Resin Pressure Measuring System

CZ-100P *(Resin Pressure Sensor)*

PCT-300 *(Output Converter)*

Instruction Manual

IM100CZ04-E3

Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.

CONTENTS

SYMBOLS

WARNING : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

CAUTION : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

 : This mark indicates that all precautions should be taken for safe usage.

 : This mark indicates important information on installation, handling and operating procedures.

 : This mark indicates supplemental information on installation, handling and operating procedures.

 : This mark indicates where additional information may be located.

⚠ WARNING

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- To prevent instrument damage of failure, protect the power line and the input/output lines from high currents with a protection device such as fuse, circuit breaker, etc.
- For an instrument with 24 V power supply, supply power from a SELV circuit.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- The resin adhered to this instrument should be cleaned to dry cloth with a clean while the resin is still hardened, be careful of burns.
- Tools such as wire wheels or abrasive cloths should never be used to clean the process diaphragm.
- Do not apply impact to nor drop this product. If so, its damage or fault may result.
- As precise parts are incorporated, do not give any shock and handle carefully during transportation and installation. Take great care not to scratch the diaphragm.
- Do not wipe or rub the nameplate on the outer case of the resin pressure sensor with a cloth moistened with an organic solvent, or a glove. If so, the printed section may be erased.
- This product uses stainless steel, aluminum, and fluororesin (O-rings and leadwire covering materials). When disposing of each part used for this product, always follows the procedure for disposing of industrial wastes stipulated by the respective local community.
- If the output from the resin pressure sensor is found to be abnormal during the operation, immediately stop the operation and inspect for any distortion or damage of the diaphragm. If the diaphragm is damaged, the pressure of the measured media (e.g.resin) is applied to the inside of the resin pressure sensor. Continued use under such conditions may result in the damage of the screw which fixes the folder in the housing, and the folder in the housing may come off in the worst case.
- Do not use the pressure sensor in stead of a blind bolt.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

1. OUTLINE

1.1 Principle of Operation

When pressure is applied to a diaphragm in the resin pressure sensor (CZ-100P), force acts upon a pressure sensing element through a metal rod located near the diaphragm.

The pressure sensing element used in CZ-100P has 4 gauges adhered to a metallic elastic body and connected to Wheatstone bridge. Each strain gauge made of metal resistance foil with small temperature coefficient slightly changes its gauge resistance due to strain occurring by the application of force to the elastic body. In this case,

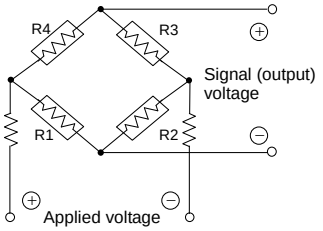


Fig. 1

as shown in the attached diagram (Fig. 1), the elastic body is in such construction that by the application of force stretching strain occurs in R1 and R3, while shrinking strain in R2 and R4 to increase the gauge resistances of R1 and R3 and to decrease those of R2 and R4. These resistance changes are detected as bridge voltage change to generate the output proportional to the force applied. The output thus generated is input to the PCT-300 output converter which can finally output the DC voltages of 0 to 10 V, 0 to 10 mV, 1 to 5 V and 4 to 20 mA from its output terminals via a 3-stage amplifier circuit.

1.2 Features

- The detection of strain caused by the deformation of an elastic metal body within its elasticity limit using the highly reliable strain gauge enables highly accurate pressure measurement.
- The dual construction of connecting pipe and pressure sensing element portions extremely lessens output indication change caused by external transient temperature change.
- Calibration normally performed to a strain gauge sensor becomes easy and accurate without monitoring the output due to the employment of the PCT-300 output converter.

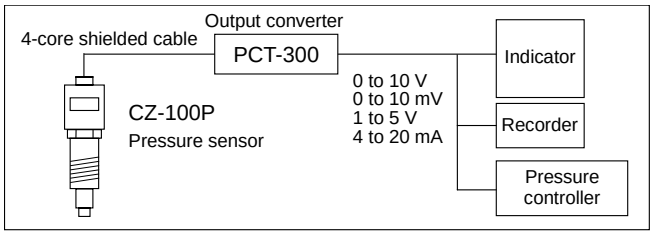


Fig. 2 Block diagram of resin pressure system

2. PRODUCT CHECK

Before using this product, check each of the following:

- Model code
- Check that all of the items delivered are complete.
- Check that there are no scratch or breakage in external appearance.

■ Resin pressure sensor

CZ-100P-□-□ □ □
(1) (2) (3) (4)

(1) Specification type

HB:	Fixed nut type	Standard	PF3/8	L = 150
HC:	Fixed nut type	Standard	PF3/8	L = 180
HZ:	Fixed nut type	Nonstandard size	PF3/8	
HL:	Loose nut type	Standard	PF3/4 (20 to 100 MPa)	
HLZ:	Loose nut type	Nonstandard size	PF3/4 (20 to 100 MPa)	
LL:	Loose nut type	Standard	PF3/4 (5 to 10 MPa)	
LLZ:	Loose nut type	Nonstandard size	PF3/4 (5 to 10 MPa)	
LLA:	Loose nut type	Standard	PF3/4 (0.5 to 1 MPa)	

(2) Diaphragm section material

S: SUS630 (Standard)
H: HASTELLOY C (Optional)

(3) Diaphragm surface treatment

N: Standard
K: CERAMIC Kanigin plate (Optional)

(4) Intrinsically safe

N: Standard (For non-explosionproof specification type)
G: Explosionproof specification type (For indoor use)
H: Explosionproof specification type (For outdoor use)

● Accessories

- Instruction Manual [IM100CZ04-E3]
- Copper Packing
  (Included in only the Loose nut type [thickness: t = 2 mm])

If any of the products are missing, damaged, or if your manual is incomplete, please contact RKC sales office or the agent.

