WINTERS INSTRUMENTS

MECHANICAL ENGINEERING SPECIFICATION GUIDE PRESSURE AND TEMPERATURE INSTRUMENTS

www.WINTERS.ca

Manufacturers of Industrial Instrumentation

WINTERS INSTRUMENTS
MISSION STATEMENT

To provide our customers with industrial instrumentation for the measure[illegible]nd temperature. WIN[illegible] will satisfy our cu[illegible]omer's requirements with [illegible]timely d[illegible]ve[illegible] of [illegible]m[illegible]citi[illegible]y priced, quality pro[illegible]ct[illegible] nc[illegible]d e[illegible]ie[illegible]tomer service.

APPROVALS / STANDARDS

ISO 9002	ASME B40.1	CAN. DEPT. OF DEFENSE
CRN	NATO	U.S. DEPT. OF DEFENSE
UL	NACE	U.S. NAVY
ULC	NEMA	U.S. COAST GUARD
CSA	FCI	
FM	CE	
3A		

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Mechanical Engineering Specification Guide Pressure and Temperature Instruments

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(Continuous product improvements may result in specifications being changed without notice)

PRESSURE GAUGES - Dry

- ✔ High Accuracy
- ✔ Tough Applications

300 Series

Pressure gauge 4 1/2” (115 mm), 6” (150 mm), 8” (200 mm) or 10” (250 mm) dial with red and black markings. Case is black painted aluminum, with plexiglass lens. Stainless steel rotary movement. Phosphor bronze bourdon tube or 316 stainless steel with OT58 brass or 316 stainless steel socket. 1/4” or 1/2” NPT connection. Micrometer adjustable pointer. Accuracy ± 0.5% (ANSI / ASME B40.1 Grade 2A).

Pressure Gauge will be WINTERS 300 SERIES.

Common Applications: **Pressure measurement of water, steam, air, oil, (eg. boilers, pumps, compressors, engines, etc.).**

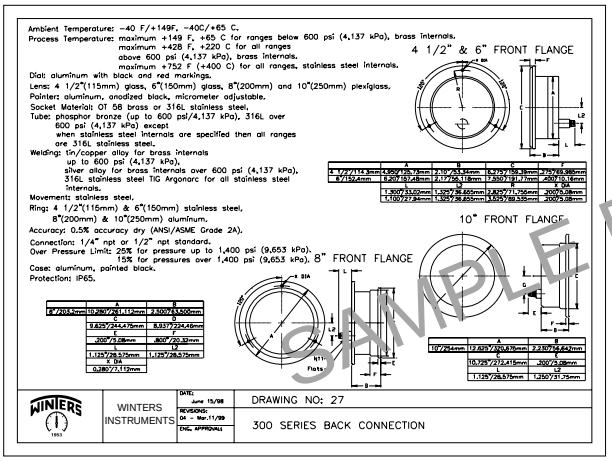
Process Series

Pressure gauge 4 1/2” (115 mm) dial with black and red markings. Casing is black, impact resistant phenolic, with a solid front and blow out back, threaded ring, plexiglass lens and integral back flange. The bourdon tube is phosphor bronze or 316 stainless steel with brass or 316 stainless steel socket, 1/4” or 1/2” NPT connection. Liquid fill option available (field fillable.) Standard micrometer adjustable pointer. Accuracy ± 0.5% of full scale range (ANSI / ASME B40.1 Grade 2A Dry). Accuracy ± 1% (ANSI / ASME, Grade 1A Liquid Filled).

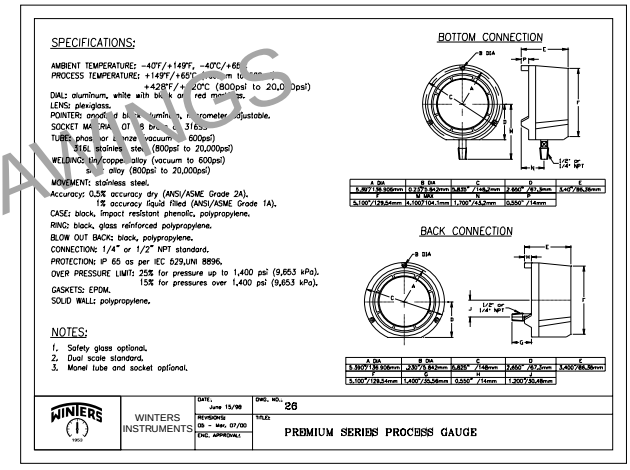
Pressure Gauge will be WINTERS PROCESS SERIES.

