TANDELTA
Oil Condition Monitoring

User Guide

SENSE-2 Kit

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DEFINITIONS


WARNING: Risk of injury or death.

CAUTION: Risk of damage to objects


IMPORTANT: Important information

TABLE OF ACRONYMS

MOT - Mobile Oil Tester Kit	TBN - Total Base Number	LHS - Left Hand Side
FSH - Full Spectrum Holistics	UKCA - UK Conformity Assessed	PDO - Process Data Object
OQS - Oil Quality Sensor	FAQ's - Frequently Asked Questions	ENC - Electronic Navigational Charts
TDN - Tan Delta Number	BS - British Standard	Ts&Cs - Terms and Conditions
TAN - Total Acid Number	RHS - Right Hand Side	

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DISCLAIMER

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain. Always ensure the correct configuration, installation, and connection of the sensor in accordance with these instructions prior to any use.
The information contained within this manual affects your legal rights, responsibilities, and safety. Failure to read and follow any instructions and warnings contained within this document may result in a serious injury to yourself or others, damage to your Tan Delta Systems product(s), or damage to other objects.
By installing and using your Tan Delta Systems product(s), you are agreeing that you acknowledge and understand this disclaimer and warning.
Tan Delta Systems accepts no liability for damage, injury or any legal responsibilities incurred directly or indirectly from the use of this product. The user shall at all times observe safe and lawful practices including, but not limited to, those set out in this document and any associated reference documents.

AMENDMENT RECORD SHEET

Version Number	Amendment(s)	Issued by	Date
1	New document	S Rickards	29 November 2024

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1 SENSE-2 KIT - INTRODUCTION

1.1 Product overview

SENSE-2 is a complete real-time oil condition analysis and equipment health monitoring kit that can be easily retrofitted onto any equipment.

It provides real-time oil condition analysis and monitoring.

The SENSE-2 includes everything needed for a quick and easy installation on any equipment – no special training or skills are required.

1.2 Kit Contents

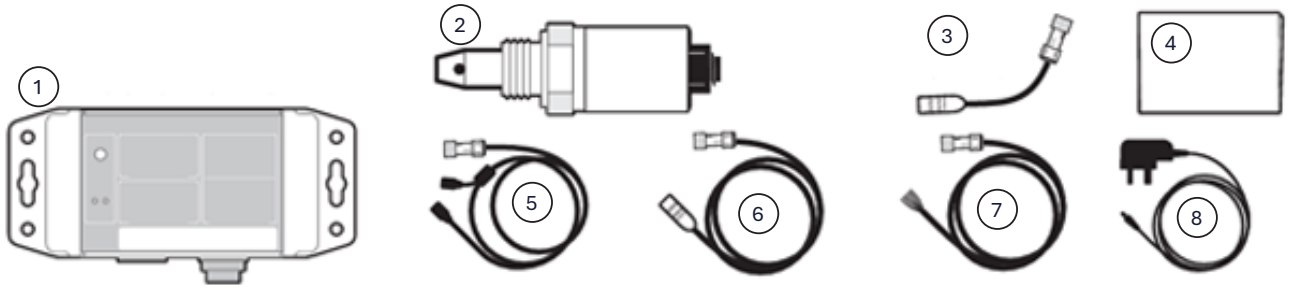

Fig. 1-1 SENSE-2 Kit Contents

Check that your kit contains the following items:

What's in the box? Product Code: SENSE-2 Kit	
Item	Description
1	1 x Display Express (OQDe-G2) Display Unit
2	Oil Quality Sensor OQSx-G2
3	Adaptor Cable (Cable M)
4	Quick Start Guide
5	Configuration Cable (Cable J)
6	Sensor to Display Cable (Cable SD)
7	Display to bare ends cable (Cable DB)
8	Power Supply (for OQDe-G2)

1.3 About this User Guide

This User Guide provides details on how to configure, install, operate, and maintain the components of the SENSE-2 Kit.

2 OQSx-G2 SENSOR CONFIGURATION

IMPORTANT:

You must configure the sensor to your specifications using the Tan Delta **Configuration and Data Management Software (CADS)**.

Install **CADS** by going to our website and clicking the link to download:
www.tandeltasystems.com/support/

NOTE:

The CADS application **must** be installed on a windows PC or laptop.

CADS **does not** operate on Mac devices or Chromebook devices.

2.1 Set Up

NOTE:

You will Administrator privileges on your computer to Install the CADS application.

Also, when CADS has installed, we recommend that you connect the Configuration cable to the PC whilst Administrator privileges are still granted, so it will recognise the cable and install any drivers that are needed.

2.1.1 Install the CADS application onto a PC / Laptop

1) Install CADS by accessing www.tandeltasystems.com/support/
2) Follow the link and download.
3) When prompted, select **Open folder** to view files.
4) Launch the **setup.exe** file and follow the instructions in the setup wizard.
5) When prompted, click on **Install**.
   When installation is complete, **CADS** is displayed.
   It may take up to a minute for the software to identify the OQSx-G2.
6) Allow the PC/laptop to automatically update drivers, if needed.

2.1.2 Start the software

Start the CADS application and wait for the home screen to load.

NOTE:

If sensors are configured to Modbus/CANbus, you **must** open the software first, and then connect the Sensor.

2.1.3 Connect the OQSx-G2

1) Once the home screen has loaded, select **Configure Oil Quality Sensor** from the options on the home screen.
2) Connect the OQSx-G2 to your computer using the configuration cable (**Cable J**) as shown in Fig. 2-1.

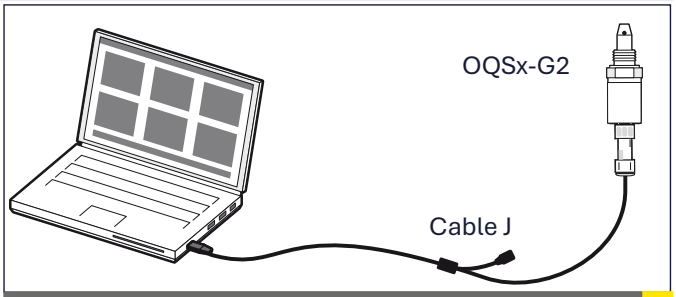

Fig. 2-1 Setting up a sensor for configuration

(Standard sensor shown)

2.1.4 Select your Sensor

CADS will display a list of all connected devices, identified by serial number, as shown in Fig. 2-2.

1) Select the required device.

2) Click the arrow in the top right corner to proceed

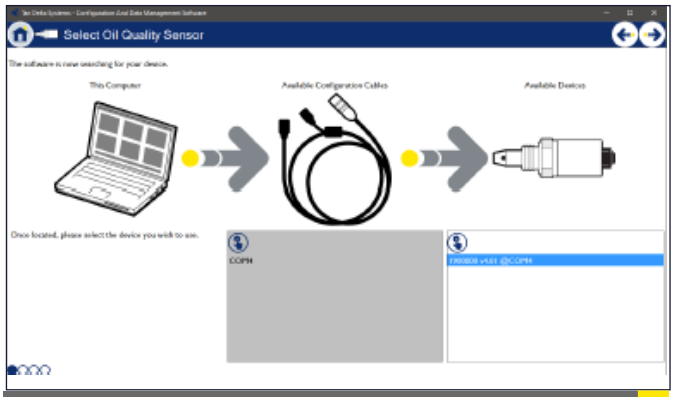

Fig. 2-2 CADS Sensor selection screen

2.1.5 Communication Settings

The CADS application lists the options for the device to which you are connecting the sensor, as shown in Fig. 2-3. SENSE-3 Gateway Devices are supplied configured for Modbus, and therefore require Custom Communications Settings.

Earlier versions of the Gateway were not configured for Modbus. If you have a query, contact Tan Delta Support www.tandeltasystems.com/support/

- **Custom Communications Settings** – Allows you to select custom **Node ID** and **Bit Rate** for RS485, CANbus, J1939, Modbus RTU.

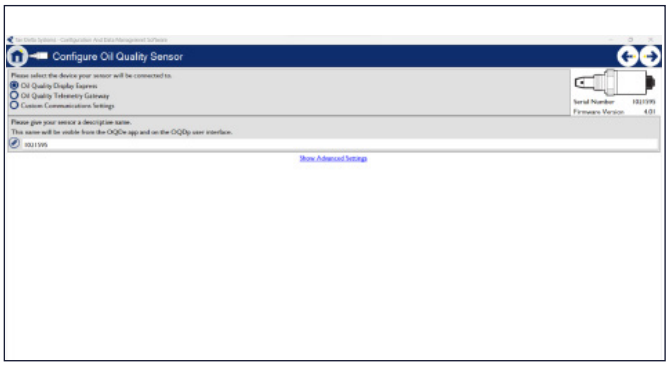

Fig. 2-3 Communication options

2.1.6 Oil Configuration

This page allows you to select any oil from our database.

The boxes at the top of each column allow you to either search or filter the database with the drop-down menu or type directly into the box.

If the oil you require is not in the database, please contact support@tandeltasystems.com for help.

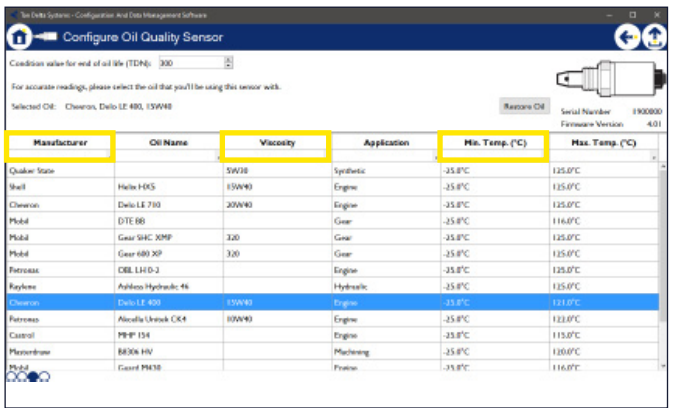

Fig. 2-5 Oil Selection

3 CADS CONFIGURATION

IMPORTANT:

You **must** configure the OQSxG2 Sensor for use with the OQDe-G2 before configuring the OQDe-G2.

