FERTRON

MBF-095

BRIX Sensor

Solids Sensors

User's Guide
Version 3.0, 24VDC

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1.   Safety

!   **During installation, maintenance and service operations,
remember to pay special attention to all instructed safety actions.**

**Always check that the incoming voltage & frequency are correct before
Making any electric connections. Wrong connection may damage the
equipment! The applicable electrical safety regulations must be closely
followed in all installation work!**

**Before any welding works in the vicinity of the devices,
make sure that operating voltage is not connected and Sensor
and the Connection Unit are well protected against welding droppings!**

**Before releasing any bolts, clamps or flanges, make sure all precautions
have been taken in account.
Releasing any sensor components under process pressure or
temperature may cause severe on health and injury risks.**

2.   General

The Sensors utilize digital microwave technology to measure suspended and dissolved solids in food, beverage and other industrial processes.
Applications cover Brix measurement of all critical processes and Brix levels throughout the sugar mill.

Digital microwave signal processing and convenient industrial design provide long term stability and quick plug & play operation eliminating need for frequent calibration or adjustment.
Extremely hard ceramic antennas ensure high durability and long-term stability.
The accurate and continuous measurement can be used for both quality monitoring and process control.

High measuring resolution facilitates exact process control to obtain maximum product quality, high yield and mill running economics.

Flow through and in-line sensor versions are available for various purposes.
Both sensor models are based on the same measuring electronics and Software and are equipped with temperature measurement and compensation.

Sensors measure concentration from 0 to 100% or as high as material can be pumped.
Maximum calibration range depends on application and process temperature.

3. Sensor Models

3.1 Model G, Flow Through sensors

Model G flow through sensors are based on hygienic Varinline body structure.
Sensor body diameter ranges from 1.5" up to 3".
The Model G2 is certified by EHDEG for critical food and beverage processes.
All Basic G models are utilizing quick coupling installation principles.
On request, various standard bolt flange adapter options are also available.

Delivery includes
- Hinged quick couplings
- EPDM gasket

Bolt flanges option by order

3.2 Model IL, In Line sensor

Model IL In-line sensor is designed for a tank wall and large diameter pipe, min 150 mm.
The antennas are located to the head of the sensor, distance 50 mm.
Model IL features quick coupling installation.
Various bolt flange adapter options are available by order.

Delivery includes
- Bolt coupling
- Weld nozzle
- EPDM gasket

Bolt flange adapter by order

3.3 Model P, Flow Through sensor

Model P, Flow Through Sensors are designed for pipelines.
Sensor is based on bolt flange installation up to 25Bar (380PSI).
Sensor replaces a section of a process pipe.
Solids sensing antennas are positioned on each side of the sensor body facing each other.
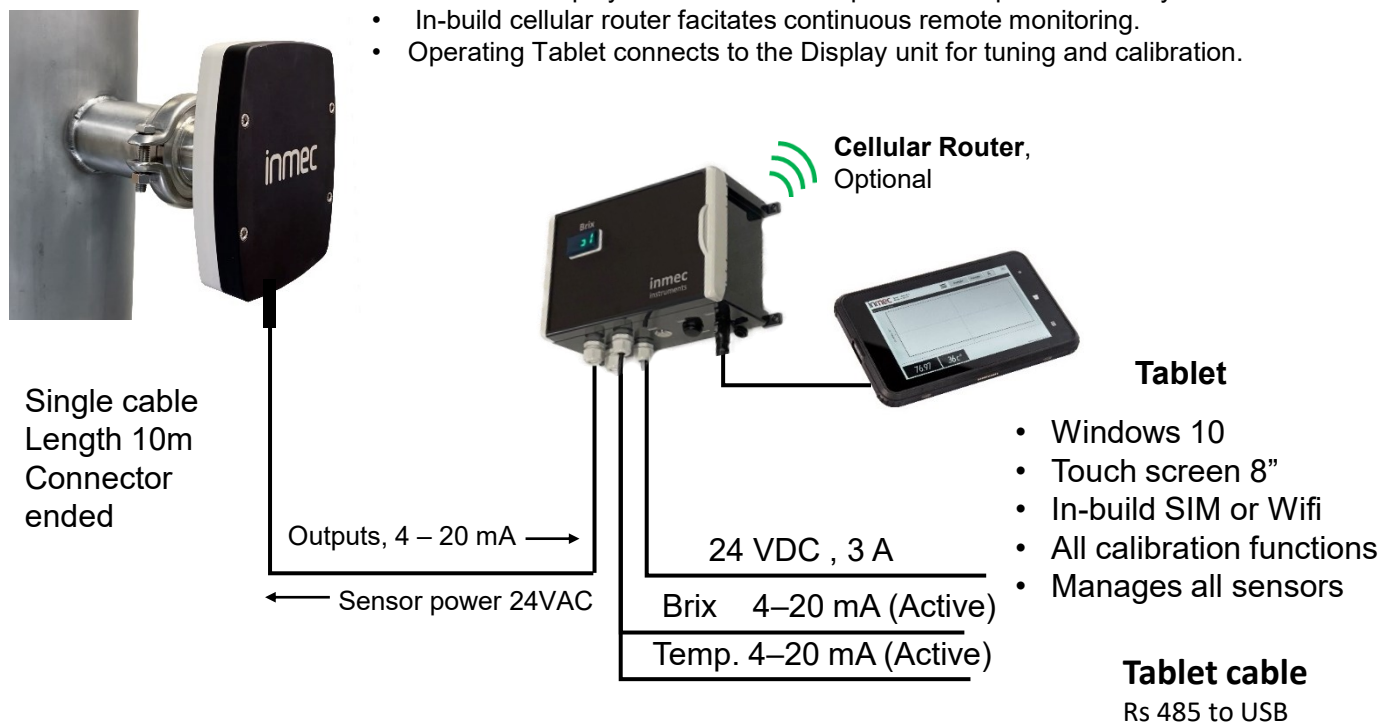
4. Display Unit

Wiring between sensor and mill system is arranged via Display Unit.
There is also display for Solids/Brix and process temperature fed by the sensor.
- In-build cellular router facitates continuous remote monitoring.
- Operating Tablet connects to the Display unit for tuning and calibration.

Cellular Router, Optional

Tablet

Single cable
Length 10m
Connector
ended

Outputs, 4 – 20 mA →

← Sensor power 24VAC

24 VDC , 3 A

Brix   4–20 mA (Active)

Temp. 4–20 mA (Active)

- Windows 10
- Touch screen 8"
- In-build SIM or Wifi
- All calibration functions
- Manages all sensors

Tablet cable
Rs 485 to USB

Display unit features:
- Numeric display (Brix, Density or %-Total Solids)
- Temp. Display, Optional

Connections:
- 24V power supply to the sensor
- Tablet, USB connection
- Brix and Temp. outputs 4 – 20 mA
- RS 485 Interface to Gateway unit
- Option: In-Build **Cellular router**, supports connected sensor
- Option: External **Gateway Unit**, supports multiple sensors

Brix Display

Tablet connector and Switches at the box
bottom for protection

Tablet cable connector

Reset Button

Remote / Local switch,
- *   Remote: Enables remote access via Router
- Local: Disables Router,. Used when Tablet connected

5.   Installation

5.1   Mechanical installation

When specifying installation location, special attention has to be paid to make sure material flow at the sensor location is stable without air formation under any process running conditions.
Installing sensor right after valves or pumps should be avoided.
The most desirable flow direction is vertical line sections having upwards flow.
Minimum of 1.5 bar pressure is recommended to avoid air formation at the sensor.

Inmec product datasheets provide information of various installation options.
It is recommended to confirm details with Inmec sales or servive representatives.

