

IRDH275 Series

Digital Ground Fault Monitor / Ground Detector
For Ungrounded (Floating) AC/DC Systems



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Features

- Meets or exceeds requirements for NEC 250.21(B) and CEC 10-106(2), as well as the upcoming 2014 requirement of NEC 250.167(A)
- Ground fault detection via insulation monitoring for ungrounded AC/DC systems, single-phase or three-phase
- Works on systems up to 793 VAC / 650 VDC
- Voltage ranges extendable up to 7200 VAC / 1760 VDC with voltage coupler modules
- Two separate adjustable response values, 1 k Ω - 10 M Ω
- Advanced measuring principle which detects both AC and DC faults, symmetrical faults, automatically adapts to high system leakage capacitances
- Info button to display device settings and system leakage capacitance
- Self monitoring
- Automatic self-test setting
- Connection for external metering
- Built-in and external test/reset
- Two separate alarms with two voltage-free SPDT contacts
- Normally energized (failsafe) or de-energized (non-failsafe) operation
- Backlit LCD display
- RS-485 interface

Approvals



Description

This device meets or exceeds the requirements of NEC 250.21(B) and CEC 10-106(2) for ground detectors in ungrounded AC systems, as well as the upcoming 2014 requirement of NEC 250.167(A) for ungrounded DC systems.

The IRDH275 monitors for ground faults in ungrounded single-phase AC, three-phase AC, and DC systems by monitoring the system's insulation resistance. It may be connected to systems of up to 793 VAC / 650 VDC. Voltage coupler accessories extend this range. The AMP Plus measuring principle utilized by the IRDH275 meets the requirements of modern power systems, including pure DC systems, systems with rectifiers, and systems with variable frequency drives (VFDs). In systems with high leakage capacitances, the IRDH275 automatically adapts itself to ensure an accurate reading.

The IRDH275 features a digital display showing the system's insulation resistance in real-time. All settings are changed via the device's built-in menu. The IRDH275 utilizes an external supply voltage for power, which allows deenergized systems to also be monitored.

For a panel mounted version, please refer to the IRDH375.

Function

When the insulation resistance from system to ground falls below the set response value, the alarm relays switch and the alarm LEDs activate. Two separately adjustable alarm-contacts can be set to a prewarning and main warning alarm. The measured value is indicated on the LCD display or an externally connectable measuring instrument. A latching setting ("fault memory") allows the device to reset automatically or require a manual reset. An external and internal test/reset can be activated remotely or on the device. A comprehensive INFO menu displays additional information such as the system's leakage capacitance.

The IRDH275 continuously monitors the equipment ground connection to ensure proper operation. The device's easy-to-use onboard menu manages all settings via the detailed LCD screen.

Additional Features

- History memory with real-time clock to store up to 300 timestamped event records
- Galvanically isolated RS-485 interface (BMS protocol) for data exchange with other Bender devices and communication systems
- Standby contacts and RS-485 communication for operating multiple ground fault detectors in systems tied together with tiebreakers or interlocks
- Galvanically isolated analog output, 0(4) - 20 mA

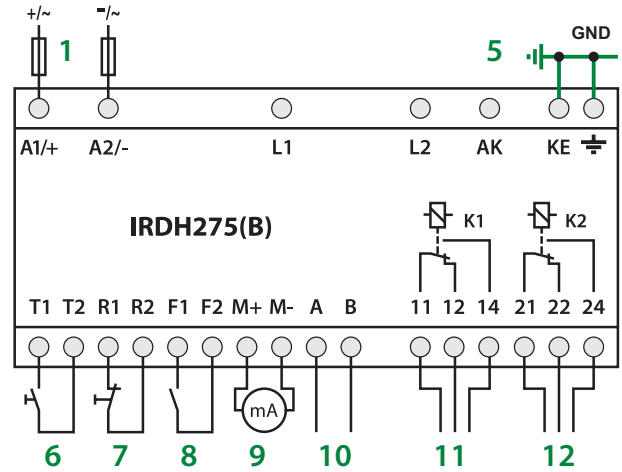
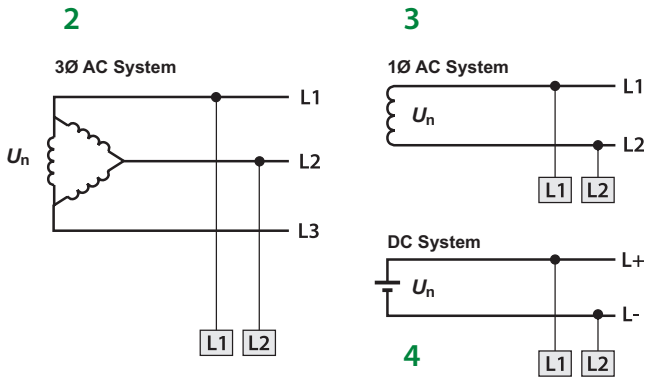
Use in Interconnected Ungrounded Systems

Only one BENDER insulation monitor may be active when several ungrounded systems are coupled together via a tiebreaker or other means. The disconnect relays and control inputs F1/F2 integrated into the IRDH275 guarantee no interference with other BENDER devices when the system tiebreaker is closed. IRDH275B models feature automatic control via RS-485 with no control inputs necessary.