Common Applications: **Severe service applications including high vibration (eg. pumps, compressors, chillers, etc).**

300 Series



Process Gauge



For Technical Drawings and a full listing of pressure ranges, please visit our website.

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PRESSURE GAUGES - Dry

- ✔ High Accuracy
- ✔ Tough Applications

Ammonia Series

Pressure gauge 2 1/2” (63 mm), 4” (100 mm), 6” (150 mm), 8” (200 mm), or 10” (250 mm) dial with black and red markings. Plexiglass lens standard. Casing is stainless steel or aluminum. Bourdon tube and socket is 316L stainless steel and stainless steel movement. Aluminum, anodized black micrometer adjustable pointer (available on 4” (100 mm) and 6” (150 mm) only). 1/4” or 1/2” NPT d. Accuracy (± 0.5% - 1% ASME / ANSI) will vary depending on dial size and liquid filling.

Pressure Gauge will be WINTERS AMMONIA SERIES.

Common Applications: **Pressure measurement of any system or equipment charged with ammonia (eg. refrigeration units).**

- ✔ Good Accuracy
- ✔ General Applications

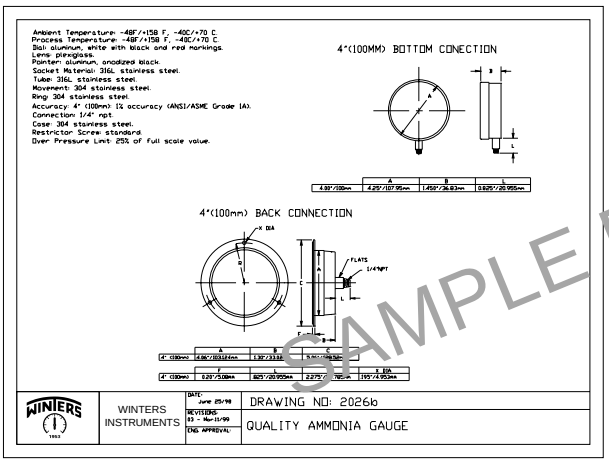
Contractor Series

Pressure gauge 4 1/2” (150 mm) size dial with white face and black and red markings. 304 stainless steel case with plexiglass lens. Brass socket with 1/4” NPT connection standard. Bronze bourdon tube, with brass movement. Aluminum, anodized black slotted adjustable pointer. Accuracy ± 1% (ANSI / ASME B40.1 Grade 1A).

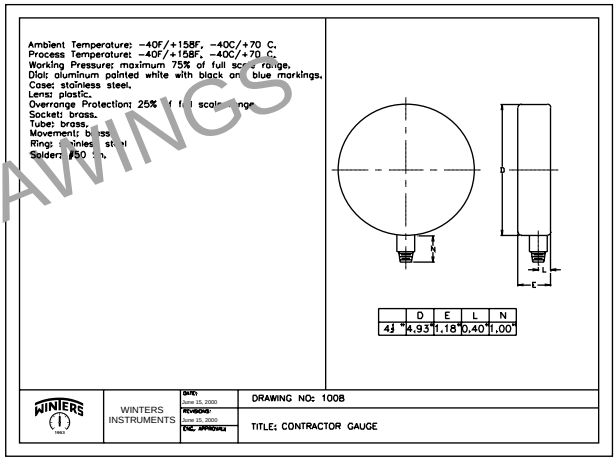
Pressure Gauge will be WINTERS CONTRACTOR SERIES.

Common Applications: **Pressure measurement of water, steam air, oil, etc. (eg. water lines, pumps, control valves).**

Ammonia Series



Contractor Series



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PRESSURE GAUGES - Dry

- ✔ Good Accuracy
- ✔ General Applications

100 Series

Pressure gauge 3 1/2” (90 mm), 4” (100 mm), 4 1/2” (115 mm) and 6” (150 mm), white aluminum dial. Case will be black painted steel, 4” (63 mm) and 6” (150 mm) bottom connection. Aluminum, painted black case for 3 1/2” (90 mm) & 4 1/2” (115 mm). Lens is glass for 3 1/2” bottom connection, and plexiglass for all others. Bronze or brass bourdon tube with brass movement. Aluminum, anodized black, adjustable pointer. Brass socket with a 1/4” NPT connection standard. Accuracy ± 1% (ANSI / ASME Grade 1A).

Pressure Gauge will be WINTERS 100 SERIES.

