IP Converter
YT-940 SERIES

PRODUCT MANUAL

rotork®

Rotork YTC Limited

VERSION 1.31

Contents

1 Introduction

1.1 General Information for the users

Thank you for purchasing Rotork YTC Limited products. Each product has been fully inspected after its production to offer you the highest quality and reliable performance. Please read the product manual carefully prior to installing and commissioning the product.

- Installation, commissioning, and maintenance of the product may only be performed by trained specialist personnel who have been authorized by the plant operator accordingly.
- The manual should be provided to the end-user.
- The manual can be altered or revised without any prior notice. Any changes in product's specification, design, and/or any components may not be printed immediately but until the following revision of the manual.
- The manual should not be duplicated or reproduced for any purpose without prior approval from Rotork YTC Limited, Gimpo-si, South Korea.
- In case of any other problems that are not stated in this manual, please make immediate contact to Rotork YTC Limited.
- IP Converter is an accessory of the control valve, so please make sure to read the applicable instruction manual of the control valve prior to installation and operation.

1.2 Manufacturer Warranty

- For the safety, it is important to follow the instructions in the manual. Manufacturer will not be responsible for any damages caused by user's negligence.
- Any modifications or repairs to the product may only be performed if expressed in this manual. Injuries and physical damages caused by customer's modifying or repairing the product without a prior consultation with Rotork YTC Limited will not be compensated. If any alterations or modifications are necessary, please contact Rotork YTC Limited directly.
- The warranty period for the product is (12) months from the date of shipment unless otherwise stated. Customers can extend the warranty period by an additional (12) months by registering the product's serial number or lot number, customer information, and installation address on the warranty extension application site Product Registration (https://www.rotork.com/en/service/product-registration).
- Manufacturer warranty will not cover products that have been subjected to abuse, accidents, alterations, modifications, tampering, negligence, misuse, faulty installation, lack of reasonable care, repair or service in any way that is not contemplated in the documentation for the product, or if the model or serial number has been altered, tampered with, defaced or removed; damages that occurs in shipment, due to act of God, failure due to power surge, or cosmetic damage. Improper or incorrectly performed maintenance will void this limited warranty.
- For detailed warranty information, please contact the corresponding local Rotork YTC Limited office or main office in South Korea.

1.3 Explosion Proof Warning & Specific Conditions of Use

Please ensure the unit is being used and installed in conformity with local, regional, and national explosion proof certified environment.

- YT-940 is Explosion proof construction for internal pressure.
  YT-940 series explosion proof grade is:

CSA	Ex db IIC T5/T6
	Ex tb IIIC T85℃/T100℃
FM	CL I, DIV 1, Grps A,B,C,D
	CL I, Zn 1, AEx d IIC T5/T6
	CL II, III, DIV 1, Grps E,F,G
	Zn 21, AEx tb IIIC T100°C/T85°C

  (Ambient Temp. T5:-40°C to +85°C, T6: -40°C to +75°C)
- KEEP COVER TIGHT WHILE CIRCUITS ARE ALIVE
  - GARDER LE COUVERCLE BIEN FERME TANT QUE LES CIRCUITS SONT SOUS TENSION
  A SEAL SHALL BE INSTALLED WITHIN 50 mm OF THE ENCLOSURE
  - UN SCELLEMENT DOIT ETRE INSTALLEA MOINS DE 50 mm DU BOITIER.
  POTENTIAL ELECTROSTATIC CHARGING HAZARD SEE INSTRUCTIONS
  - PISQUE POTENTIEL DE CHARGE ELECTROSTATIQUE. VOIR LES INSTRUCTIONS
- List of the standards, including the issue date, with which the equipment is declared to comply.
  CSA C22.2 No. 60079-0-15
  CSA C22.2 No. 60079-1-16
  CSA C22.2 No. 60079-31-15

- Explosion proof type of cables and gaskets should be used, when explosion gases are present at the installation site. Please make sure that the sealing has been done completely.
- Power should be turned off completely when opening product's cover. When opening the cover, ensure that there is no power remaining in any electrical parts nearby.
- Ring terminal with surface area of more than 1.25 mm2 with M4 spring washer should be used to connect the power.
- For external ground terminal, ring terminal with surface area of more than 5.5 mm2 should be used.
- Risk of explosion due to electro-static charge. Static electricity charge may develop when cleaning the product with a dry cloth. It is imperative to avoid static electricity charge in the hazardous environment. If cleaning the surface of the product is needed, must use wet clothes.
- Seal required within 50 mm of enclosure.
- Consult the manufacturer for dimensional information on the flameproof joint for repair.
- To maintain Type 4X(FM) and IP66 rating, when installing threaded conduit, use type PTFE tape according to instructions.

2 Product Description

2.1 General

YT-940 IP converter receives 4-20 mA DC signal from the control room and outputs 0.02 to 0.1 MPa signal to pneumatic-pneumatic positioner to operate a control valve system. YT-940 is designed to be used in explosion proof environment.

