



**INSTRUCTION MANUAL “HART”
“INTELLIGENT”
PRESSURE- AND LEVEL TRANSMITTERS
“SERIES 2000”**

*** WARNING ***

Read this manual before working with the product. For personal and system safety and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining the Series 2000, Series 2000-SAN and the Series CER-2000.
Read the precautions and warnings on page 18.

2000



2000-SAN



CER-2000



Made by:



KLAY INSTRUMENTS

Distributed exclusively in the U.S.A. by
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1 INTRODUCTION:

The SERIES 2000 and SERIES 2000-SAN are solid state pressure- and level transmitters based upon a piezo-resistive mono-crystalline silicon sensor, with a very high burst pressure. The sensor element is mounted in a stainless steel foot. A very strong stainless steel "flush" diaphragm protects the sensor from the process medium. Silicone oil fills the chamber surrounding the sensor and transfers pressure from the flush mounted diaphragm to the sensor.

The Series CER-2000 are "All Stainless" pressure transmitters based on a ceramic pressure cell, with very high burst pressure. These transmitters do not have oil filling.

Pressure exerted on the sensor element creates a very 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 applied. The transmitter electronics detects this change in bridge resistance and converts it into 4-20 mA. The amplifier system is based on a single Integrated Circuit, which ensures a perfect linearity in the 4-20 mA output.

1.1 DESCRIPTION SERIES 2000-SAN:

The SERIES 2000-SAN are specially designed to be non-clogging and capable of being cleaned inside, therefore they have a flush mounted diaphragm so they fully meet the needs of the food, chemical and pharmaceutical industries. Standard the wetted parts are made of SS 316 (AISI), a lot of other materials are available. Various process connections can be delivered, such as Tri-Clamp, SMS, dairy milk couplings, flanges and very sanitary weld-on nipples \varnothing 62 and 85 mm.

1.2 DESCRIPTION SERIES 2000:

The SERIES 2000 is specially designed for the pulp- and paper industry or similar, where clogging is a problem. The very compact construction of the SERIES 2000 permits flush installation with the tank- or pipe wall. Standard the wetted parts are made of SS 316 (AISI), a lot of other materials are available.

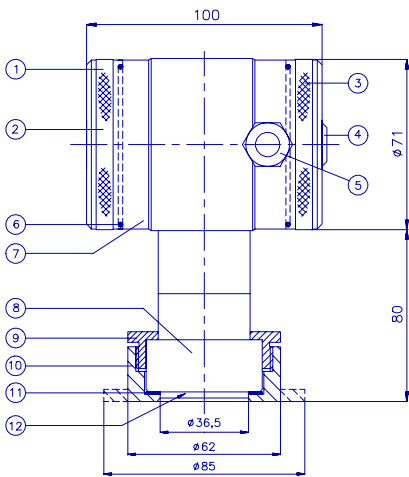
All transmitters are fully temperature compensated, which means that various process temperatures have nearly no effect on the accuracy of the output signal. When a failure occurs, the transmitter is repairable. However, for optimum accuracy the transmitter has to be send back to the factory.

1.3 DESCRIPTION SERIES CER-2000:

The Series CER-2000 are pressure transmitters based on a ceramic pressure cell, which can be used for all gauge- and absolute pressure measurement on steam, liquids and gases. These transmitters do not have oil filling.

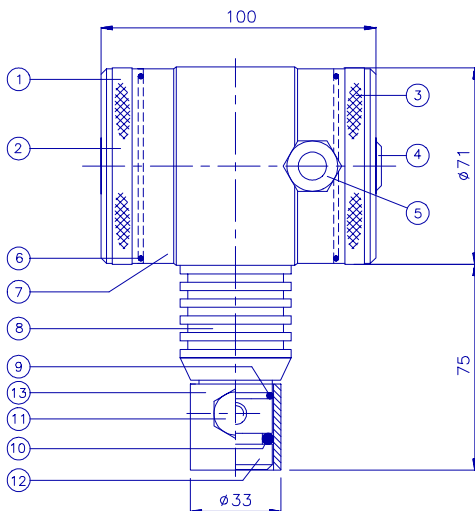
1.4 BAROMETRIC REFERENCE:

The SERIES 2000-SAN are in basic so called "relative transmitter" which means that barometric changes will not affect the zero (4 mA). The venting (4) is placed at the side of the electronic housing and is the barometric reference to atmospheric. The venting must be kept clean.



