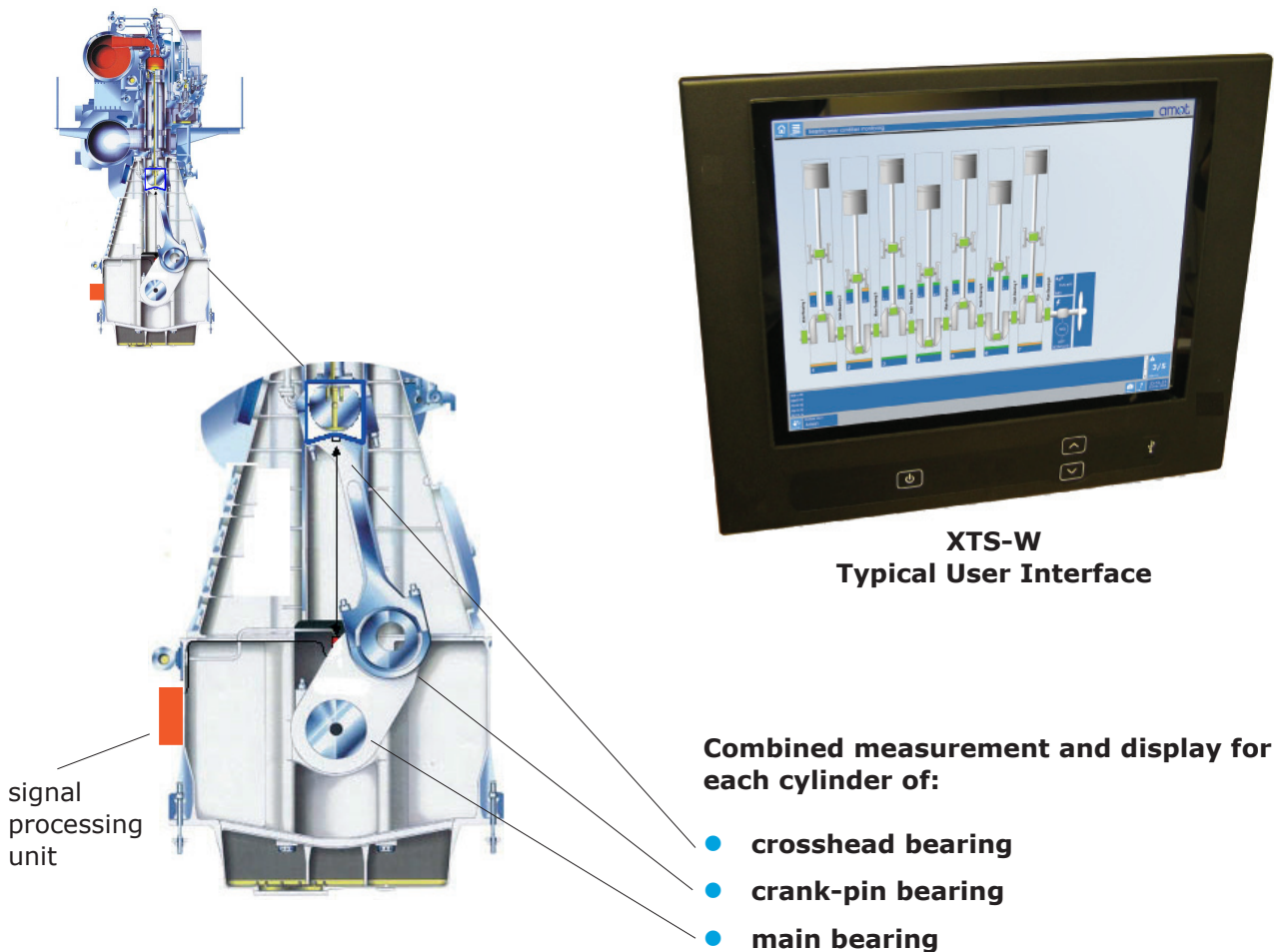


# Bearing Condition Monitor

Model XTS-W



## Application

- Monitors condition of crank train bearings in large 2-stroke diesel engines
- Monitors Bearing Wear (BWM)
- Monitors Water in Oil (WIO)
- Monitors Shaft Earth Device (SEDM)

## Key benefits

- Open-up inspections can be omitted if an XTS-W system is fitted
- Ultimate protection of engine from catastrophic damage
- Reporting and storage of long term trends - can be used as a tool for class surveying
- Simple low cost installation - no drilling of highly stressed engine components
- Provides signal for engine slow down in case of extreme bearing wear

amot

[www.amot.com](http://www.amot.com)

