

Operating Instructions

Optoelectrical Measuring System for Separation Zone and Sludge Level Detection

7210 MTS

51503697

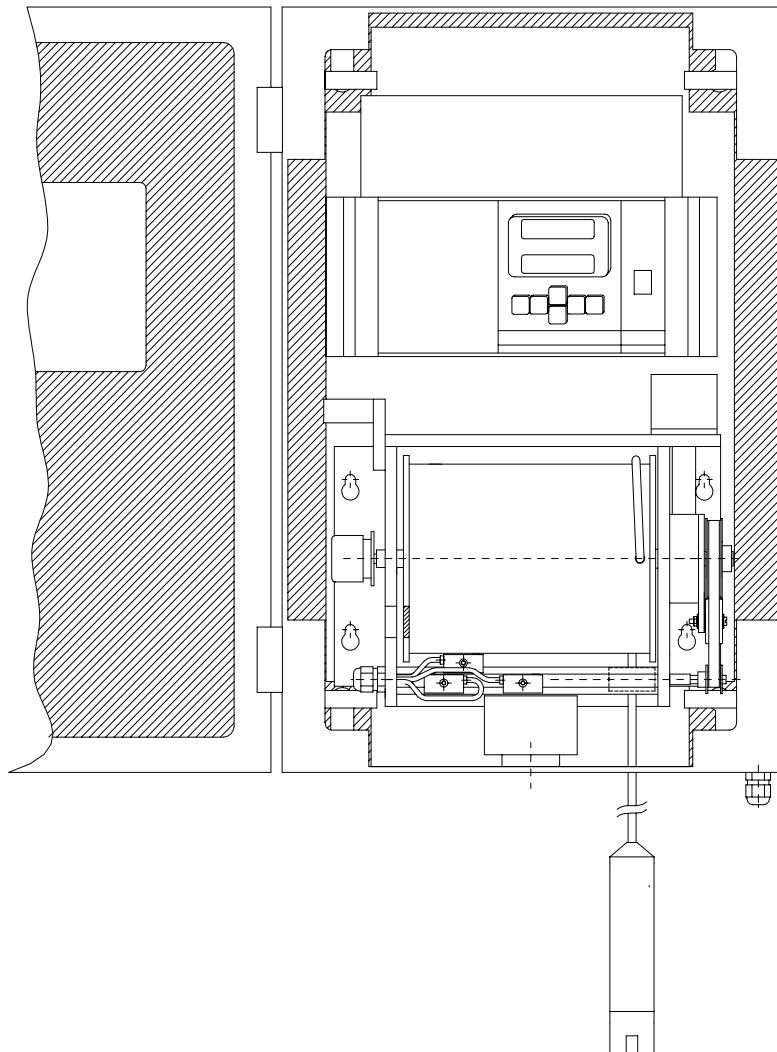


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The specifications are valid according to the technical level prevailing in July 2000 /
Software Version: PT – 4.6.

1 Safety instructions

1.1 Intended application

The Sludge Level Measuring System 7210 MTS has the task of determining the separation zone in sludge-water mixtures in settling basins and thickeners. The sludge level transmitter is not suitable for use in hazardous areas. The sensors are only suitable for use in hazardous areas if they are explicitly marked as Ex (hazardous area) sensors.

1.2 General safety instructions

The instrument has been designed according to the state of the art and complies with the applicable regulations and EN standards (see "Technical Data"). It is built in accordance with EN 61010-1 and left our factory in perfect condition with regard to safety aspects.

However, if it is used improperly or other than for its intended use, it may pose a hazard, e.g. due to improper connection.

Safety instructions for measuring system

- For safety and technical reasons, do not use the measuring system for any other purpose than the one described in these operating instructions.
- Make sure you strictly adhere to the warnings and notes in these operating instructions.
- Technical personnel must be familiar with the instructions in this manual and must adhere to them. Handling not complying with these instructions will cause personal injury and damage to property.
- Installation, electrical connection, start-up, operation and maintenance of the measuring system may only be carried out by technical personnel B authorised by the plant operators.
- Before connecting the instrument, ensure that the power supply complies with the ratings specified on the nameplate.
- A clearly marked mains disconnecting device must be installed in the vicinity of the instrument.
- The customer must protect the transmitter by a 2 A fuse.
- When the instrument is switched off, the heating module is still active. Therefore, only carry out maintenance work on the instrument when it is de-energised.
- For safety reasons, only set the limit switch and the zero positioning switch when the instrument is off (danger of personal injury).
- You could touch voltage-carrying components through the ventilation slots on the side of the housing. Do not insert any tools or wires etc into these slits.
- Before switching on the system check all the connections again for correctness.
- Do not operate damaged instruments which could pose a danger, and mark them as defective.
- Measuring point faults may only be repaired by authorised and trained personnel.
- If faults cannot be repaired, the instrument must be taken out of service and secured against unintentional start-up.

- The carrying load of the sensor cable is designed to withstand the combined weight of the sensor and the protective grating.
- Severe scratches or fouling of the measuring window can impair the measuring capability of the sensor.
- The sensor may only be opened by STM personnel otherwise the warranty provisions will become null and void.
- Repairs not described in the operating instructions may only be carried out by the manufacturer or by the Sales Centre.

1.3 Immunity to interference

This instrument has been checked for electromagnetic compatibility in industrial use according to applicable European standards. Protection against interference as specified above is valid only for an instrument connected according to the instructions in this manual.

1.4 Declaration of conformity

The instrument has been developed and manufactured in accordance with the applicable European standards and directives. You can request a Declaration of Conformity from your Sales Centre.

1.5 Safety symbols



Warning!

This symbol alerts you to hazards, which could cause serious injuries as well as damage to the instrument if ignored.



Caution!

This symbol alerts you to possible faults which could arise from incorrect operation. They could cause damage to the instrument if ignored.



Note:

This symbol indicates important items of information.

2 Instrument description

2.1 Scope of supply

Inspect the packaging and its contents for damage. If any damage is found, inform your postal service, freight handler or forwarding agent. Keep any damaged goods until matters have been clarified.

Inspect the delivery for completeness and quantity according to the delivery papers, and the instrument type and version as shown on the nameplate.

The following items are included in the delivery:

- 7210 MTS measuring system
- Allen key for installing tracking unit
- Allen key angled for adjusting proximity switch
- 1 set of elbow caps (4 pieces)
- 1 set of installation clips (4 pieces)
- 1 installation kit (4 pieces per kit)
- Sensor protection guard
- Operating Instructions

Keep the original packaging for future storing or shipping of the transmitter.

If you have any questions please contact your supplier or the Sales Centre responsible (Tel.: +49 – 7156 – 209 218).

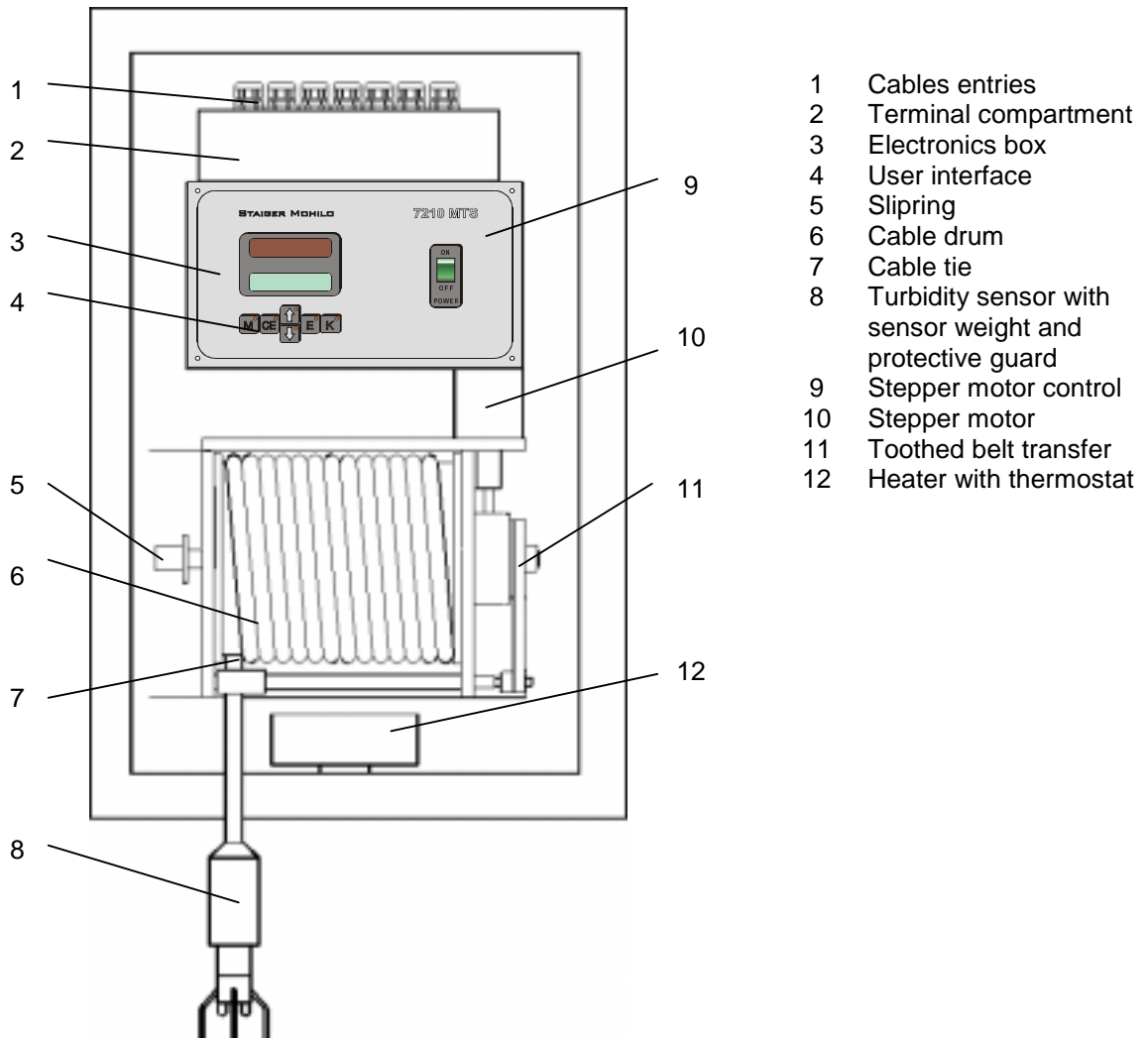
2.2 Product structure

Sludge Level Measuring System 7210 MTS	
#	51503697 Standard 7210 MTS with sensor SAM-TS
#	51503698 Ex-version 7210 MTS with sensor SAM-TS-Exi
#	51503699 Artic-version 7211 MTS with isolated case, temperature control and sensor SAM-TS

2.3 Design and functional description

The 7210 MTS Measuring System comprises the following main system components:

- Transmitter
- Sensor
- Stepper motor control
- Tracking unit (motor, cable drum, signal transmitter).



The transmitter is controlled by a 16-bit microcontroller and carries out the following functions:

- Records and processes measured variables
- Controls sensor position (depth) and detects sludge concentration
- Menu guidance on alphanumeric LC display
- Saves and manages user parameters
- Monitors system and sensor

All user parameters, such as measuring range, limits, cleaning interval and output signal setting are menu-driven and saved in a non-volatile memory.