The following examples describe In-Line and Flow through Sensor installation details

5.1.1 Model IL sensor installation at Pan bottom

- Union-L Clamp assembly is included in sensor delivery
- Clamp ring welded to the pan bottom cone. Diameter of the opening cut is 70 mm
- Make sure installation will leave necessary clearance to the calandria

Calandria

245 mm

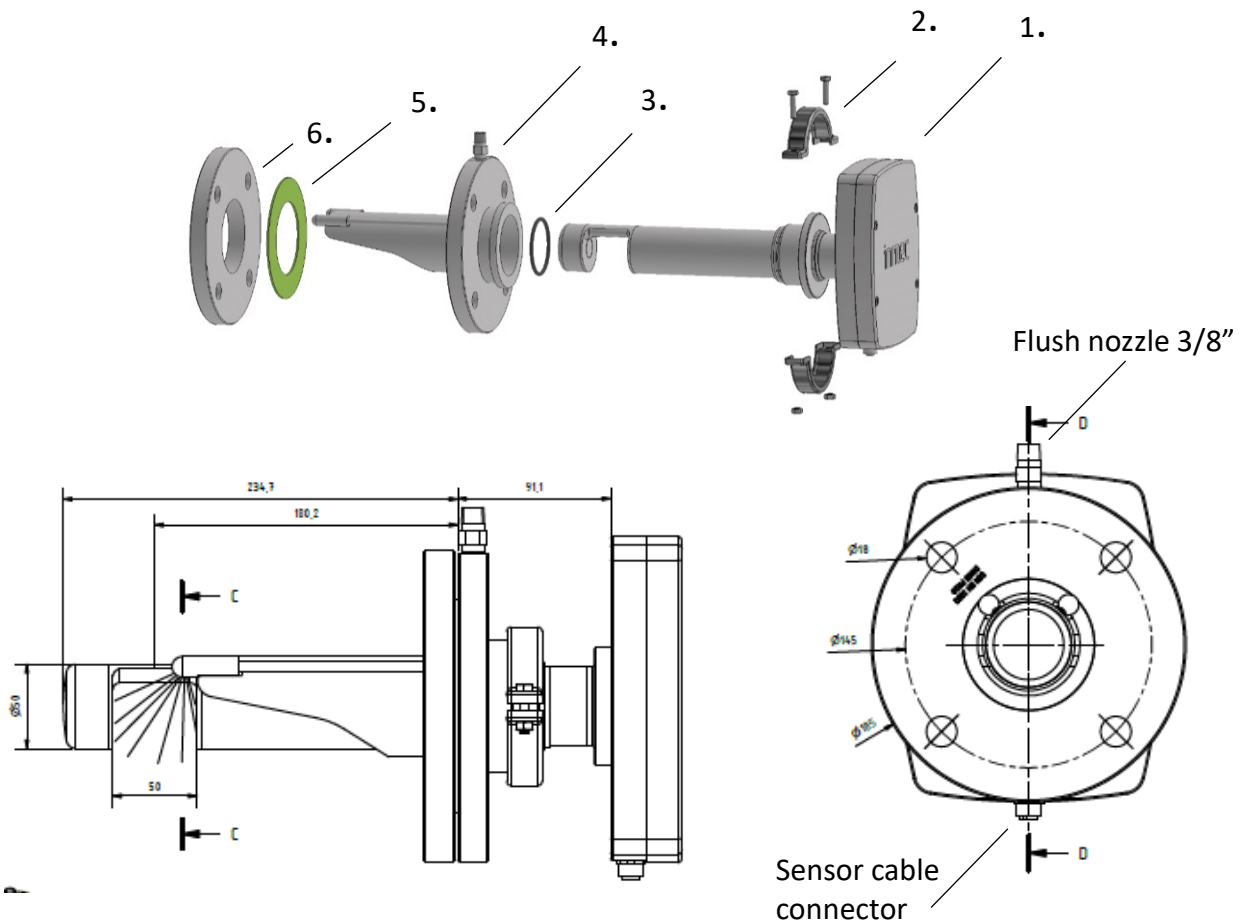260 mm
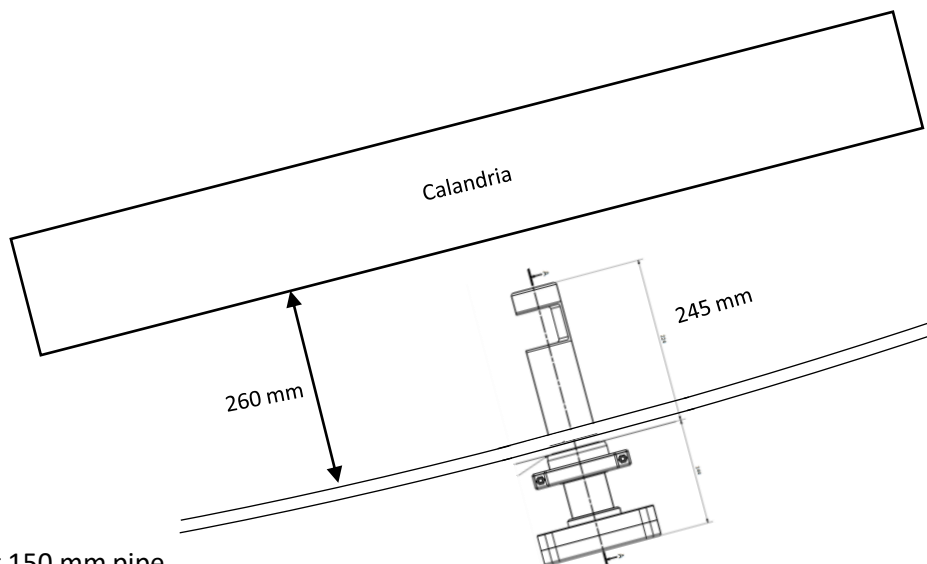
In-Line sensor at 150 mm pipe
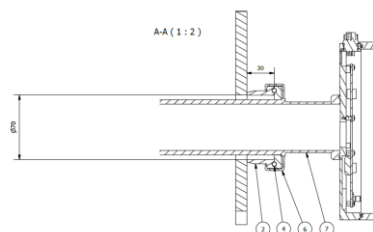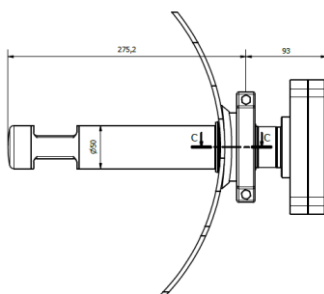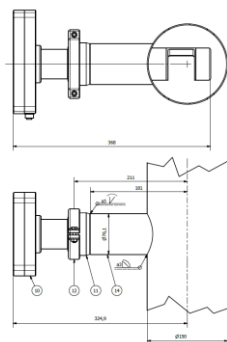
5.1.2 Model IL 50 Sensor With Flushing option installation

Parts

1. Model IL 50 Sensor
2. Bolt Clamp
3. O-Ring
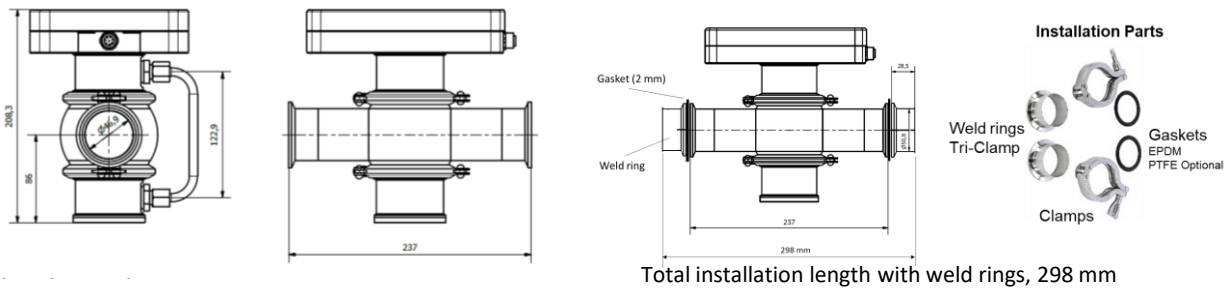4. Flushing Unit, Flange DN65-PN10
   Options, normally by customer:
5. Flange gasket, DN65
6. Process side flange, DN65-PN10, inner hole and wall cut-off diameter, 70 mm

