

Model 315M

Metal Capacitive Differential Pressure Transducers



Description

The model 315M is a capacitive differential pressure transducer with all welded stainless steel construction. BCM 115C differential pressure sensor is integrated inside the 315M. Thanks to the unique structure of metal capacitive working principle, the 315M transducer can measure low differential pressure down to 0~16mbar and sustain high static pressure up to 320bar.

Different types of fill fluid are available for this model for different applications. The fill fluid can be the standard type-a fluid for common industry of general purpose, the type-b fluid suitable for oxygen industry, or the type-c fluid suitable for tobacco industry.

With the large diameter diaphragms, the 315M can measure pressure of either viscous paste or fluids containing solid particles. Moreover, Tantalum, Hastelloy-C, or Monel diaphragms are available on request for more corrosive media applications in case 316L stainless steel is no longer applicable.

For temperature measurement, a temperature sensor (e.g., a thermal diode or a thermal resistor) can be integrated into the 315M on request.

Features

- pressure ranges: from 0~16 mbar to 0~410 bar
- static pressure: up to 320 bar for diff. pressure applications
- overload pressure: up to 520 bar for gauge pressure applications
- accuracy up to 0.25%fs
- temperature measurement available on request
- all welded stainless steel construction
- variant materials of pressure diaphragm for different corrosive media

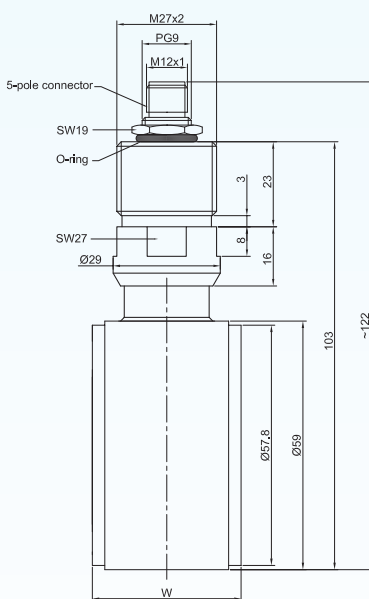
Applications

- process control systems
- hydraulic systems
- liquid level control
- biomedical instruments
- flow measurement
- OEM equipment



Dimensions

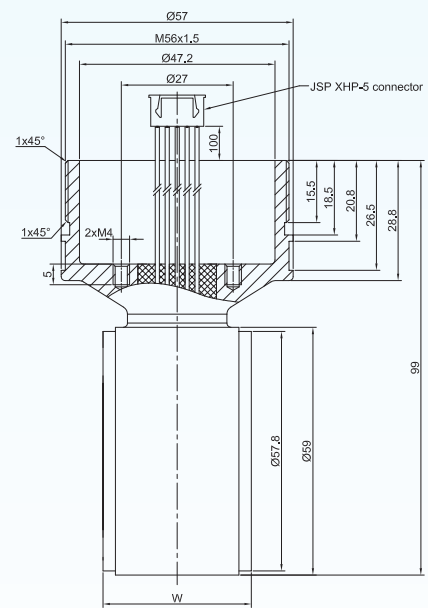
1) 315M of Capacitive Output Signal



Type-I

Pressure Range (bar)	W (mm)
0~0.016, ..., ~2	35.6
0~10	37
0~25	37.4
0~100	39
0~200	40.1, 39(#)
0~410	39

(#): Applicable for 520bar static pressure.



Type-II

Note: All dimensions are in mm.

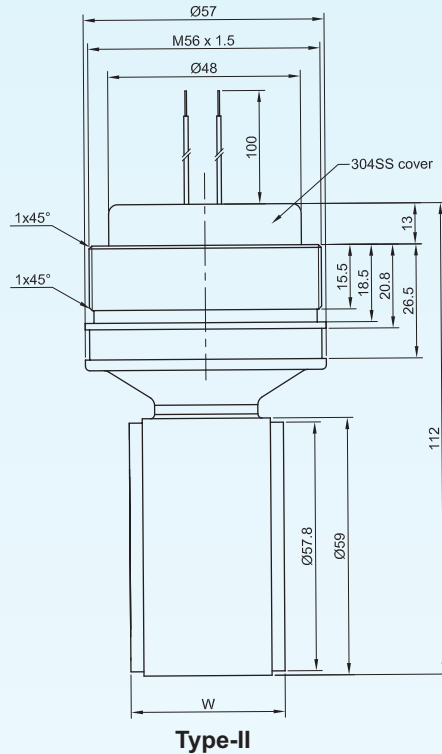
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2) 315M of Conditioned Output Signal (i.e., 4~20mA, 1~5V, or 4~20mA with HART protocol)



