

Current loop (analog output) calibration

Calibrating the current loop adjusts the 4 ... 20 mA output to a reference—either the PLC/DCS or a certified ammeter. It forces the 4 and 20 mA outputs to the external reference. The current loop is pre-adjusted at the VEGA factory with a certified ammeter, so it is usually very close to the outputs required.

Output signals are available through two channels. The two channels can control the output that goes to the devices that use the analog output. Some of these devices are:

- PLC/DCS
- Indicator
- Chart recorder

Each channel can be set up and calibrated to accommodate one of the following:

- 4 ... 20 mA
- 0 ... 20 mA
- 0 ... 100 mV

Select the output range for each channel from screen 63. A voltage output requires hardware jumpering and selecting the 0 ... 20 mA output.

The objective of calibrating the analog output is to set the low signal (4 mA, 0 mA, or 0 mV) equal to the actual low process value (or lowest value of interest), and to equate the high signal (20mA or 100mV) to the high process value (or highest value of interest.)

Calibration of the analog output signal

Calibrate the analog output signal by monitoring the current with a DC milliammeter.

Calibrate the analog output signal—Channel#1

1. Single well—Attach the DC milliammeter to terminal block TB4 at pin locations 11 and 12 for analog output #1 (density)
2. Dual well—Attach the DC milliammeter to terminal block TB1 at pin locations 10 and 11 for analog output #1 (density)
3. From screen 052, type in the password for Level 1
4. From screen 015, select SET/CAL ANALOG OUTS and press ENTER.
5. From screen 065, select CAL ANALOG OUTPUTS and press ENTER.
6. From screen 061, select CAL OUTPUT CHAN #1 and press ENTER.
7. From screen 070, press ENTER to select OUTPUT 50% OF RANGE.
8. From screen 077, select either of the following options:
 - COARSE ADJUSTMENT
 - FINE ADJUSTMENT
9. Press ENTER to continue
10. From 071 ADJUST OUT screen, select either of the following options:
 - INCREASE OUTPUT
 - DECREASE OUTPUT
11. Press ENTER
12. Watch the meter to determine when the output value is correct.
 - 12.00 mA for 4 ... 20 mA, 10.00 mA for 0 ... 20 mA, 50 mV for 0 ... 100 mV.Depending on the selection at step 5, either screen 073 or 074 displays.
 - From screen 073, press ENTER to stop increasing output.
 - From screen 074, press ENTER to stop decreasing output.
13. From screen 075, press ENTER on YES to exit setup mode.
14. Connect the write protect jumper JP17.
15. From screen 076, press ENTER on YES line to Save to the EEPROM.
16. Disconnect the write protect jumper, JP17.

Calibrate the analog output signal—Channel#2

1. Single well—Attach the DC milliammeter to terminal block TB3 at pins 3 and 4 for analog output #2 (position)
 2. Dual well—Attach the DC milliammeter to terminal block TB3 at pins 7 and 8 for analog output #2 (position)
 3. Enter the password in screen 052
 4. From screen 015, select SET/CAL ANALOG OUTS and press ENTER
 5. From screen 065, press SELECT to choose the CAL ANALOG OUTPUTS and press ENTER
 6. From screen 061, select CAL OUTPUT CHAN #2 and press ENTER
- Perform steps 7 through 16 of the Channel #1 procedure.

Calibration records

Screen	Item	Values	Values	Values	Values	Values	Values
520	25						
520	26						
520	32						
520	33						
520	39						
520	40						
527	0						
527	2						
527	18						

Note: Only personnel with SmartPro training should make changes to the Frequency Output Channel block (screen 522) parameters. If you are not trained, contact VEGA Field Service for assistance.

To setup the analog output

1. From the 052 PASSWORD screen, type in the password for Level 1
2. From the 522 FREQUOT CHANNEL screen, set the item values from the following table.

Item Number	Value
0	10
1	0
3	142
4	Density (gives 4 mA)
5	Density (gives 20 mA)
7	0
Density 4 to 20mA -	Note position 4 ... 20 mA
8	10
9	0
11	1416
12	Position (gives 4 mA)
13	Position (gives 20 mA)

For further information, refer to the SmartScan Installation and Operation Guide.

VEGA Customer Service information

To request field service within the United States and Canada, call 513-272-0131. Customers outside of the United States and Canada should contact their local VEGA representative for parts and service.

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VEGA

SMARTSCAN QUICK REFERENCE STARTUP, COMMISSIONING, AND CALIBRATION GUIDE

Version 1.0

SAFETY INSTRUCTIONS



Refer to the Radiation Safety Manual and CD that came with your source holder.