● Blind bolt (Sold separately)

This is a bolt to be used to fill the hole on the machine from which a pressure sensor has been removed. If a blind bolt is necessary, please contact with our sales staff or the nearest distributor.

■ Output converter

PCT-300 □-□ □
(1) (2) (3)

(1) Intrinsically safe

N: Standard type (Non-explosionproof construction)
E: Intrinsically safe explosionproof construction pass type

(2) Number of outputs

2: For two output points (0 to 10 V DC, 0 to 10 mV DC)
3: For three output points
(0 to 10 V DC, 0 to 10 mV DC, 1 to 5 V DC)
4: For four output points
(0 to 10 V DC, 0 to 10 mV DC, 1 to 5 V DC, 4 to 20 mA DC)

(3) Optional function

N: None
G: With gain selector switch
L: With linearizing function
(Linearity error for using this product with the CZ-100P becomes within ±0.5 % of span)

■ Sensor connection cable (Sold separately)

W-AB-N□*-PA-5000: Standard (For non–intrinsic safety) [Cable length: 5 m]
W-AB-Y□*-PB-5000: Intrinsically safety (Hazardous side) [Cable length: 5 m]
W-AB-N□*-BA-1000: Non-intrinsic safety (Non-hazardous side) [Cable length: 1 m]

*□: Cable cover type
(G: Heat-resistant glass coated cable, V: Vinyl coated cable, S: Silicon coated cable)

3. HANDLING OF THE PRESSURE SENSOR

3.1 Caution in Mounting Pressure Sensors

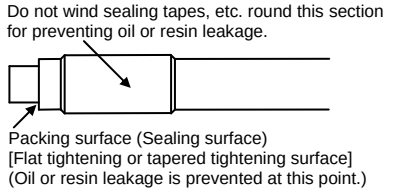
■ Mounting environment

- Ensure that no cooling pipes directly contact the pressure sensor or connector, since the pressure reading accuracy may be affected or the connector may be damaged.
- Do not locate any heat source near the pressure sensor or directly expose it to heat. Otherwise, high-temperature deterioration of the sensor block may occur. If the temperature could rise in the strain gauge block located within the housing, cover possible heat sources with insulation materials.

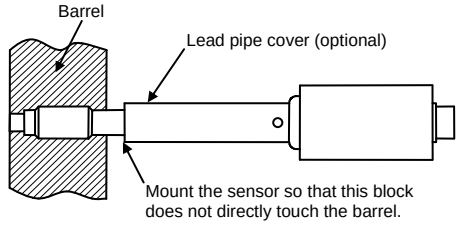
- Do not use the pressure sensor under any of the following environmental conditions:
  - Where the sensor is exposed directly to cold air, warm air or hot air.
  - Where temperature variations are large.
  - Where the sensor is exposed to direct sunlight.
  - Where the sensor is directly splashed with water or rain, or the humidity is high.
- Do not bring magnetic devices such as magnetic relays, etc. near the pressure indicator. Also, keep power lines from the resin pressure sensor cable.
- If the pressure sensor is used for screen changer operation, it may suffer an impact during screen changer operation, causing sensor troubles. In such a case, carefully consider the position and direction when installing the sensor.

■ Mounting pressure sensors

- When the diaphragm at the end of CZ-100P and its surroundings completely touch with its mounting hole, large indication error may occur. In this case, temperature may exert a large influence especially upon the zero point. Therefore, much attention should be paid when a mounting hole is drilled.



- When using a lead pipe cover (optional), pay attention that the lead pipe cover end does not directly touch the barrel. (Refer to the "**■ Exposed length at the bottom of the sensor outer case**")



- Prior to mounting the pressure sensor, check the appearance of the diaphragm. If the diaphragm has a deformed or abnormal end, it needs to be repaired or re-calibrated. As there is a case where the diaphragm is already deformed by the application of overload when used previously, carefully check its condition before the pressure sensor is re-used.

■ Mounting hole

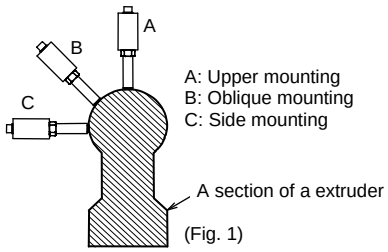
- When mounting the pressure sensor, check its mounting hole dimensions. (Do not overtighten its screw.)
- If resin or its carbide still remains in the mounting hole, this may damage the pressure sensor. Therefore, prior to mounting the sensor, always remove any residue from the mounting hole.
- Check that the diaphragm surface does not protrude from the inner wall of the barrel, since this may score the diaphragm surface with the screw, etc. If necessary, adjust the position between the diaphragm surface and the inner wall of the barrel using stainless steel packings, etc.
- For the loose nut type, resin leakage may occur more easily than the fixed nut type, as the pressure sealing surface becomes wider. If any resin leaks through the mounting gap of the sensor, use copper packings (thickness: t = 2 mm) or aluminum packings (thickness: t = 2 mm) by taking into account the position between the diaphragm surface and the inner wall of the barrel. (Copper Packing: Included in only the Loose nut type)

■ Mounting direction

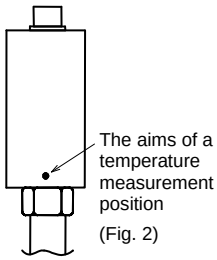
- If the sensor is installed in the upright direction (Fig.1-A), it may be affected directly by heat flow from heater or heat source (rising current of heated air). In such a case, the temperature of the strain gauge in the sensor may exceed an allowable maximum temperature of 150 °C. In order not to exceed this limit temperature, it is necessary to keep the sensor outer cylinder surface at a temperature of less than 134 °C (Fig.2). Conduct the following treatments.

