

□ UEI-710-V.5

Multifunctional change-over and monitoring device



Product Information

Table of contents

1	Application	4
2	Functions	5
2.1	Voltage monitoring	6
2.2	Change-over control with open-circuit monitoring	6
2.3	Insulation monitoring 230 V	6
2.4	Load current monitoring	6
2.5	Temperature monitoring	7
2.6	Reliable power voltage change-over	7
2.7	Insulation fault detection in the IT system (optional)	7
2.8	Monitoring the data lines – device self-monitoring	7
2.9	Messages / communication interface	7
2.10	Digital inputs	8
3	Device dimensions and connections	9
3.1	Connection diagram.....	9
3.2	Application example.....	10
4	Assembly, connection, start-up, maintenance and testing	10
5	Buttons and display	11
5.1	Meaning of LED indicators and plain text messages	11
5.2	Buttons and display symbols	13
6	Technical specifications	14

1 Application

The UEI-710-V.5 is a multifunctional change-over and monitoring device. It is used in change-over and monitoring modules (type UEI-710) in accordance with

- DIN VDE 0100-710 (VDE 0100 Part 710):2002-11, Sec. 710.537.6
- IEC 60364-7-710:2002-11
- ÖVE/ÖNORM E 8007 date of issue: 2007-12-01

as a control and monitoring device for change-overs from the general supply (GS) to the safety power supply (SS) as well as a monitoring device (in compliance with the given standard) for setting the connected IT systems.

In accordance with the given standard, it serves as a monitoring device for IT systems connected to the monitoring modules (type UEI-710).

Together with insulation fault detection devices (IFS-710-W6), it is a comprehensive solution for insulation fault detection. In addition to insulation monitoring, this allows detection of faulty outgoing circuits. In this case, the UEI-710-V.5 can display the insulation resistance and the (safety) designation of the faulty outgoing circuit.

The UEI-710-V.5 provides increased withstand voltages for the contact circuits of the monitoring modules used in "medical locations".

The UEI-710-V.5 is mainly used for the following functions:

SPR mode:

- Voltage monitoring of 3 lines in single-phase systems with up to 290 V AC:
preferred feeder = line 1
second feeder (feeder being in reserve) = line 2
outgoing feeder = line 3
- Change-over controller between line 1 and line 2
- Activation of load switch devices (contactors) with open-circuit monitoring in control lines
- Reliable provision power for itself and consumers connected to the device (such as contactors in control circuits)

ILT mode:

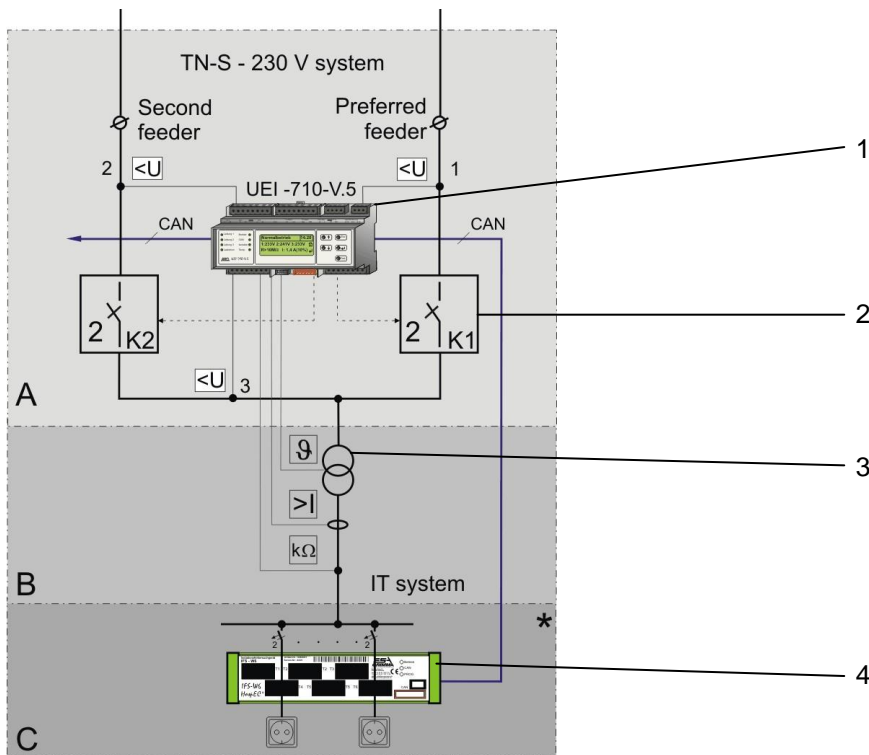
- Monitoring of insulation resistance in a single-phase 230 V AC IT system
- Monitoring of load current in IT system separating transformer using a current transformer
- Temperature monitoring of the IT system separating transformer
- Controlling of insulation fault detection (with integrated test signal generator) with fault messages for outgoing feeder together with insulation fault detection devices of type IFS-710-W6
- Monitoring of all relevant data lines in accordance with DIN VDE 0100-710 (VDE 0100 Part 710):2002-11, (section 710.531.3.1)

