Level gauge H531

user manual version 1.03

Level measurement in wells, boreholes, tanks and sumps

FIEDLER
ELEKTRONIKA PRO EKOLOGII

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1 Safety instructions

- The installation of a level gauge with external power supply must be carried out by a person with the necessary qualifications for the installation of electrical equipment. The installer must carry out the installation in accordance with all instructions, regulations and standards relating to safety and electromagnetic compatibility.
- If a malfunction of the level gauge could result in a risk to the safety or health of persons or serious damage to property, independent measures must be taken or additional equipment installed to eliminate this risk.
- All connected downstream equipment must comply with the relevant standards and safety regulations and be equipped with suitable anti-interference filters and surge protection.
- Do not use in explosion hazardous areas!
- Do not use in areas of excessive vibration**.**
- The manufacturer is not liable for damages resulting from improper installation, improper maintenance or use contrary to the recommendations in the operating instructions.

! **If an external power supply is used, it must meet all safety standards and be appropriate for the environment in which it will be operated.**

! **Connect the binary transistor output for switching a relay, solenoid valve or light or sound signal only when the supply voltage is disconnected.**

! **When installing a submersible level sensor, make sure that the maximum measuring range of the sensor is not exceeded even at the maximum possible water level.**

2 Using the level gauge H531

The battery-powered H531 level gauge assembly consists of the H531 display unit itself and a submersible level sensor. The assembly is designed for level measurement in rainwater tanks, cisterns and tanks, wells or boreholes.

The assembly can be used wherever the measuring range and accuracy of the type of sensor used is suitable and where long-term archiving of the measured values is not required (the H531 unit does not provide a datalogger function).

Binary output The H531 level gauge also includes a binary output controlled by the actual measured level and therefore the level gauge assembly can be used, in addition to displaying the level, for simple control of a pump or solenoid valve based on user adjustable parameters.

Remote access The measured level height can be transmitted via the internal communication module to the database on the server via GSM/GPRS or NB-IoT network (H531-G or H531-N level gauges). The user can then monitor the level remotely via a web browser. A special server service can also ensure that a warning SMS is sent when a preset level is reached.

Location The mechanical design of the H531 display unit with IP66 protection allows the unit to be placed outdoors directly at a well or rainwater sump. In this case, it is advisable to avoid direct sunlight on the H531 display unit to prolong the life of the unit, as UV radiation can cause the plastic materials used to become brittle.

TYPICAL APPLICATIONS

- **Monitoring water levels in wells and boreholes**
- **Monitoring the level in stormwater sumps**
- **Automatic water supply to the tank**
- **Blocking the pump in the well from running on empty**
- **Indication of reaching limit levels**

3 Quick installation of the H531

3.1.1. Installing the level sensor

From the factory, the level gauge is assembled and set so that when the sensor is lowered into the measured sump/mud/tank, the H531 display shows the measured water level above the sensor. The measuring range of the level gauge is determined by the type of sensor used (0 to 10 m, 0 to 25 m).

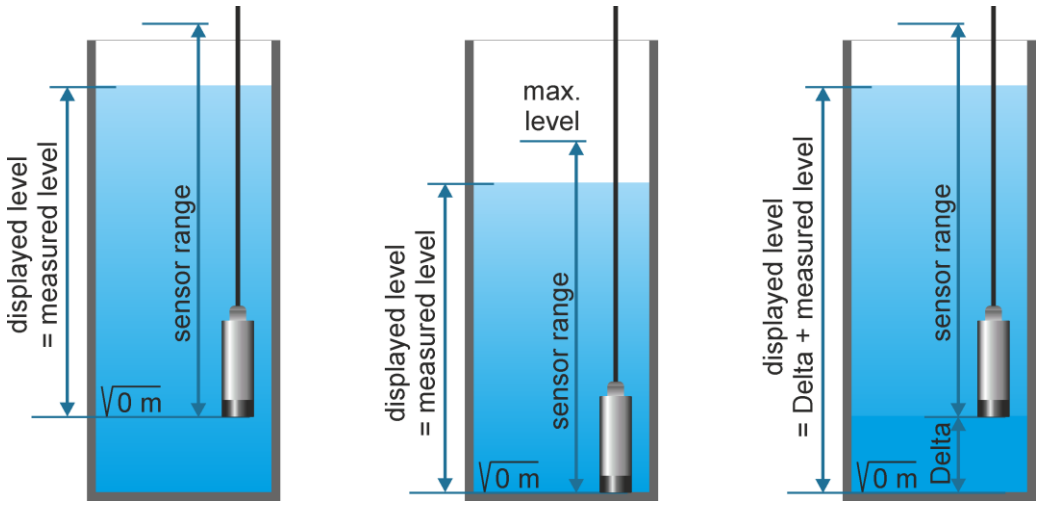
Level measurement by immersion depth

For a sensor with a measuring range of 0 to 10 mH_2 O, without further adjustment of the H531 parameters, the display will also show a level height in the range of 0 to 10 m, depending on the depth of immersion of the sensor below the measured water level.

Level measurement from the bottom

If the level gauge is to indicate the level from the bottom of the measured sump/cold and the measuring range of the sensor used is greater than or equal to the maximum possible level in the measured sump/cold, then it is sufficient to lower the level gauge to the bottom.

In these first two cases, the user does not need to make any changes to the parameter settings when installing the level gauge.



Measurement by immersion depth Level measurement from the bottom Param. Delta

Level correction by DELTA parameter

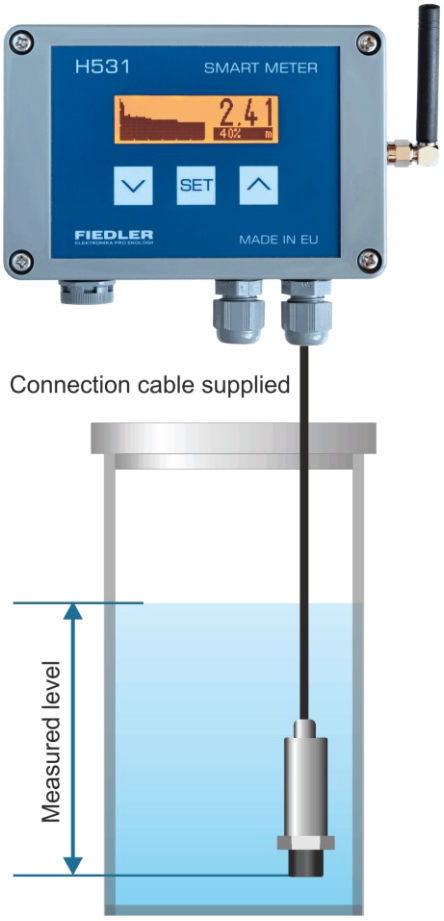
If the level gauge is to display the level from the bottom even if the measuring range of the sensor used is less than the maximum possible level in the measured sump/well (third case in the previous figure), then it is necessary to correct the measured level with the *Delta* parameter. *The* numerical value of this parameter will be permanently added to the measured level height in the H531 unit. It is clear from the principle that the displayed level height will never fall below the value of the Delta parameter in this case.

The approach to the *Delta* parameter is given in chap. *3-4-3 Delta* on p. 31.

3.1.2. Installing the display unit

The H531 display unit is usually placed close to the measured level. The maximum possible distance between the submerged transducer and the display unit is determined by the length of the connection cable between the transducer and the unit.

If it is necessary to place the display unit at a greater distance from the measured sump/cell, then the connection cable can be extended (see chap. 5.1.3 Extension of the connection cable on p. 16), or order an extra length of jumper cable from the level meter manufacturer.



Coverage from sunlight

The mechanical design of the imaging unit allows it to be placed outdoors, it is only necessary to protect the unit with a suitable cover from direct sunlight to prevent gradual degradation of the plastic imaging panel due to UV radiation.

Power supply and operating mode

The display unit is factory set to a power saving display mode, in which the unit's display wakes up only for a short time after pressing one of the unit's control buttons. The unit is powered by an internal lithium battery in this mode.

If the level gauge is to be operated in the mode with permanently switched on display of the measured level, then it is necessary to connect to the H531 display unit a source of external power supply voltage of 5 to 28 VDC (see chap. 5.2.2 on p. 19).

The installation of the level gauge is covered in more detail in the chapter 5. Installation on p. 15.

The installation and commissioning of the level gauges with the H531-G or H531-N communication module is described in chapter 7-Remote access on p. 40.

4 Basic description

TSH27 absolute level sensor

4.1. Level sensors

The submersible transducer converts the pressure applied to the diaphragm by the transducer into an electrical signal measurable by the H531 using a strain gauge sensor.

Sensor division According to the type of measuring sensor used, strain gauge sensors are divided into:

- **absolute sensors**
- **pressure compensated** sensors

The principle of measuring both types of sensors is explained in the following two chapters.

Absolute sensors do not require a special cable with a compensation capillary and therefore usually have a lower purchase price. On the other hand, they require more complex processing of their output signal in the connected display unit.

The H531 can work with both types of sensors.

Sensor location The level sensor is usually suspended by a cable above the bottom of the sump, well or borehole being monitored. However, in some cases, instead of submerging the sensor in the monitored environment, it may be advantageous to screw the sensor into a ½" sleeve located at the bottom of the vessel or sump being measured.

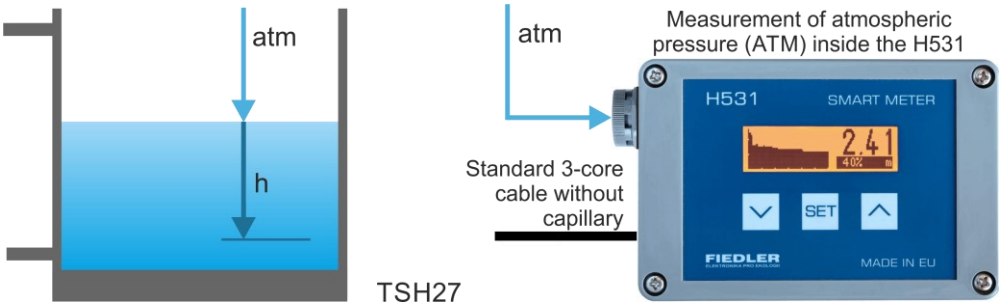
Sensor cable Each level sensor includes a cable that suspends the sensor and connects it to the H531 display unit. Since the cable is an integral part of the sensor, the length of the cable along with the measurement range of the sensor must be specified when ordering the sensor.

The connection cable is used both for powering the sensor's own electronics and for transmitting the measured signal from the sensor to the H531 unit.

Cable price by sensor type Pressure compensated sensors require a special cable with a compensation capillary. Therefore, the purchase price of such a sensor is usually higher than that of an absolute sensor. This is especially true for sensors installed in deep boreholes, which require a long connection cable.

4.1.1. Absolute level sensor

These sensors use an absolute pressure sensor to measure the water level, which measures the hydrostatic pressure of the water above the sensor (h) including the atmospheric air pressure (atm) and converts the resulting total pressure to an output voltage signal in the range of 0 to 5 V.



The principle of level measurement with an absolute level sensor

Sensor signal processing

In the H531 evaluation and display unit, the atmospheric air pressure separately measured by the H531 is automatically subtracted from the sensor output signal. The resulting value, corresponding to the height of the water level above the sensor, is converted to a numerical value displayed on the H531 LCD.

