

CS

CODE AND SPECIFICATIONS SHEET

## Liquid Level Transmitter with Diaphragm Displacement Device

## EDR-N7FS



EDR-N7FS is intelligent transmitter equipped with semiconductor sensors and micro processors.

## STANDARD SPECIFICATIONS

Model EDR-N7FS

## Differential pressure range

Range Code	Measuring Span	Settable Range Limits
8000 H8000	2 to 80kPa	$-80 \leq \text{LRV} \leq 80\text{kPa}$ , $-80 \leq \text{URV} \leq 80\text{kPa}$
40000 H40000	20 to 400kPa	$-400 \leq \text{LRV} \leq 400\text{kPa}$ , $-400 \leq \text{URV} \leq 400\text{kPa}$

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)

<b>Output</b>	4 to 20mA DC
<b>Power supply voltage</b>	11.4 to 42.0V DC
<b>Allowable load resistance</b>	600 $\Omega$ (at 24V DC power supply voltage)
<b>Communication line condition</b>	
Power supply voltage	16.7 to 42.0V DC
Load resistance	250 $\Omega$ to 1.2k $\Omega$ (Refer to Fig. 1 for the relation between power supply voltage and load resistance)

## Accuracy

Range Code	Accuracy	
8000	$\pm 0.2\%$	X is more than 8kPa
H8000	$\pm [0.1 + (0.1 \times 8/X)]\%$	X is less than 8kPa
40000	$\pm 0.2\%$	X is more than 40kPa
H40000	$\pm [0.1 + (0.1 \times 40/X)]\%$	X is less than 40kPa

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

**Zero adjustment** Externally adjustable within  $\pm 100\%$  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 (Amplifier time constant)** Adjustable from 0.2 to 102.4sec (0.1sec increment) electrically by DCR of the HART<sup>®</sup> communicator.

## Time constant of sensor body

Range Code	Time Constant (at 25°C)	
	Sensor Body	Per 1m of Capillary Tube
8000 H8000	Approx. 0.2s	Approx. 0.1s
40000 H40000	Approx. 0.1s	Approx. 0.1s

• Transmitter time constant equals total sum of the above time constant of sensor body, capillary time constant, amplifier setting time constant and dead time

**Storage temperature limits** -40 to 85°C

**Operating humidity limits** 5 to 100%RH

**Operating temperature limits**  
Ambient temperature limits

-20 to 85°C

Wetted parts temperature limits

-20 to 180°C

**Working pressure limits** Less than the maximum working pressure of flange.  
(See Fig.2 when used under negative pressure.)

**Site vibration** Less than 29.4m/s<sup>2</sup> continuous vibration

**Temperature effect** (at -20 to 60°C)

Range Code	Temperature Effect	
8000 H8000	Zero shift	$\pm [0.05 + (0.5 \times T/50)]\%$ $\pm [0.05 + (0.35 + 0.15 \times 16/X) \times T/50]\%$
	Overall shift	$\pm [0.05 + (0.8 \times T/50)]\%$ $\pm [0.05 + (0.65 + 0.15 \times 16/X) \times T/50]\%$
40000 H40000	Zero shift	$\pm [0.05 + (0.5 \times T/50)]\%$ $\pm [0.05 + (0.35 + 0.15 \times 80/X) \times T/50]\%$
	Overall shift	$\pm [0.05 + (0.8 \times T/50)]\%$ $\pm [0.05 + (0.65 + 0.15 \times 80/X) \times T/50]\%$

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 (°C).

**Static pressure effect** (at 25°C)

Range Code	Static Pressure Effect	
8000 H8000	Zero shift $\pm[0.05+(0.05 \times P/2.5)]\%$ $\pm[0.05+(0.05 \times 40/X) \times P/2.5]\%$ Overall shift $\pm[0.05+(1.95+0.1 \times 80/X) \times P/2.5]\%$	X is more than 40kPa X is less than 40kPa
40000 H40000	Zero shift $\pm[0.05+(0.05 \times P/2.5)]\%$ $\pm[0.05+(0.05 \times 200/X) \times P/2.5]\%$ Overall shift $\pm[0.05+(1.45+0.1 \times 400/X) \times P/2.5]\%$	X is more than 200kPa X is less than 200kPa

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, unit is MPa.

