Autonics

Stainless Steel Pressure Gauge
SS-3020,30,50,70 SERIES

I N S T R U C T I O N M A N U A L

Thank you for choosing our Autonics product.
Please read the following safety considerations before use.

▣ Safety Considerations

※Please observe all safety considerations for safe and proper product operation to avoid hazards.
※⚠ symbol represents caution due to special circumstances in which hazards may occur.

⚠ **Warning** Failure to follow these instructions may result in serious injury or death.
⚠ **Caution** Failure to follow these instructions may result in personal injury or product damage.

⚠ Warning

1. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.)**
   Failure to follow this instruction may result in personal injury, fire or economic loss.
2. **Do not use the unit in the place where high humidity, direct sunlight, radiant heat, vibration, impact, or salinity may be present.**
   Failure to follow this instruction may result in explosion or fire.
3. **Use maximum pressure within 75% of the maximum scale for static pressure and within 60% for coaxial pressure.**
4. **Install and use a extra protective device in the location with rapid changes, vibration or pulsation of the pressure.**
5. **When installing pressure gauge, always install the cork valve together. Slowly open or close it to avoid sudden changes in pressure.**
6. **For pressure measurement of flammable objects such as oxygen, acetylene, LPG, etc., use the pressure gauge with 'USE NO OIL' mark.**
7. **Use a special tested pressure gauge for pressure measurement of toxic or freon gas.**
8. **When measuring high temperature or corrosive liquid/gas, select pressure gauge after contact the head office.**

⚠ Caution

1. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in fire or product damage.
2. **Keep metal chip, dust, and wire residue from flowing into the unit.**
   Failure to follow this instruction may result in fire or product damage.
3. **Check the polarity of the contact before wiring the unit.**
   Failure to follow this instruction may result in explosion or fire.
4. **This product is designed to detect the pressure of noncorrosive fluid. Do not use for corrosive fluid.**
   Failure to follow this instruction may result in product damage.
5. **Since the pressure gauge is a precision instrument, do not make excessive impact when transporting, installing or using it.**
6. **Install it in a clean, ambient temperature range of -7 to 60℃, and where there is no danger of natural disasters such as lightning.**
7. **Calibrate at least once a year for precision maintenance and safety management.**
8. **Install a dedicated instrument for special applications such as food, hygiene.**

※The above specifications are subject to change and some models may be discontinued without notice.
※Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).

▣ Modes of Pressure Gauge Failure (Reference. ANSI B 40.1)

1. Fatigue Failure
   Fatigue failure caused by pressure-induced stress generally occurs from the inside to the outside along a highly stressed edge radius of a Bourbon tube, appearing as a small crack that propagates along the edge radius. Such failures are usually more critical with compressed gas media than with liquid media. Fatigue cracks usually release the medium slowly so case pressure buildup can be averted by providing pressure relief openings in the gauge case. However, in high pressure elastic elements where the yield strength approaches the ultimate strength of the element material, fatigue failure may resemble explosive failure. A snubber (restrictor) placed in the gauge pressure inlet will reduce pressure surges and fluid flow from the partially open elastic element.
2. Overpressure Failure
   Overpressure failure is caused by the application of internal pressure greater than the rated limits of the elastic element and can occur when a low pressure gauge is installed in a high pressure port or system. The effects of overpressure failure, usually more critical in compressed gas systems than in liquid-filled systems, are unpredictable and may cause parts to be propelled in any direction. Cases with pressure relief openings will not always retain expelled parts. Placing a snubber (restrictor) in the pressure gauge inlet will not reduce the immediate effect of failure, but will help control flow of escaping fluid following rupture and reduce the potential of secondary effects. It is generally accepted that solid front cases with pressure relief back will reduce the possibility of parts being projected forward in the event of failure. The window alone will not provide adequate protection against internal case pressure buildup, and can be the most hazardous component. Short duration pressure impulses (pressure spikes) may occur in hydraulic or pneumatic systems, especially when valves open or close. The magnitude of the spikes may be many times the normal operating pressure, and may not be indicated by the gauge. The result could be immediate failure, or a large upscale error. A snubber (restrictor) may reduce the magnitude of the pressure transmitted to the elastic element. Use of a pressure limiter valve can isolate the pressure gauge from pressures greater than the rated limits of the elastic element, protecting the gauge from overpressure failure. A pressure limiter valve is a device that is designed to close on rising pressure, limiting the pressure at the outlet of the device. The closing pressure is adjustable and should be set to close above the full scale range of the pressure gauge and below the rated limit of the elastic element.
3. Corrosion Failure
   Corrosion failure occurs when the elastic element has been weakened through attack by corrosive chemicals present in either the media inside or the environment outside it. Failure may occur as pinhole leakage through the element walls or early fatigue failure due to stress cracking brought about by chemical deterioration or embrittlement of the material. A diaphragm (chemical) seal should be considered for use with pressure media that may have a corrosive effect on the elastic element.
4. Explosive Failure
   Explosive failure is caused by the release of explosive energy generated by a chemical reaction such as can result when adiabatic compression of oxygen occurs in the presence of hydrocarbons. It is generally accepted that there is no known means of predicting the magnitude or effects of this type of failure. For this mode of failure, a solidwall or portion between the elastic element and the window will not necessarily prevent parts being projected forward.
5. Vibration Failure
   The most common mode of vibration failure is wear of mechanical components because of high cyclic loading caused by vibration. This is characterized by gradual loss of accuracy, and, ultimately failure of the pointer to indicate any pressure change.
6. Vibration-Induced Fatigue Failure
   Vibration may in some instances result in high loading of various parts of the pressure element assembly. This loading could cause cracks in the element itself, or in joints. Case pressure buildup may be slow, but it is possible that a large hole may suddenly develop, with a high rate of case pressure rise, which could result in a failure similar to an explosive failure.

