

ISOMETER® isoBAT425

Insulation monitoring device with coupling impedance ZE420
for batteries up to DC 400 V

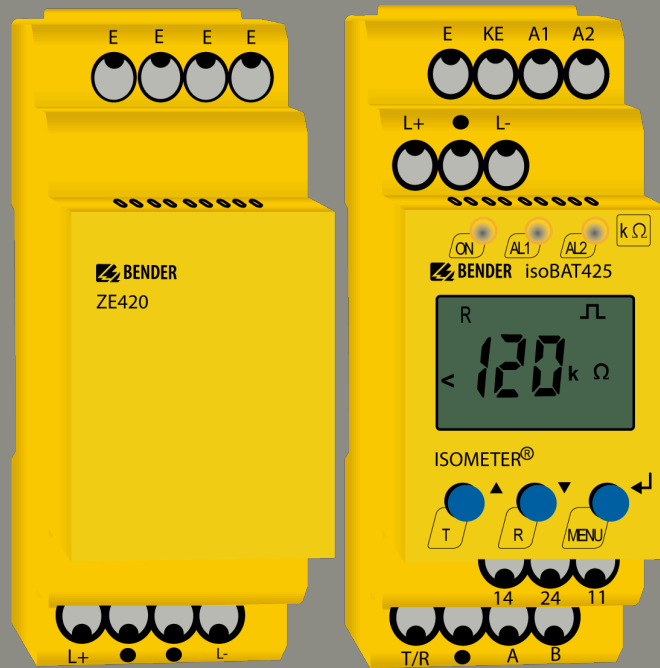


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Device features

- Monitoring of the insulation resistance R_f to earth
- Monitoring of the battery voltage U_n between the terminals "L+" and "L–"
- Configurable measuring frequency for adjustment to the physical characteristics of the battery
- Measuring the DC residual voltages U_{L+e} (L+ to PE) and U_{L-e} (L– to PE)
- Selectable start-up delay, response delay and delay on release
- Alarm output via LEDs ("AL1", "AL2"), display, and alarm relays ("K1", "K2")
- Automatic device self test
- Selectable n/c or n/o relay operation
- Measured value indication via multi-functional LC display
- Activatable fault memory
- Locating the faulty conductor L+/L–, i.e. the distribution of the insulation resistance R_f between terminals "L+" and "L–"
- Monitoring and automatic adjustment to the system leakage capacitance C_e up to 4 μ F
- Continuous connection monitoring of terminals "L+", "L–" and "E"
- Two separately adjustable response value ranges from 10 k Ω to 5 M Ω (prewarning, alarm)
- Device supply via wide-range power supply
- Password protection against unauthorised changing of parameters
- RS-485 (galvanically isolated) including the following protocols:
 - BMS (Bender measuring device interface) for the data exchange with other Bender devices
 - Modbus RTU
 - IsoData (for continuous data output)

Intended use

This ISOMETER® is intended for monitoring the insulation resistance R_f as well as the voltage of a battery during its assembly from individual battery cells. The ISOMETER® monitors the insulation resistance of batteries with nominal system voltages of DC 0...400 V. The maximum permissible system leakage capacitance is 1 μ F. Based on the measured values obtained, it is possible to determine the type and location of an insulation fault.

In order to meet the requirements of the applicable standards, customised parameter settings must be made on the equipment in order to adapt it to local equipment and operating conditions. Please heed the limits of the range of application indicated in the technical data.

Any other use or a use that goes beyond this constitutes improper use.

- i** If the ISOMETER® is installed inside a control cabinet, the insulation fault message must be audible and/or visible to attract attention.

Functional description

The isoBAT425 ISOMETER® is intended for monitoring the insulation resistance R_f as well as the voltage U_n of a battery during its assembly from individual battery cells. The ISOMETER® measures the insulation resistance R_f and the system leakage capacitance C_s of the battery to earth. Additionally, it measures the battery voltage U_n between L+ and L-, as well as the residual voltages U_{L+e} (U_{L+} to earth) and U_{L-e} (U_{L-} to earth).

