ISOMETER® isoCHA425HV with AGH420-1

Insulation monitoring device with coupling device for unearthed DC systems (IT systems) DC 0 V to 1000 V

Suitable for DC charging stations according to CCS or CHAdeMO

isoCHA425HV_D00404_02_D_XXEN/11.2021

ISOMETER® isoCHA425HV with AGH420-1

Insulation monitoring device with coupling device for unearthed DC systems (IT systems) DC 0 V to 1000 V
Suitable for DC charging stations according to CCS or CHAdeMO

ISOMETER® isoCHA425

Certifications

Device features

- Monitoring of the insulation resistance RF of DC charging stations according to CHAdeMO standard or Combined Charging System (CCS).
- ***CHAdeMO (Mode CHd and CHA):***

CHAdeMO	Mode	
	CHd	CHA
Maximum system leakage capacitance 1.6 µF per conductor	✓	✓
Detection of insulation faults in the system voltage range 50 V to 1000 V	✓	✓
One-pole insulation faults R_{FU} R_{FU} ≤ 100 kΩ: Response time ≤ 1 s 100 kΩ < R_{FU} ≤ 2 MΩ: Response time ≤ 10 s	✓	✓
Two-pole insulation faults R_{FS} R_{FS} ≤ 160 kΩ: Response time ≤ 10 s R_{FS} > 160 kΩ (200 kΩ): no detection (Deactivation)	✓	--

- ***CCS (Mode dc):***

Detection of insulation faults up to 2 MΩ with a response time of 10 s
Maximum system leakage capacitance 5 µF

- Measurement of the system leakage capacitance C_e
- Measurement of the system voltage U_n (True RMS) with undervoltage/overvoltage detection
- Measurement of the DC residual voltages U_{L1e} (between L1/+ and earth) and U_{L2e} (between L2/- and earth)
- Selectable start-up delay, response delay and delay on release
- Two separately adjustable response value ranges of 5…600 kΩ (Alarm 1, Alarm 2)
- Alarm output 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 a multifunctional LC display
- Fault memory can be activated
- RS-485 (galvanically separated) 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
- Stop mode to deactivate the measuring pulse generator

Product description

The ISOMETER® isoCHA425HV in combination with the coupling device AGH420-1 monitors the insulation resistance R_F for DC fast charging stations according to CHAdeMO standard or according to Combined Charging System (CCS) for nominal system voltage ranges between DC 0 V and 1000 V.

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 area of application indicated in the technical data.

Any use other than that described in this manual is regarded as improper.

To ensure that the ISOMETER® functions correctly, an internal system resistance of ≤ 1 kΩ must exist between L1/+ and L2/- via the source or the load.

Application

- DC charging stations for electric vehicles in accordance with the Japanese charging standard CHAdeMO
- DC charging stations for electric vehicles according to CCS (Combined Charging System) in compliance with IEC 61851-23

Function

The ISOMETER® is designed for use in DC charging stations according to CHAdeMo standard or Combined Charging System (CCS) and can be set to the respective mode in the "SEt" menu via the Mode parameter. It measures the total insulation resistance R_{FS} as well as the one-sided insulation resistance R_{FU}, the system leakage capacitance C_e, the system voltage U_n (True RMS) between L1/+ and L2/- and the DC system voltages (residual voltages) U_{L1e} and U_{L2e} between L1/+ as well as L2/- and earth.

Depending on the selected mode, the values R_{FS} and R_{FU} are combined to form the measured value R_F. In the "AL" menu a prewarning and a main alarm limit value can be set for the measured value R_F. The prewarning limit value can only be set higher than the main alarm limit value. If the measured value reaches or falls below the limit values, an alarm is signalled. For the measured value U_n, an overvoltage and undervoltage limit value can be enabled and adjusted, the violation of which triggers an alarm. The limit value alarms are only deleted when the respective measured value no longer violates the limit value including the corresponding hysteresis.

All alarms generated by the ISOMETER® are signalled via the LEDs "AL1" and "AL2". In the "out" menu, the LEDs can be assigned to the alarm relays ("K1, K2"). In addition, the operation of the alarm relays (n.o./n.c.) can be configured and the fault memory "M" can be activated or deactivated. 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.

In the "t" menu, the start-up delay at device start, the response delay and the delay on release of the alarms as well as the repetition time of the automatic device self-test can be set.

For the RS-485 interface, the protocols BMS, Modbus RTU or isoData are selected in the "out" menu. The measured values can be read and the parameters of the ISOMETER® can be set via the BMS protocols, e.g. using the BMS Ethernet gateway (COM465IP) and Modbus RTU. If the isoData protocol is selected, the ISOMETER® only sends the measured values, once per second.

The device function can be tested using the test button "T". The device parameters are set via the LC display and the control buttons on the front panel. This function can be password-protected.

