Installation Manual

Installation and Service Manual

SLL210 AnyLevel™

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1 Disclaimer

This publication is provided solely as guide for individuals who have received technical training and are familiar with the technical manuals of the METTLER TOLEDO products.

If you cannot find the information you are looking for, please contact METTLER TOLEDO Service.

METTLER TOLEDO reserves the right to make Revisions without notice. Subject to technical changes.

2 Precautions

READ this manual BEFORE operating or servicing this equipment.

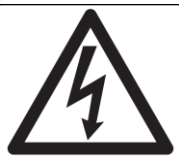
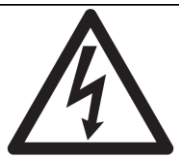
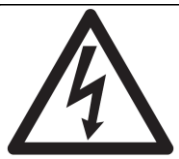
FOLLOW these instructions carefully.

SAVE this manual for future reference.

DO NOT allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment.

ALWAYS DISCONNECT this equipment from the power source before cleaning or performing maintenance.

CALL METTLER TOLEDO for parts, information, and service.

	⚠ CAUTION
	PERMIT ONLY QUALIFIED PERSONNEL TO SERVICE THIS EQUIPMENT. EXERCISE CARE WHEN MAKING CHECKS, TESTS, AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.
	⚠ CAUTION
	FOR CONTINUED PROTECTION AGAINST SHOCK HAZARD, CONNECT TO A PROPERLY GROUNDED OUTLET ONLY.
	⚠ CAUTION
	DISCONNECT ALL POWER TO THIS UNIT BEFORE INSTALLING, SERVICING, CLEANING, OR REMOVING THE FUSE. FAILURE TO DO SO COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.
	⚠ CAUTION
	BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT, ALWAYS REMOVE POWER AND WAIT AT LEAST 30 SECONDS. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN BODILY HARM OR DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT.

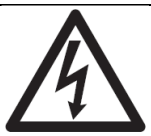
Tank Design

NOTICE
THE TANK AND ITS SUPPORT SYSTEM MUST BE DESIGNED BY A LOCALLY QUALIFIED STRUCTURAL ENGINEER; THIS INCLUDES THE SELECTION OF LEVEL SENSORS WHICH BECOME AN INTEGRAL PART OF THE SUPPORT

STRUCTURE. THIS IS PARTICULARLY CRITICAL IF THE TANK IS SUBJECT TO EXTRANEOUS FORCES, FOR EXAMPLE TO WIND OR SEISMIC ACTIVITY. REFER TO THE WEIGH MODULE SYSTEMS HANDBOOK.
NOTICE
DO NOT USE HERMETICALLY SEALED (WELDED) LEVEL SENSORS IN A VACUUM AS THEY MAY BE DAMAGED. CONTACT INDUSTRIAL SUPPORT FOR ASSISTANCE.
NOTICE
IN SELECTING THE LEVEL SENSOR RATED CAPACITY, CONSIDER ALL LOADS SUPPORTED BY THE SENSOR INCLUDING LIVE LOAD TO BE MEASURED, THE DEAD LOAD OF THE TANK AND THE WEIGHT OF SUPPORTED ANCILLARY EQUIPMENT. ALSO CONSIDER THE WEIGHT DISTRIBUTION IF NOT EVENLY DISTRIBUTED ON ALL SENSORS. REFER TO THE WEIGH MODULE SYSTEMS HANDBOOK.
NOTICE
LEVEL SENSORS CAN BE DAMAGED IN WET, WASHDOWN AND CORROSIVE CONDITIONS. REFER TO THE WEIGH MODULES SYSTEMS HANDBOOK FOR MORE INFORMATION.
NOTICE
TEMPERATURE CHANGES CAN AFFECT ZERO POINT OR SENSITIVITY AND ADD MECHANICAL BINDING OR DAMAGE TO THE LEVEL SENSORS. FOR MORE DETAILS REFER TO THE WEIGH MODULES SYSTEMS HANDBOOK.
NOTICE
IF A TANK IS INSTALLED BETWEEN 2 ROOMS AT DIFFERENT PRESSURES (E.G., A THROUGH-FLOOR TANK INSTALLATION WITH A CLEAN ROOM ABOVE), THIS WILL AFFECT LEVEL MEASUREMENT ACCURACY IF THE PRESSURE DIFFERENTIAL FLUCTUATES.
NOTICE
LEVEL SENSORS MUST BE INSTALLED BETWEEN TWO RIGID FRAMES OR SURFACES. LEVEL MEASUREMENT ACCURACY WILL BE AFFECTED IF THE SCALE LEVEL VARIES.

Installation and Service

	⚠ CAUTION
	CONFIRM WITH THE CUSTOMER THAT THE ENVIRONMENT IS SAFE FOR THE INSTALLATION OR SERVICE WORK TO BE PERFORMED. THIS IS PARTICULARLY IMPORTANT IN HAZARDOUS AREAS.
	⚠ CAUTION
	PRIOR TO COMMENCING ANY WORK, REVIEW WITH THE CUSTOMER THE NATURE OF THE WORK TO BE PERFORMED AND COMPLY WITH THE CUSTOMER'S POLICIES AND PROCEDURES FOR WORKING IN THE VICINITY OF THE TANK EQUIPMENT.
	⚠ CAUTION
	CORDON OFF THE WORK AREA TO RESTRICT ACCESS. IF WORKING ON A MEZZANINE FLOOR OR ELEVATED PLATFORM, CORDON OFF THE AREA UNDERNEATH TO PREVENT INJURIES FROM FALLING OBJECTS.

	⚠ CAUTION WEAR PROTECTIVE GEAR (E.G., GLOVES, HARD HAT, SAFETY SHOES) AS APPROPRIATE TO THE PRODUCT AND AS REQUIRED ON THE PARTICULAR WORK SITE.
	⚠ CAUTION OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.
	⚠ CAUTION EXERCISE CARE WHEN MAKING CHECKS, TESTS, AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.
	⚠ CAUTION IN CASE OF TANK MOVEMENT OR OSCILLATION, STOP AND ISOLATE THE TANK BEFORE CLEANING OR MAKING ANY ADJUSTMENTS TO THE LEVEL SENSORS.
	⚠ CAUTION BE SURE TO BLOCK THE TANK WHEN IT IS IN THE RAISED POSITION WHILE, FOR EXAMPLE, REPLACING A LEVEL SENSOR. DO NOT RELY ON THE JACKING DEVICE ALONE. THE JACK AND BLOCK SHOULD STAND VERTICALLY AND SECURELY CONTACT THE FOUNDATION AND TANK ABOVE. IF THE TANK IS NOT SECURELY BLOCKED, IT COULD SHIFT POSITION RESULTING IN BODILY HARM OR PROPERTY DAMAGE. OBSERVE ALL APPROPRIATE SAFETY PROCEDURES RELATED TO LIFTING AND JACKING.
	⚠ CAUTION IF OPERATING IN A HAZARDOUS AREA, THE HAZARDOUS AREA MUST BE MADE SAFE PRIOR TO INSTALLATION, REPLACEMENT OR TROUBLESHOOTING. FAILURE TO COMPLY COULD RESULT IN PERSONAL INJURY, DEATH, AND/OR PROPERTY DAMAGE. THE FOLLOWING CONDITIONS SHOULD BE FULFILLED: 1. THE AREA HAS BEEN RENDERED SAFE AND THE CUSTOMER'S SAFETY COORDINATOR HAS CONFIRMED THAT THERE IS NO DANGER. ENSURE THAT ALL INSTRUCTIONS RELATED TO SAFETY ISSUED BY THE CUSTOMER CAN BE COMPLIED WITH. 2. THE CUSTOMER HAS ISSUED A PERMIT ("SPARK PERMIT" OR "FIRE PERMIT") 3. THE NECESSARY TOOLS AND ANY REQUIRED PROTECTIVE CLOTHING ARE PROVIDED (DANGER OF THE BUILD-UP OF STATIC ELECTRICITY).
	⚠ CAUTION INSTALL EQUIPMENT IN A HAZARDOUS AREA ONLY IF THE FOLLOWING CONDITIONS ARE FULFILLED: 1. THE EQUIPMENT HAS BEEN DEEMED SUITABLE FOR THE PARTICULAR HAZARDOUS AREA. AS APPROPRIATE, ENSURE THAT THE INTRINSICALLY SAFE CHARACTERISTIC VALUES AND DIVISION/ ZONE APPROVALS OF THE INDIVIDUAL COMPONENTS ARE IN ACCORD WITH ONE ANOTHER.

	2. THE EQUIPMENT CAN BE INSTALLED IN ACCORDANCE WITH ITS INSTALLATION INSTRUCTIONS 3. THE EQUIPMENT CAN BE INSTALLED AND POWERED IN ACCORDANCE WITH REGULATIONS, STANDARDS AND STATUTORY REQUIREMENTS FOR ELECTRICAL AND MECHANICAL SYSTEMS IN HAZARDOUS AREAS FOR THE RESPECTIVE COUNTRY. 4. INSTALL ALL COMPONENTS IN HAZARDOUS AREAS IN SUCH A WAY AS TO AVOID IMPACTS & FALLING OBJECTS 5. IN THE EU, MECHANICAL EQUIPMENT INSTALLED IN HAZARDOUS AREAS MUST COMPLY WITH EN ISO 80079-36, NON-ELECTRICAL EQUIPMENT FOR EXPLOSIVE ATMOSPHERES. CONSULT THE METTLER TOLEDO ATTESTATION OF CONFORMITY KEMA 211129000 FOR A LISTING OF SUITABLE EQUIPMENT. 6. ENSURE PROPER EQUIPOTENTIAL GROUNDING OF THE TERMINAL, MOUNTING ACCESSORIES, AND LEVEL SENSORS. NOTE: INCORRECT OR SUBSTITUTE COMPONENTS AND/OR DEVIATION FROM METTLER TOLEDO INSTRUCTIONS CAN IMPAIR THE SAFETY OF THE SYSTEM AND COULD RESULT IN BODILY INJURY AND/OR PROPERTY DAMAGE.

NOTICE
FAILURE TO INSTALL LEVEL SENSORS AND ASSOCIATED PARTS IN STRICT CONFORMITY WITH THIS DOCUMENT MAY RESULT IN MALFUNCTION, LEVEL MEASUREMENT INACCURACY, AND MAY PERMANENTLY DAMAGE THE EQUIPMENT.
NOTICE
TAKE CARE WHEN LOWERING THE TANK ONTO THE LEVEL SENSORS NOT TO CREATE ANY SHOCK LOADS THAT COULD DAMAGE A WEIGH MODULE, LOAD CELL, OR LEVEL SENSOR.
NOTICE
DO NOT PASS WELDING CURRENT THROUGH THE LEVEL SENSORS! WHEN WELDING ON A TANK, POSITION THE GROUND CLAMP AS CLOSE AS POSSIBLE TO THE WELD SITE AND SUCH THAT THE WELDING CURRENT FLOWS DIRECTLY TO THE CLAMP WITHOUT PASSING THROUGH ANY SENSOR. SHIELD THE SENSOR CABLE FROM WELD SPATTER. NEVER WELD WITHIN 4 FEET (1.2 METERS) OF ANY SENSOR WITHOUT REMOVING THE SENSOR.
NOTICE
THE LEVEL SENSOR'S TOP AND BOTTOM PLATES AND/OR THREADED STEM MUST BE FIXED AND SUPPORTED SUFFICIENTLY TO AVOID ANY DEFORMATION OF THESE PARTS UNDER LOAD. YOU CAN FULLY SUPPORT THE BASE PLATE BY GROUTING UNDER IT OR BY SHIMMING AT MULTIPLE LOCATIONS.
NOTICE
THE ANTI-LIFT-OFF SCREW OR SLEEVE, WHERE USED, MUST BE LOCKED IN POSITION AS DESCRIBED FOR THE ANTI-LIFT-OFF FUNCTION TO OPERATE CORRECTLY. FAILURE TO DO SO MAY RESULT IN BODILY HARM OR DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT.