In the first step, the battery is assembled in two parallel strings (plus and minus string) which are not interconnected. During the second step, the two strings are connected to form a complete battery by means of another battery.

The resulting measured values allow diagnosing the type and location of the insulation fault. In the LC display, the faulty conductor is displayed with a plus or a minus sign preceding the value R_f .

The detected fault is assignable to an alarm relay via the menu. If the values R_f or U_n violate the activated response values in "AL" menu, the LEDs and the alarm relays "K1" and "K2" issue an alarm according to the alarm assignment settings in the "out" menu. In addition, the operating mode of the alarm relay can be set and the fault memory "M" can be activated in this menu.

If the values R_f or U_n do not violate their respective release value (response value plus hysteresis) for the period t_{off} without interruption, the alarm relays will switch back to their initial position and the alarm LEDs will go out. If the fault memory is activated, the alarm relays remain in alarm condition and the LEDs light until the reset button "R" is pressed or the supply voltage U_s is interrupted.

The device function can be tested using the test button "T".

Parameters are assigned to the device via the LCD and the control buttons on the front panel; this function can be password-protected. The parameters of the device can be set via Modbus RTU.

ZE420 coupling impedance

In the case of open battery strings, the ZE420 coupling impedance provides a low-resistance connection (10 kΩ) between terminals "L+" and "L-", necessary for the measuring functions of the ISOMETER®. In the case of closed batteries, the resistance is optional due to the internal resistance of the battery.

In addition to this resistance, there is also a 1.5 mA current limitation. It starts above $U_n = 25$ V and increases the internal resistance of the coupling impedance. For this reason, in the event of a cross fault, the system connection monitoring may be additionally triggered but, at the same time, the responsivity of the cross fault detection is increased.

In addition, the coupling impedance contains two capacitances for a necessary minimum leakage capacitance to earth.

