

LEVEL TRANSMITTER LTR7000



INDUSTRIAL ELECTRONICS

CONTENTS

1.	PRECAUTIONS!.....	3
2.	MANUFACTURER WARRANTY, GENERAL TERMS AND CONDITIONS.....	4
3.	DISPOSAL OF OLD ELECTRICAL & ELECTRONIC EQUIPMENT	5
4.	LEVEL TRANSMITTER LTR7000.....	5
5.	GENERAL DESCRIPTION	6
6.	FEATURES.....	8
7.	LTR7000 OVERVIEW & CONFIGURATION	11
8.	INSTALLATION.....	14
9.	ELECTRICAL SECTION.....	17
10.	CALIBRATION PROCESS - DEFAULT SETTINGS.....	22
11.	DIMENSIONS	27
12.	TECHNICAL SPECIFICATIONS	28

I. PRECAUTIONS!

There are no serviceable parts inside the **LTR7000** unit. Not to be opened by any unauthorized person. Any repair, modification, or configuration of the device must be carried out by the manufacturer, or a qualified service engineer familiar with the application.

Improper handling may result in serious personal injury and considerable material damage. All connection and maintenance work must be carried out by qualified personnel.



RISK OF ELECTRIC SHOCK!

Use the correct voltage. The LTR7000 is designed for use with specific voltage only. Connection to a different voltage may cause fire, electric shock or other damage.

Do not touch electronic parts and connection cabling with wet hands.

Disconnect power supply from the LTR7000 before maintenance or configuration, to avoid the risk of electric shock.

Attempting to use a malfunctioning LTR7000 can be dangerous.

Install the LTR7000 in an appropriate area.

LTR7000 consists of a waterproof stainless-steel tube and an IP66 polycarbonate enclosure with cable gland, which makes it appropriate for harsh industrial environment. Though if possible, it is recommended to keep the installation area protected from unnecessary harmful conditions like extremely high/low temperature, steam etc.

If there is suspicion of small object or liquids into LTR7000, unplug the unit immediately. Have the unit checked by a qualified service engineer before using it again. Any object or liquid inside the enclosure may result to fire, electric shock, or equipment damage.

Always follow the instructions given by the manufacturer and use the LTR7000 in accordance to its specifications.

2. MANUFACTURER WARRANTY, GENERAL TERMS AND CONDITIONS

Thank you for purchasing our product.

Our products have been manufactured with the latest technology, the highest quality components and have gone through rigorous quality control tests at the factory, before shipment. Make sure that the part number/type indicated on the identification label and package corresponds to the part number/type of your order. After receiving the unit, inspect it in order to ensure that no damage was caused during transportation.

GELEC and GELEC's authorized distributors warrant to the original purchaser that the product shall be free from defect in material and/or workmanship. The warranty period begins on the purchase date (proof of purchase by invoice or delivery note) and is valid for one (1) year.

In the event of malfunction during the warranty period, attributable directly to faulty material and/or faulty construction and functional defects, GELEC and authorized distributors will, at their option, either repair or replace the faulty product with the same or similar model.

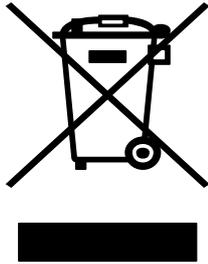
GELEC and authorized distributors shall have no obligation under this warranty, however, in the following cases:

- ▶ Any defect caused by freight damage, accident, disaster, faulty maintenance or improper handling.
- ▶ Any defect caused by modification, alteration, abuse, misuse, or incorrect installation.
- ▶ Any defect of the product caused by improper repair by third party other than GELEC and GELEC's authorized distributors.
- ▶ Any incompatibility of the product with subsequent technical innovations or regulations.
- ▶ Any defect of the product caused by external equipment.
- ▶ Any defect of the product on which the original manufacturer's labeling has been altered or removed.

In case of complaint please contact our company, or send the unit un-dismantled to your local dealer. Any necessary replacement parts and necessary repair work are covered free of charge.

All products are designed and produced by the manufacturer GELEC Co. LP to be in compliance with the EU norms applying to them. GELEC is not responsible for direct or indirect damages or malfunction caused by improper use or installation of the LTR7000.

3. DISPOSAL OF OLD ELECTRICAL & ELECTRONIC EQUIPMENT



This symbol, found on your product, indicates that this should not be treated as household waste when you wish to dispose it.

It should be handed over to an applicable collection point for the recycling of electrical and electronic equipment.

By ensuring this product is disposed of correctly, you will prevent potential negative consequences to the environment and human health, which could otherwise be caused by inappropriate disposal of this product.

The recycling of materials will help to preserve natural resources.

4. LEVEL TRANSMITTER LTR7000

This operator's manual explains the functions and operation of the LTR7000. It also gives some troubleshooting tips as well as general precautions to be taken when operating the unit. In order to ensure the best performance and effective use of the LTR7000, we recommend that you read the information in this manual carefully and follow the instructions contained.

This manual is a complete guide for the LTR7000 with information on unit user maintenance, unit installation and operational instructions. Do not touch parts of the LTR7000 that are not referred in this manual. Keep this manual for immediate reference. It should help in solving any operational questions you may have.

No part of this manual may be quoted, reproduced, stored in a retrieval system, transmitted, transcribed or translated into any other language in any form or by any means, electronic, mechanical, or otherwise, without prior written permission of "Gelec Co. LP".

Although every effort has been made to ensure that this manual provides up to date information, please note that the contents of this manual and unit specifications are subject to change without notice.

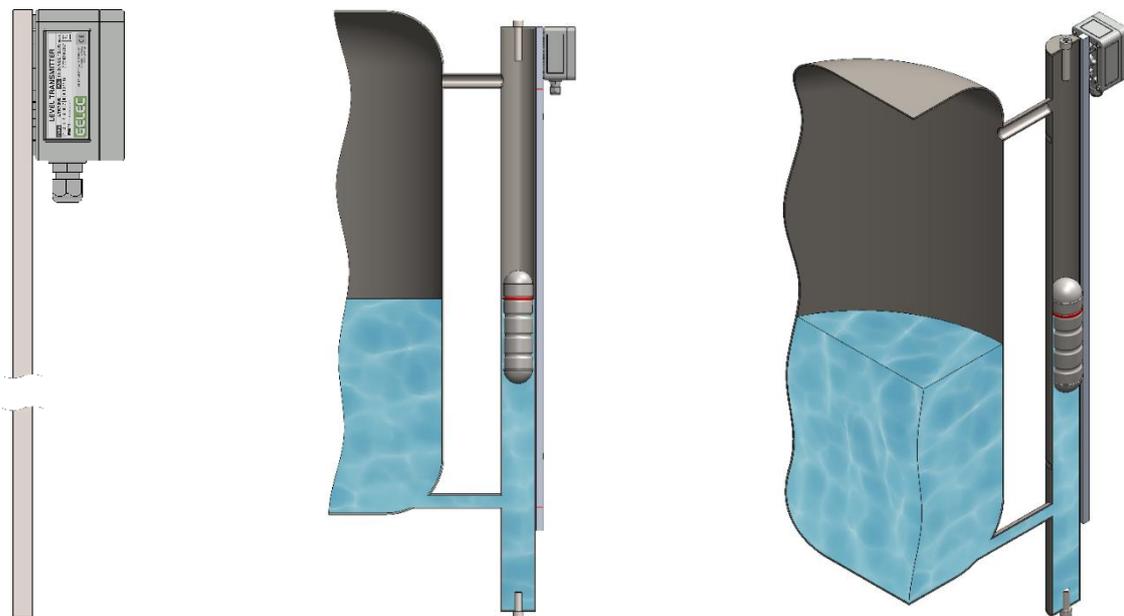
LEVEL TRANSMITTER																
TYPE		LTR7100		P.S.		15-36VDC / 2.5W max										
1	2	3	4	5	6	7	8	9	10	11	12	17	18	19	20	21
IP66 / 7mm resolution												cal. at 4-20mA (0-100cm)				

Don't forget to mention the exact type and version of your LTR7000 whenever you contact the manufacturer asking for any further information. You can find this information on the identification label of the unit.

