCD	= Contrast and brightness



Parameters	
Language	= German/English/French

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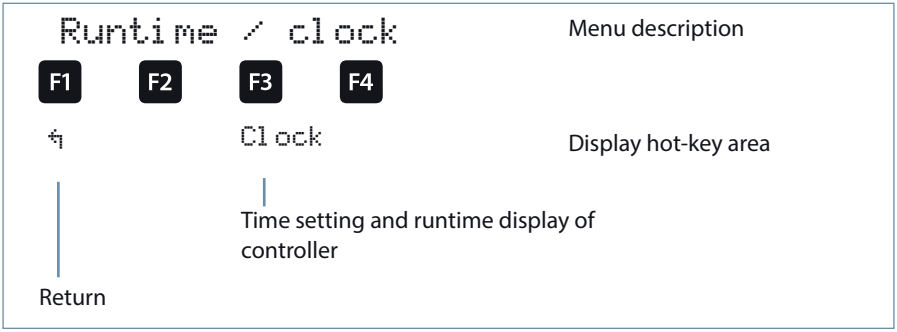
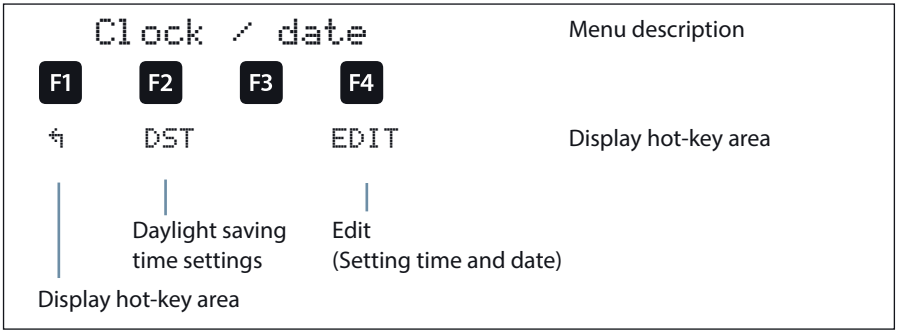
Runtime and clock:



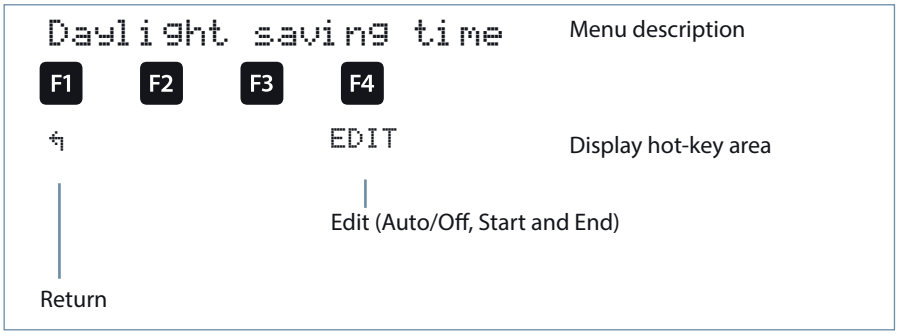
Parameters	
Runtime	= Total operating time of controller
Clock	= Time setting

After pressing the F3 (Clock) button, the following is displayed in the hot key area:



Parameters	
Clock time/date	= Time (ss:mm) and date (dd:mm:yyyy)

After pressing the F2 (DST) button, the following is displayed in the hot key area:



Parameters	
Daylight saving time	= Auto (automatic adjustment), Off (adjustment disabled) Start month and end month

5.13.8.2 Submenu System

The System submenu contains the following items:

1. Parameters

2. Reset

For the item Parameters, the switching behavior, temperature parameters and limits can be adjusted.

The switching behavior comprises the following options:

Switch-on and switch-off hysteresis		Input in % with respect to the stage power of the smallest available capacitor stage
Switching times:	Idle time after compensation	Input in seconds (0–300 sec.)
	Alarm delay for FTS	Input in seconds (3–3000 sec.) until the message **F**acility **T**oo **S**mall is issued, i.e. the alarm cosφ was not reached after expiry of the time set.
	Switching interval	Input in seconds (0 to 10 sec.). It is specified here at what interval the capacitor stages must be hooked up if there is insufficient compensation power, to achieve the set target cosφ.
	Attenuation coefficients	The attenuation coefficients (0 to 6) are there to reduce the display fluctuations; the measuring cycle of the controller is not influenced.

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The **temperature parameters** contain the general activation and deactivation of the temperature measurement and the switching behavior resulting from this. In addition, the switching threshold and hysteresis for the fan control and the switching threshold and hysteresis for the overtemperature switch-off can be set here. The following parameters are available for switching thresholds and hystereses:

Switching threshold fan	= 0 to 70°C / hysteresis = 0°C to 25°C
Operating point alarm	= 0 to 70°C / hysteresis = 0°C to 25°C
Operating point overtemperature	= 0 to 70°C / hysteresis = 0°C to 25°C

The default settings are:

Switching threshold fan	= 28°C / hysteresis = 5°C
Operating point alarm	= 45°C / hysteresis = 5°C
Operating point overtemperature	= 48°C / hysteresis = 5°C

This means that the fan switches on when 28°C is exceeded and switches off again when temperature drops below 23°C. The overtemperature alarm is triggered when 45°C are exceeded and is reset when the temperature drops below 40°C. The overtemperature stage switch-off is activated when 48°C are exceeded. After the temperature has dropped below 43°C, the stages are hooked up again if required, after the discharge time has elapsed.

The overtemperature switch-offs for the individual stages are added together so that it can be determined later on whether, and in which cabinet, there are temperature problems.

NOTE

To prevent unnecessarily frequent switching of the fan, it has a run-on time of 30 minutes.

NOTE

Now several stages can be switched simultaneously in one switch time, if the stage power of a stage is insufficient.

Example:

Settings: Qmax/Step = 20 kVar

The following can be switched at the same time:

- Stage 1 5 kVar
- Stage 2 5 kVar
- Stage 3 10 kVar

Activation takes place via: Menu extras => settings => system => parameters => switching performance => switching hysteresis => Qmax/Step (if the value entered is bigger than 0, then the function is activated).

SecureC does not work if several stages are switched in one switch time.

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If no induced current measurement has been activated and if the missing compensation power (to the target Cosphi) is greater than 3 x switching criteria (e.g. 70% of the lowest stage power) and if several stages are allowed to be switched per cycle, then the times for the switching gap are reduced to 500 ms, so that stages can be switched quickly (fast compensation of the missing compensation power).

Example:

Control deviation (missing compensation power) = 40 kVar

3 x switching criteria (= 3x 7kVar) = 21 kVar
(e.g. 70% of lowest stage power 10 kVar)

several stages per cycle (Qmax/Step) = 30 kVar

=> Switching interval is reduced to 500 ms

Stage selection mode:

In the menu switching hysteresis / F3 mode the sequence of switching criteria for the compensation stages can be changed.

The aim of the sequence of switching criteria is to use the compensation stages as evenly as possible. The following modes are available (listed according to the sequence of selection criteria:

Mode 1: Default after reset to default settings):

- longest turn-off duration of the compensation stage
- fewest switching cycles of the compensation stage
- fewest operating hours (turn-on duration) of the compensation stage

Mode 2:

- fewest operating hours (turn-on duration) of the compensation stage
- fewest switching cycles of the compensation stage
- longest turn-off duration of the compensation stage

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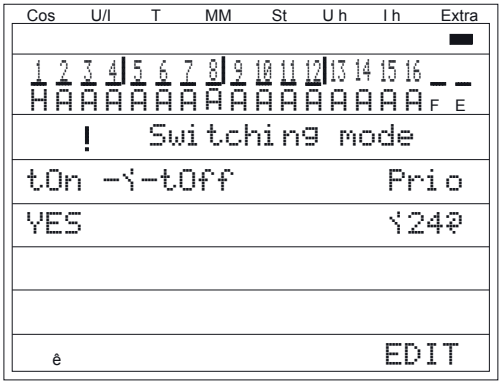
Mode 3:

- fewest switching cycles of the compensation stage
- fewest operating hours (turn-on duration) of the compensation stage
- longest turn-off duration of the compensation stage

Display example for Mode 2:



NOTE

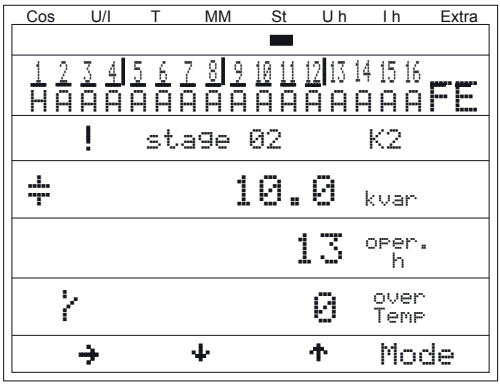
In Mode 2 under menu item stage management, instead of the operating cycle, the operating hours (turn-on duration) of the compensation stage are displayed.

Moreover in this mode, in the menu switching-hysteresis / mode with the parameter 24h exchanging the connected compensation stage with equivalent stages, but with fewer operating hours, can be activated/deactivated.

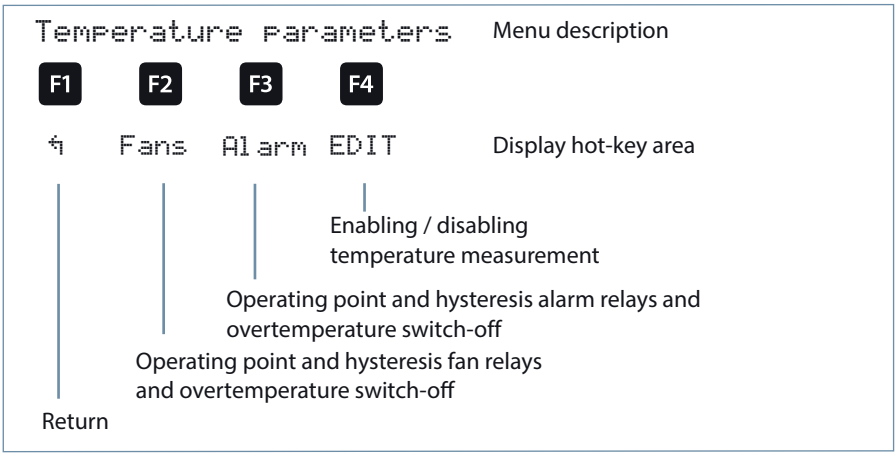
However, the prerequisite is that the equivalent stage:

- has the same compensation power
- the previous stage runtime is lower (at least 12 hours)

The exchange takes place every 24 hours.