2.4 Front view with position description of operating panel

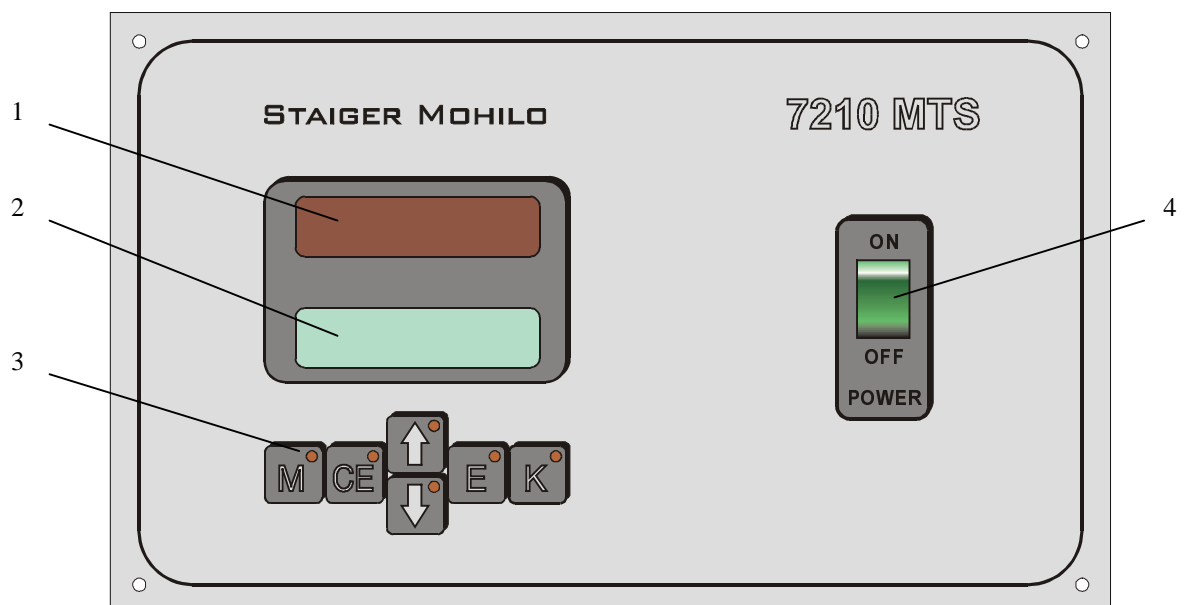
Menu-driven operation requires 6 buttons. This allows you to navigate horizontally and vertically through the submenus.

During a measurement process, the numeric measured variables are displayed on an LC display and on an LED display that is readable from a great distance.

The LEDs integrated in the keypad indicate system and output states.

- 1 = LED display
- 2 = LC display
- 3 = Operating keys
- 4 = Indicator LED
- 5 = Main switch

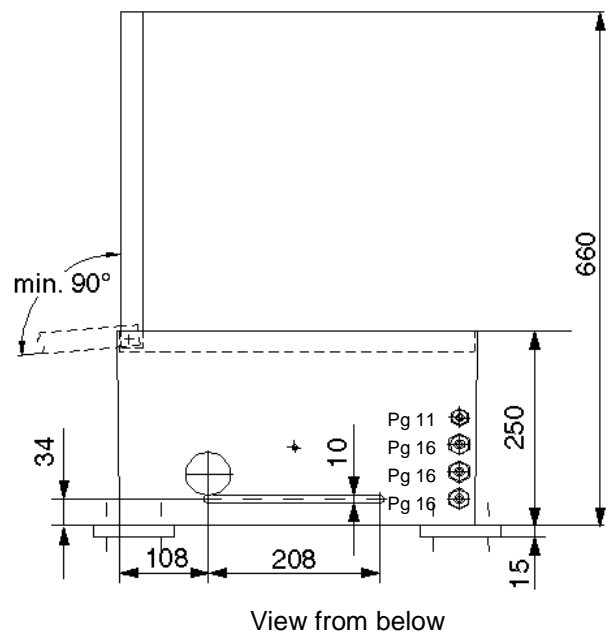
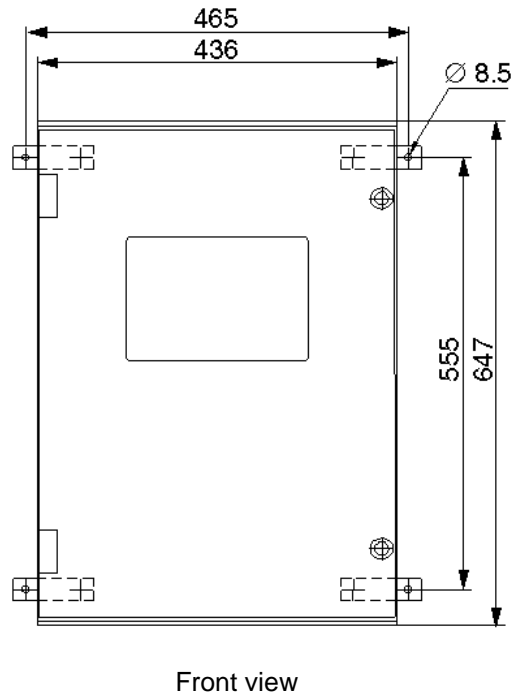
- LED 1 (M) = Limit 1
- LED 2 (CE) = Limit 2
- LED 3 (↑) = Measuring range exceeded
- LED 4 (↓) = Measuring range undershot
- LED 5 (E) = Error message
- LED 6 (K) = Calibration factor



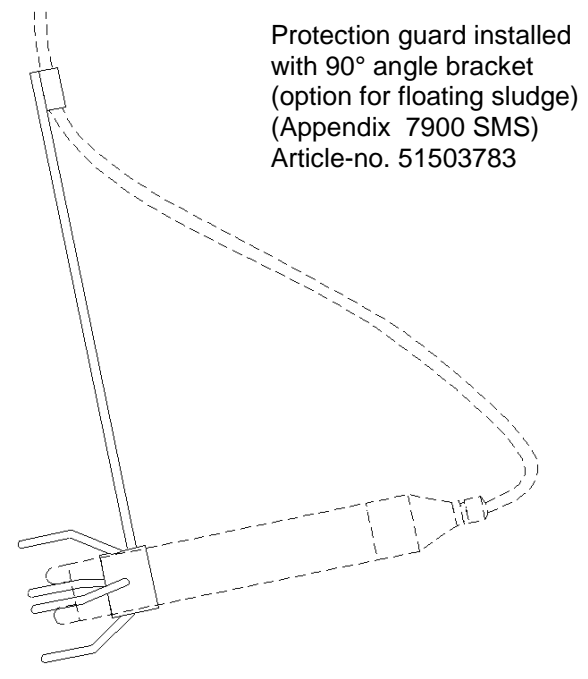
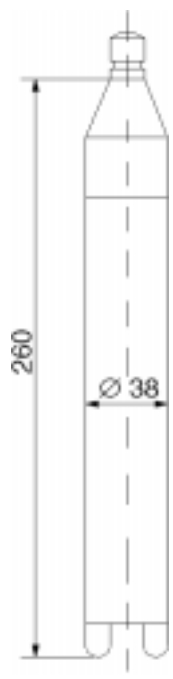
3 Installation

3.1 Dimensions

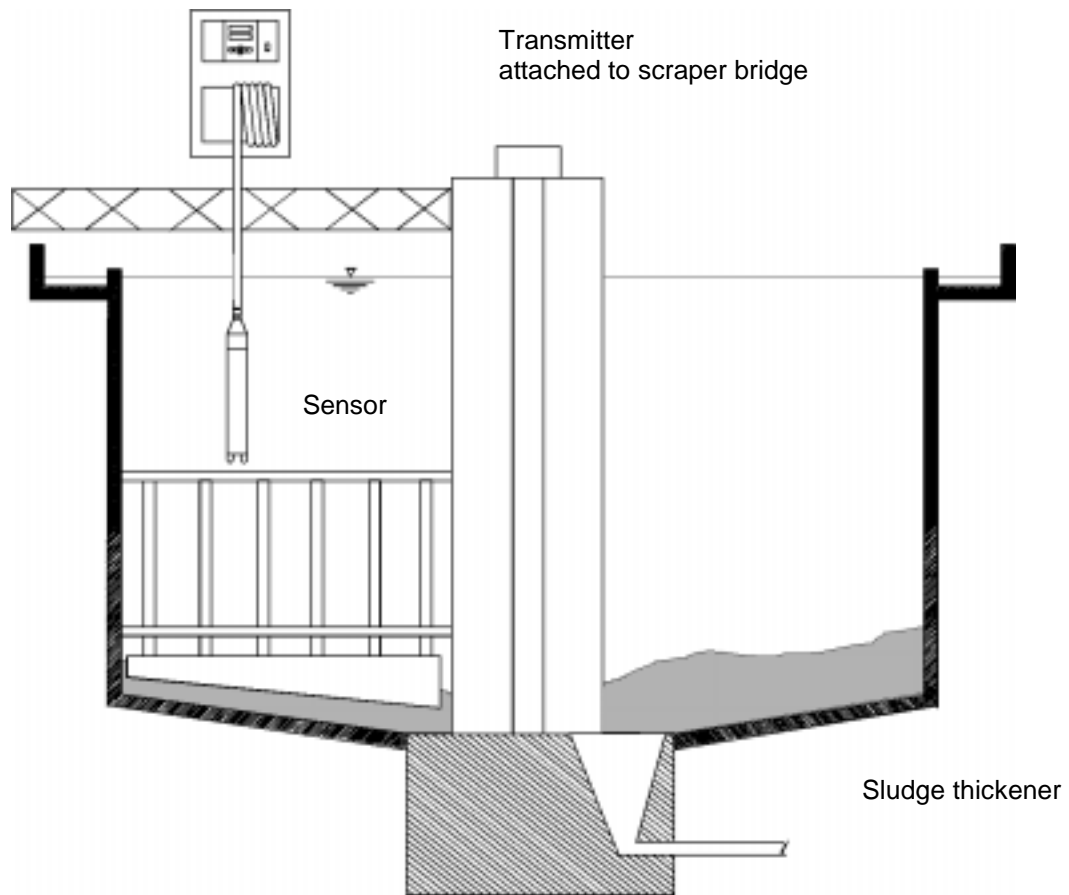
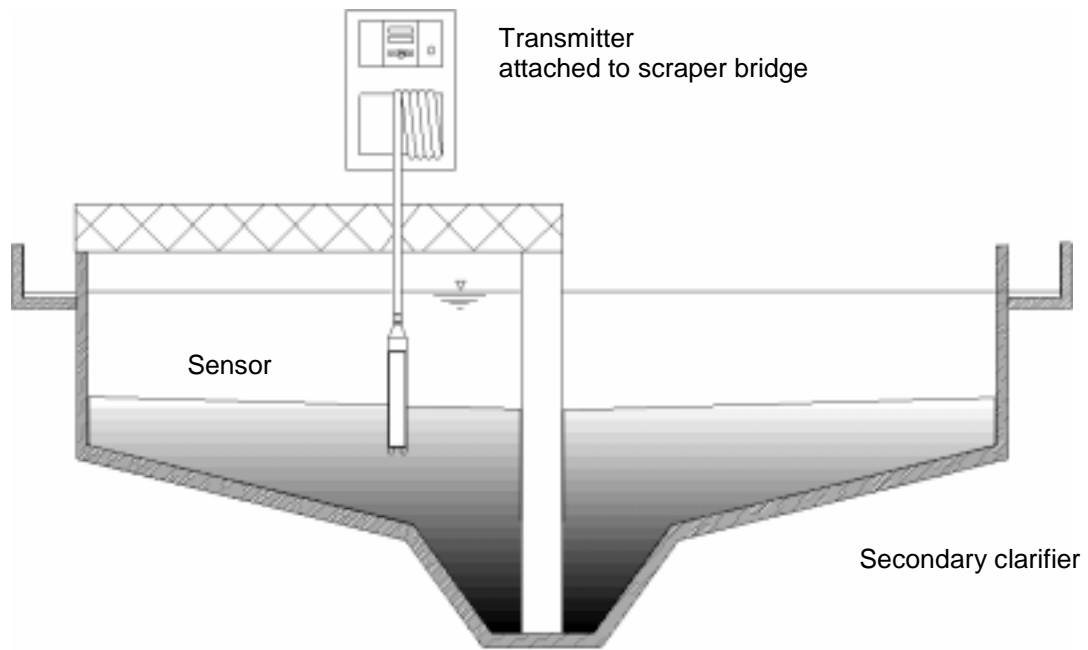
3.1.1 Transmitter