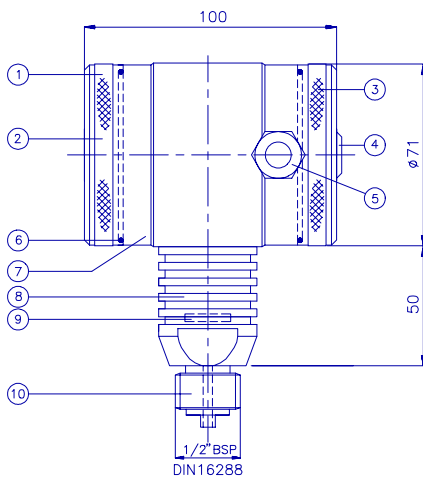
2.1 DIMENSIONAL DRAWING 2000-SAN:
PARTS DESCRIPTION: MATERIAL:

1. Cover	SS 304
2. Pushbuttons + display	(Behind cover)
3. Cover with venting	SS 304
4. Venting	PBT
5. PG9 Cable Gland	
6. O-ring (2x)	EPDM
7. Electronic housing	SS 304
8. Foot	SS 316
9. Lock-ring	SS 316 L
10. Weld-on nipple	SS 316 L
11. Packing	PTFE
12. Diaphragm	SS 316 L



2.2 DIMENSIONAL DRAWING 2000:
PARTS DESCRIPTION: MATERIAL:

1. to 7. the same as above	
8. Foot with cooling fins	SS 304
9. O-ring	Viton
10. O-ring	Viton
11. M8 bolt	SS 304
12. Diaphragm and ring	SS 316
13. Weld-on nipple f 33 mm	SS 316 L



2.3 DIMENSIONAL DRAWING CER-2000:
PARTS DESCRIPTION: MATERIAL:

1. to 7. the same as above	
8. Foot with cooling fins	SS 316
9. Ceramic sensor	Al ₂ O ₃ (96%)
10. Process connection 2" BSP (M) DIN 16288	SS 316

Note:

The ceramic sensor is sealed with an O-ring (VITON).
Other O-ring materials can be applied (on request).

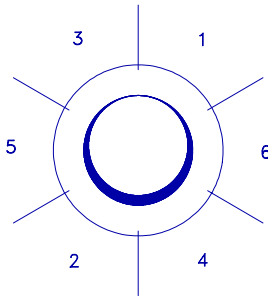
3 INSTALLING TRANSMITTER:

The diaphragm of the transmitter is protected with a special protection cap. Protect the diaphragm until installation takes place. * **DO NOT DAMAGE THE DIAPHRAGM.** *

3.1 INSTALLING WELD-ON NIPPLE:

Installation of the weld-on nipple should be performed by a skilled machinist or welder. Weld Argon, MIG or TIG with the smallest welding pin.

1. Cut a hole in the process vessel/pipe to accept the weld-on nipple. The hole should produce a tight fit when coupled with the weld-on nipple.
2. Prepare the vessel hole by bevelling the edge to accept filler material.
3. Remove the weld-on nipple from the transmitter.
4. Remove the PTFE packing of the SERIES 2000-SAN.



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 left. Allow adequate cooling between passes. To reduce the chances of distortion to the weld-on nipple, use a mandrel. (SERIES 2000-SAN Part.nr. 1019) (SERIES 2000 Part.nr. 1016)

The position of the electronic housing (SERIES 2000) is fixed by the welding position of the weld-on nipple. Before welding, locate weld-on nipple so that the cable entry and the venting are in the right direction.

5. Position the weld-on nipple in the vessel hole and tack six places. The weld sequence is shown in the figure above.
6. 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 beveled area. Adjust amperage for penetration.
7. Remove mandrel after the welding operation.

3.2 INSTALLING TRANSMITTER SERIES 2000-SAN:

1. Improper installation at the packing can cause a process leak.
2. Make sure to correctly locate the packing within the weld-on nipple.
3. Position the transmitter into the weld-on nipple and begin engaging threads. The transmitter can be rotated prior to seating enabling the user to optimize access to calibration adjustments, cable entry, and local indicator.
4. Once Lock ring (8) has been hand tightened, snug an additional turn with adjustable pliers (1/8").

3.3 INSTALLING TRANSMITTER SERIES 2000:

1. After welding, clean up edges, take care of the inside nipple wall.
2. Make sure the O-rings (10) and (11) are properly located. Improper installation at the O-ring can cause a process leak.
3. 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 nipple inside.
4. Install the transmitter and fix it with the SS M8 bolt.

3.4 **INSTALLING TRANSMITTER SERIES CER-2000:**

The position of the electronic housing is depends on the welding position of the weld-on nipple. Before welding, locate weld-on nipple so that the cable entry and the venting are in the right direction.

* DO NOT DAMAGE THE SCREW THREAD. *

3.5 **MOUNTING POSITION:**

When the transmitter is mounted horizontally, the cable gland **MUST** be pointed downwards.

3.6 **MOUNTING POSITION EFFECT (Series 2000 and Series 2000-SAN):**

All transmitters are calibrated in horizontal position.

If the transmitter is mounted vertical (up or down), there will be a little zero shift.