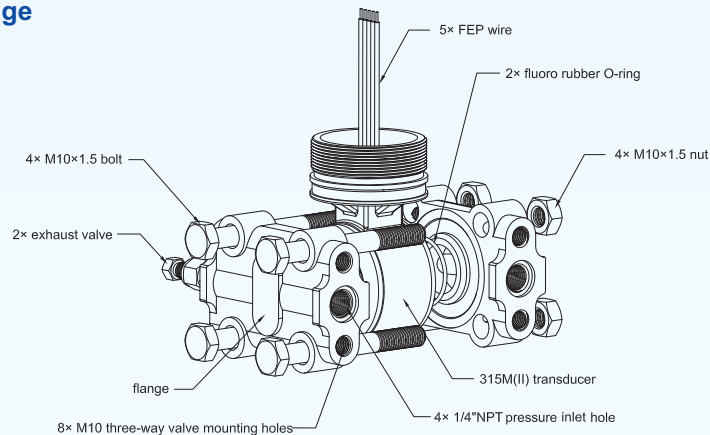
Pressure Range (bar)	W (mm)
0~0.016, ..., ~2	35.6
0~10	37
0~25	37.4
0~100	39
0~200	40.1, 39(#)
0~410	39

(#): Applicable for 520bar static pressure.

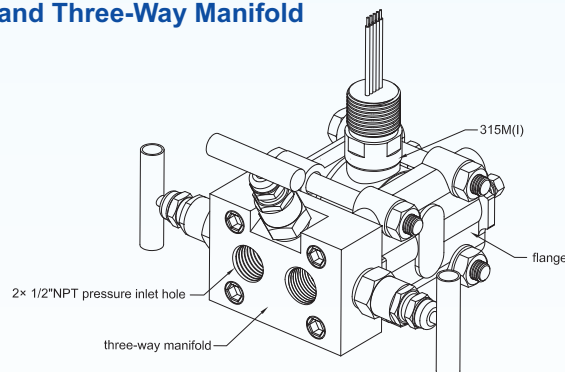
Notes:

- All dimensions are in mm.
- The Type-II is not recommended in case of conditioned output, because the electronics boards of sensor signal conditioner cannot be installed inside the transducer housing.

3) Assembly of 315M with Flange



4) Assembly of 315M with Flange and Three-Way Manifold



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Technical Data

1) 315M of Capacitive Output Signal

Parameters		Units	Specifications						Notes
pressure medium			gas, dilute liquid, paste, viscous fluid or fluid with grains, as long as it is compatible with the materials of 315M wetted parts						
differential pressure (D) ranges		bar, D	0~0.016	~0.06	~0.4, ~2, ~10	~25	~100		
static pressure		bar	20	40	100 (STD), 250, 320	125	200		1
differential overload pressure		bar	20	40	100 (STD), 250, 320	125	200		1
gauge pressure (G) ranges		bar, G	0~0.016	~0.06	~0.4, ~2, ~10	~25	~100	~200	~410
absolute pressure (A) ranges		bar, A	-	-	0~2, ~10	~25	~100	~200	-
overload for G & A pressures		bar	20	40	100 (STD), 250, 320	125	200	250 (STD), 520	520
output signal	CH	pF	≤ 100, 120 in case of 0.016barD/G						2 & 3
	CL	pF	≥ 200						2 & 3
zero offset	CH & CL	pF	140±30; 110±30 in case of 2barD/G/A; 120±30 in case of 200barG/A; 140±40 in case of 520bar static pressure						
accuracy		%fs	±0.8						4 & 5
long-terms stability		%fs/year	≤ ±0.25; ≤ ±0.5 in case of 0.016barD/G, or 200barG/A						
zero variation caused by static pressure		%fso	≤ ±0.5						6 & 7
span variation caused by static pressure		%fso	≤ ±0.5						6 & 7
operating temperature range		°C	-40 ~ +130 (standard), filled with type-a fluid for common industry. -40 ~ +130, filled with type-b fluid for oxygen industry. -40 ~ +130, filled with type-c fluid for tobacco industry.						
storage temperature range		°C	-40 ~ +120						
temperature coefficient of zero		%fso/°C	≤ ±0.04						7
temperature coefficient of span		%fso/°C	≤ ±0.08						7
temperature sensor			thermal diode (standard), Pt100						
insulation resistance		MΩ	≥ 500 @100Vdc						
response time		ms	≤ 100 in case of ranges > 0.06bar; ≤ 400 in case of 0~0.06bar range						
electrical interface			flying wires of FEP (one kind of Teflon) insulation, length = 100mm the flying wires as mentioned above with JSP HXP connector, wire length = 100mm 5-pin connector with M12x1 male thread						8
diaphragm material			316L SS (standard); option: Hastelloy-C, or Tantalum						
housing material			304 SS						
flange material (option)			304 SS (standard); option: 316 SS, Hastelloy-C, or Tantalum						

