

Smart Fluid Level Converter

Version 1.00



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1 Important Notices

Information in this document is subject to change without notice. LXNAV reserves the right to change or improve their products and to make changes in the content of this material without obligation to notify any person or organization of such changes or improvements.



A Yellow triangle is shown for parts of the manual which should be read very carefully and are important when operating the E500/E700/E900.



Notes with a red triangle describe procedures which are critical and may result in loss of data or any other critical situation.



A bulb icon is shown when a useful hint is provided to the reader.

1.1 Limited Warranty

This Smart Fluid Level Converter product is warranted to be free from defects in materials or workmanship for two years from the date of purchase. Within this period, LXNAV will, at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts and labour, provided that the customer pays for shipping costs. This warranty does not cover failures due to abuse, misuse, accident, or unauthorized alterations or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL LXNAV BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE, OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT.

Some states do not allow the exclusion of incidental or consequential damages, so the above limitations may not apply to you. LXNAV retains the exclusive right to repair or replace the unit or software, or to offer a full refund of the purchase price, at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

To obtain warranty service, contact your local LXNAV dealer or contact LXNAV directly.

1.2 Packing Lists

- Smart Fluid level converter (SmartFLC)
- Quick reference manual
- Male connector kit

2 Technical Data

2.1 General specifications

Parameter	Condition	Min	Typ	Max	Unit
Operating supply voltage ⁽¹⁾		8	12	32	V
Absolute maximum supply voltage ⁽²⁾	Non-operating	-50		36	V
Current consumption ⁽¹⁾			24		mA
Load equivalent number		1			LEN
Supply protection		-50V			V
Operating temperature		-20		+65	°C
Storage temperature		-40		+85	°C
Recommended humidity		0		95	RH
Weight		115			g
Housing length		95			mm
Housing diameter		24			mm
Ingress Protection		IP67			

Note1: Supplied via M12 NMEA2000 connector

Note2: Non-operational, voltages outside of this range may permanently damage the device

