CS

CODE AND SPECIFICATIONS SHEET

Differential Pressure Transmitter
（with temperature and pressure compensation）

EDR-N7C

EDR-N7C is intelligent transmitter equipped with semiconductor sensers and micro processors.

STANDARD SPECIFICATIONS

Model   EDR-N7C

Measuring range

Range Code	Measuring Span		Settable Range Limits
800	Differential pressure	0.5 to 8kPa	−8≦LRV≦8kPa , −8≦URV≦8kPa
	Pressure	0.2 to 5MPa abs.	0≦LRV≦5MPa abs. , 0≦URV≦5MPa abs.
	Temperature	more than 50℃	−200≦LRV≦850℃ , −200≦URV≦850℃
8000	Differential pressure	2 to 80kPa	−80≦LRV≦80kPa , −80≦URV≦80kPa
	Pressure	0.2 to 5MPa abs.	0≦LRV≦5MPa abs. , 0≦URV≦5MPa abs.
	Temperature	more than 50℃	−200≦LRV≦850℃ , −200≦URV≦850℃

Note) URV is the input differential pressure to give 100% output (20mA DC)

LRV is the input differential pressure to give 0% output (4mA DC)

Output   4 to 20mA DC

Power supply voltage   11.4 to 42.0V DC

Allowable load resistance   600Ω(at 24V DC power supply voltage)

Communication line condition

Power supply voltage 16.7 to 42.0V DC

Load resistance   250Ω to 1.2kΩ (Refer to Fig.1 for the relation between power supply voltage and load resistance)

Accuracy

Range Code	Accuracy		
800	Differential pressure	±0.2% Larger value either ±{0.05+(0.15×1/X)}% or 1.96Pa	X : more than 1kPa / X : less than 1kPa
	Pressure	±0.1% ±{0.05+(0.05×1/X)}%	X : more than 1MPa / X : less than 1MPa
	Temperature	±0.1% Larger value either ±(0.1×100/X)% or 1℃	X : more than 100℃ / X : less than 100℃
8000	Differential pressure	±0.1% ±{0.05+(0.05×8/X)}%	X : more than 8kPa / X : less than 8kPa
	Pressure	±0.1% ±{0.05+(0.05×1/X)}%	X : more than 1MPa / X : less than 1MPa
	Temperature	±0.1% Larger value either ±(0.1×100/X)% or 1℃	X : more than 100℃ / X : less than 100℃

Note 1) Accuracy is percent value against X, and X is the largest value among absolute value of URV, LRV and measuring span. Unit is kPa.

Note 2) When square root output,

if zero cut is specified,

for output less than 1.1% : ±(linear output accuracy×45) %

for output 1.1 to 50%   : ± (linear output accuracy× 50/square root output %) %

for output more than 50% : same as linear output

※Using the DCR type communicator, it is possible to select whether output under zero cutting point equals zero, or getting zero cutting point from arbitrary straight line.

if zero cut is not specified,

for output less than 20%, becomes the straight line between 0−20% point.

for output more than 20%, same as the above case that zero cut is specified

Accuracy of output after calculating temperature and pressure compensation

$\pm[0.05+\{(\text{accuracy of differential pressure input})^2 +(\text{accuracy of pressure input})^2 +(\text{accuracy of temperature input})^2\}^{1/2}]$ %
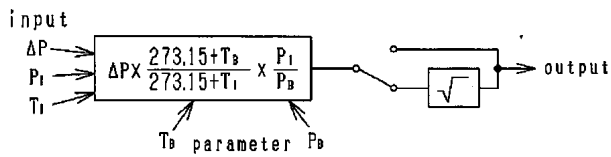
Accuracy of output after calculating saturated steam pressure compensation

$\pm[0.05+\{(\text{accuracy of differential pressure input})^2 +(\text{accuracy of pressure input})^2\}^{1/2} +(0.3/\rho_I)+(0.3/\rho_B)]$ %
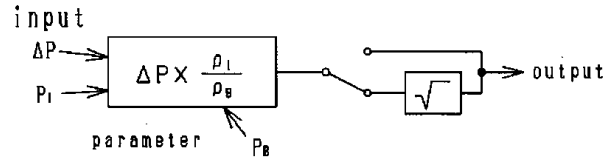
Calculation formula