General conditions for measurements: media temperature = 25°C, ambient temperature = 25°C, humidity = 60%RH.

Notes: 1. "STD" refers to standard.

2. CH is the capacitance measured between the red and white wires, while CL is the capacitance measured between the blue and white wires.

3. The listed capacitances are typical values. For batch production, CH has deviation of ≤ ±30pF while CL has deviation of ≤ ±40pF.

4. "fs" refers to full scale pressure.

5. Accuracy = $\sqrt{(\text{non-linearity})^2 + (\text{hysteresis})^2 + (\text{repeatability})^2}$.

The non-linearity, hysteresis, and repeatability are calculated by K values which are defined as $K = (CL - CH) / (CL + CH)$.

6. The variations of zero and span can be eliminated when the 115C DPS is associated with an electronics circuit which is adjusted to the given static pressure.

7. Calculated by K values which are defined in Note 5 above.

8. JSP HXP-5 connector has 5 terminals for the differential capacitive + temperature output, while JSP HXP-3 connector has 3 terminals for the differential capacitive output.

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2) 315M of Conditioned Output Signal (i.e., 4~20mA, 1~5V, or 4~20mA with HART protocol)

Parameters	Units	Specifications							Notes
pressure medium		gas, dilute liquid, paste, viscous fluid or fluid with grains, as long as it is compatible with the materials of 315M wetted parts							
differential pressure (D) ranges	bar, D	0~0.016	~0.06	~0.4, ~2, ~10	~25	~100			1
static pressure	bar	20	40	100 (STD), 250, 320	125	200			2
differential overload pressure	bar	20	40	100 (STD), 250, 320	125	200			2
gauge pressure (G) ranges	bar, G	0~0.016	~0.06	~0.4, ~2, ~10	~25	~100	~200	~410	1
absolute pressure (A) ranges	bar, A	-	-	0~2, ~10	~25	~100	~200	-	1
minimum adjustable ranges		0~0.002	~0.016	~0.06, ~0.4, ~1.8	~8	~20	~80	~180	3
overload for G & A pressures	bar	20	40	100 (STD), 250, 320	125	200	250 (STD), 520	520	2
output signal		4~20mA (standard), 1~5V, 4~20mA with HART protocol							
accuracy	%fs	±0.25, ±0.5 (standard)							4 & 5
long-terms stability	%fs/year	≤ ±0.25; ≤ ±0.5 in case of 0.016barD/G, or 200barG/A							
supply voltage (Vs)	Vs	12, ..., 30							
load resistance	Ω	≤ (Vs - 12V) / 0.02A							
zero variation caused by static pressure	%fso	≤ ±0.5							6
span variation caused by static pressure	%fso	≤ ±0.5							6
operating temperature range	°C	-40 ~ +85							
storage temperature range	°C	-40 ~ +85							
temperature coefficient of zero	%fso/°C	≤ ±0.01, ≤ ±0.025 in case of 0.016barD/G							
temperature coefficient of span	%fso/°C	≤ ±0.01, ≤ ±0.025 in case of 0.016barD/G							
insulation resistance	MΩ	≥ 500 @100Vdc							
response time	ms	≤ 100 in case of ranges > 0.06bar; ≤ 400 in case of 0~0.06bar range							
electrical interface		flying wires of PVC insulation, length = 100mm							
		the flying wires as mentioned above with JSP HXP connector, wire length = 100mm							7
diaphragm material		316L SS (standard); option: Hastelloy-C, or Tantalum							
housing material		304 SS							
flange material (option)		304 SS (standard); option: 316 SS, Hastelloy-C, or Tantalum							

General conditions for measurements: media temperature = 25°C, ambient temperature = 25°C, humidity = 60%RH.

Notes: 1. The listed D/G/A ranges refer to the designed ranges.

2. "STD" refers to standard.

