User's Manual

Hygienic & Sanitary Pressure Transmitters EJA565E

IM-P-20200627-01

YOKOGAWA

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IM-P-20200627-01

1st Edition, October 2020

Hygienic & Sanitary Pressure Transmitter
EJA565

IM-P-20200627-01 1st Edition

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1. Introduction

The EJA565E solid-state pressure and level transmitters are based on a piezoresistive silicon sensor, with a very high burst pressure. The sensor element is mounted in a stainless steel "foot". A temperature sensor is mounted inside the foot to and is used for active temperature compensation. A strong stainless steel “flush” diaphragm protects the sensor from the process medium. A minimal amount of special oil fills the chamber surrounding the sensor and transfers pressure from the flush mounted diaphragm to the sensor hydraulically.

Pressure on the sensor element creates a small deflection of the silicon substrate and bridge network. The resulting strain in the silicon resistors causes a change in the bridge resistance that is proportional to the pressure being applied. The transmitter electronics detect this change in the bridge resistance and converts it into the measured value. The amplifier system is based on a single Integrated Circuit, which ensures perfect linearity in the output, all within an accuracy of 0.1 %.

1.1 Description

The EJA565E transmitter is specially designed with a flush mounted diaphragm so it fully meet the needs of the food, pharmaceutical, chemical and other industries. Standard wetted parts are made of 316L SST, other materials are also available, like Hastelloy C. Various process connections can be adapted and available for manufacture;
(1.5”, 2” and 3” tri-clamp), SMS (1.5” and 2”), dairy milk couplings (DN 25, 40 and 50), flanges (DIN and ANSI) and sanitary weld-on nipples (ø 48, 62 and 85 mm.), among others.

Certain variants of the EJA565E are designed to be non-clogging and are capable of being cleaned inside. Various process connection types are manufactured according to 3-A (74-06) requirements such as Tri-Clamp and others.

All transmitters are temperature compensated, which means that varying process temperatures have nearly no effect on the accuracy of the output signal.

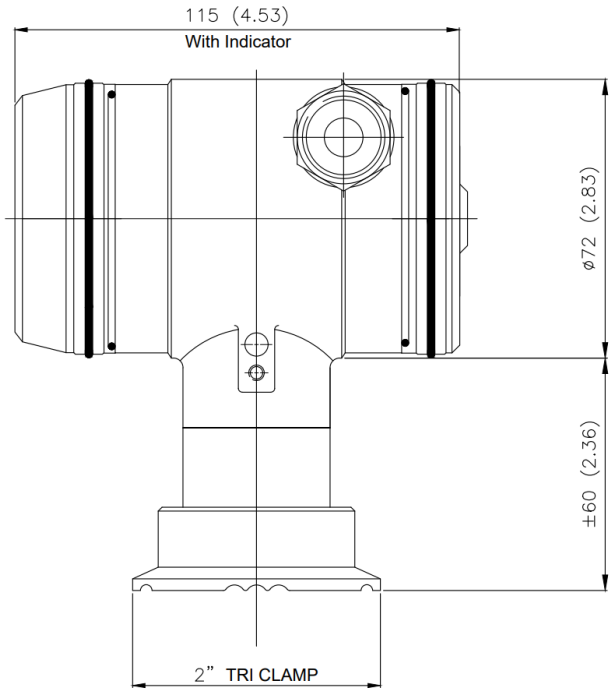
1.2 Barometric Reference

The EJA565E is a “relative transmitter” which means that barometric changes will not affect the zero. The venting is placed in the cover of the electronics housing next to the cable entry and is the filter for the barometric reference to atmospheric pressure.

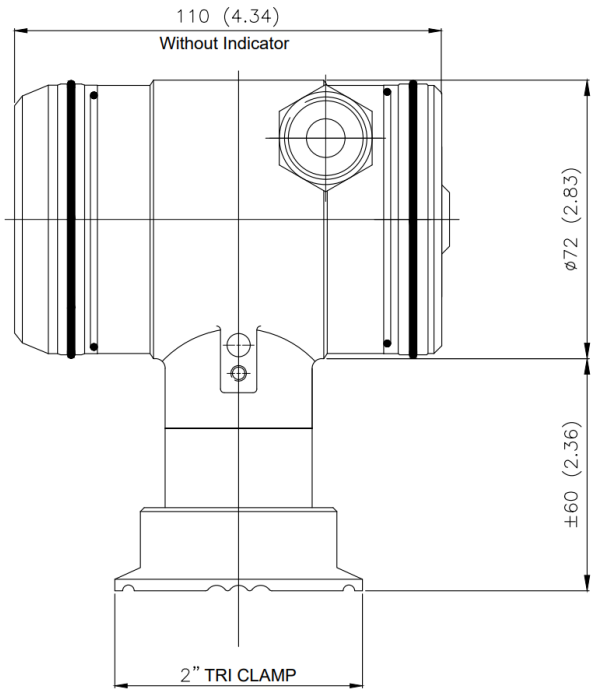
The vent mechanism must be kept clean.

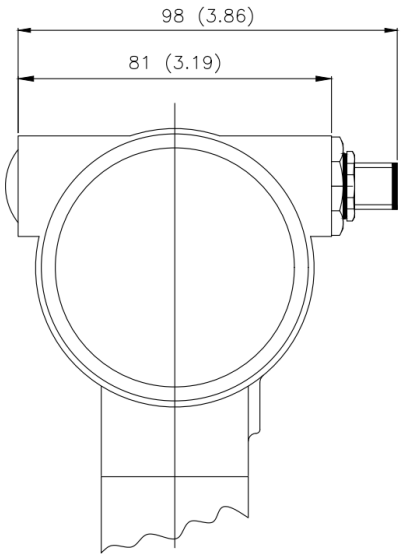
2. Dimensional Drawings

EJA565E- "T20" PROCESS CONNECTION



1/2" NPT Electrical Connection





M12 Electrical Connection

Note. Standard Drawings for all other connection types are available on request.

3. Installing the Transmitter

The diaphragm of the transmitter is protected with a special protection cap. Protect the diaphragm until installation takes place. **Take special care with the fragile diaphragm.**

3.1 Installing Weld-On Nipple

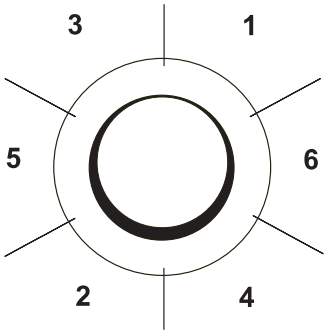
A certified welder should perform the installation of the weld-on nipple. Weld with Argon, MIG or TIG, with the smallest welding pin possible.

1. Cut a hole in the process vessel or pipe for a precise fit of the weld-on nipple. The hole should be a tight fit when coupled with the weld-on nipple.
2. Prepare the hole by bevelling the edge to accept filler material.
3. Remove the weld-on nipple from the transmitter.

   Remove the gasket and O-Ring out of the weld-on nipple!

WARNING

Improper installation may result in distortion of the weld-on nipple. Excessive heat will distort the weld-on nipple. Weld in sections as shown in the figure below. Allow adequate cooling between passes. To reduce the chances of distortion to the weld-on nipple, use a mandrel.



Determine (before welding) the position of the electronics housing, so that the cable entry and the venting are in the right position. These positions are fixed after welding.

4. Position the weld-on nipple in the vessel hole and tack six places. The weld sequence is shown in the figure above.
5. Weld the weld-on nipple in place using 0.03 to 0.045 in. (0.762 to 1.143 mm) stainless rod as filler material in the bevelled area. Adjust amperage for penetration.
6. Remove the mandrel after the welding operation.

3.2 Installing Transmitter (Code W33)

1. After welding, clean up edges, and take care of the inside nipple wall.
2. Make sure the O-rings (10) and (11) are properly located.
3. Improper installation of the O-ring can cause a process leak.
4. Apply silicone grease to the O-ring (10), diaphragm ring and the hole inside wall of the weld-on nipple, this prevents galvanic cell corrosion between transmitter and the nipple inside.
5. Install the transmitter and fix it with the SS M8 bolt.