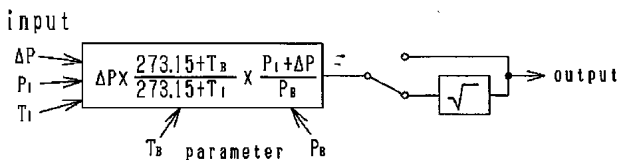[Assumed input]

Calculating temperature and pressure compensation

$$\Delta P \times \frac{273.15+T_B}{273.15+T_I} \times \frac{P_I}{P_B}$$

input: ΔP, P_I, T_I — T_B parameter P_B — output

Calculating saturated steam pressure compensation

$$\Delta P \times \frac{\rho_I}{\rho_B}$$

input: ΔP, P_I — parameter P_B — output

[Real input]

Calculating temperature and pressure compensation

$$\Delta P \frac{273.15+T_B}{273.15+T_I} \times \frac{P_I+\Delta P}{P_B}$$

input: ΔP, P_I, T_I — T_B parameter P_B — output

Calculating saturated steam pressure compensation

$$\Delta P \times \frac{\rho_H}{\rho_B}$$

input: ΔP, P_I — parameter P_B — output
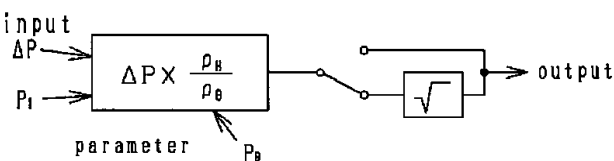
Note1: Calculation formula can be selected and set from
following five kinds by communicator
①Without compensation
②Temperature compensation
③Pressure compensation
④Temperature and pressure compensation
⑤Saturated steam pressure compensation

ΔP: Measured differential pressure (kPa)

T_I : Measured temperature (℃)

P_I : Measured pressure (MPa abs.)

T_B : Base temperature for compensation (℃)

P_B : Base pressure for compensation (MPa abs.)

ρ_I : Density in measurement pressure (kg/m³)

ρ_H: Density in the value which added measurement
differential pressure and measurement pressure
(kg/m³)

ρ_B : Density in base pressure (kg/m³)

Calculating saturated steam pressure compensation, ρ_I/ρ_B
and ρ_H/ρ_B effective to double,
It's become fixed with 2.

Temperature input Pt100Ω or JPt100Ω
(three wires connection type)

Zero adjustment Externally adjustable within ± 100% of
measurement span.

Accidental burn out Can select any one among burn up, burn
down and without burn out.

Dead time Approx. 0.4sec

Damping time constant Adjustable from 0.2 to 102.4sec (0.1sec
(Amplifier time constant) increment) electrically by the DCR
communicator.

Time constant of sensor body

Range Code	Time Constant of Sensor Body (at 25℃)
800	Approx. 0.7sec
8000	Approx. 0.2sec

· Transmitter time constant equals total sum of
the above time constant of sensor body,
damping setting time constant (amplifier time
constant) and dead time.

· When pressure pulsation is expected, fixed
electrical damper (about 1sec) shall be
specified, at the same time we recommend
that inner diameter φ1 capillary tube (more
than 1m length) is inserted.

Storage temperature limits −40 to 85℃

Operating humidity limits 5 to 100%RH

Operating temperature limits

Ambient temperature limits
−20 to 85℃ (see Fig.2)

Wetted parts temperature limits
−20 to 120℃

Working pressure limits 5MPa abs.
Note) When used under negative pressure,
refer to Fig.3

Site vibration Less than 29.4m/s² continuous vibration

Temperature effect (at −20 to 60℃)

Range Code		Temperature Effect	
800	Zero shift	±{0.05+(0.45×T/50)}%	X : more than 3.2kPa
		±{0.05+(0.25+0.2×3.2/X)×T/50}%	X : less than 3.2kPa
	Overall shift	±{0.05+(0.75×T/50)}%	X : more than 3.2kPa
		±{0.05+(0.45+0.3×3.2/X)×T/50}%	X : less than 3.2kPa
8000	Zero shift	±{0.05+(0.2×T/50)}%	X : more than 32kPa
		±{0.05+(0.1+0.1×32/X)×T/50}%	X : less than 32kPa
	Overall shift	±{0.05+(0.45×T/50)}%	X : more than 32kPa
		±{0.05+(0.35+0.1×32/X)×T/50}%	X : less than 32kPa

Note) Temperature effect is percent value against X, X is the
largest value among absolute value of URV,LRV and
measuring span. Unit is kPa.
T is temperature variation width(℃).