This is done in **CADS**. See the **previous** section of this User Guide for more information.

3.1 Configuring a display using CADS

CADS allows you to adjust the following OQDe-G2 parameters:

- **Warning & Alarm Levels**: the points at which the Status LED changes from Green, to flashing Red, to Solid Red.
- **Date/time**.

3.1.1 Connect OQDe

1) From the **CADS** home screen, select **Configure OQDe**.
2) Use the configuration cable to connect the **OQDe-G2** to your computer.

   A list of all connected devices is displayed, identified by serial number.
3) Select the required device ①
4) Click the arrow to proceed ②

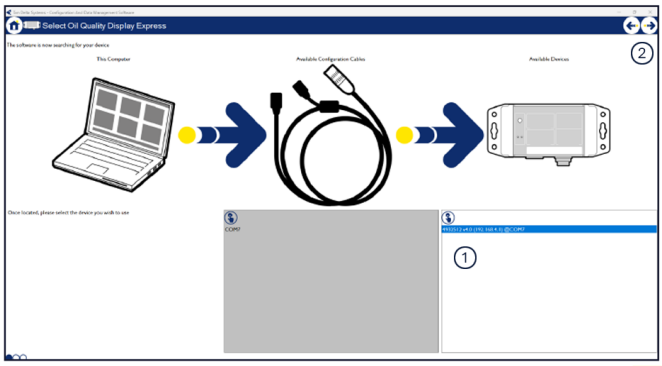

Fig. 3-1 OQDe selection screen in CADS

3.2 Configuration Options

This section describes the various options presented on the OQDe-G2 **Configuration** screen.

Fig. 3-2 CADS Default Configurations

3.2.1 Date & Time

Set the time for the display. This is used to time-stamp log files. You can set the time manually or take the setting from the connected PC or laptop.

3.2.2 Default Settings

If applicable, select the correct option from the list of default applications. These settings will generally be correct for most instances of the given application, however every application is unique and some adjustments may help optimise the system.

We can consult with you over the weeks/months after installation to ensure the system is configured perfectly to reflect your environmental and operational parameters.

3.2.3 Custom Settings

If the default settings are not suitable for your application, you can select other/custom application.

This will display the configurable warning/alarm levels as shown in Fig 3-3.

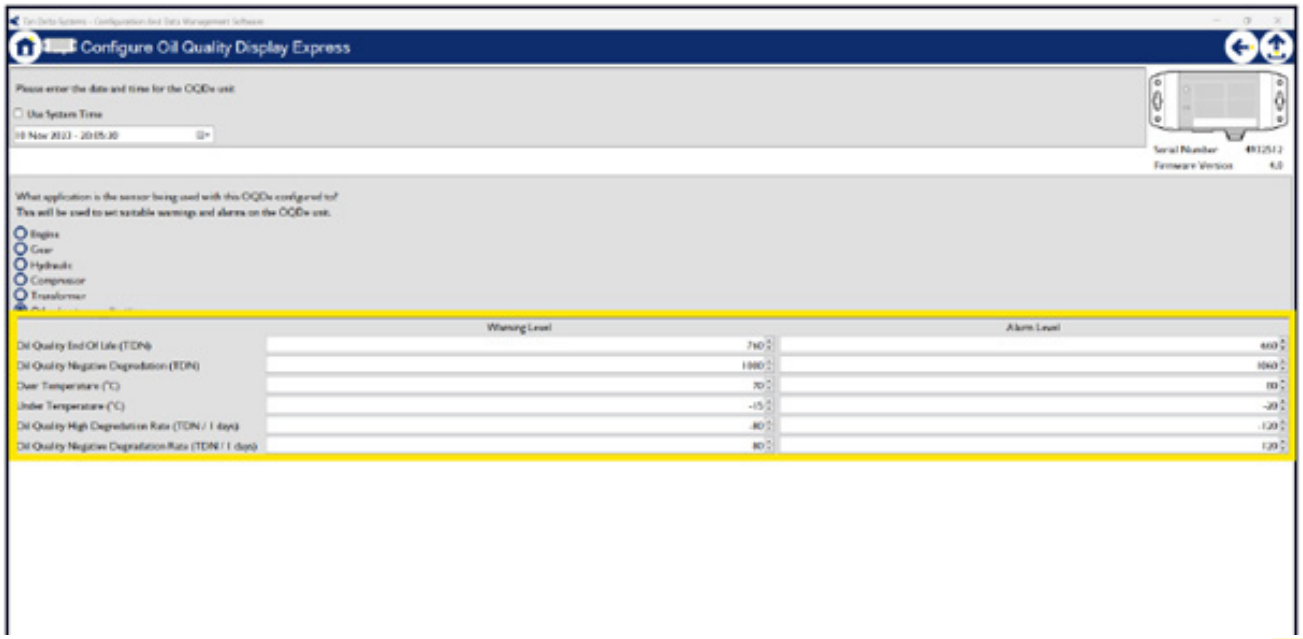

Fig. 3-3 CADS Custom Application Configuration

These warning and alarm level settings determine when the status will show, green, flashing red, and solid red.

You can set upper and lower limits for oil condition, temperature and rate of change.

These warning and alarms levels are optional settings and you can set the levels according to your specifications.

The correct levels will depend on your objectives and application, in order to create a bespoke solution we would recommend logging data for one oil change cycle or six to eight weeks and then sending the data to support@tandeltasystems.com so we can advise you.

3.2.4 Write Settings

Once your required settings are selected, use the arrow to proceed.

A pop-up message will request confirmation that new settings should be sent to the device.

Once confirmed, the settings will be written to the device.

NOTE:

Do not disconnect the device until CADS has displayed confirmation that the configuration has been successful.

4 OQDe-G2 DISPLAY EXPRESS - USING INSIGHT

4.1 Connecting OQDe-G2 to Insight

Insight is a web-based application allowing configuration of the OQDe-G2 and access to live and historic data, which can be downloaded via Wi-Fi.

To connect to Insight, first power up the OQDe-G2 using the power & data cable (Cable SD & Cable DB) or alternatively, by connecting it to a Laptop or PC using Cable J and Cable M as shown in Fig. 4-1.

The device will power on automatically and the Power LED will illuminate green.

Within a few seconds, the Wi-Fi Hotspot will start broadcasting and the Wi-Fi LED will also illuminate blue.

You can now connect to the OQDe-G2 using Wi-Fi via any PC, Tablet or Mobile Device.

Simply search for nearby devices. The default SSID of the OQDe-G2 is **TanDelta OQDe**-G2 and password is **password**.

This will create a local network between the device and the display.

Once connected, use your preferred Internet Browser, and navigate to the IP address **192.168.4.1** which takes you to the web-based Insight application.

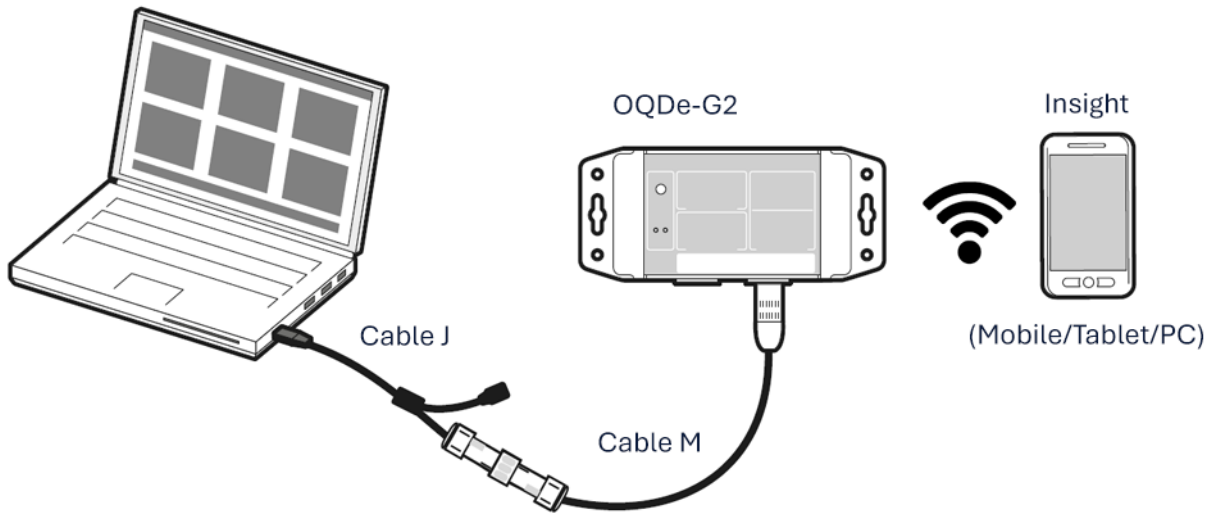

Fig. 4-1 Connecting to the OQDe-G2 via Wi-Fi Hotspot

IMPORTANT:

Cables are not supplied with this product if purchased as a stand alone product.

These are supplied separately, or as part of the Sensor 2 Kit – see the **Cable** section of our website.

For **Configuration** you will need 1 x **Cable J** and 1 x **Cable M**.

For **Installation** you will require 1 x **Cable SD** and 1 x **Cable DB**.

4.2 Using the Insight application

Using the top navigation bar, you can select the various screens within Insight: **Status**; **Data Log**, **Settings**.

You can also change the units displayed in Insight for **Oil Temperature** (°C or °F) and **Oil Condition** (TDN or %LF).

3.2.1 Status screen

The first screen you will be presented with on Insight is the Status screen as shown in Fig. 4-2.

Each box displays different information regarding the state of the OQDe-G2.

