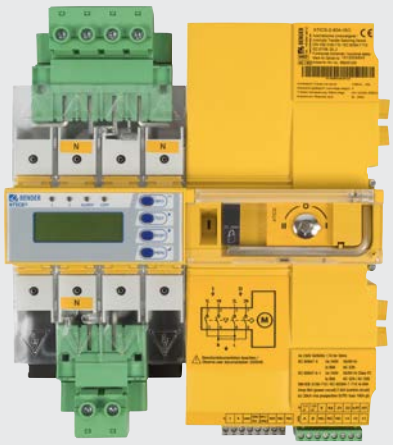
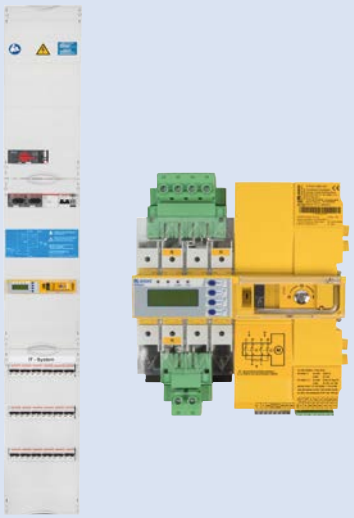
Changeover and monitoring module UFA710-2-...



Changeover and monitoring module UFA710-2-...

for medical IT systems with an insulation fault locator



UFA710-2-...-BP-B16 (design example)

Tasks

The changeover and monitoring module has the following tasks:

- Two-pole changeover of the power supply
- Voltage monitoring on the preferred supply
- Voltage monitoring on the redundant supply
- Voltage monitoring at the output of the automatic transfer switching device (line 3)
- Monitoring of the changeover switch for correct switching position
- Monitoring of the load current to delay the changeover until the protective device has disconnected the short circuit.
- Internal functional test, including checking the switching times
- Monitoring of the insulation resistance in the IT system
- Connection monitoring to the IT system (power supply and PE connection)
- Monitoring of the IT system transformer load current (connection monitoring)
- Monitoring of the IT system transformer temperature
- Detection of the faulty outgoing circuit by means of the insulation fault locator
- Communication with remote MK… alarm indicator and test combinations, and with TM… alarm indicator and operator panels via BMS bus
- Conformity with the time delay for the changeover process according to DIN VDE 0100-710/HD 60364-7-710
- Conformity with changeover period according to DIN VDE 0100-710/ HD 60364-7-710 with a changeover period of less than 15 s or even less than 0.5 s

Device features

- Continuous monitoring of the internal electronics and the circuitry with automatic alarm
- Preventive safety due to an automatic reminder of mandatory testing procedures
- Maximum reliability when switching
  - Patented switching system with mechanical and electrical interlocking
  - Weld-resistant contacts with the mechanics of a circuit breaker
  - Insensitive to voltage fluctuations and vibrations due to stable switching position and permanent contact pressure
- Continuous load current monitoring for standard-compliant behaviour in the event of a short circuit downstream of the changeover module according to DIN VDE 0100-710/ HD 60364-7-710
- Easy to use and with a good overview due to a clear menu structure and user interface
- The right information at the right time with clear alarm texts on a backlit graphic display as well as via the BMS bus
- Manually switchable. ATICS® can be locked in switching position “0” for maintenance to prevent a restart.
- Complete event log (switching operations, tests, parameter changes)
- Functional test or repair without operational interruptions by means of an optional bypass switch
- Compact structure of electronics and switching elements in an enclosure or on an equipment rack
- Changeover and IT system monitoring in one device
- Insulation fault locator for 6…24 outgoing circuits
- Easy wiring due to integrated structure
- The module is ready to connect, tested and mounted on an equipment rack for fast and easy installation in a distribution cabinet. The ATICS® automatic transfer switching device is completely pluggable.
- Communication with alarm indicator and test combinations, and TM… alarm indicator and operator panels via BMS bus
- Optional bypass switch
- Functional safety according to IEC 61508 for use in special safety environment according to SIL2
- Completely prewired and tested module, mounted on an equipment rack

Application

The factory-made modules of the UFA710 series are used for switching ($t \leq 0.5$ s) between two power supply sources (SV/AV or BSV/SV) and for monitoring IT systems in medical locations. These are also variants that can work together with an IT transformer 400/230 V. Alarm and status messages are indicated at the alarm indicator and operator units via bus technology. The module can be mounted on all common equipment rack systems.

