KBR Energy Management

Operating Instructions
Technical Parameters

multicomp

4-quadrant
power factor contoller

4D6-ESBSDS-1V1C6RO

Your Partner for Network
Analyzing

KBR GmbH
Am Kiefernschlag 7
D-91226 Schwabach

T +49 (0) 9122 6373-0
F +49 (0) 9122 6373-83
E info@kbr,de

www.kbr.de

Dear Customer

We would like to thank you for choosing a KBR GmbH quality product.

In order to familiarize yourself with the operation and programming of the device and always be able to use the whole functionality of this high-quality product, we recommend that you read this manual thoroughly.
The individual chapters serve to explain the technical details of the device and show how to avoid damage by means of proper installation and commissioning.

The manual is included in the scope of delivery of the device and must be accessible for the user at all times (e.g. in the switchgear cabinet). Even when the device is resold to third parties, the manual remains part of the device.

Although we used the utmost care in assembling this manual, we would like to thank you in advance for notifying us about any errors or ambiguous descriptions that might be in it. You will find a form for corrections in the appendix.

Sincerely,

KBR GmbH Schwabach

2009-1 GB

Safety Precautions

This manual contains notes that must be observed for your personal safety and to avoid damage to equipment. Notes are identified by a warning sign or an info symbol according to the degree of hazard they represent.

Danger

means that death, major injuries or damage **will** occur in case the appropriate safety measures are not performed.

Warning

means that death, major injuries or damage **may** occur in case the appropriate safety measures are not performed.

Caution

means that minor injuries or damage may occur in case the appropriate safety measures are not performed.

Note

is an important information on the product, product handling or the respective part of the user manual to which special reference is made.

Disclaimer

The contents of this manual has been checked with the described hardware and software components. Certain deviations, however, cannot be excluded, so the manufacturer is not liable for complete conformity. The specifications made in this manual are checked on a regular basis, necessary corrections are included in the next revision.
We appreciate your corrections and comments.

2009-1 GB

General Safety Precautions

In order to prevent operating errors, handling of the device is kept as simple as possible. This way, you will be able to use the device very soon.

In your own interest, however, you should read the following safety precautions carefully.

Warning

During installation, the applicable DIN / VDE regulations must be observed!

Mains connection, setup and operation of the device must only be performed by qualified personnel. Qualified personnel as understood in the safety precautions of this manual are persons authorized to setup, ground and mark equipment, systems and wiring systems in accordance with applicable standards.

To avoid the hazard of fire and electrical shock, the device must not be subjected to rain or other humidity!

Before the device is connected to the mains, you will have to check whether the local mains conditions comply with the specifications on the manufacturer's label. A wrong connection may destroy the device!

When connecting the device, the connection chart must be observed (see chapter "Connection chart") and the connection lines must be powerless. Only use proper line material and watch the correct polarity when wiring!

In order to ensure proper and safe operation of the product, it must be transported, stored, installed and mounted in accordance with the specifications and operated and maintained carefully.

A device showing visible damage must by all means be considered as unfit for operation and must be disconnected from the mains!

Error detection, repairs and maintenance work may only be carried out in our facilities or after contacting our service team. Every warranty obligation of the manufacturer expires if the device is opened without written consent from our service team. Proper operation can no longer be guaranteed!

Opening the device may expose parts under voltage. Capacitors in the device may still be loaded even if the device was disconnected from all voltage sources. It is generally not allowed to operate the open device!

In facilities subject to hazard of lightning, lightning protection must be provided for all input and output lines (recommendations see chapter "Protective measures")!

Product Liability

With these product, you have acquired a quality product.

In its manufacture, only components of the highest reliability and quality were used. Each device is subject to long-term testing before it is delivered.

For information on product liability, please refer to our General Terms and Conditions for electronic devices**.**

The warranted properties of the device apply only if it is operated in accordance with its intended use!

Disposal

Please dispose of defective, outdated or no longer used devices properly.
At your request, we will be pleased to dispose of the devices for you.

2009-1 GB

Table of Contents

EDEBDA0133 / 3609-1 DE

EDEBDA0133 / 3609-1 DE

1 Device memory, battery-buffered

The device is equipped with an internal data memory, which is battery buffered to preserve long-term data. To prevent it from being discharged, this backup battery (e.g. Varta CR 2032) is not built in when the device is delivered, but included separately in the delivery.

Caution

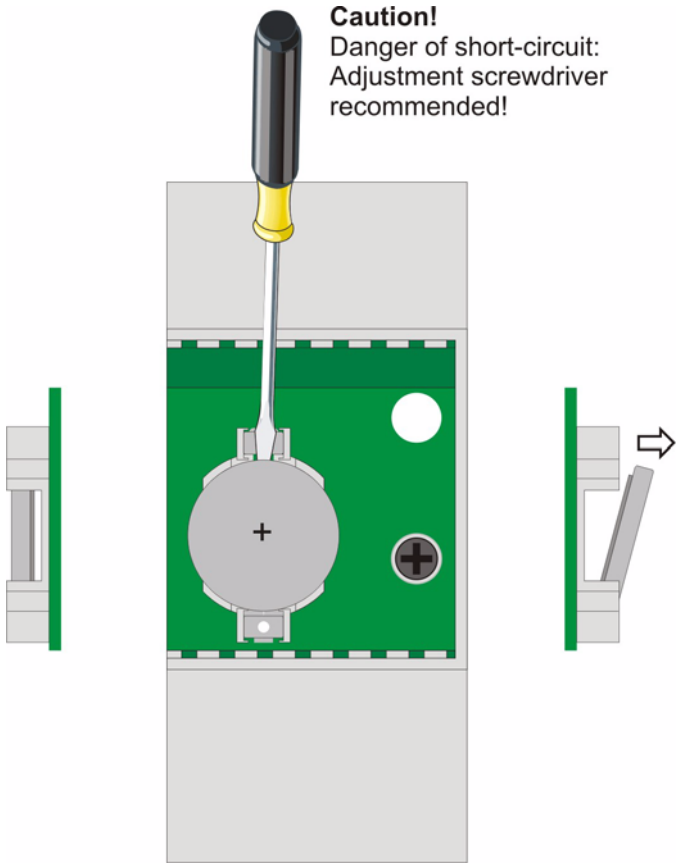
Before the initial commissioning of the device, please insert the backup battery first (as described in the following), as otherwise all storage data would be lost in case of a power failure.

Inserting or replacing backup battery:

1. Disconnect the device from the supply voltage.
2. Lift the upper casing cover with a suitable tool (e.g. a small screwdriver).
3. When replacing a battery, remove the empty battery from the clamp with the tool.
4. Push the new battery into the clamp and make sure that it is inserted correctly and has the right polarity.
5. Put the upper casing cover back on and click it into place by pushing.
6. Reconnect the device to the supply voltage.

Caution

As, when the battery is empty or removed and there is no supply voltage, not only the storage data are lost but the time is not correct anymore either, the time has to be reset in Visual Energy with the corresponding command!



2 Connection of the multicomp 4D6-ESBSDS-1V1C6RO

2.1 Installation and assembly

- During installation, the applicable VDE regulations must be observed.
- Before the device is connected to the power supply, you will have to check whether the local power supply conditions comply with the specifications on the nameplate. A wrong connection may destroy the device. A different power frequency influences the measurement accordingly.
- The device must be connected in accordance with the connection diagram.
- In case the facility is subject to lightning hazard, lightning protection measures for the power supply input must be implemented.

Caution

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

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

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

Note

The following points must be observed when connecting the device:
- Energy flow direction
- Assigning measuring voltage input / current transformer input

Current transformer connection:

- **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.
  Prerequisite is that energy is consumed.

- **Assigning measuring voltage input / current transformer input:**

  The current transformer on terminal 20/21 (k1/l1) must be arranged in the phase where the measuring voltage for the terminal 10 (L1) is tapped.

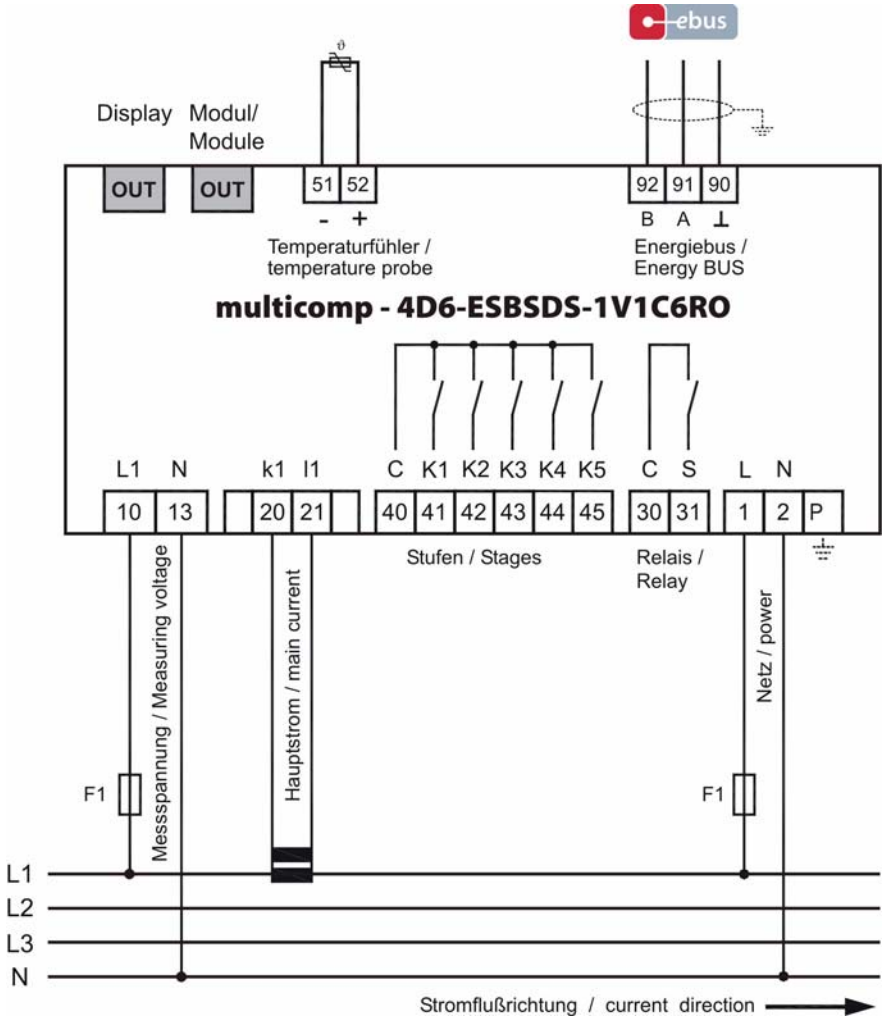
  - If the connection and energy flow direction are correct, the device displays a positive current.
  - If connected incorrectly, the current displayed is negative. Interchange the connections until the display shows correct values.

Caution

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

EDEBDA0134 / 3609-1 GB

2.2 Connection diagram



For voltage supply, see nameplate.

Caution

The coil voltage for the capacitor switching contactors and the measurement voltage have to be drawn from the same phase, as only the measurement voltage is monitored (to protect the contactors from direct resetting in case of short-term monophase power failure)

2.3 Terminal assignment

Terminal 1 (L) and 2 (N): **Connection power supply**

A control voltage is required to supply the device with power. The device is equipped with a multi-range power supply and may be supplied by voltages from 85 - 265V AC/DC (see nameplate for device voltage).

Terminal 10 (L1, Lx): **Measuring voltage input**

13 (N, Ly):

Input voltage both as PH-N and PH-PH measurement. Direct measurement for 100... 500...600V AC. Measuring intervals are programmable. Exceeding the measuring interval results in an error message.
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.

Terminal 20 (k1) and 21 (l1): **Current measuring 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.

Terminal 30 (C) and 31 (S): **Floating relay contact**

This contact serves as a message or alarm output. During operation, an acoustic or visual signal may be activated or a consumer shut down. The contact is open as long as the device is currentless, and if there is an active message. Maximum switching capacity of 2A at 250V AC.

Terminal 40 (C): **Connection for voltage supply to the relay outputs terminals 41 to 45**

The relays for the control outputs share the same connection to the supply voltage.

Terminals 41 (K1) to 45 (K5): **Relay contacts with potential**

These contacts are used as control outputs for the capacitor switching contactors. In a currentless state of the device, the contacts are opened for stages that are not hooked up.
Maximum switching capacity of 2A at 250V AC

Terminals 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.

Terminal 90 (ground): **Interface connection**

91 (A) For communication on the Energy bus or Modbus

92 (B)

EDEBDA0134 / 3609-1 GB

3 Commissioning guideline for the multicomp 4D6-ESBSDS-1V1C6RO

This guideline helps you to correctly commission the compensation controller **multicomp 4D6-ESBSDS-1V1C6RO**. 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 4D6-ESBSDS-1V1C6RO** differs.

Case 1: You have bought a complete compensation facility from KBR, and the controller is already mounted. 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 1D2-4RO, multisio 1D2-1TI2RO, multisio 1D2-4CI) 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.

3.1 Controller not preconfigured

If a not yet preconfigured controller is to be commissioned, the following procedure has to be performed step by step.

1. Configuration of additional module (multisio 1D2-4RO, multisio 1D2-1TI2RO, multisio1D2-4CI)

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 DIL switches or scan buttons on the additional module. If the compensation facility consists of several cabinets, the correct cabinet assignment has to be set up.
Detailed instructions for this step are given in chapter 3.13.2 Settings under the item 3.13.2.1 Module / display submenu.

2. Configuring current transformer values

For the compensation controller to function properly, all current transformer parameters have to be set correctly. Primary and secondary current of the transformer have to be set. These parameters can be read on the nameplate of the current transformer. In addition, the phase allocation of the transformer has to be set correctly. In the controller, the phase (L1, L2, L3) in which the current transformer is integrated has to be set.
Detailed instructions for this step are given in chapter 4.1 Transformer ratio. You can find more detailed information on this topic under chapter 3.13.1 Commissioning under item 3.13.1.1 submenu Transformer settings.

3. Setting target cosine

You can ask your energy supply company for the target cosine, which should be set up at this point. The target cosine is by default set to 0.95 inductive (see chapter Default settings).
Detailed instructions for this step are given in chapter 4.2 Set target cosine. You can find more detailed information on this topic under chapter 3.13.1 Commissioning under item 3.13.1.2 submenu Target cosine.

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.
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 confirmed and checked after each time the learning process is performed.
Detailed instructions for the auto configuration mode are given in chapter 3.13 Extra **—>** Commissioning **—>** Stages **—>** Stage **—>** Auto configuration mode (3.13.1.3).