2.2 Main Features and Functions

- Low air consumption level yields to lower plant operating cost.
- A wide range of uses with Type 4X(FM) and IP66 protection grade. (excluding the pressure gauges)
- Can be used at low voltage (8.5 V) and can be compatible with most of general controllers.
- Polyester painting makes the product strong against corrosion environment.
- Easy dial adjustment for Zero and Span.
- Modularized inner parts make maintenance easy and simple.
- I/P converter operates normally during sudden changes in supply pressure and / or high vibration environment.
- Air filter regulator <YT-200 series> can be directly installed without any pneumatic piping.
- DA and RA can be set for the output pressure relative to the input current signal by simple switch operation.
- DA and RA can be set for the analog output signal relative to the output pressure by simple switch operation. (Only 4-20 mA Analog Output option)

2.3 Label Description

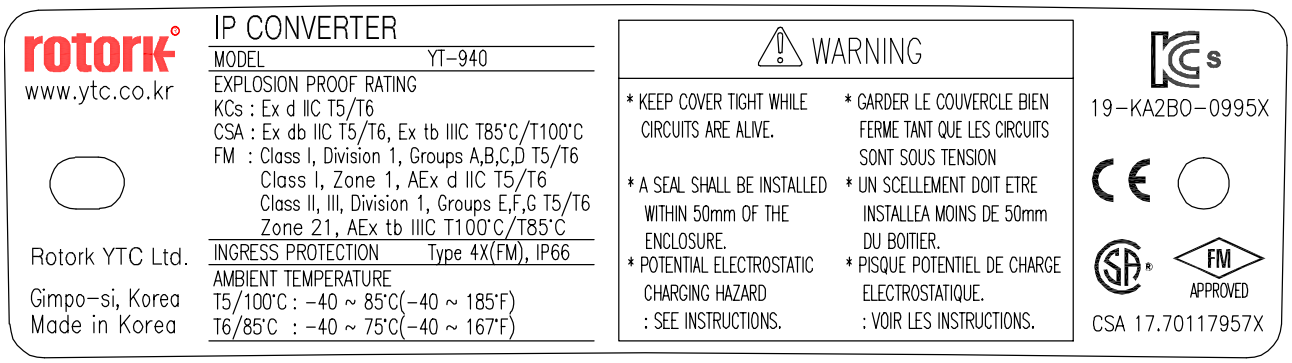

Fig. L-1: Body Label (for KCs,)

- MODEL : Indicates the model number.
- EXPLOSION PROOF : Indicates certified explosion proof grade.
- INGRESS PROTECTION : Indicates enclosure protection grade.
- AMBIENT TEMPERATURE : Indicates allowed explosion proof ambient temperature range.

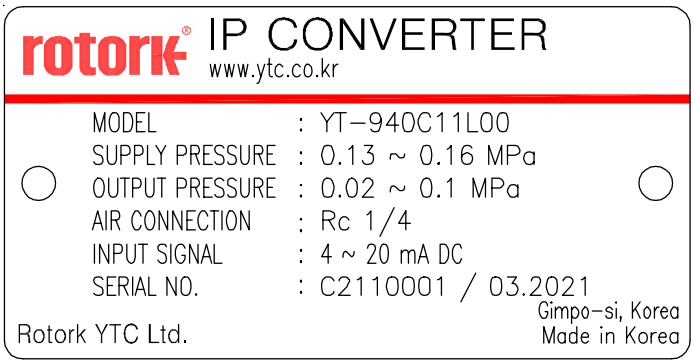

Fig. L-2: Cover Label

- MODEL : Indicates the model number and additional symbols.
- SUPPLY PRESSURE : Indicates the supply pressure range.
- OUTPUT PRESSURE : Indicates output pressure range.
- AIR CONNECTION : Indicates air connection thread type
- INPUT SIGNAL : Indicates input signal range.
- SERIAL NO. : Indicates the unique serial number.
- MONTH.YEAR : Indicates the manufactured month and year.

2.4 Product Code

YT-940 [1] [2] [3] [4] [5] [6]

[1]	Explosion Protection	C : KCs, FM, CSA
[2]	Output Pressure	1 : 0.02 to 0.1 MPa (0.2 to 1 bar) 2 : 0 to 0.12 MPa (0 to 1.2 bar) 3 : 0.04 to 0.2 MPa (0.4 to 2 bar) 4 : 0 to 0.23 MPa (0 to 2.3 bar)
[3]	Conduit – Air Connection Type	1 : G 1/2 – Rc 1/4 2 : G 1/2 – 1/4 NPT
[4]	Operating temp. (Non-explosion proof) [1]	L : -40 to 85 °C (-40 to 185 °F)
[5]	Option	0 : None 1 : 4-20 mA Analog Output
[6]	Gauge	0 : None [2] 1 : 0 to 0.2 MPa (0 to 2 bar) [3] 2 : 0 to 0.4 MPa (0 to 4 bar)

[1] This option is just the normal operating temperature of the product and is not related to explosion proof temperature. See “2.6 Certificates” for explosion proof temperature.

