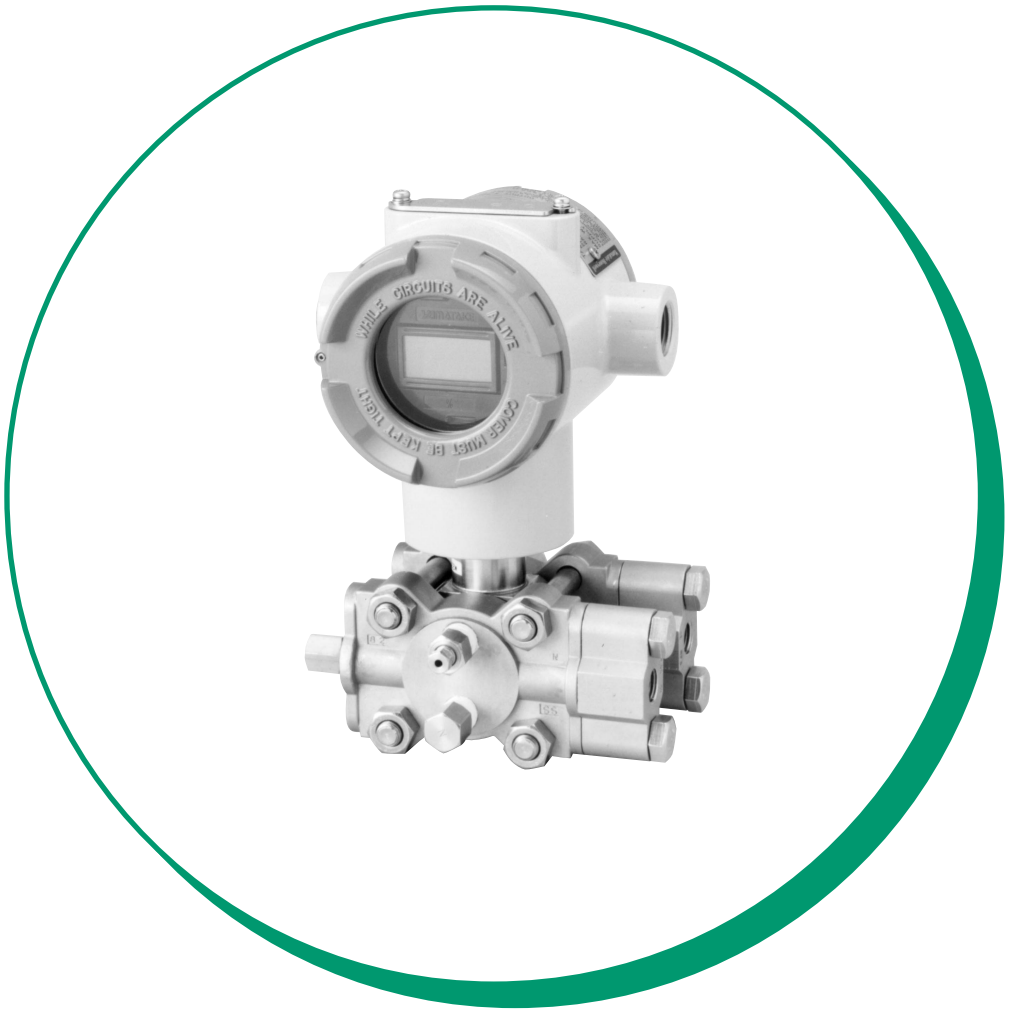
YAMATAKE

ST3000 Smart Transmitter Series900 Electronic Differential Pressure/ Pressure Transmitter Model : STD, STG, STA, STC, STE, STR, STH and STU

User's Manual



Yamatake Corporation

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Safety

Instructions

Preface

Correct installation and periodic maintenance are essential to the safe use of your differential pressure transmitters.

Read the safety instructions provided in this manual carefully and understand them fully before starting installation, operation, and maintenance work.

Inspection

On delivery, make sure that the specifications are correct and check for any damage that may have occurred during transportation. This equipment was tested under a strict quality control program before shipment. If you find any problem in the quality specifications, please contact your Yamatake Corporation representative immediately, providing the model name and serial number.

The name plate is mounted on the top of the enclosure.

Precautions

The following symbols are used in this manual to ensure user safety.

⚠ WARNING

This symbol is used to warn of hazards where failure to observe a safety instruction may result in death or serious injury.

⚠ CAUTION

This symbol is used to warn of hazards where failure to observe a safety instruction may result in injury or physical damage.

To ensure safe operation, be sure to observe the safety instructions provided on the next page.

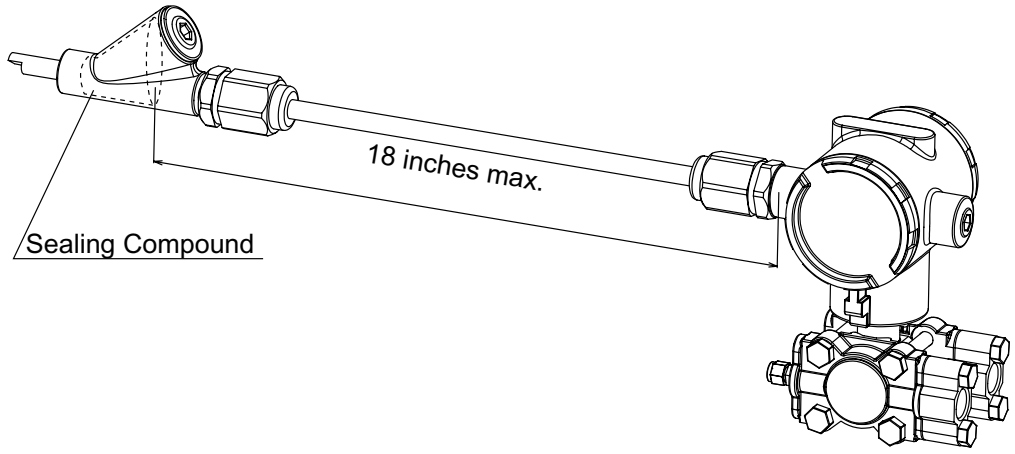
Yamatake Corporation will assume no responsibility, or offer any guarantee for any failure resulting from violation of these safety instructions.

Explosion protected Models

FM Explosionproof/Dust -ignitionproof Apparatus (in accordance with NEC)

⚠ CAUTION

- Install the apparatus only in areas for which the apparatus has been approved.
- Seal each conduit entering the apparatus enclosure within 18 in.(457mm) from the enclosure.
- Do not open the apparatus enclosure when an explosive atmosphere is present.



1. Class I, Division 1 locations

1.1 **Wiring methods**

- **Threaded rigid metal conduit, threaded steel intermediate metal conduit, or Type MI cable with termination fittings approved for the location**, can be employed
- **Threaded joints** must be made up with at least five threads fully engaged.

1.2 **Sealing**

- **Each conduit entering the apparatus enclosure is required to be sealed within 18 in. (457 mm) from the enclosure.**
- The sealing of each conduit can be provided with **a sealing fitting approved for class I locations.**
- **Sealing compound must be approved** and must not have a melting point of less than 93 ° (200 °F).
- The minimum thickness of the sealing compound should not be less than the trade size of the conduit and, in no case, less than 5/8 in.(16 mm).
- Splices and taps cannot be made in the fittings.

2. Class I, Division 2 locations

2.1 **Wiring methods**

- **Threaded rigid metal conduit, threaded steel intermediate metal conduit, enclosed gasketed busways**, or **Type PLTC cable** in accordance with the provisions of remote-control, signaling, and power-limited circuits (see NEC, Article 725), or **Type ITC cable** in cable trays, in raceways, supported by messenger wire, or directly buried where the cable is listed for this use; **Type MI, MC, MV, or TC cable with approved termination fittings** can be employed.

2.2 **Sealing**

- Each conduit entering the apparatus enclosure is required to be sealed as shown in 1.1.2.

3. Class II, Division 1 locations

3.1 **Wiring methods**

- **Threaded rigid metal conduit, threaded steel intermediate metal conduit, or Type MI cable with termination fittings approved for the location**, can be employed.

3.2 **Sealing**

- Where **a raceway** provides communication between the apparatus enclosure and an enclosure that is not required to be dust-ignitionproof, suitable means must be provided to prevent the entrance of dust into the former enclosure through this raceway. One of the following means can be used: (1) a permanent and effective seal; (2) a horizontal raceway not less than 10 ft (3.05 m) long; or (3) a vertical raceway not less than 5 ft (1.52 m) long and extending downward from the dust-ignitionproof enclosure.
- **Seals are not required to be explosionproof.**

4. Class II, Division 2 locations

4.1 **Wiring methods**

- **Rigid metal conduit, intermediate metal conduit, electrical metallic tubing, dust-tight wireways, or Type MC or MI cable with approved termination fittings, or Type PLTC in cable trays, or Type ITC in cable trays, or Type MC or TC cable installed in ladder, ventilated trough, or ventilated channel cable trays in a single layer, with a space not less than the larger cable diameter between the two adjacent cables**, can be employed.

4.2 **Sealing**

- Sealing means must be provided as shown in 1.3.2.

5. Class III, Division 1 locations

5.1 **Wiring methods**

- **Rigid metal conduit, rigid non-metallic conduit, intermediate metal conduit, electrical metallic tubing, dust-tight wireways**, or **Type MC or MI cable with approved termination fittings**, can be employed.

5.2 **Sealing**

- Sealing means are not required.

6. Class III, Division 2 locations

6.1 **Wiring methods**

- Wiring methods must comply with 5.1.