The ISOMETER® can be set to stop mode to deactivate the measuring pulse generator.

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 is transferred using 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 s. Communication with the ISOMETER® within this mode is not possible and no additional transmitter may be connected to the RS-485 bus cable.

Standards

The ISOMETER® has been developed in compliance with the following standards:

- DIN EN 61557-8 (VDE 0413-8): 2015-12/Ber1: 2016-12
- IEC 61557-8: 2014/COR1: 2016
- IEC 61851-21-2: 2018-04 Version 1.0
- IEC 61851-23

Ordering information

Nominal system voltage U_n	Type	Art. No.	
		Screw-type terminal	Push-wire terminal
DC 0 (50*)…1 000 V	isoCHA425HV-D4-4 + AGH420-1	B91036396	B71036396

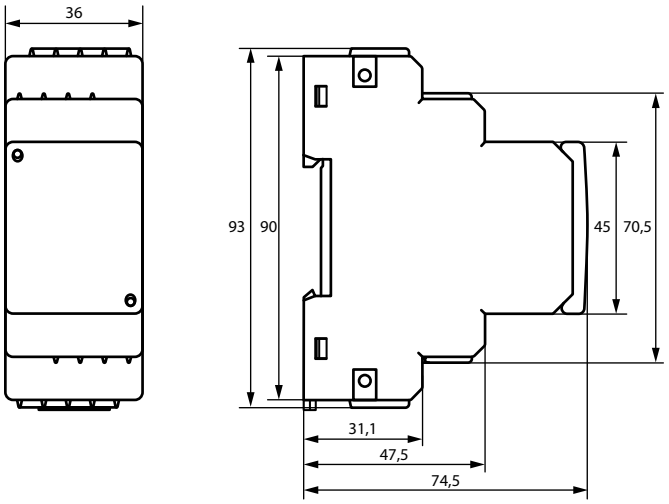
* Value for CHAdeMo

Accessories

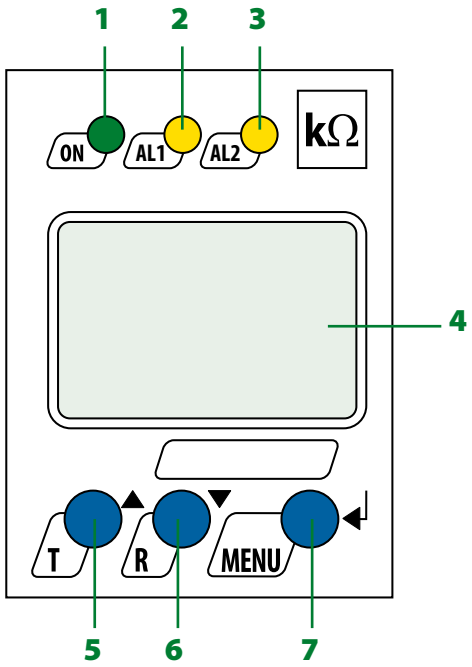
Description	Art. No.
Mounting clip for screw mounting (1 piece per device)	B98060008

Dimension diagram XM420

Dimensions in mm



Operating elements



1 - Operation LED “ON” flashes in case of interruption of the connecting wires E/KE or L1/+ / L2/- or system error.