Table1: General specifications

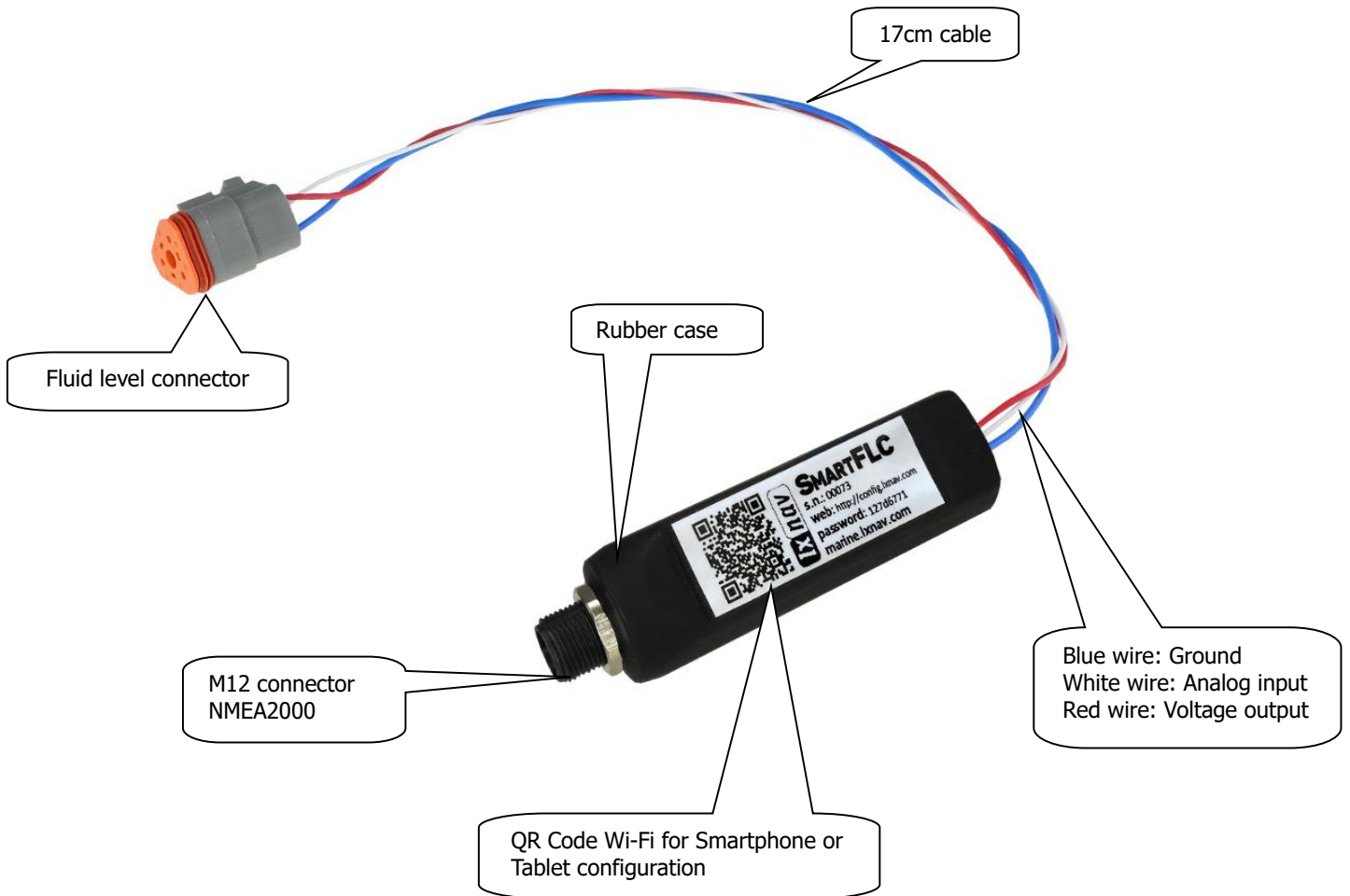
2.2 NMEA2000 specifications

Parameter	description
Compatibility	NMEA2000 compatible
Bit rate	250kbps
Connection	A coded M12 connector

Note1: Supplied via M12 NMEA2000 connector

Table2: General specifications

3 Product specification



4 Connectors on Fluid level converter

4.1 NMEA2000 Connector

M12 5-pin A-coded connector on side of unit is compatible with NMEA2000 and has standard pinout.

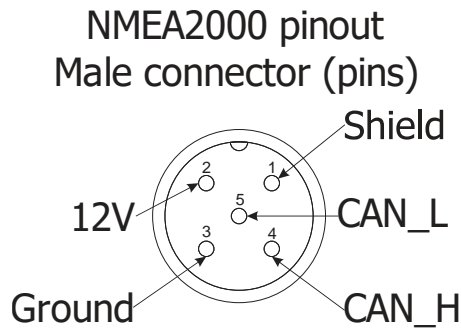


Figure 1: NMEA2000 M12 Male connector pinout (view from unit side)

4.2 Deutsch – sensor connector

4.2.1 Pinout

The pinout is shown from the unit side (female connector). Pins on housing are numbered as letters *A*, *B* and *C*.

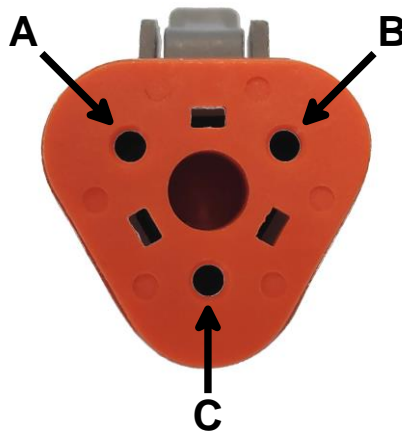


Figure 2: DT06-3S pinout

Pin	Type	Description
A	Analog input	Wire colour - white
B	Voltage output	Wire colour – red
C	Ground	Wire colour - blue

Table 3: Pinout description

4.2.2 Specifications

4.2.2.1 Voltage output

FLC unit features one switchable 5 V supply outputs for powering sensors. The output has automatic resettable fuse protection against overcurrent, overvoltage and short-circuit faults.