Measurement Method

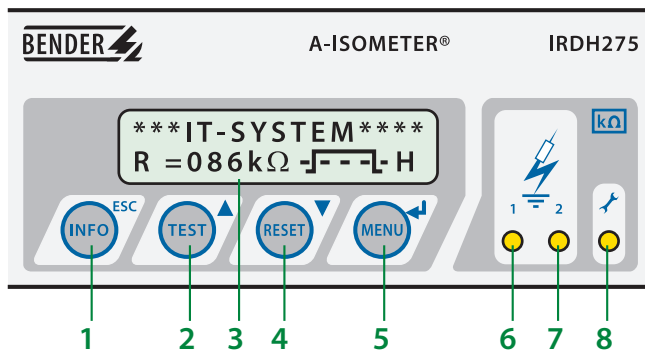
AMPPlus The IRDH275 series uses the **AMPPlus** measuring principle. This measuring principle allows for the precise monitoring of modern power supply systems, pure DC systems, systems where AC/DC rectification and power conversion may occur, systems with variable frequency drives (VFDs), and systems with high leakage capacitances.

Wiring



- 1 - External supply voltage used to power device
- 2 - Wiring diagram for a three-phase system. Only two connections to the system are necessary to monitor all three phases.
- 3 - Wiring diagram for a single-phase system
- 4 - Wiring diagram for a DC system
- 5 - Equipment ground connections
- 6 - External test button (normally open contact)
- 7 - External reset button (normally closed contact). When the terminals are open, the fault message will not be stored.
- 8 - Standby contact. When the contact is closed, no insulation measurements take place.
- 9 - IRDH275: Analog output, electrically isolated: 0 - 400 μ A
IRDH275B: Analog output, electrically isolated: 0 - 20 mA or 4 - 20 mA
- 10 - RS-485 interface:
IRDH275: One-way ASCII stream with measurement status
IRDH275B: Two-way communication with other BENDER devices, including communication gateways
- 11 - Alarm relay 1, normally energized or de energized contact
- 12 - Alarm relay 2/System Fault Relay, normally energized or de-energized contact

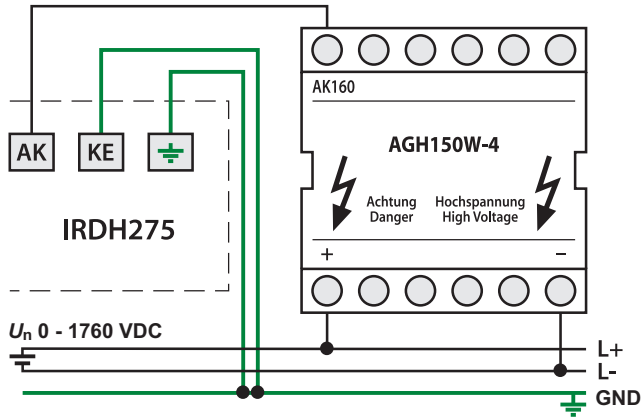
Displays and Controls



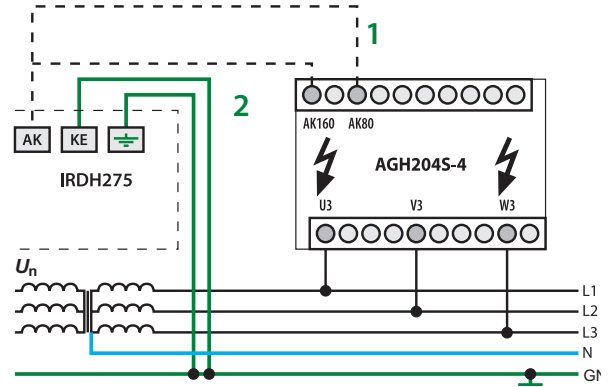
- 1 - INFO key: displays pertinent system information
ESC key: Goes back a step inside device's menu
- 2 - TEST button: Activates self-test
Arrow up key: Scrolls up inside device's menu
- 3 - LCD display
- 4 - RESET button: Resets device
Arrow down key: Scrolls down inside device's menu
- 5 - MENU key: Activates device's internal menu
Enter key: Confirm change inside device's menu
- 6 - Alarm LED 1 lights: Alarm, Prealarm
- 7 - Alarm LED 2 lights: Alarm, Main alarm
- 8 - System fault LED: Lights on connection or device error

