

Integral Orifice Assembly

Measuring line for small flow measurements

Characteristics

The Integral Orifice Assembly can be mounted directly to the differential pressure transmitter (see fig. 1).

Application

The Integral Orifice Assembly is a segment of a line to measure small flows. It is suitable for liquids and gases.

The integrated orifice is the differential pressure sensor and is mounted inside of the assembly. While medium passes through the orifice there will happen a drop of pressure. This is a proportion for the flow. The differential pressure transmitter transforms the loss of pressure to an uniformed signal, normally a current output (f.e. 4 to 20 mA)

The equation for the volume flow q_v is:

$$Q_v = c \cdot \sqrt{\Delta P}$$

Description of orifice calculation

The Integral Orifice Assembly can be ordered with 6 different sizes of orifice. To get the differential pressure and the size of the orifice, the volume or mass flow under operation condition has to be converted to equivalent volume flow for water or air. Now it is possible to choose the size of orifice and for a first approach the span of the differential pressure while using the Nomogram for liquids or gases. The exact find out of the differential pressure has to be calculated numerical in accordance to the formulas of the attached data sheets.

After changing the orifice size it is necessary to calculate again.

内藏孔板流量计

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fig.1 integral orifice assembly with transmitter

Technical Informations *Integral Orifice Assembly*

1. Size 1/2" Threaded connection

Measuring Range

liquids	0.396 up to 1109.52 GPH	
	1.500 up to 4200	1/h
gases	1.766 up to 4238 cu ft/h	
	0.050 up to 120	m ³ /h

Inside diameter of integrated orifice

size	d[inch]	d[mm]
1	0.0278	0.705
2	0.0394	1.000
3	0.0630	1.600
4	0.1260	3.200
5	0.2047	5.200
6	0.3425	8.700

Pressure rating	ANSI 600#.900#.1500#.
Temperature of medium	-40 UP TO +248°F -40 UP TO +120°C
Process connection	1/2 NPT • F
Orifice material:	316Ti(1.4571) other materials on request
Weight:	appr.4.41lbs(2 kg)

2. Flange connection type

Pressure rating: ANSI 150# to 2500#, Size: 1/2" to 1-1/2"
Process connection: ANSI B16.5 flanges, RJ or RF face
Medium: Liquid, gas or steam
Medium temperature: -40 UP TO +120°C

Quality comes first!

Integral Orifice Assembly
Measuring line for small flow measurements

Model Seletion 内藏孔板流量计选型

1. General Use Integral Orifice Assembly

一般用内藏孔板流量计 (Operation Temperature < 120 °C)

1.1. 1/2"NPT/ Rating: 600,900,1500# (螺纹连接式)

BB-102	Integral Orifice Plate 1/2" NPTF					
	Material of Orifice Plate					
	1	316Ti				
	2	1.4539				
	3	Hastelloy C4				
	4	Monel				
	Body Material					
	6	316Ti				
	7	1.4539				
	8	Hastelloy C4				
	9	Monel				
	Thread Connection Ermeto 12 x 1mm					
	A	Without			
	B	1/2"NPT	Steel			
	C	1/2"NPT	316Ti			
	Tag Plate-SS With marking					
	0	Without Tag Plate				
	40	Tag Plate with Marking				
	Documentation					
	Z	Drawing				
	D	Pressure Test				
	B	EN10204.3.1B				
	Each further Instrument					
	C	Free of Oil and Grease				
	D	Water Calibration				
BB-102	1	6	A	40		

1.2. Flange Type: 1/2" ANSI 1500# RTJ (法兰连接式)

BB1021 C40 Material: Body/Flanges- SS316/A105, Orifice- SS 316
(Upstream length 250mm,downstream length 250mm)

1.3. Flange Type: 3/4" ANSI 1500# RTJ (法兰连接式)

BB1021 C40 Material: Body/Flanges- SS316/A105, Orifice-SS 316
(Upstream length 250mm,downstream length 200mm)

1.4. Flange Type: 1"ANSI 1500# RTJ (法兰连接式)

ME13101EE321AAO Material: Body/Flanges- SS316/A105, Orifice-SS 316
(Upstream length 300mm,downstream length 200mm)

1.5. Flange Type: 1-1/2"ANSI 1500#RTJ (法兰连接式)

ME13101EE321AAO Material: Body/Flanges- SS316/A105, Orifice-SS 316
(Upstream length 300mm, downstream length 200mm)



Size: 1/2" (DN15)
BB102 一体式, 螺纹连接方案

Pressure Rating
ANSI 600 lbs
ANSI 900 lbs
ANSI 1500 lbs
ANSI 1500 lbs
ANSI 2500 lbs

