

# Isolators

## Frequency transmitter

Ex i field circuit

9146/10-11-12k Art. No. 159884



- Compact Ex i frequency transmitter for monitoring speed in hazardous areas
- Offers a variant combining limiting value evaluation + frequency to current conversion + pulse divider function with a width of just 17.6 mm
- Simple parameterisation using "ISpac Wizard" software

MY R. STAHL 9146A



Series 9146 Ex i frequency transmitters monitor the speed of rotating parts on one or two channels, e.g. the speed of fans or centrifuges. The frequency measured at the intrinsically safe input (between 0.001 and 20 kHz) is issued as a unit signal from 0/4 to 20 mA or processed by a frequency divider. In one-channel devices, these frequency transmitters check whether speeds have exceeded or fallen below the limiting values.

### Technical Data

#### Explosion Protection

|                                 |   |
|---------------------------------|---|
| Application range (zones)       | 2   |
| Ex interface zone               | 0<br>1<br>2<br>20<br>21<br>22   |
| IECEX gas certificate           | IECEX BVS 13.0095 X   |
| IECEX gas explosion protection  | Ex ec nC [ia Ga] IIC T4 Gc  |
| IECEX dust certificate          | IECEX BVS 13.0095 X   |
| IECEX dust explosion protection | [Ex ia Da] IIIC   |
| IECEX firedamp certificate      | IECEX BVS 13.0095 X   |
| IECEX firedamp protection       | [Ex ia Ma] I  |
| ATEX gas certificate            | BVS 05 ATEX E 0171 X  |
| ATEX gas explosion protection   | ⊕ II 3 (1) G Ex ec nC [ia Ga] IIC T4 Gc   |
| ATEX dust certificate           | BVS 05 ATEX E 0171 X  |
| ATEX dust explosion protection  | ⊕ II (1) D [Ex ia Da] IIIC  |
| ATEX firedamp certificate       | BVS 05 ATEX E 0171 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, AEx/Ex 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 ia]/[Ex ia] IIC<br>T4 at Ta = 70°C<br>See Doc. 9146 6 031 001 1 |
| Certificates                    | ATEX (BVS), Canada (FM), IECEX (BVS), India (PESO), USA (FM)  |

#### Explosion Protection

|                           |                     |
|---------------------------|---------------------|
| Ship approval             | CCS, EU RO MR (DNV) |
| Declaration of Conformity | ATEX (EUK)          |

#### Safety Data

|  |   |
|--|---|
| Max. voltage $U_o$   | 10.5 V  |
| Max. current $I_o$   | 23.4 mA   |
| Max. power $P_o$   | 61.4 mW   |
| Max. permissible external capacity $C_o$ for I                         | 95 $\mu$ F  |
| Max. permissible external inductance $L_o$ for I                       | 600 mH  |
| Max. permissible external capacity $C_o$ for IIC                       | 2.41 $\mu$ F  |
| Max. permissible external capacity $C_o$ for IIB                       | 16.8 $\mu$ F  |
| Max. permissible external capa.IIA                                     | 75 $\mu$ F  |
| Max. permissible external inductance $L_o$ for IIC                     | 63 mH   |
| Max. permissible external inductance $L_o$ for IIB                     | 230 mH  |
| Max. permissible external inductance $L_o$ for IIA                     | 450 mH  |
| Internal capacitance   | Negligible  |
| Internal inductance  | Negligible  |
| Safety-related max. voltage  | 253 V   |
| Intrinsically safe limiting values inductance $L_o$ /capacitance $C_o$ | Jointly connectable inductance $L_o$ /capacitance $C_o$ . |

|      |                  |  |  |  |  |
|------|------------------|--|--|--|--|
| IIC  | $L_o$ [mH]       |  |  |  |  |
|      | $C_o$ [ $\mu$ F] |  |  |  |  |
| IIB  | $L_o$ [mH]       |  |  |  |  |
|      | $C_o$ [ $\mu$ F] |  |  |  |  |
| IIA  | $L_o$ [mH]       |  |  |  |  |
|      | $C_o$ [ $\mu$ F] |  |  |  |  |
| IIIC | $L_o$ [mH]       |  |  |  |  |
|      | $C_o$ [ $\mu$ F] |  |  |  |  |
| I    | $L_o$ [mH]       |  |  |  |  |
|      | $C_o$ [ $\mu$ F] |  |  |  |  |

