



LUBE-MASTER R10

TSM MANUAL

TANK SURVAILLANCE MODULE

53430

EUROLUBE EQUIPMENT

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SWEDISH
RELIABILITY

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1. Introduction

The LUBE-Master TSM module, (**T**ank **S**urveillance **M**odule), is used to control pumps and/or measure levels in tanks using floater based level switches. A TSM can be used both for fresh and waste oil tanks.

The TSM (53430) is based on a TCM 53408 but has a lid (p/n 203 03 11) with a led indicator board (p/n 203 03 03) and a connector adapter (p/n 203 03 17) added to the main board 203 02 91.

Earlier models than serial number 12-02000 can be made with either a MPDM (53400) with another software (chip labeled TSM 1.xx.xx) and/or have a lid with chassis mounted indicator led's. Because of this a lot of this manual also in most parts covers older modules. Some features may be missing and some default settings may be different.

NOTE! The LUBE-Master installation manual should be available when installing and configuring a TSM.

2. Mechanical installation

The TSM is delivered mounted in a metal box with power supply. It can also be delivered as a spare part PCB (p/n 203 03 91) .

Complete TSM in a box is mounted on a wall or other suitable place using the four- $\varnothing 5$ mm holes in the bottom corners of the box.

If a PCB is used it is important that a power supply with enough performance is used, 24VDC 5A.

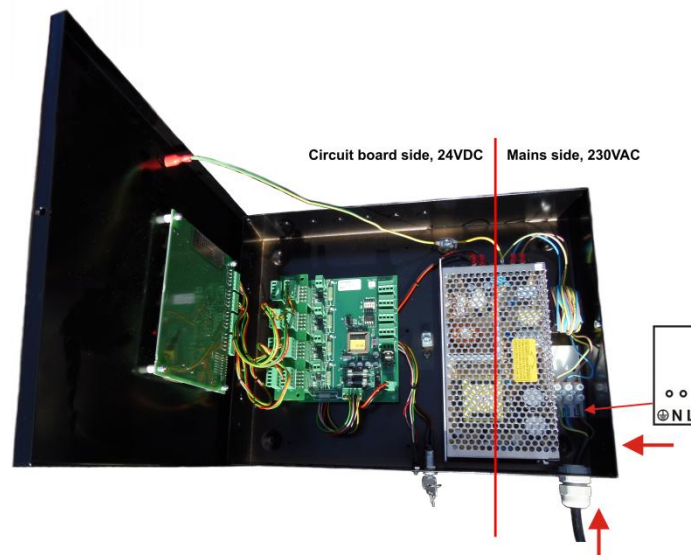
3. Electric installation

3.1. The main module

The TSM should be connected to mains 230VAC/50Hz using phase, neutral and ground.

Eurolobe recommend that the connection is done through a 2-pole lockable working switch.

The “knock-out” holes on the lower right hand (see picture) should only be used for mains power supply to separate mains from the circuit board (DC) side of the module.



The TSM is equipped with a switched power supply of 150W that can be set for 110VAC/60Hz or 230VAC/50Hz by the internal switch shown by the yellow sticker.

It has five connectors (**A**) for the LUBE-Master communication. Two of these connectors, **MPDM IN** and **MPDM OUT** are not connected to +24V and are intended for a connection to another TSM, MPDM or other modules that already have +24VDC. This is to prevent connecting +24VDC from two power supplies.

The other three connectors are used to connect external devices without a power source such as a Printer Module (PM), a LED Module (LED) and/or a KeyPad (KP). These connectors can only supply power to a single device. For more detailed information see the **LUBE-Master Manual**

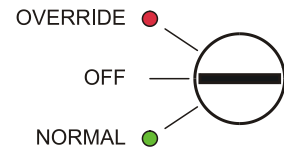
NOTE! If the communication loop begin in one of these modules it must be connected to either MPDM IN or MPDM OUT or +24V must not be connected.

The RESET-button (B) can be used to reset the module or reset the module address.

Power supply is connected to the connector (C).

NOTE! Check polarity, GND is closest to the hole!

The connector (D) is used when you install a chassis-mounted key switch and diode. With the key switch you can set the status of the module to OFF-, NORMAL-, or OVERRIDE-mode. The diodes indicate setting.



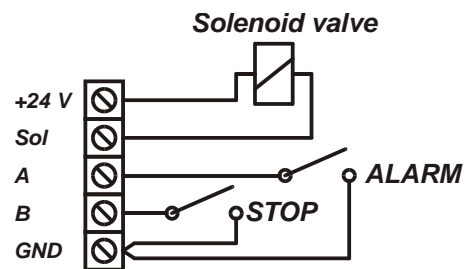
There are four connectors (E) market +24 V, OC, A, B and GND, one for each pump/tank. Solenoid valves and level sensors are connected to these connectors.

“A” of a TSM port is connected to “order oil/emptying” of the level sensor.

“B” of a TSM port is connected to “Stop level” of the level sensor.

“GND” of a TSM port is connected to common of the level sensor.

“+24V” of a TSM port is connected to one of the terminals of a solenoid valve and “Sol” is connected to the other.



TIP! If a TSM is used for a tank containing flammable liquid it could be necessary to use an EX protection.

There are two diodes (F) for every port. These indicate the status of entry points A and B, the level in the tank.