Connection

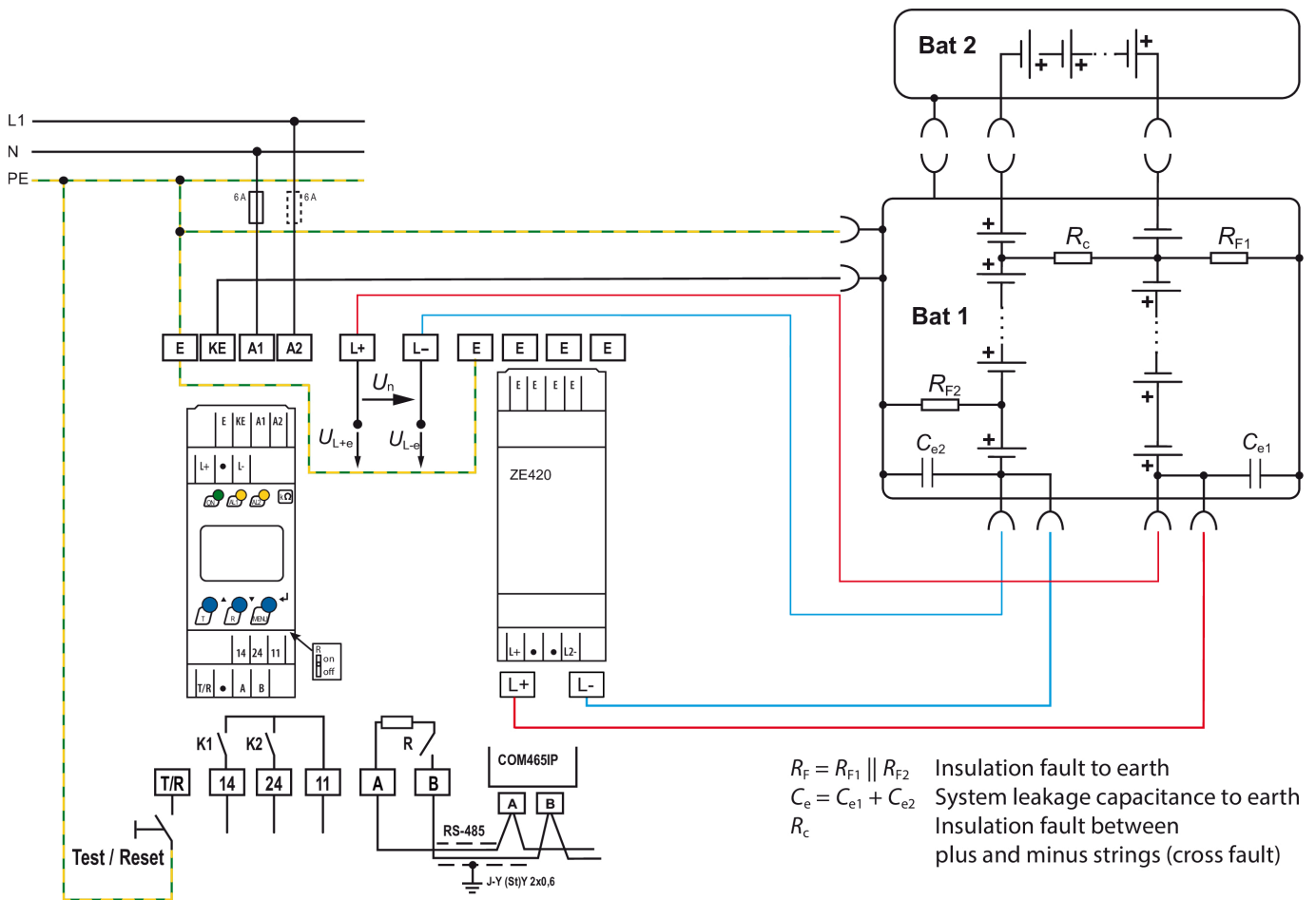
i For UL applications:

Only use 60/75 °C copper lines.

For UL and CSA applications: Connect the supply voltage via 5 A fuses.

For details about the conductor cross sections required for wiring, refer to chapter Technical data.

Wiring diagram



Terminal	Connections
A1, A2	Connection to the supply voltage U_s via fuse (line protection): If supplied from an IT system, protect both lines by a fuse.
E	Connection to PE: Use same wire cross section as for "A1", "A2".
KE	Connection to the battery enclosure
L+, L-	Connection to the battery to be monitored Indication in display: "L1" for L+; "L2" for L-
T/R	Connection for the external combined test and reset button
11, 14	Connection to alarm relay "K1"
11, 24	Connection to alarm relay "K2"
A, B	RS-485 communication interface with connectable terminating resistor Example: Connection of a BMS Ethernet gateway COM465IP

Technical data isoBAT425

(*) = Factory settings

Insulation coordination acc. to IEC 60664-1/-3
Definitions

Measuring circuit (IC1)	L+, L-
Supply circuit (IC2)	A1, A2
Output circuit (IC3)	11, 14, 24
Control circuit (IC4)	E, KE, T/R, A, B
Rated voltage	400 V
Overvoltage category	III

Rated impulse voltage

IC1/(IC2-4)	6 kV
IC2/(IC3-4)	4 kV
IC3/IC4	4 kV

Rated insulation voltage

IC1/(IC2-4)	400 V
IC2/(IC3-4)	250 V
IC3/IC4	250 V
Pollution degree	3

Safe isolation (reinforced insulation) between

IC1/(IC2-4)	Overvoltage category III, 600 V
IC2/(IC3-4)	Overvoltage category III, 300 V
IC3/IC4	Overvoltage category III, 300 V

Protective impedance device between

IC1/IC4	Overvoltage category III, 600 V
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Voltage tests (routine test) acc. to IEC 61010-1

