Isolated Power Systems VIT-AFSBY

with ATICS® changeover and monitoring device, insulation fault locator and bypass switch for operating theatres and intensive care units

With energy efficient "Green Line" Transformer

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BENDER

Isolated Power Systems VIT-AFSBY

for operating theatres and intensive care units

with ATICS® changeover and monitoring device,
insulation fault locator and bypass switch

Application

The isolated power systems of the VIT-AFSBY series supply electrical power to group 2 medical locations, e.g. operating theatres and intensive care units. For socket-outlet circuits for medical electrical equipment with nominal voltages exceeding AC 25 V or DC 60 V, the protective measure “Protection by insulation monitoring with indication in the IT system” is mandatory.
Furthermore, a changeover module is required to change over automatically from the safety power supply source to a second supply source in case of failure. An insulation fault locator is integrated in the VIT-AFSBY for quick localisation of insulation faults.

Functional description

The IT system distribution cabinet in the VIT-AFSBY series contain an isolating transformer and a changeover and monitoring module UMA710-2-xx-ISO-… with bypass switch and with all the necessary monitoring equipment for IT systems in accordance with DIN VDE 100-710:

- Changeover modules with control function
- Insulation monitoring
- Load and temperature monitoring

The isolated power systems also contains an insulation fault location device for 12, 18 or 24 outgoing circuits. On the secondary side of the isolating transformer, 12, 18 or 24 circuit breakers (B16 A, 2 pole) are built in accordingly. The socket outlets of the group 2 room are connected to these circuit breakers.

To reduce noise pollution, the waste heat is dissipated by natural convection, even at 100 % transformer load

Functions in accordance with DIN VDE 0100-710

- Voltage monitoring with adjustable control function on the preferred line and on the second line and at the output of the changeover device
- Variable changeover time *t* 0.5…15 s to change over from normal power supply source to safety power supply source resp. from uninterruptible power supply source.
- Protection against wrong operation by mechanical and electrical multiple interlocking
- Cables are laid to resist short-circuits and earth faults
- Control circuit with single fault tolerance according to DIN VDE 0100-710
- Automatic return on voltage recovery
- Functional testing including checking of the operating times
- Insulation, load current and temperature monitoring for the IT system
- Monitoring of the system/PE connections of the insulation monitoring device
- Isolating transformer 6300 or 8000 VA for IT system with inrush current < 6 x I_n

Further measures to increase the electrical safety

- Continuous monitoring of the actuation devices and automatic processes (coil, control contacts, connections).
- Monitoring for short-circuits upstream and at the output of the changeover device and the pre-defined switching behaviour
- Maximum reliability when switching:
  - due to patented switching system with mechanical and electrical interlocking
  - due to weld-free switching contacts with the mechanics of a circuit-breaker
  - resistant to e.g. voltage fluctuations or vibrations due to stable switching position and permanent contact pressure
- Preventive safety thanks to automatic reminders for prescribed tests, service times and number of switching operations
- Bypass switch for uninterrupted testing/maintenance
- Tested by the independent testing laboratory TÜV, Germany
- Tested functional safety in accordance with IEC 61508 (SIL2) of the ATICS® switch (Provide messages at two points at least)

Device features

- Installations
  - Automatic changeover and monitoring device ATICS® including monitoring of i.e.:
  - Voltage of incoming supply
  - Output voltage
  - Correct operating times
  - Changeover times
  - Insulation resistance
  - Load current
  - Transformer temperature
  - Functional safety acc. IEC 61508 (SIL2)
  - Up to 12 or 24 outgoing circuits with circuit breakers, B16 A, 2 pole
  - Insulation fault monitoring device
  - New energy-efficient isolating transformer, (6300, 8000VA) Inrush current < 6 x I_n
- Uninterrupted testing and replacement with bypass switch
- Variable changeover time $t \leq 0.5…15$ s
- Exchange of information by means of bus technology
- Connection for remote alarm and operator panels MK2430/CP305/CP9xx
- Short delivery times
- Cost and time savings thanks to ready-to-connect cabinets
- Sheet steel housing as to DIN VDE 0100-710
- Designed in accordance with the requirements of applicable standards
- Design verification according to new DIN EN IEC 61439-1, -2, VDE 0660-600-1, -2 and IEC 60364-7-710, DIN VDE 100-710
- Voluntary test of changeover module by the independent German technical service, testing and inspection organization (TÜV)

