

## TECHNICAL OFFER

# QUADRANS

IMO grade surface gyrocompass & attitude  
reference system



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## Table of contents

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|                                                          |           |
|----------------------------------------------------------|-----------|
| <b>1. Introduction .....</b>                             | <b>3</b>  |
| 1.1. Technology .....                                    | 3         |
| 1.2. Product Description.....                            | 4         |
| 1.3. Software interface .....                            | 5         |
| 1.3.1. “WEB-based” Graphic User Interface (GUI) .....    | 5         |
| 1.3.2. Communication protocol and software library ..... | 6         |
| 1.4. Certification.....                                  | 7         |
| <b>2. Performance &amp; Specifications .....</b>         | <b>8</b>  |
| 2.1. Sensors.....                                        | 8         |
| 2.1.1. Gyrocompass and motion sensor.....                | 8         |
| 2.1.2. Navigation .....                                  | 8         |
| 2.2. Compass safe distance.....                          | 8         |
| 2.3. Mechanical .....                                    | 8         |
| 2.4. Control .....                                       | 9         |
| 2.5. Power supply .....                                  | 9         |
| 2.6. Reliability.....                                    | 9         |
| 2.7. Environment.....                                    | 9         |
| <b>3. Scope of supply .....</b>                          | <b>10</b> |
| 3.1. Standard product pack .....                         | 10        |
| 3.2. Packing list.....                                   | 10        |
| 3.3. Optional accessories and services.....              | 10        |
| 3.3.1. Accessories .....                                 | 10        |
| 3.3.2. Services .....                                    | 10        |
| 3.3.3. Ancillaries.....                                  | 11        |
| <b>4. Interface .....</b>                                | <b>12</b> |
| 4.1. Electrical interface .....                          | 12        |
| 4.1.1. Power supply connector (S103Z052).....            | 12        |
| 4.1.2. Serial ports connector (S104A092) .....           | 12        |
| 4.1.3. I/O pulses connector (S104A086).....              | 13        |
| 4.1.4. Ethernet connector (S103A053) .....               | 13        |
| 4.2. Mechanical interface .....                          | 14        |
| 4.2.1. Mechanical overview .....                         | 14        |
| 4.2.2. Interface Plate.....                              | 15        |

## 1. Introduction



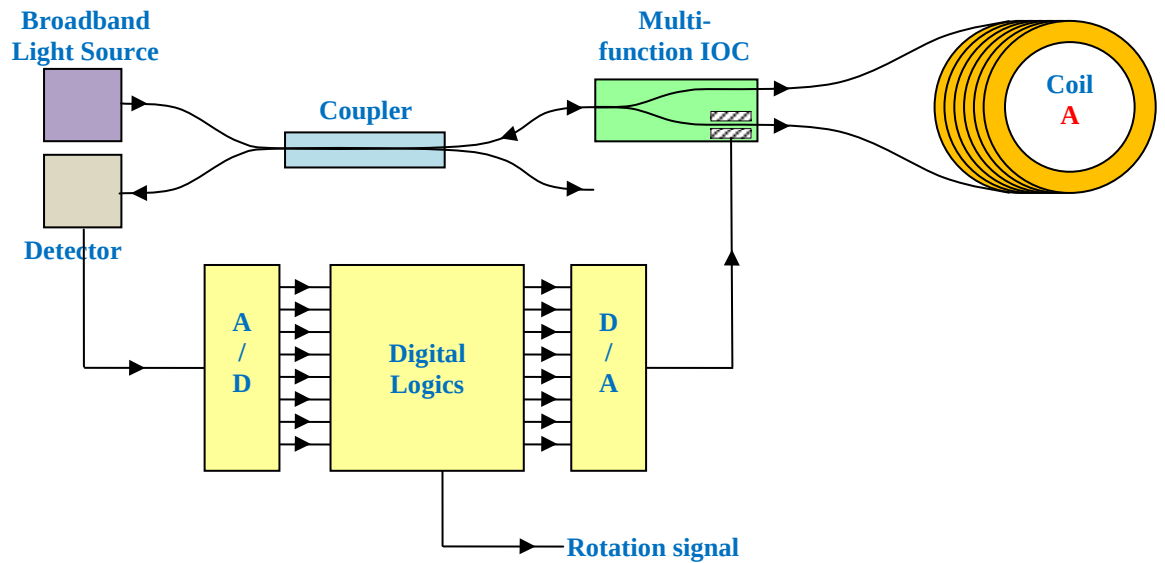
- **IMO Grade Surface Gyrocompass**
- **All-in-one high-accuracy Attitude and Heading Reference Sensor**  
Heading, Roll, Pitch, rate of turn
- **Fiber-Optic Gyroscope (FOG), unique strap-down technology**  
No spinning element, no gas cavity hence maintenance free
- **Low latency for real time control loops**
- **Multiple interfaces – aiding sensors for a range of applications**
- **Ethernet for fast and easy integration**
- **Time stamping for all data**
- **Compact, lean and reliable**  
Appropriate for all marine applications
- **Up to 5 years free warranty**