EDEBDA0134 / 3609-1 GB

After the stage power has been configured, you have to set the reactor factor. This factor can be read on the circuit diagram cover sheet or the nameplate of the stage.
If the compensation facility consists of several cabinets, the cabinet assignment should be adjusted accordingly.
Detailed instructions for this step are given in chapter 3.13.1 Commissioning under the item 3.13.1.3 Stages submenu.

5. Function test

After all values have been programmed, a function test should be performed. To do so, the controller has to be taken off the voltage supply for a few seconds.
After re-connecting it to the voltage supply, the controller has to start automatically. If the cosφ voltage is read out in the cosφ act. menu immediately after switching it on, the value for cosφ should be low and inductive. After ca. 60 seconds, the controller starts to switch on the individual capacitor stages.
The cosφ value displayed 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 facility is set up
correctly, the controller should compensate the set target cosine after a certain period of time.

3.2 Controller preconfigured

If a controller already integrated into a KBR compensation facility by default should be used, only the parameters of the current transformer have to be configured.

1. Configuring current transformer values

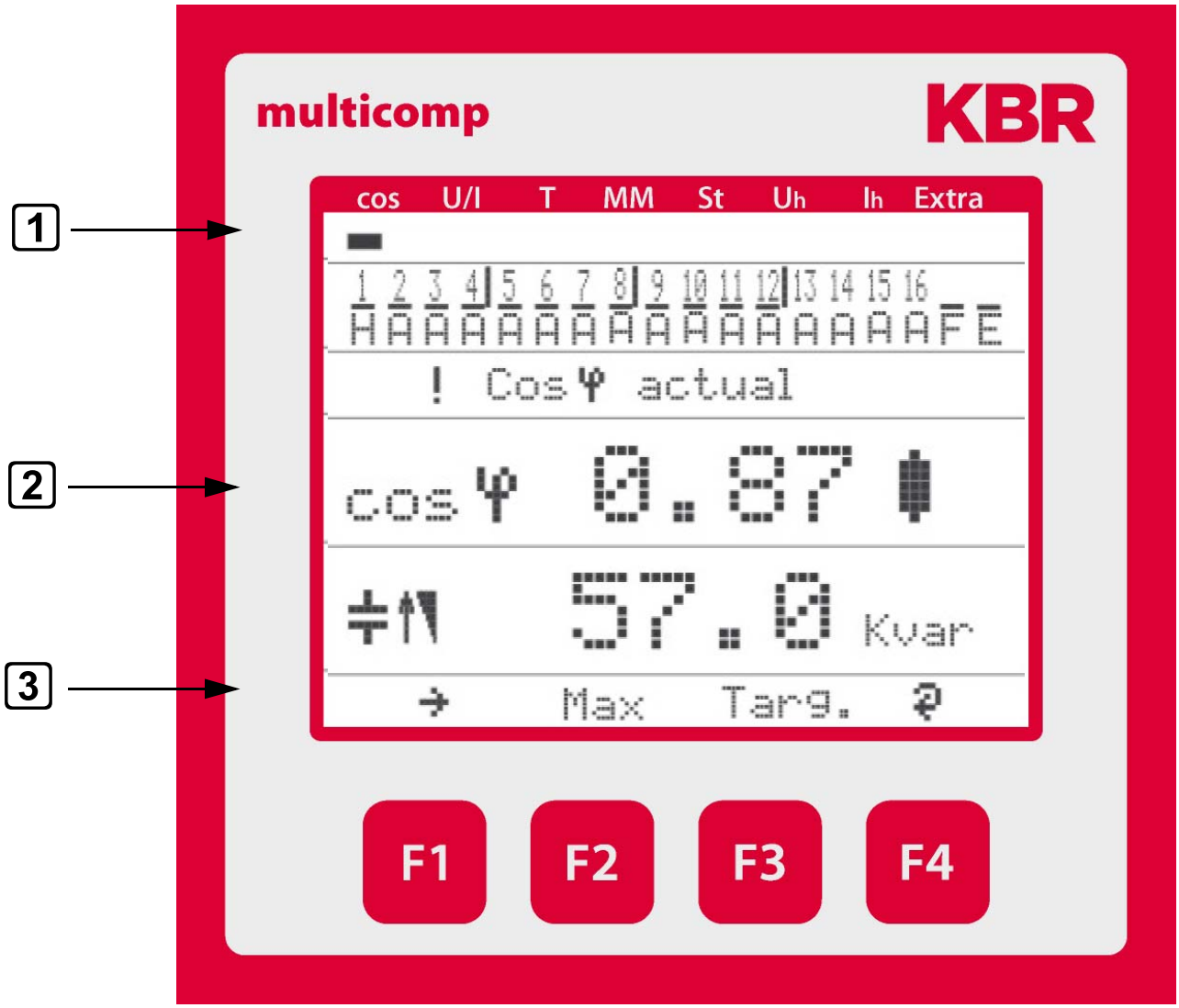
For the compensation controller to function properly, all current transformer parameters have to be set correctly. Primary and secondary current of the transformer have to be set. These parameters can be read on the nameplate of the current transformer. In addition, the phase allocation of the transformer has to be set correctly. In the controller, the phase (L1, L2, L3) in which the current transformer is integrated has to be set.
Detailed instructions for this step are given in chapter 4.1 Transformer ratio. You can find more detailed information on this topic under chapter 3.13.1 Commissioning under item 3.13.1.1 submenu Transformer settings.

2. Function test

After all values have been programmed, a function test should be performed. To do so, the controller has to be taken off the voltage supply for a few seconds.
After re-connecting it to the voltage supply, the controller has to start automatically. If the cosφ voltage is read out in the cosφ act. menu immediately after switching it on, the actual value for cosφ should be low and inductive. After ca. 60 seconds, the controller starts to switch on the individual capacitor stages.
The cosφ value displayed 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 facility is set up
correctly, the controller should compensate the set target cosine after a certain period of time.

EDEBDA0134 / 3609-1 GB

4 Operating and display panel



4.1 Description of buttons

▶ **1** **Navigation panel of display**

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

▶ **2** **Units display**

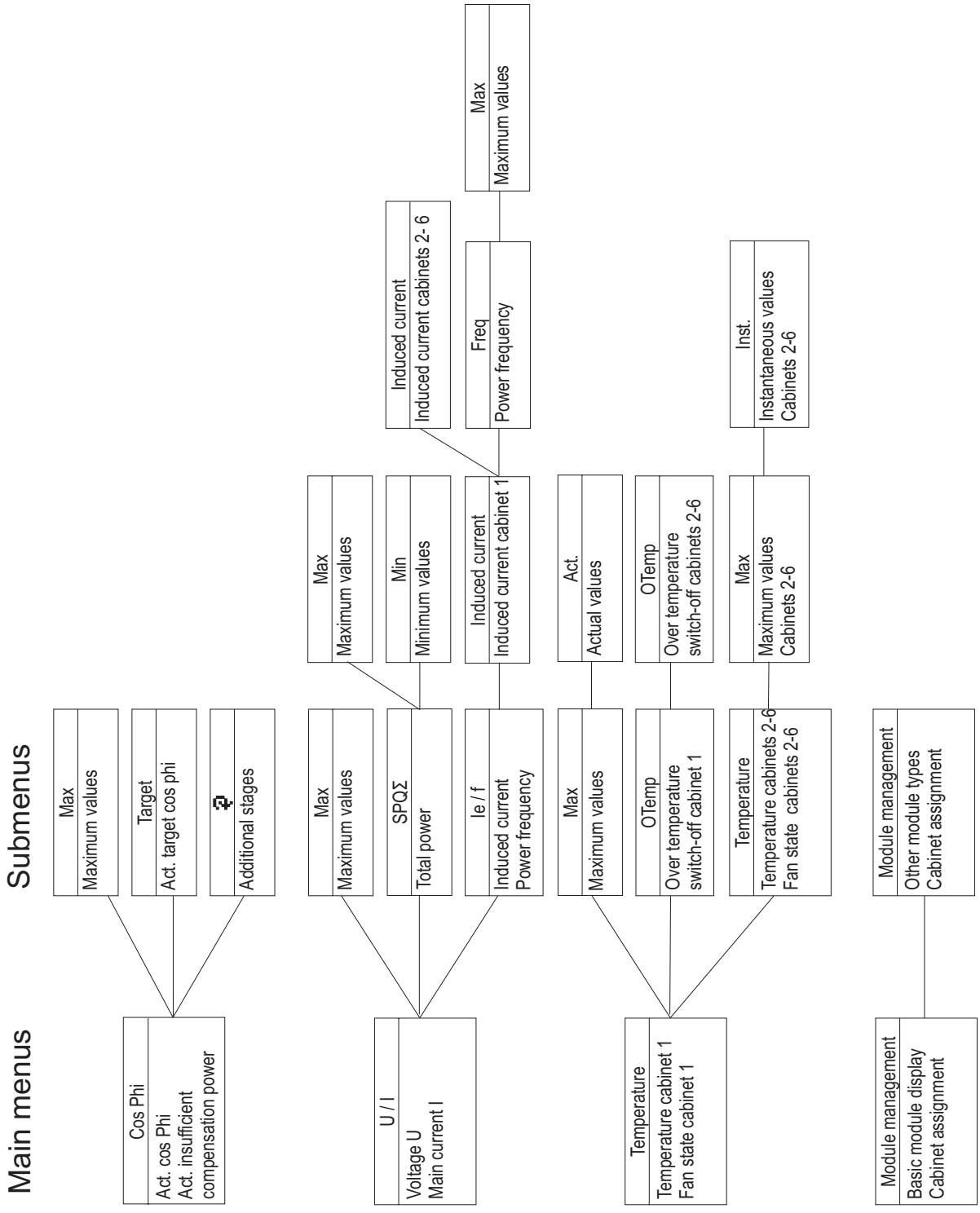
The DOT matrix display is normally used to show measured values.
In some submenus, this display area is used to show additional information to assist operation.