Changeover and monitoring module

In fault-free condition, the preferred supply line is switched on. If the voltage falls below the set value, a changeover to the second supply line will automatically take place. The changeover period can be set individually. In order to ensure operational readiness, the second line as well as the output of the changeover module (Line 3) are monitored too. On voltage recovery, return to the preferred supply line occurs automatically. Due to variable delay times (return transfer times or delay times), the changeover module meets the individual installation-specific requirements (e.g. coordination of several changeover modules, reduction of switching energy).

A bypass switch is provided for uninterrupted testing and maintenance of the changeover and monitoring device.

Insulation, load and temperature monitoring

The insulation monitoring device continuously monitors the insulation resistance, load current and the temperature of the IT system transformer. If one or several response values have been reached (insulation resistance, load current, temperature), the alarm relay switches and a corresponding message occurs. The connections to the system and PE, as well as to the measuring current transformer and temperature sensor, are permanently monitored. In the event of wire breakage or short-circuit, a message will appear. The patented AMP measuring technique is used in order to exclude the possibility of insulation monitoring being impaired by DC components.

Insulation fault location system (EDS system)

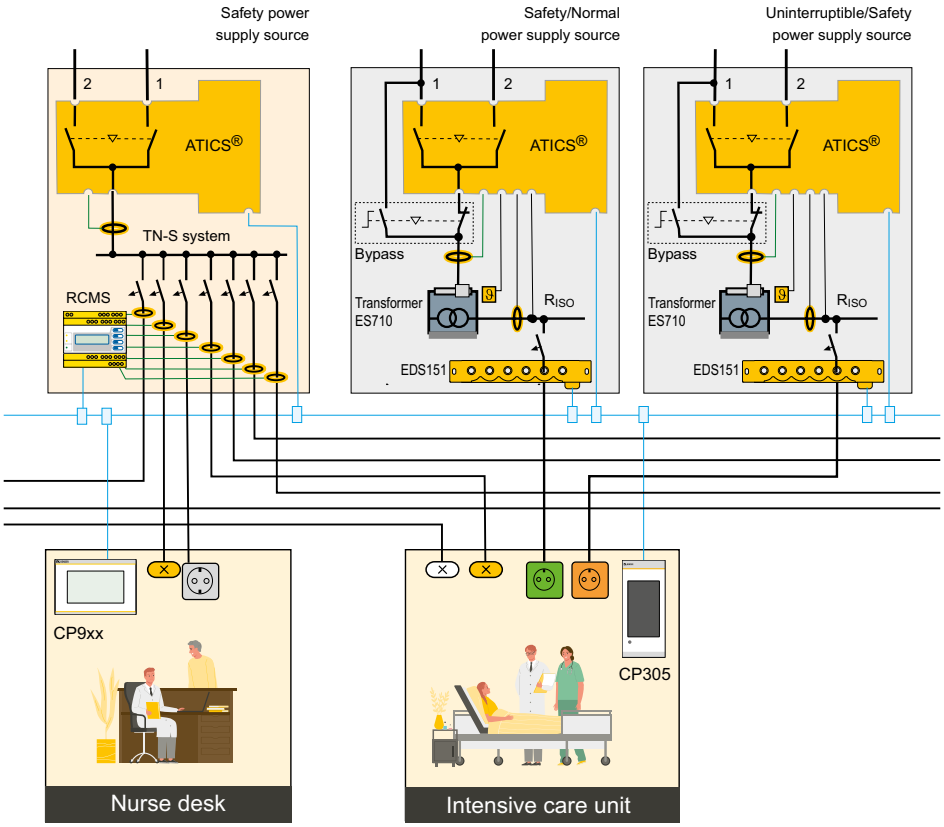
In medical used areas of room group 2, with many socket-outlet circuits or loads (e.g. intensive care units) it is often time-consuming and difficult for medical or technical personnel to locate circuit faults or loads. The EDS insulation fault location system solves this problem by automatically localising the insulation fault during operation. This has two major advantages: time- and cost-optimised fault localisation and availability, since the system remains in operation during the automatic fault search.