Using a cheap cable

The absolute pressure measurement principle used allows the sensor to be connected to the H531 level gauge via a standard 3-core cable without the usual atmospheric pressure compensation capillary. A standard cable without a compensation capillary is easier to handle, can be easily extended if necessary and is also significantly cheaper than a cable containing a compensation capillary.

TSH27 absolute sensor (without sensor cap)

ABSOLUTE LEVEL SENSOR TSH27-X/Y (0-5 V output)

The TSH27 is an inexpensive absolute level sensor that does not require a special cable with compensating capillary. The sensor has a stainless steel body with a diameter of 27 mm and is 115 mm high including the sensor cap. By unscrewing this cap, the sensor can also be installed in a ½" sleeve.

TSH27 sensors are available in two measuring ranges:

- **TSH27-10/10 or TSH27-10/25**
  (measuring range 0 .. 10 mH_2O*, PUR cable 10 m or 25 m)*
- **TSH27-25/30**
  (measuring range 0 .. 25 mH_2O*, PUR cable 30 m)*

The TSH27 can be supplied with a different cable length for an additional charge.

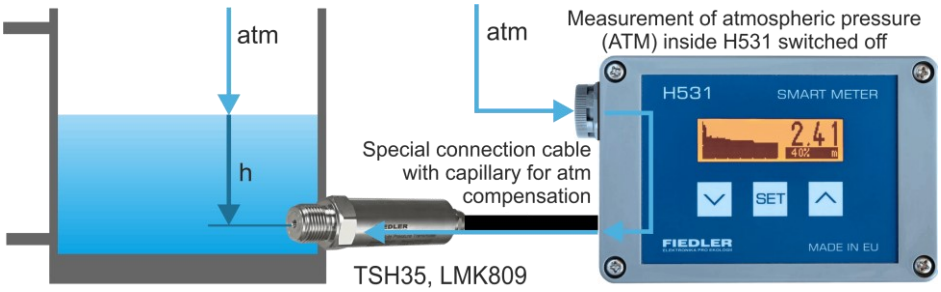
The sensors have a measurement accuracy of 2.5% of the range and an output signal of 0..5 V DC. The H531 unit is factory set to connect this type of absolute encoder.

Example 1.

TSH27-10/25 sensor with measuring range 0..10 mH_2O, cable 25 m.

4.1.2. Pressure compensated level sensors

For sensors with automatic compensation of atmospheric air pressure, a special cable containing a compensation capillary (tube) is used to supply air pressure (atm) to the back of the strain gauge diaphragm of the sensor. The sensor then measures only the pressure of the water itself above the sensor (h) acting on the front side of the measuring diaphragm, since the air pressure above the water level is compensated by the air pressure supplied by the compensation capillary to the back of the sensor diaphragm.



The principle of level measurement using a pressure compensated level sensor

The deflection of the strain gauge diaphragm caused by the water pressure is converted into a corresponding electrical signal in the sensor. The output signal from the pressure-compensated sensor therefore does not contain an air pressure component, as in an absolute level sensor, and is proportional only to the measured height of the water level (h) above the sensor.

There are many pressure compensated sensors on the market and most of them can be easily connected to the H531. The following overview lists the 2 basic types of recommended pressure compensated sensors suitable for connection to the H531 display unit.

TSH35 sensor

TSH35-10/Y LEVEL SENSORS (4-20 mA output)

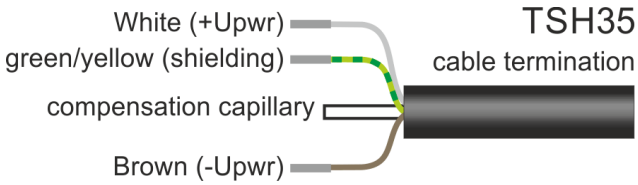
Cost-effective pressure compensated level sensor with stainless steel body and measuring diaphragm. These sensors are suitable for routine level measurements of both domestic and waste water.

The sensor has a current output of 4-20 mA and typical measurement accuracy is better than 0.5% of the measurement range. The sensor body has a diameter of 24 mm and a height of 70 mm.

TSH35-10/Y sensors are available in only one measuring range:

0 .. 10 mH_2O

The Y symbol indicates the required length of the PUR compensation cable in metres (10 m and 100 m cables are offered as standard).



Example 2. **TSH35-10/10** sensor with measuring range 0..10 mH_2O, cable 10 m.

LMK809 sensor (4-20 mA)

LMK809-X/Y LEVEL SENSORS (4-20 MA OUTPUT)

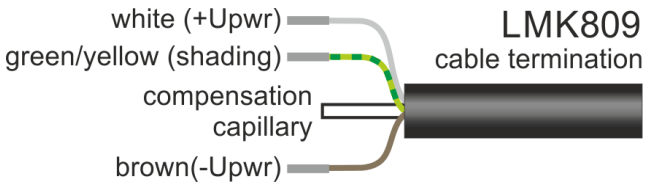
Pressure compensated level sensor with plastic body and ceramic diaphragm. These sensors are suitable for level measurement even in heavily polluted wastewater.

The sensor has a current output of 4-20 mA and typical measurement accuracy is better than 1% of the measurement range. The sensor body has a diameter of 45 mm and a height of 126 mm.

The LMK809-X/Y sensors are available in measuring ranges from 0 .. 0.4 mH_2O to 0 .. 100 mH_2O (X in the sensor ordering code):

0.4 m; 0.6 m; 1 m; 2.5 m; 4 m; 6 m; 10 m; 25 m; 40 m; 60 m; 100 mH_2O

The Y symbol represents the required length of the PUR compensation cable in metres.



Example 3.

LMK809-4/6 sensor with measuring range 0..4 mH_2O, cable 6 m.

4.2. H5 display unit 31

4.2.1. Description of H531 controls and connections

1	Graphic LCD display with backlight.
2	SET knob to turn on the display, enter MENU and confirm the MENU selection and confirm the parameter set value.
3	Knob to turn on display, move down in MENU, change parameter - decrease parameter value.
4	Knob to turn on display, move up in MENU, change parameter - increase parameter value.
5	Filter to equalize atmospheric air pressure inside and outside the H531 unit.
6	Display of the measured level value adjusted by the additive coefficient [m].
7	Displays the percentage value of the measured level adjusted by an additive coefficient relative to the set maximum level.
8	Coaxial FME connector for connecting the antenna of a GSM/GPRS or NB-IoT communication module with standard 1 dB antenna. Only H531-G and H531-NB units include the communication module.
9	Cable gland for external power supply and binary output cable.
10	Cable gland for connection of the immersion level sensor.

Mechanical arrangement

The H531 level gauge display unit is housed in a 120 x 80 x 55 mm plastic box with IP66 protection. The top of the box contains a control panel with display and three knobs. The bottom part contains the power battery and the control electronics board with terminals for connecting the cable from the level sensor, power supply and relay. Two M12 pins [9, 10] are provided on the underside of the level gauge for cable connection. Access to the terminals is possible by loosening the four M4 screws in the corners of the upper part.

Filter DA284

In addition to the cable glands, the bottom part of the unit contains a semi-permeable filter [5], which on the one hand allows the atmospheric air pressure to be equalized between the external environment and the inside of the box, and on the other hand prevents the penetration of air moisture to the electronics of the H531 unit. When using a pressure-compensated level sensor with a cable containing a compensation capillary, the filter also prevents the penetration of moisture through the capillary into the body of the sensor itself.

Graphic display

The control panel of the level gauge contains a graphic LCD display, supplemented for better readability by a switchable orange backlight. The display in basic operating mode shows the measured level [m] with a resolution of 0.1 m [6], accompanied by a graph of the last 72 measured level values [1]. The display also shows the percentage of the currently measured level relative to the set maximum possible level [7].

When the binary transistor output of the H531 unit is switched on, an icon indicating this condition appears in the upper left window of the graph.

Automatic display shutdown

The battery-powered level gauge switches on the graphic display and its backlight for a preset time only after pressing one of the control buttons. The time the display turns on after the knob is pressed is an adjustable parameter, and this feature is implemented in the unit to save power on the power supply battery.

However, the device parameters can be set to an operating mode that keeps the display, and possibly its backlight, permanently on in the presence of an external power supply (parameter *3-2-2 Working mode* on p. 26).

Control knobs

Three control knobs [2, 3, 4] are used to wake up the unit from the power saving mode to turn on the graphic LCD display (touch any of the knobs), as well as to set and change the parameters of the device. The knobs react to the touch of a finger and therefore have no mechanical switching response.

The description of individual parameters and the method of their change and setting is given in chap. 6.4 Description of individual H531 parameters on p. 26.

4.2.2. Power supply for the level gauge

Power battery

The H531 is powered by a replaceable 3.6 V lithium battery with a capacity of 19 Ah (Li-SOCl2 battery type ER34615). This battery powers both the H531 display unit itself and the TSH22 submersible level sensor.

If the level gauge includes a built-in GSM communication module, which requires higher current consumption for data transmission, then the level gauge must be powered by a spiral type lithium battery 3.6 V / 13 Ah, which provides a short-term peak current of up to 1.8 A (battery type ER34615M).

The battery used is sufficient for up to 10 years of operation of the unit without the communication module and up to 5 years of operation of the unit with the built-in GSM or NB-IoT communication module. The battery lifetime is affected by both the frequency of measurements and the frequency of data sessions to the server. Both parameters are user adjustable (see parameter *3-2-3 Measurement interval* on p. 27 and parameter *3-6-2 Transmission Interval [hr]* on p. 35).

A suitable type of replacement power supply battery can be ordered from the supplier of the level gauge.

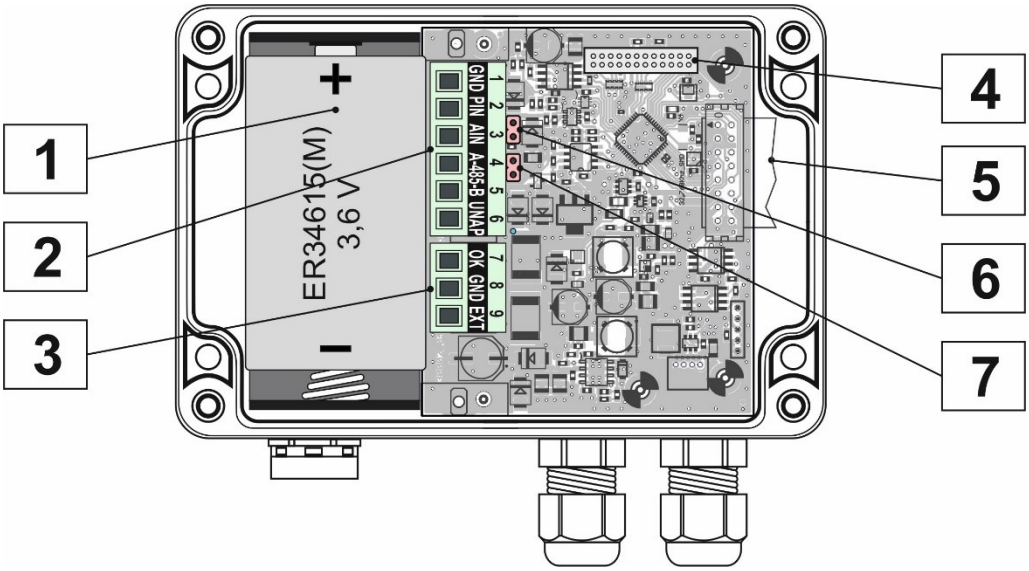
External power supply for level gauge

If you need to operate the H531 unit with the LCD display permanently on or use the communication module for frequent data transfers to the server, then it is advisable to power the H531 unit from an external power supply in addition to the replaceable battery. This should have a DC output voltage in the range of 5 to 28 V DC (typically 12 V DC / 200 mA).

