

UNIVERSAL CONVERTER



- Input for RTD, TC, Ohm, potentiometer, mA and V
- Supply for 2-wire transmitters
- Active / passive mA output and relay output
- Can be supplied separately or installed on power rail, PR 9400
- SIL 2-certified via Full Assessment



Advanced features:

- Configuration and monitoring by way of detachable display front (PR 4501); process calibration, signal and relay simulation.
- Advanced relay configuration, e.g. setpoint, window, delay, sensor error indication and power monitoring.
- Copying of the configuration from one device to others of the same type via PR4501.
- Reduced U_0 Ex data < 8.3 V for active input signals.
- TC inputs with internal or external CJC for higher accuracy.
- The device automatically detects whether it must supply an active or a passive current signal.

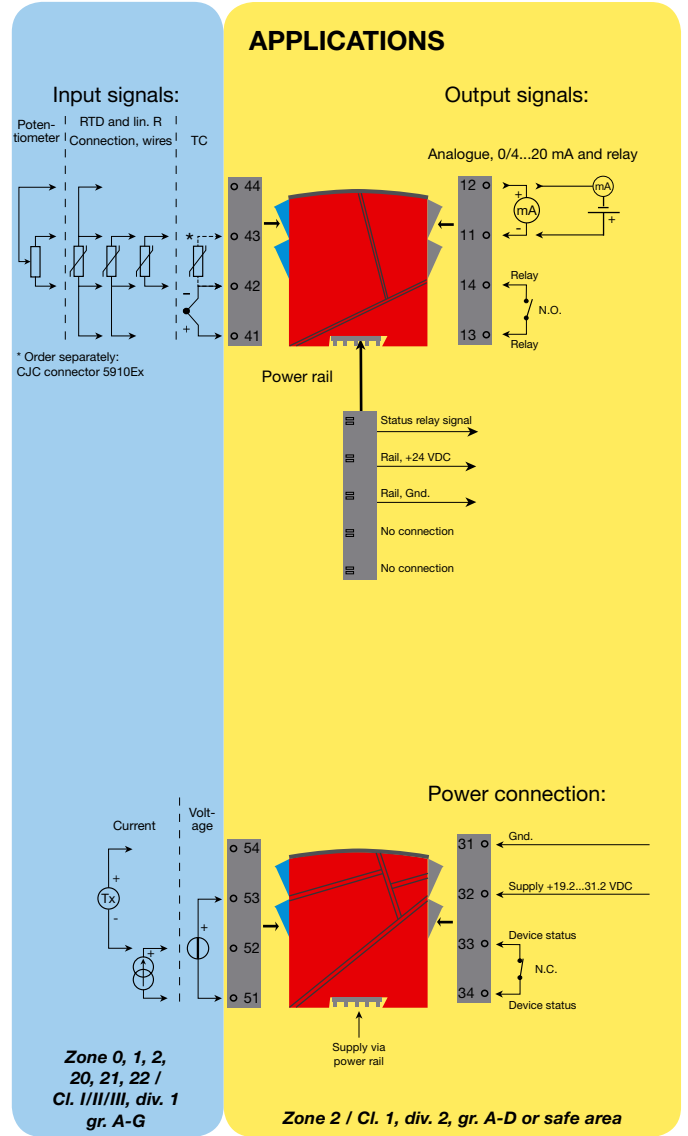
Application

- Can be mounted in the safe area and in zone 2 / div. 2 and receive signals from zone 0, 1, 2, 20, 21 and 22 / Class I/II/III, Div. 1, Gr. A-G.
- Conversion and scaling of temperature, voltage, potentiometer and linear resistance signals.
- Power supply and signal isolator for 2-wire transmitters.
- Monitoring of error events and cable breakage via the individual status relay and/or a collective electronic signal via the power rail.
- The 9116 has been designed, developed and certified for use in SIL 2 applications according to the requirements of IEC 61508.

Technical characteristics

- 1 green and 1 red front LED indicate operation status and malfunction. 1 yellow LED indicates relay status.
- 2.6 kVAC galvanic isolation between input, output and supply.

APPLICATIONS



- Order codes:** 9116B1 = Universal converter - Uo 28 VDC (max. loop voltage)
 9116B2 = Universal converter - Uo 22 VDC (max. loop voltage)
 4501 = Display / programming front
 5910Ex = CJC connector
 9400 = Power rail

PR 4501 Display / programming front



Application:

- Communications interface for modification of operational parameters in 9116.
- Fixed display for visualisation of process data and status.

