Transmitter Supply Unit
Field Circuit Ex i
Series 9160

09745E00

- Intrinsically safe input [Ex ia] IIC
- Galvanic isolation between input, output and power supply
- Open-circuit and short-circuit monitoring and messaging for input and output (can be switched off)
- For use up to SIL 2 (IEC 61508)

A3

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Basic function: analogue input 0/4 mA ... 20 mA, 1 and 2 channels.
Transmitter supply units are used for intrinsically safe operation or 2- and 3-wires transmitters or for connection to intrinsically safe mA sources.
2- and 3-wires transmitters are supplied with power via transmitter supply unit.
In 2-wires transmitters the devices transmit HART communication signal bidirectionally.

	ATEX / IECEx / GOST					
Zone	0	1	2	20	21	22
Ex i interface	x	x	x	x	x	x
Installation in			x*)			x*)

	NEC 505 Class I			NEC 506		
Zone	0	1	2	20	21	22
Ex i interface	x	x	x			
Installation in			x*)			x*)

	NEC 500					
	Class I		Class II		Class III	
Division	1	2	1	2	1	2
Ex i interface	x	x	x	x	x	x
Installation in		x*)		x*)		x*)

*) For restrictions, see explosion protection table

WebCode 9160A

Selection Table

Output version (control)	Channels	Input	Output A	Output B	LFD*	Order number	Tech. data see page
0/4 ... 20 mA active / source with HART	1	0/4 ... 20 mA	0/4 ... 20 mA	– –	no	**9160/13-11-10s**	A3/3
				– –	yes	**9160/13-11-11s**	A3/6
				0/4 ... 20 mA (without HART)	no	**9160/19-11-10s**	A3/3
			0/4 ... 20 mA	0/4 ... 20 mA (without HART)	yes	**9160/19-11-11s**	A3/6
	2	0/4 ... 20 mA	0/4 ... 20 mA	0/4 ... 20 mA	no	**9160/23-11-10s**	A3/3
					yes	**9160/23-11-11s**	A3/6
0/4 ... 20 mA passive / sink with HART	1	0/4 ... 20 mA	passive	– –	yes	**9160/13-10-11s**	A3/9
				passive (without HART)	yes	**9160/19-10-11s**	A3/9
	2	0/4 ... 20 mA	passive	passive	yes	**9160/23-10-11s**	A3/9
Note	The order numbers listed in the table are for transducers equipped with screw terminals. For transducers equipped with spring clamp terminals, replace the ending "s" for screw terminals with "k" for spring clamp terminals.						
	* LFD - line fault diagnosis Device transmits line fault on the field side via the 4 ... 20 mA signal. Without LED / relay contact.						

Explosion Protection	
Europe (ATEX)	
Gas and dust	DMT 03 ATEX E 010 X ⟨Ex⟩ II 3 (1) G Ex nA nC [ia] IIC T4 ⟨Ex⟩ II (1) D [Ex iaD]
Certificates and approvals	
Certificates	ATEX, Serbia (SRPS), Belarus (GOST-B)
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. connectable capacitance C_o / C_a	
IIC	90 nF
IIB	705 nF
Max. connectable inductance L_o / L_a	
IIC	2.3 mH
IIB	14 mH
internal capacitance C_i	negligible
internal inductance L_i	negligible
Rated insulation voltage U_m	253 V
When connecting a current source	
Max. output voltage U_o / V_{oc}	4.1 V
Max. connectable voltage U_i / V_{max}	30 V
Max. connectable current I_i / I_{max}	100 mA
Inner capacitance C_i	negligible
Inner Inductance L_i	negligible
Further parameters	
Installation	in Zone 2 and in the safe area
Further information	see respective certifcate and operating instructions
Functional safety (IEC 61508)	
Test report	Exida Stahl 05/08-34-R008
Max. SIL	2
Safe Failure Fraction SFF	73 %
MTBF	250 years
PFD_{AVG} at $T_{[Proof]}$	T[Proof] 1 year 5 years 10 years PFD_{AVG} 4.46 x 10^{-4} 2.23 x 10^{-4} 4.45 x 10^{-3}
Further information	see test report