The internal battery is disconnected while external voltage is present, thus saving battery capacity. The battery is automatically connected to the unit only during any external power failure.

4.2.3. Description of terminals and configuration jumpers of the H531

The circuit board inside the H531 unit contains connection terminals and jumpers for selecting the level sensor to be used.



1	Replaceable power supply battery type ER34615 (ER34615M for H531-G)
2	Removable terminal block for connecting the cable from the level sensor **1 - GND** negative supply voltage of the level sensor, cable shielding **2 - PIN** spare input - leave free **3 - AIN** input of the sensor signal wire 0..5 V or 4(0)-20 mA **4 - RS485-A** sensor connection via RS485 interface **5 - RS485-B** sensor connection via RS485 interface **6 - UNAP** positive supply voltage of the level sensor +12 V DC
3	Removable terminal block for connecting external power cable and binary output **7 - OK** binary output-open collector; Umax: 28 V DC, Imax: 300 mA **8 - GND** connection of the negative pole of the external supply voltage **9 - EXT** connection of the positive pole of the external supply voltage 5..28 V DC
4	Connector for connection of GSM/GPRS or NB-IoT plug-in communication module
5	Flat cable terminated with a connector to connect the display electronics located in the cap of the H531 unit
6	Mounting cable for sensors with 0-5 V output (= TSH27) (position 7 must remain unconnected)
7	Mounting jumpers for sensors with 4-20 mA output (= LMK809) (position 6 must remain unconnected)

Note: When using level sensors with RS485 digital output, the position of jumpers 6 and 7 does not matter.

5 Installation

5.1. Mechanical installation

5.1.1. Installation of the TSH27 absolute level sensor

Installation by immersion for the cable

The submersible level sensor can be simply lowered by cable into the measured object (well, sump, etc.) to such a position that even at the expected minimum level the sensor is still submerged and the maximum level in the measured object does not exceed the measuring range of the sensor (10 mH_2 O for the TSH27-10 sensor or 25 mH_2 O for the TSH27-25 sensor).

The TSH27-10 can be ordered with a 10 m and 25 m interconnecting cable. The TSH27-25 is available with a 30 m interconnecting cable.

As the TSH27 sensor cable does not contain a capillary to compensate for atmospheric air pressure (atm), the cable can be clamped tightly into the supplied cable gland to fix the sensor in the desired position - immersion depth. A cable gland on the cable, supported by the tank or well lid, prevents the sensor from dropping below the desired position.

Installation in the trailer

The TSH27 level sensor can also be installed outside the tank in a ½" sleeve located at the bottom of the measured vessel. For this type of installation, the black plastic cap of the measuring diaphragm must first be removed (unscrewed) from the sensor.

When installing the sensor, it is recommended to place a shut-off valve between the sensor and the measured vessel, which will allow the sensor to be replaced without emptying the measured vessel. In this case, however, it is necessary to use a suitable type of valve that does not increase the pressure on the measuring diaphragm of the sensor when closing, which could lead to overloading and subsequent destruction of the sensor.

5.1.2. Installing a pressure compensated level sensor

The connection cable of each pressure compensated level sensor contains a compensation capillary which must remain permeable after the sensor is installed to equalize the atmospheric air pressure between the sensor body and the surrounding environment.

Hinge-U Therefore, the cable cannot be bent to a radius of less than 15 cm during installation, nor can it be clamped by the cable grommet when hanging the sensor in the desired position as with the TSH27 sensor. For hanging the sensor by the cable with the compensating capillary, a stainless steel Hinge-U is provided, which can be ordered together with the level gauge.

Hanger-U designed to lower the pressure compensated transducer by the cable to the desired depth of the tank/sump/well to be measured.

5.1.3. Extension of the connection cable

If necessary, the connection cable between the sensor and the H531 display unit can be extended.

Note *However, for reliability of operation, we recommend that the H531 unit be placed close to the sensor itself to prevent inducing surges in the interconnecting cable or equalizing ground potential differences between the sensor and the H531 unit during storms.*

Order cable from the manufacturer Instead of extending the connecting cable, it is preferable to order the H531 level gauge assembly with the required length of connecting cable for a small extra charge.

ABSOLUTE SENSOR CABLE EXTENSION

The TSH27 absolute sensor is connected to the unit with a standard three-core cable without a compensating capillary and therefore the extension of the connecting cable can easily be realized with, for example, JYTY cables or some other type of control or communication shielded cable.

PRESSURE COMPENSATED SENSOR CABLE EXTENSION

It is also possible to extend the connection cable of a pressure compensated sensor with some type of communication or control cable, but it is necessary to ensure that the connection between the original cable from the sensor with the compensation capillary and the extension cable is permanently above the level of the measured water. The compensation capillary must continue to supply atmospheric air pressure behind the measuring diaphragm of the transducer and therefore the cable connections cannot be underwater or hermetically sealed as with the absolute transducer extension cable.

Filter DA284 In order to prevent water vapour from penetrating through the compensation capillary into the sensor body itself to its measuring electronics, it is necessary to treat the end of the compensation capillary with a suitable type of filter. Such a filter, type DA284, is located next to the cable glands on the bottom edge of the H531 display unit, or can be ordered from the level gauge manufacturer. The mechanical design of the cable connection can thus be implemented, for example, in a small installation box fitted with the above-mentioned DA284 filter on the side.

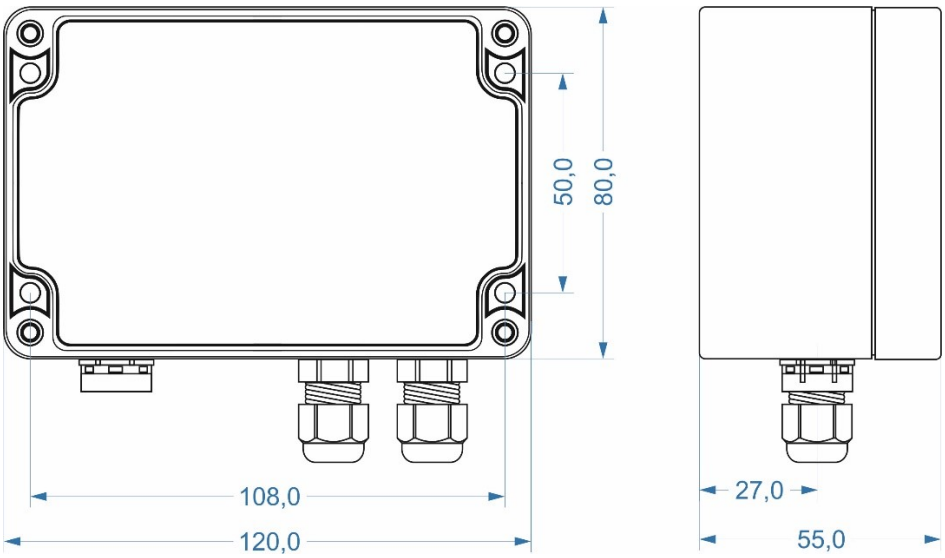
5.1.4. Installing the H531 display unit

The H531 unit is usually placed in the immediate vicinity of the measurement. The mechanical design of the unit allows it to be placed directly outdoors. In this case, it is only necessary to protect the unit with a suitable cover from rain and direct sunlight to prevent the UV radiation from gradually degrading the plastic display panel of the unit.

For the actual mounting of the H531 unit, there are 4 mounting holes in the bottom of the level gauge box that are accessible by removing the top of the display box. When installing the level gauge, the flat cable connecting the bottom and top of the H531 display unit can be disconnected for ease of installation.

The following figure shows four mounting holes with a diameter of 4.1 mm and a spacing of 50 x 108 mm.

Mechanical dimensions H531



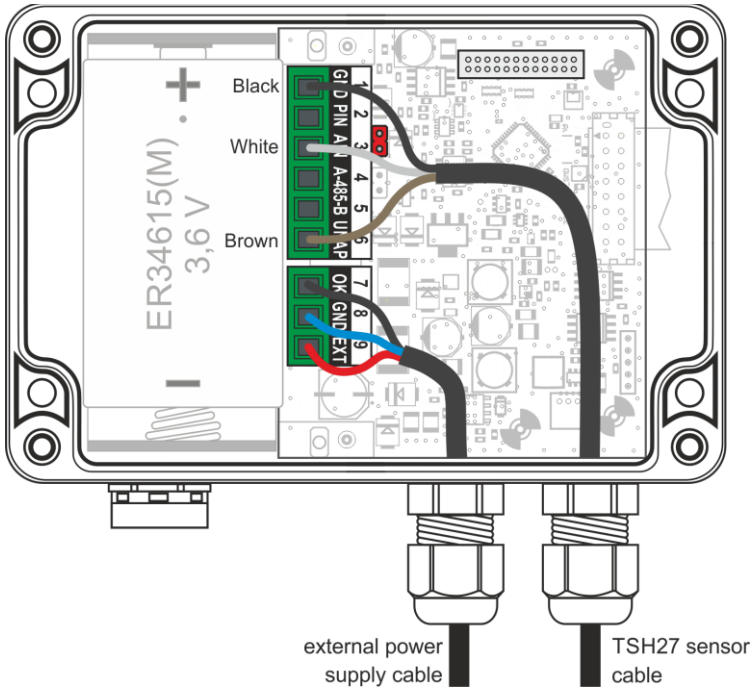
Since the H531 unit includes a display and knobs for controlling the unit, it is advisable to install the unit in an easily accessible location and preferably at eye level.

5.2. Electrical wiring

5.2.1. Connecting the level sensor to the H531 unit

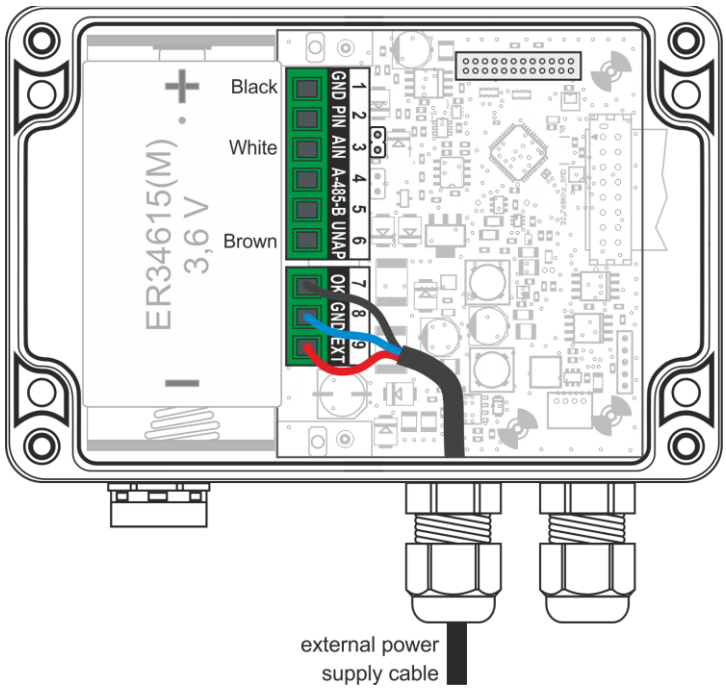
The detachable series terminal block with terminals 1 to 6 is designed for connecting a level sensor. The colour coding of the individual cores and their connection can be seen in the following figures. The cable shield is always connected to terminal GND [1].