The equipment racks can be provided by the customer when ordering.

Functions in accordance with DIN VDE 0100-710/HD 60364-7-710

- Voltage monitoring with an adjustable control function on the preferred supply line and on the second line and at the output of the changeover module
- Adjustable changeover period $t \leq 0.5...15$ s for SV/AV or BSV/SV changeovers
- Protection against wrong operation by means of mech. and electr. multiple interlocking
- Cables are laid to resist short circuits and earth faults
- Control circuit with “single-fault tolerance” according to DIN VDE 0100-710 (VDE 0100-710): 2012-10
- Automatic switching back on voltage recovery configurable
- Functional test, including checking the switching times
- Insulation, load current and temperature monitoring of the IT system Connection monitoring of mains, PE and measuring current transformers

Other safety-enhancing measures

- Continuous monitoring of all essential components and connecting wires for proper functioning
- Monitoring for short-circuits at the output of the transfer switching device with defined switching behaviour
- Maximum reliability when switching with:
  - A patented switching system with mechanical and electrical interlocking
  - Weld-resistant contacts with the mechanics of a circuit breaker
  - Insensitive to voltage fluctuations and vibrations due to stable switching position and permanent contact pressure
- Preventive safety due to an automatic reminder of mandatory testing procedures, service times, number of switching operations
- Bypass switch for uninterrupted testing/maintenance (recommended)
- Optional TÜV (Technical Inspection Association) test of the transfer switching device
- Tested functional safety acc. to. IEC 61508 (SIL2) of the ATICS® switch (provide notification in at least two places)

Functional description changeover

The changeover is controlled by the ATICS® device. If the preferred supply fails, the ATICS® ensures that the power supply is changed over safely. The switch contacts are offset on a rotating shaft. This design prevents simultaneous switching of line 1 and line 2.

The switch has three positions:

- I – Line 1 is switched on
- 0 – Both lines are switched off
- II – Line 2 is switched on.

In the normal condition (fault-free operation) the preferred supply is connected.

The ATICS® will switch to the redundant line if:

- The preferred line fails
- The “TEST” button is pressed and the test function is executed via the menu
- A digital input is configured to “TEST” and this input is enabled
- The setting “Preferred line” is reconfigured to the other line

The ATICS® switches from the redundant line back to the preferred line if:

- The voltage on the preferred line is restored, when:
  - The return transfer delay time T(2->1) has elapsed and no switching back interlocking function is active
  - After pressing the “RESET” button and the switching back interlocking function has been deleted via the menu
  - If the redundant line fails (even when the switching back interlocking function is enabled)
- The setting “Preferred line” is reconfigured to the other line
- The digital input is configured to “TEST” and this input is reset
- A transfer switching device test is enabled and the test time has expired

The factory settings guarantee a changeover period of $t \leq 0.5$ seconds and switching back within 10 seconds when voltage is restored on the preferred supply. Therefore, the ATICS® can be used in IT systems with a requirement for a changeover period $t \leq 0.5$ s (IT systems with operating theatre lights, endoscopic field illumination in operating theatres or other essential sources of light, etc.).

When there is a short circuit downstream of the automatic transfer switching device, the automatic transfer switching device must not continually change back and forth between the two lines. This can occur when the short-circuit current is small and the automatic transfer switching device switches faster than the short-circuit breaker trips. The ATICS® monitors the load current downstream of the automatic transfer switching device in order to detect a possible short-circuit.

If the preferred line fails and a short-circuit current is detected at the same time, the ATICS® does not switch over immediately but only once the circuit breaker has tripped. If the ATICS® detects a supply failure or a fault, an alarm will appear on the LCD, the “ALARM” LED lights up, the alarm relay trips (if set) and this alarm is forwarded to other Bender devices (such as an alarm indicator and test combination) via the BMS bus.

Functional description IT system monitoring insulation fault location

In group 2 medical locations, reliable operation must be ensured even in the event of an insulation fault or a short-time overload. Therefore, electrical loads are supplied by IT systems with insulation monitoring and overload and overtemperature monitoring of the isolating transformers.