Always refer to the safety instructions in this guide and the country specific installation standards. Follow the prevailing safety regulations, radiation regulations, and accident prevention rules of your company and country.

General

The SmartScan should not be used in temperatures < -50 °C (-58 °F) or > +48 °C (+118 °F).

Safety information for EX areas

- This equipment is suitable for use in the following environment:
- CSA Class I, Div 1, Groups C & D
- CSA Class I, Zone 1 EX d IIB T3
- ATEX II 2G EEX d (ia) IIb T3

Special installation, maintenance, or operating instructions

If it is necessary to open the SmartScan, the following warning applies:

WARNING! EXPLOSION HAZARD – Substitution of components may impair suitability for use in hazardous locations.

WARNING! EXPLOSION HAZARD - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

AVERTISSEMENT: - RISQUE D'EXPLOSION - AVANT DE DÉCONNECTER L'ÉQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DÉSIGNÉ NON DANGEREUX.

WARNING! EXPLOSION HAZARD

If there is any damage to the SmartScan field enclosure, verify that the environment is in a non-hazardous condition before opening. Interaction between the positioning system and the enclosure can cause sparking.

Caution! Open circuits before removing cover. There is more than one live circuit. Refer to the system interconnect drawing. A seal shall be installed within 450 mm (1.48 ft) of the enclosure. Do not operate machine with grounding wire disconnected.

AVERTISSEMENT: - Ouvrir les circuits avant d'enlever le couvercle. Un scellement doit être installé à moins de 450 mm du boîtier. Ne pas mettre l'appareil en marche quand le conducteur de mise à la terre est débranché.

CAUTION! Do not operate the machine with the grounding wire disconnected.



WARNING! The SmartScan contains high voltage components (110VAC and 230VAC). Do not operate this system with an open enclosure. Turn off all power and wait a minimum of 10 minutes before opening the closure(s) or performing any maintenance on the system.

SETUP

NOTE: Prepare to put a homogeneous liquid in the vessel for a tank compensation profile. An empty vessel is only a viable alternative for the S-3922 dual well model.

Note: Follow the prevailing radiation safety regulations and accident prevention rules of your company and country.

CHECKLIST FOR FIELD SERVICE COMMISSIONING

- ❑ Remove the doors from the SmartScan and visually inspect for loose wires, connectors, correct field wiring, and shield terminations. Verify that the major components did not come loose during shipment.
- ❑ Apply power to the field electronics and use a voltmeter to monitor DC voltages at the power supply.
- ❑ Observe LEDs on the controller board

LED	Operating Description
10	Flashing at a rate of about twice a second
9	On
8	ON, initially, then OFF when communication starts
7	Pulses if communicating, otherwise OFF
6	Pulses if communicating, otherwise OFF
5	OFF is no motion commanded, otherwise ON
4	OFF initially, ON after three seconds (motor control line)
3	OFF
2	ON – faintly
1	ON
- ❑ Plug the hand-held terminal into the phone jack S2 on the frame controller board.
- ❑ Press NEXT SCREEN and then PREVIOUS SCREEN. This causes the CPU to repaint the MOTION CONTOL screen. From the MOTION CONTROL screen, verify the operation of the home position limit switch and the tag up sequencing.
 1. Use the select key to move the cursor to the TAG UP field.
 2. Press ENTER to activate the tag up sequence.
 3. Observe that the measurement assembly drives up until it trips the home position limit switch (the assembly drives slowly downward until the limit switch releases and the motion stops.
- ❑ Verify the well to mounting flange alignment.
 1. Move the cursor to the MOVE DOWN field.
 2. Press ENTER to start the assembly moving down into the well.
 3. Observe the tape as the assembly travels past the area of the mounting flange/well connection.
 4. If the tape jerks or moves abruptly, you may need to adjust the alignment.
 5. Repeat the motion past this area several times in both the up and down direction until you achieve smooth operation.
- ❑ Verify the operation of the loss of tension switch.
 1. Move the cursor to the DRIVE DOWN field.
 2. Press ENTER to cause the assembly to move down into the well.
 3. Manually cause loss of tension switch to release. This should stop the motion and keep it stopped until the limit switch is released.
- ❑ Verify the operation of the encoder.
 1. Move the cursor to the DRIVE UP field.
 2. Press ENTER to cause the assembly to go up. If the encoder is working correctly, the assembly should stop just short of the home limit switch.
- ❑ Check the sensor output.
 1. Press the NEXT SCREEN. A screen displays with 3 columns of numbers in 4 rows.
 2. The 1st number in the 1st column represents the measurement signal in terms of counts. While the measurement assembly is at the home position, the S-3910 has a high number (greater than 1,000) and the S-3920 has a low number (less than 20).
 3. The 2nd number in the 1st column represents the degree Kelvin. This number should be between 2,500 to 2,900 depending on the temperature.
 4. The 3rd number represents the temperature on the frame controller board in terms of millivolts (20mV per degree Kelvin). This number should be between 5,000 to 6,000 depending on the temperature.
- ❑ Verify communication is taking place.
 1. Power up the SmartScan wall mount electronics.
 2. Observe LED 6 and 7. The LEDs connect to the transmit and receive lines of the communications channel. If the communications are active, the LEDs pulse as communication packets flow between the measurement electronics and the wall mount unit.
 3. Replace the cover and the doors.
- ❑ Inspect the SmartPro for internal and field wiring.
 1. Verify all components are in place and secure.
 2. Apply power to the SmartPro.
 3. Use a voltmeter to monitor DC voltages at the power supply.

