

Binary Output without Power Supply

Series 9176



10495E00

- > For intrinsically safe operation of Ex i solenoid valves, indicators and horns
- > Power supply by control circuit, loop powered
- > Intrinsically safe output [Ex ia] IIC / [Ex ib] IIC
- > Galvanic isolation between inputs and outputs
- > For use up to SIL 3 (IEC 61508)

A3



Binary outputs are used for intrinsically safe operation of Ex i solenoid valves, indicator lamps or horns. Power supply of the devices is carried out via a control circuit, thus, no separate auxiliary power supply is required. Binary output is available in single or double channel versions. Outputs of the double channel version are galvanically separated.

	IECEx / ATEX							NEC 505			NEC 506				NEC 500					
	0	1	2	20	21	22	Zone	0	1	2	20	21	22	Division	1	2	1	2	1	2
Zone	x	x	x	x	x	x	Ex i interface	x	x	x				Ex i interface	x	x	x	x	x	x
Ex i interface																				
Installation in		x		x			Installation in		x		x			Installation in		x		x		x

WebCode 9176A

Binary Output without Power Supply

Series 9176



Selection Table

Version	Channels	No-load voltage U_{out}	Max. output current $I_{out\ max}$	Internal resistance R_i	Order number	Tech. data see page
Binary output without power supply Series 9176	1	10 V	60 mA	150 Ω	9176/10-12-00s	3
		17.5 V	45 mA	130 Ω	9176/10-14-00s	5
		25 V	29 mA	320 Ω	9176/10-15-00s	7
			35 mA	250 Ω	9176/10-16-00s	9
			43 mA	460 Ω	9176/10-17-00s	11
	2	10 V	60 mA / 120 mA *)	150 Ω / 75 Ω *)	9176/20-12-00s	3
		17.5 V	45 mA / 90 mA *)	130 Ω / 65 Ω *)	9176/20-14-00s	5
		25 V	29 mA / 58 mA *)	320 Ω / 160 Ω *)	9176/20-15-00s	7
			35 mA / 70 mA *)	250 Ω / 125 Ω *)	9176/20-16-00s	9
			43 mA / 86 mA *)	460 Ω / 230 Ω *)	9176/20-17-00s	11

Note The order numbers listed in the table are for devices equipped with screw-type terminals. For devices equipped with spring-type terminals, replace the ending "s" for screw-type terminals with "k" for spring-type terminals.

*) Parallel connection of the outputs possible. Doubling of the output current.

Explosion Protection

Global (IECEx)

Gas and dust	IECEx BVS 13.0012 X Ex nA [ia Ga] IIC T4 Gc [Ex ia Da] IIIC
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Europe (ATEX)

Gas and dust	BVS 04 ATEX E 075 X Ex II 3 (1) G Ex nA [ia Ga] IIC T4 Gc Ex II (1) D [Ex ia Da] IIIC
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Certifications and certificates

Certificates	IECEx, ATEX, Brazil (INMETRO), India (PESO), Canada (cFM), Kazakhstan (TR), Russia (TR), Serbia (SRPS), Ukraine (TR), USA (FM), Belarus (TR)
Ship approval	DNV

Further parameters

Installation	in Zone 2, Div. 2 and in the safe area
Further information	see respective certificate and operating instructions

Functional safety (IEC 61508)

Test report	STAHL 04/04-03 R003
Max. SIL	3
Safe Failure Fraction SFF	100 %
PFD _{Avg} at T _[Proof]	T _[Proof] PFD _{Avg}
	10 years 0

Further information For further information see safety test report.

Binary Output without Power Supply for I_{max} = 60 mA

Series 9176/xx-12-xx



Technical Data

Safety data

Max. values per output

Version

Max. voltage U_o

Max. current I_o

[Ex ia]

[Ex ib]

9176/1x-12-xx (1 channel)

11.3 V

9176/2x-12-xx (2 channels)

11.3 V

75 mA

--

The binary outputs 9176 can be used for operation with devices marked Ex ib IIC/IIB T*. Here the I_o values for [Ex ib] are valid.