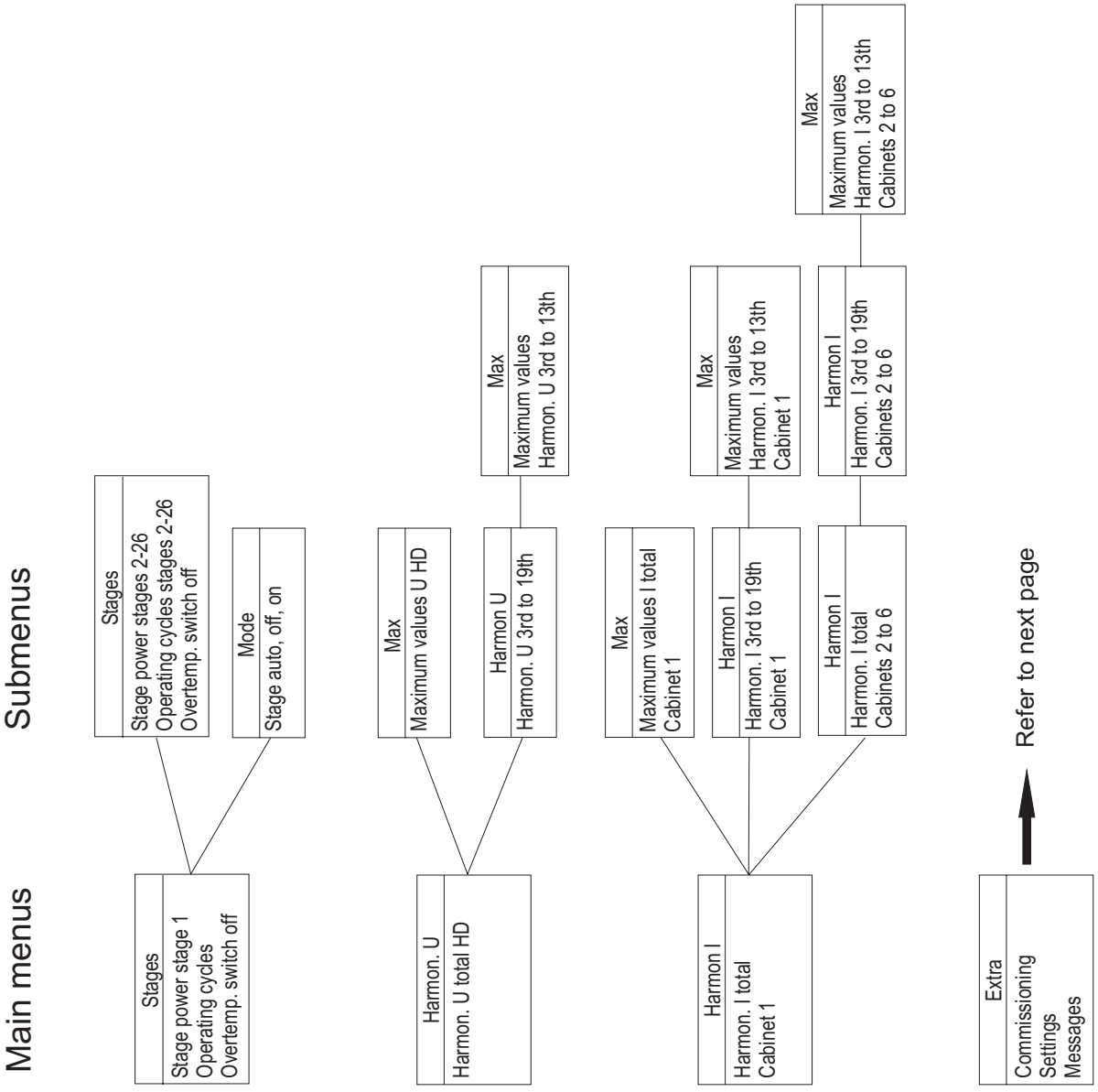
▶ **3** **Hot key area**

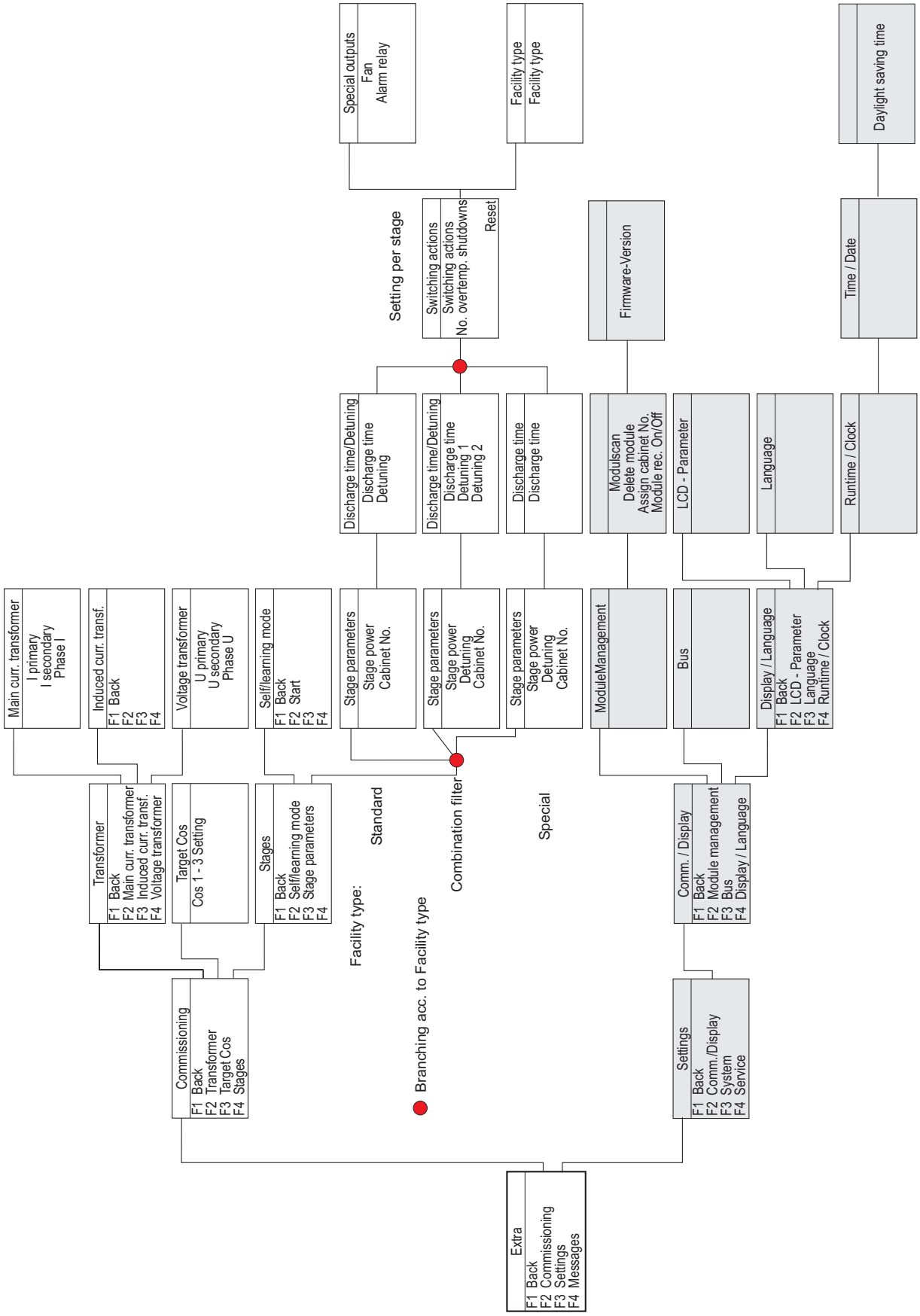
The text line corresponds to the function keys lying below it and is used to issue messages and text. The interaction of key and accompanying display enables a very convenient operation which is self-explanatory.

EDEBDA0134 / 3609-1 GB

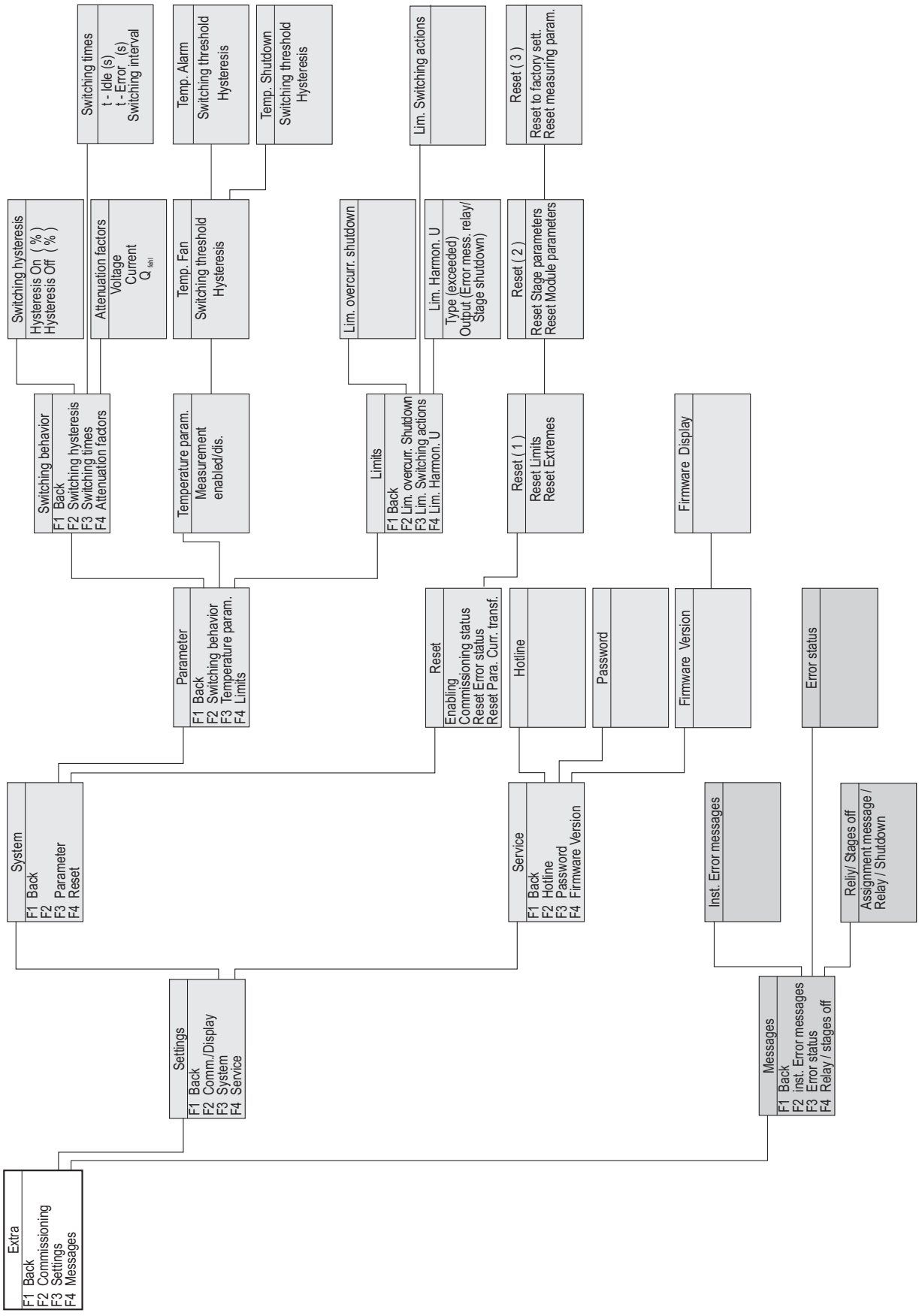
4.2 Navigation and device displays




Main menus
Submenus
Stages
Stage power stage 1
Operating cycles
Overtemp. switch off
Stages
Stage power stages 2-26
Operating cycles stages 2-26
Overtemp. switch off
Mode
Stage auto, 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 13th
Harmon I
Harmon. I total
Cabinet 1
Max
Maximum values I total
Cabinet 1
Harmon I
Harmon. I 3rd to 19th
Cabinet 1
Max
Maximum values
Harmon. I 3rd to 13th
Cabinet 1
Harmon I
Harmon. I total
Cabinets 2 to 6
Harmon I
Harmon. I 3rd to 19th
Cabinets 2 to 6
Max
Maximum values
Harmon. I 3rd to 13th
Cabinets 2 to 6
Extra
Commissioning
Settings
Messages
Refer to next page



EDEBDA0134 / 3609-1 GB



EDEBDA0134 / 3609-1 GB

4.3 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
+	Enter value
?	Selection
◎	Energy recovery (generator operation)
!	Attention Message
✎	Edit
↯	Switching (make or break)
▲	Maximum value
▼	Minimum value
cosΨ	Active power factor
cosPhi	Active power factor
Max	Display and processing for maximum values
Mom	Display for actual values
Para	Return for configuration
EDIT	Perform configuration
Freq.	Power frequency
U ph-n	Voltage phase / neutral conductor
I ph-n	Current phase / neutral conductor
PΣ	Active power – total (three-phase)
PQS Σ	Active power / reactive power / apparent power - total (three-phase)
Lim	Limit
DC	Damping coefficient
Module	Module management
YES	Confirmation to save configuration
NO	Discard configuration
SCAN	Scan mode (search mode) for module search and EBUS address assignment
Modus	Switching mode of stages
Harm. U	Voltage harmonics (distortion factor)
Harm. I	Current harmonics (distortion current intensity)
Firmware	Operating system software of basic device or of display module
Setup	Device configuration
Mess.	Error messages and error state
Displ.	Operating system of display module
Basic para.	Basic parameters (submenus)
⅀ⅈⅇU	Measuring voltage transformer prim./sec.
⅀ⅈⅇI	Series transformer prim./sec.

EDEBDA0134 / 3609-1 GB

Learn	Learning function stage power
Bus	Bus parameters
LCD	LCD parameters (display mode)
Dfact	Damping 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

Operating messages for individual switching stages:

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

1	= switching stage number
–	= stage is switched on
A	= in automatic operation mode

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

1	= switching stage number
–	= stage is switched on
H	= in manual operation

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

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

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

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

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

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

EDEBDA0134 / 3609-1 GB

Settings:

Damping (DC)	=	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 action follows.
Alarm delay (t-alarm)	=	Concerns the FTS message (facility too small), i.e. all stages are hooked up, but 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 und the over or undercompensation, i.e. the hooking up or switching off starts at the percentage set.
Switch damping	=	The time set defines the interval between two switching actions.
Operating cycle limit	=	When the set value is reached a message is issued. The value is based on the details from the contactor manufacturer.
Switch-off threshold (Lim-U)	=	Overvoltage switch-off to protect the facility, i.e. switching off the stages starts when the set limiting value is exceeded (hysteresis = 1% of the measurement voltage)

4.4 Device programming

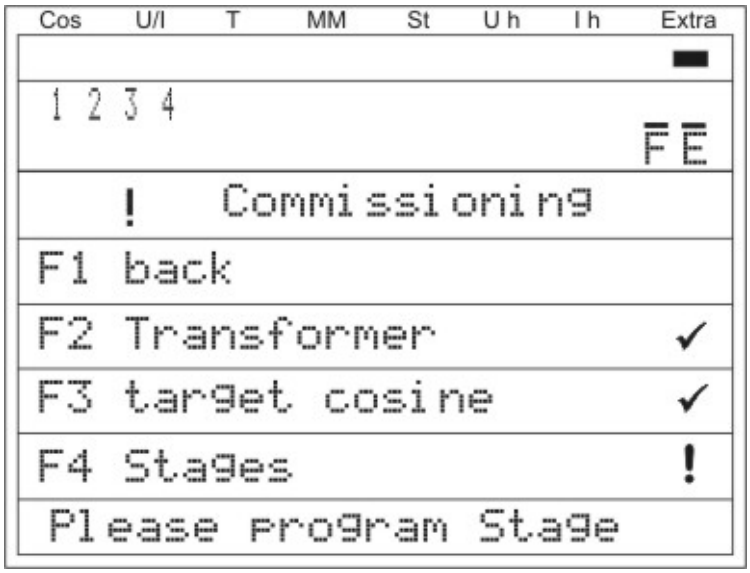
The menu navigation of the **multicomp 4D6-ESBSDS-1V1C6RO** is self-explanatory.
The user is guided and supported by the device through operating hints on the display for that particular situation. The following terms are available for programming:

Para	Return for configuration
EDIT	Perform configuration
↓	Submenu or parameter selection
+	Enter value
?	Selection
YES	Confirmation to save configuration
NO	Discard configuration
↰	Return

EDEBDA0134 / 3609-1 GB

4.5 Start menu Commissioning

If the **multicomp 4D6-ESBSDS-1V1C6RO** is being **commissioned for the first time**, after setting up the supply voltage for the **multicomp 4D6-ESBSDS-1V1C6RO** the menu **Extras / Commissioning** is displayed as the start screen (after the initialization phase):

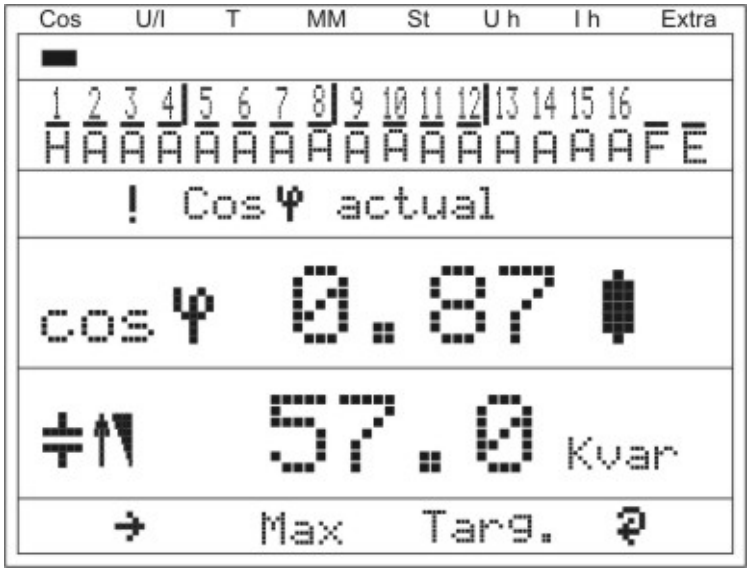


This display is used for the **Initial commissioning** of the controller, where all the necessary settings can be made.