  1. In order to avoid heat flow, wind a heat insulating material round such a heat source (heater, etc.).

  2. Further extend the length of the exposed lead pipe.
- In order to keep the specified sensor performance longer, it is recommended that the sensor outer cylinder surface temperature be keep at less than 134 °C.
- When the sensor is installed in the upright position, thermal effects on the sensor may not sufficiently lessen even if the length of the exposed lead pipe is further extended. In this case, take measures of *1*.
- The effect of heat flow lessens as the installing direction of the sensor changes from the slanting direction (Fig.1-B) to the horizontal direction (Fig.1-C) in this order. In this case, take measures of *1* and *2* if necessary by checking the sensor outer cylinder surface temperature. (To the relevant manufacturer: It is recommended that the sensor be installed in the horizontal or slanting direction in order to lessen the effect of heat on the strain gauge.)



(Fig. 1)



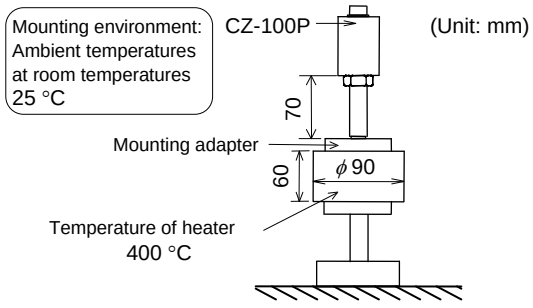
(Fig. 2)

■ Exposed length at the bottom of the sensor outer case

- Cases where the temperature of the strain gauge in the sensor become less than 150 °C is as follows:
  - The effect of heat flow is small.
  - The sensor is installed in the upright position.
  - The diaphragm is at a temperature of 400 °C.
  - The length of the exposed sensor outer cylinder is more than 70 mm. (Refer to below)

  However, as the effect of heat flow from an actual extruder is serious, if there is no enough exposed section below the sensor outer cylinder even at a diaphragm temperature of less than 200 °C, the operating temperature of the sensor strain gauge may exceed its limit. Therefore, check the temperature environment where the sensor is installed (by indirectly checking the temperature of the sensor outer cylinder surface), and take necessary measures to lessen the temperature of the sensor strain gauge by using a heat insulating material, if necessary.

If the temperature of the sensor outer cylinder surface exceeds 160 °C, the outer cylinder surface changes its color from black to dark brown and then brown in this order. If it exceeds 180 °C, the color may change to silver.



- A lead pipe cover (optional) is mainly for protecting the exposed section below the sensor outer cylinder from being exposed to cold wind. Therefore, do not install the sensor such that it is embedded in the heat source (such as in the barrel or heater) together with the lead pipe cover. This may heighten thermal conductivity from the heat source, resulting in a temperature increase in the sensor strain gauge.

3.2 Caution in Removing Pressure Sensors

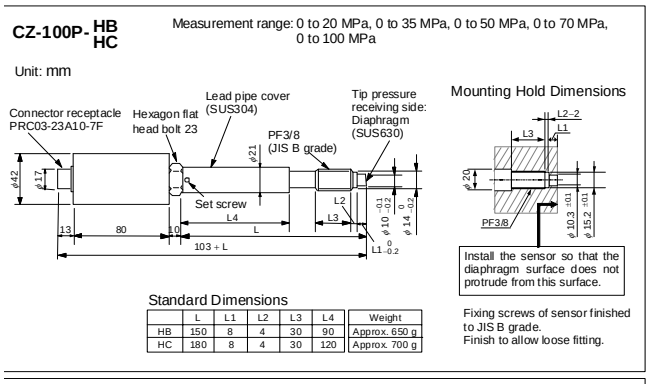
- **Always remove the sensor while resin is being melted**, since the diaphragm of the sensor may be damaged if the sensor is removed after the resin has hardened. If the sensor is re-mounted under this condition the repeatability may deteriorate.
- When removing the pressure sensor, remove it under the same temperature as that during installation. Removing the pressure sensor under the different temperature as that during installation cause irregular engagement of the thread.
- If resin flows into the gap between the lead pipe and the mounting hole, it may be impossible to remove the sensor even with the threads completely disengaged. In this case, if the sensor is forcibly removed using a puller, the sensor may be knocked when removed, damaging the diaphragm and reducing the accuracy. Slowly remove the sensor without knocking it.
- Remove the resin attached to the pressure sensing part (diaphragm and its surrounding section) after melting it by applying light heat to the side of the pressure sensing part using a burner (Do not let the temperature exceed 400 °C). In addition, care should be taken not to scratch the pressure sensing block.
  If not, diaphragm damage or resin leakage may result.

3.3 Cautions during Extruder Cooling Down

If the temperature is decreased while resin remains in the extruder with the pressure sensor installed, the diaphragm may be depressed and deformed by resin contraction, etc. As a result, a measurement error or pressure dead-band may occur. If the extruder is cooled down, completely remove all the resin remaining in the barrel, or remove the sensor. Especially take care for the low pressure sensor, as this effect becomes serious.