3.3 Mounting Position

When the transmitter is mounted horizontally, the cable gland must be pointed downwards. Furthermore, 3-A certified units with leakage detection holes in weld-on nipples should be on teh lowest point and pointing down 90 degrees fom the horizontal.

3.4 Mounting Position Effect

All transmitters are calibrated in vertical position (diaphragm points downwards). If the transmitter is mounted in another position, there can be a little zero shift. (example 4,02 mA instead of 4,00 mA). After installation of the transmitter the zero must be set to 4,00 mA with P103 (cancel mounting position effect). This will not affect the span.

3.5 Calibration

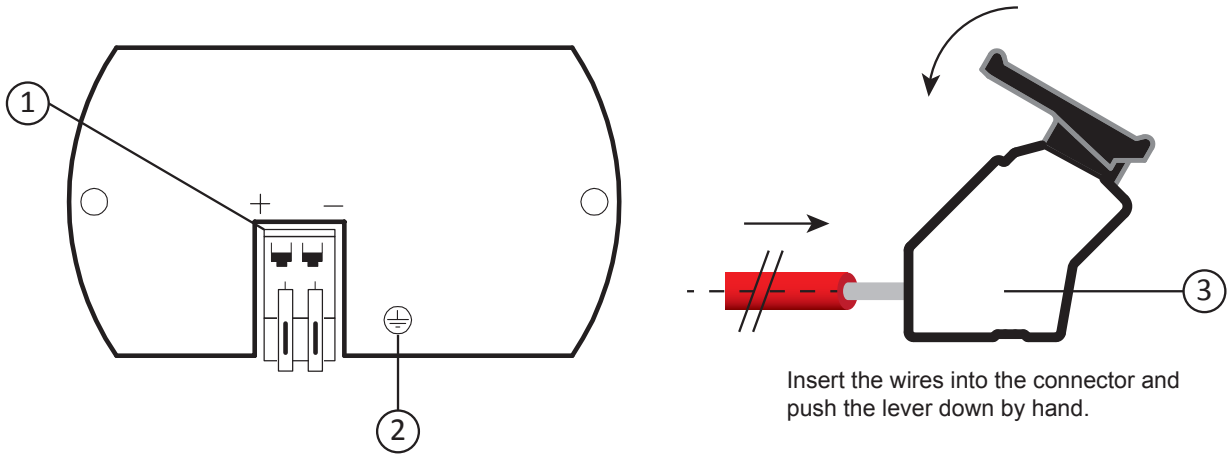
All transmitters are fully calibrated at the factory, to customer specified range. If the calibration is not specified, the transmitter will be calibrated at the maximum span.

3.6 Wiring

The figure below shows the wiring connection of the transmitter. The 2-wires must be connected to + and - on the terminal board. The wiring terminals can be connected without a screwdriver. The opening levers of the terminals can be lifted and pressed down by hand. Lift the opening levers of the terminals and insert the corresponding wires. Press down the levers by hand, the terminal spring will close and the wire is clamped.

The transmitter must always be connected with standard two-wire shielded cable. Do not run signal wiring in open trays with power wiring, or near heavy electrical equipment (e.g. Frequency controllers or heavy pumps). Shielding must always be connected at the side of the power supply. In case the process connection is already connected to ground (e.g. via the tank or pipe line) do not connect the instrument to ground. In applications with synthetic process connections, the enclosure (internal or external) must be connected to ground.

Reversing the polarity will not damage the transmitter, but the transmitter will not function until the + and – are properly connected.



Insert the wires into the connector and push the lever down by hand.

① Voltage Supply / Output Signal (4-20 mA)
② Internal Ground
③ Terminal Connector

CAUTION

- Please ensure that the transmitter is not connected to ground twice to prevent an earth loop.

4. Remaining

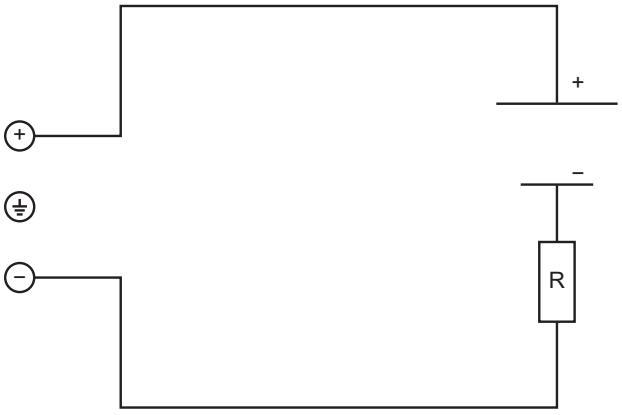
4.1 External Load

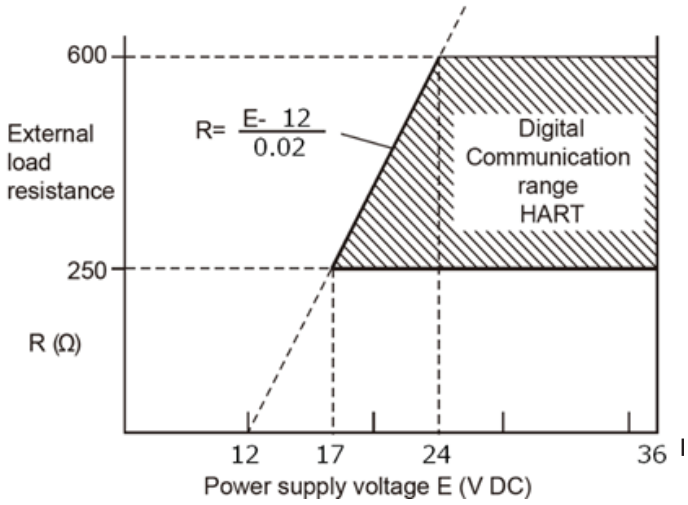
External loads must be placed in the negative side of the 2-wire loop. The minimum power supply is based on the total circuit resistance. The maximum external load (RI max.) for 24 Vdc will be 600 Ω (Ohm).

CAUTION

- With a loop resistance of 250 Ω a power supply of at least 17 Vdc must be used.

$$R_I \text{ max.} = \frac{\text{Voltage - 12 V (min.)}}{\text{20 mA}}$$

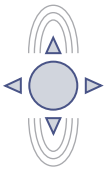




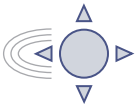
5. Graphic Display and Navigation Button

The EJA565E has a multifunctional display where different values can be displayed simultaneously. The display is equipped with a backlight. The entire menu is controlled by a navigation button. The navigation button has the following degrees of movement: up, down, left, and right. The navigation button needs to be pushed when confirmation or saving is needed.

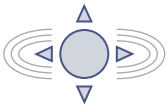
Figure 1. Display EJA565E, fully rotatable (360°)



Move the navigation button up or down to browse through various menus. These movements can be distinct in choices of: program points, navigation through menus and increase or decrease measurement values.



It is always possible to return to the previous menu. Move the navigation button to the left to return to the previous menu.

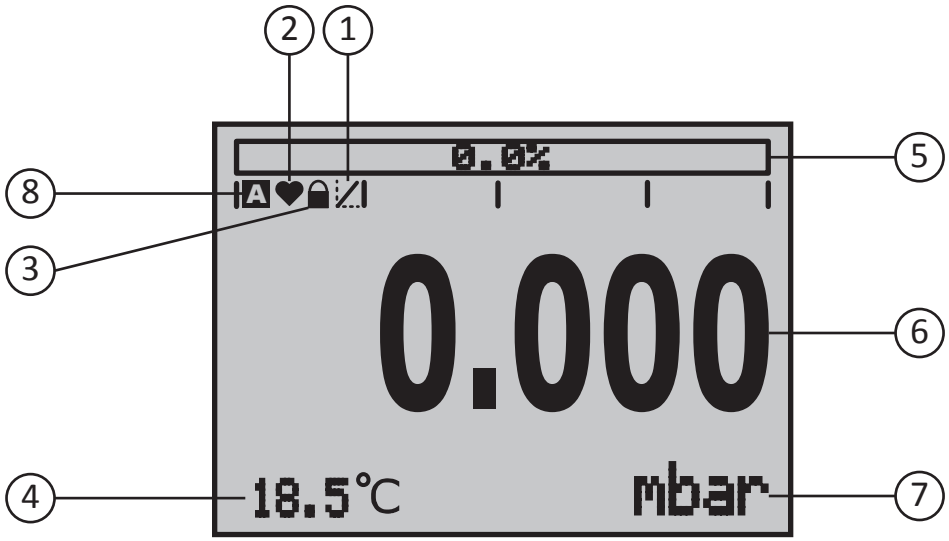


Move the navigation button left or right to navigate horizontally through the menu or positions on the display.