3.1.2 Sensor

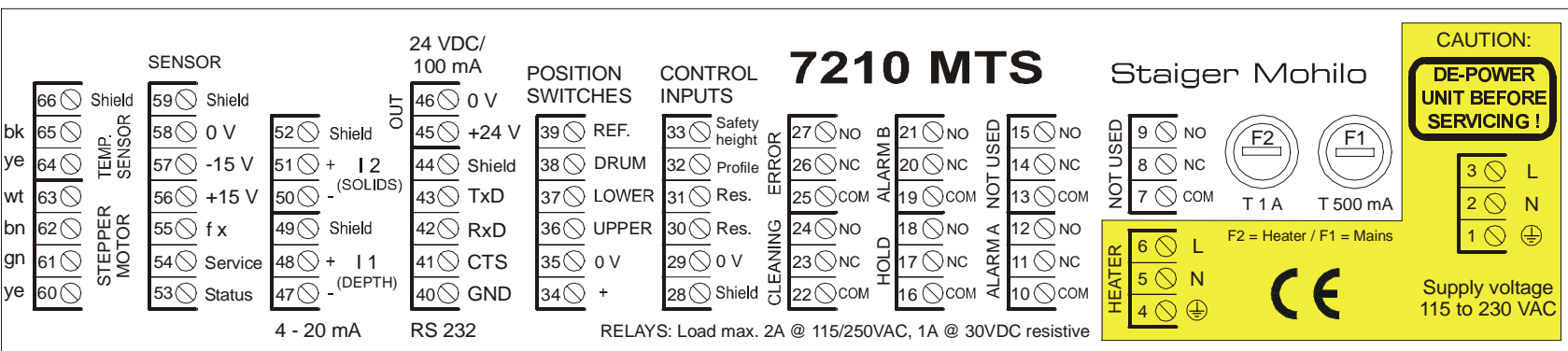


3.2 Instrument arrangement

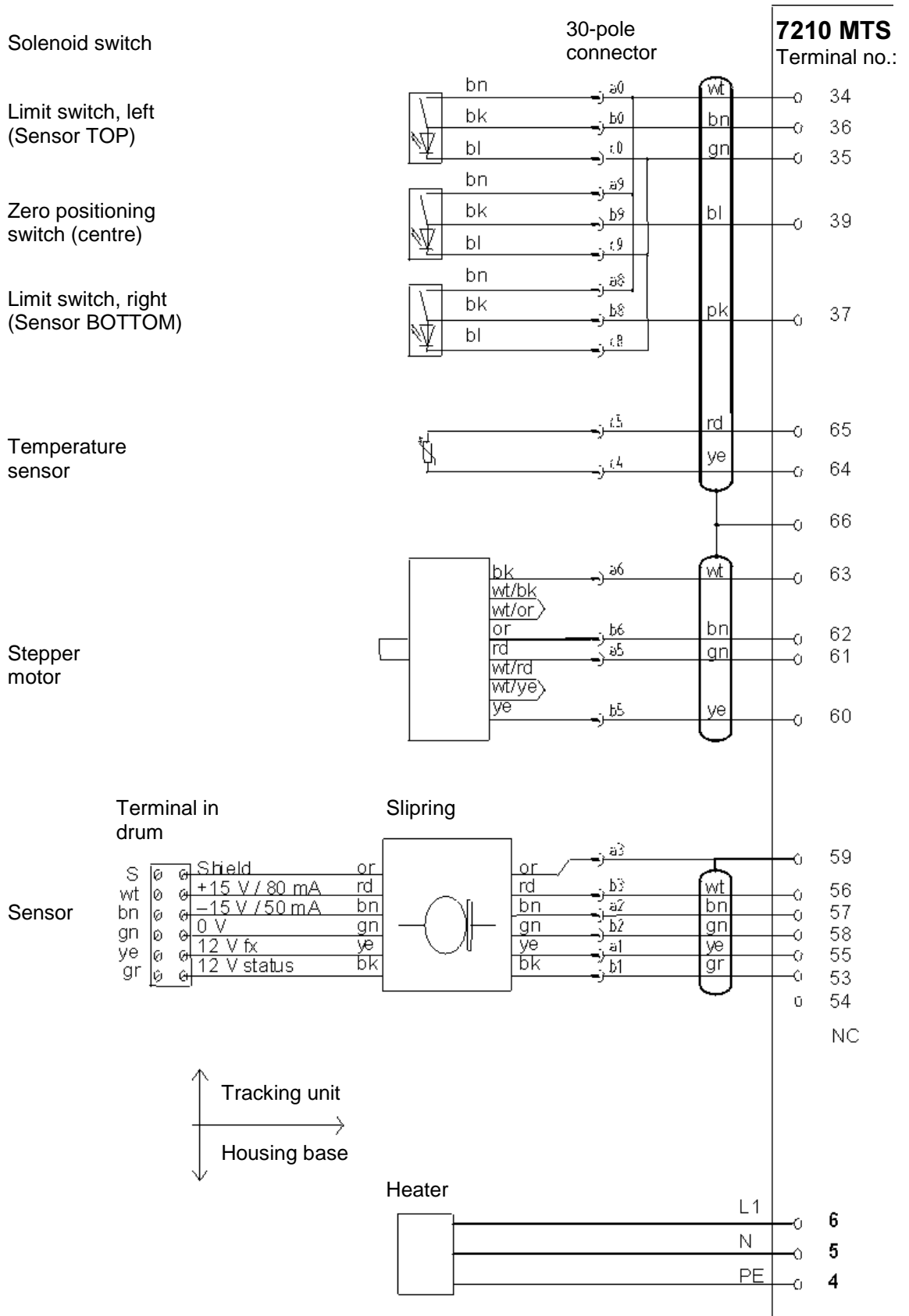


4 Electrical connection

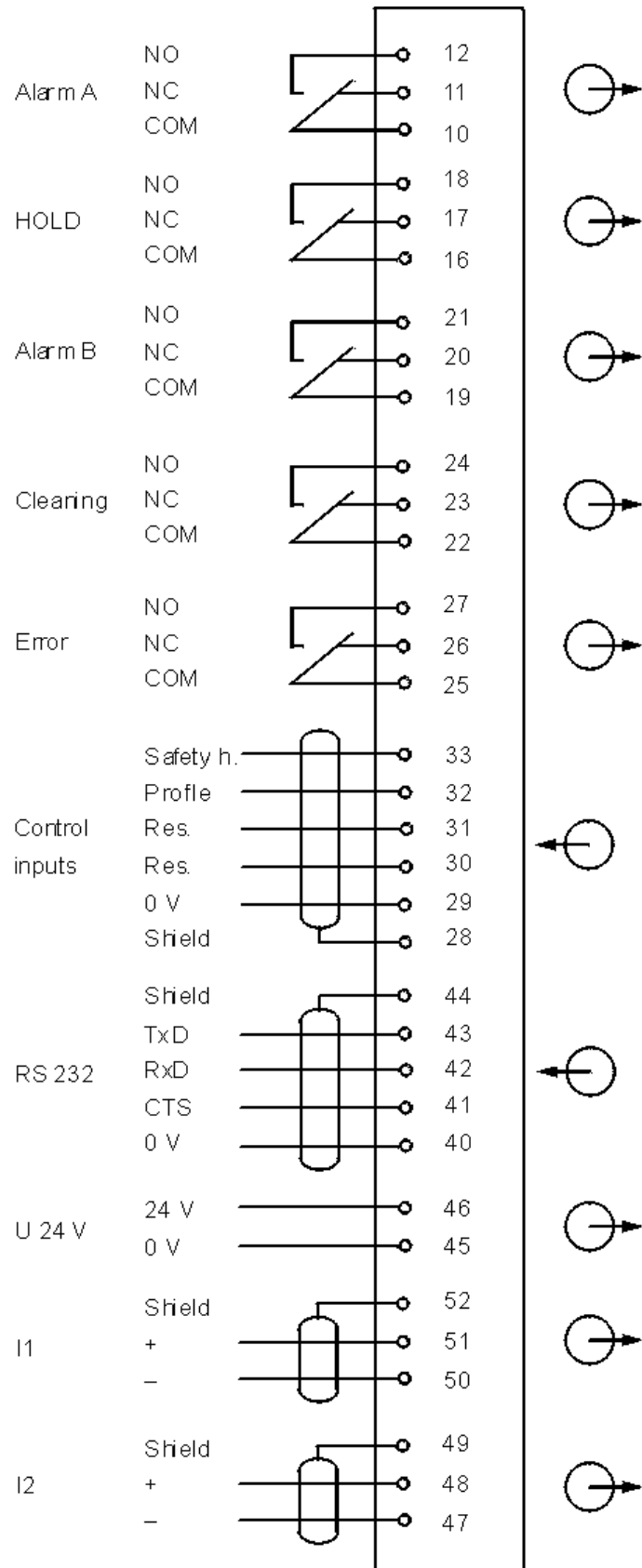
4.1 Pin assignment



4.2 Circuit diagram of hardware wiring



4.3 Circuit diagram of input and outputs



4.3.1 Control inputs (24 V)

Safety height: Move to safety height (active at +24 V)

Profile: Execute profile run (active at +24 V)

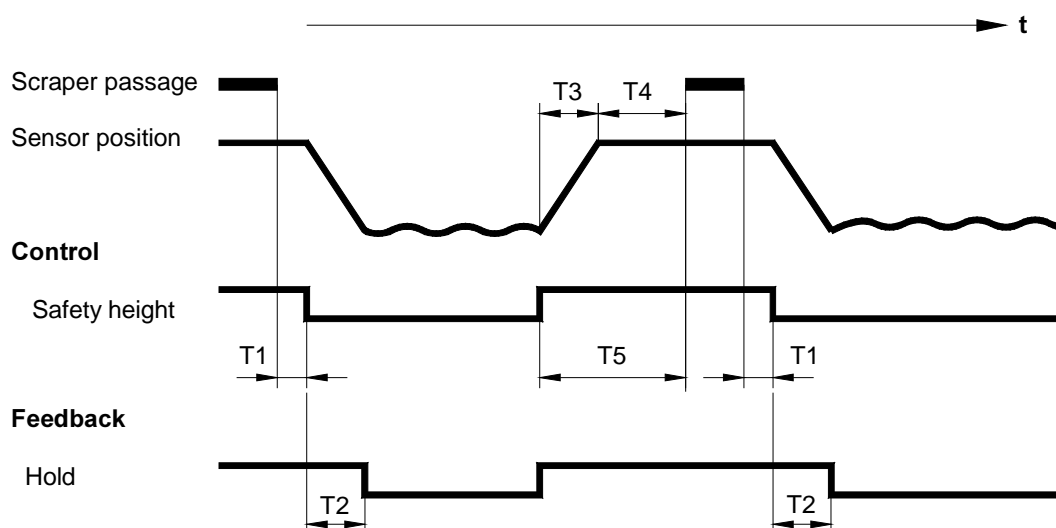
As long as the "Safety height" input is not active, the instrument is in measuring mode. If a 24 V (pulse \square 200 ms) is applied to the input, the sensor goes to safety height and dwells there for the safety period setting. The sensor then moves back to its previous position and starts measuring automatically. The transition from inactive to active input signal must be identical with a derivative action time in accordance with the travel time of the sensor, its speed and the speed of the scraper.



Note:

- U_a (+24 V, terminal 45) can be used to control the "Safety height" (terminal 33) input. This requires a link between terminal 46 (0 V) and terminal 29 (0 V)!

Scraper passage



- T1 Control delay after scraper passage: 1 to 10s
- T2 Run time of sensor downwards = basin depth : 10cm/s \approx 80s
- T3 Run time of sensor upwards \approx 80s
- T4 Safety time, min. response time + scraper tracking time
- T5 Derivative action time = T3 + T4 (must also be ensured at high travel speed)

4.3.2 Functions

The functions described below are tripped by a control signal or an integrated timer in automatic measurement mode.

