

# RAO02

## ABB Ability™ Symphony® Plus Hardware Selector



The RAO02 Redundant Analog Output module processes up to 16 high-level, group isolated, analog output field signals. Each channel is independently configurable for either 4 to 20 mA or 1 to +5 VDC ranges. FC 221 (I/O Device Definition) sets AO module operating parameters and each output channel is configured using FC 223 (Analog Output CH) to set individual output channel parameters such as engineering units, High/Low Alarm limits, default value in event of loss of communication with controller, etc.

D/A resolution of each channel is 12 bits. The RAO02 module has one D/A converter for each output channel.

In current mode, the RAO02 module supports HART v5.4 instruments and provides short circuit protection by limiting current to a maximum of 26 mA. The RAO02 module will also detect an open circuit in less than 5 seconds.

### Features and benefits

- 16 independently configurable channels supporting:
- 4 to 20 mADC or 1 to +5 VDC
- Up to 24 HART v5.4 secondary variables Total
- Max 4 sec vars per analog input CH
- Sec HART variables available to control logic
- 12 to 16-Bit (with polarity) A/D resolutionV
- A/D update of all 16 Channels in 100 msec
- Accuracy is  $\pm 0.1\%$  of Full Scale Range where FSR = 25 mA or 6.25 VDC

| General info                |                                   |
|-----------------------------|-----------------------------------|
| Article number              | 2VAA008428R1 (RAO02)              |
| Type                        | Redundant Analog Output           |
| Signal specification        | AO: 4...20 mA, or 1...+5 VDC      |
| Life cycle status           | ACTIVE                            |
| Number of channels          | 16                                |
| Signal type                 | AO                                |
| HART                        | Yes                               |
| SOE                         | No                                |
| Redundancy                  | Yes                               |
| Form factor                 | Standard (190 mm)                 |
| Mounting                    | Horizontal Row or Vertical Column |
| MTBF (per MIL-HDBK-217-FN2) | PR A: 109,487 Hours               |
| MTTR (Hours)                | 1 Hours                           |

| <b>Detailed data</b>                |   |
|-------------------------------------|---|
| Module power requirements           | 100mA typical @24 VDC ± 10%   |
| Module power connection             | POWER TB on cHBX01L or VBX01T   |
| Field IO power                      | 16 mA/CH typical, 22mA/CH maximum @ 24 VDC ±10%                           |
| Overvoltage category                | Category I for power, inputs or outputs. Tested according to EN 61010-1   |
| Max field cable length              | 600 meters (1968 feet)  |
| Number of Channels                  | 16 independently configurable AI channels                                 |
| Signal ranges and types             | Analog Inputs: 4...20 mA, or 1...+5 VDC with HART                         |
| No. of HART modems                  | 1 HART modem per module   |
| Max no. of secondary HART variables | Up to 24 secondary variables Total, up to 4 variables per CH (HART v 5.4) |
| Secondary HART variable update rate | 2.5 seconds typical, 8.0 seconds max                                      |
| Input Impedance                     | 250 Ω current mode (externally powered), >= 250 kΩ voltage mode           |
| Output load                         | 0 to 750 Ω Current mode, minimum 22kΩ voltage mode                        |
| A/D Conversion                      | 1 A/D converter per module  |
| A/D Update rate                     | 100 msec for all 16 channels  |
| D/A Conversion                      | 12-Bits   |
| Accuracy, FSR                       | ±0.01% FSR, FSR = 25 mA or 6.25 VDC                                       |
| Temp effect on accuracy             | Max ±0.003% per deg C   |
| Field signal to Logic isolation     | Galvanically isolated, 1500 V up to 1 minute                              |
| Channel isolation                   | 1x16 group isolated, 1500 V up to 1 minute                                |
| Short circuit protection            | Max 96 mA per CH  |

| <b>Diagnostics</b>  |   |
|---------------------|---|
| Front plate LED's   | STATUS LEDs: R (Run) and F (Fault) + 1 thru 8 |
| Local availability  | Mini USB connection on module front plate     |
| Remote availability | HN800 device diagnostics via SPE              |

**Environment and certification**

|  |  |
|--|--|
| Temperature, Operating                 | -40 to +70 °C Tested according to IEC/EN 60068-2-1, IEC/EN 60068-2-2   |
| Temperature, Storage                   | -40 to +85 °C Tested according to MIL-STD-810G   |
| Relative humidity                      | 20% to 95% @ 40°C non-condensing. Tested according to IEC/EN 60068-2-78, IEC/EN 61298-3  |
| Vibration (operational sinusoidal)     | 5 to 60 Hz 0.137 mm (0.0054 in.), 60 to 150 Hz 1.0 G. Tested according to IEC/EN 60068-2-6   |
| Vibration (transportation)             | 10 to 500 Hz. Tested according to MIL-STD-810G   |
| Shock (storage)                        | 15 G, 11 msec. Tested according to IEC/EN 60068-2-27   |
| Drop                                   | 100 mm. Tested according to IEC/EN 60068-2-31  |
| Protection class                       | IP20 according to EN 60529, IEC 529  |
| Altitude (operational)                 | Sea level to 3,048 meters (10,000 ft.) Tested according to MIL-STD-810G  |
| Altitude (storage)                     | Sea level to 12,192 meters (40,000 ft.) Tested according to MIL-STD-810G   |
| Air quality                            | ISA S71.04 G1, ISA S71.04 G3 compliant versions SPCxxxA are also available   |
| ESD immunity                           | Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-2, Severity level 3   |
| Surge immunity                         | Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-5, Severity level 3   |
| Electrical fast transient immunity     | Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-4, Severity level 3   |
| Radiated RFI immunity                  | Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-3, Severity level 3   |
| Conducted Immunity                     | Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-6, Severity level 3   |
| Magnetic field immunity                | Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-8, Severity level 4   |
| Radiated emission                      | Tested according to IEC/EN 61000-6-4, CISPR 11 + A1, CISPR 16-1-1, Group 1, Class A, ISM equipment according to IEC/EN 61000-6-2, IEC/EN 61000-4-6, Severity level 3 |
| Conducted emission                     | Tested according to IEC/EN 61000-6-4, CISPR 11 + A1, CISPR 16-1-1, Group 1, Class A, ISM equipment   |
| Voltage dips and interruption immunity | Tested according to IEC/EN 61000-6-2, IEC/EN 61000-4-11  |
| CSA non-hazardous locations            | Certified for use as process control equipment in an ordinary (non-hazardous) location   |
| CSA hazardous, nonincendive locations  | Class I, Division 2, Groups A, B, C, D   |
| CE Mark                                | CE Mark EMC directive 2004/108/EC & Low Voltage Directive 2006/95/EC   |
| RoHS compliance                        | RoHS Directive 2015/863  |
| WEEE compliance                        | DIRECTIVE/2012/19/EU   |

**Compatibility**

|                             |  |
|-----------------------------|--|
| Use with MTU                | HBR01-EPD, HBR01-FPH, VBR01-EPD, VBR01-FPH |
| Module keying code for base | slot #1 = 04, slot #2 = 16                 |

**Dimensions**

|        |        |
|--------|--------|
| Width  | 27 mm  |
| Depth  | 106 mm |
| Height | 190 mm |
| Weight | 240 g  |

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