#### Electrical Data

|                    |                                    |
|--------------------|------------------------------------|
| Number of channels | 1                                  |
| LFD relay          | Yes                                |
| Parameterisation   | With parameterising set 9199/20-02 |

#### Auxiliary Power

|                               |                   |
|-------------------------------|-------------------|
| Auxiliary power               | 24 V DC           |
| Auxiliary power voltage range | 18 to 31.2 V      |
| Voltage range residual ripple | $\leq 3,6 V_{SS}$ |
| Nominal current               | 55 mA             |
| Power consumption             | 1.32 W            |

#### Auxiliary Power

|                              |                 |
|------------------------------|-----------------|
| Max. power dissipation       | 1.1 W           |
| Polarity reversal protection | Yes             |
| Undervoltage monitoring      | Yes             |
| Operation indication         | Green "PWR" LED |

#### Galvanic Isolation

|  |                 |
|--|-----------------|
| Test voltage as per standard             | IEC EN 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       |
| Test voltage as per standard             | EN 50178        |
| Output to auxiliary power                | 350 V AC        |
| Output to output                         | 350 V AC        |
| Fault message contact to auxiliary power | 350 V AC        |
| Fault message contact to output          | 350 V AC        |

#### Input

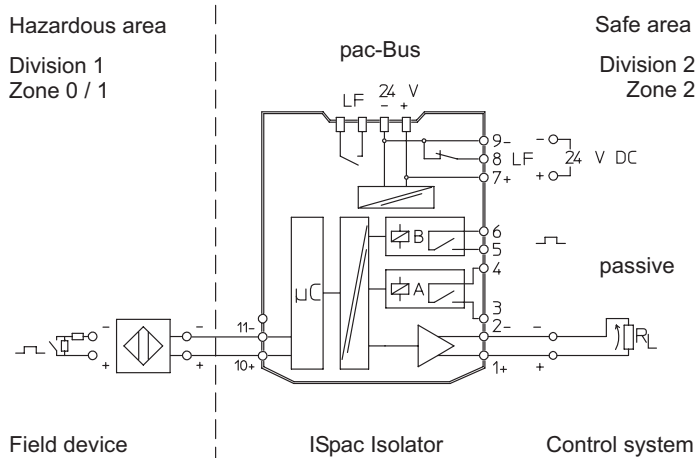
|  |   |
|--|---|
| Input signal                               | As per EN 60947-5-6 (NAMUR)   |
| Input current for ON                       | $\geq 2.1$ mA   |
| Input current for OFF                      | $\leq 1.2$ mA   |
| Hysteresis                                 | Approx. 0.2 mA  |
| Input internal resistance $R_i$            | 1000 $\Omega$   |
| Input for open-circuit voltage $U_a$       | 8,5 V   |
| Short-circuit current                      | $\leq 8.5$ mA   |
| Input frequency                            | 0.0010 – 20000 Hz   |
| Input for centre resolution note           | < 0.1 % of measuring range  |
| Line fault and loss of power signalisation | - Contact (30 V/100 mA), closed against earth in case of error<br>- pac-Bus, potential-free contact (30 V/100 mA) |

#### Output

|                                   |  |
|-----------------------------------|--|
| Output per channel                | 0/4 to 20 mA   |
| Output signal                     | 0/4 to 20 mA   |
| Function range output             | 0 – 20.5 mA  |
| Min. output current               | 0 mA   |
| Max. output current               | 20.5 mA  |
| Max. load resistance $R_L$        | 600 $\Omega$   |
| Average measurement fault         | $\leq 0,1\%$   |
| Temperature influence             | $\leq 0,05\%$ / 10 K                                 |
| Operating modes                   | Counter, period measurement, variable gate time      |
| Limit contact (per channel)       | 2 NO/NC  |
| Switching voltage limiting values | $\leq \pm 30$ V                                      |
| Switching current limiting values | $\leq \pm 50$ mA                                     |
| Switch-on resistance              | $\leq 12.5$ ohm (typical < 9.5 ohm)                  |
| Anti-pumping device               | Reset using DIP switch or "Power Off" (configurable) |
| Switching state indication        | Yellow "OUT" LED disconnection                       |
| Start override                    | OFF/1 to 999 seconds                                 |
| Pulse output                      | One configurable NO                                  |
| Pulse OUT frequency range         | 0 ... 5 kHz  |