Max. power P_o

Max. connectable capacitance

IIC

IIB

Max. connectable inductance

IIC

IIB

1.79 µF

12.1 µF

1.79 µF

12.1 µF

Internal capacitance C_i

internal inductance L_i

Isolation voltage U_m

6.3 mH

25 mH

1.1 nF

negligible

253 V AC

6.3 mH

25 mH

1.1 nF

negligible

253 V AC

Maximum values for two outputs connected in parallel

Version

Max. voltage U_o

Max. current I_o

[Ex ia]

[Ex ib]

9176/1x-12-xx (1 channel)

--

9176/2x-12-xx (2 channels)

11.3 V

150 mA

--

The binary outputs 9176 can be used for operation with devices marked Ex ib IIC/IIB T*. Here the I_o values for [Ex ib] are valid.

Max. power P_o

Max. connectable capacitance

IIC

IIB

--

420 mW

1.79 µF

12.1 µF

Max. connectable inductance

IIC

IIB

--

1.5 mH

6 mH

Internal capacitance C_i

internal inductance L_i

Isolation voltage U_m

--

2.2 nF

negligible

--

253 V AC

Input

Voltage for ON / OFF

ON

18 ... 31.2 V

OFF

0 ... 5 V

18 ... 31.2 V

0 ... 5 V

Control Power P_E
(with I_A = max. required output current)

0.3 W+ (I_A x 15 mW / mA)

0.3 W+ (I_A x 15 mW / mA)

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Binary Output without Power Supply for Imax = 60 mA

Series 9176/xx-12-xx



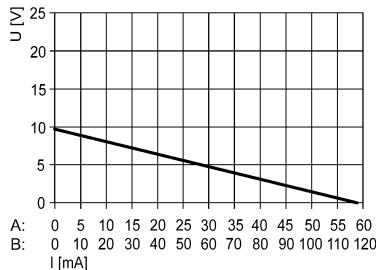
Technical Data

Ex i output

Output characteristic

at U_N ; -20 °C ... +60 °C

X-axis (I [mA])



A: characteristic curve each channel
B: characteristic curve channel 1 parallel
channel 2 (only types 9176/20-...-...)

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Maximum values per output

Version

No-load voltage U_{out}

9176/1x-12-xx (1 channel)

9176/2x-12-xx (2 channels)

10 V

Max. output current

60 mA

60 mA

I_A max

Internal resistance R_i

150 Ω

150 Ω

Residual ripple output

≤ 100 mV

≤ 100 mV

Switching delay

≤ 12 ms

≤ 12 ms

AUS → EIN

≤ 25 ms

≤ 25 ms

Switching delay

EIN → AUS

≤ 25 ms

Switching frequency

≤ 10 Hz

≤ 10 Hz

Indication

LED yellow "OUT" per channel

LED yellow "OUT" per channel

Maximum values for two outputs connected in parallel

Version

9176/1x-12-xx (1 channel)

9176/2x-12-xx (2 channels)

No-load voltage U_{out}

--

10 V

Max. output current

--

120 mA

I_A max

Internal resistance R_i

--

75 Ω

Residual ripple output

--

≤ 100 mV

Switching delay

--

≤ 12 ms

AUS → EIN

--

≤ 25 ms

Switching delay

EIN → AUS

≤ 25 ms

Switching frequency

--

≤ 10 Hz

Indication

--

LED yellow "OUT" per channel

Binary Output without Power Supply for I_{max} = 45 mA

Series 9176/xx-14-xx



Technical Data

Safety data

Max. values per output

Version

Max. voltage U_o

Max. current I_o

[Ex ia]

[Ex ib]

9176/1x-14-xx (1 channel)

19.6 V

9176/2x-14-xx (2 channels)

19.6 V

150 mA

60 mA

The binary outputs 9176 can be used for operation with devices marked Ex ib IIC/IIB T*. Here the I_o values for [Ex ib] are valid.

Max. power P_o

Max. connectable capacitance

IIC

IIB

732 mW

732 mW

235 nF

235 nF

1470 nF

1470 nF

Max. connectable inductance

IIC

IIB

1.5 mH

1.5 mH

6 mH

6 mH

Internal capacitance C_i

1.1 nF

1.1 nF

internal inductance L_i

negligible

negligible

Isolation voltage U_m

253 V AC

253 V AC

Maximum values for two outputs connected in parallel

Version

9176/1x-14-xx (1 channel)

9176/2x-14-xx (2 channels)

Max. voltage U_o

--

19.6 V

Max. current I_o

--

300 mA

[Ex ia]

--

120 mA

[Ex ib]

The binary outputs 9176 can be used for operation with devices marked Ex ib IIC/IIB T*. Here the I_o values for [Ex ib] are valid.