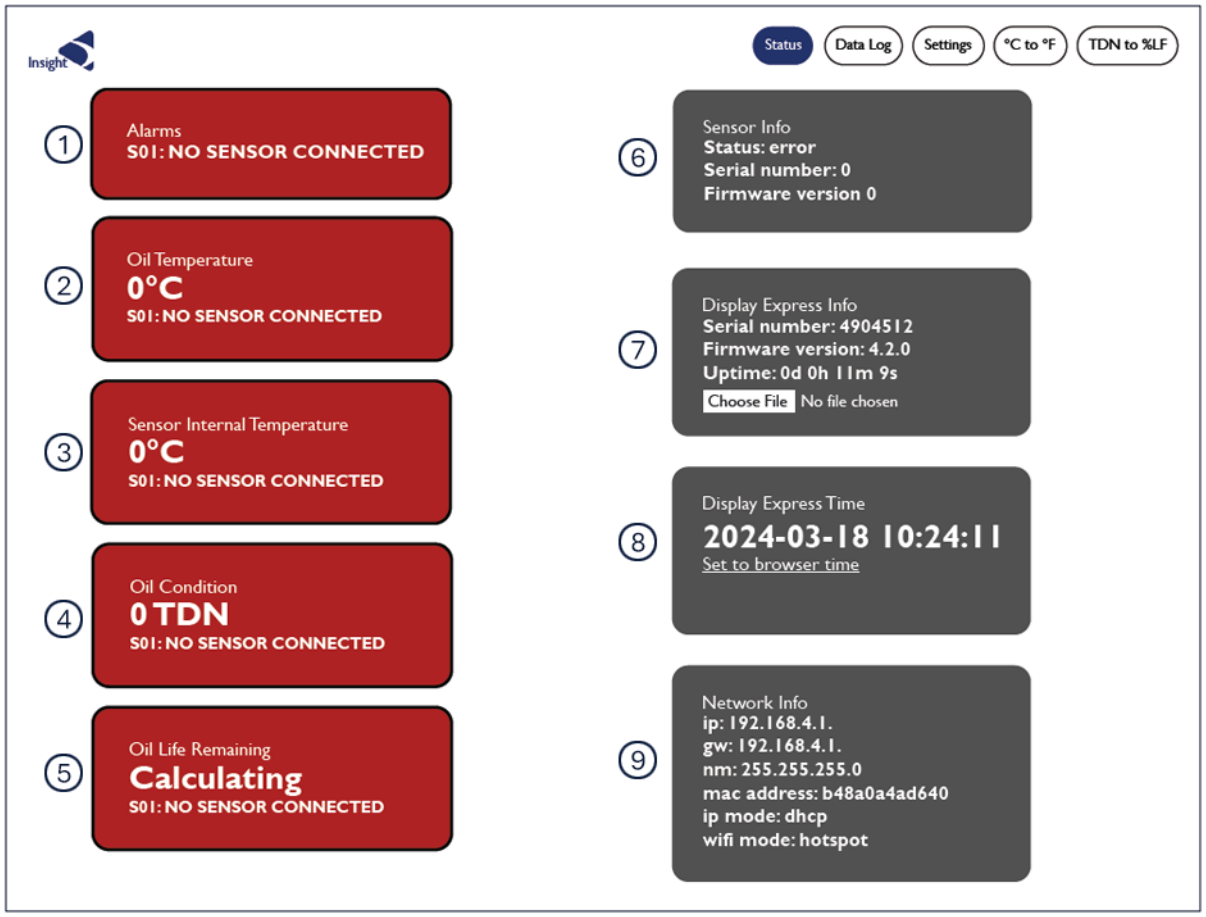

Fig. 4-2 Insight Status screen

① **Alarms**

The Alarms box will display all Checks or Alerts corresponding to the Event Codes listed in Section 6.5 of this User Guide.

If accessing for the first time, there may be an Alert triggered (S01) as there is still no sensor connected to the device. This can be ignored, or you can connect an OQSxG2 Sensor at this point which will remove the Alert.

② **Oil Temperature**

Displays the temperature of the Oil as measured by the Sensor.

③ **Sensor Internal Temperature**

Displays the internal temperature of the Sensor.

④ **Oil Condition**

Displays the Oil Condition in either Tan Delta Number (TDN) or Loss Factor (%LF).

With no Sensor connected to the device, the Oil Condition will display as 0 TDN or 45 %LF on Insight.

On the OQDe-G2 unit, the Oil Condition will display as **- - - -** until a configured Sensor is connected to the OQDe-G2.

⑤ **Oil Life Remaining**

The Oil Life Remaining (OLR) will remain as **Calculating...** on Insight for the first 14 days of the device being connected to a configured Sensor which is submerged in oil.

On the OQDe-G2 unit the OLR will display as **- - -** during this period.

After this point, both the OQDe-G2 and Insight will display the true OLR in days.

This figure will get more accurate as the oil moves towards its end of life.

⑥ **Sensor Info**

If a Sensor is connected, you will see the Sensor Info box populated with the Serial Number and Firmware Version.

⑦ **Display Express Info**

Displays the Serial Number and Firmware version of the OQDe-G2, along with Uptime, which is the length of time for which the OQDe-G2 has been powered on.

The OQDe-G2 firmware can be updated manually if required by selecting **Upgrade firmware**, then selecting the firmware file from the PC / mobile device storage.

⑧ **Display Express Time**

Shows the time that the OQDe-G2 clock is set to currently.

It can be set to the time of the browser you are using to view Insight.

NOTE:

This will affect the Timestamps on the Datalogs from the point it is changed.

⑨ **Network Info**

Displays IP/Gateway/Netmask, as well as the MAC address of the OQDe-G2, the IP mode, and the Wi-Fi mode (Hotspot or WLAN).

4.2.2 Data Log Screen

The OQDe-G2 has an internal clock and logs real-time oil quality readings.

Data logs can be downloaded here as a CSV file. See Fig. 4-3.

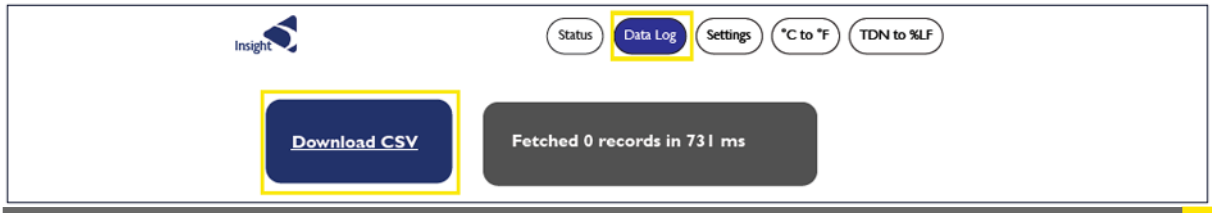

Fig. 4-3 Insight Data Log screen

To clear all historic Data Logs, go to:

> Settings >

Clear Datalog >

Set to TRUE >

Click Apply >

Reboot device by disconnecting/reconnecting.

The Datalog will clear upon reboot and can take several minutes depending on the number of data logs.

4.2.3 Settings screen – Configuring the OQDe-G2

The **Settings** screen (Fig. 4-4) is where you can configure the OQDe-G2.

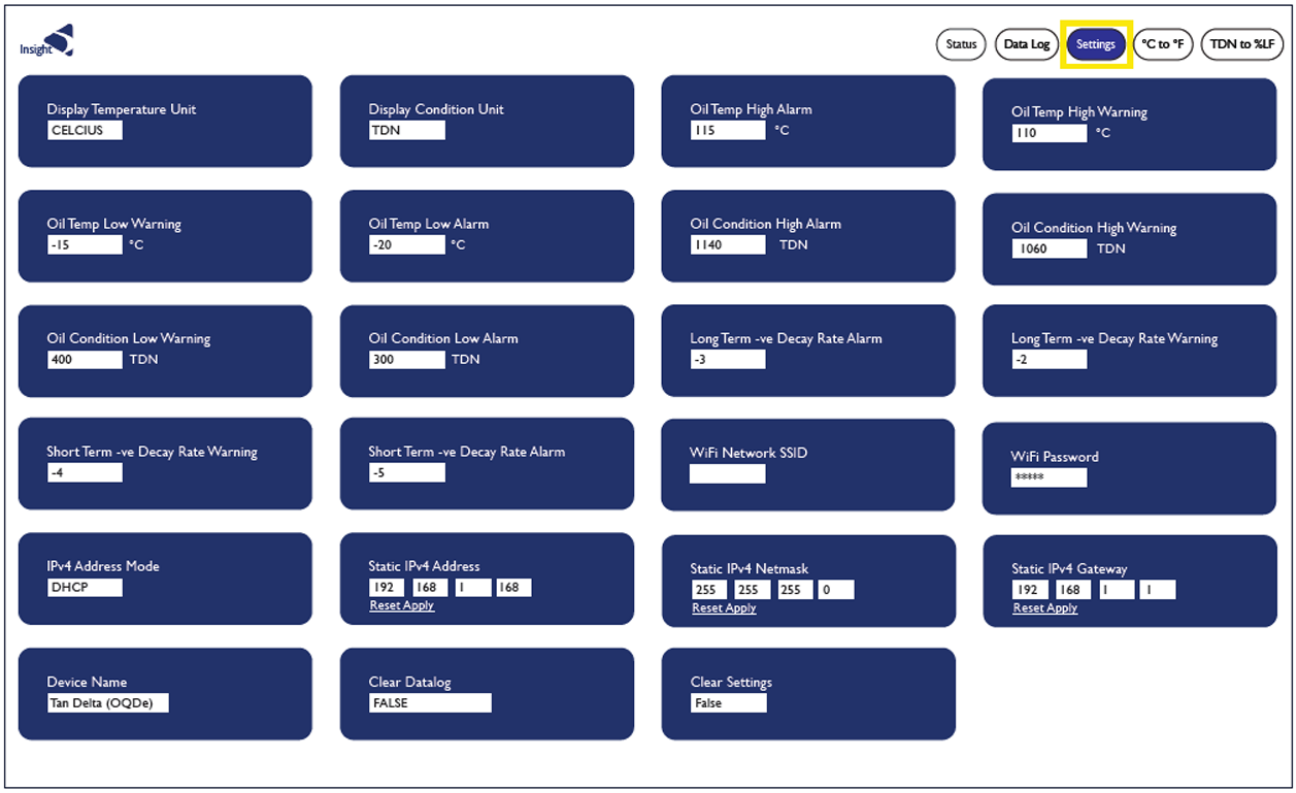

Fig. 4-4 Insight Settings screen

IMPORTANT:

Configure the OQDe-G2 prior to installation on site.