Use and Routine Maintenance

	⚠CAUTION

IN HAZARDOUS AREAS:

1. AVOID ELECTROSTATIC CHARGING DURING OPERATION AND MAINTENANCE. KEEP THE EQUIPMENT AWAY FROM PROCESSES THAT GENERATE HIGH CHARGING POTENTIAL SUCH AS ELECTROSTATIC COATING, RAPID TRANSFER OF NON-CONDUCTIVE MATERIALS, RAPID AIR JETS, AND HIGH PRESSURE AEROSOLS.

2. DO NOT USE A DRY CLOTH TO CLEAN NON-CONDUCTIVE PARTS OF LOAD CELLS, WEIGH MODULES, LEVEL SENSORS AND THEIR ACCESSORIES. ALWAYS USE A DAMP CLOTH TO GENTLY CLEAN THESE ITEMS.

NOTICE

DO NOT OVERLOAD THE TANK BY EXCEEDING TANK CAPACITY.

NOTICE

EXERCISE CARE IN LOADING A TANK TO AVOID SHOCK DAMAGE TO THE LEVEL SENSORS; THIS CAN OCCUR IF HEAVY SOLID OBJECTS ARE DROPPED OR LOWERED QUICKLY ONTO IT. REFER TO THE WEIGH MODULE SYSTEMS HANDBOOK.

NOTICE

IN CASE OF TANK MOVEMENT OR OSCILLATION, STOP AND ISOLATE THE TANK BEFORE CLEANING THE LEVEL SENSORS.

NOTICE

ICE BUILD-UP AROUND THE LEVEL SENSOR CAN SERIOUSLY IMPACT PERFORMANCE AND MAY DAMAGE THE SENSOR. AVOID STANDING WATER, ESPECIALLY IN AREAS WHERE IT CAN FREEZE.

NOTICE

SNOW, ICE, CONDENSATION, OR DEBRIS BUILD-UP ON A TANK WILL DIRECTLY IMPACT THE MEASUREMENT. REFER TO THE WEIGH MODULE SYSTEMS HANDBOOK.

NOTICE

WIND AND DRAFTS ACTING ON THE UNDERSIDE, SIDE, OR TOP OF A TANK CAN AFFECT LEVEL MEASUREMENT ACCURACY.

Disposal of Electrical and Electronic Equipment

IN CONFORMANCE WITH THE EUROPEAN DIRECTIVE 2002/96 EC ON WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE) THIS DEVICE MAY NOT BE DISPOSED OF IN DOMESTIC WASTE. THIS ALSO APPLIES TO COUNTRIES OUTSIDE THE EU, PER THEIR SPECIFIC REQUIREMENTS.

PLEASE DISPOSE OF THIS PRODUCT IN ACCORDANCE WITH LOCAL REGULATIONS AT THE COLLECTING POINT SPECIFIED FOR ELECTRICAL AND ELECTRONIC EQUIPMENT.

	IF YOU HAVE ANY QUESTIONS, PLEASE CONTACT THE RESPONSIBLE AUTHORITY OR THE DISTRIBUTOR FROM WHICH YOU PURCHASED THIS DEVICE. SHOULD THIS DEVICE BE PASSED ON TO OTHER PARTIES (FOR PRIVATE OR PROFESSIONAL USE), THE CONTENT OF THIS REGULATION MUST ALSO BE RELATED. THANK YOU FOR YOUR CONTRIBUTION TO ENVIRONMENTAL PROTECTION.

3 Introduction

This document is intended to cover the electrical and mechanical installation in non-hazardous environment. For more information for installation please refer to the additional documentation on the download page. Link

For background information about tank installations please refer to the Weigh Module Systems Handbook. Link

Consideration of all safety relevant design precautions including but not limited to wind load resistance and thermal expansion is required. Level detection sensor installation requires mechanical and electrical skills and shall only be performed by trained and authorized technicians.

4 General Rules

4.1 Welding

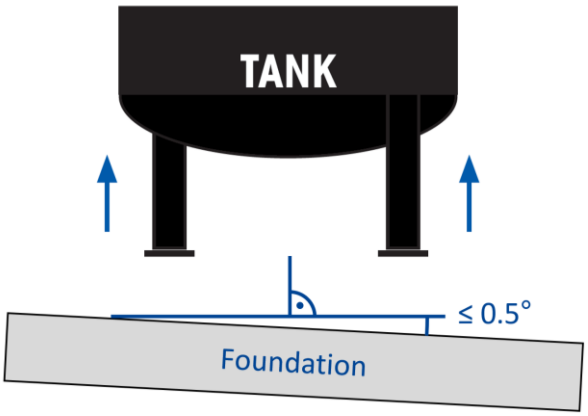
Stray current can destroy the level sensor. Therefore, do not pass welding current through the sensor! Whenever welding cannot be avoided, ground the welding device as close as possible to the welding seam. Never weld closer than 1.2 meter (4 feet) to any sensor.

4.2 Foundation Strength

In terms of foundation strength please ensure the surface is stiff enough to avoid deflection. Soft floors can cause deflection relative to tank accessories such as pipes, leading to inaccuracy of the measurement result. In cases of soft foundation causing deflection please reinforce foundation if necessary and contact your civil engineering office to get support.

4.3 Leveling

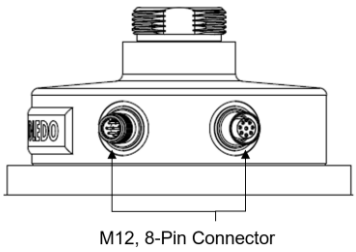
Unevenly installed level sensor can result in inaccurate measurement results. To achieve good accuracy of your products a general rule of thumb can be applied: leveling must be within 0.5° in any direction. This equals an upward or downward slope of 1mm (1/32inch) per 100mm (4inches).



5 Product Description

The SLL210 AnyLevel™ sensors come in a laser welded stainless steel housing with protection class IP69K. To cover as much storage tank applications as possible the sensors are available in two sizes, covering the capacities 1t, 3 t (Size 1) and 10t, 30 t (Size 2). For one storage tank one sensor per support point is needed and the sensors are connected to each other in a daisy chain.

5.1 Sensor Overview



Size 1 sensor with receiver option.

5.2 Configuration Overview

Level sensors are offered in different variants of capacity, material, and communication protocols to meet the different needs. The following table gives an overview of the different variant configurations:

Sizes	Materials	Communication protocol
Size 1: 1 t /3 t	Stainless steel (SS)	4-20 mA (optional with HART)
Size 2: 10 t / 30 t	Carbon steel (CS)	IO-Link

5.3 Model Identification

The SLL210 model number and serial number are located on the type-plate attached to the level sensor. Figure 1-1 shows an example of the type-plate. The model Identification regarding the communication Protocol is according to the following.

- A (4-20 mA analog)
- AH (4-20 mA analog HART®)
- IOL (IO-Link)

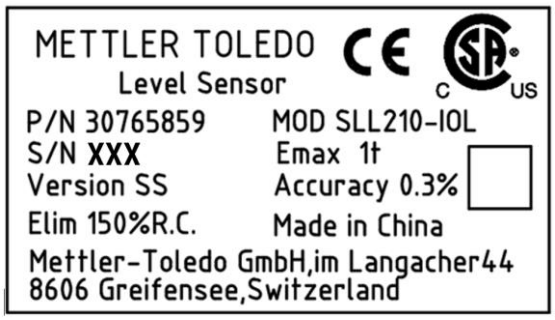
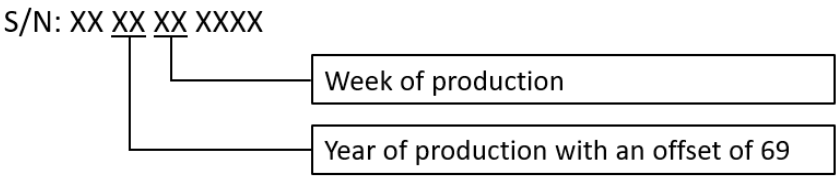


Figure 1-1: SLL210-IOL type plate example

The date of manufacture can be identified via the serial number according to the following illustration.



5.4 Item Numbers

Please refer to the SLL210 Product Brochure for a complete listing of the item numbers for all different sensor variants as well as the accessories.

5.5 Certificates, Approvals and Declarations

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

You can download the approvals, certificates, and declarations from the Product Compliance Document System - METTLER TOLEDO (mt.com).

5.6 Registered Trademarks

AnyLevel™

Smart5™

HART®

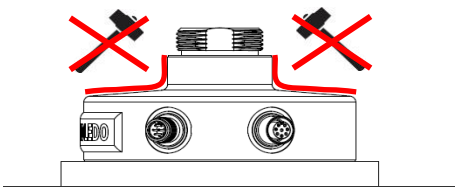
5.7 Incoming Inspection, Transport, Storage

For Incoming Acceptance check the packing and contents for any signs of damage. Check the shipment, make sure nothing is missing and that the scope of supply matches your order.

For Transport Follow the safety instructions and transport conditions for instruments of more than 18 kg.

For Storage pack the measuring instrument so that is protected against impacts for storage and transport. The original packing material provides the optimum protection for this. The permissible storage temperature is -40 °C to +80 °C.

Ensure that you avoid impacts on the top sensor surface!



6 Mechanical Installation and Wiring

6.1 Mechanical Options

We offer three different options of mechanical tank installation to meet various tank feet requirements.

6.1.1 Receiver Option (Size 1 and Size 2)

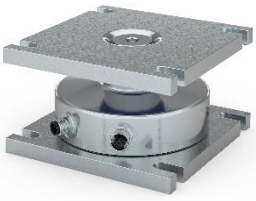
The Receiver option is installed by positioning the sensors below the tank legs. The receiver has a pan with a concave shape and a radius of 60 mm (2.4''). The tank leg bottom radius shall be smaller or equal to the receiver radius to ensure proper load transfer. Shim below the sensor until the load distribution is smaller or equal to ±10 %. The base plate can be fixed to the ground to ensure a defined position and prohibit sliding of the sensor. Four mounting bolts M10 (3/8'') for Size 1 (1 t / 3 t version) or four mounting bolts M20 (3/4'') for Size 2 (10 t / 30 t version) should be used.