IC2/(IC3-4)	AC 2.2 kV
IC3/IC4	AC 2.2 kV

Supply voltage

Supply voltage U_s	AC 100...240 V / DC 24...240 V
Tolerance of U_s	-30...+15 %
Frequency range U_s	47...63 Hz
Power consumption	≤ 3 W, ≤ 9 VA

Monitored IT system

Nominal system voltage U_n	DC 0...400 V
Tolerance of U_n	+25 %

Measuring circuit

Measuring voltage U_m	±12 V
Measuring current I_m , R_F , $Z_F = 0 \Omega$	≤ 110 μ A
Internal resistance R_I , Z_1	≥ 115 k Ω
Permissible system leakage capacitance C_e	≤ 1 μ F

Response values

Response value R_{an1}	11...5000 k Ω (1500 k Ω)*
Response value R_{an2}	10...4900 k Ω (1000 k Ω)*
Relative uncertainty R_{an}	±15 %, at least ±2 k Ω
Hysteresis R_{an}	25 %, at least ±1 k Ω
Voltage detection U_{BatH}	4...500 V (400 V)
Voltage detection U_{BatL}	3...499 V (378 V)
Voltage detection U_{CrossH}	4...500 V (345 V)
Voltage detection U_{CrossL}	3...499 V (6 V)
Overvoltage detection	510 V
Relative uncertainty U	±5 %, at least ±0.5 V
Hysteresis U	5 %, at least 2 V

Time response

 Response time t_{ae} at $R_F = 0.5 \times R_{an}$ for the measuring pulse period durations

$T_{MP} = 0.8$ s	≤ 3.5 s
$T_{MP} = 2$ s	≤ 8 s
$T_{MP} = 4$ s	≤ 16 s
$T_{MP} = 8$ s	≤ 32 s
Start-up delay t	0...10 s (0 s)*
Response delay t_{on}	0...99 s (0 s)*
Delay on release t_{off}	0...99 s (0 s)*

Displays, memory

Display	LC display, multi-functional, not illuminated
Display range measured value insulation resistance (R_F)	1 k Ω ... 10 M Ω
Operating uncertainty	±15 %, at least ±2 k Ω
Display range measured value system voltage (U_n)	DC 0...500 V
Operating uncertainty	±5 %, at least ±0.5 V
Display range measured value system leakage capacitance at $R_F > 10$ k Ω	0...9.99 μ F
Operating uncertainty	±10 %, at least ±0.02 μ F
Password	off / 0...999 (off / 0)*
Fault memory alarm messages	on/(off)*

Interface

Interface / protocol	RS-485 / BMS, Modbus RTU, isoData
Baud rate	BMS (9.6 kbit/s), Modbus RTU (selectable), isoData (115.2 kbit/s)
Cable length(9.6 kbit/s)	≤ 1200 m
Cable: twisted pairs, shield connected to PE on one side	min. J-Y(St)Y 2 x 0.6
Terminating resistor	120 Ω (0.25 W), internal, can be connected
Device address, BMS bus, Modbus RTU	3...90 (3)*

Switching elements

Switching elements	2 x 1 n/o contacts, common terminal 11
Operating principle	n/c or n/o (n/o)*
Electrical endurance	10.000 cycles
Electrical endurance at DC 30 V / ≤ 0.1 A (L/R = 7 ms)	10 ⁶ cycles

Contact data acc. to IEC 60947-5-1

Utilisation category	AC-12 / AC-14 / DC-12 / DC-12 / DC-12
Rated operational voltage	230 V / 230 V / 24 V / 110 V / 220 V
Rated operational current	5 A / 2 A / 1 A / 0.2 A / 0.1 A
Minimum contact rating	1 mA at AC/DC ≥ 10 V

Environment/EMC

EMC	IEC 61326-2-4
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Ambient temperatures

