



Differential Pressure Densimeter

Operation manual



1. GENERAL INFORMATION

1.1 General information

This manual refers to the following products:

DTS300 and must be kept near the equipment for easy reading and consultation.

It must be read, understood, and strictly follow in order to avoid and prevent accidents and/or malfunctions.

Dwel will not be liable for any injury to people and/or damage to property deriving from disregard of this manual.

1.2 Copyright

Any reproduction of this document, even partial or for internal use, requires Dwel's approval.

1.3 Warning

This manual uses the following safety symbols:



Warning: Indicates that failure to avoid a potentially dangerous situation may result in life-threatening and serious injury.



Important: Indicates that the operation may cause system errors due to hardware or software damage



Note: Use this for important information related to operations and performance to draw attention.



Warning

- In order to avoid process leakage, the densitometer should be correctly installed with the pipeline or the connected body before pressurization, without loosening, firm, and the contact surface should have a sealing gasket;
- To prevent explosion, in explosive environment, do not disassemble the meter cover or connect the circuit when the circuit is powered on. Make sure the installation of the densitometer complies with intrinsically safe or non-flammable site regulations.
- To meet explosion-proof requirements, ensure that the density meter's cover, plug, and electrical interface bolts are fully tightened.
- The signal transmission line of the densitometer should be installed in the metal pipe separately and should not be mixed with other electrical lines;
- The densitometer housing must be well grounded.

2. TRANSPORTATION AND STORAGE

2.1 The product is typically packaged individually. When storing, please ensure it is placed back into its original packaging to maintain protection.

2.2 For long-term storage, the following conditions must be met:

- Ambient temperature: -20°C to 85°C; Relative humidity: 5% to 100% RH
- The product must be kept away from rain, water seepage, or leakage.
- Exposure to vibration and shock should be minimized.
- When storing used products, the residual liquid in the products should be cleaned

3. SPECIFICATIONS

- Density range: 0-1g/ cm³ ; 0-2g/ cm³ ; 0-3g/ cm³ (Optional)
- Output: 4-20mA analog output, digital signal output optional (HART protocol)
- Power supply: 16-30 Vdc , 24 Vdc is recommended
- Accuracy: 0.001g/cm³
- Resolution: 0.001g /cm³
- Medium temperature range: 0-100 °C, 0-200 °C, 0-300°C (Optional)
- Temperature accuracy: 0.2 °C
- Environmental temperature range: 0 to 80 °C (Optional)
- Humidity range: 0-90%

4. INSTALLATION, MOUNTING AND MAINTENANCE

4.1 Installation Precautions

4.1.1 Installation Site Precautions

Although the densimeter is designed to operate reliably even in harsh environments, please observe the following points to ensure long-term accuracy and stable performance:

(1) Ambient Temperature

Avoid installing the instrument in locations with large temperature fluctuations.

If exposed to radiant heat inside a workshop, appropriate heat-shielding and ventilation measures should be implemented.

(2) Atmospheric Conditions

Do not install the densimeter in corrosive environments.

When installation in such environments is unavoidable, ensure proper ventilation and prevent rainwater or moisture from entering electrical conduits.

(3) Shock and Vibration

Although the densimeter is designed to resist shock and vibration, it should still be installed in locations where external vibration and mechanical impact are minimal.

(4) Installation of Explosion-proof Models

Explosion-proof densimeters must be installed in hazardous areas according to the classification of the explosive gases present and in compliance with relevant hazardous-area installation standards.

4.1.2 Pressurized Systems



- When the densimeter is installed in a pressurized process line:

Never loosen any process connection parts, as this may cause dangerous discharge of process fluid.

- When draining residual liquid from the diaphragm assembly, take precautions to avoid contact with the skin, eyes, or body, and avoid inhaling vapors, as the residual fluid may be toxic or harmful.

To ensure correct operation when pressurizing the densimeter, observe the following precautions:

- (a) Verify that all process connections are securely tightened.
- (b) Ensure that the impulse lines are free of leakage.
- (c) Never apply pressure exceeding the specified working pressure.