Technical Data	
Electrical data	
Auxiliary power	
Nominal voltage U_N	24 V DC
Voltage range	18 ... 31.2 V
Residual ripple	≤ 3.6 V_{SS}
Nominal current at U_N, 20 mA	
1 channel	70 mA
2 channels	125 mA
Power consumption at U_N, 20 mA	
1 channel	1.7 W
2 channels	3 W
Power dissipation at U_N, R_L = 250 Ω	
1 channel	1.3 W
2 channels	2.2 W
Reverse polarity protection	yes
Operation indication	LED green "PWR"
Undervoltage monitoring	yes (no faulty module / output states)
Galvanic isolation	
Test voltages	
Acc. to standard	EN 60079-11
Ex i / I.S. input to output	1.5 kV AC
Ex i / I.S. input to power supply	1.5 kV AC
Ex i / I.S. input to error contact	1.5 kV AC
Ex i / I.S. inputs to each other	500 V AC
Acc. to standard	EN 50178
Output to auxiliary power	350 V AC
Outputs interconnected	350 V AC
Error contact to power supply and outputs	350 V AC

Technical Data

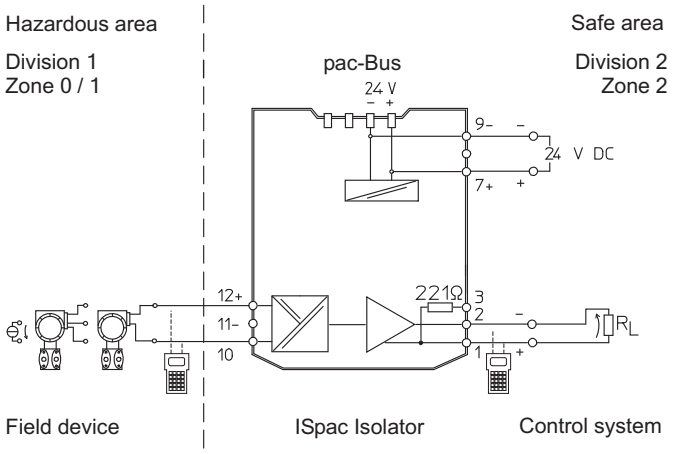
Electrical data			
Ex i / I.S. input			
Input signal	0/4 ... 20 mA with HART		
Functional range	0 ... 24 mA		
Max. input current for mA-sources	50 mA		
Supply voltage for transmitters	≥ 16 V at 20 mA		
Supply voltage residual ripple	≤ 25 mV_{eff}		
No-load voltage	≤ 26 V		
Short-circuit current	≤ 35 mA		
Input resistance (AC-Impedance HART)	≈ 500		
Input resistance for mA sources	30 Ω		
Communication signal	bi-directional HART transmission, 0.5 ... 10 kHz (at 2-wire transformer)		
Output			
Output signal	with 9160/.3-11-10		0/4 ... 20 mA with HART
	with 9160/19-11-10	output A	0/4 ... 20 mA with HART
		output B	0/4 ... 20 mA without HART
Load resistance R_L	0 ... 600 Ω (terminal 1+ / 2- or 5+ / 6-) 0 ... 379 Ω (terminal 3+ / 2-) (with internal 221 Ω resistor for HART)		
Residual ripple	≤40 μA_{eff}		
No-load voltage	≤ 15.5 V		
Communication signal	bi-directional HART transmission, 0.5 ... 30 kHz (with 9160/19, only for output A)		
Response time (10 ... 90 %)	≤25 ms		
Fault detection Ex i / I.S. input			
Behaviour of the output	= Input signal		
Fault detection output			
Open-circuit	< 2 mA		
Fault limits			
	Accuracy, typical data expressed as % of calibrated span at U_N, 23 °C		
Linearity error	≤ 0.1 %		
Offset error	≤ 0.1 %		
Temperature effect	≤ 0.1 % / 10 K		
Power supply effect within voltage range	≤ 0.01 %		
effect load resistance	≤ 0.02 %		
Cross-talk channel 1 / channel 2	≤ 0.01 %		
Electromagnetic compatibility	Tested under the following standards and regulations: EN 61326-1 Use in industrial environment		
Ambient conditions			
Ambient temperature			
Single device	-20 ... +70 °C / -4 ... +158 °F		
Group assembly	-20 ... +60 °C / -4 ... +140 °F The installation conditions affect the ambient temperature. Observe operating instructions		
Storage temperature	-40 ... +80 °C / -40 ... +176 °F		
Relative humidity (no condensation)	≤ 95 %		