All operating and fault messages are shown with LED indicators and screens. The menu can be used to configure the UEI-710-V.5. All settings, messages and commands are stored in non-volatile memory. The integrated, buffered real-time clock (RTC) adds a time stamp to the messages.

2 Functions

The following figure contains a basic overview of a change-over and/or monitoring module. The letters in the illustration represent the following:

- A Change-over controller 1/N 230 V AC, and control voltage supply and change-over
- B Insulation, load current and temperature monitoring in single-phase 230 V AC IT system
- C Insulation fault detection system (optional)



* Maximum 96 channels (16 x IFS-710-W6) on UEI-710-V.5

Figure 1: Basic display of change-over and/or monitoring modules

- 1 Multifunctional change-over and monitoring device UEI-710-V.5
- 2 Electrically locked and mechanically latched contactors (2-pin)
- 3 IT system separating transformer
- 4 Insulation fault detection device IFS-710-W6

2.1 Voltage monitoring

The device monitors the voltages in single-phase systems (AC 230 V, 50 Hz) on the preferred feeder (line 1) and the second feeder (line 2) as well as the voltage downstream of the contactors (outgoing feeder to consumers). The triggering values for the lower and upper voltages are configurable.

2.2 Change-over control with open-circuit monitoring

In normal mode, power is supplied to the connected consumers from line 1.

If the monitored voltage exceeds or falls below the thresholds, the system will automatically switch over to line 2 (second reliable system) from line 1 using load switch device (latched contactors). Once the voltage on line 1 becomes stable again, the system will switch back to this line. The change-over times are configurable.

The UEI-710-V.5 continuously measures and monitors the voltages on lines 1, 2 and 3. Basically, the decision to change-over from the voltage status of line 3 (outgoing feeder) depends on other factors. The software performs a plausibility check to determine whether the currently active switchgear is functioning properly. In this way, it is possible to determine the failure of a latching component and thus prevent a change-over by continuously actuating the contactor.

The contactors are actuated by relays. An integrated measuring circuit monitors all of the control circuits for wire breakage.

For test purposes, the change-over can be activated using a password-protected menu command on the device. This action is saved in the non-volatile history together with a date and time (RTC) stamp.

2.3 Insulation monitoring 230 V

The device monitors and measures the insulation resistance in single-phase 230 V AC IT systems. Monitoring is performed using a patented pulse method. The AC IT systems being monitored may also contain DC components.

The system automatically adapts to different system leakage capacitances (up to max. 4 μ F). The triggering values can be configured using the limits given in the menu (50 ... 250 k Ω).

Every ten (10) minutes, the UEI-710-V.5 performs an automatic self-test of the insulation monitoring. Here, the device simulates an insulation fault internally and checks the monitoring functionality. Faults are transmitted as messages and stored in the history together with a date and time (RTC) stamp.

The insulation monitoring functionality can also be tested directly on the device using the button "Test" or peripheral terminals / annunciator and control panels (e.g. BMTI 5 / series FolioTec) at any given time. Optionally, an additional external switch can be used (at digital input DI-3).

2.4 Load current monitoring

The load current is monitored in single-phase IT system separating transformers using a special external current transformer of type ILT-W that is directly connected to the UEI-710-V.5. The measurement is performed as "true RMS" (RMS = root mean square). The connections of the current transformer are monitored continuously for short circuits and wire breakage. The triggering values for load current monitoring can be set in the menu.

2.5 Temperature monitoring

The temperature is monitored using the PTC thermistors or break contacts integrated in the transformer winding. Multiple PTC thermistors / break contacts can be connected to the UEI-710-V.5 in series (observe the technical data). If the temperature of the IT system separating transformer exceeds the limit value (120°C), the resistance will increase in the sensor or the contacts will open. This change in resistance is captured and evaluated by the UEI-710-V.5.