Technical characteristics

- LCD display with 4 lines; Line 1 shows input status, line 2 toggles between input value and tag. no. Line

3 shows output value and UNIT. Line 4 shows status for relay and communication and whether the device is SIL-locked. Static dot = SIL-locked and flashing dot = not SIL-locked.

- Unauthorised programming access can be blocked by password protection.

Mounting / installation

- Click 4501 onto the front of 9116.

Electrical specifications

Specifications range..... -20°C to +60°C
 Storage temperature -20°C to +85°C

Common specifications:

Supply voltage, DC 19.2...31.2 VDC
 Max. consumption..... ≤ 3.5 W
 Fuse..... 1.25 A SB / 250 VAC
 Isolation voltage, test / operation..... 2.6 kVAC / 250 VAC
 Communications interface Programming front 4501
 Signal / noise ratio..... Min. 60 dB (0...100 kHz)
 Response time (0...90%, 100...10%):
 Temperature input, programmable. 1...60 s
 mA / V input, programmable..... 0.4...60 s
 Calibration temperature..... 20...28°C
 Accuracy, the greater of the general and basic values:

General values		
Input type	Absolute accuracy	Temperature coefficient
All	≤ ±0.1% of span	≤ ±0.01% of span / °C

Basic values		
Input type	Basic accuracy	Temperature coefficient
mA	≤ ±16 µA	≤ ±1.6 µA / °C
Volt	≤ ±20 µV	≤ ±2 µV / °C
Pt100, Pt200, Pt1000	≤ ±0.2°C	≤ ±0.02°C / °C
Pt500, Ni100, Ni120, Ni1000	≤ ±0.3°C	≤ ±0.03°C / °C
Pt50, Pt400, Ni50	≤ ±0.4°C	≤ ±0.04°C / °C
Pt250, Pt300	≤ ±0.6°C	≤ ±0.06°C / °C
Pt20	≤ ±0.8°C	≤ ±0.08°C / °C
Pt10	≤ ±1.4°C	≤ ±0.14°C / °C

TC type:		
E, J, K, L, N, T, U	≤ ±1°C	≤ ±0.1°C / °C
R, S, W3, W5, LR	≤ ±2°C	≤ ±0.2°C / °C
B: 160...400°C	≤ ±4.5°C	≤ ±0.45°C / °C
B: 400...1820°C	≤ ±2°C	≤ ±0.2°C / °C

EMC immunity influence < ±0.5% of span
 Extended EMC immunity:
 NAMUR NE 21, A criterion, burst..... < ±1% of span

Auxiliary supplies for 9116B1:
 2-wire supply (terminal 54...52) 28...16.5 VDC/0...20 mA
 Auxiliary supplies for 9116B2:
 2-wire supply (terminal 54...52) 22...16.5 VDC/0...20 mA
 Wire size (max...min.)..... AWG 26...14/0.13...2.08 mm² stranded wire

Relative humidity < 95% RH (non-cond.)
 Dimensions, without 4501 (HxWxD).. 109 x 23.5 x 104 mm
 Dimensions, with 4501 (HxWxD)..... 109 x 23.5 x 116 mm
 Protection degree IP20

RTD, linear resistance and potentiometer input:

Input type	Min. value	Max. value	Standard
Pt100	-200°C	+850°C	IEC60751
Ni100	-60°C	+250°C	DIN 43760
Linear resist.	0 Ω	10000 Ω	-
Potentiometer	10 Ω	10000 Ω	-

Input for RTD types:
 Pt10°, Pt20°, Pt50°, Pt100, Pt200, Pt300, Pt400, Pt500, Pt1000, Ni50, Ni100, Ni120, Ni1000

Effect of sensor cable resistance (3- / 4-wire), RTD < 0.002 Ω / Ω
 Sensor error detection, RTD..... Programmable ON / OFF
 Short circuit detection, RTD Yes
 Cable resist. per wire (max.), RTD 50 Ω
 Sensor current, RTD Nom. 0.2 mA

TC input:

Input for TC types..... B, E, J, K, L, N, R, S, T, U, W3, W5, LR

Cold junction compensation (CJC):
 via ext. sensor in connector 5910.. 20...28°C ≤ ±1°C
 -20...20°C/28...70°C ≤ ±2°C
 via internal CJC sensor ±(2.0°C + 0.4°C * Δt)
 Δt = internal temperature - ambient temperature

Sensor error detection..... Programmable ON or OFF (only wire breakage)

Sensor error current:
 when detecting / else Nom. 2 µA / 0 µA

Current input:

Measurement range 0...25 mA
 Program. measurement ranges..... 0...20 and 4...20 mA
 Input resistance Nom. 20 Ω + PTC 50 Ω
 Sensor error detection:
 Loop break 4...20 mA..... Yes
 NB: Only when input is selected as 4...20 mA

