256 Pneumatic Pressure Indicator

51425699

This equipment should be installed, maintained, and operated by technically qualified personnel. Any errors or omissions in data, or the interpretation of data, are not the responsibility of Slope Indicator Company. The information herein is subject to change without notification.

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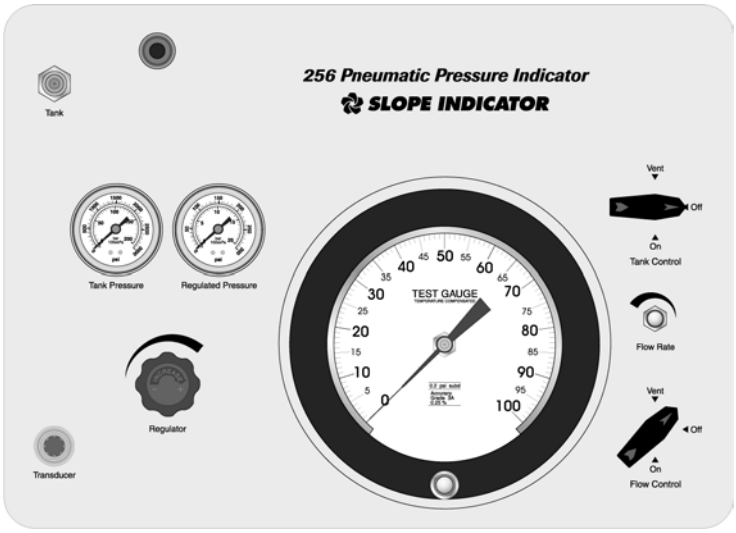
Contents

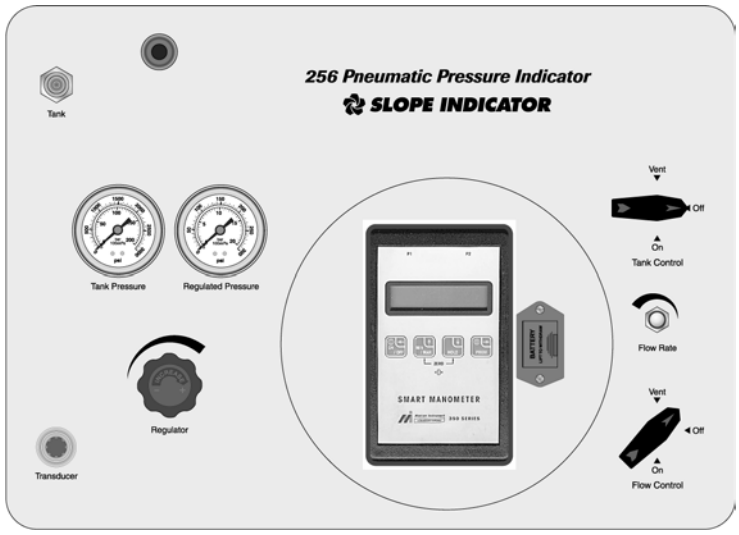
Indicator Controls

The 256 Pneumatic Pressure Indicator

The 256 pneumatic pressure indicator is designed to read twin-tube pneumatic transducers, including piezometers, settlement cells, and total pressure cells. The indicator may be equipped with an analog or digital pressure gauge. A triple tube version of the 256 is available on special order.