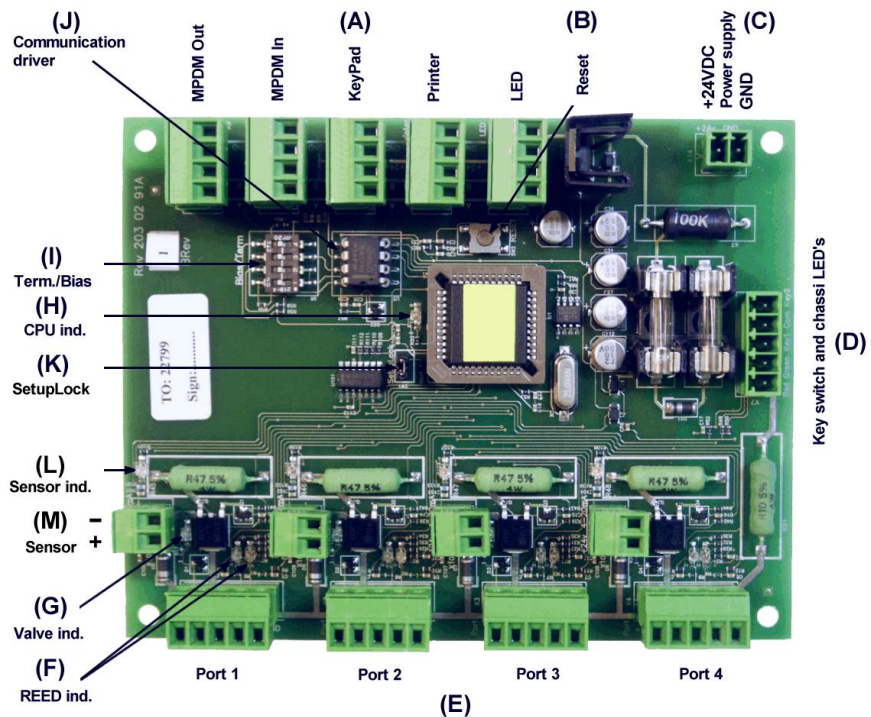
One diode (G) on each port indicates if the solenoid valve is open or not.

If the diode (H) is flashing the module is operational and working properly. A steady light or completely off indicates a problem.

DIL switches for termination and BIAS are located at (I). (J) Shows the position of the replaceable communication driver. The **SetupLock** jumper at position (K) has no function for a TSM.

A LED (L) shows if an analogue sensor is detected or not, lit if detected. The analogue sensors are connected to the 2-pole connectors marked (M). The polarity is marked on the PCB.

TSM200
PCB 203 02 91X
with chip TSM 2.xx.xx.



3.2. Connection adapter (203 03 17)

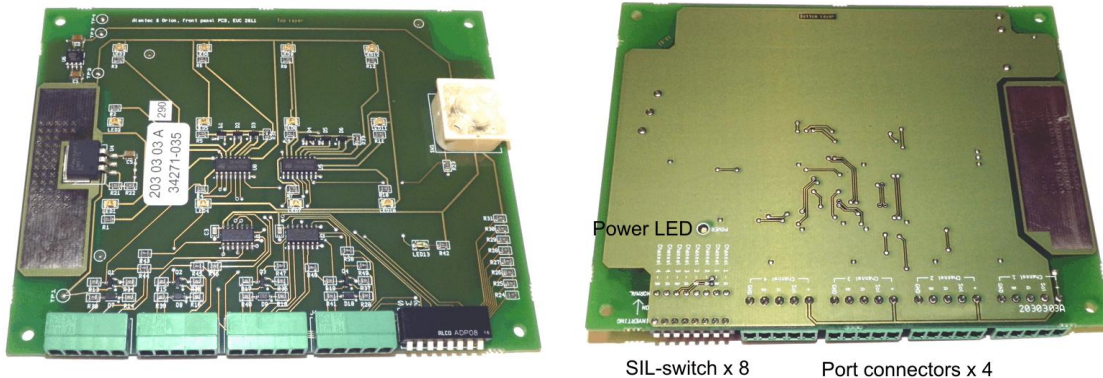
To simplify the connection of the level sensors and the pump controllers there are a connection adapter inserted in the main board port connectors. It splits each port connector into two identical connectors, one for the indicator board in the lid and one for the level sensors and pump controllers.



This enables the possibility to fully remove the lid in an easy way but still keep the control functionality of the module.

3.3. Lid indicator board (203 03 03)

By the indicator board mounted in the lid of the module the status of the discrete level sensors and the pump control can be seen from the outside.



The indicator board is powered by the Port 1 inter connection cable. If the board has power (24VDC) the power led (see picture) will be lit.

The 8-pole SIL-switch block can be used to invert the LED output compared to the sensor/pump signal. This can be used depending on the NC/NO of the sensor and pump control used.

The SIL-Switch stock default for TSM 53430 is all ON. This is shown by the text to the left of the switch block in the right picture above.

NOTE ! Never disconnect or connect the lid indicator board when power is on. Doing that could cause damage to the lid indicator board.

4. Configuration

An LUBE-MASTER configuration sheet *should* always be filled or altered during the configuration.

NOTE! To obtain technical support a copy of the configuration sheet for the complete installation must be sent to Alentec & Orion AB at

E-mail: lubemaster@alentec.se

Post: Alentec & Orion AB
LUBE-Master Support Team
Grustagsvägen 4
SE-138 40 Älta
SWEDEN

4.1. Check before configuration

Check that the TSM is working and communicating with the system according to the LUBE-Master *Manual* chapter *Testing modules*.

NOTE! Do not forget to check and adjust the termination and BIAS according to LUBE-Master Manual.

4.2. Addressing the TSM

A new module has a default address when delivered such as MPDM 1000, PM 2000, KP 3000, LED 4000, TSM 8000 and so on. To set an address for a new TSM or a TSM with unknown address press and hold its RESET button for 5 seconds to set a temporary address. Immediately enter set-up mode from a KP and type 0 and then ENTER to get to the Main menu of the TSM, see below.

NOTE! Only one new module can be installed at a time. If you press the RESET-button on several terminals simultaneously or in a sequence, only the most recently pressed will be active.

TIP! Follow preferably "Recommendation for setting new addresses" when setting addresses.

4.3. Set-Up mode

Type the word "SETUP" on a KeyPad and press ENTER.

Type the **password** and press ENTER.

Type the address for the TSM that is to be configured and press ENTER to access its main menu. It is possible to add the 4-digit menu code to go directly to the desired menu.

Scroll through the TSM sub menus by pressing ↑ or ↓. When the desired menu is shown press ENTER etc. On display it shows TCM because the TSM and TSM share the same software.

4.4. Change address [TCM//Address]

Enter menu [TCM//Address] by pressing ENTER.

Press ENTER to get the cursor.

Type in the **desired address** and acknowledge by pressing ENTER. When the cursor disappears it is finished.