Voltage input:

Measurement range 0...12 VDC
 Program. measurement ranges..... 0...1 / 0.2...1 / 0...5 / 1...5 / 0...10 and 2...10 VDC
 Input resistance Nom. >10 MΩ

Current output:

Signal range (span)..... 0...23 mA
 Programmable signal ranges..... 0/4...20 / 20...0/4 mA
 Load (max.)..... 20 mA / 600 Ω / 12 VDC
 Load stability ≤ 0.01% of span / 100 Ω
 Sensor error reaction..... 0 / 3.5 / 23 mA / none
 NAMUR NE 43 Upscale/Downscale. 23 mA / 3.5 mA
 Output limitation:
 on 4...20 and 20...4 mA signals..... 3.8...20.5 mA
 on 0...20 and 20...0 mA signals..... 0...20.5 mA
 Current limit ≤ 28 mA

2-wire 4...20 mA output:

Signal range 4...20 mA
 Load stability ≤ 0.01% of span / 100 Ω
 Load resistance ≤ (Vsupply-3.5)/0.023 A [Ω]
 External 2-wire supply range..... 3.5...26 VDC

Relay output in safe area:

Relay functions..... Setpoint, Window, Sensor error, Power and Off
 Hysteresis, in % of span/display range 0.1...25 / 1...25
 ON and OFF delay..... 0...3600 s
 Sensor error reaction..... Break / Make / Hold
 Max. voltage 250 VAC / 30 VDC
 Max. current 2 AAC / 2 ADC
 Max. AC power..... 500 VA / 60 W

Status relay in safe area:

Max. voltage 125 VAC / 110 VDC
 Max. current 0.5 AAC / 0.3 ADC
 Max. AC power..... 62.5 VA / 32 W

Marine approval:

Det Norske Veritas, Ships & Offshore. Pending

GOST R approval:

VNIIFTRI, Cert No. Pending

SIL certification:

exida, Cert No. XXXXXX

Observed authority requirements: Standard:

EMC 2004/108/EC EN 61326-1
 LVD 2006/95/EC EN 61010-1
 ATEX 94/9/EC EN 60079-0, -11, -15, -26 and EN 61241-0, -11
 IECEx IEC 60079-0, -11, -15 -26 IEC 61241-0 and -11
 c FM us..... FM 3600, 3611, 3810
 CSA E60079-0, -15
 CSA 22.2 -25, -142, -213
 ANSI/ISA-12.00.01 / 12.12.02
 UL, Standard for Safety..... UL 61010-1
 SIL IEC 61508