**Overpressure effect**  $\pm 0.5\%$  (at 1.37MPa application)  
(Zero shift) (at the maximum span)

**Material**

Diaphragm SUS316L  
(Diaphragm material shall be selected considering corrosion resistance, hydrogen permeability, etc.)

Wetted parts other than diaphragm SUS316

Standard flange SUS304

Capillary tube SUS316 (polyethylene covered)

Amplifier case Aluminum alloy

**Filled liquid** Silicone oil

**Process connection** JIS 10K 80A RF  
(equivalent flange) wafer type

**Flange extension length** 0mm

**Capillary tube length** 5m

**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 (8/20  $\mu$ sec)  
Impulse test voltage: 15,000V (1.2/50  $\mu$ sec)

**Finish** Light gray amplifier case (acid resistant coating)

**Weight** Approx. 10kg

**Installation** Directly fitted to the tank.

**Accessories** 2-inch pipe mounting bracket and U-bolt.  
Zero adjustment magnet.

**ADDITIONAL SPECIFICATION**

**Communication method** HART® protocol

**Structure**

TIIS Ex explosion proof type Flameproof  
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°C

Wetted parts temperature limits : -20 to 100°C

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°C

Wetted parts temperature limits : -40 to 120°C

**Indicator**

Digital indicator 4.5figures display (0 to 100% scale standard)

(Can set to arbitrary scale within the range of -17,500 to 17,500)

Scale plates for variou units to be sticked are supplied.

**Flange****standard**

JIS 20K, ANSI 150, ANSI 300,

JPI 150, JPI 300, etc.

Connection diameter 80A(3B)

(Extension length 0mm)

100A(4B) (Extension length > 0mm)

50mm, 100mm, 150mm

**Flange****extension length****Diaphragm cover****(only for diameter 80 A (3B) without extension)**

FEP diaphragm cover (pressure : more than atmospheric pressure, operating temperature : -10 to 120°C)

Accuracy is added  $\pm 0.5\%$  for cover fitted diaphragm.

**Capillary tube****length**

1 to 10m (1m unit)

(less than 40A (1.5B) extension type is not available for more than 6m tube)

**Capillary****taking out****direction**

Horizontal or vertical to diaphragm plane.

**Wetted parts material**

Diaphragm	Wetted Parts Other Than Diaphragm
SUS316L	SUS316L
Hastelloy C	Hastelloy C
Tantalum	Tantalum
SUS316L (with gold plate)	SUS316

Note) Tantalum is available only for 0m extension  
 ※ 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 SUS316 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)

**Filled liquid**

- Fluorine oil      Wetted parts temperature limits : -20 to 120°C  
 Specific gravity : 1.860 (at 20°C)  
 (See Fig.6-4 for negative pressure)  
 Specify also no-oil finish together for oxygen measurement
- Silicone oil for sanitary use      Wetted parts temperature limits : -20 to 150°C  
 Specific gravity : 0.965 (at 25°C)  
 (See Fig.6-4 for negative pressure)
- Propylene glycol      Wetted parts temperature limits : -20 to 150°C  
 Specific gravity : 1.037(at 25°C)  
 (not possible to use at negative pressure)

**Wetted parts finish**

No oil finish or no-oil and no water finish

**Process fluid condition**

- Vacuum type      Liquid contact temperature : -20 to 180°C  
 Ambient temperature limits : -20 to 85°C  
 Filled liquid is the same as standard specification (Workable pressure is different depending on temperature. Use after confirming Fig.2.)