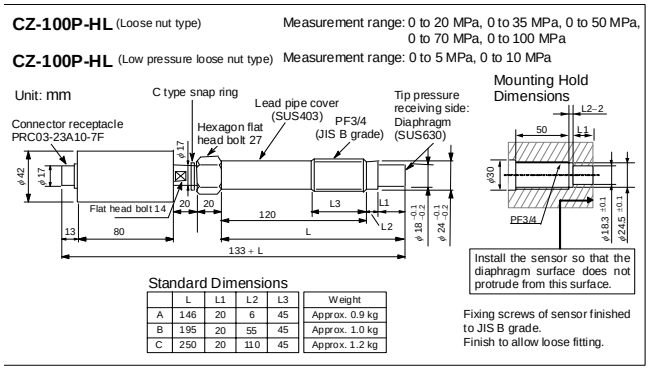
3.4 Dimensions

■ Resin pressure sensor (CZ-100P)



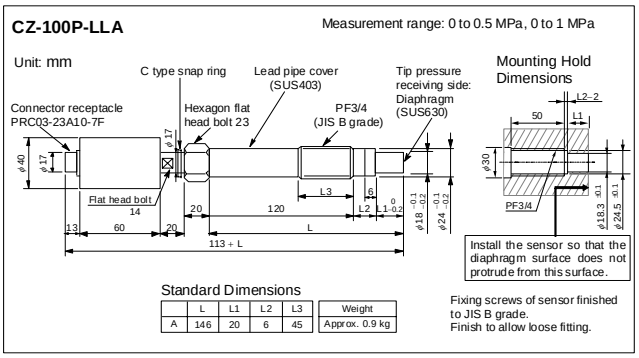
Standard Dimensions

	L	L1	L2	L3	L4	Weight
HB	150	8	4	30	90	Approx. 650 g
HC	180	8	4	30	120	Approx. 700 g



Standard Dimensions

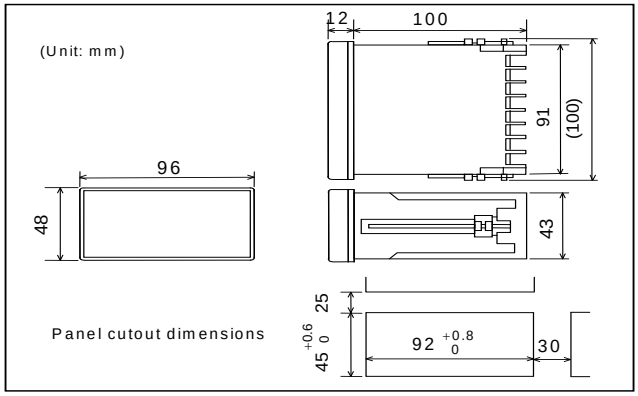
	L	L1	L2	L3	Weight
A	146	20	6	45	Approx. 0.9 kg
B	195	20	55	45	Approx. 1.0 kg
C	250	20	110	45	Approx. 1.2 kg



Standard Dimensions

	L	L1	L2	L3	Weight
A	146	20	6	45	Approx. 0.9 kg

■ Output converter (PCT-300)



3.5 Pressure Sensor Installation

1. Make sure the mounting hole is correctly machined. If installing the pressure sensor into a previously used hole, make sure the hole is thoroughly cleaned to remove any plastic residue.
2. Lubricate the threads with a high temperature anti-seize lubricant.
3. Tighten the hexagon nut part with a torque wrench. When tightening the pressure sensor, always tighten only the hexagon nut part.
   - Fixed nut type (PF3/8 thread: HB, HC type): 30.0 N·m [300 kgf·cm]
   - Loose nut type (PF3/4 thread: LL, HL, LLA type): 60.0 N·m [600 kgf·cm]
   - Fixed nut type (Unified thread: UB, UC type): 30.0 N·m [300 kgf·cm]

Tighten the pressure sensor to secure it after the temperature rises.

Do not tighten any block other than the hexagonal nuts, since this may damage the pressure sensor.

4. WIRING

4.1 Wiring Precaution

- The CZ-100P (sensor) connect to the PCT-300 (output converter) using the 4-conductor shielded cable attached.
- The rated output of the CZ-100P (mV/V: Described on the nameplate adhered) is obtained when standard cable length is 5 m. If cable length is extended beyond the above figure, correct the rated output in accordance with the following equation.

Equation:

$$e1 = e2\,(1 + K \cdot l) \longrightarrow e2 = \frac{e1}{1 + K \cdot l}$$

e1: Rated output in standard cable length of 5 m (mV/V : Described on the nameplate adhered)
e2: Rated output after cable extension
K: Correction factor* 1.96×10^{-4}/m
[Non-explosionproof specification type]
* When 0.5 mm^2 × 4-core shielded cable (standard cable) or same as standard cable is used.)
l: Extended cable length (m)

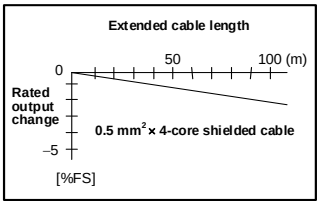


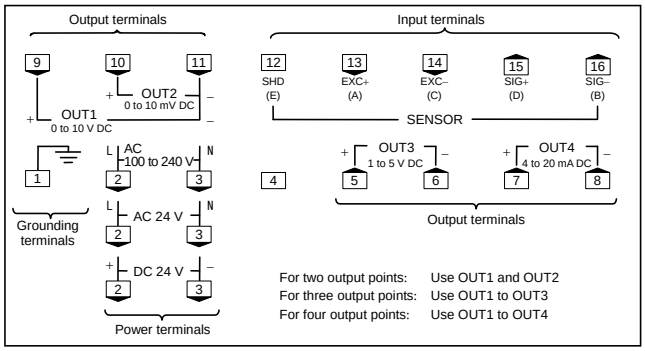
Figure: Rated output change with cable extended

For the explosionproof specification type, the K value becomes "1.40×10^{-4} /m."