Parameter	Condition	Min	Typ	Max	Unit
Power output voltage	$0 < I_{load} < 50\text{mA}$	4.9	5	5.15	V
Power output current	$V_{out} > 4.9\text{V}$	0		50	mA
Short circuit current limit	$V_{out} = 0\text{V}$	50	85	130	mA
Maximum overload voltage ⁽¹⁾		-25		40	V

Note 1: Voltage forced back into the 5V output pin. Voltage outside of this range may permanently damage the device

Table 4: Power output electrical characteristics

4.2.2.2 Analog input

Fluid N2K unit features one fully configurable analog input for:

- Voltage sensors: 0-5V
- Resistive: European, ABYC (US) and Asian standards

Analog input has an internal switchable pullup resistor to 5V, thereby relieving the user of manual resistor installation.

Parameter	Condition	Min	Typ	Max	Unit
Input resistance	$0\text{V} < V_{in} < 30\text{V}$ Pullup disabled	0.9	1.0	1.1	MΩ
Input capacitance	$0\text{V} < V_{in} < 30\text{V}$ Pullup disabled	0.9	1.0	1.1	nF
Operating input range		0		18	V
Absolute maximum input voltage ⁽¹⁾		-36		36	V
Internal pullup resistance	Pullup enabled		500		Ω

Note 1: Continuously applied voltage. Voltage outside of this range may permanently damage the device

Table 5: Analog input electrical characteristics

4.2.2.3 Accuracy

Shown accuracy limits represent the edges of the acceptable accuracy windows for the above specified operating conditions, typical values may be lower.

Parameter	Condition	Value
Voltage Input Accuracy	$0\text{V} < V_{in} < 18\text{V}$	< 1 %
Voltage Input ADC Resolution		4.5 mV

Table 6: Accuracy specifications

4.2.3 Connector crimping

This chapter guides you through crimping wires into the EMU connectors provided. Tools needed are:

- Crimping pliers
- Wire stripper

Figure 3 shows the contents of the sensor connection kit supplied together with the SmartFLC unit. It contains (from left to right):

- Endcap
- Housing for male terminals
- 3 crimp terminals
- Watertight grommet

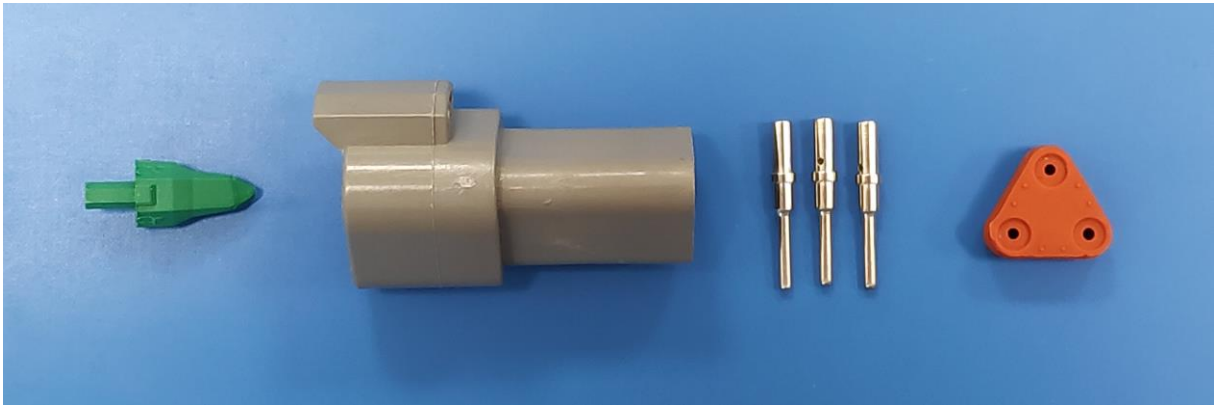
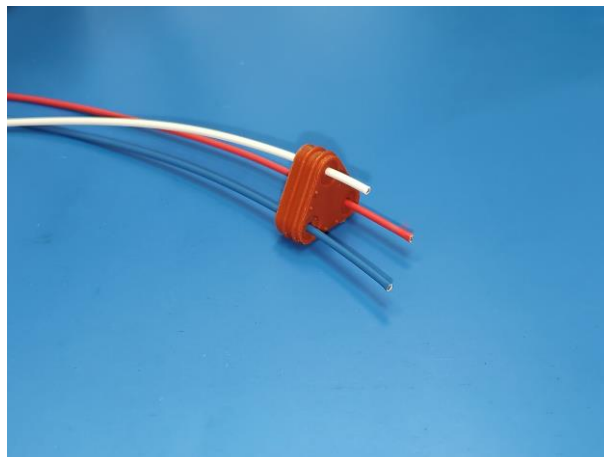