By pushing the navigation button each choice will be **confirmed** or a setting will be **saved**.

5.1 Graphic Display Readout

When the transmitter is powered, a flash screen with the name of the transmitter and the software version appears for a few seconds. After this the home screen will show the measured value setting as set in the factory.



Explanation of Symbols

1. **Linear output:** Displays when any form of linearization is applied. A Straight line means no linearization is applied. When a linearization is applied, a curve will be displayed.
2. **HART protocol:** Displays a HART symbol.
3. **Write Protection On/Off:** Displays if protection against adjustments and configuration is on or off
4. **Secondary Measurement:** Displays the secondary measurement chosen.
5. **Bargraph 0-100 % from Span:** Displays the percentage of the measured span.
6. **Measurement:** Displays the current measurement in mA, percentage or a selectable unit.
7. **Unit:** Displays the selected unit.

5.2 Summary of Programming Points

PROGRAM POINT	NAME	FUNCTION
P100	Menu-Exit Menu	Start and exit
P101	Zero Value	Zero adjustment (ZERO 4 mA) with or without test pressure
P102	Span Value	Span adjustment (SPAN 20 mA) with or without test pressure
P103	Mount Correction	Cancel mounting position effect (4 mA)
P104	Units	Selection of engineering unit to be displayed
P105	Reverse mA	Output selection 4-20 mA or 20-4 mA
P106	Damping	Adjustable damping (0.00 to 25.00 seconds)
P107	Language	Language choice between: English, Dutch, German, Russian, Polish and French.
P108	Device Setup	Configuration of: Protection, Alarm, Backlight, Temperature, Secondary value, (Set time and HART Version.)
P109	Readout	Readout options on display: Current, unit, percentage and temperature
P110	Current Simulation	Current simulation 4-20 mA (Stepwise or free adjustable)
P111	Tank Linearization	Configuration for tank linearization
P112	Burst Mode	Configuration for burst mode
P113	Information	Contact information of Yokogawa Instruments, made settings, and software revision
P114	Factory	Only available for the manufacturer
P115	Factory	Only available for the manufacturer

6. Explanation Programming Points

P101 Zero value 6.1 Zero Adjustment (ZERO)

The transmitter is set to 0 mbar at atmospheric pressure.

The **ZERO** can be adjusted at a lower or higher point. This will be explained step by step by an example.

Example: Increase ZERO to 100 mBar.

1. The measuring unit of the transmitter is set to mBar. If not this can be selected by choosing the right measuring unit in program point **P104 – UNITS (paragraph 6.4)**
2. Navigate to program point **P101 - ZERO Value**, and push the navigation button to enter the menu.
3. Two choices appear on the screen: "**set manual**" and "**use process**"

   Set manual = Configuration without test pressure.

   Use process = Configuration with applied pressure.
4. Choose "**set manual**", +000.0 (mBar) will appear on the display.
5. Increase this value with the navigation button to 100 mBar, push to confirm, and select SAVE to save the setting.
6. The transmitter will return to the home screen. The measurement value at atmospheric pressure is now -100 mBar. At an applied pressure of 100 mbar the transmitter will display 0 mbar.

The menu zero adjustment also has the choice of "**use process**". The transmitter can be adjusted to zero in a real process situation. When chosen, the transmitter will measure the pressure in an actual process. This measurement will be used as the zero value. (4 mA)

1. Navigate to program point **P101**, and push the button to enter the menu.
2. Choose "**use process**" , and push to confirm. The transmitter will display the actual measured value.
3. Push the navigation button to confirm, and select SAVE to save the setting.
4. The transmitter will return to the main menu.

P102 Span value 6.2 Span Adjustment (SPAN, 20 mA)

This setting can be used to adjust the range (SPAN) according to an entered value or adjusted with or without an applied pressure. The maximum pressure which can be measured (20 mA) is the measurement at

ZERO (P101) + the entered value **SPAN (P102)**. If the **ZERO (P101)** is increased then the maximum measured value will automatically be set higher by the same amount as the zero.

This will be explained step by step by an example.

Example:
Measurement range 0 – 2000 mbar = 4 - 20 mA.

The **span** must be set at 2000 mbar

1. Navigate to program point **P102 - SPAN Value**, and push the navigation button to enter the menu.
2. Two choices appear on the screen: **Set manual** and **Use process**

   Choose **Set manual**, a value will appear on the screen. (Depending on the range.)
3. Adjust the **SPAN** with the navigation button to 2000 mbar. and select SAVE to save the setting
4. The transmitter will return to the home screen.

The menu span adjustment also has the choice of "**use process**". The transmitter can be adjusted to the span in a real process situation. When chosen, the transmitter will measure the pressure in an actual process. This measurement will be used as the span value. (20 mA)

1. Navigate to program point **P102**, and push the button to enter the menu.
2. Choose "**Use process**", and push to confirm. The transmitter will display the actual measured value.
3. Push the navigation button to confirm, and select SAVE to save the setting.
4. The transmitter will return to the main menu.

TIP

P102 is the adjustment of the total span. When a compound range must be adjusted (for example -1 till +3 bar), a span of 4 bar must be programmed.

The Zero (P101) must be set at -1 bar. The transmitter is adjusted at **- 1 bar = 4 mA** and **+3 bar = 20 mA**.

P103 Mount corr. 6.3 Cancel Mounting Position Effect 4 mA

All transmitters are vertically calibrated. If the transmitter is installed horizontally, the transmitter has a small “mounting position” effect on the zero (4 mA). The current value displayed may be 4.020 mA instead of 4.000 mA. This effect can be eliminated within this menu.

1. Navigate to program point **P103 – MOUNT corr.**, and push the navigation button to enter the menu.
2. Two choices appear on the screen: “**Set**” and “**Reset**”

   Choosing **Set** will adjust the zero to 4.000 mA in the mounting position when applicable.

   - Select **Set**, and push the button to confirm.
   - The Save icon will be displayed to indicate that the setting is saved.
   - The transmitter will return to the main menu.

   Choosing **Reset** will put the transmitter back to factory setting. (vertical adjustment 4 mA)

   - Select **Reset**, and push the button to confirm, the setting will be put back to factory setting. The Save icon will be displayed to indicate that the setting is saved.
   - The transmitter will return to the main menu.

CAUTION

- Do not apply pressure while executing “Cancel mounting position effect”
- For low pressure ranges, the mounting effect on the zero point will be more noticeable, therefore it is important to execute P103 after installing the transmitter.

P104 Units 6.4 Display Setting of Units

Various engineering units can be displayed by the display.

1. Navigate to program point **P104 – UNIT**, and push the navigation button to enter the menu.
2. Several engineering units can be selected. Each selected engineering unit is automatically converted to the correct value of the corresponding unit.
3. Navigate through this menu and choose the required unit, push to confirm.
4. The Save icon will be displayed to indicate that the setting is saved.
5. The transmitter will return to the main menu and the measured reading will be displayed in the home screen with the chosen unit.

CAUTION

- The selected pressure unit is only visible on the display if UNITS is chosen in program point P109 – Readout.

P105 Reverse mA 6.5 Output Selection 4-20 mA or 20-4 mA

The transmitter is factory set to 4-20 mA.