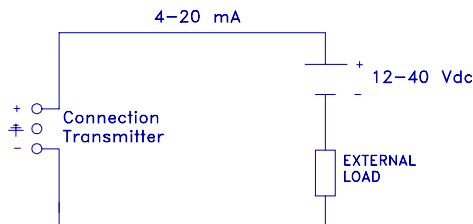
If the transmitter is mounted up, there is a zero shift (e.g. 4,03 mA instead of 4mA). If the transmitter is mounted down there is a zero shift (e.g. 3.97 mA instead of 4mA). After installation of the transmitter the zero must be set to 4.00 mA with “**P103**” in the programming mode.

This will not affect the span.

3.7 **CALIBRATION:**

All transmitters are fully calibrated at the factory, to the conditions stipulated in users order. When the buyer has not requested calibration, the transmitter will be calibrated at the highest span.

It is advisable to re-calibrate the transmitter after shipment.



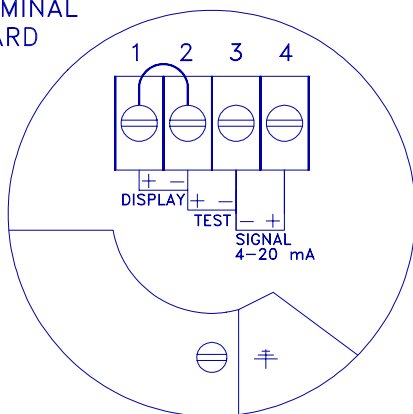
3.8 **WIRING:**

Under the cover (3) you will find the terminal board.

The push buttons “**Zero**”, “**Span**” and “**Prog**” are under the other cover (1).

In most circumstances the load must be placed in the negative leg of the 2-wire loop.

TERMINAL BOARD



The figure left shows the wiring connection of the transmitter.

The 2-wires must be connected to connectors 3(-) and 4 (+) of the terminal board.

The signal wiring does not need to shielded, but twisted pairs yield best results. **DO NOT** run signal wiring in open trays with power wiring, or near heavy electrical equipment. Signal wiring may be grounded at any point on the measurement loop, or it may be left ungrounded. We advise to choose the negative side of the power supply as a grounding point.

The transmitter case may be grounded or left ungrounded.

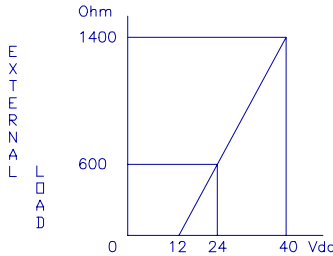
Care must be taken to assure that the polarity of the power supply is correct, a reversal of wiring polarity will not damage the transmitter, but it will not function until the wiring is connected correctly.

4.1 **DIGITAL LOCAL INDICATOR:**

All transmitters from the Series 2000 are standard equipped with a digital display. In the standard execution the covers are "closed". The three push buttons and the display are behind the cover (3). As an option an "open" cover can be delivered to achieve the display can be used as a local display in the process. The full scale point may be set to any value between 0000 and 9999 (4 digit). (Option: "I" extra price).

4.2 **CE-rules:**

All our transmitters are manufactured according to the CE-rules. All transmitters are standard equipped with RFI filters. The influence on Radio Frequency Interference between 10 MHz to 10 GHz is negligible



The minimum power supply is based on the total circuit resistance. The maximum load (Ri max.) in case of 24 Vdc is 600 Ω (Ohm).

By increasing the power supply, the external load can be increased to 1400 Ω / 40 Vdc. (see figure left).

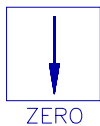
$$Ri \text{ max.} = \frac{\text{Power Supply} - 12 \text{ Vdc}}{20 \text{ mA}}$$

5. **FUNCTIONS OF PUSH BUTTONS:**

The Series 2000 can be programmed easily by use of the 3 front panel pushbuttons (See picture right). The display can show engineering units of: mH2O, inH2O, bar and PSI.

The functions of the three pushbuttons will be explained below.

This button has 2 functions:



1. It can be directly used for adjusting the zero (zero / 4mA), with or without a test pressure. When the zero (4 mA) must be adjusted at 0 (atmospheric pressure), the button must be held until the word "zero" appears on the display. The transmitter is now set to 4 mA.

2. Also, this button must be used for stepping down in the programming menu or to decrease a value (-).

This button has 2 functions:



1. It can be directly used for adjusting the span (20 mA), when using a test pressure (air). When a test pressure (e.g. 2 bar) is supplied to the transmitter, the button must be held until the word "SPAN" appears on the display. The transmitter is adjusted at 20 mA now. The span can also be adjusted without test pressure (see P102).

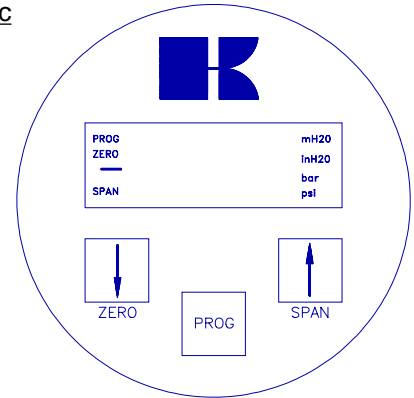
2. Also, this button must be used for stepping up in the programming or to increase a value (+).