6.1.2 Stem Option (Size 1 only)

The Stem option needs to be installed by mounting the threaded stem to the tank leg. The Stem option is available as ISO Stem (M20) or Stem UNF (3/4'') for the US. The stem is secured by a counter nut using a 30 mm tool wrench. This procedure needs to be applied for all legs of one tank system. With the Stem option, it is possible to compensate for height differences of the foundation. Turn the stem until the load distribution is less than or equal to ±10 % and secure it with the counter nut. After the tank is in the desired place and the height difference is compensated with the threaded stem, the base plate needs to be mounted to the ground using 4 M10 (3/8'') screws per sensor. With this installation the sensors withstand the uplift forces given in the product Product Brochure.

6.1.3 Plate Option (Size 1 and Size 2)

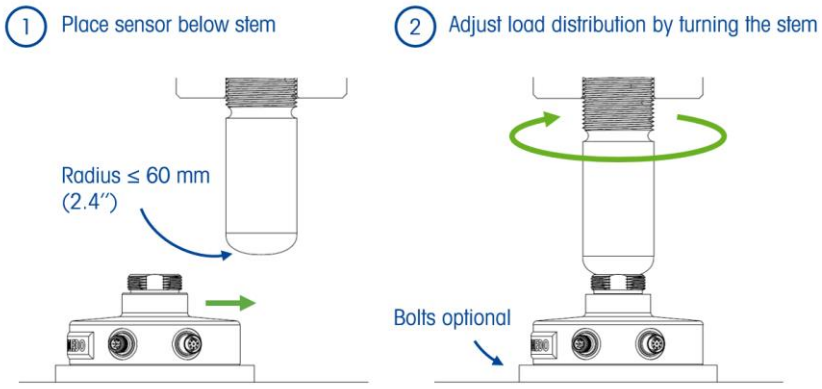
The Plate option needs to be installed by mounting the top plate of each Level sensor to the tank leg using four mounting bolts M10 (3/8'') for Size 1 (1 t / 3 t version) or four mounting bolts M20 (3/4'') for Size 2 (10 t / 30 t version). This procedure needs to be applied for all legs of one tank system. The base plate needs to be fixed to the ground (same screw sizes as for the top plate). Differences in the foundation height need to be compensated by shimming to ensure a uniform load distribution of ±10 %. With this installation, the sensors withstand the uplift forces given in the product datasheet.



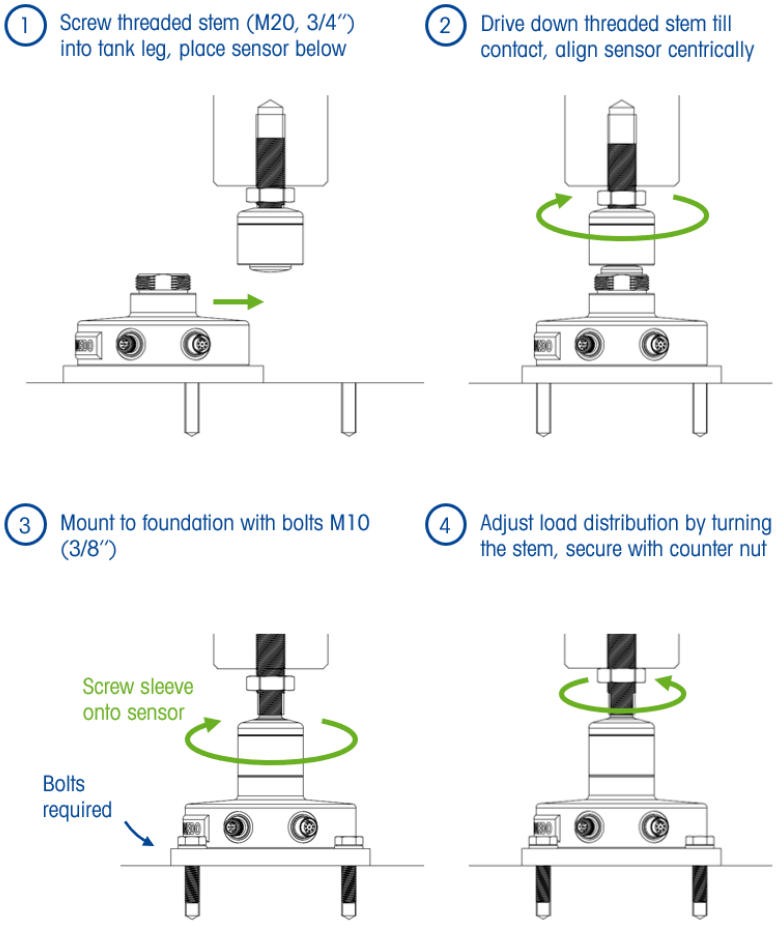
6.2 Installation Guidance

The following illustrations show the step-by-step tasks to install the different Level sensor options

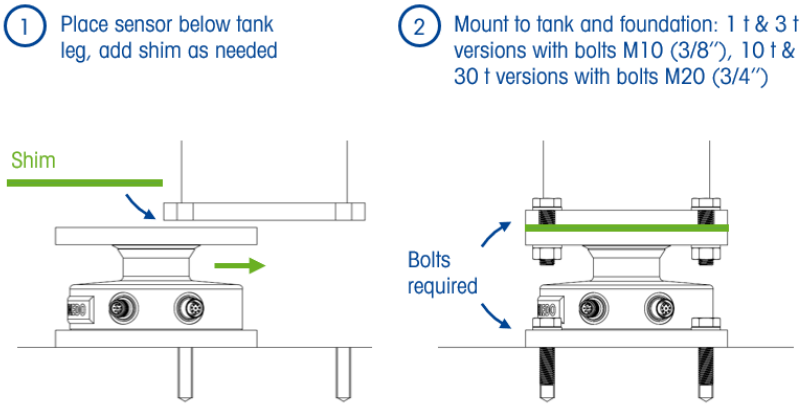
6.2.1 Receiver Option



6.2.2 Stem Option



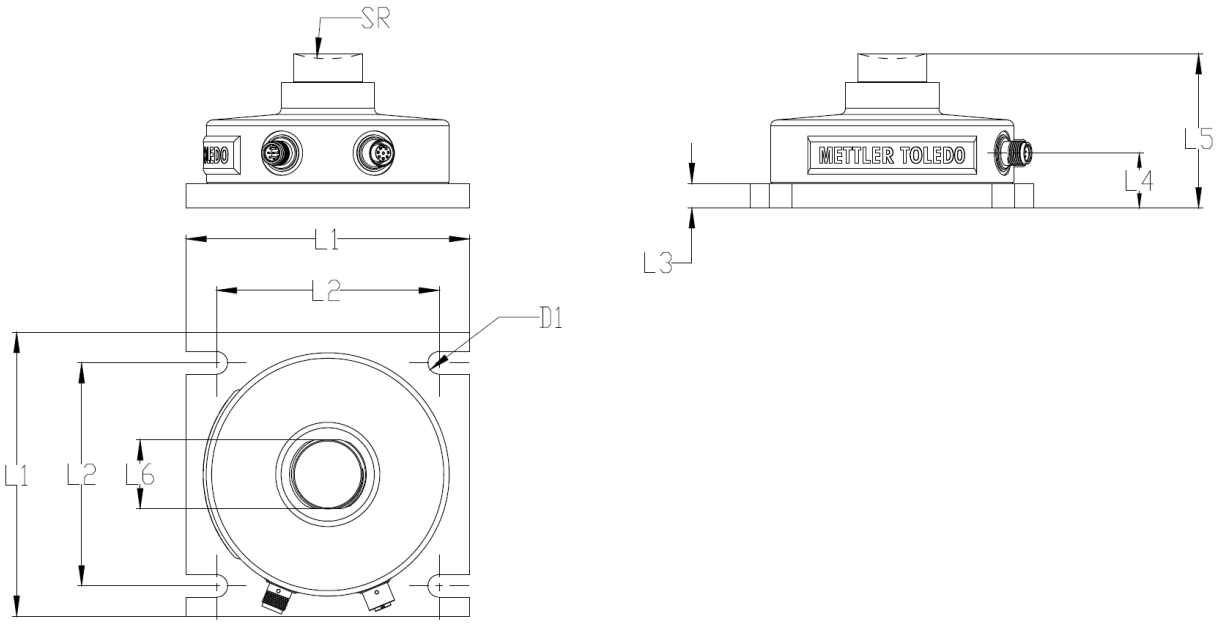
6.2.3 Plate Option



6.3 Dimensions

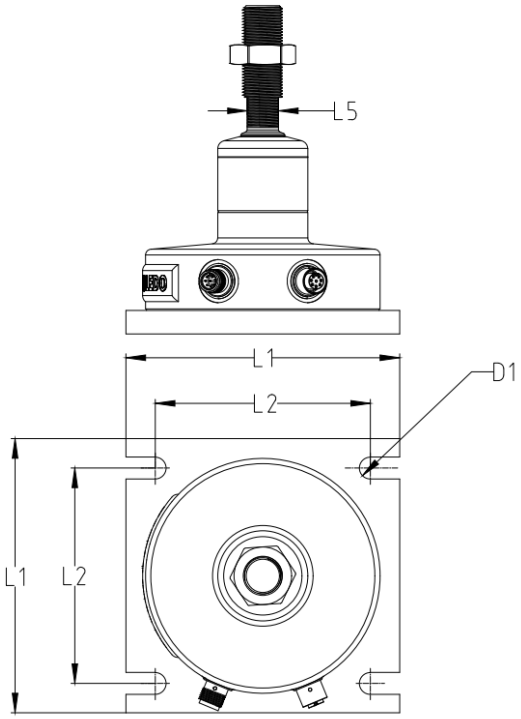
Regarding the screw positions at the sensor, the exact dimensions can be read from the following drawing and the related table.

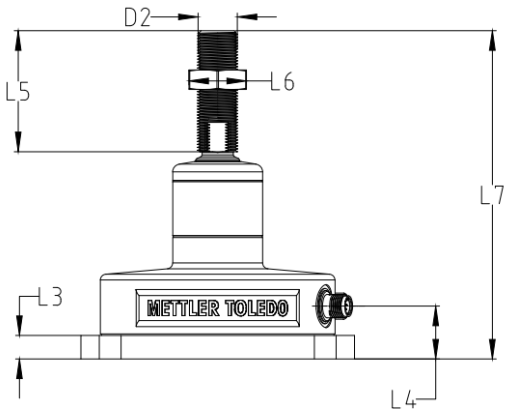
6.3.1 Receiver Kit



Capacity	Location and dimensions (mm [inch])							
	L1	L2	L3	L4	L5	L6	D1	SR
1T / 3T	140 [5.51]	110 [4.33]	12 [0.47]	27 [1.06]	76 [2.99]	34 [1.33]	11.2 [0.44]	60 [2.36]
10T / 30T	210 [8.26]	160 [6.29]	15 [0.59]	34 [1.33]	95 [3.74]	Width 61 [2.40]	22 [0.86]	60 [2.36]