1. Navigate to program point **P105 – Reverse mA**, and push the navigation button to enter the menu.
2. Two choices appear on the screen: **4-20 mA** and **20-4 mA**
3. Make an output choice and push to confirm.
4. The Save icon will be displayed to indicate that the setting is saved.
5. The transmitter will return to the main menu.

P106 Damping 6.6 Damping Adjustment

The transmitter has an adjustable damping between 0.00 to 25.00 seconds.

Factory setting = 0.00 seconds

1. Navigate to program point **P106 – DAMPING**, and push the navigation button to enter the menu.
2. Two choices appear on the screen: **Set** and **Reset**
3. Make a choice and push to confirm.

   Choosing Set allows a value to be set between 0.00 and 25.00 seconds.

   - Select Set, and push the button to confirm.
   - Adjust the damping with the navigation button, push to confirm.
   - The Save icon will be displayed to indicate that the setting is saved.
   - The transmitter will return to the main menu.

   Choosing Reset will put the setting back to factory setting (0.0 seconds)

   - Select Reset, and push the button to confirm.
   - The Save icon will be displayed to indicate that the setting is saved, the setting will be put back to factory setting 0,00 s.
   - The transmitter will return to the main menu.

P107 Languages 6.7 Language

In this menu the preferred menu language can be selected.

1. Navigate to program point **P107 - LANGUAGE**, and push the navigation button to enter the menu.
2. Seven choices appear on the screen: **English**, **Dutch**, **Spanish**, **German**, **Russian**, **Polish** and **French**.
3. Make a choice and push to confirm.
4. The Save icon will be displayed to indicate that the setting is saved.
5. The transmitter will return to the main menu.

P108 Device setup 6.8 Device Setup

In this menu, several operational settings can be made for the transmitter and the display.

1. Navigate to program point **P108 – Device Setup**, and push the navigation button to enter the menu.
2. Eight choices appear on the screen: **Protection**, **Alarm output**, **Backlight**, **Temp units**, **Temp min/max**, **Sec. Value**, **Set Time** and **HART Version**
3. Choose the desired option, push to confirm.
4. Below are the choices displayed. They can be selected and configured using the navigation button.

   Protection

   - **Local:** The local protection for adjusting settings locally on the transmitter.
   - **External:** The external security for adjusting settings remotely on the transmitter by HART protocol.

   Alarm output

   - **Low:** The lower limit of the lowest permissible current value. (3.2 mA)
   - **High:** The upper limit of the maximum permissible current value (22.8 mA)

   When exceeding the above limits, a warning symbol will display on the screen.

   Backlight

   Choice between: **On**, **Sleep mode** (Turn off backlight after 5 minutes) and **Off**. The intensity of the backlight is depending on the output current.

   Temp units:

   Choice between: **Celsius** and **Fahrenheit**.

   Temp min/max:

   Two choices appear on the screen: **Readout** and **Reset**

   By choosing **Readout** the last measured minimum and maximum temperature values of process and ambient appear. For the process temperature, a new value is stored in a change of temperature more than 2°C. For the ambient temperature this is 5°C. By choosing **Reset** the previous stored values will be deleted.

Sec. Value:

Four choices appear on the screen for the secondary readout on the main screen: **Current**, **Unit**, **Rate** and **Temperature**.

Sec. Time:

(Only available when using HART 7 Protocol)

An input screen to enter the date and time will appear.

HART version:

Choice between: **HART 5.0** and **HART 7.0**.

P109 Readout 6.9 Readout

In this menu, the readout on the display is determined. This is the type of measurement that appears on the home screen.

Factory Setting = Unit

1. Navigate to program point P109 – READOUT, and push the navigation button to enter the menu.
2. Nine choices appear on the screen:

   Current: Present current value (4-20mA)

   Unit: Pressure unit as chosen in P104

   Percentage: 0-100%

   Temperature: Actual sensor temperature (°C or F)*

   *(Indication of process temperature, accuracy depending on sensor position)

   Hectoliter: Number of hectoliters (only possible in combination with linearization P111)

   Cubic meter: Number of cubic meters (only possible in combination with linearization P111)

   Liter: Number of liters (only possible in combination with linearization P111)

   Kilogram: Number of kilograms (only possible in combination with linearization P111) After selecting this readout the Specific Gravity of the medium (SG = g/cm³) must be entered with a value between 0.2 and 4.0 g/cm³.

   The specific gravity will appear on the home screen (g/cm³) under the primary chosen readout. This readout will be indicated as a linear measurement, and displayed by the symbol on the home screen.

   Tons: Number of tons (only possible in combination with linearization P111)

   After selecting this readout the Specific Gravity of the medium (SG = g/cm³) must be entered with a value between 0.2 and 4.0 g/cm³. This readout will be indicated as a linear measurement, and displayed by the symbol on the home screen. The specific gravity will appear on the home screen (g/cm³) under the primary chosen readout.
3. Navigate to the desired choice, confirm the selection by pushing the navigation button. The Save icon will be displayed to indicate that the setting is saved.
4. The transmitter will return to the main menu.

CAUTION

- For measuring weight (Kg and Tons), a reliable accuracy cannot be guaranteed, the transmitter cannot compensate for Specific Gravity changes or any thermal increase or decrease.

P110 Curr sim. 6.10 Current Simulation (4-20 mA)

The transmitter can simulate an output between 4-20 mA.

Using five predefined steps or a free selectable value between 3.90 mA to 20.8 mA

1. Navigate to program point **P110 – CURR SIMU**, and push the navigation button to enter the menu.
2. Two choices appear on the screen: “**Set**” and “**Free**”
3. Choosing **Set** allows a value to be set in five steps: 4, 8, 12, 16, 20 mA
   - By default the current simulation is **Not active**, as shown in the display
   - Choose one of the five steps, and push to confirm
   - The status on the display will change to **Active** and the current simulation is started for the selected step.
   - Push the navigation button to de-activate the current simulation.
   - Move the navigation button to the left to

go back and leave this menu.

4. With the option **Free**, a current between 4 and 20 mA can be configured.
   - By default the current simulation is **Not active**, as shown in the display.
   - Enter the desired value, and push to confirm.
   - The status on the display will change to **Active** and the current simulation is started for the selected value.
   - Push the navigation button to de-activate the current simulation.
   - Move the navigation button to the left to go back and leave this menu.

P111
Tank lin.

6.11 Tank Linearization

In this menu, various tank linearizations can be selected.

Factory setting = No linearization

For a horizontal tank or a tank with a cone, linearization can be configured. The volume as a measured value will be displayed on the home screen. (Must be set in P104)

The values (configured in the following settings) must be in meters.

1. Navigate to program point P111 – TANK LIN, and push the navigation button to enter the menu. Six choices appear on the screen:

   No Lin: No linearization

   Hor. Tank: Linearization setting for a horizontal tank: cylindrical and elliptic

   Vert. Cone: Linearization setting for a vertical tank with a conical bottom.

   Vert. Sphere: Linearization setting for a vertical tank with a spherical bottom.

   Vert. Trunc: Linearization setting for a vertical tank with a truncated bottom.

   Free lin: Free linearization setting, adjustable in 70 free programmable points.

The following describes the setting for each linearization configuration.