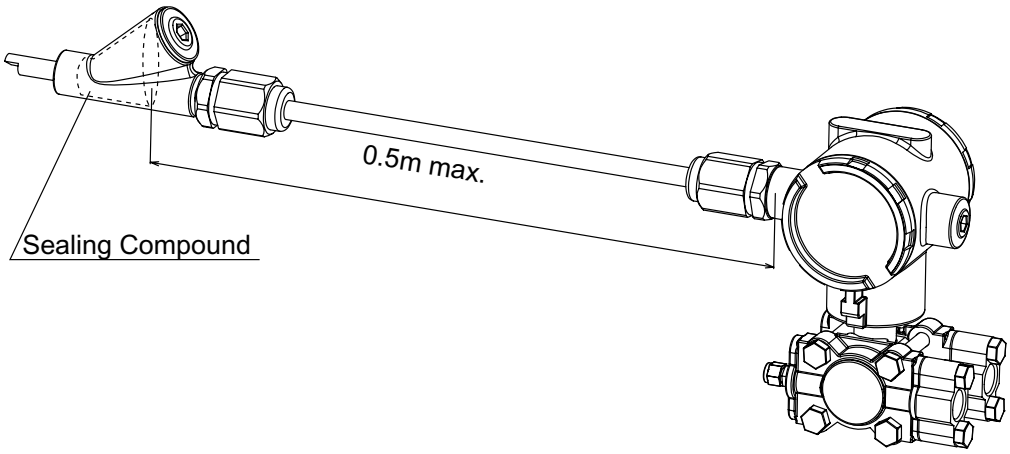
6.2 **Sealing**

- Sealing means are not required.

CSA Explosionproof / Dust-ignitionproof Apparatus (in accordance with CEC)

⚠ CAUTION

- Install the apparatus only in any hazardous (classified) locations for which the apparatus has been approved.
- Seal each conduit entering the apparatus enclosure within 500 mm of the enclosure according to the test report.
- Do not open the apparatus enclosure when an explosive atmosphere is present.



1. Class I, Division 1 locations

1.1 (a) **Threaded rigid metal conduit or** (b) **cables approved for hazardous locations with associated cable glands approved for the particular hazardous locations**, can be used.

1.2 **Threaded joints** must have **at least five full threads** fully engaged.

1.3 **Seals must be provided in conduit or cable systems** to prevent passage of gases, vapours or flames.

1.3.1 **The seal is located in each run of conduit entering the apparatus enclosure** as close as practicable to and **in no case more than 500 mm from the enclosure.**

1.3.2 The seal can be made in **a sealing fitting** approved for the location.

- **Sealing compound** must be approved for the purpose.
- The melting point of the sealing compound should not be less than 93°C (200°F).
- The minimum thickness of the sealing compound should not be less than the trade size of the conduit and in no case, less than 5/8 in. (16 mm).
- Splices and taps are not made in the fittings.

2. Class I, Division 2 locations

2.1 (a) **Threaded metal conduit**, or (b) **cables approved for hazardous locations with associated cable glands approved for the particular location**, or (c) **Type TC cable** installed in cable tray, or (d) **Type ACWU cable with associated cable glands approved for the particular location**, can be used.

2.2 **Seals must be provided in conduit or cable systems** to prevent passage of gases, vapours or flames.

2.2.1 **The seal is located** in each run of **conduit** entering **the apparatus enclosure** as close as practicable to and **in no case more than 450 mm from the enclosure**;

2.2.2 **The sealing in Class I, Division 2 locations** conforms to **1.3.2.**

3. Class II, Division 1 locations

3.1 (a) **Threaded rigid metal conduit**, or (b) **cables approved for hazardous locations with associated cable glands approved for the particular hazardous location**, can be used.

3.2 Where **a raceway** provides communication between the apparatus enclosure and an enclosure that is not required to be dust-tight, the entrance of dust into the former enclosure through this raceway must be prevented by (a) a permanent and effective seal, or (b) a horizontal section not less than 3 m long in the raceway, or (c) a vertical section of raceway not less than 1.5 m long and extending downward from the dust-tight enclosure.

4. Class II, Division 2 locations

4.1 (a) **Threaded metal conduit**, or (b) **cables approved for hazardous locations with associated cable glands approved for the particular location**, or (c) **Type TC cable** installed in cable tray, or (d) **Type ACWU cable with associated cable glands approved for the particular location**, can be used.

4.2 **Sealing of raceways** conforms to **3.2.**

5. Class III, Division 1 locations

5.1 **Wiring methods**

(a) **Threaded rigid metal conduit** or (b) **cables approved for hazardous locations with associated cable glands approved for the particular hazardous locations**, can be used.

5.2 **Sealing**

Sealing means are not required.

6. Class III, Division 2 locations

6.1 **Wiring methods**

The wiring methods in Class III, Division 2 locations conform to 5.1 except that in sections, compartments, or areas used solely for storage and containing no machinery. (In such sections, compartments, or areas, open wiring methods conforming to the rules for non-hazardous locations may be used.)

6.2 **Sealing**

Sealing means are not required.

FM /CSA Nonincendive Apparatus

⚠ CAUTION

- **The nonincendive apparatus** can be installed only in **Division 2** hazardous (classified) locations for which the apparatus has been approved.
- **Tampering and replacement of any components within the nonincendive apparatus** may impair safe use of the apparatus.

Installation requirements

1. Wiring of the nonincendive circuit is permitted using **any of the methods suitable for wiring in ordinary (unclassified) locations.**

~Note *Nonincendive apparatus is composed of all nonincendive circuits in which any arc or thermal effect produced **under normal operating conditions of the apparatus** is not capable of igniting the explosive atmospheres. This protection technique is permitted for apparatus in those **Class I, Division 2, Class II, Division 2**, and **Class III locations**. Nonincendive apparatus looks like intrinsically safe apparatus but are not, require associated apparatus (ex. shunt diode barriers).*

2. **In any raceway, junction box, or similar fitting**, the conductors of the nonincendive circuit cannot be placed with the conductors of any other system, unless (1) the conductors of the two systems are separated by a suitable mechanical partition, or (2) all of the conductors of either system are segregated by a grounded metal shield.

3. **It is recommended that separate nonincendive circuit conductors** to be in separate cables, unless (1) the conductors of each circuit are within a grounded metal shield, or (2) the conductors of each circuit have insulation with a minimum thickness of 0.01 in. (0.254mm)

4. **If a raceway (including conduit) and cable for a nonincendive circuit in Class I, Division 2 or Class II, Division 2 locations is capable of transmitting flammable atmosphere through the raceway and cable from the Division 2 location to a non-hazardous location**, it must be properly sealed at the boundary by using of non-approved sealing fittings.

ATEX Flameproof Apparatus

1. General

1.1 **The apparatus protected by the flameproof enclosure** in accordance with EN 50018 can be installed in such hazardous areas, for which the apparatus has been certified, as an explosive atmosphere containing flammable substances in the form of **gas, vapour, mist** or **dust** may be present.

~Note *The apparatus has been certified to comply with EN 50281-1-1(dust ignition protection).*

1.2 **The apparatus enclosure must be kept closed in hazardous areas when the apparatus is energized** because the internal circuit of the apparatus is capable of igniting in the explosive atmosphere. (Never connect any hand-held communicator to the apparatus terminals by opening the cover, except while no explosive atmosphere is present.)

1.3 It is required to connect **the external earthing terminal of the apparatus to the equipotential bonding system** which includes protective conductors, metal conduits, metal cable sheaths, steel wire armouring and metallic parts of structures, but does not include the neutral conductors of the power systems.

~Note *The protective conductor to which exposed conductive parts of equipment (machines, apparatus, devices, components and instrumentation thereof) are connected, must be separated in the hazardous area from the neutral conductor, and must be connected to the power system earth point in the non-hazardous area, if the power system is directory earthed.*

For external earthing and bonding of the apparatus it is recommended to use a **cable lug** so that the conductor is secured against loosening and twisting, and so that the contact pressure is permanently secured.

1.4 Either **cable systems** (cable entry systems) or **conduit systems** can be employed for wiring of the apparatus in the hazardous areas (see 2 or 3).

1.5 **Non-sheathed single core cables are not permitted for live conductors** unless they are installed inside enclosures or conduit systems.

1.6 **Conduits** and, **in special cases, cables** (for example, where there is a pressure difference) **must be sealed** so as to prevent the passage of the explosive atmosphere.

1.7 **Further information concerning installation and maintenance of apparatus** is given by relevant clauses in the following documents.

EN 60079-14 Electrical apparatus for explosive gas atmospheres
Part 14: **Electrical installations in hazardous areas**
EN 60079-17 Part 17: **Inspection and maintenance of electrical installations in hazardous areas.**
EN 60079-19 Part 19: **Repair and overhaul for apparatus used in explosive atmospheres**
EN 50281-1-2 Electrical apparatus for use in the presence of combustible dust
Part 1-2: Electrical apparatus protected by enclosures
-- **Selection, installation and maintenance**

2.Cable systems

2.1 **Thermoplastic sheathed cables, thermosetting sheathed cables**, or **elastomeric sheathed cables** can be selected for fixed wiring in the hazardous areas.

2.2 Flameproof cable entry devices (cable glands) certified to comply with EN 50018 and appropriate to the type of cable employed, must be used for the connection of cables to the apparatus.

3. Conduit systems

For conduit systems, relevant national standards or codes of practice should be followed prior to the following recommendations.

3.1 **Screwed heavy gauge steel, solid drawn or seam welded conduit, or flexible conduit for protection of cables in explosive atmospheres** (see ISO 10807) can be selected for fixed wiring in the hazardous areas.

3.2 **Conduit must be threaded for connection** to permit the full engagement of five threads.

3.3 Either **conduit entry devices** or **sealing devices such as stopping boxes** should be provided at the wall of the apparatus enclosure to limit the pressure piling effect and to prevent hot gases from entering the conduit system from the enclosure containing a source of ignition. **Each type of both the devices must be certified** to comply with EN 50018.

3.4 **The stopping boxes**, if used, **should be filled with a compound** which does not shrink on setting and is impervious to, and unaffected by, chemicals found in the hazardous area. **The depth of the compound in the stopping box** should be at least equal to the internal diameter of the conduit, but in no case less than 10 mm.

3.5 When the conduit contains three or more **non-sheathed single or multi-core cables**, the total cross-sectional areas of cables, including insulation, should not be more than 40% of the cross-sectional area of the conduit.