Functionality of the EDS system

If the ATICS-2-xx-ISO changeover and monitoring device reports an insulation fault, the insulation fault location starts: The device generates a test current of max. 1 mA. This test current flows via the insulation fault location and via the earth cable (PE cable) back to the test device. The locating current is detected by the measuring current transformer in the fault path and signalled by the EDS insulation fault locator via the bus. The localisation of the faulted circuit or load is based on the assignment of the measuring current transformer/outgoing circuit to an individual text message, e.g. on a alarm and control panel CP9xx, on the alarm and test combination CP305 or MK2430.

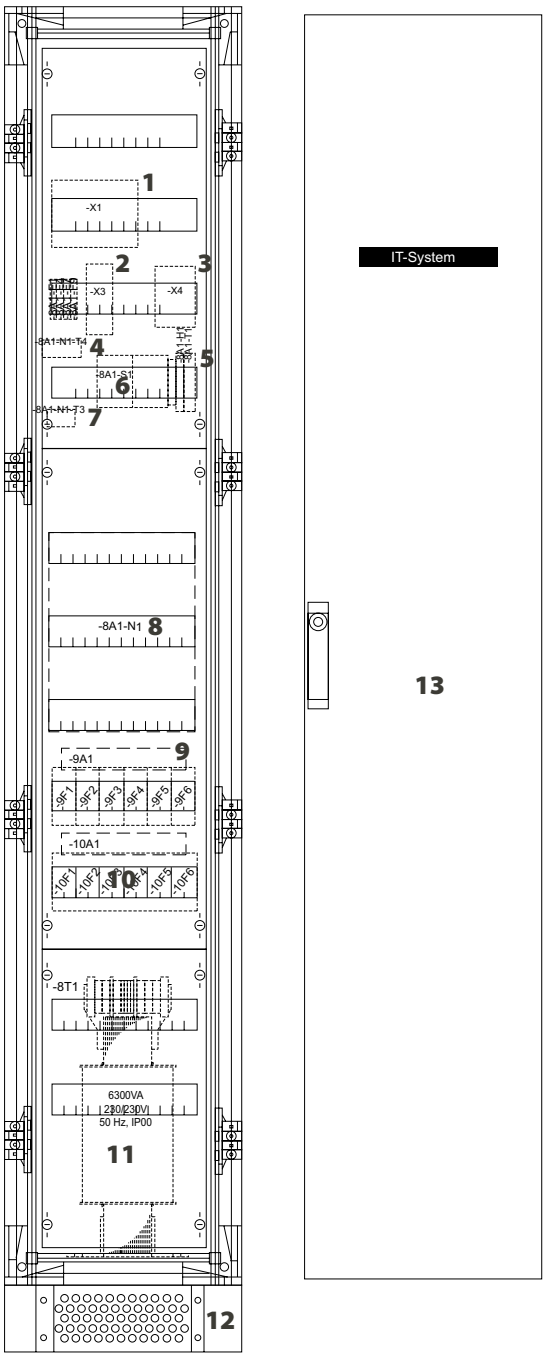
Messages displayed in plain text

The unique status, warning and fault messages are displayed in plain text, whereby the required alarm and test combination MK2430, CP305 or the alarm and control panel CP9xx must be provided in the medical area at a suitable location that is permanently monitored by the medical staff. A two-wire bus cable is required to connect the isolated power systems VIT-AFSBY to the alarm indicator panels.