Flush nozzle 3/8"
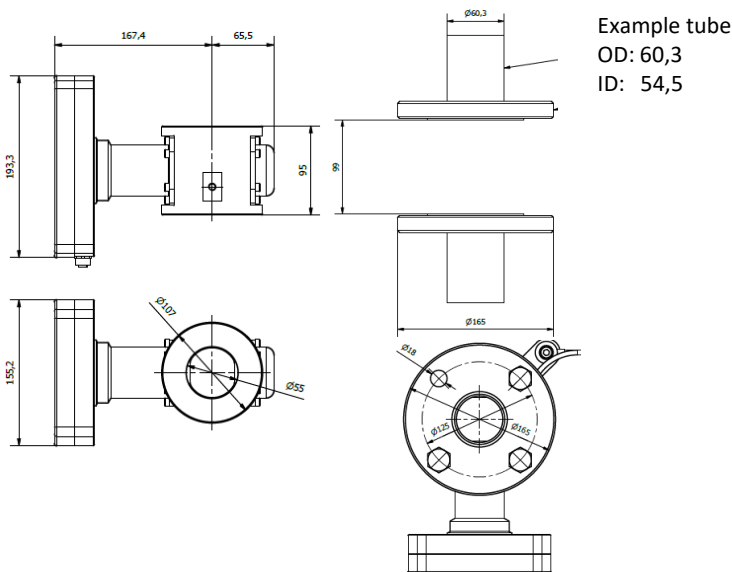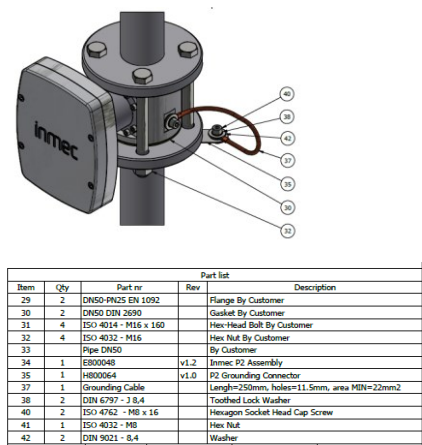
Sensor cable connector

Note: MAKE SURE FLUSH NOZZLE AND SENSOR CABLE CONNECTOR ARE POINTED AND OROENTED AS ABOVE.
180 degrees apart
This is to ensure flush is pointed correctly
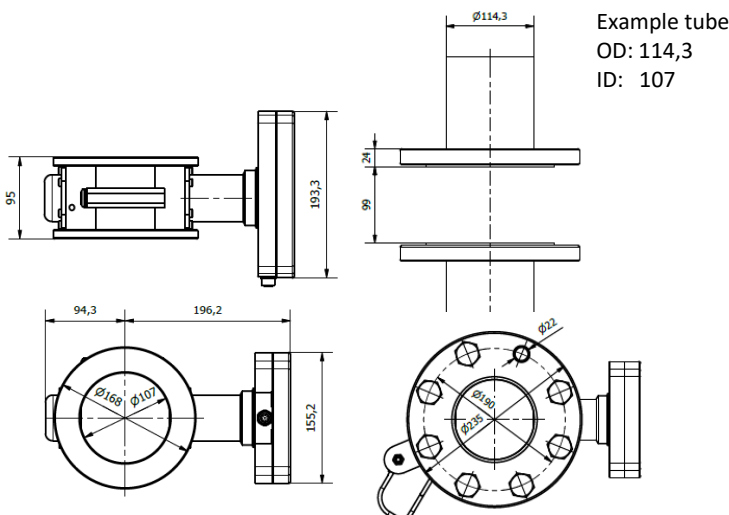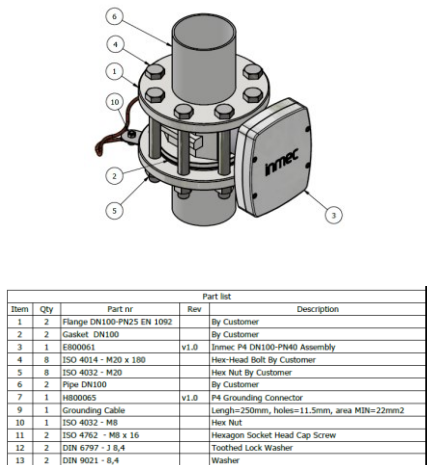
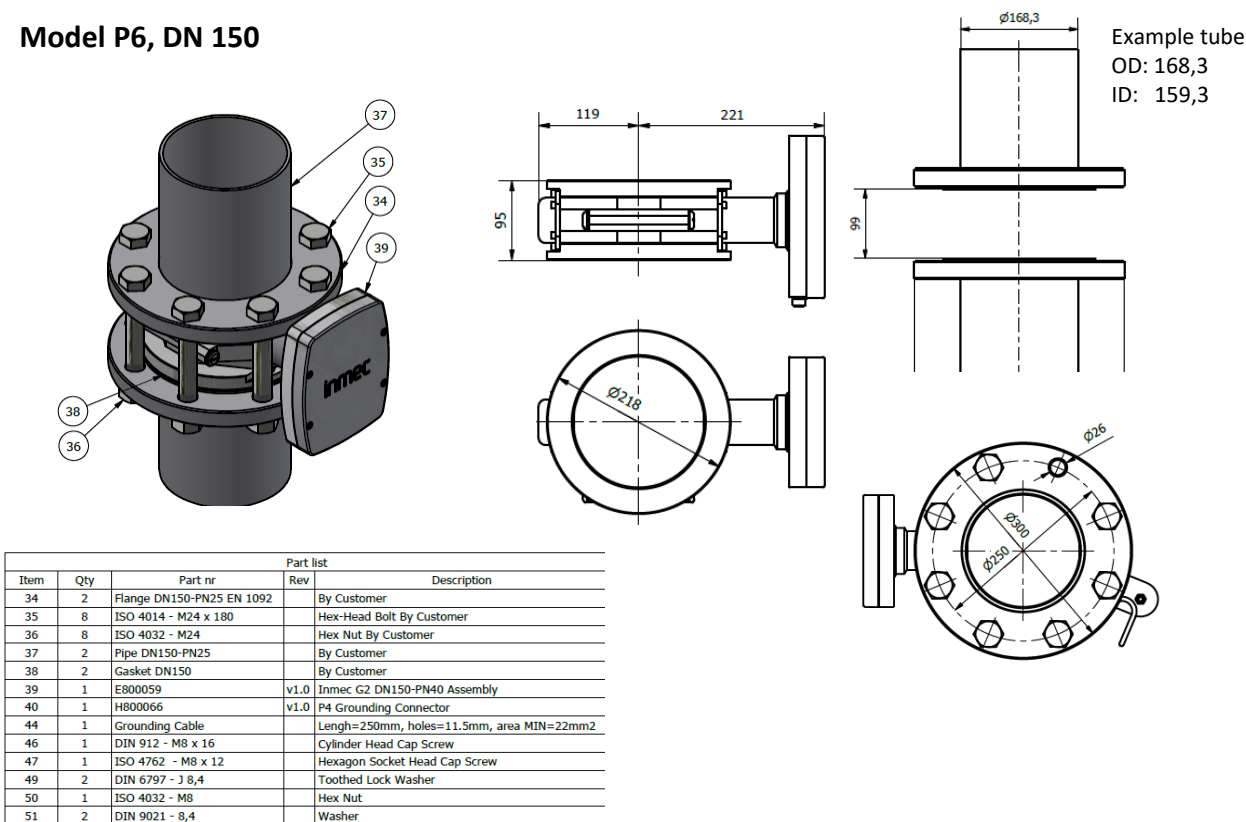## Flow Through Sensors, installation dimensions

Model G2

Gasket (2 mm)