- ❑ Verify that the SmartPro communicates with the field electronics.
 1. From screen 440, move the cursor to the STORAGE field and press ENTER. Screen 458 displays.
 2. Press START/MAN UP. The right hand side of lines 2, 3, and 4 contain status fields that give an indication of active modes, limit switch trips, and alarm messages.
 3. The status field on line 2 changes to STOR after pressing START. After a short time, the STOR message disappears .
 4. The status field on line 3 changes to show T_LS for a short time.
 5. When the T_LS message changes back to LOCL, the gauges is tagged up. This sequence demonstrates that accurate communication is taking place.
 6. If the status field on line 4 changes to FAIL, it indicates a problem with communication.
 7. If the FAIL message appears for a brief period then disappears on a continuous basis, this can indicate an intermittent connection or more likely, an improperly terminated shield.

CALIBRATION

Step 1: Select data collection method

The preferred method of data collection is the TIMED AVERAGE method. If process requirements indicate a different method, use the START/STOP PRESSES method. Choose the methods for Channel #1 before performing the CAL LO and CAL Hi procedures.

1. Select data collection method.
2. Connect the write protect jumper JP17.
3. From screen 193, select Channel #1.
4. From screen 194, select either TIMED AVERAGE or START/STOP PRESSES and press ENTER.
5. Timed Average method: On screen 195, enter the new value in the New Time field and press ENTER.
 - Press Select (YES).
 - Press Enter.
 - Save to upper RAM.
6. Start/Stop PresSES method: From screen 194, select START/STOP PRESSES and press ENTER.
7. Disconnect the write protect jumper, JP17.

Step 2: Collecting data for the zero and span

Step 3 sets the upper and lower detector signal limits that are associated with the endpoints of the calibration. You do not have to collect data at the endpoints of the calibration, but in general the closer to the ends the better. Perform this procedure one time only for the initial process calibration.

Calibrate low on process—Channel #1

- √ Have the actual process value for the lightest density process material at the top of the tank.
1. Connect the write protect jumper JP17.
 2. From screen 440, select SINGLE PT mode and press ENTER.
 3. Move the sensor assembly to a point in the tank that contains a known low density process material.
 4. Enter the password in screen 052 and press ENTER.
 5. From screen MAIN MENU 1 OF 2, select CALIBRATE SYSTEM and press ENTER.
 6. From screen 018, select CALIBRATE GAGE and press ENTER.
 7. From screen 008, choose SELECT CHANNEL and press ENTER.
 8. Verify that you are using the correct product code (0 for Channel #1).
 9. From screen 146, select CAL CHANNEL #1 and press ENTER.
 10. From screen 149, select MORE CAL FUNCTIONS and press ENTER.
 11. From screen 150, select MORE CAL FUNCTIONS and press ENTER.
 12. From screen 151, select MORE CAL FUNCTIONS and press ENTER.
 13. From screen 152, select CAL LO ON PROCESS and press ENTER.
 14. If you selected the TIMED AVERAGE data collect method, perform the following:
 - From screen 210, select YES.
 - From screen 211, press ENTER when the countdown reaches 0.
 15. If you selected STOP/START PRESSES data collect method, perform the following:
 - From screen 213, select START DATA COLLECT.
 - From screen 214, press ENTER on STOP DATA COLLECT when enough data has been collected to determine the curve.
 - From screen 212, enter the actual value of the process and press ENTER.
 16. Press ENTER to continue.
 17. From screen 157, press ENTER on the YES line to save to upper RAM or NO to abort the save.