NOTE:

Configure the OQDe-G2 via Insight or using CADS.

There are older Bluetooth versions of the OQDe-G2 which are configurable via CADS only.

Fig. 4-5 shows the parameters that are configurable on the OQDe-G2, and the default values set on the device.

Parameter	Options	Default
Display Temperature Unit	°Celsius or °Fahrenheit	°Celsius
Display Oil Condition Unit	Tan Delta Number (TDN) or %Loss Factor (%LF)	Tan Delta Number (TDN)
Oil Temp High Alarm	Any numerical value – Recommended to configure before first use, however, can be adjusted at any time during operation.	115°C
Oil Temp High Warning		110°C
Oil Temp Low Warning		-15°C
Oil Temp Low Alarm		-20°C
Oil Condition High Alarm	Recommended to configure before first use. Recommended values depend on Application. See Fig. 3-6. If your application is not listed, contact Tan Delta Support.	1140 TDN (Application: Diesel Engine)
Oil Condition High Warning		1060 TDN (Application: Diesel Engine)
Oil Condition Low Warning		400 TDN (Application: Diesel Engine)
Oil Condition Low Alarm		300 TDN (Application: Diesel Engine)
Long term +ve decay rate Warning	It is strongly recommended to discuss your application with Tan Delta Support before changing any of these default values.	3 TDN/day
Long term +ve decay rate Alarm		2 TDN/day
Long term -ve decay rate Warning		-2 TDN/day
Long term -ve decay rate Alarm		-3 TDN/day
Short term +ve decay rate Warning		5 TDN/day
Short term +ve decay rate Alarm		4 TDN/day
Short term -ve decay rate Warning		-4 TDN/day
Short term -ve decay rate Alarm		-5 TDN/day
Wi-Fi Network SSID	Any value	
Wi-Fi Password	Any value	password
IPv4 Address Mode	DHCP or Static	DHCP
Static IPv4 Address	Any numerical value	192 168 1 168
Static IPv4 Netmask	Any numerical value	255 255 255 0
Static IPv4 Gateway	Any numerical value	192 168 1 1
Device Name (also appears as SSID)	Numbers and letters	TanDelta OQDe
Clear Datalog	TRUE or FALSE	FALSE
Clear Settings	TRUE or FALSE	FALSE

Fig. 4-5 Default Parameters and Configuration Options

> **NOTE:**
>
> It is **not** recommended to clear settings.

To clear all Settings, go to:

> Clear Settings>

Set to TRUE >

Click Apply >

Reboot device by disconnecting/reconnecting.

4.2.4 Application Settings

By default, the Oil Condition Warning and Alarm levels are set to that of a Diesel Engine. However, every application is unique, and some adjustments may help optimise the system.

For some common applications, illustrative warning and alarm values are shown in Fig. 4-6.

Any value below 4 mA indicates a fault.

	Engine (e.g. Diesel)	Gas Engine	Hydraulic	Compressor	Transmission
High Alarm	**5.6 mA (1140 TDN)**	**5.6 mA (1140 TDN)**	**6.4 mA (1060 TDN)**	**7.7 mA (1050 TDN)**	**6 mA (1100 TDN)**
High Warning	6.4 mA (1160 TDN)	6.4 mA (1160 TDN)	7 mA (1000 TDN)	7 mA (1000 TDN)	7 mA (1000 TDN)
Condition OK					
Low Warning	13 mA (400 TDN)	9.4 mA (760 TDN)	9.4 mA (760 TDN)	10.5 mA (650 TDN)	10 mA (700 TDN)
Low Alarm	**14 mA (300 TDN)**	**10.4 mA (660 TDN)**	**10.4 mA (660 TDN)**	**11 mA (600 TDN)**	**12 mA (500 TDN)**

Fig. 3-6 Generic Warnings / Alarms (Inc 4 - 20 mA)

Alternatively, if a bespoke solution is required, we recommend logging data for one oil change cycle, or six to eight weeks, and then sending the data to support@tandeltasystems.com.

We can then advise you on your application settings.

4.3 Connecting OQDe-G2 to Wireless Local Area Network (WLAN)

The OQDe-G2 supports connection to a Wireless Local Area Network. To connect to your WLAN, you must first connect to the OQDe-G2 via Wi-Fi Hotspot.

1) Connect to the OQDe-G2 via Wi-Fi Hotspot (See Section 4.1).
2) Open the Insight application, using the IP Address **192.168.4.1**.
3) Click on the **Settings** screen
4) In the **Wi-Fi Network SSID** box, type in the SSID of your WLAN, click **Apply**.
5) In the **Wi-Fi Password** box, type in the **Password** of your WLAN, click Apply.
6) Reboot the OQDe-G2 by disconnecting/reconnecting power. The OQDe-G2 is now connected to your WLAN.

4.4 Finding the IP Address of OQDe-G2 on Wireless Local Area Network (WLAN)

Once connected to your WLAN, to access Insight, you will need the IP address of the OQDe-G2 to access settings or download datalogs.

This will no longer be 192.168.4.1 because the device is no longer connected via Hotspot. To find the new IP address of the OQDe-G2, connect via CADS:

1) Connect OQDe-G2 to your Laptop/PC via Cables J and M (Figure 25).

2) On the Laptop/PC launch CADS and wait for the home screen to load.

3) Once the home screen has loaded, select **Configure OQDe**

   You will now see a list of all connected devices. Under **Available Devices**, you will find the **Serial Number** and **IP Address** of the OQDe-G2 (See Fig. 3-7).

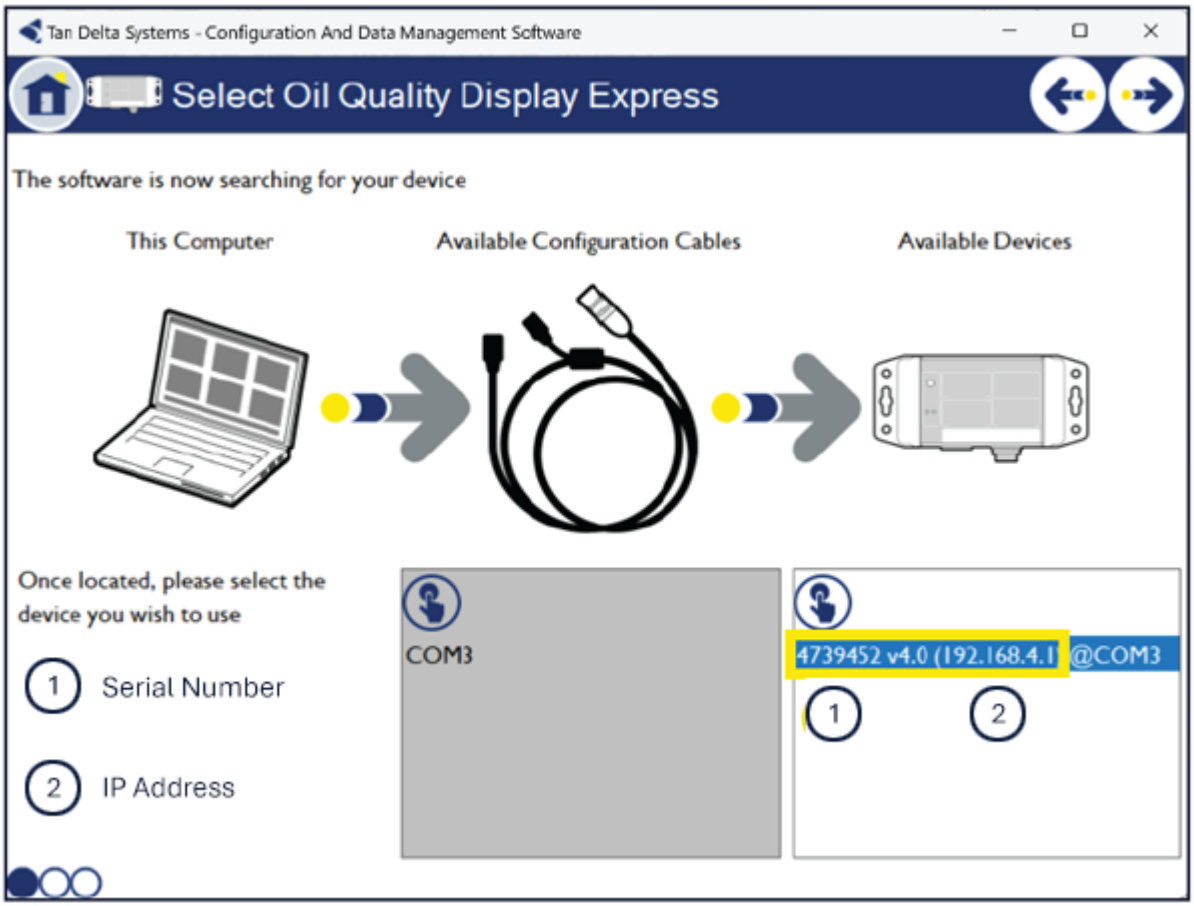

Fig. 3-7 Displaying IP Address of OQDe-G2 in CADS

4) Make a note of the IP Address, close CADS.

5) Open your browser and navigate to the IP Address of the device to access Insight.

4.5 Upgrading your Firmware

Insight provides a facility to upgrade the display firmware from a provided file. This can be done using a PC or mobile device, provided the firmware file is available on that device.

Firmware is upgraded from the Status screen by selecting **Upgrade firmware** then selecting the firmware file from the PC / mobile device storage.

Fig. 4-8 Firmware upgrade sequence

5 OQSx-G2 SENSOR INSTALLATION

5.1 Precautions

Read these instructions before installing the oil quality sensor.

The sensor is robust, however it can be damaged by mistreatment.