# Bearing Condition Monitor - XTS-W

## Display and Monitor Unit

### • Screen under alarm conditions



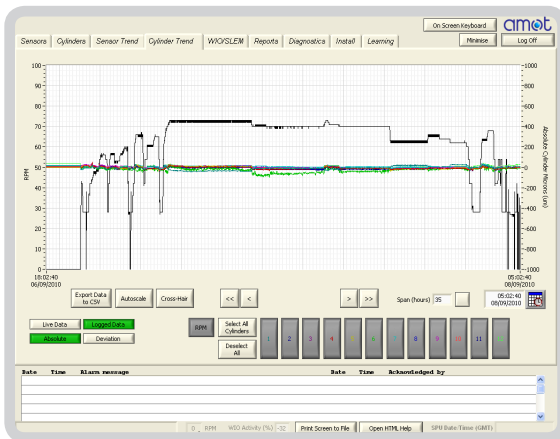
The Display and Monitor Unit comprises application-specific software, running on a marine approved PC.

The unit provides:

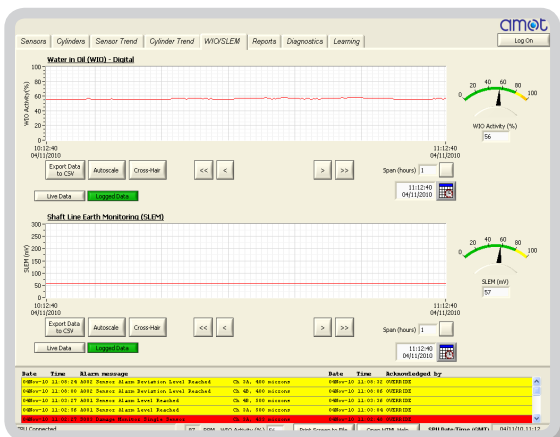
- Wear trend and prediction capability
- Alarm/warning indication
- Continuous bearing wear status display
- Water in oil activity display
- Shaft earth device monitoring (SEDM)

The use of proximity sensing and the availability of signal post-processing enables real-time wear trend analysis. Through analysis of the rate of change of the bearing condition it provides much earlier indication of potential bearing problems.

### • Trend lines using data from selected sensors



### • Water-in-oil displaying water activity (aW) and shaft earth device monitoring (SEDM)



# Bearing Condition Monitor - XTS-W

## Water in Oil Monitoring (WIO)

| Engine condition   | Water activity (aw) |
|--------------------|---------------------|
| Normal running     | 0 - 0.7 (0-70%)     |
| First alarm level  | 0.5 (50%)           |
| Second alarm level | 0.9 (90%)           |

### Humidity measurement in oil

Similar to the humidity in the air, the water content in oil can be indicated by the relative value aw:

- aw (actual water content as a fraction of the water content in saturated oil)
- aw = 0 corresponds to water-free oil
- aw = 1 indicates saturated oil (displayed as 0-100% on XTS-W)

- The new generation XTS-W has fully integrated water-in-oil (WIO) and shaft earth device monitoring (SEDM). Separate screens show trends, real-time measurement of Water Activity (aw). Alarm levels are as defined by engine manufacturers.

- The sensor is installed in the main lube oil line at the inlet to the engine

- There are 2 alarm set points, see above

- In addition full trend data is available as standard allowing interrogation of the system to determine rate of water contamination.

## Shaft Earth Device Monitoring (SEDM)

- Provides a constant display of shaft potential
  - confirms that the bonding equipment is successfully maintaining this at a level not exceeding the value of 80 mV
- Uses high silver composition brushes running on a silver track - provides effective and sustained low conductivity necessary to ensure that the shaft bonding and its connections maintains a contact resistance no greater than 0.001 Ohms
- Combines earthing, monitoring and alarming in one installation

The AMOT Shaft Earth Device Monitor comprises a split slipping arrangement and ancillary brush gear, which is designed to be easily installed by proficient technical personnel and without the need for specialist tools.

The slipping is supplied as two identical halves, rolled to the specified shaft diameter.