4. Installation in explosive atmospheres caused by air/dust mixtures

4.1 **Conduit** or **cable glands**, if employed to connect cables to the apparatus, must be selected and used in such a way that an IP6X protection (dust-tight) is guaranteed.

4.2 It is recommended to maintain the apparatus so that **the dust layer will not exceed a thickness of 5mm**.

~Note *Where **the ignition temperature of a dust layer up to 5mm thickness** is equal to, or higher than, the value that is obtained by adding 75K to the maximum surface temperature of the enclosure "T …°C" as marked on the apparatus, the apparatus is incapable of causing ignition of the dust layer. (T…°C is based on the maximum ambient temperature.)*

Instruction for Safety

1. Introduction

Explosion protected models

Smart Pressure Transmitters **ST3000 series 900** has been constructed and certified to comply with the CENELEC standards EN 50014, EN 50018,

EN 50281-1-1 and EN1127-1. Be sure to read all applicable laws of your country and local regulations for the installation of equipment for explosive atmospheres.

EN 50014, Electrical apparatus for potentially explosive atmospheres - General requirements

EN 50018, Electrical apparatus for potentially explosive atmospheres - Flameproof enclosure “d”

EN 50281-1-1, Electrical apparatus for use in the presence of combustible dust - Part1-1: Electrical apparatus protected by enclosures

EN 1127-1, Explosive atmospheres-Explosion prevention and protection- Part 1: Basic concepts and methodology

2. Smart Pressure Transmitters ST3000 series 900

Safety information marked on the transmitter

“  **II 2 G D EEx d II C T6”** is a full marking in accordance with the Directive 94/9/EC.

“II” indicates “equipment - group II” for use in places other than mines.

“2” indicates “equipment - category 2” for use in areas in which explosive atmospheres are likely to occur (**Zone 1**).

“**G”** is the symbol of the equipment - group and the equipment - category concerning explosive atmospheres caused by gases, vapors or mists.

“D” is the symbol of the equipment - group and the equipment - category concerning explosive atmospheres caused by dust (“Dust ignition protection”).

“d” is the symbol for the type of protection d (flameproof enclosure).

“IIC” indicates that the group equipment is suitable for use in the explosive gas group “C” which contains hydrogen, acetylene and carbon disulfide (Annex A to EN 50014).

“**T6**” indicates that the maximum surface temperature of the transmitter is in the temperature class T6, i. e. the maximum surface temperature never exceeds 85°C at the maximum ambient temperature of 60°C.

For particular use in the presence of combustible dust only,

“  **II 2 D”** can be abstracted from the full marking.

“IP67” indicates a protection class provided by enclosures (known as **IP code** specified in EN 60529), i. e. the first numeral “6” means that the transmitter is protected by a dust - tight enclosure as prescribed in EN 50281-1-1. The second

numeral **“7”** means that the transmitter is protected against the effects of temporary immersion in water.

“**CE**” (CE marking) indicates that, in accordance with the relevant European Directives: **Directive 94/9/EC** (ATEX Directive) and **Directive 89/336/EEC** (EMC Directive), the transmitter complies with the protection requirements relating to the design and construction of the transmitter. In addition, the CE marking is followed by the identification number **0344** of the notified body (KEMA) responsible of the production quality assurance notification under Directive 94/9/EC.

“**INERIS 99ATEX0010 X”:** The certificate number of EC-type examination carried out by INERIS responsible of the examination under Directive 94/9/EC.

“**DATE”**: The year of construction of Smart Pressure Transmitter ST3000 series 900 is printed with the last two figures, together with the name of the month.

3. Installation

3.1 Operating condition

⚠ WARNING

Never open the enclosure while the internal circuit is alive.

3.2 Mounting and wiring

For use in explosive atmospheres of gase, fluid or vapor:

The cable and conduit entry devices must be of a certified flameproof type, suitable for the conditions of use and correctly installed.

With the use of conduit entries a sealing device must be provided either in the flameproof enclosure or immediately on the entrance thereto.

For use in the presence of combustible dust:

The cable and conduit entry devices must be of a certified flameproof type of E - or ATEX - Generation, suitable for the conditions of use and correctly installed. Those devices must satisfy the requirements for IP6X (dust - tight) as specified in EN 60529.

For external earthing and bonding:

A cable lug must be used so that the conductor is secured against loosening and twisting and so that the contact pressure is permanently secured.

Special condition for safe use:

The fastening screws of this apparatus are made of stainless steel and have a yield stress of 500N/mm^2

4. Operation

Precautions

⚠ WARNING

Do not open the enclosure when energized.

5. Maintenance

⚠ WARNING

Unauthorized modifications of any part of the enclosure or the internal circuit may invalidate the verified explosion protection of Smart Pressure Transmitter ST3000 series 900.

The integrity of enclosure must always be maintained.

6. Troubleshooting

⚠ WARNING

Do not open the enclosure when energized.

7. Specifications

Item	Description
Enclosure rating	IP67
Explosion protection	Flameproof **II 2 D EEx d IIC T6;** Dust ignition protection **II 2 D;** for ambient temperature - 20 to 60°C (Note 1)

~Note *The cable and conduit entry devices must be of a certified flameproof type (see 3.2 Mounting and wiring)*

FM Intrinsically Safe System (in accordance with NEC and ANSI/ISA RP 12.6)

⚠ CAUTION

- Only suitable **associated apparatus separately approved by FM (FMRC)** shall be connected to the intrinsically safe apparatus.
- Electrical equipment connected to the associated apparatus in non-hazardous locations shall not use or generate more than 250 Vrms.
- Tampering and replacement of any components within the intrinsically safe apparatus with non-factory components may adversely affect the safe use of the system.

Installation requirements

1. The intrinsically safe and associated apparatus shall be installed in accordance with **the control drawing(s)** attached.

   Especially, the control drawing(s) provides guidance on determining **the maximum allowed capacitance and inductance of the interconnecting cables**.

2. The intrinsically safe and associated apparatus is permitted to be installed in any hazardous (classified) location for which they have been approved, **by using any of the wiring methods suitable for ordinary (unclassified) locations**, including wiring methods for communication systems.

3. **Conductors of the intrinsically safe circuit shall not be placed in raceways, cable trays, and cables with conductors of any non-intrinsically safe circuit, unless** (1) the conductors of the intrinsically safe circuit are separated from these of the non-intrinsically safe circuits by a distance of at least 50 mm, and secured or separated by a grounded partition or an approved insulating partition; or (2) either all of the intrinsically safe circuit conductors or all of the non-intrinsically safe circuit conductors are in grounded metal-sheathed or metal-clad cables where the sheathing or cladding is capable of carrying fault current to ground.

4. **Different intrinsically safe circuits shall be in separate cables, unless** (1) the conductors of each circuit are within a grounded metal shield, or (2) the conductors of each circuit have insulation with a minimum thickness of 0.01 inch (0.25 mm).

5. Intrinsically safe apparatus, associated apparatus, shields of conductors or cables, enclosures and raceways, if of metal, shall be grounded.

6. **If the associated apparatus is a type of shunt diode barriers**, supplementary bonding to the grounding electrode is needed. And the grounding path resistance from the farthest barrier to the grounding electrode shall not exceed 1Ω.

   In practice, the bonding to the grounding electrode is achieved by connecting the grounding terminals of the barriers to the intrinsically safe ground bus which is connected to the grounding electrode with an insulated conductor not smaller than No.12 AWG (2.05 mm in dia.).

7. **In hazardous locations, non-current-carrying metal parts** of the apparatus, raceways, and other enclosures of the intrinsically safe system shall be bonded to ensure **the electrical continuity**.

8. **In non-hazardous locations, where metal raceways are used for the intrinsically safe system wiring in hazardous locations, all intervening raceways, fittings, boxes, enclosures, etc**. between the hazardous locations and the point of grounding for the power supply system or point of grounding of a separately derived system, shall be grounded by using bonding jumpers with proper fittings or other approved means of bonding.

9. Where **conduits and cables** are used to protect the intrinsically safe wiring against environments, the conduits and cables **must be sealed** so that they do not transmit gases, vapors, or dust from a hazardous location to a non-hazardous location. **Sealing fittings** should be installed in each conduit run leaving the hazardous location, on either side of the boundary within 10 ft (3.05 m) of the boundary. Such seals need not be explosionproof.

10. **The grounding electrode** usually available on premises is specified in a), b), c) or d):

    a) **Metal underground water pipe** in direct contact with the earth for 10 ft (3.05 m) or more.

    b) **Metal frame of the building**, where effectively grounded.

    c) Concrete-encased electrode. An electrode encased by at least 2 in. (50.8 mm) of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of at least 20 ft (6.1m) of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods not less than 1/2 in. (12.7 mm) diameter, or consisting of at least 20 ft (6.1 m) of bare copper conductor not smaller than No.2 AWG (6.54 mm in dia.).

    d) **Ground ring**. A ground ring encircling the building or structure, in direct contact with the earth at a depth below earth surface not less than 2 1/2 ft (762 mm), consisting of at least 20 ft (6.1 m) of bare copper conductor not smaller than No.2 AWG.