2.6 Reliable power voltage change-over

The voltages in both independent sources of power (line 1 and line 2) are constantly being monitored. The reliable power source for the device itself and, for instance, the control circuits of the contactors is normally drawn from line 2. If the voltage on line 2 falls below the configured triggering value, the device changes over to line 1 and provides power to the control circuits and to itself from this line.

2.7 Insulation fault detection in the IT system (optional)

The UEI-710-V.5 detects and permanently monitors the insulation resistance of the IT system. If the insulation resistance falls below a specified value, the integrated test signal generator will start the fault detection process.

This feeds a test signal (limited to 1 mA) into the IT system. The insulation fault detection devices (IFS-710-W6) detect the test signal by their integrated current transformers (one in each outgoing circuit). Insulation monitoring is turned off during the insulation fault detection process. The test signal generator evaluates the fault detection and transfers the evaluation via standard field bus (CAN).

Corresponding messages are shown on UEI-710-V.5 and peripheral display devices (e.g. BMTI 5). The messages contain detailed information about the faulty circuit and are stored for later analysis in the history of the UEI-710-V.5, of the BMTI 5 and/or panels.

2.8 Monitoring the data lines – device self-monitoring

The UEI-710-V.5 continuously monitors all relevant data lines in accordance with DIN VDE 0100-710 (VDE 0100 Part 710):2002-11, (section 710.531.3.1). Furthermore, it also performs automatic device self-monitoring.

2.9 Messages / communication interface

Operating and fault messages are given by the LED indicators and shown on the display of the UEI-710-V.5. They can also be transmitted via the potential-free exchanger of the integrated signal relay.

The CAN interface can be used to transmit data as well as the current operational and fault status to external peripheral equipment.

2.10 Digital inputs

Eight (8) digital inputs are available. DI1 and DI2 are provided for return messages from the contactors. Inputs DI3 to DI5 can be configured to analyse signals from an external switch (“ISO Test 230 V”), insulation monitoring device of type “Insulation Monitor 24V” (for operating lights) and the “automatic cutout triggered” signal.