### 1.1. Technology

QUADRANS is providing raw accelerations and rotations of a body frame.

The inertial measurement unit is the core component of the system. It is the assembly of three Fiber Optic Gyroscopes (FOGs) and three accelerometers mounted on three orthogonal axes.

A fiber optic gyroscope is a 2 wave ring interferometer made of a multi-turn fiber coil enclosing an area  $A$  (see Figure hereafter). Light entering the interferometer is split into two counter propagating waves which recombine perfectly in phase after having travelled along the same path in opposite directions. When the FOG is rotating, a relativistic effect, known as Sagnac effect, induces a difference of transit time between the two waves which can be measured by interferometric means. The difference of transit time is proportional to the product of the rotation rate  $\Omega$  and the area  $A$  enclosed by the coil (counted as many times as the fiber coil turns around  $A$ ). The FOG sensitivity can be increased by increasing the number of turns of the fiber coil and/or the fiber coil diameter.



*The heart of a FOG*

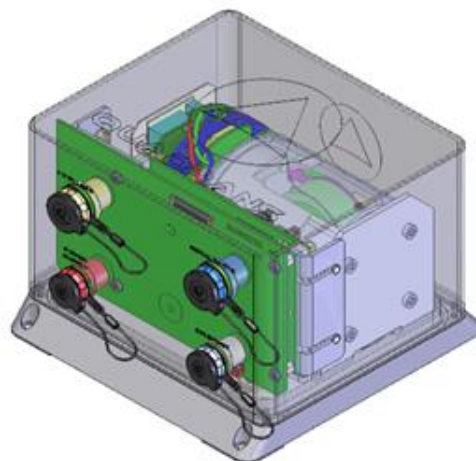
FOGs manufactured by iXBlue cover the medium to very high performance range: from 0.1 deg per hour bias to 0.0003 deg per hour bias (for space applications).

## 1.2. Product Description

QUADRANS is a small size, low weight, low power consumption, IMO-certified, solid-state Fiber-Optic gyrocompass providing all necessary data for demanding navigation and control applications: True-North heading, roll, pitch and rates of turn.

Developed for high end marine gyrocompass applications, it can be interfaced easily with other industry standard navigation sensors and systems.

Based on iXBlue's latest Fiber-Optic Gyroscope (FOG) technology, QUADRANS has no moving part and offers high performance and long lifetime without any need for preventive maintenance.