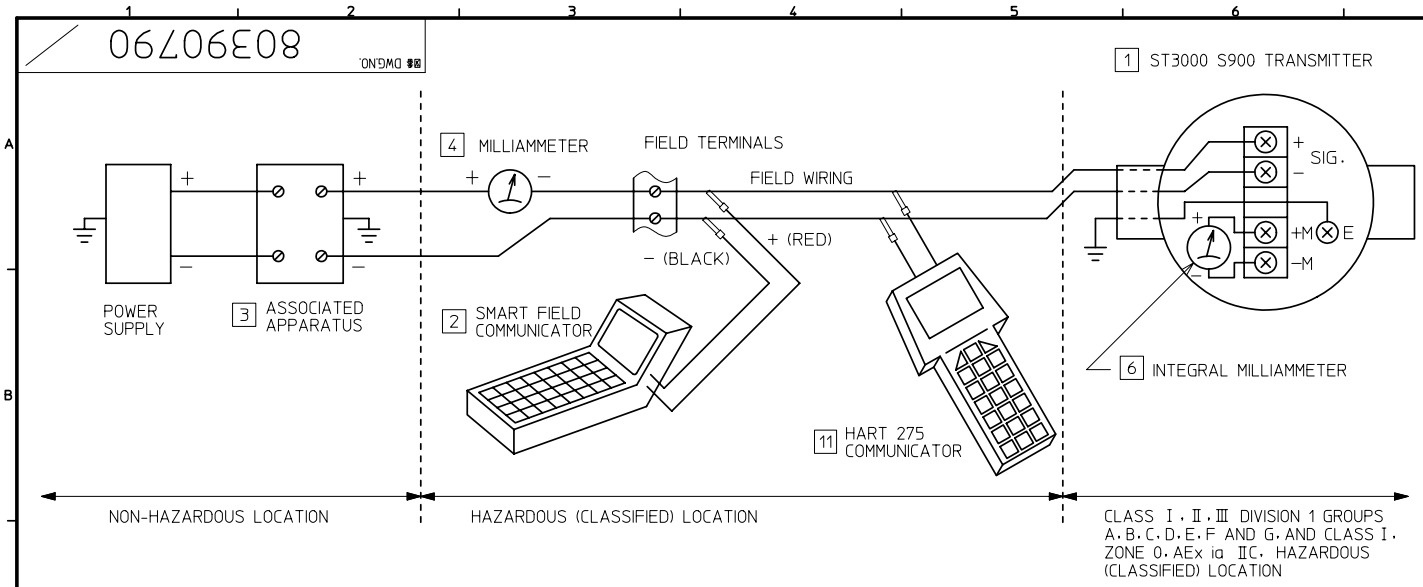
    Where none of the above electrodes is available, made electrodes should be used:

e) Rod and pipe electrodes. Not less than 8 ft (2.44 m) in length, consisting of the following materials, and being installed in the following manner:

- Electrodes of pipe or conduit shall not be smaller than 3/4 in. trade size and, where of iron or steel, shall have the outer surface galvanized or otherwise metalcoated for corrosion protection.
- Electrodes of rods of iron or steel shall be at least 5/8 in. (15.87 mm) in diameter. Stainless steel rods less than 5/8 in. (15.87 mm) in diameter, non-ferrous rods, or their equivalent shall not be less than 1/2 in. (12.7 mm) in diameter.
- The electrode shall be installed such that at least 8 ft (2.44 m) of length is in contact with the soil. It shall be driven to a depth of not less than 8 ft (2.44 m).

f) **Plate electrodes.** Each plate electrode shall expose not less than 2 sq ft (0.186 sq m) of surface to exterior soil. Electrodes of iron or steel plates shall be at least 1/4 in. (6.35 mm) in thickness. Electrodes of non-ferrous metal shall be at least 0.06 in. (1.52 mm) in thickness.

A single electrode consisting of a rod, pipe, or plate that does not have a resistance to ground of 25Ω or less shall be augmented by one additional electrode of any of the types specified in a) to f). Where multiple rod, pipe, or plate electrodes are installed, they shall not be less than 6 ft (1.83 m) apart.



5 THE TRANSMITTER MAY BE MOUNTED WITHIN A CLASS Ⅰ, DIVISION 2 AND CLASS Ⅰ, ZONE 2, HAZARDOUS (CLASSIFIED) LOCATION WITHOUT THE FMRC APPROVED ASSOCIATED APPARATUS IF THE POWER SUPPLY RATINGS DO NOT EXCEED THE MAXIMUM VOLTAGE, CORRENT AND POWER RATINGS OF THE TRANSMITTER. THE CLASS Ⅰ, DIVISION 2 & CLASS Ⅰ, ZONE 2 INSTALLATION AND WIRING PRACTICES SHOULD BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70).

4 THE FMRC APPROVED MILLIAMMETER SHALL CONTAIN THE FOLLOWING INTERNAL PARAMETERS: RESISTANCE = 36 Ω, Li=60μH, AND Ci=0F. THE MILLIAMMETER MUST HAVE A SUITABLE FMRC APPROVAL FOR THE HAZARDOUS AREA.

3 INTERCONNECTION MAY ONLY OCCUR BETWEEN THE INTRINSICALLY SAFE APPARATUS (ST3000 S900 TRANSMITTER) AND FACTORY MUTUAL ENTITY APPROVED ASSOCIATED APPARATUS. INSTALLATION OF THE ASSOCIATED APPARATUS SHALL COMPLY WITH THE MANUFACTURER'S INSTRUCTION OF THE ASSOCIATED APPARATUS. THE FACTORY MUTUAL APPROVED ASSOCIATED APPARATUS INCLUDES ANY FACTORY MUTUAL ENTITY APPROVED SINGLE OR DUAL BARRIER.

2 THE FMRC APPROVED SMART FIELD COMMUNICATOR (SFC) MAY BE CONNECTED AT ANY POINT IN THE LOOP BETWEEN THE FMRC ENTITY APPROVED ASSOCIATED APPARATUS AND THE TRANSMITTER.
ENTITY PARAMETERS: Vmax.=42.4V, Imax.=225mA,
Voc=7.5V, Isc=22.1mA, Po=41.4mW
Ci=0, Li=0

BECAUSE THE SFC HAS THE MAXIMUM OUTPUT PARAMETERS OF Voc=7.5V, Isc=22.1mA, AND Po=41.4mW, IF THE SFC IS APPLIED IN THE INTRINSICALLY SAFE LOOP, THE MAXIMUM ALLOWABLE CONNECTED INDUCTANCE (La) AND CAPACITANCE (Ca) OF THE LOOP MUST BE CONSIDERED (SEE SHEET 4). WHEN SELECTING AN APPROPRIATE BARRIER AS THE ASSOCIATED APPARATUS AND A SUITABLE WIRING CABLE TO CONNECT THE BARRIER TO THE TRANSMITTER.

NOTES 1 MAXIMUM ENTITY PARAMETERS OF ST3000 S900 TRANSMITTER:
Vmax.= 42.4V, Imax.=165mA, Pi=1.2W, Ci=32nF, Li=0.858mH

10 INSTALLATION OF ALL FMRC APPROVED DEVICES SHALL BE IN ACCORDANCE TO THE MANUFACTURERS INSTALLATION DRAWINGS WHEN INSTALLING THE EQUIPMENT.

9 INTRINISIC SAFE INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA RP12.6 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA70).

8 DUST-TIGHT CONDUIT SEAL SHOULD BE USED WHEN INSTALLED IN CLASS Ⅱ AND CLASS Ⅲ ENVIRONMENTS.

7 TO DETERMINE PROPER MATCHING OF I.S.EQUIPMENT AND THE MAXIMUM WIRING LENGTH USE THE FOLLOWING ENTITY PARAMETER MATCHING FORMULAS:
Uo or Voc or Vt ≤ Vmax,
Io or Isc or It ≤ Imax,
Po ≤ Pi,
Ca or Co ≥ ΣCi + Ccable,
La or Lo ≥ ΣLi + Lcable

6 INTEGRAL MILLIAMMETER
WITH INTERNAL PARAMETERS:
INDUCTANCE=10μ Hmax,
CAPACITANCE=1nFmax,
RESISTANCE=3Ω max

NOTE
THIS DRAWING MUST NOT BE CHANGED WITHOUT PRIOR AUTHORIZATION FROM FACTORY MUTUAL

名称 TITLE
EXTERNAL WIRING DIAGRAM
ST3000 TRANSMITTER
INTRINSICALLY SAFE LOOP

YAMATAKE
DWG.NO. 80390790
改番 REV. 03
シート SHT. 1/3
A3

DWG.NO. 80390790

11 THE FMRC APPROVED HART 275 COMMUNICATOR (HHT) MAY BE CONNECTED AT ANY POINT IN THE LOOP BETWEEN THE FMRC ENTITY APPROVED ASSOCIATED APPARATUS AND THE TRANSMITTER.
EXAMPLE ENTITY PARAMETERS,SEE HHT CONTROL DRAWING FOR ACTUAL ENTITY PARAMETERS: Vmax.=30V, Imax.=300mA.
Voc=1.7V, Isc=32mA
Ci=0.07μF, Li=0

BECAUSE THE HHT HAS THE MAXIMUM OUTPUT PARAMETERS OF Voc=1.7V AND Isc=32mA. IF THE HHT IS APPLIED IN THE INTRINSICALLY SAFE LOOP, THE MAXIMUM ALLOWABLE CONNECTED INDUCTANCE (La) AND CAPACITANCE (Ca) OF THE LOOP MUST BE CONSIDERED (SEE SHEET 5). WHEN SELECTING AN APPROPRIATE BARRIER AS THE ASSOCIATED APPARATUS AND A SUITABLE WIRING CABLE TO CONNECT THE BARRIER TO THE TRANSMITTER.

12 SMART FIELD COMMUNICATOR (SFC) AND HART 275 COMMUNICATOR (HHT) SHALL NOT BE CONNECTED IN THE LOOP AT THE SAME TIME.

13 AEx ib IS SUITABLE ONLY FOR CLASS I, ZONE 1 HAZARDOUS (CLASSIFIED) LOCATIONS AND IS NOT SUITABLE FOR CLASS I, ZONE 0, OR CLASS I, DIVISION 1 HAZARDOUS (CLASSIFIED) LOCATIONS.

14 THE POWER SUPPLY CONNECTED TO THE ASSOCIATED APPARATUS MUST NOT USE OR GENERATE MORE THAN 250 Vrms OR Vdc.

CONSIDERATION OF AN INTRINSICALLY SAFE LOOP BASED ON ENTITY PARAMETERS

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS TO ASSOCIATED APPARATUS NOT SPECIFICALLY EXAMINED IN SUCH COMBINATION.