Technical Data

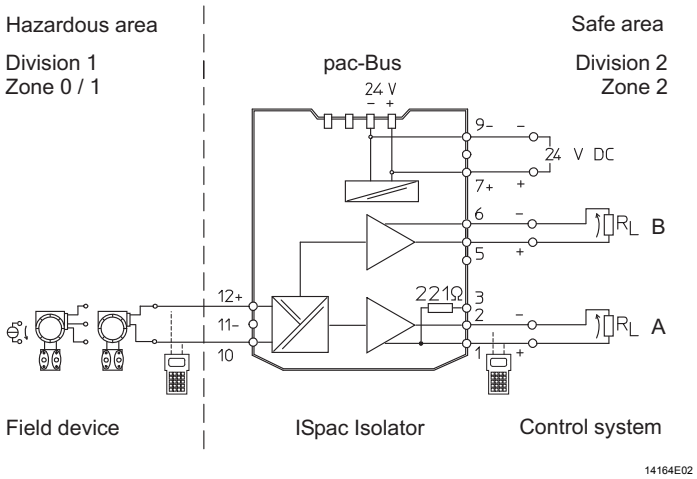
Electrical connection

Connection diagram

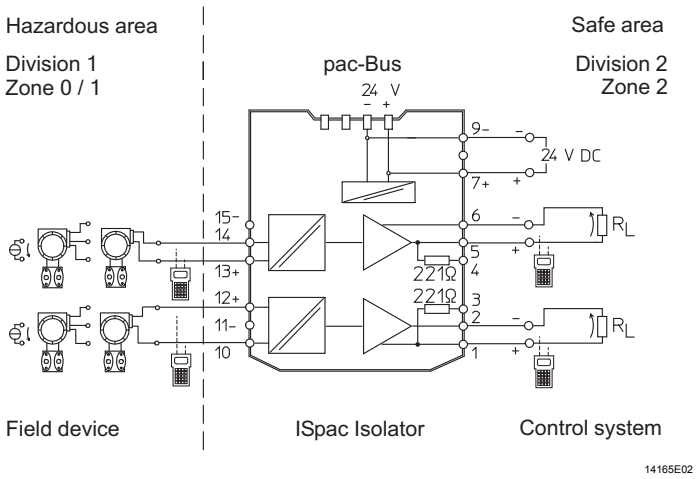
1 channel, output: active / source **9160/13-11-10.**



1 channel, output A: active / source, output B: active (without Hart) **9160/19-11-10.**



2 channels, outputs: active / source **9160/23-11-10.**



Explosion Protection	
Global (IECEx)	
Gas and dust	IECEx BVS 08.0050X Ex nA nC [ia Ga] IIC T4 Gc [Ex ia Da] IIIC
Europe (ATEX)	
Gas and dust	DMT 03 ATEX E 010 X ⟨Ex⟩ II 3 (1) G Ex nA nC [ia] IIC T4 ⟨Ex⟩ II (1) D [Ex iaD]
USA (NEC)	
Gas and dust	3017145 (FM) CL. I, DIV. 2, GP. A,B,C,D AIS CL. I, Zone 2, GP. IIC CL. I, II, II, DIV. 1, GP. A,B,C,D,E,F,G CL. I, ZONE 0 [AEx ia] IIC, T4 MOUNTING VERTICAL Ta = 70 °C OR HORIZONTAL TA = 60 °C E81680 (UL) CL. I, GR ABCD CL II EFG CL III MOUNTING VERTICAL Ta = 70 °C OR HORIZONTAL Ta = 60 °C
Russia (Gost-R)	
Gas	2 Ex nA nC [ia] IIC T4
Certificates and approvals	
Certificates	IECEx, ATEX, Brazil (INMETRO), Canada (CSA), Kazakhstan (GOST-K), Korea (KTL) only for 9160/13-11-11, Russia (GOST-R), Serbia (SRPS), Ukraine (GOST-U), USA (FM, UL), Belarus (GOST-B)
Other approvals	ship approval (DNV)
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. connectable capacitance C_o / C_a	
IIC	90 nF
IIB	705 nF
Max. connectable inductance L_o / L_a	
IIC	2.3 mH
IIB	14 mH
internal capacitance C_i	negligible
internal inductance L_i	negligible
Rated insulation voltage U_m	253 V
When connecting a current source	
Max. output voltage U_o / V_{oc}	4.1 V
Max. connectable voltage U_i / V_{max}	30 V
Max. connectable current I_i / I_{max}	100 mA
Inner capacitance C_i	negligible
Inner Inductance L_i	negligible
Further parameters	
Installation	in Zone 2, Div. 2 and in the safe area
Further information	see respective certifcate and operating instructions
Functional safety (IEC 61508)	
Test report	Exida Stahl 05/08-34-R008
Max. SIL	2
Safe Failure Fraction SFF	73 %
MTBF	250 years
PFD_{AVG} at $T_{[Proof]}$	T[Proof] 1 year 5 years 10 years PFD_{AVG} 4.46×10^{-4} 2.23×10^{-4} 4.45×10^{-3}
Further information	see test report