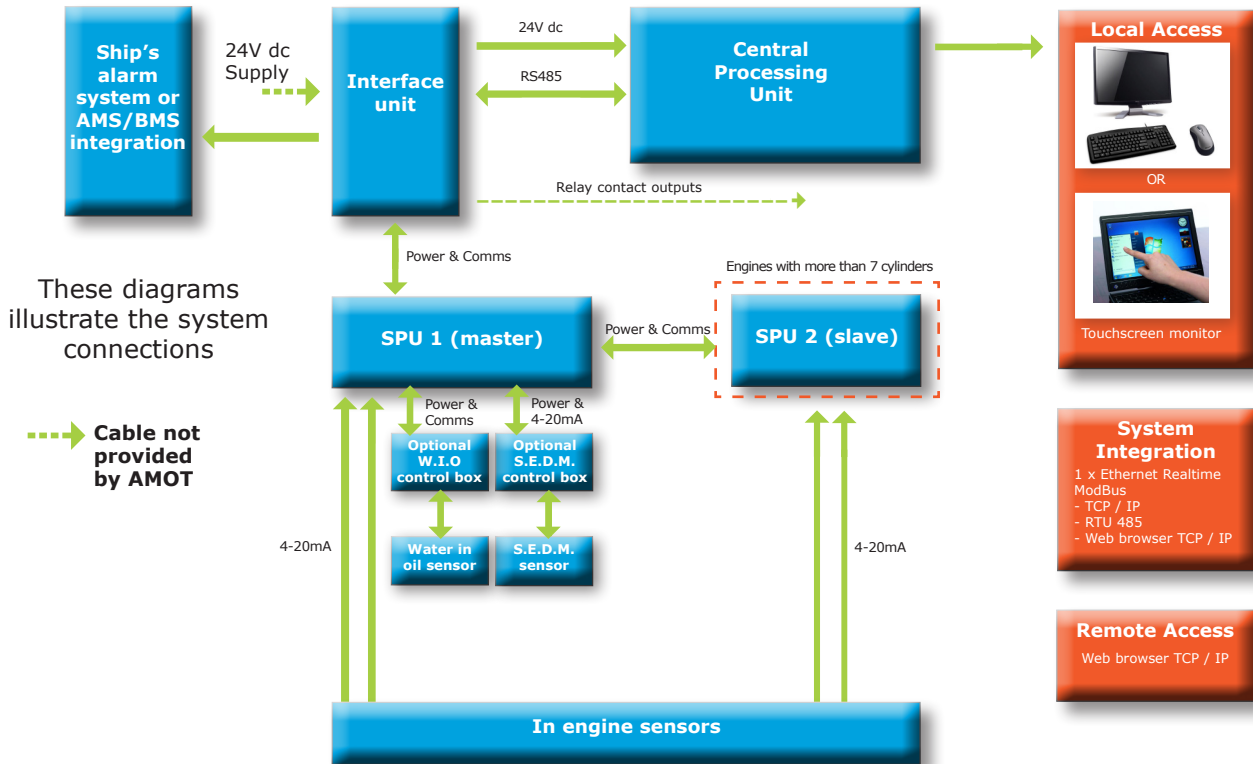
The Shaft Earth Device Monitor provides a permanent and readily available indication on the condition, and therefore effectiveness, of the shaft bonding system.

To ensure a continuous cathode bond and the shaft bearing is not damaged, the monitor should display shaft potential not exceeding 80 mV. Readings in excess of this value are indicative of worn bonding brushes or poorly maintained brush gear and/or slippings.

Measurement of the shaft potential is achieved by the installation of a single monitoring brush which runs on the main shaft bonding slipping, but has its brush gear mounted on a separate and insulated spindle. This brush gear is connected directly to the condition monitor unit.

