



K 7215: Feeding and Current Distribution

- for SELV and PELV with display module for 24 VDC or 48 VDC
- redundant feeding up to 150 A total current
- for fusing of up to 18 single circuits with circuit breakers (manufacturer E-T-A[®])

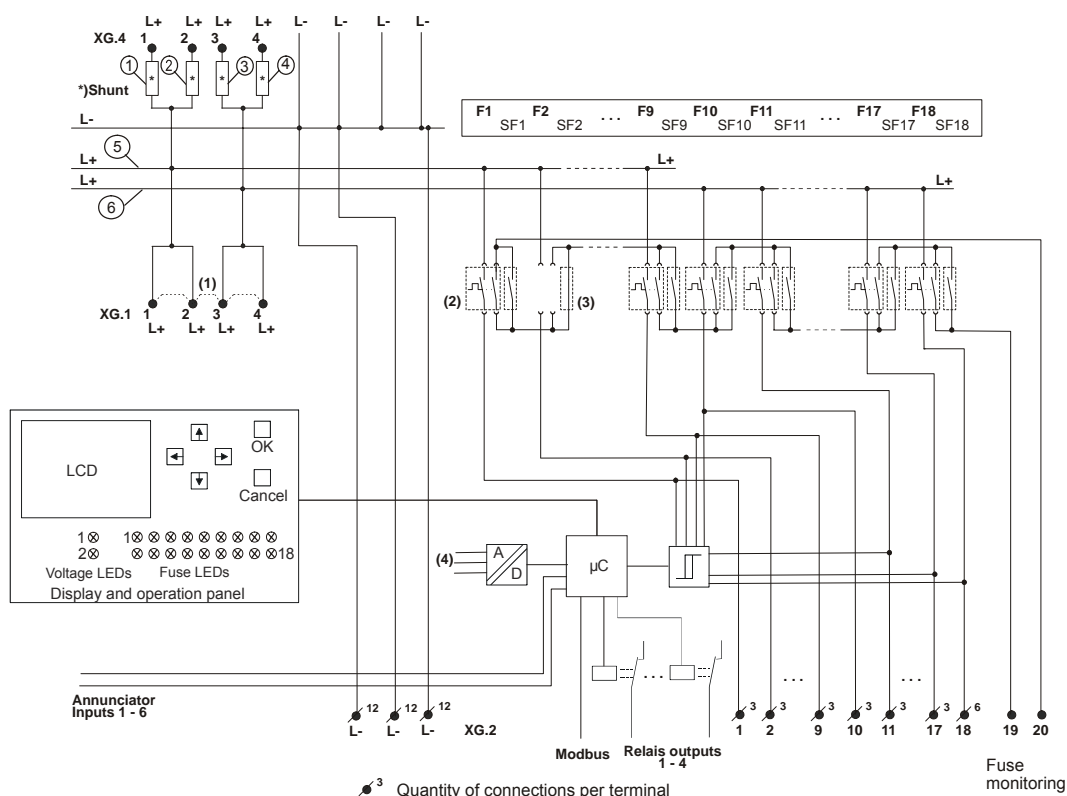


Figure 1: Wiring Diagram

Explanations

The supply inputs are XG.1 (without current measurement) or XG.4 (with current measurement)

- (1) After inserting the provided jumper into the terminal the two separated groups are interconnected (see "Groups of Supply Terminals" on page 7)
- (2) Circuit breaker F.. with monitoring contact
- (3) The monitoring contacts of non-equipped circuit breaker slots can be overridden with the slide switches SF..

Position 1	circuit breaker not equipped
Position 2	circuit breaker equipped.
- (4) The following analog values are measured:
 - the voltages at the measuring points ⑤ and ⑥,
 - the current at the measuring points ① to ④,
 - 2 temperatures with PT 1000 sensors

Construction

Printed circuit board with front sockets for up to 18 circuit breakers (with monitoring), connecting field on the rear with tension spring clamps.