of span = of the currently selected measurement range

9000 EMC specifications - immunity :

Port	Phenomenon	Test standard	IEC 61326		NAMUR NE21 : 2007		IEC 61326-3-1		PR standard specifications		
			Test value	Criterion	Test value	Criterion	Test value for safety functions	Criterion	Test value	Criterion	
Enclosure	ESD input terminals	IEC 61000-4-2	4 kV Contact	B	6 kV Contact	B	6 kV Contact	6 kV Contact	FS	6 kV Contact	B
	ESD	IEC 61000-4-2	4 kV/8 kV Contact/Air	B	6 kV / 8 kV Contact / Air	A	6 kV / 8 kV Contact / Air	6 kV / 8 kV Contact / Air	FS	6 kV / 8 kV Contact / Air	A 1%
	HF field	IEC 61000-4-3	10 V/m, 80...1000 MHz 3 V/m, 1.4...2 GHz 1 V/m, 2...2.7 GHz	A	10 V/m, 80...1000 MHz 3...10 V/m, 1.4...2 GHz	A	20 V/m, 80...1000 MHz 10 V/m, 1.4...2 GHz 3 V/m, 2...2.7 GHz	20 V/m, 80...1000 MHz 10 V/m, 1.4...2 GHz 3 V/m, 2...2.7 GHz	FS	20 V/m, 80...1000 MHz 10 V/m, 1.4...2 GHz 3 V/m, 2...2.7 GHz	A 0.5%
	Magnetic field	IEC 61000-4-8	30 A/m	A	100 A/m	A	30 A/m	30 A/m	FS	30 A/m	A 0.5%
	Burst	IEC 61000-4-4	2 kV	B	2 kV	A	4 kV	4 kV	FS	4 kV	A 1.0%
	Surge	IEC 61000-4-5	1 kV / 2 kV, Diff. / Comm. 0 Ω/10 Ω	B	0.5 kV / 1 kV, Diff. / Comm. 0 Ω/10 Ω	A	1 kV / 2 kV, Diff. / Comm. 0 Ω/10 Ω	1 kV / 2 kV, Diff. / Comm. 0 Ω/10 Ω	FS	1 kV / 2 kV, Diff. / Comm. 0 Ω / 10 Ω	A 1.0%
	Conducted RF	IEC 61000-4-6	3 V, 150 kHz...80 MHz	A	10 V, 10 kHz...80 MHz Covers RF + LF	A	10 V, 150 kHz...80 MHz	10 V, 150 kHz...80 MHz	FS	10 V, 150 kHz...80 MHz	A 0.5%
	Interruptions	IEC 61000-4-29	60% for 10 ms 100% for 20 ms	B	100% for 20 ms	B	60% for 10 ms 100% for 20 ms	60% for 10 ms 100% for 20 ms	FS	60% for 10 ms 100% for 20 ms	B
I/O signal	Conducted LF	IEC 61000-4-16	Not required		Not required		1.5...15 kHz, 1...10 V 15...150 kHz, 10 V 50/60 Hz, 100 V	1.5...15 kHz, 1...10 V 15...150 kHz, 10 V 50/60 Hz, 100 V	FS	15 Hz...150 kHz, 10 V 50 Hz, 300 Ω, 230 V	A 0.5%
	Burst	IEC 61000-4-4	2 kV	B	2 kV	A	15...150 kHz, 10 V	15...150 kHz, 10 V	FS	2 kV	A 1.0%
	Surge input	IEC 61000-4-5	1 kV / 2 kV, Diff. / Comm. 40 Ω	B	0.5 kV / 1 kV, Diff. / Comm. 40 Ω	B	50/60 Hz, 100 V	50/60 Hz, 100 V	FS	1 kV / 2 kV Diff. / Comm. 40 Ω	B
	Surge output	IEC 61000-4-5	1 kV / 2 kV, Diff. / Comm. 40 Ω	B	0.5 kV / 1 kV, Diff. / Comm. 40 Ω	B	2 kV Comm. 40 Ω	2 kV Comm. 40 Ω	FS	1 kV / 2 kV Diff. / Comm. 40 Ω	A 1.0%
	Conducted RF	IEC 61000-4-6	3 V	A	10 V, 10 kHz...150 kHz	A	10 V, 150 kHz...80 MHz	10 V, 150 kHz...80 MHz	FS	10 V 150 kHz...100 MHz	A 0.5%
	Conducted LF	IEC 61000-4-16	Not required		Not required		1.5...15 kHz, 1...10 V 15...150 kHz, 10 V 50/60 Hz, 100 V	1.5...15 kHz, 1...10 V 15...150 kHz, 10 V 50/60 Hz, 100 V	FS	15 Hz...150 kHz, 10 V 50 Hz, 300 Ω, 230 V	A 0.5%

9000 EMC specifications - immunity:

	Essential operation (functional safety)	Continuous unmonitored operation	Continuous monitored operation	Non-continuous operation
ESD IEC 61000-4-2	A	B	B	C
EM IEC 61000-4-3	A	A	A	B
Burst IEC61000-4-4	A	B	B	B
Surge IEC 61000-4-5	A	B	B	C
Conducted RF IEC 61000-4-6	A	A	A	C
Voltage interrupts IEC 61000-4-11	A	B	C	C

Note For type testing, it is highly recommended that performance criteria A be chosen for all phenomena and all tests. However, performance criteria B and/or C may be accepted provided that both the specification and the test report highlight such deviation(s) for the relevant combination(s) of function and test.

Specified function	Normal test level	Increased test level
Normal function	Normal specification (performance criteria A; B; C)	May fail
Safety function	Performance criteria - A, or - B + observed deviation + recovery time to be documented in the data sheet, or - C + observed behaviour documented in the data sheet	Performance criteria FS (i.e. no effect outside the specification, or defined state)

A: During testing, normal performance within the specification limits.

B: During testing, temporary degradation, or loss of function or performance which is self recovering.

C: During testing, temporary degradation, or loss of function or performance which requires operator intervention or system reset occurs.

9000 EMC specifications - emission:

Class B equipment		Standard CISPR 22	
Disturbance	Test method	Frequency range	Limits
Radiated	Quasi-peak	30 to 230 MHz	30 dB ($\mu\text{V}/\text{m}$)
		230 to 1000 MHz	37 dB ($\mu\text{V}/\text{m}$)
Conducted	Quasi-peak	0.15...0.50 MHz	40 to 30 dB (μA)
	Average		30 to 20 dB (μA)
	Quasi-peak	0.50 to 30 MHz	30 dB (μA)
	Average		20 dB (μA)