Intensive care area group 2

Design



1 - Terminals for the incoming conductors

2 - Terminals for the control connections

3 - Terminals for the outgoing conductors

4 - Current transformer for load monitoring of the IT transformer

5 - Power supply unit for MK2430/CP305/CP9xx alarm indicator and test combinations

6 - Bypass switch

7 - Current transformer for current monitoring

8 - Changeover and monitoring device ATICS® (3 rows)

9 - EDS151 insulation fault locator

10 - B1x A circuit breaker, 6 outputs per row

11 - IT system transformer

12 - base, perforated

13 - front door

Design details Isolated Power Systems

Data Isolated Power Systems

Cabinet range	ABB – Striebel & John, Triline R
Cabinet type	
VIT-AFSBY-112S-	1/8 R 4
VIT-AFSBY-114S-	1/10 R 4
Degree of protection	IP21
Protection class	SK I (earthed))
Ventilation	natural convection, ventilation openings
Panel construction	partition between the different types of supply systems
Cable entry	incoming and outgoing cables from above
Doors and walls	sheet steel 1.5…2 mm
Doors/hinge	right
Door lock	Bar lock with 3 mm double-bit insert
Paint finish	RAL 7035
Plinth	sheet steel, height 100 mm, RAL 7005

Installation data

Type of assembly	floor-mounted cabinet with door and plinth
Type of installation	free-standing
Ambient temperature	max. 30 °C
Dimensions (B x H x T)	
VIT-AFSBY-112S-	374 x 2025 x 425 mm
VIT-AFSBY-114S-	374 x 2325 x 425 mm

Type of wiring

Klemmenraum	at the top
Cable duct	none
Protective/neutral conductor	PE terminals, disconnect terminal ≤ 10 mm²
Busbars	none
Conductor colours	acc. to DIN EN 60446 (VDE 0198), IEC 60446
Conductors	halogen-free

Labelling

Devices	adhesive labels, DIN EN 61346-2, IEC 61346-2
Isolated Power Systems	adhesive labels, black type on a white
System type labelling	according to DIN

System data

Type of system	IT system
Nominal voltage	N/PE/AC 230 V

Technical data

Insulation coordination acc. to IEC 60664-1 [1)]

Rated insulation voltage	AC 400 V
Voltage test acc. to IEC 61010-18 (normal/protective separation)	2.21 kV/3.54 kV

Poweer unit/switching elements [1)]

Switching system	Patented mechanical/electrical locking system
Rated operational voltage U_e	AC 230 V
Operating range U_e	0.8…1.15 x U_e
Frequency f_e	50…60 Hz
Rated operational current I_e of the module	(AC-3) 63 A/80 A
Fuse	63 A/80 A gG
Utilization category	AC-3
Changeover period, adjustable	≤ 0.5 s…15 s
Strom während des Umschaltvorgangs	<17 A/<30 ms
Circuit breaker (project-related)	B 16 A

Voltage monitoring/switching [1)]

Response values	
undervoltage alarm 1 (1 V steps)	160…220 V
overvoltage alarm 2 (1 V steps)	240…275 V
Response time t_{on} (50 ms steps)	50 ms…100 s
Return transfer time t_{off} (50 ms steps)	50 ms…100 s
Hysteresis (1 % steps)	2…10 %
Frequency measurement	40…460 Hz
Relative percentage error	± 1 %

Isolating transformer

Classification of insulation	t_a 40/B
Insulation	double insulation
Ambient temperature	≤ 40 °C
Rated power	3150…8000 VA
Rated frequency	50…60 Hz
Rated input voltage	AC 230 V
Rated output voltage	AC 230/115 V
Inrush current I_E	< 6 x I_n
Leakage current	≤ 0.5 mA
No-load input current i_0	≤ 3 %
Short-circuit voltage U_k	≤ 3 %
Shielding	between primary and secondary winding

Current monitoring (output current) [1)]

Measuring range I_n (true r.m.s.)	0…200 A
Response value for message (1 A steps)	1…160 A
Response value for short-circuit detection	160 A
Response delay t_{on} (50 ms steps)	50 ms…100 s
Delay on release t_{off} (50 ms steps)	50 ms…100 s
Hysteresis	5…30 %

Insulation monitoring [1)]