Common Applications: **Pressure measurement of water, steam, air, oil, (eg. water lines, pipelines, pumps, control valves etc.).**

PRESSURE GAUGES - Liquid Filled

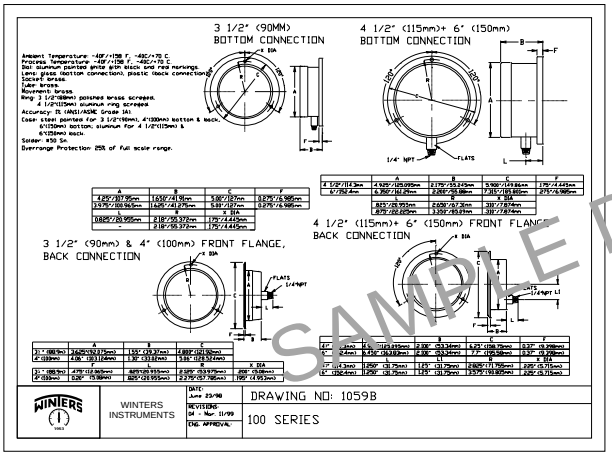
Liquid Filled Quality Series

Pressure gauge 2 1/2 “ (63 mm) or 4” (100 mm) size dial with white face and black and red markings. Glycerin filled. Case is 304 stainless steel. Plexiglass lens standard. Socket OT 58 brass or 316 stainless steel, with a 1/4” or 1/2” NPT standard connection. Brass (or stainless steel) C-shaped bourdon tube with OT brass movement. Aluminum, anodized black pointer. Accuracy ± 1.6% (ANSI / ASME B40.1 Grade 1A).

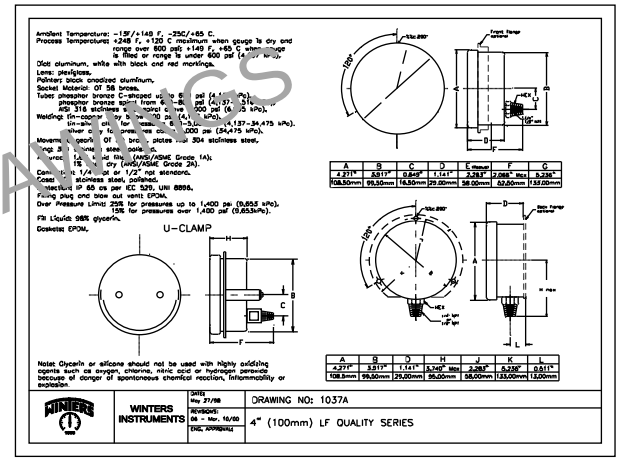
Pressure Gauge will be WINTERS LIQUID FILLED QUALITY SERIES.

Common Applications: **Instrument used for many high vibration industrial applications (eg. pumps, compressors, pipelines, motors, winches, etc).**

100 Series



Liquid Filled Quality Series



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PRESSURE TRANSMITTERS

- ✔ **Excellent Accuracy**
- ✔ **Tough Application**

PTQ Series

Pressure transmitter housing is stainless steel, carbon steel or brass. Accuracy will depend on pressure range and housing specifications (± 0.4% - ± 0.5%). Burst Pressure 1.5X - 5X depending on pressure range. Compensated Temperature Performance ± 0.5% full scale output 100°F (37.7°C) for zero and span respectively from 30°F - 180°F (30°C - 82°C). Electrical Output 4-20 mA, 2 wire or (0.5 - 4.5 Vdc - 3 wire). 1/4" NPT male pressure connection.

Pressure Transmitter will be WINTERS PTQ SERIES.

Common Applications: **Pressure measurement utilized in water measurement, steam sterilizers, air conditioning, refrigeration, pumps, compressors, etc.**

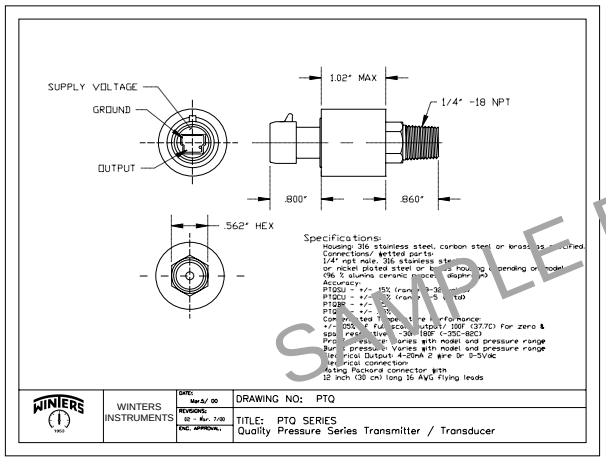
PT Series

Pressure transmitter housing is 316 stainless steel. Accuracy ±0.5% full scale. Compensated Temperature Performance ± 1.5% full scale output / 100°F (37.7°C) for zero and span respectively from -40°F / 180°F (-40°C / 142°C). Electrical output 4-20 mA, 2 wire , and excitation voltage 8 - 38 Vdc. Electrical connection is 24" wire pigtail DIN 43650 w / mate Bendix 6 - Pin. Pressure connection 1/4" NPT male or 1/4" NPT female.