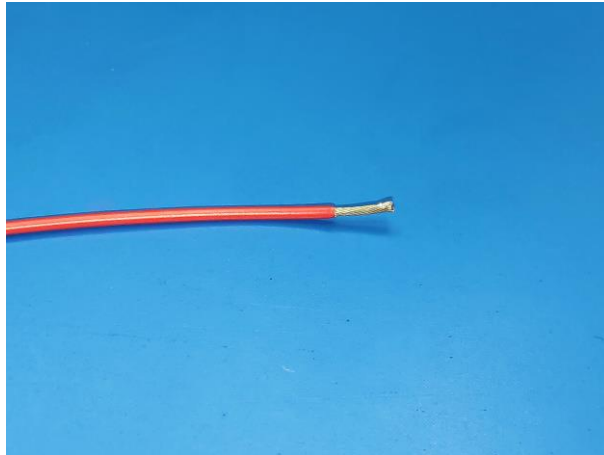
Figure 3: Sensor connection kit

For correct crimping procedure follow instruction steps bellow:

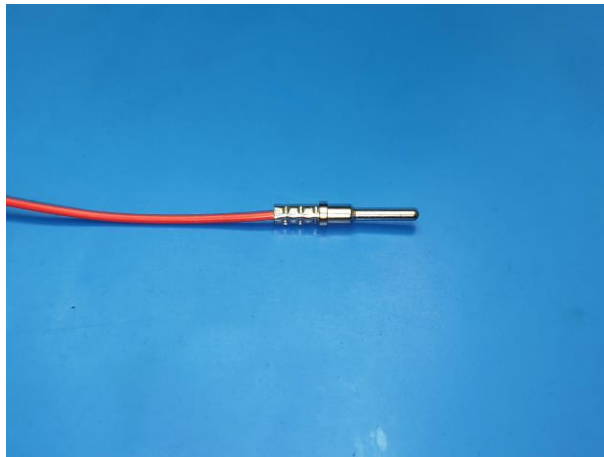
Step 1: Pull all necessary wires through grommet.



Step 2: Strip wires. Stripped length should be somewhere around 6mm.



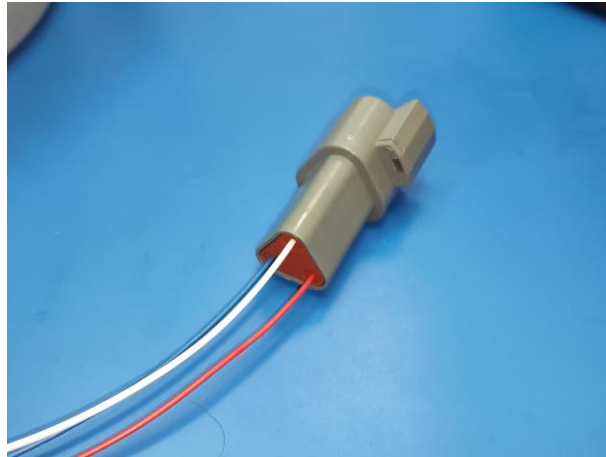
Step 3: Insert the wire into the crimp contact and press it with pliers. The result should look like the picture below. Pliers used in this step were from Deutsch HDT-48-00.



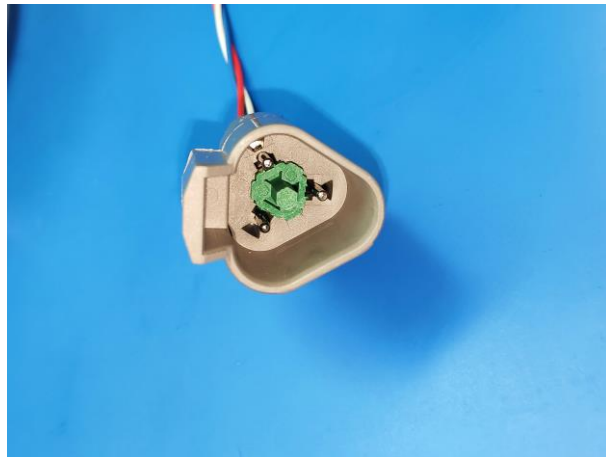
Step 4: Insert three crimped pins into connector on dedicated place. Make sure pins are secured, test them with slight pull outwards. Take care not to mix pins functionality.