Measuring range	10 k…1 MΩ
Response value R_{an1} (alarm 1)	50…250 kΩ
Relative uncertainty	± 15%
Hysteresis	≤ 25%
Response time t_{an} at R_F = 0.5 x R_{an} and C_e = 1µF	≤ 3.5 s
Measuring voltage U_m	≤ DC 12 V
Measuring current I_m (at R_F = 0 Ω)	≤ 120 µA
Internal resistance DC R_i	≥ 240 kΩ
Impedance Z_i at 50 Hz	≥ 240 kΩ
Permissible system leakage capacitance C_e	≤ 1 µF

Load current monitoring [1)]

Measuring range, from response value	10…110 %
Response value (1A steps)	5…50 A (100A)
Hysteresis	5…30 %

Temperature monitoring [1)]

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

Insulation fault location [1)]

Test current I_T	1 mA
Test cycle/pause	2 s/4 s

Interface [1)]

Interface/protocol	RS-485/BMS
Baud rate	9.6 kBit/s
Cable length	≤ 1200 m
Cable, recommended (twisted pairs, shielded, shield connected to PE on one side)	min. J-Y(St)Y 2x0.6
Terminating resistor	120 Ω (0.25 W)
Device address	2…90
Display, characters	graphic display
History memory (messages)	300 data records

Switching elements (alarm contacts) [1)]

Number	1 changeover contact, potential-free
Operating principle (N/C or N/O operation selectable)	N/C operation
Contact data	AC 230V, 5 A/DC 30V, 5A
Rated operational voltage U_e	AC 230 V/DC 220V
Electrical endurance	10.000 number of cycles
Minimum contact rating	10 mA at AC/DC > 5 V

Environment/EMC [1)]

Monitoring device EMC immunity	EN 61000-6-2
Monitoring device EMC emission	EN 61000-6-4

Classification of climatic conditions acc. to IEC 60721

Stationary use	3K22
Transport	2K11
Long-term storage	1K22
Operating temperature, Bender devices	-10…+55 °C

Classification of mechanical conditions acc. to IEC 60721

Stationary use	3M11
Transport	2M4
Long-term storage	1M12

Terminals [1)]

Control section

Connection	Pluggable screw terminals
Connection properties	
rigid/flexible	0.14…1.5mm²
Stripping length	7mm

Power section

Connection	Pluggable screw terminals
Connection properties	
rigid/flexible	10…70mm²/6…50 mm²
Stripping length	15 mm

Outgoing section

Connection	cage clamp terminals
Connection properties	
rigid/flexible/Conductor sizes	0.08…2.5 mm²/ 4 mm²
Stripping length	6…7 mm

Technical data (continued)

Product standards	
Insulation monitoring	IEC 61557-8
Load and temperature monitoring	DIN VDE 0100-710 IEC 60364-7-710
Changeover device	DIN VDE 0100-710, IEC 60364-7-710 IEC 60947-6-1
Isolated Power Systems	IEC/DIN EN 61439-1, -2, VDE 0660-600-1, -2
Isolating transformer	DIN VDE 0100-710, IEC 60364-7-710 IEC 61558-1, IEC 61558-2-15

Other	
Operating mode	continuous operation
Mounting	vertical
Schematic diagram/circuit diagram	Documentation will be created according to project-specific and customer-specific requirements
Documentation number	D00198
Weight/power consumption	see “Variants”

[1] For more detailed technical information, please refer to the Technical Device Manual ATICS®, D00046.

Variants

Type	Dimensions in mm			Circuit breaker	Transformer capacities	Dissipation loss[1]	Weight
	Width	Depth	Height				
VIT-AFSBY-112S-6300	374	425	2025	max. 12 pieces	6300 VA	ca. 253 W	ca.150 kg
VIT-AFSBY-112S-8000					8000 VA	ca. 298 W	ca.160 kg
VIT-AFSBY-114S-6300			2325	max. 24 pieces	6300 VA	ca. 253 W	ca.160 kg
VIT-AFSBY-114S-8000					8000 VA	ca. 298 W	ca.170 kg

[1] Information on energy-efficient “Green Line” transformers.

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