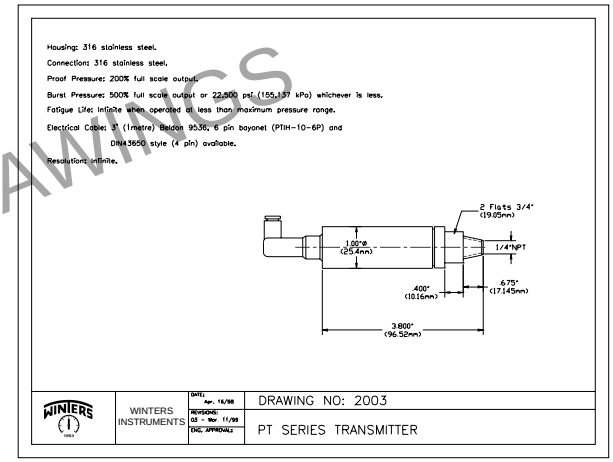
Pressure Transmitter will be WINTERS PT SERIES.

Common Applications: **Pressure measurement utilized in tanks, pumps, compressors, automation equipment, boilers, chillers, etc.**

PTQ Series Transmitter



PT Series Transmitter



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THERMOMETERS

- Fully Adjustable
- Good Accuracy

Bi-Metal Series

Bi-Metal Thermometer is 3” (75 mm), 4” (100 mm), or 5” (125 mm) aluminum dial with black markings. Case is 304 stainless steel, with standard glass, (hermetically) sealed lens (liquid fill option available with certain temperature ranges below 250°F (120°C). Brass, black painted pointer. External recalibrator screw. Operating temperature range of material being measured will fall approximately in the middle of the scale. Stem shall be 2.5”, 4”, 6”, 9”, or 12” fully adjustable. Connection 1/2” NPT standard. Accuracy ± 1% of full scale.

Thermometer will be WINTERS BI-METAL THERMOMETER SERIES.

Common Applications: **Temperature measurement in various industrial applications (eg. heating, cooling, pipelines, pumps, tanks etc).**

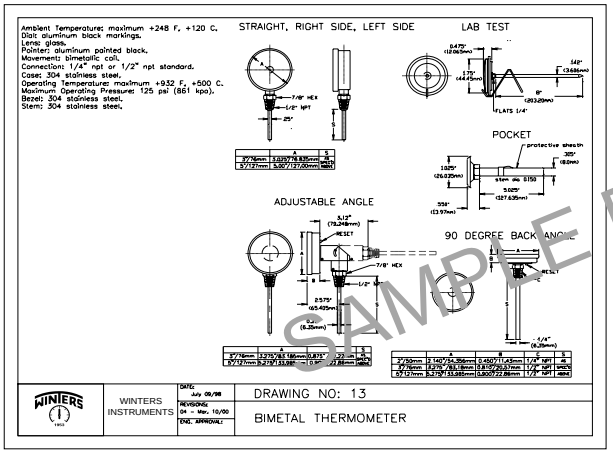
9IT Series

Thermometer is 9” (228 mm) impact resistant case Valox (Aluminum optional) with black markings. Glass lens standard. Tube filled with green organic liquid. Operating temperature range of material being measured will fall approximately in the middle of the scale. Thermowells will have 3/4” NPT. Thermometers for measuring air temperature should have duct flange instead of separable thermowell. Accuracy rating ± 1%. Dual Scale F/C standard, single scale optional.

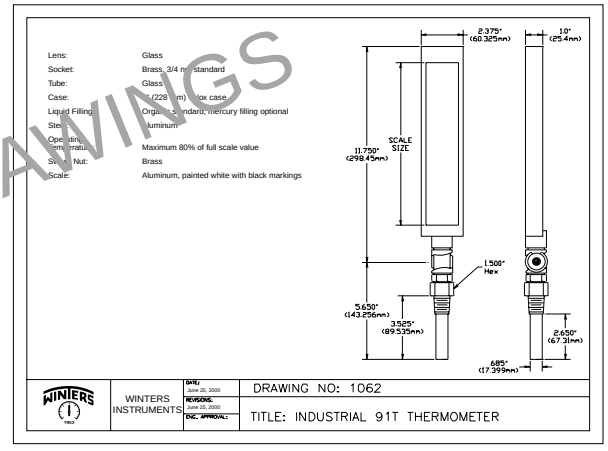
Thermometer will be WINTERS 9IT SERIES.