*Compact and rugged QUADRANS mechanical design*

## 1.3. Software interface

### 1.3.1. “WEB-based” Graphic User Interface (GUI)

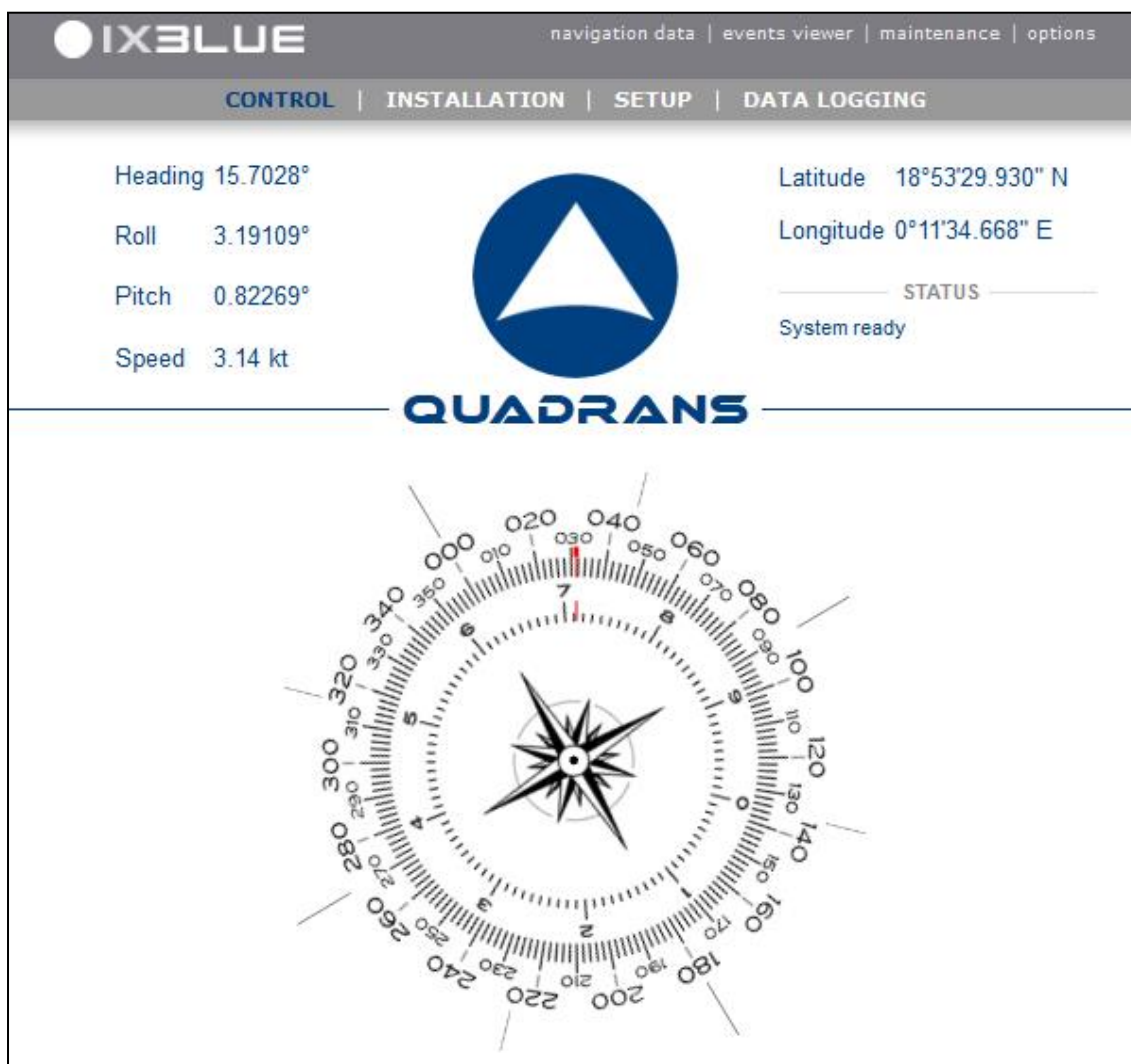
QUADRANS is delivered with iXBlue WEB-based graphic user interface which is progressively installed to the full range of products, providing a common look-and-feel to the whole iXBlue range. Directly Ethernet compatible, this feature greatly improves the ease of installation and operation of the equipment thanks to its interactive menu screens and network characteristics. QUADRANS is easily interfaced to any TCP/IP network or wireless network, and running the WEB-based GUI is achieved with any terminal with WEB browser installed (PC computer, MAC, pocket PC's, etc): dedicated PC and software is no longer required when using the system.