Profile run

Trigger: 24V pulse (□ 200ms) at "Profile" input

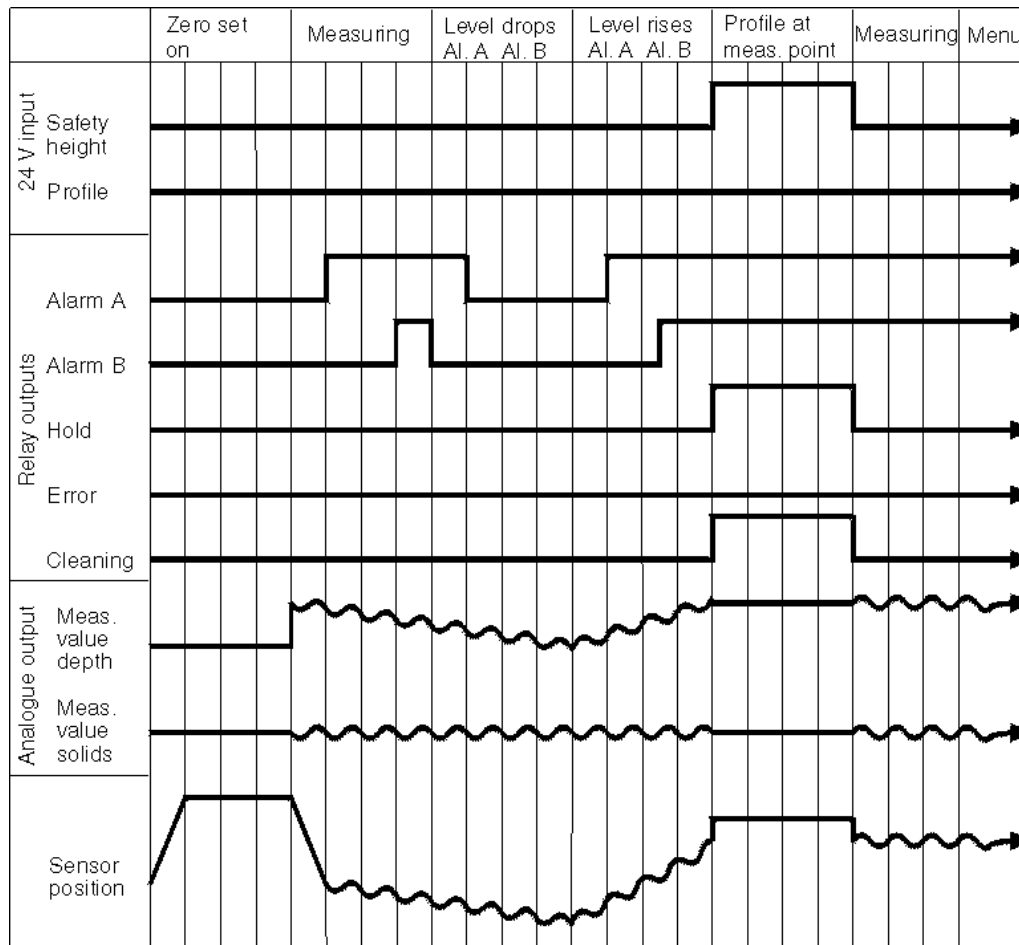
The sensor takes a solids content profile once from the surface (highest calibrated displacement point) to the basin bottom (lowest calibrated displacement point):

- Fast travel to highest point
- Record profile at five-fold control speed using LC display:
Depth at current output 1 and (option) solids content at current output 2
- Fast assumption of measuring position before start of profile run.



Note:

- U_a (+24 V, terminal 45) can be used to control the "Profile" (terminal 32) input. This requires a link between terminal 46 (0 V) and terminal 29 (0 V)!
- The speed of the profile run is dependent on the signal filter time set.



Synchronisation run

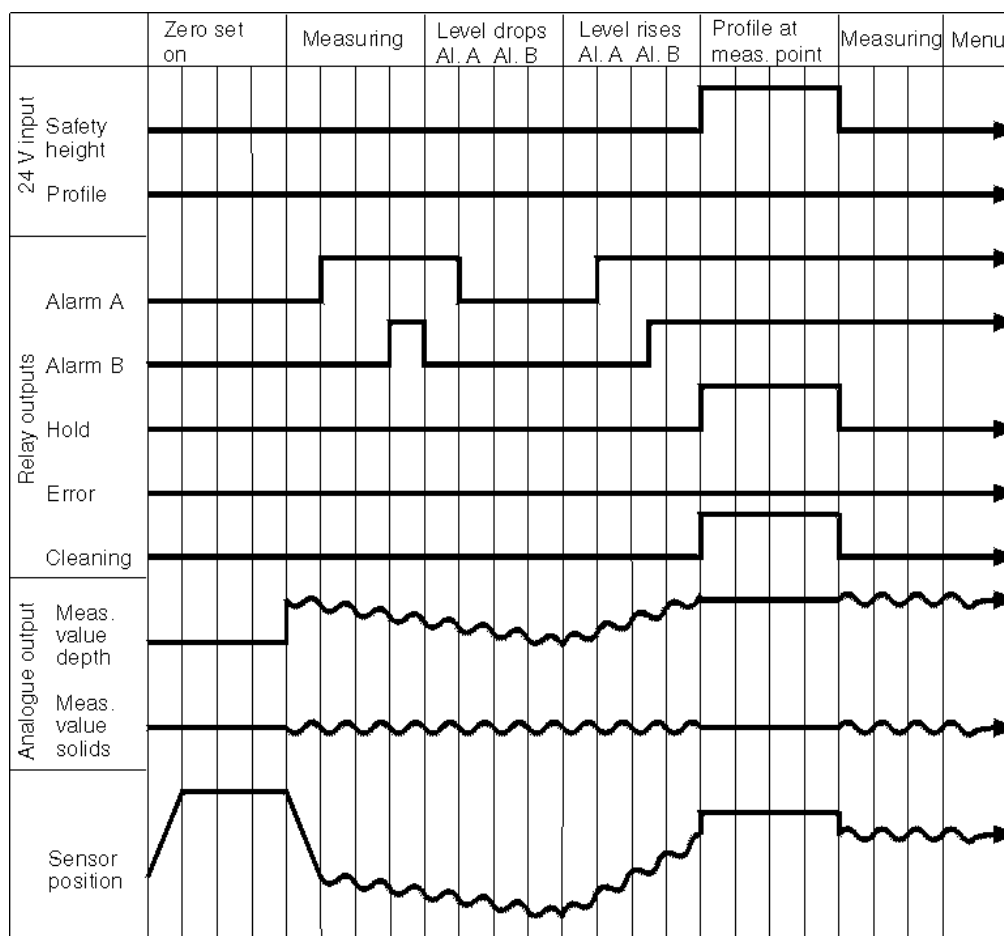
Trigger: 24V pulse (□ 200 ms) at "Safety height" input (terminal 33)

The sensor travels to the safety height from the current measuring position at fast speed (see PARAMETER ENTRY menu), dwells there for the safety period (if the "Safety height" signal is still pending, until it is cancelled) and returns - also at fast speed - to the original measuring position. In the meantime the measurement is interrupted and the current signals (depth, solids) are frozen.



Note:

- U_a (+24 V, terminal 45) can be used to control the "Safety height" (terminal 33) input. This requires a link between terminal 46 (0 V) and terminal 29 (0 V)!



Zero set

Trigger: timed ("Auto height zero" parameter)

Once after every auto height zero, the zero positioning switch is approached to check and, if necessary, correct the reference point of the depth measurement. In the meantime the measurement is interrupted and the current signals for depth and solids are frozen.

4.3.3 Signal outputs (switch contacts)

- “Alarm A”: Switches when the limit of Alarm A is exceeded or undershot
- “Alarm B”: Switches when the limit of Alarm B is exceeded or undershot
- “Hold”: Measurement interrupted, value recorded
- “Error”: Retrieve error message via operating menu
- “Cleaning”: Switch contact for cleaning sensor

The table below lists the switching states of the switch contacts:

	Condition fulfilled	not fulfilled	Mains off
Alarm A	A: 10-12 R: 10-11	A: 10-11 R: 10-12	10-11
Alarm B	A: 19-21 R: 19-20	A: 19-20 R: 19-21	19-20
Error	A: 25-27 R: 25-26	A: 25-26 R: 25-27	25-26
Hold	A: 16-18 R: 16-17	A: 16-17 R: 16-18	16-17
Cleaning	A: 22-24 R: 22-23	A: 22-23 R: 22-24	22-23

A: Normally open contact configured

R: Normally closed contact configured

If condition fulfilled, the following prevails:

-Alarm A:	Sensor position > Limit 1
-Alarm B:	Sensor position > Limit 2
-Error:	Diagnostic alarm occurred
-Cleaning:	Cleaning process is active
-Hold:	Measurement frozen

4.3.4 Analog outputs (I-1; I-2)

Current output I-1: 0 or 4 mA = zero point depth
(terminals 47 – 49) 20 mA = end point depth

Current output I-2: 0 or 4 mA = measuring range of min. solids content
(terminals 50 – 52) 20 mA = measuring range of max. solids content

Configuring the current outputs (see Section 6.9 CONFIGURATION)



Note:

- Max. load 500 Ω

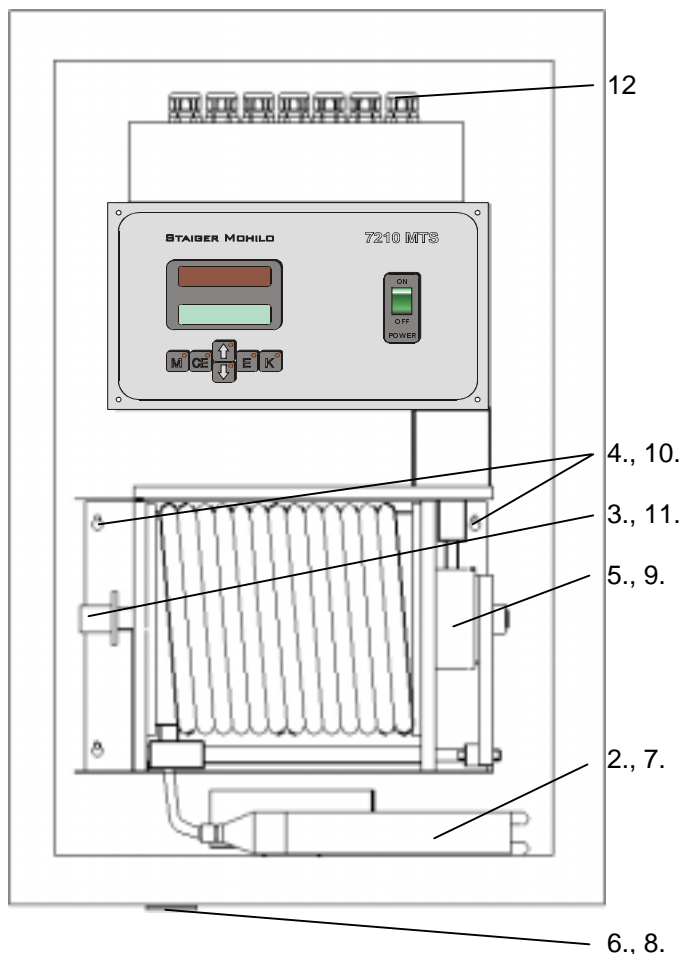
5 Start-up



Warning!

- The heating is switched on when the mains voltage is on (uncontrolled). Temperature control is only active after the mains switch is switched on.
- Before connecting the instrument, ensure that the power supply complies with the ratings specified on the nameplate.
- A clearly marked mains disconnecting device must be installed in the vicinity of the instrument.
- The customer must protect the transmitter by a 2 A fuse.
- Before switching on the system check all the connections again for correctness.
- Only switch on the transmitter when the sensor connector is plugged in and screwed tight. Only unplug or plug the sensor connector when the transmitter is switched off.
- Do not turn the cable drum by hand.