The insulation monitoring in the ATICS® device measures the insulation resistance in AC IT systems, which may also contain DC voltage components. Adaptation to the system leakage capacitances occurs automatically.

The load current is measured using a BV384213 (STW2) measuring current transformer.

The temperature in the transformer winding is measured via PTC thermistors.

If any of the measured values does not fall within the limits, an alarm (common alarm) will be triggered. The “ALARM” LED lights up, the alarm relay trips (if set). This alarm is forwarded to other Bender devices (such as an alarm indicator and test combination) via the BMS bus.

When an insulation fault has been detected in an IT system, the integrated locating current injector generates a defined locating current signal. In the factory settings, this function is always activated (if an EDS has been integrated). This signal is detected and evaluated by insulation fault locators (EDS). Alarm indicator and monitoring devices signal the faulty outgoing circuit.

Continuous self-monitoring of the monitoring module and the measuring lead for insulation, load and temperature monitoring guarantee high system availability. A test button allows simulating fault cases and thus checking the function of the monitoring system. The communication between changeover module and alarm and indicator units provides mutual connection control and thus increases operational safety.

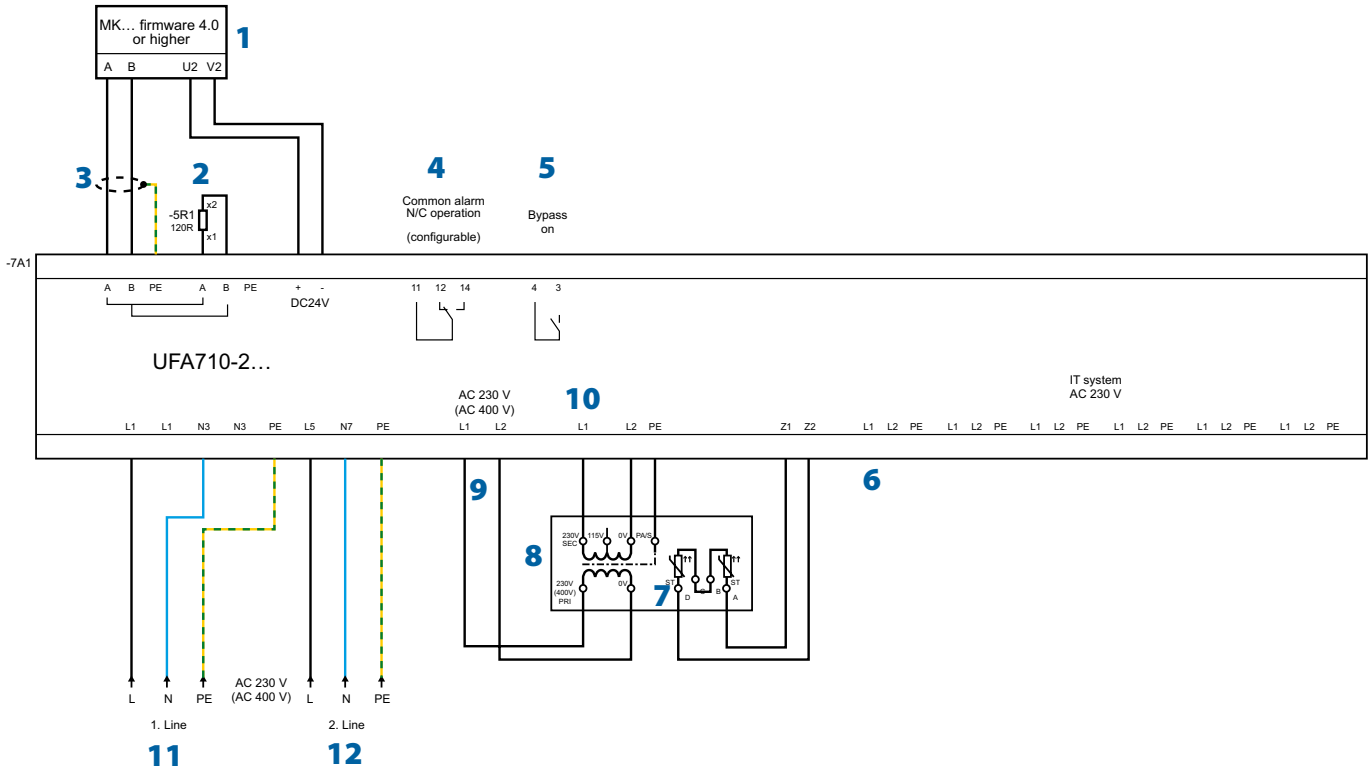
Bypass switch

On the UFA710-2-…-BP changeover and monitoring module, uninterrupted testing or repair of the ATICS® transfer switching and monitoring device can be carried out by means of the bypass switch. Please read the instructions for operation of the bypass switch in the manual.

Clear text display of messages

Operating, warning and fault messages are indicated by means of clear text display. The required alarm indicator and test combination MK2430, MK800 or the remote alarm indicator and operator panel TM800 must be installed in a place in the medical location where they are permanently supervised by the medical staff. The module and the alarm and indicator units are connected via a two-wire bus cable.

Wiring diagram UFA710-2-… (example illustration)



1 - Alarm indicator and test combination MK…(firmware 4.0 or higher)

2 - Remove terminating resistor if other bus devices are to be connected here