Weld ring

Weld rings
Tri-Clamp

Installation Parts

Gaskets
EPDM
PTFE Optional

Clamps

Total installation length with weld rings, 298 mm

Model P2, DN 50

Example tube
OD: 60,3
ID: 54,5

Part list				
Item	Qty	Part nr	Rev	Description
29	2	DN50-PN25 EN 1092		Flange By Customer
30	2	DN50 DIN 2690		Gasket By Customer
31	4	ISO 4014 - M16 x 160		Hex-Head Bolt By Customer
32	4	ISO 4032 - M16		Hex Nut By Customer
33		Pipe DN50		By Customer
34	1	E800048	v1.2	Inmec P2 Assembly
35	1	H800064	v1.0	P2 Grounding Connector
37	1	Grounding Cable		Lengh=250mm, holes=11.5mm, area MIN=22mm2
38	2	DIN 6797 - J 8,4		Toothed Lock Washer
40	2	ISO 4762 - M8 x 16		Hexagon Socket Head Cap Screw
41	1	ISO 4032 - M8		Hex Nut
42	2	DIN 9021 - 8,4		Washer

Model P4, DN 100

Example tube
OD: 114,3
ID: 107

Part list				
Item	Qty	Part nr	Rev	Description
1	2	Flange DN100-PN25 EN 1092		By Customer
2	2	Gasket DN100		By Customer
3	1	E800061	v1.0	Inmec P4 DN100-PN40 Assembly
4	8	ISO 4014 - M20 x 180		Hex-Head Bolt By Customer
5	8	ISO 4032 - M20		Hex Nut By Customer
6	2	Pipe DN100		By Customer
7	1	H800065	v1.0	P4 Grounding Connector
9	1	Grounding Cable		Lengh=250mm, holes=11.5mm, area MIN=22mm2
10	1	ISO 4032 - M8		Hex Nut
11	2	ISO 4762 - M8 x 16		Hexagon Socket Head Cap Screw
12	2	DIN 6797 - J 8,4		Toothed Lock Washer
13	2	DIN 9021 - 8,4		Washer

Flow Through Sensors, installation dimensions

Model P6, DN 150

Example tube
OD: 168,3
ID: 159,3

Part list				
Item	Qty	Part nr	Rev	Description
34	2	Flange DN150-PN25 EN 1092		By Customer
35	8	ISO 4014 - M24 x 180		Hex-Head Bolt By Customer
36	8	ISO 4032 - M24		Hex Nut By Customer
37	2	Pipe DN150-PN25		By Customer
38	2	Gasket DN150		By Customer
39	1	E800059	v1.0	Inmec G2 DN150-PN40 Assembly
40	1	H800066	v1.0	P4 Grounding Connector
44	1	Grounding Cable		Lengh=250mm, holes=11.5mm, area MIN=22mm2
46	1	DIN 912 - M8 x 16		Cylinder Head Cap Screw
47	1	ISO 4762 - M8 x 12		Hexagon Socket Head Cap Screw
49	2	DIN 6797 - J 8,4		Toothed Lock Washer
50	1	ISO 4032 - M8		Hex Nut
51	2	DIN 9021 - 8,4		Washer

5.2   Electrical installation
The Display Unit, 24 VDC model

Router, Optional
- Cellular
- Wifi

Single cable
Length 10m
Connector ended

Brix (Concentration), 4 – 20 mA
Process temperature, 4 – 20 mA

Sensor power 24V

Power input 24 VDC,3A

Brix   4–20 mA (Active)

Temp. 4–20 mA (Active)

MAIN POWER and I/O - Connections		
X1		
13	+	**+ 24 VDC**
13	+	
14	-	**GND**
14	-	
15	+	4-20 mA output Active, BRIX
16	-	4-20 mA output Active, BRIX
17	+	4-20 mA output Active,TEMP
18	-	4-20 mA output Active,TEMP
19		Option
20		Option

Please note!
Analog outputs, 4 -20mA,
are Active and isolated.
Max load 750 Ohm

Display Unit dimensions

155 mm

275 mm
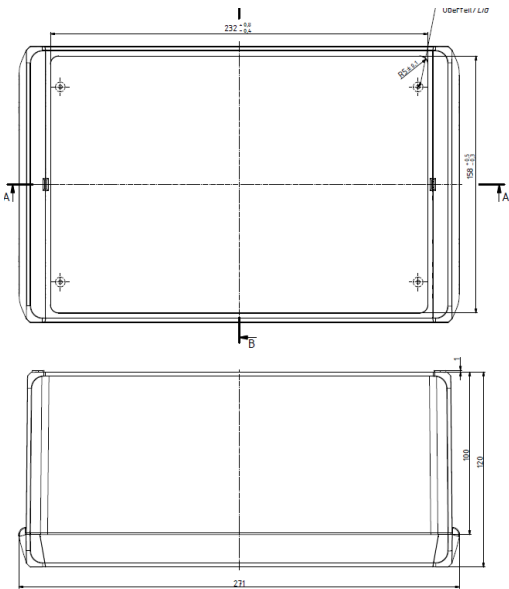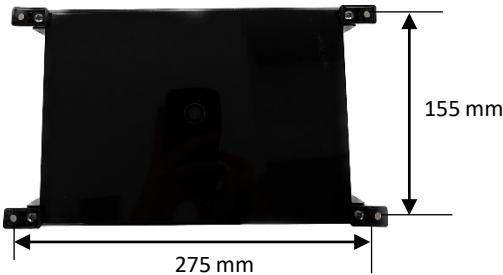
5.3   Brix display Settings

You will find operating buttons on the back side of the Connection Unit front panel

PROG

ARROWS
For parameter and
value entry

Brix lower level parameter (4 mA)

Brix upper level Parameter (20 mA)
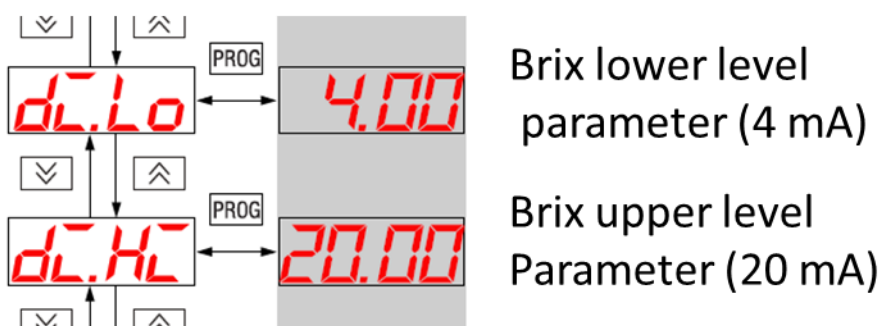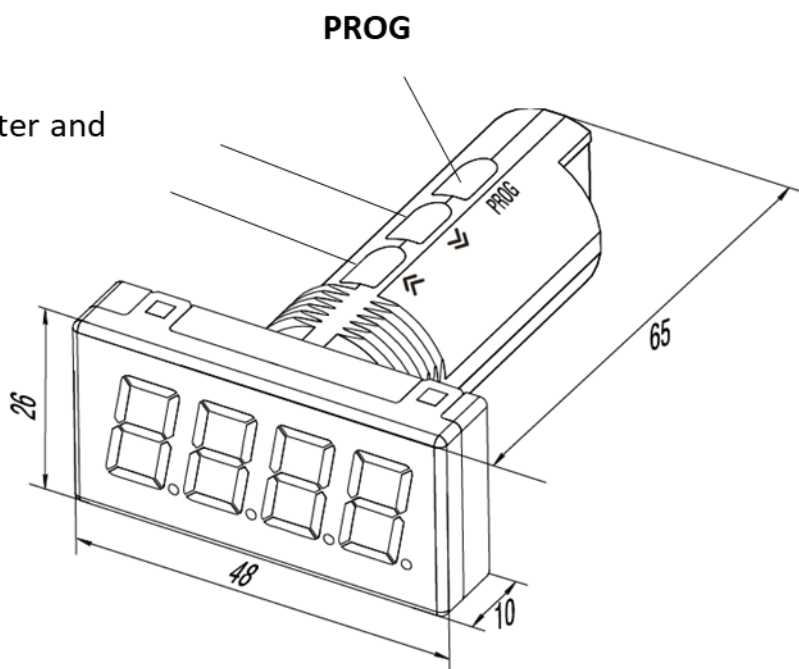
Steps to set limit parameters

1. Press PROG
2. Press Arrows to go to limit parameter
3. Press PROG
4. Press or hold Arrows to select right value
5. Press PROG
6. Press PROG for 5 seconds to return to normal mode, or wait 20 seconds

6. Starting up

Whenever starting up a new Inmec Sensor, check with Inmec Represenstative that presettings for your measurement application have been installed.
Typically there are application specific preset parameters that are based on information given to Inmec prior to delivery.
Set Sensor real time clock to the Tablet clock. See page 22.
As soon as presettings and basic parameters (see page 18) are in place, start up with sampling can be launched.