[2] Select for 1, 2 in [2] Output Pressure.

[3] Select for 3, 4 in [2] Output Pressure.

2.5 Product Specification

Model		YT-940	
Input Signal		4-20 mA DC	
Impedance		Max. 390 Ω @ 20 mA DC	
Supply Pressure – Output Pressure	**Standard**	①	0.13 to 0.16 MPa (1.2 to 1.6 bar) – **0.02 to 0.1 MPa (0.2 to 1.0 bar)**
	Multi-range	②	0.14 to 0.16 MPa (1.4 to 1.6 bar) – **0.00 to 0.12 MPa (0 to 1.2 bar)**
		③	0.22 to 0.24 MPa (2.2 to 2.4 bar) – **0.04 to 0.2 MPa (0.4 to 2.0 bar)**
		④	0.25 to0.27 MPa (2.5 to 2.7 bar) – **0.00 to 0.23 MPa (0 to 2.3 bar)**
Explosion Protection		Flameproof enclosure. Refer to “2.6 Certifications”.	
Ambient Temperature	**Operating**	-40 to 85 °C (-40 to 185 °F)	
	Explosion Proof	T5	-40 to 85 °C (-40 to 185 °F)
		T6	-40 to 75 °C (-40 to 167 °F)
Air Consumption		Below 2 LPM (Sup. = 0.14 MPa @ idle)	
Flow Capacity		70 LPM (Sup. = 0.14 MPa)	
Linearity		± 0.5 % F.S.	
Hysteresis		± 0.5 % F.S.	
Sensitivity		± 0.2 % F.S.	
Repeatability		± 0.3 % F.S.	
Conduit Entry		G 1/2	
Air Connection		Rc 1/4 or 1/4 NPT	
Ingress Protection		Type 4X(FM), IP66 (excluding the pressure gauges)	
Housing Material		Aluminum	
Weight		2.5 kg (5.6 lb)	
Painting		Polyester Powder Coating	

⚠ Tested under ambient temperature of 20 °C, absolute pressure of 760 mmHg, and humidity of 65 %.
Please contact Rotork YTC Limited for detailed testing specification.

2.6 Certifications

※ All certifications below are posted on Rotork YTC Limited homepage(www.ytc.co.kr).

➢ KCs (Korea)

Type : Explosion proof construction for internal pressure
Rating : Ex d IIC T5/T6
Certification No. : 19-KA2BO-0995X
Ambient temperature : -40 to +75°C(T6), -40 to +85°C(T5)

➢ FM

Type : Explosion proof construction for internal pressure
Rating : Class I, Division 1, Groups A,B,C,D; T6, T5
Class II, III, Division 1, Groups E, F, G; T6, T5
Class I, Zone 1, AEx d IIC T6, T5
Zone 21 AEx tb IIIC T85°C, T100°C
T6/ T85°C Ta= -40°C to +75°C, T5/T100°C Ta = -40°C to +85°C
Type 4X and IP66
Certification No. : FM16US0105X

➢ CSA

Type : Explosion proof construction for internal pressure
Rating : Ex db IIC T5/T6
Ex tb IIIC T85°C/T100°C
Certification No. : CSA 17.7011795X
Ambient temperature : -40 to +75°C(T6), -40 to +85°C(T5)

➢ Electromagnetic Compatibility (EMC)

- EMC directive 2014/30/EC from April 2016
- EC Directive for CE conformity marking