This button has 2 functions:



1. It is used to adjust the 12 Programming Points (P101 to P112). Push it once and P100 is displayed, use the [8] (SPAN) to step to P101 etc.

2. This button must also be used for confirming the adjustments (enter).



For example if you want to change the adjustment in bars (P104), the following steps must be taken:

1. Push on [PROG] till "100" appears on the display.
2. Push on [SPAN] 4 times to go to point "P104" (adjustment pressure unit).
3. Push [PROG] to confirm this.
4. Push several times on [SPAN] (8) to reach 3 (= bar).
See also the conversion table (page 11).
1 = m WC, 3 = bar, 5 = PSI, 11 = inch WC
5. Confirm this by pushing once at [PROG].
The transmitter is now adjusted to read in "bar".

6. PROGRAMMING POINTS (P101 - P112):

The following points can be adjusted by means of the three push buttons.

For an explanation of these points see page 9 to 12 of this manual.

To change one of these points you have to push on [PROG] until "100" appears on the display.

To go to from a lower program (P101) to a higher one (P102), push on button [8] (SPAN).

To confirm the adjustments you always have to press on [PROG].

*) Standard adjustments ex works.

Programming points:

P101	Zero adjustment (4 mA)
P102	Span adjustment (20 mA)
P103	Cancel mounting position effect
P104	Adjustment pressure unit (See conversion table)
P105	4 - 20 mA *) 20 - 4 mA (Reverse output)
P106	Adjustment damping (0 to 25 sec)
P107	Indication of process temperature (Read out on display)
P108	0 = °C (*) 1 = °F
P109	Read out on display: 0 = current (4 - 20 mA) 1 = pressure unit (conversion table) 2 = percentages 3 = temperature 4 = hectoliters
P110	Simulation current (4-20 mA)
P111	Linearization 0 = no linearization 1 = cylindrical tank (horizontal) 2 = vertical tank with cone (bottom)
P112	HART Lo.Pr = Local Protection (OFF/ON) Co.Pr = Communicate. Prot. (OFF/ON)

7. READING ON THE DISPLAY:

On the standard built-in display several values can be shown.

During the programming of the transmitter the display shows all the information that is needed.

When the transmitter is in the process, the display gives all the information of the process pressure or temperature.

On the display the following units can be displayed: mH₂O, inH₂O, bar and PSI. In addition, the output can be shown in "mA" or "%". See also programming points P104 and P109.

N.B.: The standard transmitter is supplied with two "closed" covers shielding the buttons and the display. As an option an "open" cover (IP 65) can be fitted. The display can then be used as a local process display. (Option: "1" extra price). The full scale can be set between 0000 and 9999 (4 digit).

8. EXPLANATION PROGRAMMING POINTS P101 to P112:

P 101 ZERO ADJUSTMENT (4 MA)

The transmitter as standard is adjusted to 4.00 mA at atmospheric pressure. It is also possible to adjust a zero-suppression or elevation.

For example: zero elevation of 1 m WK.

1. Push at [PROG] until "100" is shown on the display.
2. Push once at [8] / SPAN till "101".
3. Confirm this by pushing [PROG].
4. Now the display will show 0.00 mH₂O. Push at [8] till 1.00 mH₂O is on the display.
5. Confirm with [PROG].
6. The output of the transmitter will be lower than 4 mA. The output at atmospheric pressure will be for example 3.68 mA. When a pressure of 1 m WC is applied on the diaphragm the output will be 4.00 mA.

The elevation can be cancelled by pushing at [ZERO] till zero disappears out of the display. The transmitter is now adjusted at 4 mA at atmospheric pressure.

P 102 SPAN ADJUSTMENT (20 MA) WITHOUT TEST PRESSURE:

Before adjusting the span take care the right pressure unit is selected. (See also P104 and P109).

Example: Adjustment of the span at 0 - 2 bar.

First off all the pressure unit must be adjusted at "bar". (See P104 and P109).

1. Push [PROG] till "100" is shown on the display.
2. Push twice at [8] / SPAN until "102" is on the display.
3. Confirm this by pushing [PROG].
4. Push [SPAN] (+) or [ZERO] (-) to select the measuring range that is required.
5. Confirm by pushing [PROG].
The transmitter is adjusted now.

N.B.: P102 is the adjustment of the total span. When a "compound" range must be adjusted (for example -1 to +3 bar), a span of 4 bar must be programmed. At P101 (ZERO,4 mA), -1 bar must be adjusted. Now the transmitter is adjusted at: - 1 bar = 4 mA and +3 bar = 20 mA.