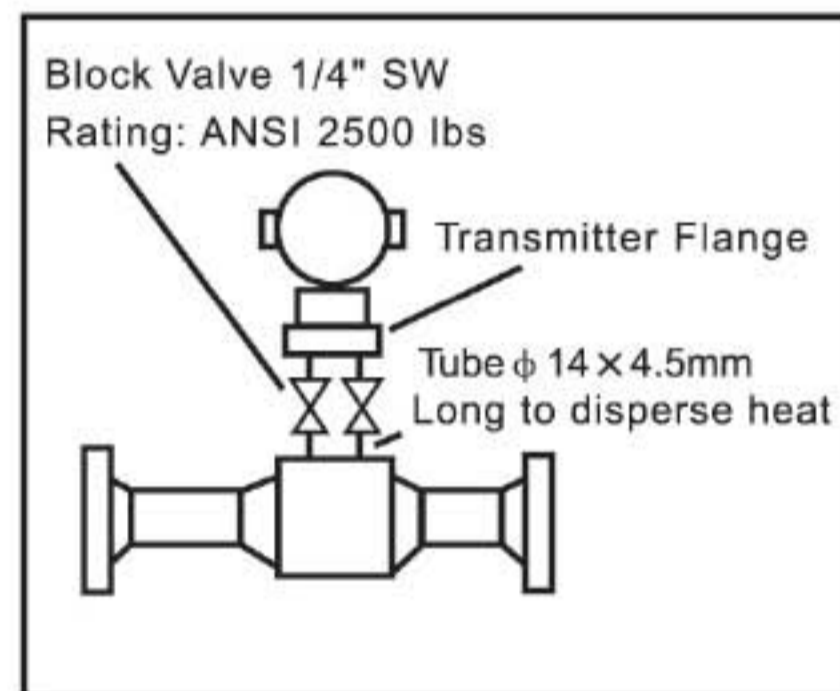


Size: 3/4" (DN20) to 1-1/2" (DN40)
A06 基本式(无截止阀和三阀组)

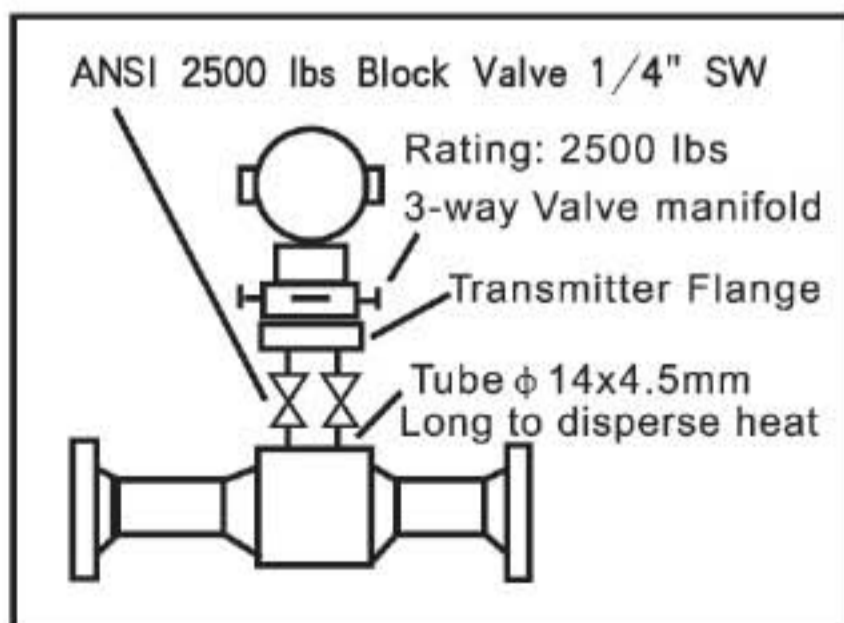
2. High Temperature Model selection 高温内藏孔板选型



Code: A06+A66 (变送器法兰+三阀组)
Without Block Valve Design
无截止阀设计方案



Code: A65+A06 (截止阀+变送器法兰)
Without Manifold Design
无三阀组设计方案



Code: A80 (截止阀+变送器法兰+三阀组)
2 Block Valve: A7-2PT-SZ14x4.5, PN400
Body/Trim Material: 316Ti, Packing: Graphite
Complete with flange for 3-way manifold



A65 Block Valve
Body/Trim: 316Ti
Packing: Graphite
Rating: 2500lbs, 1/4"