4.1.3 During on-site piping welding, ensure that welding current does not pass through the densimeter.

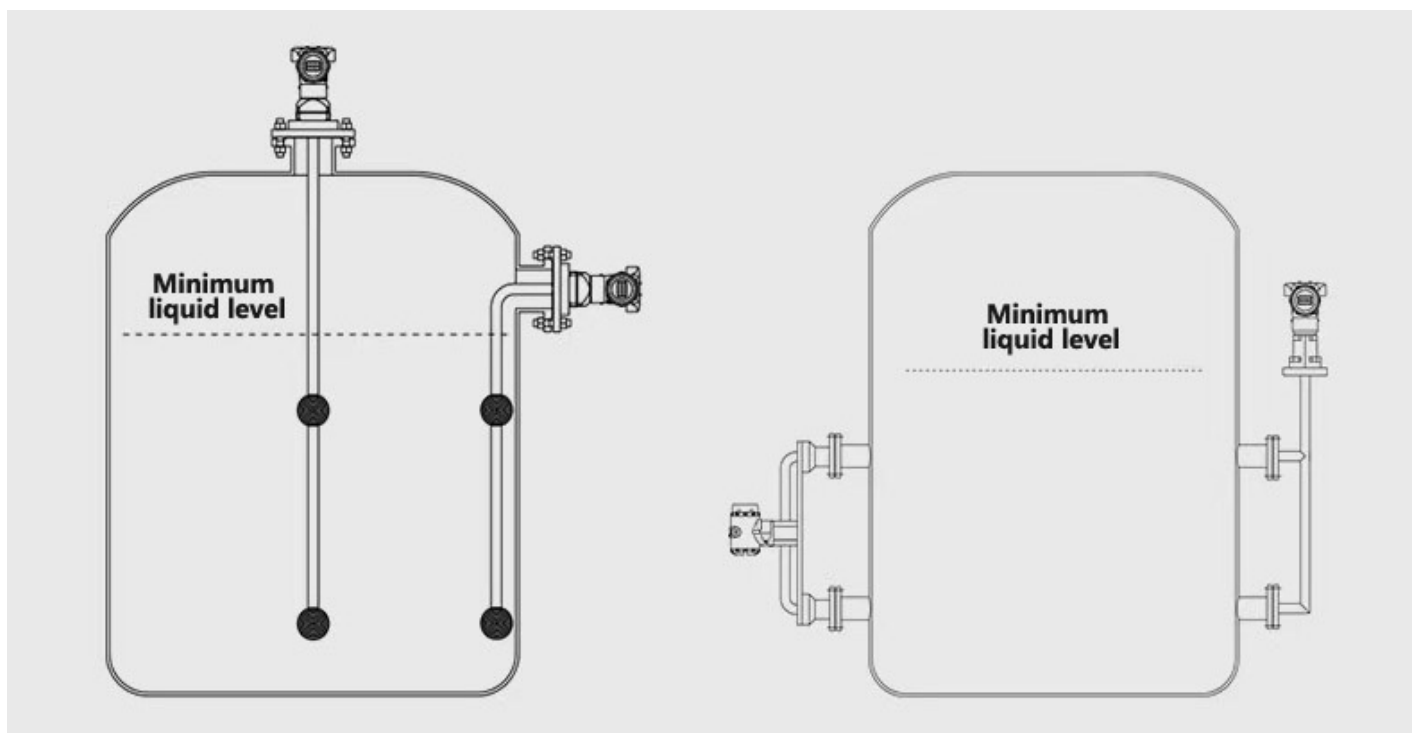


Important

During on-site piping welding, ensure that welding current does not pass through the densimeter. After installation, do not step on or apply weight to the densimeter.

Before assembling the densimeter with the impulse lines, carefully consider the temperature, density, and other characteristics of the measured medium, and determine whether any auxiliary devices are required between the densimeter and the impulse piping.

4.2 Installation



Important

Before the densimeter is put into operation — after installation and wiring are completed—the tank is generally empty. At this time, the zero point of the densimeter should be calibrated. The simplest method is to use the keypad on the densimeter's display and perform the zero-reset function under the corresponding code. Please refer to the operation procedure in the Appendix for detailed instructions.

5. ELECTRICAL CONNECTION



Important

During wiring, avoid routing cables near high-capacity transformers, motors, or other sources of electrical interference. Remove the dust cap from the power inlet before wiring. The threaded sections must be waterproofed (it is recommended to use a non-hardening silicone-based sealing compound).

To prevent signal interference, the signal cable and power cable must not be routed through the same conduit.

For explosion-proof models, all wiring must be carried out strictly in accordance with applicable explosion-proof installation standards to ensure safety and proper performance.

5.1 Cable Selection

Use 600V-rated PVC insulated shielded cables, or equivalent stranded cables of similar specifications.

In areas prone to electromagnetic interference, use higher-quality shielded cables.

For environments with high or low ambient temperatures, select cables with appropriate temperature resistance.

In locations containing harmful gases, liquids, oil, or solvents, use flame-retardant and oil-resistant insulated cables.

