

# SOLENOID / ALARM DRIVER



- Universal Ex driver for solenoids, acoustic alarms and LEDs
- Extended self-diagnostics
- 1 or 2 channels
- Can be supplied separately or installed on power rail, PR 9400
- SIL 2-certified via Full Assessment



### Advanced features

- Universal Ex driver for the control of solenoids etc. with various Ex data by way of three built-in Ex barriers.
- Two hardware versions make it possible to choose either Low (35 mA) or High (60 mA) current output.
- Configuration and monitoring by way of detachable display front (PR 4501).
- Selection of direct or inverted function for each channel via PR 4501 and the possibility of reducing the output current to the hazardous area to suit the application.
- Optional monitoring of the output current to the hazardous area by way of PR 4501.
- Optional redundant supply via power rail and/or separate supply.

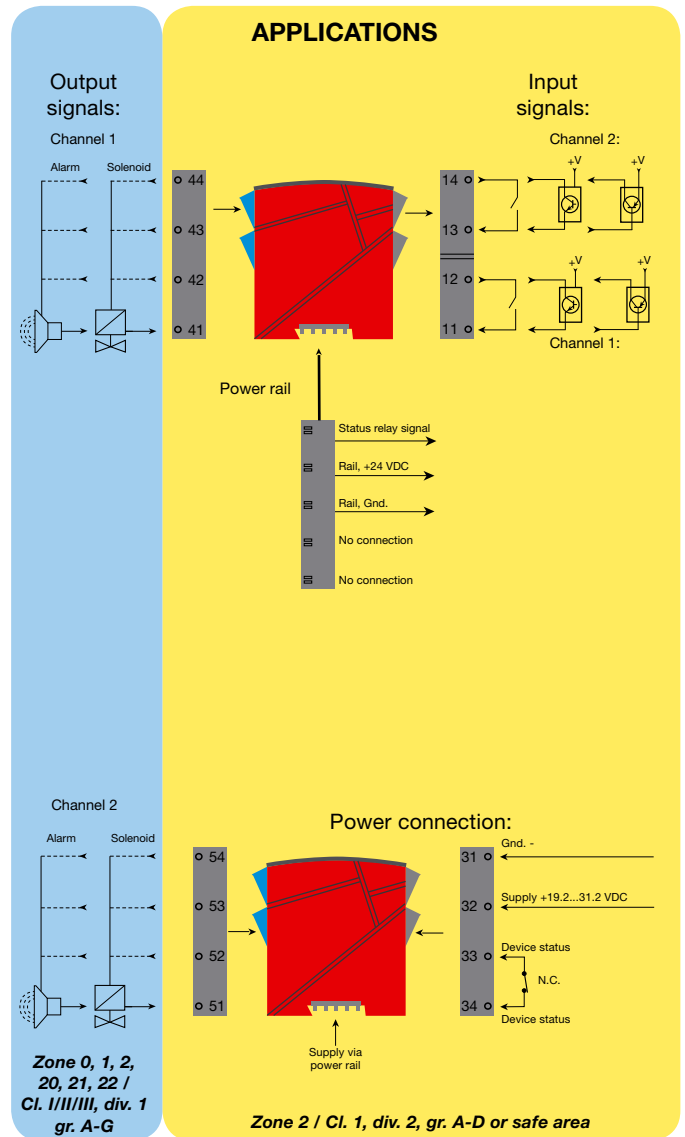
### Application

- The device can be mounted in the safe area and in zone 2 / div. 2 and transmit signals to zone 0, 1, 2, 20, 21 and 22.
- Ex driver for the control of ON / OFF solenoids, acoustic alarms and LEDs mounted in the hazardous area.
- The 9203 is controlled by an NPN/PNP signal or a switch signal.
- Monitoring of internal error events via the individual status relay and/or a collective electronic signal via the power rail.
- The 9203 has been designed, developed and certified for use in SIL 2 applications according to the requirements of IEC 61508.