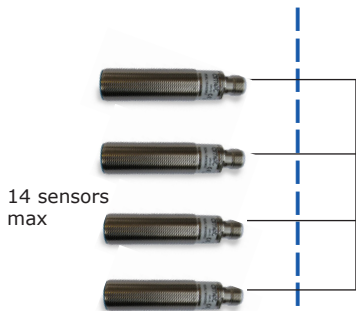
# Bearing Condition Monitor - XTS-W

## System Interconnectivity

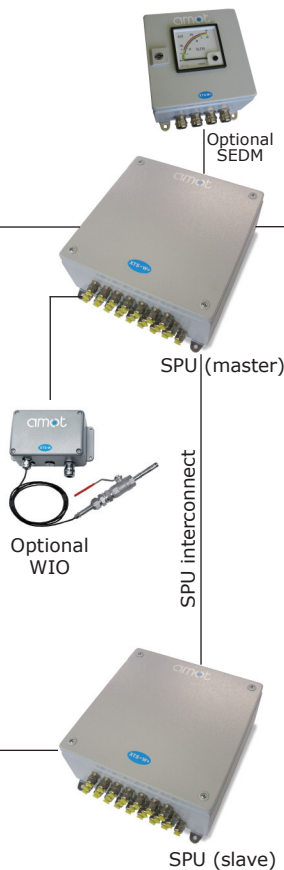


### In Engine

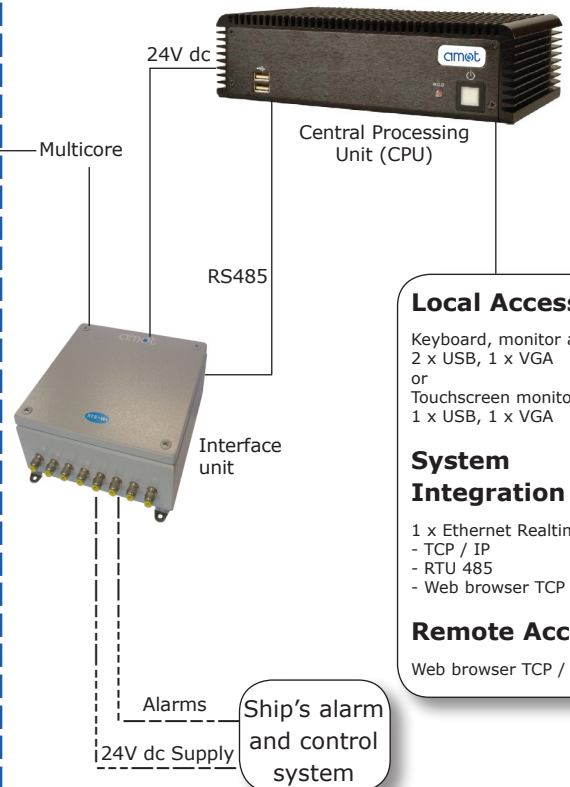
Proximity sensors



### On Engine



### Engine Control Room



- Local Access**
- Keyboard, monitor and mouse
  - 2 x USB, 1 x VGA
- OR
- Touchscreen monitor
  - 1 x USB, 1 x VGA
- System Integration**
- 1 x Ethernet Realtime ModBus
  - TCP / IP
  - RTU 485
  - Web browser TCP / IP
- Remote Access**
- Web browser TCP / IP

# Bearing Condition Monitor - XTS-W

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## Overview of System Components

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### Proximity Sensors



The proximity sensors are robust, proven electronic sensors, which use a low intensity electromagnetic field to detect the position of the guide shoes at bottom dead centre (BDC). The sensors are fixed to custom designed brackets for different engine types.

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### Optional Water in Oil Sensor



The water in oil sensor monitors moisture content in the engine's lubricating oil.

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### Optional Shaft Earth Device Monitor



The shaft earth device monitor measures the electrical potential between the propeller shaft and the hull.

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### Central Processing Unit (CPU)



The Central Processing Unit (CPU) provides data storage, full class reporting and local user interface.

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### Signal Processing Unit (SPU)



The Signal Processing Unit is capable of simultaneously processing signals from up to 14 proximity sensors, one water in oil sensor and one shaft earth device monitor (SEDM).

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### Interface Unit



The Interface Unit houses the necessary circuitry to distribute 24V dc to both the engine-mounted SPU and PC. It also provides the terminations for alarm integration with additional alarm diagnostics.

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# Bearing Condition Monitor - XTS-W

## Specification

### Proximity Sensor

|                |                                   |                          |                |
|----------------|-----------------------------------|--------------------------|----------------|
| Sensing range: | 3-5mm nominal - mild steel target |                          |                |
| Repeatability: | +/- 0.3mA device to device        |                          |                |
| Output type:   | 4-20mA passive                    |                          |                |
| Head Voltage:  | Nominal 18V                       | Limits 12 to 36V         |                |
| EMC:           | To EN60947-5-2                    |                          |                |
| Screening:     | Screened cable                    | Not terminated at sensor |                |
| Thread:        | M18 x 1.0                         |                          |                |
| Sealing:       | IP68                              |                          |                |
| Temperature:   | Storage                           | -40° to +150°C           | -40°F to 302°F |
|                | Operating                         | 20° to +90°C             | -4°F to 194°F  |
| Vibration:     | > 4g                              |                          |                |

### Signal Processing Unit

|                               |   |               |  |
|-------------------------------|---|---------------|--|
| Input voltage:                | 15 to 31.2V dc, 18 - 24V dc typical                           |               |  |
| Current consumption @ 18V:    | 350mA average   | 600mA max     |  |
| Proximity sensor connections: | 14 x self-powered 4-20mA loops                                |               |  |
| Extended memory slot:         | Accepts standard SD cards up to 2Gb                           |               |  |
| RS485 communications:         | 38400, N, 8, 1  |               |  |
| Output isolation:             | 5300V AC (RMS)  |               |  |
| Enclosure:                    | Fabricated steel box  |               |  |
| IP Rating:                    | IP55  |               |  |
| Vibration:                    | 5~25 Hz: +/-1.6mm    25~100Hz: +/-4g to Lloyds on Engine spec |               |  |
| Operating temperature:        | 0°C to 70°C   | 32°F to 158°F |  |
| Humidity:                     | 20% to 95% non-condensing                                     |               |  |
| Storage temperature:          | -20°C to 70°C   | -4°F to 158°F |  |