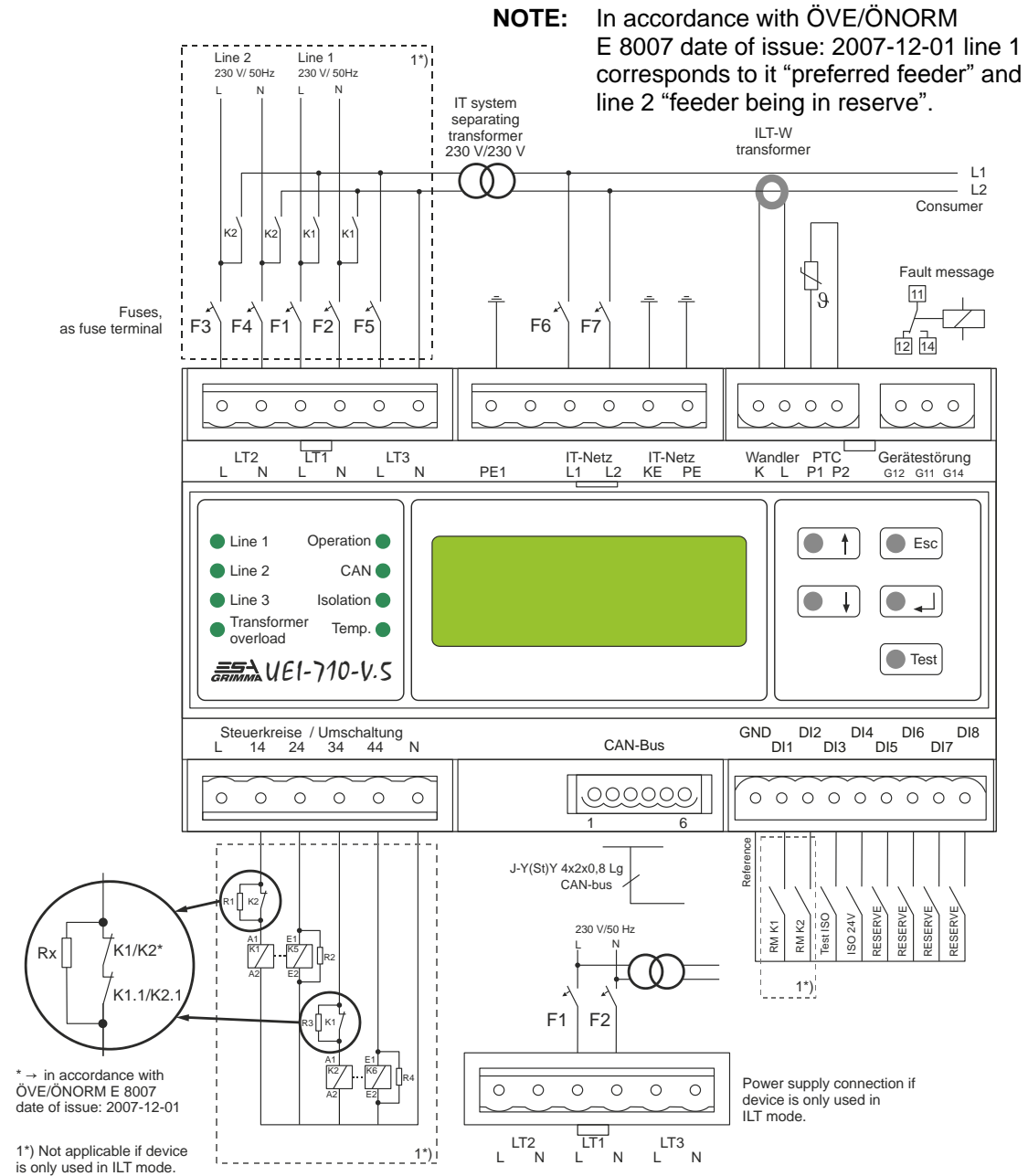
Digital input	Configurable function	Note
DI1, DI2	Not configurable	Return message contactor 1 and 2
DI3	Configurable test EXT	Connection of external switch / actuation of insulation monitoring test in 230 V AC IT system
DI4	Configurable ISO24V	Connection of external insulation monitoring device for 24 V operating theatre lights / triggered fault signals shown on display and transmitted via CAN bus
DI5	Configurable automatic cutout	Connection of break contact for monitoring triggering automatic cutout / fault message on the display after triggering
DI6, DI7, DI8	Not configurable	Free inputs (logical statuses are transmitted via CAN bus)

Table 1: Digital inputs

If the functions are not configured for DI3 to DI5 in the described manner (“off”), the logical statuses of these inputs are transmitted via the CAN bus. This is continuously performed for the not configurable digital inputs DI6 to DI8.