Technical Data	
Electrical data	
Auxiliary power	
Nominal voltage U_N	24 V DC
Voltage range	18 ... 31.2 V
Residual ripple	≤ 3.6 V_{SS}
Nominal current at U_N, 20 mA	
1 channel	70 mA
2 channels	125 mA
Power consumption at U_N, 20 mA	
1 channel	1.7 W
2 channels	3 W

Technical Data

Electrical data

Auxiliary power			
Power dissipation at U_N, R_L = 250 Ω			
1 channel	1.3 W		
2 channels	2.2 W		
Reverse polarity protection	yes		
Operation indication	LED green "PWR"		
Undervoltage monitoring	yes (no faulty module / output states)		
Galvanic isolation			
Test voltages			
Acc. to standard	EN 60079-11		
Ex i / I.S. input to output	1.5 kV AC		
Ex i / I.S. input to power supply	1.5 kV AC		
Ex i / I.S. input to error contact	1.5 kV AC		
Ex i / I.S. inputs to each other	500 V AC		
Acc. to standard	EN 50178		
Output to auxiliary power	350 V AC		
Outputs interconnected	350 V AC		
Error contact to power supply and outputs	350 V AC		
Ex i / I.S. input			
Input signal	0/4 ... 20 mA with HART		
Functional range	0 ... 24 mA		
Max. input current for mA-sources	50 mA		
Supply voltage for transmitters	≥ 16 V at 20 mA		
Supply voltage residual ripple	≤ 25 mV_{eff}		
No-load voltage	≤ 26 V		
Short-circuit current	≤ 35 mA		
Input resistance (AC-Impedance HART)	≈ 500 Ω		
Input resistance for mA sources	30 Ω		
Communication signal	bi-directional HART transmission, 0.5 ... 10 kHz (at 2-wire transformer)		
Output			
Output signal	with 9160/x3-11-11		0/4 ... 20 mA with HART
	with 9160/19-11-11	output A	0/4 ... 20 mA with HART
		output B	0/4 ... 20 mA without HART
Load resistance R_L	0 ... 600 Ω (terminal 1+ / 2- or 5+ / 6-) 0 ... 379 Ω (terminal 3+ / 2- or 4+ / 6-) (with internal 221 Ω resistor for HART)		
Residual ripple	≤40 μA_{eff}		
No-load voltage	≤ 15.5 V		
Communication signal	bi-directional HART transmission, 0.5 ... 30 kHz (with 9160/19, only for output A)		
Response time (10 ... 90 %)	≤25 ms		
Fault detection Ex i / I.S. input			
Open circuit	< 2 mA		
Short circuit	> 22 mA		
Behaviour of the output	= Input signal		
Output current at I_E = 0	I_A = 0 mA		
Fault detection output			
Open-circuit	< 2 mA		
Fault message Ex i input/output			
Settings (switch LF)	activated / deactivated		
Indication of faulty line	LED red „LF“ per channel		
Message faulty line and power supply failure	- Contact (30 V / 100 mA) closed to ground in case of fault - pac-Bus, floating contact (30 V / 100 mA)		
Fault limits			
	Accuracy, typical data expressed as % of calibrated span at U_N, 23 °C		
Linearity error	≤ 0.1 %		
Offset error	≤ 0.1 %		
Temperature effect	≤ 0.1 % / 10 K		
Power supply effect within voltage range	≤ 0.01 %		
effect load resistance	≤ 0.02 %		
Cross-talk channel 1 / channel 2	≤ 0.01 %		
Electromagnetic compatibility	Tested under the following standards and regulations: EN 61326-1 Use in industrial environment		