The following must be noted:

- Install the sensor into the equipment **before** making electrical/wiring connections.
- Make sure that the fittings being used correspond with the sensor thread size
- Tighten to no more than 20 Nm with a 32 mm spanner.
  Do not over tighten.
- Do not attempt to screw or tighten the sensor using the body. Always use the “Hex” head with the correct size spanner (32 mm).
- Refer to Fig. 5-1. To prevent vibration having any adverse effects to the cable/ sensor connectors, the cable must either be mounted on the same plane as the sensor, or have a loop fitted to absorb vibration.
- Do not twist the cable relative to the sensor head.
- Keep away from sharp edges which may cut into the cable.
- Do not bend the cable excessively, minimum bend radius = 50 mm (2 inches).
- Where possible, keep the cable away from sources of heat, (such as an engine block), and electrical interfaces.
- Oil pressure must not exceed 70 bar.

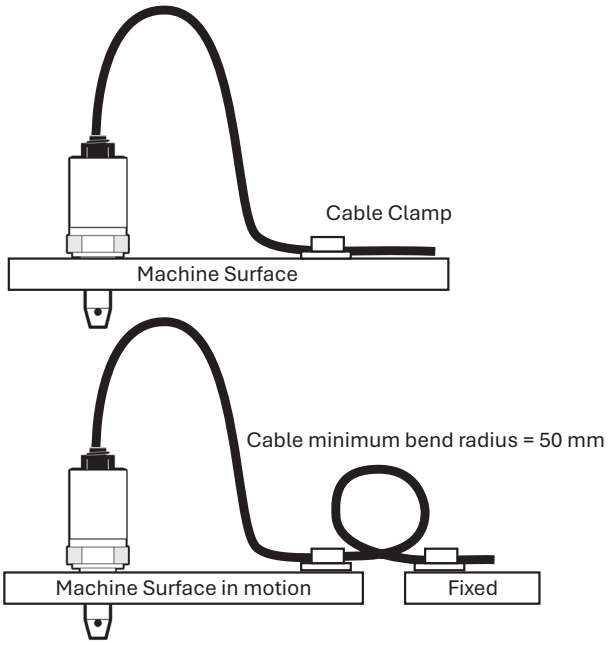

Fig. 5-1 Cable Fitting

5.2 Choosing the Sensor Mounting Location

The performance of the sensor will be enhanced through careful consideration of the mounting location.

Refer to Fig. 5-2.

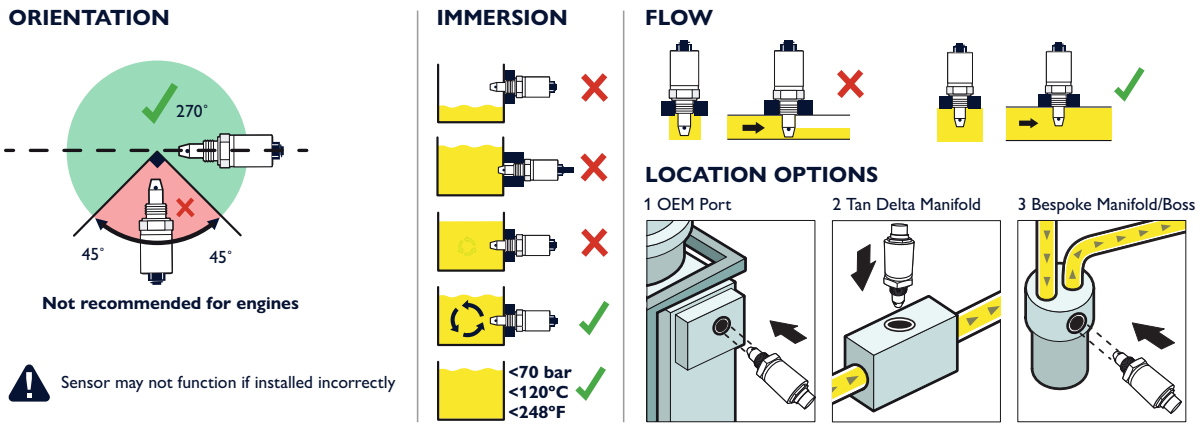

Fig. 5-2 Choosing a mounting location for the Sensor

The following guidelines must be followed.

- The Sensor must, if possible, be mounted in a horizontal position.
- Whenever possible, the sensor **should not** be mounted in the bottom of a sump, as the sensor head may become restricted which will prevent correct operation.
- Dynamic oil flow is necessary: do not mount in places where the oil is likely to stagnate or be static; The oil in the sensor needs to be representative of the whole system.
- The sensor nose must remain immersed in the oil at all times.
- When the oil quality sensor is mounted in a pipeline, make sure that the sensor will not restrict flow.
- For maximum performance when mounting the oil quality sensor in a lubrication system, make sure that the sensor is located prior to the oil filters, oil coolers etc. This ensures that the oil is representative of the whole system.

5.3 Fitting Method

- Use a 32 mm Torque-adjustable spanner for installation.
- Decide on an appropriate location for the sensor head installation.
- Drain the lubricant sufficiently to allow the sensor to be fitted.
- Install the sensor head into the selected location/position. Torque to 20 Nm, being careful not to over-tighten.
- Route the cable, fixing it with cable ties at appropriate intervals.
- Avoid sharp edges and hot surfaces.
- Connect the sensor to the chosen interface.

5.4 Electrical Connection

5.4.1 Power Supply

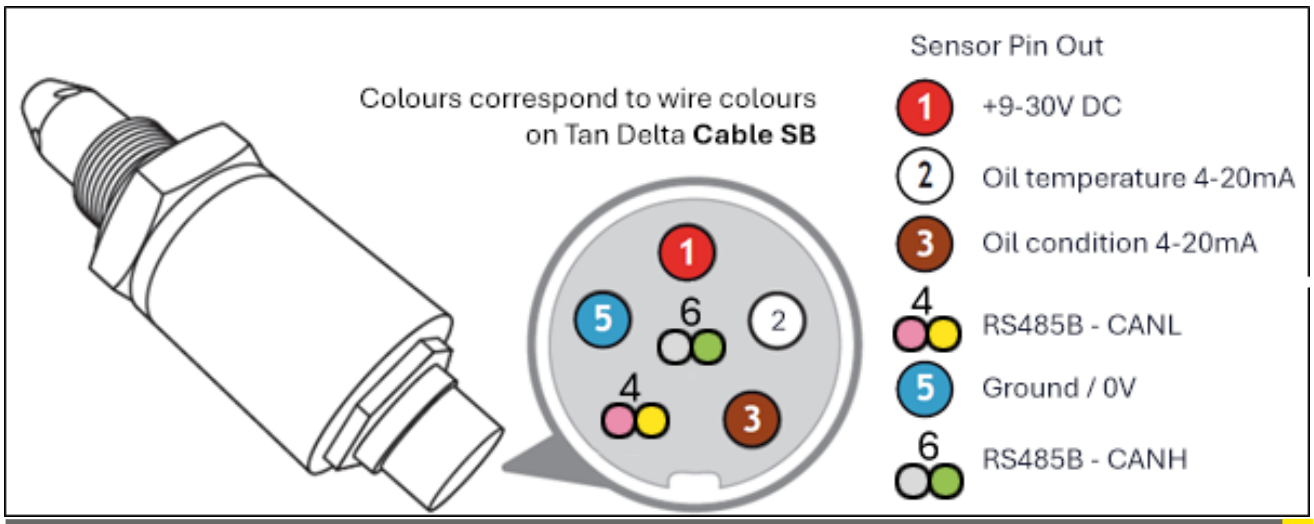

Fig. 5-3 OQSx-G2 cable connector pin out & Tan Delta cable schedule

5.4.2 Connecting the sensor to your system

If the sensor is not used as part of either a SENSE-2 or SENSE-3 kit, we recommend using a Tan Delta OQSx-G2 to Bare Ends cable (**Cable SB** – various lengths available). Refer to Fig. 5-3 for the bare end wire connection details.

Align and slot in the 6-pin connector and then tighten the connector screw-cap.

NOTE:

To prevent possible damage, it is recommended that any unused cable ends are insulated.

5.4.3 Data Output

You can use the output from Pins 2 and 3 to provide an analog indication of the oil temperature and condition on other, third party, data acquisition and control systems.

Oil condition is output on Pin 3 and is linearly scaled from 4 mA to 20 mA.

This can easily be converted to the TDN using the table in “8.1 Appendix 1” on page 16.

A clean oil should provide an output of about 8 mA.

For some common applications, illustrative the warning and alarm values are shown in Fig. 5-4.

Any value below 4 mA or above 20 mA indicates a fault.

	Engine (e.g. Diesel)	Gas Engine	Hydraulic	Compressor	Transmission
High Alarm	**5.6 mA (1140 TDN)**	**5.6 mA (1140 TDN)**	**6.4 mA (1060 TDN)**	**7.7 mA (1050 TDN)**	**6 mA (1100 TDN)**
High Warning	6.4 mA (1160 TDN)	6.4 mA (1160 TDN)	7 mA (1000 TDN)	7 mA (1000 TDN)	7 mA (1000 TDN)
Condition OK					
Low Warning	13 mA (400 TDN)	9.4 mA (760 TDN)	9.4 mA (760 TDN)	10.5 mA (650 TDN)	10 mA (700 TDN)
Low Alarm	**14 mA (300 TDN)**	**10.4 mA (660 TDN)**	**10.4 mA (660 TDN)**	**11 mA (600 TDN)**	**12 mA (500 TDN)**

Fig. 5-4 Generic Warnings / Alarms (Inc 4 - 20 mA)

5.4.4 Using the Oil Temperature analog output

The analog output on pin 2 provides a linearly scaled measure of Oil Temperature in °C as follows:

- 4 mA = -30°C
- 20 mA = +130°C

Refer to Appendix 2.

6 OQDe-G2 DISPLAY EXPRESS INSTALLATION

6.1 Mounting

The OQDe-G2 has a flange on either side with mounting holes to allow it to be fixed to any suitable flat surface.

Once your OQDe-G2 is correctly configured, you need to mount it using the flanges on the sides.