Max. power P_o

1464 mW

Max. connectable capacitance

IIC

235 nF

IIB

1470 nF

Max. connectable inductance

IIC

0.3 mH

IIB

1.5 mH

Internal capacitance C_i

--

2.2 nF

internal inductance L_i

--

negligible

Isolation voltage U_m

--

253 V AC

Input

Voltage for ON / OFF

ON

18 ... 31.2 V

18 ... 31.2 V

OFF

0 ... 5 V

0 ... 5 V

Control Power P_E
(with I_A = max. required output current)

0.38 W+ (I_A x 26 mW / mA)

0.38 W+ (I_A x 26 mW / mA)

A3

Binary Output without Power Supply for $I_{max} = 45 \text{ mA}$

Series 9176/xx-14-xx



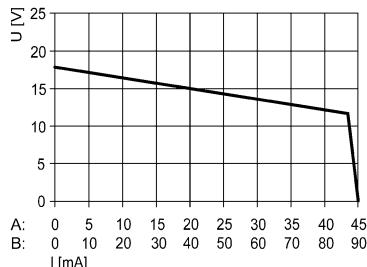
Technical Data

Ex i output

Output characteristic

at U_N ; -20 °C ... +60 °C

X-axis (I [mA])



A: characteristic curve each channel
B: characteristic curve channel 1 parallel
channel 2 (only types 9176/20-...)

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Maximum values per output

Version

No-load voltage U_{out}

Max. output current

$I_{A max}$

Internal resistance R_i

Residual ripple output

Switching delay AUS -> EIN

Switching delay EIN -> AUS

Switching frequency

Indication

Maximum values for two outputs connected in parallel

Version

No-load voltage U_{out}

Max. output current

$I_{A max}$

Internal resistance R_i

Residual ripple output

Switching delay AUS -> EIN

Switching delay EIN -> AUS

Switching frequency

Indication

9176/1x-14-xx (1 channel)

17.5 V

45 mA

130 Ω

≤ 100 mV

≤ 20 ms

≤ 40 ms

≤ 10 Hz

LED yellow "OUT" per channel

9176/2x-14-xx (2 channels)

17.5 V

45 mA

130 Ω

≤ 100 mV

≤ 20 ms

≤ 40 ms

≤ 10 Hz

LED yellow "OUT" per channel

9176/1x-14-xx (1 channel)

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9176/2x-14-xx (2 channels)

17,5 V

90 mA

65 Ω

≤ 100 mV

≤ 20 ms

≤ 40 ms

≤ 10 Hz

LED yellow "OUT" per channel

Binary Output without Power Supply for I_{max} = 29 mA

Series 9176/xx-15-xx



Technical Data

Safety data

Max. values per output

Version

Max. voltage U_o

Max. current I_o

[Ex ia]

[Ex ib]

9176/1x-15-xx (1 channel)

27.6 V

9176/2x-15-xx (2 channels)

27.6 V

Max. power P_o

Max. connectable capacitance

IIC

IIB

Max. connectable inductance

IIC

IIB

Internal capacitance C_i

internal inductance L_i

Isolation voltage U_m

596 mW

596 mW

85 nF

85 nF

667 nF

667 nF

Maximum values for two outputs connected in parallel

Version

Max. voltage U_o

Max. current I_o

[Ex ia]

[Ex ib]

9176/2x-15-xx (2 channels)

27.6 V

Max. power P_o

Max. connectable capacitance

IIC

IIB

Max. connectable inductance

IIC

IIB

Internal capacitance C_i

internal inductance L_i

Isolation voltage U_m

--

1192 mW

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--

--

665 nF

--

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--

2.5 mH

--

2.2 nF

--

negligible

--

253 V AC

Input

Voltage for ON / OFF

ON

18 ... 31.2 V

18 ... 31.2 V

OFF

0 ... 5 V

0 ... 5 V

Control Power P_E
(with I_A = max. required output current)