3. The minimum adjustable range refer to the minimum range which can be calibrated by the sensor signal conditioner to the conditioned output from the corresponding designed range under condition of meeting the specifications listed in the table above.

E.g., the designed range of 0~2barD can be calibrated to measure minimum 0~0.4barD which has 4mA output signal related to 0barD while 20mA output signal related to 0.4barD.

4. "fs" refers to full scale pressure.

5. Accuracy = sqrt (non-linearity² + hysteresis² + repeatability²).

6. The variations of zero and span can be eliminated when the transducer is associated with an electronics circuit which is adjusted to the given static pressure.

7. JSP HXP-2 connector has 2 terminals for the current loop, while JSP HXP-3 connector has 3 terminals for the voltage output.

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Ordering Information

1) 315M of Capacitive Output Signal (standard)

example: 315M(I-DP)-2-100-5-0.8%fs-TA-ThermalDiode-NoF-21-FW-(*)

transducer types & pressure references	
315M(I-DP), 315M(II-DP): 315M type-I or -II for DP applications	
315M(I-hDP), 315M(II-hDP): 315M type-I or -II for DP of high static pressure of 250bar or 320bar	
315M(I-AP), 315M(II-AP): 315M type-I or -II for absolute pressure applications	
315M(I-GP), 315M(II-GP): 315M type-I or -II for gauge (relative) pressure applications	

pressure ranges & references vs static (overload) pressure	
0.016 = 0~16mbarD(^), or G	vs 20bar
0.06 = 0~60mbarD(^), or G	vs 40bar
0.4 = 0~400mbarD(^), or G	vs 100bar (standard), 250bar, or 320bar
2 = 0~2barD(^), G, or A	vs 100bar (standard), 250bar, or 320bar
10 = 0~10barD(^), G, or A	vs 100bar (standard), 250bar, or 320bar
25 = 0~25barD(^), G, or A	vs 125bar
100 = 0~100barD(^), G, or A	vs 200bar
200 = 0~200barG, or A	vs 250bar (standard), or 520bar
410 = 0~410barG	vs 520bar
(^): DP sensors can work with both $DP \leq 0$ and $DP \geq 0$, e.g., 0~2barD = measuring range of both -2~0bar and 0~+2bar.	

static (overload) pressure	
20 = 20bar in case of 16mbarD/G	
40 = 40bar in case of 60mbarD/G	
100 = 100bar in case of 400mbarD/G, 2barD/G/A, or 10barD/G/A	
125 = 125bar in case of 25barD/G/A	
200 = 200bar in case of 100barD/G/A	
250 = 250bar in case of 400mbarD/G, 2barD/G/A, 10barD/G/A, or 200barG/A	
320 = 320bar in case of 400mbarD/G, 2barD/G/A, or 10barD/G/A	
520 = 520bar in case of 200barG/A, or 410barG	

output signal	
5 = differential capacitive + temperature signal	
3 = differential capacitive signal	

accuracy	
0.8%fs	

operating temperature range	
Ta = -40 ~ +130°C (standard, fill fluid type-a for common industry)	
Tb = -40 ~ +130°C (fill fluid type-b for oxygen industry)	
Tc = -40 ~ +130°C (fill fluid type-c for tobacco industry)	

temperature sensor	
ThermalDiode (standard)	Pt100
NS = no temperature sensor	Other temperature sensor available on request.

mechanical interface	
NoF = no flange (standard)	F = flange with exhaust valve
F3M = flange with exhaust valve and three-way manifold	

materials			
code	diaphragm	housing	flange & exhaust valve & manifold
21 (standard)	316L SS	304 SS	304 SS
22	316L SS	304 SS	316 SS
23	Hastelloy-C	304 SS	316 SS
24	Hastelloy-C	304 SS	Hastelloy-C
25	Tantalum	304 SS	316 SS
26	Tantalum	304 SS	Tantalum

electrical interface	
FW (standard) = flying wires, length = 100mm. Wire length can be customized, e.g. FW(50mm).	
JSTconnector = flying wires with JST XHP-5 or XHP-3 connector (according to the output signal), wire length = 100mm. Wire length can be customized, e.g. JSTconnector(50mm).	
M12connector = 5-pin connector with M12x1 thread (applicable only for 315M type-I)	

“(*)” is necessary only if any customized parameter is required, otherwise it is neglectable.