Connecting the TSH27 level sensor



Remark: ***The TSH27 and TSH35 or LMK809 sensors have interchanged power and signal wire colours. Therefore, pay due attention to the sensor connection!***

Connecting the LMK809 or TSH35 level sensor



Setting jumpers The two previous sensors also have different type of analog output signal (0..5 V for TSH27, 4-20 mA for LMK809 and TSH35) and therefore it is necessary to set the correct position of jumpers 6 and 7 from the picture on page 6. 14.

The correct jumper position for each type of sensor is also shown in the previous two figures by the red highlighted rectangle to the right of terminals 3 and 4.

5.2.2. Connecting an external power supply to the H531

Terminals 8 and 9 are used to connect an external supply voltage in the range of 5 to 28 V DC (typically 12 V DC) from a safe voltage source designed for the environment of the level gauge installation site. The positive terminal of the power supply is connected to terminal 9 [EXT] and the negative terminal to terminal 8 [GND].

An external power supply is only required when operating the H531 unit with the backlit display permanently on or in the case of frequent data transmissions to the server for level gauges equipped with a communication module (H531-G or H531-N). For other normal operation of the level gauge, no external power supply is required and the H531 level gauge can be operated permanently from the internal power supply battery.

A suitable power supply can be ordered together with the level gauge:

DELTA-12V/10W
DIN rail power supply; 12 V DC / 10 W

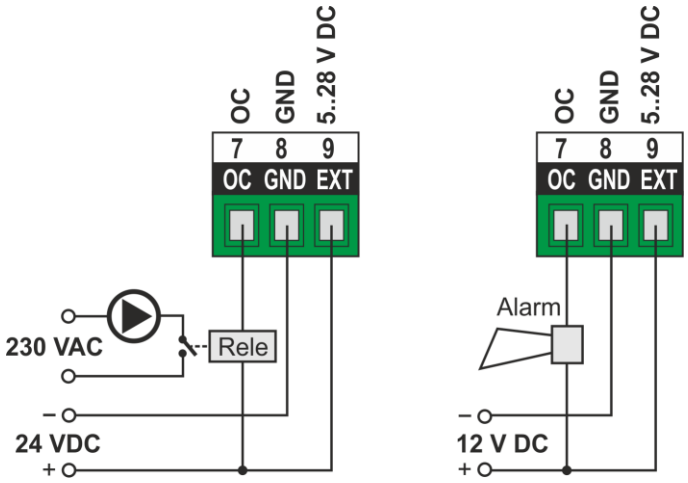
ESPE-0312-W2E
Socket adapter, 12 V DC / 300 mA

! The external power supply must meet all safety standards and be appropriate for the environment in which it will be operated.

5.2.3. Connecting a relay or other power element to the H531

The H531 includes an open-collector binary output that can directly switch an alarm siren or auxiliary power relay. The binary output switching transistor connected between terminals 7 [OK] and GND [8] can handle a continuous maximum current of 0.5 A and is rated to switch loads connected to supply voltages up to 28 VDC.

A pump supplied with 230 VAC mains voltage must be connected to the H531 level gauge via an external auxiliary relay as shown in the following figure.



Example of connecting an external relay or audible siren to the terminals of a level gauge.

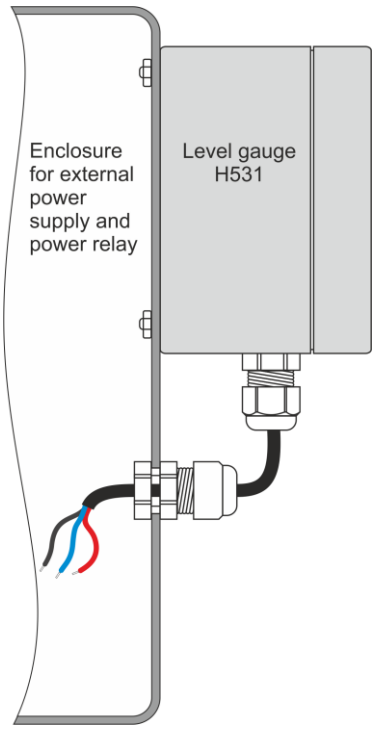
In the picture, the coil of the power relay and the warning siren are connected to an external supply voltage of 24 V DC and 12 V DC respectively. However, the external supply voltage of the H531 level gauge can range from 5 V to 28 V DC.

INSTALLATION NOTE H531 FOR PUMP CONTROL OR EL. VALVE

Power distribution box

If the H531 level gauge is to directly control a pump or other power element via an auxiliary relay, then it is usually advisable to use a suitable power cabinet for the placement of the power elements and the source of external supply voltage. The H531 level gauge display unit can then usually be placed on the front panel of the power cabinet.

Since the H531 level gauge contains only 2 cable glands and one of these glands is permanently occupied by the connected level sensor, the external supply voltage wires (terminals 8, 9) and the relay coil control signal (terminal 7) need to be combined into one 3-core cable and the cable needs to be pulled through the free cable gland of the H531 unit.



6 Parameters

6.1. Parameters of the H531 level gauge

The parameters are used to set the desired functions of the level gauge by the user. The parameters are optimally set at the factory and in most cases of basic operation of the level gauge there is no need to change them by the user.

6.1.1. Parameter display

The display and editing of individual H531 parameters is done in the Main Menu.

Entering the menu, changing individual parameters and then exiting the menu is done using the three control buttons UP, DOWN and SET (see picture on p. 12).

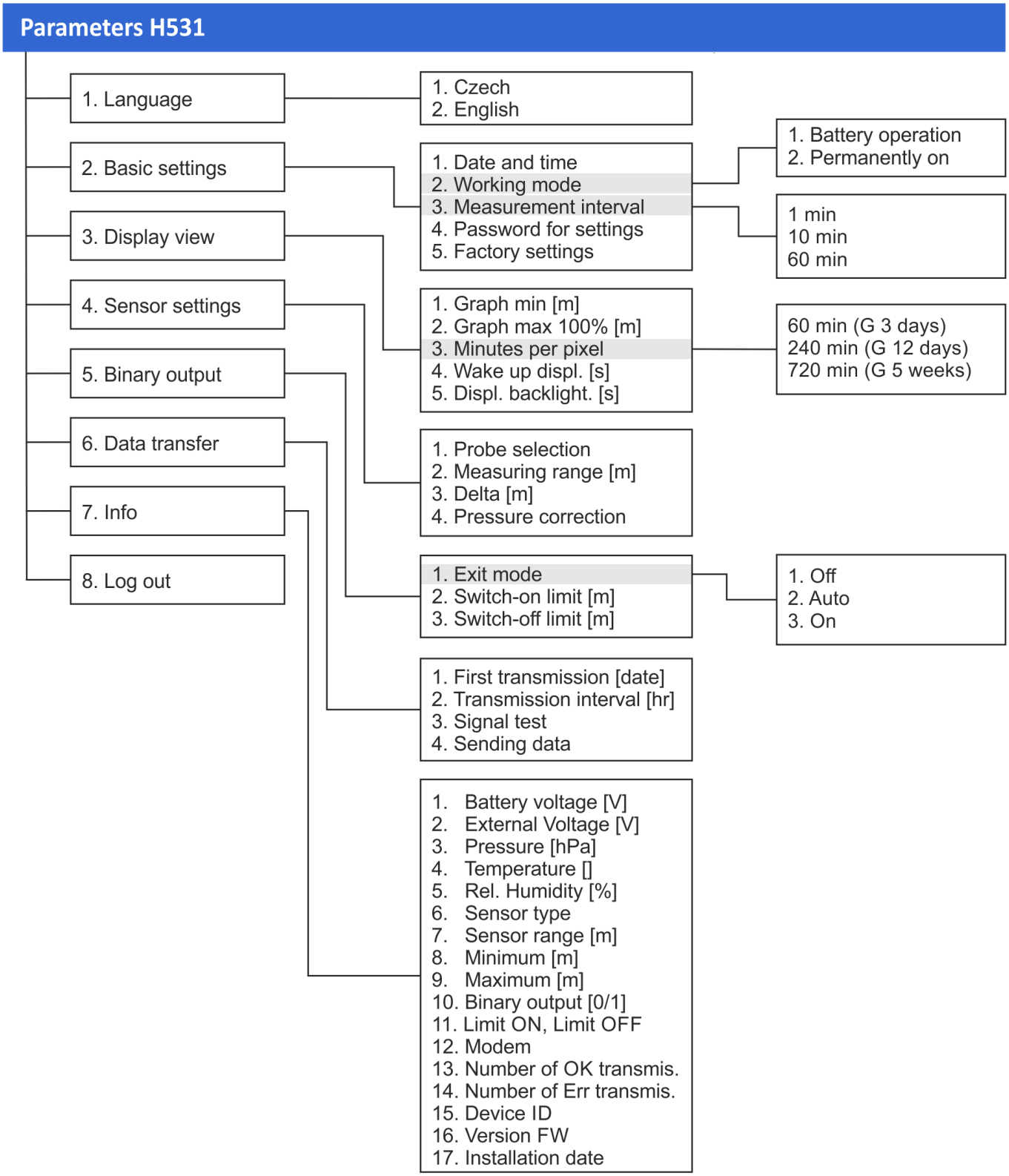
The unit's menu can be entered simply by repeatedly pressing the middle SET button, which also confirms the menu selection or the entered parameter value. The UP and DOWN buttons can then be used to scroll through the menu items or change the value of a numeric parameter.

1	The name of the current menu.
2	Individual items of the current menu. The menu item can be the name of a nested menu with a directory icon in front of the item name (see figure), or the current menu parameter itself.
3	The selected menu item is displayed negatively (light font on a dark background). The item is selected using the UP and DOWN buttons. Confirm the selection by pressing the SET button.
4	The informative bargraph indicates the vertical position of the selected current menu item in the list of all current menu items.

6.1.2. MENU structure H531

The parameters of the level gauge are thematically divided into six basic groups, which form the structure of the main menu of the level gauge.

The seventh group 7. Info does not contain adjustable parameters, but is used to display selected quantities and identification and production data of the level gauge.



6.2. Procedure for editing parameters

The selected parameter can be changed by repeatedly pressing the SET knob, which switches the display mode from displaying the measured level to parameter editing mode using the nested MENU menu.

The selected parameter can be changed either by selecting it from the offered list or by setting a numerical value of the parameter.

Functions of H531 fingerboards

SET	▪ Switching on the display, pressing repeatedly to enter the MENU ▪ Confirmation of the selected item marked with the inverse display ▪ Confirmation of the set parameter value and return to MENU
^	▪ Moving up in MENU in cyclic mode ▪ Cyclic switching between options: set parameter / Back / Ok ▪ Increase the numeric value of the parameter being set, selection from the list
v	▪ Moving down in MENU in cyclic mode ▪ Cyclic switching between options: set parameter / Ok / Back ▪ Decreasing the numerical value of the parameter being set, selection from the list

Basic rules

Generally, the inverted text (light font on a dark background) is selected by pressing the SET knob and movement between MENU items, the selected option shown in inverted text, or changing the value of a numeric parameter is done by pressing the UP or DOWN knob.