3 Device dimensions and connections

3.1 Connection diagram



3.2 Application example

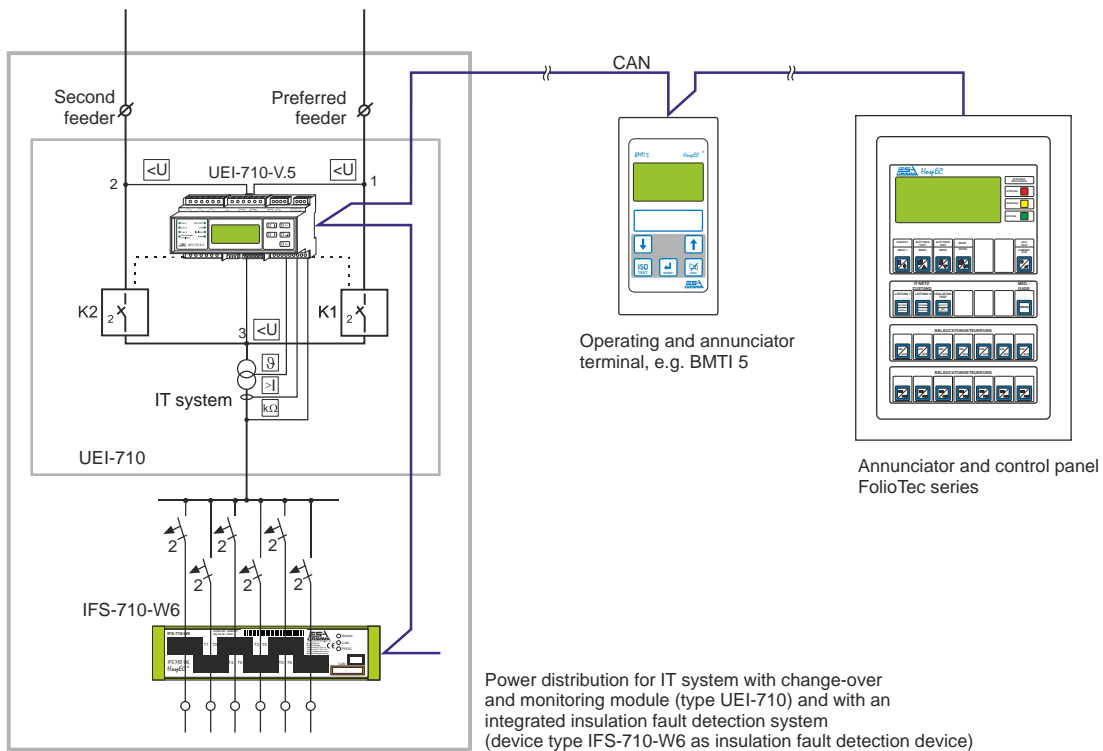


Figure 3: Application example

4 Assembly, connection, start-up, maintenance and testing

The UEI-710-V.5 is installed in distribution boards (DIN 43871) on top-hat rails (DIN EN 60715).

Only qualified electricians are permitted to assemble, connect and commission the equipment. All such work must be performed in full compliance with the pertinent safety regulations and standards.

The UEI-710-V.5 is connected in accordance with the connection diagram and the individual connection specifications (see chapter 3 on page 9). Observe the technical specifications of the device (see chapter 6 on page 14). A separate documentation is provided with information about the CAN bus.

5 Buttons and display

5.1 Meaning of LED indicators and plain text messages

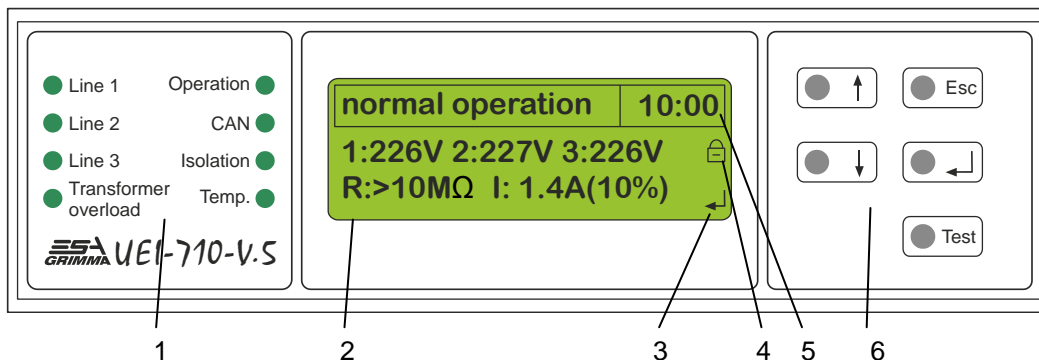


Figure 4: Front view of UEI-710-V.5 in normal operation (no errors / faults are present)

- | | |
|-----------------------------|--|
| 1 Status LED indicators | 4 Menu permissions (🔒 = protected, 🗝️ = enabled) |
| 2 Status messages | 5 Time |
| 3 Display of active buttons | 6 Buttons |

If the UEI-710-V.5 is currently operating in normal mode (i.e. no errors or faults are present, see Figure 4), the “basic screen” will appear. The following is displayed:

- First line: Operating status and time
- Second line: Voltages from lines 1, 2 and 3
- Third line: Insulation resistance of monitored 230 V AC IT system, the current load in ampere (A) and the utilisation in percent (%) of the IT system separating transformer

Errors or faults are shown as plain text messages in the first line. If multiple messages occur simultaneously, these alternate automatically on the display. It is not necessary to acknowledge the messages. Once the fault(s) have been eliminated, the basic screen appears again.

An exception is made for some messages relevant to the change-over function (e.g. control circuits); once the fault or error has been remedied, the device must be reset whereby the messages in the display are also deleted.

All messages are stored to history with the date and time stamp.

An extensive description of operation, messages and possible causes of faults are described in the operating manual of the UEI-710-V.5.