If you choose to save the results, the AVG. COUNT stores in memory for later use. Do this only when you are sure the results are correct and you are ready to continue.
 18. Select YES and press ENTER to continue.
 19. Save to EEPROM.
 20. Disconnect the write protect jumper, JP17.

Calibrate high on process—Channel #1

- √ Have the actual process value for the highest density process material at the bottom of the tank.
1. Connect the write protect jumper JP17.
 2. From screen 440, select SINGLE PT Mode and press ENTER.
 3. Move the sensor assembly to a point in the tank that contains a known high density process material.
 4. From screen 052, input the level 1 access password and press ENTER.
 5. From screen MAIN MENU 1 OF 2, select CALIBRATE SYSTEM and press ENTER.
 6. From screen 018, select CALIBRATE GAGE and press ENTER.
 7. From screen 008, press ENTER at SELECT CHANNEL.
 8. Verify that you are using the correct product code (0 for Channel #1).
 9. From screen 146, select CAL CHANNEL #1 and press ENTER.
 10. From screen 149, select MORE CAL FUNCTIONS and press ENTER.
 11. If you selected the TIMED AVERAGE data collect method, perform the following:
 12. From screen 150, select CAL HI ON PROCESS and press ENTER.
 13. From screen 047, select either YES or NO.
 14. From screen 027, press ENTER when the countdown reaches 0 seconds left.
 15. From screen 156, enter the actual value of the process and press ENTER.
 16. Press ENTER to continue.
 17. On screen 157, press ENTER on the YES line to save to Upper RAM or NO to abort the save.
 18. Save to EEPROM
 19. If you selected STOP/START PRESSES data collect method, perform the following:
 - From screen 153, select START DATA COLLECT.
 - From screen 154, press ENTER on STOP DATA COLLECT when enough data has been collected to determine the curve.
 - On screen 157, press ENTER on the YES line to save to Upper RAM or NO to abort the save.
 - Save to EEPROM.
 20. If you choose to save the results, the AVG. COUNT stores in memory for later use.
 21. Select YES and press ENTER to continue.
 22. Disconnect the write protect jumper, JP17.

Step 3: Calculating the calibration

The data collected in the previous section does not immediately impact the gauge's calibration parameters.

- √ Verify that a linearizer curve is loaded into the gauge before performing the Two Point Cal function for a dual-well system.
1. Connect the write protect jumper JP17.
 2. From screen 146, select CAL CHANNEL #1 and press ENTER.
 3. From screen 149, select MORE CAL FUNCTIONS and press ENTER.
 4. From screen 150, select MORE CAL FUNCTIONS and press ENTER.
 5. From screen 151, select MORE CAL FUNCTIONS and press ENTER.
 6. From screen 152, select TWO POINT CALIBRATE and press ENTER.
 7. From screen 155, select YES and press ENTER.
 8. From screen 157, select YES and press ENTER.
 9. Save to EEPROM.
 10. Disconnect the write protect jumper, JP17.

Step 4: Saving the calibration information to EEPROM

After completion of step 3, all of the calibration information is in the RAM memory of the SmartScan. You must copy this data to the non-volatile EEPROM for long-term storage.

1. Connect the write protect jumper JP17.
2. From screen 100, choose SELECT COPY RAM TO EEPROM.
3. Enter 1 and press ENTER to initiate the transfer. If a zero displays, the transfer was successful. If a one displays, the transfer was unsuccessful.
4. If the transfer was unsuccessful, verify that the jumper on JP17 is in place. It is necessary to place the jumper on JP17 to enable any uploading to the EEPROM.
5. Disconnect the write protect jumper, JP17.

Optional Step: Setting the absorber value

Before starting this procedure:

- √ Calibrate on a known process fluid, such as water or another fluid of known density and record the counts
 - √ Establish the initial calibration
1. Move the SmartScan to the absorber position.
 2. Adjust the absorber thickness until the SmartScan reads close to the lower process range.
 3. Perform a data collect and determine the process value that the absorber is reading.
 4. Connect the write protect jumper, JP17.
 5. From screen 159, select LOW ABSORBER VALUE and press ENTER.
 6. From screen 147, enter the new value in the NEW field and press ENTER.

Press ENTER on YES to save.
 7. Press ENTER on YES to save.
 8. Disconnect the write protect jumper, JP17. This protects the information in the EEPROM.

Note: The SmartScan Model S-3922 has a specific method for calibration. Contact VEGA Field Engineering for further instructions.