Using graphic and conversational menu screens the WEB-based GUI allows:

- Defining the installation parameters i.e., the parameters that do not change from one mission to another, orientation and misalignment of the system with respect to the vessel (MECHANICAL PARAMETERS option), lever arms for external monitoring points, the INPUTS (external sensors, UTC), the OUTPUTS and the IP address, DHCP and PPP modes, network mask (NETWORK option)
- Defining the set-up parameters i.e., the parameters that may vary from one mission to another or even during the same mission: manual position and speed updates, external sensors configuration, warning configuration, etc.
- Monitoring the QUADRANS operations such as
  - Display data in real time
  - Be informed of the system status
  - Data logger
  - Check the initial alignment procedure
- Performing maintenance tasks including:
  - System restart
  - Firmware updates
  - Parameters reset
  - Support contact

**Note:**

The use of the WEB-based User Interface is not necessary to operate the system. It is a tool for configuring the system, modifying configuration during operation, and displaying or recording data output from the system.



*WEB based interface screen example*

### 1.3.2. Communication protocol and software library

All communication to and from QUADRANS are achieved using industry standard NMEA0183, ASCII or binary data telegrams through the Ethernet or serial input/output ports, messages content is fully described in the user manual provided with the equipment.

This allows QUADRANS to smoothly interface to iXBlue or already existing third party hardware and software, or easily interface to peripherals or other systems.

## 1.4. Certification

QUADRANS is certified with the International Maritime Organization for gyrocompasses and ISO 8728.

QUADRANS is certified with the International Maritime Organization for gyrocompasses for High Speed Craft and ISO 16328.

For any other certification request, please contact us.

## 2. Performance & Specifications

### 2.1. Sensors

#### 2.1.1. Gyrocompass and motion sensor

|                                 |                                                                   |
|---------------------------------|-------------------------------------------------------------------|
| Heading accuracy (1) (2) (4)    | 0.23 deg                                                          |
| Roll and pitch accuracy (2) (4) | 0.1 deg                                                           |
| Rate of Turn accuracy (4)       | 0.05 deg / min                                                    |
| Settling time (3)               | 5 minutes (initial) + 25 minutes (fine)                           |
| Range                           | Heading: 0 to 360°<br>Roll: -180° to +180°<br>Pitch: -90° to +90° |

(1) Secant latitude = 1 / cosine latitude

(2) RMS values. 68% of the data is within this value of confidence

(3) Initial alignment must be performed in static conditions or at drift

(4) Maximum error=3\*RMS error

#### 2.1.2. Navigation

Position & Speed are available with QUADRANS.

Position accuracy is dependent on aiding position sensor accuracy; typically we reduce the level of noise of the external aiding device by a factor 3 and rejects position spikes to provide smooth and high data rate navigation.

### 2.2. Compass safe distance

|                                |         |
|--------------------------------|---------|
| Standard compass safe distance | 0.3 m   |
| Steering compass safe distance | < 0.2 m |

### 2.3. Mechanical

|                        |                            |
|------------------------|----------------------------|
| Dimensions (l x w x h) | 160 mm x 160 mm x 113,5 mm |
| Weight                 | 2.5 kg                     |
| Construction           | Aluminum                   |
| Mounting (5)           | 3 Ø 4.5 holes              |
| Connectors             | Fischer series and TNC     |
| Water tightness        | IP66                       |

(5) Two alignment pin holes are provided under the base plate for accurate assembly/removal of QUADRANS

## 2.4. Control

|                       |                                                             |
|-----------------------|-------------------------------------------------------------|
| Serial RS232 or RS422 | 2 input and 2 output ports & repeater port                  |
| Ethernet ports        | UDP (unicast, multicast, broadcast)/ TCP (client or server) |
| Pulse ports           | 4 inputs/2 outputs, 5 V (TTL level)                         |
| Input/ output formats | industry standards: NMEA 0183, ASCII, BINARY                |
| Baud rate             | 600 bauds to 460 kbauds                                     |
| Data output rate      | 0.1 Hz to 200 Hz                                            |
| Data input rate       | Up to 100 Hz                                                |

*All inputs/ outputs are available on the Ethernet link. Outputs can be duplicated both on serial and Ethernet port.  
 QUADRANS supports the input of GPS or EM log for ease of operation and full heading accuracy*