Technical Data		
Total current	150 A max.	
Power supply	SELV or PELV, 24 VDC or 48 VDC	
Operating voltage	24 VDC	48 VDC
min. ($\cong - 15 \%$)	20.4 V	40.8 V
max. ($\cong + 20 \%$)	28.8 V	57.6 V
Current consumption	110 mA	85 mA
Ripple W_{ss}	$\pm 15 \%$	$\pm 15 \%$
Protection class	IP00	
Inputs for voltage measurement		
Measuring range	0 ... 60 V	
Resolution	0.1 V	
Accuracy	2 %	
Input resistance	23 k Ω	
Quantity	2	
Inputs for current measurement		
Measuring range	0 ... 60 A	
Resolution	0.1 A	
Accuracy	1 %	
Input resistance	1 M Ω	
Quantity	4	
Inputs for PT1000 temperature sensors		
Measuring range	-10 ... 100 °C	
Resolution	0.1 °C	
Accuracy	+/- 2 °C	
Measuring current	250 μ A	
Quantity	2	
Monitoring inputs for circuit breakers		
Range of voltage	0 ... 48 V	
Low level	< 6 V	
High level	> 14 V	
Input resistance	25 k Ω	
Quantity	18	
Annunciation inputs to be connected to potential-free contactors		
Current	< 6 mA @ 24 V, <12 mA @ 48 V	
Quantity	6	
Relay outputs		
Type	Floating, normally open	
Permissible switching voltage	48 VDC	
Permissible switching current	500 mA	
Quantity	4	
Communication interface	MODBUS slave over RS 485	
Ambient temperature	0 °C...+60 °C	
Storage temperature	-40 °C...+85 °C	
Dimensions	19 inches, 2 units high	
Mounting depth	approx. 180 mm	
Weight	1.4 kg (without circuit breakers)	

Table 1: Technical Data

Preferred type of circuit breakers (not delivered with K 7215):

Nominal current	Manufacturer	Type	HIMA part no.
4 A	E-T-A®	2210-S211-P1T2-H111 4 A	57 0350040
16 A	E-T-A®	2210-S211-P1T2-H111 16 A	57 0350160

Table 2: Preferred type of circuit breakers

For further details refer to the original data sheet E-T-A®.

Connections and wiring

Connection	Max. Cross section of wires
XG.1, XG.4: 1 / 2 / 3 / 4	16 mm ²
Feeding L-	16 mm ²
Distribution L-	2.5 mm ²
XG.2: 1...20	2.5 mm ²

Table 3: Connections and Wiring

Pin assignment of the SUB-D socket for MODBUS

Modbus slave

Connection	Signal	Function
1	---	---
2	---	---
3	RxD/TxD-A	Receive/Transmit data A
4	CNTR-A	Control signal A
5	DGND	Data reference potential
6	VP	5 V, positive pole of supply voltage
7	---	---
8	RxD/TxD-B	Receive/Transmit data B
9	CNTR-B	Control signal B

Table 4: Pin Assignment of the SUB-D Socket for MODBUS

Note The connecting cable BV 7043 must **not** be used to connect this device.

Assignment of the Terminals of the Current Loop and Temperature Input and the Relay Outputs (XG.3)

See rear view (Figure 3:)

Terminal	Input/Output	Function
1	Annunciator input 6	L-
2		Annunciator input
3	Annunciator input 5	L-
4		Annunciator input
5	Annunciator input 4	L-
6		Annunciator input
7	Annunciator input 3	L-
8		Annunciator input
9	Annunciator input 2	L-
10		Annunciator input
11	Annunciator input 1	L-
12		Annunciator input
13	Relay output 4	
14		
15	Relay output 3	
16		
17	Relay output 2	
18		
19	Relay output 1	
20		
21	Temperature input 2	Feeding +
22		Feeding -
23		Measurement +
24		Measurement -
25	Temperature input 1	Feeding +
26		Feeding -
27		Measurement +
28		Measurement -

Table 5: Assignment of the Upper Terminals (XG.3)

Accessories

Accessories supplied by HIMA:

- M 3447 Labelling field with three guiding rings (1 HU)
- M 3443 Labelling field with cable duct (1 HU)
- M 3445 Labelling field with 2 cable ducts (1 HU)