Technical Data

Ambient conditions

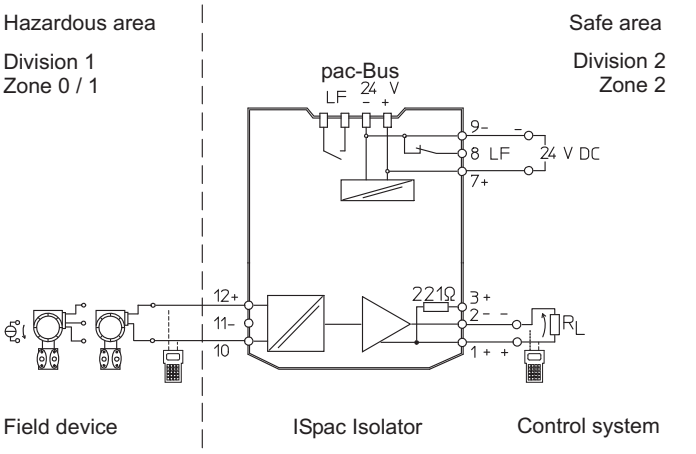
Ambient temperature	
Single device	-20 ... +70 °C / -4 ... +158 °F
Group assembly	-20 ... +60 °C / -4 ... +140 °F The installation conditions affect the ambient temperature. Observe operating instructions
Storage temperature	-40 ... +80 °C / -40 ... +176 °F
Relative humidity (no condensation)	≤ 95 %

Technical Data

Electrical connection

Connection diagram

1 channel, output: active / source **9160/13-11-11.**



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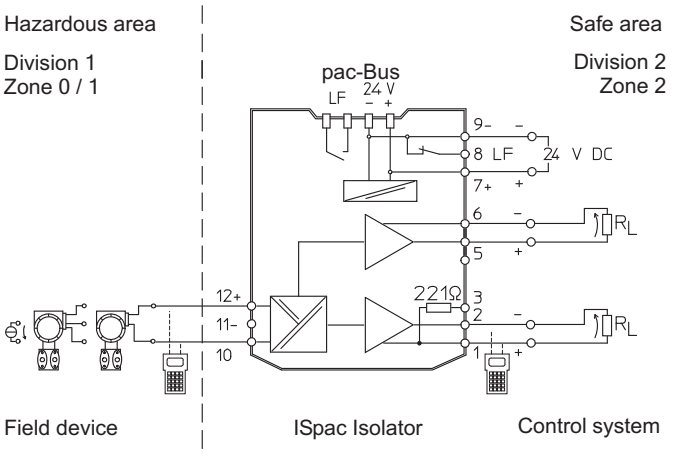
1 channel, output A: active / source, output B: active (without HART) **9160/19-11-11.**



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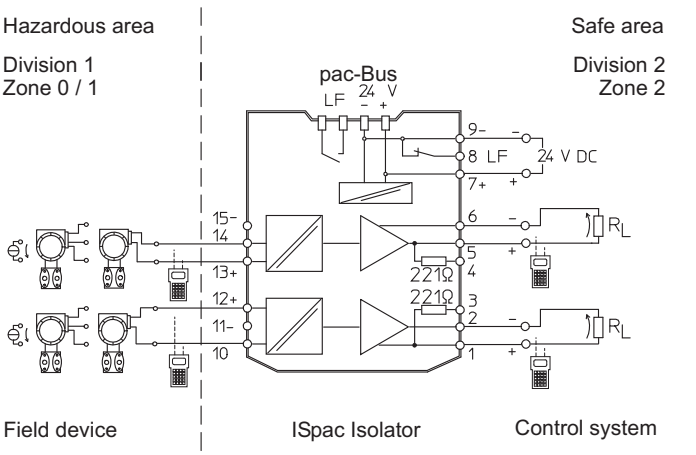
2 channels, outputs: active / source **9160/23-11-11.**