Step 5: Install water grommet on back side of connector.



Step 6: From the front side insert secure tab. This prevents crimp contacts to fall out of connector housing.

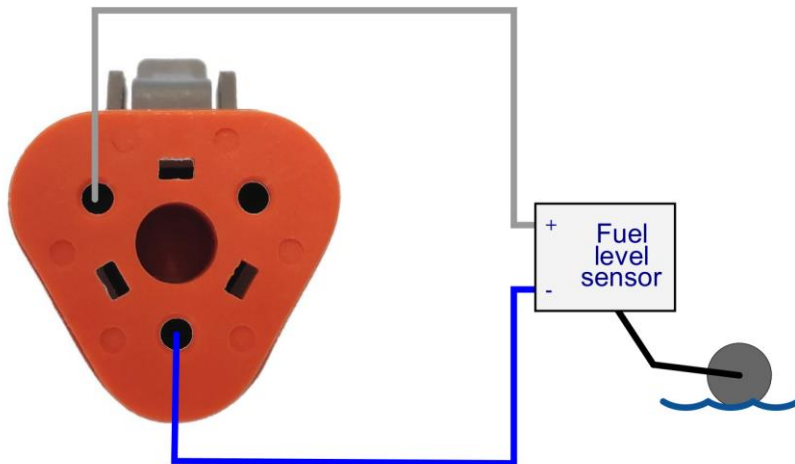


5 Sensor wiring

All wirings are shown with respect to female connector on Fluid N2K.

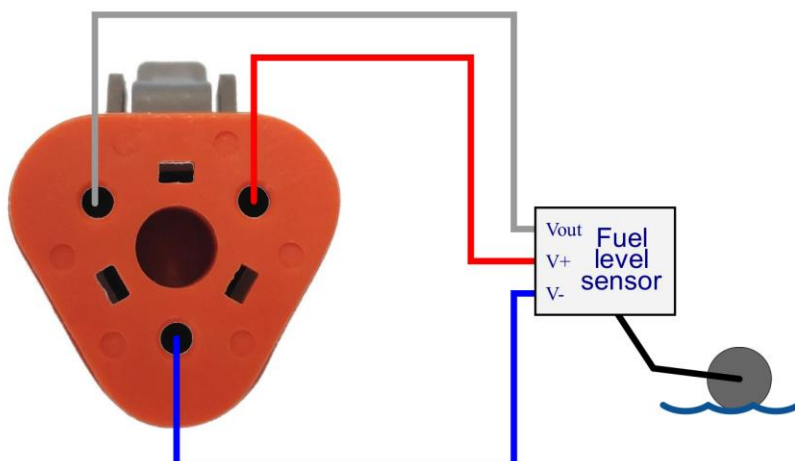
5.1 Resistive type sensors

Use only ground and analog input connections. Polarity on sensor side is not important.



5.2 Voltage output type sensors

All three contacts are used in this configuration. V+ and V- terminals are for powering fluid level sensor and analog input measures voltage.



6 Configuration and calibration via LXNAV E-series chartplotter

To operate properly, the SmartFLC must be configured prior use. Configuration can be performed via one of LXNAV E-series chartplotter. Configuration menu is accessible under settings menu:

Settings->Network->Connected Devices->LXNAV EMU->Device setup

6.1 Configuration

Inside this page user can choose between different options for particular FLC.

6.1.1 Input type

User can select:

- None
- Fluid level
- Voltage reference

6.1.2 Fluid level sensor type

Some standard and generic available options:

- Resistive 240-33 Ohm (US)
- Resistive 3 – 180 Ohm (EU)
- Resistive 105 – 5 Ohm (Asia)
- Resistive 2 – 90 Ohm (EU)
- VDO 0.5 – 4.5 V
- Generic voltage 5 V
- Generic voltage with reference

6.1.3 Fluid type

Types of measured fluid:

- Fuel
- Fresh Water
- Waste Water
- Live Well
- Oil
- Black Water (Sewage)
- Fuel (Gasoline)

6.1.4 Tank capacity

Textbox for capacity of tank.