Wiring diagrams – Connecting to voltage couplers

IRDH275 with voltage coupler AGH150W-4

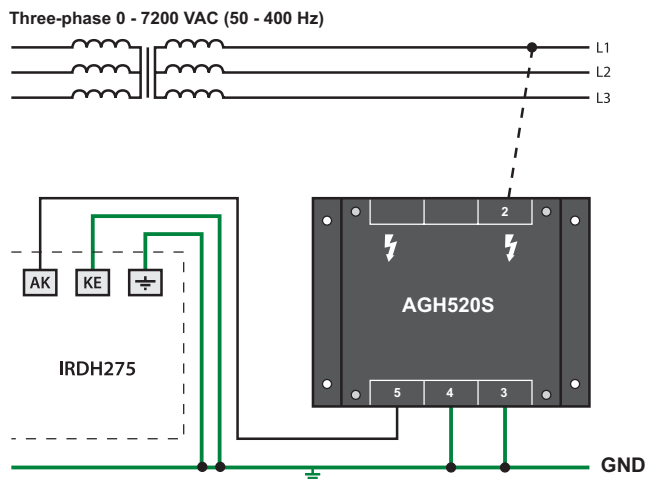


IRDH275 with voltage coupler AGH204S-4

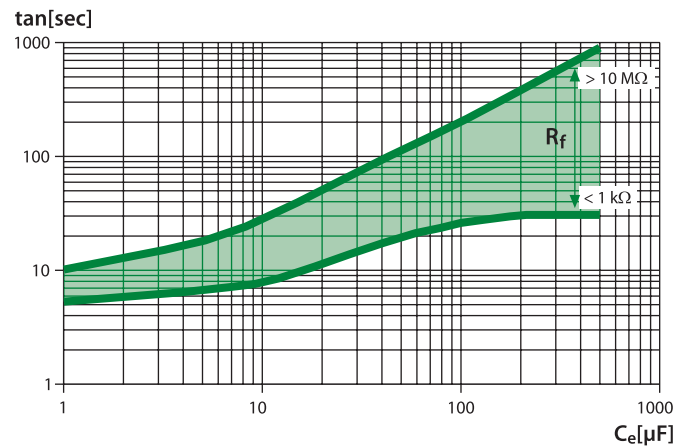


- 1 - without rectifiers $U_n = 3AC\ 0 - 1650\ V\ (DC\ max.\ 1000\ V)$
- 2 - with rectifiers $U_n = 3AC\ 0 - 1300\ V\ (peak\ voltage\ down-stream\ of\ the\ rectifier\ or\ intermediate\ voltage\ max.\ 1840\ V)$

IRDH275 with voltage coupler AGH520S



Sample Response Times



Response times in relation to the system leakage capacitances: $C_e = 1 - 500\ \mu F$, $U_n = 0 - 793\ V/50\ Hz$

Ordering Information

RS-485 interface	Analog Output	Supply voltage U_S ¹⁾		Type	Ordering No.
		AC	DC		
One-way ASCII string	0 - 400 μ A	88 - 264 V (42 - 460 Hz)	77 - 286 V	IRDH275-435	B 9106 5100
		–	19.2 - 72 V	IRDH275-427	B 9106 5104
		–	10.2 - 36 V	IRDH275-425	B 9106 5108
Proprietary 2-way protocol	0(4) - 20 mA	88 - 264 V (42 - 460 Hz)	77 - 286 V	IRDH275B-435	B 9106 5101
		–	19.2 - 72 V	IRDH275B-427	B 9106 5105
		–	10.2 - 36 V	IRDH275B-425	B 9106 5109

¹⁾ Absolute values

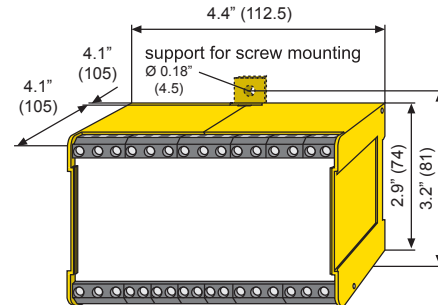
All versions support adding option “W” (added to the end of the part number), adding additional shock/vibration protection and wider temperature range.