Common Applications: **Temperature measurement in various industrial applications (eg: heating / cooling, pipelines, pumps, condensers, steam turbines, etc).**

Bi-Metal Series



9IT Series



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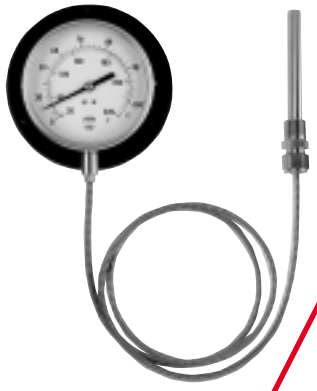
THERMOMETERS

- ✔ Good Accuracy
- ✔ Remote or Direct

Remote Reading Series



Thermometer is gas or vapour filled. Dial sizes available include 2 1/2" (63 mm) {Gas only}, 3 1/2" (90 mm), 4" (100 mm), 4 1/2" (115 mm), 6" (150 mm) or 8" (200 mm) with black and red markings. Casing is steel, aluminum, phenolic or stainless steel. Lens is polycarbonate. Aluminum, anodized black pointer. Internals shall be phosphor bronze tube, brass movement for gas filled or brass tube for vapour filled. Connection shall be brass or 316 stainless steel. Capillary will be brass or AISI 316 stainless steel with brass or AISI 316 stainless steel 1/2" OD x 6" standard bulb. Operating temperature is 75% of full scale value. Accuracy ± 0.5% full scale for gas filled or ± 3% full scale for vapour filled.

Thermometer will be WINTERS REMOTE READING THERMOMETER SERIES.

Common Applications: **Industrial applications requiring a remote reading indication (eg. boilers, pipelines, tanks, refrigeration unit, etc.**

5AS Series

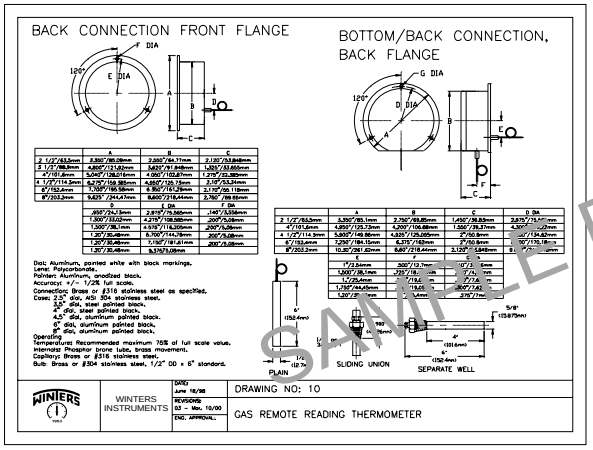
Thermometer is 5" (127 mm) aluminum scale with black markings. Black polypropylene (aluminum available*) case with glass lens. Glass, kerosene, tinted red filled tube (cushioned). Straight or 90° angle (back connection). Brass separable thermowell 1/2" npt with swivel nut standard. Accuracy ± 2% of full scale. Operating temperature range of material being measured will fall approximately in the middle of the scale.

Thermometer will be WINTERS 5AS SERIES.

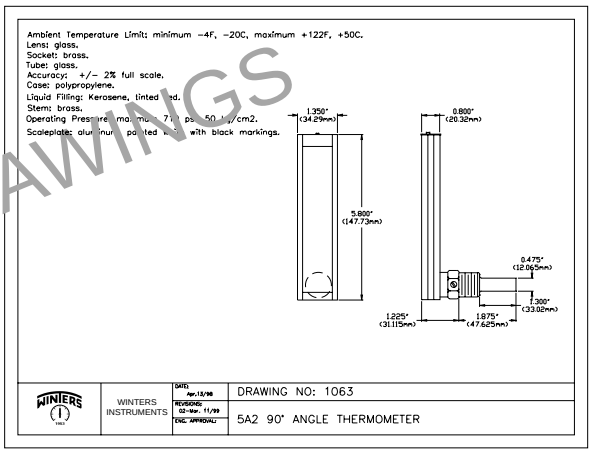
Common Applications: **Industrial applications requiring a direct temperature reading (eg. pipelines, air ducts, storage tanks, pumps, chillers, etc).**

* Winters HVAC Thermometer (GC Series) available in gold aluminum casing 4 1/2" (115 mm) or 6" (150 mm)

Remote Reading



5AS Series



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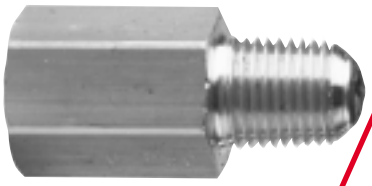
ACCESSORIES

- Durable
- Versatile

Snubbers

Recommended for use with pressure instruments to ensure protection from sudden surges, fluctuating pressures / pulsation and or sudden shock.