### Interface Unit

|                      |  |  |  |
|----------------------|--|--|--|
| Alarm outputs:       | Double pole change over relays:  |  |  |
|                      | Maximum current:   | 5A dc at 30V dc, resistive load<br>2A dc at 30V ac, inductive load |  |
| Input voltage:       | 24V dc +30% -25%   |  |  |
| Current consumption: | 1 AMP (and PC 3 AMP)   |  |  |
| Alarm connections:   | 'Healthy', 'Alarm' and 'Slowdown'  |  |  |
| Alarm polarity:      | 'Healthy' and 'Alarm' are normally energised, 'Slowdown' normally de-energised |  |  |

# Bearing Condition Monitor - XTS-W

## Specification continued

|                        |   |               |
|------------------------|---|---------------|
| Communications:        | RS485   | 2 wire        |
| Connections:           | RS485-A:D9S   | Pin 1         |
|                        | RS485-B:D9S   | Pin 2         |
| RS485 data format:     | 38400, N, 8, 1  |               |
| Fuses:                 | 3 x 2A antisurge, 1 x 5A antisurge 5 x 20 mm 'T' type |               |
| <b>Enclosure:</b>      | Fabricated steel box                                  |               |
| IP rating:             | IP55  |               |
| Vibration:             | 5~13.2Hz: +/-1.0mm                                    |               |
|                        | 13.2Hz~100Hz: 0.7g to Lloyds off Engine specification |               |
| Operating temperature: | 0°C to +45°C  | 32°F to 113°F |
| Humidity:              | 20% to 95% non-condensing                             |               |
| Storage temperature:   | -5°C to +45°C   | 23°F to 113°F |

### Central Processing Unit (CPU)

|                         |   |  |
|-------------------------|---|--|
| Power supply:           | 9 - 36V dc (24 V dc supplied from IF box) |  |
| USB connections:        | 4 x USB 2.0 ports                         |  |
| Local display:          | 1 x VGA port                              |  |
| Ethernet connection:    | 2 x 10 / 100                              |  |
| Operating temperature:  | -10 to +55°C                              |  |
| Mounting:               | DIN mount or VESA MIS-D 75 wall mount     |  |
| Weight (net / gross):   | 2.1 kg / 3.9 kg                           |  |
| Dimensions (D x W x H): | 132 x 229 x 64 mm                         |  |

### Water in Oil Sensor (optional)

|  |  |                                   |
|--|--|-----------------------------------|
| Water activity sensor:                   | Measuring range  | 0 ...1aw                          |
| Accuracy:                                | Including hysteresis and non-linearity and repeatability, traceable to international standards administered by NIST, PTB, BEV) |                                   |
|  | -15...40°C (5...104°F) <0.9aw ± (0.013 + 0.3%*mv) aw   |                                   |
|  | -15...40°C (5...104°F) >0.9aw ± 0.023aw  |                                   |
| Accuracy continued:                      | -25...70°C (-13...158°F) ± (0.014 + 1%*mv) aw  |                                   |
|  | -40...180°C (-40...356°F) ± (0.015 + 1.5%*mv) aw   |                                   |
| Temperature dependence of electronics:   | Typ. ± 0.0001 [1/°C] (typ. ± 5.6 * 10 <sup>-5</sup> [1/°F])  |                                   |
| Temperature dependence of sensing probe: | Typ. ± (0.00002 + 0.0002 x aw) x ΔT [°C] ΔT = T - 20°C   |                                   |
| Response time:                           | With stainless steel filter at 20°C / t90 typ. 10min in still oil  |                                   |
| Temperature sensing element:             | Pt1000   | (tolerance class A, DIN EN 60751) |