5. GENERAL DESCRIPTION

The LTR7000 is an industrial, rangeable resistive chain level transmitter, suitable for non-invasive level measurement in open or closed tanks. Its operation is based on the magnetic floating principle and communicating vessels.

A magnetic float inside a measuring chamber mounted to the application tank, follows the fluid level changes during process. Having an array of closely spaced hall effect sensors, the LTR7000 senses the float's position and therefore the height of the fluid level. It provides a continuous, linear current and voltage output signal (4-20, 0-20, 4-21mA / 0-5, 0-10V), proportional to the level height and available for further processing.



The two output signals can be utilized simultaneously or independently and their respective output range is selected through a dip-switch. LTR7000 zero and span settings can be easily rescaled in order to meet each application's operating requirements, while factory default settings can be restored at any time.

It consists of a stainless-steel square tube which incorporates the sensor chain and a fiberglass reinforced polycarbonate enclosure, including the microprocessor based transmitter and the connection terminal block.

With 7mm sensing resolution and a variety of standard analog signals that can be assigned by the user to any level range up to 205cm, the LTR7000 is an ideal solution for industrial, heavy-duty level measurement applications.

MAIN FEATURES

- ▶ High measuring accuracy (7mm resolution) in industrial environment
- ▶ Five length versions available (65/100/135/170/205 cm)
- ▶ Two analog outputs (mA/V)
- ▶ Five signal standards available (4-20, 0-20, 4-21mA / 0-5, 0-10V)
- ▶ 12mT (120 Gauss) sensor sensitivity - North pole activated
- ▶ Separate calibration of High and Low critical levels
- ▶ Error state recognition with relevant output signal
- ▶ Status LED, calibration button, configuration dip-switch
- ▶ Factory calibrated to full measuring range
- ▶ Factory default settings can be restored
- ▶ Stainless steel square tube 12x12mm
- ▶ IP66 robust and durable structure
- ▶ 15-36 VDC / 2.5W max
- ▶ Protective circuit against reverse polarity

ADVANTAGES

- ▶ Reliable and cost effective operating philosophy
- ▶ Unaffected from media variables (foam, viscosity, dielectrics, pressure, pH etc.)
- ▶ Proper for special conditions (surface agitation, boiling, high empty/fill rates etc.)
- ▶ Suitable for process/storage vessels with non-magnetic measuring chamber
- ▶ Ideal for high-temperature and high-pressure applications

6. FEATURES

LTR7000 VERSIONS

LTR7000 is provided in five length versions, depending on the maximum level height that the device can measure. The resolution is the same in all versions, while the different length options cover a wide range of installation configurations.

	LTR7065	LTR7100	LTR7135	LTR7170	LTR7205
Measured level height	0-65 cm	0-100 cm	0-135 cm	0-170 cm	0-205 cm
Total device height	79 cm	114 cm	149 cm	184 cm	219 cm
Sensor resolution	7 mm				

TWO ANALOG OUTPUTS / FIVE OUTPUT RANGES AVAILABLE

LTR7000 provides two analog outputs (mA & V) which can be used either simultaneously, or independently. There are five common output signal standards available, covering the majority of process control applications.

The selection of the desired output range can be made from the internal configuration dip switch (SW1/SW2/SW3). The available output ranges are the following.

mA output ranges : 4 - 20 mA , 0 - 20 mA , 4 - 21 mA

V output ranges : 0 - 10 V , 0 - 5 V

Each output range change, forces the device to properly reconfigure its output linearization.

Notice that the output signal cannot get values outside the selected range, even if the application fluid (and therefore the floating magnet) exceeds the calibrated operating region.

SIMPLE CALIBRATION PROCEDURE / DEFAULT SETTINGS

LTR7000 standard versions are **factory calibrated in order to exploit the whole length of their active measuring segment**. So, the minimum output signal of the selected output range is provided when the float's magnet is aligned with the lowest point of their sensor chain (bottom engraved line on the tube), while the maximum output signal is provided when the float's magnet is aligned with the highest point of their sensor chain (top engraved line on the tube).

The factory calibrated level ranges are the following.

LTR7065 : 0-65cm

LTR7100 : 0-100cm

LTR7135 : 0-135cm

LTR7170 : 0-170cm

LTR7205 : 0-205cm

By following a simple calibration procedure, LTR7000 can be calibrated to provide its output ranges in different level limits than the factory pre-calibrated ones. There is also the option to restore the default factory calibration settings at any time, if needed. Refer to the relevant section for more information.

TWO ERROR STATES - ERROR OUTPUT

LTR7000 is designed to detect and manage two Error states that are likely to occur.

As long as the device is in Error state, the STATUS LED indicates the problem and a signal almost equal to power supply voltage ($V_{PS}-1V$) is provided through the ERROR OUTPUT for further utilization.

If the *ERROR OUTPUT* cannot be used due to application restrictions, there is the option to get an error signal from the mA output as well. The device can provide **an 'out of range' 24mA signal, which can be recognized as an error signal** from the connected PLC. The output signal value (min or max) during an Error state can be selected from the internal configuration dip-switch (SW4), depending on the application needs. Refer to the relevant section for more information.

ERROR 1 - STATUS LED FLASHING RED (3Hz)

Check the device for the following possible problems.

mA OUTPUT OPEN CIRCUIT

A simple way to confirm an open circuit, is to cut power supply, disconnect the external circuit from the mA output and short-circuit terminals #3 and #4 with a cable. Turn on the power for a few seconds, the problem should be solved and the LTR7000 should not be in Error state. Check the external circuit for disconnections.

Notice that if you are using only the V output, a 390Ω resistor must be connected at the mA output (terminals #3 and #4). Consult the relevant connection diagram and confirm that this resistor is properly connected.

HIGH LOAD RESISTANCE R_L

The load resistance value connected to mA output (including line resistance), may be higher than it should be. Refer to the relevant table and confirm that the externally connected circuit has the proper resistance value.

INTERNAL OVERHEATING

Internal overheating is unlikely to occur and may be caused due to wrong electrical connections, excessive temperature in the installation area, or LTR7000 hardware damage. Confirm that all connections and installation environment meet the device specifications.

ERROR 2 - STATUS LED FLASHING RED (1Hz)

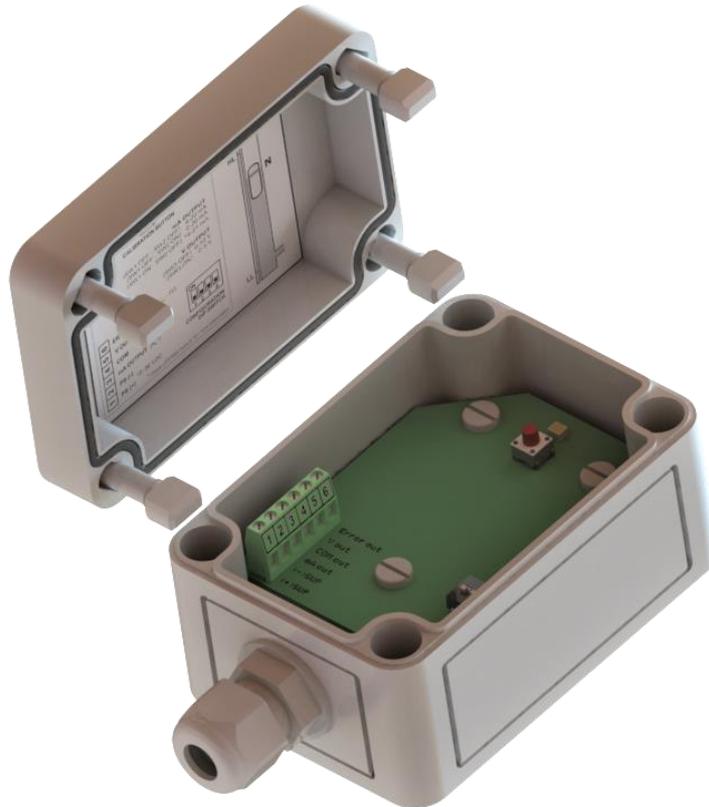
THE FLOAT IS MAGNETICALLY UNCOUPLED FROM THE ACTIVE MEASURING SEGMENT, OR INTERNAL HARDWARE FAILURE.