## 2.5. Power supply

|                   |                                                |
|-------------------|------------------------------------------------|
| Power supply      | 24 V <sub>DC</sub> (15 to 36 V <sub>DC</sub> ) |
| Power consumption | 10 W                                           |

## 2.6. Reliability

|                        |               |
|------------------------|---------------|
| MTBF (computed)        | 100,000 h     |
| Warranty period        | Up to 5 years |
| Preventive maintenance | None          |

## 2.7. Environment

|                            |                             |
|----------------------------|-----------------------------|
| Operating temperature      | -20 °C to +55 °C            |
| Storage temperature        | -40 °C to +80 °C            |
| Angular dynamic            | +/- 500°/s                  |
| Acceleration dynamic range | +/-5 g                      |
| Vibration(6)               | Sinus 0.5g max (4 to 50 Hz) |
| shock survival             | > 15g (11 ms)               |
| EMC                        | IEC60945                    |

(6) IMO specification and criteria

### 3. Scope of supply

#### 3.1. Standard product pack

| Qty. | Designation   | Ordering code |
|------|---------------|---------------|
| 1    | PACK QUADRANS | KAA00071      |

#### 3.2. Packing list

| Qty. | Designation                                                   | Ordering code                                                                                   |
|------|---------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 1    | QUADRANS (code OTAN 6605-14-572-0244)                         | PAA00004                                                                                        |
| 1    | Quick Start Guide (paper copy)                                | N/A                                                                                             |
| 1    | CD-ROM with user manual                                       | N/A                                                                                             |
| 1    | Power supply Converter – 220Vac to 24Vdc– Fischer 3pin – 1,5m | SEL00008                                                                                        |
| 1    | Cable - Pigtail - Fischer 3pin - 5m - Power                   | SCA00051                                                                                        |
| 1    | Cable - 220V - 2,5m – EU or UK or USA or DK or AUS            | FCO00003 (EU)<br>or FCO00005 (UK)<br>or FCO00006 (USA)<br>or FCO00004 (DN)<br>or FCO00002 (AUS) |
| 1    | Cable – Ethernet – Fischer 4pin – 5m                          | SCA00050                                                                                        |
| 1    | Acceptance test report                                        | N/A                                                                                             |
| 1    | Calibration certificate                                       | N/A                                                                                             |
| 1    | Warranty certificate                                          | N/A                                                                                             |
| 1    | Ethernet and factory setting certificate                      | N/A                                                                                             |
| 1    | IMO declaration of conformity                                 | N/A                                                                                             |

#### 3.3. Optional accessories and services

##### 3.3.1. Accessories

| Designation                                                | Ordering code |
|------------------------------------------------------------|---------------|
| Flight Case – Rugged – QUADRANS                            | DCV00003      |
| Cable - Pigtail - Fischer 19pin - 5m - Serial I/O          | SCA00048      |
| Cable - Pigtail - Fischer 16pin - 5m - Pulse I/O           | SCA00049      |
| Cable - Test - Fischer 19pin to 7 SubD - 0,2m - Serial I/O | SCA00046      |
| Cable - Test - Fischer 16pin to BNC - 0,2m - Pulse I/O     | SCA00045      |
| Kit - Mechanical Interface Plate - 50                      | MDI04075      |

##### 3.3.2. Services

| Designation                           | Ordering code |
|---------------------------------------|---------------|
| Support engineering day rate QUADRANS | \$SE_0004     |
| Training day rate QUADRANS            | \$SE_0009     |
| Warranty extension 1 year QUADRANS    | \$SE_0054     |

### **3.3.3. Ancillaries**

iXBlue offers a complementary range of highly reliable ancillaries which have been qualified for QUADRANS installation. Different types of repeaters, interface box and uninterruptible power supplies with different features are also available on request.

For more information, please contact us.