Temperature measurement, incl. enabling:



Parameters	
Temperature measurement	= active / inactive
Switching threshold fan	= 0 to 70°C / hysteresis = 0°C to 25°C
Operating point alarm	= 0 to 70°C / hysteresis = 0°C to 25°C
Operating point overtemperature	= 0 to 70°C / hysteresis = 0°C to 25°C

NOTE

The set temperature operating points and hysteresis are equally valid for the controller basic module and the additionally connected temperature module.

Moreover, limits are available for the overvoltage switch-off of the system, monitoring of the operating cycles of the stage contactors, monitoring of the current consumption of individual stages, monitoring of the current consumption of complete cabinets and the switch-off of stages if voltage harmonics are too high.

The setting range of the overvoltage switch-off goes up to 150% of the measuring

voltage, i.e. for a programmed measuring voltage of primarily 400 V Ph/Ph, the setting range is 230 V to 346 V Ph/N. The setting range is dependent on the programmed primary measuring voltage.

When the limit for the overvoltage switch-off is exceeded, the hooked up compensation stages are immediately switched off. After the temperature has dropped below the limit by 1% of the limit, the compensation stages are hooked up again after the discharge time has elapsed.

The configuration and functionality of the induced current limits is described in the menu "Functions of the controller in the secureC safety and maintenance concept" at the beginning of the user manual.

NOTE

The default setting for the overvoltage limit is, for a measuring voltage of 230 V PH-N, 10% more, i.e. 253 V PH-N. In case of operation via voltage transformer, the limit has to be set correspondingly higher.

Example: For a voltage transformer of 500 V PH-PH
primary and 230 V PH-PH secondary, the limit has to be set to 550 V PH-PH (500 V PH-PH + 10% (= 50 V) equals 550 V PH-PH).

This limit has to be configured manually!

The limit of the capacitor contactor operating cycles is used as an indication for customers that the capacitor contactor could be worn out due to the number of switching operations accumulated. However, the message E09 Lim operating cycles does not affect the function of the compensation system at all. It is merely used as a "maintenance instruction".

Operating cycle counting is always activated. However, the message E09 Lim operating cycles is only displayed when the system is defined as the standard system, meaning that all stages are switched via contactors.

In case of a special system (combination of contactors and thyristor switches), this message is suppressed. If the operating cycle count limit is set to 0, there is no message display, either.

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The limit of the harmonic switch-off refers on one hand to the total of all measuring voltage harmonics (Lim harm. U HD), on the other hand, limits may be assigned for each harmonic separately (3rd to 13th harm. U). The programming range lies between 0 and 99%.

Furthermore it can be set here whether the alarm relay should switch in case a limit is violated, stages should be switched off, or both. In addition, harmonics monitoring can be disabled here.

The Reset menu item offers various methods of resetting the programmed controller parameters. This has the advantage that not all programmed parameters are deleted at the same time, but only a specific range.

The following reset options are available:

1. **Commissioning - Reset:** Here the parameters are reset to commissioning status, i.e. error status and current transformer ratio are deleted.
2. **Reset of the limits:** For Ph/N and Ph/Ph voltage, voltage harmonics and induced current monitoring.
3. **Reset of extreme values:** All established maximum and minimum values are deleted together (for overview of maximum and minimum values, see list).
4. **Reset of stage parameters:** The stage parameters stage power, cabinet No., discharge time, detuning, operating cycle alarm limit, system type, special outputs fans/alarm relays are deleted together for all stages.
5. **Reset module parameters:** All scanned temperature, relay and induced current measurement modules will be deleted.
6. **Reset to default settings:** The programmable parameters are reset to the default settings. A list of the settings can be found in the Technical Data.
7. **Reset of measuring parameters:** The transformer settings for current and voltage, the attenuation coefficients U, I and Q, the transformer setting for the induced current measuring module and the energy measuring module, the rated voltage and the rated frequency will be reset.

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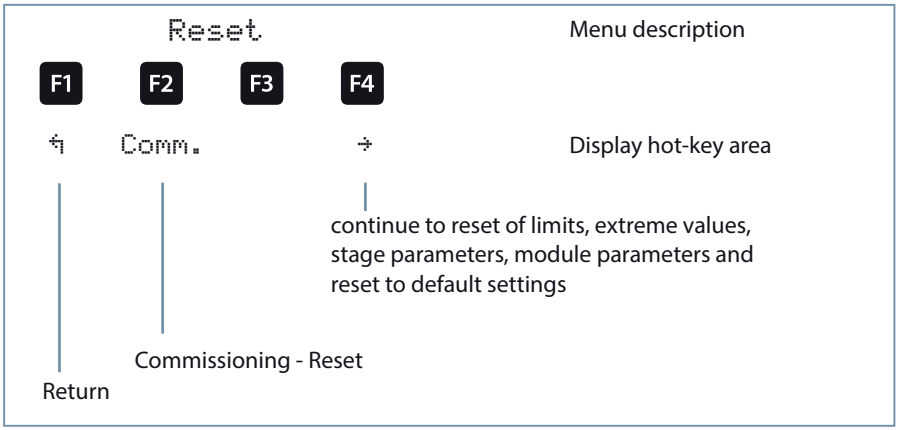
Reset functions:



Parameters	
Reset:	Commissioning reset, limits, extreme values, stage parameters, module parameters, reset to factory settings and reset of measuring parameters

Overview of extreme values (maximum and minimum),
part of which can only be read out via KBR eBus or Modbus:

Extreme values	Output	
Maximum: Voltage PH-N	Display	Bus
Maximum: Voltage PH-PH	Display	Bus
Maximum: Current (main current)	Display	Bus
Maximum: cos Phi		Bus
Maximum: Power factor		Bus
Maximum: Voltage distortion factor	Display	Bus
Maximum: Total apparent power	Display	Bus
Maximum: Total active power	Display	Bus
Maximum: Total reactive power	Display	Bus
Maximum: Voltage 3rd harmonic	Display	Bus
Maximum: Voltage 5th harmonic	Display	Bus

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Continued: Overview of extreme values

Extreme values	Output	
Maximum: Voltage 7th harmonic	Display	Bus
Maximum: Voltage 9th harmonic	Display	Bus
Maximum: Voltage 11th harmonic	Display	Bus
Maximum: Voltage 13th harmonic	Display	Bus
Maximum: Voltage 15th harmonic	Display	Bus
Maximum: Voltage 17th harmonic	Display	Bus
Maximum: Voltage 19th harmonic	Display	Bus
Maximum: Total harmonic currents		Bus
Maximum: Current 3rd harmonic		Bus
Maximum: Current 5th harmonic		Bus
Maximum: Current 7th harmonic		Bus
Maximum: Current 9th harmonic		Bus
Maximum: Current 11th harmonic		Bus
Maximum: Current 13th harmonic		Bus
Maximum: Current 15th harmonic		Bus
Maximum: Current 17th harmonic		Bus
Maximum: Current 19th harmonic		Bus
Maximum: Mains frequency	Display	Bus
Maximum: Mains compensation power	Display	Bus
Maximum: connected compensation power		Bus
Maximum: Temperature value main unit	Display	Bus
Maximum: Temperature value module 1	Display	Bus
Maximum: Temperature value module 2	Display	Bus
Maximum: Temperature value module 3	Display	Bus
Maximum: Temperature value module 4	Display	Bus
Maximum: Temperature value module 5	Display	Bus
Minimum: Voltage PH-N		Bus
Minimum: Voltage PH-PH		Bus

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Continued: Overview of extreme values

Extreme values	Output	
Minimum: Current (main current)	Display	Bus
Minimum: cos Phi		Bus
Minimum: Power factor		Bus
Minimum: Mains frequency		Bus
Minimum: Missing compensation power		Bus
Minimum: connected compensation power		Bus
Minimum: Apparent power	Display	Bus
Minimum: Active power	Display	Bus
Minimum: Reactive power	Display	Bus
Minimum: Temperature value main unit		Bus
Minimum: Temperature value module 1		Bus
Minimum: Temperature value module 2		Bus
Minimum: Temperature value module 3		Bus
Minimum: Temperature value module 4		Bus
Minimum: Temperature value module 5		Bus

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5.13.8.3 Service submenu

The Service submenu contains the following items:

1. Hotline
2. Password
3. Firmware version

Under the item **Hotline**, the service address and telephone hotline of the company **KBR GmbH, Schwabach**, can be displayed.

Under the item **Password**, changes to the controller parameters can be password-protected. The password can be any 4-digit number code. **The controller is delivered with the release code 9999, i.e. all functions of the device are available.**

The device's internal serial number is also shown in this menu

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Information on password protection of secureC:

Five passwords are managed. The actual password is also assigned a password number.

The following variants are available:

Possible password variants	
1. User password	Password that can be freely selected from between 0001 and 9999 Assigned password number: 00
2. Master password	Password set by KBR: 1976 Assigned password number: 00
3. KBR password	Password set by KBR, valid only in conjunction with the password number Assigned password number: 01 to 25
4. Day password	Temporary password, valid for 1 day, generated by KBR Assigned password number: 01 to 25.
5. Unlock password	Password for complete unlock, generated by KBR (existing password will be deleted) Assigned password number: 41

After locking with the secureC password (KBR password), level 1 is shown. This means that no operationally-specific parameters can be changed.

secureC cannot be unlocked with the master password 1976.

With a level 1-blocked controller, the following parameters are freely accessible:

LCD parameters	Language settings
Time	Bus parameters
Series transformer parameters	Target cosine phi

If there is an active secureC password and an active customer password, "Level Locked" is shown. After the customer password has been entered, Level 1 is shown.

If a locked controller is unlocked and no input is made for 5 minutes, the controller is locked again.