Mechanical Design

Views

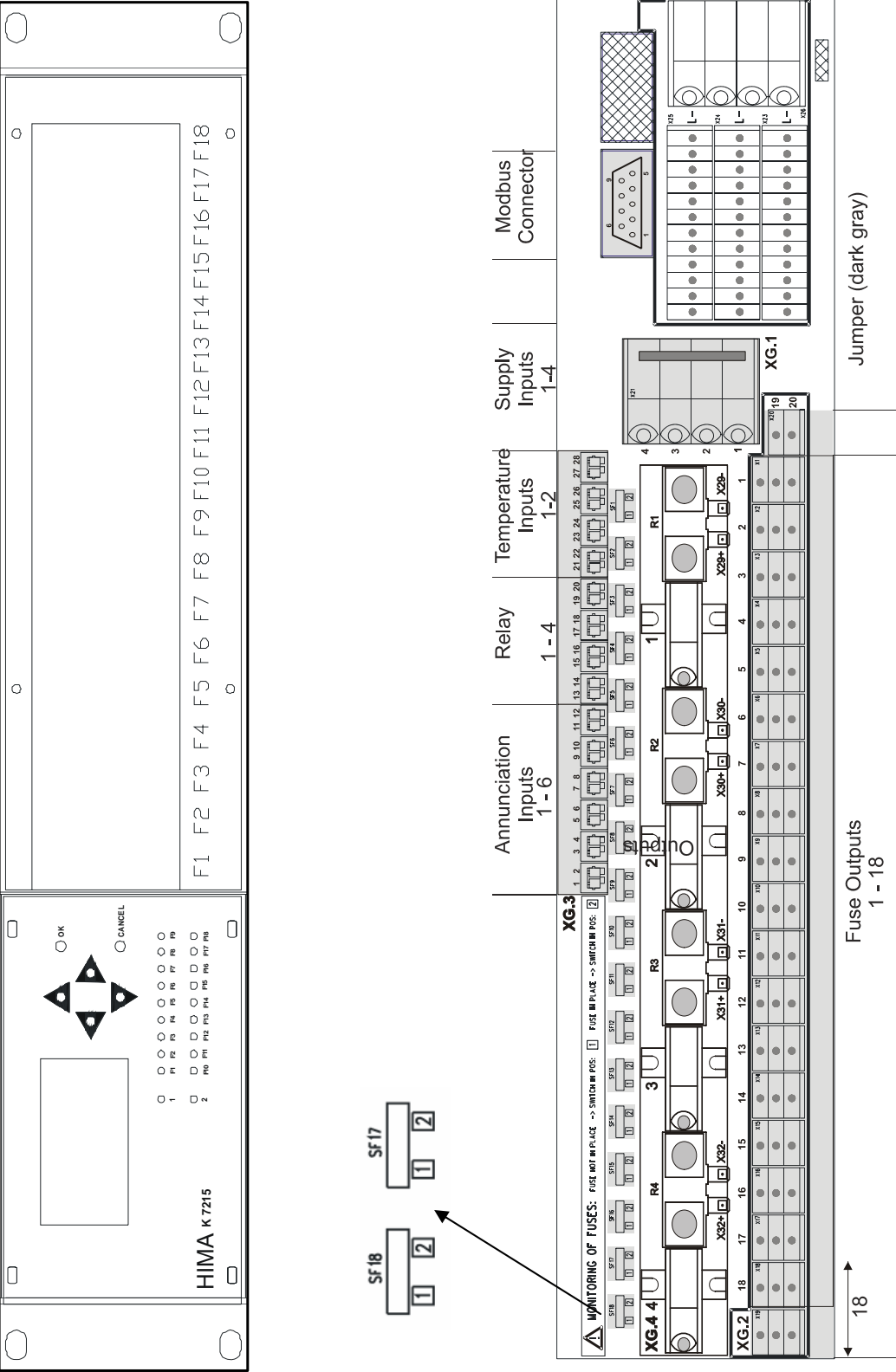


Figure 2: Front View With Control Panel and Slots for Circuit Breakers F1 to F18

Figure 3: Rear View With Slide Switches SF1 to SF18 and Terminals (Highlighted by Grey Colour and Labeled)

Functionality of the Device

The device is a current distribution, equipped with monitoring and display possibilities.