256 Indicator with Analog Gauge



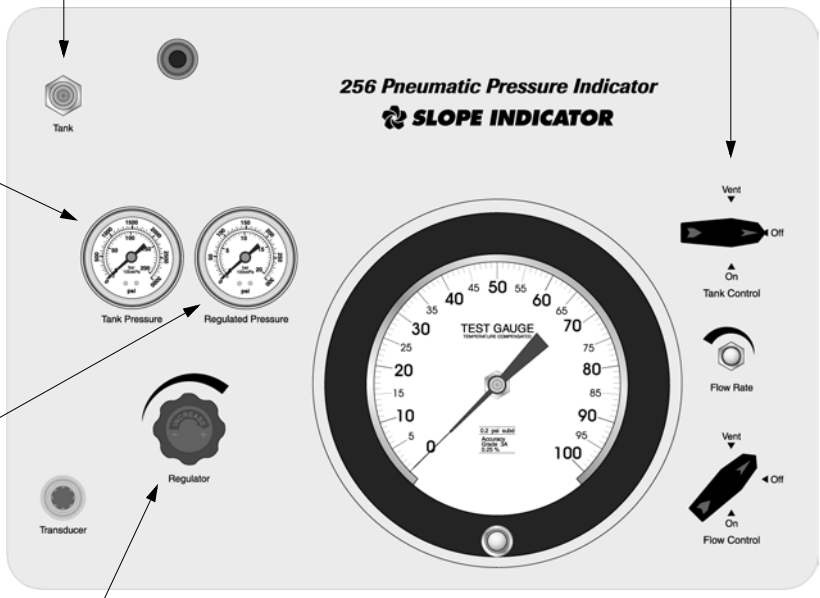
256 Indicator with Digital Gauge

Tank Controls

Use these components to fill the internal tank, monitor the pressure in the tank, and adjust the pressure supplied to the indicator circuits.

Tank: The internal tank is filled through this quick-connect plug. Use the filler hose supplied with the indicator. The tank is rated for 2015 psi (135 bar). See Filling & Venting the Tank for instructions.

Tank Control: The tank control valve provides a way to empty the tank for air-transport. Normally, you can turn the tank control valve to the "On" position and leave it there.



Tank Pressure: The tank pressure gauge indicates the pressure of the gas in the tank.

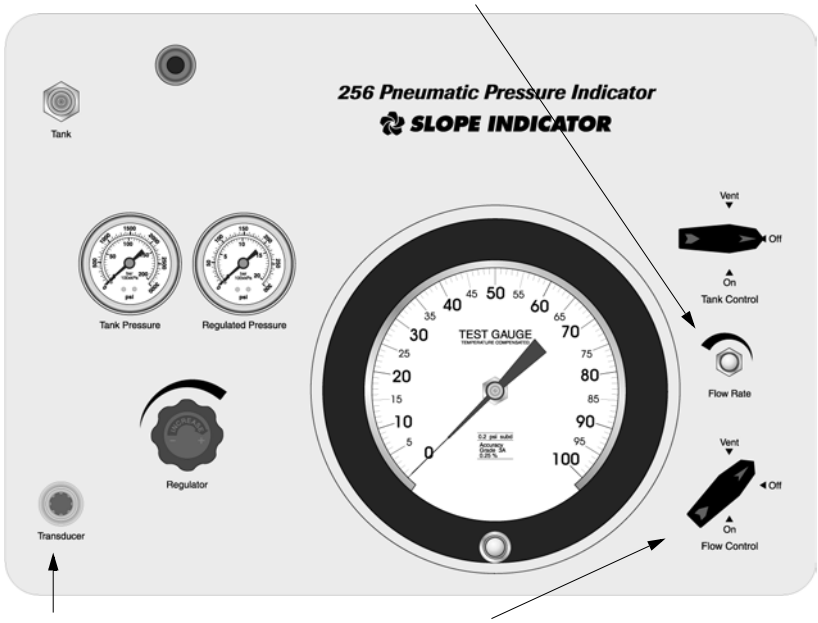
Regulated Pressure: The regulated pressure gauge indicates the pressure of the gas supplied to the indicator circuits.

Regulator: The regulator controls the pressure supplied to the indicator circuits. Turn the knob clockwise to increase pressure. We recommend that you set the regulated pressure no higher than the pressure rating of your gauge.

Flow Controls

Use these controls to direct the flow of gas to the transducer, adjust the flow rate, and shut off the flow. You can also vent gas from the indicator circuits before zeroing the pressure gauge.

Flow Rate: Turn the flow rate valve counter clockwise to increase the flow rate. When you activate the transducer, adjust the flow rate so that the reading on the pressure gauge increases by about 1 psi per second.



Twin Tubing: The input tube (black) has a quick-connect plug. Wipe any dirt off the quick-connect plug before using it.

The vent tube (clear) may have a dust cap. Remove the cap and connect the tube to the return flow indicator (see description on next page).