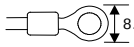
- If the pressure sensor is used together with the output converter (Model PCT-300), always connect a grounding wire to the equipment side. (Ground the grounding terminal.)
- Connect a grounding wire to the extruder.
- For a heat-resistant glass covered cable, the cover is made of fibers. Therefore, the electrical insulation may deteriorate if the cable is exposed to high humidity or conductive liquid (water, etc.) and cause a pressure indication error. For this reason, avoid underground wiring or wiring within electric conduits passing through humid areas as much as possible.

4.2 Wiring Method

■ Terminal configuration figure of output converter (PCT-300)

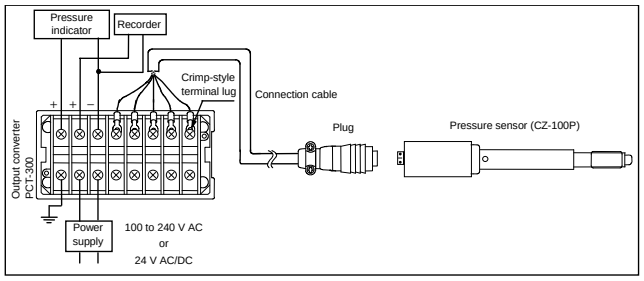


Do not excessively tighten the terminal screws. In addition, use the solderless terminal appropriate to the screw size (M3).



Recommended tightening torque:
0.4 N·m [4 kgf·cm]
Max. 1.0 N·m [10 kgf·cm]

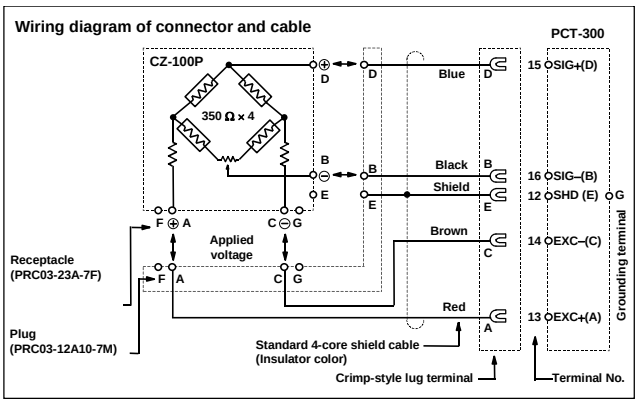
■ Wiring



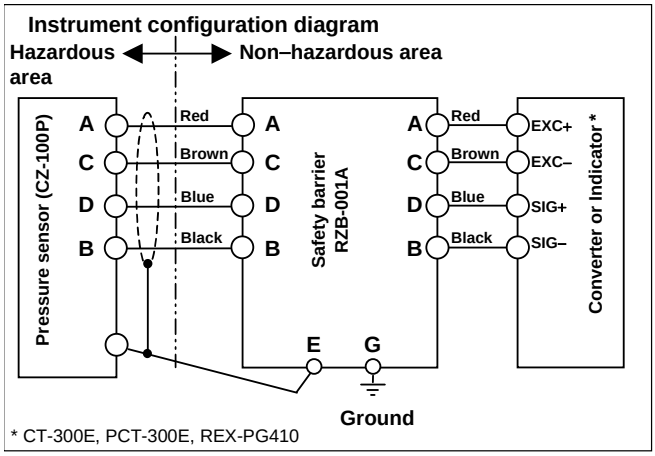
Do not place magnet relays or any other equipment which causes magnetic disturbance near the output converter. Install the power cable away from the 4-core shielded cable.

When connecting the sensor to a pressure indicator or recorder, check its polarity and output signal.

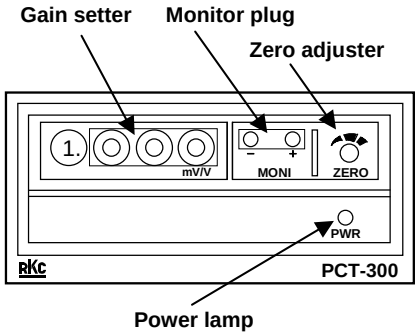
NDI standardized connector (plug, receptacle and jack) is used.



■ Wiring example of explosionproof specification sensor



5. ADJUSTMENT



■ Adjustment procedures

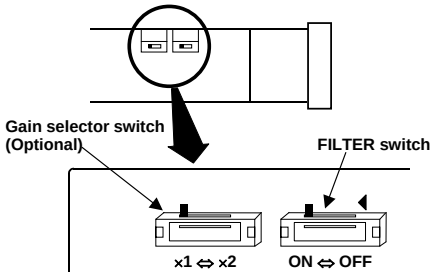
1. Check the rated output (mV/V) described on the nameplated of the CZ-100P (This output should be corrected when the cable is extended.) and then set that value on the rotary switch which is gain setter of the PCT-300.