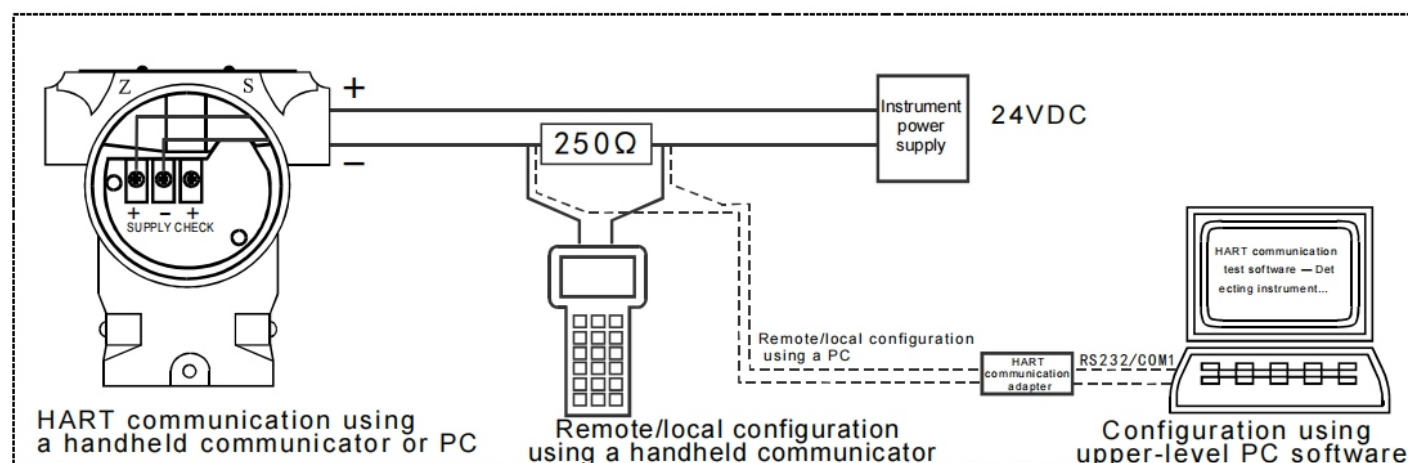
For wire terminations, it is recommended to use crimp terminals with insulated sleeves (compatible with M4 screws).

5.2 External Junction Box Connection

Connect the power supply wires to the ****+**** and ****–**** terminals.

For field current measurement, use the ****CHECK**** terminals.

The ****SUPPLY**** and ****CHECK**** terminals share the same “–” terminal.

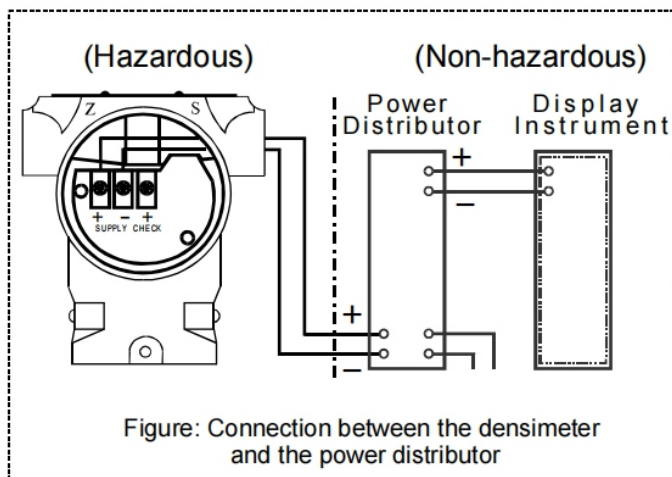


5.3 Wiring

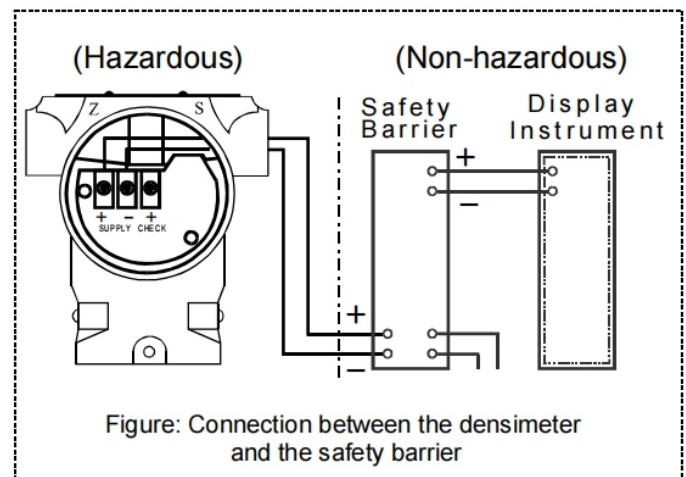
5.3.1 Loop Configuration

Since the densimeter is a two-wire transmission instrument, the signal wires also serve as the power supply wires. A DC power supply is required for operation. The connection between the densimeter and the power distributor is shown in the diagram. For intrinsically safe models, the densimeter must be used together with a certified safety barrier.