Transducer Socket: Connect tubing from the transducer here. To make the connection, hold down the socket sleeve, press the quick-connect plug into the socket, then release the sleeve.

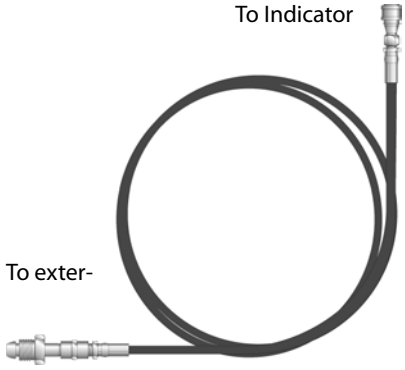
Flow Control: The flow control valve is the most frequently used control. The "On" position directs a flow of gas to the transducer. The "Off" position shuts off the flow of gas. The "Vent" position is used when you zero the pressure gauge.

Return Flow Indicator

The return flow indicator looks like a flowmeter but has a different purpose. It is used to detect the return flow of gas carried by the transducer's vent tube. A rising ball indicates a return flow. See "Reading Pneumatic Transducers" for details.

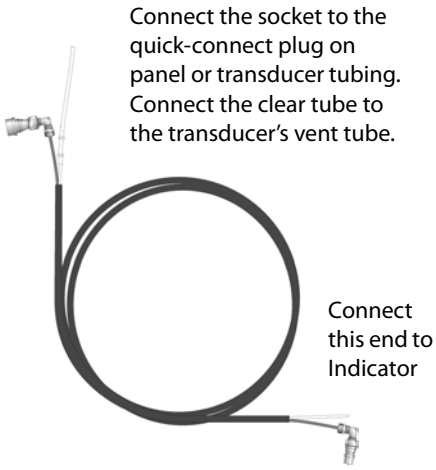
Filler Hose

A filler hose is supplied with the indicator to charge the internal tank with nitrogen gas from an external source. Use the screw-in fitting to connect to the external nitrogen cylinder. Connect the socket end of the hose to the tank fill plug on the indicator.



Jumper Tubing

Jumper tubing, supplied with the indicator, serves as an extension of the tubing from the transducer. It is used when connectors are hard to reach. The jumper has a quick-connect socket at one end and a quick-connect plug at the other end.



Keep Quick-Connectors Clean

Always check that quick-connect plugs are clean before inserting them into quick-connect sockets. Dirt can damage O-rings and degrade the performance of the indicator.

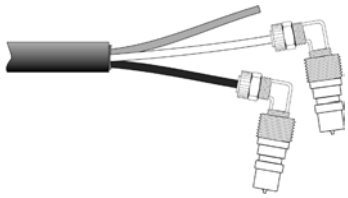
Flowmeter

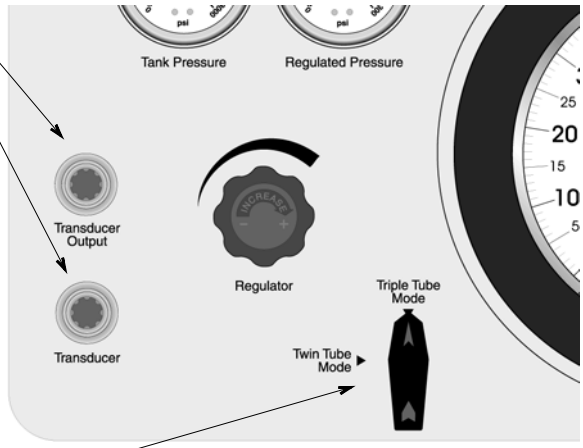
The precision flowmeter is used to monitor the rate of flow of the gas being directed into the pneumatic tubing. Use the flow rate valve to control the flow rate.

Triple-Tube Mode

The triple tube version of the 256 has an additional control for reading twin or triple tube transducers. With a triple tube transducer, one tube is used to activate the transducer and to maintain a flow of gas through the transducer. The second tube is used to vent excess gas from the transducer. The third tube is used to read the transducer. Pressure in the third tube is static, i.e. there is no flow of gas in the tube.