2.7 Parts, Assembly and Operation Logic

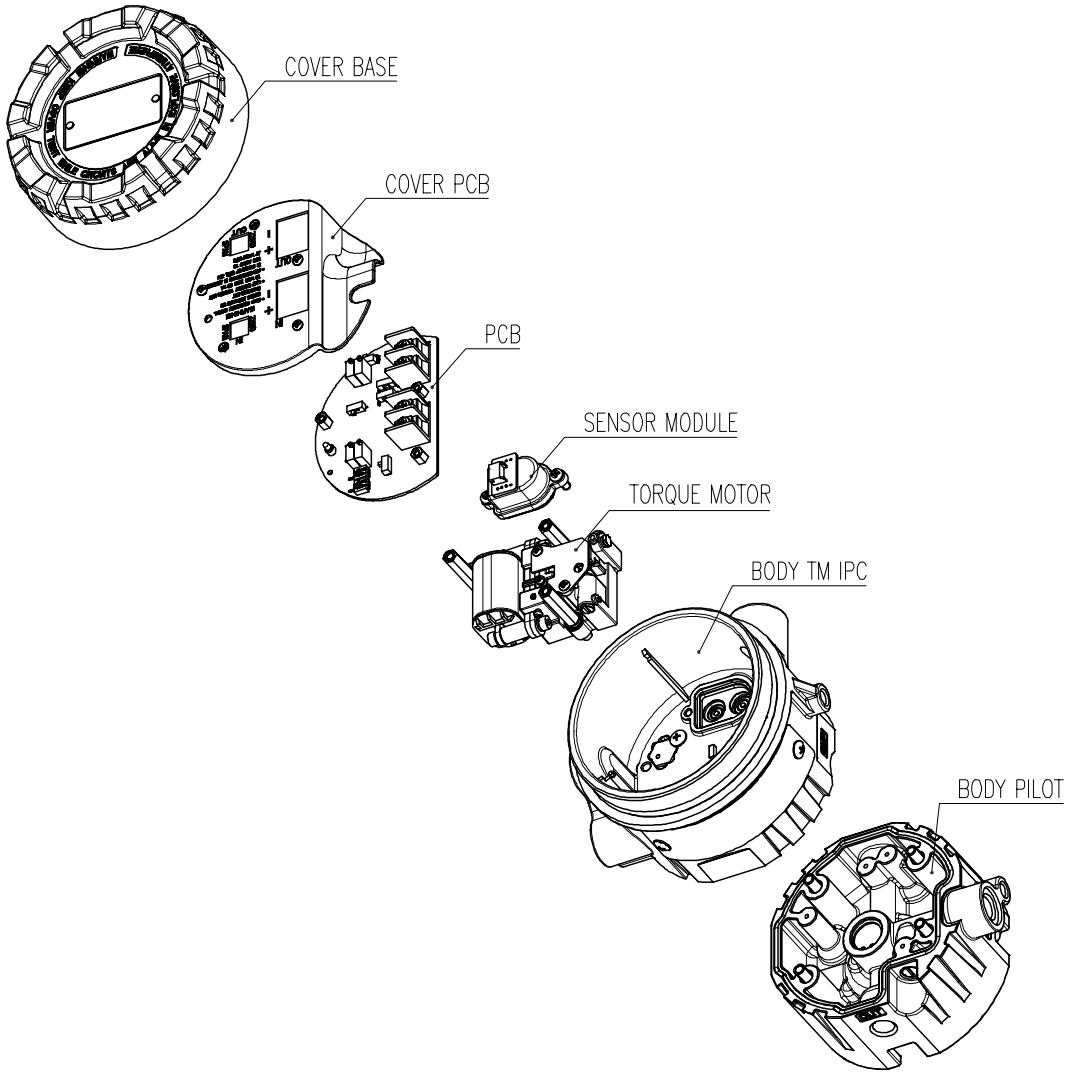

Fig. 2-1: Exploded view

As input signal is being supplied to YT-940, the pressure sensor which is being connected to output port, will sense the pressure level. The main PCB will compare the input signal and output pressure level and increase or decrease the electric current of torque motor.