LED “Line 1” Status of line 1 and corresponding contactor (K1)

Off	ILT mode or no power supply
Green	Normal operation with closed contactor
Flashes green	Normal operation with opened contactor
Orange	Voltage outside the triggering values
Flashes red	Malfunction measuring circuit

LED “Line 2”	Status of line 2 and corresponding contactor (K2)
Off	ILT mode or no power supply present
Green	Voltage OK and contactor is closed
Flashes green	Voltage OK and contactor is open
Orange	Voltage outside the triggering values
Flashes red	Malfunction measuring circuit
LED “Line 3”	Voltage status on outgoing feeder
Off	ILT mode or no power supply
Green	Voltage OK
Orange	Voltage outside the triggering values
Flashes red	Malfunction measuring circuit
LED “Transformer overload”	Load current status of the IT system separating transformer
Green	Load current OK, < triggering threshold (load)
Orange	Load current too high, > triggering threshold (load)
Flashes red	Connection fault of current transformer / connection fault k/l, offset fault
LED “Operation”	Device status, critical fault
Off	No power supply
Green	Normal operation
Orange	Detected fault, e.g. fault in line 1
Flashes red	Device error or fault
LED “CAN”	Status of the communication interface
Off	CAN bus out of operation (“stand-alone” operation of device)
Green	CAN bus OK (communication OK, device is receiving)
Flashes green	CAN bus OK (communication OK)
Flashes red	CAN bus fault (address conflict or connection fault)
LED “Isolation”	Insulation monitoring of 230 V AC IT system
Green	Insulation resistance OK, > triggering threshold (R-on230)
Orange	Insulation resistance falls below the triggering threshold, (R-on230)
Flashes orange	Insulation fault detection is starting
Flashes red	Connection fault L1/L2 or connection fault KE/PE1, other: Voltage/current fault GND/KE, DAC, ADC comm.
LED “Temp.”	Temperature status of the IT system separating transformer
Green	Temperature OK
Orange	Temperature too high

5.2 Buttons and display symbols





Button	Function
	Enter button (Display on screen if "active") Normal operation: Activate the operating menu Menu: Open the submenus and menu items Configuration mode: "Enter" button to apply values
	Up / Down buttons (Display on screen if "active") Normal operation: Manual scrolling when faults are present Menu: Navigation through submenus and between menu items Configuration mode: Setting the values
Esc	Escape-Taste (Display on screen if "active") Normal operation: No function Menu: Navigate one menu level back, long button press: back to "basic screen" Configuration mode: Values are not applied when changed
Test	"Test" button Long button press Press the button for at least 2 s to generate an internal insulation fault. At the same time, the monitoring circuit functionality and the connection to the IT system and/or PE are checked. Messages are transmitted via the signal relay and the CAN bus. Short button press Open menu item "7.2 comm. test"
Mode indicator	Meaning
	"Protected" Values in the menu can only be viewed but not changed.
	"Enabled" Values in the menu can be edited and saved.

Table 2: Buttons and display symbols

6 Technical specifications

Operation	
Rated voltage U_e (insulation coordination acc. to IEC 60664-1).....	250 V AC
Rated impulse withstand voltage	4 kV
Pollution degree	3
Supply voltage U_S (drawn internally from control circuit)	230 V AC, 50...60 Hz
Working area	0.85 ... 1.25 x U_S
Internal consumption	approx. 5 W
Voltage monitoring (line 1, 2 and 3)	
Monitored system	1/N AC 0 ... 290 V, 50 ... 60 Hz
Required back-up fuses (6 pieces)	T 6.3 A / 250 V
Lower triggering value (undervoltage).....	configurable 200 ... 230 V
Upper triggering value (overvoltage).....	configurable 240 ... 260 V
Triggering value control voltage change-over	approx. 195 V
Hysteresis.....	10 V
Internal resistance R_i total in acc. with PE1	500 ... 530 k Ω
Internal resistance R_i LT1/LT2/LT3-L/N individual in acc. with PE1	1200 k Ω
Change-over controlling	
Switching delay time T_{vh}	configurable 0 ... 20 s
Reverse switching delay time T_{vr}	configurable 0 ... 20 s
No-load switching time (pause time) T_{nu}	configurable 0 ... 20 s
Controller relay outputs SK14 – SK44	
Switching elements	4 x 1 NO contacts (switch to L)
Contact rated voltage	250 V AC
Making capacity.....	5 A AC
Sum output current, control circuit-N (SK14-44 + control circuit-L)	max. 6 A AC
Insulation monitoring 230 V/insulation fault detection	
Monitored system (L1/L2).....	230 V AC, 50 ... 60 Hz
Triggering value / hysteresis	configurable 50 ... 250 k Ω / 25%
Permissible system leakage capacitance C_e	max. 4 μ F
Trigger time t_r at $R_F = 0.5 \times R_r$ and $C_e = 1 \mu$ F	3 s
Measurement voltage U_m / measurement current I_m (insulation monitoring)	≤ 20 V / ≤ 77 μ A
Permissible external DC voltage U_{dce}	\leq DC 375 V
Internal resistance DC R_i	≥ 320 k Ω
Impedance Z_i for 50 Hz	> 300 k Ω
Test current I_T during insulation fault detection.....	max. 1 mA
Load current monitoring	
Triggering value / hysteresis	configurable 5 ... 50 A / 4%
Measurement precision for crest factor < 2 ($I_{eff} \leq 50$ A).....	$\pm 10\%$
Temperature monitoring	
Triggering value / return value	4 k Ω / 1.5 k Ω
PTC thermistor in acc. with DIN 44081	max. 6 in series
Indicators and history	
LCD display	Backlit full graphic display with 120 x 32 pixels
LED indicators	8x multicolour LED
History with RTC	200 datasets