5.1 Mounting the sensor



1. Remove the shipment restraints from the cable drum and sensor.
2. Remove sensor from inside the housing.
3. Slacken connector on tracking unit.
4. Slacken screws on tracking unit using supplied Allen key.
5. Raise tracking unit to remove.
6. Remove cover of sensor bushing in housing base.
7. Insert sensor through sensor bushing. Insert cable through slot.
8. Close sensor bushing with cover.
9. Remount tracking unit.
10. Tighten screws using Allen key.
11. Replug connector.
12. Plug in mains connector.

5.2 System configuration

After switch-on, a programmed, balanced transmitter starts the measuring cycle automatically. Intervention is not necessary. A transmitter that is not pre-programmed requires the following steps to start up:

1. During switch-on, hold down the 'M' and '□' keys until MEASUREMENT menu appears.
2. Press '□' key until MANUAL menu appears.
3. Confirm by pressing 'E'.
4. Set top and bottom limit positions by means of switch contacts.
5. Switch off instrument.
6. Switch on instrument. Instrument carries out zero positioning run automatically.
7. Go through the following menu options in succession:
 - CONFIGURATION
 - Enter code 91
 - Default set-up yes (dwell time 3s)
 - CALIBRATION DEPTH
 - PARAMETER ENTRY
 - CALIBRATION SOLIDS (only when you generate your own sludge profile)
 - SOLIDS INPUT (only if you executed CALIBRATION SOLIDS).



Caution!

Only use the keystroke combination 'M' and '□' for the first start-up. If you use this keystroke combination at a later stage, always perform a zero positioning run after you change the instrument configuration.

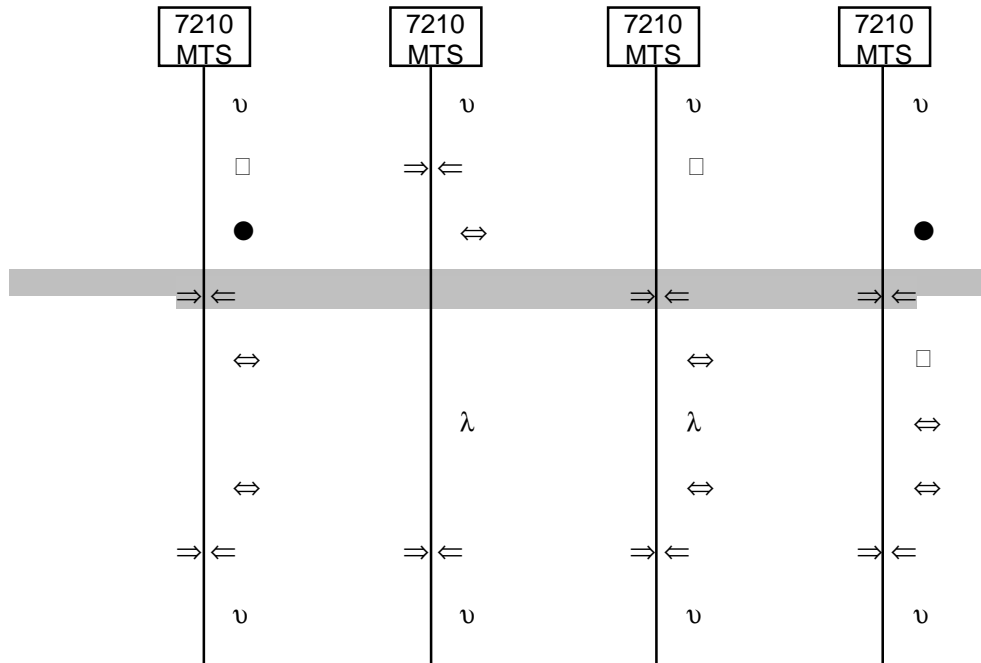


Note:

- If the display changes slowly during CALIBRATION, we advise you to set a shorter signal filter time in the PARAMETER ENTRY menu (e.g. 2 seconds).
- With CONFIGURATION you can load a factory calibration containing default parameters for the sensor (for default set-ups, see Appendix).
- Carry out the CALIBRATION DEPTH menu option to match local conditions.
- The CALIBRATION SOLIDS is only necessary in certain cases, e.g. for profile run, otherwise the default set-up is sufficient.

5.3 Configuring the switch contacts

Below are some examples of possible system configurations.



- ◆ : Top and bottom end positions (Reed contacts 1 and 2)
- ◆ λ : Zero positioning switch (Reed contact 3)
- ⇒ ⇐ : Calibrated zero and end points of sensor path (corresponding to 0/4mA or 20mA at analog output)
- : Safety height (software set-up)
- ⇔ : Limits Alarm A and Alarm B
- ≡ : Water level



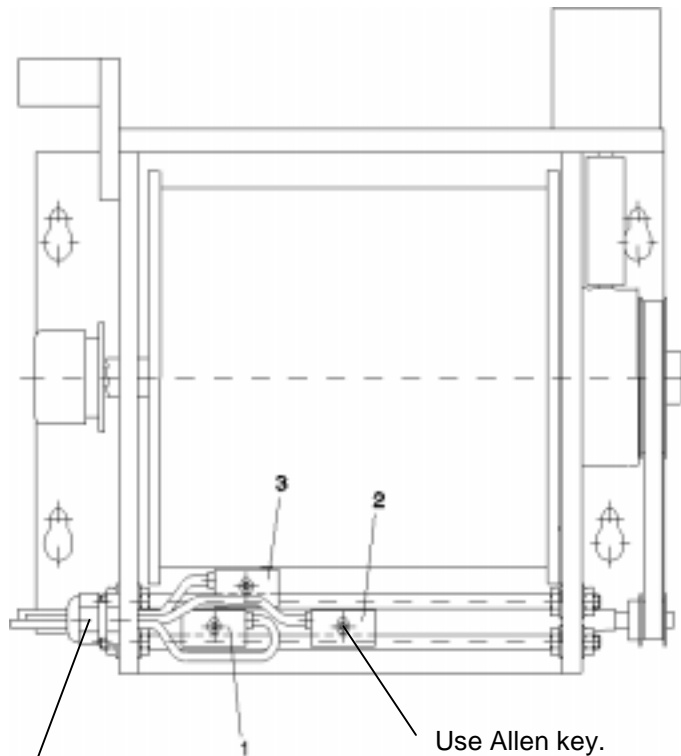
Note:

Please note the following basic rules for configuring contacts:

- The calibrated zero and end points of the sensor path are located with the limit positions specified by Reed contacts 1 and 2.
- The reference point defined by Reed contact 3 (zero set switch) (standard path on system reset or for zero positioning run) is freely selectable between Reed contacts 1 and 2 – if this is mechanically possible.
- Do not re-adjust the reference point after the zero positioning run!
- The safety height may be in the positive or negative path area, i.e. above or below the calibrated path zero point "0 cm".

5.4 Adjusting the proximity switch

Three proximity switches are located on two rails below the cable drum. They are assigned the following functions:



1 Proximity switch bottom rail left: At the top limit of the sensor stroke, the tracking unit stops the drive motor. Responds in manual and measuring modes and on calibration.

2 Proximity switch bottom rail right: At the bottom limit of the sensor stroke, the tracking unit stops the drive motor. Responds in manual and measuring modes and on calibration.

3 Proximity switch bottom rail centre: As reference point zero positioning run; the position of the reference point is indispensable.

After setting the switches, tighten the cable and close the screw union.

Tighten screws.

Mount switches in parallel to the magnetic mount.



Caution!

- Switch off the instrument to set the limit switch (danger of injury)!
- The zero positioning switch must be fixed between the top and bottom limit switches!
- After calibrating the depth, do not reset the zero positioning switch, otherwise the internal reference point will no longer be correct. Despite the correct reading in the display, the sensor can be located at a totally different position. This will cause damage to the sensor (e.g. in basin with rake mechanism!).
- The reference point is approached briefly on every zero positioning run.

6 Operation

6.1 Key assignment

After switch-on, always carry out a zero positioning run to define the sensor position. Then the instrument is automatically in measuring state.

If you hold down the '**M**' key during switch-on, a zero positioning run is carried out and the instrument remains in MEASUREMENT menu but does not start a measuring operation.

If you hold down the '**M**' and '□' keystroke combination during switch-on, the instrument goes directly to the CONFIGURATION menu without carrying out a zero positioning run (only for start-up).

Navigate through the main menu vertically by pressing the arrow keys, '□' and '□'; select a menu option by pressing '**E**'.

- '□' Navigate forwards through the main menu key
- '□' Navigate backwards through the main menu key
- '**E**' Select main menu option or submenu option key
- '**M**' To start of main menu (MEASUREMENT option) key
- '**K**' Select Calibration factor key

Press '**E**' and '**CE**' to navigate horizontally forwards and backwards through the selected submenu.

- '**E**' Navigate forwards in submenu
- '**CE**' Navigate backwards in submenu

Increment and decrement numerical values in a submenu option by holding down the '□' and '□' keys. Confirm by pressing '**E**'.

- '□' Increment numerical value
- '□' Decrement numerical value
- '**E**' Accept value

Code number to access submenu: enter number '**91**'

6.2 Main menu

The Main menu contains a succession of operations (in upper case letters):

```

MEASUREMENT
|
PARAMETER ENTRY
|
CALIBRATION SOLIDS
|
CALIBRATION DEPTH
|
SOLIDS INPUT
|
FREQUENCY
|
CONFIGURATION
|
LANGUAGE
|
DIAGNOSITC
|
MANUAL

```

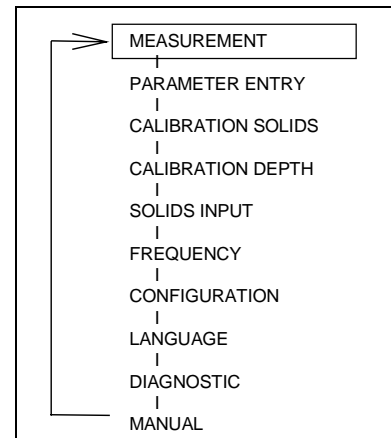
Menu structure

MEASUREMENT	—————	Meas. value depth	[m], [ft]
		Measured value solids content	[g/l], [%], [ppm], [mg/l]
		Analog output depth	[mA]
		Analog output solids content	[mA]
		Frequency probe signal	[Hz]
PARAMETER ENTRY	—————	Conc. setpoint at x.x	[g/l], [%], [ppm], [mg/l]
		Alarm A setpoint	[m], [ft]
		Alarm B setpoint	[m], [ft]
		Signal filter	[s]
		Pause	[s]
		Manual override	yes/no
		Safety height	[m]
		Safety period	[s]
		Meas. interval	[min]
		Meas. period	[min]
		Cleaning	schedule/sync
		Cleaning interval	[min] (only at "schedule")
		Cleaning period	[s]
		Auto height zero	[h]
		Washing interval	[h]
CALIBRATION SOLIDS	—————	Code number	91
		Number of points	n
		Value meas. point 1...n	[Hz]
CALIBRATION DEPTH	—————	Code number	91
		Meas. direction	from ground/from surface
		Zero set	[m]
		Max. range set	[m]
SOLIDS INPUT	—————	Code number	91
		Value meas. point 1...n	[g/l], [%], [ppm], [mg/l]
FREQUENCY	—————	Code number	91
		Value frequency 1...n	[Hz]
CONFIGURATION	—————	Code number	91
		Default setup	yes/no
		Type of sensor	SAM,SAV,SAH,SWN,SRH,SSN
		Unit of measure	[g/l], [%], [ppm], [mg/l]
		Depth/height unit	[m], [ft]
		Calibration factor	[%]
		Measurement	continuous/periodic
		Analog output	0/4 ... 20 mA (0 ... 20 g/l)
		Alarm A setpoint	NC/NO
		Alarm B setpoint	NC/NO
		Diagnostic alarm	NC/NO
LANGUAGE	—————	German	
		English	
		French	
		Italian	
		Spanish (other languages on request)	
DIAGNOSTIC	—————	Error display	
MANUAL	—————	Depth	[m], [ft]
		Solids content	[g/l], [%], [ppm], [mg/l]

6.3 MEASUREMENT menu

MEASUREMENT

- |
- Display of measured variables
 - Depth (or height above base or floor) [m], [ft]
 - Solids content [g/l], [%], [ppm], [mg/l]
- |
- Display of analog outputs
 - Sensor position (depth) [mA]
 - Solids content [mA]
- |
- Service display
 - Depth (or height above base or floor) [m], [ft]
 - Frequency of sensor signal [Hz]



Function:

This menu option records and evaluates the sensor signals (solids content / frequency in Hz) which determine the vertical position of the sensor (depth) and set the analog current.