## 4. Interface

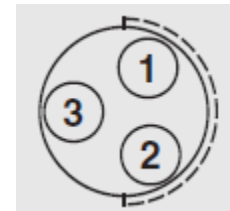
### 4.1. Electrical interface

The connector references of QUADRANS are as follows:

Power supply: S103Z052  
 Serial ports: S104A092  
 I/O pulses: S104A086  
 Ethernet: S103A053

#### 4.1.1. Power supply connector (S103Z052)

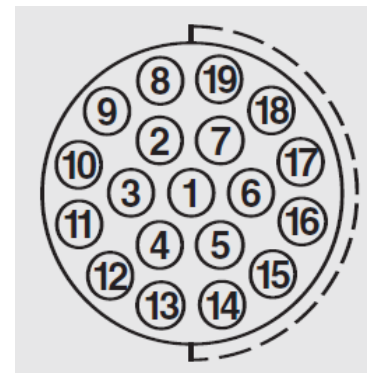
| Pin # | Signal                 |
|-------|------------------------|
| 1     | 24 V DC                |
| 2     | Electrical Ground (0V) |
| 3     | Mechanical Ground      |



Plug pin-out  
(soldering side)

#### 4.1.2. Serial ports connector (S104A092)

| Pin # | Signal                              |
|-------|-------------------------------------|
| 1     | Port A TX RS232 / TX RS422 (port A) |
| 2     | Port A TX RS422 (port B)            |
| 3     | Port A TX GND <sup>(7)</sup>        |
| 4     | Port B TX RS232 / TX RS422 (port A) |
| 5     | Port B TX RS422 (port B)            |
| 6     | Port B TX GND <sup>(7)</sup>        |
| 7     | Port A RX RS232 / RX RS422 (port B) |
| 8     | Port A RX RS422 (port A)            |
| 9     | Port A RX GND <sup>(7)</sup>        |
| 10    | Port B RX RS232 / RX RS422 (port B) |
| 11    | Port B RX RS422 (port A)            |
| 12    | Port B RX GND <sup>(7)</sup>        |
| 13    | Reserved                            |
| 14    | Reserved                            |
| 15    | Reserved                            |
| 16    | Repeater TX RS232                   |
| 17    | Repeater RX RS232                   |
| 18    | Reserved                            |
| 19    | Repeater RX/TX GND <sup>(7)</sup>   |



Plug pin-out  
(soldering side)

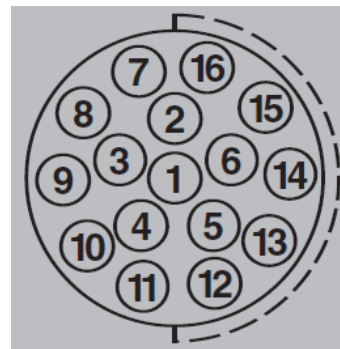
<sup>(7)</sup> All RX/TX GND are isolated from each other.

### 4.1.3. I/O pulses connector (S104A086)

| Pin # | Signal                               |
|-------|--------------------------------------|
| 1     | PPS input signal                     |
| 2     | PPS input GND                        |
| 3     | Reserved                             |
| 4     | Reserved                             |
| 5     | Input pulse A signal <sup>(8)</sup>  |
| 6     | Input pulse A GND <sup>(8) (9)</sup> |
| 7     | Input pulse B signal <sup>(8)</sup>  |
| 8     | Input pulse B GND <sup>(8) (9)</sup> |
| 9     | Input pulse C signal <sup>(8)</sup>  |
| 10    | Input pulse C GND <sup>(8) (9)</sup> |
| 11    | Pulse out A signal                   |
| 12    | Pulse out A GND <sup>(9)</sup>       |
| 13    | Pulse out B signal                   |
| 14    | Pulse out B GND <sup>(9)</sup>       |
| 15    | Reserved                             |
| 16    | Reserved                             |

<sup>(8)</sup> Can be used as incoming event marker or EM LOG input pulse signals.

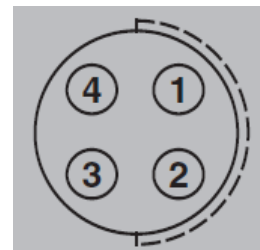
<sup>(9)</sup> All pulse GND signals are common.