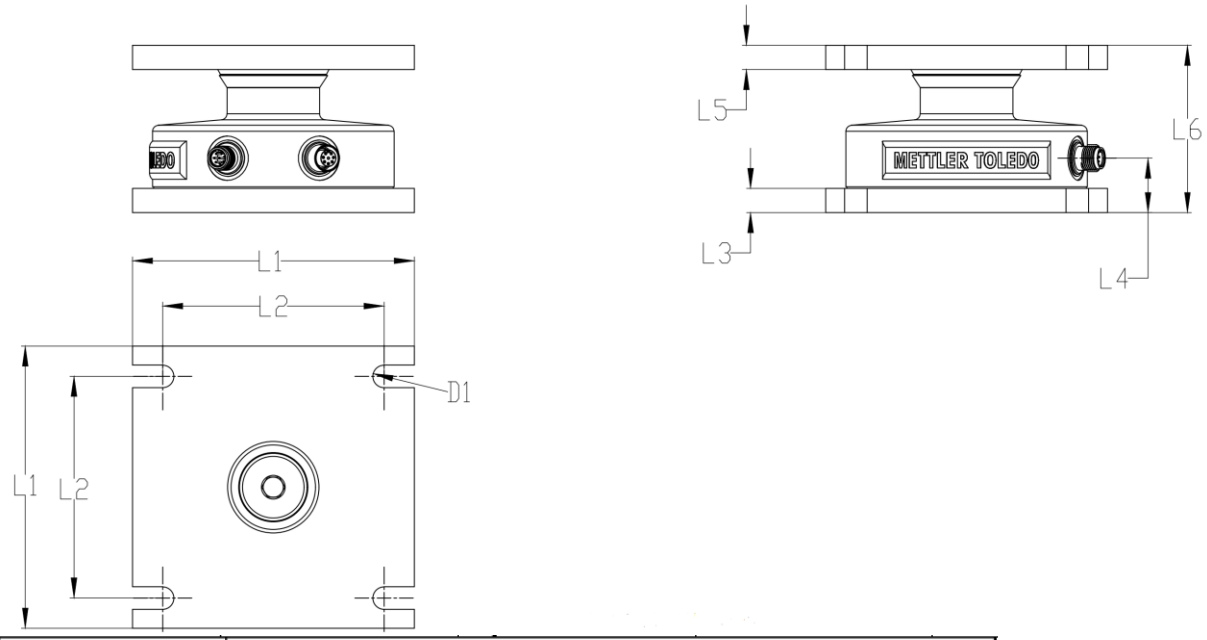
6.3.2 Stem Kit





Capacity	Location and dimensions (mm [inch])								
	L1	L2	L3	L4	L5	L6	L7	D1	D2
1T / 3T	140 [5.51]	110 [4.33]	12 [0.47]	110 [4.33]	16 [0.62]	30 [1.18]	168 [6.61]	11.2 [0.44]	M20X1.5 [¾"-16 UNF]

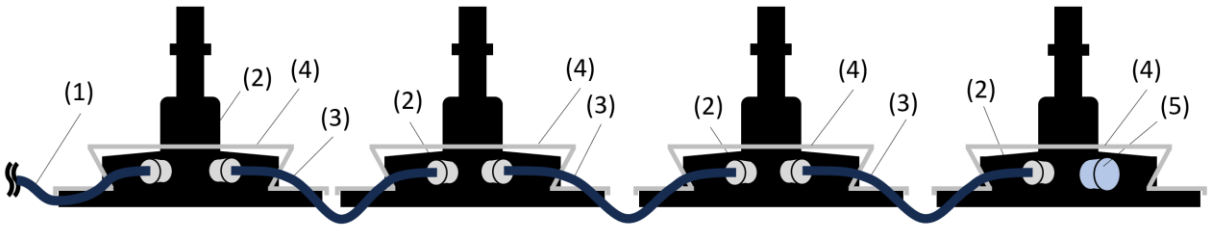
6.3.3 Plate Kit



Capacity	Location and dimensions (mm [inch])					
	L1	L2	L3	L4	L6	D1
1T / 3T	140 [5.51]	110 [4.33]	12 [0.47]	27 [1.06]	83 [3.26]	11.2 [0.44]
10T / 30T	210 [8.26]	160 [6.29]	19 [0.74]	34 [1.33]	102.6 [4.03]	22 [0.86]

6.4 Cable connection

The SLL210 AnyLevel™ system is designed for daisy chain topology. This means the sensors need to be connected to each other using a standard M12 8-Pin cell-to-cell cable. The first Sensor in this Daisy chain needs to be connected to the control system by using the homerun cable.



The picture above shows how the sensors (2) are connected. Standard M12 cables (3) are used to connect the sensors, whereas the direct PLC connectivity requires a Homerun cable (1). The Connectors are protected from mechanical hazards by a metallic cover (4). Depending on the protocol, the last sensor is terminated with a resistor or a Button (5).

On the last sensor there is a terminal resistor installed for the IO-Link version and the 4-20 mA HART Version. The 4-20 mA version requires an LED button (see ordering information in Product Brochure) which is plugged into the 8-Pin connector of the last sensor. The order of the connection is self-explaining, as there is always a male and a female connector on all the level sensors being connected with a male to female cable.

After connecting the sensors using the cell-to-cell cables, the metallic cover (Figure 1, (4)) can be mounted by loosening two of the mounting bolts holding the bottom plate, inserting the metallic cover by sliding it in from the front and fastening the mounting bolts again. After this, disconnection of the cables and damage due to

mechanical hazards are prevented. In the tables below the maximum number of sensors in a daisy chain specified for different supply voltages. The total length of the homerun and cell-to-cell cables is given for a standard 8-wirecable with 24 AWG wire size.

Input voltage 24V

Cell to cell / Homerun	20m	15m	10m	5m	1m
200m	3	4	4	4	4
150m	5	5	5	6	6
100m	6	7	8	9	10
50m	8	9	11	12	12
5m	11	12	12	12	12

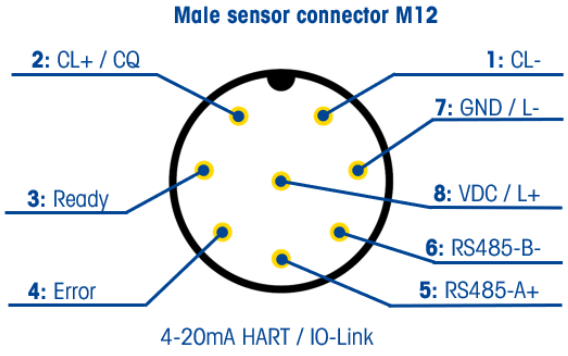
Input voltage 30V

Cell to cell / Homerun	20m	15m	10m	5m	1m
200m	6	6	6	6	6
150m	7	8	8	9	9
100m	9	10	11	12	12
50m	11	12	12	12	12
5m	12	12	12	12	12

6.5 Pin Assignment

The cell-to-cell cable is independent of the communication protocol. A dedicated cable with 8-Pin to 5 Pin connector is offered as Homerun cable for the IO-Link version. For the 4-20 mA and HART version an 8 Pin cable with connector on the sensor side and open end on the other side can be ordered according to the ordering information in the Product Brochure.

On the following figure, the pin layout of the male connector is shown, it is the same for every sensor version.



Homerun cable colors

	Signal	Color
1	CL-	Blue
2	CL+ / CQ	White
3	Ready	Yellow
4	Error	Pink
5	RS485-A+	Green
6	RS485-B-	Brown
7	GND / L-	Black
8	VDC / L+	Red

The output signal is provided on Pins 1 and 2 for 4 – 20 mA and 4 – 20 mA HART versions, and on Pins 3 and 4 for IO-Link. Pins 5 and 6 are used for the internal communication of the sensor network. Pins 7 and 8 are the power supply.

7 Operation

In this chapter the set-up procedure and the basic operation of the sensor system are described.

7.1 IO-Link

To operate IO-Link sensors, an IODD file needs to be added to the control system. This file contains information about the device's identity, parameters, process data, diagnosis data, communication properties and the structure of the user interface. **The Data Structure and the process parameters are explained in detail in APPENDIX 1: IO-Link.**

The setup of the sensor system in the IO-Link environment needs to be executed according to the following routine.

1. Connect the sensors to each other in a daisy chain via 8-Pin M12 cables and plug in the Terminal resistor to the last sensor.
1. Connect the first sensor to the IO-Link Master via the Homerun cable.
2. After power on, wait approx. 12 s.

Software setup:

1. Start the IO-Link Software on a PC.
2. Set up the connection to the IO-Link Master by connecting it to a PC via USB or Ethernet cable.
3. Assign the IO-Link **Device Description File** SLL210xxx.xml to the IO-Link Master

