ISOMETER® isoCHA425

Insulation monitoring device for unearthed DC systems (IT systems) DC 50 V up to 400 V

Suitable for the charging of electric vehicles acc. to Japanese charging standard CHAdeMO

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Device features

- Monitoring the insulation resistance R_F for DC charging stations according to Japanese charging standard CHAdeMO
- Detection of unipolar insulation faults in the nominal voltage range between 50 V und 400 V within 1 s
- Detection of two-pole insulation faults within 10 s
- Measurement of the nominal system voltage Un (true RMS) with undervoltage and overvoltage detection
- Measurement of residual voltages U_{L+e} (between U_{L+} and earth) and U_{L-e} (between U_{L-} and earth)
- Automatic adaptation to the system leakage capacitance Ce up to 2 µF
- Selectable start-up delay, response delay and delay on release
- 2 separately adjustable response value ranges of 5…250 kΩ (Alarm 1, Alarm 2)
- Alarm signalling via LEDs (AL1, AL2), a display and alarm relays (K1, K2)
- Automatic device self test with connection monitoring
- Selectable N/C or N/O relay operation
- Measured value indication via multi-functional LCD
- Fault memory can be activated
- RS-485 (galvanically isolated) including the following protocols:
  - BMS interface (Bender measuring device interface) for data exchange with other Bender components
  - Modbus RTU
  - IsoData (for continuous data output)
- Password protection to prevent unauthorised parameter changes

Product description

The ISOMETER® monitors the insulation resistance of DC charging stations according to the Japanese charging standard CHAdeMO for voltages between DC 50 V and 400 V.

Asymmetric insulation faults are reported with a response time ≤ 1 second. Symmetrical insulation faults within 10 seconds. The maximum permissible system leakage capacitance C_e is 2 µF.

In order to meet the requirements of 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.

Applikation

- DC charging stations for electric vehicles according the Japanese charging standard CHAdeMO

Funktion

The ISOMETER® measures the RMS value (True RMS) of the nominal system voltage U_n between L+ and L- as well as the residual voltages U_{L+e} (between L+ and earth) and U_{L-e} (between L- and earth).

It determines from a minimum value of the nominal system voltage the faulty system conductor DC+/DC-, which shows the distribution of the insulation resistance between conductors DC+ and DC-. The distribution is indicated by a "+" or "-" sign preceding the insulation resistance measurement. The value range of the faulty system conductor is ±100 %:

Indication	Meaning
-100 %	Asymmetrical fault on conductor DC-
0 %	Symmetrical fault
+100 %	Asymmetrical fault on conductor DC+

The partial resistances can be calculated from the total insulation resistance R_F and the fault location (R %) using the following formula:

Fault on conductor DC+ -> R_{DC+F} = (200 % * R_F)/(100 % + R%)
Fault on conductor DC- -> R_{DC-F} = (200 % * R_F)/(100 % – R%)

It is possible to assign the detected fault or the faulty conductor to an alarm relay via the menu. If the values R_F oder U_n violate the response values activated in the "AL" menu, this will be indicated by the LEDs and relays "K1" and "K2" according to the alarm assignment set in the "out" menu. In addition, the operation of the relay (n.o./n.c.) can be set and the fault memory "M" is activated.

If the values R_F or U_n do not violate their release value (response value plus hysteresis) for the period t_{on} without interruption, the alarm relays will switch back to their initial position and the alarm LEDs AL1/AL2 stop lighting. 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 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. Parameterisation is also possible via the BMS bus, for example by using the BMS Ethernet gateway (COM465IP) or the Modbus RTU.

Interface/protocols

The ISOMETER® uses the serial hardware interface RS-485 with the following protocols:

- **BMS**
  The BMS protocol is an essential component of the Bender measuring device interface (BMS bus protocol). Data transmission takes place with ASCII characters.
- **Modbus RTU**
  Modbus RTU is an application layer messaging protocol and it provides Master/Slave communication between devices that are connected altogether via bus systems and networks. Modbus RTU messages have a 16-bit CRC (Cyclic Redundant Checksum), which guarantees reliability.
- **IsoData**
  The ISOMETER® continuously sends an ASCII data string with a cycle of approximately 1 second. Communication with the ISOMETER® within this mode is not possible and no additional transmitter may be connected to the RS-485 bus cable.

The parameter address, baud rate and parity for the interface protocols are configured in the “out” menu.