Note

These settings are described in detail in menu 2.13 Main menu Extras / 2.13.1 Commissioning

4.6 Main menu Cos φ



First menu line

Second menu line

Third menu line

Fourth menu line

Fifth menu line

Sixth menu line

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

First menu line:	Shows which of the eight main menus is being displayed
Second menu line:	Status display of the output lines
Third menu line:	Description of the menu and messages currently displayed
Fourth and fifth menu lines:	Value display for the current menu
Sixth menu line:	Navigation in the menu displayed

```
          cos φ Actual          Menu description

 F1       F2       F3       F4
  →       Max      Targe    ⚲     Display hot-key area
  I       I        I        I
  I       I        I        Continue with additional stages
  I       I        Display of the actual target-cosφ
  I       Display of the maximum value of the missing compensated power
 Scroll through main menu
```

Display as example:

Main menu	= cosφ actual
Stage mode:	= Stage 1 handswitch 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
Measured cosφ:	= 0.87 inductive
Switching on / off:	= Switch on, since capacitor power is missing
Missing compensated power:	= 57.0 kvar
Additional modules	= exists (⚲)

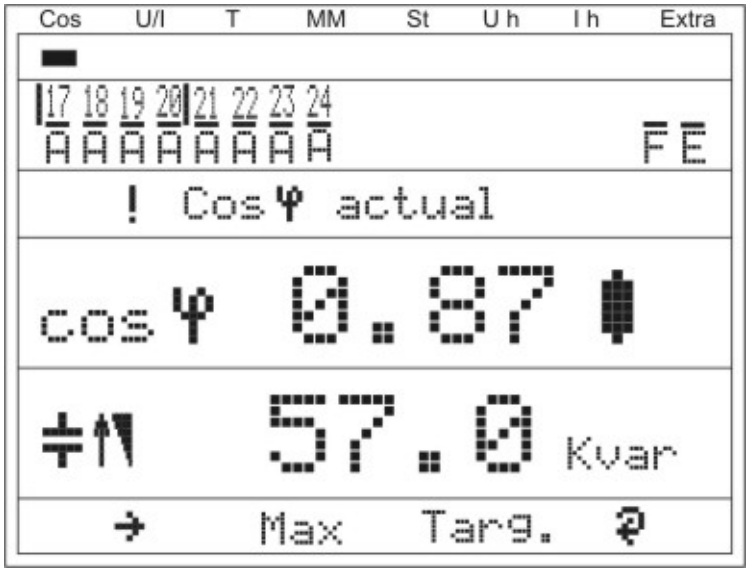
By pressing the button F2 , you can display the **maximum value of the missing compensation power**. The value is displayed in kvar, with time and date stamp. The value is only displayed if all available stages are switched on and the configured alarm CosPhi is not reached when the set alarm delay time 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 (refer to item 3.13.3.1) with a **time stamp and kvar specification**.

Note

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

By pressing the F4 (?) button, the following is displayed:



Display as example:

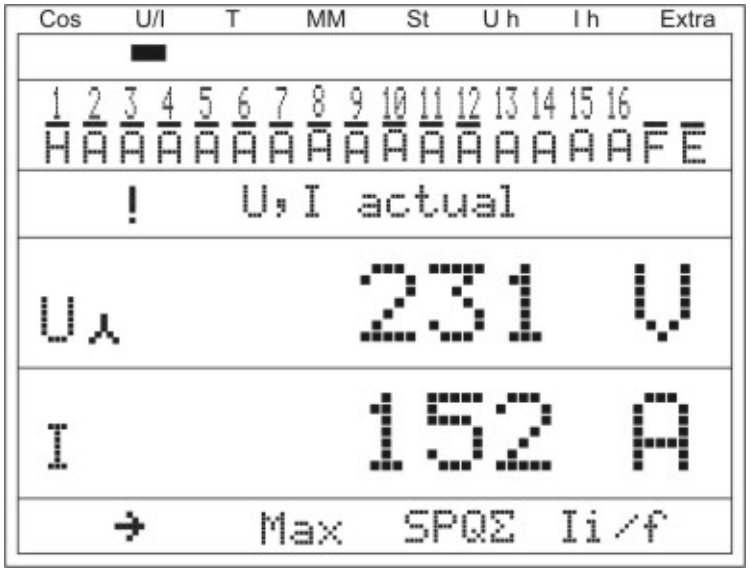
Main menu	= cosφ actual
Stage mode:	= Stages 17 to 24 Automatic mode On
Fan:	= On
Alarm relay:	= On
Alarm message:	= exists (!)
Menu description:	= cosφ actual
Measured cosφ:	= 0.87 inductive
Switching on / off:	= Switch on, since capacitor power is missing
Missing compensation power:	= 57.0 kvar

EDEBDA0134 / 3609-1 GB

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

4.7 Main menu Voltage / Current



U, I Actual — Menu description

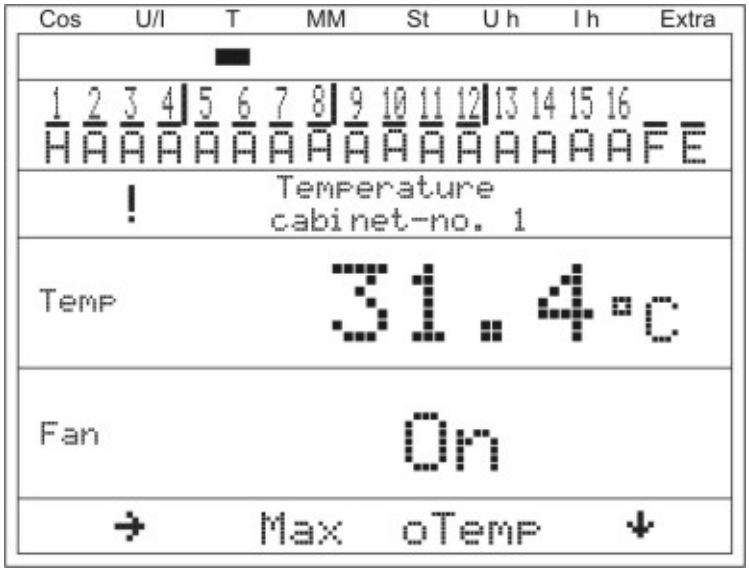
F1	F2	F3	F4	
→	Max	SPQΣ	Ii/f	Display hot-key area
I	I	I	I	
I	I	I		Display induced current, power frequency, maximum value
I	I			Totals for three-phase apparent, active, reactive power, minimum and maximum values
I				Display and processing for U/I maximum value

Scroll through main menu

Display as example:

Phase voltage = 231 V
Apparent current monophase = 152 A

4.8 Main menu temperature



Temperature
Cabinet No. 1

Menu description

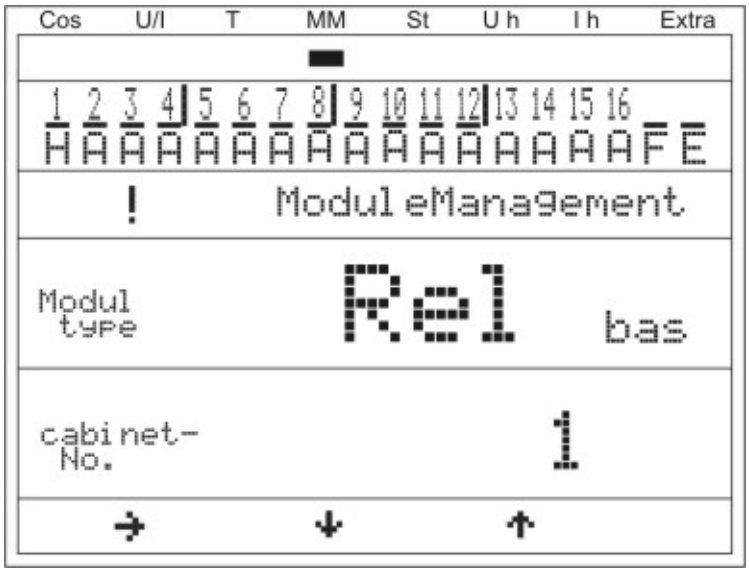
F1	F2	F3	F4	
→	Max	oTemp	↓	Display hot-key area
I	I	I	I	
I	I	I	Submenu Temperature modules 1 to 3	
I	I	Display of overtemperature switch-offs, sorted by cabinet		
I	Display and processing for maximum values, sorted by cabinet			

Scroll through main menu

Display as example:

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

4.9 Main menu Module - Management



Module management — Menu description

F1 F2 F3 F4

→ ↓ ↑ — Display hot-key area

I I I

I I I

I I — Additional module - Display descending

I — Additional module - Display ascending

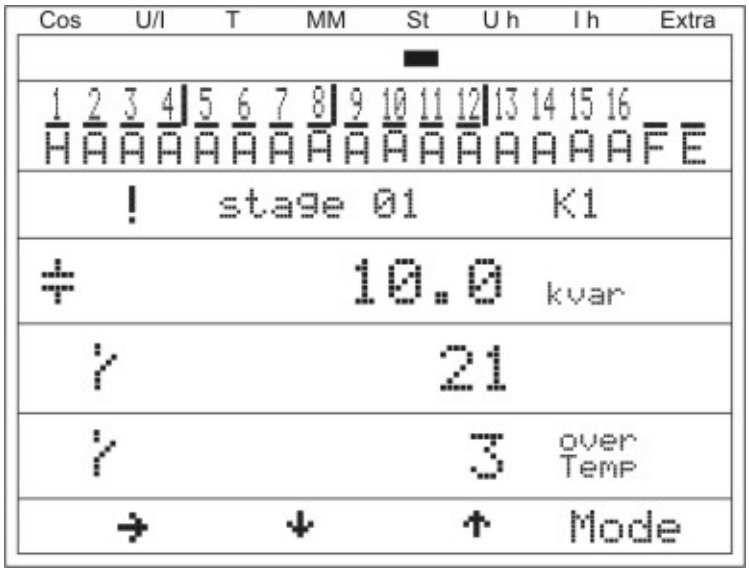
Scroll through main menu

Display as example:

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

EDEBDA0134 / 3609-1 GB

4.10 Main menu Stages



Stage parameters Menu description

F1	F2	F3	F4	
→	↓	↑	Mode	Display hot-key area
I	I	I	I	
I	I	I		Set switch mode of stages (On, Off, Automatic mode)
I	I			Additional stages - Display descending
I				Additional stages - Display ascending

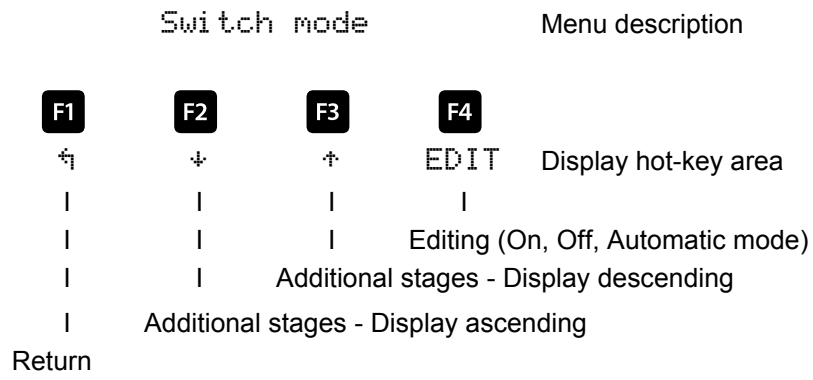
Scroll through main menu

Display as example:

Stages 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-offs: = 3

EDEBDA0134 / 3609-1 GB

4.10.1 Submenu Mode



Parameter mode: = Manual on, Manual off, Automatic mode
Special mode: = Locked

Note

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

4.10.2 Stage resonance frequency monitoring

A stage is only locked from further use if it enters the critical range (resonance frequency) due to capacitance loss. To unlock the stage, go to the Menu **Stage administration, submenu Mode** (3.10.1)

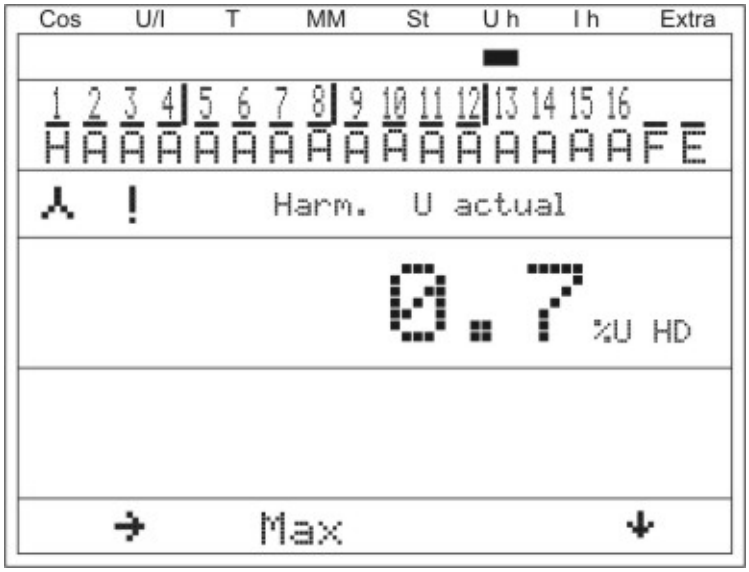
1. **Evaluating the resonance frequency:**

a) Detuning 5.5%, 7% or 8% (5th harmonic is critical)
If the resonance frequency is bigger than 89% of the 5th harmonic, the warning threshold is exceeded.
If the resonance frequency is bigger than 93% of the 5th harmonic, the alarm threshold is exceeded.

b) Detuning 12.5% or 14% (3rd harmonic is critical)
If the resonance frequency is bigger than 96% of the 3rd harmonic, the warning threshold is exceeded.
If the resonance frequency is bigger than 97% of the 3rd harmonic, the alarm threshold is exceeded.

EDEBDA0134 / 3609-1 GB

4.11 Main menu Uh distortion factor for voltage



Display as example:

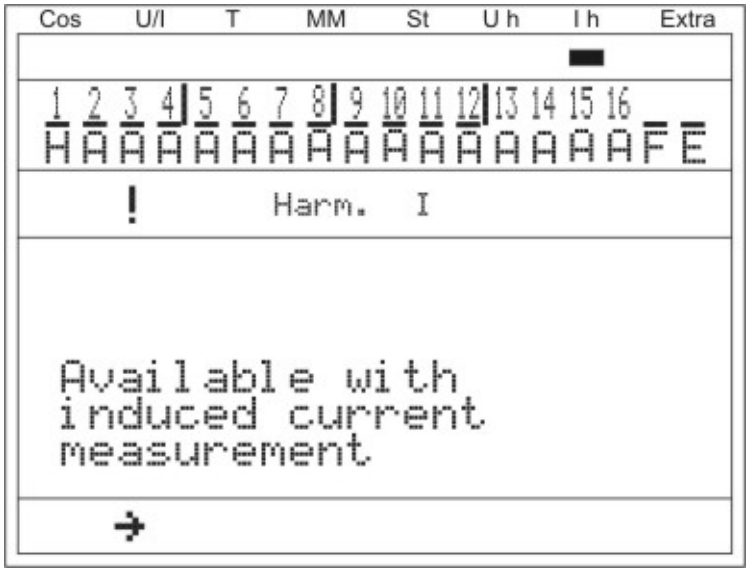
Total - harmonics of measuring voltage: = 0,7%.