The float must have an adequate magnetic field and move within the sensor chain range (vertical and horizontal axis) at all process stages. Ensure that the LTR7000 has not been moved from its proper installation position. Inspect the measuring chamber and the magnetic float for defects, or replace the magnetic float and try again. If the measuring chamber is significantly wider than the float, the float can be out of sensor range within the chamber.

Check electrical connections and disconnect/reconnect power. If this error remains, the device has a non-repairable damage. Hardware failure is the most possible cause. Before replacing the damaged device with a new one, ensure that any possible problem that could have caused the hardware failure (e.g. wrong connections) is solved.

7. LTR7000 OVERVIEW & CONFIGURATION

The LTR7000 is a level transmitter with a 6-pole terminal block, a calibration button, a configuration dip-switch and a status LED. Its consists of a 12x12 mm AISI 304 stainless steel square tube and an IP66 fiber-glass reinforced polycarbonate housing with all-round foamed-in PU seal, proper for electronic devices exposed in harsh industrial environment. It is designed to be installed outside the measuring chamber of a process tank.



CALIBRATION BUTTON

The calibration button inside the transmitter enclosure, is used in LTR7000 calibration process and when the calibration settings need to be reset to default. **This button must be used by an engineer familiar with the device operation and the application in general.** Refer to the relevant sections in this manual for more information.

CONFIGURATION DIP SWITCH

The internal 4-position dip-switch specifies the output range of the LTR7000 analog outputs (mA/V) and their output value during *ERROR* state. **Dip-switch adjustments must not be done when the device is powered.** Disconnect power supply, open the enclosure and proceed to switch adjustments according to the following information. If there is not a dip-switch inside your LTR7000 version, consider all switches being at OFF position.

► **SW1/SW2 switches** (mA output range selection)

With SW1/SW2 switches you can select the **mA** output range at terminals **#3(+)** / **#4(COM)**.

4 - 20 mA → **SW1 : OFF** , **SW2 : OFF** (default)
0 - 20 mA → **SW1 : OFF** , **SW2 : ON**

4 - 21 mA → **SW1 : ON** , **SW2 : OFF**

When this mA output setting is selected, the V output doesn't have a normal behavior.

Do not use V output when this mA setting is selected.

--- **Do not set both SW1/SW2 to ON** ---

This setting is used only in manufacturing stages and can lead to device malfunction.

► **SW3 switch** (V output range selection)

With SW3 switch you can select the **Volt** output range at terminals **#5(+)** / **#4(COM)**.

0 - 10 V → **SW3 : OFF** (default)
0 - 5 V → **SW3 : ON**

Ensure that the mA output range is not set to 4-21mA setting (SW1: ON / SW2: OFF).

V output doesn't have a normal behavior with this mA setting selected and cannot be used.

► **SW4 switch** (Output value during **ERROR** state)

With SW4 switch you can select the output value during ERROR state, according to the selected output range. Refer to the ERROR section in this manual, for more information about the possible errors.

	4-20mA	0-20mA	4-21mA	0-10V	0-5V
SW4 : OFF (default)	4 mA	0 mA	4 mA	0 V	0 V
SW4 : ON	24 mA*	24 mA*	24 mA*	10 V	5 V

* You can exploit the 'out of range' 24mA output for *ERROR* recognition from your PLC, when the dedicated *ERROR OUTPUT* cannot be used due to application restrictions.

This is an actual advantage only for mA output ranges. For the V output ranges, the output value options are within the measuring range and cannot be utilized. Though, you can choose between minimum and maximum output, according to your application needs.

STATUS LED

The STATUS LED inside the transmitter enclosure, indicates various operational stages of the LTR7000. This LED is useful during connection and calibration stages and it is not visible during normal operation with the cover screwed on the enclosure. Consult the following table for quick reference and the relevant sections for detailed information.

LED COLOR	LTR7000 STATUS
GREEN	Device powered - Normal operation (magnetic float within sensor range)
FLASHING GREEN	High-Level calibration mode
FLASHING BLUE	Low-Level calibration mode
GREEN/RED	Confirmation of calibration processes
FLASHING RED (3 Hz)	ERROR 1
FLASHING RED (1 Hz)	ERROR 2
OFF	Device not powered

ACTIVE MEASURING SEGMENT

Only a specific segment of the LTR7000 square tube includes the measuring hall effect sensors, and this is defined by **two engraved lines at the back side of the tube**.

The bottom engraved line is located 3cm above the bottom of the tube in all LTR7000 versions. The top engraved line can be found close to the transmitter enclosure. The distance between them, depends on the LTR7000 version.

Install LTR7000 in a way that the application's fluid level (and therefore the float's magnet) is constantly **within the active measuring segment**, in order to have proper operation.

MAGNETIC FLOAT

The used magnetic float must have proper buoyancy, with the incorporated magnet fitted at the correct position in it. Check the relation between the magnet and the level when the float is in the fluid. The float must be suitable for the application fluid and process conditions (pressure, temperature, density etc.). Its shape and dimensions must allow free and vertical movement in the measuring chamber, as close as possible to the LTR7000.