6.11.1 Linearization Disable

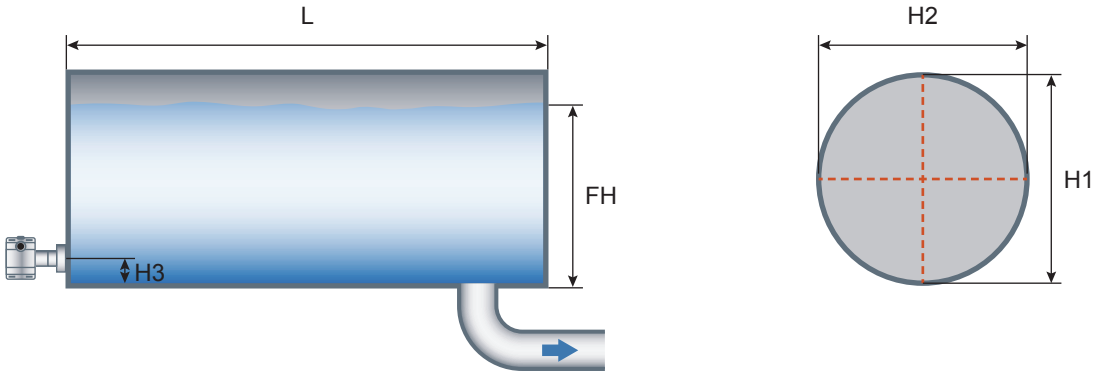
With the choice No. Lin. an existing linearization can be turned off and can be identified by the symbol on the home screen: 

Linearization can be recognized by the following symbol on the home screen: 

2. Select No Lin. and confirm this with the button.
3. The Save  icon will be displayed to indicate that the setting is saved.

The following pages describe the setting for each type of linearization.

6.11.2 Linearization Horizontal Tank (with Flat End)



1. Navigate to **Hor. Tank.** with the navigation button, and push to confirm.
2. Two choices appear on the screen: **Input** and **Simulate**
3. Select **Input**, and push to confirm.
4. Six choices appear on the screen:

DISPLAY	DRAWING	EXPLANATION
Length	L	The length of the tank
Height 1	H1	The height of the tank
Height 2	H2	The diameter of the tank (with a cylindrical tank, this is equal to the height of the tank)
Height 3	H3	The height till the topside of the diaphragm (or weld-on nipple)
Height 4	H4	Value must be 0
Fill Height	FH	The maximum percentage of filling of the tank

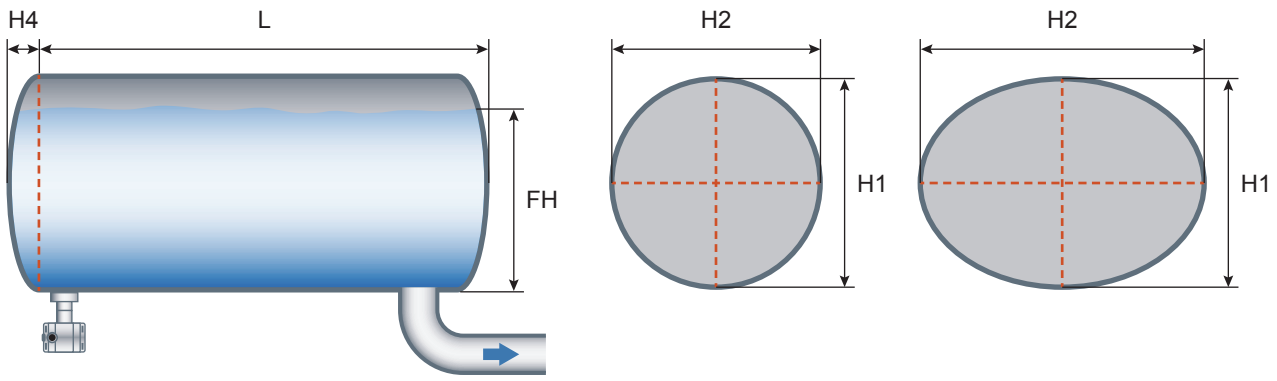
5. Fill in each value except Height 4, and confirm each selection with the control button. **The values must be entered in meters.**
6. Select SAVE to save the setting.
7. The transmitter will return to the main menu.

■ Simulation

After linearization is entered and stored, it is possible to perform a simulation based on the entered values. Based on the value entered in mWc, the transmitter will display the number of hectoliters (on the basis of the specified linearization values).

1. Navigate to program point **P111 – TANK LIN**, and push the navigation button to enter the menu.
2. Navigate to **Hor. Tank.** with the navigation button, and push to confirm.
3. Two choices appear on the screen: **Input** and **Simulate**
4. Select **Simulate**, and push to confirm.
5. Fill in the desired value based on mWc, the number of hectoliters change directly with a change in the value mWc.

6.11.3 Linearization Horizontal Tank with a Parabolic End (Cylindrical or Elliptic)



1. Navigate to **Hor. Tank.** with the navigation button, and push to confirm.
2. Two choices appear on the screen: **Input** and **Simulate**
3. Select **Input**, and push to confirm.
4. Six choices appear on the screen:

DISPLAY	DRAWING	EXPLANATION
Length	L	The length of the tank
Height 1	H1	The height of the tank
Height 2	H2	The diameter of the tank (with a cylindrical tank, this is equal to the height of the tank)
Height 3	H3	The height till the topside of the diaphragm (or weld-on nipple)
Height 4	H4	The length of 1 parabolic end of the cylinder
Fill Height	FH	The maximum percentage of filling of the tank

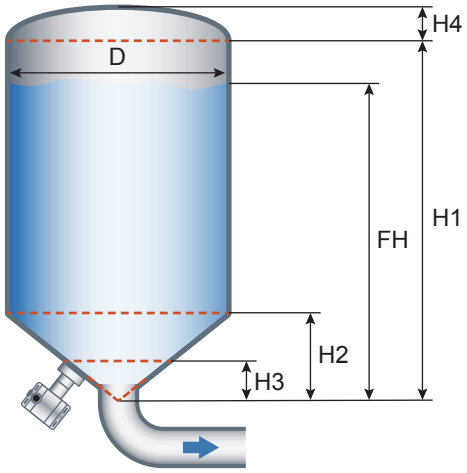
5. Fill in each value, and confirm with the navigation button. **The entered value's must be in meters.**
6. Select SAVE to save the setting.
7. The transmitter will return to the main menu.

Simulation

After linearization is entered and stored, it is possible to perform a simulation based on the entered values. Based on the value entered in mWc, the transmitter will display the number of hectoliters (on the basis of the specified linearization values).

1. Navigate to program point **P111 – TANK LIN**, and push the navigation button to enter the menu.
2. Navigate to **Hor. Tank.** with the navigation button, and push to confirm.
3. Two choices appear on the screen: **Input** and **Simulate**
4. Select **Simulate**, and push to confirm.
5. Fill in the desired value based on mWc, the number of hectoliters change directly with a change in the value mWc.

6.11.4 Linearization Vertical Tank with a Conical Bottom



1. Navigate to **Vert. Cone.** with the navigation button, and push to confirm.
2. Two choices appear on the screen: **Input** and **Simulate**
3. Select **Input**, and push to confirm.
4. Six choices appear on the screen:

DISPLAY	DRAWING	EXPLANATION
Height1	H1	The height of the tank
Diameter	D	The diameter of the tank
Height 2	H2	The height of the cone
Height 3	H3	The height till the topside of the diaphragm
Height 4	H4	The height of the parabolic tank roof
Fill Height	FH	The maximum percentage of filling of the tank

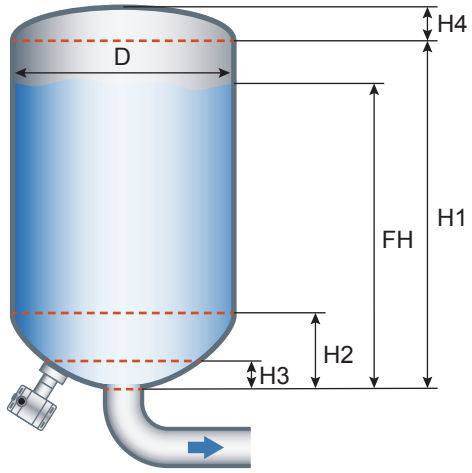
5. Fill in each value, and confirm with the navigation button. **The entered value's must be in meters.**
6. Select SAVE to save the setting.
7. The transmitter will return to the main menu.

Simulation

After linearization is entered and stored, it is possible to perform a simulation based on the entered values. Based on the value entered in mWc, the transmitter will display the number of hectoliters (on the basis of the specified linearization values).