Operation:

Press 'E' to toggle between the following displays:

- physical measured variables
- analog output signal (current) corresponding to depth or solids content
- sensor frequency (unconditioned signal for solids content)

- 'E' Changes between the displays for measured variable, analog output and frequency
- 'M' Returns to Main menu

The position control executes the following sensor movements on every measuring process start and in measurement mode:

- a) If the sensor is outside the permitted depth measuring range (between path zero point and path end point) at the start of the measurement, the sensor moves to path centre at fast speed before start of the measuring process.
- b) The sensor moves to the zero positioning switch briefly to define the sensor position after the period defined under "Auto height zero". During this time, the display or the analog output signal is not affected.
- c) The safety signal ("Safety height" input) triggers the sensor to move to a predetermined position for a specific period (PARAMETER ENTRY: safety period and safety height) to avoid the basin scraper. The display and the analog output are frozen.



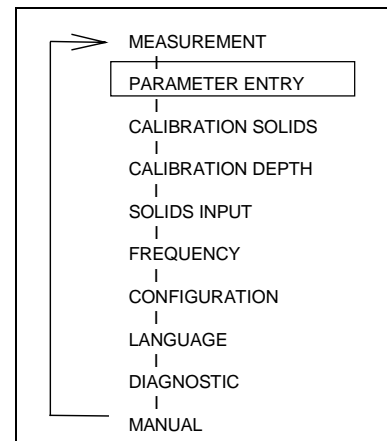
Note:

- After calibrating the depth, do **not** re-adjust the zero positioning switch. It acts as reference point for counting the motor steps.
- U_a (+24 V, terminal 45) can be used to control the "Safety height" (terminal 33) input. This requires a link between terminal 46 (0 V) and terminal 29 (0 V)!

6.4 PARAMETER ENTRY menu

PARAMETER ENTRY

Conc. setpoint at	[g/l], [%], [ppm], [mg/l]
Alarm A setpoint	[m], [ft]
Alarm B setpoint	[m], [ft]
Signal filter	[s]
Pause	[s]
Manual override	yes/no
Safety height	[m]
Safety period	[s]
Meas. interval	[min]
Meas. period	[min]
Cleaning	schedule/sync. with scraper
Cleaning interval	[min] (only with "schedule" cleaning)
Cleaning period	[s]
Auto height zero	[h]
Washing interval	[h]



Function:

- **Conc. setpoint**
Set the required concentration setpoint which the sensor will search.
- **Set the depth alarm setpoint A and B:**
Sensor position (depth) threshold for alarm relay. Switching hysteresis ±2% from limit.
- **Set signal filter:**
The signal filter defines the length of the time interval (in seconds) during which the sensor signal (equivalent to the solids content value) is averaged arithmetically. The sensor signal is measured every 0.5 seconds. The signal filter value setting applies to the measurement and sensor calibration. The signal filter setting affects the travel speed of the sensor.

Sensor travel speed

Signal filter [s]	Measurement run [cm/s]	Profile run [cm/s]
1	2	10
2	1	5
5	0.33	2
10	0.17	1
20	0.17	0.57
30	0.09	0.33

- **Setting the pause time:**
Setting a pause time between 30 and 360s. If a concentration setpoint is found, the sensor is raised by 6cm and dwells there for the pause period setting. Then a new search starts.
- **Setting the manual override:**
Select yes: When the "Safety height" input is controlled, the sensor travels in all operating modes (automatic and manual) to the safety height setting.
Select no: When the "Safety height" input is controlled, the sensor travels to the safety height setting only in automatic mode.
- **Setting the safety height and the safety period:**
Defines the position (safety height), i.e. the position the sensor adopts for the period (safety period) of the scraper run in order to leave the basin for a short period. Measurement and analog output are frozen for this period.
- **Setting the measuring interval / setting the measurement period:**
If you selected a period measurement under CONFIGURATION, define the time interval [min] and the period for the measurement [min] here.
- **Select between schedule and sync. cleaning:**
During a cleaning run, the sensor travels to safety height and is cleaned there externally with water. During the cleaning process, measurement is interrupted and values are frozen.
Sync. cleaning: Sensor cleaning is always triggered synchronously with a zero positioning run.
Schedule cleaning: If you selected "Schedule cleaning", the sensor is additionally cleaned periodically (schedule) on expiry of the selected cleaning interval.
- **Setting the cleaning interval:**
Time period between two sensor cleaning processes when "Schedule cleaning" is selected.
- **Setting the cleaning period:**
Time taken by a sensor cleaning process [s].
- **Setting the auto height zero:**
Indicates after how many hours the sensor starting position will be reset to zero automatically to be equivalent to the position of the zero positioning switch. If you enter 0 hours, no zero positioning run takes place.
- **Setting the washing interval:**
During a washing operation, the sensor travels to the clear water zone within the basin and automatically cleans itself there by moving up and down. The washing operation starts automatically when the sensor travels to the top path end of the calibrated depth without interruption, e.g. in the event of floating sludge.
An interval time of 0 ... 4 hours is set between washing operations. On expiry of the interval time, the sensor travels 120 cm below the top path end of the calibrated depth. Then it executes the following movements:
80cm up - 10cm up - 10cm down - 10cm up - 10cm up -
40cm up - 200cm below the top path end of the calibrated depth.
From there it restarts the search for the separation zone.
If you set the washing interval to 0, no washing run takes place.

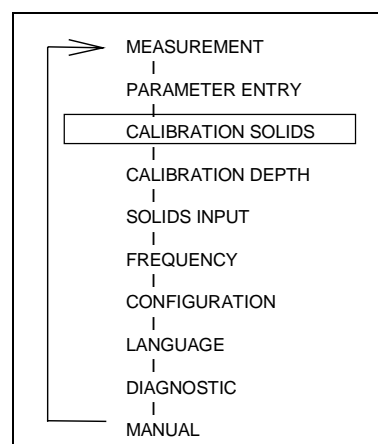
Operation:

Navigate through the submenu and select numerical values, see Section 6.1 "Key assignment".
Press 'M' to return to the Main menu.

6.5 CALIBRATION SOLIDS menu

CALIBRATION

Code number		[91]
Number of points		[n]
Value meas. point 1...n		[Hz]



Function:

During calibration, sensor signals (measuring points 1 to n) of comparative media of known concentration are detected and saved in random order. The measuring system is calibrated with empirical values before it leaves the factory. An application-specific calibration is required if the sensor does not operate with defaults for turbidity (e.g. Formazine).

During calibration, the sensor can be moved up and down manually by pressing '↓' and '↑'.



Note:

- If you do not confirm the frequency displayed for each measuring point by pressing 'E' and you confirm the menu option by pressing 'M', the new frequency value is adopted. If you confirm by pressing 'E', the new frequency is saved and the previous frequency is deleted.
- In general, we advise you to set a signal filter of 2s when calibrating.

Operation:

- **Entering the code number (default = 91):**
2-digit number. If you enter a different code number, the program exits the submenu and returns to the MEASUREMENT menu.
- **Selecting the number of points:**
Number of value pairs used for calibrating sensor frequency solids content (minimum 2, maximum 8).
- **Measuring points 1...n:**
Display the number of measuring points and the currently measured sensor signal.
Accept the measured variable (sensor signal) by pressing 'E'.
Go back one measuring point by pressing 'CE'.
Press 'M' to return to the Main menu.

Example:

MEASUREMENT menu option

Press ↓ until

CALIBRATION
SOLIDS

appears,
then press 'E'.

Code No.:

↑ enter 91,
↓ then press 'E'.

Meas. points

↑ e.g. 3 meas. points (2 - 8),
↓ then press 'E'.

Place sensor in **1st bucket (filled with water)** and stir; measuring frequency appears at about **4000 Hz** in clear water.

1st meas. point

is equivalent to zero point; when display is stable, accept value by pressing 'E'.

Place sensor in **2nd bucket (filled with sludge of average solids content)** and stir; measuring frequency appears at about **3000 Hz**.

2nd meas. point

when value is stable, save by pressing 'E'.

Place sensor in **3rd bucket (filled with sludge of high solids content)** and stir; measuring frequency appears of about **2000 Hz**.

3rd meas. point

when value is stable, save by pressing 'E'.

6.6 CALIBRATION DEPTH menu

CALIBRATION DEPTH

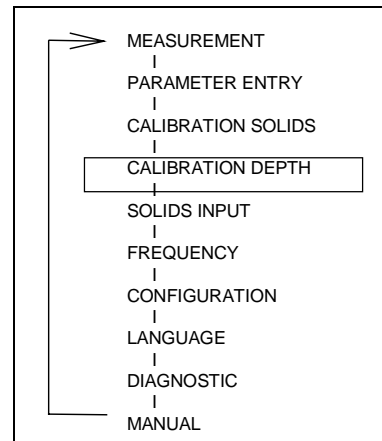
Code number	[91]
Meas. direction	from ground/from surface
Zero set	
Max. range set	[m]

Function:

The CALIBRATION DEPTH menu defines the measurement direction (upwards or downward) and the path measuring range limited by the zero and end points.

Operation:

- **Entering the code number (default = 91):**
2-digit number. If you enter a different code number, the program exits the submenu and returns to the MEASUREMENT menu.
- **Selecting the measurement direction:**
From surface: The path zero point is located near to the basin surface and the path end point is below it (in the direction of the basin bottom). An increase in the meter value is equivalent to the sensor lowering.
From ground: The path zero point is located near to the basin bottom and the path end point above it (in the direction of the basin surface). An increase in the meter value is equivalent to the sensor rising.
- **Zero set (= 0/4mA):**
Move sensor to zero point position, i.e. move the sensor by pressing ↓ and ↑ until the required path zero point is reached. Then confirm by pressing "E".
- **Max. range set (= 20mA):**
Move sensor to the end of the measuring range, i.e. move the sensor by pressing ↓ and ↑ (the sensor's position is displayed in meters), until the required path end point. Then confirm by pressing "E".
This defines the height and depth measuring range (sensor travel path).



Note:

- After calibrating the depth, do **not** re-adjust the zero positioning switch! This acts as the reference point for counting the motor steps.
- When you calibrate the depth, the current output 1 is also affected. This function is designed to monitor the current signal from the control room, for example.

6.7 SOLIDS INPUT menu

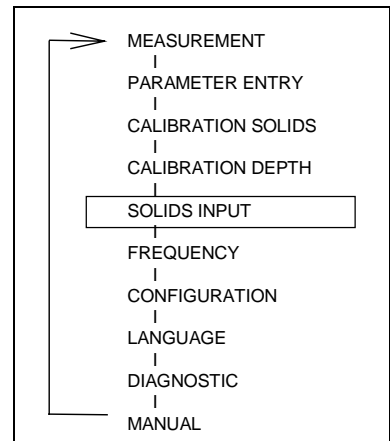
SOLIDS INPUT

Code number [91]
 Value meas. point 1...n [g/l], [%], [ppm], [mg/l]*

* Enter the measured variables determined in the laboratory and confirm by pressing 'E'.