0.5 W+ (I_A x 37 mW / mA)

0.5 W+ (I_A x 37 mW / mA)

A3

Binary Output without Power Supply for $I_{max} = 29 \text{ mA}$

Series 9176/xx-15-xx



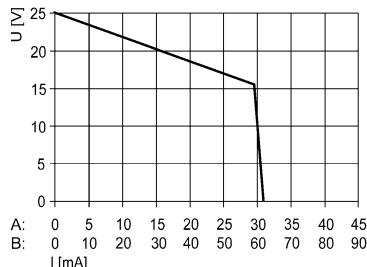
Technical Data

Ex i output

Output characteristic

at U_N ; -20 °C ... +60 °C

X-axis (I [mA])



A: characteristic curve each channel
B: characteristic curve channel 1 parallel
channel 2 (only types 9176/20-...-...)

06310E00

Maximum values per output

Version

No-load voltage U_{out}

9176/1x-15-xx (1 channel)

Max. output current

25 V

$I_A \text{ max}$

29 mA

Internal resistance R_i

320 Ω

Residual ripple output

≤ 100 mV

Switching delay

≤ 18 ms

AUS → EIN

≤ 50 ms

Switching delay

≤ 50 ms

EIN → AUS

≤ 10 Hz

Switching frequency

LED yellow "OUT" per channel

9176/2x-15-xx (2 channels)

25 V

29 mA

320 Ω

≤ 100 mV

≤ 18 ms

≤ 50 ms

≤ 10 Hz

LED yellow "OUT" per channel

Maximum values for two outputs connected in parallel

Version

9176/1x-15-xx (1 channel)

No-load voltage U_{out}

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Max. output current

--

$I_A \text{ max}$

--

9176/2x-15-xx (2 channels)

25 V

58 mA

160 Ω

≤ 100 mV

≤ 18 ms

≤ 50 ms

≤ 10 Hz

LED yellow "OUT" per channel

Binary Output without Power Supply for Imax = 35 mA

Series 9176/xx-16-xx



Technical Data

Safety data

Max. values per output

Version

Max. voltage U_o

Max. current I_o

[Ex ia]

[Ex ib]

9176/1x-16-xx (1 channel)

27.6 V

9176/2x-16-xx (2 channels)

27.6 V

110 mA

50 mA

The binary outputs 9176 can be used for operation with devices marked Ex ib IIC/IIB T*. Here the I_o values for [Ex ib] are valid.

Max. power P_o

Max. connectable capacitance

IIC

IIB

Max. connectable inductance

IIC

IIB

85 nF

667 nF

85 nF

667 nF

Internal capacitance C_i

internal inductance L_i

Isolation voltage U_m

1.1 nF

negligible

253 V AC

1.1 nF

negligible

253 V AC

Maximum values for two outputs connected in parallel

Version

9176/1x-16-xx (1 channel)

9176/2x-16-xx (2 channels)

27.6 V

Max. voltage U_o

Max. current I_o

[Ex ia]

[Ex ib]

220 mA

100 mA

The binary outputs 9176 can be used for operation with devices marked Ex ib IIC/IIB T*. Here the I_o values for [Ex ib] are valid.

Max. power P_o

Max. connectable capacitance

IIC

IIB

--

1520 mW

--

665 nF

Max. connectable inductance

IIC

IIB

--

--

1.8 mH

Internal capacitance C_i

internal inductance L_i

Isolation voltage U_m

--

2.2 nF

negligible

253 V AC

Input

Voltage for ON / OFF

ON

18 ... 31.2 V

18 ... 31.2 V

OFF

0 ... 5 V

0 ... 5 V

Control Power P_E
(with I_A = max. required output current)

0.5 W+ (I_A x 37 mW / mA)

0.5 W+ (I_A x 37 mW / mA)

A3

Binary Output without Power Supply for $I_{max} = 35 \text{ mA}$

Series 9176/xx-16-xx



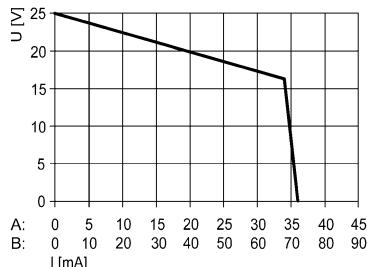
Technical Data

Ex i output

Output characteristic

at U_N ; -20 °C ... +60 °C

X-axis (I [mA])



A: characteristic curve each channel
B: characteristic curve channel 1 parallel
channel 2 (only types 9176/20-...-...)