Plug pin-out  
(soldering side)

### 4.1.4. Ethernet connector (S103A053)

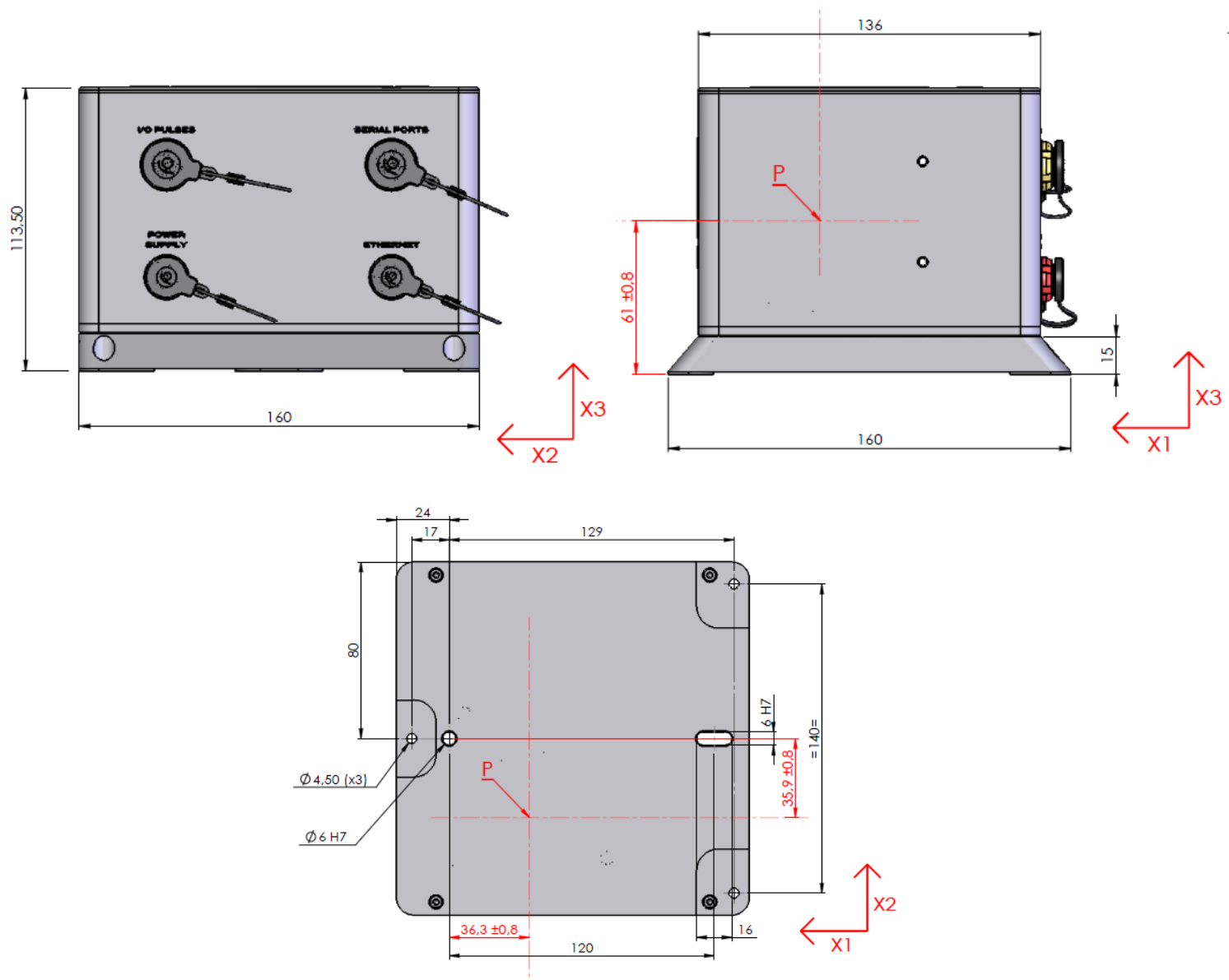
| Pin # | Signal          |
|-------|-----------------|
| 1     | Ethernet TX+    |
| 2     | Ethernet TX-    |
| 3     | Ethernet RX+    |
| 4     | Ethernet RX-    |
| Body  | Ethernet shield |



Plug pin-out  
(soldering side)

## 4.2. Mechanical interface

### 4.2.1. Mechanical overview



### 4.2.2. Interface Plate