2.8 Product Dimension

2.8.1 YT-940 series

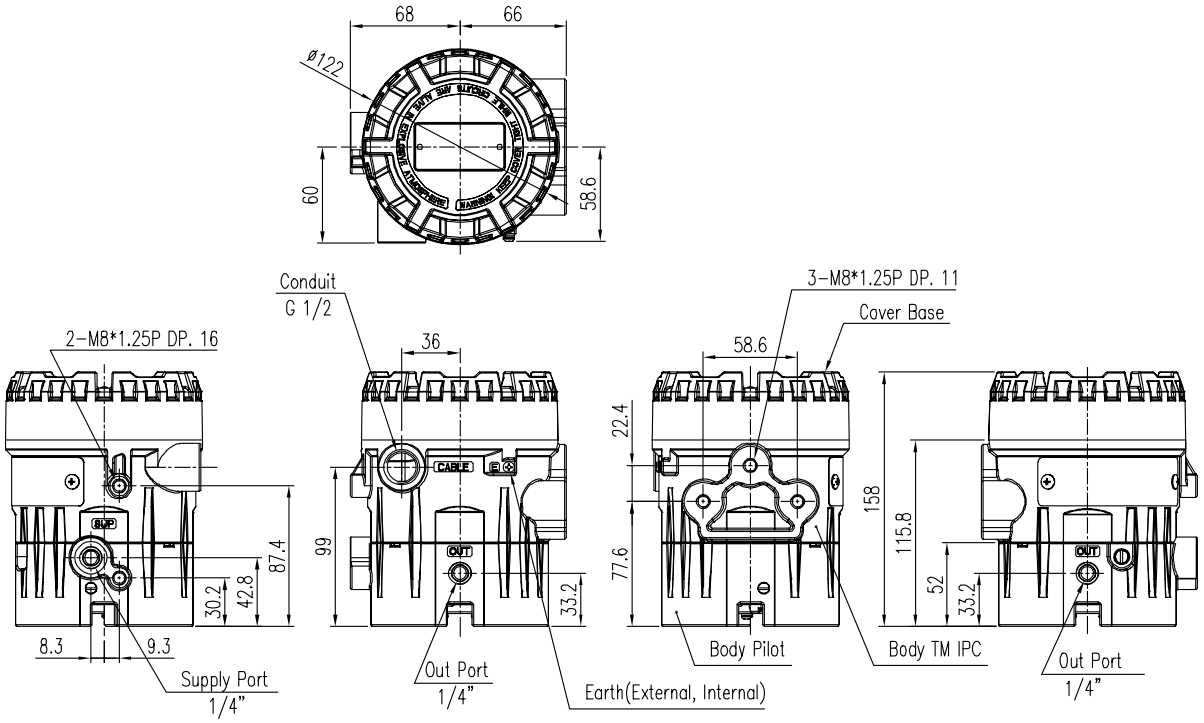

Fig. 2-2: YT-940

2.8.2 YT-940 + YT-200 AFR directly mounted + Pressure gauge

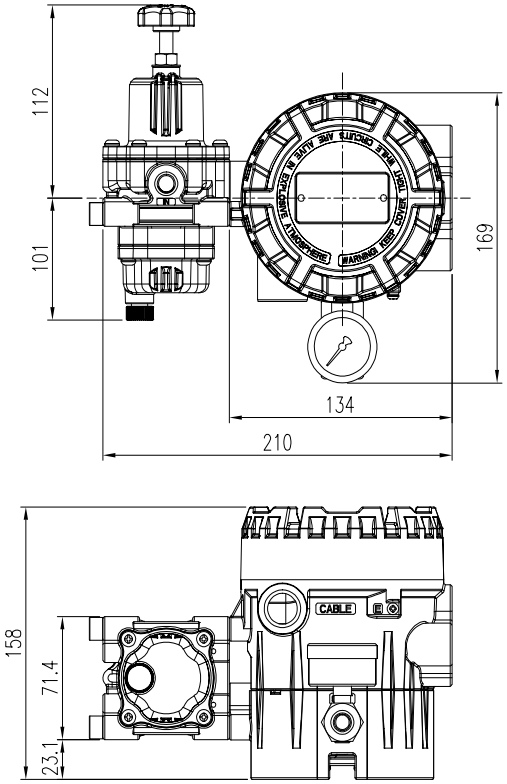

Fig. 2-3: YT-940 + Air filter regulator(YT-200) + Pressure gauge

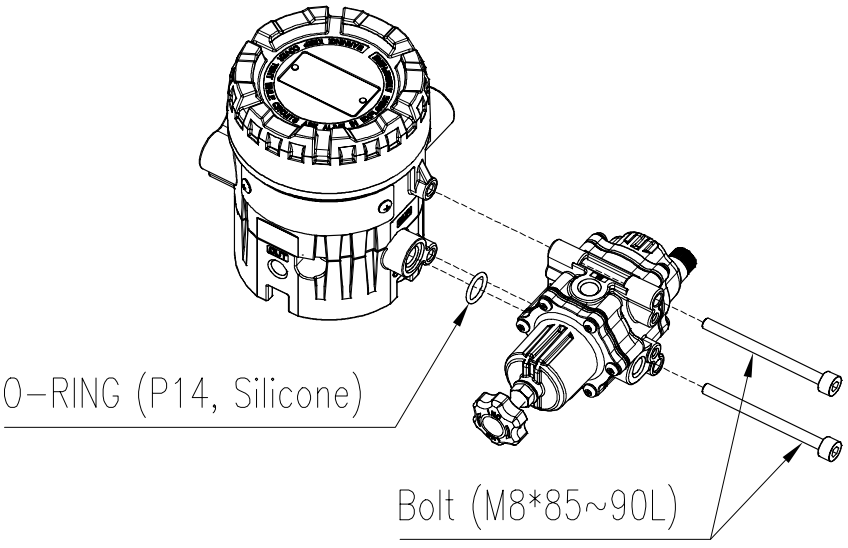

Fig. 2.4 Exploded view

3 Installation

3.1 Safety and Installation Tips

When installing the unit, please ensure to read and follow safety instructions.

- Any input or supply pressures to valve, actuator, and / or to other related devices must be turned off.
- Use bypass valve or other supportive equipment to avoid entire system “shut down”.
- In case of hazardous area, please ensure there is no explosion gas in the atmosphere.
- When installing the unit, please ensure the cover base is headed upward, so internal dew condensation can go out through the draining hole.