6.1　　　　Operating Tablet

Power switch　　　　　　　　　**CIM card slot**

Power inlet

USB to sensor

Inmec SW is a Windows application. Tablet is either included in the sensor delivery or it has been provided by the sensor user.
In order to operate sensor parameters, connect cable from the Tablet to the connector of Sensor Display Unit. Tablet cable comes with the sensor delivery.
Remote operations are carried out via Wifi or Cellular Connection.
CIM card slot is integrated to he tablet. Remote operation requires TeamViewer.
When connecting Tablet to the sensor connection unit, Inmec software detects the sensor automatically by its serial number as Application-SW starts.
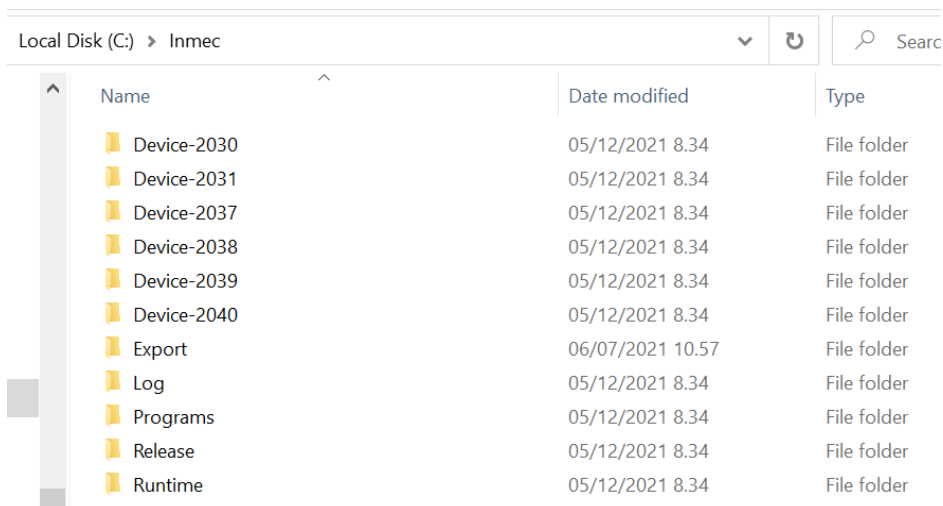
6.1.1 Tablet connection to the Sensors

Before Sensors can be operated by the Windows Tablet, a dedicated sensor folder needs to be added and configured correctly. All Inmec Sensor related files and folders are found in the Inmec folder at Drive C:

Below an example of folder structure where Inmec Folder contains all Sensor folders. Sensor folders are named as Device-2030 to Device-2040, where four digit code represents Sensor Serial number.
When adding a a new sensor to this structure, contact Inmec representative to ensure correct settings will be included and set.

Local Disk (C:) > Inmec		
Name	Date modified	Type
Device-2030	05/12/2021 8.34	File folder
Device-2031	05/12/2021 8.34	File folder
Device-2037	05/12/2021 8.34	File folder
Device-2038	05/12/2021 8.34	File folder
Device-2039	05/12/2021 8.34	File folder
Device-2040	05/12/2021 8.34	File folder
Export	06/07/2021 10.57	File folder
Log	05/12/2021 8.34	File folder
Programs	05/12/2021 8.34	File folder
Release	05/12/2021 8.34	File folder
Runtime	05/12/2021 8.34	File folder

6.2   Inmec application software

Application software is a user interface to operate Inmec Sensors.
Application is pre-configured and ready to be used as Tablet is powered ON.
Just click the Inmec short cut to launch the Application.
The Inmec program runs as Windows application. All operating is carried out by using the Tablet.
Application detects each Sensor automatically by its ID (Serial Number) as cable is connected and application started.
Active parameters of the connected sensor will be downloaded automatically to the Tablet as Parameters page is opened.

PIN code

Click ⠀⠀🗑⠀⠀   To open PIN entry keypad.
Enter PIN   Operating pages become available
Click ≡   To open list of available pages
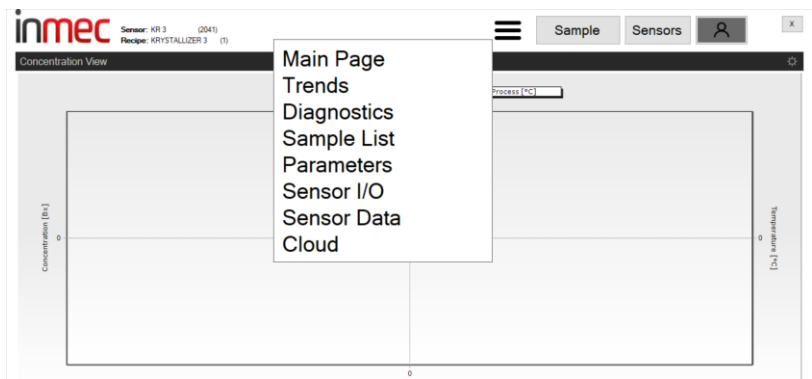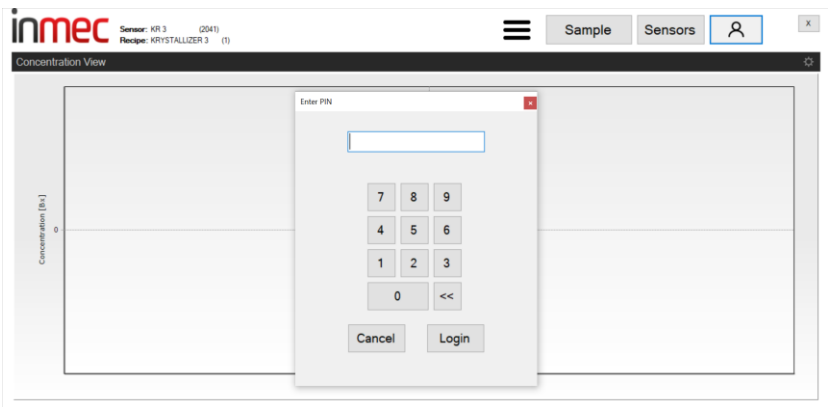
6.3   Operating pages

6.3.1   Main-Page

Main page illustrates the Brix and temperature trends and numeric values of Brix and process Temperature.

| Pages | Sample button | Sensors | PIN entry | Close |
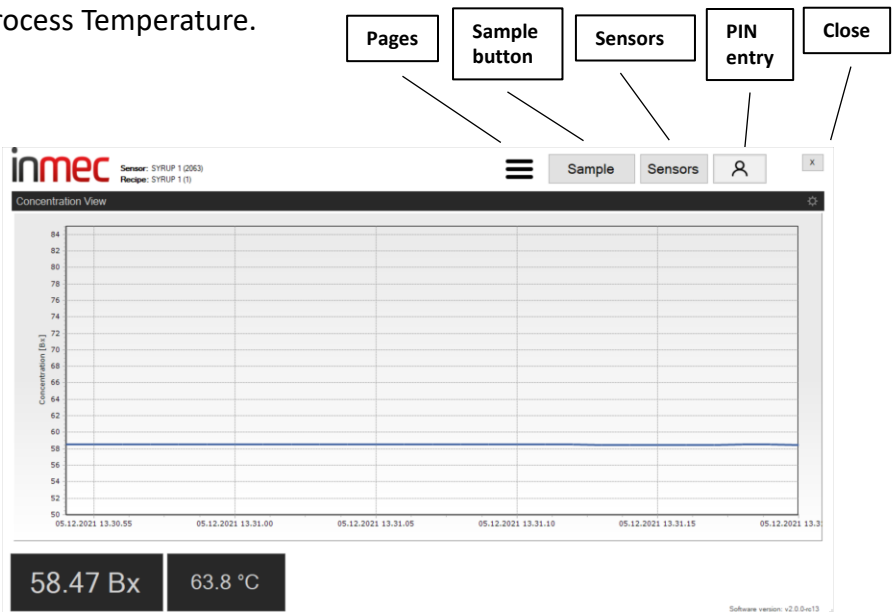
6.3.2   Trends-Page