The device is capable of distributing the current, fed in from up to 4 sources (via XG.1 or XG.4), to 18 circuit breakers maximum.

Sources and circuit breakers may be separated into two groups of up to 2 sources and 9 circuit breakers each.

The voltage and current values, as well as two temperature values, can be displayed at the device, can control relay outputs, and can be transported via MODBUS to process monitoring systems, etc.

The states of 6 current loop inputs can also be transported via MODBUS.

Operating States and Display

The operating states of the K 7215 are displayed by the following display elements:

- 18 red-green LEDs labelled "F1" to "F18": one for each of the 18 circuit breakers, the device K 7215 can be equipped with
- 2 red-green LEDs labelled "1" and "2": one for the voltage monitoring of each group of 9 circuit breakers
- graphical LCD, 128 by 64 pixels, to display measurement values, and for configuration.

Display of Circuit Breakers

Each of the 18 LEDs "F1" to "F18" displays the state of the corresponding circuit breaker according to the table.

Voltage behind Circuit Breaker?	Slot Configuration	LED displays
Yes	Circuit breaker plugged in	Green
Yes	Circuit breaker plugged in, but not configured	Red blinking
No	Circuit breaker plugged in	Red
No	Free	Off

Table 6: Display of Circuit Breakers

Monitoring of the Supply Voltage

As the device K 7215 can operate as well at a supply voltage of 24 V as at 48 V, the supply voltage used in each group is detected at power-up, and depending on this, the voltage measured during operation is displayed with LED "1" and "2" in the following way:

Supply Voltage	Measured Voltage	LED displays
24 V	20.4 to 28.8 V	Green
24 V	Outside of 20.4 to 28.8 V	Red
48 V	40.8 to 57.6 V	Green
48 V	Outside of 40.8 to 57.6 V	Red

Table 7: Monitoring of the Supply Voltage

Note	If after the self test (circa 5 seconds), one of the supply voltages is outside of the named ranges during power-up, the voltage cannot be monitored!
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LCD Panel

After the end of the self test at power-up time, the main display is shown. It displays the currents and voltages of the two voltage supply groups, and the two temperatures. In the lowest

line, the state of the device is shown, i.e. overflows in voltage or temperatures, etc. are pointed out, or "normal operation" is displayed.

HIMA K7215	
U1: 24.1V	U2: 23.8V
I1: 40.5A	I3: 35.5A
I2: 40.0A	I4: 33.0A
T1: 57°C	T2: 42°C
normal operation	

Table 8: Main display

Messages that may appear in the lowest line:

normal operation	Normal operation
under voltage	The supply voltage of one group is below the tolerance range ($< -15\%$)
over voltage	The supply voltage of one group is above the tolerance range ($> +20\%$)
over temperature	One of the temperatures has exceeded the limit set for it
over load	Over current, i.e. <ul style="list-style-type: none"> one of the currents at the measuring points 1 to 4 is higher than 50 A the sum of the currents at the measuring points 1 to 4 is higher than 150 A

Groups of supply terminals

The device has 4 terminals L+ (XG.1 without, or XG.4 with current measurement) to which the supply voltage (either 24 V or 48 V) can be connected. Each 2 of these inputs form a group together with 9 slots for circuit breakers:

- the terminals 1 and 2 together with the slots F1...F9, and
- the terminals 3 and 4 together with the slots F10...F18.

The two separated groups may be connected by a jumper.

Note If the jumper is mounted, both groups must be connected to the same supply voltage, i.e., either both groups are connected to 24 V or both to 48 V!

If the groups are separated, the supply voltages may be different.

Note It is only allowed to install signal lines at an input and output of the K 7215 with a maximum length of 30 m.

Inputs

The module K 7215 has 2 temperature inputs and 6 current loop inputs which can be assigned freely by the user.

The values of all inputs can be read via MODBUS.

Temperature Inputs

To both temperature inputs, PT1000 sensors may be connected to measure temperatures at critical places.

The temperatures are checked against their limit values configured. If one of the limit values is exceeded, the message "over temperature" appears in the main display, and the relay output number 3 is opened. The limits have a hysteresis of 2 °C.