※ Installed in accordance with the National Electrical Code(NEC), ANSI/NFPA 70, or CEC Part 1 as applicable.(FM approved product)

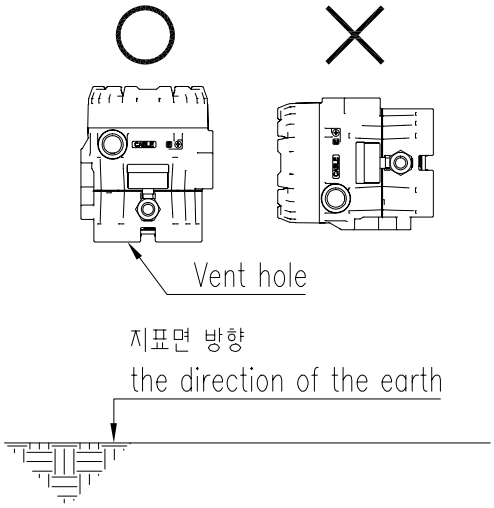

Fig. 3-1: Right installing direction of The product

4 Connection - Air

4.1 Safety

- Supply pressure should be clean and dry air – avoiding moisture, oil and dust.
- Always recommended to use air filter regulator (i.e. YT-200 series).
- Rotork YTC Limited **has not tested positioner's operation with any other gases other than clean air. Please contact Rotork YTC Limited for any questions.**

4.2 Supply Pressure Condition

- Dry air with dew point of at least 10 °C lower than ambient temperature.
- Avoid from dusty air. If require, we recommend to use air filter regulator which contains 5 micron or lower filter (YT-200)
- Avoid oil.
- Comply with ISO 8573-1 or ISA 7.0.01.
- Is designed to be used with the pressure below 0.24 MPa (2.4 bar).
- Set air filter regulator's pressure level 0.02 MPa (0.2 bar) higher than required max. output pressure.

4.3 Piping Condition

- Ensure inside of pipe is clean of obstructions.
- Do not use pipeline that is squeezed or shows any type of damages.
- Pipeline should have more than 6mm of inner diameter (10 mm outer diameter) to maintain flow rate.
- The length of pipeline system should not be extremely long. Longer pipeline system may affect flow rate due to the friction inside of the pipeline.

5 Connection – Power

5.1 Safety

- When installing in hazardous and explosive gas area, conduit tube or pressure-proof packing union must be used. The compound charging box should be the flameproof type and must be sealed completely.
- There is a conduit entry on the product. Conduit entry connection tap is G 1/2.
- Before connecting terminal, ensure that the power is off completely. **Do not open the cover when the power is still alive.**
- Please use ring terminal to protect against vibration or any other external impact.
- YT-940 should be grounded at outside of terminals or inside of the product.
- Please use twisted cable with conductor section are 1.25 mm^2 and that is suitable for 600 V (complying with the conductor table of NEC Article 310). The outer diameter of the cable should be between 6.35 to 10 mm. Use shield wire to protect against electro-magnetic field and noise.
- **DO NOT connect Voltage source (9 to 28 V DC) to Input (4-20 mA DC) terminal (IN+, IN-) as it will cause PCB failure.**
- Please do not install the cable near high noise equipment, such as high-capacity transformer or motor. Please use shielded cable if necessary.