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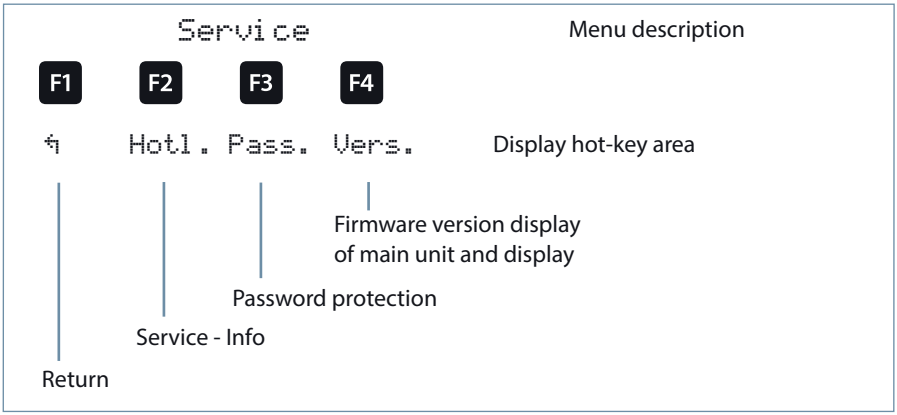
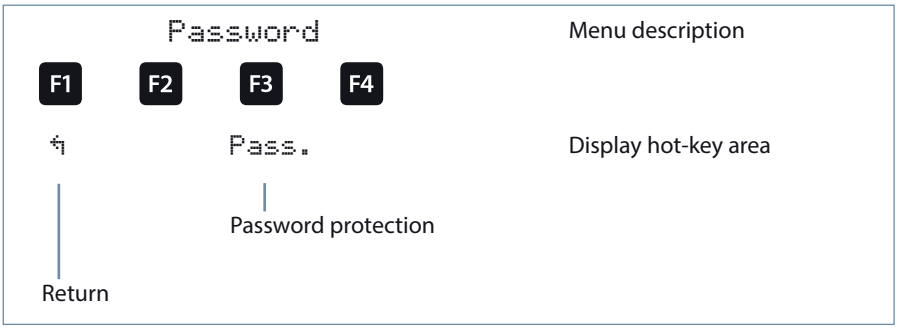
Hotline (service / information):



Password protection:



Parameters	
Code	= 4-digit combination, release code 9999 means that all functions of the unit are available.

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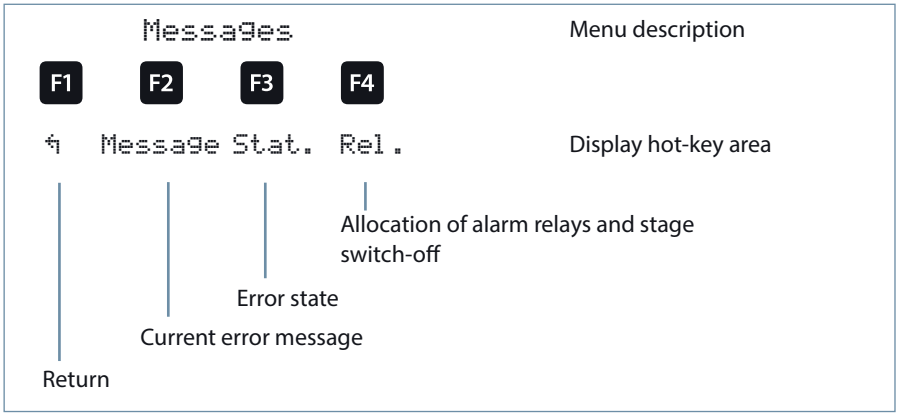
Under the item Firmware version, the firmware states of the controller and the separated LC display can be shown. Here the term BS stands for Basic, 7.00 for the firmware version and r001 for the release of the firmware version of the basic module, 7.00 stands for the firmware version and r001 for the current release of the firmware version of the display module.

The firmware version of any connected additional modules can be displayed under Extras ➔ Settings ➔ Modules/display ➔ Module management via the module configuration.

5.13.9 Messages



5.13.9.1 Submenu Messages

The Messages submenu contains the following items:

1. Current error messages

2. Error state messages

3. Relay/stage switch-off

Under the item **current error messages**, error messages are displayed that are temporary and do not have to be acknowledged, since they are shown for only as long as the error occurs. An exception to this is the message FTS (“facility too small”), which is both displayed as an error message and a status message.

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Under the item "Error state messages," messages are shown that must be deleted manually. This means that these messages, which are relevant for the correct operation of the system, do not go unnoticed.

The following status and error messages can be displayed:

Status messages (must be acknowledged)

E01	Power failure has occurred
E02	A limit has been violated
E05	Reset has been performed
E09	Operating cycles of a stage above limit (contactor stage)
E10	Limit violation of voltage
E11	Current direction (k and l of the current transformer were swapped)
E12	Facility too small (FTS)
E13	RTC capacitor empty
E14	Parameter error (default value replaces incorrect value)
E15	Input overload (current or voltage at the basic module)

Error messages (do not have to be acknowledged)

E17	No measuring voltage	Alarm relay Stage switch-off
E19	Stage power?	Alarm relay
E20	Facility too small (FTS)	Alarm relay
E21	Limit violated	Alarm relay
E22	Limit violated, stage switch-off active	Alarm relay Stage switch-off
E23	Stage switch-off temperature reached on at least one temperature sensor (stage switch-off always active)	Alarm relay
E24	Alarm temperature exceeded or short circuit on any temperature probe, or broken wire	Alarm relay
E25	No measuring current (for low load operation, the stages are switched off after one hour)	Alarm relay

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Continued: Error messages

E25	No measuring current (for low load operation, the stages are switched off after one hour)	Alarm relay
E26	Capacitor current too high (with induced current measurement)	Alarm relay
E27	Check fuse (for induced current measurement, no current increase due to connection of a stage)	Alarm relay
E28	Loss of capacitance	Alarm relay
E29	Contactor defect (current does not decrease when stage is switched off)	Alarm relay
E30	Stage locked due to induced current error	Alarm relay
E31	Induced current limit violated	
E33	Relay module 1 cannot be reached	Alarm relay
E34	Relay module 2 cannot be reached	Alarm relay
E35	Relay module 3 cannot be reached	Alarm relay
E36	Relay module 4 cannot be reached	Alarm relay
E37	Relay module 5 cannot be reached	Alarm relay
E38	Temperature module 1 cannot be reached	Alarm relay
E39	Temperature module 2 cannot be reached	Alarm relay
E40	Temperature module 3 cannot be reached	Alarm relay
E41	Temperature module 4 cannot be reached	Alarm relay
E42	Temperature module 5 cannot be reached	Alarm relay
E43	Induced current module 1 cannot be reached	Alarm relay
E44	Induced current module 2 cannot be reached	Alarm relay
E45	Induced current module 3 cannot be reached	Alarm relay
E46	Induced current module 4 cannot be reached	Alarm relay
E47	Induced current module 5 cannot be reached	Alarm relay
E48	Induced current module 6 cannot be reached	Alarm relay

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NOTE

Under the item Relay / stage switch-off , an action according to the preceding list can be activated or deactivated when one of the error messages E17 to E48 is displayed.

For the error message E24 alarm temperature exceeded or short circuit on any temperature probe, or broken wire, an additional note is displayed in the main menu Temperature:

SC = Short circuit
BR = Broken wire
NA = Temperature measurement not activated

Message window => Rel.: Error message text: Error message, alarm relay and message (ER+M), off (function deactivated).

When the Generator mode is active, the window "message outputs" is accessible in the window "Info" via F3 (Outp.). Here, the different statuses of the controller about free relay outputs can be displayed.

Mode Target CosPhi at DI => Phi:
PhiA, PhiB, PhiC, PhiD, Phi-default, aOn (all stages On), aOff(all stages off)

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6 Basic device configuration

The menu guidance of the multicomp D6-xxx-7 is self-explanatory.

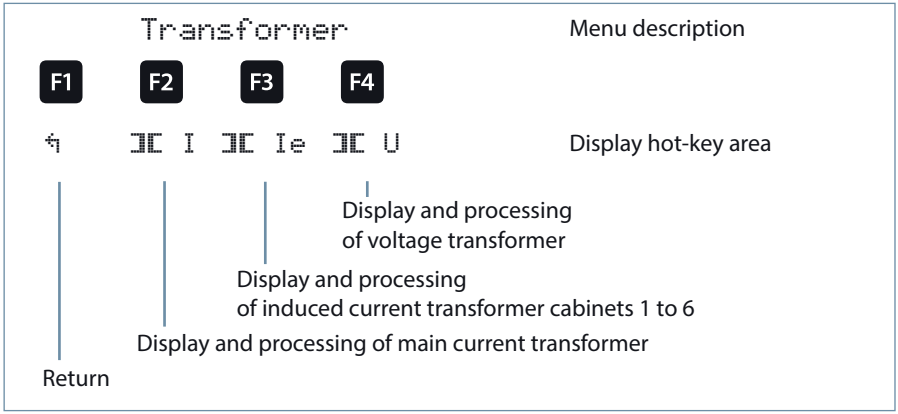
The operator is guided and supported by the device through operating instructions displayed for the respective situation.

As an example of the basic configuration procedure, the functions in the Commissioning menu will be looked at more closely in the following.