Pressure effect(at 25℃)

Range Code		Pressure Effect	
800	Zero shift	$\pm[0.05+(0.1\times8/X\times P/5)]\%$	
8000	Zero shift	$\pm[0.05+(0.1\times P/5)]\%$	X is more than 40kPa
		$\pm[0.05+(0.1\times40/X)\times P/5]\%$	X is less than 40kPa
	Overall shift	$\pm[0.05+(0.3+0.1\times80/X)\times P/5]\%$	

Note) Static pressure effect is percent value against X, X is the largest value among absolute value of URV, LRV and measuring span. Unit is kPa. P is static pressure value, unit MPa.

Overpressure effect　　$\pm0.5\%$
(Zero shift)　　　　　(at maximum working pressure application)
　　　　　　　　　　(at maximum span)

Material
　　Diaphragm　　　　Hastelloy C
　　　　　　　　　　(Diaphragm material shall be selected considering corrosion resistance, hydrogen transmission, etc.)
　　Wetted parts other　SUS316
　　than diaphragm
　　Amplifier case　　Aluminium alloy
　　Mounting plate　　SPCC (acid resistant coating)
　　U bolt　　　　　　SUS304
Filled liquid　　　Silicone oil
Process connection　Top connection Rc1/4 without oval flange
Electrical connection　G1/2
Check terminal　　With output check terminal
　　　　　　　　　　(output voltage 40 to 200mV DC)
Certifications　　Degree of protection JIS C 0920 IP67
Surge absorber　　Built-in transmitter
　　　　　　　　　　Surge capacity　　　: 1,000A (8/20μsec)
　　　　　　　　　　Impulse test voltage :15,000V (1.2/50μsec)
Finish　　　　　　Light gray amplifier case (acid resistant coating)
Weight　　　　　　Approx. 3.3kg
Installation　　　On 2-inch pipe with U bolt.
Accessories　　　2-inch pipe mounting bracket and U-bolt.
　　　　　　　　　　Zero adjustment magnet.

ADDITIONAL SPECIFICATION

Structure
TIIS Ex explosion　　Flameproof
proof type　　　　　Exdo II CT4
　　　　　　　　　　Exdo II CT4X
　　　　　　　　　　Note) X is for operating condition (as below)
　　　　　　　　　　　　With meter : Abnormality code is displayed on meter to alert winking, so it is no need to build external alarm display system.
　　　　　　　　　　　　Without meter : it is necessary to build external alarm display system, output exceeds 21mA
　　　　　　　　　　Ambient temperature limits : −20 to 55℃
　　　　　　　　　　Wetted parts temperature limits: −20 to 100℃

Electrical connection
　　X-RCAC type pressure resistant packing fixture must be used for using pressure resistant oil filled explosion proof type products. (also applicable to use SXBM-16B made by Shimada Electric Co., Ltd.)

FM explosion proof type　　Explosion proof CLI,DIV 1,GPS B,C&D
Dust-ignition proof CL Ⅱ/Ⅲ,GPS E,F&G
Temperature Code T4
NEMA 4X
Ambient temperature limits : −40 to 60℃
Wetted parts temperature limits: −40 to 120℃

NEPSI explosion proof Approval　　Explosion proof Grade Ex dII CT4
Ambient temperature range −20〜60℃
Certificate No.GYJ111366

Indicator　　Digital indicator　4.5 figures display
　　　　(0 to 100% scale standard)
(Can set to arbitrary scale within the range of −17,500 to 17,500)
Scale plates various units to be sticked are supplied.
Indication reshuffling of the differential pressure / pressure / temperature and the arbitrary scale setting
　(range of − 1,750-1,750) of the pressure are possible by the communicator, too.
In the case of temperature indication, display 〝°〝 and, in the case of pressure indication, distinguish 〝P〝 next to numerical value.(Refer to fig. 4 for the indication example)

Wetted parts matelials

Diaphragm	Wetted Parts
SUS316L	SUS316
SUS316L	SUS316L

※ Material shall be selected considering corrosion resistance. In case hydrogen is present in measuring fluid, it is possible hydrogen transmission can be generated through diaphragm. If corrosion resistance is not so important, we recommend SUS316L or SUS3l6 with gold plating because hydrogen transmission value of these material is relatively low. (But it is difficult to prevent hydrogen transmission completely even if diaphragm of SUS316L with gold plating is applied).