3 - Shielded cable 2x2x0.8 mm, (for A/B, U2/V2)

4 - Alarm contacts for common alarms

5 - Alarm contact Bypass ON

6 - IT system outgoing circuit AC 230 V

7 - Temperature monitoring for the IT system transformer

8 - IT system transformer AC 230/230 V (AC 400/230 V)

9 - Primary side of the IT system transformer AC 230 V (AC 400 V)

10 -Secondary side of the IT system transformer (AC 230 V, 50 Hz)

11 -Preferred line (line 1) AC 230 V, 50 Hz (AC 400 V, 50 Hz)

12 -Redundant line (line 2) AC 230 V, 50 Hz (AC 400 V, 50 Hz)

The image shows an example of a typical wiring diagram (black box).
Please observe the individual, job-related or project-related documentation provided.

Technical data

Insulation coordination acc. to IEC 60664-1 *)

Rated insulation voltage	AC 250 V
Rated impulse withstand voltage/pollution degree	4 kV/3
Nominal insulation voltage	400 V

Voltage ranges *)

Nominal system voltage U_n	AC 230 V
Nominal frequency f_n	50…60 Hz
Supply voltage U_S	from the system being monitored
Frequency range of U_s	50…60 Hz
Current consumption during the changeover process	17 A/< 30 ms

Power section/switching elements *)

Rated operational voltage U_e	AC 230 V
Frequency of U_e	48…62 Hz
Rated operational current I_e	for ATICS-2-63A-…-xx: 63 A for ATICS-2-80A-…-xx: 80 A
Crest factor	≤ 1.2
Number of cycles at nominal load	< 6000

Voltage monitoring*)

Frequency range f_n	40…70 Hz
Response value undervoltage adjustable	160…207 V
Response value overvoltage	240…275 V
Response time t_{on}	50 ms…100 s
Delay on release t_{off}	200 ms…100 s
Hysteresis	2…10 %

Insulation monitoring (for ATICS-2-xx-ISO-xx only) *)

Nominal system voltage (operating range)	80…275 V
Measuring range	10 kΩ…1 MΩ
Response value adjustable	50…250 kΩ
Relative uncertainty	±15 %
Hysteresis	≤ 25 %
Response time t_{an} at $R_F = 0.5$ x R_{an} and $C_e = 1$ µF	≤ 5 s
Permissible system leakage capacitance C_e	≤ 5 µF
Measuring voltage U_m	DC 12 V
Measuring current I_m (at RF = 0 Ω)	≤ 120 µA
Max. permissible extraneous DC voltage U_{fg}	DC 375 V
Automatic self test	every hour

Insulation fault location *)

Test current I_T	1 mA
Test pulse/break	2 s/4 s

Monitoring of the IT system transformer load current *)

Measuring current transformers	STW2, STW3, SWL-100A
Measuring range I_L (True r.m.s.)	10…110 % of the response value
Response value adjustable	5…(50) 100 A
Hysteresis	5…30 %

Temperature monitoring for the IT system transformer *)