INSTRUMENT DISPLAY IN THE EDIT MODE OF THE SELECTED PARAMETER:

1	The name of the selected parameter.
2	The current value of the selected parameter is displayed in light font on a dark line. After pressing the SET knob, the inverted display narrows down to the parameter value itself and the UP or DOWN knobs can then be used to change the value of this selected parameter according to the list of preset values offered.
3	Option for confirming the newly set value of the selected parameter and saving it to the instrument memory. This option can be accessed using the UP or DOWN knobs.
4	Option to exit the setting procedure of the selected parameter without saving the new parameter value to the instrument memory. This option can be accessed using the UP or DOWN knobs.

End of editing

Exit the parameter editing mode and return to the measured level display mode by selecting (UP/DOWN) and confirming (SET) the last **Back** item of each MENU:

Example 4.

Change the "Measurement interval" parameter from 60 min to 1 min

1. Default mode Main MENU:

- Access to the Main MENU after repeated pressing of the SET knob
- Enter the "Basic Settings" MENU by pressing the SET knob.

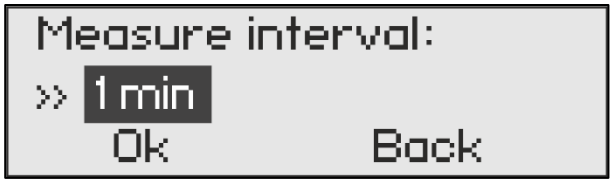
2. Select the desired parameter from the Basic Settings menu:

- Parameter "Measurement interval" select the UP or DOWN knobs.
- Confirm your selection with the SET knob.

3. Display the current value of the selected parameter:

- Use the SET knob to confirm the inverted option and enter the mode of setting the value of the selected parameter

4. Mode for setting the value of the selected parameter:



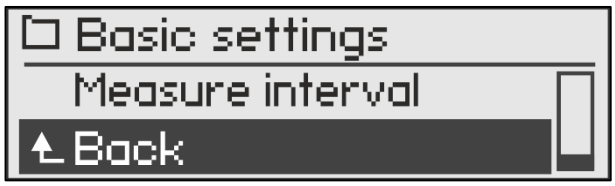
- Use the UP/DOWN knobs to select the desired parameter value from the list and confirm with the SET knob.

5. Save and exit parameter editing mode:

- Select "OK" with the UP/DOWN knobs and confirm with the SET knob. This option will end the parameter editing, save the new value in the instrument memory and return to the "Basic Settings" menu.

▪ The "Back" option terminates the parameter editing without saving its new value to the instrument memory. The original value of the parameter is not changed.

6. Return to level display mode:



▪ Select the last item in the Basic Setup menu with the UP/DOWN knobs and confirm this choice with the SET knob.

▪ Follow a similar procedure in the Main Menu. This will return the unit to the measured level display mode.

6.3. Basic factory settings of the H531 level gauge

The H531 level gauge is set by the manufacturer to measure and display the level within the measuring range given by the level sensor used. Thus, even without further parameter setting, the level gauge can be used for a basic display of the water level above the submerged transducer.

Note: In the following chapter. 6.4 6.6, which is devoted to a detailed description of the individual parameters of the level gauge, the value of each parameter in the basic factory setting (default value) is always indicated.

Saving mode In order to allow the level gauge to operate continuously without the presence of an external power supply, the level gauge is factory set to operate in power saving mode with the display switched off. The display is automatically switched on for 60 seconds after the last press of one of the knobs.

Measurement interval and graph *The Measurement Interval* parameter is set to 60 min and the *Minutes per pixel* parameter is also set to 60 min. Therefore, the graph of the last measured level values displayed on the unit's display represents a time span of the last 3 days.

Binary output The binary output is disabled in the basic factory setting.

PRODUCTION SETTINGS FOR LEVEL GAUGES WITH COMMUNICATION MODULE

The H531-G with GSM communication module has a 24 hour interval for transferring the measured data to the server in the basic factory setting.

6.4. Description of individual H531 parameters

3-1 Language

3-1-1 Language

Select the language version for the parameter names displayed on the instrument display.

1-1 Czech

Switch the language settings of the device to Czech.

1-2 English

Switch the language settings of the device to English.

3-2 Basic settings

Parameter group for setting the basic functions of the level gauge.

3-2-1 Date and time [HH:MM DD.MM.YYYY]

The date and time settings are important when displaying time stamps on the horizontal axis of the display graph and when sending data to the server for H531 units equipped with a GSM or NB-IoT communication module.

Setting the real date and time of the device. Once set, the time can deviate from the real time by a maximum of 180 s per year.

If the instrument is equipped with a communication module for transmitting the measured data to the server, the time correction takes place automatically when communicating with the server.

The instrument operates permanently in standard time without the possibility of switching between standard time and daylight saving time (in summer, the real time of the instrument is delayed by 1 hour compared to daylight time).

3-2-2 Working mode

The choice of the operating mode of the instrument has a major impact on the current consumption of the instrument and thus on the total operating time of the instrument powered only by the battery without battery replacement.

2-1 Battery operation

In this economical operating mode, the level measurement only takes place at the interval specified by the parameter *3-2-3 Measurement interval*. Between measurements, the instrument is in a hibernated state with minimal current consumption.

The display of the device, including the backlight, is switched off and on only for a short period of time given parameters *3-3-4 Display wake-up [s]* a *3-3-5 Display backlight [s]* after touching one of the instrument buttons.

2-2 Permanently on

In this operating mode, the H531 level gauge including the display is permanently switched on and the level gauge continuously measures and displays the measured level using the connected sensor regardless of the parameter setting *3-2-3 Measurement interval*.

This operating mode is only suitable for instruments powered by an external mains voltage source, as a permanently switched on display and continuous measurement significantly reduces the life of the power supply battery.

Default: *2-1 Battery operation*

3-2-3 Measurement interval

The value of the parameter "Measurement interval" selected from the list determines the interval in minutes between each level measurement in operating mode *2-1 Battery operation.* In operating mode *2-2 Permanently on* this parameter is meaningless and the level gauge takes continuous level measurements at a frequency of approximately 5 measurements per second.

In mode *2-1 Battery operation* the selected value of this parameter affects the power consumed by the power supply battery. If it is not necessary to display the average value from a rapidly changing level in the graph, then select a higher value for this parameter (10 min or 60 min).

3-1 1 min

Level measurements will be taken at a frequency of 1x per minute.

3-2 10 minutes

Level measurements will be taken at a frequency of once every 10 minutes.

3-3 60 minutes

Level measurements will be taken at a frequency of once every 60 minutes.

Default: *60 min*

3-2-4 Password for settings

This parameter is used to prevent unauthorized reconfiguration of the level gauge parameters. If a non-zero number is set as the Password, then this Password will be required before displaying the individual MENU options.

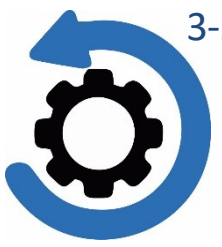
A correctly entered Password maintains free access to the unit's MENU for 60 minutes from the last time any of the unit's buttons were pressed. After that, further access to the parameters is blocked until the next time the correct parameter value is entered *3-2-4 Password*.

Immediate blocking of access to the unit MENU is done by selecting the option 3-8 Log out (the last item in the main MENU of the H531 unit).

The value of the Password = 000 (zero) parameter disables the request to enter the Password. However, the unit settings are not protected against intentional or unintentional overwriting of the level gauge parameters in this case.

Default: *000*

3-2-5 Factory settings



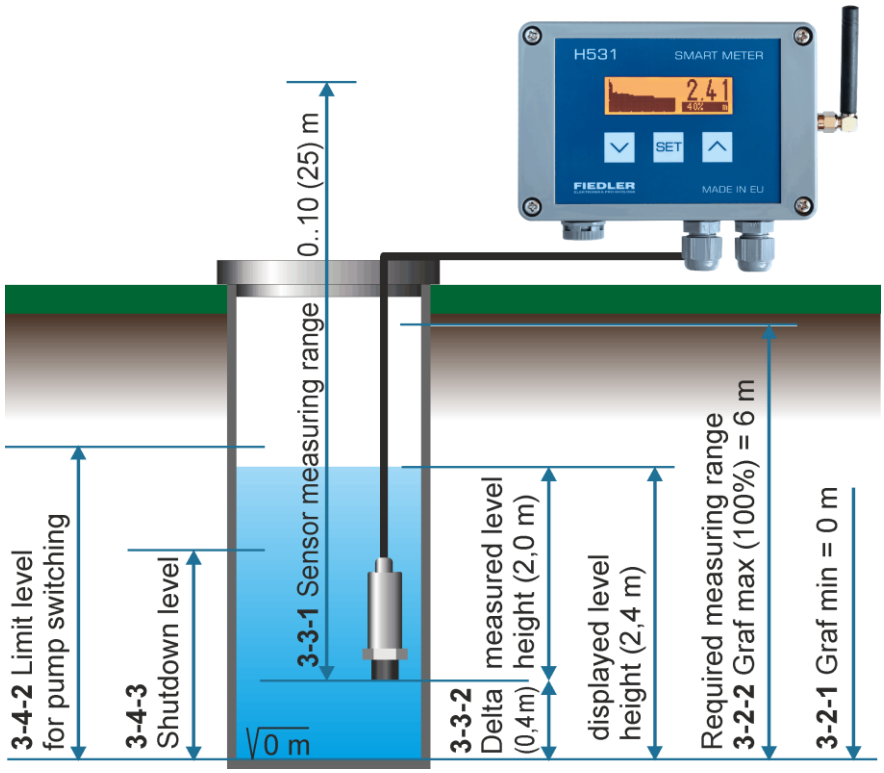
Submenu for setting all user accessible parameters to the factory default settings (default values).

The default values of each parameter are always listed at the end of the corresponding chapter dealing with the description of the parameter.

3-3 Display view

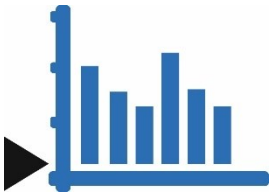
A group of parameters for setting the operating mode of the H531 backlit LCD display, including setting the display range of the left vertical axis of the graph and the time period for graphical display of the measured level.

IMPORTANT PARAMETERS OF THE H531 LEVEL GAUGE



Graphical representation and meaning of H531 parameters for display and control.

3-3-1 Graph min [m]

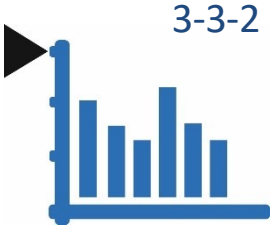


Parameter for graphical display of the level on the unit display. The parameter value is equal to the minimum displayed level. Usually this parameter is set to 0 m (see item [2] in the figure on the following page).

If the value of the parameter is greater than 0, then levels below the value of this parameter will not be displayed in the bars of the graph. On the other hand, by setting this parameter to a value close to the maximum measured level, it is possible to highlight the minimum measured level differences.