Harm. U Mom — Menu description

F1	F2	F3	F4	
→	Max		↓	Display hot-key area
I	I		I	
I	I			Continue to the 3rd and up to the 19th harmonic
I	I			
I	Additional stages - Display ascending			

Scroll through main menu

4.12 Main menu Ih distortion current intensity



Harm. I — Menu description

F1 F2 F3 F4

→ — Display hot-key area

I

I

I

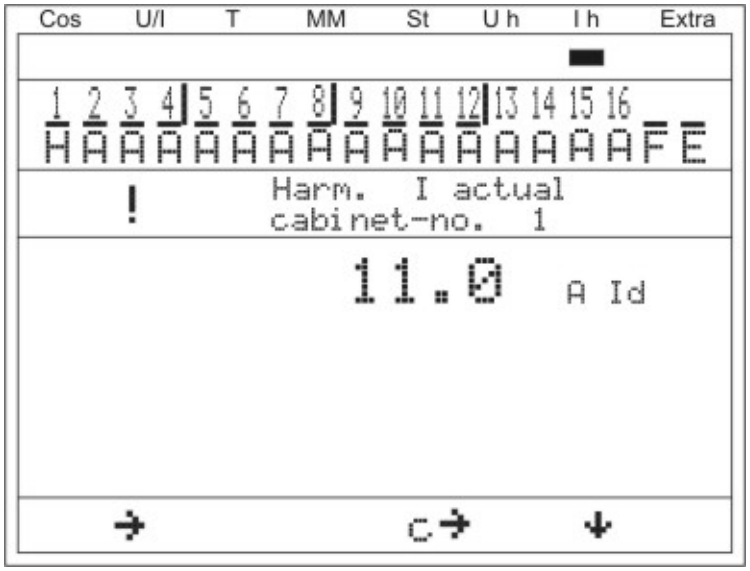
I

Scroll through main menu

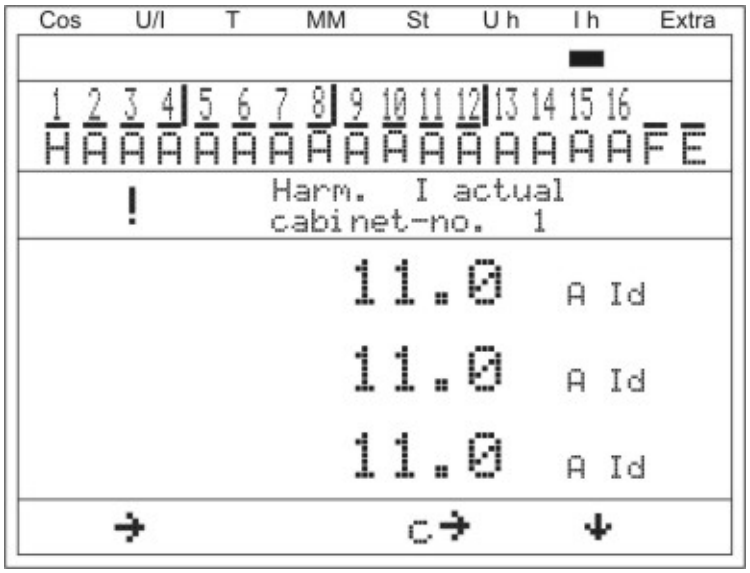
Note

This menu is only available for induced current measurement (has to be activated in the menu 3.13.1 Commissioning —> Transformer —> Induced current transformer —> Para).
Please check whether the induced current measurement module has already been scanned.

In case an induced current measurement is activated (e.g. **monophase** induced current measurement), the following window appears:



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



EDEBDA0134 / 3609-1 GB

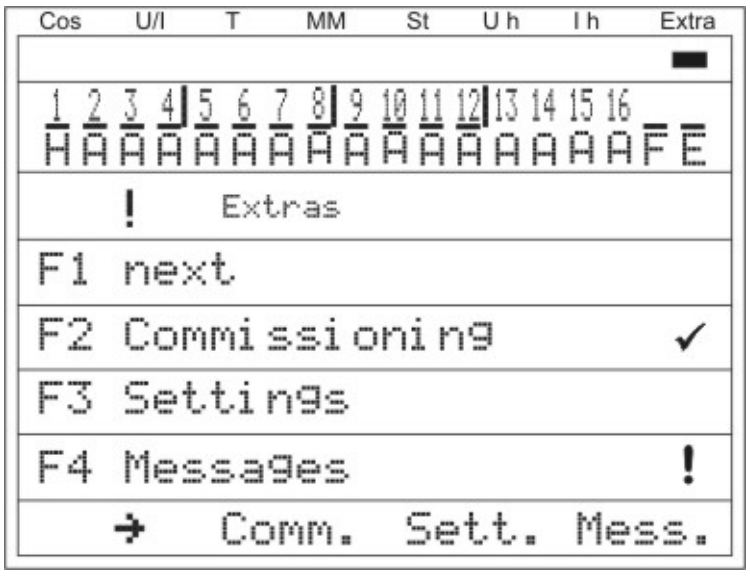
Harm. I mom Menu description

F1	F2	F3	F4	
→		S →	↓	Display hot-key area
I		I	I	
I		I	Continue to the 3rd and until the 19th harmonic	
I		Harmonics display for induced current measurement of next cabinet		
I				
Scroll through main menu				

Display as example:

Cabinet No.: = 1
Induced current measurement: = three-phase
Harmonic: = total Id
Harmonic currents L1: = 11 A
Harmonic currents L2: = 11 A
Harmonic currents L3: = 11 A

4.13 Main menu Extras



Extras Menu description

F1	F2	F3	F4	
→	Comm.	Sett.	Mess.	Display hot-key area
I	I	I	I	
I	I	I	Display message (! = message exists)	
I	I	Settings communication / display, system, service		
I	Commissioning parameters			
Scroll through main menu				

Note

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

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
        i. Activate, monophase or three-phase
        ii. Primary current cabinet 1
        iii. Secondary current cabinet 1
        iv. Continue with cabinets 2 to 6
    c. Voltage transformer
        i. Primary voltage
        ii. Secondary voltage
        iii. Phase allocation
2. cosφ - 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 power
        ii. Cabinet No.
        iii. Discharge time
        iv. Detuning / reactor factor
        v. Operating cycles
        vi. Overtemperature switch-offs
        vii. Facility type
        viii. Special outputs fans / alarm relays
    c. Nominal value (rated voltage Ph-Ph, power frequency)

The Settings submenu contains the following items:

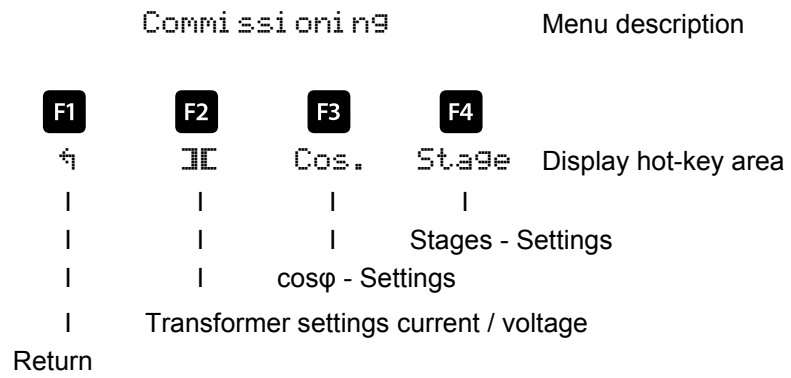
1. Communication / Display
2. System
3. Service

The Messages submenu contains the following items:

1. Active error messages
2. Error state
3. Allocation for message
    a. Alarm relay
    b. Stage switch-off

EDEBDA0134 / 3609-1 GB

4.13.1 Commissioning



4.13.1.1 Submenu Transformer settings

The Transformer settings submenu contains the following items:

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

Under the item **Series 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**!

Under the item **Voltage transformer** the primary and secondary current, as well as phase allocation of the measurement voltage must be specified.

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 99.99kA 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).

The voltage transformer submenu contains the following items:

1. Primary voltage
2. Secondary voltage
3. Phase allocation of measurement 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 10,000/100V means a primary voltage of 10,000V and a secondary voltage of 100V.
The input field ranges from 1V to 9,999kV for the primary voltage and 100V or 500V for the secondary voltage.

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

EDEBDA0134 / 3609-1 GB

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 measuring device in a three-phase network without neutral conductor.

In the 700 V variant, this also serves to adapt the measurement voltage to the measuring device.
Make sure that the measuring devices are configured for the operation with a zero-point creator.

Transformers are available in the following variants:

Variant 400/100:	Primary:	400 V phase to phase voltage
	Secondary:	100 V phase to phase voltage
Variant 700/100:	Primary:	700 V phase to phase voltage
	Secondary:	100 V phase to phase voltage

4.13.1.2 Submenu Target cosine

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.

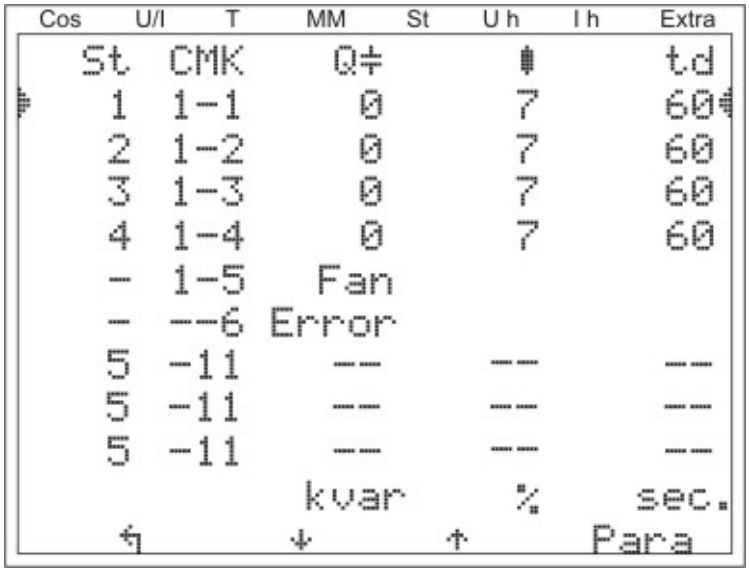
Under the item **Alarm cosφ** a value of inductive 0.50 to capacitive 0.50 can be entered.

4.13.1.3 Submenu Stages

The Stages submenu contains the following items:

1. Auto configuration mode
2. Stage parameters direct input
3. Nominal 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 3.13 Extra Commissioning —> Stages —> Auto configuration mode —> Start.

First, the configured parameters are displayed. If needed, the 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 4D6-ESBSDS-1V1C6RO** determines the corresponding stage power. After successfully determining the stage power, the result is displayed and can be saved by confirming it (press button F1 (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 a connected series transformer
2. Alternatively measurement via induced current transformer and current measuring module multisio 1D2-4CI
3. Correct programming of the primary and secondary voltage, and of the phase allocation
4. Correct programming of the primary and secondary current, and of the phase allocation
5. Correct programming of the primary and secondary current, and of the induced current transformer
6. Possible additionally connected modules must be detected and stored with the help of the Settings —> Module / Display —> Module management menu item
7. The capacitor stages have to be connected
8. Active power output must be available
9. The currently measured cosφ must be inductive

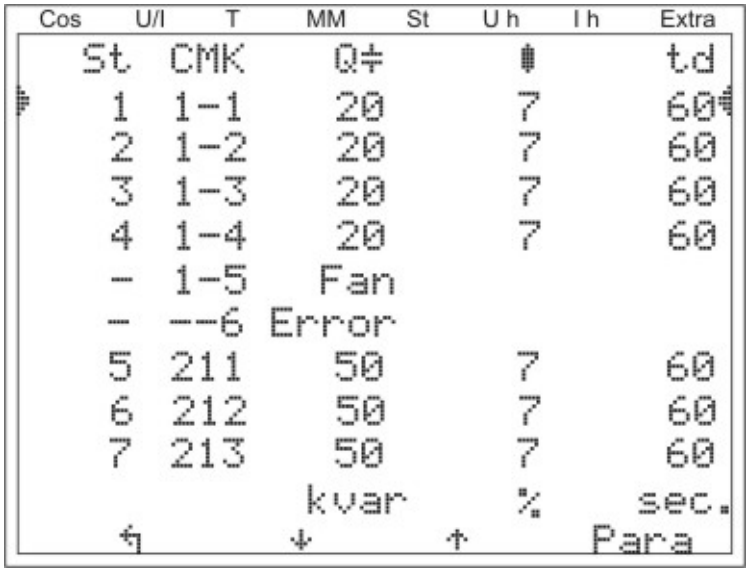
If all these prerequisites are met, the auto configuration mode of the stage powers can be started.

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 9999 kvar
2. Cabinet Nos. 1 to 6
3. Discharge time 0, 3, 30, 60, 300, 600, 900 sec.
4. Detuning 0, 5.5, 7, 8, 12.5, 14%
5. Operating cycle reset
6. Overtemperature switch-offs, reset
7. Facility type standard, combination filter, special
8. 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.

EDEBDA0134 / 3609-1 GB

For a completely configured controller, the following window appears:



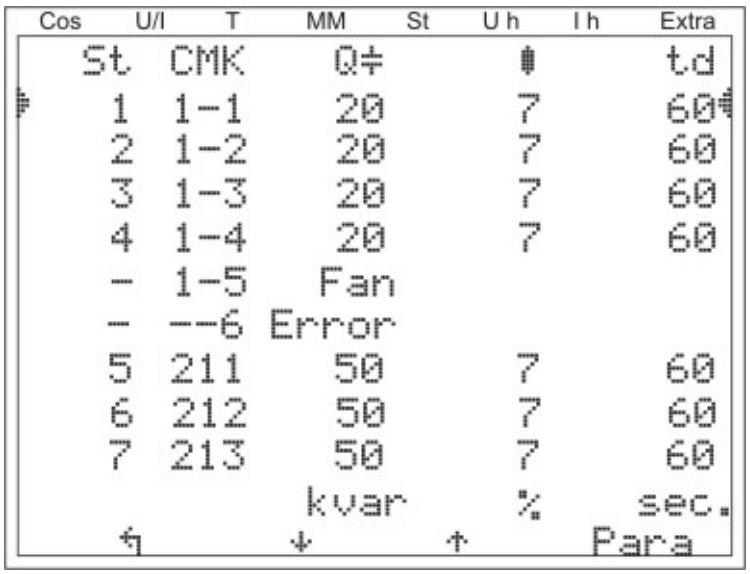
The following abbreviations apply:

St.	stage
CMK	C = Cabinet No.
	M = Module No (Module**multisio 1D2-4RO**)
	K = Capacitor stage output
Q≑	Compensation power of stage, in kvar
♦	Stage detuning in %
te	Stage discharge time in seconds
▸ ◂	Cursor for stage selection with ↓ or ↑

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

Menu 3.13 Extras —> Commissioning —> Stages —> Stage parameters:

After pressing button F3 (stage) the following is displayed in the hot-key area:



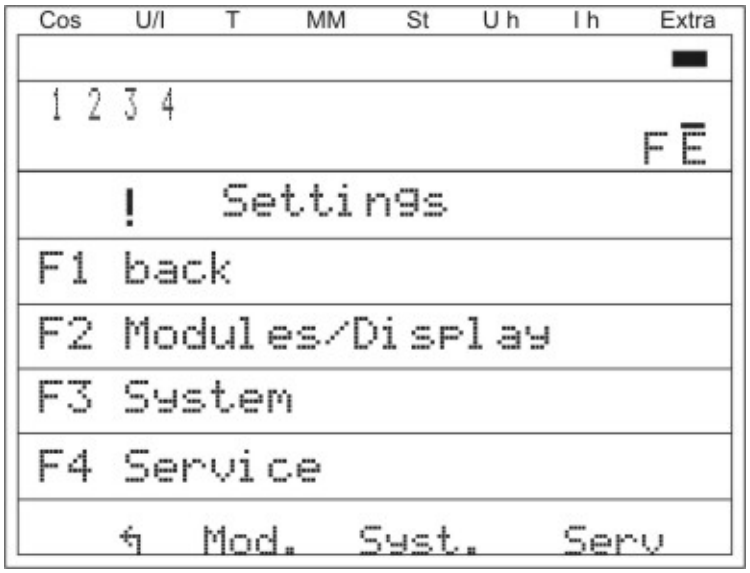
EDEBDA0134 / 3609-1 GB

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 accepting the changes by pressing F3 (Yes).