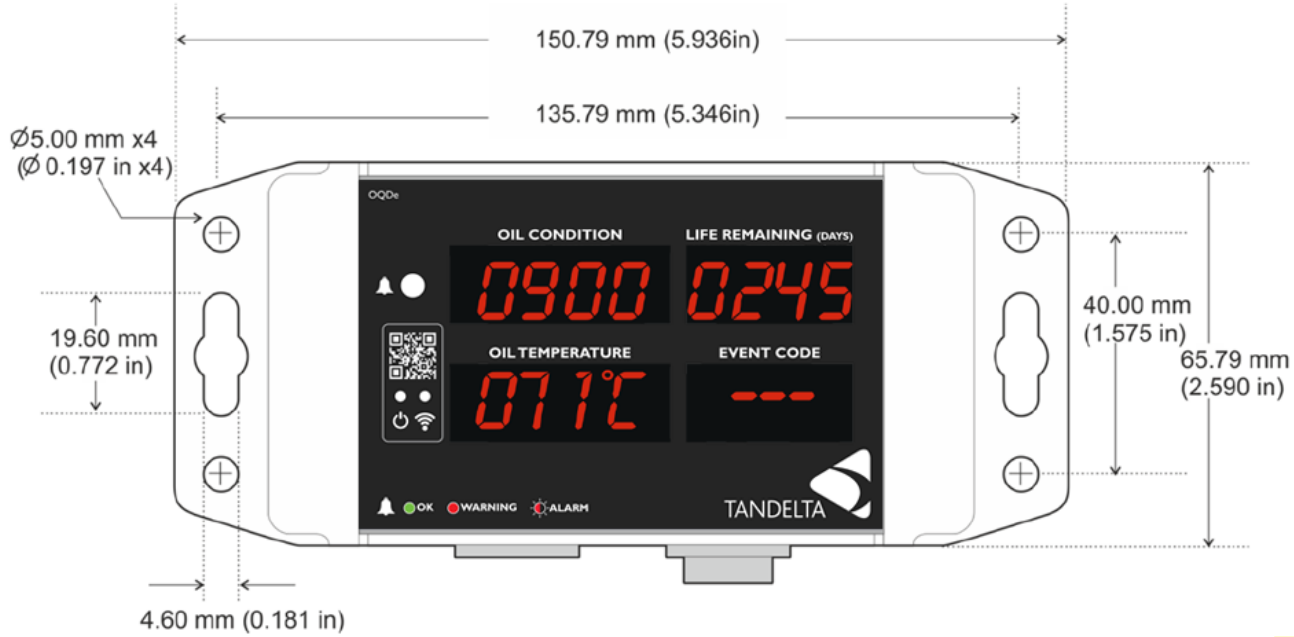

Fig. 6-1 OQDe-G2 Mounting Dimensions

Make sure that the following environmental specifications are not exceeded in the proposed location.

Protection Rating	IP67
Enclosure Type:	Rugged, polycarbonate machined housing with mounting flanges
Temperature (Operating)	-30C to +65C
Temperature (Storage)	-30C to +70C
Pressure (Ambient)	1 bar +/- 150mbar
Chemical Exposure (Splash)	Water, Mineral and Synthetic Oils

6.2 Connection

6.2.1 Connecting the Oil Quality Sensor

Refer to Fig. 6-2. Connect the Oil Quality Sensor (OQSxG2) to the left-hand connector on the OQDe-G2 using a **Cable SD** (Sensor to Display Cable).

Cable SD is available in 2, 5, 10, 15, 25, 50, and 100 m lengths as standard.

Align and slot in the 6-pin connector and then tighten the connector screw-cap.

Refer to the **Set Up and Calibration** section of the Sensor User Guide for more information.

NOTE:

The right-hand connector can be used to connect an OQDe-G2 to a Laptop/PC by RS485 using Cables J & M in conjunction

The OQDe-G2 can also be connected to other devices for remote monitoring purposes by using a combination of Cables M & SB, or Cable DB (Display to Bare Ends).

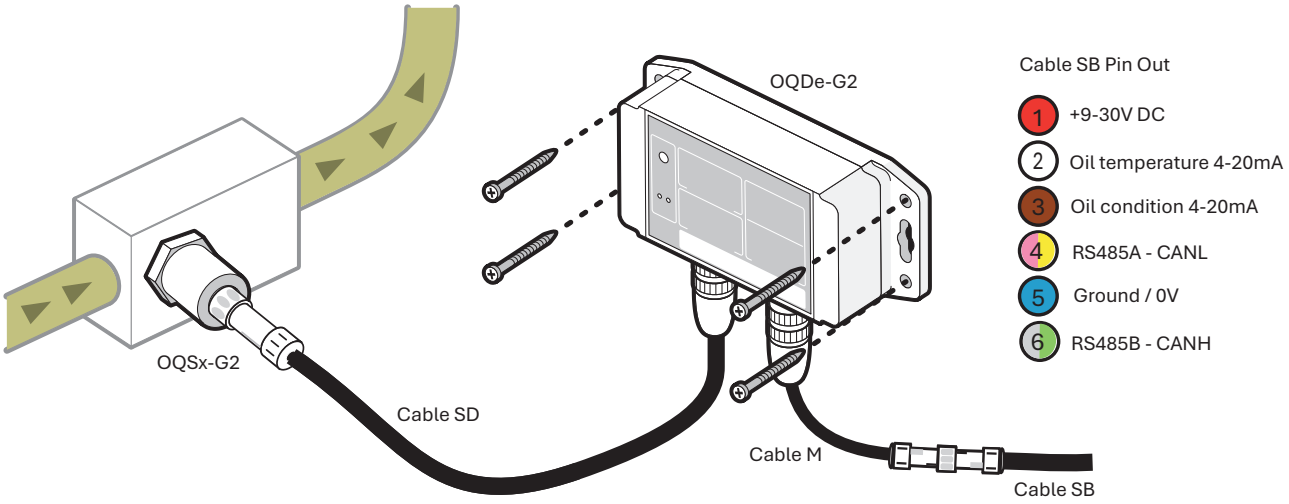

Fig. 6-2 OQDe-G2 Installation and Connection

6.2.2 Using the Analog Output

Refer to Fig. 6-3. Analog outputs measuring oil quality and oil temperature are looped through the OQDe-G2 from the OQSxG2.

You can use these outputs to provide analog indication of the oil temperature and condition on other, third party, data acquisition and control systems.

If you want to connect to the OQDe-G2 via 4-20 mA in order to read the Oil Condition and Oil Temperature Data, connect a suitable power supply (9-30 Vdc, at least 100 mA) to the Red wire (power) and Blue wire (ground) on Cable SB / Cable DB.

Using the Oil Condition analog output

Oil condition is output on the black wire and is linearly scaled from 4 mA to 20 mA.

This can easily be converted to the TDN or % Loss Factor scale using the table in the Appendix 1.

A clean oil should provide an output of about 8 mA.

For some common applications we, recommend the warning/alarm settings in Fig. 3-6.

Any value below 4mA or above 20 mA indicates a fault.

Using the Oil Temperature analog output

The analog output on the white wire provides a linearly scaled measure of Oil Temperature in °C between -30°C (4 mA) and +130°C (20 mA) – see Appendix 2.

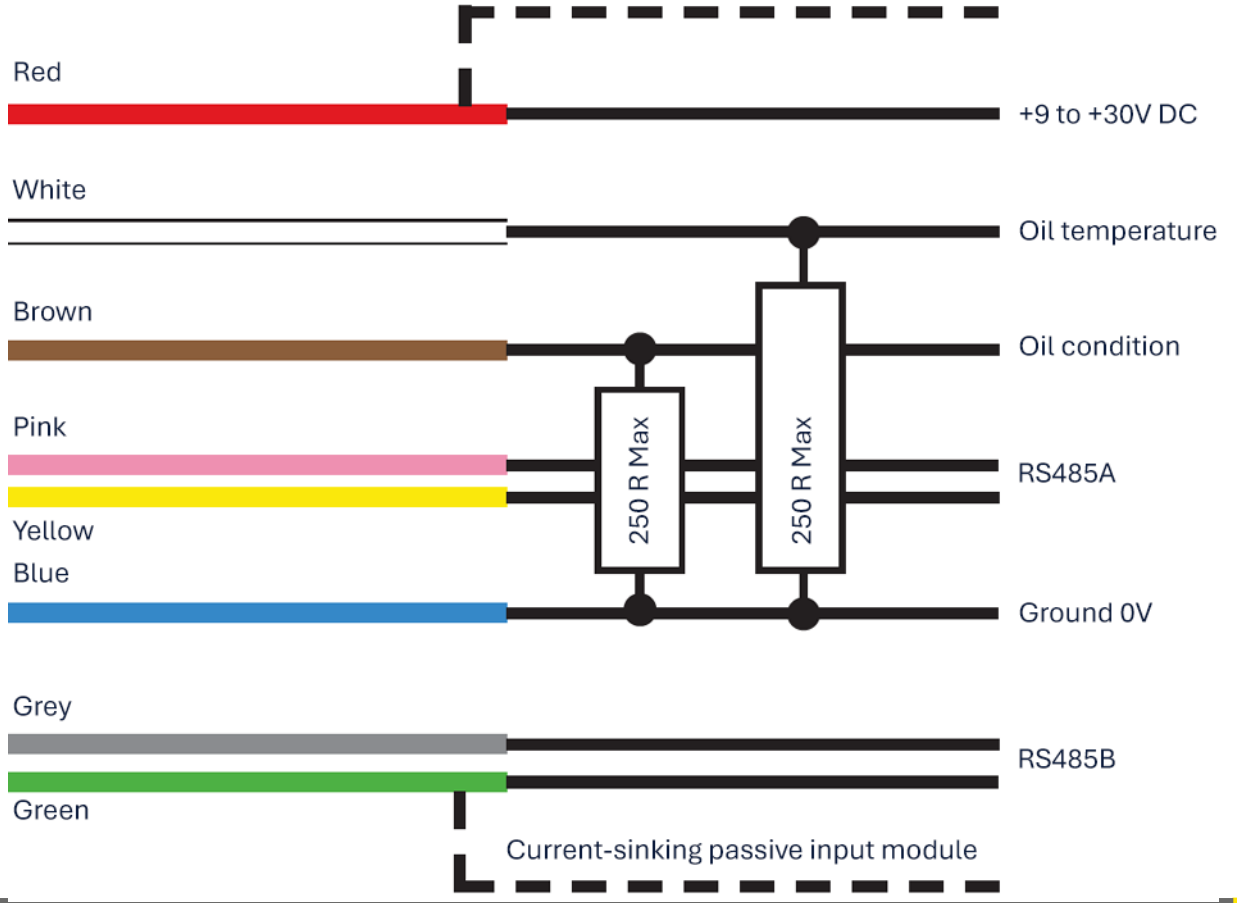

Fig. 6-3 Wiring diagram for OQDe-G2 Power Supply and Data output (4-20 mA)

6.3 Operation

6.3.1 Switching On

IMPORTANT:

The OQDe-G2 MUST be connected to a configured Sensor which is submerged in oil otherwise the OQDe-G2 will not function as intended.