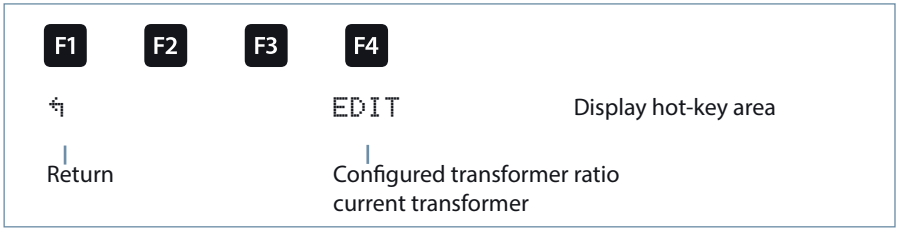
Menu item: Transformer

6.1 Setting transformer ratio

After pressing the F2 (⊐I⊏) button, the following is displayed in the hot key area



After pressing the F2 (⊐I⊏ I) button, the following is displayed in the hot key area



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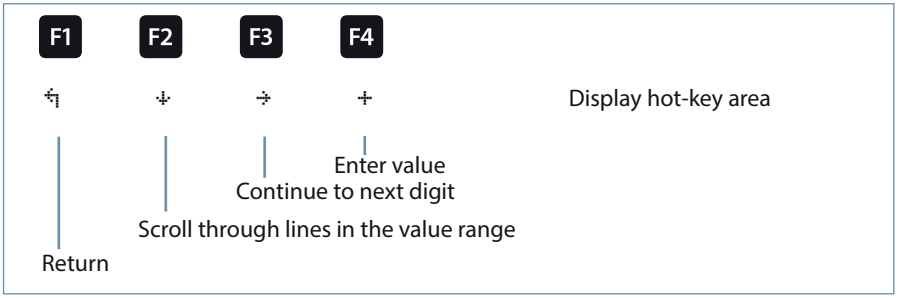
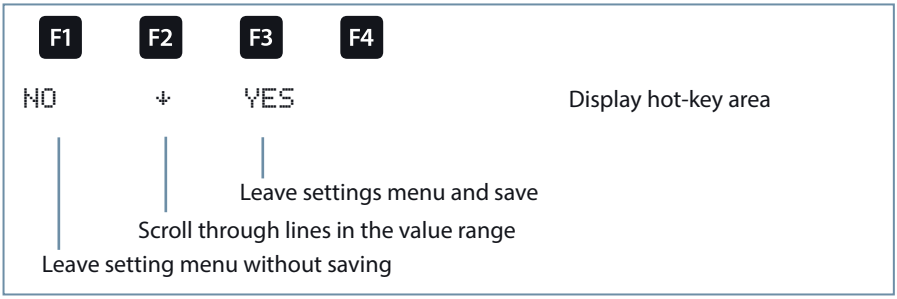
After pressing the F2 (EDIT) button, the following is displayed in the hot key area



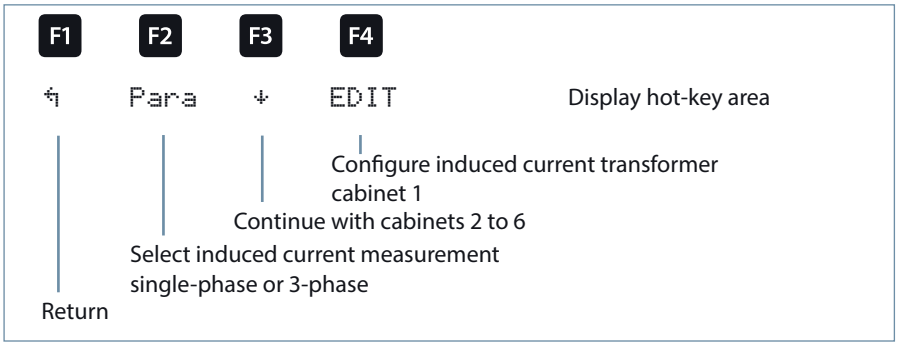
If the setting was changed, the following display appears after the third line in the hot key area of the display if the ↓ key (scrolling function) is pressed:



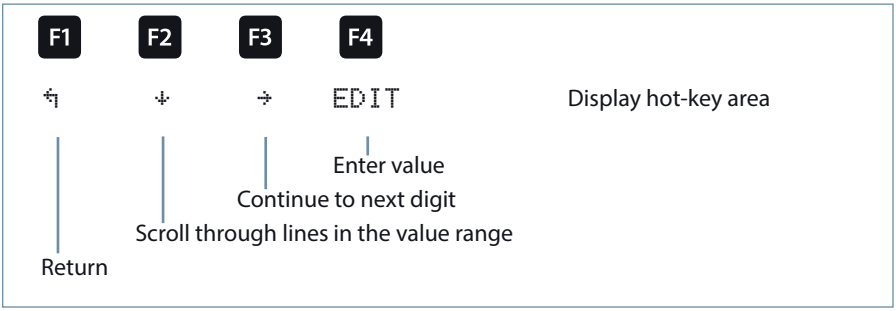
NOTE

The settings for the voltage transformer are identical !

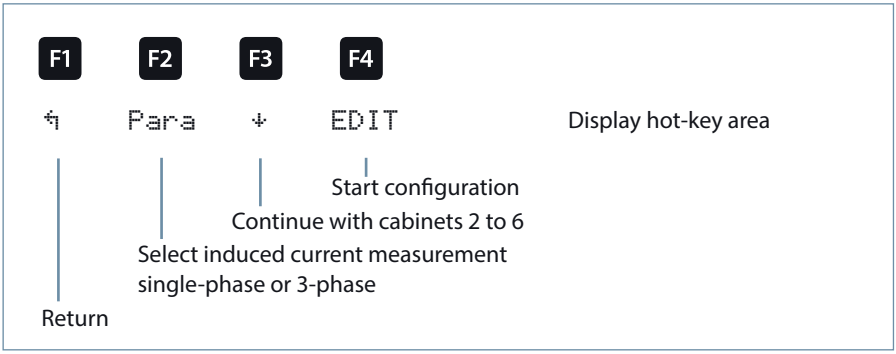
After pressing the F3 (⅄Ⅎ Ie) button, the following is displayed in the hot key area:



After pressing the F4 (EDIT) button, the following is displayed in the hot key area:



If the setting was changed, the following display appears after the second line in the hot-key area of the display when the ↓ key (scrolling function) is pressed:



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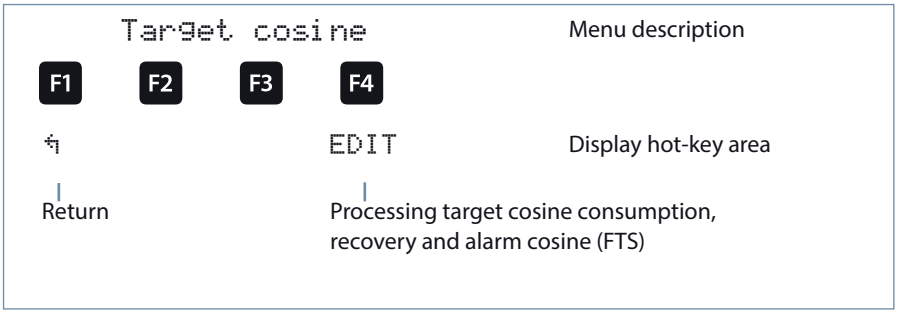
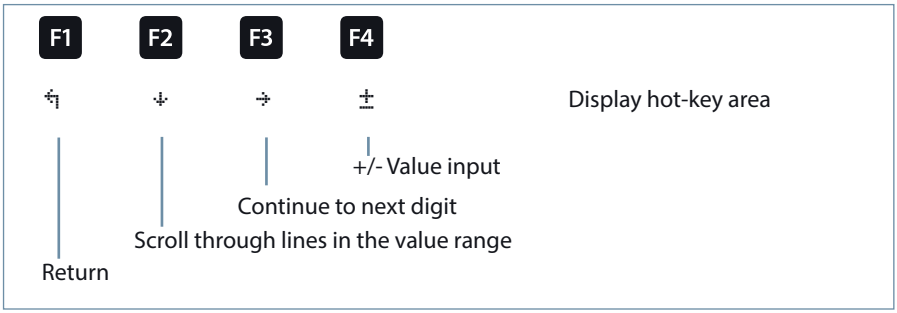
6.2 Set target cosφ

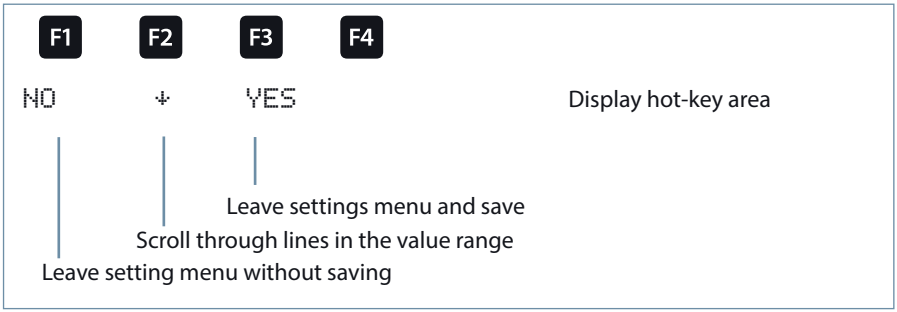
After pressing the F3 (Cos.) button, the following is displayed in the hot key area:



After pressing the F4 (EDIT) button, the following is displayed in the hot key area:



If the setting was changed, the following display appears after the third line in the hot key area of the display if the ↓ key (scrolling function) is pressed



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6.3 Notes on troubleshooting

Undercompensation, not enough stages are switched on.

Check controller for error messages If the target cos phi is set to 0.8 capacitive, you need to start switching on capacitors. If the system is not over-dimensioned, almost all stages need to be switched on.

Check the system's main fuse and group fuses. All values can be found in the enclosed documents. The group fuses must display at least 1.7 times the value of the capacitor power.

If the fuses blow despite being correctly selected, the groups must be checked individually for excessive current input and defective contactors.

Undercompensation, all stages are switched on.

The existing system is not sufficient (e.g. due to new inductive consumers).

Please contact your local representative (enlarge your system). See the cover sheet of these operating instructions for the service telephone number, or menu item Extras / submenu 7.

Undercompensation, too many stages are switched on.

Check controller settings (target cos phi capacitive?).

Is the transformer installed in the wrong position?

Controller switches too often, in particular during light load times (at the weekend, at night).

Check the transformer ratio configuration.

If necessary, (manually) switch a small stage on permanently.

Please call your local representative if you are unable to find the cause of the error. The phone number can be found on the cover sheet of these operating instructions or in the menu item Extras / submenu Service

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6.3.1 System and safety devices maintenance

In order to ensure that your system functions properly and has a long service life, perform the following checks after commissioning and then on an annual basis.