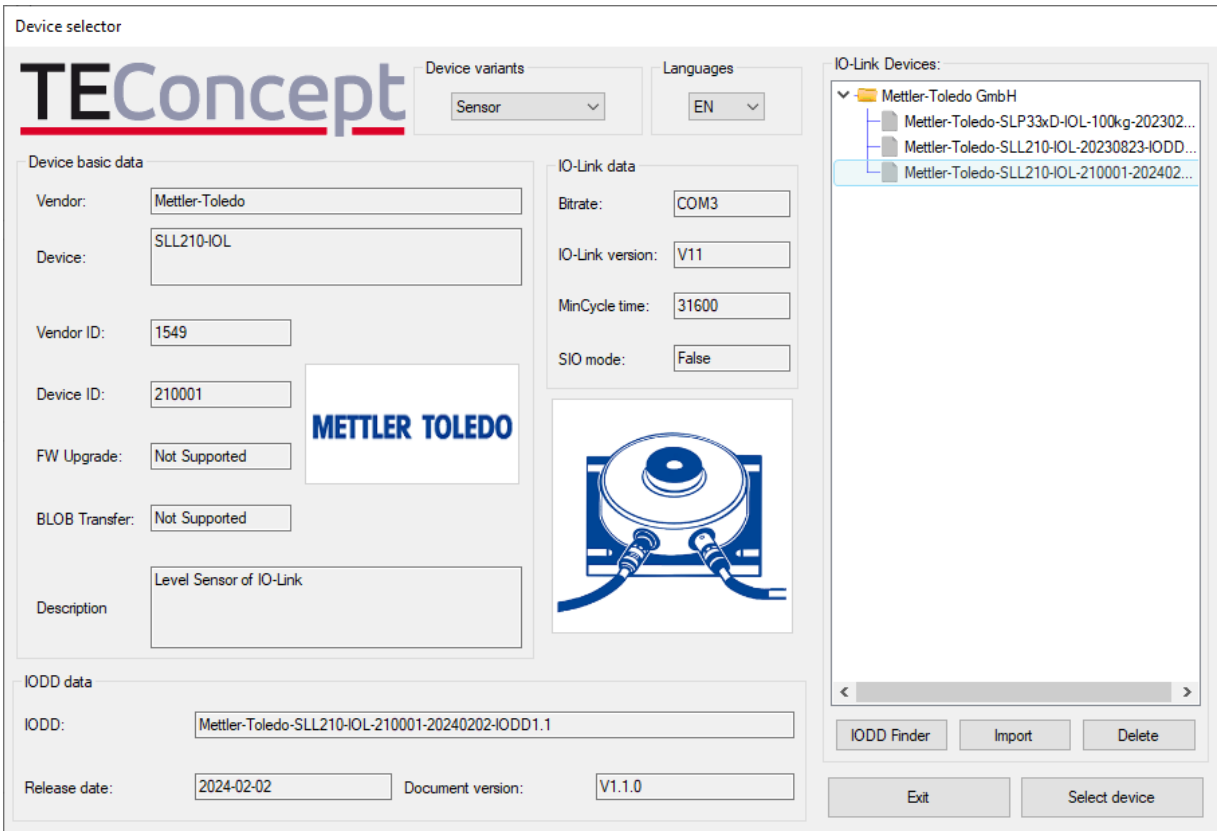
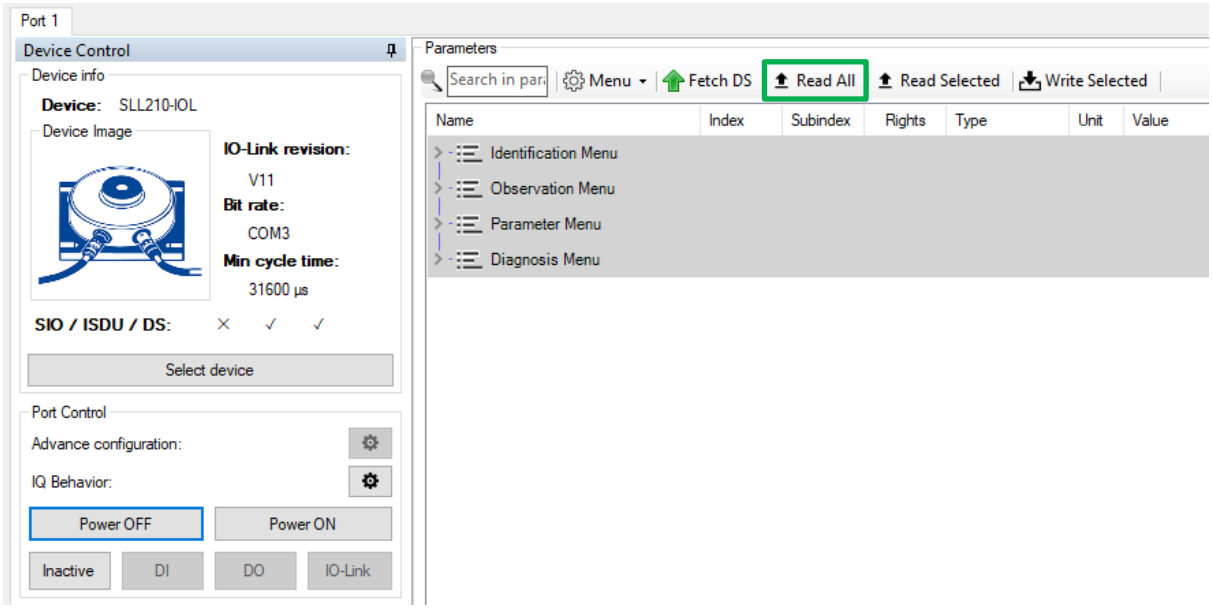
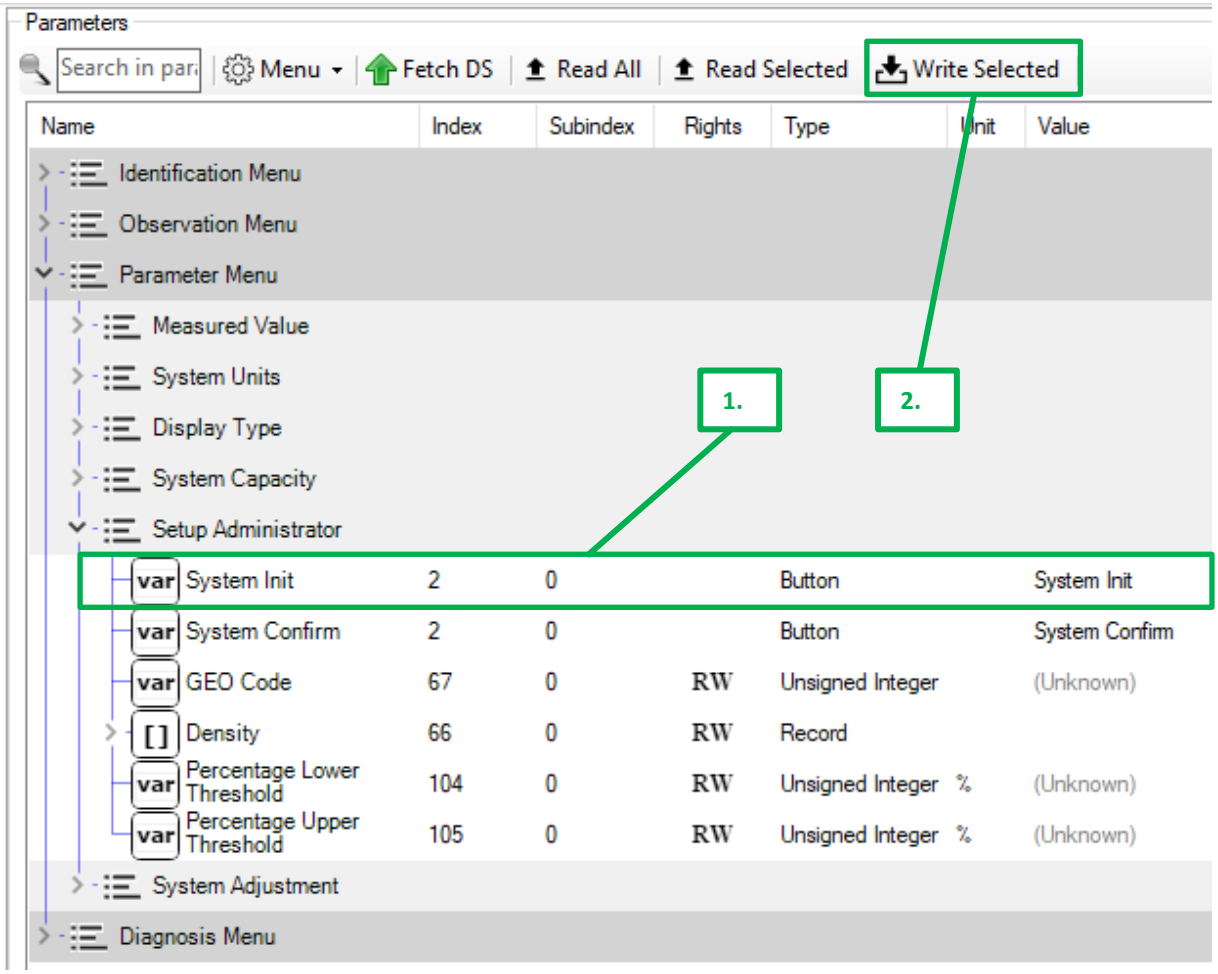


Figure: IO-Link device description file selection in the IO-Link Control Tool Software environment from TE Concept GmbH.

4. You are now able to access all functions such as device settings, operation, diagnostic functions. Hit "**Read all**" to read the parameters from the sensor system.

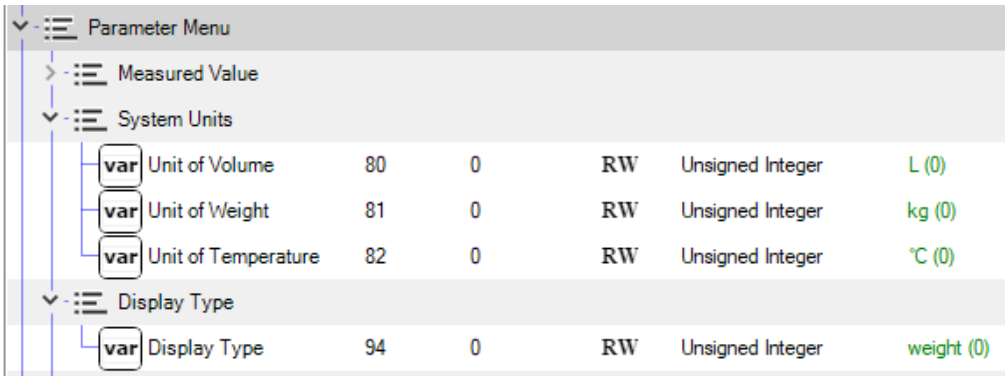

Port 1
Device Control
Device info
Device: SLL210-IOL
Device Image
IO-Link revision:
V11
Bit rate:
COM3
Min cycle time:
31600 µs
SIO / ISDU / DS:
Select device
Port Control
Advance configuration:
IQ Behavior:
Power OFF
Power ON
Inactive
DI
DO
IO-Link
Parameters
Search in par
Menu
Fetch DS
Read All
Read Selected
Write Selected
Name
Index
Subindex
Rights
Type
Unit
Value
Identification Menu
Observation Menu
Parameter Menu
Diagnosis Menu

5. In **Parameter Menu/Setup Administrator** Write the command **"System Init"** to initialize the sensor connection. Ensure that the **Specialist Mode** is enabled to access this Parameters.



a. Main Status will change from INITIALIZING (0) to INITIALIZED (2)
b. Number of sensors is recognized.
c. Measured Data is outputted.
d. Heartbeat is running.

6. In the **Parameter Menu**, define the **System Units**. Default values are in **bold**:
    e. System Volume.
        i. **L (0)**
        ii. m^3 (1)
        iii. ft^3 (2)
        iv. yd^3 (3)
        v. US gal (4)
        vi. US bsh (5)
    f. Define the weight unit.
        i. **Kg (1)**
        ii. Lb (2)
        iii. t (3)
    g. Define the temperature unit.
        i. **°C (1)**
        ii. °F (2)
    h. Define the display type.
        i. **Weight**
        ii. Volume
        iii. Percent



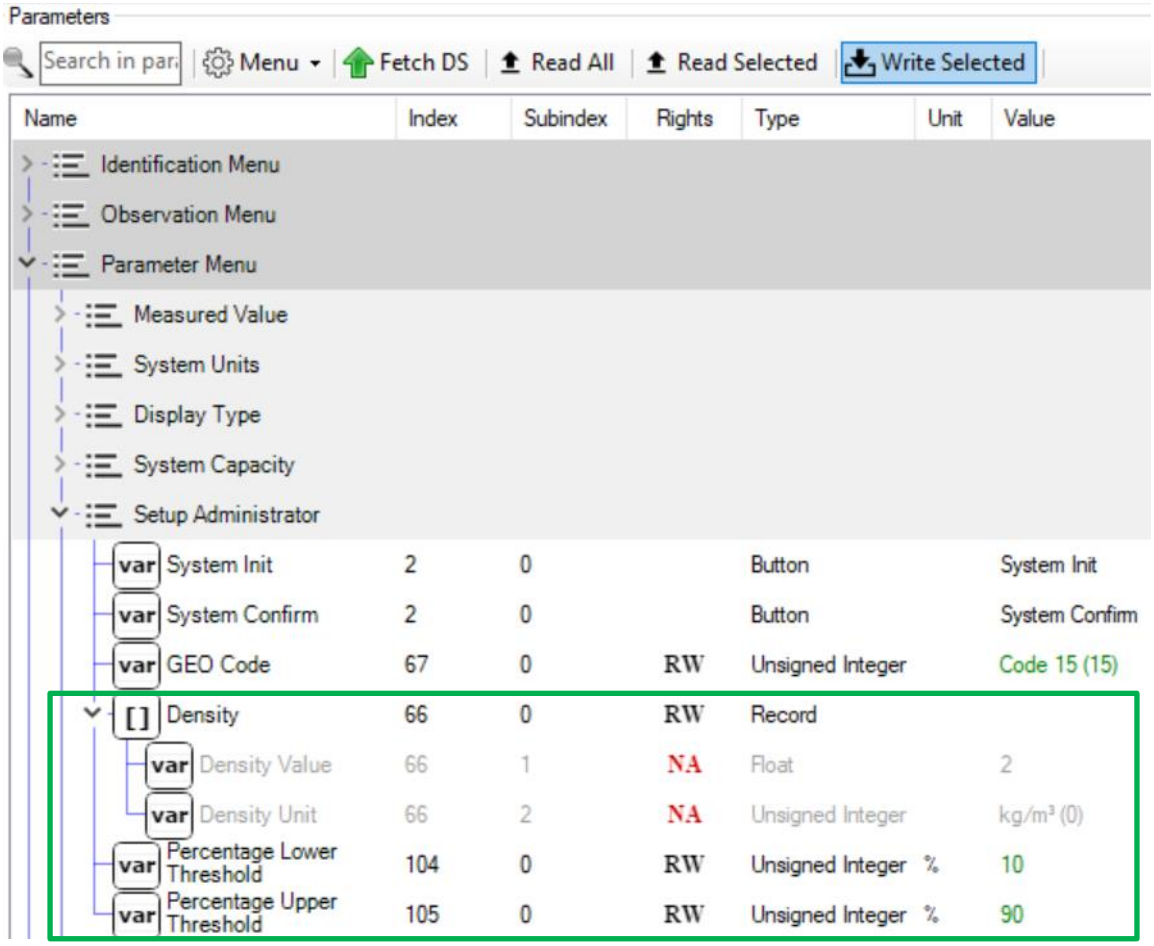
3. In the **Parameter Menu/Setup Administrator**
   a. Assign the GEO Code from 0 to 31 according to g-value listed in the table below, or the METTLER TOLEDO reference table in APPENDIX 2.