2. The pressure reading zero point is adjusted by the zero adjuster in PCT-300. Perform this zero adjustment after the position installed with CZ-100P on the extruder reaches the desired temperature and is in the steady state after the lapse of a certain time. If an indicator is not available, adjust the zero point on the monitoring terminals using a circuit tester. In addition, perform the above adjustment after warming up for 20 minutes or more with the power switch of PCT-300 turned ON (power lamp lights) after wiring has been finished.

When the gain setter and zero adjuster are set using small screwdriver.

When the sensor is provided with the gain selection function (optional), the output value is doubled if the function is set to "×2," which is effective for increasing the reading at low-pressure. The valid range is within the output range of PCT-300, which corresponds to half of full-scale pressure.

Turn the FILTER switch to the OFF side (100 Hz, –3 dB) when quick response is required. The FILTER switch is turned to the ON side (10 Hz, –3 dB) prior to shipment.



6. LINEARIZING FUNCTION SETTING

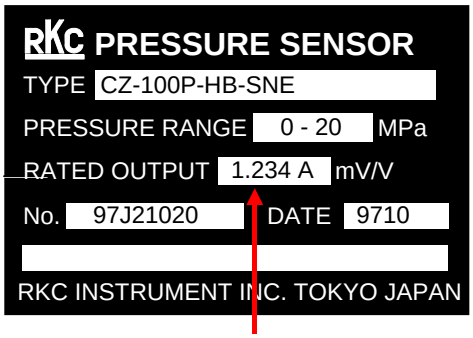
WARNING

- To prevent electric shock and instrument failure, always turn off the power supply before pulling out the internal chassis.
- To prevent injury or instrument failure, do not touch the internal printed circuit board.

■ Linearizing switch changing

1. First check the output characteristic type (A, N or B) engraved at the end of the figure showing the rated output value on the rating nameplate attached to the outer chamber of the pressure sensor.

Example: Rating nameplate

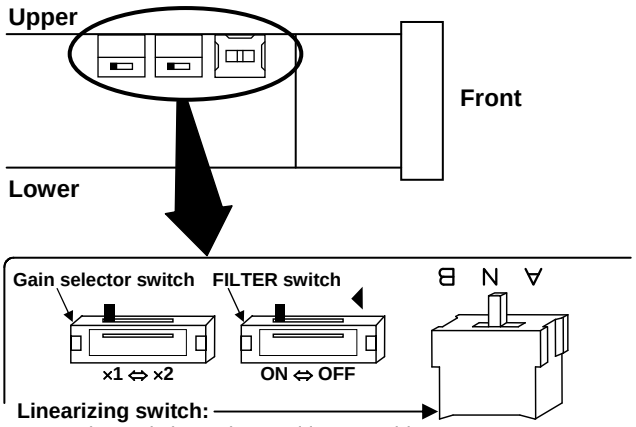


A, N or B is engraved in this section.
For products other than corresponding to the linearizing function, the output characteristic type (A, N or B) is not engraved in this section.

2. Next, check that the power to the PCT-300 output converter is turned off, then remove the internal assembly from the case.

3. Set the linearizing switch on the side of the internal assembly of the PCT-300 to the position matching the output characteristic type of the pressure sensor to be connected.

Internal assembly of PCT-300



Set the switch to the position matching the output characteristic type of the pressure sensor.

The gain selector switch or linearizing switch is optional.
The figure on the left side shows all the optional switches to simplify the explanation.

4. House the internal assembly in the case. This completes the setting.

7. TROUBLES AND CAUSE

Problem	Possible cause
Indication pointer completely defects to the left or right.	• No indicator input circuit connected. • No 4-conductor shielded cable connected. • The defective connector used (standard or water resistant connector).
Digital display over-scale or underscale.	• Wires disconnected or shorted. • No internal sensor wiring connected. • The fiberglass coated cable immersed into water or exposed to high temperature, resulting in deteriorated insulation resistance. • No rated output set to the PCT-300 (different gain). • The double gain selector switch turned ON. • The strain gauge deteriorated due to exposure to high temperature. • No zero adjuster adjusted.
No pressure is indicated under pressurized condition.	• Irregularly tapped hole for installing the CZ-100P. (The sensor tip strongly contacting with the tapped hole.) • The diaphragm deteriorated, deformed or damaged. * • Mechanical Lead pipe deformation by external force.
Pointer or indication fluctuates during relay actuation.	• No measures for relay spark killing taken. • No 4-conductor cable shield perfectly wired or grounded. • The PCT-300 located near magnetically operated relays.
Pressure indication is fluctuated.	• Value different from the sensor rated output set to the rated output setter for the PCT-300. • The diaphragm deteriorated, deformed or damaged. * • The sensor exposed to hot or cold wind. • Some potential against the earth generated (2-point grounding, etc.).
Normal operation was performed, but no reading was received after a while or the reading varied and was unstable.	• Imperfect connecter contact. • The lead pipe deformed by external force. • The diaphragm deteriorated, deformed or damaged. * • The fiberglass coated cable immersed into water or exposed to high temperature, resulting in deteriorated insulation resistance. • The sensor exposed to hot or cold wind. • The extruder now in unstable operation or temperature rise.
Indication fluctuates from the beginning.	• The sensor tip forcibly tightened due to the small tapped hole. • The lead pipe cover contacting with the barrel, etc.
Resin leakage.	• The sealed surface deformed or scratched. • Foreign material (carbide, etc.) attached on the sealed surface. • Low sealed surface accuracy (parallelism, axis, etc.). • No screw threaded down to the extreme end. • Tightened at less than appropriate torque or not tightened.
No threads regularly engaged (no screw removed).	• No screw threaded down to the extreme end. • Not threaded as conforming to the standard. • The screw with burrs used. • Tightened at excessive torque. • Tightened at temperature different from the initial tightening temperature. • Foreign material attached on the threaded section, or stained.