- Check and re-tighten all connections. Screw connections may become loose at the beginning due to thermal stress.
- Check fuses, safety devices and switching equipment. Contactors are wearing parts. If the contactor is intact, switching must take place without excessive formation of sparks.
- Check the control performance in automatic mode.
- Check the cooling air setting (fans, temperature monitoring function):
  - Temperature relay of controller switches ventilators on at 28°C,
  - Temperature monitoring switches system off via controller at 48°C.
- Clean the filter mats if necessary, depending on how dirty they are.
- Visual inspection of capacitors for leaks (a reliable encapsulation of the dielectric is a prerequisite for the long life of the capacitor).
- Examine the current input and capacitor terminal voltage once every three months.
- Check the reactive energy consumption on the basis of the electricity bill.

6.3.2 Temperature limits

Valid for systems in cabinets:

+ 35° C on a 24-hour average

+ 20° C on an annual average

+ 40° C short-term highest value

- 10° C lowest value

The above information applies particularly to reactor-connected systems. The current consumption and the temperature of these systems must be checked regularly so that overloading of the capacitors can be detected at an early stage. A higher input current can be caused by an increasing proportion of harmonics or by a change in capacitance of capacitors.

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7 Technical Data

7.1 Measuring accuracy

Current	± 0,5 % / ± 1 digit
Voltage	± 0,5 % / ± 1 digit
Power	± 1 % / ± 1 digit
Power factor	± 2 % / ± 1 digit
Frequency	± 0.1 Hz / ± 1 digit

7.2 Device memory

Work, data & parameter memory		2 MB flash
Program memory		512 kB flash
Memory type		Ring buffer
Extreme values (max./min.)		Extreme values that occurred after connection to the power supply or after the extreme value memory has been deleted manually including date and time (maximum indicator function)
Event memory	Memory size	1500 events including date and time of their occurrence
Operation logbook	Memory size	500 events including date and time of their occurrence
Limit violation	Recording time	≥ 200 ms
Voltage dips of the measuring voltage	Recording time	≥ 20 ms; threshold can be set using the computer, value after reset 85% of rated voltage (according to EN 61000-4-30).

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7.3 Measuring principle

Sampling	64 readings per period
A/D converter	12 bit
Measurement of U and I	simultaneous recording of measured values for U and I
Update speed (complete measuring cycle)	~ 330 ms
Harmonics calculation	FFT with 64 points over one period
Frequency measurement	Consumption: Voltage measured between phase Lx – N / Ly); correct frequency measurement due to power supply correction

7.4 Power supply

Power supply	US1: 100 - -240V ±10% DC/50/60 Hz
Power consumption	22 VA

7.5 Hardware inputs

Voltage measuring input	Terminals 10 and 13	57.75V... 500 V...600 V AC, designed for a max. rated voltage of 500 V AC, over 500 V AC PH-PH to 30.00 kV AC PH-PH with voltage transformer auxiliary
	Input impedance	at least 2.5 MOhm
	Measuring range	programmable
Temperature input	Terminals 51 and 52	- Connection for PT1000 temperature probe
	Measuring range	-20°C to 100°C ± 2°C
Current measuring input	Terminals 20 and 21	0.05 A...5 A...6 A AC (with x/5A transformer), designed for a max. rated current of 5 A AC 0.01 A...1 A...1.2 A AC (with x/1A transformer), designed for a max. rated current of 1 A AC
	Power consumption	0.3 VA per input at 6 A, 0.05 A per input at 1.2 A
	Measuring range	programmable

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7.6 Hardware outputs

Relay outputs	Switching stages	5 on basic device, one of these can be configured as fan
	Switching capacity	250V (AC) / 2A per relay
Alarm relay	Apparent power	250V (AC) / 2A floating, configurable as fans or switching stage
Interface	Serial interface	RS-485
	Bus protocol	KBR Energy bus / Modbus
	Transmission speed	38.400 baud, can be selected on Modbus 4,800, 9,600, 19,200 baud
	Address assignment	Can be addressed up to address number 9999 for KBR eBus; scan mode can be activated on the device
		Bus addresses for Modbus 1 to 247 configurable on the device
Display and confiuration interface	Serial interface	RS-485 (RJ12)
Module bus interface	Serial interface	RS 485 (RJ12) for ready-made KBR system cable (6-pin modular cable, unshielded), max. length 30 m if placed suitably

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7.7 Electrical connection

Connection elements		Plug-in terminals
Permissible cross-section of the connecting cables		2.5 mm²(Bus connection and temperature probe 1.5mm²)
Measuring voltage inputs	Fuse	max. 1 A slow-blow or max. C2 automatic, additionally mains disconnection device approved according to UL/IEC
Measuring current input	Fuse	NONE!!! Always short-circuit current transformer terminals k and l prior to opening the circuit!
Input control voltage	Fuse	max. 1 A slow-blow or max. C2 automatic, additionally mains disconnection device approved according to UL/IEC
Relay output	Fuse	max 2A medium time-lag
BUS connection	Connection material	For proper operation please only use shielded twisted-pair cables; e.g. J-Y(St)Y EIB 2x2x0.8
Transformer connection	Connections	See wiring diagram
BUS connection	Pins for BUS connection via RS-485	Terminal 90 (⊥) → Pin ⊥ → Terminal 91 (A) → Pin A → Terminal 92 (B) → Pin B →

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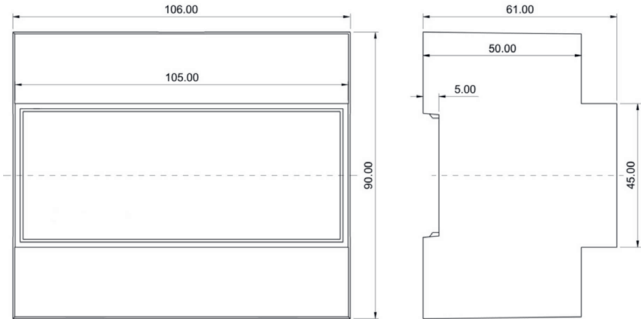
7.8 Mechanical data

DIN rail measuring device	Housing dimensions	90 x 106 x 61 mm (H x W x D),
	Mounting type	Wall mounting on DIN rail 7.5 mm deep, in accordance with DIN EN 50022
	Weight	Approx. 650g

Dimensioned drawing



7.9 Ambient conditions / electrical safety

Surrounding conditions	Standards	DIN EN 60721-3-3/A2: 1997-07; 3K5+3Z11; (IEC721-3-3; 3K5+3Z11)
	Operating temperature	K55 (-5°C …. +55 °C)
	Air humidity	5 % … 95 %, non-condensing
	Storage temperature	K55 (-25°C …. +70°C)
	Operating height	0…2,000 m above sea level
Electrical safety	Standards	DIN EN 61010-1: 2011-07
	Protection class	I
	Overvoltage category	CAT III
	Rated insulation voltage	4kV
Protection type	Standards	IP20 in accordance with DIN EN 60529: 2014-09
EMC	Standards	DIN EN 61000-6-2:2006-03 + amendment 1:2011-03 DIN EN 61000-6-3:2011-09 + amendment 1:2012-11 DIN EN 61326-1:2013-07

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8 Appendix

8.1 General technical data for modules (except multimess D4-0-BS)

Power supply:	Via module bus	24 V DC/approx. 2 W
	Connection	Modular connector RJ12:6P6C
Module bus interface:	Serial interface	RS485
	Module bus connection	RJ12 for ready-made KBR system cable, max. length 30 m when placed suitably
	Transmission speed	38400 Bps
	Bus protocol	KBR module bus
Mechanical data:		
DIN rail measuring device	Housing dimensions	90 x 36 x 61 mm (H x W x D) or multisio D4-1 4RO ISO 90 x 71 x 61 mm
	Mounting type	Wall mounting on DIN rail 7.5 mm deep, in accordance with DIN EN 50022. Suitable for distribution board mounting
	Weight	Approx. 100g
Standards and Miscellaneous:		
Ambient conditions	Standards	DIN EN 60721-3-3/A2: 1997-07; 3K5+3Z11; (IEC721-3-3; 3K5+3Z11)
	Operating temperature	-5°C ... +55°C
	Air humidity	5% ... 95%, non-condensing
	Storage temperature	-25°C ... +70°C

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8.2 Relay output module multisio D2 4RO

8.2.1 Connection diagram for relay output module

Terminal assignment:
Terminal 40: Shared connection (C)
Terminal 41: Output relay 1 (K1)
Terminal 42: Output relay 2 (K2)
Terminal 43: Output relay 3 (K3)
Terminal 44: Output relay 4 (K4)
IN/OUT:
Module bus/power supply

8.2.3 Relay output module LED display

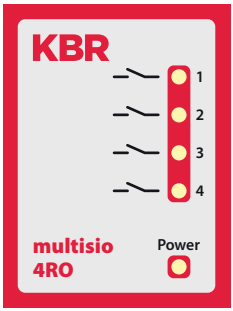
The LEDs on the relay output module indicate the current state of the relay output. If the output is active, the LED is on.
If the output is passive, the LED is off.

In KBR eBus scan mode, all four output LEDs flash.

In module detection mode, the output LEDs generate a chase light effect.

The LEDs represent:
LED1 for: Output relay 1 (K1) switched
LED2 for: Output relay 2 (K2) switched
LED3 for: Output relay 3 (K3) switched
LED4 for: Output relay 4 (K4) switched

Power LED: Operating voltage



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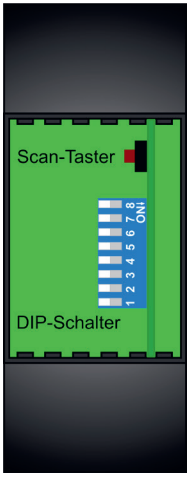
8.2.4 Function of Scan button

NOTE

If the scan button is pressed briefly, the module enters scanning mode.