P 103 **CANCEL MOUNTING POSITION EFFECT:**

All transmitters are calibrated horizontally. When a transmitter of the Series 2000 or 2000-SAN is installed vertically, there will be a small “mounting effect” on the zero (4 mA). For example the transmitter shows 4.03 mA instead of 4.00 mA. This can be easily cancelled with P103. When “103” is selected “NULL” appears on the display. Now the transmitter is automatically adjusted at 4.00 mA. The span will not be affected.

P 104 **ADJUSTMENT PRESSURE UNIT ON DISPLAY (See Conversion table):**

Several engineering units can be shown on the display by using a conversion factor. (See conversion table below). Four engineering units will light up on the display (mH2O, inH2O, bar and PSI).

N.B.: To show one of the engineering units, P109 must be adjusted at 1 (= pressure unit).

This will be explained with an example (e.g. bar):

1. Push at [PROG] till “100” is shown on the display.
2. Push 4 times at [8], go to [P104].
3. Push at [PROG] to confirm this.
4. Push at [8] / [SPAN] and adjust at 3 (= bar).
 1 = mH2O (=mWC), 3 = bar, 5 = PSI, 11 = inch WC.
5. Confirm with [PROG].
 The transmitter will now read out in bars.

CONVERSION TABLE:

104	CONVERSION FACTOR	DISPLAY
1	1.000	mH2O (mWC) *
2	1000	mm WC
3	0.09806	bar *
4	98.0665	mbar
5	1.4223	PSI *
6	0,00133	Torr.
7	9.80665	KPa
8	0.009807	MPa
9	0.1	Kgf/cm ²
10	73.556	mm HG
11	40.81633	inH2O (“WC) *
12	2.895906	“HG

*) *Pressure units which can be shown on the display.*

When the value of the highest range is larger than 9999, “NA” will appear in the display (Not Applicable). Another unit must be chosen.

P 105 **REVERSE OUTPUT (20 - 4 mA):**

The transmitter as standard is adjusted to 4-20 mA.
Push on [PROG] and go to P105.
Push once at [8] to change the output to 20-4 mA (Reverse output).
Push at [PROG] to confirm this.
Now the transmitter will give 20 mA at atmospheric pressure.

P 106 **ADJUSTMENT DAMPING (0 till 25 sec):**

In P106 an electronic damping can be adjusted between 0 and 25 seconds. This can be done with the push buttons [8] (up) and [9] (down). Always confirm by pushing once at [PROG].

P 107 **INDICATION OF Process Temperature (Read out on display):**

1. Push [PROG] until "100" is shown on the display.
2. Push 7 times at [8], go to [P107].
3. Push [PROG] to confirm this.
Now the process temperature appears on the display (Indication: +/-2EC).

This will remain on the display. To get the actual pressure back on the display you have to push again on P107 until the actual pressure appears on the display again.

P 108 **TEMPERATURE IN °C or °F:**

The temperature of the transmitter is standard adjusted at °C. When pushing at [8] in P108, this will change into °F. Always confirm by pushing once at [PROG].

P 109 **READ OUT ON DISPLAY:**

0 = current	(4 - 20 mA)
1 = pressure unit	(See conversion table)
2 = percentages	(0 - 100%)
3 = temperature	(EC of EF)
4 = hectoliter	(only in combination with P111)

As standard the transmitter is delivered with read out in mA (0). To change this, follow the next steps:

1. Push [PROG] until "100" is shown on the display.
2. Push 9 times at [8] / SPAN till "109" appears on the display.
3. Confirm with [PROG].
4. Push once at [8].
5. Push [PROG] to confirm this.
The transmitter will now read mH₂O (m WC).

The pressure unit can be changed with the conversion table in "P104".
1 = mH₂O (=m WK), 3 = bar, 5 = PSI, 11 = inch WK.

Also the read out can be 0 - 100%. In this case select "P109", option 2.

P 110 **SIMULATION OF CURRENT (4-20 mA):**

The transmitter can be used as a simulator of a current between 4 - 20 mA. This can be done in P110 with the push buttons [8] and [9].

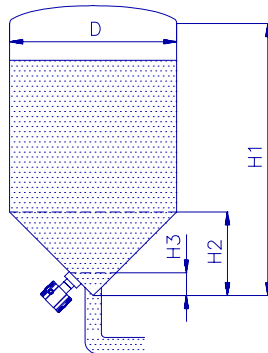
LINEARIZATION:

- 0 = no linearization
- 1 = cylindrical tank (horizontal)
- 2 = tank with bottom cone

As standard the transmitter is delivered without linearization (= 0). However, for a horizontal tank or a tank with a bottom cone, a linearization can be applied to achieve the current signal (mA) is equal to the level in the tank. All values must be programmed in meters.