Trend page includes trends of the measured variables.
Tablet will record all measured data as long as it is connected.
Enter database file name and Check Write to DB to launch datalogging.
Collected database can be opened by Clicking Select Range to UI.
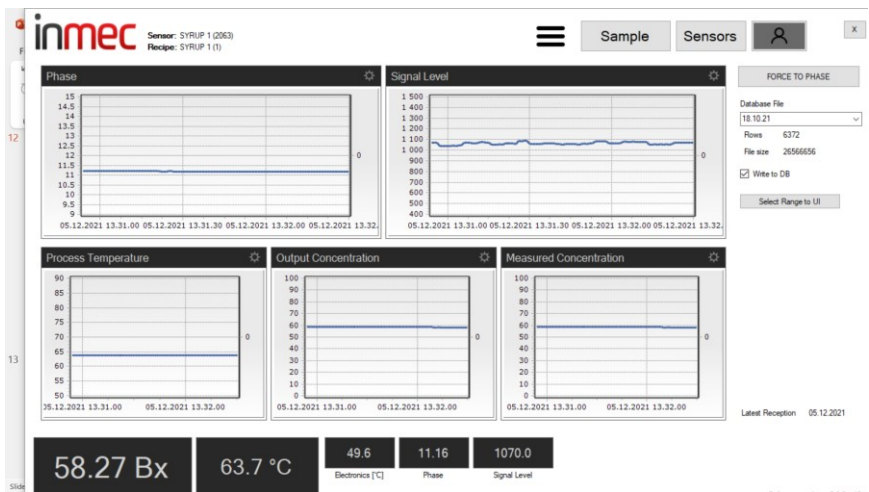
6.3.3 Diagnostics-page

Graphics on the Diagnostics page indicates status of the internal measuring loop of the sensor.
The left graph illustrates even sinus wave in case everything is in order.
In case any distorsion is observed, contact Inmec represenstative for further troubleshooting.
Distorsion may be caused by false parameters or failed hardware components.
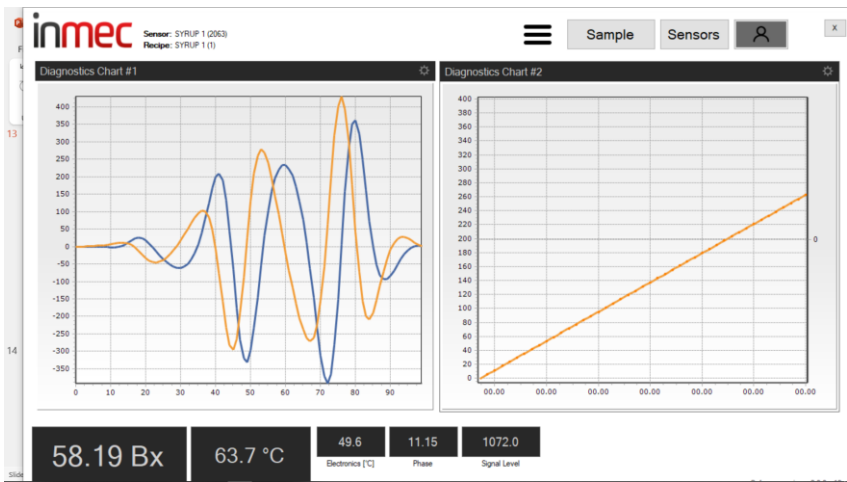

6.3.4 Sample List-page

Sample list contains all samples collected for calibrations.
List shows recorded Sensor readings over sampling periods and entered lab. values.
Each line on the list represents one individual sample.
When opening the Sample list page it shows active samples which have been used to carry out Autocalibration the last time.
Graph on the right window shows active Autocalibration status.
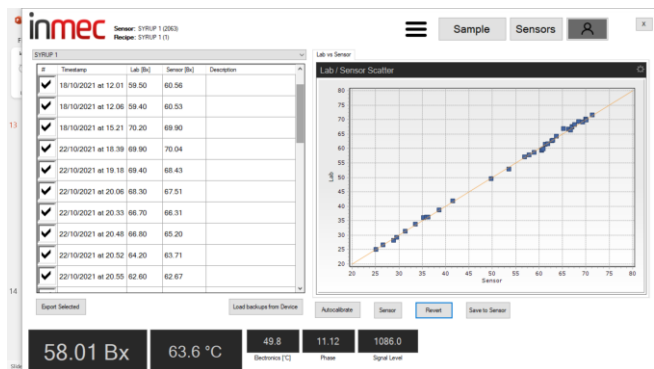
6.3.5   Parameters-Page

Paremeters define Sensor functions.
The list of existing running parameters can be retrieved from the sensor
As soon as Sensor cable is connected and the Application is running.

After changing a parameter value, Click Save to Sensor and tuned
parametrers will be saved and activated at the Sensor.
Settings will also be saved to Parameter history of the Tablet.
If you wish to go back to previous parameters, go to Retrive From History
and select and open previous settings from the list.
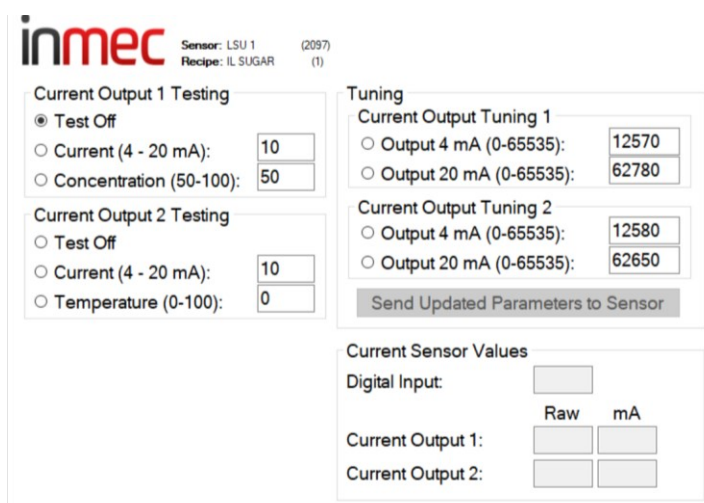
6.3.6   Sensor I/O-Page

This page is used to test Sensor Inputs and outputs.
Select and Enter current or concentration value to send it to Output 1.
Select and Enter current or temperature value to send it to Output 2.

Digital Input indicator activates when input reads 24VDC signal.

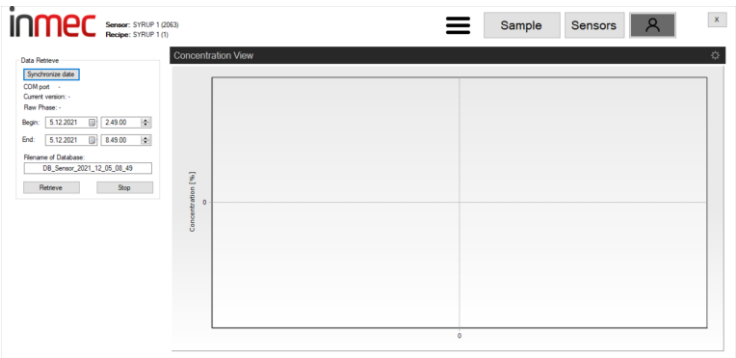After testing, Click Test Off and return back to normal operating mode

Change output Hardware parameters
for output fine tuning.