Switch setting illustrated
OFF = white
ON = gray

8.2.5 DIP switch functions

The DIP switches do not function when in operation on the multicomp D6-xxx-7

Module-specific technical data:		
Hardware outputs:		
	5-pole plug terminal	
Supply voltage for the relay outputs:	Terminal 40	Non-floating
4 relay outputs	Terminals 41 to 44	Non-floating
	Contact capacity	500 VA each, 2 A, 250 V and 50/60 Hz
	Overvoltage category	CAT II
Display	LED	4x message 1x operation display
Control unit	DIP switch	1x eightfold
	Button	Scan button (module bus)

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8.3 Function description of the relay output module multisio D4-4RO ISO

The multisio D4-4RO ISO-1 hardware supports 4 floating relay outputs, 5 LEDs and an 8-fold DIP switch.

The relay outputs serve to control contactors of devices or other systems.

The module can be accessed by a master device (multimax 3D6, multisio 5D6 or higher, or a computer with VE via multisys D2-ESBS-3) using the module bus interface. The master device has to configure the module.

The operating voltage is supplied via the module bus interface. The module cannot be used on its own.

8.3.1 Connection diagram for relay output module

Terminal assignment

Terminal 40: Input relay 1 (A1)

Terminal 41: Output relay 1 (A1)

Terminal 42: Input relay 2 (A2)

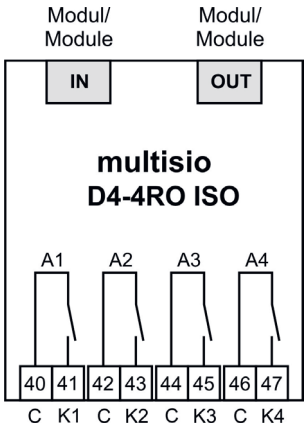
Terminal 43: Output relay 2 (A2)

Terminal 44: Input relay 3 (A3)

Terminal 45: Output relay 3 (A3)

Terminal 46: Input relay 4 (A4)

Terminal 47: Output relay 4 (A4)



IN/OUT: Module bus/power supply

NOTE

The module relay outputs are designed as floating outputs.

8.3.2 Relay output module LED display

In the KBR module bus scanning mode, all 4 output LEDs flash. In module detection mode, the output LEDs generate a chase light effect.

The LEDs represent:

LED1 for: Output relay 1 (A1) switched

LED2 for: Output relay 2 (A2) switched

LED3 for: Output relay 3 (A3) switched

LED4 for: Output relay 4 (A4) switched

Power LED: Operating voltage

8.3.3 Function of Scan button

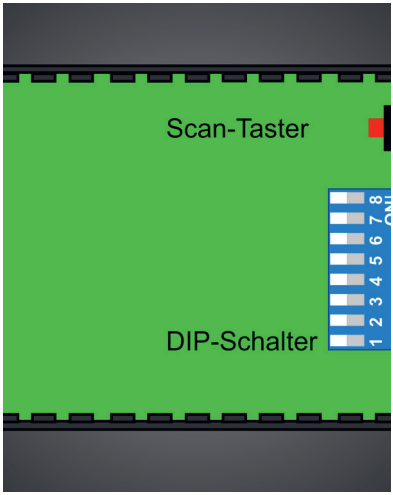
NOTE

If the scan button is pressed briefly, the module enters the scan mode.

Illustrated switch setting:

OFF = white

ON = gray



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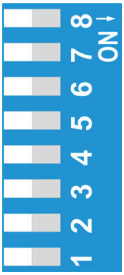
8.3.4 DIP switch functions

8.3.4.1 Operating mode



For every output, the multisio 1D4-4RO ISO differentiates between the operating modes "normal" and "manual." Switching is performed via the DIP switches 5 to 8.

The DIP switches are assigned to the outputs as follows:

- DIP switch 5 determines the operating mode of output 1
- DIP switch 6 determines the operating mode of output 2
- DIP switch 7 determines the operating mode of output 3
- DIP switch 8 determines the operating mode of output 4

If the DIP switch is set to Off, the respective output is in the normal operating mode. If the DIP switch is set to On, the respective output is in the manual operating mode.

Illustrated switch setting:
OFF = white
ON = grey

8.3.4.2 DIP switch settings

Normal operating mode

In the normal operating mode, the state created in the module is issued at the corresponding output.

Manual operating mode

In manual operating mode, the state of DIP switches 1 to 4 is issued at the corresponding output instead of the state created by the module.

The DIP switches are assigned to the outputs as follows:

DIP switch 1 determines the state of output 1

DIP switch 2 determines the state of output 2

DIP switch 3 determines the state of output 3

DIP switch 4 determines the state of output 4

If the DIP switch is set to Off, the output is passive / off. If the DIP switch is set to On, the output is active / on

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DIP operating mode		State DIP		Explanation
S5	Off	—	—	Output 1 = normal operating mode
	On	S1	Off	Output 1 = manual operating mode passive / off
			On	Output 1 = manual operating mode passive / off
S6	Off	—	—	Output 2 = normal operating mode
	On	S2	Off	Output 2 = manual operating mode passive / off
			On	Output 2 = manual operating mode passive / off
S7	Off	—	—	Output 3 = normal operating mode
	On	S3	Off	Output 3 = manual operating mode passive / off
			On	Output 3 = manual operating mode passive / off
S8	Off	—	—	Output 4 = normal operating mode
	On	S4	Off	Output 4 = manual operating mode passive / off
			On	Output 4 = manual operating mode passive / off

8.3.4.3 Technical data

Power supply:	Via module bus	24VDC / ca. 1.3W
	Connection	RJ-12:6P6C modular connector
Hardware outputs:	4 plug terminal, each 2 pole	
4 relay outputs	Terminals 40 to 47	floating
	Contact capacity	500VA each, 2A, 250V and 50/60Hz
	Overvoltage category	CAT II
Module bus interface:	Serial interface	RS-485
	Module bus connection	RJ-12 for ready-made KBR system cable, max. length 30 m when suitably placed
	Transmission speed	38400 Bps
	Bus protocol	KBR module bus

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Display:	LED	4x message 1x operation display
Control unit	DIP switch	1x eightfold, for manual operation
	Button	Scan button (module bus)
Mechanical data:		
DIN rail measuring device	Housing dimensions	90 x 70 x 61 mm (H x W x D)
	Mounting type	Wall mounting on DIN rail 7.5 mm deep, in accordance with DIN EN 50022. Suitable for distribution board mounting
	Weight	Approx. 130g
Standards and Miscellaneous:		
Ambient conditions	Standards	DIN EN 60721-3-3/A2: 1997-07; 3K5+3Z11; (IEC721-3-3; 3K5+3Z11)
	Operating temperature	-5°C ... +55°C
	Air humidity	5% ... 95%, non-condensing
	Storage temperature	-25°C ... +70°C
Electrical safety	Standards	DIN EN 61010-1/A2: 2001 + B1: 2002-11 + B2: 2004-1; (IEC1010-1/A2)
	Protection type	IP20 in accordance with DIN EN 40050 part 9:1993-05
	Electromagnetic compatibility	DIN EN 61000-6-3: 2001 + A11: 2004; (IEC61000-6-3) DIN EN 61000-6-2: 2001 (IEC61000-6-2)

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8.4 Temperature module multisio D2 1TI2RO

8.4.1 Temperature module connection chart

Terminal assignment

Terminal 40: Relay input Alarm

Terminal 41: Relay output Alarm

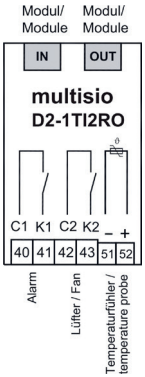
Terminal 42: Relay input Fan

Terminal 43: Relay output Fan

Terminal 51: Temperature input - PT1000

Terminal 52: Temperature input + PT1000

IN/OUT: Module bus/power supply



NOTE

The module relay outputs are designed as floating outputs.

8.4.2 Temperature module LED display

In KBR eBus scan mode, all four input LEDs flash. In the module detection mode, the input LEDs generate a chase light effect.

The LEDs represent:

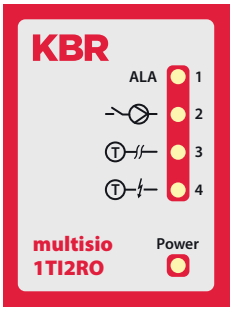
LED1 on: Alarm relay switched (contact open)

LED2 on: Fan relay closed

LED3 on: Temperature probe not connected

LED4 on: Short circuit on temperature probe

Power LED: Operating voltage

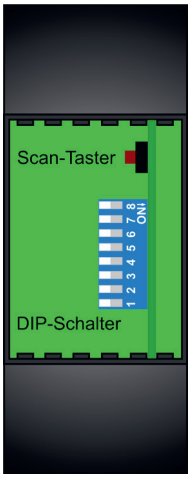


8.4.3 Function of Scan button

NOTE

If the scan button is pressed briefly, the module enters scanning mode.

Switch setting illustrated
OFF = white
ON = gray



8.4.4 DIP switch functions

The DIP switches do not function when in operation on the multicomp D6-xxx-7

Module-specific technical data:		
Hardware inputs:		
Temperature inputs	Measuring range	-20°C to +100°C +/- 2°C
	2-pole plug terminal	for PT-1000 sensor
Hardware outputs:		
2 relay outputs	4-pole plug terminal	floating
	Contact capacity	500VA each, 2A, 250V and 50/60Hz
	Overvoltage category	CAT II
Display	LED	4x message, 1x operation display
Control unit	DIP switch	1x eightfold
	Button	Scan button (module bus)

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8.5 Current measurement module multisio D2-4CI

The multisio D2-4CI may only be operated with a series-connected current transformer.

CAUTION

The transformers may not be secondarily grounded.

Up to 690 V network (phase to phase voltage), the connected current transformers have to be designed for a test voltage of at least 2500 VAC for 1 minute.

8.5.1 Current measuring module connection chart

Terminal assignment

Upper terminal row:

Terminal 20: Current input k1

Terminal 21: Current input I1

Terminal 22: Current input k2

Terminal 23: Current input I2

Lower terminal row:

Terminal 24: Current input k3

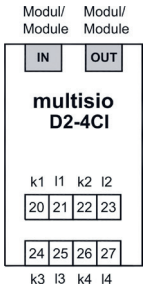
Terminal 25: Current input I3

Terminal 26: Current input k4

Terminal 27: Current input I4

IN/OUT:

Module bus/power supply



NOTE

Connect the current transformers according to the terminal numbers, i.e. transformer 1 to terminal 20/21, transformer 2 to terminal 22/23 etc.! The current inputs of the module are not galvanically separated.