Function:

- **Entering the code number (default = 91):**
 2-digit number. If you enter a different code number, the program exits the submenu and returns to the MEASUREMENT menu.
- **Value meas. point 1...n:**
 The SOLIDS INPUT menu is for entering and saving solids content values - known or determined later in the laboratory - corresponding to the measuring points 1...n (i.e. frequencies saved under "CALIBRATION SOLIDS").



Operation:

Navigate through the submenu and select numerical values, see Section 6.1 "Key assignment". Press 'M' to return to the Main menu.

Set the 3rd decimal place: after pressing ↓ or ↑ also press 'E'!

Example:

MEASUREMENT menu

Press ↓ until

SOLIDS INPUT

appears. Then press 'E'.

Code No.:

↑
↓

Enter 91, then press 'E'.

1st meas. point
x.xx g/l

↑
↓

Enter zero point 0.00, press 'E' to confirm 0.00g/l (equiv. to clear water)

2nd meas. point
x.xx g/l

↑
↓

Enter laboratory value (e.g. 3.5g/l) and confirm by pressing 'E'.

3rd meas. point
x.xx g/l

↑
↓

Enter laboratory value (e.g. 6.3g/l) and confirm by pressing 'E'.

-> M

Press 'M'.

MEASUREMENT

6.8 FREQUENCY menu

```

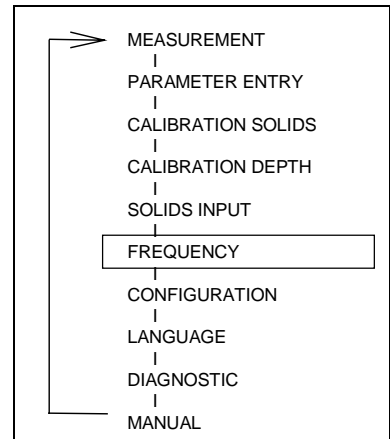
FREQUENCY
|
Code number      [91]
|
Value frequency 1...n  [Hz]
    
```

Function:

- **Entering the code number (default = 91):**
2-digit number. If you enter a different code number, the program exits the submenu and returns to the MEASUREMENT menu.
- **Value frequency 1...n**
When you enter the frequency [Hz], you can request the sensor signals detected for measuring points 1...n and edit them manually.

Operation:

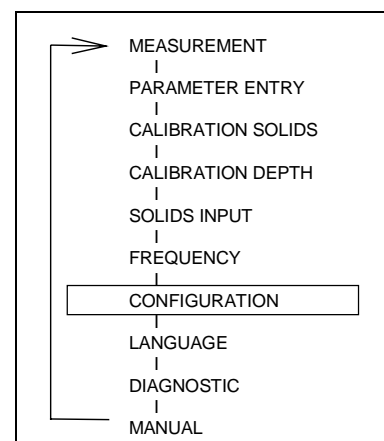
Navigate through the submenu and select numerical values, see Section 6.1 "Key assignment". Press 'M' to return to the Main menu.



6.9 CONFIGURATION menu

```

CONFIGURATION
|
Code number      [91]
|
Default setup
|
Type of sensor   SAM,SAV,SAH,SWM,SWN,SRH,SSN
|
Unit of measure  [g/l], [%], [ppm], [mg/l]
|
Depth/height unit  [m], [ft]
|
Calibration factor  [%]
|
Measurement      continuous/periodic
|
Analog output     0-20 mA / 4-20 mA
|
Alarm A           NC/NO
|
Alarm B           NC/NO
|
Diagnostic alarm  NC/NO
    
```



Function:

- **Entering the code number (default = 91):**
2-digit number. If you enter a different code number, the program exits the submenu and returns to the MEASUREMENT menu.
- **Default setup:**
Default parameters are loaded (see Appendix) when you press the two arrow keys together.

**Note:**

- When the default values are loaded, the previous memory values are overwritten!
- If you require a medium-specific calibration, press 'E' and continue as described in Chp. 5 "Start-up".

- **Type of sensor:**

The 7210 MTS measuring system is fitted with a standard SAM sensor. When a special version is shipped, please change the default setting for the sensor type accordingly.

- **Unit of measure:**

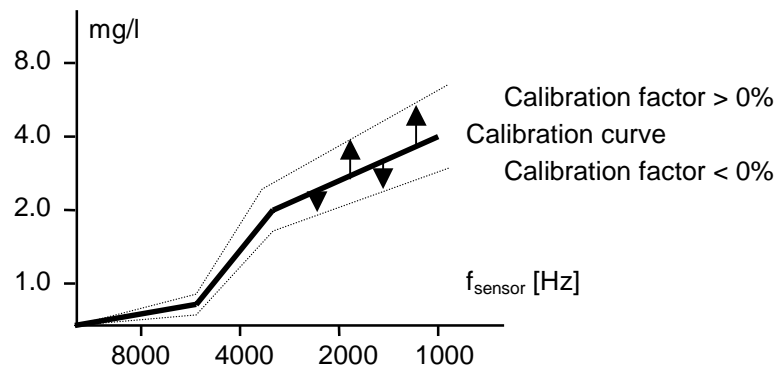
Physical unit of measure of the concentration. Available units include [g/l], [%], [ppm], [mg/l].

- **Depth/height unit:**

Indicates the depth of the separation zone. You can select between [m] and [ft]

- **Calibration factor:**

Linear adaptation factor of the calibration curve when the medium measured has reduced fluctuations. Input limits: $\pm 25\%$.

- **Measurement:**

continuous: Measuring operation with no interruption, continuous search for separation zone.
periodic: Under PARAMETER ENTRY, set a "measuring interval" (5 ... 60 min) and a "Meas. period" (1 ... 15 min). Always start a washing run before every measurement run. Then the search for the separation zone starts for the time set under "Meas. period".

- **Analog output:**

You can choose whether the defined depth measuring range is mapped linearly on a current range of 0-20mA or 4-20mA. The measuring range start is always equivalent to 0mA or 4mA (0g/l) and the measuring range end to 20mA (20g/l). Signal output 1 is equivalent to the sludge level depth and signal output 2 to the solids content.

- **Alarms A and B, diagnostic alarm:**

Set whether the relay operates as normally closed or normally open.

Operation:

For how to navigate through the submenu and select numerical value, see Section 6.1 "Key assignment".

Press 'M' to return to the Main menu.

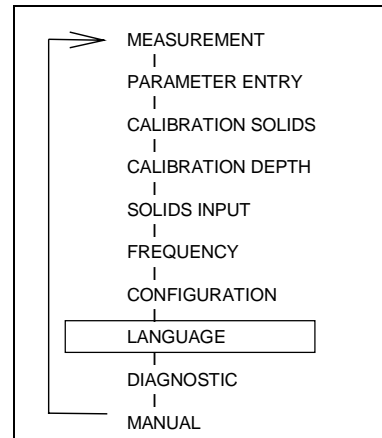
6.10 LANGUAGE menu

LANGUAGE

|
German - English - French - Italian - Spanish
(other languages on request)

Operation:

Change Language by pressing “ and “,
Confirm the language by pressing ‘E’,
back to Main menu: press ‘M’.



6.11 DIAGNOSTIC menu

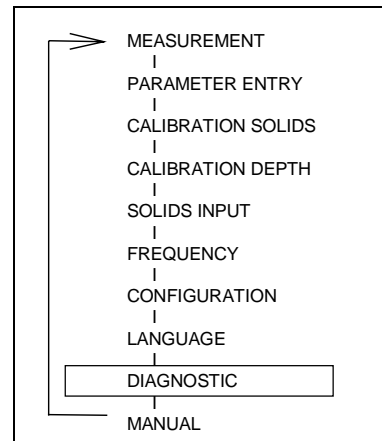
DIAGNOSTIC

|
Error display

Operation:

Retrieve error messages in succession by pressing ‘E’ and ‘CE’. After the last message, press ‘M’ to return to the Main menu.

You can only set the "Error" signal output when the error cause is present uninterrupted for min. 30 seconds plus twice the signal filter time.

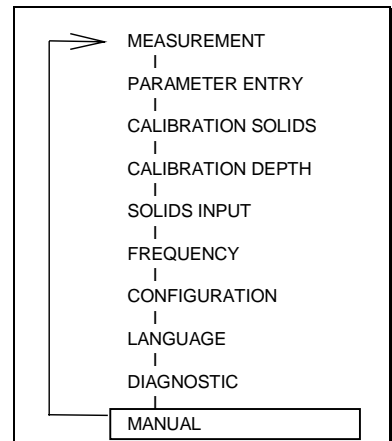


Error display	Cause	Remedial action
No sensor signal	Transmitter receives no frequency signal from sensor (e.g. due to cable break). This error causes a frequency display of 0Hz irrespective of "Error" output.	Check electrical connection STM Service
Sensor soiled	Transmitter receives no frequency signal from sensor but receives status message (e.g. soiled sensor window). This error causes a frequency display of 505Hz irrespective of "Error" output.	Clean sensor STM Service
Error * / Check calibration	Error occurs when you enter measuring points of identical frequency in CALIBRATION SOLIDS menu.	Correct your frequency input.

If measurement is faulty, always carry out the steps for first start-up again.

6.12 MANUAL menu

MANUAL
 |
 Depth [m], [ft]
 Solids content [g/l], [%], [ppm], [mg/l]



Function:

In manual mode, the sensor position is displayed in meters and the solids content measured at that point. Press ↓ and ↑ to move the sensor up or down or beyond the path zero and end points.

Do not set the current outputs in manual mode!

Operation:

Press 'M' to return to the Main menu.

7 Maintenance



Warning!

When the instrument is switched off, the heating module is still active. Therefore, only carry out maintenance work on the instrument when it is de-energised.



Note:

- Proper functioning can only be ensured if the instrument is operated according to the operating instructions!
- If measurement is faulty, always carry out the steps for first start-up again.
- All parameter settings are stored in a non-volatile memory. The battery life is approx. 5 years.
- The terminal box contains all the fuses for the transmitter (see Pin Assignment in Section 4.2).
- Severe scratches or fouling of the measuring window can impair the measuring capability of the sensor.
- Depending on the application, the cleaning cycle can be extended (empirical values).
- The sensor may only be opened by STM personnel otherwise the warranty provisions become null and void.
- Repairs not described in the operating instructions may only be carried out by the manufacturer or by the service organisation (Tel. +49 – 7172 – 184 – 177).

7.1 Maintenance plan

The 7210 MTS measuring system generally requires little maintenance. However, you should carry out the following servicing work to ensure that the sensor remains in perfect working condition:

Weekly:

Clean sensor

Remove residue using spray water.

Do not clean the measuring window using hard, pointed objects.

Yearly:

General function test

Check sensor calibration.

Check age of battery (battery life is approx. 5 years)

Tighten cable terminals and check for firm seat.

7.2 Replacing the sensor

If the sensor has to be replaced, please observe the following instructions:

1. Only replace the sensor in de-energised state (heating off)!
2. Unreel the sensor in "MANUAL" mode until there are only about 1½ windings of cable on the drum. (If necessary, remove the bottom limit switch. Mark the position first!)
3. Continue unreeling the sensor slowly in "MANUAL" mode until the mounting plate appears in the mounting window on the left drum side.
4. Switch off the mains switch and unplug the connector between the electronics and the tracking unit.
5. Slacken the connector and slacken the four fixing screws to which the tracking unit is attached (you do not need to remove them completely).
6. Lift the tracking unit out, unscrew the mounting plate and unplug the sensor cable.
7. You can now pull out the cable through the drum, the guide block and the housing base. To make it easier to pass the cable through the drum, you can use a drawing wire.
8. Mount the sensor in the reverse order of operations. Make sure that you route the cable properly and avoid overlaps.