A66 3-Way Manifold
Body/Trim: 316Ti
Packing: PTFE
Rating: 2500 lbs, 1/4"

Model selection

Transmitter Model: INT5331DA321BC6

Sensor Model: MBL500 - SJ - R33 - A80 - A66

Integral Orifice Unit
Rating: 900 - 2500 lbs
Size: 1/2" - 2"
Process Connection:
Flanges, RJ Seal face
Material: As required

Three Way Manifold,
Rating 2500 lbs (PN400)
Body/Trim Material: 316SS
2 Shut-off Valves With Direct welded
Transmitter flange, Material: 316Ti
1/4", 2500 lbs, SW.
R33: 3/4" 2500 lbs A105/A106
SJ: ANSI B16.5, RJ face flangs

MBL500	Measuring section with integral concentric squareedge orifice, flange & Acc.	
	Flange Face, Rating, Material & Body Material	
SA	RF - 125 RAAH	Size and Pressure Rating
SJ	RJ	
Size and Material Code	R27	flange: A105, body: A106A234WPA
	SR27	flange: A105, Body & Pipe: SS316L
	S27	flange: SS316L, body: SS316L
	R28	flange: A105, body: A106A234WPA
	SR28	flange: A105, Body & Pipe: SS316L
	S28	flange: SS316L, body: SS316L
	R29	flange: A105, body: A106A234WPA
	SR29	flange: A105, Body & Pipe: SS316L
	S29	flange: SS316L, body: SS316L
	R30	flange: A105, body: A106A234WPA
	SR30	flange: A105, Body & Pipe: SS316L
	S30	flange: SS316L, body: SS316L
	R31	flange: A105, body: A106A234WPA
	SR31	flange: A105, Body & Pipe: SS316L
S31	flange: SS316L, body: SS316L	
SA	RF - 125 RAAH	Size and Pressure Rating
SJ	RJ	
Size and Material Code	R32	flange: A105, body: A106A234WPA
	SR32	flange: A105, Body & Pipe: SS316L
	S32	flange: SS316L, body: SS316L
	R33	flange: A105, body: A106A234WPA
	SR33	flange: A105, Body & Pipe: SS316L
	S33	flange: SS316L, body: SS316L
	R34	flange: A105, body: A106A234WPA
	SR34	flange: A105, Body & Pipe: SS316L
	S34	flange: SS316L, body: SS316L
	R35	flange: A105, body: A106A234WPA
	SR35	flange: A105, Body & Pipe: SS316L
	S35	flange: SS316L, body: SS316L
	R36	flange: A105, body: A106A234WPA
	SR36	flange: A105, Body & Pipe: SS316L
S36	flange: SS316L body: SS316L	
	Flange plate to direct mount a manifold	
A06	Flange plate for 3-way manifold, material SS316TI	
A80	2 of shut off valve's type A7-2PT-SZ14x4,5, material: SS316TI (PN400) Complete with flange plate for 3-way manifold	
	Instrument connection	
A66	Direct mount, 3-way manifold, PN400, Body & Trim: 316/316L, (only with A06/A80)	
A65	2 of shut off valve's type A7-2PT-SZ14x4.5 material: SS316TI (PN400)	

Model selection (低压内藏孔板流量计选型)