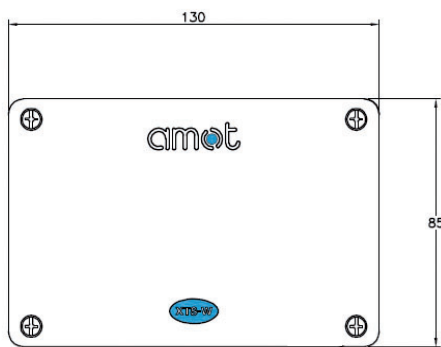
# Bearing Condition Monitor - XTS-W

## Specification continued

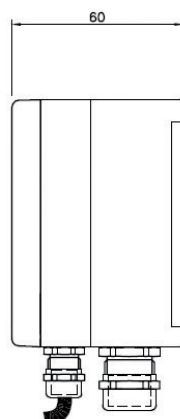
|   |   |                 |
|---|---|-----------------|
| Working range sensing probe:                | -40...180°C   | (-40...356°F)   |
| Accuracy of electronics:                    | Temperature dependant typ. $\pm 0.005^{\circ}\text{C}/^{\circ}\text{C}$           |                 |
| Pressure range sensing probe:               | 0.01...20bar  | (0.15...300psi) |
| Sensor protection:                          | Stainless steel filter  |                 |
| Operating temperature range of electronics: | -40...60°C  | (-40...140°F)   |
| Working and storage temperature range:      | -40...60°C  | (-40...140°F)   |
| Electromagnetic compatibility:              | EN 61000-6-2 EN 61000-6-3 ICES-003 Class B<br>EN 61326-1+A1+A2 FCC Part15 Class B |                 |

## Dimensions

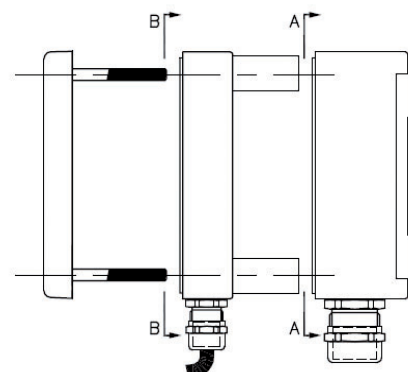
### Water In Oil Junction Box (optional)



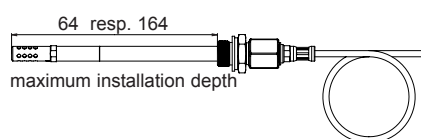
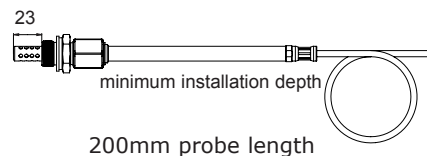
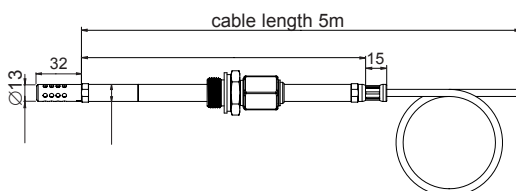
VIEW OF LID ONLY