6.2 Calibration

When calibrating fuel level sensor, it is necessary to follow some rules. At the beginning go to calibration menu that can be found under this path:

Settings->Network->Device calibration->Fluid level->Fluid level

For the first calibration fuel or any other fluid tank has to be empty. At the beginning there are already two existing calibration points added to calibration table – 0 litres, 0 % and 100 litres, 100 %. Maximum capacity value depends on selected value in configuration menu. User can add up to 10 additional calibration points which increases accuracy of indication due to non-linearity of sensor or different shapes of tanks.

7 Configuring via Wi-Fi and QR code:

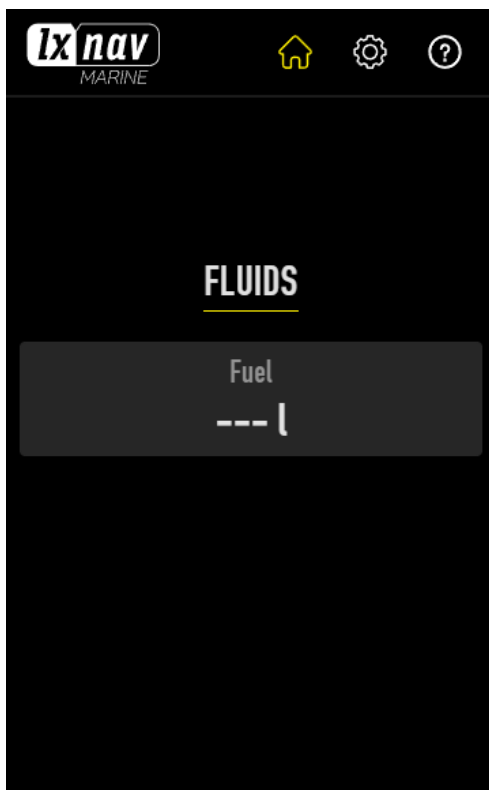
7.1.1 Configuration via Wi-Fi

SmartFLC has integrated Wi-Fi hot spot, to which you can connect with your smartphone or tablet. Password can be copied from label on SmartFLC unit or QR code. After scanning the QR code you must run a web browser on your smartphone or tablet to access to the configuration page.

Configuration consist of three pages. Home, Config and Info

7.1.1.1 Home

On home page user can view the configured fluid sensor data.



7.1.1.2 Configuration page

The settings, which must be selected is the type of the Analog input, Display units and NMEA. Calibration is stored in the SmartFLC unit. All changes must be confirmed with save button.

ANALOG INPUTS:

On this page user configure function the analog input. *Check next chapter for configuration details*

DISPLAY UNITS

Display units have following functions:

Temperature

- Celsius
- Kelvin
- Fahrenheit

Pressure

- Psi
- Bar
- kPa

Volume

- Litres
- Imperial gallons
- US gallons

Flow rate

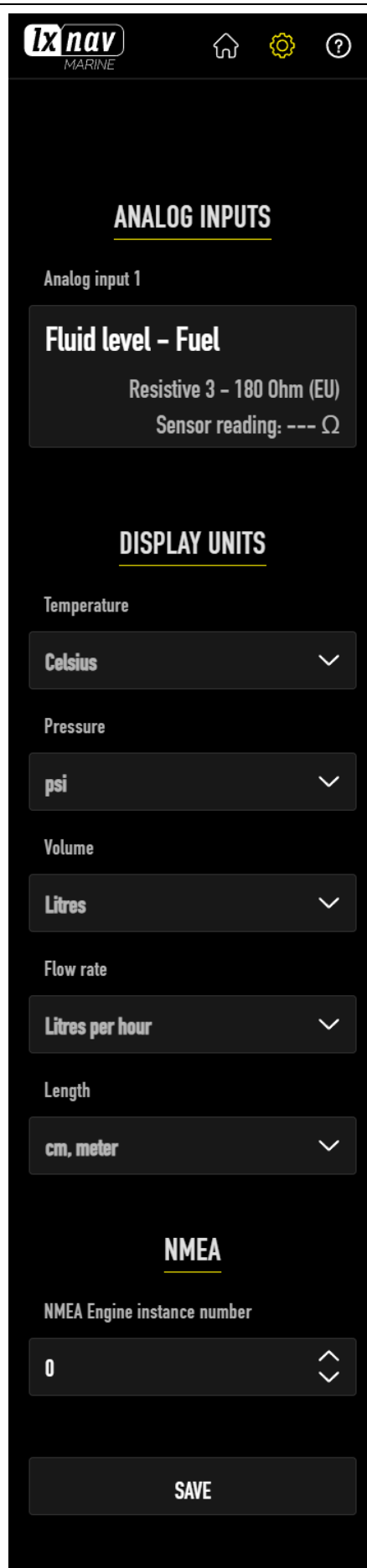
- Litres per hour
- Imperial gallons per hour
- Gallons per hours