4.13.2 Settings

Settings — Menu description

F1	F2	F3	F4	
↰	Mod.	Syst.	Serv	Display hot-key area
I	I	I	I	
I	I	I	Service	
I	I	System		
I	Modules / display			
Return				

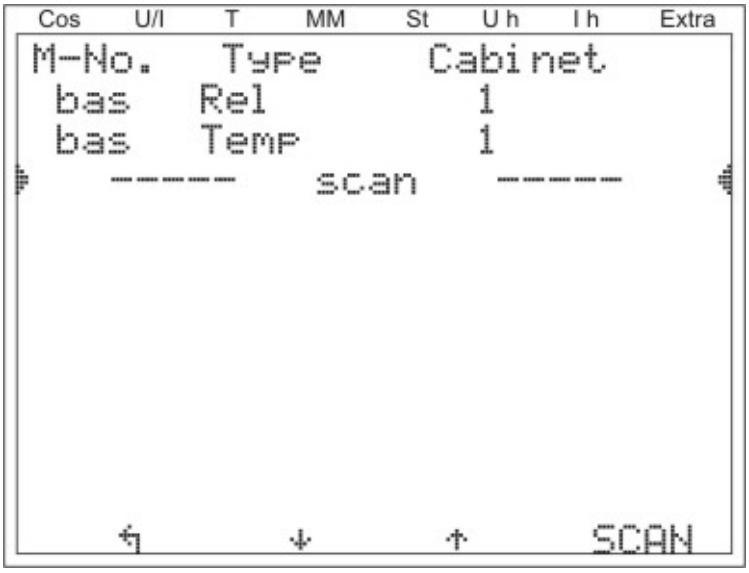


4.13.2.1 Submenu Modules/display

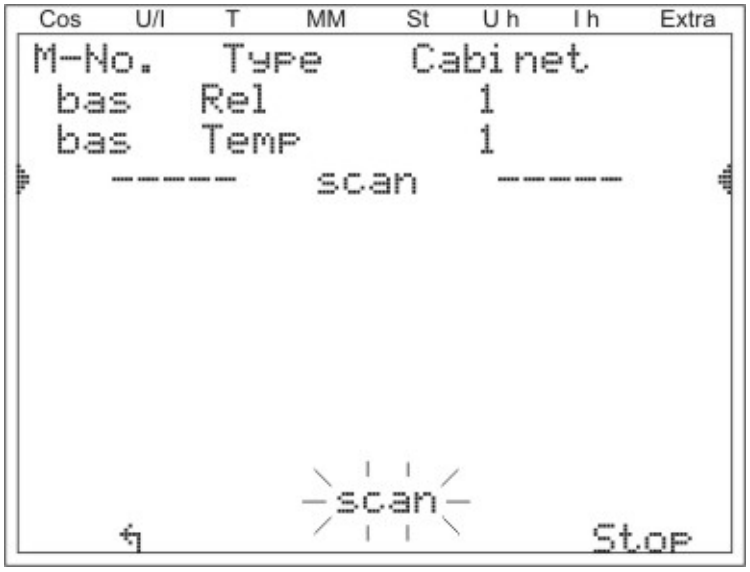
The Modules/display submenu contains the following items:

1. ModuleManagement
2. Bus parameters
3. Display / Language

Under the item **Module management** the additionally connected modules (relay module 1D2-4DO, temperature module 1D2-1TI2RO and current measuring module 1D2-4CI) are scanned, deleted and configured.



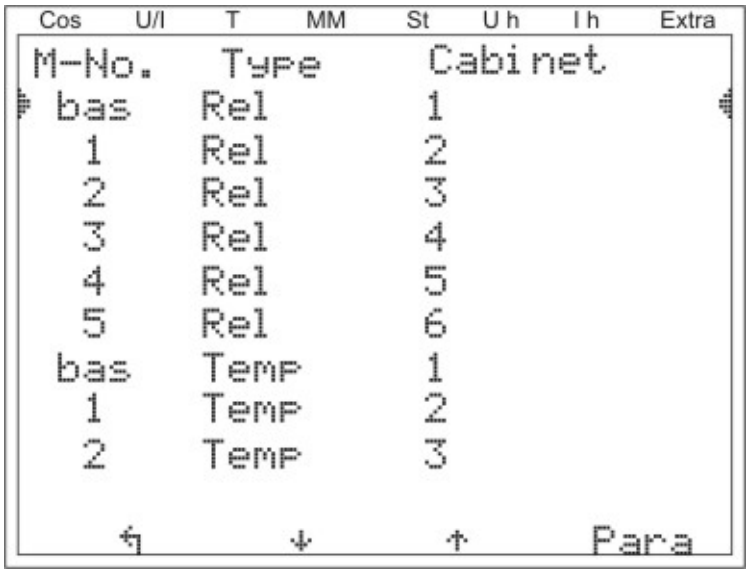
Description of the module scan:



Press the button F2 (↓) 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 DIL switch S6 (for modules **multisio 1D2-4RO** and **multisio 1D2-1TI2RO**) or the scan button (for module **multisio 1D24CI**) (refer to additional modules - function of the module DIL switches). 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



EDEBDA0134 / 3609-1 GB

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 (↑).

Module management Menu description

F1	F2	F3	F4	
↰	↓	↑	Para	Display hot-key area
I	I	I	I	
I	I	I	Configuring switchgear cabinet No.	
I	I	Number of additional modules		
I	Number of additional modules			
Return				

Parameters:
Module management = Cabinet Nos. 1 to 6

After pressing button F4 (Para)the following display appears in the hot-key area of the display:

F1	F2	F3	F4	
↰			EDIT	Display hot-key area
I			I	
I			Assignment of switchgear cabinet No.	
I				
I				
Return				

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

F1	F2	F3	F4	
↰	→	Del.	+	Display hot-key area
I	I	I	I	
I	I	I	Configuring of switchgear cabinet No.	
I	I	Deleting the displayed scanned mode		
I	Continue with submenus 3 and 4			
Return				

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, 1.01 as the firmware version and r013 as the release of the firmware version.

After pressing button F4 (+) the following display appears in the hot-key area of the display:

F1	F2	F3	F4	
NO	YES	→	+	Display hot-key area
I	I		I	
I	I		Enter value	
I	I			
I	Leave setting menu and save			
Leave setting menu without saving				

After pressing the button F1 or F2 the following display appears in the hot-key area of the display:

F1	F2	F3	F4	
↰			EDIT	Display hot-key area
I			I	
I			Assignment of switchgear cabinet No.	
I				
I				
Return				

Additional modules - function of the module DIL switches:

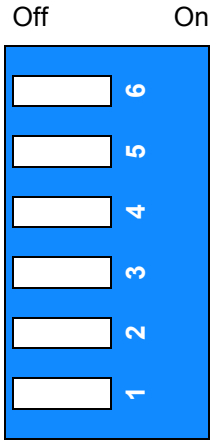
Basic setting = all switches to off

Temperature module:

If the switch S6 is set to On and switched
to Off again, the module will change to scanning mode.

S5 = Off
- S1 = no function
- S2 = no function
- S3 = no function
- S4 = no function

S5 = On
- S1 = alarm relay on
- S2 = fan relay on
- S3 = no function
- S4 = no function

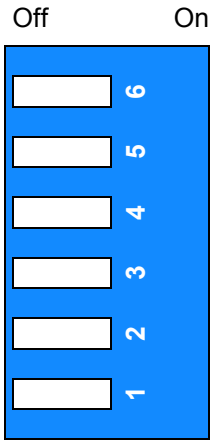


Relay module:

If the switch S6 is set to On and switched
to Off again, the module will change to scanning mode.

S5 = Off
- S1 = no function
- S2 = no function
- S3 = no function
- S4 = no function

S5 = On
- S1 = no function
- S2 = no function
- S3 = no function
- S4 = no function



With the item **Bus parameters**, the bus operation is configured (Ebus and Modbus). Here the bus address for the KBR - Energy bus and the bus address and protocol type for the Modbus can be set.

```
        Bus parameters          Menu description

 F1      F2      F3      F4
  ↰               Ebus    EDIT   Display hot-key area
  I                I       I
  I                I       Selecting the Ebus or Modbus bus protocol
  I               Set bus parameters (address for Ebus or address and protocol type for Modbus)
  I
Return
```

Parameters:
Bus = Ebus or Modbus
Bus address 0 to 9999 for 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 (Ebus or Modbus) the controller is restarted, i.e. all hooked up capacitor stages are discarded and hooked up again.

With the item **Display / Language**, the settings for the external LCD display and the user language German / English 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.

LCD display:

```
        Bus parameters          Menu description

 F1      F2      F3      F4
  ↰      test            EDIT   Display hot-key area
  I       I               I
  I       I              Settings for contrast and brightness
  I       I
  I      Display test
Return
```

Parameters:
LCD = Contrast and brightness

Language:

```
          Language                Menu description

F1    F2    F3    F4
 ↰                 EDIT   Display hot-key area
 |                   |
 |                 Set user language (German / English)
 |
 |
Return
```

Parameters:
Language = German / English

Runtime and clock:

```
       Runtime / clock            Menu description

F1    F2    F3    F4
 ↰           Clock          Display hot-key area
 |             |
 |             |
 |           Time setting and runtime display of controller
 |
Return
```

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

After pressing button F4 (clock), the following display appears in the hot-key area of the display:

```
         Clock / date              Menu description

F1    F2    F3    F4
 ↰     DST          EDIT   Display hot-key area
 |      |            |
 |      |          Edit (Setting time and date)
 |      |
 |    Daylight saving time - settings
Return
```

Parameter time/date = time (ss:mm) and date (dd:mm:yyyy)

After pressing button F4 (DST), the following display appears in the hot-key area of the display:

```
Daylight saving time        Menu description

F1      F2      F3      F4
 ↰                      EDIT    Display hot-key area
 I                       I
 I                    Edit (Auto/Off, Start and End)
 I
 I
Return
```

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

4.13.2.2 Submenu System

The System submenu contains the following items:

1. Parameters
2. Reset

Under the item **Parameters**, the switching performance, temperature parameters and limits can be set.

The ***switching performance*** comprises the following options:

Switch-on and switch-off hysteresis	Input in %, in relation 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 displayed, i.e. the alarm cosφ has not been reached after the set time has elapsed.
Switching interval	Input in seconds (0 to 10 sec.). Determines the interval in which the capacitor stages are switched on in case of missing compensation power, in order to reach the set target cosφ.
Damping coefficients	The damping coefficients (0 to 6) are used to reduce deviations in the display. The measuring cycle of the controller is not influenced.

The ***temperature parameters*** contain the basic enabling and disabling of the temperature measurement and the switching performance resulting from this. In addition the operating point and hysteresis for the fan switch and the operating point and hysteresis for the overtemperature switch-off can be set here. The following parameters are available for operating points and hystereses:

Operating point 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:

Operating point fan	= 28°C / hysteresis = 5°C
Operating point alarm	= 50°C / hysteresis = 5°C
Operating point overtemperature	= 50°C / hysteresis = 5°C

EDEBDA0134 / 3609-1 GB

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 50°C is exceeded and is reset when temperature drops below 45°C. The overtemperature stage switch-off turns on when 55°C is exceeded. After the temperature has dropped below 50°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 (see menu Stages 3.10).

The overtemperature stage switching performance is as follows:

1.) Reducing the cabinet temperature when the alarm threshold is exceeded (prerequisite: at least 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 and detuning, same type (thyro/contactor)) from a cabinet with low 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 threshold), 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 reactor factor are available for selection, 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 "circuit 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.
If the temperature falls below the switch-off temperature (not yet below hysteresis), no other stages are switched off (due to overtemperature). 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.

Temperature measurement, incl. enabling:

```
Temperature parameters        Menu description

F1      F2      F3      F4
↰       Fans    Alarm   EDIT  Display hot-key area
 I       I       I       I
 I       I       I       Enabling / disabling temperature measurement
 I       I       Operating point and hysteresis alarm relays and overtemperature switch-off
 I       Operating point and hysteresis fan relays and overtemperature switch-off
Return
```

Parameters:

Temperature measurement	= active / inactive
Operating point 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

EDEBDA0134 / 3609-1 GB

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 set for the overvoltage switch-off of the facility, monitoring of the capacitor contactor operating cycles 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 400V Ph/Ph the setting range is 230V to 346V Ph/N. The setting range is dependent on the programmed primary measurement voltage.

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

Note

The default setting for the overvoltage limit is, for a measurement voltage of 230V PH-N, about 7% more, i.e. 245V PH-N. In case of operation via voltage transformer, the limit has to be set accordingly higher.

Example: For a voltage transformer of 500V PH-PH primary and 230 V PH-PH secondary, the limit has to be set to 535V PH-PH (500V PH-PH + 7% (=35V) equals 535V 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 due to the number of switches accumulated, the capacitor contactor could be worn out. This message in no way influences the function of the compensation facility. It is used merely as a "maintenance instruction".

The ***limit* of the harmonic switch-off** refers on one hand to the total of all measurement 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.