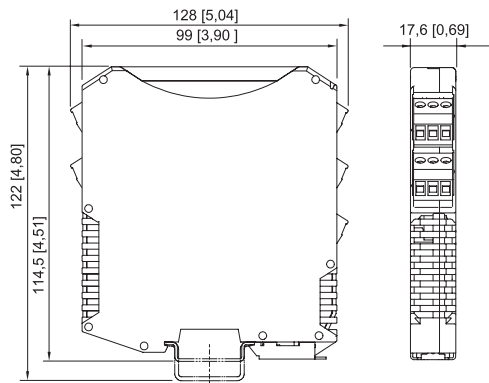
| <b>Output</b>                            |   |
|--|---|
| IN / OUT splitting ratio                 | 1:1 ... 1:20000   |
| Pulse output note                        | If the "Pulse output" function is activated, the forwarding of a pulsed signal at the input is activated at output "B" (see connection diagram) |
| Fault message contact switching capacity | 30 V / 100 mA   |
| LF switch user adjustment                | Activated/deactivated   |
| Indication of line fault                 | Red "LF" LED  |
| Wire breakage error detection            | $I_E < 0.05$ to $0.35$ mA   |
| Short circuit error detection            | $R_E < 100$ to $360$ ohm  |
| Behaviour of the output                  | Configurable, factory setting   |
| Behaviour of the output note             | Short circuit: 3.8 mA, line breakage: 20.5 mA   |
| <b>Ambient Conditions</b>                |   |
| Ambient temperature                      | -40 °C ... +70 °C (Single device)<br>-40 °C ... +60 °C (Group assembly)   |
| Ambient temperature                      | -40 °F ... +158 °F (Single device)<br>-40 °F ... +140 °F (Group assembly)   |
| Storage temperature                      | -40 °C ... +80 °C   |
| Storage temperature                      | -40 °F ... +176 °F  |
| Maximum relative humidity                | 95%   |
| Use at the height of                     | < 2000 m  |
| Electromagnetic compatibility            | Tested to the following standards and regulations: EN 61326-1 For use in industrial areas; NAMUR NE 21  |
| <b>Mechanical Data</b>                   |   |
| Degree of protection (IP)                | IP30  |
| Degree of protection (IP) terminals      | IP20  |
| Fire resistance (UL 94)                  | V0  |
| Enclosure material                       | Polyamide   |
| Grid dimension                           | 17.6 mm   |
| Width                                    | 17.6 mm   |
| Width, inches                            | 0.69 in   |
| Height                                   | 114.5 mm  |
| Height, inches                           | 4.51 in   |
| Length                                   | 128 mm  |
| Length, inches                           | 5.04 in   |
| Weight                                   | 125 g   |
| Weight                                   | 0.28 lb   |
| <b>Mounting / Installation</b>           |   |
| Mounting type                            | DIN rail NS35/15, NS35/7.5  |
| Mounting orientation                     | Vertical<br>Horizontal  |
| Connection type                          | Spring clamp terminal   |
| Min. rigid conductor cross section       | 0.2 mm <sup>2</sup>   |
| Max. rigid conductor cross section       | 2.5 mm <sup>2</sup>   |
| Min. flex conductor cross section        | 0.2 mm <sup>2</sup>   |
| Max. flex conductor cross section        | 2.5 mm <sup>2</sup>   |
| Connection cross-section AWG             | 24 – 14   |

#### Technical Drawings – Subject to Alterations



Connection diagram 9146/10-11-12

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



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

## Accessories

### 9146 Parameterisation



Parameterisation ex works optionally available for all variants.

**Art. No.**

270534

### ISpac Wizard parameterising set



The software is used to commission, configure and diagnose Series 9146, 9162 and 9182 ISpac isolators.  
For further information, see the operating instructions.  
Delivery form: USB stick; parameterising software incl. parameterising cable/adaptor  
System requirements:  
IBM-compatible PC with MS XP, Vista, Windows 7, 10  
RS 232 C interface  
RS 232/USB adaptor

**Art. No.**

202595

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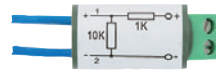
## Resistive coupling element

Art. No.



The 0/4 to 20 mA signal of channel 1 is converted to a 0/2 to 10 V signal. The resistive coupling element replaces the existing connection terminal. (Set with 5 pieces)

273968



Additional connection of contacts also in hazardous areas to enable short-circuit and wire breakage detection

105944

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.