

# Isolator Barriers

Transmitter supply unit

Ex i field circuit

9160/23-11-11s Art. No. 220322



- Can be used universally for 2- and 3-wire transmitters and mA sources (4-wire transmitters)
- High degree of accuracy
- Variants with wire breakage and short-circuit monitoring
- Transparent for HART signals

MY R. STAHL 9160A



9160 series transmitter supply units can be used for the intrinsically safe operation of two- and three-wire transmitters or intrinsically safe mA sources such as four-wire transmitters. The unit allows HART signals to be transmitted in both directions. The portfolio includes single- and dual-channel units and a version for signal duplication.

## Technical Data

| Explosion Protection            |  |
|---------------------------------|--|
| Application range (zones)       | 2  |
| Ex interface zone               | 0, 1, 2, 20, 21, 22  |
| IECEX gas certificate           | IECEX BVS 08.0050 X  |
| IECEX gas explosion protection  | Ex nA nC [ja Ga] IIC T4 Gc   |
| IECEX dust certificate          | IECEX BVS 08.0050 X  |
| IECEX dust explosion protection | [Ex ia Da] IIIC  |
| IECEX firedamp certificate      | IECEX BVS 08.0050 X  |
| IECEX firedamp protection       | [Ex ia Ma] I   |
| ATEX gas certificate            | DMT 03 ATEX E 010 X  |
| ATEX gas explosion protection   | ⊕ II 3 (1) G Ex nA nC [ja Ga] IIC T4 Gc  |
| ATEX dust certificate           | DMT 03 ATEX E 010 X  |
| ATEX dust explosion protection  | ⊕ II (1) D [Ex ia Da] IIIC   |
| ATEX firedamp certificate       | DMT 03 ATEX E 010 X  |
| ATEX firedamp protection        | ⊕ I (M1) [Ex ia Ma] I  |
| FMus certificate                | FM16US0122X  |
| cFM certificate                 | FM16CA0067X  |
| Marking cFMus                   | Class I, Div. 2, Groups A,B,C,D;<br>Class I, Zone 2, nA nC Group IIC<br>AIS Class I,II,III, Div. 1, Groups A,B,C,D,E,F,G;<br>Class I, Zone 0, [AEx/Ex ia] IIC<br>T4 Mounting vert. at Ta = 70°C , or horizontal Ta = 60°C<br>See Doc. 91 606 01 31 1 |
| Certificates                    | ATEX (BVS), Brazil (ULB), Canada (FM), China (NEPSI), IECEX (BVS), Korea (KTL), SIL (exida), USA (FM)  |
| Ship approval                   | CCS, EU RO MR (DNV)  |
| Declaration of conformity       | ATEX (EUK), China (CCC)  |