Response value	4 kΩ
Release value	1.6 kΩ
Measuring time	≤ 2 s
PTC resistors acc. to DIN 44081	max. 6 in series

ATICS digital input *)

Digital inputs, galv. separated	1
Operating principle	adjustable
Function	adjustable

ATICS alarm output *)

Switching element, galv. separated	1 potential-free changeover contact
Operating principle	adjustable
Function	adjustable

Interfaces

Interface/protocol	RS-485/BMS
Baud rate	9.6 kbit/s
Max. cable length (without additional bus amplifier)	≤ 1200 m
Cable (twisted pairs, shielded, shield connected to PE on one side)	recommended: J-Y(St)Y min. nx2x0.8
Terminating resistor	120 Ω (0.25 W)
Device address on BMS bus	2…90

Connection type power section

Connection type	modular terminals
Cage-clamp spring terminal (at I_e < 65 A, AC3)	1.5…35 mm²
Screw-type terminals tightening torque	0.5…0.6 Nm
Cage-clamp spring terminal (at I_e ≥ 65 A, AC3)	6…35 mm²
Screw-type terminals tightening torque	0.5…0.6 Nm

Connection type control section

Connection type	modular terminals
Cage-clamp spring terminals	0.8…2.5 mm²

Environment/EMC

EMC immunity	acc. to EN 61000-6-2
EMC emission	acc. to EN 61000-6-4
Ambient temperature, during operation	-25…+55 °C
Climatic conditions for stationary use (IEC 60721-3-3)	3K23 (except condensation and formation of ice)
Climatic conditions for transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Climatic conditions for long-term storage (IEC 60721-3-1)	1K22 (except condensation and formation of ice)

Other

Operating mode	continuous operation
Mounting	vertical
Degree of protection, internal components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Mounting into standard distribution panels	see table “Dimensions and weights”
Protection class	Class I
Power consumption	for ATICS-2-63A-…-xx: approx.16 W for ATICS-2-80A-…-xx: approx. 28 W
Weight approx.	refer to “Dimensions and weights” table

*) For further technical details, please refer to the “ATICS-2-ISO” manual

Ordering details

Nominal current (AC3) of the transfer switching device	Max. permissible current acc. to DIN VDE 0100-710/HD 60364-7-710	Permissible back-up fuse max.	Power consumption max.	Number of outgoing circuits B16A *	Type
63 A	63 A	80 A, gG	16 W	6	UFA710-2-63-06-B16
					UFA710-2-63-BP-06-B16
			17 W	12	UFA710-2-63-12-B16
					UFA710-2-63-BP-12-B16
			18 W	18	UFA710-2-63-18-B16
					UFA710-2-63-BP-18-B16
			19 W	24	UFA710-2-63-24-B16
					UFA710-2-63-BP-24-B16
80 A	80 A	100 A, gG	28 W	6	UFA710-2-80-06-B16
					UFA710-2-80-BP-06-B16
			29 W	12	UFA710-2-80-12-B16
					UFA710-2-80-BP-12-B16
			30 W	18	UFA710-2-80-18-B16
					UFA710-2-80-BP-18-B16
			31 W	24	UFA710-2-80-24-B16
					UFA710-2-80-BP-24-B16

* Other circuit breakers on request
All UFA modules listed in the table can also be purchased as 400 V version with the same ordering details with the additional marking "-400"

Dimensions and weights

Type	Sections/rows	Dimensions in mm			Recommended cabinet depth	Approx. weight.
	Quantity	Width (W)	Height (H)	Depth (D)	mm	kg
UFA710-2-…-06-B16	1/8	250	1200	250 (on request 190)	350 (on request 300)	12
UFA710-2-…-12-B16	1/9	250	1350			14
UFA710-2-…-18-B16	1/10	250	1500			16
UFA710-2-…-24-B16	1/11	250	1650			18
UFA710-2-…-BP-06-B16	1/8	250	1200			13
UFA710-2-…-BP-12-B16	1/9	250	1350			15
UFA710-2-…-BP-18-B16	1/10	250	1500			17
UFA710-2-…-BP-24-B16	1/11	250	1650			19

One row has a height of 150 mm. One section has a width of 250 mm.
All UFA modules listed in the table can also be purchased as 400 V version with the same dimensions.

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