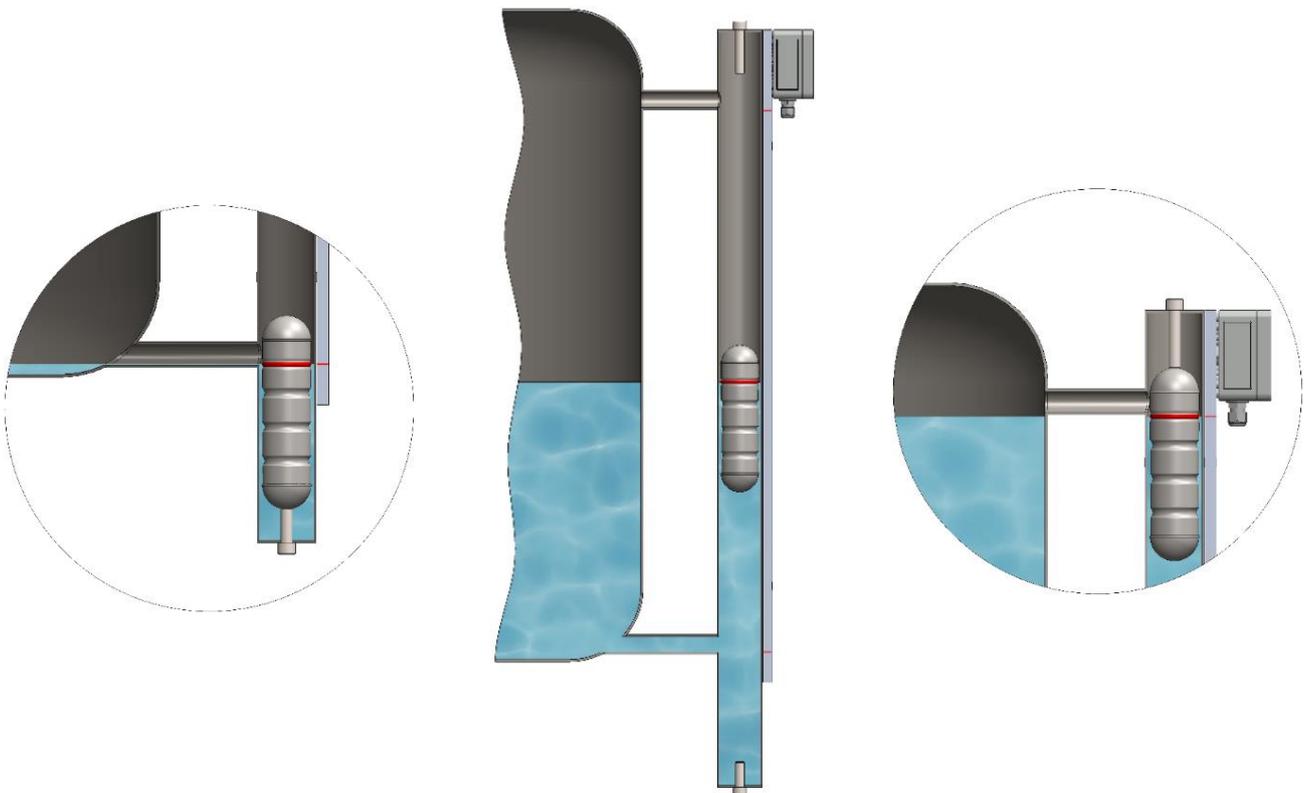
8. INSTALLATION

In this section, you can find useful information that have to be taken under consideration during LTR7000 installation. Always follow the recommended instructions and use the LTR7000 in accordance to its specifications.

INSTALLATION AREA

Having an IP66 fiberglass reinforced polycarbonate enclosure, the LTR7000 is suitable for use in harsh industrial environment. Though if possible, it's recommended to keep it protected from steam, extremely low/high temperatures, direct sunlight and excessive amount of liquids on the enclosure. Fluid insertion into housing may cause permanent damage, electric shock or fire.

Install far from strong magnetic fields that could affect the device measurement and provide sufficient space for maintenance and inspection. Maintain the sensor clean and never operate it with open enclosure. If the enclosure becomes damaged, disconnect the device immediately and order a replacement.



The two engraved lines on the LTR7000 (measuring segment) and the float's magnet can be seen in the pictures above highlighted in red, along with the proper installation of a fully operating system.

MAGNETIC FLOAT / APPLICATION TANK

The shape of the tank must allow a **linear relationship between the fluid volume and the measured level**. Otherwise a proper software must be developed, which will automatically calculate the filled volume of the tank, depending on the output of the transmitter.

Since there is no direct contact between any part of the LTR7000 and the measured fluid, the system supports both atmospheric and high-pressure applications. The measuring chamber's material must be **non-magnetic**.

It is recommended to **use mechanical stops inside the measuring chamber** (ideally adjustable), in order to restrict the float's magnet within the LTR7000 active measuring segment limits, even if the fluid level gets out of these limits in some process stages (tank draining, overflowing etc.).

The magnetic float must **move freely during level alterations and not being blocked** by the measuring chamber, or possible sediments, dirt, dregs etc. Ensure that the float installation environment allows proper and smooth vertical movement. Partial or full blockage will cause faulty/misleading readings.

A small magnet (south pole) can be attracted from the incorporated float and stick outside the measuring chamber following its movement. **This will 'visualize' the float's position and behavior inside the chamber** and help you to easily confirm the proper correlation between the level and the float.

The measuring chamber should be cleaned and inspected regularly, depending on the nature of the measured fluid and the process characteristics. Fluids that create sediments over time, are most likely to need maintenance more frequently.

PLACEMENT ON THE MEASURING CHAMBER

The LTR7000 tube contains the hall effect sensor chain and has to be tangent to the measuring chamber, in order to be as close as possible to the magnetic float. On the back of the tube, at the side that faces the measuring chamber, there are two engraved lines that define the **active measuring segment** (check the relevant section for more details).

In a common installation, the LTR700 is installed with the bottom engraved line at the point where the magnetic float stands in an empty tank. Notice that this point is not the bottom of the measuring chamber, but the position of the float's incorporated magnet.

It may be difficult to specify the exact position of the magnetic float inside the measuring chamber. In order to find this point and make sure that the magnet will always move within the LTR7000 measuring segment during process stages, follow the below procedure.

- Empty the tank, so the magnetic float drops at the lowest possible position inside the measuring chamber.
- Having the dip-switch SW4 to ON position and the LTR7000 far from the measuring chamber and the magnetic float, monitor its output with a multimeter. At this point, the output provides an error value (24mA), because the magnet is uncoupled from the sensors.
- Place the LTR7000 on the measuring chamber in a high position and slowly start sliding it towards the magnetic float, while checking the multimeter. When the bottom engraved line reaches the float's magnet, the LTR7000 output will change to the minimum value of the selected output range (4mA or 0mA), because the magnet triggers the first sensor of the active measuring segment. Continue sliding the LTR7000 1cm more, to safely pass this critical point.
- ✓ Mark this position for the LTR7000 final mounting. This position allows you to exploit the whole active measuring segment of your version. Re-calibrate Low Level after the final mounting, in order to precisely get the minimum output of the selected output range when the tank is empty.

9. ELECTRICAL SECTION

ELECTRICAL CONNECTIONS

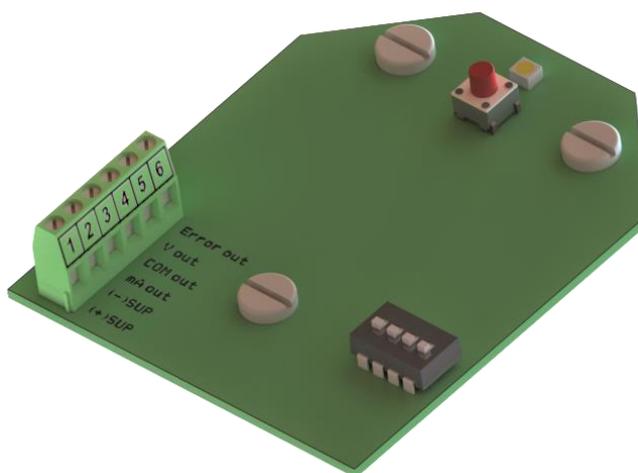
The LTR7000 is equipped with a 6-pole terminal block.

The terminal block is manufactured to provide resistance to stress, corrosion, cracking, electrolytic corrosion and screw loosening in case of vibrations. This way, conductor connections are maintained reliable and maintenance-free in harsh industrial environment.

The conductor's stripping length should be max **6 mm**, with its cross-section within the following ranges (depending on type). The recommended tightening torque is max 0.2 Nm.

Rigid solid / flexible stranded : **0.34 - 1.5 mm²**
 AWG : **22 - 16**

Clamp all types of copper cables without pre-treatment. Do not solder the conductors, as it affects the proper connection quality. Two conductors with the same cross section make contact safely in the clamping parts. If necessary, copper ferrules can be used as a protection against splicing when stranded conductors are wired. In general terms, ensure that you are having reliable mechanical connection and electrical contact.



CABLE GLAND

At the bottom side of the transmitter enclosure, there is a **M16x1.5mm** cable gland, for connection cables with outer diameter Ø4-10mm. Ensure that you have a firm and reliable final assembly, in order to maintain the IP rating of the enclosure. Do not install cable glands whilst circuits are live. Similarly, following energizing of the electrical circuits, cable glands should not be dismantled or opened until the circuit has been safely de-energized.

CONNECTION TERMINALS

Read carefully the following information and refer to the connection diagrams and technical data, regarding proper wiring of the LTR7000 with the associated equipment.

Confirm that you have proper connections before unit operation. Wrong connections may lead to permanent device or external equipment damage. Don't proceed to any connection modification, while the unit is powered.