BASICALLY, THE MAXIMUM UNPROTECTED CAPACITANCE (Ci) AND INDUCTANCE (Li) OF THE INTRINSICALLY SAFE APPARATUS, INCLUDING INTERCONNECTING WIRING PARAMETERS (Lcable, Ccable), MUST BE EQUAL OR LESS THAN THE CAPACITANCE (Ca) AND INDUCTANCE (La) WHICH CAN BE SAFELY CONNECTED TO THE ASSOCIATED APPARATUS. ALSO, THE MAXIMUM OUTPUT PARAMETERS (Voc, Isc, Po) OF THE ASSOCIATED APPARATUS MUST BE EQUAL OR LESS THAN THE MAXIMUM ENTITY PARAMETERS (Vmax, Imax, Pmax) OF THE INTRINSICALLY SAFE APPARATUS.

IF THE SFC IS CONNECTED TO THE INTRINSICALLY SAFE LOOP, FURTHER CONSIDERATION MUST BE TAKEN AS SHOWN BY THE FOLLOWING EXAMPLES.

EXAMPLE 1. La

MAXIMUM OUTPUT CURRENT (Isum) TO THE LOOP IN THE WORST SITUATION IS THE SUM OF THE DELIVERED CURRENT (Isc) BY THE BARRIER AND THAT (Isc) BY THE SFC. IF Isc OF THE BARRIER IS 93mA,

Isum = 93mA + 22.1mA = 115.1mA.

THEN, BY APPLYING 120mA (THE NEXT HIGHER VALUE OF THE RESULTING Isum) TO THE TABLE OF NEXT PAGE, La FOR GROUP A/B IS DETERMINED : La=2.50mH.

THE ABOVE OBTAINED La VALUE MUST SATISFY THE BELOW RELATIONSHIP.

La ≧ Li (TRANSMITTER) + Lcable + Li (SFC).

ACCORDINGLY, THE WIRING INDUCTANCE NEVER EXCEEDS THE VALUE La - Li (TRANSMITTER) - Li (SFC), i.e. IF Li OF TRANSMITTER IS 11μH,

Lcable ≦ 2.50mH - 11μH - 0 = 2.489mH.

NOTE: IF THE ABOVE Lcable VALUE IS SMALLER THAN THE INDUCTANCE OF A CABLE, ANOTHER BARRIER WITH A SMALLER Isc VALUE SHOULD BE SELECTED.

EXAMPLE 2. Ca

MAXIMUM OUTPUT VOLTAGE (Vsum) TO THE LOOP IN THE WORST SITUATION IS THE SUM OF THE DELIVERED VOLTAGE (Voc) BY THE BARRIER AND THAT (Voc) BY THE SFC. IF Voc OF THE BARRIER IS 28V.

Vsum = 28V + 7.5V = 35.5V.

THEN, BY APPLYING 36V (THE NEXT HIGHER VALUE OF THE RESULTING Vsum) TO THE TABLE OF NEXT PAGE, Ca FOR GROUP A/B IS DETERMINED : Ca=0.08 μF.

THE ABOVE OBTAINED Ca VALUE MUST SATISFY THE BELOW RELATIONSHIP.

Ca ≧ Ci (TRANSMITTER) + Ccable + Ci (SFC).

ACCORDINGLY, THE WIRING CAPACITANCE NEVER EXCEEDS THE VALUE Ca - Ci (TRANSMITTER) - Ci (SFC), i.e. IF Ci OF TRANSMITTER IS 0.032 μF

Ccable ≦ 0.08 μF - 0.032 μF - 0 = 0.048 μF.

NOTE: IF THE ABOVE Ccable VALUE IS SMALLER THAN THE CAPACITANCE OF A CABLE, ANOTHER BARRIER WITH A SMALLER Voc VALUE SHOULD BE SELECTED.

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IF THE HHT IS CONNECTED TO THE INTRINSICALLY SAFE LOOP, FURTHER CONSIDERATION MUST BE TAKEN AS SHOWN BY THE FOLLOWING EXAMPLES.

EXAMPLE 3. La

MAXIMUM OUTPUT CURRENT (Isum) TO THE LOOP IN THE WORST SITUATION IS THE SUM OF THE DELIVERED CURRENT (Isc) BY THE BARRIER AND THAT (Isc) BY THE HHT. IF Isc OF THE BARRIER IS 93mA.

Isum = 93mA + 32mA = 125mA.

THEN, BY APPLYING 130mA (THE NEXT HIGHER VALUE OF THE RESULTING Isum) TO THE RIGHT TABLE, La FOR GROUP A/B IS DETERMINED : La=2.00mH.

THE ABOVE OBTAINED La VALUE MUST SATISFY THE BELOW RELATIONSHIP.

La ≧ Li (TRANSMITTER) + Lcable + Li (HHT).

ACCORDINGLY, THE WIRING INDUCTANCE NEVER EXCEEDS THE VALUE La - Li (TRANSMITTER) - Li (HHT), i.e. IF Li OF TRANSMITTER IS 11μH,

Lcable ≦ 2.00mH - 11μH - 0 = 1.989mH

NOTE : IF THE ABOVE Lcable VALUE IS SMALLER THAN THE INDUCTANCE OF A CABLE, ANOTHER BARRIER WITH A SMALLER Isc VALUE SHOULD BE SELECTED.

EXAMPLE 4. Ca

MAXIMUM OUTPUT VOLTAGE (Vsum) TO THE LOOP IN THE WORST SITUATION IS THE SUM OF THE DELIVERED VOLTAGE (Voc) BY THE BARRIER AND THAT (Voc) BY THE HHT. IF Voc OF THE BARRIER IS 28V.

Vsum = 28V + 1.7V = 29.7V.

THEN, BY APPLYING 30V (THE NEXT HIGHER VALUE OF THE RESULTING Vsum) TO THE RIGHT TABLE, Ca FOR GROUP A/B IS DETERMINED : Ca=0.12μF.
THE ABOVE OBTAINED Ca VALUE MUST SATISFY THE BELOW RELATIONSHIP.

Ca ≧ Ci (TRANSMITTER) + Ccable + Ci (HHT).

ACCORDINGLY, THE WIRING CAPACITANCE NEVER EXCEEDS THE VALUE Ca - Ci (TRANSMITTER) - Ci (HHT), i.e. IF Ci OF TRANSMITTER IS 0.032μF,

Ccable ≦ 0.12μF - 0.032μF - 0 = 0.088μF.

NOTE : IF THE ABOVE Ccable VALUE IS SMALLER THAN THE CAPACITANCE OF A CABLE, ANOTHER BARRIER WITH A SMALLER Voc VALUE SHOULD BE SELECTED.

Isum = Isc (ASSOCIATED APPARATUS) + Isc(SMART COMMUNICATOR OR HART COMMUNICATOR)
Vsum = Voc (ASSOCIATED APPARATUS) + Voc (SMART COMMUNICATOR OR HART COMMUNICATOR)

Isum (MILLI AMPERES)	La (MILLI HENRYS)		
	A/B	C	D
20	90.00	330.00	700.00
21	82.00	300.00	635.30
23	68.00	250.00	530.10
25	58.00	210.00	449.00
28	46.00	170.00	358.40
30	40.00	150.00	312.40
32	36.00	135.00	274.80
35	31.00	110.00	229.90
40	23.00	87.00	176.30
45	19.00	70.00	139.40
50	15.00	56.00	113.10
55	12.00	48.00	93.50
57	11.00	43.00	87.10
60	10.00	40.00	78.70
62	9.50	37.00	73.70
65	8.80	34.00	67.10
70	7.50	28.00	57.90
75	6.70	25.00	50.50
80	6.00	22.00	44.40
85	5.50	20.00	39.30
90	5.00	18.00	35.10
100	4.00	15.00	28.50
110	3.00	12.00	23.60
120	2.50	10.00	19.80
130	2.00	9.00	16.90
140	1.60	8.00	14.60
150	1.30	7.00	12.70
160	1.00	6.20	11.20
170	0.80	5.50	9.90
180	0.60	5.00	8.80
200	0.50	4.00	7.20
220	0.40	3.20	5.90

Vsum (VOLTS)	Ca (MICROFARADS)		
	A/B	C	D
5	91.97	275.91	735.77
10	3.21	9.64	25.69
15	0.78	2.35	6.26
20	0.34	1.01	2.7
22	0.26	0.78	2.09
24	0.21	0.63	1.67
26	0.17	0.51	1.37
28	0.14	0.43	1.14
30	0.12	0.36	0.97
32	0.11	0.32	0.84
34	0.09	0.28	0.73
36	0.08	0.24	0.65
38	0.08	0.22	0.58
40	0.06	0.19	0.52
42	0.06	0.18	0.47

名称 TITLE
EXTERNAL WIRING DIAGRAM
ST3000 TRANSMITTER
INTRINSICALLY SAFE LOOP

YAMATAKE
図番 DWG.NO. 80390790
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シート SHT. 3
A3

About This Publication

This manual is intended as a detailed “how to” reference for installing, piping wiring, configuring, starting up, operating, maintaining, calibrating, and servicing Yamatake’s family of ST3000 Smart Transmitters. It is based on using a model SFC160/260 Smart Field Communicator as the operator interface for the ST3000 Smart Transmitter. Be aware that some data in this manual overlaps information in the field Communicator Model SFC160/260 Operating Guide.

While this manual provides detailed procedures to assist first time users, it also includes keystroke summaries for most procedures as a quick reference for experienced users.

Precautions

General Precautions

1. Checking the Product

When you accept the ST3000 Smart Transmitter, check its appearance to make sure that it is not damaged.

A Smart Transmitter with semi-standard or special specifications may have different accessories.

2. Check the specifications

The specifications are marked on the name plate on the outside of the transmitter case. Make sure that the specifications match your order by referring to the specifications.

In making an inquiry, identify the model No. and the product No.

3. Transportation

We recommend to transport the transmitter to the installation site in the packaged state in order to prevent damages from occurring during transportation.

4. Storage Environment

(1) Storage location

During storage, protect the transmitter from rain water as well as from heavy vibration and shock. Store it at normal temperature and humidity (about 25°C, 65%RH) as much as possible.

(2) Store the transmitter in original packaging if possible.

(3) If a used transmitter must be stored for some period, wash it thoroughly after making sure that no fluid remains in the pressure receiving section.

5. Installation Environment

In order to maintain the original performance and reliability for a long time, install the transmitter in the following environment:

(1) Ambient temperature

(a) The temperature gradient and temperature changes in installation environment should be as small as possible.