For taking measures, also refer to "**4. HANDLING OF THE PRESSURE SENSOR**." The converter is described on a basis of the PCT-300. The operation of the PG-410 may differ from that of the PCT-300 described here.

☞ For the cause of diaphragm deterioration, deformation or damage, refer to the following "*** Main causes**."

Continued on the next page.

*** Main causes:**

These causes may arise independently or in mutual relations.

• Generative cause in operation

Overpressure	Load pressure exceeding its limit applied.
Irregular thread engagement	The metal pressure sensing surface mechanically scratched or chipped off.
Metal fatigue	The metal sensing surface fatigued by the application of changing or repeating pressure.
Corrosion	The pressure sensing surface corroded due to its contact with corroding material.
Abrasion	The pressure sensing surface worn away due to the mixture of fillers, etc.
Shrinkage	The pressure sensing surface deformed due to the shrinkage of resin adhered to its surface as a result of extruder cooling down.
Separation	The pressure sensing surface deformed or damaged by resin adhered to its surface due to the removal of the sensor while the resin is not yet melted or its melted condition is imperfect.
Protrusion	The pressure sensing surface deformed or damaged due to the protrusion of the push rod from the lead pipe as a result of an external force applied by the screen changer, etc.
Contact	The pressure sensing surface deformed due to the forced contact of the sensor outer side with the hole inner surface as a result of the finish of the hole inner surface.

• Generative cause in mounting and removing

Impact	The pressure sensing surface deformed due to its strong strike with solid material.
Dropping	The pressure sensing surface or its circumference scratched or deformed due to sensor dropping.
Handling	After the resin attached to the sensor tip is heated by a gas burner, etc. for its removal at the time of inspection, the pressure sensing surface scratched with a metal brush, etc.
Excessive tightening	The diaphragm deformed or damaged as the push rod pushes the diaphragm from the inside as a result of the deformation of the sensor flange by excessive tightening torque.

8. EXPLANATION OF EACH TERMS

Term	Explanation
Rated pressure	The maximum pressure which satisfies the specification. There are stipulated pressure ranges.
Rated output	Value obtained by subtracting the output at no-load from that at the rated pressure load. Electrically, it is output voltage per Volt in DC (mV/V) obtained through the bridge circuit when rated pressure is applied. At an application voltage of 10 V from the converter, a voltage of mV × 10 is output.
Accuracy	The maximum error including linearity and hysteresis.
Linearity	The maximum error from a reference line (straight line without error) when pressure-loaded in the pressure rise direction continuously from no-load to the rated pressure.
Hysteresis	The maximum difference between pressures at the same point in the rise and fall directions when the same pressure is loaded.
Repeatability	The difference between measured values obtained each time when pressure-loaded three times repeatedly from no-load to the rated pressure within a short period of time*.
Temperature effect on zero point	Zero-point output variation when the diaphragm temperature changes by 10 °C.
Temperature effect on output (sensitivity)	Output sensitivity (span) variation when the diaphragm temperature changes by 10 °C.
Allowable overpressure	The high limit of overpressure within a short period of time* at which the accuracy can be guaranteed even after the pressure returns to the rated pressure when overpressure-loaded.
Limit overpressure	The high limit of overpressure within a short period of time* at which no diaphragm is damaged when overpressure-loaded. However, no accuracy is guaranteed after the pressure returns to the rated pressure.

* Short period of time: From several seconds to several minutes.

9. SPECIFICATIONS

9.1 Resin Pressure Sensor (CZ-100P)

• Specification

Sensing block construction:
4-side adhesion-type strain gauge, wheatstone bridge

Rated pressure:
Fixed nut type: 20 MPa, 35 MPa, 50 MPa, 70 MPa, 100 MPa
Loose nut type (LL type): 5 MPa, 10 MPa
Loose nut type (HL type): 20 MPa, 35 MPa, 50 MPa, 70 MPa, 100 MPa
Loose nut type (LLA type): 0.5 MPa *, 1 MPa
* However, this range can be used when combined with the CT−300 (the ZK−872 specification) or REX−PG410

Rated output
[Calibration temperature: At diaphragm temperature of 150 °C]**:**
1.2 to 1.8 mV/V
1.0 to 1.6 mV/V (For the LLA type “0 to 1 MPa” range)
0.5 to 0.8 mV/V* (For the LLA type “0 to 0.5 MPa” range)
* When using the CT-300 ZK-872

The output of each sensor becomes a specific value within the range of 1.2 to 1.8 mV/V.

Bridge impressed voltage:
10 V DC (When using PCT−300, or CT−300)
7.7 V DC (When using the REX−PG410)

Accuracy [At diaphragm temperature of 150 °C]:
SUS630 diaphragm specification type:
± 1.0 % of span (the range of 70 MPa or less),
± 2.0 % of span (the range of more than 70 MPa)
HASTELLOY C diaphragm specification type:
± 1.0 % of span (the range of 50 MPa or less),
± 2.0 % of span (the range of more than 50 MPa)

Linearity [At diaphragm temperature of 150 °C]:
Same as **Accuracy**

Hysteresis [At diaphragm temperature of 150 °C]:
SUS630 diaphragm specification type:
± 1.0 % of span (the range of 70 MPa or less),
± 2.0 % of span (the range of more than 70 MPa)
± 0.2 % of span (LLA type)
HASTELLOY C diaphragm specification type:
± 1.0 % of span (the range of 50 MPa or less)
± 2.0 % of span (the range of more than 50 MPa)

Repeatability [At diaphragm temperature of 150 °C]:
SUS630 diaphragm specification type: ± 0.2 % of span
HASTELLOY C diaphragm specification type: ± 0.4 % of span

Zero balance:
± 0.6 mV/V (± 40 % of span)

Bridge resistance:
Input side*: 374 ± 10 Ω, Output side: 350 ± 5 Ω
* As the input side of bridge resistance, the 350 ± 5 Ω type is also available. This type is interchangeable with the 374 ± 10 Ω type.