1. Navigate to program point **P111 – TANK LIN**, and push the navigation button to enter the menu.
2. Navigate to **Vert. Sphere.** with the navigation button, and push to confirm.
3. Two choices appear on the screen: **Input** and **Simulate**
4. Select **Simulate**, and push to confirm.
5. Fill in the desired value based on mWc, the number of hectoliters change directly with a change in the value mWc.

6.11.5 Linearization Vertical Tank with a Spherical Bottom



1. Navigate to **Vert. Sphere.** with the navigation button, and push to confirm.
2. Two choices appear on the screen: **Input** and **Simulate**
3. Select **Input**, and push to confirm.
4. Six choices appear on the screen:

DISPLAY	DRAWING	EXPLANATION
Height1	H1	The height of the tank
Diameter	D	The diameter of the tank
Height 2	H2	The height of the spherical bottom
Height 3	H3	The height till the topside of the diaphragm
Height 4	H4	The height of the parabolic tank roof
Fill Height	FH	The maximum percentage of filling of the tank

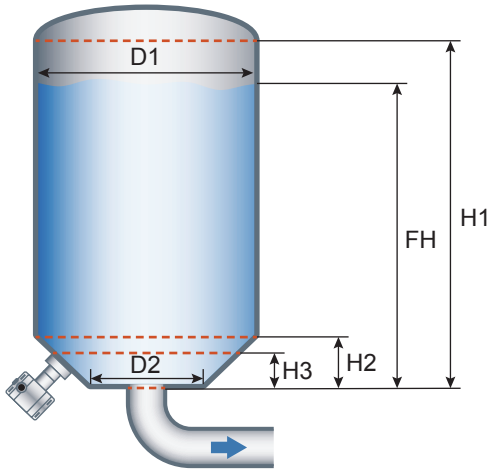
5. Fill in each value, and confirm with the navigation button. **The entered value's must be in meters.**
6. Select SAVE to save the setting.
7. The transmitter will return to the main menu.

■ Simulation

After linearization is entered and stored, it is possible to perform a simulation based on the entered values. Based on the value entered in mWc, the transmitter will display the number of hectoliters (on the basis of the specified linearization values).

1. Navigate to program point **P111 – TANK LIN**, and push the navigation button to enter the menu.
2. Navigate to **Vert. Cone.** with the navigation button, and push to confirm.
3. Two choices appear on the screen: **Input** and **Simulate**
4. Select **Simulate**, and push to confirm.
5. Fill in the desired value based on mWc, the number of hectoliters change directly with a change in the value mWc.

6.11.6 Linearization Vertical Tank with a Truncated Bottom



1. Navigate to **Vert. Trunc.** with the navigation button, and push to confirm.
2. Two choices appear on the screen: **Input** and **Simulate**
3. Select **Input**, and push to confirm.
4. Six choices appear on the screen:

DISPLAY	DRAWING	EXPLANATION
Height1	H1	The height of the tank
Diameter 1	D1	The diameter of the tank
Height 2	H2	The height of the cone
Height 3	H3	The height till the topside of the diaphragm
Diameter 2	D2	The diameter of the truncated bottom
Fill Height	FH	The maximum percentage of filling of the tank

5. Fill in each value, and confirm with the navigation button. **The entered value's must be in meters.**
6. Select SAVE to save the setting.
7. The transmitter will return to the main menu.

Simulation

After linearization is entered and stored, it is possible to perform a simulation based on the entered values. Based on the value entered in mWc, the transmitter will display the number of hectoliters (on the basis of the specified linearization values).

1. Navigate to program point **P111 – TANK LIN**, and push the navigation button to enter the menu.
2. Navigate to **Vert. Trunc.** with the navigation button, and push to confirm.
3. Two choices appear on the screen: **Input** and **Simulate**
4. Select **Simulate**, and push to confirm.
5. Fill in the desired value based on mWc, the number of hectoliters change directly with a change in the value mWc.

6.11.7 Free Linearization

Free Linearization in Process

1. Navigate to program point **P111 – TANK LIN**, and push to confirm.
2. Navigate to **Free lin.** with the navigation button, and push to confirm.
3. Two choices appear on the screen: **Measured** and **Manual**
4. Select **Measured** to configure a free linearization in a process situation.
5. Two choices appear on the screen: **Input** and **Simulate**
6. Select **Input**, and push to confirm
7. Five choices appear on the screen:

DISPLAY	EXPLANATION
Clear table	The previous entered values for linearization will be deleted. It is advisable to use this feature for each time a new linearization is configured. **CAUTION** • All entered values and dimensions of an existing / previous linearization will be erased.
Volume units	Select the preferred unit: Liters, Hectoliters, Kg and Tons (after linearization the unit can be changed and selected in **P109**)
Height	The height of the tank can be filled in (highly recommended for an accurate linearization). The transmitter will determine with this height the span. A linearization will be made with the smallest possible deviation. Factory setting = Saved span in **P102**.
Start Point	The filling of a tank can be measured up to 70 points. The transmitter must be installed in an actual process to accomplish these measurements. The measuring must take place from low to high. (Filling an empty tank). The actual measuring will be displayed on the screen in percentage (%) for **Xn** (filling) and for **Yn** the measured volume. To enter the next measured point move the navigation button up and enter the values.
Save	When all desired measurements are completed and all parameters have been set, the linearization must be saved. Push the navigate button to the left and select SAVE to save the linearization. The transmitter will return to the main menu.

CAUTION

- When a tank filling (**Xn**) does not reach 100% of the height of the tank, the transmitter will calculate the remaining part. This calculating method is linear and will only be used for the remaining part up to 100%.

- It is not advisable to manually adjust the SPAN in program point P102 after a linearization has been configured. If the SPAN is adjusted after a linearization configuration, a warning will appear on the screen when entering P102.
- When the a free linearization is used for measuring weight (Kg and Tons), a reliable accuracy cannot be guaranteed due to external influences such as heat and tank wall expansion. **The change of Specific Gravity due to different temperatures cannot be compensated by the pressure transmitter.**

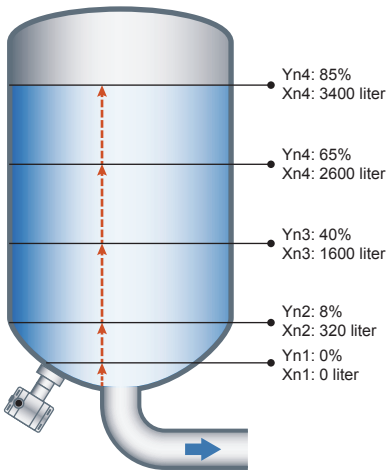
Simulation

After linearization is entered and saved, it is possible to perform a simulation. (Based on the saved linearization) The transmitter will convert the entered mWc to hectoliters.

6.11.8 Free Linearization Manually

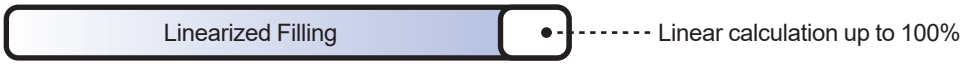
When it's not possible to enter and measure for a linearization in an actual process condition, a free linearization can be configured manually. Known measurements values and volumes must be entered manually in the transmitter.