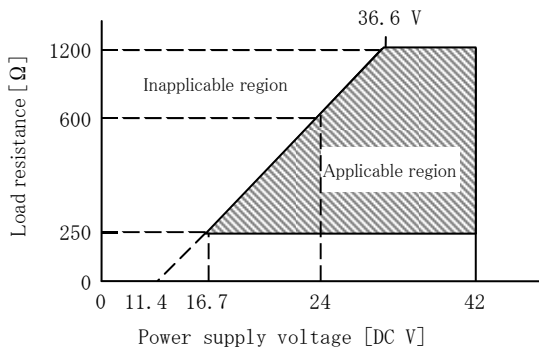
**Density correction**

Arithmetic processing function of density correction for measurement of liquefied gas level.

Standard installed correction table

Oxygen, Nitrogen, Argon, Butane, Carbon oxide and Propane
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Above correction table is installed as standard, be able to select by the DCR or the HART® communicator.  
 (contact us when other than above is required)



A minimum load resistance of 250Ω shall be required to communicate by connecting to communicator.

Fig.1 Supply voltage / load resistance property of transmitter

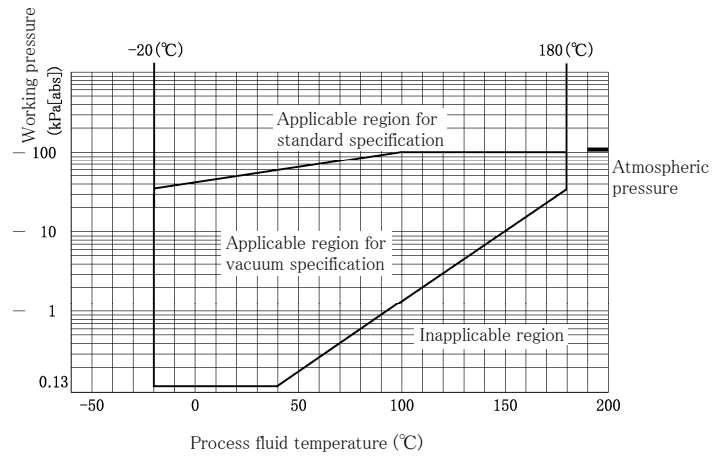


Fig.2 Working pressure and process fluid temperature (Specification for standard or vacuum type)

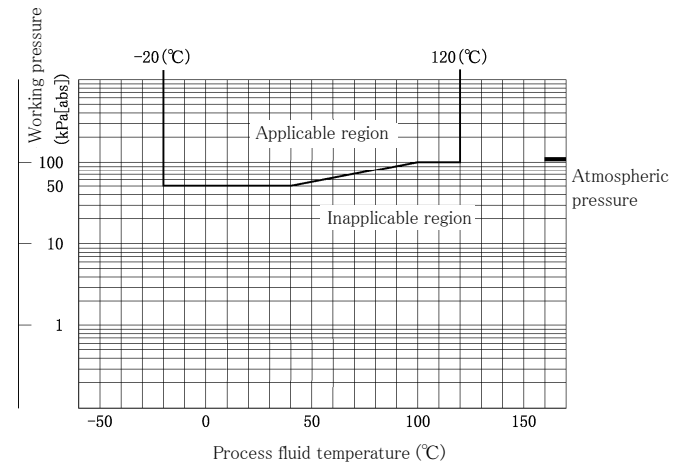


Fig.3 Working pressure and process fluid temperature (Filled liquid : Fluorine oil)