# Isolator Barriers

Transmitter supply unit

Ex i field circuit

9160/23-11-11s Art. No. 220322



## Safety Data

|  |   |               |               |               |               |
|--|---|---------------|---------------|---------------|---------------|
| Max. voltage $U_o/V_{oc}$  | 27 V  |               |               |               |               |
| Max. current $I_o/I_{sc}$  | 88 mA   |               |               |               |               |
| Max. power $P_o$   | 576 mW  |               |               |               |               |
| Max. permissible external capacitance $C_o/C_a$ for IIC                | 0.09 $\mu$ F  |               |               |               |               |
| Max. permissible external inductance $L_o/L_a$ for IIC                 | 2.3 mH  |               |               |               |               |
| Max. permissible external capacitance $C_o/C_a$ for IIB                | 0.705 $\mu$ F   |               |               |               |               |
| Max. permissible external inductance $L_o/L_a$ for IIB                 | 17 mH   |               |               |               |               |
| Max. permissible external capa.IIA                                     | 2330 nF   |               |               |               |               |
| Max. permissible external inductance $L_o$ for IIA                     | 28 mH   |               |               |               |               |
| Max. perm. ext. capacit. IIIC  | 0.705 $\mu$ F   |               |               |               |               |
| Max. permis. ext. induct. IIIC   | 17 mH   |               |               |               |               |
| Max. permissible ext. capac. I   | 3750 nF   |               |               |               |               |
| Max. permissible external inductance $L_o$ for I                       | 40 mH   |               |               |               |               |
| Max. voltage $U_o$ isolation amplifier                                 | 4.1 V   |               |               |               |               |
| Max. current $I_o$ isolation amplifier                                 | negligible  |               |               |               |               |
| Max. power $P_o$ isolation amplifier                                   | negligible  |               |               |               |               |
| Max. voltage $U_i$ isolation amplifier                                 | 30 V  |               |               |               |               |
| Max. current $I_i$ isolation amplifier                                 | 100 mA  |               |               |               |               |
| Max. power $P_i$ isolation amplifier                                   | internally limited                                      |               |               |               |               |
| Internal capacitance isolation amplifier                               | Negligible  |               |               |               |               |
| Internal inductance $L_i$ isolation amplifier                          | Negligible  |               |               |               |               |
| Max. voltage $U_i$   | 30 V  |               |               |               |               |
| Max. current $I_i$ note  | Internally limited                                      |               |               |               |               |
| Max. power $P_i$   | 100 mW  |               |               |               |               |
| Internal capacitance   | Negligible  |               |               |               |               |
| Internal inductance  | Negligible  |               |               |               |               |
| Safety-related max. voltage  | 253 V AC  |               |               |               |               |
| Intrinsically safe limiting values inductance $L_o$ /capacitance $C_o$ | Jointly connectable inductance $L_o$ /capacitance $C_o$ |               |               |               |               |
| IIC  | $L_o$ [mH]  | 2 mH          | 1 mH          | 0.500 mH      | 0.200 mH      |
|  | $C_o$ [ $\mu$ F]  | 0.042 $\mu$ F | 0.056 $\mu$ F | 0.072 $\mu$ F | 0.090 $\mu$ F |
| IIB  | $L_o$ [mH]  | 17 mH         | 2 mH          | 0.500 mH      | 0.200 mH      |
|  | $C_o$ [ $\mu$ F]  | 0.290 $\mu$ F | 0.320 $\mu$ F | 0.460 $\mu$ F | 0.600 $\mu$ F |
| IIA  | $L_o$ [mH]  | 28 mH         | 2 mH          | 1 mH          | 0.200 mH      |
|  | $C_o$ [ $\mu$ F]  | 0.410 $\mu$ F | 0.320 $\mu$ F | 0.540 $\mu$ F | 0.820 $\mu$ F |
| IIIC   | $L_o$ [mH]  | 17 mH         | 2 mH          | 0.500 mH      | 0.200 mH      |
|  | $C_o$ [ $\mu$ F]  | 0.290 $\mu$ F | 0.320 $\mu$ F | 0.460 $\mu$ F | 0.600 $\mu$ F |
| I  | $L_o$ [mH]  | 40 mH         | 20 mH         | 0.500 mH      | 0.100 mH      |
|  | $C_o$ [ $\mu$ F]  | 0.480 $\mu$ F | 0.660 $\mu$ F | 0.810 $\mu$ F | 1.200 $\mu$ F |

# Isolator Barriers

Transmitter supply unit

Ex i field circuit

9160/23-11-11s Art. No. 220322



## Functional Safety

|  |          |
|--|----------|
| SIL  | 2        |
| HFT  | 0        |
| SFF  | 85%      |
| Lambda SD  | 0 FIT    |
| Lambda SU  | 0 FIT    |
| Lambda DD  | 163 FIT  |
| Lambda DU  | 28 FIT   |
| PFD <sub>avg</sub> at T <sub>proof</sub> 1 year  | 2,29E-04 |
| PFD <sub>avg</sub> at T <sub>proof</sub> 2 years | 3,38E-04 |
| PFD <sub>avg</sub> at T <sub>proof</sub> 5 years | 6,64E-04 |

## Electrical Data

|                               |                     |
|-------------------------------|---------------------|
| Number of channels            | 2                   |
| Transmitter feed operation    | Yes                 |
| Isolation amplifier operation | Yes                 |
| LFD relay                     | Yes                 |
| Communication signal          | HART, 0.5 to 10 kHz |

## Auxiliary Power

|                                 |                       |
|---------------------------------|-----------------------|
| Auxiliary power                 | 24 V DC               |
| Auxiliary power nominal voltage | 24 V DC               |
| Auxiliary power voltage range   | 18 ... 31.2 V         |
| Auxiliary pwr nom. voltage DC   | 24 V                  |
| Voltage range residual ripple   | ≤ 3,6 V <sub>SS</sub> |
| Nominal current                 | 148 mA                |
| Max. power dissipation          | 2.8 W                 |
| Power consumption               | 3.4 W                 |
| Polarity reversal protection    | Yes                   |
| Undervoltage monitoring         | Yes                   |
| Operation indication            | Green "PWR" LED       |