TERMINALS #1 - #2 (POWER SUPPLY - V_{PS})

Connect the power supply (**15-36 VDC**) to terminals **#1 (+)** and **#2 (-)**.

Maximum power consumption is approximately 2.5W. There is not an electrical safety fuse in the internal power circuit. Although there is polarity protection, ensure that you are applying proper voltage and polarity.

TERMINALS #2 - #6 (ERROR OUTPUT)

Terminals **#2 (COM)** and **#6 ($V_{PS} - 1V$)** provide the Error output signal during operation. An internal *High Side Driver* provides a voltage output signal during *ERROR* state, almost equal to power supply voltage ($V_{PS} - 1V$).

The output current limit is **500mA**, while the Current Limit Initial Peak is **3A max**.

If you don't need this output, leave the relevant terminals unconnected. Refer to the relevant section in this manual for more information.

TERMINALS #5 - #4 (V OUTPUT SIGNAL)

Terminals **#5 (V_{OUT})** and **#4 (COM)** provide the Voltage output signal during operation. The output range (**0...5V / 0...10V**) can be selected from the internal configuration dip switch. Refer to the relevant section in this manual for more information.

The output continuous current limit is **10mA**, with an overcurrent protection of **30mA max**.

If you are going to use the *V OUTPUT* without using the *mA OUTPUT*, **you must connect a 390Ω** resistor to the *mA OUTPUT* (terminals 3-4). Check the relevant connection diagram.

For having the signal unaffected from any interference, it is recommended to use a shielded cable with twisted pair, properly grounded at the side of the signal receiving device.

Ensure that the mA output range is not set to 4-21mA setting. Voltage output doesn't have a normal behavior with this mA setting selected and cannot be used.

TERMINALS #3 - #4 (mA OUTPUT SIGNAL)

Terminals **#3 (I_{OUT})** and **#4 (COM)** provide the mA output signal during operation. The output range (**4-20mA / 0-20mA / 4-21mA**) can be selected from the internal configuration dip-switch.

When 4-21 mA output range is selected, the V output doesn't have a normal behavior. **Don't use V output when this mA range is selected.**

Notice that, even if the selected maximum output value is 20 or 21mA, this output may be configured to provide **24mA for ERROR recognition** (SW4 at the internal dip-switch). Refer to the relevant section in this manual for more information.

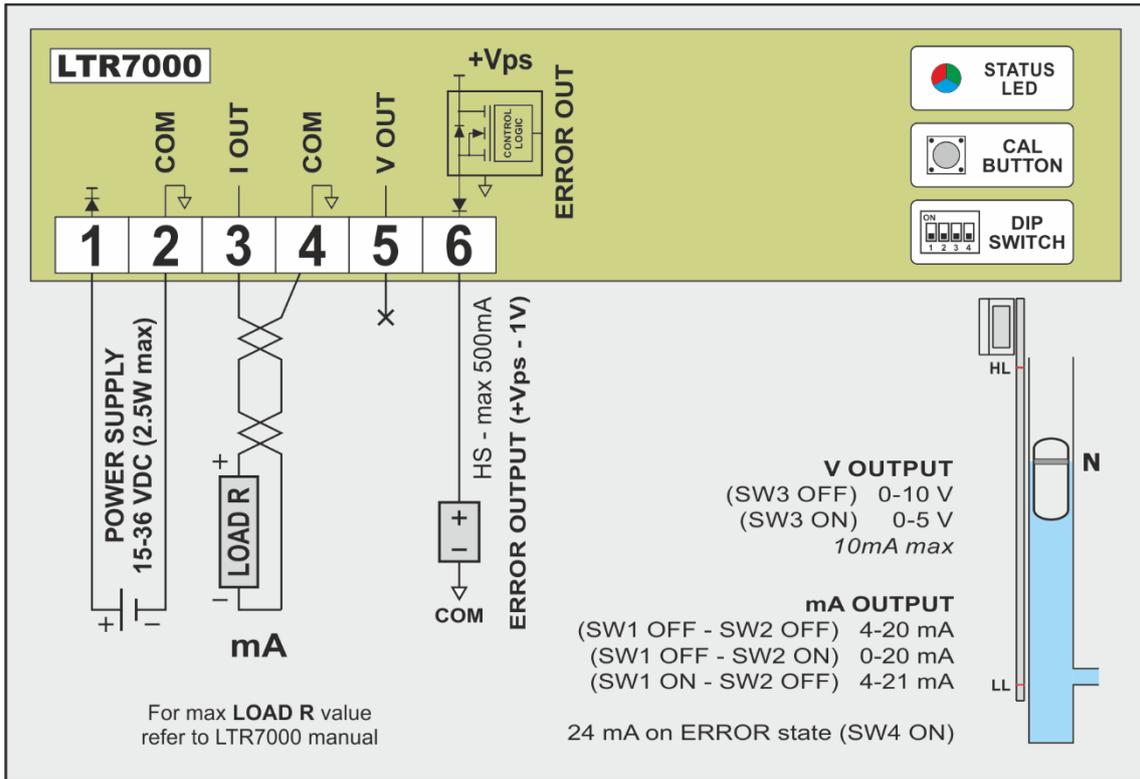
For having the signal unaffected from any interference, it is recommended to use a shielded cable with twisted pair, properly grounded at the side of the signal receiving device.

MAXIMUM LOAD RESISTANCE (R_L)

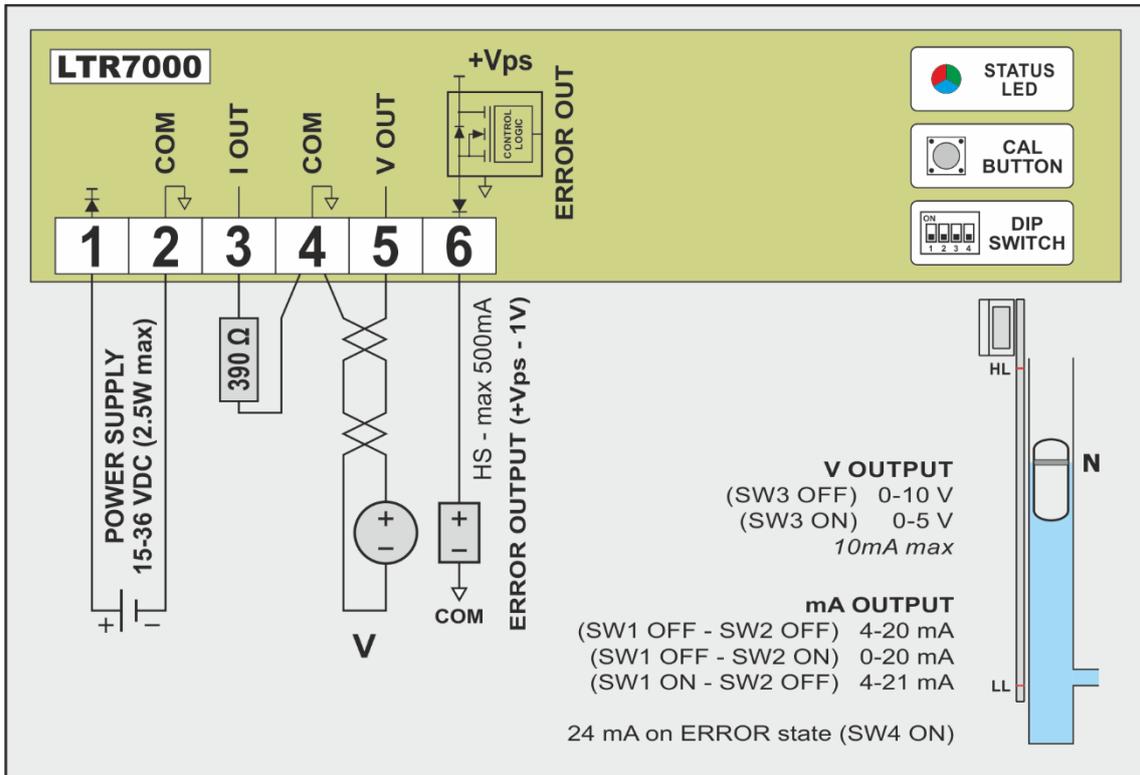
The output current is proportional to level height. In order to get proper and linear mA fluctuation, a maximum load resistance R_L (including line resistance) must not be exceeded depending on the supply voltage (V_{PS}) of the device. Consult the following table for the maximum load resistance you should have for each supply voltage.