Wetted parts finish　No oil finish or no-oil and no water finish
Process connection　Rc1/2, Rc1/4, 1/2NPT, 1/4NPT,
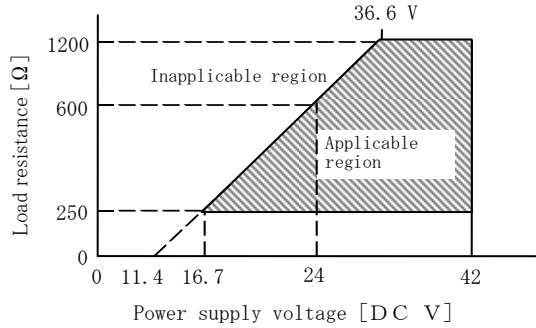15A socket welding (socket screw-in type)
(with oval flange)

Steam jacket   To be attached to the sensor body
(Steam temperature shall be set to get liquid
contact temperature less than 120 ℃. But
less than 100℃ for explosion proof type)

Drain vent plug   Thermal insulation type

A minimum load resistance of 250Ω shall be
required to communicate by connecting to
communicator.
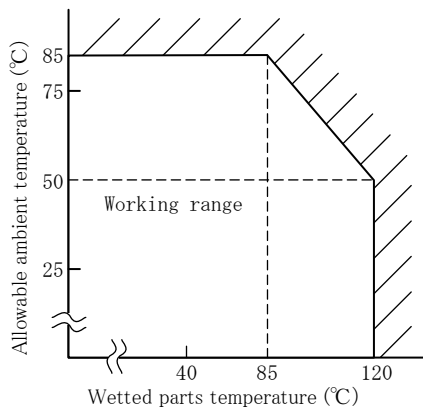
Fig.1 Supply voltage / load resistance property
of transmitter

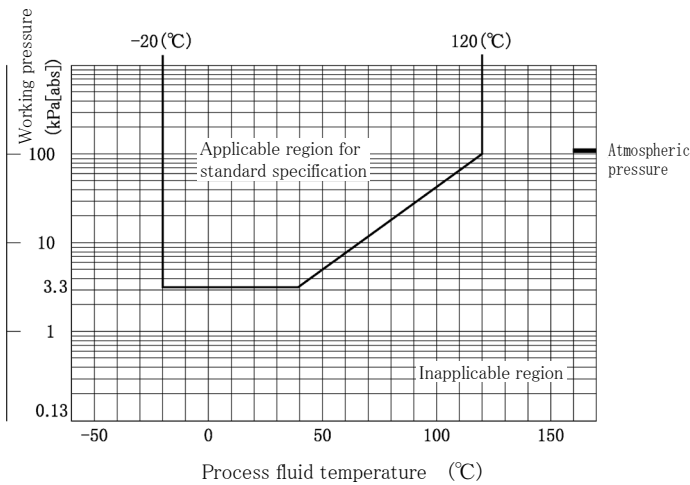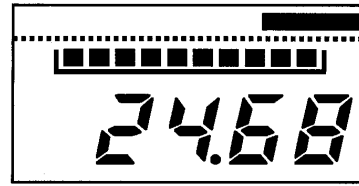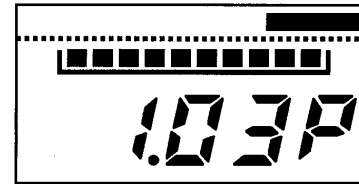Fig.2 Wetted parts temperature and allowable
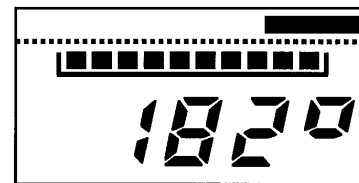ambient temperature