Triple Tubing: Connect the clear output tube to the transducer output socket. Connect the black input tube to the transducer socket. The red vent tube should be open to atmosphere.





Mode: Use the triple-tube position to read the pressure from the output tube. It connects the output socket to the pressure gauge. Use the twin-tube position to read twin tube transducers. In the twin tube position, both transducer sockets are connected to the gauge.

Pressure Gauges

Overview

The instructions below describe how to zero the pressure gauges and how to read them. Zeroing the gauge before taking a reading eliminates error due to changes in barometric pressure. After zeroing, take a reading. Then check the zero again.

Ametek USG Test Gauge

Zeroing the gauge

1. Check that no transducer is connected.
2. Turn the tank control to the Off position.
3. Turn the flow control to the Vent position.
4. If the pointer does not point to zero, remove the face plate of the gauge. Hold the hub of the pointer, insert the adjustment tool (provided with the gauge) in a hole near the hub of the pointer, then rotate the tool until the pointer points to zero.

Reading the Ametek gauge

Tap the gauge lightly, then move your head so that your eye looks straight down at the pointer and you cannot see a reflection of the pointer in the mirror band around the scale. Note the reading.

Ashcroft Test Gauge

Zeroing the gauge

1. Check that no transducer is connected.
2. Turn the tank control to the Off position.
3. Turn the flow control to the Vent position.
4. If the pointer does not point at zero, use the adjustment ring located on the bezel of the face plate. Loosen the knurled locking screw. Then rotate the ring in either direction until the point is zeroed. Then, holding the ring, tighten the locking screw.

Reading the gauge

Tap the gauge lightly, then move your head so that your eye looks straight down at the pointer and you cannot see a reflection of the pointer in the mirror band around the scale. Note the reading.

Meriam Instruments Smart Manometer

The 350 Smart Manometer provides user-selectable units for pressure readings. You can also program an auto-off setting so that the Manometer shuts itself off after a set period of time. Please refer to the operating instructions supplied with the Manometer for more information.

Zeroing the Gauge

1. Check that no transducer is connected.
2. Turn the tank control to the Off position.
3. Turn the flow control to the Vent position.
4. Press the On/Off key. The manometer turns on, displays its current settings, and then displays a reading, which should be close to zero.
5. To zero the manometer, press both the Min/Max and Hold keys at the same time, then release the keys. The manometer displays "Zero in Progress" and displays a count down. The zeroing operation is finished when the unit returns to measurement mode and displays a reading.

Reading the gauge

Press the On/Off key. The manometer turns on, displays its current settings, and then displays the pressure reading.

Changing the Battery

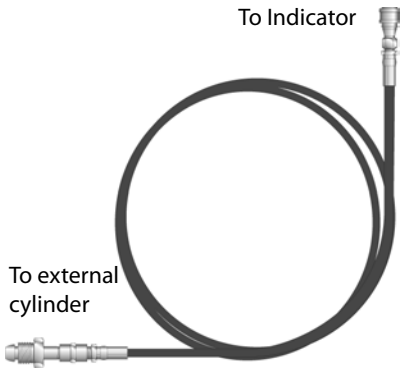
1. Change the battery when the display shows "Low Power Detect" or "Replace Battery."
2. The battery is located to the right of the manometer. Using the fingernail slot, move the "door" in the direction of the arrow and lift out the battery holder. Replace the battery and slide the battery holder back into place.

   Remove battery when indicator is stored for longer than two weeks.

Filling and Venting the Tank

Filling the Tank

1. The internal tank has a capacity of 160 liters (8.1 cubic feet) of compressed gas. It must be charged with dry nitrogen gas (5 to 7 ppm H_20) from an external source. A cylinder of nitrogen gas is usually available from a welding supply company.



   Use the filler hose is supplied with the indicator. The screw-in fitting connects to the external nitrogen cylinder, and the socket end of the hose connects to the tank fill plug on the indicator. Do not use a kinked or badly abraded filler hose.

2. Turn the tank control valve to the Off position to prevent gas from escaping from the tank. Turn the regulator knob counterclockwise until the regulated pressure gauge reads zero. This protects the regulator.