Standards

- DIN EN 61557-8 (VDE 0413-8): 2015-12/Ber1: 2016-12
- IEC 61557-8: 2014/COR1: 2016

Certifications

Ordering information

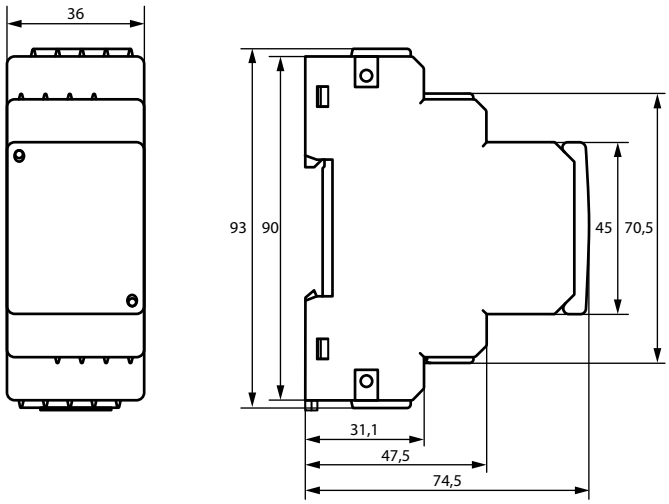
Supply voltage U_S		System leakage capacitance C_e	Type	Art. No
AC	DC			Push-wire terminal
100…240 V, 47…63 Hz	24…240 V	≤ 2 µF	isoCHA425-D4-4	B71036395

Accessories

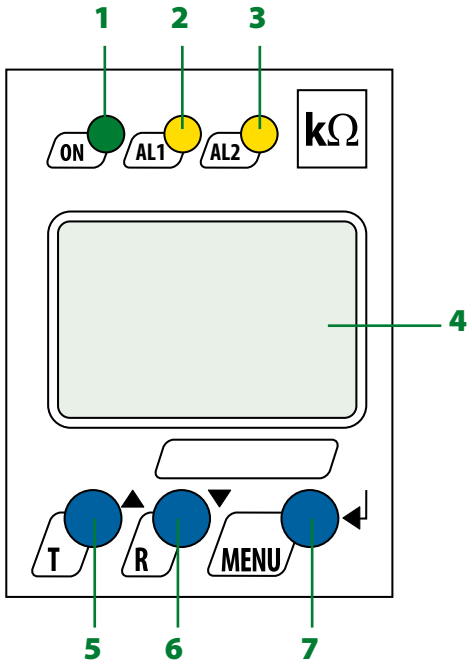
Description	Art. no.
Mounting clip for screw mounting (1 piece per device)	B98060008

Dimension diagram XM420

Dimensions in mm



Operating elements



1 - LED “ON” (operation LED) flashes in case of interruption of the connecting wires E/KE or L1/+/L2/- or system fault.

2 - Alarm LED “AL1”, lights when the values fall below the set response value Alarm 1 and flashes in case of interruption of the connecting wires E/KE or L1/+/L2/-, or system faults as well as in the case of overvoltage (can be activated).

3 - Alarm LED “AL2” lights when the values fall below the set response value Alarm 2 and flashes in case of interruption of the connecting wires E/KE or L1/+/L2/- or system faults as well as in the case of undervoltage (can be activated).

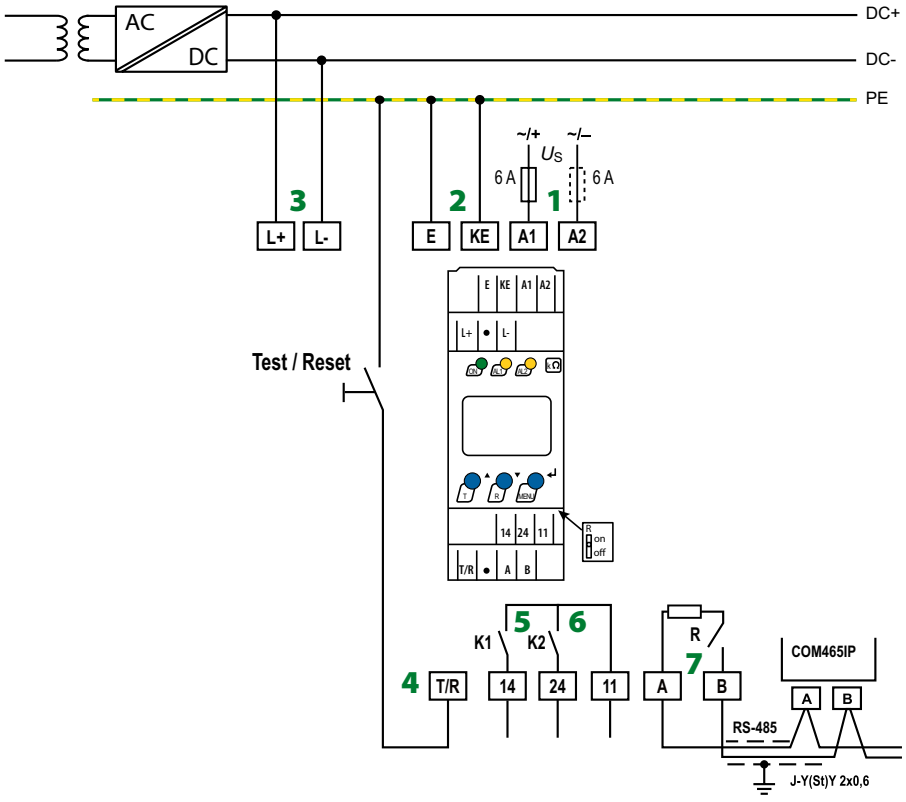
4 - LC display

5 - Test button “T”: Call up the self-test
Arrow up button: Parameter change, move upwards in the menu