09884E00

Maximum values per output

Version

No-load voltage U_{out}

Max. output current

$I_{A\ max}$

Internal resistance R_i

Residual ripple output

Switching delay AUS -> EIN

Switching delay EIN -> AUS

Switching frequency

Indication

Maximum values for two outputs connected in parallel

Version

No-load voltage U_{out}

Max. output current

$I_{A\ max}$

Internal resistance R_i

Residual ripple output

Switching delay AUS -> EIN

Switching delay EIN -> AUS

Switching frequency

Indication

9176/1x-16-xx (1 channel)

25 V

35 mA

250 Ω

≤ 100 mV

≤ 18 ms

≤ 50 ms

≤ 10 Hz

LED yellow "OUT" each channel

9176/2x-16-xx (2 channels)

25 V

35 mA

250 Ω

≤ 100 mV

≤ 18 ms

≤ 50 ms

≤ 10 Hz

LED yellow "OUT" each channel

9176/1x-16-xx (1 channel)

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9176/2x-16-xx (2 channels)

25 V

70 mA

125 Ω

≤ 100 mV

≤ 18 ms

≤ 50 ms

≤ 10 Hz

LED yellow "OUT" each channel

Binary Output without Power Supply for $I_{max} = 43 \text{ mA}$

Series 9176/xx-17-xx



Technical Data

Safety data

Max. values per output

Version

Max. voltage U_o

Max. current I_o

[Ex ia]

Max. power P_o

Max. connectable capacitance

IIC

IIB

Max. connectable inductance

IIC

IIB

Internal capacitance C_i

internal inductance L_i

Isolation voltage U_m

Maximum values for two outputs connected in parallel

Version

Max. voltage U_o

Max. current I_o

[Ex ia]

Max. power P_o

Max. connectable capacitance

IIB

Max. connectable inductance

IIB

Internal capacitance C_i

internal inductance L_i

Isolation voltage U_m

9176/1x-17-xx (1 channel)

27.6 V

60 mA

415 mW

85 nF

667 nF

6.6 mH

40 mH

1.1 nF

negligible

253 V AC

9176/2x-17-xx (2 channels)

27.6 V

60 mA

415 mW

85 nF

667 nF

6.6 mH

40 mH

1.1 nF

negligible

253 V AC

9176/1x-17-xx (1 channel)

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9176/2x-17-xx (2 channels)

27.6 V

120 mA

830 mW

665 nF

7.5 mH

2.2 nF

negligible

253 V AC

Input

Voltage for ON / OFF

ON

OFF

Control Power P_E
(with $I_A = \text{max. required output current}$)

18 ... 31.2 V

0 ... 5 V

0.5 W+ ($I_A \times 37 \text{ mW} / \text{mA}$)

18 ... 31.2 V

0 ... 5 V

0.5 W+ ($I_A \times 37 \text{ mW} / \text{mA}$)

A3

Binary Output without Power Supply for Imax = 43 mA

Series 9176/xx-17-xx



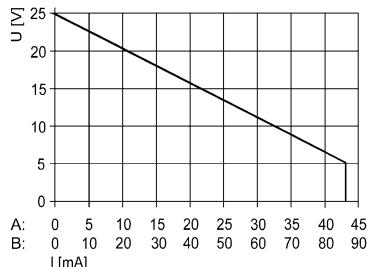
Technical Data

Ex i output

Output characteristic

at U_N ; -20 °C ... +60 °C

X-axis (I [mA])



A: characteristic curve each channel
B: characteristic curve channel 1 parallel
channel 2 (only types 9176/20-...-...)