3. Slowly open the valve of the nitrogen cylinder - typically less than one full turn - and begin filling tank.

4. When the tank pressure gauge reads 2,000 psi, close the valve on the external cylinder.

5. Check that the valve on the external cylinder is turned off, then carefully loosen the hose fitting at the cylinder to release pressure from the filler hose. The filler hose connection to the indicator is made so that no gas will escape from the indicator tank.

6. Disconnect the filler hose from the indicator, and finally, disconnect the filler hose from the cylinder.

Note: Tank pressure normally drops 100 to 200 psi after the gas in the tank cools.

Venting the Tank

Air transport safety regulations in the US and many other countries require that pressure in the internal tank be reduced to zero.

1. Turn the regulator knob counter-clockwise to reduce the regulated pressure temporarily.
2. Turn both the flow control valve and the tank control valve to the Vent position. You will hear noise from venting gas.
3. Now turn the regulator knob clockwise to increase the outflow of gas. The noise of venting gas will increase and tank pressure will drop.
4. When tank pressure falls close to 0 psi, turn the tank control valve to the Off position. Turn the regulator knob counter-clockwise to keep the tank dry inside.

Reading Pneumatic Transducers

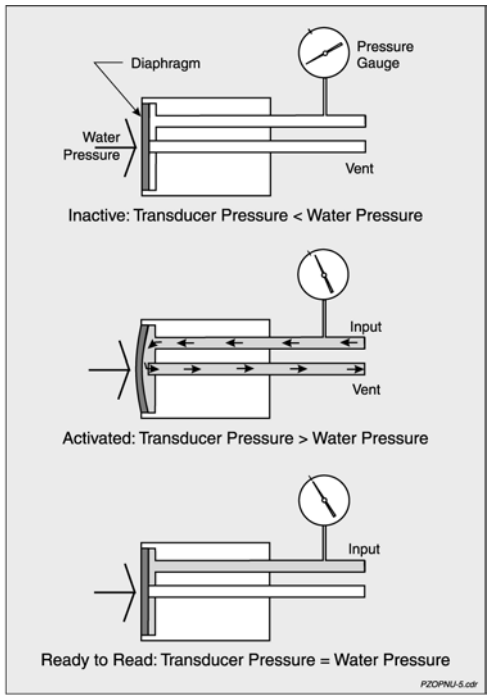
Introduction

Pneumatic transducers are used in piezometers, total pressure cells, and settlement cells. These transducers share the same basic operating principle. The illustration below shows a piezometer, but total pressure cells and settlement cells operate the same way.

Operating Principle

The single moving part in a pneumatic transducer is a flexible rubber diaphragm. Water pressure acts on one side of the diaphragm and gas pressure acts on the other.

When a reading is required, the operator connects a pneumatic indicator to the tubing from the transducer and sends compressed nitrogen gas from the indicator down the input tube.



Gas pressure increases inside the transducer. Finally, when the pressure of the gas exceeds the pressure of the water, the diaphragm is forced outward, away from the vent tube. Excess gas then escapes through the vent tube to the surface.

On detecting a return flow of gas at the surface, the operator turns off the flow of gas into the transducer. Gas continues to flow out through the vent tube, and pressure inside the transducer decreases until water pressure forces the diaphragm to its original position, sealing off the vent tube and preventing further escape of gas.

At this point, there is a balance between the pressure of gas inside the transducer and the pressure of water outside. The operator then notes the reading on the indicator's pressure gauge.

Reading Methods

There are two commonly used methods for reading pneumatic piezometers and other types of pneumatic transducers: reading after shut-off and reading with flow.

Reading after Shut-Off

This method is the normal way to read twin-tube transducers. The transducer is activated by a flow of gas.Then, when a return flow is detected, the gas is shut off.

Using the 256 indicator: Turn the flow control valve to the On position to activate the transducer. The reading on the pressure gauge goes up. Then, when you detect a return flow of gas from the vent tube, turn the flow control valve to the Off position. The reading on the pressure gauge drops and finally stabilizes. Tap the gauge and write down the reading.