SIDE VIEW



BOX ASSEMBLY



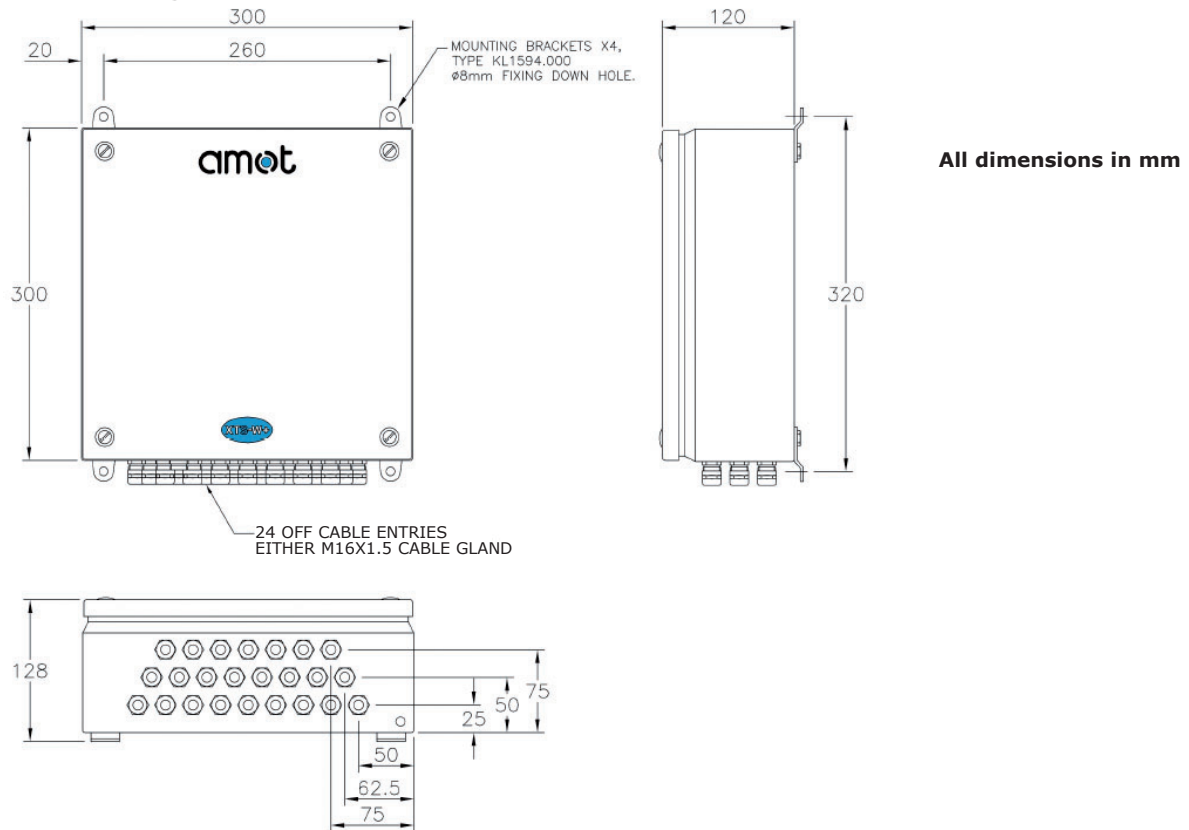
All dimensions in mm



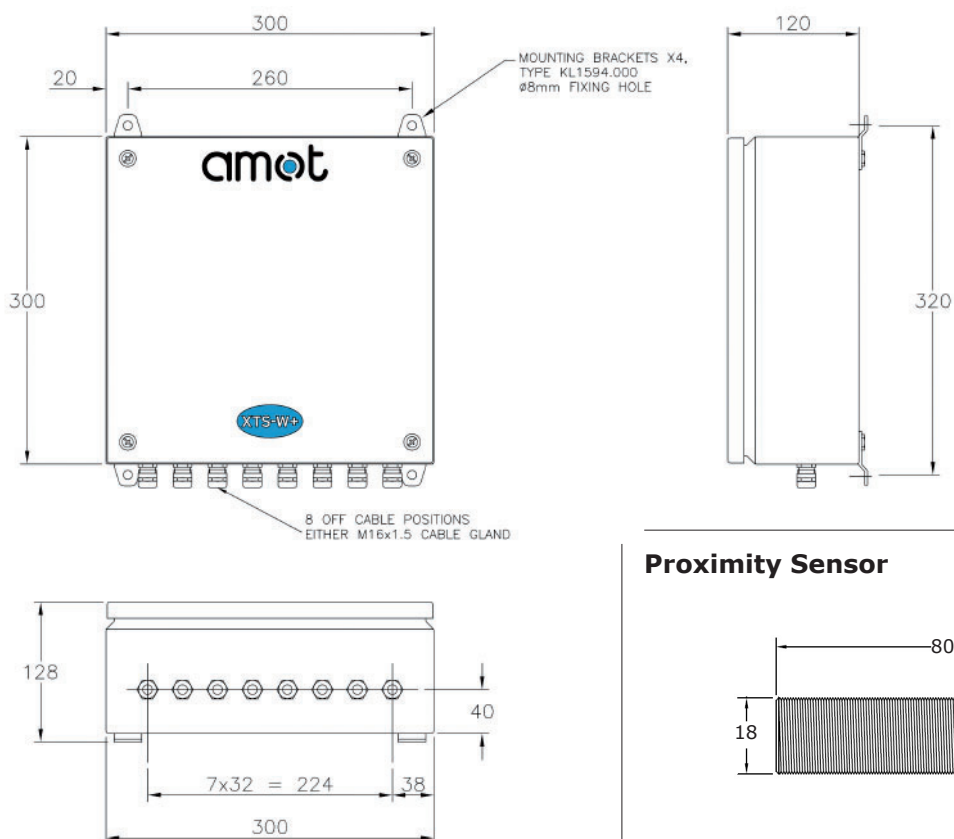
# Bearing Condition Monitor - XTS-W

## Dimensions

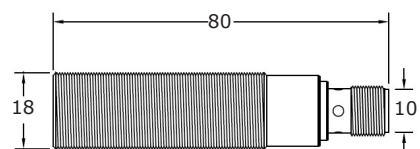
### Signal Processing Unit



### Interface Unit



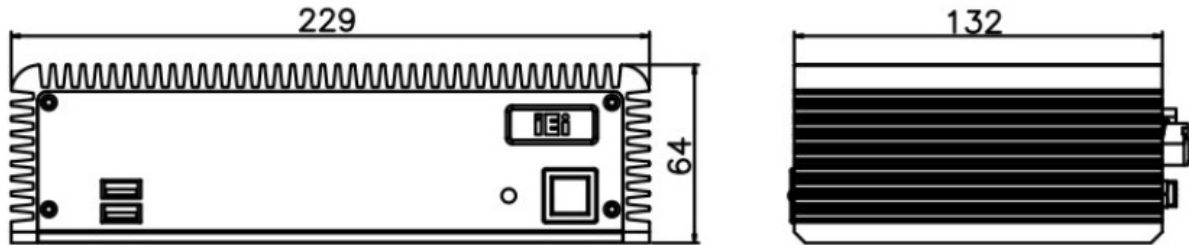