06471E02

Explosion Protection	
Global (IECEx)	
Gas and dust	IECEx BVS 08.0050X Ex nA nC [ia Ga] IIC T4 Gc [Ex ia Da] IIIC
Europe (ATEX)	
Gas and dust	DMT 03 ATEX E 010 X ⟨Ex⟩ II 3 (1) G Ex nA nC [ia] IIC T4 ⟨Ex⟩ II (1) D [Ex iaD]
USA (NEC)	
Gas and dust	3017145 (FM) CL. I, DIV. 2, GP. A,B,C,D AIS CL. I, Zone 2, GP. IIC CL. I, II, II, DIV. 1, GP. A,B,C,D,E,F,G CL. I, ZONE 0 [AEx ia] IIC, T4 MOUNTING VERTICAL Ta = 70 °C OR HORIZONTAL TA = 60 °C E81680 (UL) CL. I, GR ABCD CL II EFG CL III MOUNTING VERTICAL Ta = 70 °C OR HORIZONTAL Ta = 60 °C
Russia (Gost-R)	
Gas	2 Ex nA nC [ia] IIC T4
Certificates and approvals	
Certificates	IECEx, ATEX, Brazil (INMETRO), Canada (CSA), Kazakhstan (GOST-K), Russia (GOST-R), Serbia (SRPS), Ukraine (GOST-U), USA (FM, UL), Belarus (GOST-B)
Other approvals	ship approval (DNV)
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. connectable capacitance C_o / C_a	
IIC	90 nF
IIB	705 nF
Max. connectable inductance L_o / L_a	
IIC	2.3 mH
IIB	14 mH
internal capacitance C_i	negligible
internal inductance L_i	negligible
Rated insulation voltage U_m	253 V
When connecting a current source	
Max. output voltage U_o / V_{oc}	4.1 V
Max. connectable voltage U_i / V_{max}	30 V
Max. connectable current I_i / I_{max}	100 mA
Inner capacitance C_i	negligible
Inner Inductance L_i	negligible
Further parameters	
Installation	in Zone 2, Div. 2 and in the safe area
Further information	see respective certifcate and operating instructions
Functional safety (IEC 61508)	
Test report	Exida Stahl 05/08-34-R008
Max. SIL	2
Safe Failure Fraction SFF	73 %
MTBF	250 years
PFD_{AVG} at $T_{[Proof]}$	T[Proof] 1 year 5 years 10 years PFD_{AVG} 4.46×10^{-4} 2.23×10^{-4} 4.45×10^{-3}
Further information	see test report

Technical Data	
Electrical data	
Auxiliary power	
Nominal voltage U_N	24 V DC
Voltage range	18 ... 31.2 V
Residual ripple	≤ 3.6 V_{SS}
Nominal current at U_N, 20 mA	
1 channel	70 mA
2 channels	125 mA
Power consumption at U_N, 20 mA	
1 channel	1.7 W
2 channels	3 W