The key to reliable readings: Allow sufficient time for excess gas to vent from the transducer after the flow of gas is shut off.

Reading with Flow

This method is used with triple-tube transducers and is sometimes suitable for twin-tube transducers. The transducer is activated by a flow of gas. Then, when a return flow is detected, the flow rate is slowed.

Using the 256 indicator: Turn the flow control valve to the On position to activate the transducer. The reading on the pressure gauge goes up. Then, when you detect a return flow of gas, set the flow rate valve so that the flowmeter shows 30mm on its scale. This is equivalent to 47 cc/m or 0.1 SCFH. Monitor the flowmeter to ensure that the flow rate remains constant. When the reading on the pressure gauge stabilizes, tap the gauge and write down the reading.

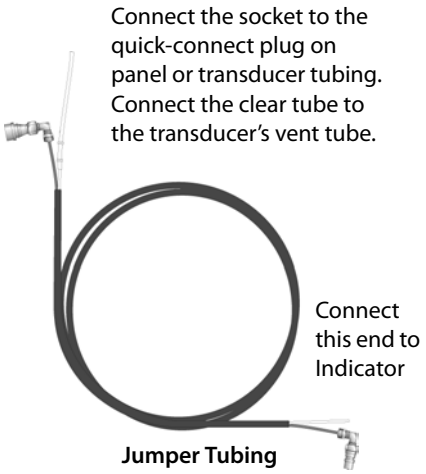
The key to reliable readings: Accurate control of the flow rate, which requires a flowmeter.

Reading after Shut-Off

Introduction

The Standard Method for Reading Twin-Tube Transducers

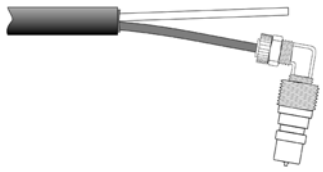
Set Up



1. Before leaving for the site, check that you have enough gas in the tank. The tank pressure should be higher than 35 bar or 500 psi. Refill the tank, if necessary.
2. Check the regulated pressure. As a general rule, it should be no higher than the pressure rating of your pressure gauge.Turn the knob clockwise to increase the pressure or counter-clockwise to decrease the pressure.
3. Turn the tank control valve to the On position to supply gas to the indicator. You can leave the valve in this position most of the time.
4. Check that you have the jumper tubing. The jumper serves as an extension of the tubing from the transducer and is used when connectors are hard to reach.
5. As a general rule, you should zero the pressure gauge on site.

Connect Tubing

1. The twin-tubing from the transducer contains a black tube and a clear (whitish) tube.
2. The black tube is terminated with a quick-connect plug. Connect the black tube to the indicator's transducer socket. If the plug is mounted in a panel, use the jumper to connect between panel-mounted plug and the indicator.



3. The clear tube is the vent tube. The vent tube may be protected by a dust cap. Remove the cap before you activate the transducer or you may be surprised by a pop when returning gas blows it off. Connect the vent tube to the return flow indicator or place it in a clear, water-filled bottle, as described below.

   Tip: If you place the end of the vent tube in a water-filled bottle, the return flow of gas will be visible as bubbles. When the bubbles stop or slow significantly, you can be sure that excess gas has escaped and the transducer is ready to read.

Activate

1. Turn the flow control valve to the On position.
2. If necessary, adjust the flow rate with the flow rate valve. The reading on the pressure gauge should increase at about 1 psi per second (slightly faster than 0.05 bar per second).

Tip: Transducers with longer lengths of tubing take more time to activate and read. Increasing the flow rate will not significantly reduce this time. In fact, a faster flow rate may result in a longer wait for the reading to stabilize because additional gas must flow through the transducer.

Read

1. Wait for a return flow of gas from the vent tube. If you are using a bubble bottle, watch for bubbles.
2. When you detect a return flow, turn the flow control valve to the Off position.
3. Wait for the pressure reading to stabilize. If you are using a bubble bottle, wait for the bubble rate to slow to about 2 bubbles per second. This rate of flow is insignificant to the accuracy of the reading.
4. Tap the gauge and write down the reading.