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

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

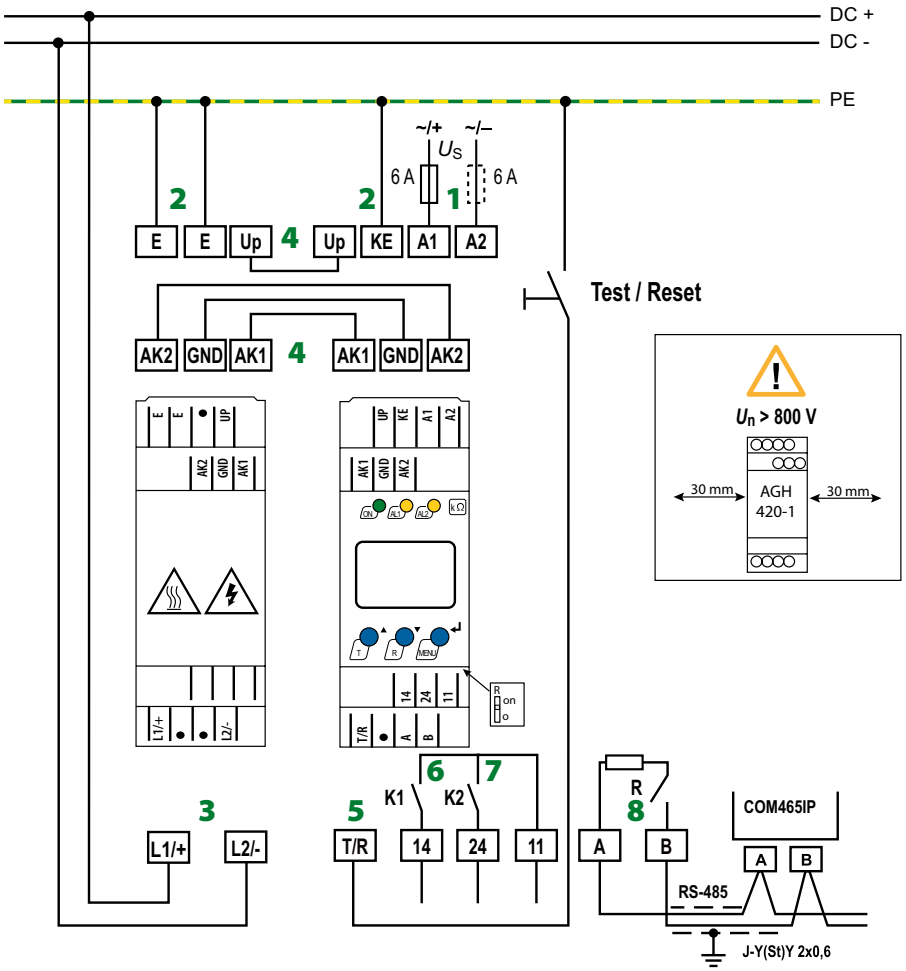
4 - LC display

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

6 - Reset button “R”: delete stored alarms
Arrow-down button: change parameters, move down in the menu

7 - Menu button “MENU”: call up the menu system
Enter button: confirm parameter changes

Wiring diagram



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

2 - **E, 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 - **Up, AK1, GND, AK2** Connect the terminals of the AGH420-1 to the corresponding terminals of the ISOMETER® isoCHA425HV.

5 - **T/R** Connection for external combined test and reset button.

6 - **11, 14** Connection to alarm relay "K1"

7 - **11, 24** Connection to alarm relay "K2"

8 - **A, B** RS-485 communication interface with connectable terminating resistor.

Example: Connection of a BMS Ethernet gateway COM465IP

* ***For UL applications:***
Use 60/75 °C copper lines only!
UL and CSA applications require the supply voltage to be protected via 5 A fuses.

Technical data isoCHA425HV

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

Definitions:	
Supply circuit (IC2)	A1, A2
Output circuit (IC3)	11, 14, 24
Control circuit (IC4)	Up, KE, T/R, A, B, AK1, GND, AK2
Rated voltage	240 V
Overvoltage category	III
Rated impulse voltage:	
IC2/(IC3-4)	4 kV
IC3/IC4	4 kV
Rated insulation voltage:	
IC2/(IC3-4)	250 V
IC3/IC4	250 V
Pollution degree	3
Protective separation (reinforced insulation) between:	
IC2/(IC3-4)	overvoltage category III, 300 V
IC3/IC4	overvoltage category III, 300 V
Voltage tests (routine test) acc. to IEC 61010-1:	
IC2/(IC3-4)	DC ±3.1 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

IT system being monitored

Nominal system voltage U_n with AGH420-1	DC 0…1 000 V
Tolerance of U_n	DC +10 %
Nominal system voltage range U_n with AGH420-1 (UL508)	DC 0…600 V

Response values

Response value R_{an1}	R_{an2}…600 kΩ (600 kΩ)*
Response value R_{an2}	5 kΩ…R_{an1} (120 kΩ)*
Hysteresis R_{an}	25 %, > 1 kΩ
Undervoltage detection $U<$	10…1.09 kV (off)*
Overvoltage detection $U>$	11…1.10 kV (off)*
Overload detection $U>$	1.20 kV (cannot be deactivated)
Hysteresis U	5 %, > 5 V

System voltage

Nominal voltage U_n	DC 0…1000 V +10 %
Measuring range	±1200 V_{PEAK}
Display range	0 V…1.2 kV (measurement True RMS)
Measurement and relative uncertainty	±5 %, > ±5 V

Mode CCS (dc)

Permissible system leakage capacitance C_e	≤ 5 µF
Measuring and display range R_F	1 kΩ…2 MΩ
Operating uncertainty R_F/relative uncertainty R_{an}	±15 %, ±2 kΩ
Measuring and display range C_e	0…17 µF
Operating uncertainty C_e:	
R_F < 10 kΩ	no measurement
R_F ≥ 10 kΩ	±15 %, ±0.1 µF
Response time t_{an}:	
R_{an} = 2.0 x R_F and C_e = 1 µF acc. to IEC 61557-8	≤ 10 s
R_{an} = 1.2 x R_F and C_e ≤ 5 µF	≤ 10 s

Mode CHAdeMO (CHd and CHA)