Accessories

Description	Type	Ordering No.
External meters	7204-1421	B 986 763
	9604-1421	B 986 764
	9620-1421	B 986 841
Voltage couplers	AGH150W-4	B 9801 8006
	AGH204S-4	B 914 013
	AGH520S	B 914 033

Dimensions

Dimensions in inches (mm)



Technical data

Insulation coordination acc. to IEC 60664-1

Rated insulation voltage	AC 800 V
Rated impulse voltage/pollution degree	8 kV/3

Voltage ranges

Nominal system voltage U_n	AC, 3(N)AC 0 - 793 V, DC 0 - 650 V
Rated frequency f_n	DC, 0.2 - 460 Hz
Supply voltage U_S	AC 88 - 264 V, DC 77 - 286 V
Frequency range U_S	20 - 460 Hz
Power consumption	≤ 14 VA

Response values

Response value R_{an1} (Alarm 1)	1 k Ω - 10 M Ω
Response value R_{an2} (Alarm 2)	1 k Ω - 10 M Ω
Absolute error (1 k Ω - 10 k Ω)	+ 2 k Ω
Relative percentage error (10 k Ω - 10 M Ω)	0 % - + 20 %
Response time t_{an} at $R_F = 0.5 \times R_{an}$ and $C_e = 1 \mu F$	< 5 s
Measuring time	see characteristic curves (TGH page 69)
Hysteresis (1 k Ω - 10 k Ω)/(10 k Ω - 10 M Ω)	+ 2 k Ω /25 %

Measuring circuit

Measuring voltage U_m (peak value)	± 50 V
Measuring current I_m (at $R_F = 0 \Omega$)	$\leq 278 \mu A$
Internal DC resistance R_i	≥ 180 k Ω
Impedance Z_i at 50 Hz	≥ 180 k Ω
Permissible extraneous DC voltage U_{fg}	≤ 1200 V
Permissible system leakage capacitance	$\leq 500 \mu F$
Factory setting	150 μF

Displays

Display (illuminated)	two-line display
Characters (number of characters, height)	2 x 16 characters/4 mm
Display range, measuring value	1 k Ω - 10 M Ω
Absolute error (1 k Ω - 10 k Ω)	± 1 k Ω
Relative percentage error (10 k Ω - 10 M Ω)	± 10 %

Outputs

Test/reset button	internal/external
Current output measuring instrument	120 k Ω
Load	$\leq 400 \mu A$ (12.5 k Ω)
Load B version	≤ 20 mA (500 Ω)

Serial interfaces

IRDH275	RS-485/ASCII
IRDH275B	RS-485/BMS
Max. cable length	3900 ft
Recommended cable (shielded, shield on one side connected to ground)	J-Y(ST)Y 2 x 0.6
Terminating resistor	120 Ω (0.5 W)

Switching elements

Number of switching elements	2 SPDT contacts
Operating principle	normally energized/de energized operation
Factory setting	normally de energized operation
Electrical service life, number of cycles	12000
Contact class IIB in accordance with DIN IEC 60255-0-20	
Rated contact voltage	AC 250 V/DC 300 V
Making capacity	AC/DC 5 A
Breaking capacity	2 A, AC 230 V, PF = 0.4 - 0.2 A, DC 220 V, L/R = 0.04 s
Minimum contact current at DC 24 V	2 mA (50 mW)

General data

Shock resistance IEC 60068-2-27 (during operation)	15 g/11 ms
Bumping IEC 60068-2-29 (during transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6 (during operation)	1 g/10 - 150 Hz
Vibration resistance IEC 60068-2-6 (during transport)	2 g/10 - 150 Hz
Ambient temperature (during operation/during storage)	- 10 °C - + 55 °C/- 40 °C - + 70 °C
Climatic class acc. to DIN IEC 60721-3-3	3K5
Operating mode	continuous operation
Mounting	display oriented
Connection	screw-type terminals
Connection properties rigid/flexible	AWG 24...12 / 24...14
Degree of protection, internal components /terminal (DIN EN 60529)	IP30 / IP20, NEMA 1
DIN rail mounting acc. to	DIN EN 60715/IEC 60715
Screw mounting, mounting plate	2 x M4
Flammability class	UL94V-0
Product standards	DIN EN 61557-8: 1998-05 EN 61557-8: 1997-03, IEC 61557-8: 1997-02 ASTM F1669M-96, ASTM F1207M-96

Operating manual	TGH1361
Weight	approx. 1.1 lb

Option "W"

Shock resistance IEC 60068-2-27 (during operation)	30 g/11 ms
Bumping IEC 60068-2-29 (during transport)	40 g/6 ms
Vibration resistance IEC 60068-2-6	1.6 mm/10 - 25 Hz, 4 g/25 - 150 Hz
Ambient temperature (during operation)	- 40 °C - + 70 °C
Ambient temperature (during transport)	- 40 °C - + 85 °C