Press EXIT two times to leave Set-Up mode.

```
Reel:SETUP      ‡
EXIT STOP CE ENT
```

```
PASS:_         ‡
Enter Password
```

```
Addr:8????_   ‡
Address[CODE]
```

```
TCM:          ‡
TCM MainMenu
```

```
TCM:          ‡
TCM MainMenu
```

```
Address:8XXX   ‡
Ange Address 8???
```

```
Address:8XXX   ‡
Set Address 8???
```

NOTE! If two or more TSM's have the same address the system will fail. The TSM's has to be re-addressed.

Hint! Follow preferably "Recommendation for setting addresses" when setting addresses.

4.5. Recommendation for setting addresses

Each module demands a unique 16 bit hexadecimal address. There are some forbidden and some reserved addresses but it is possible to use all addresses between 0001 and 9999. To make it easier to upgrade and support the system we recommend using the chart to the right.

This means that the first TSM should have the address 8001 and the next one 8002 etc. It is a good idea not to use the default address 8000, it makes it easier to add new Tam's

NOTE! It is essential to add modules to the configuration sheet continuously as they are configured to avoid collisions.

NOTE! Address 0000 is forbidden and addresses above 9999 are reserved for the system.

Address	Module
0000	Forbidden
1000 – 1xxx	MPDM
2000 – 2998	PM
2999	PC-database
3000 – 3xxx	KeyPad
4000 – 4xxx	LED-display
5000 – 5xxx	PLC-modules
6000 – 6xxx	Reserved
7000 – 7xxx	Reserved
8000 – 8xxx	TCM
9000 – 9xxx	Others
A000 – FFFF	Forbidden

5. Configure the ports

A TSM has four ports that are used to control four different pumps/tanks.

5.1. Connect a tank to a port [TCM//PortX/Tank]

To set a tank number for a port, from the main menu.

Enter menu [TSM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Press **ENTER** to get the cursor.

Check the number of the tank that is connected to portX, type that number in and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode.

TCM:	‡
TCM MainMenu	

PortX:	‡
TCM MainMenu	

Tank:X	‡
Set TankNo ???	

Tank: <u>X</u>	‡
Set TankNo ???	

5.2. Set the Mask [TCM//PortX/Mask]

Using the Mask each tank function can be set. This is done by adding the values for the desired functions, in the chart to the right.

EXAMPLE: Port 1 measures the level of a waste oil tank and controls the air to a waste oil pump using an Eurolube 2-levels sensor 53132. This is up done by calculating the value of the Mask $1+4+8=13$. The Mask should be set to 13.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **Mask**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **mask value** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode.

Function	Value
Waste oil tank	1
Not in use	2
Invert B	4
Invert A	8

TCM:	‡
TCM MainMenu	

PortX:	‡
TCM MainMenu	

Mask:X	‡
Set Mask 0-15	

Mask: <u>X</u>	‡
Set Mask 0-15	

Mask:X	‡
Set Mask 0-15	

5.3. Analogue sensor settings

5.3.1. Set the input signal filter time constant

This time constant (*Tau*) is used to filter the sensor signal to create an accurate tank level. “0” means no filter and a higher value gives slower response but a more accurate value. The default value of “6” is in most cases good. It means that for a step in the tank level the reading of the level is on 99,9 % after 30 seconds.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **T**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **time constant** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode.

TCM:	‡
TCM MainMenu	

PortX:	‡
TCM MainMenu	

T:6	‡
Time constant	

T:6	‡
Time constant	

T:6	‡
Time constant	

5.3.2. Adjusting the offset

Offset adjusting is used to obtain “0” volume when the tank is empty. If the sensor 53417 is used a normal value is -0.080. The “-“ sign is typed on the keypad by first pressing down arrow (yellow) two times followed by the “?” mark.

If the tank is empty, put the sensor in the tank at the bottom. If there is fluid in the tank hold the sensor outside the tank at bottom level. Adjust the offset value until the tank level shows “0”.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **O**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **offset value** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode.

TCM:	‡
TCM MainMenu	

PortX:	‡
TCM MainMenu	

O:0.000	‡
Zero adjust	

O:-0.120_	‡
Zero adjust	

O:-0.120	‡
Zero adjust	

5.3.3. Adjusting the calibration

The calibration factor should normally be set to “1.018” if all other values are set properly. The intention with the calibration factor is to set the amplification so that the analogue input of the port matches the sensors output.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **C**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **calibration value** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode

TCM:	‡
TCM MainMenu	

PortX:	‡
TCM MainMenu	

C:1.000	‡
Calibration	

C:1.000	‡
Calibration	

C:1.000	‡
Calibration	

5.3.4. Set sensor full scale

The sensor full scale value is the pressure corresponding to 20 mA. If a pressure sensor is used the value should be in [bar]. For sensor part number 53417 the value should be as default "0.400"

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **SFS**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **sensor full scale value** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode.

```
TCM:                ‡
TCM MainMenu
```

```
PortX:              ‡
TCM MainMenu
```

```
SFS:0.400          ‡
Full Scale [bar]
```

```
SFS:0.400          ‡
Full Scale [bar]
```

```
SFS:0.400          ‡
Full Scale [bar]
```

5.4. Fluid specification

5.4.1. Set fluid name

The fluid name set in the TSM makes it possible to show the fluid name in the info box for the graphic representation of the analogue sensor. It should be set to the same value as in the PC database.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **FN**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **name of the fluid** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode

```
TCM:                ‡
TCM MainMenu
```

```
PortX:              ‡
TCM MainMenu
```

```
FN:                 ‡
Name (max 16 ch)
```

```
FN:_                ‡
Name (max 16 ch)
```

```
FN:Name            ‡
Name (max 16 ch)
```

5.4.2. Set fluid part number

The fluid part number set in the TSM makes it possible to show the fluid part number in the info box for the graphic representation of the analogue sensor. It should be set to the same value as in the PC database.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **FP**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **part number of the fluid** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode

```
TCM:                ‡
TCM MainMenu
```

```
PortX:              ‡
TCM MainMenu
```

```
FP:                 ‡
Part number
```

```
FP:_                ‡
Part number
```

```
FP:XXXXXXXXX       ‡
Part number
```

5.4.3. Set the fluid density

If a pressure sensor is used it is essential to set the true density of the fluid because the pressure at the bottom of the tank depends on fluid level and fluid density. The density is about 1 Kg/l and for water and 0.875 Kg/l for mineral oil at 20°C.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **D**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **Density** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode

TCM:	‡
TCM MainMenu	

PortX:	‡
TCM MainMenu	

D:1.000	‡
Density [kg/L]	

D:1.000	‡
Density [kg/L]	

D:1.000	‡
Density [kg/L]	

5.5. Tank specification

5.5.1. Set tank capacity

The tank capacity set in the TSM is used to create a true graphic representation of the analogue sensor status. It should be set to the same value as in the PC database.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **TankVol**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **capacity of the tank** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode

TCM:	‡
TCM MainMenu	

PortX:	‡
TCM MainMenu	

TankVol:1000	‡
Set max vol [L]	

TankVol:1000	‡
Set max vol [L]	

TankVol:1000	‡
Set max vol [L]	

5.5.2. Set the tank reorder volume level

The tank reorder volume set in the TSM is used to create a true graphic representation of the analogue sensor status and start auto warning if that is enabled. It should be set to the same value as in the PC database.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **ReVol**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **reorder volume level of the tank** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode

TCM:	‡
TCM MainMenu	

PortX:	‡
TCM MainMenu	

ReVol:1000	‡
Reorder vol [L]	

ReVol:1000	‡
Reorder vol [L]	

ReVol:1000	‡
Reorder vol [L]	

5.5.1. Set the tank stop volume level

The tank stop volume set in the TSM is used to create a true graphic representation of the analogue sensor status and start auto warning if that is enabled. It should be set to the same value as in the PC database.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **StopVol**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **stopr volume level of the tank** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode

TCM:	‡
TCM MainMenu	

PortX:	‡
TCM MainMenu	

StopVol:1000	‡
Stop vol [L]	

StopVol:1000	‡
Stop vol [L]	

StopVol:1000	‡
Stop vol [L]	

5.5.2. Set tank bottom area

Setting the tank bottom area is only usable for a tank with the same projected area throughout the total tank height.

For other tank forms the profil has to be downloaded to the TSM from a PC.

The area should be in square meters. When the area is typed in and <ENTER> is pressed the volume for each step on the scale is calculated and stored in the TSM.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **SFS**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **sensor full scale value** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode.

TCM:	‡
TCM MainMenu	

PortX:	‡
TCM MainMenu	

TBA:	‡
Bottom area [m2]	

TBA:1.000_	‡
Bottom area [m2]	

TBA:1.000	‡
Bottom area [m2]	

5.5.3. To configure a TSM port for a tank that does not have a constant area

Each TSM port can handle tanks of any shape buy using a tank shape file. To upload a tank shape file to the TSM module it must be connected to a PC with LUBE-Master WinTools installed. After the tank shape file has been uploaded the TSM can be disconnected from the PC. For detailed information see the LUBE-Master WinTools manual.

5.6. Displaying tank content on a LED display

5.6.1. Set LED address

By specifying a LED address (4XXX) it is possible to show the content of the tank in real time on a remote or local LED display. Observe that the addressed LED will not be available for dispensing information.

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **LED**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **LED address** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode.

```
TCM:          ‡
TCM MainMenu
```

```
PortX:       ‡
TCM MainMenu
```

```
LED:         ‡
LED Address 4???
```

```
TankVol:4XXX_ ‡
LED Address 4???
```

```
TankVol:4XXX ‡
LED Address 4???
```

5.6.2. Set LED update interval

The default update interval is 1 second but since tanks seldom changes with a speed that needs updating every second it good to increase the interval to free up network for more important things. This is especially good in large systems.

The interval is set in seconds. A setting of 5 will update the LED every 5 seconds

Enter menu [TCM//PortX] by scrolling with ↑ or ↓.

At **PortX**: press **ENTER**.

Scroll to **LEDui**: using ↑ or ↓.

Press **ENTER** to get the cursor.

Type the **interval wanted** and press **ENTER** to acknowledge. When the cursor disappears it is finished.

Press **EXIT** two times to leave Set-Up mode.

```
TCM:          ‡
TCM MainMenu
```

```
PortX:       ‡
TCM MainMenu
```

```
LEDui:       ‡
Update interval?
```

```
LEDui:1_    ‡
Update interval?
```

```
LEDui:1     ‡
Update interval?
```

5.7. Set the type of tank (PC system).

To make it possible for the PC software to handle tank information, volumes, sensor inputs and valve output it is necessary to define which TSM port to use, if it is a fresh oil tank or a waste oil tank, if there are any level sensors connected and of which type if there are.

These settings are done from the PC using the LUBE-Master WinDB Manager software and are described in detail in the LUBE-Master WinTools Manual. Below is only a short description.

To tell the system which hardware to use for each PC tank the TSM address and TSM port has to be set for all PC tanks.

Each PC tank could share a TSM port if the same solenoid valve is used to control all pumps. This is not recommended because of the loss of security and redundancy.

The system must be told what hardware there is and how to use it properly. This is done through the Tank Type.

Tank type is set by a string of 0 and 1 where the first position sets if it is a fresh or waste oil tank. The second position tells if there is a discrete level sensor present or not and the third position defines if there is an analogue sensor present or not.

Tank type is "0??" for fresh oil and "1??" for waste oil.

Tank type is "?0?" for NO discrete sensor and "?1?" for discrete sensor connected.

Tank type is "??0" for NO analogue sensor and "??1" for an analogue sensor connected.

Example:

TankType = 000, a fresh oil tank without sensors.

TankType = 010, a fresh oil tank with a discrete level sensor.