Signal relay (fault message)	
Switching elements	1 exchanger
Rated contact voltage.....	AC 250 V / DC 300 V
Making capacity.....	AC/DC 5 A
Breaking capacity for AC 230V, cos phi 0.4	2 A
Breaking capacity for DC 220V, L/R = 0.04s	0.2 A
Electrical service life	12000 switching cycles
Contact category	IIB (IEC60255-0-20)
Functionality	configurable, open-circuit or closed-circuit principle
Time-delayed triggering (for specific messages)	configurable 0 ... 10 s
Digital inputs DI1 – DI8	
(Connection only with original accessories or with potential-free contacts)	
DI1 and DI2 internal feedback.....	NO contact
DI3 – external switch for insulation test.....	NO contact
DI4 – insulation 24 V operating theatre light	NC contact
DI5 – automatic cutout	NC contact
DI6 to DI8 – free inputs	NO or NC contact
Conductor length inputs	max. 3 m (only within control cabinet)
Communication interface	
Interface / protocol.....	CAN / CAN 2.0 (in acc. to ISO 11898)
Max. conductor length (for 20 kbit/s).....	2500 m
Conductor (shielded, shielded on one side on PE).....	J-Y(St)Y min. 4 x 2 x 0.8 Lg (VDE 0815)
Termination resistance	120 Ω (0.25 W)
Addressing range	1...16
Environmental conditions / electromagnetic compatibility (EMC)	
EMC.....	IEC 61326-2-4
Ambient temperature (operation)	-10°C to +45°C
Ambient temperature (storage)	-40°C to +70°C
Climatic conditions acc. to DIN IEC 60721-3-3.....	3K5
Shock resistance IEC60068-2-27 (operation)	15g / 11 ms
Shock resistance IEC60068-2-29 (transportation)	40g / 6 ms
Vibration load IEC 60068-2-6 (operation)	1g / 10 ... 150 Hz
Vibration load IEC 60068-2-6 (transportation)	2g / 10 ... 150 Hz
Installation specifications	
Operating mode.....	continuous operation
Installation position.....	vertical
Assembly	top-hat rails in acc. with IEC 60715
Device dimensions in mm (H x W x D).....	90 x 160 x 73
Type of connection	terminal blocks
Wire size / single-wire / fine-wire.....	0.2 ... 4 mm ² / 0.2 ... 2.5 mm ² (AWG 24-12)
Protection class in acc. with EN 60529 for installations / terminals	IP30 / IP20
Flammability class	UL94V-0
Weight	approx. 500 g
Order information	
UEI-710-V.5.....	Item no.: 0080140
ILT-W.....	Item no.: 0080037
IFS-710-W6	Item no.: 0080091

**ESA Elektroschaltanlagen
Grimma GmbH**

Broner Ring 30
D-04668 Grimma

Tel.: +49 (0) 3437 9211-0
Fax: +49 (0) 3437 9211-26

E-Mail: info@esa-grimma.com
Internet: www.esa-grimma.com

UEI-710-V.5

Multifunctional change-over and
monitoring device
Product Information (PI)

Published by:
ESA Elektroschaltanlagen
Grimma GmbH

Reprint only with publisher's permission.
All rights reserved.
Subject to change without notice.

Revision date: 08-2009