Fig.3 Working pressure and process fluid temperature

Differential pressure display (0.00～25.00kPa)

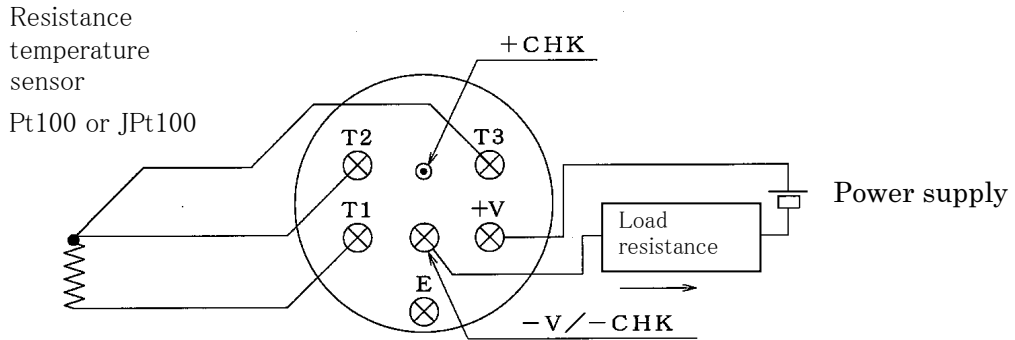Differential pressure display (0.00～5.00MPa abs.)

Temperature display

Note 1)   In the case of temperature indication, display ″°″
and, in the case of pressure indication,
distinguish ″P″ next to numerical value.

Note 2)   The bar graph displays the percentage of the span
of the differential pressure by a 10% unit
(round off one place).

Note 3)   The indication of the LCD is able to change
setting of either / change indication to only
differential pressure by a communicator.
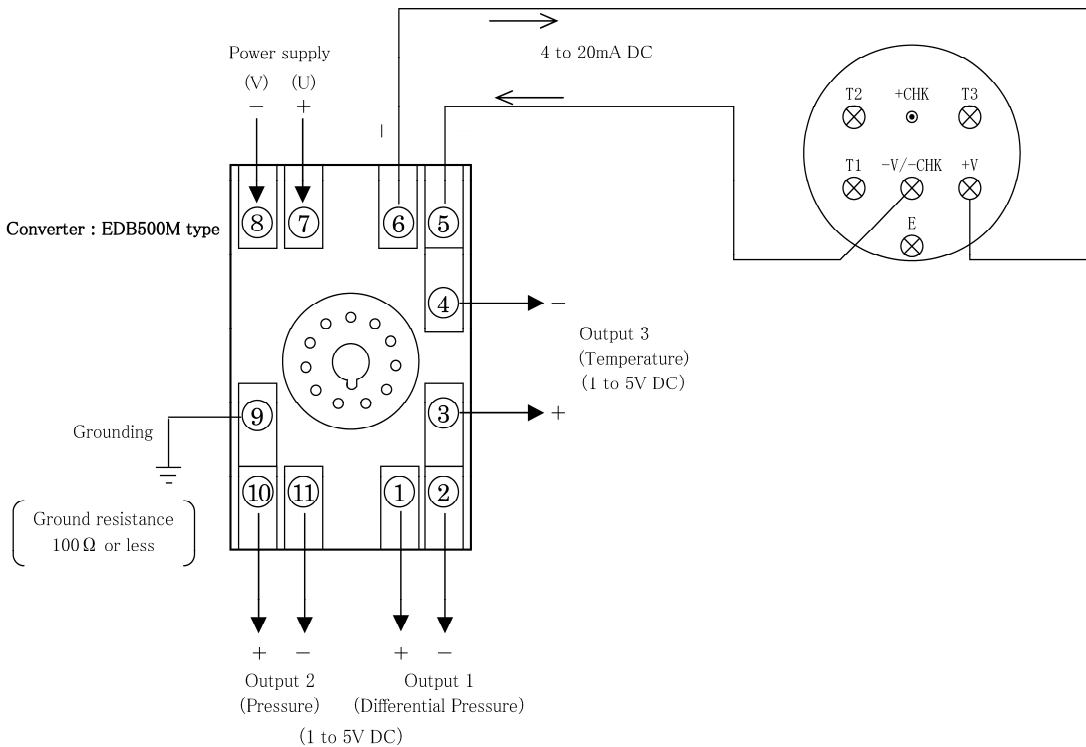
Fig.4 Indication example