• Temperature characteristics

Maximum diaphragm:
400 °C

Maximum strain gauge temperature:
150 °C

When the temperature at the bottom of outer tube (nut side) is more than 134 °C, the temperature at the strain gauge exceed 150 °C.*

* If the temperature at the strain gauge exceed 150 °C, the performance cannot be assured. Therefore, cover the heat source with a heat insulating material so that the above temperature does not exceed 150 °C.
The temperature at the strain gauge can be expected not to rise when:
• the long type of sensor is used or
• the sensor is installed aslant or transversely.
If any of the above measures can be taken, take it.

Zero shift due to temperature change:
SUS630 diaphragm specification type
[As to diaphragm temperature]:
0.2 % of span/10 °C
HASTELLOY C diaphragm specification type
[As to diaphragm temperature]:
0.3 % of span/10 °C
(0.5 MPa: 0.4 % of span/10 °C)

Output (sensitivity) shift due to temperature change:
Same as **Zero shift due to temperature change**

• Mechanical characteristics

Allowable over pressure: 120 % of span
(LLA type 0.5 MPa: 1000 % of span, LLA type 1 MPa: 500 % of span)

Limited over pressure: 150 % of span
(LLA type 0.5 MPa: 2000 % of span, LLA type 1 MPa: 1000 % of span)

Diaphragm material:
SUS630 (Standard), HASTELLOY C (Optional)

Diaphragm surface treatment:
Non surface treatment (Standard),
CERAMIC Kanigin plate (Optional)

Fixing screw section material:
SUS403

Lead pipe cover material:
SUS304 (Fixed nut type only)

Recommended tightening torque:
30 N·m (300 kgf·cm) [Fixed nut type, PF3/8]
60 N·m (600 kgf·cm) [Loose nut type, PF3/4]

9.2 Output Converter (PCT-300)

• Input

Input sensor:
Strain gauge type sensor
[Resin pressure sensor (CZ-100P: RKC product)]

Input range:
Standard specification:
0 to 19.99 mV (Excluding bias portion that allows zero adjustment)
Explosion-proof construction specification:
0 to 11.6 mV (Excluding bias portion that allows zero adjustment)

Input impedance:
1 MΩ or more

Action at input break:
Upscale (The sensor power supply break is the same)

• Sensor power supply

Applied voltage:
Standard specification: 10 V DC (Normal current 28 mA)
Explosion-proof construction specification:
8.2 V DC (Normal current 16 mA)

Accuracy:
Within +0.1 %, –0.4 %

Temperature drift:
30 ppm/°C or less

• Zero point

Adjustment range:
Standard specification:
±7 mV (Input conversion)
Explosion-proof construction specification:
±6 mV (Input conversion)

Temperature drift:
Within +0.02 % of span/°C

• Gain

Adjustment range:
Standard specification:
Input range “10.00 to 19.99 mV” can be used as rating (10 V etc.).
Explosion-proof construction specification:
Input range “5.80 to 11.60 mV” can be used as rating (10 V etc.).

Setting accuracy:
Within +0.2 % of span/°C

Temperature drift:
100 ppm/°C or less

Optional functions:
Gain selector switch provided (Selection 1× ⇔ 2×)

• Output

Output type:
0 to 10 V DC (Load resistance: 2 kΩ or more)
0 to 10 mV DC (Load resistance: 10 kΩ or more)
0 to 5 V DC (Load resistance: 1 kΩ or more)
4 to 20 mA DC (Load resistance: 600 Ω or less)

Monitor voltage:
0 to 10 V DC (Pin size of tester conforming: ϕ2.0)

• General specifications

Linearity:
Within ± 0.01 % of span

Noise:
Within ± 0.1 % p-p of span (0.1 to 10 Hz)

Response:
10 Hz/100 Hz transfer type [Factory shipment: 10 Hz]

Power supply:
90 to 264 V AC (power supply voltage range),
Compatible 50 Hz/60 Hz, Rated: 100 to 240 V AC
21.6 to 26.4 V AC (power supply voltage range),
Compatible 50 Hz/60 Hz, Rated: 24 V AC
21.6 to 26.4 V DC (power supply voltage range),
Rated: 24 V DC

Power consumption:
12.5 VA max. (at 240 V AC), 7.5 VA max. (at 100 V AC),
8 VA max. (at 24 V AC), 190 mA max. (at 24 V DC)

Insulation resistance:
Between input/output terminal and grounding:
20 MΩ or more at 500 V DC
Between power terminal and grounding:
20 MΩ or more at 500 V DC

Withstand voltage:
Between input/output terminal and grounding:
1 minute at 1000 V AC
Between power terminal and grounding:
1 minute at 1500 V AC

Weight:
Approx. 290 g

• Operating environment

Allowable ambient temperature:
0 to 50 °C

Allowable ambient humidity:
45 to 85 % RH (Non condensing)

Ambient operating atmosphere:
There should be neither corrosive gases nor much dust.

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