(b) If a transmitter is exposed to heat radiated from the process side, lower its ambient temperature as much as possible by insulating it or by selecting a well-ventilated location for installation.

(c) If a process fluid can freeze, prevent freezing by means of heat insulation.

(2) Emvironment

Avoid corrosive emvironment as much as possible.

Install in explosion proof and intrinsically safe conditions.

(3) Shock and vibration

Install the transmitter where shocks and vibrations will be as small as possible.

(4) Installation of explosion proof type transmitter.

Refer to “Instructions for Explosion proof Transmitter“.

6. Application of Pressure to transmitter

In applying pressure to this transmitter, observe the following rules.

(1) The locking bolts of the adapter flange are loose when shipped. Tighten them to the specified torque.

(2) Do not apply a pressure that exceeds the specified level.

(3) Do not tighten or loosen bolts while pressure is being applied to the transmitter.

(4) When a transmitter is used for measuring a poisonous substance, handle it carefully even after the pressure is released.

7. Electronic Parts

(1) This transmitter has several CMOS electronic components. Since static electricity can easily cause the functional destruction of a CMOS component, never directly touch them or touch a circuit with your hands.

(2) Is components must be touched, equalize the potential of the components before doing so.

(3) When the printed wiring board (PWB) is removed, protect it in a non-conductive bag.

8. Using a Transceiver

(1) When a transceiver is used very near a transmitter, its transmission frequency (in the form of high frequency noise) may cause radio interference.

(2) When using a transceiver, determine the distance that will be necessary for avoiding any interference, and ensure that the distance between the transceiver and the transmitter is greater.

(3) When using a transceiver, be sure to close the cover of the transmitter

9. Welding in Proximity

(1) When welding is to be carried out near the transmitter, the welding current may affect the operation of the transmitter depending on the grounding method.

(2) Directly ground the welding equipment and power transformer. Do not ground to the stanchion pipe of the transmitter.

(3) Turn off the power supply to the transmitter.

Technical Assistance

If you encounter a problem with your ST3000 Smart Transmitter, check to see how your transmitter is currently configured, and verify that all selections are consistent with your application.

If the problem persists, please call Yamatake group representatives.

An engineer will discuss your problem with you. Please have your complete model number, serial number, and software revision number on hand for reference, You can find the model and serial numbers on the transmitter nameplates. You can also view the software version number using the SFC.

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Chapter 1 : Overview-First Time Users Only

1-1 : Introduction

This section is intended for users who have never worked with our ST3000 Smart Transmitter and its companion operator interface device, the hand-held Smart Field Communicator (SFC). It provides some general information to acquaint you with the ST3000 Smart Transmitter and the SFC.

1-2 : ST3000 Smart Transmitters

Yamatake's ST3000 Smart Transmitter includes model variations of these basic pressure measurement types.

- Differential Pressure
- Gauge Pressure
- Absolute Pressure

Transmitter adjustments

Except for optional zero and span adjustments available with ST3000 Smart Transmitters only, the ST3000 Smart Transmitter has no physical adjustments.

You need an SFC to make adjustments to a ST 3000 Smart Transmitter.

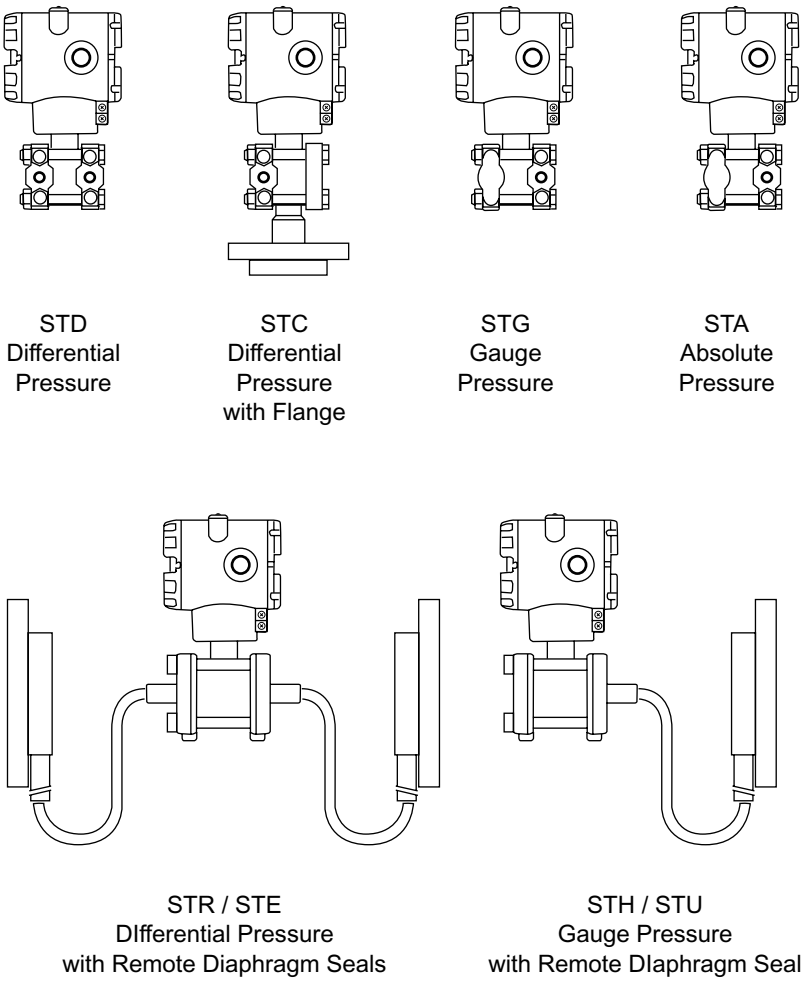


Figure 1-1 ST3000 Smart Transmitter Family.

1-3 : Smart Field Communicator

About SFC communications

The portable, battery-powered SFC serves as the common communication interface device for Yamateke's family of Smartline Transmitters. It communicates with a transmitter through serial digital signals over the 4 to 20 mA line used to power the transmitter. A request/response format is the basis for the communication operation. The transmitter's microprocessor receives a communication signal from the SFC, identifies the request, and sends a response message.

Figure 1-2 shows a simplified view of the communication interface provided by an SFC.

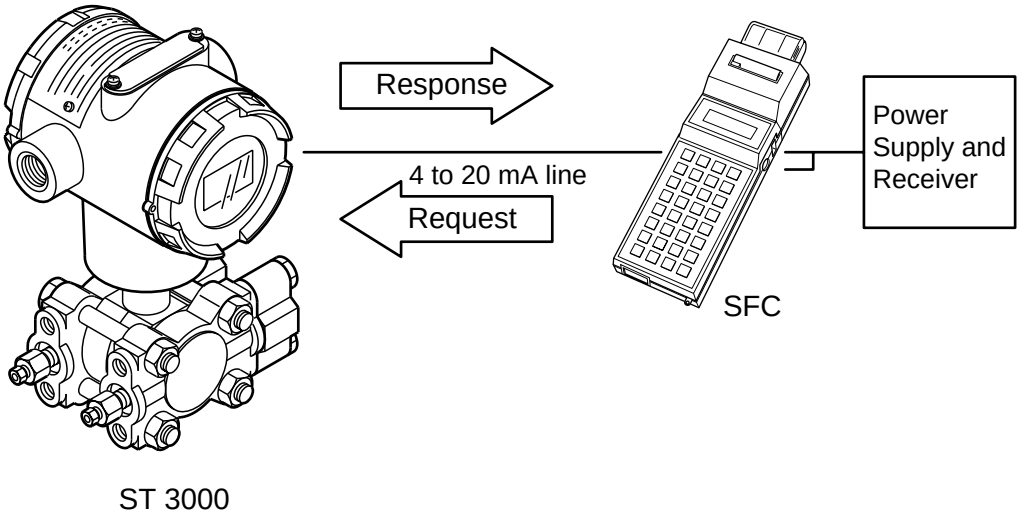


Figure 1-2 Typical SFC Communication Interface.

Purpose of SFC

The SFC allows you to adjust transmitter values, or diagnose potential problems from a remote location such as the control room. You can use the SFC to

- Configure: Define and enter the transmitter's operating parameters including
  - range values,
  - output conformity,
  - damping time,
  - tag number (ID), and more
- Monitor: Read the input pressure to the transmitter in engineering units and the transmitter's output in percent.
- Display: Retrieve and display data from the transmitter or SFC memory.
- Change Mode of Operation: Tell transmitter to operate in either its analog (4-20mA) mode or its digital enhanced (DE) mode.
- Check Current Output: Use the transmitter to supply the output current desired for verifying analog loop operation, troubleshooting, or calibrating other components in the analog loop.
- Troubleshoot: Check status of transmitter operation and display diagnostic messages to identify transmitter, communication, or operator error problems.

SFC model differences

As Yamatake's family of Smartline Transmitters has evolved, the SFC has been changed to meet new model and functionality requirements.

Now there are two following types of SFC:

- SFC160..... Without Printer
- SFC260..... With Printer

1-4 : Transmitter/SFC Order

Order components

Figure 1-3 shown the components that are shipped and should be received for a typical ST3000 Smart Transmitter and SFC order.