### Proximity Sensor



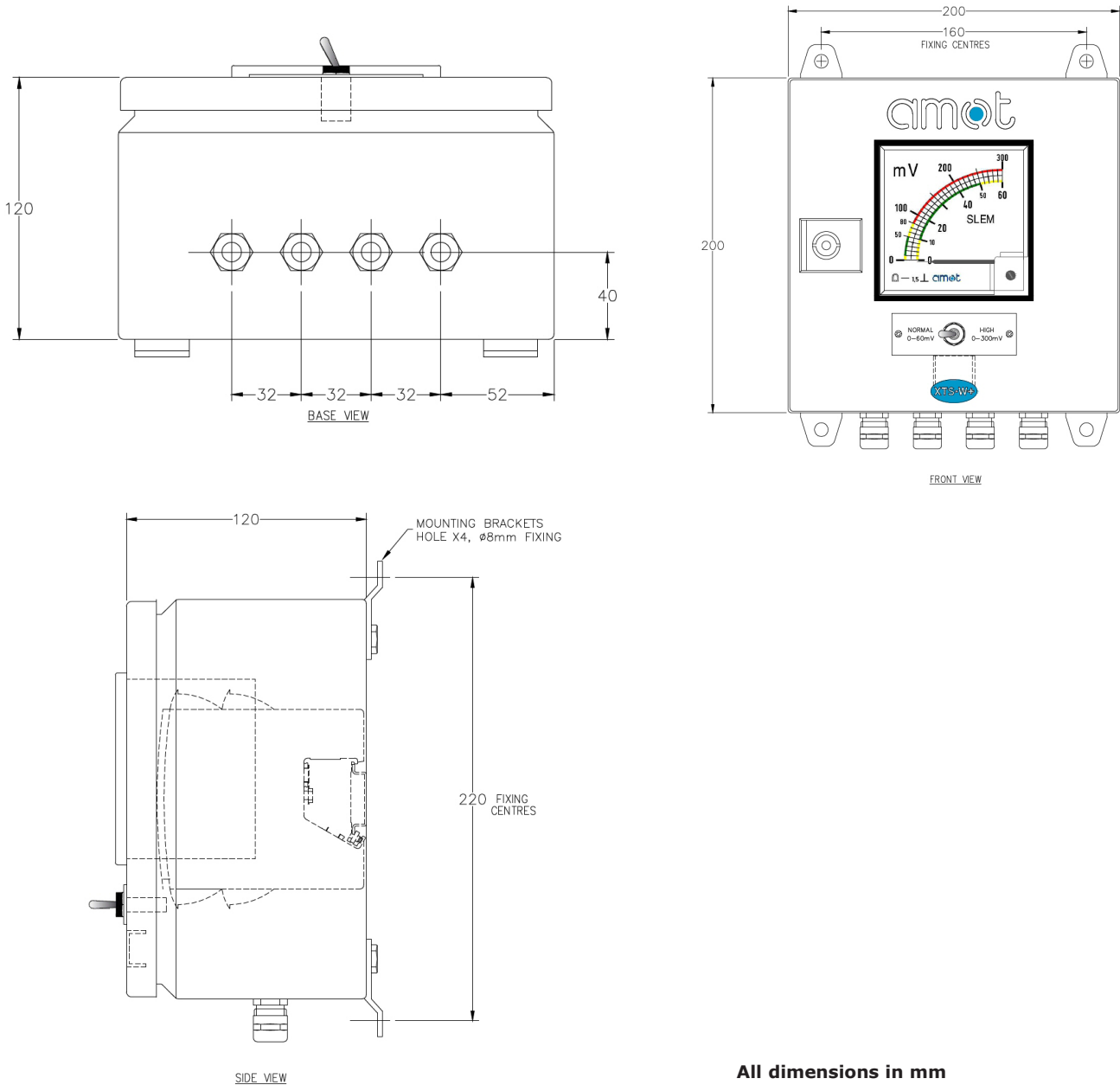
# Bearing Condition Monitor - XTS-W

## Dimensions

### Central Processing Unit (CPU)



### Shaft Earth Device Monitor (SEDM) (optional)



All dimensions in mm

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