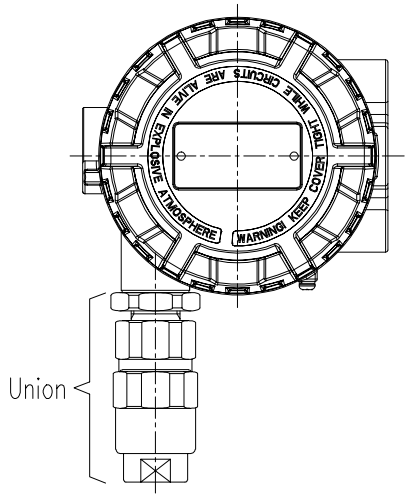

Fig. 5-1: Pressure-proof packing union

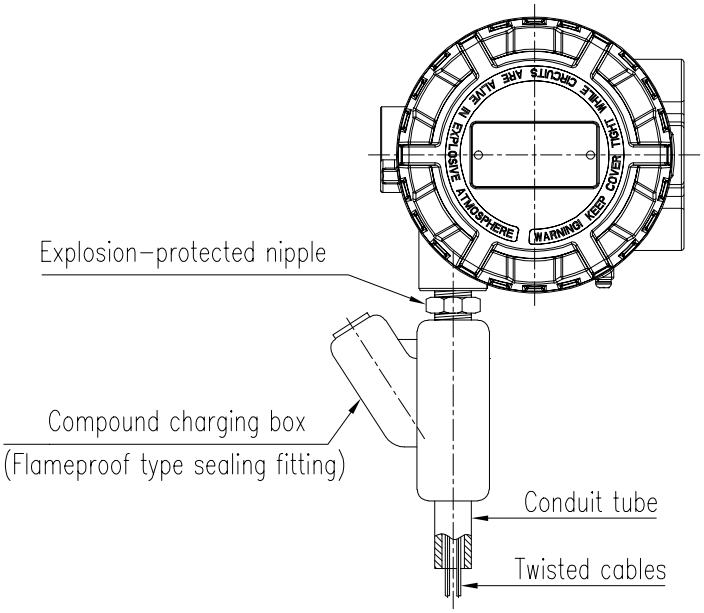

Fig. 5-2: Flame proof type compound charge box

5.2 Terminal Overview

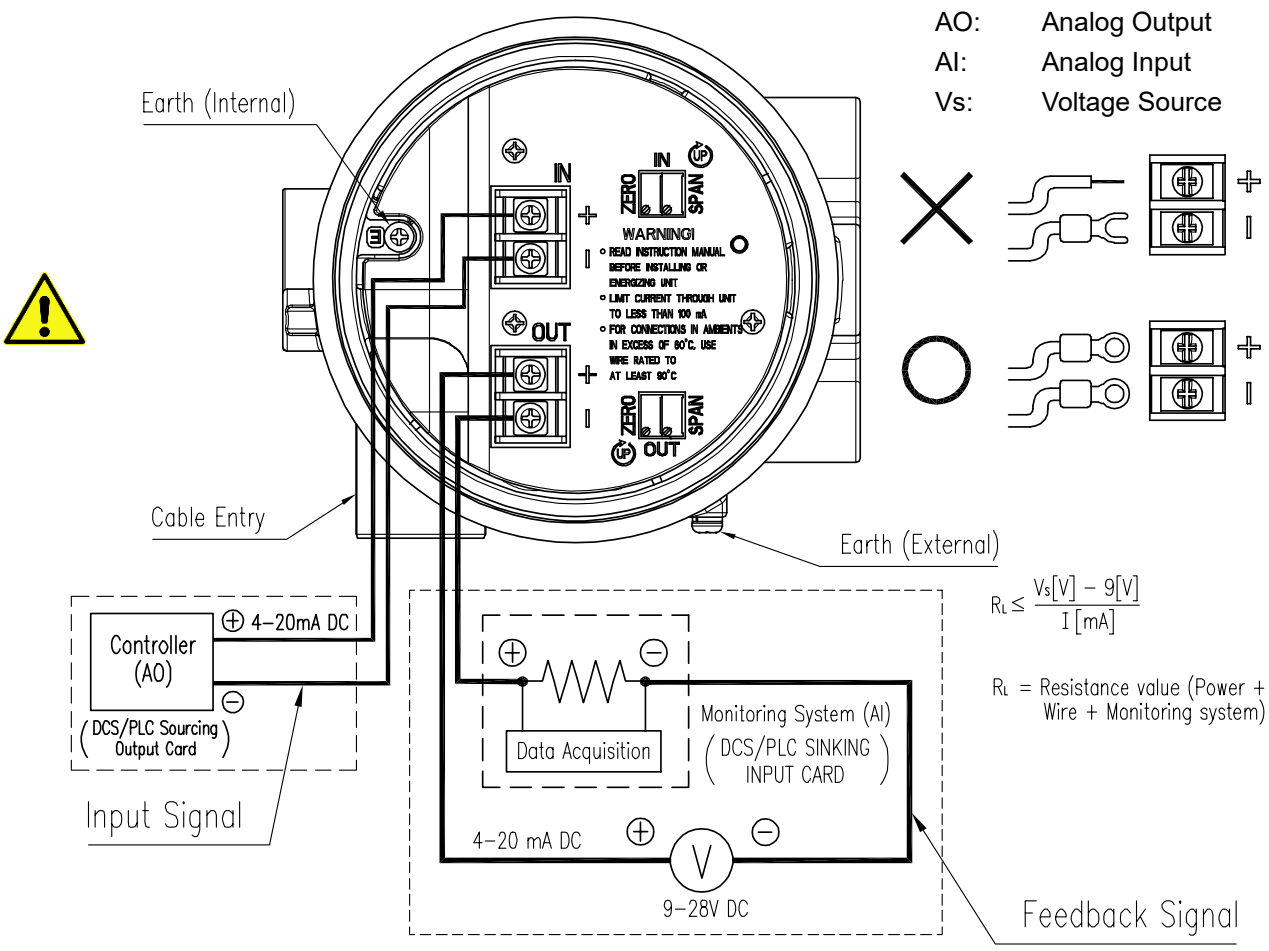

Fig. 5-3: Terminal Overview

5.2.1 Input Signal Terminal

1) Open cover base.
2) Please use appropriate union by considering the operating condition. Insert cable with using proper flameproof type packing union
3) Locate cable entry (G 1/2) of input signal on the left hand and bottom side of the product. Insert cables into the conduit entry and secure them with (+) and (-) terminals on the plate. Make sure to tighten bolts with 1.5 N · m (15 kgf · cm) torque. Please check the polarity of the terminals.
4) There are one terminal inside and one outside for grounding.
5) Ground resistance must be below 100 ohm.

6 Adjustments

Before our product is dispatched from our factory, input signal against supply pressure or supply pressure against input signal will be set correctly. But, if additional setting requires, please see below.