**Linearization horizontal tank:**

1. Push [PROG] until "100" is shown on the display.
2. Push 11 x at [8] / SPAN till "111" appears. (Confirm with [PROG])
3. Push [8] once. (Confirm with [PROG])
4. Enter the height (H) of the tank in meters. (Confirm with [PROG])
5. Enter the length (L) of the tank. For a cone shaped tank, take the cylindrical length plus the length of 1 cone. (Confirm with [PROG])

Linearization standing tank with cone:

1. Push [PROG] till "100" appears on the display.
2. Push 11 times at [8] till "111" appears. (Confirm with [PROG])
3. Push twice at [8]. (Confirm with [PROG])
4. Enter height (H1) of tank. (Confirm with [PROG])
5. Enter diameter (D) of tank. (Confirm with [PROG])
6. Enter height (H2) of cone. (Confirm with [PROG])
7. Enter the height (H3) from the bottom of the tank to the topside of the diaphragm (or weld-on nipple). (Confirm with [PROG]).

Note:

When the specific gravity of the fluid is unequal to 1, you must take care of it by defining the **calibration** of the transmitter. $Calibration = Height \times Specific\ Gravity$. (Calibration: see P102).

WRITE PROTECTION:

The Series 2000 with HART-Protocol can be protected for writing (Write Protection). This is possible for two kinds of writings:

- Changes via the Display ("Lo.Pr" = Local Protection).
- Changes via external HART configuration software by the **Hand-held terminal or the P.C.** ("Co.Pr."= Communication Protection).

Standard, the transmitter is set to no-write protection.

Adjustment Local Protection:

1. Push [PROG] till "100" appears on the display.
2. Push [8] / SPAN 12 times till "112" appears on the display.
3. Push [PROG] to confirm. ("Lo.Pr." appears on the display).
4. Push [8] for adjusting to "ON" or "OFF".
5. Push [PROG] to confirm.

Adjustment Communication Protection:

1. Push [PROG] till "100" appears on the display.
2. Push [8] / SPAN 12 times till "112" appears on the display.
3. Push [PROG] to confirm. ("Lo.Pr." appears on the display).
4. Push once more at [PROG]. ("Co.Pr." appears on the display).
5. Push [8] for adjusting to "ON" or "OFF".
6. Push [PROG] to confirm.

N.B. When Lo.Pr. is set to "ON", the display shows 104, 105, 107, 108, 109 and 111 and the adjusted values of the parameters. Afterwards "PROT" (Protected) is shown.

Both protections can be adjusted at the same time, independently from each other.

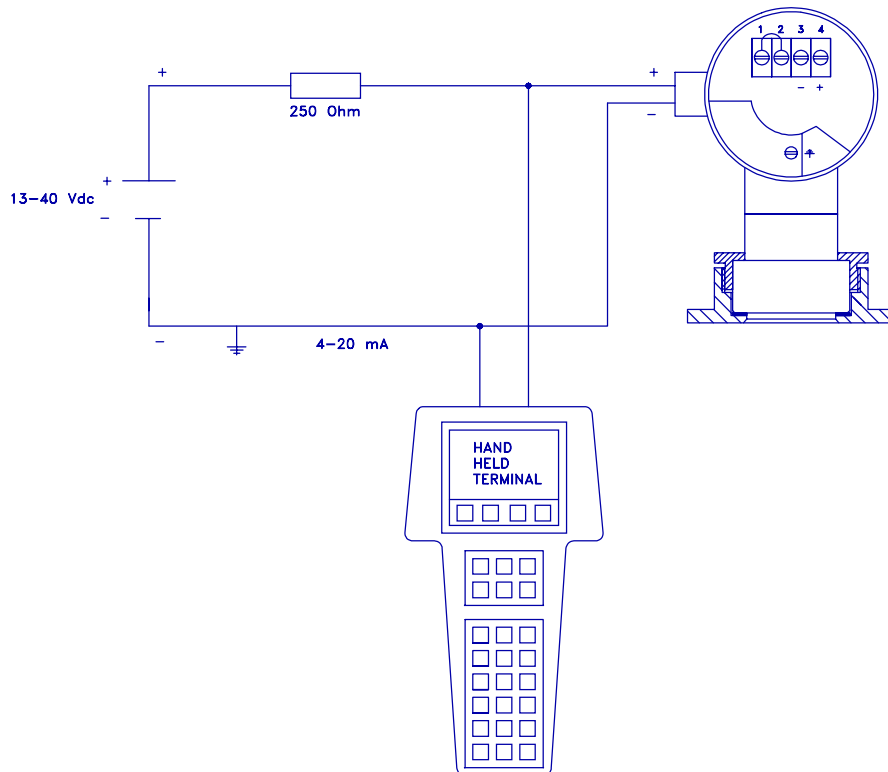
9 **PROGRAMMING WITH THE HAND HELD TERMINAL:**

The series 2000 can be programmed very easily with the Hand Held Terminal (HHT) from the "HART Foundation" or the HHT from "Rosemount" (type 275 Hart Communicator).

The HART (Highway Addressable Remote Transducer) Communicator provides a common communication link to all HART-compatible, microprocessor-based instruments.