Default: *0 m*

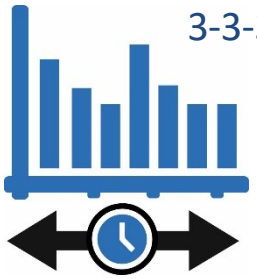
3-3-2 Graph max 100% [m]



This parameter specifies the maximum level height corresponding to the desired 100% chart display. See item [1] in the figure on the following page.

Usually this parameter is set to be equal to the height of the monitored sump or tank, the depth of the well, borehole, etc. The parameter can be changed in steps of 0.1 m.

Default: *Measuring range of the level sensor used (usually 10 m or 25 m)*



3-3-3 Minutes per pixel

This parameter sets the time period in minutes that will be displayed as a single bar (pixel) on the level graph.

The graph consists of a total of 72 columns, i.e. depending on the value of this parameter, it shows a time period ranging from 3 days to approximately 5 weeks. The lower horizontal axis of the graph carries the time markers [3].

1	On the vertical axis the value of the parameter *3-3-2 Graph max 100% [m]*; Next column to the right of the axis = oldest value displayed in the chart
2	Parameter value *3-3-1 Graph min [m]*
3	Time stamps given by the parameter *3-3-3 Minutes per pixel*
4	The latest value displayed in the chart (it will gradually move to the left)
5	Last measured value in numeric form
6	Percentage of the current measured value relative to the parameter value *3-3-2 Graph max 100% [m]*

The rightmost column of the graph contains the most recent displayed value and this gradually moves to the left as time passes, so that the oldest displayed value of the measured level is in the leftmost column of the graph.

After the unit has been switched on for the first time or the power battery has been replaced, the graph contains no measured values (bars). They will gradually increase in the interval given by this parameter.

3-1 60 min (Chart: 3 days)

One bar of the chart represents 60 minutes. The whole graph shows the level over a period of approximately 3 days. The time marker on the axis of the graph indicates an interval of 1 day.

3-2 240 min (Chart: 12 days)

One bar of the graph represents 4 hours. The entire graph shows the level over a period of approximately 12 days. The time marker on the axis of the graph indicates an interval of 1 day.

3-3 720 min (Chart: 5 weeks)

One bar of the chart represents 12 hours. The whole graph shows the level over a period of approximately 5 weeks. The time marker on the axis of the graph indicates an interval of 1 week.

Default: *60 min (Chart: 3 days)*

The internal memory of the instrument allows switching of individual display ranges (values of this parameter) without loss of measured and displayed data.

3-3-4 Display wake-up [s]

This parameter determines the time since the last press of one of the unit's buttons for which the display will show the measured values.

When the time specified by this parameter has elapsed, the display is switched off, thus saving the power of the power supply battery.

When setting the parameter *3-2-2 Working mode* to the option *2-2 Permanently on,* setting this parameter is meaningless and the H531 display will be permanently on.

Default: *60 s*

3-3-5 Display backlight [s]

This parameter determines the length of time the orange LED backlight will be on since the last time one of the unit's buttons was pressed.

When the time specified by this parameter has elapsed, the display backlight is switched off, thus saving the power of the power supply battery.

If the *Display Backlight* time is set to be shorter than the *Display Wake-up* time, the display will operate in a reflective mode after the backlight is turned off, with slightly less legibility of the displayed data compared to when the backlight is on.

If the *Display Backlight* time is longer than the *Display On* time, the backlight will be switched off when the display is switched off.

In the working mode of the device *2-2 Permanently on* the backlight of the on display will be permanently on when this parameter is set to 99 seconds.

Default: *60 s*

Note Operation of the level gauge with permanently switched on and illuminated display can only be enabled when the H531 is powered from an external mains voltage source (see chap. 5.2.2 Connecting an external power supply to the H531 on p. 19).

3-4 Level sensor

Menu for Setting the type of level sensor used and its measuring range, the displacement of the measured zero (Delta parameter) and for compensation of the atmospheric air pressure correction when using an absolute level sensor.

3-4-1 Probe selection

Parameter for selecting the type of sensor used. The H531 is usually supplied with a specific type of level sensor and therefore the user does not have the possibility to set this parameter (the parameter is already set when the level sensor is manufactured).

Default: *According to the type of connected sensor*

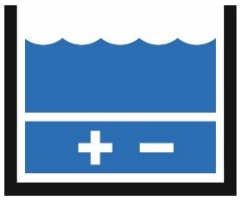
3-4-2 Measuring range [m]

Parameter for setting the measuring range of a pressure-compensated level sensor with analogue current output in metres of water column. The value of this parameter thus corresponds to a maximum sensor output current of 20 mA. Type LMK809 sensors are available in a wide range of measuring ranges from 0..0.4 mH_2O to 0..100 mH_2O.

Absolute level sensors have a measuring range limited to 10, 25 or 100 mH_2O. The used measuring range of the connected absolute level sensor is already set into the H531 unit at the time of manufacture of the level gauge, and the user's choice of measuring range is therefore overridden for these types of sensors.

Default: *According to the type of connected sensor*

3-4-3 Delta



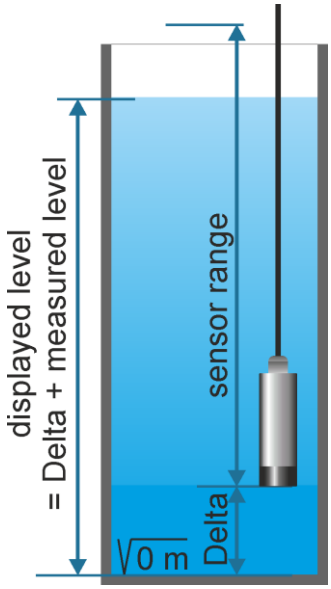
A parameter for setting the desired level height when installing a level gauge, if the desired level height cannot be set simply by the depth of the sensor immersion in the sump/well/tank.

The Delta parameter can take both positive and negative values and its value is added to the level measured by the level sensor.

The meaning of the parameter is clear from the pictures on this page and on page 2. 28.

Example 5.

With the Delta parameter, for example, the actual level in the well from the bottom can be displayed on the unit's display, even if the submersible level sensor is suspended 0.4 m above the bottom. In this case, Delta = 0.4 m is set. The parameter can be changed in steps of 0.01 m.



When setting the Delta parameter to a non-zero value, it is necessary to note that the displayed level cannot be less than the Delta parameter, even when the sump or well is completely empty.

Default: *0,00 m*

3-4-4 Pressure correction

This menu option is only used to compensate for any difference in atmospheric pressure measurement between the connected absolute level sensor (TSH27, TSH28) and the H531 unit.

Pressure correction cannot be used for sensor types other than TSH27 or TSH28

Remark: *Before the TSH27 (TSH28) type level gauge is handed over to the user, an initial pressure correction is carried out by the manufacturer and usually does not need to be carried out any further when the gauge is in operation. However, a slight difference in the atmospheric pressure measurement between the TSH27 sensor and the H531 unit may occur over time and is usually due to the aging of the TSH27 sensor. Other reasons for calibration include, for example, replacement of the TSH27 sensor with a sensor with a different measuring range or replacement of a damaged TSH27 sensor.*

The principle of level measurement using the TSH27 or TSH28 sensor was explained in chap. 4.1.1 - Absolute level sensor on p. 9.

TSH27 PRESSURE CORRECTION PROCEDURE

It is necessary to remove the TSH27 sensor from the water before starting the pressure correction so that the calculation of the atmospheric pressure correction is not affected by the hydrostatic pressure of the water on the sensor.

A properly set up TSH27 and H531 transducer assembly should indicate a 0.00 m level in the air.

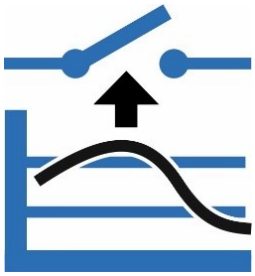
If a non-zero level is displayed, then the *Pressure Correction* option must be initiated by touching the middle SET button. During pressure correction, any pressure difference measured by the TSH27 sensor and the H531 unit will be reset to zero by the level gauge measurement assembly.

The corrected calibration coefficient is then stored in the H531 memory only after the calibration is confirmed by selecting the virtual "OK" button on the unit display.

TSH28 PRESSURE CORRECTION PROCEDURE

The procedure for correcting the pressure of the TSH28 absolute sensor with current output is the same as described above for the TSH27 sensor with voltage output.

A basic and important prerequisite for a successful pressure correction is the **removal of the sensor from the water**.



3-5 Binary output

Setting parameters for controlling the OK binary output (switching on or off the transistor switch - Open Collector).

The OK binary output can be used for switching a power relay, contactor or audio or light signalling (more in chap. 5.2.3 Connecting a relay or other power element to the H531 on p. 20).

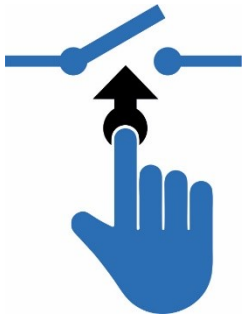
For proper operation of the OK binary output it is necessary to have a switched load (siren, relay,...) connected at the other end to an external power supply.

3-5-1 Output mode

Menu for setting the automatic control of the OK transistor binary output of the H531 level gauge unit according to the set limit limits and the current measured level.

In addition, the options in this menu can be used to force the OK binary output on or off regardless of the set switching limits and the current measured level (so-called manual control).

The manual control can be used, for example, to verify the function of a connected actuator (pump, solenoid valve, alarm signaling, etc.) or in case of a level sensor failure to temporarily activate the OK when filling/draining the monitored sump or tank.



1-1 Off

Permanently disable the transistor binary output OK until the setting of this parameter is changed to *1-2 Auto* or *1-3 On*.

1-2 Auto

OK binary output control enabled according to the current measured level value and set limit parameters (parameters *3-5-2 Switching limit [m]* a *3-5-3 Extension limit [m]*.

1-3 On

Permanent switching of the binary output OK until the setting of this parameter is changed to *1-1 Off* or *1-2 Auto*.

Default: *Off*

3-5-2 Switching limit [m]

The value of this parameter determines the level in meters at which the OK transistor binary output will be triggered.

The parameter can be changed in steps of 0.01 m.

Default: *1 m*

3-5-3 Extension limit [m]

The value of this parameter determines the level height in meters at which the OK transistor binary output will open.

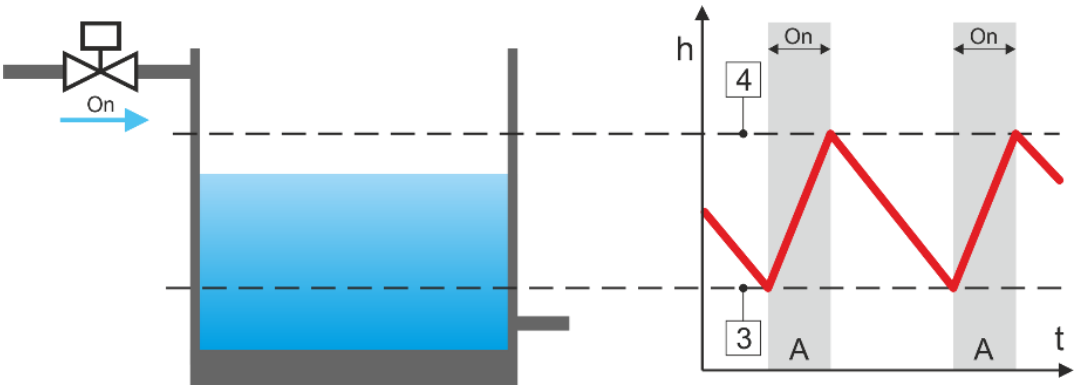
The parameter can be changed in steps of 0.01 m.