To activate HW parameters, Click:
Send Updated Parameters to Sensor

Current HW parameters
and corresponding mA values
Illustrate Active status

6.3.7   Sensor Data- Page

Sensor Data page is mainly used by Sensor main user.
When necessary, click Syncronize Date to set Sensor time and date to
Tablet time.
Select Begin and End time for retrieving logged data from the sensor.
Enter Filename of the saving database.
Click: Retrieve, to Launch data download form the sensor.
Graph on the right shows data trend and loading progress.
Logging interval is set by parameter no: 504

7.   Parameter tuning

As soon as you have entered the right entry code, the parameters below are available for tuning and taking in use.
The list can be found on the Parameter page of the Central Unit display.
When opening the parameter page, existing sensor parameters will be first retrieved from the sensor memory.
After changing parameter value, activate parameters by Clicking Save to Sensor button on the screen.
As saving parameters, they will also be saved automatically to parameter history, from history list they can be called back and activated to the sensor.
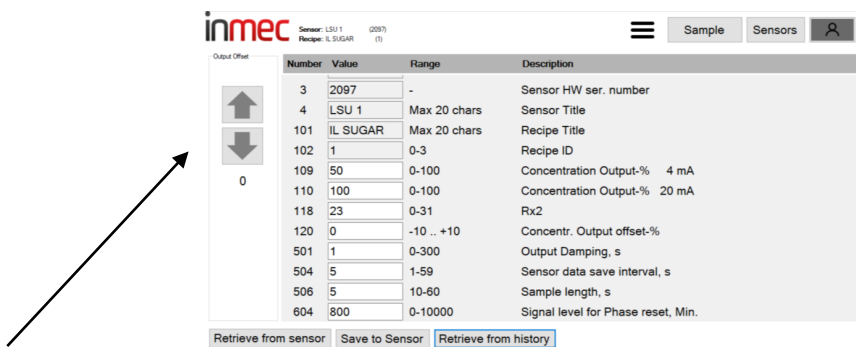
Use the arrow keys to set output offset,
Parameter (120) value follows
automatically

Parameter	Description
4	Sensor Title, typically describing the part of the process
101	Recipe Tilte, Typically only one recipe per sensor in use
109	Calibrated concentration min-% that corresponds 4mA output. Value has to match system input settings
110	Calibrated concentration max-% that corresponds 20mA output. Value has to match system input settings
118	Attenuation, Rx2 This parameter sets sensor Signal level. Decreasing value increases signal level
120	Concentration output offset. Concentration value follows offset directly, can be tuned by arrows also
501	4-20 mA output damping, sets damping parameter for the output
504	Datalogging interval
506	Sample saving time during sampling
604	Signal level for Phase Reset at Vacuum Pan start, contact Inmec for tuning

All other parameters are reserved for authorized service personnel.
Additional parameters related to the application can be enabled at start-up

7.1 Setting basic parameters for the start up

Basic parameters define the most important functions for successful start up and sensor operation over time.
Depending on material measured and application, values of basic parameters may vary significantly.

Brix (Concentration) Range parameters:

      109   Brix Level at 4 mA
      110   Brix Level at 20 mA

Attenuation parameter, Rx2

      118   Attenuation value defines signal level.
                  As Pin-code entered, Value is illustrated on the Tablet screen
                  Parameter value can be set between 1 – 32.
                  Set value to have Signal level varying between 500 – 2000 during pan cycle.
                  In case of Vacuum Pan Signal level needs to be at 800-1000 at the beginning of pan cycle.
                  Contact Inmec representative for further advise.

Signal level for Phase Reset at Vacuum Pan start

      604   Sets signal level to execute Phase Reset at the beginning of pan cycle.
                  For example. Value 900 means that Phase reset will be executed as signal level drops below   900

8.   Taking laboratory samples for calibration

Laboratory samples correlating with sensor values are used for checking and calibrating the sensor.
Always when taking lab. Sample, connect Tablet to the sensor and activate measured value
recording by Pushing Sample button on the Tablet screen.
There is a softkey (Sample button) at Tablet display that enables Brix recording over 5 seconds.
Green progress bar illustrates the recording duration.

Sample button

9.   Sampling results and calibration

Every sample recorded are illustrated on the **Sample List** page.
Enter PIN code to open **Sample List** page
After sampling, measurement results appear on the list.
Lab. Results shall be entered next to those values for calibration.
Graphics on the right side of the page shows correlation between measurements and laboratory
results.
To carry out calibration Click **Autocalibrate**-button. Optimum correlation will be illustrated.
Save to Sensor button saves and activates the calibration to the sensor.
After saving calibration, you are have finished calibration and Tablet can be disconnected.
To veryfy calibration periodically, repeat sampling to see new points appearing on the Sample list.
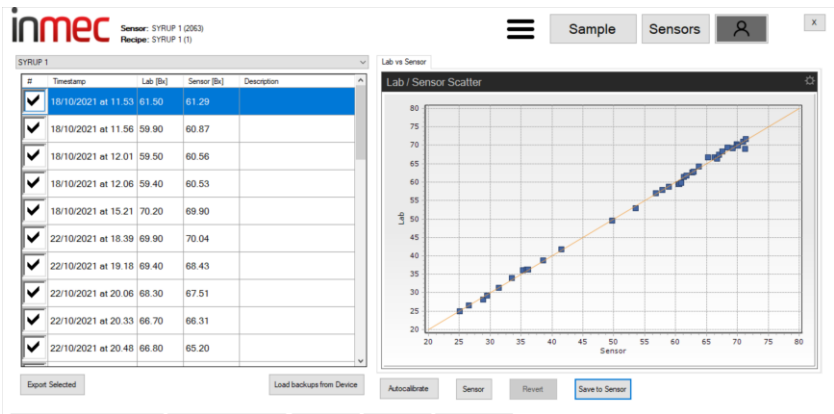
Graphs below shows the correlation between measurements and laboratory results.
There may be a difference between laboratory and sensor results.
To re calibrate the sensor, Auto Calibrarion will be executed as described below.