WARNING:

When using a HHT to function properly, a **minimum resistance of 250 Ohms** *must* be present in the loop of the 2-wire system. (See figure below).



9.1 **HART COMMUNICATOR 275 (HHT):**

The HHT must be connected to the 2-wire system as shown in the figure above.

Use the I/O key to power and power off the HART communicator.

When you power up the communicator it automatically searches for a HART-compatible device on the 4-20 mA loop. If a device is not found, the communicator displays the message "No device found. Press OK...".

Press the OK "F4" function key and the main menu appears on the display.

If a HART-compatible device is found, the communicator displays the Online Menu ("2").

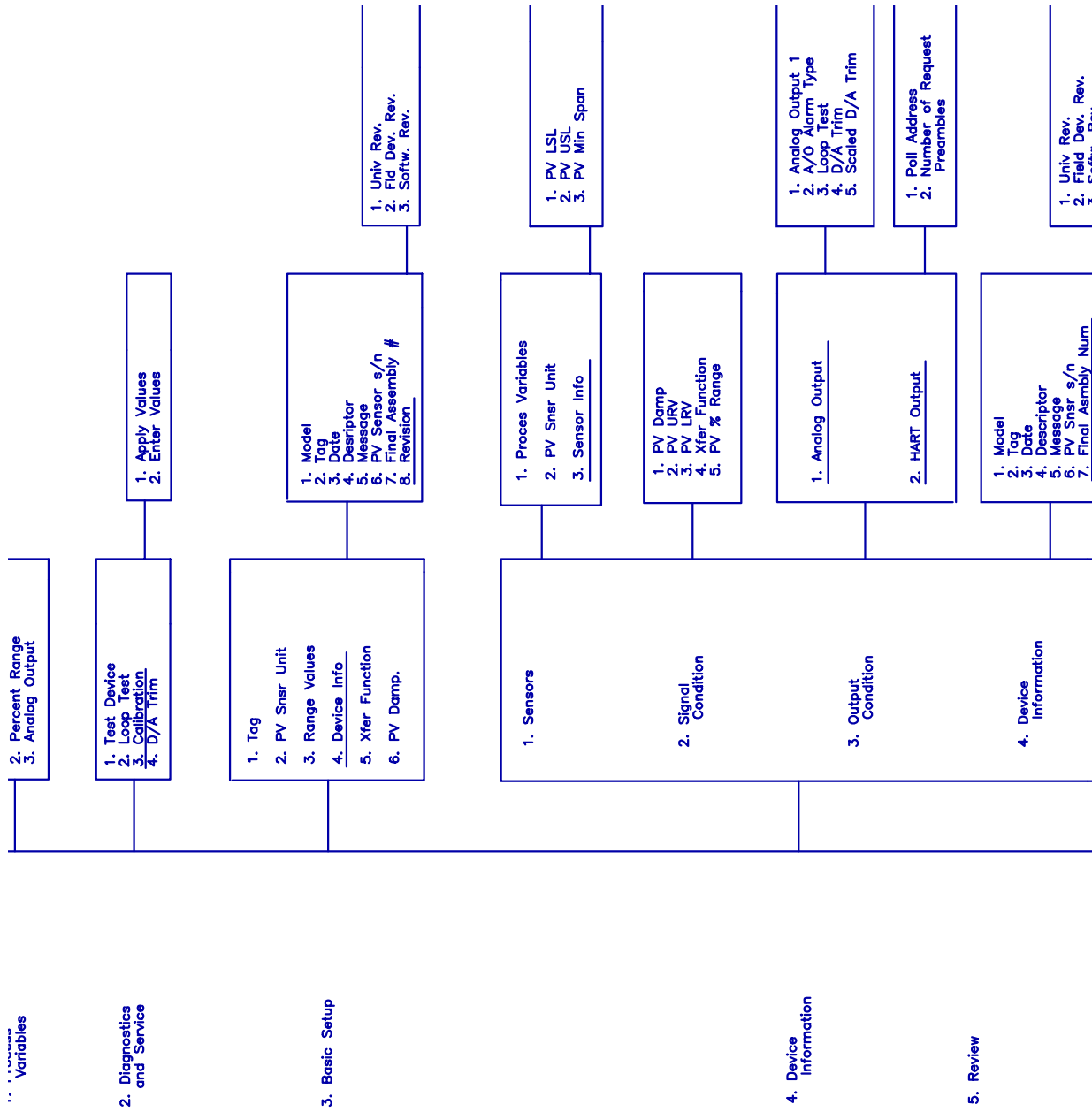
When the communication is completed, the name from the transmitter¹ appears on the display.

Since there is no device description available yet on the series 2000 and the Peramic 'S' the GENERIC online menu (1) appears. (See also schedule on the next page.)

This menu is divided in 5 sections (see figure on the next page).

1. Only a name from a device appears if the Device Description from that device is programmed in the HHT. If the device description is not present in the HART communicator the **Generic Online** menu appears.