### Technical characteristics

- 1 green and 2 yellow/red front LEDs indicate operation status and malfunction.
- 2.6 kVAC galvanic isolation between input, output and supply.

### APPLICATIONS



Order 9203B

| Type  | Ex barrier [Ex ia]    | Channels                             |
|-------|-----------------------|--------------------------------------|
| 9203B | Low current . . . : 1 | Single . . . : A<br>Double . . . : B |
|       | High current. . . : 2 | Single . . . : A                     |

Order codes:

4501 = Display / programming front  
9400 = Power rail

PR 4501 Display / programming front



Application

- Communications interface for modification of operational parameters in 9203.
- When mounted in the process, the display shows process values and device status.

Technical characteristics

- LCD display with 4 lines; Line 1 (H=5.57 mm) shows status for each channel (OK or error). Line 2 (H=3.33 mm) shows output for channel 1 (ON / OFF), line 3

(H=3.33 mm) shows output for channel 2 (ON / OFF), and line 4 shows whether the device is SIL-locked. Static dot = SIL-locked and flashing dot = not SIL-locked. Line 4 also indicates if the outputs is active.

- In order to protect the configuration against unauthorised changes, access to the menus can be blocked by a password.

Mounting / installation

- Click 4501 onto the front of 9203.

Electrical specifications:

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

Common specifications:

Supply voltage..... 19.2...31.2 VDC  
Max. consumption..... ≤ 3.5 W (2 channels)  
Fuse..... 1.25 AT SB / 250 VAC

Isolation voltage, test / operation:

Input / output / supply..... 2.6 kVAC / 250 VAC  
Output 1 to output 2..... 1.5 kVAC /  
150 VAC reinforced  
Status relay to supply..... 1.5 kVAC /  
150 VAC reinforced

Communications interface ..... Programming front 4501  
Calibration temperature..... 20...28°C

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

Wire size (min....max.)..... 0.13...2.08 mm<sup>2</sup> /  
AWG 14...26  
stranded wire  
Screw terminal torque ..... 0.5 Nm  
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  
Weight ..... 170 g / 185 g with 4501

NPN and mechanical switch:

Trig level LOW ..... ≤ 2.0 VDC  
Trig level HIGH..... ≥ 4.0 VDC  
Max. external voltage..... 28 VDC  
Input impedance ..... 3.5 kΩ

PNP:

Trig level LOW ..... ≤ 8.0 VDC  
Trig level HIGH..... ≥ 10.0 VDC  
Max. external voltage..... 28 VDC  
Input impedance ..... 3.5 kΩ

Outputs:

Output ripple ..... < 40 mV RMS

Relay output:

Status relay in safe area:

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

Ex / I.S. approvals:

IECEX certificate ..... KEM 09.0001X  
ATEX certificate ..... KEMA 07ATEX0147 X  
FM certificate ..... 3035277 / 3035277C

Marine approval:

Det Norske Veritas, Ships & Offshore.. Pending

GOST R approval:

VNIIFTRI, Cert No. .... Pending

SIL certification:

exida, Cert. No ..... PREI 070902 P0002 C04

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

|                    | 9203B1A / 9203B1B         |          |          |                           |          |          |                           |          |          | 9203B2A           |          |          |                   |          |          |                   |          |          |           |          |          |             |        |     |           |  |  |
|--------------------|---------------------------|----------|----------|---------------------------|----------|----------|---------------------------|----------|----------|-------------------|----------|----------|-------------------|----------|----------|-------------------|----------|----------|-----------|----------|----------|-------------|--------|-----|-----------|--|--|
|                    | Terminal<br>41-42 / 51-52 |          |          | Terminal<br>41-43 / 51-53 |          |          | Terminal<br>41-44 / 51-54 |          |          | Terminal<br>41-42 |          |          | Terminal<br>41-43 |          |          | Terminal<br>41-44 |          |          |           |          |          |             |        |     |           |  |  |
| Uo                 | 28 V                      |          |          | 28 V                      |          |          | 28 V                      |          |          | 28 V              |          |          | 28 V              |          |          | 28 V              |          |          |           |          |          |             |        |     |           |  |  |
| Io                 | 93 mA                     |          |          | 100 mA                    |          |          | 110 mA                    |          |          | 115 mA            |          |          | 125 mA            |          |          | 135 mA            |          |          |           |          |          |             |        |     |           |  |  |
| Po                 | 0.65 W                    |          |          | 0.70 W                    |          |          | 0.77 W                    |          |          | 0.81 W            |          |          | 0.88 W            |          |          | 0.95 W            |          |          |           |          |          |             |        |     |           |  |  |
| Vout.<br>no load   | Min. 24 V                 |          |          | Min. 24 V                 |          |          | Min. 24 V                 |          |          | Min. 24 V         |          |          | Min. 24 V         |          |          | Min. 24 V         |          |          |           |          |          |             |        |     |           |  |  |
| Vout.<br>with load | Min. 12.5 V               |          |          | Min. 13.5 V               |          |          | Min. 14.5 V               |          |          | Min. 11.5 V       |          |          | Min. 9 V          |          |          | Min. 12.5 V       |          |          | Min. 10 V |          |          | Min. 13.5 V |        |     | Min. 11 V |  |  |
| Iout. max          | 35 mA                     |          |          | 35 mA                     |          |          | 35 mA                     |          |          | 50 mA             |          |          | 60 mA             |          |          | 50 mA             |          |          | 60 mA     |          |          | 50 mA       |        |     | 60 mA     |  |  |
|                    | IIC                       | IIB      | IIA      | IIC                       | IIB      | IIA      | IIC                       | IIB      | IIA      | IIC               | IIB      | IIA      | IIC               | IIB      | IIA      | IIC               | IIB      | IIA      | IIC       | IIB      | IIA      | IIC         | IIB    | IIA |           |  |  |
| Co                 | 80 nF                     | 640 nF   | 2.1 μF   | 80 nF                     | 640 nF   | 2.1 μF   | 80 nF                     | 640 nF   | 2.1 μF   | 80 nF             | 640 nF   | 2.1 μF   | 80 nF             | 640 nF   | 2.1 μF   | 640 nF            | 2.1 μF   | 640 nF   | 2.1 μF    | 640 nF   | 2.1 μF   | 640 nF      | 2.1 μF |     |           |  |  |
| Lo                 | 4.2 mH                    | 16.8 mH  | 32.6 mH  | 3.5 mH                    | 14.2 mH  | 27.6 mH  | 2.9 mH                    | 11.8 mH  | 22.8 mH  | 2.69 mH           | 10.8 mH  | 20.8 mH  | 9.1 mH            | 17.6 mH  | 7.8 mH   | 15.1 mH           | 7.8 mH   | 15.1 mH  | 7.8 mH    | 15.1 mH  | 7.8 mH   | 15.1 mH     |        |     |           |  |  |
| Lo/Ro              | 54 μH/Ω                   | 218 μH/Ω | 436 μH/Ω | 50 μH/Ω                   | 201 μH/Ω | 402 μH/Ω | 46 μH/Ω                   | 184 μH/Ω | 369 μH/Ω | 44 μH/Ω           | 176 μH/Ω | 353 μH/Ω | 163 μH/Ω          | 327 μH/Ω | 150 μH/Ω | 301 μH/Ω          | 150 μH/Ω | 301 μH/Ω | 150 μH/Ω  | 301 μH/Ω | 150 μH/Ω | 301 μH/Ω    |        |     |           |  |  |