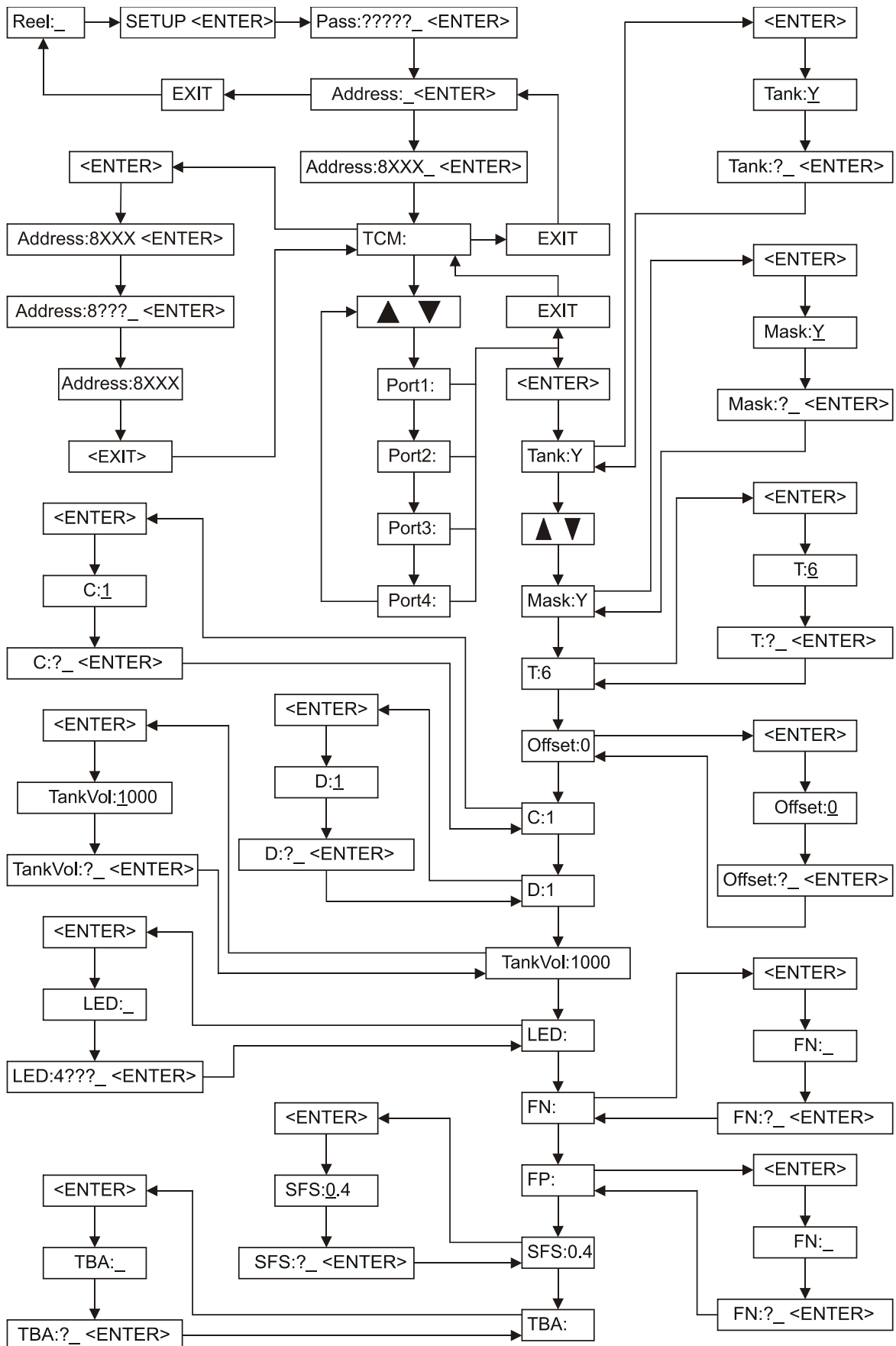
TankType = 110, a waste oil tank with a discrete level sensor.

TankType = 001, a fresh oil tank with an analogue level sensor.

TankType = 101, a waste oil tank with an analogue level sensor.

TankType = 111, a waste oil tank with both a discrete and an analogue sensor.

6. Menu tree



7. Fast Menu codes

With a PC, the LUBE-Master WinTools software and a SIO, you can customize the quick menu that appear when you press "???" on a keypad. To do this, assign a name to the menu, a module address and then a code. Password is optional. This code can also be used together with the address after you have typed SETUP followed by the password.

For a TSM-module it will look like this,

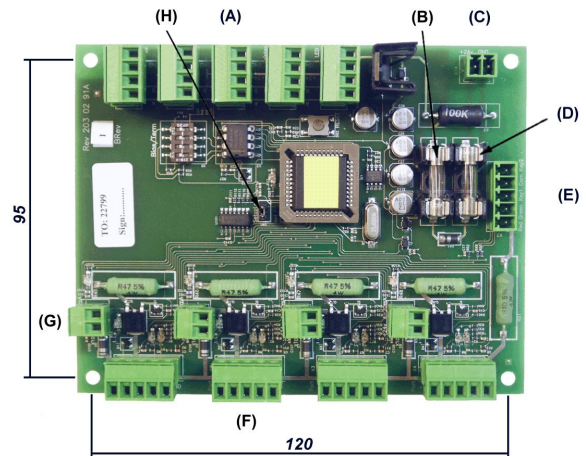
Set Mask 80000101 YYYYYY where YYYYYY=password

Part	Function	Address	Code	Comment
Main menu	Change address		0800	
Ports	Change Tank No.		0X00	Where X is the port number
	Change Mask.		0X01	Where X is the port number
Only for TSM with analogue sensor support (PCB 203 02 91 A and higher)				
	Change Time constant		0X02	Where X is the port number
	Change Offset		0X03	Where X is the port number
	Change Calibration		0X04	Where X is the port number
	Change Density of fluid		0X05	Where X is the port number
	Change Max volume of tank		0X06	Where X is the port number
	Change LED Address		0X07	Where X is the port number
	Change Name of Fluid		0X08	Where X is the port number
	Change Part number of fluid		0X09	Where X is the port number
	Change Sensor full scale		0X10	Where X is the port number
	Change Reorder volume		0X11	Where X is the port number
	Change Stop volume		0X12	Where X is the port number
	Change LED update interval		0X13	Where X is the port number
	Shows current volume [L]		0X60	Where X is the port number
	Show sensor signal [%] & [mA] (Observe! -Does not always reflect the content of tank because it refers to the sensor max scale not the max volume of the tank.)		0X61	Where X is the port number
	Change Tank area		0X62	Where X is the port number

8. Technical specification

Printed circuit board

Net ports:	5 LUBE-Master ports (A) for data communication, 2 without +24VDC.
Discrete level inputs:	4 (F), for one or two levels. Switch or active signal max 50 V. Supports reorder and stop set-up for both fresh and waste oil.
Control outputs:	4 (F) for solenoid valve 24 VDC max 1,25 A. Closes after about 30 s when short circuited, this is logged in the database.
Analogue level inputs:	4 (G) 4 - 20mA, 24VDC with 10-bit A/D-converters.
Other:	RISC-based microprocessor EEPROM, 64 KB. Connector (E) for 3-pos key switch. Connector (C) for 24 VDC power supply. SetupLock jumper (H), not used.
Fuses:	T6.3A (D) and F1.6A (B)
Max current:	500 mA + 4x1.25 A for solenoid valves.