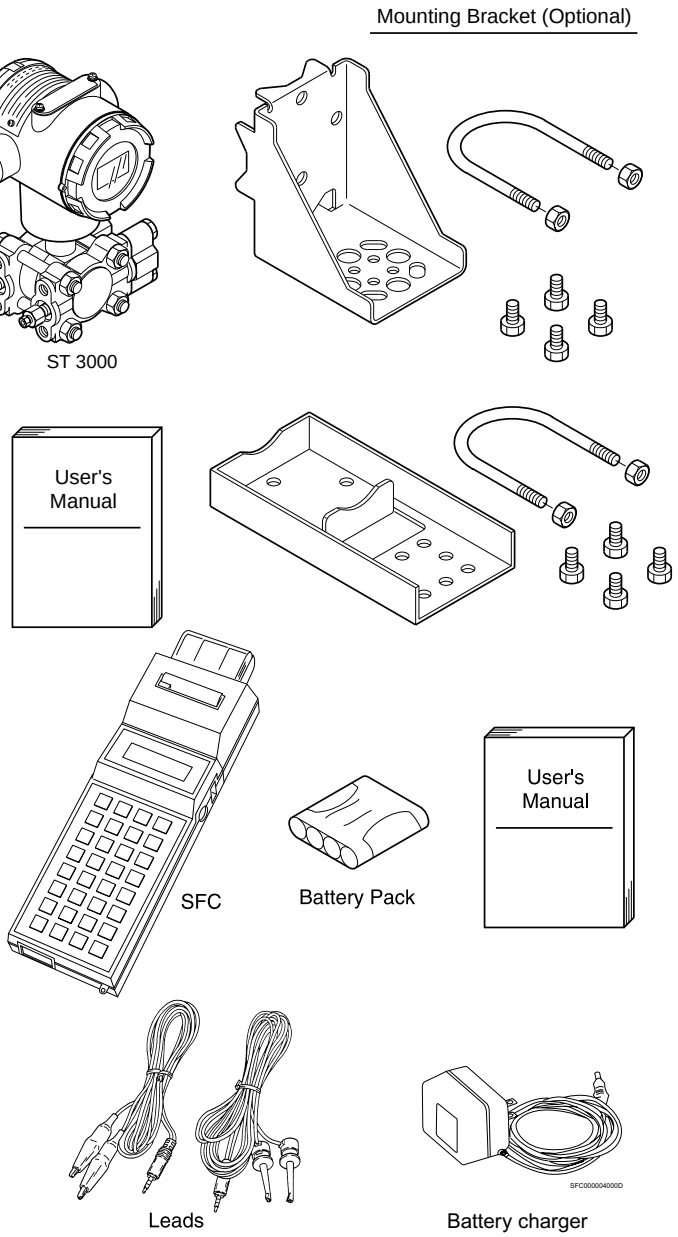


Figure 1-3 Typical ST3000 Smart Transmitter and SFC Order Components.

Chapter 2 : Quick Start Reference

2-1 : Introduction

This section assumes that the ST3000 Smart Transmitter has been installed and wired correctly, and is ready to be put into operation. It also assumes that you are somewhat familiar with using the SFC and that the transmitter has been configured correctly for your application. If the transmitter has not been installed and wired, you are not familiar with SFC operation, and/or you do not know if the transmitter is configured correctly, please read the other sections of this manual before operating your transmitter.

This section provides a list of typical start-up tasks and tells you where you can find detailed information about performing the task.

2-2 : Getting ST3000 Smart Transmitter On-Line Quickly

Quick start-up tasks

Table 2-1 lists common start-up tasks for an ST3000 Smart Transmitter using an SFC and gives an appropriate section in this manual to reference for more information about how to do the task. The start-up tasks are listed in the order they are commonly completed.

Table 2-1: Start-up Tasks Reference

Task	Description	Reference Section
1	Connecting SFC	5-1-1
2	Setting Tag No. and Checking Specifications	5-2
3	Starting Communications	5-2-1
4	Setting Tag No.	5-2-2
5	Checking Output Format	5-2-3
6	Checking Display Setting	5-2-4
7	Checking Engineering Unit of Measured Pressure	5-2-5
8	Checking Low and High Limits of Setting Range	5-2-6
9	Checking Damping Time Constant	5-2-7
10	Checking Sealed Liquid Temperature Correction Function Setting	5-2-8

Chapter 3 : Considerations before installation

3-1 : Introduction

This section reviews things you should take into consideration before you install the transmitter and start using the SFC. Of course, if you are replacing an existing ST3000 Smart Transmitter and you did not order a new SFC; you can skip this section.

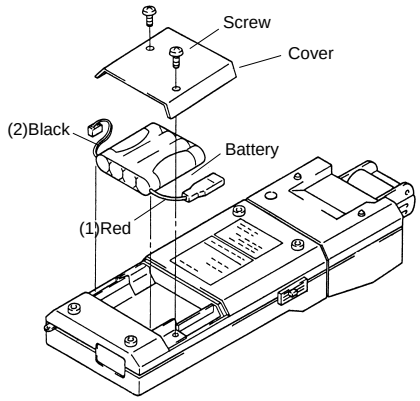
3-2 : Considerations for SFC

Install SFC battery pack

If the SFC battery pack was removed for shipping and/or storage, you will have to install the battery pack and charge the batteries before you can operate the SFC.

The procedure in Table 3-1 outlines the steps for installing and charging the battery pack.

Table 3-1: Installing and Charging SFC Battery Pack

Step	Action
1	Turn SFC face down on working surface. Use metric hex wrench (2.5mm) to remove screw in battery compartment cover and remove cover.
2	Insert battery pack in compartment and connect plug in compartment to pin on battery pack. Example-Battery pack installation. 
3	Replace cover and tighten hex screws.
4	Connect lead from battery charger to recessed connector on left side of SFC **⚠ WARNING** The SFC battery charger is not intrinsically safe. Always recharge the SFC battery pack in a nonhazardous location.

Temperature Limits

The ambient operating temperature limits for the SFC are -10° to 50°C (14° to 122°F) with relative humidity in the range of 10 to 90% RH.

Usage guidelines

- Be sure to put an analog control loop into its manual mode before initiating SFC communications with an ST3000 Smart Transmitter operating in its analog mode. Communication superimposes digital signals on the loop wiring that could affect the analog control signal. This is not necessary when the transmitter is operating in its digital (DE) mode.
- Be sure the power supply voltage does not exceed 45V DC. The ST3000 Smart Transmitter and SFC were designed to operate with voltages below 45V DC.
- Be sure there is at least 250 ohms of resistance between the SFC and the power supply for proper communications.

Chapter 4 : Installation

4-1 : Introduction

This section Provides information about installing the ST3000 Smart Transmitter.

It includes procedures for mounting, piping and wiring the transmitter for operation.

4-2 : Mounting ST3000 Smart Transmitter

Summary

You can mount all transmitter models except those with integral flanges to a 2-inch (50 mm) vertical or horizontal pipe using our optional angle or flat mounting bracket or a bracket of your own. Those models with integral flanges are supported by the flange connection.

Figure 4-1 shows typical bracket mounted and flange mounted transmitter installations for comparison.

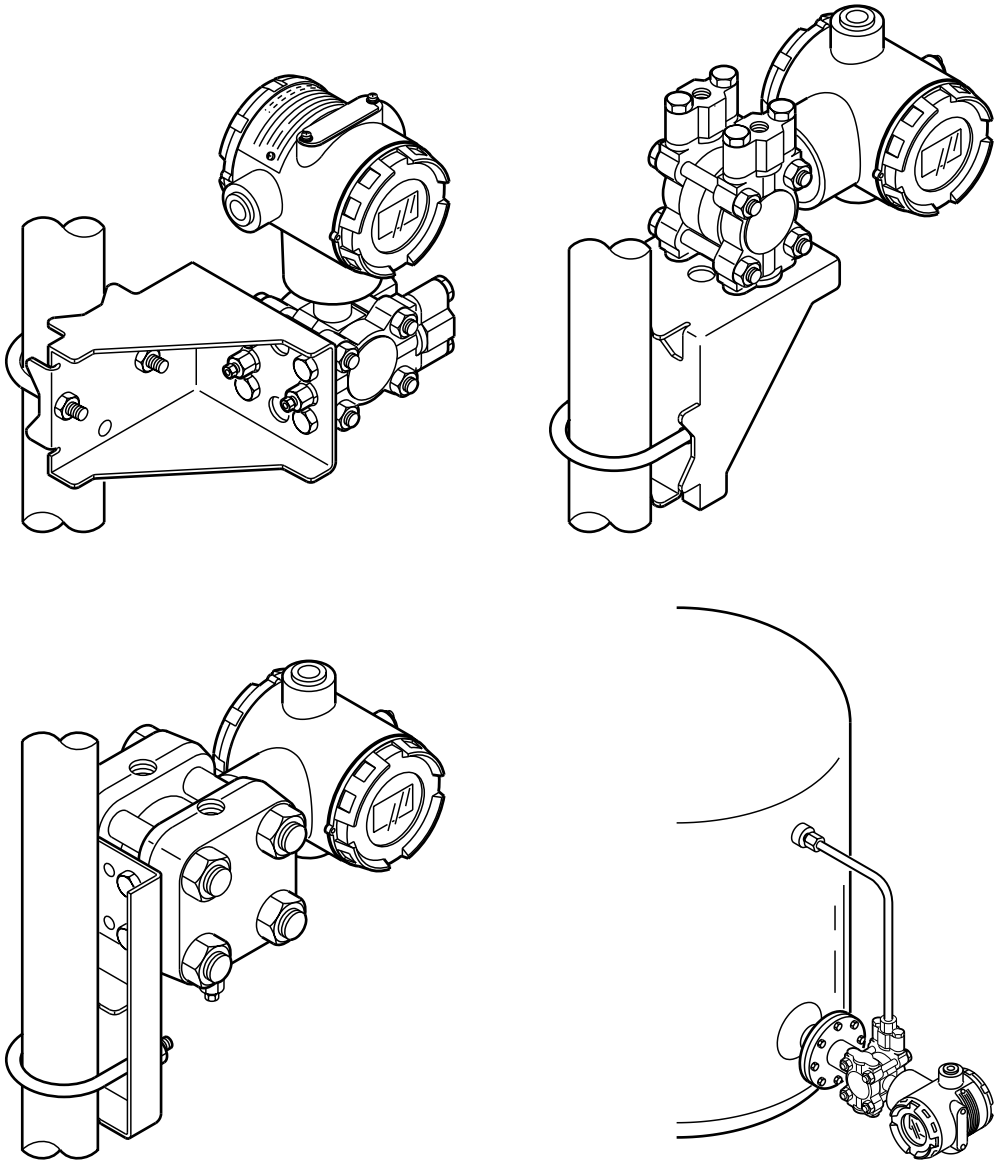


Figure 4-1 Typical Bracket Mounted and Flange Mounted Installations.