6 - Reset button “R”: Delete stored insulation fault alarms
Arrow down button: Parameter change, move downwards in the menu

7 - Menu button “MENU”: Call up the menu system.
Enter button: Confirms parameter changes

Wiring diagram



1 - A1, A2 Connection to the supply voltage via fuse (line protection):
If supplied from an IT system, both lines have to be protected by a fuse.*

2 - E, KE Connect each terminal separately to PE:
The same wire cross section as for A1, A2 is to be used.

3 - L+, L– Connection to the IT system to be monitored.

4 - T/R Connection for the external combined test and reset button

5 - 11, 14 Connection to alarm relay K1

6 - 11, 24 Connection to alarm relay K2

7 - A, B RS-485 communication interface with connectable terminating resistance
Example: Connection of a BMS-Ethernet-Gateway COM465IP

**** For UL applications:***
Only use 60/75 °C copper lines!
For UL and CSA applications, it is mandatory to use 5 A fuses for the protection of the supply voltage.

Technical data

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

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
Polution degree	3
Protective separation (reinforced insulation) between:	
IC1/(IC2-4)	Overvoltage category III, 600 V
IC2/(IC3-4)	Overvoltage category III, 300 V
IC 3/IC4	Overvoltage category III, 300 V
Voltage test (routine test) according to IEC 61010-1:	
IC2/(IC3-4)	AC 2.2 kV
IC 3/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

IT system being monitored

Nominal system voltage U_n	DC 50…400 V
Tolerance of U_n	+25 %

Measuring circuit

Measuring voltage U_m	±12 V
Measuring current I_m at R_F, $Z_F = 0$	≤ 110 µA
Internal resistance R_i, Z_i	≥ 115 kΩ
Permissible system leakage capacitance C_e	≤ 2 µF

Response values

Response value R_{an1}	R_{an2}…250 kΩ (46 kΩ)*
Response value R_{an2}	5 kΩ…R_{an1} (23 kΩ)*
Relative uncertainty R_{an}	±15 %, at least ±2 kΩ
Hysteresis R_{an}	25 %, at least 1 kΩ
Undervoltage detection $U<$	10 V … $U>$ (off/10 V)*
Overvoltage detection $U>$	$U<$ … 500 V (off/500 V)*
Relative uncertainty U	±5 %, at least ±5 V
Hysteresis U	5 %, at least 5 V

Time response

Response time t_{an} of $R_F = 0{,}5 \times R_{an}$ and C_e=1 µF according to IEC 61557-8	≤ 1 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 kΩ…2 MΩ
Operating uncertainty	±15 %, at least ±2 kΩ
Display range measured value nominal system voltage (U_n)	50…500 V_{RMS}
Operating uncertainty	±5 %, at least ±5 V
Display range measured value system leakage capacitance of R_F > 10 kΩ (only "dc" mode)	0…17 µF
Operating uncertainty of $R_F \geq 20$ kΩ and $C_e \leq 5$ µF	±5 %, at least ± 0,1 µF
Password	off/0…999 (0, off)*
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 kBits/s)
Cable length (9.6 kBits/s)	≤ 1200 m
Cable: shield connected to PE on one side	recommended: CAT6/CAT7 min. AWG23*
* alternative: twisted pairs, shield connected to PE on one side	J-Y(St)Y min. 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 contacts, common terminal 11
Operating principle	N/C operation/N/O operation (N/C operation)*
Electrical endurance, number of cycles	10 000

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
Necessary minimum contact load (relay manufacturer's reference)					10 mA/DC 5 V

Environment/EMC

EMC	IEC 61326-2-4
Ambient temperatures:	
Operation	-40…+70 °C
Transport	-40…+85 °C
Storage	-40…+70 °C
Climatic class acc. to IEC 60721:	
Stationary use (IEC 60721-3-3)	3K24 (without condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11 (without condensation and formation of ice)
Long-time storage (IEC 60721-3-1)	1K22 (without condensation and formation of ice)
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

Connection

Connection type	push-wire terminal
Nominal current	≤ 10 A
Conductor sizes	AWG 24 -14
Stripping length	10 mm
rigid	0.2…2.5 mm²
flexible without ferrules	0.75…2.5 mm²
flexible with ferrules with/without plastic sleeve	0.25…2.5 mm²
Multi-conductor flexible with TWIN ferrules with plastic sleeve	0.5…1.5 mm²
Opening force	50 N
Test opening, diameter	2.1 mm

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
Documentation number	D00352
Weight	≤ 150 g

( )* = factory setting

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