Under the item **Reset** there are various methods of resetting the programmed parameters of the controller. 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:

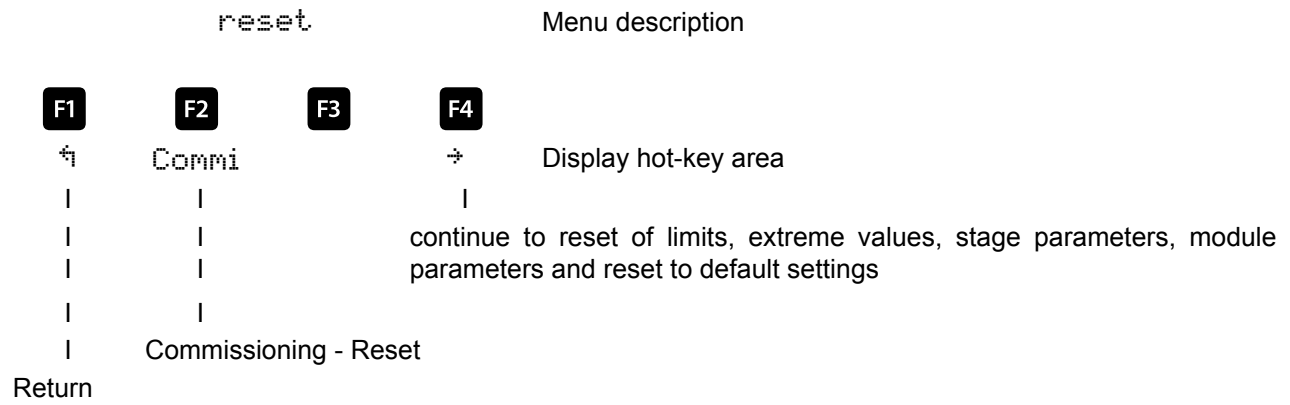
1. Commissioning - Reset:	You can reset the parameters to the commissioning status, i.e. error state and current transformer ratio are deleted.
2. Reset limits:	For Ph/N and Ph/Ph voltage, as well as voltage harmonics
3. Reset extreme values:	All maximum and minimum values recorded are deleted at once (overview of maximum and minimum values: cf. list).
4. Reset stage parameters:	The stage parameters stage power, cabinet No., discharge time, detuning / reactor factor, operating cycle alarm limit, facility type, special outputs fans / error message relay are deleted for all stages at once.

EDEBDA0134 / 3609-1 GB

5. Reset module parameters: All scanned temperature, relay and induced current measurement modules are deleted.

6. Reset to factory settings: Here, the programmable parameters are reset to default settings. A listing of the settings can be found in the attachment 5. **Technical data**.

Reset functions:



Parameters:
Reset = commissioning reset, limiting values, extreme values, stage parameters, module parameters and reset to factory settings

Overview of extreme values (maximum and minimum), can partially only be read out via Ebus or Modbus:

	Output	
Maximum: Voltage PH-N	Display	Bus
Maximum: Voltage PH-PH	Display	Bus
Maximum: Current (main current)	Display	Bus
Maximum: Induced current		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
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 of 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: Power frequency	Display	Bus
Maximum: Missing compensation power	Display	Bus
Maximum: Hooked up 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
Minimum: Current (main current)		Bus
Minimum: Induced current		Bus
Minimum: cos Phi		Bus
Minimum: Power factor		Bus
Minimum: Power frequency		Bus
Minimum: Missing compensation power		Bus
Minimum: Hooked up compensation power		Bus
Minimum: Apparent power	Display	Bus

EDEBDA0134 / 3609-1 GB

	Output	
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

4.13.2.3 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 defaulted with the code 9999, i.e. all functions of the device are available.**

Hotline (service / information):

```
                Service                 Menu description

 F1      F2      F3      F4
  ↰     Hotl.   Pass.   Vers.   Display hot-key area
  I       I       I       I
  I       I       I     Firmware version display of main unit and display
  I       I     Password protection
  I     Service - Info
Return
```

Password protection:

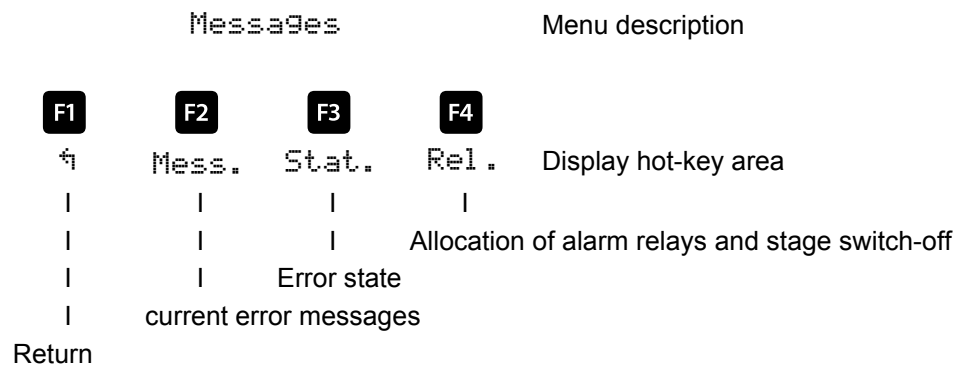
```
                Password                Menu description

 F1      F2      F3      F4
  ↰                       EDIT   Display hot-key area
  I                         I
  I                       Enter password (programming protection)
  I
  I
Return
```

Parameters:
Code = 4-digit number combination, **release code 9999: all device functions** are available.

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, 4.00 for the Firmware version and r001 for the release of the firmware version of the basic module, 4.00 stands for the firmware version and r001 for the current release of the firmware version of the display module.
The firmware version of possible connected additional modules can be displayed under Extras —> Settings —> Modules / display —> Module management via the module configuration.

4.13.3 Messages



4.13.3.1 Messages submenu

The Messages submenu contains the following items:

1. Current error messages
2. Error state
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.

Under the item **Error state**, messages are shown that must be deleted manually. This means that these messages, which are relevant for the flawless operation of the facility, 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 limiting value (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	Battery voltage critical
E14	Parameter error (default value replaces incorrect value)
E15	Input overload (series transformer)

EDEBDA0134 / 3609-1 GB

Error messages

(must not be acknowledged)

		Possible action:
E17	No measurement 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 probe (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 measured current (for light 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	Capacitance loss	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
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

Under the item **Relay / stage switch-off** , an action acc. to the list 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

If a stage is detected to be defective (**E26 Capacitor current too high**), a message is displayed. Limiting condition is the stage pattern of the stages created, e.g. in case a 30 kvar stage has the current consumption of a 40 kvar stage.

EDEBDA0134 / 3609-1 GB

If this in the case, compare the nameplate of the stage with the configured stage power and adjust the stage configuration if necessary (wrong programming).

If the values on the nameplate match the configured stage power, repair the stage.

The error message **E27 Check fuse** is displayed if the current consumption of the facility (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 defect** (stuck) is displayed.

5 Basic device programming

The menu navigation of the **multicomp 4D6-ESBSDS-1V1C6RO** is self-explanatory.
The user is guided and supported by the device through operating hints on the display for that particular situation.

As an example of the basic procedure in programming, the functions in the menu **Commissioning** are used.

Menu item: Transformer

Transformer Menu description

F1 F2 F3 F4

↰]I[I]I[Ie]I[U Display hot-key area

I I I I

I I I Display and processing for voltage transformer

I I Display and processing induced current transformer cabinets 1 to 6

I Display and processing for main current transformer

Return

5.1 Set transformer

After pressing the button F2 (]I[) the following display appears in the hot-key area of the display:

Transformer Menu description

F1 F2 F3 F4

↰]I[I]I[Ie]I[U Display hot-key area

I I I I

I I I Display and processing for voltage transformer

I I Display and processing induced current transformer cabinets 1 to 6

I Display and processing for main current transformer

Return

After pressing the button F2 (]I[) the following display appears in the hot-key area of the display:

F1 F2 F3 F4

↰ EDIT Display hot-key area

I I

I Configured transformer ratio current transformer

I

I

Return

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

F1	F2	F3	F4	
↰	↓	→	+	Display hot-key area
I	I	I	I	
I	I	I	Enter value	
I	I	Continue to next digit		
I	Scroll through the lines in the value area			
Return				

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

F1	F2	F3	F4	
NO	↓	YES		Display hot-key area
I	I	I		
I	I	I		
I	I	Leave settings menu and save		
I	Scroll through lines in the value area			
Leave setting menu without saving				

Note

The settings for the voltage transformer are identical !

After pressing button F3 (⊐C Ie) the following is displayed in the hot-key area:

F1	F2	F3	F4	
↰	Para	↓	EDIT	Display hot-key area
I	I	I	I	
I	I	I	Configure induced current transformer cabinet 1	
I	I	Continue with cabinets 2 to 6		
I	Select induced current measurement monophase or 3-phase			
Return				

After pressing the button F4 (EDIT), the following display appears in the hot-key area of the display:

F1	F2	F3	F4	
↰	↓	→	+	Display hot-key area
I	I	I	I	
I	I	I	Enter value	
I	I	Continue to next digit		
I	Scroll through lines in the value area			
Return				

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

F1	F2	F3	F4	
NO	↓	YES		Display hot-key area
I	I	I		
I	I	I		
I	I	Leave settings menu and save		
I	Scroll through lines in the value area			
Leave setting menu without saving				

After pressing button F3 (YES) the following is displayed in the hot-key area:

F1	F2	F3	F4	
↰	Para	↓	EDIT	Display hot-key area
I	I	I	I	
I	I	I	Start configuration	
I	I	Continue with cabinets 2 to 6		
I	Select induced current measurement monophase or 3-phase			
Return				

5.2 Set Target cosφ

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

Target cosine Menu description

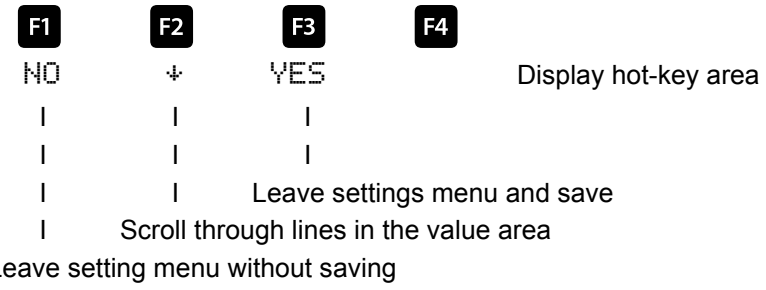
F1	F2	F3	F4	
↰			EDIT	Display hot-key area
I			I	
I			Processing target cosine consumption, recovery and alarm cosine (**FTS**)	
I				
I				
Return				

After pressing button F4 (EDIT) the following display appears in the hot-key area of the display:

F1	F2	F3	F4	
↰	↓	→	±	Display hot-key area
I	I	I	I	
I	I	I	±Enter value	
I	I	Continue to next digit		
I	Scroll through lines in the value area			
Return				

EDEBDA0134 / 3609-1 GB

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



5.3 Note on detecting errors

Undercompensation, not enough stages are switched on.

Check controller for error displays (refer to Section 2.13.3). If the target cos phi is set to 0.8 capacitive, the capacitors have to be switched on. If the facility is not over-dimensioned, almost all stages need to be switched on.
Check the main fuse and group fuses of the facility. All values are entered in the enclosed documents. The group fuses must display at least 1.7-times the value of the capacitor power.

If the fuses do not hold, despite their being correctly selected, the groups must be checked individually for excessive current input and for defective contactors.

Undercompensation, all stages are switched on.

The existing facility is not sufficient (e.g. due to new inductive consumers).
Please contact your local representative (extend your facility). See the cover sheet of these operating instructions for the service telephone number, or menu item Extras / submenu 7.

Overcompensation, too many stages are switched on.

Check controller settings (target cos phi capacitive?).
Transformer connected in the wrong position?

Controller switches a lot, in particular during low load (at the weekend, during the night).

Check programming of the transformer ratio.
Switch on a small stage permanently (manually), if required.

If no cause of error is found, please call your local representative. The phone number can be found on the cover sheet of these operating instructions or in the menu item Extras / submenu Service

EDEBDA0134 / 3609-1 GB

5.3.1 Facility and safety devices maintenance

In order to ensure proper function and a long service life of your facility, the following checks have to be performed after commissioning and then once a year!

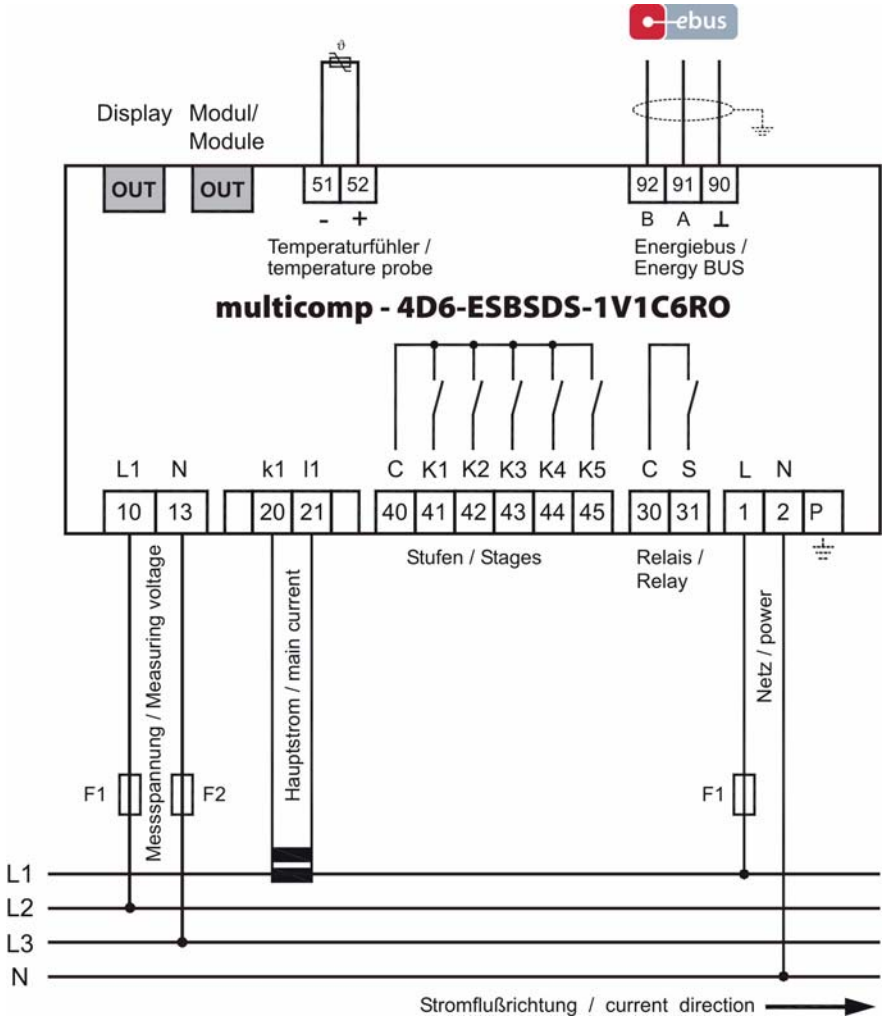
- Check and retighten all connections. Screwed connections may become loose at the beginning due to thermal stress.
- Check fuses, safety devices and switching equipment. Contactors are wear parts. If the contactor is intact, switching must take place without excessive formation of sparks.
- Check the controller behavior in automatic mode.
- Examine the cool air proportions (ventilators, temperature monitoring function):
  - Temperature relay of controller switches ventilators on at 28°C,
  - Temperature monitoring switches facility off via controller at 55°C.
- Clean filter mats, 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 every three months.
- Inspect the reactive energy consumption by means of the electricity bill.