Methods of changing direction of indicator after mounted are shown below.

a) Rotate electronics housing 90° horizontally.

Loosen 3 mm set screw on outside neck of transmitter. Rotate electronics housing in a maximum of 90 degree increments (left or right) from the center to a position you require and tighten the set screw.

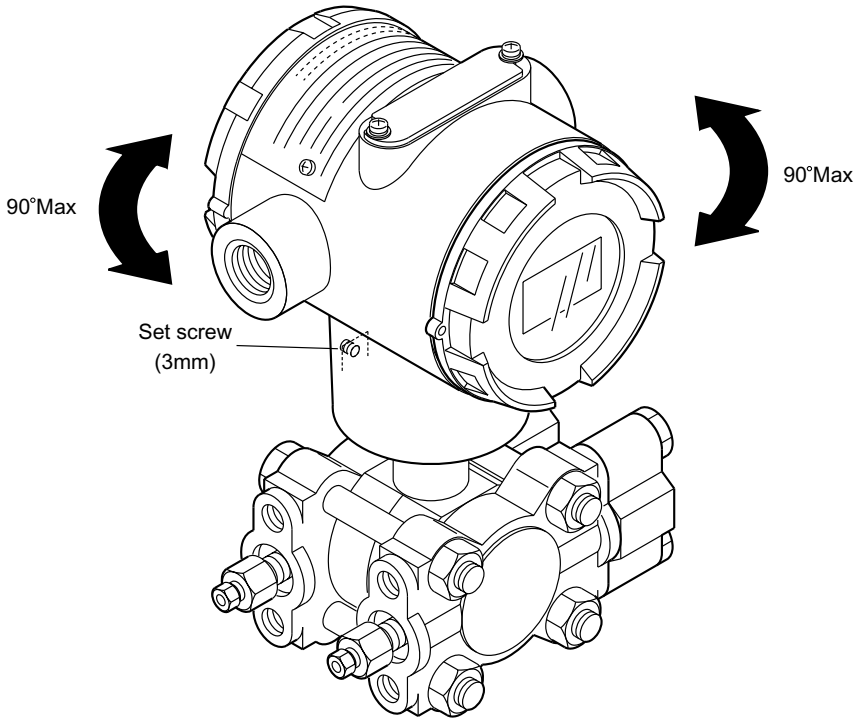


Figure 4-2

b) Rotate digital display module

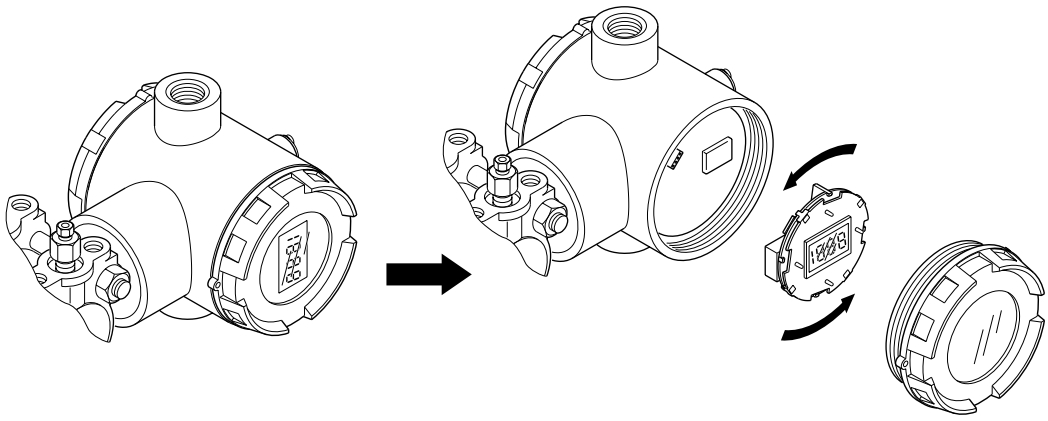


Figure 4-3

Flange mounting

To mount a flange mounted transmitter model, bolt the transmitter's flange to the flange pipe on the wall of the tank. Tighten the bolts to a torque of

SNB : $20 \pm 1\ N \bullet m$

SUS304 : $10 \pm 1\ N \bullet m$

ATTENTION

On insulated tanks, remove enough insulation to accommodate the flange extension.

Figure 4-4 shows a typical installation for a transmitter with the flange on the high pressure (HP) side so the HP diaphragm is in direct contact with the process fluid. The low pressure (LP) side of the transmitter is vented to atmosphere (no connection).

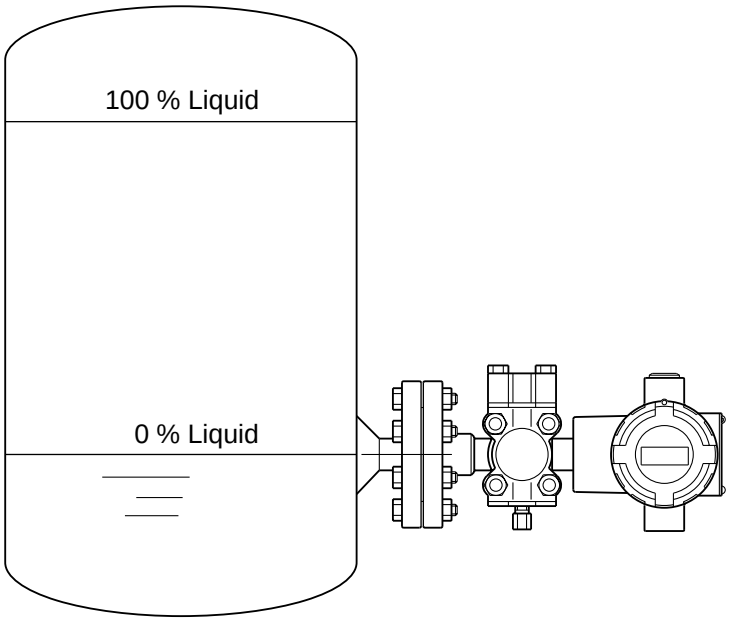


Figure 4-4 Typical Flange Mounted Transmitter Installation.

Remote seal mounting

Use the procedure in "Table 4-1:Mounting Remote Diaphragm Seal Transmitter" to mount a remote diaphragm seal transmitter model. Figure 4-5 shows a typical installation for a remote diaphragm seal transmitter for reference.

ATTENTION

Mount the transmitter flanges within the limits stated here for the given fill-fluid in the capillary tubes with a tank at one atmosphere.

Table 4-1: Mounting Remote Diaphragm Seal Transmitter

Step	Action
1	Mount transmitter at a remote distance determined by length of capillary tubing.
2	**If Transmitter Model Number Is...** STR929, STR930 STE929, STE930 **Then Connect Remote Seal on...** H mark side of transmitter to upper flange mounting on tank wall. ATTENTION On insulated tanks, remove enough insulation to accommodate the flange extension.
3	**If Transmitter Model Number is...** STR929, STR930 STE929, STE930 **Then Connect Remote Seal on...** Opposite side of transmitter to lower flange mounting on tank wall. ATTENTION On insulated tanks, remove enough insulation to accommodate the flange extension.
4	Tighten bolts to torque of SNB7: $20 \pm 1\ N \bullet m$, SUS304: $10 \pm 1\ N \bullet m$.

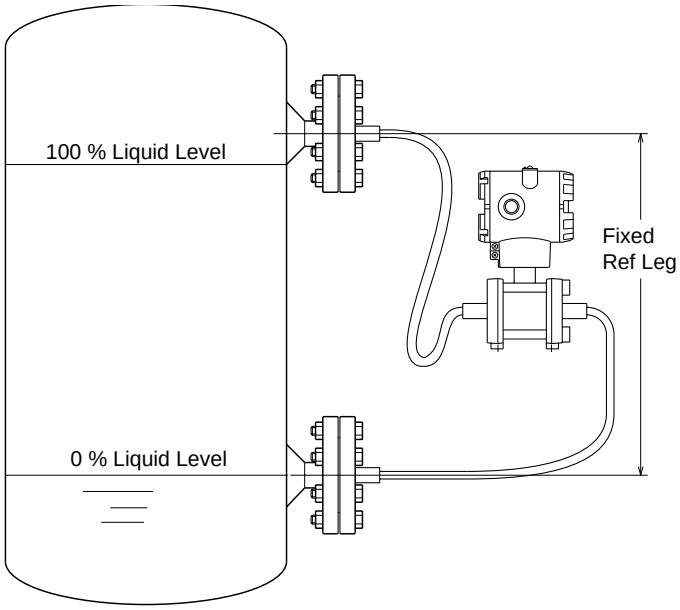


Figure 4-5 Typical Remote DIaphragm Seal Transmitter Installation

ATTENTION

Calculation of Allowable Transmitter Installation Location in Remote Seal Type Differential Pressure Transmitter.

When installing a remote seal type differential pressure transmitter on an enclosed tank, we recommend the installation of the main unit below the lower flange. However, it is sometimes necessary to install the transmitter main unit between the upper and lower flanges due to piping restrictions.

The condition that must be satisfied to ensure normal transmitter operations is specified here.

If a transmitter is installed in the position shown in Figure 4-6, the inner pressure of the tank (P_0) and the head pressure of the liquid sealed in the capillary can be applied to its main unit (low limit flange side).

The transmitter functions normally as long as the pressure applied to its diaphragm surface is equal to or higher than the low limit P (kPa abs.) of the allowable pressure of its main unit.

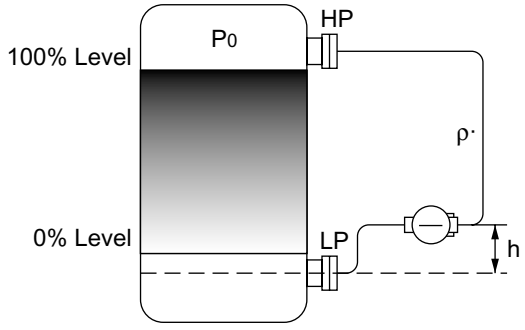


Figure 4-6