A temperature sensor can be connected to the device using either two-lead wiring or four-lead wiring. To connect the sensor to the temperature input 1, use the terminals 25 to 28 of the terminal row XG.3; to connect to the temperature input 2, use the terminals 21 to 24.

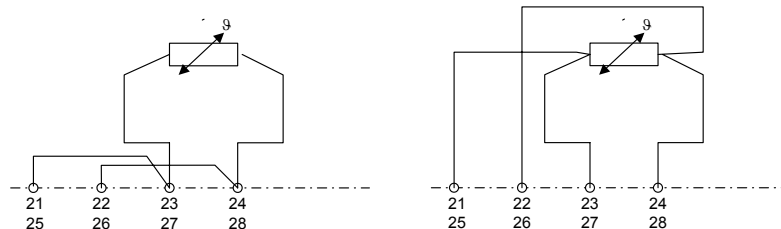


Figure 4: Two-Lead Wiring (Left) and Four-Lead-Wiring (Right) of a Temperature Sensor to the Terminals of the K 7215

Annunciator Inputs

The 6 annunciator inputs only can be read via MODBUS and do not have any functionality within the device. If the contactor is opened, or if the input is not connected, the value 1 can be read via MODBUS, otherwise 0.

A contactor has to be connected to the terminals 1 and 2, 3 and 4, etc. of the terminal row XG.3.

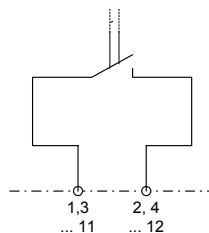


Figure 5: Connection of a Contactor to an Annunciator Input

If a current loop input is connected to the terminals 19 and 20, the tripping of one circuit breaker or several circuit breakers can be reported.

Relay Outputs

The 4 relay outputs each have a contact being closed in the normal state, but opened in the failure state.

Relay Output 1

This opens if the supply voltage of the group 1 is outside of the tolerance range: -15 % up to +20 %.

Relay Output 2

This opens if the supply voltage of the group 2 is outside of the tolerance range: -15 % up to +20 %.

Relay Output 3

This opens if one of the temperatures has exceeded its limit value.

Relay Output 4

This opens if over current appears, i.e.

- one of the currents at the measuring points ① to ④ exceeds 50 A
- the sum of the currents at the measuring points ① to ④ exceeds 150 A.

Communication over MODBUS

The module contains a MODBUS slave, which can be configured concerning baud rate, parity, and slave address.

The values can be read as follows:

MODBUS Function Code 04 (Analog values represented by integers)

Address	Type	Range	Unit	Explanation
0	Unsigned int	0..6000	0.01 A	Current at meas. point 1
1	Unsigned int	0..6000	0.01 A	Current at meas. point 2
2	Unsigned int	0..6000	0.01 A	Current at meas. point 3
3	Unsigned int	0..6000	0.01 A	Current at meas. point 4
4	Unsigned int	0..6000	0.01 V	Voltage of group 1
5	Unsigned int	0..6000	0.01 V	Voltage of group 2
6	Int	-1000..10000	0.01 °C	Temperature 1
7	Int	-1000..10000	0.01 °C	Temperature 2

Table 9: Reception Buffer for MODBUS Function Code 04

MODBUS Function Code 02 (Binary values)

Address	Type	Explanation
0	Bool	Circuit breaker 1 on
1	Bool	Circuit breaker 2 on
2	Bool	Circuit breaker 3 on
3	Bool	Circuit breaker 4 on
4	Bool	Circuit breaker 5 on
5	Bool	Circuit breaker 6 on
6	Bool	Circuit breaker 7 on
7	Bool	Circuit breaker 8 on
8	Bool	Circuit breaker 9 on
9	Bool	Circuit breaker 10 on
10	Bool	Circuit breaker 11 on
11	Bool	Circuit breaker 12 on
12	Bool	Circuit breaker 13 on
13	Bool	Circuit breaker 14 on
14	Bool	Circuit breaker 15 on
15	Bool	Circuit breaker 16 on
16	Bool	Circuit breaker 17 on
17	Bool	Circuit breaker 18 on
18	Bool	Current loop input 1
19	Bool	Current loop input 2
20	Bool	Current loop input 3
21	Bool	Current loop input 4
22	Bool	Current loop input 5
23	Bool	Current loop input 6

Table 10: Reception Buffer for MODBUS Function Code 02

The binary values for the circuit breakers are 1, if there is voltage at the output of the circuit breaker.