System voltage U_n	measurement only from U_n ≥ DC 50 V
Permissible system leakage capacitance C_e	per conductor ≤ 1.6 µF
One-pole fault R_{FU}	
Measuring and display range R_{FU}	1 kΩ…2 MΩ
Measurement uncertainty R_{FU}/relative uncertainty R_{an}:	
≤ 200 kΩ and U_n ≥ 100 V	±15 %, ±2 kΩ
U_n > 200 V	±15 %, ±2 kΩ
Two-pole fault R_{FS} (only CHd Mode)	
Measuring and display range R_{FS}	1 kΩ…160 kΩ
Measurement uncertainty R_{FS}/relative uncertainty R_{an}:	
< 160 kΩ	±15 %, ±2 kΩ
Measuring and display range C_e	0…17 µF
Measurement uncertainty C_e:	
R_F < 10 kΩ	no measurement
R_F ≥ 10 kΩ	±15 %, ±0.1 µF
Response time t_{an}:	
R_{an} = 1.2 x R_{FU} and R_{FU} ≤ 100 kΩ and U_n > 100 V	≤ 1.0 s
R_{an} = 1.2 x R_F	≤ 10 s

Displays, memory

Password	off/0…999 (off/0)*
Fault memory alarm messages	on/(off)*
Display	LC display, multifunctional, not illuminated

Time response

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)*

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)	≤ 1 200 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 contact, common terminal 11
Operating principle	N/C operation/N/O operation (N/O operation)*
Electrical endurance under rated operating conditions, 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
Minimum contact load					10 mA/5 V DC

Environment/EMC

EMC	IEC 61326-2-4, IEC 61851-21-2:2018-04 Ed. 1.0

Ambient temperatures:

Operation	-40…+70 °C
Transport	-40…+85 °C
Storage	-40…+70 °C

Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K24 (except condensation and formation of ice)
Transport (IEC 60721-3-2)	2K11 (except condensation and formation of ice)
Long-term storage (IEC 60721-3-1)	1K22 (except 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

Technical data isoCHA425HV (continued)

Connection

Connection type	Screw or push-wire terminal
Screw terminals:	
Nominal current	≤ 10 A
Tightening torque	0.5…0.6 Nm (5…7 lb-in)
Conductor sizes.	AWG 24…12
Stripping length	8 mm
Rigid / flexible	0.2…2.5 mm²
Flexible with ferrules with / without plastic sleeve	0.25…2.5 mm²
Multiple conductor rigid.	0.2…1.5 mm²
Multiple conductor flexible	0.2…1.5 mm²
Multiple conductor with ferrules without plastic sleeve	0.25…1.5 mm²
Multiple conductor flexible with TWIN ferrules with plastic sleeve	0.25…1.5 mm²
Push-wire terminals:	
Nominal current	≤ 10 A
Cross section	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	Ø 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 mounting	2 x M4 with mounting clip
Documentation number	D00404
Weight	≤ 150 g

( )* = factory settings

Technical data AGH420-1

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

Definitions:	
Measuring circuit (IC1)	L1/+, L2/-
Control circuit (IC2)	AK1, GND, AK2, Up, E
Rated voltage	1000 V
Overvoltage category	III
Rated impulse voltage:	
IC1/IC2	8 kV
Rated insulation voltage:	
IC1/IC2	1000 V
Pollution degree	3
Protective separation (protective impedance) between:	
IC1/IC2	overvoltage category III, 1000 V

IT system being monitored

Nominal system voltage range U_n	DC 0…1000 V
Tolerance of U_n	DC +10 %
Nominal system voltage range U_n (UL508)	DC 0…600 V

Measuring circuit

Measuring voltage U_m	±45 V
Measuring current I_m at R_F	≤ 400 µA
Internal DC resistance R_i	≥ 120 kΩ

Environment/EMC

EMC	IEC 61326-2-4
Ambient temperatures:	
Operation	-40…+70 °C
Transport	-40…+85 °C
Storage	-40…+70 °C

Classification of climatic conditions acc. to IEC 60721:

Stationary use (IEC 60721-3-3)	3K24 (except condensation and formation of ice)
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

Single cables for terminals Up, AK1, GND, AK2:

Cable length (AGH420-1 ➔ isoCHA425HV)	≤ 0.5 m
Cross section	≥ 0.75 mm²

Other

Operating mode	continuous operation
Mounting	cooling slots must be ventilated vertically
Distance to adjacent devices from U_n > 800 V	≥ 30 mm
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 mounting	2 x M4 with mounting clip
Weight	≤ 150 g

BENDER
The Power in Electrical Safety©

Bender GmbH & Co. KG
Londorfer Straße 65 • 35305 Grünberg • Germany
Tel.: +49 6401 807-0 • info@bender.de • www.bender.de

BENDER Group