## Galvanic Isolation

|  |                 |
|--|-----------------|
| Test voltage as per standard             | EN IEC 60079-11 |
| Ex i input to output                     | 1.5 kV AC       |
| Ex i input to auxiliary power            | 1.5 kV AC       |
| Ex i input to fault message contact      | 1.5 kV AC       |
| Ex i input to Ex i input                 | 500 V AC        |
| Test voltage as per standard             | EN 50178        |
| Output to auxiliary power                | 350 V AC        |
| Output to output                         | 350 V AC        |
| Galvanic separation FMC to HE and output | 350 V AC        |

## Input

|                      |   |
|----------------------|---|
| Input function       | Isolation amplifier<br>Transmitter power unit |
| Input                | 0/4 ... 20 mA with HART                       |
| Input signal         | 0/4 to 20 mA with HART                        |
| Function range input | 0 ... 24 mA                                   |

# Isolator Barriers

Transmitter supply unit

Ex i field circuit

9160/23-11-11s Art. No. 220322



## Input

|                                      |                      |
|--------------------------------------|----------------------|
| Max. input current, mA sources       | 50 mA                |
| Input for open-circuit voltage $U_a$ | $\leq 26$ V          |
| Short-circuit current                | $\leq 35$ mA         |
| Supply voltage for transmitter       | $\geq 16$ V at 20 mA |
| Input resistance                     | $\leq 100$ ohm       |

## Output

|  |   |
|--|---|
| Output                                     | 0/4 to 20 mA with HART  |
| Output signal                              | 0/4 to 20 mA with HART  |
| Function range output                      | 0 – 24 mA   |
| Output A                                   | 0/4 to 20 mA  |
| Output B                                   | 0/4 to 20 mA  |
| Behaviour of the output                    | = input signal  |
| Output current at $I_e=0$                  | 0 mA  |
| Output residual ripple                     | $\leq 40$ $\mu$ Aeff  |
| Load resistance $R_L$                      | 0 ... 600 $\Omega$ (terminal 1+/2- resp. 5+/6-)<br>0 ... 379 $\Omega$ (terminal 3+/2- resp. 4+/6-)<br>(With internal 221 ohm resistor for HART) |
| Settling time 10-90%                       | $\leq 100$ $\mu$ s  |
| LF switch user adjustment                  | Activated/deactivated   |
| Wire breakage error detection input        | $< 3.6$ mA  |
| Short circuit error detection input        | $> 20.5$ mA   |
| Wire break. err detection OFF              | $< 3,6$ mA  |
| Line fault indication                      | Red "LF" LED; per channel   |
| Fault message contact switching capacity   | 30 V / 100 mA   |
| Line fault and loss of power signalization | - Contact (30 V/100 mA), closed against earth in case of error<br>- pac-Bus, potential-free contact (30 V/100 mA)                               |
| Deviations / error note                    | Information in % of the measuring range (20 mA) at $U_N$ , 23 °C  |
| Deviation                                  | $\leq 0,1$ %  |
| Temperature influence error limits         | $\leq 0.05\%$ / 10 K  |

## Device Specific Data

|                          |                  |
|--------------------------|------------------|
| LED operating conditions | LED "PWR", green |
|--------------------------|------------------|

## Ambient Conditions

|                               |   |
|-------------------------------|---|
| Ambient temperature °C        | -20 °C ... 70 °C (Single device)<br>-20 °C ... 60 °C (Group assembly)                                     |
| Ambient temperature °F        | -4 °F ... +158 °F (Single device)<br>-4 °F ... +140 °F (Group assembly)                                   |
| Note                          | The installation conditions affect the ambient temperature.<br>Observe the "Cabinet installation guide".  |
| Storage temperature °C        | -40 °C ... 80 °C  |
| Storage temperature °F        | -40 °F ... +176 °F  |
| Max. relative humidity        | 95%   |
| Use at the height of          | $< 2000$ m  |
| Max. operating altitude       | 2000 m  |
| Electromagnetic compatibility | Tested to the following standards and regulations: EN 61326-1 For use in industrial areas;<br>NAMUR NE 21 |