Casing

Power supply:	Primary 230VAC/50Hz/2A or 110VAC/60Hz/3A set by a switch. Short circuit protected
Casing:	Strong black powder painted steel box
Outer measures:	345 x 265 x 65 mm.
Fitting:	4 x ø5mm CC = 290 x 210 mm
Weight:	3,9 kg.

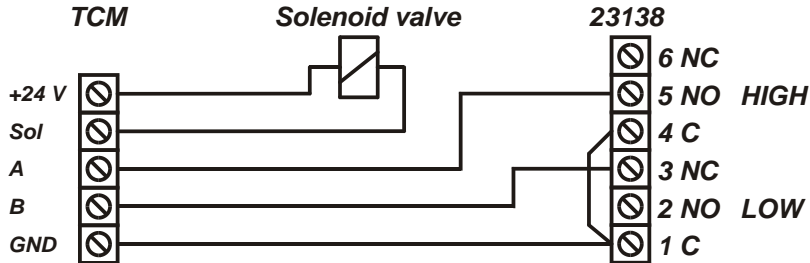
Environment

Use:	Indoors. Temperature 0 - +55°C Humidity 90-95%, not condensing
Transport:	Temperature -40 - +70°C Humidity 90-95%, not condensing
Storage:	Temperature -40 - +70°C Humidity 90-95%, not condensing

9. To connect discrete level sensors 53132/138/171 and solenoid valves

9.1. Fresh oil tank, 53138 (2-levels)

To achieve a proper function, that is the pump starts only if there are enough oil in the tank, a dispense point is open and the sensor works properly, the following connection should be made.

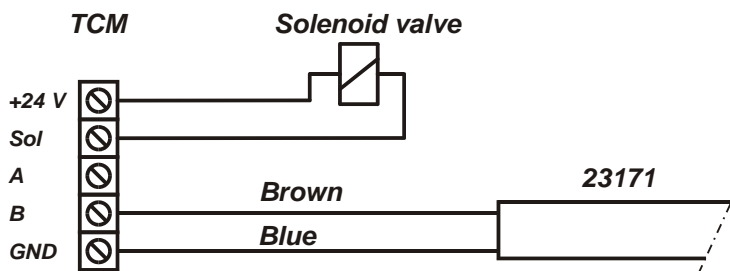


The TSM port should be set to control the appropriate PC tank in relation to the physical tank. Correct TankType, TSMAddress and TSMPort should be set using with WinDB Manager.

MASK =12, TankType = 01?

9.2. Fresh oil tank, 53171/53183 (1-level)

To achieve a proper function, that is the pump starts only if there are enough oil in the tank, a dispense point is open and the sensor works properly, the following connection should be made.

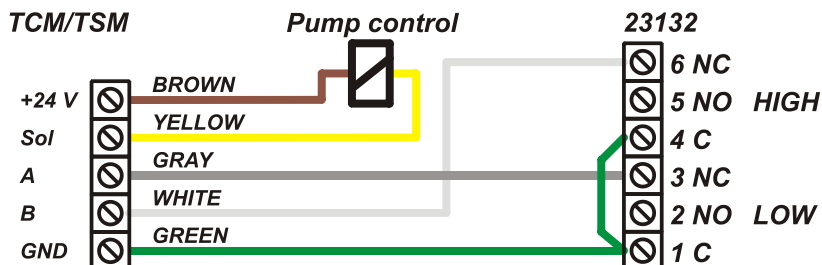


The TSM port should be set to control the appropriate PC tank in relation to the physical tank. Correct TankType, TSMAddress and TSMPort should be set using with WinDB Manager.

Mask = 4, TankType=01?

9.3. Waste oil tank, 53132 (2-levels)

To achieve a proper function, that is the pump stops if the physical tank is full or if the sensor is disconnected, the following connection should be made. Colours are if you use control cable 53412.



The TSM port should be set to control the appropriate PC tank in relation to the physical tank. Correct TankType, TSMAddress and TSMPort should be set using with WinDB Manager

MASK = 13, TankType = 11?

9.4. One TSM port controls a number of pumps

It is possible to control several pumps with only one solenoid valve, that is all pumps starts if one dispense point is opened. To do this the solenoid valve is connected between +24V and Sol of a TSM port. The port is set to a tank that does not exist in the PC database and the Mask is set to 0.

For all PC tanks that should be controlled by this solenoid valve the TSMAddress and TSMPort should be set to this port. Using the WinDB Manager does this.

If this method is used of coarse no level sensor can be used.

10. EX-barrier 53187 for discrete level sensors.

An EX-barrier is needed between the level sensor and the tank module if the liquid is classed as flammable. For this purpose the EX-barrier 53178 and a special EX approved cable 53164 can be used.

The EX-barrier, the solenoid valve that controls the air to the pump and the tank module should be placed outside the EX-classed area. The EX approved cable should be used to connect the level sensor on the tank inside the EX-classed area with the EX-barrier outside the EX-classed area.