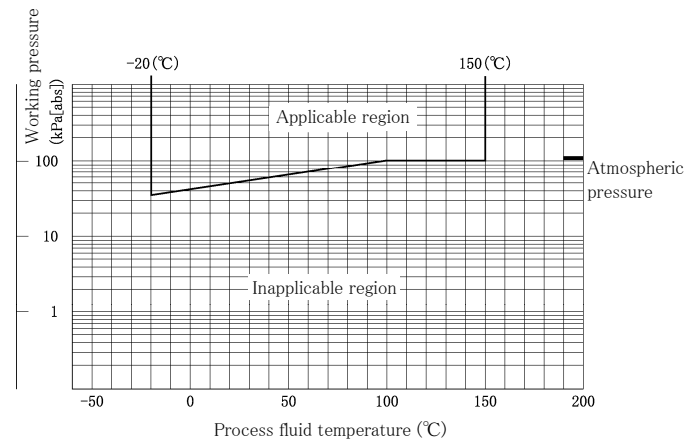


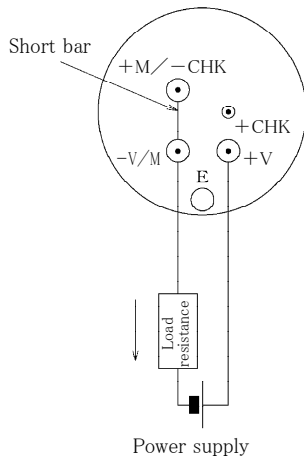
Fig.4 Working pressure and process fluid temperature (Filled liquid : Silicone oil for sanitary use)

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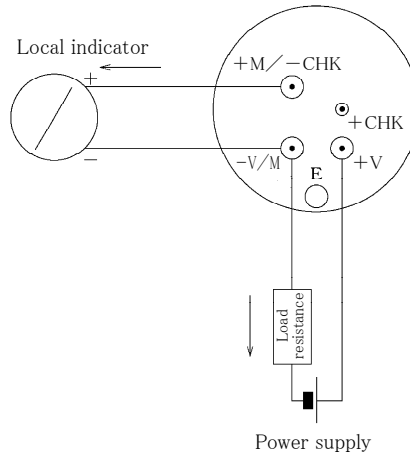
## EXTERNAL CONNECTION

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Without local indicator



With local indicator connected



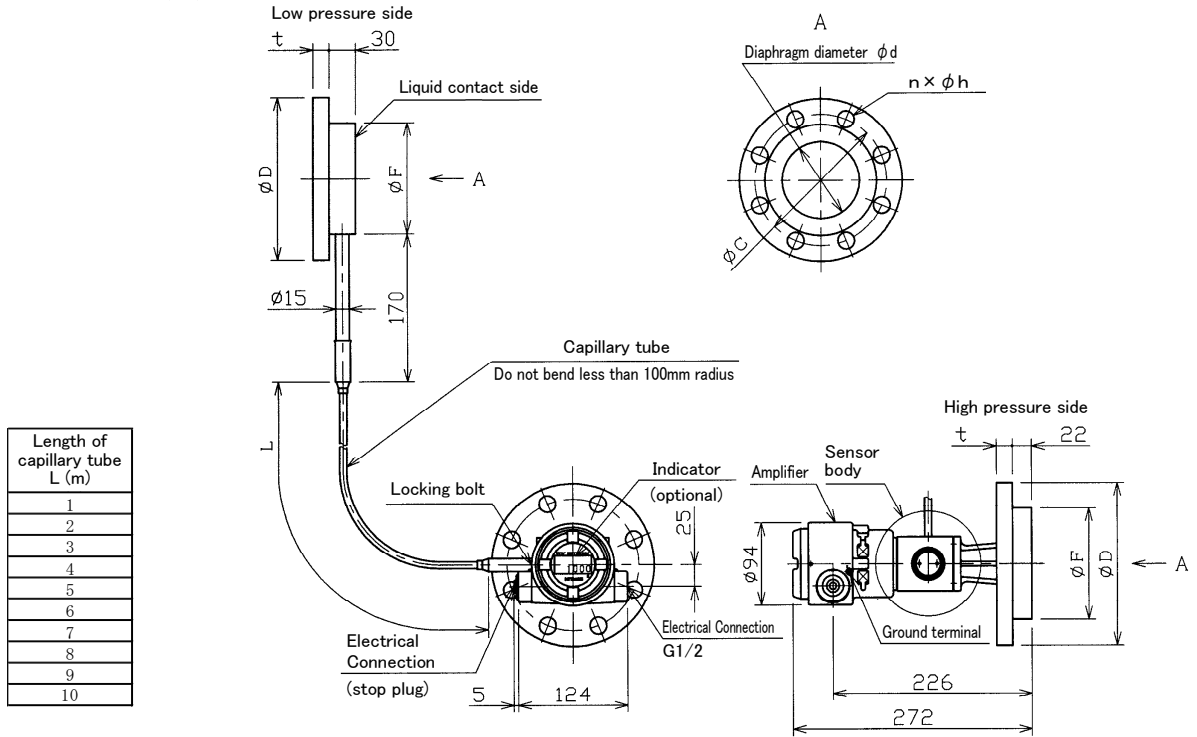
Notes:

- (1) Grounding shall be done according to class D grounding practice (grounding resistance less than  $100\ \Omega$ )
- (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.

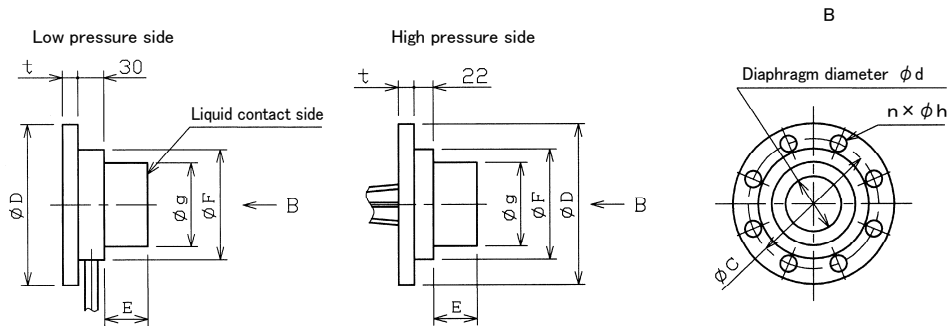
# DIMENSIONS (Unit : mm)

Wafer type

● Without extension (E0)

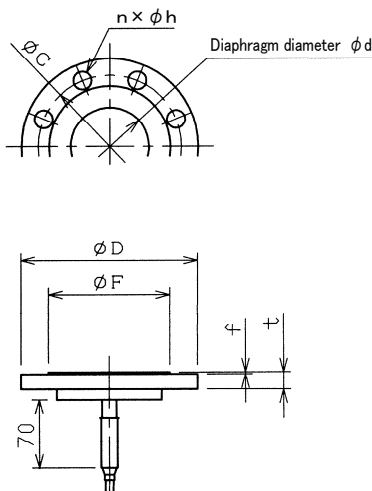


● With extension (E50, E100, E150)



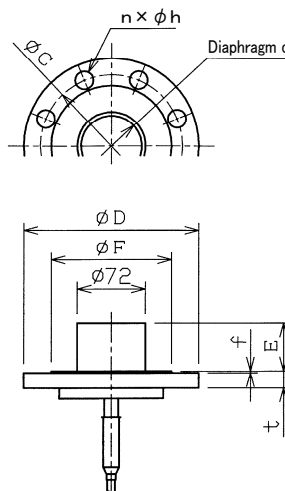
Low pressure side : Back-drawn capillary type

● Without extension (E0)

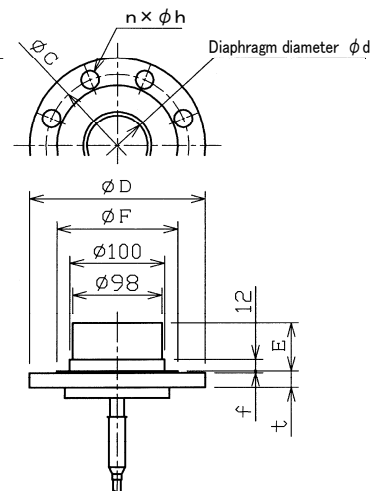


● With extension (E50, E100, E150)

80A (3B)



100A (4B)



Wafer type

Without extension (E0)