5.3.2 Limit temperatures

Valid for facilities 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 facilities. The input current and the temperature of these facilities must be checked regularly so that an overload on 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 capacity of capacitors.

5.4 Connection chart measuring voltage PH-PH



* For voltage supply, see nameplate.

6 Technical data

6.1 Measuring and display values

Voltage	Actual value of a measuring interval	Phase - 0 or phase - phase, depending on programming
	Units	[V, kV, MV] display is switched automatically
	Measuring range	0.00kV to 10.00 MV
Current	Actual value of a measuring interval	Actual value per phase
	Units	[A;kA] display is switched automatically
	Measuring range	0.00A to 10.00kA
Frequency	Power frequency measurement	f_{Grid} ; measured with power supply correction
	Units	[Hz]
	Measuring range	40.....70Hz
Apparent power	Calculation	S_{total}, three-phase
	Units	[VA; kVA; MVA, TVA] display is switched automatically
	Measuring range	0.00VA to 200TVA
Active power	Calculation	$P_{total;}$ three-phase
	Units	[W; kW; MW; TW]; display is switched automatically
	Measuring range	0.00W to 200TW
Reactive power	Calculation —> ind. & cap.	$Q_{total;}$ distinction between ind./cap.
	Units	[Var; kvar; Mvar] display is switched automatically
	Measuring range	0.00VAr to 200TVAr
cosφ (fundamental shift)	Calculation —> ind. & cap.	cosφ; distinction between ind./cap. cosφ in the display
	Measuring range	cosφ 0.1ind. <—1 —> 0.1cap.
Power factor	Measuring range	0.00 to 1.00, can only be read out via Bus
Temperature	Measuring range	-20°C to 100°C ± 2°C /
Harmonics	Distortion factor (THD) of voltage	Voltage: KF-U
	Partial distortion factors	3.; 5.; 7.; 9.; 11.; 13.; 15.; 17. and 19th harmonic of the voltage
	Units	[%]
	Measuring range	0.00% to 100%
Harm. Harmonics of the current	Current harmonics Total of current harmonics	3.; 5.; 7.; 9.; 11.; 13.; 15.; 17. and 19th harmonic for each phase Current: I_{Sum}
	Units	[A]
	Measuring range	0.00A to 999.9kA

6.2 Measuring accuracy

Current	± 2% / ± 1digit
Voltage	± 2% / ± 1digit
Power	± 4% / ± 1digit
Power factor	± 2% / ± 1digit
Frequency	± 0.1% / ± 1digit

EDEBDA0134 / 3609-1 GB

6.3 Measuring principle

Reading	64 values per period
A/D converter	10 Bit
Measuring U and I	Acquiring measuring values for U and I simultaneously;
Updating speed (complete measuring cycle)	~ 330 ms
Calculation of harmonics	DFT with 64 points over one period
Frequency measurement	Mode: Voltage measurement between phase Lx - N / Ly); correct frequency measurement due to power supply correction

6.4 Device memory

Data storage	512 kB RAM battery-buffered
Program and parameter memory	256 kB flash
Memory type	Ring buffer
Extreme values (Max./Min.)	The highest values that have occurred (maximum indicator function) since switching on power supply or manually deleting extreme value
Event memory: Memory size	4096 events
Limit violations: acquisition time	≥ 550 ms

6.5 Power supply

Power supply	85 to 265V AC/DC; 15VA

6.6 Hardware inputs

Measuring voltage input	U_{PH-N} U_{PH-PH}	57.75V...**289V**...347V AC 100V ... **500V**...600V AC (over 500V AC PH-PH to 30,00KV AC PH-PH with voltage transformer auxiliary)
	Direct impedance	at least 2.5 MOhm
	Measuring range	programmable
Temperature input	Measuring range	-20°C to 100°C ± 2°C /
	- Connection for PT1000 temperature probe	
Measuring input for current		0.05A...**5A**...6A AC for x/5A - transformer 0.01A...**1A**..0.2A AC for x/1A - transformer
	Power consumption	≤2VA per input at 6A
	Measuring range	programmable

6.7 Hardware outputs

Interface	Serial interface	RS 485 for connection to the Energy Bus; a max. of 32 devices per bus segment, up to 1000 m without bus amplifier, for additional information see installation guide KBR Energy Bus
	Transmission speed	38400 baud
	Bus protocol	KBR ENERGY BUS
	Addressing	Can be addressed up to addr. 9999 via software, scanning mode can be activated on the device
Module bus interface	Serial interface	RS 485 (RJ12) for ready-made KBR system cable (6 pole modular cable, unshielded), max. length 30 m when placed accordingly.

6.8 Electrical connection

Connection elements		Screw-type terminal
Permissible cross section of the connection lines		2.5 mm^2 (Bus connection and temperature probe 1.5mm^2)
Measurement voltage inputs	Fuse protection	max. 6 A
Measuring current input	Fuse protection	NONE!!! Always short-circuit current transformer terminals k and l prior to opening the circuit!
Input Control voltage	Fuse protection	max. 6 A
Relay output	Contact capacity	500VA, 2A, 250V and 50/60 Hz
BUS connection	Connection material	For proper operation please only use shielded twisted-pair cables; e.g. I-Y(St)Y 2x2x0.8
Transformer connection	Connections	see connection chart
BUS connection	Pins for BUS connection via RS485	**Device** **MULTIMASTER** **or** **interface adapter** terminal 90 (⊥) → Pin ⊥ → see software manual terminal 91 (A) → Pin A → see software manual terminal 92 (B) → Pin B → see software manual

6.9 Mechanical data

Top hat rail device	Housing measures	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 Suitable for distribution board mounting
	Weight	approx. 650g

6.10 Standards and Miscellaneous

Environmental conditions	Standards	DIN EN 60721-3-3/A2: 1997-07; 3K5+3Z11; (IEC721-3-3; 3K5+3Z11)
	Operating temperature	- 5°C ….+140.00?
	Humidity	5% ….....95%
	Storage temperature	-25°C ….+70°C
Electrical safety	Standards	DIN EN 61010-1/A2: 1996-05; (IEC1010-1/A2)
	Protection class	II, in accordance with DIN EN 61010-/A2: 1996-05
	Overvoltage category	CAT III: U_{PH-PH} up to 400V
	Mode of protection	IP20 in accordance with DIN EN 40050 Part 9: 1993-05
	Electromagnetic compatibility	DIN EN 61000-6-3: 2005-06; (IEC 61000-6-3) DIN EN 61000-6-2: 2000-03; (IEC 61000-6-2)
Password protection	4-digit	Deleting and programming parameters on the device is not enabled if password protection is active.

EDEBDA0134 / 3609-1 GB

6.11 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 for recovery)	inductive 1.00
Cosφ 3 (alarm - cosφ for FTS message)	inductive 0.92
Damping coefficient for current and voltage	2
Temperature measurement	Active
Operating point fan	28°C, hysteresis 5°C
Operating point alarm	50°C, hysteresis 5°C
Operating point emergency off	55°C, hysteresis 5°C
Idle time	30 sec.
Alarm relay time	1200 sec.
Alarm relay	Break contact
Hysteresis connection	100% of smallest available stage
Hysteresis disconnection	100% of smallest available stage
Switch attenuation (stage interval)	8 sec.
Switching cycle limit	80.000
Stage power	No stage power programmed
Stages	Facility type standard
	Discharge time 60 sec.
	Detuning 7%
	Cabinet No. 1
	Stage 5 as fan
Harmonics monitoring	Enabled, THD 8%, error message is displayed
Induced current measurement	deactivated
Language	germ. (German text display)
Password	9999 / all functions can be accessed
Limiting value overvoltage switch-off	Active, 245V Ph-N, stages switch off, error message is displayed

Unchanged by a RESET:

Bus address
Date and time

EDEBDA0134 / 3609-1 GB

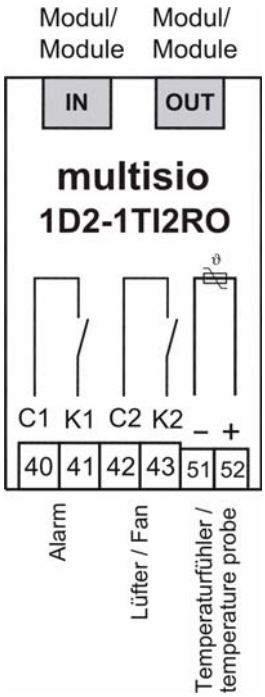
7 Appendix

7.1 Temperature module - connection chart

7.1.1 Terminal assignment

Terminal 40: alarm relay C1
Terminal 41: alarm relay K1
Terminal 42: fan relay C2
Terminal 43: fan relay K2
Terminal 51: temperature probe PT 1000 (-)
Terminal 52: temperature probe PT 1000 (+)

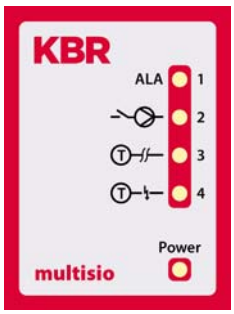
IN / OUT: Module bus / supply voltage



7.1.2 LED display

LED1: Alarm relay (on = relay idle state, alarm)
LED2: Fan relay (on = relay switched on, fan on)
LED3: No PT 1000 connected, line open
LED4: No PT 1000 connected, line short-circuited

LED5: Operating voltage



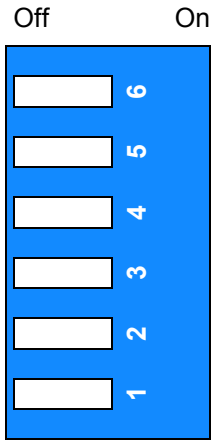
7.1.3 Additional modules – function of the DIL switches

Basis setting: all switches to off

If the switch S6 is set to On and switched back to Off after approx. 3 seconds (max. 6 seconds), the module will change to scanning mode.

S5 = Off
S1 = no function
S2 = no function
S3 = no function
S4 = no function

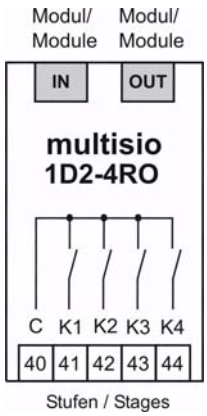
S5 = On
S1 = alarm relay on
S2 = fan relay on
S3 = no function
S4 = no function



EDEBDA0134 / 3609-1 GB

7.2 Relay module - connection chart

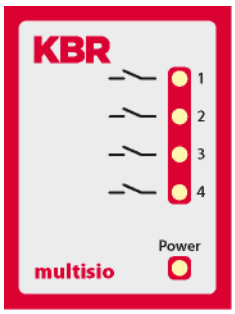
7.2.1 Terminal assignment



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 / supply voltage

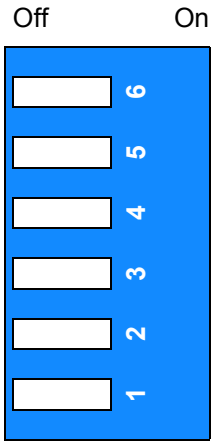
7.2.2 LED display



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

LED5: operating voltage

7.2.3 Function of the DIL switches



Basis setting: all switches to off

If the switch S6 is set to On and switched back to Off after approx. 3 seconds (max. 6 seconds), the module will change to scanning mode.

S5 = Off
- S1 = no function
- S2 = no function
- S3 = no function
- S4 = no function

S5 = On
- S1 = no function
- S2 = no function
- S3 = no function
- S4 = no function

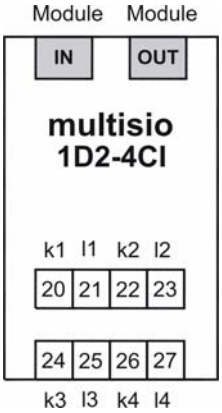
Attention:

The multisio 1D2-4CI may only be operated with series-connected current transformers!
The transformers may not be grounded secondarily.
Up to the 690V network (phase to phase voltage),
the connected current transformers have to be designed for a test voltage of at least 2500VAC for 1 minute.

7.3 Current measuring module - connection chart

7.3.1 Terminal assignment

IN / OUT: Module bus / supply voltage



Terminal 20: transformer connection k 1
Terminal 21: transformer connection I 1
Terminal 22: transformer connection k 2
Terminal 23: transformer connection I 2
Terminal 24: transformer connection k 3
Terminal 25: transformer connection I 3
Terminal 26: transformer connection k 4
Terminal 27: transformer connection I 4

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.!

7.3.2 LED display

LED 1: operating voltage

7.3.3 Function of scan button

By pressing the button for a short time, the current measurement module is put into scan mode.

An
KBR GmbH
Abteilung Entwicklung
Am Kiefernschlag 7
D-91126 Schwabach

To
KBR GmbH
Development
Am Kiefernschlag 7
D-91126 Schwabach / Germany

Vorschläge:
Korrekturen:
Betrifft Gerät:

Suggestions:
Corrections:
Device concerned

Sollten Sie beim Lesen dieser Bedienungsanleitung oder Druckschrift auf Druckfehler gestoßen sein, bitten wir Sie, uns diese mitzuteilen. Ebenso freuen wir uns natürlich über Anregungen, Hinweise oder Verbesserungsvorschläge.

If you come across misprints in this user manual or printed material, please take the time to notify us. We will also be glad to hear your ideas, notes and suggestions for improvement.

Bitte geben Sie die betreffende Anleitung oder Druckschrift mit Versionsnummer und/oder Ausgabestand an.

Please identify the user manual or printed material in question with version number and/or revision number.

Absender / Sender:

Name:
Firma/Dienststelle, / Copany/Department:
Anschrift / Address:
Telefon / Phone:
Telefax / Fax:
email:

Korrekturvorschläge zur Bedienungsanleitung / Druckschrift

Corrections/Suggestions for user manual / Printed material

Version