Difference

Click.
Autocalibrate

After Autocalibrate

Click
Save to Recipe
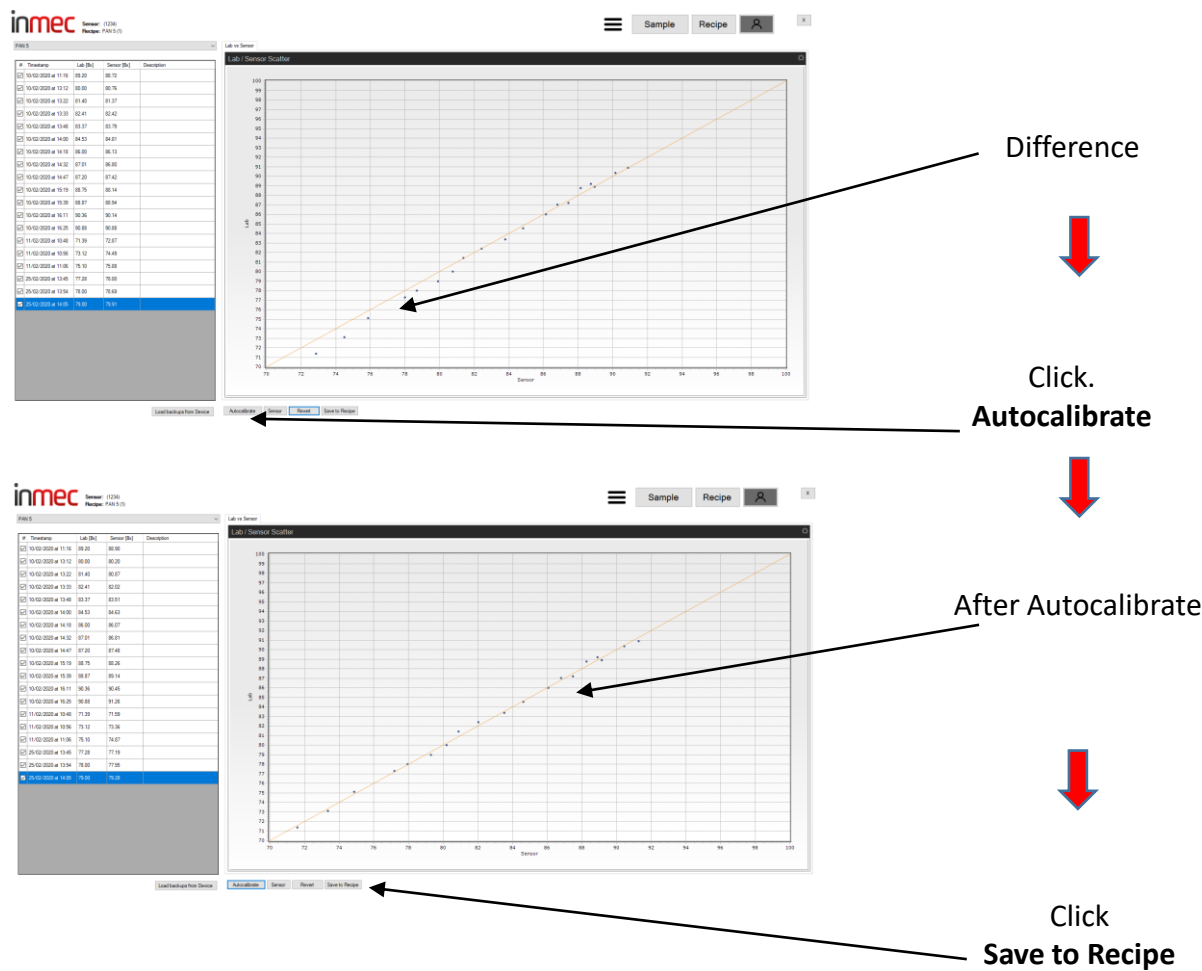
10.　　Maintenance

As far as regular maintenance is concerned, Inmec Concentration sensors do not require
any other tasks than possible cleaning after certain running period.
Interval of required cleaning depends on process conditions.
After running campaign of certain duration, cleaning right after the campaign
may be necessary to avoid build up drying on sensing antennas during long shut down.
It is always a necessary precaution to protect units during maintenance work in the near by.
Especially welding work requires thorough protection and power shut down to avoid
external and internal damages.

11.　　Troubleshooting

The two graphics below illustrate ideal measurement and signal formation of the sensor.
In disturbance case the left picture shows distortion and the right picture shows heavy
and continuous bend. (Diagnostics-page)
In case of suspected deviation on either picture, contact Inmec service representative.
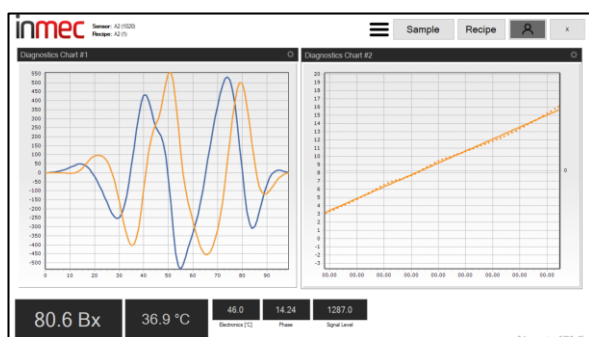
12.　　Testing analog output

Analog output Testing and Tuning features are described below. (Sensor I/O – page)
To be successful, have your partner monitoring DCS (PLC) system Input.
To start checking and tuning set correct Brix range parameters at Parameters-page.
Parameter numbers: 109 and 110. Tune Output Hardware values for finetuning

12.   Setting Sensor date and time

Inmec sensors are equipped with a real time clock. All data collected is synchronized and stamped according to the clock time.
To set correct Clock time, proceed as below.

1. First make sure the time of the operating Tablet is correct
2. Connect Tablet to the sensor
3. Enter the PIN
4. Go to Page **Sensor Data**
5. Click **Synchronize** Date Button, Wait for a few seconds and time is synchronized.
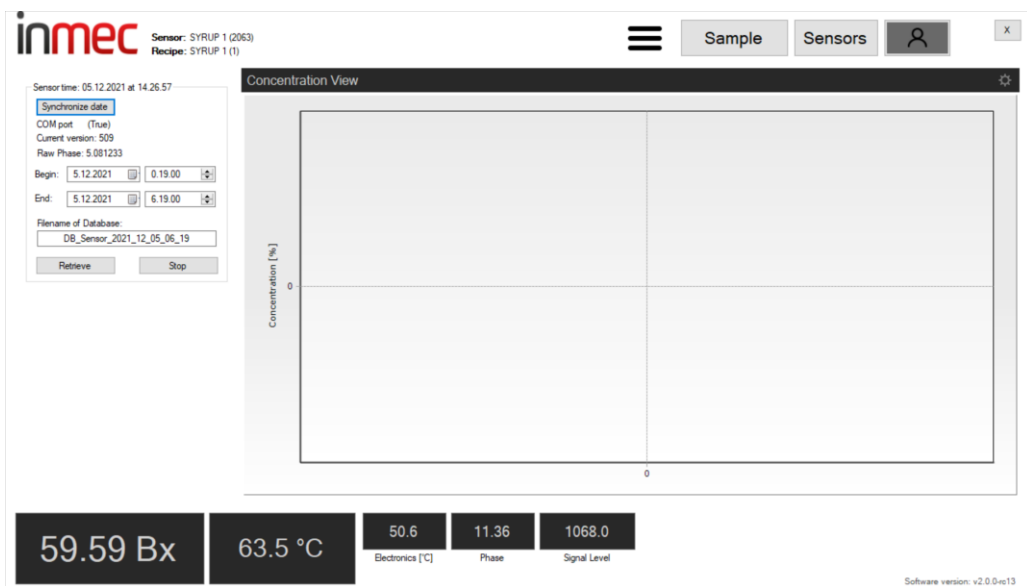
Sensor specifications Inmec Model IL-50 sensor

Measurement

Operating power	Sensor	24V, 2 Amps
Microwave power	15 mW	
Connection	Cable to Connection unit, 8 wire shielded. Connectors Aisi316L	
Measuring range	0-95%, or as high as material can be pumped	
Repeatability	+/- 0.01 % concentration	
Sensitivity	+/-0.001% concentration	
Measuring resolution	0.01% concentration	
Output filtering	1 – 300s	
Outputs	2* 4 – 20 mA, Active Isolated. Max Load 750 Ohm	
Input	Digital Input 24VDC. Used as Line run signal. Optional with the Temp. Output	
Signal processor	DSP	

Process conditions

pH range	3 – 14
Temperature	0 – 140 C
Conductivity	Max. 13mS/cm
Pressure	
Minimum	Recommended min 1.5 bar to avoid free air
Maximum	
• Model IL-50	PN10 with Union-L Coupling

Environment

Temperature	0 – +70 ; Protection needed in case of direct heat source
Housing	IP65
Vibration	max. 20 m/s2 10-2000Hz

Materials

Model IL	Sensor body, Aisi 316L
Housing Parts	Aluminum, Anonized
Antennas	Ceramic

Sensor weights

Model	Weight
IL-50	5.4 kg

Display Unit specifications

Operating power	24 VDC, 3 A
Connection	Cable to sensor, 10m, 8 wire shielded. Connectors Aisi316L
Outputs	2* 4 – 20 mA, Active and Isolated. Max load 750 Ohm
Input	Digital Input 24VDC. Used as Line run signal (optional with Temp. Output)

Environment

Temperature	0 – +70
Housing	IP65

Material	Stainless steel
Unit weight	6 kg
Dimensions	400*300*250 mm
Wall mount	4 bolt loops

Features

- User operations by Windows Tablet
- Numeric display for Brix measurement
- USB connection for Tablet
- 24V supply to the sensor
- 2* 4-20mA outputs, Active
- Remote access via Tablet or Gateway unit
- Optional GSM Router

Wiring diagram

WIRING DIAGRAM, CURST/DUABS_Router_2 Displays_24vdc