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<br>3 V/m, 1.4...2 GHz<br>1 V/m, 2...2.7 GHz | A         | 10 V/m, 80...1000 MHz<br>3...10 V/m, 1.4...2 GHz | A         | 20 V/m, 80...1000 MHz<br>10 V/m, 1.4...2 GHz<br>3 V/m, 2...2.7 GHz | 20 V/m, 80...1000 MHz<br>10 V/m, 1.4...2 GHz<br>3 V/m, 2...2.7 GHz | FS                         | 20 V/m, 80...1000 MHz<br>10 V/m, 1.4...2 GHz<br>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,<br>Diff. / Comm. 0 Ω/10 Ω                            | B         | 0.5 kV / 1 kV,<br>Diff. / Comm. 0 Ω/10 Ω         | A         | 1 kV / 2 kV,<br>Diff. / Comm. 0 Ω/10 Ω                             | 1 kV / 2 kV,<br>Diff. / Comm. 0 Ω/10 Ω                             | FS                         | 1 kV / 2 kV, Diff. / Comm.<br>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<br>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<br>100% for 20 ms                                   | B         | 100% for 20 ms                                   | B         | 60% for 10 ms<br>100% for 20 ms                                    | 60% for 10 ms<br>100% for 20 ms                                    | FS                         | 60% for 10 ms<br>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<br>15...150 kHz, 10 V<br>50/60 Hz, 100 V    | 1.5...15 kHz, 1...10 V<br>15...150 kHz, 10 V<br>50/60 Hz, 100 V    | FS                         | 15 Hz...150 kHz, 10 V<br>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,<br>Diff. / Comm. 40 Ω                                | B         | 0.5 kV / 1 kV,<br>Diff. / Comm. 40 Ω             | B         | 50/60 Hz, 100 V  | 50/60 Hz, 100 V  | FS                         | 1 kV / 2 kV<br>Diff. / Comm. 40 Ω                                  | B      |
|            | Surge output        | IEC 61000-4-5  | 1 kV / 2 kV,<br>Diff. / Comm. 40 Ω                                | B         | 0.5 kV / 1 kV,<br>Diff. / Comm. 40 Ω             | B         | 2 kV<br>Comm. 40 Ω   | 2 kV<br>Comm. 40 Ω   | FS                         | 1 kV / 2 kV<br>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<br>15...150 kHz, 10 V<br>50/60 Hz, 100 V    | 1.5...15 kHz, 1...10 V<br>15...150 kHz, 10 V<br>50/60 Hz, 100 V    | FS                         | 15 Hz...150 kHz, 10 V<br>50 Hz, 300 Ω, 230 V                       | A 0.5% |

## 9000 EMC specifications - immunity:

|                                      | Essential operation<br>(functional safety) | Continuous<br>unmonitored<br>operation | Continuous<br>monitored<br>operation | Non-continuous<br>operation |
|--------------------------------------|--|--|--------------------------------------|-----------------------------|
| ESD<br>IEC 61000-4-2                 | A  | B                                      | B                                    | C                           |
| EM<br>IEC 61000-4-3                  | A  | A                                      | A                                    | B                           |
| Burst<br>IEC61000-4-4                | A  | B                                      | B                                    | B                           |
| Surge<br>IEC 61000-4-5               | A  | B                                      | B                                    | C                           |
| Conducted RF<br>IEC 61000-4-6        | A  | A                                      | A                                    | C                           |
| Voltage interrupts<br>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<br>(performance criteria A; B; C)   | May fail   |
| Safety function    | Performance criteria<br>- A, or<br>- B + observed deviation + recovery<br>time to be documented in the<br>data sheet, or<br>- C + observed behaviour<br>documented in the data sheet | Performance criteria<br>FS<br>(i.e. no effect outside the<br>specification, or<br>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 ( $\mu\text{A}$ )    |
|                   | Average     |                   | 30 to 20 dB ( $\mu\text{A}$ )    |
|                   | Quasi-peak  | 0.50 to 30 MHz    | 30 dB ( $\mu\text{A}$ )          |
|                   | Average     |                   | 20 dB ( $\mu\text{A}$ )          |