Brass Snubber

Snubber is housed with brass material. Snubbing element is sintered, porous type 316 stainless steel. Retainer is 300 series stainless steel. 1/4" or 1/2" NPT standard connection. Operating Temperature is -65°F -650°F (-53°C / 343°C). Operating Pressure is maximum 10,000 psi (68,950 kPa). Burst Pressure is 30,000 psi (206,850 kPa).

Snubber will be WINTERS ACCESSORIES "A" SERIES - BRASS SNUBBER.

Stainless Steel Snubber

Snubber is housed with 300 series stainless steel. Snubbing element will be sintered, porous type 316 stainless steel. Retainer is 300 series stainless steel. 1/4" or 1/2" NPT standard connection. Operating Temperature is 20°F / 1500°F (-195°C / 815°C). Operating Pressure is maximum 20,000 psi (137,900 kPa). Burst Pressure is 60,000 psi (413,700 kPa).

Snubber will be WINTERS ACCESSORIES "A" SERIES - STAINLESS STEEL SNUBBER.

Needle Valve

Recommended to reduce / restrict non-corrosive applications up to 400 psi (2758 kPa). The valve can also be used to throttle pulsation.

Needle valve is housed with #59-1 forged brass. Handle is ABS plastic, dyed red. Rubber O ring with a #59-1 brass shaft and nut. 1/4" NPT female connection standard. Operating Temperature 10°F / 212°F (-23°C / 100°C). Maximum Operating Pressure is 400 psi (2758 kPa).

Needle Valve will be WINTERS ACCESSORIES "A" SERIES NEEDLE VALVE.

Mini Ball Valve

Recommended as an isolation valve for pressure gauges or transmitters.

Mini Ball Valve is housed with forged brass, the ball from stainless steel. The gaskets are made from Teflon. The handle will be steel plated, plastic covered. 1/4" npt female and 1/4" NPT male standard connection. Operating Temperature -10°F / 212°F (-23°C / 100°C). Maximum Operating Pressure is 400 psi (2758 kPa).

Mini Ball Valve will be WINTERS ACCESSORIES "A" SERIES MINI BALL VALVE.

Syphon

Recommended to reduce process media temperatures prior to entering pressure gauge or transmitter (eg. steam).

Syphon will be steel coil welded or seamless 304 stainless steel. Coil shall be 180°. Connection shall be 1/4" NPT or 1/2" NPT male. Maximum Operating Pressure varies (see website for variations).

Syphon will be WINTERS ACCESSORIES "A" SERIES SYPHON.

Winters Instruments also offers a full line of Diaphragm Seals, for more information, please visit our website.

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THERMOWELLS

- ✔ Durable
- ✔ Versatile

Bi-Metal Thermometer Thermowells

Bi-Metal thermometer thermowell is brass or 304/ 316 stainless steel, (Monel, Inconel, Hastelloy C, Titanium) available. Thermowell construction consists of a step form .260" (6.604 mm) bore standard. 1/2" or 1/4" NPT thermometer connection x 3/4", 1/2" or 1" NPT process connection. Thermometer stem length is 2.5" (63 mm), 4" (100 mm), 6" (150 mm), 9" (228.6 mm) {available with 2.5" lag extension}.

Thermowell will be WINTERS BI-METAL THERMOMETER THERMOWELL "B" SERIES.

Other Available Thermowell options: BSP threads, Flanged, Tapered

Common Applications: **Applications requiring sealed systems, tanks, pressure lines, etc.**

9IT Industrial Thermometer Thermowells

Industrial Thermowell is brass or 304/316 stainless steel construction with 7/16" tapered bore with step form standard. Thermowell **length is 4 1/4" (107.95 mm) with 2 1/2" (63 mm) Insertion length, 3/4" NPT process connection.**

Thermowell will be WINTERS THERMOWELL "W" SERIES.

Industrial Thermowell is brass, 304 or 316 stainless steel construction with 7/16" tapered bore with step form standard. Thermowell **length is 4 1/4" (107.95 mm) with 1 3/4" (44.45 mm) Insertion length, 1/2" or 3/4" NPT process connection. 1" (25.4 mm) lag extension available.**

Thermowell will be WINTERS THERMOWELL "W" SERIES.