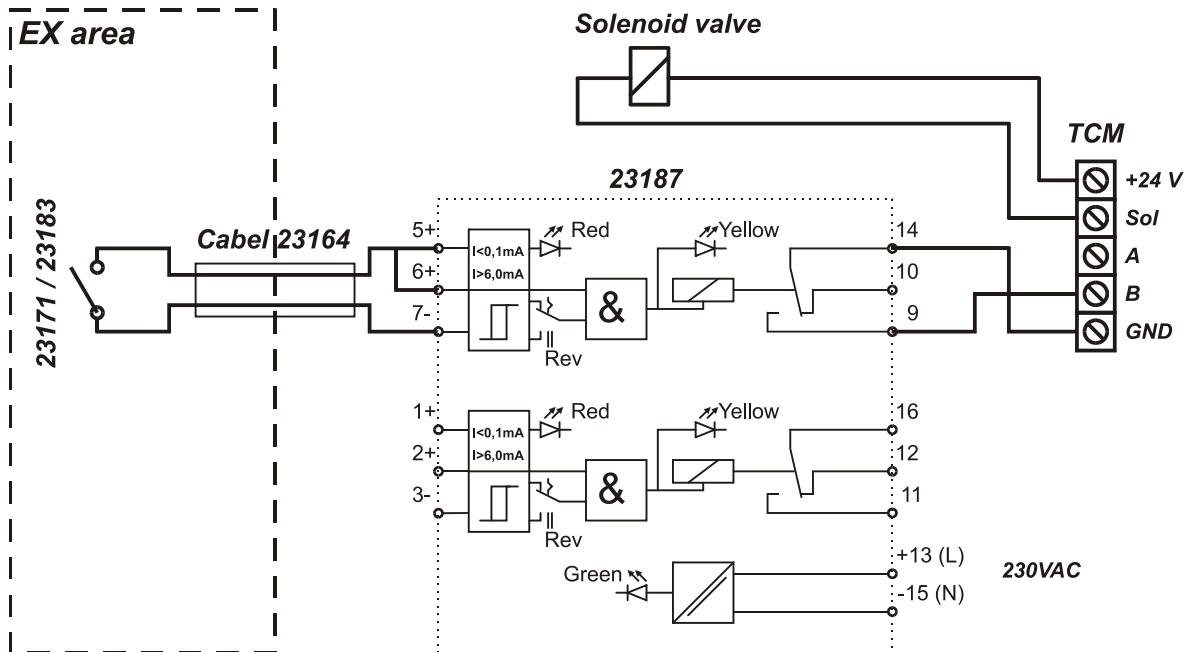
Connecting a fresh oil tank 53171/53183 (1-Level).

To achieve a proper function, that is the pump starts only if there are enough oil in the tank, a dispense point is open and the sensor works properly, the following connection should be made.

The TSM port should be set to control the appropriate PC tank in relation to the physical tank.

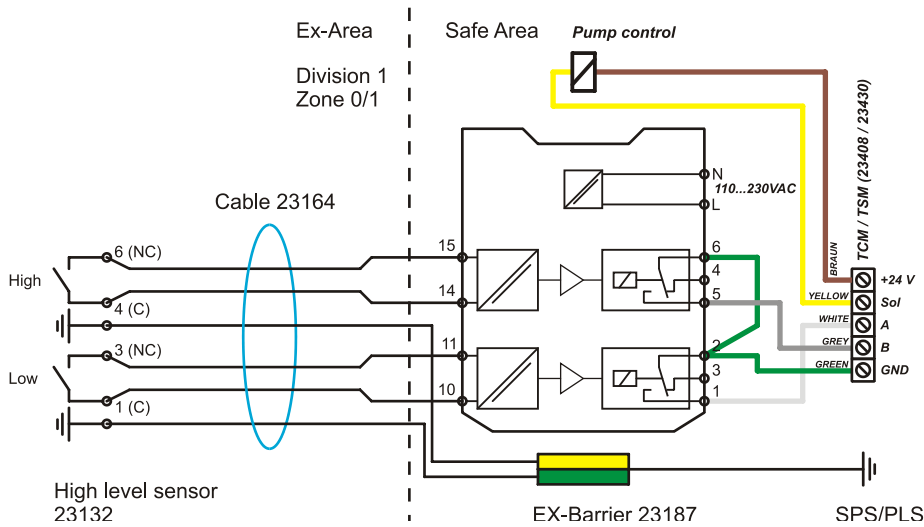
Correct TankType, TSMAddress and TSMPort should be set using with WinDB Manager

Mask = 4, TankType=01?



10.1. Connecting a waste oil tank 53132 (2-Levels)

To achieve a proper function, that is the pump stops if the physical tank is full or if the sensor is disconnected, the following connection should be made.



The TSM port should be set to control the appropriate PC tank in relation to the physical tank.

Correct TankType, TSMAddress and TSMPort should be set using with WinDB Manager
MASK = 13, TankType = 11?.

11. To connect an analogue sensor

The four analogue inputs on the TSM support any standard industrial 2-lead / 4-20mA / 24VDC sensors. To connect sensors a 2-pole connector is used.

11.1. Analogue sensor 53417

The submerged pressure based level sensor 53417 is a robust sensor that can be used with good accuracy for tanks with a height of 1 – 5 meters. Max height depends on density of fluid. The measuring resolution for a TSM with a 53417 sensor is 4 mm for water and about 4.5 mm for mineral oil.

Connect the red wire to +24VDC and the black wire to Sense. +24VDC and Sense are printed on the PCB.

If the sensor cable (6.5 m) is too short to reach the TSM it can be lengthened using a standard 2-lead wire with copper area of 0.5 mm² for each lead. For this purpose use the by-packed connection box.



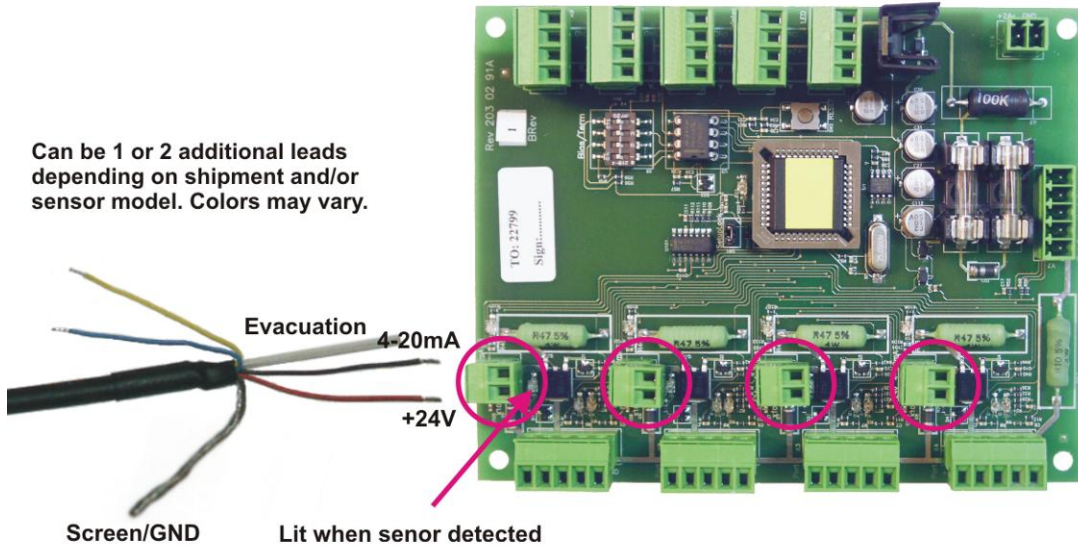
It is not necessary to use the shield to obtain a good signal because the signal is current based. The shield can be used for protection grounding purposes if needed.