Flange standard (equivalent flange)		φD	φF	φd	φC	n×φh	t
JIS10K 80A RF <standard specification >		185	127	88	150	8×19	18
80A	JIS20K	200	127	88	160	8×23	22
	JIS30K	210	127	88	170	8×23	28
	JIS40K	210	127	88	170	8×23	32
	JIS63K	230	127	88	185	8×25	40
100A	JIS10K	210	154	88	175	8×19	18
	JIS20K	225	154	88	185	8×23	24
	JIS30K	240	154	88	195	8×25	32
	JIS40K	250	154	88	205	8×25	36
	JIS63K	270	154	88	220	8×27	44
80A (3B)	ANSI150	191	127	88	152.4	4×20	24
	ANSI300	210	127	88	168.3	8×23	29
	ANSI600	210	127	88	168.3	8×23	32
	ANSI900	241	127	88	190.5	8×26	38.5
	ANSI1500	267	127	88	203.2	8×32	48
ANSI2500	305	127	88	228.6	8×35	67	
100A (4B)	ANSI150	229	154	88	190.5	8×20	24
	ANSI300	254	154	88	200	8×23	32
	ANSI600	273	154	88	215.9	8×26	38.5
	ANSI900	292	154	88	235	8×32	44.5
	ANSI1500	311	154	88	241.3	8×35	54
	ANSI2500	356	154	88	273	8×42	76.5

※JPI flange is the same size as ANSI flange.  
 ※φd is for diaphragm material SUS316L.

With extension (E50, E100, E150)

Flange standard (equivalent flange)		φD	φF	φg	φd	φC	n×φh	t
JIS10K 100A RF <standard specification >		210	154	96	88	175	8×19	18
80A	JIS10K	185	127	72	64	150	8×19	18
	JIS20K	200	127	72	64	160	8×23	22
	JIS30K	210	127	72	64	170	8×23	28
	JIS40K	210	127	72	64	170	8×23	32
	JIS63K	230	127	72	64	185	8×25	40
100A	JIS20K	225	154	96	88	185	8×23	24
	JIS30K	240	154	96	88	195	8×25	32
	JIS40K	250	154	96	88	205	8×25	36
	JIS63K	270	154	96	88	220	8×27	44
	80A (3B)	ANSI300	191	127	72	64	152.4	4×20
ANSI600		210	127	72	64	168.3	8×23	29
ANSI900		210	127	72	64	168.3	8×23	32
ANSI1500		241	127	72	64	190.5	8×26	38.5
ANSI2500		267	127	72	64	203.2	8×32	48
100A (4B)	ANSI150	305	127	72	64	228.6	8×35	67
	ANSI300	229	154	96	88	190.5	8×20	24
	ANSI600	254	154	96	88	200	8×23	32
	ANSI900	273	154	96	88	215.9	8×26	38.5
	ANSI1500	292	154	96	88	235	8×32	44.5
	ANSI2500	311	154	96	88	241.3	8×35	54

※JPI flange is the same size as ANSI flange.  
 ※φd is for diaphragm material SUS316L.

Low pressure side : Back-drawn capillary type

Without extension (E0)

Flange standard (equivalent flange)		φD	φF	φd	φC	n×φh	t	f
JIS10K 80A RF <standard specification >		185	127	88	150	8×19	18	2
80A	JIS20K	200	127	88	160	8×23	22	2
	JIS30K	210	127	88	170	8×23	28	2
	JIS40K	210	127	88	170	8×23	32	2
	JIS63K	230	127	88	185	8×25	40	2
100A	JIS10K	210	151	88	175	8×19	18	2
	JIS20K	225	160	88	185	8×23	24	2
	JIS30K	240	160	88	195	8×25	32	2
	JIS40K	250	165	88	205	8×25	36	2
	JIS63K	270	165	88	220	8×27	44	2
80A (3B)	ANSI150	191	127	88	152.4	4×20	23.9	1.6
	ANSI300	210	127	88	168.1	8×23	28.5	1.6
	ANSI600	210	127	88	168.1	8×23	38.3	6.4
	ANSI900	241	127	88	190.5	8×26	44.5	6.4
	ANSI1500	267	127	88	203.2	8×32	54.2	6.4
ANSI2500	305	127	88	228.6	8×35	73	6.4	
100A (4B)	ANSI150	229	157	88	190.5	8×20	23.9	1.6
	ANSI300	254	157	88	200.2	8×23	31.8	1.6
	ANSI600	273	157	88	215.9	8×26	44.5	6.4
	ANSI900	292	157	88	235	8×32	50.9	6.4
	ANSI1500	311	157	88	241.3	8×35	60.4	6.4
	ANSI2500	356	157	88	273	8×42	82.6	6.4

※JPI flange is the same size as ANSI flange.  
 ※φd is for diaphragm material SUS316L.