Table: Gravity values mapped to integer numbers (GEO Code)

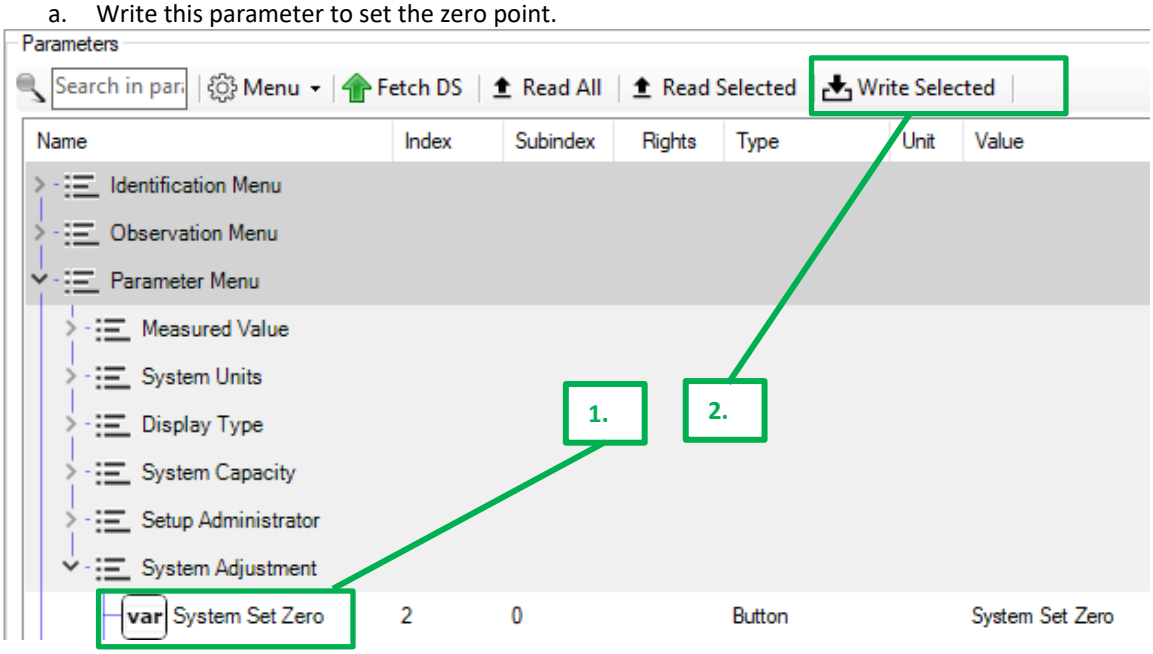
g-value (m/s^2)	**GEO Code**
9.770390	0
9.772378	1
9.774367	2
9,776356	3
9.778347	4
9.780338	5
9.782330	6
9.784323	7
9.786316	8
9.788311	9
9.790306	10
9.792302	11
9.794299	12
9.796297	13
9.798295	14
9.800295	15

g-value (m/s^2)	**GEO Code**
9.802295	16
9.804296	17
9.806298	18
9.808300	19
9.810304	20
9.812308	21
9.814313	22
9.816319	23
9.818326	24
9.820333	25
9.822341	26
9.824351	27
9.826361	28
9.828371	29
9.830383	30
9.832396	31

   b. Assign the density (previously defined units apply).
      i. **kg/m^3 (0)**
      ii. g/ml (1)
      iii. lb/ft^2 (2)
      iv. lb/yd^3 (3)
      v. lb/US gal (4)
      vi. lb/US bsh (5)
   c. Assign percentage value for lower threshold.
   d. Assign percentage value for upper threshold.


Parameters
Search in par
Menu
Fetch DS
Read All
Read Selected
Write Selected
Name
Index
Subindex
Rights
Type
Unit
Value
Identification Menu
Observation Menu
Parameter Menu
Measured Value
System Units
Display Type
System Capacity
Setup Administrator
System Init 2 0 Button System Init
System Confirm 2 0 Button System Confirm
GEO Code 67 0 RW Unsigned Integer Code 15 (15)
Density 66 0 RW Record
Density Value 66 1 NA Float 2
Density Unit 66 2 NA Unsigned Integer kg/m³ (0)
Percentage Lower Threshold 104 0 RW Unsigned Integer % 10
Percentage Upper Threshold 105 0 RW Unsigned Integer % 90

4. In the **System Adjustment/System set Zero**
    a. Write this parameter to set the zero point.



7.2 4-20 mA HART

The setup of the sensor system in the HART Protocol environment needs to be executed according to the following routine.

2. Connect the sensors in a daisy chain via 8-Pin M12 cables and plug in the Terminal resistor to the last sensor.
3. Connect the master sensor to the control system via the Homerun cable.
4. After powering on the system, wait 12 s.

Software setup:

1. Start the HART Software
2. Select the HART Communication server
3. Assign the Device description file to the device catalog “METTLER_TOLEDO.SLL210-AH.x.x.xHART.fdix”
4. In case everything is installed correctly, the Device Type SLL210-AH will show up in the device catalog.
5. You are now able to access all functions such as device settings, operation, and diagnostic functions.

Sensor parametrization:

5. Initialize the sensor network in the software.
    a. Device Settings / Basic Setup / Initialize System
        i. Start initializing.
        ii. Set the Geo Code according to the METTLER TOLEDO reference table in Appendix 2.
6. Set the unit
    a. Device Settings/Display setup / PV unit
        i. kg / t / lb / ton
7. Start the adjustment.
    a. Basic setup/ Start adjustment.
    b. Set the 0 % level / Next / Apply the new 0 % input, Next/ Start adjustment, Next.
    c. Set the 100 % level / Next / Apply the new 0 % input, Next/ Start adjustment, Next.
8. Set the values for lower and upper limit of the storage silo.
    a. Device settings / System setup / PV lower range value
    b. Device settings / System setup / PV upper range value
    c. Device settings / System setup / Upper threshold
    d. Device settings / System setup / Lower threshold

7.2.1 Malfunction 4-20 mA HART

For the 4 – 20 mA HART digital version, the system shall output malfunction indication current when the system has a malfunction. The malfunction current is always 3.6 mA. During initialization the output current is 3.6 mA. The table below shows the different output current values, and what those mean.

Case Category	Case description	mA	Measures
System failed	#1 sensor can't work or 4-20mA cable broken	0	Replace #1 sensor or 4-20mA cable
System initializing	System is initializing	3.6	Wait for initialize finish or finished initialization needs user confirmation.
System malfunction	System can’t work	3.6	Get information from HART commands or DD display.
System weight exceeds upper threshold	System weight is above 112.5%*{System Capacity}	22	Check tank weight
System working	System can work	3.8 ~ 20.5	None

7.3 4-20 mA

The setup of the 4-20 mA sensor system needs to be executed according to the following routine.

1. Connect the sensors in a daisy chain via 8-Pin M12 cables and plug in the LED button to the last sensor.
2. Connect the master sensor to the power supply and the control system.
3. After power on the system, wait approx.12 s.
4. Initialization will start automatically; the LED Button will blink fast (LED frequency: 5 Hz).
5. When the initialization is finished, the LED Button will be constantly on.
6. For Zeroing, press the LED Button for 1 < 4 s.
7. For resetting the system, press the LED Button for 4 < 10 s.
8. System is working (LED frequency: 1 Hz)

The following table gives an overview about different blinking modes and button operations.

Description	**Rate / time**
Slow blinking	1 Hz
Fast blinking	5 Hz
Short press	1 s- 4 s
Long Press	4 s – 10 s
No press	<1s
Invalid press	>10 s

7.3.1 Malfunction 4-20 mA

For the 4 – 20 mA analog version, the system will output a malfunction indication current when system has a malfunction. The current range is <= 3.6 mA or = 22.0 mA. The mapping between malfunction and current is shown below. The current can be detected, e.g., by a digital hand-held multimeter.

Malfunction Category	Malfunction description	mA	Measures
System failed	#1 sensor can't work or 4-20mA cable broken	0	Replace #1 sensor or 4-20mA cable
Single sensor broken (communication OK)	#1 Sensor broken	0.2	Replace #1 sensor
	#2 Sensor broken	0.4	Replace #2 sensor
	#3 Sensor broken	0.6	Replace #3 sensor
	#4 Sensor broken	0.8	Replace #4 sensor
	#5 Sensor broken	1	Replace #5 sensor
	#6 Sensor broken	1.2	Replace #6 sensor
	#7 Sensor broken	1.4	Replace #7 sensor
	#8 Sensor broken	1.6	Replace #8 sensor
	#9 Sensor broken	1.8	Replace #9 sensor
	#10 Sensor broken	2	Replace #10 sensor
	#11 Sensor broken	2.2	Replace #11 sensor
	#12 Sensor broken	2.4	Replace #12 sensor
RESERVED		2.6	RESERVED
Communication errors	Communication errors may relate to broken sensor or broken cable.	2.8	Check the Cable connections, do a reset of the system by pressing the button for 5 seconds. If this does not solve the error, replace the sensors
System initializing or other system errors	System is initializing.	3.0	Wait for initialize finish or need RESET.
Installation errors	Mixed sensor type, etc.	3.2	Check sensor type.
Environment errors	Low/High supply voltage, low/high temperature, etc	3.4	Use multimeter to check
System weight exceeds lower threshold	System weight is below -2.5%*{System Capacity}	3.6	Check level sensor installation.
System weight exceeds upper threshold	System weight is above 112.5%*{System Capacity}	22	Check tank weight

8 Service Parts and Accessories

There are no dedicated services parts available. Accessories are listed in the following table.