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8.5.2 Current measurement module LED display

In KBR-eBus scanning mode, the power LED flashes quickly; in the module detection mode it flashes slowly.

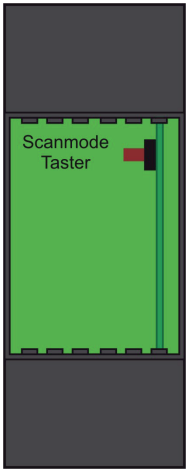
In normal operation, the LED is illuminated constantly.

Power LED: Operating voltage

8.5.3 Function of Scan button

NOTE

If the scan button is pressed briefly, the module enters scanning mode.



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Module-specific technical data:		
Hardware inputs:		
4 current measuring inputs	Measuring range	0 to 6A AC
	2x 4-pole plug terminal	Permissible width of connection lines 2.5 mm²
Measuring current input	Fuse	NONE!!!
		Always short-circuit current transformer terminals k and l before opening the circuit!
	Overvoltage category	CAT II
Display	LED	1x operation display / status display
Control unit	Button	Scan button (module bus)

8.6 Technical data of the multimess D4-0-BS measuring module

8.6.1 Measuring accuracy

Current	± 0.5 % / ± 1 digit
Voltage	± 0.5 % / ± 1 digit
Apparent power	± 1 % / ± 1 digit
Active power	± 1 % / ± 1 digit
Reactive power	± 1 % / ± 1 digit
Frequency	± 0.1 Hz / ± 1 digit

8.6.2 Measuring principle

Sampling	128 readings per period
A/D converter	12 bit
Measurement of U and I	Simultaneous recording of measured values for U and I
Update speed (complete measuring cycle)	< 1 sec.
Harmonics calculation	DFT with 128 points over one period
Frequency measurement	Consumption: Voltage measured between phase L1, L2, L3 – N

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8.5.3 Device memory

Main and data memory		16kB RAM unbuffered
Program / parameter memory		256 kB Flash / 4kB EEP
Energy meter P+, P-, Q+, Q-		saved in EEP
Limit violation	Recording time	8 min. for average current value, saved in RAM

8.5.4 Power supply

Measuring module power supply	50...230...280 VAC Ph-N, 3.2 VA, 50/60 Hz from the measuring voltage
Module bus power supply	ext. 24 VDC, 0.3 W, via RJ12 module bus connector

8.5.5 Hardware inputs and outputs

8.5.5.1 Inputs

Voltage measuring inputs	U_{L1-N} ; U_{L2-N} ; U_{L3-N}	3 x 50 V...230 V...280 V AC 50/60 Hz
	Input impedance	900 kOhm each (Ph-N)
Current measuring inputs	I_{L1}; I_{L2}; I_{L3}	3 x 0,02A...5A...6A AC
	Power consumption	<_ 0.3 VA per input at 6A

8.5.5.1 Outputs

serial interface	Module bus	RS485 via RJ12 interface
	Baud rate	38400
	Address assignment	Can be addressed using the display or visual energy (connection via multisio 3D2 ESBS gateway)

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8.5.6 Electrical connection

Connection elements		Plug-in terminals
Permissible cross-section of the connecting cables		2.5 mm^2
Measuring voltage inputs	Fuse	max. 6 A
Measurement current inputs	Fuse	NONE!!! Always short-circuit current transformer terminals k and l before opening the circuit!
Input control voltage		via measuring voltage
Module bus connection	Connection material	Ready-made KBR system cable (6 pole modular cable, unshielded), max. length 30 m when suitably placed

8.5.7 Mechanical data

Top-hat rail devices	Housing dimensions	90 x 71 x 61 mm (H x W x D)
	Mounting type	Wall mounting on DIN rail 7.5mm deep, in accordance with DIN EN 50022 Suitable for distribution board mounting
	Weight	Approx. 175g

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8.5.8 Standards and miscellaneous

Ambient conditions	Standards and subsequent amendments	DIN EN 60721-3-3/A2: 1997; 3K5+3Z11; (IEC721-3-3; 3K5+3Z11)
	Operating temperature	-5°C … +55°C
	Air humidity	5% … 95% non-condensing
	Storage temperature	-25°C … +70°C
Electrical safety	Standards and subsequent amendments	DIN EN 61010: 2001 +B1: 2002; +B2: 2004
	Protection category	II
	Overvoltage category	CAT III: U_{PH-PH} up to 400V
	Protection type	IP 20 DIN EN 60529:1991 +A1:2000
	Electromagnetic compatibility	DIN EN 61000-6-1: 2007, DIN EN 61000-6-2: 2005, DIN EN 61000-6-3: 2007, DIN EN 61000-6-4: 2007

8.5.9 Commissioning the multimess D4-0-BS at the multicomp D6-xxx-7

To commission the multimess D4-0-BS at the multicomp D6-xxx-7, please proceed as follows:

1. Connect the measuring module to the multicomp D6-xxx-7 via the module bus interface.

2. At the terminals 10 (L1), 11 (L2), 12 (L3) and 13 (N), connect the measuring voltage (the operating voltage of the measuring module).

3. On the multicomp display, select the menu Settings > Extras > Settings > Modules > Module management > Module.

4. Displayed are the multicomp basic module, modules already existing and the menu item “scan.”

5. After selecting this menu item with the cursor buttons, the scan mode can be started with the scan button. The scan display will flash. This way, the scan button on the measuring module (close to the status LED, flashing green) is unlocked.

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12. By pressing the scan sensor button for approx. 4 seconds, set the measuring module into scan mode (the green status LED flashes more quickly).

The multicomp basic module recognizes the measuring module and adds it to the list of connected modules. You can now scan further modules, which are automatically added to the module list or, by touching the stop button, end the scanning process. The multicomp D6-xxx-7 can manage a maximum of six modules.

8.9.10 Connections

Terminals 10–13 (L1, L2, L3, N)	Measuring voltage. The power supply of the device is also provided by the measuring voltage. For technical data, please refer to the nameplate.
Terminal 20 (k1) and 21 (I1) 22 (k2) and 23 (I2) 24 (k3) and 25 (I3)	Measuring inputs for current. The measuring inputs for current must be connected via current transformers x/1A AC or x/5A AC. When connecting transformers, pay attention to the energy flow direction and the correct assignment of measuring voltage inputs to the current transformers.

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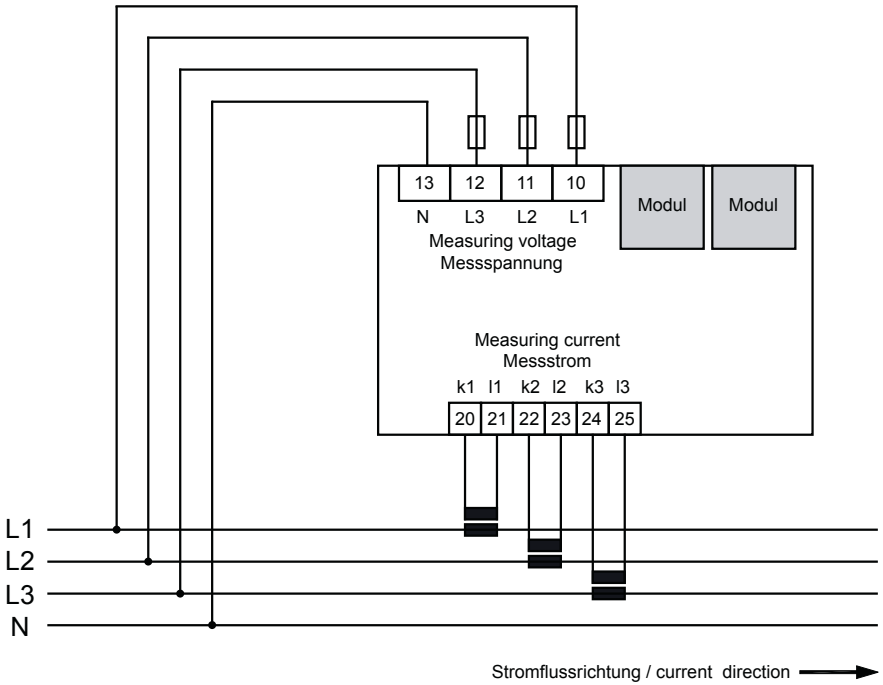

13
12
11
10
N
L3
L2
L1
Modul
Modul
Measuring voltage
Messspannung
Measuring current
Messstrom
k1 l1 k2 l2 k3 l3
20 21 22 23 24 25
L1
L2
L3
N
Stromflussrichtung / current direction

9 multisio D2-4AI analog input module

The hardware of the multisio D2-4AI supports 4 analog inputs and 5 LEDs.

With its four analog measuring inputs, current values from 0 to 20 mA and voltage values from 0 to 10 V can be measured.

The four input LEDs indicate the state of the analog inputs, and the power LED shows whether the operating voltage is present.

The module can be accessed by a master device (multicomp D6-xxx-7 with a module bus or a computer with VE via multisys 3D2-ESBS/multisys 3D2-BSES) using the module bus interface.

The master device has to configure the module and read out the data acquired by the module for further processing.

The operating voltage is supplied via the module bus interface. The module cannot be used on its own.

9.1 Analog input module connection diagram

Terminal assignment

Terminal 70: Analog input 1 +

Terminal 71: Analog input 1 -

Terminal 72: Analog input 2 +

Terminal 73: Analog input 2 -

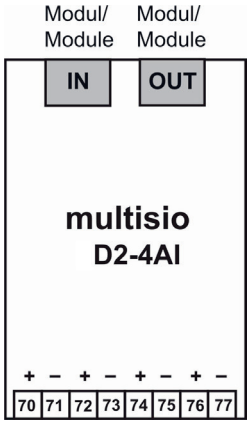
Terminal 74: Analog input 3 +

Terminal 75: Analog input 3 -

Terminal 76: Analog input 4 +

Terminal 77: Analog input 4 -

IN/OUT: Module bus/power supply



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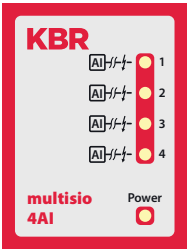
9.2 Analog input module LED display

In KBR module bus scanning mode, all 4 input LEDs flash. In the module detection mode, the input LEDs generate a chase light effect.