V _{PS} (V)	max R _L (Ω) for 20mA max output	max R _L (Ω) for 24mA max output
15	550	420
16	600	460
17	650	500
18	700	540
19	750	580
20	800	620
21	850	660
22	900	700
23	950	740
24	1000	780
25	1050	820
26	1100	860
27	1150	900
28	1200	940
29	1250	980
30	1300	1000
31	1350	1040
32	1400	1080
33	1450	1120
34	1500	1160
35	1550	1200
36	1600	1240

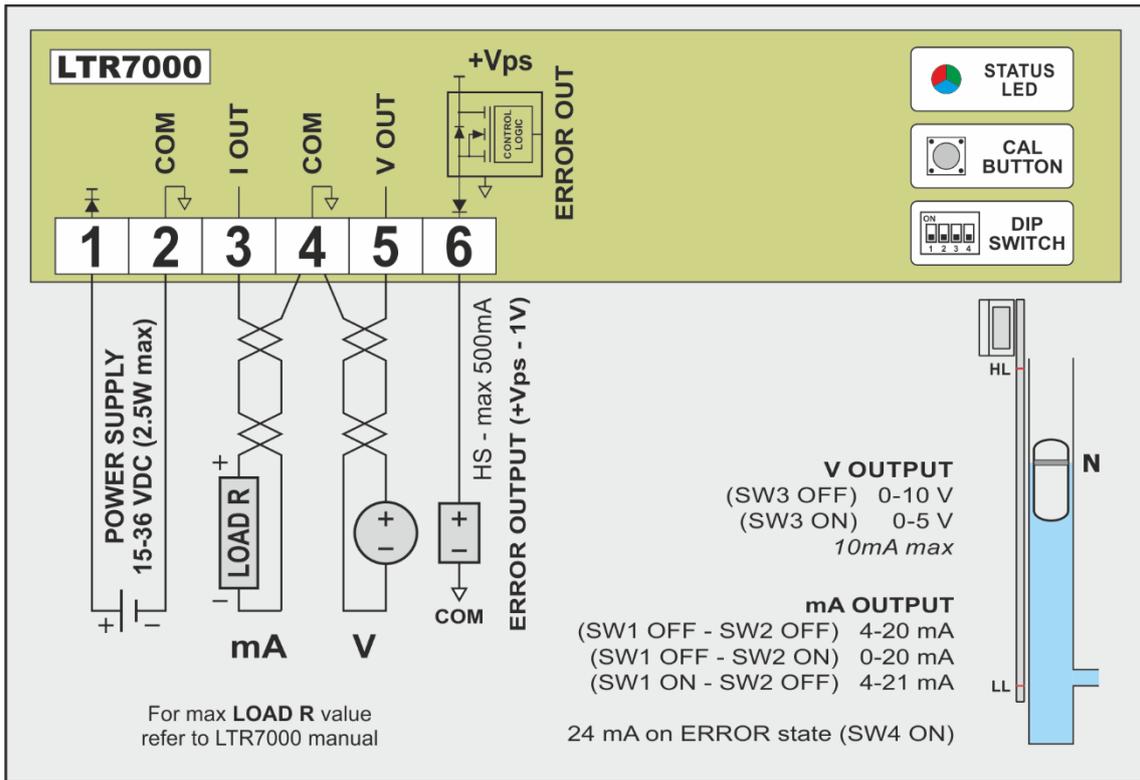
LTR7000 Connection Diagram (only mA output used)



LTR7000 Connection Diagram (only V output used)



LTR7000 Connection Diagram (V & mA outputs used)



10. CALIBRATION PROCESS - DEFAULT SETTINGS

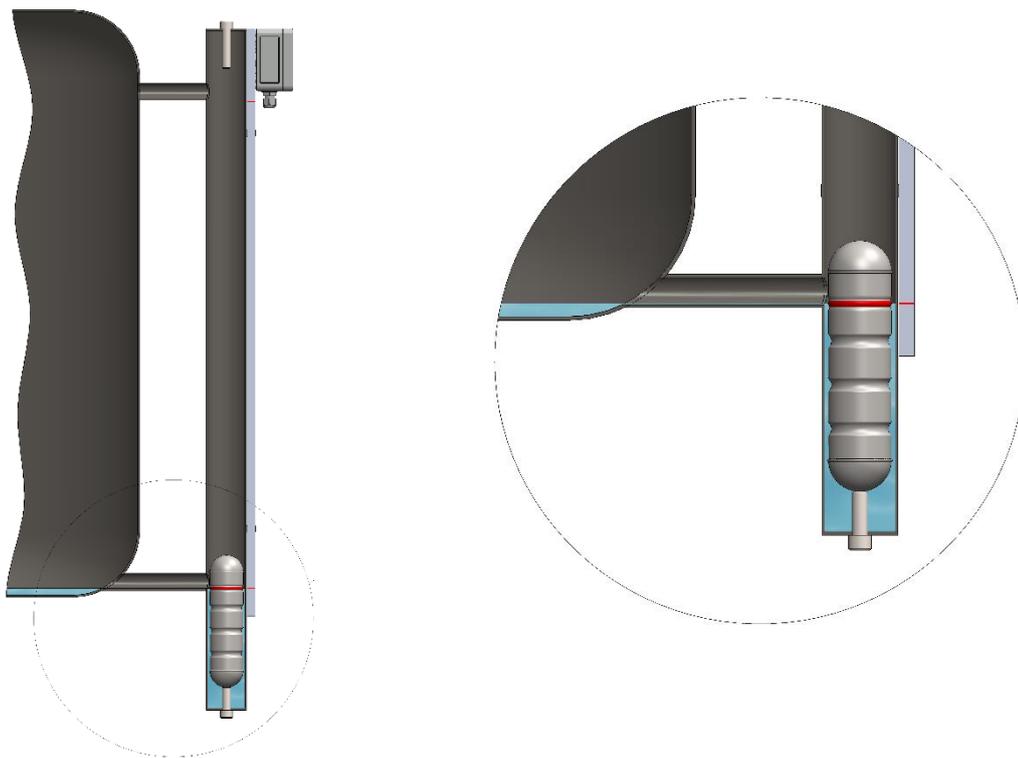
LTR7000 operating model involves **two critical levels ('Low level' & 'High Level')** which **can be re-calibrated by the user** in order to meet the application requirements. The device configures the output linearization after each level calibration. The fluid level during process and therefore the magnetic float, should be between 'Low' and 'High' levels in order to cause the relevant output changes.

Notice that if the level during process exits the calibrated level limits, but it is still within the LTR7000 active measuring segment, there will not be an ERROR 2 output signal. In this case, the output maintains the minimum/maximum value of the selected output range.

LOW LEVEL

'Low Level' is defined as the level where the LTR7000 provides the **minimum output value of the selected output range** (for example 4mA, if the selected range is 4-20mA).

Unless otherwise stated on the product label, **LTR7000 is factory calibrated to provide the minimum output when the float's magnet (north pole) is aligned with the bottom engraved line**, which defines the low end of the device's active measuring segment.