OBSERVE! It is important that the transparent tube is not blocked and that the humidity protection filter is used. A blocked tube will cause measuring failure. Not using the humidity protection could cause sensor malfunction due to corrosion caused by condensed water.

11.2. Connecting an analogue sensor.

The LUBE-Master TSM uses 2-lead 4-20mA 24VDC technique but there are several other techniques that uses more leads. Because of this the sensor can have more than 2-leads but they are not used.

OBSERVE! Colors may vary between shipments and sensor types so check the sensor manual before connecting it.



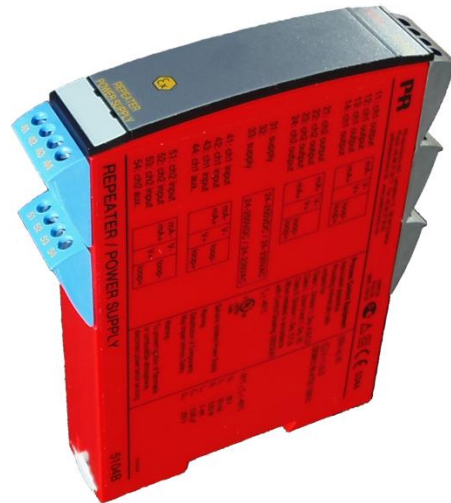
Correct TankType, TSMAddress and TSMPort should be set using with WinDB Manager
 MASK = ??, TankType = ??1

12. EX-barrier 53188 for analogue sensors.

An EX-barrier is needed between the level sensor and the tank module if the liquid is classed as flammable. For this purpose the EX-barrier 53188 and a special EX approved cable p/n 53164 should be used.

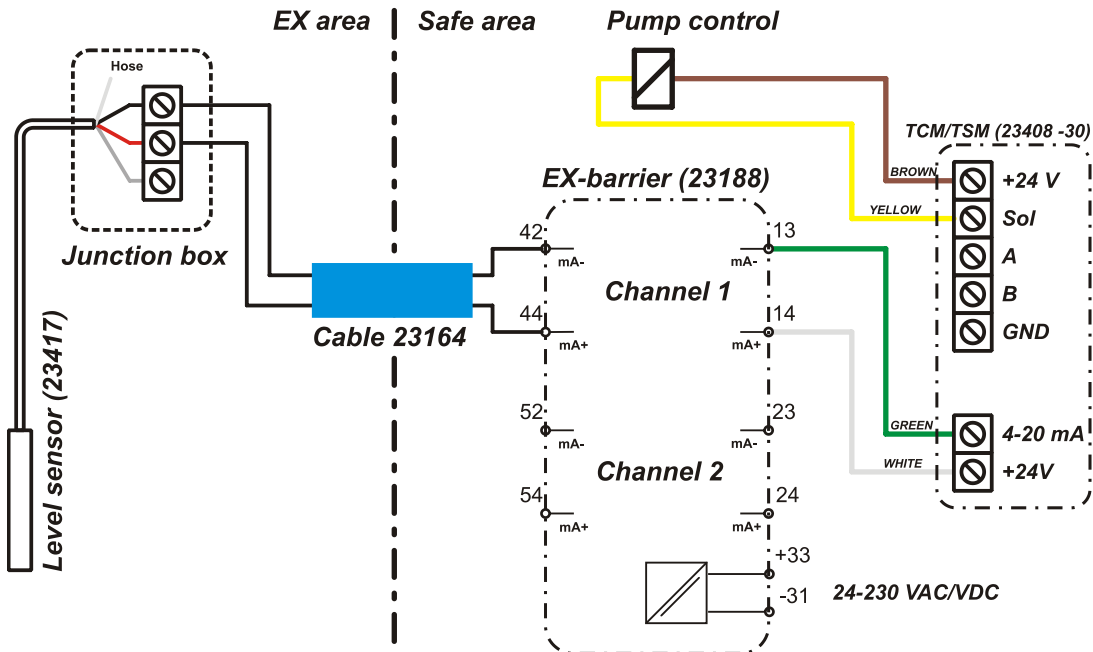
The EX-barrier, the solenoid valve that controls the air to the pump and the tank module should be placed outside the EX-classed area.

The EX approved cable should be used to connect the level sensor on the tank inside the EX-classed area with the EX-barrier outside the EX-classed area.



12.1. Connection

The analogue EX-barrier 53188 can handle 2 analogue sensors. Here is shown how to connect an analogue sensor 53417 to a TSM port using channel 1 of the EX-barrier.



NOTE! The lead colours of the sensor may vary depending on the shipment and make but there are always +, - and GND/Screen. Known variations are “+” is RED, “-“ is BLACK or BLUE and GND is YELLOW or SCREEN.

In the connection sample picture the leads of the blue EX-Cable (53164) has for visibility been given different colours, in the real cable they are black with figures.

13. MPDM PCB mounted in a TSM box

In a small system or at limited space it is possible to mount an additional module PCB in a TSM. In this example a MPDM board is added. To do this the TSM PCB has to be moved and turned one quarter of a turn.

See pictures below: Make sure that the TSM is disconnected from the mains power supply and the LUBE-Master network before any work is started. Use a voltmeter to make sure that there is no power.

To the left is how the standard TSM looks like inside.

Turn the TSM PCB a quarter of a turn and place it at the top of the box. Move the plastic distances to the holes which make it possible to place the PCB as shown in the picture to the right. Do not damage the cabling.

Fasten the short plastic distances so the new card can be placed closest to the bottom like in the picture.