Generic Online Menu



9.2 GENERIC ONLINE MENU:

The Generic Online Menu is divided in 5 sections (see figure on the previous page).

The first section is named **Device Setup** and contains a submenu (See 9.3). Section 2 displays critical, up-to-date device information such as the process variable (**PV**). Section 3 shows the analog output (**AO**) in mA. Section 4 & 5 are showing the adjustments of the **Lower Range Value** (zero) and the **Upper Range Value** (span).

These configuration parameters for the connected device may be accessed using the **Device Setup** menu. This menu is divided in 5 submenus.

9.3 DEVICE SETUP:

The Device Setup menu is divided in the following sections.

1. **Process Variables (PV):**
This shows the process variables.
2. **Diagnostics & Service:**
For execution of the diagnostic functions and for test/service activities.
3. **Menu Basic Setup:**
In this menu several adjustments can be changed.
4. **Menu Device Setup:**
This is the configuration menu for detailed transmitter adjustments.
5. **Review:**
This review menu is only for showing the most important adjustments.

9.4 PROCESS VARIABLES (PV):

This menu displays:

1. **Present Variable:** Actual value from the pressure or level.
2. **Percent Range:** Percentage Value
3. **Analog Output:** Analog output in mA.

9.5 DIAGNOSTICS & SERVICE:

The diagnostic & service functions can be used for test/service activities. The following sections are available:

1. **Test Device:** Not available.
2. **Loop Test:** This is the simulation function. With this "loop test" the transmitter can be used as a simulator of a current between 4 - 20 mA.
3. **Calibration:** This is the zero and span adjustment. This can be done with or without test pressure (dry calibration).
4. **D/A Trim:** With the D/A Trim the D/A converter from the transmitter can be re-adjusted. When this is necessary, contact HiTECH.

9.6 **BASIC SETUP:**

1. **Tag:** Input of Tag number.
2. **PV Sensor Unit:** Input of engineering units.
Several engineering units can be shown on the display from the HHT (See P104). When a unit is chosen which is not available in the transmitter, there will be an error message.
3. **Range Values:** Input Lower- and Upper Range Values.
4. **Device Info:** Overview of device information.
5. **Xfer Function:** Is standard Linear. Can not be changed.
6. **PV Damp:** Adjustment of the electronic damping (0 tot 25 sec.).

9.7 **DEVICE INFORMATION:**

This configuration menu is for detailed transmitter adjustments, and consists of the following menus:

1. **Sensors:** Adjustment of Process variables, PV sensor Units, Sensor Info.
2. **Signal Condition:** Adjustment of Damping, Upper- / Lower Range Value, Transfer Function, PV % Range.
3. **Output Condition:** This menu has two sections. The Analog Output and the HART Output. In the Analog Output menu the following adjustments can be shown: Analog Output, A/O Alarm type, Loop Test, D/A Trim. In the HART output menu several HART adjustments can be programmed. Do not change.
4. **Device Inf.:** Adjustment of some different transmitter variables, such as Model, TAG-number, Date, Message, etc.

9.8 **REVIEW:**

This menu gives a list of adjustments, variables and constants of the transmitter.

- * Check if the specifications of the transmitter meet the needs of the process conditions.
- * When the Series 2000-SAN is used as a level transmitter, be aware of the place where the transmitter is mounted. Here are some suggestions:
 1. DO NOT mount a level transmitter in- or near filling or discharging pipes.
 2. In case of automatic cleaning systems or hand cleaning: never point the water jets on the diaphragm, take necessary steps to avoid this. Guarantee will not be granted.
- * When the Series 2000 is used as a pressure transmitter, be aware of the following points:
 1. 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).
 2. Install a pressure transmitter a few pipe bends away from pumps, as well on the suction or pressure side of the pump.
- * WELDING INFORMATION:
When using the Series 2000 or 2000-SAN code "W" the welding information on page 4 must be followed exactly. This is very important to prevent distortion of the weld-on nipples. It also prevents the screw thread from the Series 2000-SAN (M56 x 1,25) 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.
- * As soon as the wiring is brought inside through the PG9 cable gland and connected to the terminal board, make sure the cable gland is tight, so that moisture cannot enter the electronic 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 delivered on request. (The normal venting will be removed)
- * Turn the covers (1 and 3) hand-tight, so that moisture cannot enter into the electronic housing.
- * WARRANTY: The warranty is 1 year from purchase date. Klay Instruments assumes no liability for consequential damage of any kind due to use or misuse of the Series 2000. Decision regarding warranty claims is at the discretion of the manufacturer. Transmitter must be shipped prepaid to the factory on manufacturer's authorization.
- NOTE: Klay Instruments reserves the right to change its specifications at any time, without notice. Klay Instruments is not an expert in the customer's process (technical field) and therefore does not warrant the suitability of its product for the application selected by the customer.

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