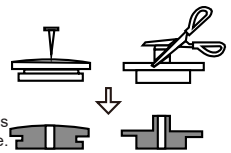
▣ Model

Model number	Model name
SS-3021~4	Pressure gauges
SS-3025~8	Pressure gauges with contact
SS-3031~6	Diaphragm seal type pressure gauges
SS-3051S~4S	Low-pressure gauges
SS-3071~4	Liquid-filled pressure gauges

* Refer to catalog or homepage to check specification per model or special model, and contact us for inquiries.

▣ CAP CUT

After installation, add a small hole or cut the upper side part to make a outlet.
If the output is not created, the pressure gauge may cause malfunction When internal pressure is generated inside the pressure gauge. (Extra protection is needed when using it in outdoor.)



▣ Safety Recommendations (Reference. ANSI B 40.1)

1. Operating pressure
   Do not operate continuously at a pressure over 75% of the maximum value because Bourdon tube is subjected to high internal stresses. In particular, operating pressure gauge in excess of 1,000 psi (approx. 6.9 MPa) occurs early fatigue failure and rupture.
2. Material
   Check if the material of the working part is suitable for the pressure medium. Pressure gauges are susceptible to stress corrosion or chemical reaction because it is mostly made by copper alloy (brass, bronze). The wall of the Bourdon tube is relatively thin and decreasing wall thickness directly affects the accuracy. It is not always good way to use same material to tank or related pipe and a Bourdon tube. Materials with an 0.001 in (approximately 0.025 mm) annual corrosion rate may be not suitable for Bourdon tube with a wall thickness of 0.008 in (approx. 0.2 mm) but pipe. It is essential to select the appropriate Bourdon tube according to purpose.
3. The periodic pressure fluctuation and vibration
   Continuous and rapid movement of the pointer bring the excessive wear of the internal mechanical structure, causes the overall error for the indicated pressure and fatigue failure of the Bourdon tube.
   If the movement of the pointer is caused by mechanical vibration, pressure gauges must be isolated and installed in a vibration-free location and connected with flexible tubes. If it is due to pressure pulses, suitable dampers must be used between the pressure medium and the pressure gauge.
4. Metal fatigue
   Using Bourdon tube for a long time also causes breaks down and pressurized media leaks as like spring. The failure occurs earlier when the greater the number of pressure cycles and the higher the level of pressure cycles are applied.
   The discharge of pressurized media shall be localized or directed in a safe manner because the failure by fatigue can be explosive and dangerous.
5. Frequency of accuracy test
   If the pressure measurement is important, the degradation of overall accuracy and the failure of the pressure gauge can result in damage to life or property, it is needed to conduct accuracy test and whether normal operating conditions regularly.
6. Using oxygen
   A pressure gauge used to measure the pressure of the oxygen must be free from contamination on the part where the pressure is passed.
   ANSI B40.1 defines various level of cleanliness. To prevent contamination of the pressure gauge, it is essential to keep clean not only for the pressure gauge, but also connected parts (pressure stabilizer, cylinder etc). The filter in the instrument should be cleaned or replaced by inspecting regularly.
   A sudden influx of high-pressure gases can instantly raise the temperature, which can be ignited by contaminations with the presence of oxygen and cause violent explosion.
   When a high pressure gas rapidly flows instantaneously and , is superimposed on the contaminants in the presence of oxygen can lead to violent explosion. Therefore, when opening the oxygen supply tank valve, open it very slowly.
   To do this, open the tank valve momentarily and then close it gently before mount pressure stabilizer. Do not lock too tightly at this time.
   This not only blows up dust from the valve, but also creates conditions that allow the valve to open slowly.
   When conducting oxygen tank bleeding before mounting pressure stabilizer, be careful not to point the opening of the valve towards the exposed flame or operator.
   When opening the oxygen tank valve, the operator shall not stand at the front or rear of the pressure gauge, this position ensures that particles protruding from the pressure gauge do not face the operator even if an explosion due to equipment contamination occurs. And it must wear protective equipment for eyes and face.
7. Using hydrogen
   A hydrogen embrittlement occurs when steel Bourdon tube which contains 400 stainless steel is subjected to stress.
   Use special material to Bourdon tube when measuring gas which contains hydrogen (natural gas, sour oil).
8. The exhaust of the case
   Keep pressure ejection devices on case (the pressure connection around the separation distance, the rubber ring, the rear outlet of the pressure gauge, etc.) not to be blocked. Because there is a possibility that pressure medium could flow into the case.
   When this happens, the pressure medium shall be vented from the case to prevent the accumulation of pressure sufficient to rupture the case or the front glass.
   However, if there is a violent explosion, then exhausting does not prevent to rupture the case.
9. Liquid-filled pressure gauge
   Pressure gauge used in the place of severe vibration or pressure pulses present may improve performance by filling the case with the viscous fluid. And it is needed to be sealed to prevent liquid escaping. However, there is a need for some way of exhausting.
   In some cases, the exhaust outlet may be sealed to prevent loss of liquid during transport, but it must be opened after the pressure gauge is installed. Installation instructions must be followed for proper exhaust of the pressure gauge. The most widely used filling solution is a mixture of glycerin and water. Glycerin will cause an explosion, combined with strong oxidizer (chlorine, nitric acid, hydrogen peroxide, etc.) may result in loss of life or damage to property. If the pressure gauge is used for that purpose, it shall not use glycerin filled pressure gauge. Contact the manufacturer to select suitable medium.
10. Do not turn forcedly with holding the body, use specified tool (spanner).

- Incorrect installation-

- Correct installation-

※ Follow above instructions. Otherwise, It may cause unexpected accidents.

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