Make sure that you have configured the OQDe-G2 and OQSxG2, and connected them correctly as described in Sections 6.1 and 6.2.

To begin operation:

1) Switch on the power supply. The green power LED is illuminated.

   The OQDe-G2 starts an initial self-test period lasting approximately one minute.

2) On completing its self-test, the OLR will display as **- - -** for the first 14 days of operation. After this point, both the OQDe-G2 and Insight will display the true OLR in days.

   This figure will get more accurate as the oil moves towards its end of life.

7 OQDe-G2 - UNDERSTANDING DATA

7.1 Tan Delta Full Spectrum Holistic (FSH) Data

Dynamic Maintenance Optimisation (DMO) is the method by which the data can be used to optimise the maintenance intervals for the lubricating oil in the application.

Changing the oil at an interval determined by the OQDe-G2 means that you are only changing the oil when you need to, not at a predetermined schedule when the oil may still be in a useable condition.

The OQDe-G2 is a powerful tool for instant data display, providing a visual display of the holistic oil condition as well as the current Oil Condition value, Oil Temperature and Oil Life Remaining (OLR).

Using the display alone to review the oil condition is simple:

- If the oil status indicator is **green**, then the oil is still in a good useable condition.
- If the oil status indicator is **red**, you should be planning to carry out an oil change at the earliest opportunity.
- If the oil status indicator is **flashing red**, the machine should not be used, and the oil should be changed immediately.

In addition to the oil status indicator, the Oil Condition value can be viewed and checked to see the current oil condition against the standard table shown in Appendix 1.

Oil temperature and OLR are also viewable on the OQDe-G2.

Fig. 7-1 Oil status indicator

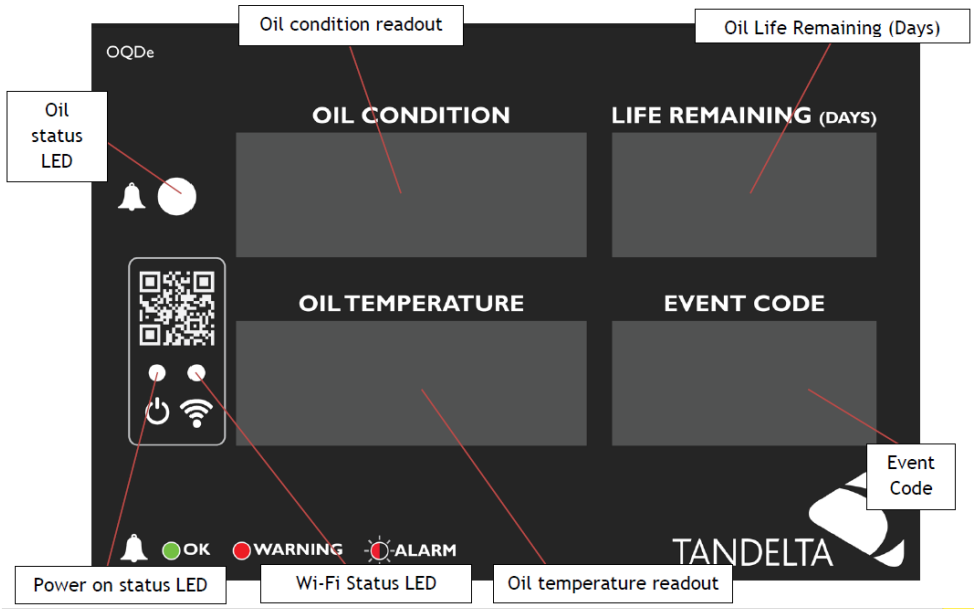

Fig. 7-2 Oil Quality Display Express (OQDe-G2) overview

7.2 CADS application

Data can also be accessed from the OQDe-G2 using **CADS** to either view whilst connected to the display through the in-built graphing screens, or to download to analyse and interrogate offline.

NOTE

Fig. 7-3 shows data for a sensor tested out of oil.

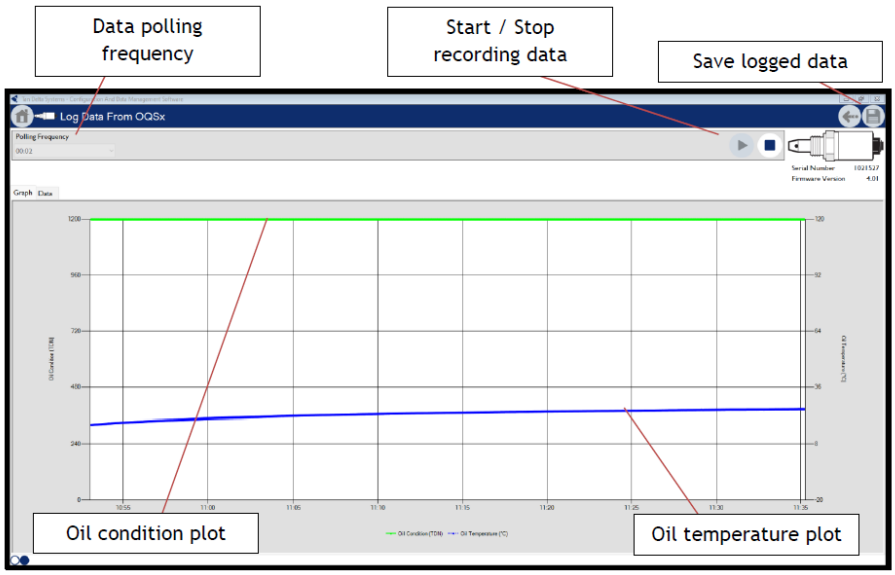

Fig. 7-3 CADS data display

7.3 Insight

Insight uses any internet-enabled device to access, via Wi-Fi, the data collected by the OQDe-G2.

Live data can be viewed in **Insight** in real time, or historical data logs can be downloaded as a CSV file.

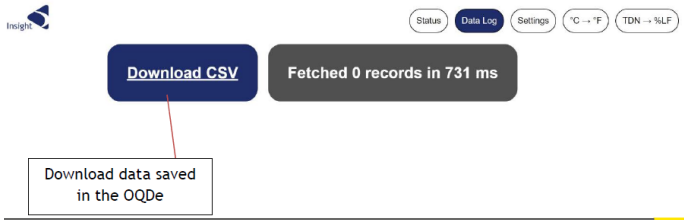

Fig. 7-4 Insight data log screen

7.4 Dynamic Maintenance Optimisation (DMO)

Dynamic Maintenance Optimisation (DMO) is the method by which the data can be used to optimise the maintenance intervals for the lubricating oil in the application.

Changing the oil at an interval determined by the Tan Delta Sensor means you are only changing the oil when you need to, not at a predetermined schedule when the oil may still be in a usable condition.

In this section we will demonstrate the methods by which DMO can be implemented.

The OQDe-G2 displays DMO through using an LED indicator.

- If the oil status indicator is **green**, then the oil is still in a good usable condition.
- If the oil status indicator is **red**, you should plan to carry out a maintenance intervention the earliest opportunity.
- If the oil status indicator is **flashing red**, the machine should not be used, and the oil should be changed immediately.

Fig. 7-5 Oil status indicator

7.5 Partially / Fully integrated sensors

Sensors integrated into third party solutions can feed data directly into these systems either using Analog signals or Digital Signal protocols.

For more information on the available communication protocols, please contact Tan Delta Support.

Oil condition is output in analog format on Pin 3 and is linearly scaled from 4mA to 20mA.

This can easily be converted to the TDN or Loss Factor scale using the table provided in Appendix 1.

A clean oil should provide an output of about 8mA.

For some common applications we recommend the warning/alarm settings shown in Fig. 7-6.

Any value below 4mA or above 20 mA indicates a fault.

	Engine (e.g. Diesel)	Gas Engine	Hydraulic	Compressor	Transmission
High Alarm	5.6mA (1140 TDN)	5.6mA (1140 TDN)	6.4mA (1060 TDN)	6.7mA (1050 TDN)	6mA (1100 TDN)
High Warning	6.4mA (1060 TDN)	6.4mA (1060 TDN)	7mA (1000 TDN)	7mA (1000 TDN)	7mA (1000 TDN)
Condition OK					
Low Warning	13mA (400 TDN)	9.4mA (760 TDN)	9.4mA (760 TDN)	10.5mA (650 TDN)	10mA (700 TDN)
Low Alarm	14mA (300 TDN)	10.4mA (660 TDN)	10.4mA (660 TDN)	11mA (600 TDN)	12mA (500 TDN)

Fig. 7-6 Generic Warning / Alarms (inc 4-20mA)

The analog output on pin 2 provides a linearly scaled measure of Oil Temperature in °C between -30°C (4mA) and +130°C (20mA) – See Appendix 2.

The third-party systems using a 4-20mA analog signal should be configured using the table shown in Fig. 7-5 as a guide, and may subsequently be fine-tuned with the assistance of Tan Delta Support.

Fig. 7-6 details the logic that can be applied to installations into third-party systems to determine various event variables.

If your Display Express or third-party device allows this level of customisation, you may wish to utilise some of the detailed algorithm logic to provide warnings or alarms through the third-party display / system.