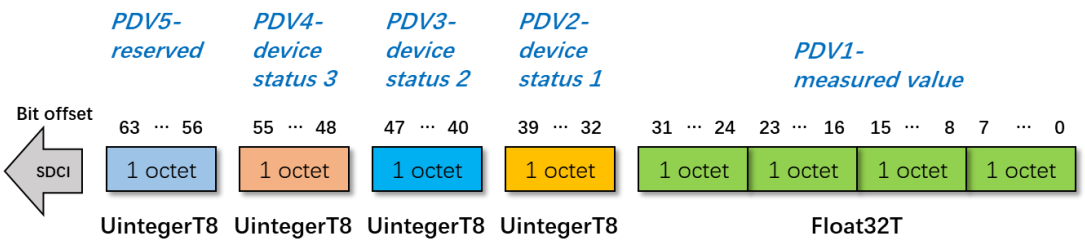
Accessories	Material No.
Level Sensor Button with LED M12	30937213
Level Sensor Terminal Resistor M12 120 Ohm	30937214
Cable LC-LC M12 8 Pin SLL210 1 m	30937215
Cable LC-LC M12 8 Pin SLL210 2 m	30937216
Cable LC-LC M12 8 Pin SLL210 5 m	30937217
Cable LC-LC M12 8 Pin SLL210 7 m	30937218
Cable LC-LC M12 8 Pin SLL210 10 m	30937219
Cable LC-LC M12 8 Pin SLL210 20 m	30937220
4–20 mA HART Cable Homerun M12 8 Pin SLL210 5 m	30937221
4–20 mA HART Cable Homerun M12 8 Pin SLL210 10 m	30937222
4–20 mA HART Cable Homerun M12 8 Pin SLL210 15 m	30937223
4–20 mA HART Cable Homerun M12 8 Pin SLL210 25 m	30937224
4–20 mA HART Cable Homerun M12 8pin SLL210 50 m	30937225
4–20 mA HART Cable Homerun M12 8 Pin SLL210 100 m	30937226
4–20 mA HART Cable Homerun M12 8 Pin SLL210 150 m	30937227
4–20 mA HART Cable Homerun M12 8 Pin SLL210 200 m	30937228
IO-Link Cable Homerun M12 8 Pin SLL210 1 m	30937229
IO-Link Cable Homerun M12 8 Pin SLL210 2 m	30937230
IO-Link Cable Homerun M12 8 Pin SLL210 5 m	30937231
IO-Link Cable Homerun M12 8 Pin SLL210 10 m	30937232
IO-Link Cable Homerun M12 8 Pin SLL210 20 m	30937233
4–20 mA Extension Homerun Extended M12 8 Pin SLL210 25 m	30937234
4–20 mA Extension Homerun Extended M12 8 Pin SLL210 100 m	30937235

APPENDIX 1: IO-Link

Data Structure

Process Data Input structure

Process data input	Index 40	Subindex 0	RecordT (64 Bit)
Measured Value		Octet 0 ~ 3	Float32T (32 Bit)
Device status 1		Octet 4	UIntegerT (8 Bit)
Number Of Sensors			UIntegerT (4 Bit)
System Status			UIntegerT (4 Bit)
Device status 2		Octet 5	UIntegerT (8 Bit)
Smart5 Level5 Alarm			BooleanT (1 Bit)
Smart5 Level4 Alarm			BooleanT (1 Bit)
Smart5 Level3 Alarm			BooleanT (1 Bit)
Smart5 Level2 Alarm			BooleanT (1 Bit)
Reserved			BooleanT (1 Bit)
Reserved			BooleanT (1 Bit)
Reserved			BooleanT (1 Bit)
Heartbeat			BooleanT (1 Bit)
Device status 3		Octet 6	UIntegerT (8 Bit)
Measured Unit			UIntegerT (4 Bit)
Measured Type			UIntegerT (2 Bit)
Lower Alarm Status			BooleanT (1 Bit)
Upper Alarm Status			BooleanT (1 Bit)
Reserved		Octet 7	UIntegerT (8 Bit)



IODD Explanation

Identification

Parameter	Index	Subindex	Data Type	RW
Vendor name	Index 16	Subindex 0	StringT (19 Byte)	RO
Factory setting	Mettler-Toledo GmbH			
Vendor text	Index 17	Subindex 0	StringT (14 Byte)	RO
Factory setting	Mettler-Toledo			
Product Name	Index 18	Subindex 0	StringT (30 Byte)	RO
Factory setting	SLL210-IOL Level Sensor System ACS210-IOL Level Sensor System		Level sensor system Zone2 box system	
Product Text	Index 20	Subindex 0	StringT (19 Byte)	RO
Factory setting	Level Sensor System			
Product ID	Index 19	Subindex 0	StringT (6 Byte)	RO
Factory setting	Sensor Zone2 box		Level sensor system Zone2 box system	
Serial Number	Index 21	Subindex 0	StringT (10 Byte)	RO
	xxxxxxxx			
Hardware Version	Index 22	Subindex 0	StringT (5 Byte)	RO
	x.x.x			
Firmware Version	Index 23	Subindex 0	StringT (14 Byte)	RO
	x.x.x.xxxxxxxx			
Application Specific Tag	Index 24	Subindex 0	StringT (32 Byte)	RW
Factory setting	***			
Function Tag	Index 24	Subindex 0	StringT (32 Byte)	RW
Factory setting	***			
Application Specific Tag	Index 24	Subindex 0	StringT (32 Byte)	RW
Factory setting	***			

Process Data Input/Output

Parameter	Index	Subindex	Data Type	RW
Measured Data	**Index 40**	**Subindex 1**	**Float32T (32 Bit)**	**RO**
		Measured value. The data type and unit of this value matches subindex 9 and subindex 10. If the value is not available, it shows -999999.0.		
Number Of Sensor	**Index 40**	**Subindex 2**	**UintegerT (4 Bit)**	**RO**
Value range	1 - 12	Number of sensors in level sensor system.		
Main Status	**Index 40**	**Subindex 3**	**UintegerT (4 Bit)**	**RO**
Value range	0 (INITIALIZING)	The system is initializing.		
	1 (INIT FINISH WAIT CONFIRM)	The sensor in system changed. System Confirm is need which defined at command 161.		
	2 (INITIALIZED)	The system is working.		
Heart Beat	**Index 40**	**Subindex 4**	**BooleanT (1 Bit)**	**RO**
Value range	0 - 1	Switch every second.		
SMART5 BLUE	**Index 40**	**Subindex 5**	**BooleanT (1 Bit)**	**RO**
Value range	0 - 1	System status, blue alarm. (reserved)		
SMART5 YELLOW	**Index 40**	**Subindex 6**	**BooleanT (1 Bit)**	**RO**
Value range	0 - 1	System status, yellow alarm. Following events will trigger this alarm: [1] "Sensor unloaded" [2] "Temperature out of operating range" [3] "System overload"		
SMART5 ORANGE	**Index 40**	**Subindex 7**	**BooleanT (1 Bit)**	**RO**
Value range	0 - 1	System status, orange alarm. (reserved)		
SMART5 RED	**Index 40**	**Subindex 8**	**BooleanT (1 Bit)**	**RO**
Value range	0 - 1	System status, red alarm. Following events will trigger this alarm: [1] "Serious sensor overload" [2] "Sensor is broken" [3] "Extreme Temperature" [4] "Senor is broken (Memory error)" [5] "Mixed sensor type (capacity)" [6] "Mixed sensor type (HART/IO-Link)" [7] "Network failure / comm. Lost" [8] "System data corrupt"		

Unit Of Measure	Index 40	Subindex 9	UIntegerT (4 Bit)	RO
Value range	0 - 15	Selected unit of measured value. [Weight] 0: kg, 1:lb, 2: t, 3: US tn [Volume] 6: L, 7: m^3, 8: ft^3, 9: yd^3, 10: US gal, 11: US bsh [Percentage] 14: % [Not Available] 15: NA		

Display Type	Index 40	Subindex 10	UIntegerT (2 Bit)	RO
Value range	0 - 2	Selected type of measured value. 0: Weight 1: Volume 2: Percentage		

Parameters

Measured Value

Parameter	Index	Subindex	Data Type	RW
System Weight	**Index 77**	**Subindex 0**	**Float32T (32 Bit)**	**RO**
Total weight measured in level sensor system.				
System Volume	**Index 78**	**Subindex 0**	**Float32T (32 Bit)**	**RO**
Volume measured in level sensor system. System Volume = System Weight (index 77) * Density (index 66). If the Density is not available, the System Volume show -999999.0.				
System Percentage	**Index 79**	**Subindex 0**	**Float32T (32 Bit)**	**RO**
Percentage measured in level sensor system. System Percentage (index 79) = System Weight (index 77) / System Span Weight (index 92)				

System Unit

Parameter	Index	Subindex	Data Type	RW
Unit of Volume	**Index 80**	**Subindex 0**	**Float32T (32 Bit)**	**RW**
All volume in the system uses this unit.				
Value range	**0**	**L**		
	1	m^3		
	2	ft^3		
	3	yd^3		
	4	US gal		
	5	US bsh		
Unit of Weight	**Index 81**	**Subindex 0**	**Float32T (32 Bit)**	**RW**
All weight in the system uses this unit.				
Value range	**0**	**kg**		
	1	lb		
	2	t		
	3	US tn		
Unit of Temperature	**Index 82**	**Subindex 0**	**Float32T (32 Bit)**	**RW**
All temperature in the system uses this unit.				
Value range	**0**	• **° C**		
	1	• ° F		

Display Type

Prameter	Index	Subindex	Data Type	RW
Display Type	**Index 94**	**Subindex 0**	**UIntegerT (8 Bit)**	RW
Select the display type of measured value which will used at Process Data (Measured Data subindex 1).				
Value range	**0**	**Weight**		
	1	Volume		

	2	Percentage

System Capacity

Parameter	Index	Subindex	Data Type	RW
System Capacity Weight	**Index 74**	**Subindex 0**	**Float32T (32 Bit)**	**RO**
This parameter shows the system capacity weight. System capacity weight (index 74) = Number of Sensor * Sensor capacity. Such as, the system contains 8 1t sensors, this parameter shows 8 t.				
System Absolute Weight	**Index 76**	**Subindex 0**	**Float32T (32 Bit)**	**RO**
This parameter shows the system total weight.				

Setup Administrator

Parameter	Index	Subindex	Data Type	RW
GEO Code	**Index 67**	**Subindex 0**	**UintegerT (32 Bit)**	**RW**
GEO code which indicates the local gravity value. The default value is 12.				
Value range	0 – 31			
Density	**Index 66**	**Subindex 0**		**RW**
Density Value	**Index 66**	**Subindex 1**	**Float32T (32 Bit)**	**RW**
Density Unit	**Index 66**	**Subindex 2**	**UIntegerT (32 Bit)**	**RW**
It is the density of the liquid, and the volume is calculated by weight and this parameter. The default density value is NaN (Not A Number), and the display value is -999999.0. The density value and unit should be changed simultaneously.				
Percentage Lower Threshold	**Index 104**	**Subindex 0**	**UIntegerT (8 Bit)**	**RW**
If the measured percentage is lower than this value, the Lower Alarm Status in PD will be set.				
Value range	1 – 99			
Percentage Upper Threshold	**Index 105**	**Subindex 0**	**UintegerT (8 Bit)**	**RW**
If the measured percentage is higher than this value, the Upper Alarm Status in PD will be set.				
Value range	1 – 99			

System Commands	Text	Description
160	**SYSTEM INIT**	It will trigger system initialize and all parameters will be cleared.
161	**SYSTEM CONFIRM**	If system first initialize or the system topology changed, likely sensors insert or remove, the system status is wait confirm. And this command can be triggered to confirm the changed topology.