Default: *2 m*

The following two figures graphically show the limit value settings *3-5-2 Switching limit [m]* a *3-5-3 Extension limit [m]* for automatic water supply and pumping in 1-2 Auto mode.

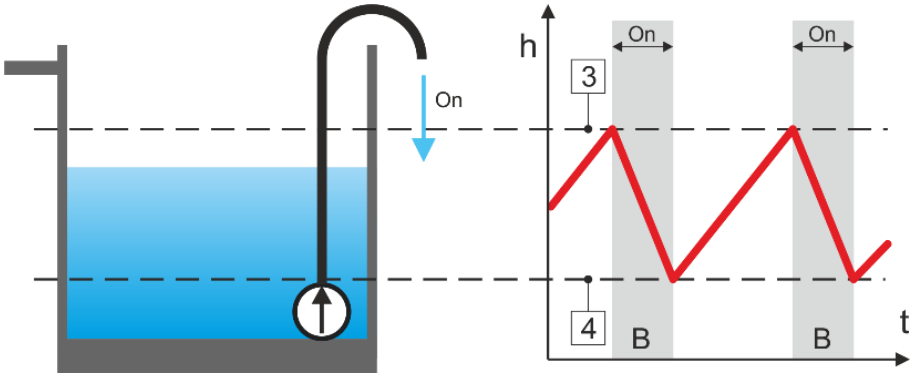
The red curve in the right part of the pictures indicates the level change in time, the grey shading "On" the time of switching the transistor binary output OK.

CONTROLLED AUTOMATIC DISCHARGE



Example 6. Setting of the switch-on [3] and switch-off [4] levels for controlled water supply to the sump by means of a solenoid valve.

CONTROLLED AUTOMATIC PUMPING

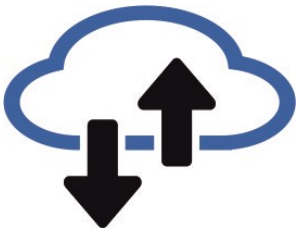


Example 7. Setting the switch-on [3] and switch-off [4] levels for controlled pumping of water from the sump by the submersible pump.

Display OK in the chart After enabling automatic output mode (1-2 Auto), the unit's display will show the set limit values for that parameter on the right side of the graph using two arrows *3-5-2 Switching limit [m]* a *3-5-3 Extension limit [m]*.

Default settings *The default values "Switching Limit" and "Switching Limit" are preset from the instrument's factory for controlled underflow, which switches on when the level drops to 1 m and switches off when the level reaches the set switching limit of 2 m.*

3-6 Data transfer



Parameters for setting the automatic transmission of the last measured level values via the internal communication module of the H531-G (H531-N) to the cloud (see chapter *7. Remote access* on p. 40).

The basic version of the H531 does not include any communication module and therefore the data transfer parameters cannot be set by this unit.

The H531-G level gauge unit contains a communication module in GSM/GPRS network. The H531-N level gauge unit includes a communication module in NB-IoT network.

3-6-1 First transmission [HH:MM DD.MM.YYYYY]

Parameter for setting the time and date of the first data transfer of the measured value to the server.

The set time value defines the moment when the communication module is switched on and the subsequent data transfer of the measured data to the cloud.

The date usually does not need to be set and it is sufficient to leave it in the preset form 01.01.2020. Only if it is necessary to start transferring data sometime in the future, or if the transfer interval is weekly (parameter *3-6-2 Transmission Interval)*, it is also advisable to set the date parameter to the desired future day or to the desired day of the week.

Default: *06:30 01.01.2022*

3-6-2 Transmission Interval [hr]

This parameter allows you to set the frequency of automatic transmission of the current measured level value to the server. The data transfer always occurs at the hour and minute specified by the parameter *3-6-1 First transmission [HH:MM DD.MM.YYYYY]*, to which the value of this parameter is successively added *3-6-2 Transmission Interval*.

The size of this parameter can be set from 24 hours to 168 hours (=1 week).

H531-G The H531-G with GSM/GPRS communication module must first be "logged" into the network before each data transmission. This energy-consuming task should only be performed once a day with a battery-powered instrument, otherwise the battery life would be significantly reduced.

H531-N The H531-N level meter using the NB-IoT network has a communication module that is permanently logged into the network, so it is possible to set the parameter value for this type of unit to transmit data more frequently than once a day.

Volume of transmitted data The set frequency of data transfers also has a significant impact on the total volume of data transferred to the cloud, because each data session contains not only the measured level data, but also the necessary overhead data for the security and operation of the communication protocol between the level meter and the server. Thus, as more frequent data sessions are set up, the volume of this overhead data overwhelms the measured level data.

Default: *24 hours*

3-6-3 Signal test

Start the procedure to measure the GSM field strength at the H531-G installation site. For reliable transmission of the measured data to the database on the Internet server, a GSM field strength of at least 15% from 0 to 100% is required.

More is devoted to this issue in the chapter 7.2.2 Antenna on p. 42.

The procedure for starting the GSM signal test procedure is clear from the following example.

Example 8.

Starting the "Signal Test" procedure

1. Selecting the "Data transfer" submenu

Use the UP / DOWN knobs to select the "Data Transfer" submenu from the "Main Menu" items.

Confirm the selection with the SET knob.

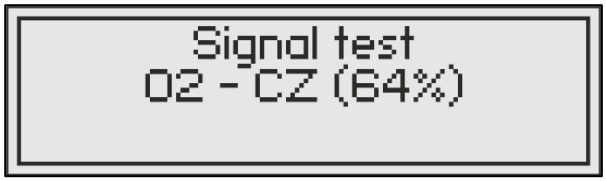
2. Selecting the "Signal test" procedure:

Use the UP / DOWN knobs to select the "Signal Test" menu item from the "Data Transfer" menu.

Confirm the selection with the SET knob.

After starting the "Signal test" procedure, the device first logs into the GSM network. This process is indicated by the following picture with a flashing pair of dots in the middle of the frame.

After the device is logged into the GSM network, instead of flashing dots, the name of the GSM operator is displayed in the middle of the display frame and the currently measured GSM field strength in brackets.



The level gauge automatically switches to the basic display mode after about 10 seconds of displaying the GSM field strength.

3-6-4 Sent data

Menu option for emergency and user-provoked data transfer to the server outside the set transfer interval. This option can be useful, for example, when installing the H531-G level gauge and then checking the currently measured data displayed in the cloud application on the server.

The procedure for starting the GSM signal test procedure is clear from the following example.

Example 9.

Starting the "Send data" procedure

1. Selecting the "Data Transfer" submenu

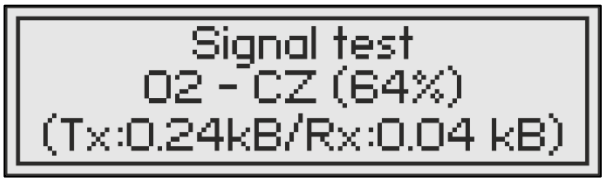
Use the UP / DOWN knobs to select the "Data Transfer" submenu from the "Main Menu" items. Confirm the selection with the SET knob.

2. Selection of the "Signal test" procedure:

Use the UP / DOWN knobs to select the "Data transfer" menu item from the "Send data" menu. Confirm the selection with the SET knob.

After the "Send data" procedure is started, the device is first logged into the GSM network.

After the device is logged into the GSM network, the name of the GSM operator and the GSM field strength are displayed on the device display.



During the data transfer to the server, the continuous volume of sent (Tx) and received (Rx) data in kB is displayed on the bottom line.

When the data transfer to the cloud is complete, the display automatically switches to the basic display mode of the measured level.

The GSM communication module switches off automatically together with the display when the level gauge enters the power saving mode.

3-7 Info

This last menu in the H531 menu is used to display selected quantities and identification and production data of the level gauge. The displayed values cannot be changed and are mainly for diagnostic purposes.

1 Battery voltage [V]
The voltage magnitude of the power supply battery in the loaded state.

2 External power supply [V]
The size of the external supply voltage. A value of 0 V indicates that the external power supply is switched off.

3 Pressure [hPa]
The current atmospheric air pressure value measured by the H531 unit. The air pressure is important for compensating the output signal of the absolute level sensors (TSH27, TSH28).

4 Temperature [° C]
Display the current temperature inside the H531.

5 Rel. Humidity [%]
Display of the current relative humidity inside the instrument. A relative humidity reading higher than 75% indicates a leak in the cabinet or a cable gland failure. Elevated relative humidity inside the unit can adversely affect the reliability and life of the electronic components of the H531 due to condensation.

6 Probe:
Display the type of connected level sensor. E.g. "TSH27 10m" or "LMK809".

7 Sensor range [m]
Display of the measuring range of the connected level sensor.

8 Minimum:
Display of today's minimum measured level including the measurement time in the form h:min Minimum [m] for the period from midnight to the present moment.

9 Maximum:
Display of today's maximum measured level including the measurement time in the form h:min Maximum [m] for the period from midnight to the present moment.

10 Binary output [0/1]
Current state of the binary output (on/off).

11 Limit ON [m] Limit OFF [m]

Set values of the switching and expansion limit of the binary output OK.

12 Modem
Type of communication module used.

13 Number of OK transmissions
Number of data sessions made to the server via the communication module.

14 Number of ERR transmissions
Number of failed data sessions to the server due to communication errors. Usually, the main cause of incomplete data sessions is a weak radio network field at the device installation site or low battery voltage.

15 Device ID
Unique identification number of the level gauge.

16 FW version
The current version of the installed firmware (software) of the level gauge.

17 Date of installation
Date of commissioning of the level gauge.

18 Back
Exit the "Info" menu and return to the parent menu.

3-8 Log out

This last option of the basic menu is used to return to the basic display mode of the unit and to log the user out of the unit's setup mode without waiting for the user to automatically log out 60 minutes after the last press of any of the unit's buttons.

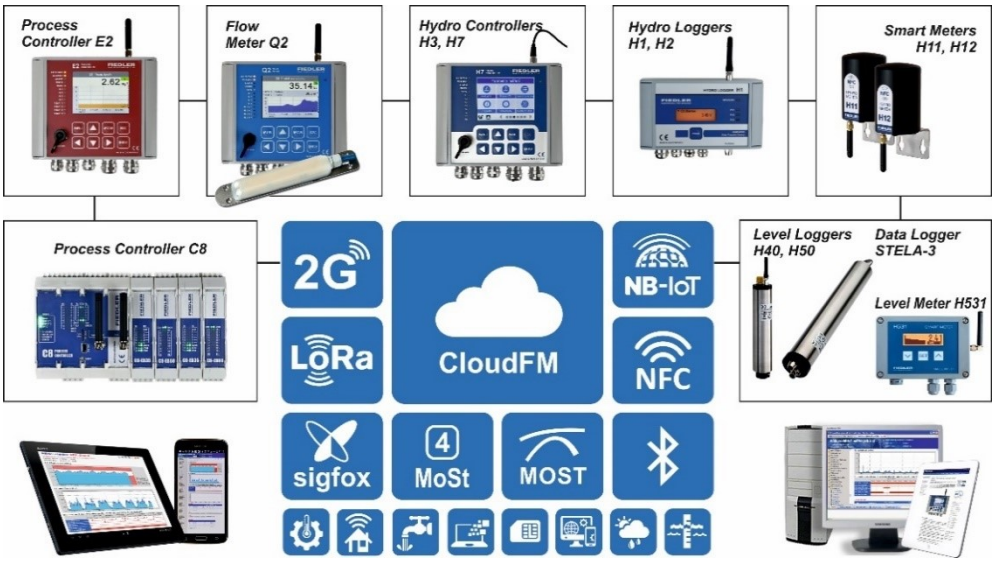
To log the user back into the setup mode after logging out, it is necessary to re-enter the Password.