General Type & Explosion-proof Type



Intrinsically Safe Type



5.3.2 Wiring Work

(1) General Type and Intrinsically Safe Type

Use waterproof metal conduit fittings for cable routing.

Apply a non-hardening sealing compound to the threads of the junction box conduit entry and the metal fitting to ensure waterproofing.

(2) Explosion-proof Type

The cable must pass through an explosion-proof sealing fitting connected to an explosion-proof metal conduit.

The explosion-proof sealing fitting is required for wiring explosion-proof models.

※ Apply a non-hardening sealing compound to the threads of the junction box conduit entry and the explosion-proof sealing fitting for waterproofing.

※ Sealing accessories must be installed at the junction box entry to ensure proper sealing.

※ Apply a non-hardening sealing compound to the threads of the junction box entry, metal flexible conduit, and sealing accessories to ensure waterproofing.

5.4 Grounding

A grounding terminal is provided both inside and outside the junction box. Either terminal may be used. Proper grounding is essential!

6. OPERATION

6.1 Start-up Preparation



Note

For side-mounted models, ensure that the process connection valves—including the pressure inlet valve, drain valve, and shut-off valve—are all closed.

6.2 Start-up

After the zero point and full span range have been calibrated, proceed with the following steps:

(1) Verify Operating Conditions

If the process liquid exhibits periodic fluctuations, the damping of the densimeter output signal may be adjusted using a handheld communicator or upper-level PC software.

Use a secondary instrument or the built-in LCD display to observe output variations, then set an appropriate damping time constant.

(2) After confirming stable operating conditions, perform the following actions:



Important

- * Disconnect the communicator or PC communication modem from the junction box and ensure that all terminal screws are securely tightened.
- * Tighten the covers of the junction box and amplifier enclosure firmly until they cannot be turned further.
- * For explosion-proof models, both end covers must be locked. The covers cannot be opened by hand.
- * If the densimeter will remain out of service for an extended period, the process fluid inside the pressure chambers should be completely drained.

6.3 Shutdown

To stop the densimeter, follow these steps:

1. Turn off the power supply.
2. Close the shut-off valve.
3. Close the pressure inlet valve.

Measurement Mode

Press Z → 000000 (Lower-left code: 01) → Press Z → Move flashing characters → Press S → 000002 (Modify digits)

Press Z → Code 02 → **Unit Selection**

Code 02: Unit Selection → 000002 (Modify code) → Press S → 12.008 (Lower-left code: 02) → Press S → 12.008 (Change to the required measurement unit)

Press Z → Code 03 → **Lower Range Setting**

Code 03: Lower range → -5.0000 (Lower-left code: 03) → Press S → Character flashes → Press Z to move character → Press S to modify character → -5.0000 (Modify to "-") → Press Z until the cursor reaches the leftmost digit → Press S to modify character → Character → Press S to modify character → 5.0000 (Modify to "+") → Press S to modify character → 5.0000

Press Z → Code 04 → **Upper Range Setting**

Code 04: Upper range → 5.0000 (Lower-left code: 04) → Press S → Character flashes → Press Z to move character → Press S to modify character → Same procedure as above

Press Z → Code 05 → **Damping Configuration**

Code 05: Damping Configuration → 5.0000 (Lower-left code: 05) → Press S → Character flashes → Press Z to move character → Press S to modify character → Same procedure as above

Press Z → Code 06 → **Zero Pressure Reset**

Code 06: Zero Pressure Reset → 0.0000 (Lower-left code: 06) → Press S → "NO" flashes → Press S → "YES" flashes → Press Z to Confirm → Must be performed under zero pressure conditions

Press Z → Code 08 → **Linear/Square-root Selection**

Code 08: Linear / Square-root Selection → 0.0000 (Lower-left code: 08) → Press S → "LIN" flashes → Press S → 0.0000 (Square-root code: SqRT) → Press S → 0.0000 (SqRT flashes) → Press S to switch between linear mode and square-root mode

Appendix 2: Densimeter Calibration Procedure