System Adjustment

Parameter	Index	Subindex	Data Type	RW
System Lower Weight	**Index 75**	**Subindex 0**	**UIntegerT (8 Bit)**	**RO**
Setting of automatic zero tracking function.				
Value range	0% System Capacity – 80% System Capacity			
System Span Percentage	**Index 65**	**Subindex 0**	**UIntegerT (8 Bit)**	**W**
Set the system span by current loaded percentage.				
Value range	50% - 100%			
System Span Weight	**Index 92**	**Subindex 0**	**UIntegerT (8 Bit)**	**RW**
Set the system span by reference weight. The default value is system capacity.				
Value range	20% System Capacity – 100% System Capacity			
System Span Volume	**Index 93**	**Subindex 0**	**UIntegerT (8 Bit)**	**RW**
Set the system span by reference volume. Note the “Density (index 66)” should be set before writing this parameter, or the setting will be ignored. The default value is system capacity if “Density (index 66)” is set.				
Value range	20% System Capacity – 100% System Capacity			

System Commands	Text	Description
163	**System Set Zero**	Sets zero point of the system.

Diagnostics

Sensor Overview

Each index has 12 subindexes which can be accessed by a read command.

Parameter	Index	Subindex	Data Type	RW
Sensor Status	**Index 68**	**Subindex 0 - 12**	**Array UIntegerT (8 Bit)**	**RO**
Indicator the status of the sensor. It has following possible status: [0] NOT EXIST (Sensor is not available) [1] OFFLINE (System can't detect the sensor any more) [2] ONLINE HEALTHY (Sensor works well) [3] ONLINE ERROR (Sensor is online, but reports error)				
Sensor Absolute Weight	**Index 84**	**Subindex 0 - 12**	**Array Float32T**	**RO**
List each sensor's weight related to production zero.				
Sensor Temperature	**Index 85**	**Subindex 0 - 12**	**Array Float32T**	**RO**
List each sensor's temperature.				
Sensor Serial Number	**Index 86**	**Subindex 0 - 12**	**Array StringT (10 Byte)**	**RO**
List each sensor's serial number.				
Sensor Model Number	**Index 87**	**Subindex 0 - 12**	**Array StringT (8 Byte)**	**RO**
List each sensor's model number. Each sensor's model number should be same.				
Sensor Firmware Version	**Index 88**	**Subindex 0 - 12**	**Array StringT (14 Byte)**	**RO**
List each sensor's firmware version.				
Sensor Capacity	**Index 95**	**Subindex 0 - 12**	**Array Float32T**	**RO**
List each sensor's capacity in system weight unit. Each sensor's capacity should be same.				
Sensor Overload Count	**Index 96**	**Subindex 0 - 12**	**Array UIntegerT (32 Bit)**	**RO**
List each sensor's overload count.				
Value range	⩾ 0			
Sensor Serious Overload Count	**Index 97**	**Subindex 0 - 12**	**Array UIntegerT (32 Bit)**	**RO**
List each sensor's serious overload count.				
Value range	⩾ 0			

Events

Code	Name	Description	Action
0x8CA1 36001d	Serious sensor overload [Error]	Overload weight out of specification (150% capacity), keep until next power up.	Please inspect the load on the sensor or call METTLER TOLEDO Service.
0x8CA2 36002d	Sensor unloaded [Warning]	The load on Level sensor is lower than operation limit, keep until weight return to normal.	Please inspect the load on the sensor or call METTLER TOLEDO Service.
0x8CA3 36003d	Sensor is broken [Error]	Indicator the weighing function is down.	Call METTLER TOLEDO Service, replace with a new Level sensor
0x8CA4 36004d	Temperature out of operating range [Warning]	Temperature of Environment out of specification(-10~40 ℃), keep until temperature returns to range.	1. Check environment temperature 2. If environment temperature is within range, call METTLER TOLEDO service
0x8CA5 36005d	Extreme Temperature [Error]	Environment temperature goes above/below operating range by more than -20 °C/+65°C. We know the measurement is completely wrong.	Call METTLER TOLEDO Service, replace with a new Level sensor.
0x8CA8 36008d	Sensor Broken (Memory) [Error]	The hardware of Level sensor is broken.	Replace with a new Level sensor.
0x8CA9 36009d	Mixed capacity [Error]	The sensor's capacity in the system is not the same.	Check if all sensor capacity is same.
0x8CAA 36010d	Mixed connectivity type [Error]	The sensor's type in the system is not the same.	Check if sensor capacity and protocol are the same.
0x8CAB 36011d	Network failure / comm. Lost [Error]	Network failure or communication Lost.	1. Check if sensor or cable is broken according to user manual. 2. Try to initialize the system again.
0x8CAC 36012d	System overload [Warning]	System overload (number of sensors * sensor Rated Capacity). E.g., wind load on outdoor silos, system load goes above 100% system capacity for more than a minute.	Please inspect the load on Level sensor or call METTLER TOLEDO Service.
0x8CAD 36013d	System data corrupt [Error]	System data corrupt.	Please initialize system and do device setup again.
0x8CB4 36020d	Upper Range Changed [Notification]	System span updated automatically due to the change of zero point.	Only notification.

APPENDIX 2: GEO-CODES

Latitude North or South, in Degrees and Minutes	Height Above Sea Level, in Meters										
	0	325	650	975	1300	1625	1950	2275	2600	2925	3250
	325	650	975	1300	1625	1950	2275	2600	2925	3250	3575
	Height Above Sea Level, in Feet										
	0	1060	2130	3200	4260	5330	6400	7460	8530	9600	10660
	1060	2130	3200	4260	5330	6400	7460	8530	9600	10660	11730
0° 0'–5° 46'	5	4	4	3	3	2	2	1	1	0	0
5° 46'–9° 52'	5	5	4	4	3	3	2	2	1	1	0
9° 52'–12° 44'	6	5	5	4	4	3	3	2	2	1	1
12° 44'–15° 6'	6	6	5	5	4	4	3	3	2	2	1
15° 6'–17° 0'	7	6	6	5	5	4	4	3	3	2	2
17° 10'–19° 2'	7	7	6	6	5	5	4	4	3	3	2
19° 2'–20° 45'	8	7	7	6	6	5	5	4	4	3	3
20° 45'–22° 22'	8	8	7	7	6	6	5	5	4	4	3
22° 22'–23° 54'	9	8	8	7	7	6	6	5	5	4	4
23° 54'–25° 21'	9	9	8	8	7	7	6	6	5	5	4
25° 21'–26° 45'	10	9	9	8	8	7	7	6	6	5	5
26° 45'–28° 6'	10	10	9	9	8	8	7	7	6	6	5
28° 6'–29° 25'	11	10	10	9	9	8	8	7	7	6	6
29° 25'–30° 41'	11	11	10	10	9	9	8	8	7	7	6
30° 41'–31° 56'	12	11	11	10	10	9	9	8	8	7	7
31° 56'–33° 9'	12	12	11	11	10	10	9	9	8	8	7
33° 9'–34° 21'	13	12	12	11	11	10	10	9	9	8	8
34° 21'–35° 31'	13	13	12	12	11	11	10	10	9	9	8
35° 31'–36° 41'	14	13	13	12	12	11	11	10	10	9	9
36° 41'–37° 50'	14	14	13	13	12	12	11	11	10	10	9
37° 50'–38° 58'	15	14	14	13	13	12	12	11	11	10	10
38° 58'–40° 5'	15	15	14	14	13	13	12	12	11	11	10
40° 5'–41° 12'	16	15	15	14	14	13	13	12	12	11	11
41° 12'–42° 19'	16	16	15	15	14	14	13	13	12	12	11
42° 19'–43° 26'	17	16	16	15	15	14	14	13	13	12	12
43° 26'–44° 32'	17	17	16	16	15	15	14	14	13	13	12
44° 32'–45° 38'	18	17	17	16	16	15	15	14	14	13	13
45° 38'–46° 45'	18	18	17	17	16	16	15	15	14	14	13
46° 45'–47° 51'	19	18	18	17	17	16	16	15	15	14	14

Latitude North or South, in Degrees and Minutes	Height Above Sea Level, in Meters										
	0	325	650	975	1300	1625	1950	2275	2600	2925	3250
	325	650	975	1300	1625	1950	2275	2600	2925	3250	3575
	Height Above Sea Level, in Feet										
	0	1060	2130	3200	4260	5330	6400	7460	8530	9600	10660
	1060	2130	3200	4260	5330	6400	7460	8530	9600	10660	11730
47° 51′–48° 58′	19	19	18	18	17	17	16	16	15	15	14
48° 58′–50° 6′	20	19	19	18	18	17	17	16	16	15	15
50° 6′–51° 13′	20	20	19	19	18	18	17	17	16	16	15
51° 13′–52° 22′	21	20	20	19	19	18	18	17	17	16	16
52° 22′–53° 31′	21	21	20	20	19	19	18	18	17	17	16
53° 31′–54° 41′	22	21	21	20	20	19	19	18	18	17	17
54° 41′–55° 52′	22	22	21	21	20	20	19	19	18	18	17
55° 52′–57° 4′	23	22	22	21	21	20	20	19	19	18	18
57° 4′–58° 17′	23	23	22	22	21	21	20	20	19	l9	18
58° 17'–59° 32'	24	23	23	22	2\2	21	21	20	20	19	19
59° 32'–60° 49'	24	24	23	23	22	22	21	21	20	20	19
60° 49'–62° 9'	25	24	24	23	23	22	22	21	21	20	20
62° 9'–63° 30'	25	25	24	24	23	23	22	22	21	21	20
63° 30'–64° 55'	26	25	25	24	24	23	23	22	22	21	21
64° 55'–66° 24'	26	26	25	25	24	24	23	23	22	22	21
66° 24'–67° 57'	27	26	26	25	25	24	24	23	23	22	22
67° 57'–69° 35'	27	27	26	26	25	25	24	24	23	23	22
69° 5'–71° 21'	28	27	27	26	26	25	25	24	24	23	23
71° 21'–73° 16'	28	28	27	27	26	26	25	25	24	24	23
73° 16'–75° 24'	29	28	28	27	27	26	26	25	25	24	24
75° 24'–77° 52'	29	29	28	28	27	27	26	26	25	25	24
77° 52'–80° 56'	30	29	29	28	28	27	27	26	26	25	25
80° 56'–85° 45'	30	30	29	29	28	28	27	27	26	26	25
85° 45'–90° 00'	31	30	30	29	29	28	28	27	27	26	26

METTLER TOLEDO Service

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METTLER TOLEDO Service assures the quality, measuring accuracy and preservation of value of all METTLER TOLEDO products for years to come.
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