Industrial Thermowell is brass, 304 or 316 stainless steel construction with 7/16" tapered bore with step form standard. **Thermowell length is 6 3/4" (171.45 mm) with 5" (127 mm) Insertion length, 3/4" NPT process connection.**

Thermowell will be WINTERS THERMOWELL "W" SERIES.

Industrial Thermowell is brass, 304 or 316 stainless steel construction with 7/16" tapered bore with step form standard. **Thermowell length is 6 3/4" (171.45 mm) with 2.5" (63 mm) Insertion length, 3/4" NPT process connection.**

Thermowell will be WINTERS THERMOWELLS "W" SERIES.

- **All 9IT Thermowells have a 1 1/4" NF thermometer connection**

Other Thermowell Options Available: **Longer lengths, Caps and Chains Other thread sizes**

Other materials available: Monel, Inconel, Hastelloy C & Titanium

Other Thermowells Available

- Glass Thermometer test wells
- Flanged Thermowells
- Socket-Weld Thermowells
- Tapered and straight wells for 1/4" (6.35 mm) to 3/8" (9.525 mm) bore diameters

WINTERS
1953

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SELECTING A PRESSURE GAUGE

Selecting the appropriate Pressure Gauge for the correct application can sometimes be a challenge depending on the application. Following the guidelines below can help ensure the gauge chosen is suitable for the application.

Bourdon Tube Pressure Gauge Operating Principal

Winters utilizes bourdon or "C" or spiral shaped pressure tubes which are utilized throughout all industries. The bourdon tube itself in thinly waved into a semicircle (C-shaped) or spiral. As pressure is applied through the socket, the bourdon tube straightens itself causing the precision movement to shift upward or downward for vacuum measurements. The movement then transforms the motion of the bourdon tube pointer which indicates the inputted pressure.

The bourdon system is analog based and does not require any additional power sources. Winters' pressure gauges measure full vacuum, compound and pressure ranges to 20,000+ psi and suitable for all clean and non-clogging liquids and gaseous media.

Environment & Application

As the bourdon tube is in direct contact with the medium being measured, the medium characteristics must be considered. If the application is corrosive the medium may solidify at various temperatures or it may contain solids that will leave deposits inside the bourdon tube. For gases or liquids that will not solidify under normal conditions or leave deposits, a bourdon gauge is acceptable, otherwise a diaphragm seal should be used. Choosing the material of the pressure gauge is important at this stage, again if the environment is corrosive stainless steel internals and casing should be chosen over brass. Brass is more suitable for general applications. Moisture and weather conditions must also be considered as their effect may be harmful to a gauge's performance.

Temperature

Normal temperature ranges are -40°C to 70°C (-40°F to 158°F) for dry gauges and -25°C to 65°C (-13°F to 149°F) for glycerin filled.

Gauge Options

Restrictor screws, snubbers and liquid filling are excellent options for reducing the effects of vibration and pulsation and increasing the service life of pressure gauges. In situations where temperature is extreme, utilizing a syphon or remote monitoring the pressure gauge with a capillary and diaphragm seal are some alternatives.

Pressure Range

Select a pressure range with full scale pressure range of approximately twice the normal operating pressure. The maximum operating pressure should not exceed 75% of the full scale range. Failure to select a gauge with in these criteria may ultimately result in fatigue of the bourdon tube.

Connections

Bottom and back (centre and lower) connections are available for various WINTERS gauges. The standard thread is NPT, however other options are available such as BSP, SAE and many other special fittings.

Accuracy

The degree of accuracy required for the specification should be determined to ensure the proper gauge is used. WINTERS offers pressure gauges with accuracy ± 0.10% to ± 3%.

For more information on Choosing a Pressure Gauge, please contact Winters Instruments.

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SELECTING A THERMOMETER

Choosing the appropriate Thermometer for a specification is an important task. Improper application may be detrimental to the thermometer, causing failure and possible personal injury or property damage. Using the guidelines below will assist you in choosing the correct thermometer for the appropriate application.

Environment & Application

Knowing the environment and media, that the thermometer will be subjected to is essential. This information will determine what type of thermometer is required; Bi-Metal, Remote Reading, or Glass, and if thermowells are necessary.

Bi-metal Thermometers

Bi-Metal thermometers are a direct sensing instrument. They are hermetically sealed and therefore, completely waterproof. For accurate readings, the stem should be immersed at least 2.5" (63 mm). All Bi-Metal thermometers are made of stainless steel construction to protect against corrosive conditions.