Technical Data

Electrical data

Auxiliary power			
Power dissipation at U_N, R_L = 250 Ω			
1 channel	1.3 W		
2 channels	2.2 W		
Reverse polarity protection	yes		
Operation indication	LED green "PWR"		
Undervoltage monitoring	yes (no faulty module / output states)		
Galvanic isolation			
Test voltages			
Acc. to standard	EN 60079-11		
Ex i / I.S. input to output	1.5 kV AC		
Ex i / I.S. input to power supply	1.5 kV AC		
Ex i / I.S. input to error contact	1.5 kV AC		
Ex i / I.S. inputs to each other	500 V AC		
Acc. to standard	EN 50178		
Output to auxiliary power	350 V AC		
Outputs interconnected	350 V AC		
Error contact to power supply and outputs	350 V AC		
Ex i / I.S. input			
Input signal	0/4 ... 20 mA with HART		
Functional range	0 ... 24 mA		
Max. input current for mA-sources	50 mA		
Supply voltage for transmitters	≥ 16 V at 20 mA		
Supply voltage residual ripple	≤ 25 mV_{eff}		
No-load voltage	≤ 26 V		
Short-circuit current	≤ 35 mA		
Input resistance (AC-Impedance HART)	≈ 500 Ω		
Input resistance for mA sources	30 Ω		
Communication signal	bi-directional HART transmission, 0.5 ... 10 kHz (at 2-wire transformer)		
Output			
Output signal	with 9160/x3-10-11		current sink, max. 30 V with HART
	with 9160/19-10-11	output A	current sink, max. 30 V with HART
		output B	current sink, max. 30 V without HART
Minimum load resistance R_L	0 Ω for 5 ... 15 V 500 Ω for 24 V 800 Ω for 30 V		
Residual ripple	≤ 40 μA_{eff}		
No-load voltage	≤ 15.5 V		
Communication signal	bi-directional HART transmission, 0.5 ... 30 kHz (with 9160/19, only for output A)		
Response time (10 ... 90 %)	≤25 ms		
Fault detection Ex i / I.S. input			
Open circuit	< 2 mA		
Short circuit	> 22 mA		
Behaviour of the output	= Input signal		
Output current at I_E = 0	I_A = 0mA		
Fault detection output			
Open-circuit	< 2 mA		
Fault message Ex i input/output			
Settings (switch LF)	activated / deactivated		
Indication of faulty line	LED red „LF“ per channel		
Message faulty line and power supply failure	- Contact (30 V / 100 mA) closed to ground in case of fault - pac-Bus, floating contact (30 V / 100 mA)		
Fault limits			
	Accuracy, typical data expressed as % of calibrated span at U_N, 23 °C		
Linearity error	≤ 0.1 %		
Offset error	≤ 0.1 %		
Temperature effect	≤ 0.1 % / 10 K		
Power supply effect within voltage range	≤ 0.01 %		
effect load resistance	≤ 0.02 %		
Cross-talk channel 1 / channel 2	≤ 0.01 %		
Electromagnetic compatibility	Tested under the following standards and regulations: EN 61326-1 Use in industrial environment		

Technical Data

Ambient conditions

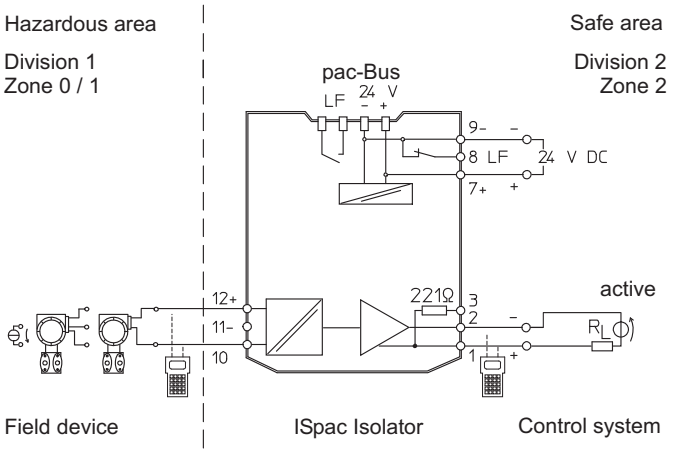
Ambient temperature	
Single device	-20 ... +70 °C / -4 ... +158 °F
Group assembly	-20 ... +60 °C / -4 ... +140 °F
	The installation conditions affect the ambient temperature.
	Observe operating instructions
Storage temperature	-40 ... +80 °C / -40 ... +176 °F
Relative humidity (no condensation)	≤ 95 %