With extension (E50, E100, E150)

Flange standard (equivalent flange)		φD	φF	φd	φC	n×φh	t	f
JIS10K 100A RF <standard specification >		210	151	88	175	8×19	18	2
80A	JIS10K	185	127	64	150	8×19	18	2
	JIS20K	200	127	64	160	8×23	22	2
	JIS30K	210	127	64	170	8×23	28	2
	JIS40K	210	127	64	170	8×23	32	2
	JIS63K	230	127	64	185	8×25	40	2
100A	JIS20K	225	160	88	185	8×23	24	2
	JIS30K	240	160	88	195	8×25	32	2
	JIS40K	250	165	88	205	8×25	36	2
	JIS63K	270	165	88	220	8×27	44	2
	80A (3B)	ANSI150	191	127	64	152.4	4×20	23.9
ANSI300		210	127	64	168.1	8×23	28.5	1.6
ANSI600		210	127	64	168.1	8×23	38.3	6.4
ANSI900		241	127	64	190.5	8×26	44.5	6.4
ANSI1500		267	127	64	203.2	8×32	54.2	6.4
100A (4B)	ANSI2500	305	127	64	228.6	8×35	73	6.4
	ANSI150	229	157	88	190.5	8×20	23.9	1.6
	ANSI300	254	157	88	200.2	8×23	31.8	1.6
	ANSI600	273	157	88	215.9	8×26	44.5	6.4
	ANSI900	292	157	88	235	8×32	50.9	6.4
	ANSI1500	311	157	88	241.3	8×35	60.4	6.4

※JPI flange is the same size as ANSI flange.  
 ※φd is for diaphragm material SUS316L.

## CODE TABLES

No. Item	1	5	6	7	2~4,8~13	Description
Model	Range code	Flange standard	Flange extension	capillary length	Option code	
EDR-N7FS						Water-proof, diaphragm material ; SUS316L, wetted parts other than diaphragm ; SUS316, without indicator.
	8000					
	40000					
	H8000					HART® communication type
	H40000					
		80J10				Flange standard ; JIS 10K 80A RF wafer type equivalent flange
			E0			Flange extension length : 0mm
				5		Capillary tube length : 5m
					- □ - □	Select a necessary code alone among those in the optional code table below.