Verify

It is a good practice to verify the reading.

1. Turn the flow control valve On.
2. Wait for a return flow, then turn the flow control valve Off.
3. Wait for the reading to stabilize and compare it to the first reading. Repeat this process until you have repeatable readings.

Shut Down

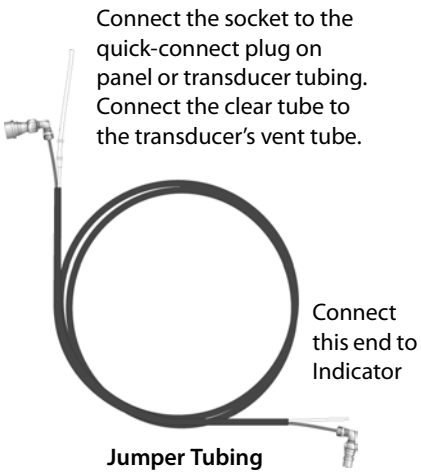
1. Disconnect the tubing from the indicator and replace any dust caps.
2. If this is the last reading for the day, turn the tank control valve Off, turn the flow control to Vent, and turn the regulator knob counter-clockwise to reduce the regulated pressure to zero.

Reading Twin-Tubes with Flow

Introduction

This requires a flowmeter. Recent models of the 256 indicator are equipped with a flowmeter.

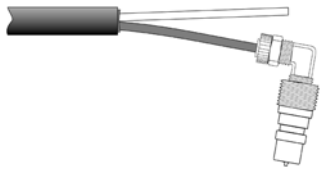
Set Up



1. Before leaving for the site, check that you have enough gas in the tank. The tank pressure should be higher than 35 bar or 500 psi. Refill the tank, if necessary.
2. Check the regulated pressure. As a general rule, it should be no higher than the pressure rating of your pressure gauge.Turn the knob clockwise to increase the pressure or counter-clockwise to decrease the pressure.
3. Turn the tank control valve to the On position to supply gas to the indicator. You can leave the valve in this position most of the time.
4. Check that you have the jumper tubing. It serves as an extension of the tubing from the transducer and is used when connectors are hard to reach.
5. As a general rule, you should zero the pressure gauge on site.

Connect Tubing to the Indicator

1. The twin-tubing from the transducer contains a black tube and a clear (whitish) tube.
2. The black tube is terminated with a quick-connect plug. Connect the black tube to the indicator's transducer socket. If the plug is mounted in a panel, use the jumper to connect between panel-mounted plug and the indicator.



3. The clear tube is the vent tube. The vent tube may be protected by a dust cap. Remove the cap before you activate the transducer or you may be surprised by a pop when returning gas blows it off. Connect the vent tube to the return flow indicator or place it in a clear, water-filled bottle, as described below.

Tip: If you place the end of the vent tube in a water-filled bottle, the return flow of gas will be visible as bubbles. When the bubbles stop or slow significantly, you can be sure that excess gas has escaped and the transducer is ready to read.

Activate

1. Turn the flow control valve to the On position.
2. If necessary, adjust the flow rate with the flow rate valve. The reading on the pressure gauge should increase at about 1 psi per second (slightly faster than 0.05 bar per second).

Tip: Transducers with longer lengths of tubing take more time to activate and read. Increasing the flow rate will not significantly reduce this time. In fact, a faster flow rate may result in a longer wait for the reading to stabilize because additional gas must flow through the transducer.

Read

1. Wait for a return flow of gas from the vent tube. If you are using a bubble bottle, watch for bubbles.
2. Then, when you detect a return flow of gas, set the flow rate valve so that the flowmeter shows 30mm on its scale. This is equivalent to 47 cc/m or 0.1 SCFH.
3. Wait for the pressure reading to stabilize. With 500 feet of tubing, this takes about 90 seconds.
4. Tap the gauge and write down the reading.

Verify

It is a good practice to verify the reading.

1. Briefly turn the flow control valve to the Vent position. The purpose is to change the reading on the pressure gauge.
2. Wait for the reading to stabilize and compare it to the first reading. Repeat this process until you have repeatable readings.