# Isolator Barriers

Transmitter supply unit

Ex i field circuit

9160/23-11-11s Art. No. 220322



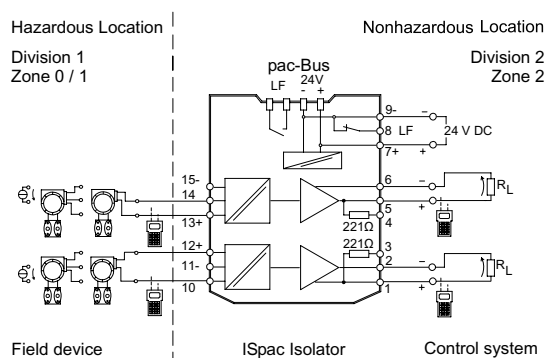
## Mechanical Data

|                                       |  |
|---------------------------------------|--|
| Degree of protection (IP)             | IP30   |
| Degree of protection (IP) terminals   | IP20   |
| Fire resistance (UL 94)               | V0   |
| Enclosure material                    | Polyamide  |
| Min. rigid conductor cross section    | 0.2 mm <sup>2</sup>  |
| Max. rigid conductor cross section    | 2.5 mm <sup>2</sup>  |
| Min. flexible conductor cross section | 0.2 mm <sup>2</sup>  |
| Max. flexible conductor cross section | 2.5 mm <sup>2</sup>  |
| Connection cross-section              | 0.2 to 2.5 mm <sup>2</sup> flexible<br>0.25 to 2.5 mm <sup>2</sup> flexible with core end sleeve |
| Width                                 | 17.6 mm  |
| Width, inches                         | 0.69 in  |
| Height                                | 114.5 mm   |
| Height in inches                      | 4.51 in  |
| Length                                | 108 mm   |
| Length in inches                      | 4.25 in  |
| Weight                                | 200 g  |
| Weight                                | 0.44 lb  |

## Mounting / Installation

|                              |                            |
|------------------------------|----------------------------|
| Mounting type                | DIN rail NS35/15, NS35/7.5 |
| Grid dimension               | 17.6 mm                    |
| Mounting orientation         | Vertical<br>Horizontal     |
| Connection type              | Screw terminal             |
| Connection cross-section AWG | 24 ... 14                  |

## Technical Drawings – Subject to Alterations



Connection diagram 9160/23-11-11

# Isolator Barriers

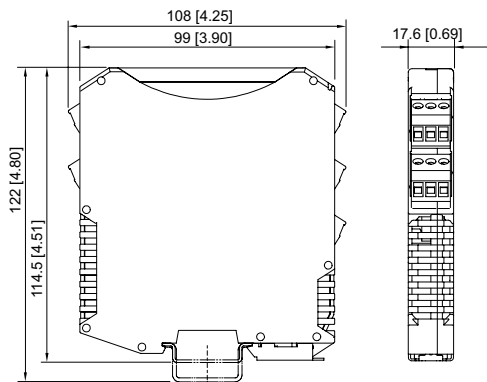
Transmitter supply unit

Ex i field circuit

9160/23-11-11s Art. No. 220322



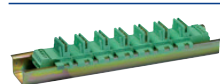
## Dimensional Drawings (All Dimensions in mm [inches]) – Subject to Alterations



ISpac Series 9143, 9146, 9147, 9160, 9162, 9163, 9165, 9167, 9170, 9172, 9175, 9176, 9180, 9182, 9193, ISbus Series 9412 with screw terminal

## Accessories

### pac-Bus

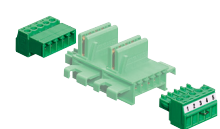


Wiring auxiliary power and collective error message

Art. No.

160731

### Terminal set for pac-Bus



For the supply of 24 V DC auxiliary power via terminals (alternative to using the supply module 9193/21-11-11), with jumper for error message chain for ISpac module 91xx

Art. No.

160730

## Spare Parts

### Screw terminal



3-pole plug, screw connector  
thread: M3  
stripping length: 7 mm  
color: green

Art. No.

112817



3-pole plug, screw connector  
thread: M3  
stripping length: 7 mm  
color: black

Art. No.

112816



3-pole plug, screw connector  
thread: M3  
stripping length: 7 mm  
color: blue

Art. No.

112818

### Spring clamp terminal



3-pole plug with test tap, spring clamp connection  
stripping length: 10 mm  
color: green

Art. No.

112825

# Isolator Barriers

Transmitter supply unit

Ex i field circuit

9160/23-11-11s Art. No. 220322



## Spring clamp terminal

## Art. No.



3-pole plug with test tap, spring clamp connection  
stripping length: 10 mm  
color: black

112824



3-pole plug with test tap, spring clamp connection  
stripping length: 10 mm  
color: blue

112826

We reserve the right to make alterations to the technical data, dimensions, weights, designs and products available without notice. The illustrations cannot be considered binding.