1. Navigate to program point **P111 – TANK LIN**, and push to confirm.
2. Navigate to **Free lin.** with the navigation button, and push to confirm.
3. Two choices appear on the screen: **Measured** and **Manual**
4. Select **Manual** to configure a free linearization in a process situation.
5. Two choices appear on the screen: **Input** and **Simulate**
6. Select **Input**, and push to confirm
7. Five choices appear on the screen:

DISPLAY	EXPLANATION
Clear table	The previous entered values for linearization will be deleted. It is advisable to use this feature for each time a new linearization is configured. **CAUTION** • All entered values and dimensions of an existing / previous linearization will be erased.
Volume units	Select the preferred unit: Liters, Hectoliters, Kg and Tons (after linearization the unit can be changed and selected in **P109**)
Height	The height of the tank can be filled in (highly recommended for an accurate linearization). The transmitter will determine with this height the span. A linearization will be made with the smallest possible deviation. Factory setting = Saved span in **P102**.
Start Point	The contents of a tank can be configured up to 70 points. The entered value's must be from low to high (Filling an empty tank). The manually entered values will be displayed on the screen in percentage (%) for **Xn** and for **Yn** in Hectoliters. To enter the next measured point move the navigation button up and enter the values. **Example:** A tank filling must programmed in the transmitter. • Choose **Clear Table** to remove all possible previous settings. • Choose the preferred **Volume units**. • Fill in the **Height** of the tank (highly recommended for an accurate linearization). • In menu **Start Point** the linearization points can be filled in. In **Xn1** the percentage of the filling must be filled in. In **Yn1** the corresponding volume. After this, there are 69 more linearization points available. • When all (needed) points are filled in, the linearization must be saved. Push the navigation button to the left and select SAVE to save this linearization  The figure above shows a tank with standard dimensions. Free linearization can applied on a wide variety of tanks with non-standard dimensions.
Save	When all desired measurements are completed and all parameters have been set, the linearization must be saved. Push the navigate button to the left and select SAVE to save the linearization. The transmitter will return to the main menu.

CAUTION

- When a tank filling (**Xn**) does not reach 100% of the height of the tank, the transmitter will calculate the remaining part. This calculating method is linear and will only be used for the remaining part up to 100%.



- It is not advisable to manually adjust the SPAN in program point P102 after a linearization has been configured. If the SPAN is adjusted after a linearization configuration, a warning will appear on the screen when entering P102.
- When the a free linearization is used for measuring weight (Kg and Tons), a reliable accuracy cannot be guaranteed due to external influences such as heat and tank wall expansion. **The change of Specific Gravity due to different temperatures cannot be compensated by the pressure transmitter.**

Simulation

After linearization is entered and saved, it is possible to perform a simulation. (Based on the saved linearization) The transmitter will convert the entered mWc to hectoliters.

P112
Burst mode

6.12 Burst Mode

The transmitter can be configured for Burst mode. This will enable continuously broadcasting standard HART reply messages.

1. Navigate to program point **P115 – Burst Mode** and push the navigation button to enter the menu.
2. A message appear on the screen, push to enter this menu.
3. Three choices appear on the screen: "**0**", "**1**" and "**2**"
4. With these choices, three distinct types of burst messages can be configured. Make a choice, and push the button to confirm.
5. Four choices appear on the screen: **Mode Cntrl**, **Cmd number**, **Period** and **Trigger** With these choices the chosen burst message (0,1 and 2) can be configured. Select **Mode Cntrl**, and push to confirm.
6. Two choices appear on the screen: "**On**" and "**Off**"
   - Choose **On** to turn on burst mode.
   - Choose **Off** to turn off burst mode.
7. Select Cmd number, and push to confirm.

   Five choices appear on the screen:
   - **Cmd 01:** Primary Variable
   - **Cmd 02:** Current and Percent of Range
   - **Cmd 03:** Dynamic Variables and Current
   - **Cmd 09:** Device Variables with Status
   - **Cmd 48:** Additional Transmitter Status

   Choose the preferable burst mode, and push to confirm.
8. Select **Period**, and push to confirm.

   Two choices appear on the screen: "**Max Time**" and "**Min Time**"
   - Select **Max Time** to set the maximum amount of time when the message will be send. This value can be set from 0.5 to 3600 seconds.
   - Select **Min Time** to set the minimum amount of time when the message will be send. This value can be set from 0.5 to 3600 seconds.

   Enter the preferred value, and push to confirm.
9. Select **Trigger**, and push to confirm.

   Five choices appear on the screen:
   - **Continuous:** The Burst message is send continuously.
   - **Windowed:** The Burst message is triggered when the measured value deviates more than the specified trigger value.

- **Rising:** The Burst message is triggered when the measured value rises above the triggered value.
- **Falling:** The Burst message is triggered when the measured value falls below the triggered value.
- **On-Change:** The Burst message is triggered when any value in the measuring changing.

Choose the desired burst mode, and set the preferred parameters.

6.13 Information

This menu shows a collection of information from the transmitter and contact information from the manufacturer.

1. Navigate to program point P113 - Information and push the navigation button to enter the menu.
2. Push the navigation button up and down to see all of the information
3. Push the button to leave this menu.

Below is a representation of this information screen:

Version	Software revision
No:	Serial number transmitter
Zero	Zero (Bar)
Span	Span (Bar)
Damping	Damping (in seconds)
Output	Output 4-20 or 20-4 mA
Local Prot	Protection On or Off
Alarm	Alarm output (3.2 or 22.8 mA)
Sec. Value	Selected secondary configuration
Backlight	Backlight On, Sleep mode or Off
Temp	Temperature unit Celsius or Fahrenheit
HART version	HART version 5 or 7

6.14 Factory

Only available for the manufacturer.

6.14 Factory

Only available for the manufacturer.