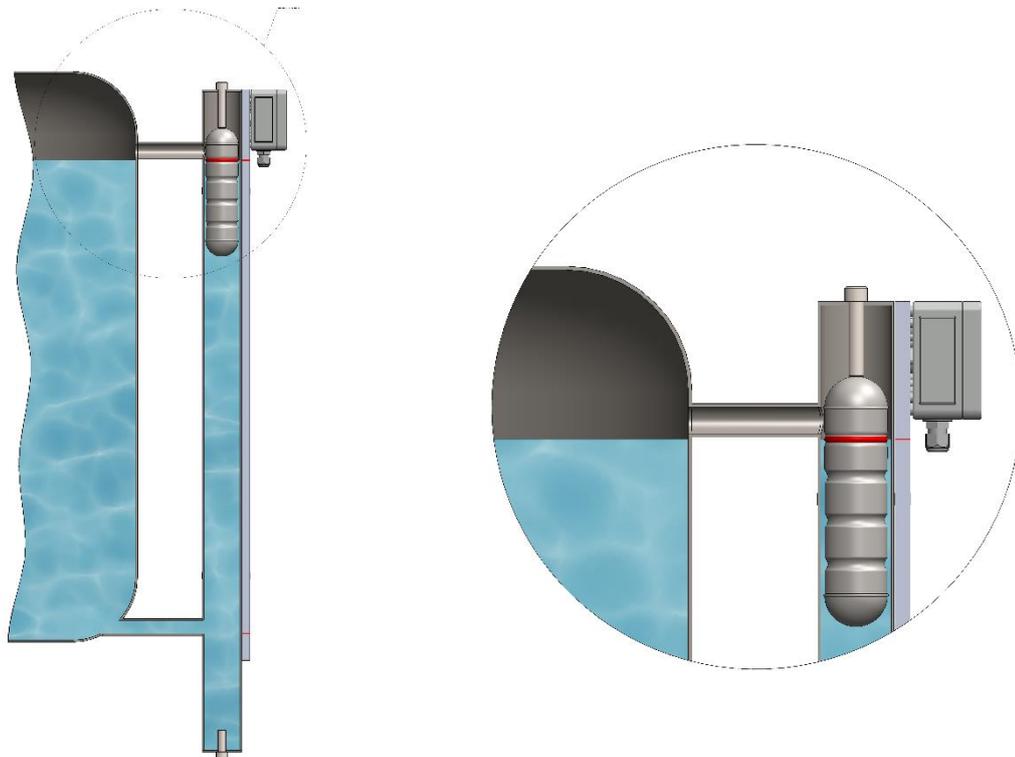


FACTORY CALIBRATED LOW LEVEL (min output signal)

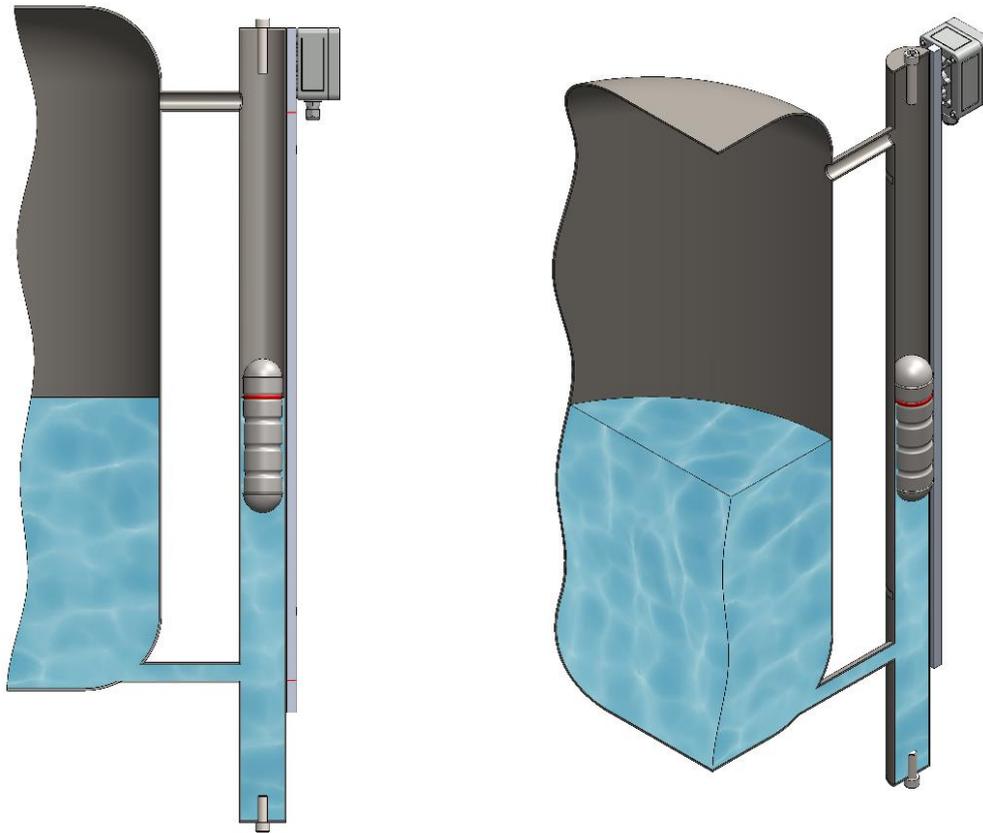
HIGH LEVEL

'High Level' is defined as the level where the LTR7000 provides the **maximum output value of the selected output range** (for example 20mA, if the selected range is 4-20mA).

Unless otherwise stated on the product label, **LTR7000 is factory calibrated to provide the maximum output when the float's magnet (north pole) is aligned with the top engraved line**, which defines the high end of the device's active measuring segment.



FACTORY CALIBRATED HIGH LEVEL (max output signal)



OPERATING LEVEL (between LOW and HIGH)

Any modification of the calibration must be processed by an engineer familiar with the device operation, the associated equipment and the application in general.

IMPORTANT CALIBRATION NOTES

- ▶ In order to begin the calibration procedure, LTR7000 must be at its **final installation position with all connections completed**.
- ▶ **Ensure that you have a proper electrical layout.** Refer to the LTR7000 manual and confirm that every part and connection of the electrical layout meets the recommended requirements.
- ▶ **The two levels can be separately calibrated.** You don't have to calibrate both levels, each time a change at one of them is needed. The device automatically reconfigures its output linearization.
- ▶ **Use Calibration Button carefully** and avoid any contact with the LTR7000 board and components. Short-circuits, or electrostatic discharge may permanently damage the device.
- ▶ **After any calibration procedure connect properly a multimeter,** to confirm the desired output behavior.

RESET TO DEFAULT SETTINGS

The default factory calibration settings can be restored with the following procedure.

- ▶ Turn off the power supply of LTR7000 (STATUS LED is OFF).
- ▶ Press and hold CALIBRATION BUTTON when power supply is off.
- ▶ While still pressing, turn on power and wait until the LED starts flashing GREEN/RED. Flashing GREEN/RED means that settings are reset. Release the button.
- ✓ Settings are reset to default. LTR7000 returns in Normal Operation (STATUS LED constant GREEN).

LOW-LEVEL CALIBRATION PROCEDURE

LTR7000 should be in normal operation (STATUS LED constant GREEN) before proceeding.

- ▶ Set the fluid at the level you want the LTR7000 to provide the minimum output value and wait until it becomes calm.
- ▶ Press and hold CALIBRATION BUTTON until the STATUS LED starts flashing BLUE. Flashing BLUE means that the device is in Low-Level Calibration mode.
- ▶ Press and hold* CALIBRATION BUTTON until the LED starts flashing GREEN/RED. Flashing GREEN/RED means that data are saved. Release the button.
- ✓ Low Level value is registered. LTR7000 automatically exits Low-Level Calibration mode and returns in Normal Operation (STATUS LED constant GREEN).