Examples of Ordering Code

- standard transducer:
315M(I-DP)-10-100-5-0.8%fs-TA-ThermalDiode-NoF-21-FW
- customized transducer:
315M(I-DP)-10-100-5-0.8%fs-TA-Pt1000-F-21-JSTconnector-(*)
(*): Customized temperature sensor = Pt1000.

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2) 315M of Conditioned Output Signal (i.e., 4~20mA, 1~5V, or 4~20mA with HART protocol)

example: 315M(I-DP)-0/2-100-4/20mA-0.5%fs-TA-NoF-21-FW-(*)

transducer types & pressure references
315M(II-DP): 315M type-II for DP applications
315M(II-hDP): 315M type-II for DP of high static pressure of 250bar or 320bar
315M(II-AP): 315M type-II for absolute pressure applications
315M(II-GP): 315M type-II for gauge (relative) pressure applications

designed pressure ranges & ref.	examples of selected ranges(#)	static (overload) pressure
0~16mbarD(*), or G	0/0.016, -0.016/+0.016, -0.002/+0.002	20bar
0~60mbarD(*), or G	0/0.06, -0.06/+0.06, -0.016/+0.016	40bar
0~400mbarD(*), or G	0/0.4, -0.4/+0.4, -0.06/+0.06	100bar (standard), 250bar, or 320bar
0~2barD(*), G, or A	0/2, -2/+2, -0.4/+0.4	100bar (standard), 250bar, or 320bar
0~10barD(*), G, or A	0/10, -10/+10, -1.8/+1.8	100bar (standard), 250bar, or 320bar
0~25barD(*), G, or A	0/25, -25/+25, -8/+8	125bar
0~100barD(*), G, or A	0/100, -100/+100, -20/+20	200bar
0~200barG, or A	0/200, -1/+200, -1/+80	250bar (standard), or 520bar
0~410barG	0/410, -1/+410, -1/+180	520bar

(*) DP sensors can work with both $DP \leq 0$ and $DP \geq 0$, e.g., 0~2barD = measuring range of both -2~0bar and 0~+2bar.
 (#) The selected range must be between the designed range and the minimum adjustable range as specified in Technical Data. The products will be calibrated according to the selected range before delivery.
 Taking "-2/+2" as example, this range refers to 4mA output signal at -2barD while 20mA output signal at +2barD.

static (overload) pressure
20 = 20bar in case of 16mbarD/G
40 = 40bar in case of 60mbarD/G
100 = 100bar in case of 400mbarD/G, 2barD/G/A, or 10barD/G/A
125 = 125bar in case of 25barD/G/A
200 = 200bar in case of 100barD/G/A
250 = 250bar in case of 400mbarD/G, 2barD/G/A, 10barD/G/A, or 200barG/A
320 = 320bar in case of 400mbarD/G, 2barD/G/A, or 10barD/G/A
520 = 520bar in case of 200barG/A, or 410barG

output signal
4/20mA (standard) 1/5V
4/20mAwithHART If another output is required, consult BCM.

accuracy
0.25%fs
0.5%fs (standard)

fill fluid
Ta = fill fluid type-a for common industry (standard)
Tb = fill fluid type-b for oxygen industry
Tc = fill fluid type-c for tobacco industry

mechanical interface
NoF = no flange (standard) F = flange with exhaust valve
F3M = flange with exhaust valve and three-way manifold

materials			
code	diaphragm	housing	flange & exhaust valve & manifold
21 (standard)	316L SS	304 SS	304 SS
22	316L SS	304 SS	316 SS
23	Hastelloy-C	304 SS	316 SS
24	Hastelloy-C	304 SS	Hastelloy-C
25	Tantalum	304 SS	316 SS
26	Tantalum	304 SS	Tantalum

electrical interface
FW (standard) = flying wires, length = 100mm. Wire length can be customized, e.g, FW(50mm).
JSTconnector = the flying wires with JST XHP-2 or XHP-3 connector (according to the output signal), wire length = 100mm. Wire length can be customized, e.g, JSTconnector(50mm).
Other electrical interface available on request.

"(*)" is necessary only if any customized parameter is required, otherwise it is neglectable.

Examples of Ordering Code

- standard transducer:
315M(II-DP)-(-1/+2)-100-4/20mA-0.5%fs-TA-NoF-21-FW
- customized transducer:
315M(II-DP)-(0/2)-250-1/5V-0.25%fs-TA-F-21-TE104257/2(150mm)-(*)
 (*): Customized electrical interface = TE 104257/2 connector with 150mm flying wires.

The listed dimensions, specifications, and ordering information are subject to change without prior notice.

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