Operation	-25...+55 °C
Transport	-40...+85 °C
Storage	-40...+70 °C

Classification of climatic conditions acc. to IEC 60721

Stationary use (IEC 60721-3-3)	3K22
Transport (IEC 60721-3-2)	2K11
Long-term storage (IEC 60721-3-1)	1K22

Classification of mechanical conditions acc. to IEC 60721

Stationary use (IEC 60721-3-3)	3M11
Transport (IEC 60721-3-2)	2M4
Long-term storage (IEC 60721-3-1)	1M12

Other

Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically
Degree of protection, built-in components (DIN EN 60529)	IP30
Degree of protection, terminals (DIN EN 60529)	IP20
Enclosure material	polycarbonate
DIN rail mounting acc. to	IEC 60715
Screw fixing	2 x M4 with mounting clip
Weight	≤ 150 g

Technical data ZE420

Insulation coordination acc. to IEC 60664-1/-3

Definitions

Measuring circuit (IC1)	L+, L-
Control circuit (IC2)	E
Rated voltage	400 V
Overvoltage category	III

Rated impulse voltage

IC1/IC2	6 kV
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Rated insulation voltage

IC1/IC2	400 V
Pollution degree	3

Protective impedance device between

IC1/IC2	Overvoltage category III, 600 V
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Monitored IT system

Nominal system voltage U_n	DC 0...400 V
Tolerance of U_n	+25 %

Environment/EMC

EMC	IEC 61326-2-4
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Weight	≤ 150 g

Connection (for ISOMETER® and ZE420)

Push-wire terminals	
Nominal current	≤ 10 A
Conductor sizes	AWG 24...14
Stripping length	10 mm
Rigid	0.2...2.5 mm ²
Flexible without ferrules	0.75...2.5 mm ²
Flexible with ferrules with/without plastic sleeve	0.25...2.5 mm ²
Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.5...1.5 mm ²
Opening force	50 N
Test opening	∅ 2.1 mm

Standards and certifications

The ISOMETER® was developed in compliance with the following standards:



EU Declaration of Conformity

The EU Declaration of Conformity is available at the following Internet address:

https://www.bender.de/fileadmin/content/Products/CE/CEKO_isoXX425.pdf

UKCA Declaration of Conformity

Die UKCA-Konformitätserklärung ist unter folgendem Link verfügbar:

https://www.bender.de/fileadmin/content/Products/UKCA/UKCA_isoXX425.pdf

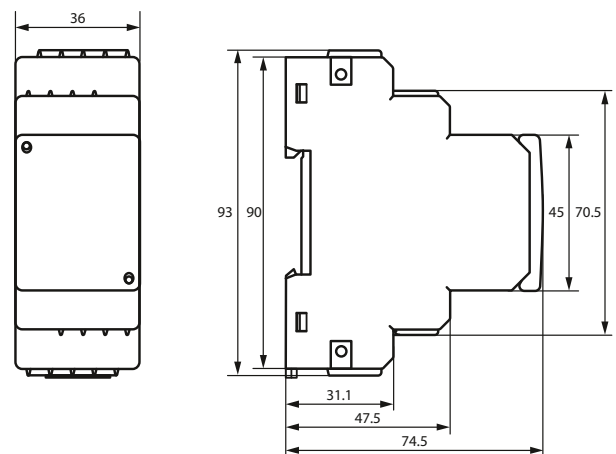
Ordering data

Type	Nominal system voltage U_n	Article number	
		Push-wire terminals	Screw-type terminals
isoBAT425-D4-4 mit ZE420	DC 0...400 V	B71036327	-
isoBAT425-D4-4	DC 0...400 V	B71036324	-
ZE420	DC 0...400 V	B71036326	-

Accessories

Description	Article number
Mounting clip for screw mounting	B98060008
XM420 mounting frame	B990994

Dimensions



Dimension diagram (in mm)



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Subject to change!
The specified standards take into account the
edition valid until 08.2024 unless otherwise
indicated.