### Option

No.	item	code	Description	
2	Adjustable range	C ( )	Enter adjustable range and unit in parenthesis	
		CDH( )	Adjustable range and the unit are filled in parentheses at the pressure measurement on a high-pressure side.	
		CDL( )	Adjustable range and the unit are filled in parentheses at the pressure measurement on a low-pressure side.	
3	Certification	XC	TIIS Explosion proof standard approval	
		FM	FM explosion proof approval	
4	Indicator	M	With Digital indicator	
		MJ( )	Digital indicator and actual scale display Fill in ( ) with scale and unit mark	
5	Flange standard	JIS	80J20	Flange standard JIS 20K 80A RF equivalent wafer type
			80J30	Flange standard JIS 30K 80A RF equivalent wafer type
			80J40	Flange standard JIS 40K 80A RF equivalent wafer type
			80J63	Flange standard JIS 63K 80A RF equivalent wafer type
			100J10	Flange standard JIS 10K 100A RF equivalent wafer type
			100J20	Flange standard JIS 20K 100A RF equivalent wafer type
			100J30	Flange standard JIS 30K 100A RF equivalent wafer type
			100J40	Flange standard JIS 40K 100A RF equivalent wafer type
			100J63	Flange standard JIS 63K 100A RF equivalent wafer type
			ANSI	80A150
		80A300		Flange standard ANSI 300 3B RF equivalent wafer type
		80A400		Flange standard ANSI 400 3B RF equivalent wafer type
		80A600		Flange standard ANSI 600 3B RF equivalent wafer type
		80A900		Flange standard ANSI 900 3B RF equivalent wafer type
		80A1500		Flange standard ANSI 1500 3B RF equivalent wafer type
		80A2500		Flange standard ANSI 2500 3B RF equivalent wafer type
		100A150		Flange standard ANSI 150 4B RF equivalent wafer type
		100A300		Flange standard ANSI 300 4B RF equivalent wafer type
		100A400		Flange standard ANSI 400 4B RF equivalent wafer type
		JPI	100A600	Flange standard ANSI 600 4B RF equivalent wafer type
			100A900	Flange standard ANSI 900 4B RF equivalent wafer type
			100A1500	Flange standard ANSI 1500 4B RF equivalent wafer type
			100A2500	Flange standard ANSI 2500 4B RF equivalent wafer type
			80JP150	Flange standard JPI 150 3B RF equivalent wafer type
			80JP300	Flange standard JPI 300 3B RF equivalent wafer type
			80JP400	Flange standard JPI 400 3B RF equivalent wafer type
			80JP600	Flange standard JPI 600 3B RF equivalent wafer type
			80JP900	Flange standard JPI 900 3B RF equivalent wafer type
			80JP1500	Flange standard JPI 1500 3B RF equivalent wafer type
		JPI	80JP2500	Flange standard JPI 2500 3B RF equivalent wafer type
100JP150	Flange standard JPI 150 4B RF equivalent wafer type			
100JP300	Flange standard JPI 300 4B RF equivalent wafer type			
100JP400	Flange standard JPI 400 4B RF equivalent wafer type			
100JP600	Flange standard JPI 600 4B RF equivalent wafer type			
100JP900	Flange standard JPI 900 4B RF equivalent wafer type			
100JP1500	Flange standard JPI 1500 4B RF equivalent wafer type			
100JP2500	Flange standard JPI 2500 4B RF equivalent wafer type			
6	Flange extension length		E50	Extension length 50mm
			E100	Extension length 100mm
		E150	Extension length 150mm	
7	Capillary tube length	1	1m	
		2	2m	
		3	3m	
		4	4m	
		6	6m	
		7	7m	
		8	8m	
		9	9m	
		10	10m	
		1U	1m Back-drawn capillary type	
		2U	2m Back-drawn capillary type	
		3U	3m Back-drawn capillary type	
		4U	4m Back-drawn capillary type	
		5U	5m Back-drawn capillary type	
6U	6m Back-drawn capillary type			
7U	7m Back-drawn capillary type			
8U	8m Back-drawn capillary type			
9U	9m Back-drawn capillary type			
10U	10m Back-drawn capillary type			

8	Material	316L	Diaphragm ; SUS316L, Other wetted parts ; SUS316L
		HC	Diaphragm ; Hastelloy C, Other wetted parts ; Hastelloy C
		TA	Diaphragm ; Tantalum, Other wetted parts ; Tantalum (only for E0)
		AU316	Diaphragm ; SUS316L with gold plate , Other wetted parts ; SUS316
9	Filled liquid	FO	Fluorine oil
		100CS	Silicon oil for sanitary use
		PG	Propylene glycol
10	No oil	NL	No-oil finish
		NLW	No-oil and dehydrating finish
11	Process fluid conditions	V	Vacuum type
12	Density correction	D( )	Arithmetic processing function of density correction for measurement of liquefied gas level. It selects from Oxygen, Nitrogen, Argon, Butane, Carbon dioxide, and Propane and it fills it in in parentheses.
13	With temperature compensation function	SA	With temperature compensation function for capillary tube

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.

- HART® is a registered trademark of the HART Communication Foundation.
- 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.