The binary values for the current loop inputs are 1, if the loop is open or the terminal is not connected.

Configuration

If the main display is shown on the LCD panel, the "Setup Menu" can be called by pressing the button "OK".

Operating within the menus:

- Using the buttons ↑ and ↓, the cursor can be moved up and down to select a menu item.
- Using the button "OK",
within the "Setup Menu" the submenu of the selected main menu item is entered,

in the submenus the values of modified items are stored, and the "Setup Menu" is displayed again.

- Using the button "Cancel"
in the "Setup Menu", the main display is displayed again,
in the submenus, the modified values are discarded, and the "Setup Menu" is displayed again.
- Using the buttons ← und →, the value of a submenu item can be modified by increasing/decreasing numerical values, selecting of alternatives, etc.

"Setup Menu"

The "Setup menu" contains the following items for submenus, in this order:

- Fuses
- Temperature Alarm
- MODBUS
- Display
- Self Test
- Info

Selecting a menu item and pressing the button "OK" opens the submenu having the same name.

Menu "Fuses"

This menu is a list of all circuit breakers, which does not displayed complete on the LCD panel. Therefore it is scrolled when the cursor is moved to select a circuit breaker.

For each circuit breaker, one of two states can be set:

- free (the slot is free)
- in place (a circuit breaker is plugged into the slot)

Menu "Temperature Alarm"

Settings for the limit and availability of the sensors:

- T1/2 Alarm: threshold for excess temperature
Can be set to values from 20°C up to 100°C in steps of 1°.
- T1/2 installed:
Setting, if a temperature sensor is installed, possible values are "yes" and "no". If "yes" is set for a sensor, its value is displayed in the main display, and is used to calculate the value of the relay output.

Menu "MODBUS"

The following parameters of the MODBUS slave can be set:

- Baud rate
possible values are 9600, 19200, 38400, and 57600 Baud.
- Parity
Possible values are "Even", "Odd", and "None".
- Address
MODBUS slave address in the range of 1 to 247.

Menu "Display"

It contains the following settings:

- Brightness:
Setting of the brightness. A bar chart shows the brightness set.
This parameter only influences the background light.
- Contrast:
Setting of the contrast. A bar chart shows the contrast set.
- Show U1
Show U2
Show I1
Show I2
Show I3
Show I4

Each of these measuring values is displayed in the main display, if you select "yes", and not displayed if you select "no".

- Show splitter
If you select "yes", a vertical bar is shown in the main display, separating the groups U1, I1, I2 and U2, I3, I4 more clearly.

Menu "Self Test"

The menu has the following items:

- Red LED
Value range from 0 to 19
- Green LED
Value range from 0 to 19
- LCD Test
Values 0 and 1

The first two menu items make it possible that each of the 20 LEDs lights in the wanted color, without respect to the color reflecting the device's current state.

For the red and the green LEDs, there are two menu items. To make one LED light, the number has to be set in one of the menu items. The assignment of number and LED is given in the table.

Number	LED	Remarks
0	F1	LEDs for the circuit breakers 1 ... 18
1	F2	
...	...	
17	F18	
18	1	Voltage-LED for group 1
19	2	Voltage-LED for group 2

Table 11: LEDs in Menu "Self Test"

If the same LED is set in the red and the green menu item at once, it lights in orange colour. An LED lights in test mode, until another one is selected, or until pressing the "OK" or "Cancel" buttons leaves the menu. Then, the LEDs display the state of the module again.

The menu item "LCD Test" starts the display test, if its value is changed. If the value is set to 1, the complete display is made dark (all pixels are ON) and if set to 0, the display is made bright (all pixels are OFF). This state is kept until pressing the other arrow key activates either the opposite state, or until pressing the button "OK" or "Cancel" leaves the submenu.

Menu "Info"

The menu simply displays the software revision of the device.

The user can leave the menu by pressing either the "OK" or the "Cancel" button.