12019E00

Maximum values per output

Version

No-load voltage U_{out}

9176/1x-17-xx (1 channel)

25 V

Max. output current

43 mA

I_A max

460 Ω

Internal resistance R_i

≤ 100 mV

Residual ripple output

≤ 18 ms

Switching delay

AUS → EIN

Switching delay

EIN → AUS

Switching frequency

≤ 50 ms

Indication

LED yellow "OUT" per channel

9176/2x-17-xx (2 channels)

25 V

43 mA

460 Ω

≤ 100 mV

≤ 18 ms

≤ 50 ms

≤ 10 Hz

LED yellow "OUT" per channel

Maximum values for two outputs connected in parallel

Version

9176/1x-17-xx (1 channel)

No-load voltage U_{out}

--

Max. output current

--

I_A max

--

Internal resistance R_i

--

9176/2x-17-xx (2 channels)

25 V

86 mA

230 Ω

≤ 100 mV

≤ 18 ms

≤ 50 ms

≤ 10 Hz

LED yellow "OUT" per channel

Binary Output without Power Supply

Series 9176



Technical Data

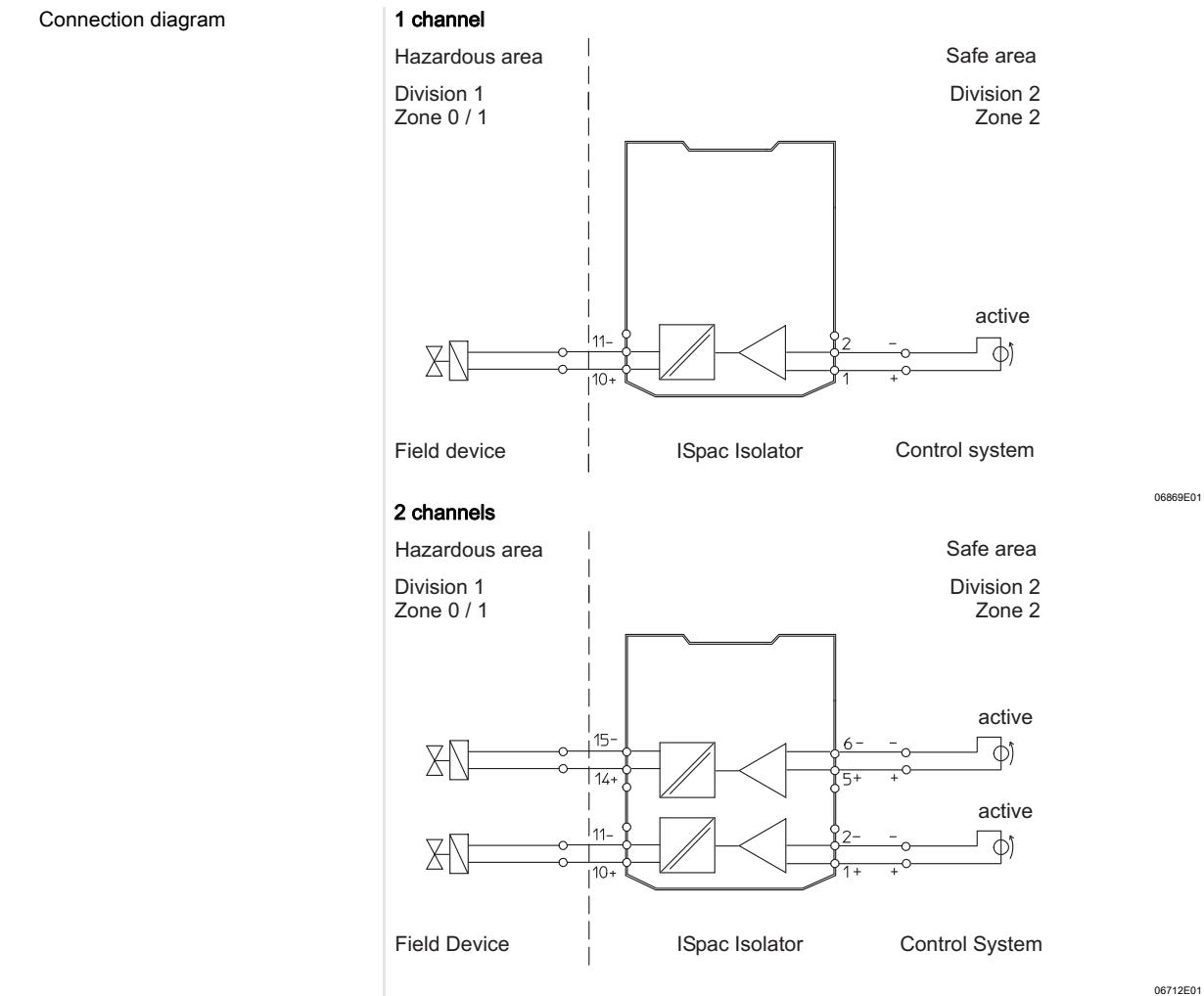
Electrical data

Auxiliary power	without
Galvanic separation	
Test voltage	
acc. to standard	EN 60079-11
Ex i output to input	1.5 kV AC
Ex i outputs to each other	500 V AC
acc. to standard	EN 50178
Inputs to each other	350 V AC
Electromagnetic compatibility	Tested under the following standards and regulations: EN 61326-1 Use in industrial environment; NAMUR NE 21