Event Code	Algorithm	Description	Check/ Alert
---	n/a	All OK	n/a
S01	n/a	No Sensor Connected – Please Connect the Sensor.	A
S02	n/a	Sensor Not Configured – Configure the Sensor via CADS.	A
S03	n/a	Display Not Configured – Configure the Display via Insight	A
S04	n/a	New Sensor Detected	n/a
E01	Current Temperature >= Temp High Warning Level	Oil Temperature High – Check Regularly.	C
E02	Current Temperature >= Temp High Alarm Level	Oil Temperature Very High – Immediate Action Required.	A
E03	Current Temperature <= Temp Low Warning Level	Oil Temperature Low – Check Regularly.	C
E04	Current Temperature <= Temp Low Alarm Level	Oil Temperature Very Low – Immediate Action Required.	A
E05	Current Oil Condition >= Oil Condition High Warning Level	Oil Condition Too High – Check Regularly.	C
E06	Current Oil Condition >= Oil Condition High Alarm Level	Oil Condition Very High – Immediate Action Required.	A
E07	Current Oil Condition <= Oil Condition Low Warning Level	Oil Near End Of Life – Check Regularly.	C
E08	Current Oil Condition <= Oil Condition Low Alarm Level	Oil At End Of Life – Immediate Action Required.	A
E09	Current Oil Condition >= 1200 TDN	Sensor In Air – Immediate Action Required	A
E11	Long Term +ve Decay Rate Warning (TDN/day)	Oil Quality degrading faster than expected – Check Regularly.	C
E12	Long Term +ve Decay Rate Alarm (TDN/day)	Oil Quality degrading much faster than expected – Immediate Action Required.	A
E13	Long Term -ve Decay Rate Warning (TDN/day)	Oil Quality improving faster than expected - Check Regularly.	C
E14	Long Term -ve Decay Rate Alarm (TDN/day)	Oil Quality improving much faster than expected - Immediate Action Required.	A
E15	Short Term +ve Decay Rate Warning (TDN/day)	Oil Quality degrading faster than expected - Possible Water/Coolant Contamination - Check Regularly.	C
E16	Short Term +ve Decay Rate Alarm (TDN/day)	Oil Quality degrading much faster than expected – Highly Likely Water/Coolant Contamination - Immediate Action Required.	A
E17	Short Term -ve Decay Rate Warning (TDN/day)	Oil Quality improved - Suspected oil top up / sweetening - Check Regularly	C
E18	Short Term -ve Decay Rate Alarm (TDN/day)	Oil Quality improved too much - Suspected Air or severe fluid contamination - Immediate Action Required.	A

Fig. 7-7 Data Logic Table

8 OQSX-G2 SENSOR - SUPPORT

Issue	Possible cause	Checks	What to do if the check fails...
No Output from the sensor Analog Outputs	Power Issue?	Make sure that the power supply is 9-30V DC	Make sure sensor earth connection is properly made.
			Contact Tan Delta Support
No Output from the sensor Digital Outputs	Power Issue?	Make sure that the power supply is 9-30 V DC	Make sure sensor earth connection is properly made.
			Contact Tan Delta Support
	Communication issue	Check communication with CADS using Cable J	Connect in the correct order: CADS looking for sensor > Connect Cable J (ID COM port) > Connect Sensor
			Contact Tan Delta Support
	Cable Issue	Check cable connections are correct	Check the cable for damage
			Disconnect the sensor and receiving device / system, check the cable for continuity
			Check the cable for shorts across wire cores
			Contact Tan Delta Support
Sensor analog output implausible	Connection / integration issue	Is the receiving device / system current sensing?	Install a resistor in parallel to the receiver device (not to exceed 250 R)
Sensor output implausible	Oil condition high (above 1200 TDN)	Sensor nose is in air	Immerse sensor nose in oil continually
			Check that the correct oil profile is being used
	Oil Condition extremely high (above 1500 TDN)	Contact Tan Delta Support	
	Oil Condition low (Below 300 TDN)	Oil likely to be very worn or contaminated	Change Oil
	Oil condition extremely low (Below 0 TDN)	Oil likely to be highly contaminated	Change Oil
	Oil condition extremely low (Below -1000 TDN)	Has sensor got an oil profile loaded?	Configure sensor with an oil profile
			Sensor possibly in water or contaminated with metallic particles. Clean sensor and investigate source of contamination
			Contact Tan Delta Support
Sensor output unstable (Noisy or unreadable)	Incorrect oil profile being used	Check oil profile is correct	Contact Tan Delta Support
	Air / cavitation	Install sensor where it will be continually immersed in oil with no air bubbles	Contact Tan Delta Support
	Heavy contamination	Replace Oil & investigate the source of the contamination	Contact Tan Delta Support

9 SENSOR CLEANING & MAINTENANCE

CAUTION:

For accurate results during testing, it is vitally important to do any test using a clean sensor.

Any oil residue from a previous test **MUST** be removed.

To clean the sensor:

1) Clean any excess oil from the end of the sensor with absorbent paper.
2) Remove the remaining oil by spraying Loctite 7063 cleaner into each of the four holes at the end of the sensor, and all over the outside of the tip.
3) Give a general exterior wash on both sides as shown in Fig. 9-1.
4) Give a longer blast into the centre hole (2 seconds).
5) Give the sensor a sharp shake to dislodge any solvent remaining around the electrode.
6) Leave to dry for at least 1 minute.

Fig. 9-1 Cleaning the Sensor

*Loctite 7063 Solvent Cleaner Recommended

Other low residue cleaners may also be suitable, please refer to your distributor for more information. See Section 5.1.

NOTE:

The sensor does not require cleaning once it has been installed, unless the application is relatively high in particulate contamination.

9.1 Cleaning Procedure – Using Odourless Kerosene

1) Unplug and remove the sensor then use absorbent paper to wipe off the excess oil from the sensor tip and thread.
2) Attach a bottle adaptor to a sample bottle and pour in approximately 15ml of kerosene.
3) Screw in the sensor and shake vigorously for 2 minutes to ensure the kerosene washes up around the tip of the sensor.
4) Remove the sensor from the adaptor and shake rigorously over the absorbent paper to dislodge any excess kerosene.
5) Leave to dry for a few minutes.

10 SENSE-2 KIT - SUPPORT

Issue	Possible cause	Checks	What to do if the check fails...
No lights on the display	Power Issue?	Make sure that the power supply is 9-30V DC	Make sure sensor earth connection is properly made.
			Contact Tan Delta Support
Display shows unrecognised / unreadable text	Configuration issue	Configure the display using CADS. The display must be powered on using the provided universal power supply when configuring.	Contact Tan Delta Support
Cannot connect to display using CADS	Display circuitry damaged	If the display is not recognised by CADS, it is possible that the communication circuitry may be damaged through an incorrect installation.	Contact Tan Delta Support
Display shows event code S01	No Sensor connected	Connect sensor	Configure sensor using CADS for use with Display Express
			If sensor won't communicate sensor may be damaged, contact Tan Delta Support
			If sensor does communicate, but you still get S01, display may be damaged, contact Tan Delta Support
Display shows event code S02	Sensor not configured	Configure sensor using CADS	Contact Tan Delta Support
Display shows event code S03	Display not configured	Configure display using CADS	Contact Tan Delta Support
Display shows event code S04	New Sensor Detected		
Display shows event code E## (i.e E01 to E18)	Refer to the Eent Code table in this User Guide for more information		
Short term negative decay rate event codes appear following an oil change	Oil change has not been logged in the display	Connect to the display using Insight and use the "oil change" function to log an oil change,	Contact Tan Delta Support
Display shows "---" days remaining for long periods of time	Oil condition is not changing sufficiently to calculate the remaining days until oil change	Check oil is moving in the system, if a hydraulic or gear application, this is normal as oil will condition may be quite static or stable for a long period of time.	Contact Tan Delta Support
Cannot connect to Insight page	Not connected to display hotspot	Connect your PC or mobile device to the WiFi hotspot generated by the display	Contact Tan Delta Support
	Hotspot password has been changed	Contact installer to check hotspot password setting	Contact Tan Delta Support
	IP address for Insight has been changed	Connect Display to CADS via Cable M & Cable J. When connected, CADS will show the current set IP address of the display.	Contact Tan Delta Support

11 APPENDIX 1

Oil Condition Conversion Chart

The table below gives illustrative and guideline figures only.
For further advice on setting your alarms, contact our support team
www.tandeltasystems.com/support/

Number Format
TDN = Always 4 digits
Conversion
4 - 20 mA to TDN = (mA -17) * -100

4 - 20 mA	TDN	Alarm Setting
<4		
4 mA	1200	
5 mA	1200	High Alarm
6 mA	1100	High Warning
7 mA	1000	
8 mA	0900	
9 mA	0800	
10 mA	0700	
11 mA	0600	
12 mA	0500	
13 mA	0400	Low Warning
14 mA	0200	Low Alarm
15 mA	0200	
16 mA	0100	
17 mA	0000	
18 mA	0000	
19 mA	0000	
20 mA	0000	

12 APPENDIX 2

Oil Temperature Analog Output

The table below shows how the Oil Temperature output (4 - 20 mA) converts to temperature.
The conversion from mA to °C and °F are as follows:

Output	Pin	Calculation	Unit	Low	High
Oil Temperature	2	°C = (mA * 10) – 70	°C	4 mA = - 30°C	20 mA = 130°C
		°F = (mA * 18) – 94	°F	4 mA = -22°F	20 mA = 266°F

OQSxG2 Output 4-20 mA value	Temperature Conversion	
	°C	°F
20	130	266
19.5	125	257
19	120	248
18.5	115	239
18	110	230
17.5	105	221
17	100	212
16.5	95	203
16	90	194
15.5	85	185
15	80	176
14.5	75	167
14	70	158
13.5	65	149
13	60	140
12.5	55	131
12	50	122
11.5	45	113
11	40	104
10.5	35	95
10	30	86
9.5	25	77
9	20	68
8.5	15	59
8	10	50
7.5	5	41
7	0	32
6.5	-5	23
6	-10	14
5.5	-15	5
5	-20	-4
4.5	-25	-13
4	-30	-22
<4	Fault	

13 SOFTWARE USER AGREEMENT

IMPORTANT:

Please read carefully before using the Software.

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