6.1 Zero and Span Adjustments of Output pressure

(Based on 4-20 mA / 0.02 to 0.1 MPa)

1) After wirings have been completed, please supply 4 mA as input signal to YT-940. Please check output pressure and adjust zero adjustment bolt by using small (-) screw driver. In general, zero should be set at 0.02 MPa.
2) Supply 20 mA. Please check output pressure and adjust span adjustment bolt to required end output. In general, span should be set at 0.1 MPa.
3) Supply 4 mA again. Please check the output pressure and repeat step 1 and 2 until required point have been set completely.
4) Close the cover base completely.

6.2 Zero and Span Adjustments of Analog Output

(Based on 4-20 mA / 0.02 to 0.1 MPa)

1) Analog output requires DC 9 to 28 V. Supply 4 mA. Please check if the output pressure is at zero point and receive analog output signal correctly. If not, adjust zero adjustment bolt by using small (-) screw driver until the receiving analog output signal is set as 4 mA.
2) Supply 20 mA. Please check if the output pressure is at end point and receive analog output signal correctly. If not, adjust span adjustment bolt by using small (-) screw driver until the receiving analog output is set as 20 mA.
3) Supply 4 mA again. Please check the analog output signal and repeat step 1 and 2 until required point have been set completely.
6) Close the cover base completely before using the product.

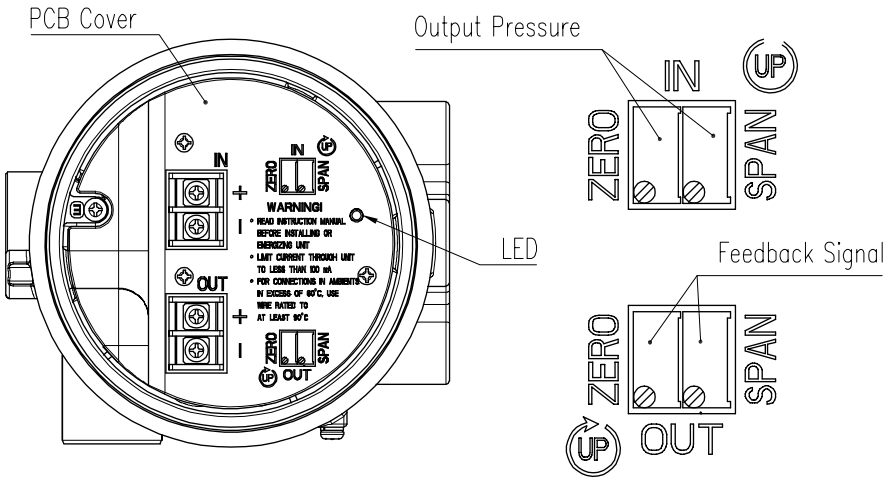

Fig. 6-1: Zero, Span

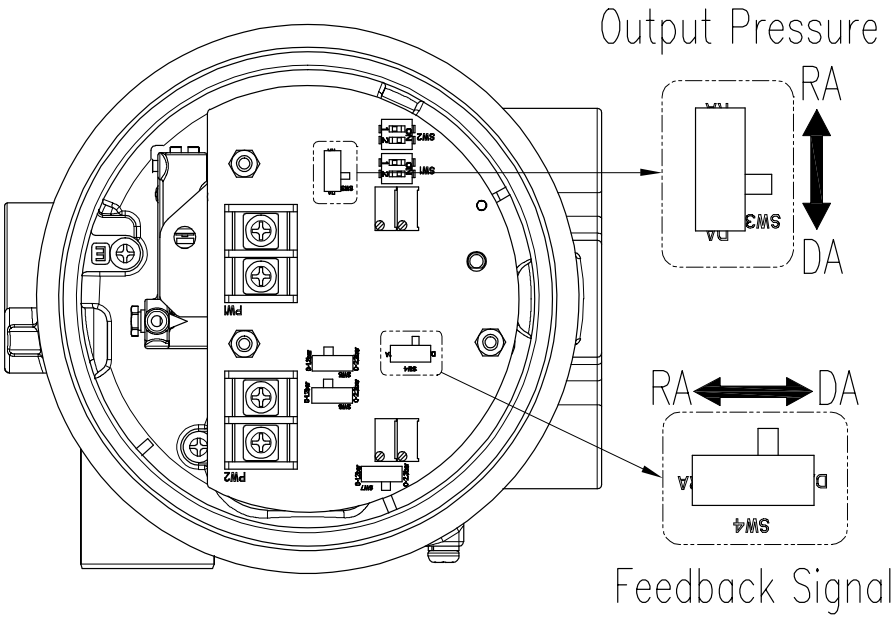

Fig. 6-2: DA, RA setting (without PCB cover)

6.3 DA and RA setting relative to the input signal

The above figure shows a PCB with plastic PCB cover removed. If the “Output Pressure” switch is switched to DA direction, the output pressure increases when the current increases. If it is switched to RA direction, the output pressure decreases when the current increases.

6.4 DA and RA setting relative to analog output (Only analog output option)

If the “Analog Output” switch is switched to DA direction, the analog output current increases when the output pressure increases. If it’s switched to RA direction, the analog output current decrease when the output pressure increase.

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