Ambient conditions

Ambient temperature	
Single device	-20 ... +70 °C
Group assembly	-20 ... +60 °C
Storage temperature	The installation conditions affect the ambient temperature. Observe the "Cabinet installation guide".
Relative humidity (no condensation)	-40 ... +80 °C ≤ 95 %

Electrical connection



Binary Output without Power Supply

Series 9176

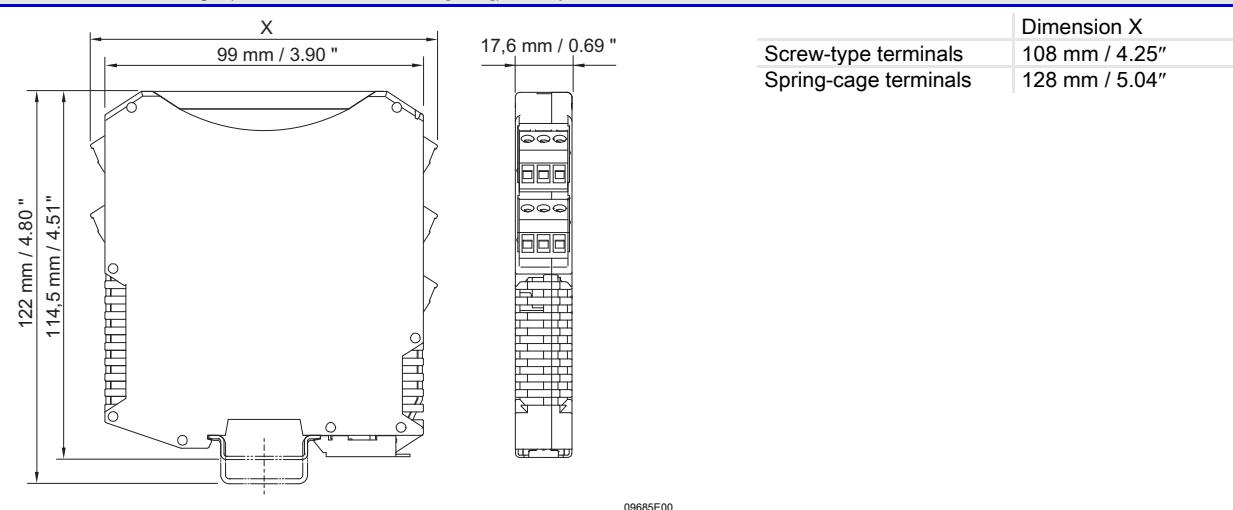


Technical Data

Mechanical data

Connection	Screw-type terminals	Spring-type terminals
Single-wire connection		
- rigid	0.2 ... 2.5 mm ²	0.2 ... 2.5 mm ²
- flexible	0.2 ... 2.5 mm ²	0.2 ... 2.5 mm ²
- flexible with core end sleeves (without / with plastic sleeve)	0.25 ... 2.5 mm ²	0.25 ... 2.5 mm ²
Two-wire connection		
- rigid	0.2 ... 1 mm ²	--
- flexible	0.2 ... 1.5 mm ²	--
- flexible with core end sleeves	0.25 ... 1 mm ²	0.5 ... 1 mm ²
Weight	approx. 160	
Mounting type	on top hat rail (NS35/15, NS35/7.5) or in pac-Carrier	
Mounting orientation	horizontal or vertical	
Enclosure	IP30	
Terminals	IP20	
Enclosure material	PA 6.6	
Fire resistance (UL-94)	V0	

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



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.