The LEDs represent:



LED1 for input 1

LED2 for input 2

LED3 for input 3

LED4 for input 4

Power LED on: Operating voltage is applied

The LEDs on the module with 4 digital inputs turn on when an analog input signal is detected and the measured values are within the set limits. The LEDs go out if no analog encoder is connected or if the encoder is short-circuited. The LEDs flash if the value exceeds or falls below a limit.

NOTE

For operation at the multicomp D6-xxx-7 base device, the module is always set up for 0–20 mA/0–10 V, meaning that the LEDs of inputs 1–4 are always on.
The conversion 4–20 mA/2–10 V takes place in the base device.

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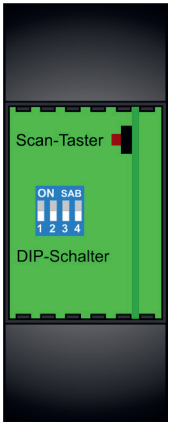
9.3 Function of Scan button

NOTE

If the scan button is pressed briefly, the module enters the scan mode.



Illustrated switch setting:

OFF = white

ON = gray

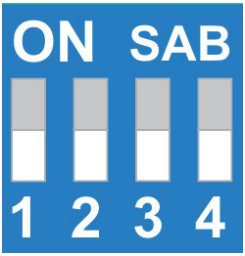
9.4 Function of DIP switch

Switch set to off:	Switch set to on:
S1 = 0 / 2-10 V	S1 = 0 / 4-20 mA
S2 = 0 / 2-10 V	S2 = 0 / 4-20 mA
S3 = 0 / 2-10 V	S3 = 0 / 4-20 mA
S4 = 0 / 2-10 V	S4 = 0 / 4-20 mA

Illustrated switch setting:

OFF = white

ON = gray



9.5 Technical data:

Power supply:	Via module bus	24VDC / ca. 1.3W
	Connection	RJ-12:6P6C modular connector
Hardware inputs:		
4 analog inputs:	Measuring range	0/4 - 20 mA, 0/2 - 10 V
	Plug-in terminal, 8-pin	
Module bus interface:	Serial interface	RS-485
	Module bus connection	RJ-12 for ready-made KBR system cable, max. length 30 m when suitably placed
	Transmission speed	38400 Bps
	Bus protocol	KBR module bus
Display:	LED	4x message 1x operation display
Control unit:	DIP switch	1x fourfold, input configuration
	Button	Scan button (module bus)
Mechanical data:		
DIN rail device:	Housing dimensions	90 x 36 x 61 mm (H x W x D)
	Mounting type	Wall mounting on DIN rail 7.5 mm deep, in accordance with DIN EN 50022. Suitable for distribution board mounting
	Weight	Approx. 100g
Standards and Miscellaneous:	Standards	DIN EN 60721-3-3/A2: 1997-07; 3K5+3Z11; (IEC721-3-3; 3K5+3Z11)
	Operating temperature	-5°C ... +55°C
	Air humidity	5% ... 95%, non-condensing
	Storage temperature	-25°C ... +70°C

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Electrical safety:	Standards	DIN EN 61010-1/A2: 2001 + B1: 2002-11 + B2: 2004-1; (IEC1010-1/A2)
	Protection type	IP20 in accordance with DIN EN 40050 part 9:1993-05
	Electromagnetic compatibility	DIN EN 61000-6-3: 2001 + A11: 2004; (IEC61000-6-3) DIN EN 61000-6-2: 2001 (IEC61000-6-2)

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10 multisio D2-4DI digital input module

The hardware of the multisio D2-4DI supports 4 digital inputs, 5 LEDs and an 8-pin DIP switch.

If a switch connected to the digital input is closed, the module detects it as active. An open switch is detected as passive.

Ensure that the polarity is correct when you connect the electronic switches.

The four input LEDs indicate the state of the digital inputs and the power LED indicates whether the power is on or off.

The multisio D2-4DI manages the digital inputs with two different methods you can choose from. You can configure each input separately as a pulse counter input or state-controlled input.

The module can be accessed by a master device (multisio xD6 (from 5D6-ESBS-5DI6RO-1DO) with a module bus, multicomp with a module bus or a computer with VE via multisys 3D2-ESBS/multisys 3D2-BSES) using the module bus interface.

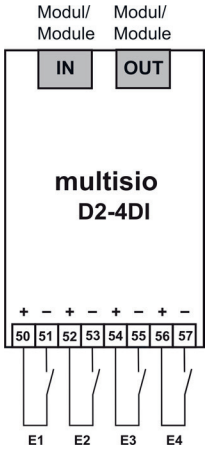
The master device has to configure the module and read out the data acquired by the module for further processing.

The operating voltage is supplied via the module bus interface. The module cannot be used on its own.

10.1 Digital input module connection diagram

Terminal assignment
Terminal 50: Digital input 1 +
Terminal 51: Digital input 1 -
Terminal 52: Digital input 2 +
Terminal 53: Digital input 2 -
Terminal 54: Digital input 3 +
Terminal 55: Digital input 3 -
Terminal 56: Digital input 4 +
Terminal 57: Digital input 4 -

IN/OUT: Module bus/power supply



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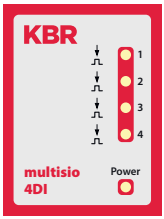
10.2 Digital input module LED display

In KBR module bus scanning mode, all 4 input LEDs flash. In the module detection mode, the input LEDs generate a chase light effect.



The LEDs represent:

LED1 for input 1
LED2 for input 2
LED3 for input 3
LED1 for input 4

Power LED on: Operating voltage is applied

The LEDs on the digital input module indicate the current state of the digital input. If the input is active, the LED is on. If the input is passive, the LED is off.

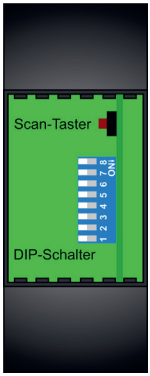
10.3 Function of Scan button

NOTE

If the scan button is pressed briefly,
the module enters scanning mode.

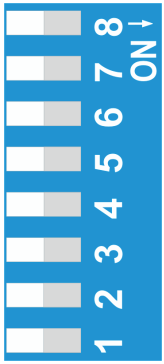
Illustrated switch setting:

OFF = white
ON = gray



10.3 Function of the DIP switches

10.3.1 Operating mode



For every input, the multisio D2-4DI differentiates between the operating modes "normal" and "manual." Switching is performed via the DIP switches 5 to 8. The DIP switches are assigned to the outputs as follows:

- DIP switch 5 switches the operating mode of input 1
- DIP switch 6 switches the operating mode of input 2
- DIP switch 7 switches the operating mode of input 3
- DIP switch 8 switches the operating mode of input 4

If the DIP switch is set to Off, the respective input is in normal operating mode. If the DIP switch is set to On, the respective

input is in manual operating mode.

Illustrated switch setting:
OFF = white
ON = gray

Normal operating mode

In normal operating mode, the current state of the associated input is further processed.

Manual operating mode

In manual operating mode, the state of DIP switches 1 to 4 is further processed, instead of the state of the corresponding input. The DIP switches are assigned to the inputs as follows:

- DIP switch 1 switches the state of input 1
- DIP switch 2 switches the state of input 2
- DIP switch 3 switches the state of input 3
- DIP switch 4 switches the state of input 4

If the DIP switch is set to Off, the input state passive/off is further processed. If the DIP switch is set to On, the input state active/on is further processed.

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10.4 DIP switch settings

Operating mode DIP		State DIP		Explanation
S5	Off	---	---	Input 1 = normal operating mode
	On	S1	Off	Input 1 = manual operating mode passive/off
			On	Input 1 = manual operating mode active/on
S6	Off	---	---	Input 2 = normal operating mode
	On	S2	Off	Input 2 = manual operating mode passive/off
			On	Input 2 = manual operating mode active/on
S7	Off	---	---	Input 3 = normal operating mode
	On	S3	Off	Input 3 = manual operating mode passive/off
			On	Input 3 = manual operating mode active/on
S8	Off	---	---	Input 4 = normal operating mode
	On	S4	Off	Input 4 = manual operating mode passive/off
			On	Input 4 = manual operating mode active/on

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10.5 Technical data:

Power supply:	Via module bus	24 V DC/approx. 2 W
	Connection	RJ-12:6P6C modular connector
Hardware inputs:		
4 digital inputs	S_0 compatible	< 2 mA = off, > 10 mA = on
	Output voltage	< 24 V DC, ensure correct polarity
	Output current	<= 15 mA
	Plug-in terminal, 8-pin	
Module bus interface:	Serial interface	RS-485
	Module bus connection	RJ-12 for ready-made KBR system cable, max. length 30 m when suitably placed
	Transmission speed	38400 Bps
	Bus protocol	KBR module bus
Display:	LED	4x message 1x operation display
Control unit	DIP switch	1x eightfold, input configuration
	Button	Scan button (module bus)
Mechanical data:		
DIN rail measuring device	Housing dimensions	90 x 36 x 61 mm (H x W x D)
	Mounting type	Wall mounting on DIN rail 7.5 mm deep, in accordance with DIN EN 50022. Suitable for distribution board mounting
	Weight	Approx. 70 g

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Standards and Miscellaneous:		
Ambient conditions	Standards	DIN EN 60721-3-3/A2: 1997-07; 3K5+3Z11; (IEC721-3-3; 3K5+3Z11)
	Operating temperature	-5°C ... +55°C
	Air humidity	5% ... 95%, non-condensing
	Storage temperature	-25°C ... +70°C
Electrical safety:	Standards	DIN EN 61010-1/A2: 2001 + B1: 2002 - 11 + B2: 2004-1; (IEC1010-1/A2)
	Protection type	IP20 in accordance with DIN EN 40050 part 9:1993-05
	Electromagnetic compatibility	DIN EN 61000-6-3: 2001 + A11: 2004; (IEC61000-6-3) DIN EN 61000-6-2: 2001 (IEC61000-6-2)

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