7.3 Spare parts

You can order the following spare parts for the 7210 MTS measuring system:

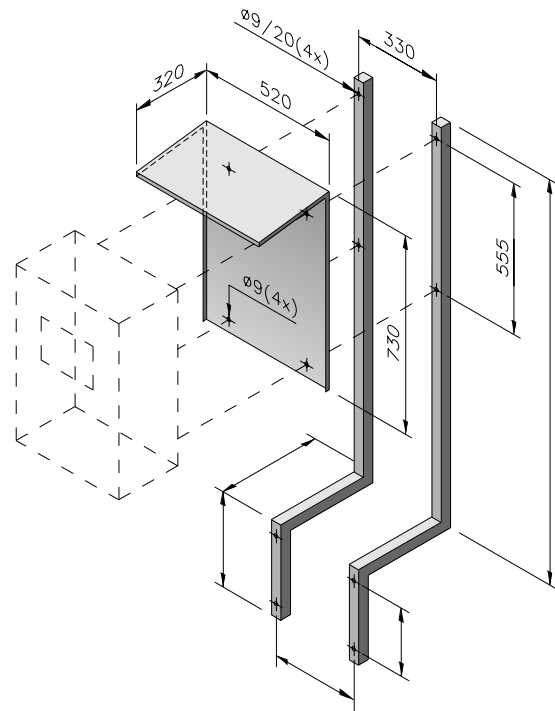
- Front control cabinet door
Order No.: 51503608
- Heating module
Order No.: 51503606
- Transmitter
Order No.: 51503605
- Protection guard
Order No.: 51503783
- Sensor with 13 m cable
Order No.: 51503700
- Tracking unit
Order No.: 51503604
- Ex-sensor with 13 m cable
Order No.: 51503701
- Terminal housing for Ex-sensor
Order No.: 51503846

8. Accessories

Accessories

7900 KOS

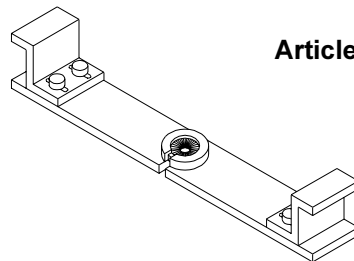
Article no. 51503706



Bracket with protective roof for mounting the sludge level measurement system **7210 MTS** on rotating scraper bridges.

Material: Stainless steel (1.4301)

The bracket is manufactured to customer's specifications.



7900 SRB

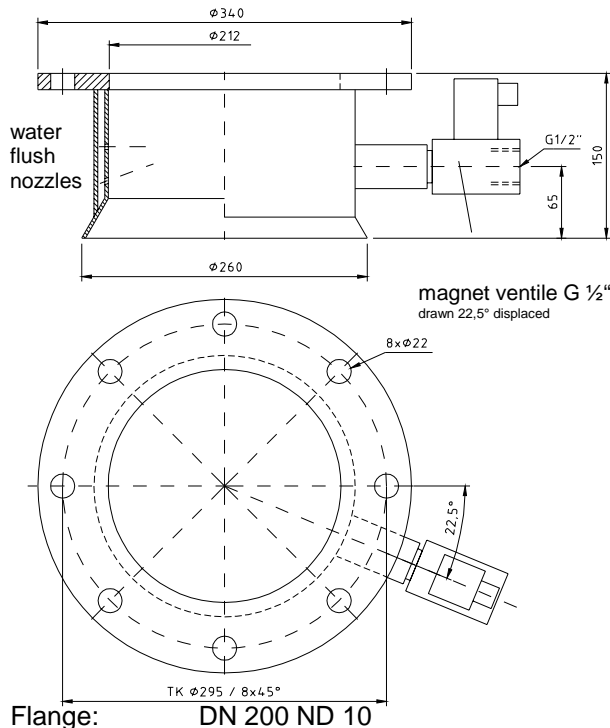
Article no. 51503707

Probe cable cleaning device with round brush for the sludge measurement system **7210 MTS**.

Simple fixing on the **7900 KOS** bracket.

Cleaning equipment for sludge level measurement system 7200 MTS:

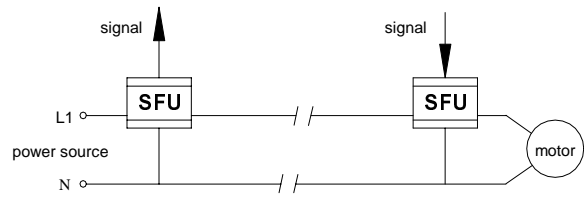
7900 SPU-VA Article no. 51503708



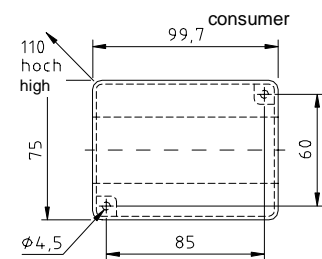
Flange: DN 200 ND 10
 Material: Stainless steel, W.Nr. 1.4571

7900 SFU

Article no. 51503609
 SFU2 (analog 4-20 mA)



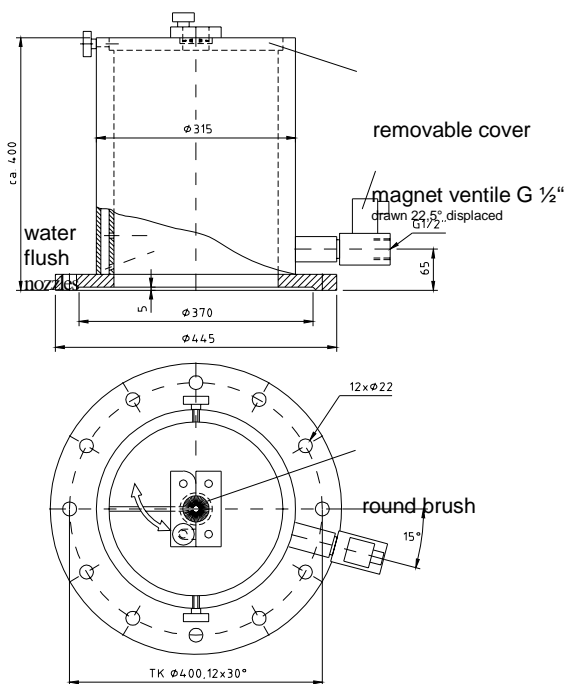
Installation dimensions:



Remote signal transmission modules. A signal indicating that the threshold value has been reached or the actual measured value as well can be transformed over existing power cables (220 / 380 VAC, 6 A) to the control booth and be separated out electrically. This reduces costs for installation of additional slip rings on rotating scraper bridges and/or subsequent laying of lines.

Installation: on standard rails
 Enclosure class: IP 20

7900 SPU-PP Artikel-Nr. 51503709



Flange: DN 300 ND 10; Material: PP

9 Technical Data

7210 MTS measuring system

General data

Manufacturer	Staiger Mohilo
Equipment name	Sludge Level Measuring System 7210 MTS

Transmitter

Mechanical data

Dimensions of transmitter (L x W x D)	647 x 436 x 250 mm
Total weight of sensor and tracking unit	approx. 30 kg
Display	LED display (14 mm) for current measured variable, 2-line LC display (5 mm) for parameter entry

Materials

Housing	Polyester connector between electronics and tracking unit
Sight window	Polycarbonate
Ingress protection	IP 54

Input

Signal input 1	Measuring input
Measured variables	Turbidity measurement, altitude measurement
Measuring principle, turbidity measurement	Multi-beam pulsed light method
Measuring light	Infrared light at 880 nm
Measuring range	0 ... 12 g/l; 0.01 ... 1%
Accuracy	□ 1% of measured variable
Reproducibility	0.5%
Altitude measurement	Stepper motor control
Measuring range	0 ... 11 m, freely programmable measuring range
Signal input 2 (24 V DC)	Synchronisation, e.g. for raising the sensor for scraper passage
Signal input 3 (24 V DC)	Profile run

Output

Signal output 1	0/4...20 mA for sludge level measurement (height)
Signal output 2	0/4...20 mA for solids content measurement (concentration 0 ... 20 g/l)
Load	max. 500 ohms
Switching outputs	2 limit contacts, freely configurable 1 relay contact for sensor cleaning 1 relay contact for error signal
Switching power	2 A at 115/230 V AC, 1 A at 30 V DC

Electrical connection

Power supply	230/115 V AC, 50/60 Hz +6 ... -10%
Power consumption	max. 105 VA (electronics + heating)

Heating

Heating power	thermostatically controlled, 55 VA
---------------	------------------------------------

Ambient conditions

Ambient temperature	-20 ... +60 °C
---------------------	----------------

Tracking unit

Components

Cable drum (w x □)	210 x □160 mm
Cable length	13 m
Drive	Stepper motor with worm gear and toothed belt
Stepping rate	200 steps per revolution
Signal transmission	Noble metal sliprings
Tracking speed	max. 10 cm/s

Sensor

Mechanical data

Dimensions (l x □)	260 x □ 38 mm
--------------------	---------------

Materials

Sensor	Stainless steel SS 316Ti and polyoxymethylene
Sensor cable	Polyurethane sheath
Sensor weight	Stainless steel SS 316Ti and polyamide 6.6 GFRP
Protection guard	Stainless steel SS 316Ti

Altitude measurement

Max. sensor stroke	11.4 m
Travel speed of sensor	10 cm/s (manual mode)

Operating conditions

Temperature	Max. 50 °C
Pressure	Max. 6 bar

Subject to modifications.

10 Appendix

10.1 Form for settings of 7210 MTS

Main menu	Parameters	Unit / Select	Setting
Serial Number			
Software Version			
MEASUREMENT	Measured value depth	[m], [ft]	
	Measures value solids	[g/l], [%], [ppm], [mg/l]	
	Analog output depth	[mA]	
	Analog output solids	[mA]	
	Frequency probe signal	[Hz]	
PARAMETER ENTRY	Conc. setpoint	[g/l], [%], [ppm], [mg/l]	
	Alarm A setpoint	[m], [ft]	
	Alarm B setpoint	[m], [ft]	
	Signal filter	[s]	
	Pause	[s]	
	Manual override	yes/no	
	Safety height	[m]	
	Safety period	[s]	
	Measuring interval	[min]	
	Measurement period	[min]	
	Cleaning	schedule/sync	
	Cleaning interval	[min] (only for schedule)	
	Cleaning period	[s]	
	Auto height zero	[h]	
	Washing interval	[h]	
CALIBRATION SOLIDS	Number of points	n	
	Measuring point 1 ... n	[Hz]	
CALIBRATION DEPTH	Meas. direction	from ground/from surface	
	Zero set	[m]	
	Max. range set	[m]	
SOLIDS INPUT	Measuring point 1 ... n	[g/l], [%], [ppm], [mg/l]	
FREQUENCY	Frequency 1 ... n	[Hz]	
CONFIGURATION	Default setup	yes/no	
	Type of sensor	SAM,SAV,SAH,SRH	
	Unit of measure	[g/l], [%], [ppm], [mg/l]	
	Depth/height unit	[m], [ft]	
	Calibration factor	[%]	
	Measurement	continuous/periodic	
	Analog output	0/4 ... 20 mA	
	Alarm A	NC/NO	
	Alarm B	NC/NO	
	Diagnostic alarm	NC/NO	
LANGUAGE	Language	G/E/F/I/S	
DIAGNOSTIC	Error display		
MANUAL	Depth	[m], [ft]	
	Solids content	[g/l], [%], [ppm], [mg/l]	

10.2 Default setup

Parameter	Factory setting
Unit of measure	g/l
Analog output	4...20mA
Limits	Normally open contact
No. of calibration points	4
Frequency 1[Hz]	4250
Frequency 2[Hz]	2650
Frequency 3[Hz]	2150
Frequency 4[Hz]	1000
Frequency 5[Hz]	-
Frequency 6[Hz]	-
Frequency 7[Hz]	-
Frequency 8[Hz]	-
Concentration 1	0.0
Concentration 2	5.0
Concentration 3	10.0
Concentration 4	15.0
Concentration 5	-
Concentration 6	-
Concentration 7	-
Concentration 8	-
Conc. setpoint	1.0
Signal filter [s]	5
Pause [s]	60
Cleaning	sync.
Cleaning interval [min]	0
Cleaning period [s]	1
Zero positioning run, schedule [h]	24
Type of sensor	SAM

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