7. Programming

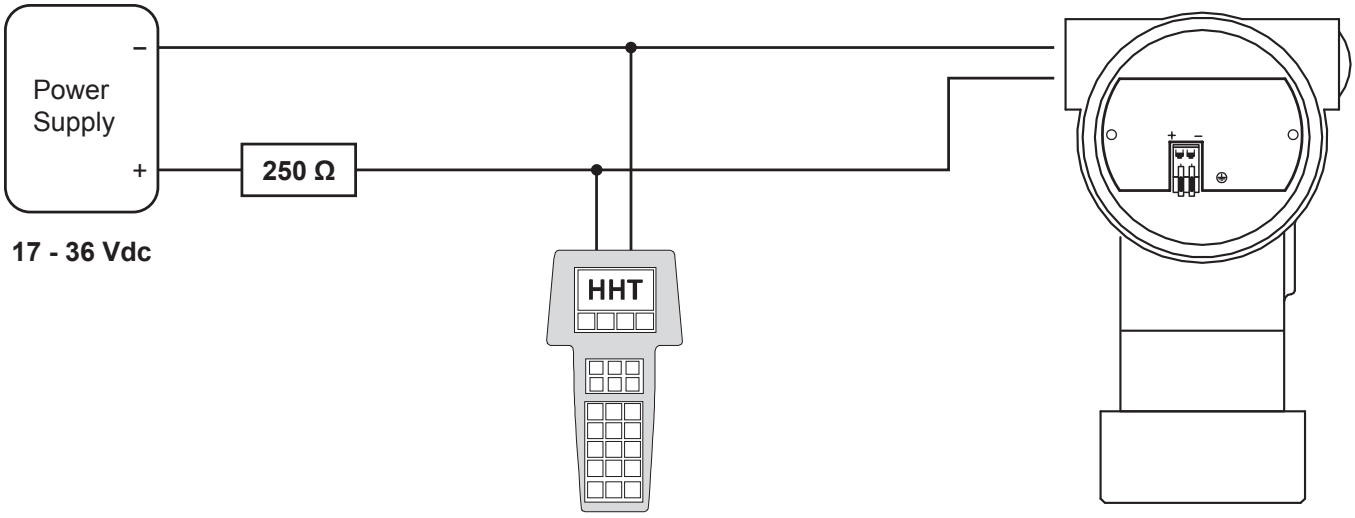
7.1 Programming with Hand Held Terminal

CAUTION

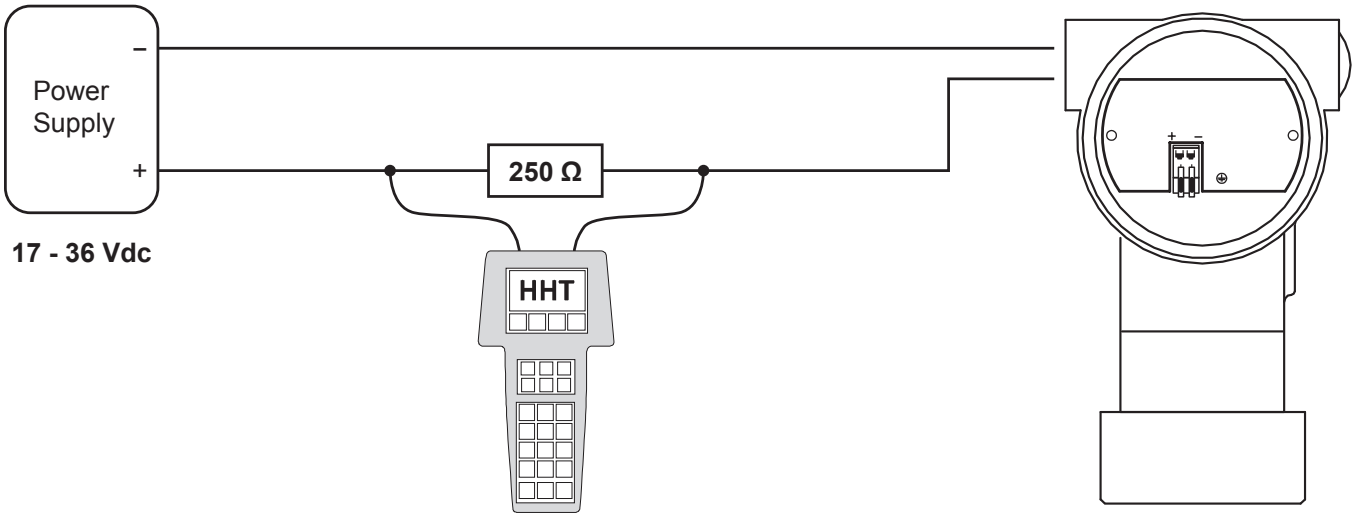
- When using HART or a Hand Held Terminal (HHT), a minimum resistance of **250 Ω** must be present in the loop of the 2-wire system. This is necessary for proper communication (see drawing below). A power supply of at least **17 Vdc** must be used.

The EJA565E can easily be programmed with the Hand Held Terminal (YHC HART Communicator).

Option 1: HART Hand Held terminal connected across the transmitter.



Option 2: HART Hand Held terminal connected across the loop resistor.



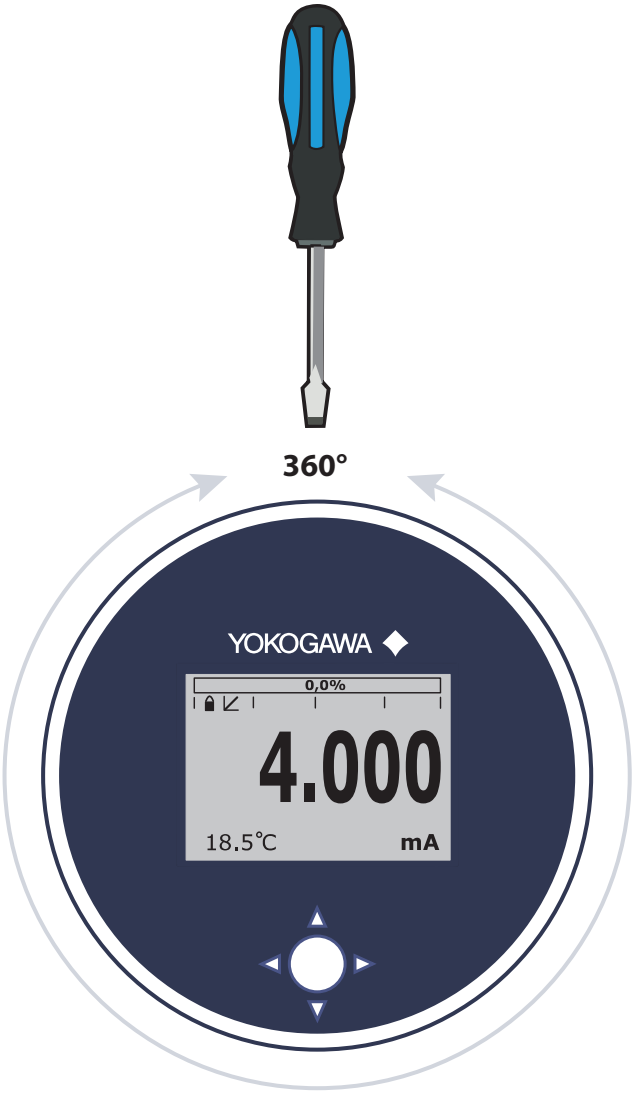
7.2 HART Commands and Parameters

Dynamic Variables (Command #3)		Note
PV	Pressure	Selected units (psi...mBar)
SV	Sensor Temperature	Selected units (Deg. F or C)
TV	Electronic Temperature	Selected units (Deg. F or C)
FV	(Pressure)	Same as PV

- Dynamic variables (PV,SV,TV,FV) and current can be read using HART Command #3.
- Device variables with Status can be read using HART Command #9.

7.3 Rotatable Display

The display of the EJA565E is fully rotatable. To rotate the display, place a small screw driver into the recess on top of the display. Turn it by hand by moving the screw driver into the desired direction, use the other hand to guide this movement to avoid any damages. The display can be turned both left and right.



8. Specifications

Please refer to the General Specifications. Document GS-P-20200626-01 for model, suffix, option codes and all required dimensional and electrical specifications.

The General Specificaitions listed below can be downloaded from the Yokogawa Corporation of America website: https://www.yokogawa.com/us/solutions/products-platforms/field-instruments/pressure-transmitters/hygienic-sanitary-transmitters/

■ General Specification List

Model	Document Title	Document No.
EJA564E, EJA565E	Hygienic & Sanitary Pressure Transmitter	GS-P-20200626-01

9. Precautions and Warnings

CAUTION

- Check if the specifications of the transmitter meet the needs of the process conditions
- When the EJA565E is used as a level transmitter, be aware of the place where the transmitter is mounted. Here are some suggestions:
  - DO NOT mount a level transmitter in- or near filling or discharging pipes.
  - In case of automatic cleaning systems or hand cleaning: never point the water jets on the diaphragm, take necessary steps to avoid this. This will void the warranty.
- When the EJA565E is used as a pressure transmitter, be aware of the following points:
  - Rapid closing valves in combination with high flow velocity will cause water hammer(spikes) and can destroy the transmitter. DO NOT mount a transmitter near such valves, always a few pipe bends away up or down stream (avoid suction).
  - Install a pressure transmitter a few pipe bends away from pumps, as well on the suction or pressure side of the pump.

Welding Information

CAUTION

- When using the EJA565E process connectors suffix code “W” the welding information on page 6 must be followed exactly. This is very important to prevent distortion of the weld-on nipples. It also prevents the screw thread from the EJA565E from being deformed.
- The diaphragm of the transmitter is protected with a special protection cap. Protect the diaphragm until installation takes place, to prevent damaging of the diaphragm.
- Configuring the transmitter locally and remotely simultaneously will cause transmission errors and must be prevented.
- As soon as the wiring is brought inside through the cable gland and connected to the terminal board, make sure the cable gland is tightly fixed, so that moisture cannot enter into the electronics housing.
- Avoid high pressure water-jets pointed at the venting.
- If the ambient conditions are very wet, we advise to use a venting through the cable. A special vented cable can be connected on request. (The normal venting will be removed) In that case the transmitter is IP68.
- The covers (1) and (3) must be fully engaged, so that moisture cannot ingress into the electronics housing.

Revision Information

- Title : Hygienic & Sanitary Pressure Transmitter
  EJA565E
- Manual No. : IM-P-20200627-01

Sept. 2020/1st Edition/R1.01 or later Newly published

■ For Questions and More Information
If you have any questions, you can send an E-mail to the following address.
E-mail: support@us.yokogawa.com
■ If you want have more information about Yokogawa products, you can visit Yokogawa's homepage at the following web site.
Homepage: http://www.yokogawa.com/
■ Written by Marketing Dept. - Yokogawa
Transmitters Div.
Yokogawa Corporation of America
■ Published by Yokogawa Corporation of America
2 Dart Road, Newnan, Georgia 30265 U.S.A.
■ Printed by Yokogawa Corporation of America