Length

- cm, meter
- inch, feet

NMEA:

Insert the NMEA Engine instance number to identify the unit connected on the network.



7.1.1.2.1 Analog input configuration

Next setting, which must be selected is the type of the fluid and last the tank volume.

Calibration is stored in the SmartFLC unit.

All changes must be confirmed with save button.

CONFIGURATION

Input type

- Litres per hour
- Imperial gallons per hour
- Gallons per hours

Position/Level sensor type

- Resistive 3 - 180 Ohm (EU)
- Resistive 240 - 33 Ohm (US)
- Resistive 3 - 180 Ohm (EU)
- Resistive 105 - 5 Ohm (Asia)
- Resistive 2 - 90 Ohm (EU)
- VDO 0.5 - 4.5V
- Generic voltage
- Generic voltage with reference
- Resistive 90 - 2 Ohm (EU)
- Generic resistance
- Current 4 - 20mA

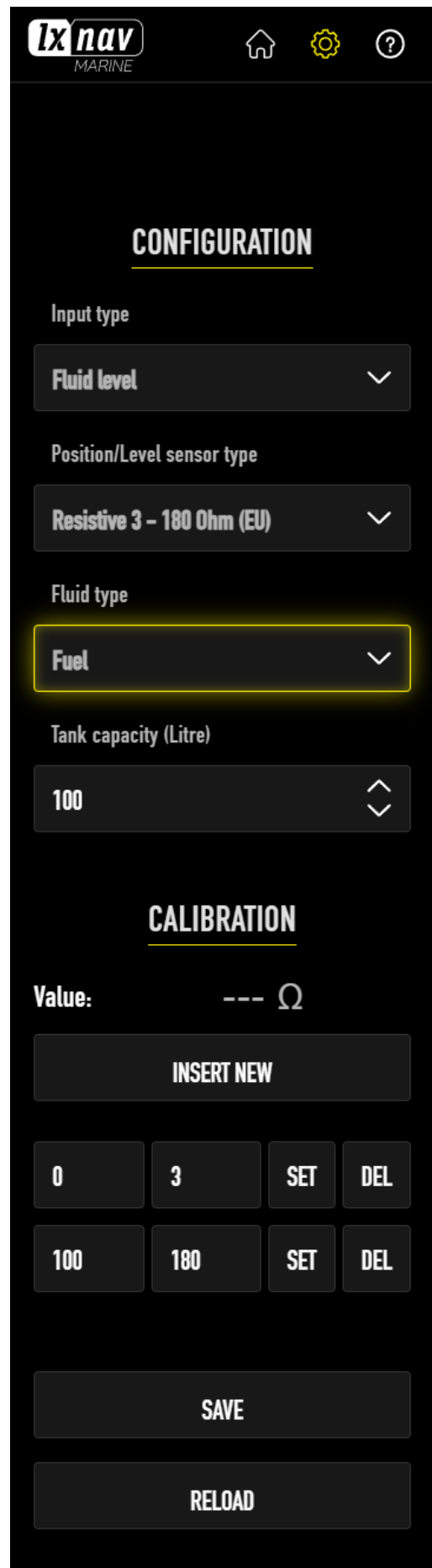
Fluid type

- Fuel
- Fresh Water
- Waste Water
- Live Well
- Oil
- Black Water
- Gasoline

CALIBRATION

For the first calibration fuel or any other fluid tank has to be empty. At the beginning there are already two existing calibration points added to calibration table – 0 litres, 0 % and 100 litres, 100 %.