Technical Data

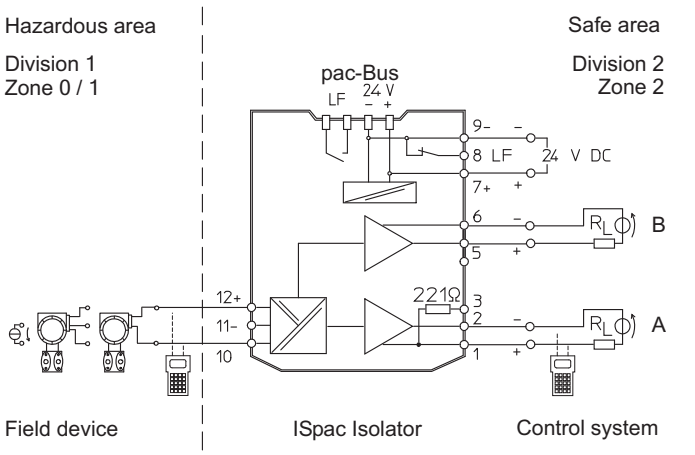
Electrical connection

Connection diagram

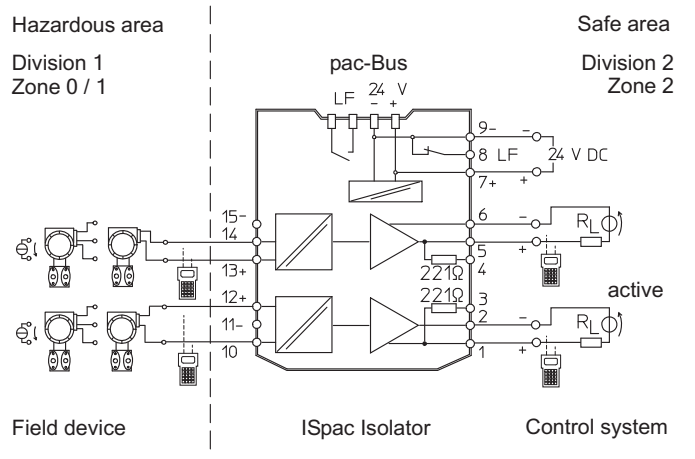
1 channel,
output: passive / sink
9160/13-10-11.



1 channel,
output A:
passive / sink
output B: passive
(without Hart)
9160/19-10-11.



2 channels,
outputs: passive / sin
9160/23-10-11.

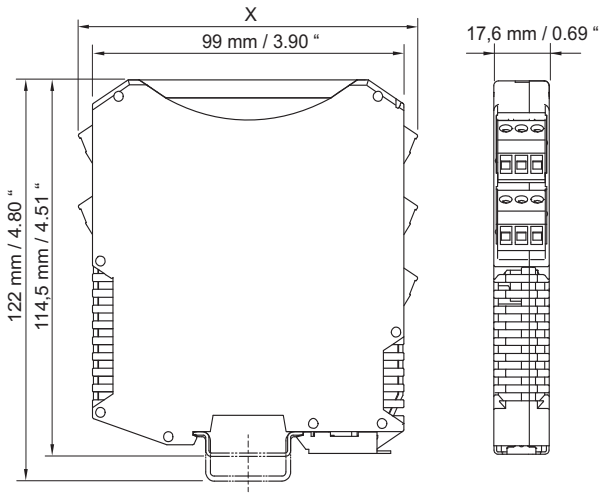


Technical Data

Mechanical data

		Screw terminals	Spring clamp terminals
Connection			
	Connection single-wire		
	- rigid	0.2 ... 2.5 mm² / 24 ... 14 AWG	0.2 ... 2.5 mm² / 24 ... 14 AWG
	- flexible	0.2 ... 2.5 mm² / 24 ... 14 AWG	0.2 ... 2.5 mm² / 24 ... 14 AWG
	- flexible, end covering sleeves (without / with plastic sleeving)	0.25 ... 2.5 mm² / 22 ... 14 AWG	0.25 ... 2.5 mm² / 22 ... 14 AWG
	Connection two wires		
	- rigid	0.2 ... 1 mm² / 24 ... 14 AWG	- -
	- flexible	0.2 ... 1.5 mm² / 24 ... 16 AWG	- -
	- flexible, end covering sleeves	0.25 ... 1 mm² / 22 ... 16 AWG	0.5 ... 1 mm² / 20 ... 16 AWG
Weight	approx. 160 g		
Installation type	on DIN rail (NS35/15, NS35/7.5) or in pac-Carrier		
Installation position	vertical or horizontal		
Enclosure	IP30		
Terminals	IP20		
Enclosure material	PA 6.6		
Fire resistance (UL-94)	V0		

Dimensional Drawings (All Dimensions in mm / inch) - Subject to Alterations



	Dimension X
Screw terminals	108 mm / 4.25″
Spring cage terminals	128 mm / 5.04″

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Representante oficial de:

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