Shut Down

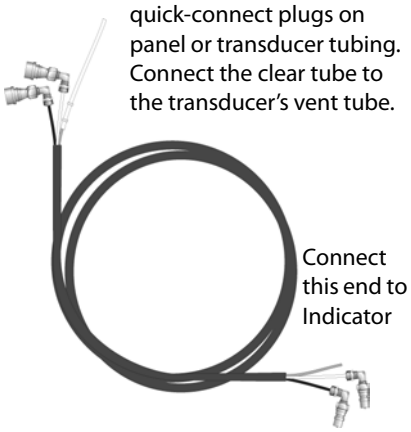
1. Disconnect the tubing from the indicator and replace any dust caps. Pressure remaining in the transducer tubing helps keep out water.
2. If this is the last reading for the day, turn the tank control valve Off, turn the flow control to Vent, and turn the regulator knob counter-clockwise to reduce the regulated pressure to zero.

Reading Triple-Tube Transducers

Overview

This requires the special-order triple tube model of the 256 indicator.

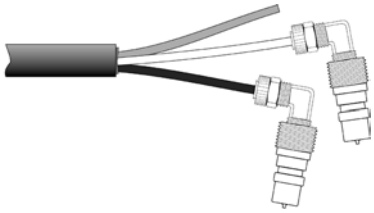
Set Up



Jumper Tubing

1. Before leaving for the site, check that you have enough gas in the tank. The tank pressure should be higher than 35 bar or 500 psi. Refill the tank, if necessary.
2. Check the regulated pressure. As a general rule, it should be no higher than the pressure rating of your pressure gauge.Turn the knob clockwise to increase the pressure or counter-clockwise to decrease the pressure.
3. Turn the tank control valve to the On position to supply gas to the indicator. You can leave the valve in this position most of the time.
4. Check that you have a triple-tube jumper. It serves as an extension of the tubing from the transducer and is used when connectors are hard to reach.
5. As a general rule, you should zero the pressure gauge on site.

Connect Tubing



1. The triple-tubing from the transducer contains a black tube, a clear (whitish) tube, and a red tube.
2. Connect the black tube to the indicator's transducer socket.
3. Connect the clear tube to the indicator's transducer output socket.

   If the plugs are mounted in a panel, use the jumper to connect between panel-mounted plug and the indicator.
4. The red tube is the vent tube. It may be protected by a dust cap. Be sure to remove the cap before you activate the transducer or you may be surprised by a pop when returning gas blows it off. Connect the vent tube to the return flow indicator or place the end of the tube in a clear, water-filled bottle.

Activate

1. Turn the mode valve to the Triple-Tube position.
2. Turn the flow control valve to the On position.
3. If necessary, adjust the flow rate with the flow rate valve. The reading on the pressure gauge should increase at about 1 psi per second (slightly faster than 0.05 bar per second).

Tip: Transducers with longer lengths of tubing take more time to activate and read. Increasing the flow rate will not significantly reduce this time. In fact, a faster flow rate may result in a longer wait for the reading to stabilize because additional gas must flow through the transducer.

Read

1. Wait for a return flow of gas from the vent tube. If you are using a bubble bottle, watch for bubbles.
2. Then, when you detect a return flow of gas, set the flow rate valve so that the flowmeter shows 30mm on its scale. This is equivalent to 47 cc/m or 0.1 SCFH.
3. Wait for the pressure reading to stabilize. With 500 feet of tubing, this takes about 90 seconds.
4. Tap the gauge and write down the reading.

Verify

It is a good practice to verify the reading.

1. Turn the mode valve to twin-tube mode. Then briefly turn the flow control valve to Vent. This releases pressure from both the black input tube and the clear output tube and causes a change in the reading on the pressure gauge.
2. Turn the mode valve back to the triple-tube mode. Wait for the reading to stabilize and compare it to the first reading. Repeat this process until you have repeatable readings.

Shut Down

1. Disconnect the tubing from the indicator, and replace any dust caps.
2. If this is the last reading for the day, turn the tank control valve Off, turn the flow control to Vent, and turn the regulator knob counter-clockwise to reduce the regulated pressure to zero.