7 Remote access

The H531-G or H531-N level gauges can use the built-in communication module to transmit the measured level to a database on a web server - CloudFM - operated by the level gauge manufacturer. The transmitted level data is then accessible to an authorised user via a standard web browser.

The communication between the station and the cloud is typically implemented through the network of a provider such as GSM/GPRS mobile network operators or IoT networks.

Collection of measured data on the server



Available types of H531 level gauges

The following overview table lists the available or upcoming types of H531 level gauges divided by the type of communication module:

H531	Level gauge without communication module
H531-G	Level gauge with internal GSM/GPRS communication module
H531-N	Level meter containing internal NB-IoT communication module

As communication technologies are constantly expanding, check with the manufacturer for the current range of H531-type level gauges.. equipped with remote transmission of measurement data to the cloud.

7.1. System architecture data collection

7.1.1. Active stations system

The H531-G and H531-N are characterized by long battery life and very low operating costs with regular data transfer to the server. This has been achieved by a system of active stations (level gauges) and a passive server. The server is always on and waiting for data from the individual stations, which themselves determine when the data will be transmitted to the server. In terms of long-term battery life, the communication module in the level gauge is only switched on for the time necessary to transfer data from the station to the server.

7.1.2. Data services

As mentioned, communication between the station and the cloud is typically done over a paid provider network such as mobile network operators or IoT networks.

The installed communication module therefore includes a suitable SIM card type. This "borrowed" SIM card has a low monthly fee optimised for the operation of the H531 and provides the necessary data volume to cover the requirements of the level gauge.

The system allows the use of operationally cheap types of tariff SIM cards without a fixed IP address. The fixed IP address is usually charged for, which increases the overall operating costs.

7.1.3. Cloud Services

Measured data from individual level gauges are sent to the cloud for further processing and visualization of the historical course of levels in the form of clear graphs and tables. Cloud services allow you to receive data from multiple level gauges simultaneously.

Remark: *The cloud is a group of securely connected powerful servers. The servers are located in server rooms with state-of-the-art HW and SW provisioning, high connectivity and data is permanently backed up to other machines with different geographical locations. The system is designed for maximum user comfort in accessing data and also to eliminate data loss.*

7.1.4. Datahosting Summary Service

Services for data transferred in mobile or IoT networks (chap: 7.1.2 Data services) and cloud services (chap: 7.1.3 **Cloud Services**), such as archiving, visualisation and processing of data from individual level gauges, are available to users of level gauges as part of the Datahosting subscription package.

The owner of the level gauge can choose from two types of packages:

Datahosting-1Y ..... one-year service package
Datahosting-5Y ..... five-year service package

The data hosting is operated on the basis of a contract concluded between the user/owner of the H531-x level meter and the data hosting service provider, which is the manufacturer of the level meter. For up-to-date information on data packages and user account set-up options for data access, please visit the manufacturer's website at:

https://www.fiedler.company/cs/produkty/software

7.2. Level gauge H531-G

The H531-G with remote access to the measured values uses a GSM/GPRS network for data transmission.

7.2.1. GSM/GPRS technology

GSM/GPRS technology is a universally applicable technology with excellent local and global coverage. It offers low running costs with good battery life.

SIM card The level gauge with built-in GSM/GPRS communication module has the type designation H531-G. The communication module integrated in the level gauge contains a chip SIM card or a flip-up holder for a standard SIM card.

GSM connector The external GSM antenna connects to the SMA coaxial connector located on the right side wall of the level gauge box. The built-in communication module of the level gauge is connected to this connector via a U.FL/SMA antenna reducer, which is also included with the -H531G level gauge.

7.2.2. Antenna

The H531-G includes an angled antenna with SMA connector.

GSM field intensity Reliable GPRS communication requires a GSM field strength of at least 20% from 0 to 100% at the location of the H531-G. At lower signal strengths, some GPRS data sessions may not take place at all or only on other days with better GSM signal propagation conditions. Therefore, when installing the level meter, it is important to ensure that it is placed in a suitable location, also in terms of sufficient GSM signal strength at the installation site.

More powerful GSM antennas In locations with very weak GSM signal, the standard antenna with 1 dB gain can be replaced by a larger omnidirectional magnetic antenna with up to 9 dB gain, type AGSM-9dB-SMA.

AGSM-1dB-SMA	AGSM-3dB-SMA	AGSM-9dB-SMA	AGSM-3dB/P-SMA
			
antenna supplied as standard Gain: 1 dB	attachment: magnet cable: 3m Gain: 3 dB	attachment: magnet cable: 3.5m Gain: 9 dB	Mounting: M12 cable: 3m Gain: 2 dB

External antenna for metal enclosures

When installing a level gauge, it is often the case that the instrument is placed in a metal cabinet or otherwise shielded from the external GSM field. In this case it is advisable to use a special hemispherical AGSM-3dB/P-SMA antenna, which is placed on the outer side surface of the metal housing. The antenna is fixed in a 12 mm diameter hole with a threaded nut.

DISPLAY OF GSM FIELD STRENGTH WHEN INSTALLING A LEVEL GAUGE

The current intensity of the GSM field at the installation site of the H531 level gauge can be found by running the "Signal test" procedure in the "Data transfer" submenu (see chap. 3-6-3 Signal test on p. 36).

7.2.3. Parameters of the H531-G level gauge

Parameters for setting the H531-G communication module are contained in the submenu *3-6 Data transfer* on p. 35, along with procedures for testing the GSM field strength and for emergency transfer of measured data to the cloud outside the normal set transfer interval.

Technical parameters

Display unit H531

Analog measurement input	voltage 0-5 V or current 4-20 mA / 0-20 mA (selectable via jumpers and parameters)
Frequency of measurements	5 measurements/sec
Measurement of atmospheric air pressure	integrated barometer, type. Measuring accuracy. ±0.1 hPa
Display	32 x 128 pixel backlit LCD graphic display
Resolution of the displayed level	0,1 m
Serial communication line	Modbus RTU / FINET protocol
Output for sensor power supply	12 V / max. 40 mA
Input Surge Protection	suppressors 600 W, 15 V DC
Binary output	open collector, Umax 28 V DC, Imax 0.5 A
External power supply voltage	+5 to +28 V DC / max 0.5 A for 12 V DC
Operating temperature range	-20° C ... +50 C °
Dimensions	120 x 80 x 55 mm (without M12 cable glands)
Weight	220 g
Material / Coverage	ABS / IP65

Level sensors TSH27-10 TSH27-25

Sensor type	Absolute strain gauge sensor with voltage output, air pressure compensation outside the sensor
Measuring range of the TSH27-10 sensor	0 .. 10 mH_2 O
Measuring range of the TSH27-25 sensor	0 .. 25 mH O_2
Measurement accuracy	±2.5% of the measuring range
Output signal	0 .. 5 V DC
Supply voltage	12 V DC /max 20 mA
Connection cable TSH27-10	shielded PUR cable 3x 0,25; length 10 m or 25 m
Connection cable TSH27-25	shielded PUR cable 3x 0,25; length 30 m
Working temperature	-0° C ... +40 C °
Storage temperature	-30° C ... +75 C°
Sensor material	Stainless steel, polyurethane cable insulation
Dimensions	diameter 27 mm, height 80 mm
Mounting thread	G1/2"
Weight / protection / IP68	350 g without cable

TSH35 level sensors

Sensor type	pressure compensated strain gauge sensor
Sensor measuring range	0 .. 10 mH_2 O

Measurement accuracy	± 1 % of measuring range
Output signal	2-Wire: 4-20 mA
Supply voltage	8-28 V DC /max 25 mA
Connection cable	shielded PUR cable
Operating temperature range	-0° C ... +50 C °
Sensor material	stainless steel housing. steel 304; diaphragm 316L
Dimensions	diameter 24 mm, height 75 mm
Weight / Coverage	150 g without cable / IP68

LMK809 level sensors

Sensor type	pressure compensated strain gauge sensor
Sensor measuring range	From 0 ... 0.4 mH_2 O to 0 ... 100 mH O_2
Measurement accuracy	± 1 % of measuring range
Output signal	2-Wire: 4-20 mA
Supply voltage	9-28 V DC /max 25 mA
Connecting cable	shielded PUR cable
Operating temperature range	-0° C ... +50 C °
Sensor material	Housing: PP-HT; diaphragm: ceramic AL O $_{23}$
Dimensions	diameter 45 mm, height 126 mm
Weight / Coverage	320 g without cable / IP68

CE

CE version

The instruments listed in this user manual comply with the EMC directives 89/336/EU including their supplements, as well as EN 61326-1:98 including supplements.

Disposal of equipment

The manufacturer has concluded a take-back contract with ASEKOL a.s. You can find a list of collection points in your area at www.asekol.cz.

Installation according to this user manual may only be carried out by personnel at least in accordance with Section 5 of Decree 50/1978 Coll. or 51/1978 Coll.

Warranty Card

Type: H531___ v. no.: _____ Date of sale: _____

Sensor: _____ v. no.: _____

.....

Manufacturer / Supplier

The product was tested and set up correctly before being shipped from the company. Nevertheless, it may happen that during operation, defects may appear on the device that are undetectable when the product is tested by the manufacturer.

If any defect is caused by faulty material, workmanship or software, the product will be repaired or replaced free of charge if the claim is made within the warranty period, which is :

two years from the date of sale.

If the manufacturer is unable to repair or replace the product within the warranty period, it may provide a refund of the purchase price upon return.

The manufacturer is not liable for defects caused by interference with the design of the device, damage to the device or improper connection. When installing and operating the device, it is necessary to observe all the instructions in the Technical Specifications, the related ČSN and safety rules.

All repairs during the warranty period are the sole responsibility of the manufacturer. For hygiene reasons, only clean and properly packaged products should be sent for repair.

Assurance of conformity

within the meaning of Act No.22/1997 Coll., on technical requirements for products

Manufacturer :

FIEDLER AMS s.r.o.
Lipová 1789/9, 370 05 České Budějovice, Czech Republic
ID:03155501

Pursuant to§ 13 paragraph (5) of Act No.22/1997 Coll., on Technical Requirements for Products, we assure the distributor/customer that we have issued a "Declaration of Conformity" for the products manufactured/imported by us, which are covered by the aforementioned Act and the relevant government regulations

In Ceske Budejovice on 11. 06. 2021

Ing. Jindřich Fiedler
Managing Director

CRJF231127.103c
H531, H531-G

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