Remote Reading

Remote Reading thermometers are instruments used to measure temperature from a remote source. By means of a capillary tube with a sensing probe at one end and an indicating dial on the other, temperatures can be determined from a source that is up to 30' (100 m) away.

Remote reading thermometers are filled with either gas or vapour depending on the specification.

Gas filled thermometers are filled under pressure with inert gas for positive movement, accuracy and sensitivity. The accuracy delivered by this system is 0.5% of full scale value when temperature measured is in the mid scale of the dial.

Vapour filled thermometers have non-linear scales (non-equal graduations across the entire scale). To ensure exceptionally close readings, the operating temperature should fall in the upper half of the thermometers scale. The accuracy delivered by this system is 3% of the full scale.

Glass Thermometers

Glass thermometers have a glass tube filled with liquid which expands or contracts according to reflections in the temperatures. Glass thermometers can be filled with kerosene, tinted red or organic fluid.

Thermowells

Thermowells must be used on any application where the stem of the thermometer may be exposed to pressure, corrosive fluids, or high velocity. The use of a thermowell permits the instrument to interchange for calibration of the thermometer without disturbing or closing down the process. Thermowells are available in brass and stainless steel with standard thread connections. Other materials and flange options are available upon request.

For more information on Choosing a Thermometer, please contact Winters Instruments.

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SELECTING A PRESSURE TRANSMITTER

Selecting the correct Pressure Transmitter for the appropriate application can be a complex task. Choosing the incorrect transmitter can make the operation of the equipment ineffective and possibly hazardous. Following the guidelines listed below can assist you in choosing the appropriate pressure transmitter for your specific application.

Sensor

There are a wide variety of sensor technologies to choose from including, sputtered, CVD, bonded strain gauge, ceramic capacitance, and piezo-electric. Each has their own performance advantages.

Output

There are various electrical connections involving transmitters. The most common output signals are: milliamp (4-20mA), Volts (0-5VDC, 1-5VDC, 0.5-4.5VDC, 0-10VDC), and millivolts per volt (100, 200, 300mV/V).

Connection

Some common types of connections are: 1/4" or 1/2" NPT thread, 1/4" SAE, Sanitary, Flush, among many others. The size of the connection should also be considered.

Accuracy

Accuracy can be expressed along several different parameters, but the most common is as a percent of value of full-scale output (FSO). Accuracy can range from 1% FSO down to 0.01% depending on your requirements. When needed, external zero and span adjustment controls can be added to the transmitter, allowing for fine tuning of the unit.

Electrical Connector

There are various electrical connectors. Some common connector types and brands you will encounter including: flying wire (straight wire without any connector attached), DIN 43650, Mini-DIN, Turck, Packard, Lumberg, Submersible, Bendix PTIH-8-4P, 1/2" conduit and terminal block.

Environment

It may be important to consider whether or not a corrosive agent will come into contact with the transmitter. If this is the case, it will be necessary to ensure that the can (housing) of the transmitter is made with a suitable material such as stainless steel.

Temperature

Temperature is another variable that effects the overall performance of a transmitter / transducer, particularly its accuracy. Temperature compensation circuitry is added to correct for the inherent temperature induced error of a transducer. If needed, the unit can be compensated to allow it to operate at elevated temperatures.

For more information on Choosing a Pressure Transmitter, please contact Winters Instruments.

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PRESSURE and TEMPERATURE TERMINOLOGY and DEFINITIONS

Absolute Pressure
Pressure measured relative to ambient pressure.

Accuracy
The conformity of an indication to it's true value. Accuracy is a percentage of the full value.

Ambient Conditions
The surrounding environmental conditions of the medium surrounding the instrument.

Burst Pressure
The maximum pressure that can be applied to the bourdon tube without rupturing the bourdon tube or causing leakage in a transmitter.

Housing / Can
The housing which covers the electronic components of a transducer / transmitter. The majority will have 316 stainless steel can / housing, although other materials such as brass and carbon steel are also available.

Excitation
The external electrical voltage and / or current applied to a transducer / transmitter for it's proper operation.

Life Cycle
The number of times an instrument can provide a pressure measurement within it's specified accuracy tolerance.

Gauge Pressure
Pressure measured relative to ambient atmospheric pressure.

Transmitter
A device that sends out a signal in milliamps (mA) and a transducer sends a signal in volts (V) or, millivolt per volt (mV / V).

Process Connection
The connection used to attach the transmitter to the application in the same manner as a pressure gauge or thermometer.

Proof Pressure
The maximum pressure that can be applied to the transmitter without a permanent change in the performance of the unit.

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