* An **instant press** of the CALIBRATION BUTTON (not press and hold) when the device is in Low-Level Calibration mode, **bypasses this mode** and leads to High-Level Calibration mode (STATUS LED starts flashing GREEN). **The present data are not saved** and the device maintains the value it had before entering Low-Level Calibration mode.

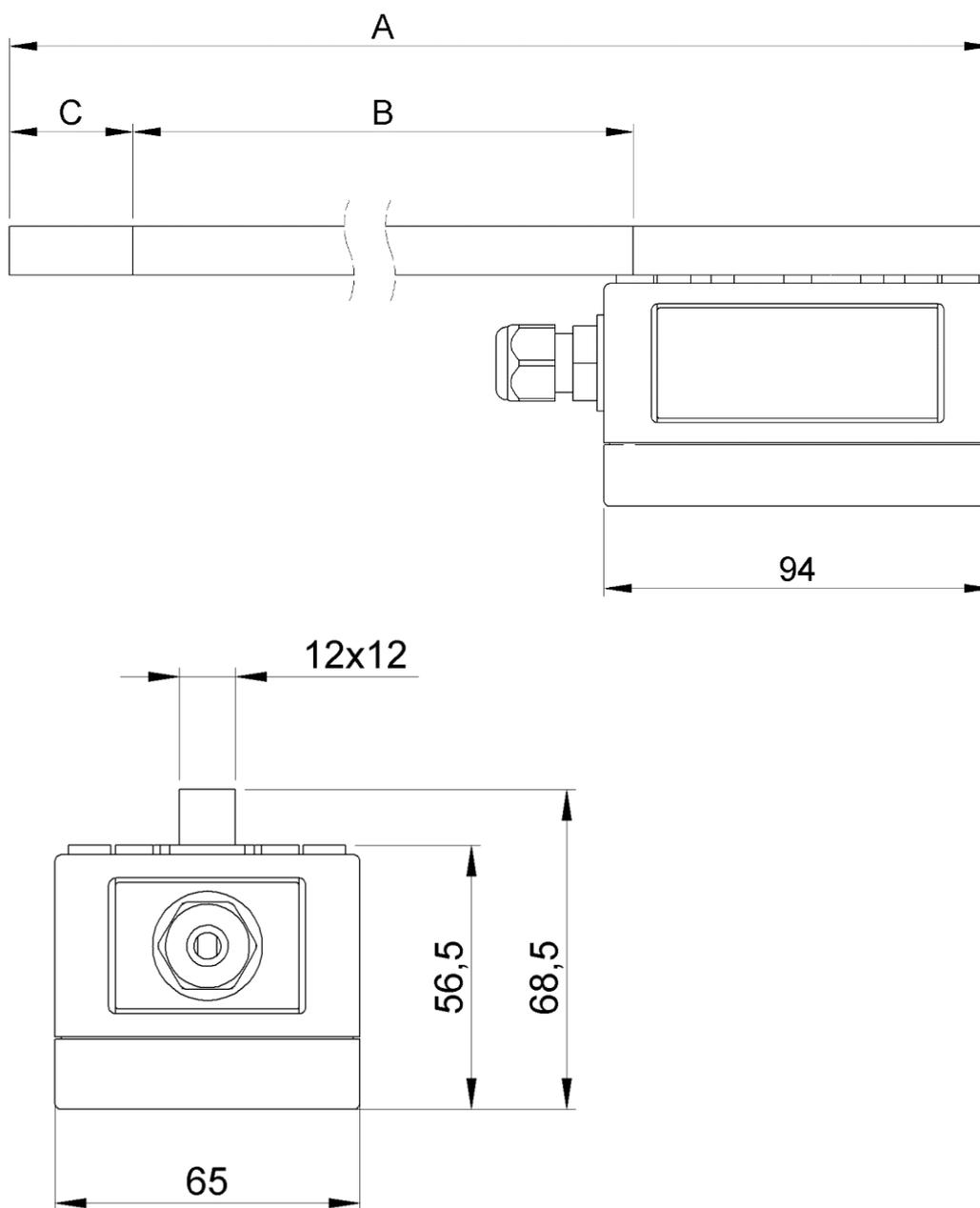
HIGH-LEVEL CALIBRATION PROCEDURE

LTR7000 should be in normal operation (STATUS LED constant GREEN) before proceeding.

- ▶ Set the fluid at the level you want the LTR7000 to provide the maximum output value and wait until it becomes calm.
- ▶ Press and hold CALIBRATION BUTTON until the STATUS LED starts flashing BLUE.
- ▶ Press instantly CALIBRATION BUTTON. The STATUS LED starts flashing GREEN. Flashing GREEN means that the device is in High-Level Calibration mode.
- ▶ Press and hold* CALIBRATION BUTTON until the LED starts flashing GREEN/RED. Flashing GREEN/RED means that data are saved. Release the button.
- ✓ High Level value is registered. LTR7000 automatically exits High-Level Calibration mode and returns in Normal Operation (STATUS LED constant GREEN).

* An **instant press** of the CALIBRATION BUTTON (not press and hold) when the device is in High-Level Calibration mode, **bypasses this mode** and LTR7000 returns in normal operation (STATUS LED constant GREEN). **The present data are not saved** and the device maintains the value it had before entering High-Level Calibration mode.

II. DIMENSIONS



	LTR7065	LTR7100	LTR7135	LTR7170	LTR7205
A (TOTAL HEIGHT)	790	1140	1490	1840	2190
B (MEASURING SEGMENT)	650	1000	1350	1700	2050
C (OFFSET)	30				

* All dimensions are in mm

12. TECHNICAL SPECIFICATIONS

LTR7000 GENERAL DATA	
Height	790 / 1140 / 1490 / 1840 / 2190 mm
Width	65 mm
Depth	68,5 mm
Weight	600 / 790 / 980 / 1170 / 1360 gr
Housing materials	Fiberglass reinforced polycarbonate - Grey Stainless steel AISI 304
Degree of protection	IP66 (NEMA 4X)
Operating temperature	-25 ... +80 °C (-13 ... +176 °F)
Storage temperature	-25 ... +80 °C (-13 ... +176 °F)
Temperature of mounted surface	-25 ... +125 °C (-13 ... +257 °F)
Features	
Internal Hall-Effect Sensors	Contactless switching
	Hall voltage generator for magnetic sensing
	Noise rejection
	Temperature compensated
	120 Gauss (12mT) typical sensitivity
Resolution	7mm
ELECTRICAL DATA	
Supply voltage	15-36 VDC
Power consumption	2,5 W max
ERROR OUTPUT (Terminals 2-6)	
Current limit	500 mA
Current limit initial peak	3 A max (short circuit protection)
V OUTPUT (Terminals 5-4)	
Available output ranges	0-10 V / 0-5 V
Maximum continuous current	10 mA (minimum 1k Ω R _L)
Overcurrent protection	30 mA
mA OUTPUT (Terminals 3-4)	
Available output ranges	4-20mA / 0-20mA / 4-21mA
Maximum Load resistance (R _L) (depending on V _{PS} - check relevant section)	1.600 Ω (for 20mA max output) 1.240 Ω (for 24mA max output)

Electrical connection characteristics	
Terminal block configuration	6 poles / 3.5mm pitch
Terminal block materials	PA – UL 94 V0 Galvanized steel / Tin-plated cooper alloy
Clamping parts resistance	Electrolytic corrosion Rusting Stress corrosion cracking
Conductor cross section range	IEC rigid solid: 0,34 – 1.5 mm ² IEC flexible stranded: 0,34 - 1.5 mm ² AWG: 22 - 16
Conductor stripping length	6mm max / NOT soldered
Tightening torque	0.2 Nm
Cable gland	M16x1,5mm (clamping range Ø4-10mm)
STANDARDS	
In conformance with the following standards:	CE

Specifications are subject to change without prior notice.



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