Resistance
temperature
sensor
Pt100 or JPt100
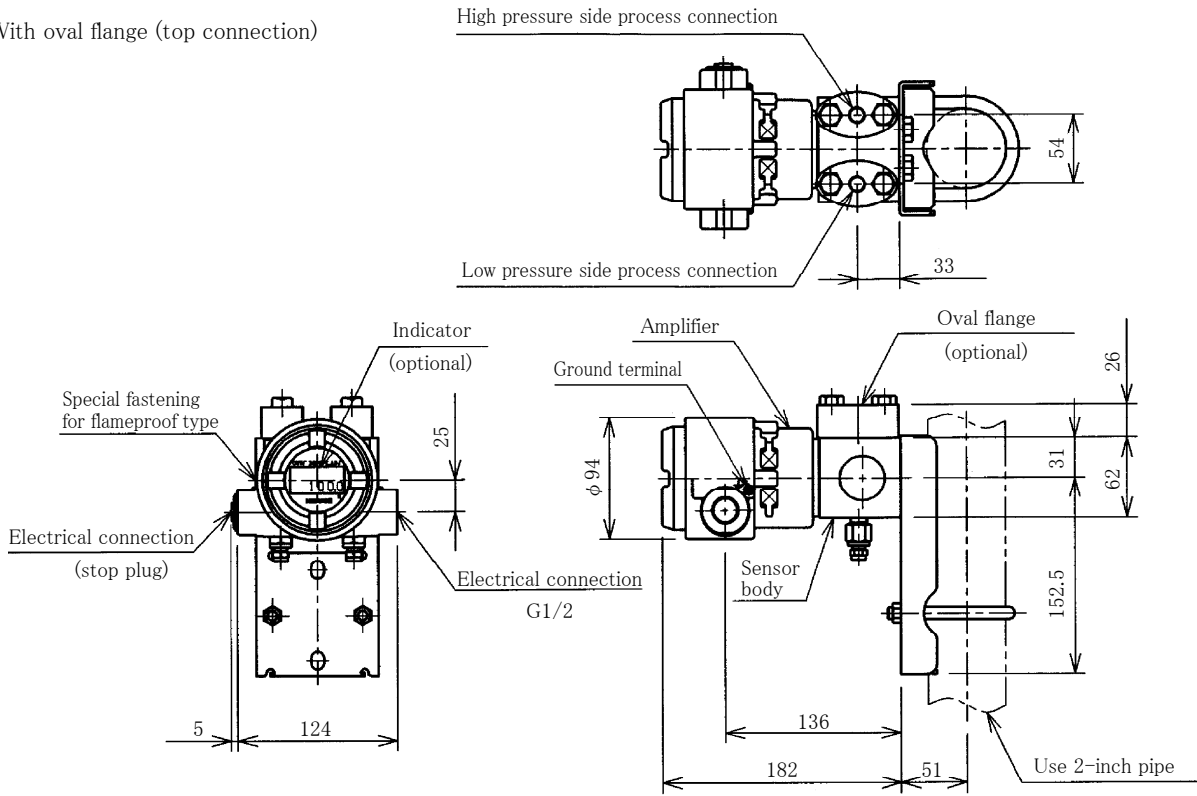
+CHK

T2   T3
T1   +V
E
−V／−CHK

Power supply

Load
resistance

Notes:
(1) Grounding shall be done according to class D grounding practice (grounding resistance less than 100 Ω)
(2) Grounding shall be done at one point either transmitter side or receiver instrument side, Give attention to avoid grounding at two points.
(3) Grounding terminals on transmitter side are furnished inside of terminal box and outside of amplifier case. Either of them can be utilized.
(4) Local indicator is not able to use.