Maximum capacity value depends on selected value in configuration menu. User can add up to 10 additional calibration points which increases accuracy of indication due to non-linearity of sensor or different shapes of tanks.



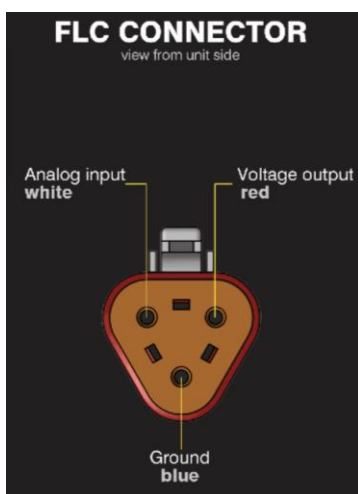
7.1.1.3 Info page

DEVICE INFO

On info page is information about SmartFLC unit serial number, hardware version, software version...

MANUAL

Manual shows where to inputs the sensors as show in the picture below



DEVICE UPDATE

Device update can be performed via NMEA2000 network or via Wi-Fi.

Device update over NMEA2000 network

To perform device update via NMEA2000 network, you need one of LXNAV NMEA2000 displays connected to network (E350, E500, E700, E900).

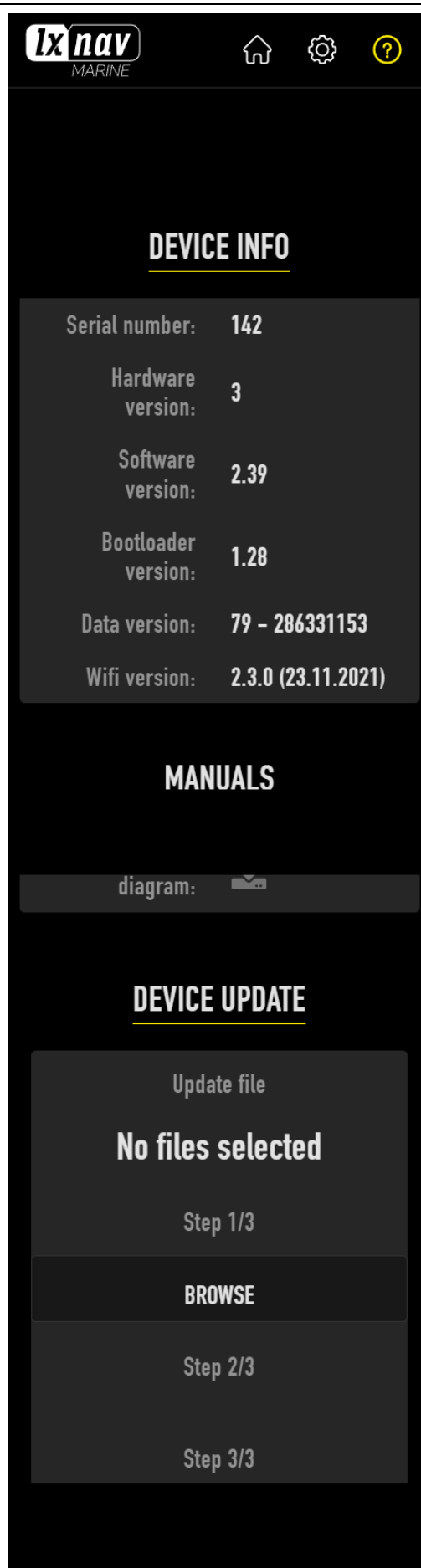
Device update using Wi-Fi

Please download with smartphone the latest update from the LXNAV web site (if available) and save it on your mobile phone into download folder.

Connect to the SmartFLC Wi-Fi.

1. BROWSE the file in your mobile device files,
2. UPLOAD the file,
3. When upload is completed, proceed with the update by pressing UPDATE button.

Wait one minute and the device will be updated.



8 Revision history

Date	Version	Description
April 2020	1.0	Initial release of this manual
July 2023	1.0	Update Smart features - connecting with Wi-Fi & QR code