●With EDB500M

Power supply
(V)   (U)
−   +

4 to 20mA DC

T2   +CHK   T3
T1   −V/−CHK   +V
E

Converter : EDB500M type

⑧ ⑦   ⑥ ⑤

④

Output 3
(Temperature)
(1 to 5V DC)

Grounding

⑨   ③ +

⑩ ⑪   ① ②

Ground resistance
100 Ω or less

+   −   +   −
Output 2   Output 1
(Pressure)   (Differential Pressure)
(1 to 5V DC)

DIMENSIONS（Unit : mm）

● With oval flange (top connection)

High pressure side process connection

Low pressure side process connection

54

33

Special fastening
for flameproof type

Indicator
(optional)

Electrical connection
(stop plug)

25

Electrical connection
G1/2

5   124

Amplifier

Ground terminal

φ94

Oval flange
(optional)

26

31

62

Sensor
body

152.5

136

182   51

Use 2-inch pipe

CS·3253 - 976

CODE TABLES

No. Model	1 Range code	2～9 Option	Description
EDR-N7C			Water - proof, without indicator, diaphragm material:Hastelloy C, wetted perts other than diaphragm:SUS316,
	800		top process connection Rc1/4 without oval flange, Range of differential pressure:0～Range code,
	8000		Range of pressure:0～5MPa abs.,Range of temperature:0～300℃, Base pressure 0.5MPa abs., Base temperature:50℃。
		－ □ － □	Select a necessary code alone among those in the optional code table below.

OPTION

No.	Item	Code	Description
2	Adjustmment range	C( )	Fill in ( ) with adjustment range, unit mark, Fill in necessary items differential pressure, pressure and temperature in that order.
3	Certification	XC	JIS explosionproof standard approval : Exdo CT4X
		FM	FM explosionproof standard approval : CL, DIV1, GPS B, C&D
		NEPSI	NEPSI explosionproof standard approval : Exd II CT4
4	Indicator	M	With digital indicator
		MJ( )	With digital indicator and actual scale display Fill in ( ) with scale and unit mark
5	Wetted Parts materials	316L316	Diaphragm : SUS316L,　　Body wetted parts : SUS316
		316L	Diaphragm : SUS316L,　　Body wetted parts : SUS316L
6	No-oil finish	NL	No-oil finish
		NLW	No-oil and dehydrating finish
7	Process connections	R2	Top connection with oval flange Rc1/2
		R4	Top connection with oval flange Rc1/4
		N2	Top connection with oval flange 1/2 - 14NPT
		N4	Top connection with oval flange 1/4 - 18NPT
		S2	Top connection with oval flange 15A pipe insertion welding
		B0	Bottom connection　Rc1/4, without oval flange
		BR2	Bottom connection　with oval flange Rc1/2
		BR4	Bottom connection　with oval flange Rc1/4
		BN2	Bottom connection　with oval flange 1/2 - 14 NPT
		BN4	Bottom connection　with oval flange 1/4 - 18 NPT
		BS2	Bottom connection　with oval flange 15A pipe insertion welding
8	Steam jacket	ST	With steam jacket * Steam temperature shall be set to get process fluid temperature 　less than 120℃. But less than 100℃ for explosion proof type.
		STP	With steam jacket, drain/vent plug for winterizing type * Steam temperature shall be set to get process fluid temperature 　less than 120℃. But less than 100℃ for explosion proof type.
		P	Drain/vent plug for winterizing type
9	Calculation formula	OFF	Without compensation(An initial value when there is not designation)
		TEMP( )	Temperature compensation, Fill in ( ) with base temperature in ℃
		PRESS( )	Pressure compensation, Fill in ( ) with base pressure in MPa abs.
		TP( )	Temperature and pressure compensation, Fill in ( ) with in order of base temperature in ℃ and base pressure in MPa abs.
		STEAM( )	Saturated steam pressure compensation, Fill in ( ) with base pressure in MPa abs.

Note)　Please select the material of the diaphragm in consideration of corrosion resistance.
　　　　Hastelloy C might generate the hydrogen permeation by the galvanizing steel pipe piping and the water quality, etc.,
　　　　and cause the output shift and the transformation of the diaphragm.
　　　　Please select small SUS316L of the hydrogen permeation when there is no problem in corrosion resistance.

●Be sure to read the User's Manual to ensure correct, safe use.

●Some specifications and design are subject to change with or without notice for improvement of quality and performance.