Transmitter Model: INT4331EA221BC6

Sensor Model: MBL500 - SA - R25 - A80 - A66

MBL500 Measuring section with integral concentric squareedge orifice, flange & Acc.		
Flange Face, Rating, Material & Body Material		
SA	RF-125 RAAH	
SJ	R J	
		Size and Pressure Rating
Size and Material Code	R12	flange: A 105, body: A106A234WPA
	SR12	flange: A105, body & pipe: SS316L
	S12	flange: SS316L, body: SS316L
	R13	flange: A105, body: A106A234WPA
	SR13	flange: A105, body & pipe: SS316L
	S13	flange: SS316L, bod : SS316L
	R14	flange: A105, body: A106A234WPA
	SR14	flange: A105, body & pipe: SS316L
	S14	flange: SS316L, body: SS316L
	R15	flange: A105, body: A106A234WPA
	SR15	flange: A105, body & pipe: SS316L
	S15	flange: SS316L, body: SS316L
	R16	flange: A105, body: A106A234WPA
	SR16	flange: A105, body & pipe: SS316L
	S16	flange: SS316L, body: SS316L
	SA	RF- 125 RAAH
SJ	R J	
		Size and Pressure Rating
Size and Material Code	R17	flange: A105, body: A106A234WPA
	SR17	flange: A105, body & pipe: SS316L
	S17	flange: SS316L, body: SS316L
	R18	flange: A 105, body: A106A234WPA
	SR18	flange: A105, body & pipe: SS316LPA
	S18	flange: SS316L, body: SS316L
	R19	flange: A105 body: A106A234WPA
	SR19	flange: SS316L, body: A106A234WPA
	S19	flange: SS316L, body: SS316L
	R20	flange: A 105, body: A1D6A234WPA
	SR20	flange: A105, body & pipe: SS316LPA
	S20	flange: SS316L body: SS316L
	R21	flange: A105, body: A106A234WPA
	SR21	flange: A105, body & pipe: SS316LPA
	S21	flange: SS316L, body: SS316L
	SA	RF-125RAAH
SJ	R J	
		Size and Pressure Rating
Size and Material Code	R22	flange: A 105, body: A106A234WPA
	SR22	flange: A105, body & pipe: SS316L
	S22	flange: SS316L, body: SS316L
	R23	flange: A105, body: A106A234WPA
	SR23	flange: A105, body & pipe: SS316L
	S23	flange: SS316L, body: SS316L
	R24	flange: A105, body: A106A234WPA
	SR24	flange: A105, body & pipe: SS316L
	S24	flange: SS316L, body: SS316L
	R25	flanae: A105, body: A106A234WPA
	SR25	flange: A105, body & pipe: SS316LA
	S25	flange: SS316L body: SS316L
	R26	flange: A105, body: A1D6A234WPA
	SR26	flange: A105, body & pipe: SS316L
	S26	flange: SS316L body: SS316L
	Flange plate to direct mount a manifold	
A06	Flange plate for 3-way manifold, material SS316TI	
A80	2 of shut off valve's type A7-2PT-SZ14x4,5, material: SS316TI (PN400) Complete with flange plate for 3-way manifold	
Instrument connection		
A66	Direct mount, 3-way manifold, PN400, Body & Trim: 316/316L, (only with A06 / A80)	
A65	2 of shut off valve's type A7-2PT-SZ14x4.5 material: SS316TI (PN400)	

Transmitter Model Selection



Ordering date	Order code
INT.5331-	INT.5331-
Pressure & flow,2-wire system	
Static 6090 psi	
Min Span	
1" to 100"H20(abs)	D
2.4" to 240"H20(abs)	E
6.4" to 640"H20(abs)	F
20" to 2000"H20(abs)	G
4.36Psi to 435Psi	H
Welded Parts Material	
(Process flange made of Stainless steel)	
Process Diaphragm Parts of meas,seal	
Stainless Steel	A
Hastelloy	B
Gold	L
Process Connection	
Female thread 1/4-18NPT & flange connection to BIN19213	
-Sealing screw opposite process connection	1
-Mounting thread M12	3
-Mounting thread 7/16-20UNF	
-Sealing screw opposite process flange	
-Mounting thread M12	5
-Mounting thread 7/16-20UNF	7
Non-weld parts materials	
Processflange Electronics housing	
Screws	
Steel	0
Stainless	2
(<PN315)	
Stainless steel SST Preo.cast	3
(<PN315)	
Design	
• Standard version	1
• Intemational Version	
English labelInscription,documentation in5 language on CD	2
Explosion protection	
• Without explosion protection	A
• With explosion protection(CENELEC)	
Type of protection:	
- "intrinsic safety"(EExia)	B
- "Explosion-proof"(EEX d) ²⁾	D
- "intrinsic safety" and explosion-proof (EEXia and EEXd) ²⁾ (planned)	P
• Use in zone 2 (planned)	E
• With explosion protection	
• FM and CSA intrinsically sate and explosion-proof	NC
Electrical connection/cable Inlet	
• Screwed gland Pg13.5	A
• Screwed gland M20X1.5	B
• Screwed gland 1/2-1/4 NPT	C
• Han 7D plug ³⁾	D
indicators	
• Without indicator (digital display hidden,setting:mA)	1
• With indicator (digital display visible, setting:mA)	6
• With indicator (digital display visible, setting as specified,Order code Y21 required)	7

Ordering date	Order code
Further designs	
Please add'Z'to Order No.and specify Order code(s)	
Transmitter with mounting bracket made of	
• steel	A01
• stainless steel	A02
instead of PPM(Mton),process flange O-ring made of:	
•PTFE(Teflon)	A20
•FEP(withsilicone cora,approved for food)	A21
•FFPM(Kalrez)	A22
•NBR(BBuna N)	A23
Han 7D plug (metal.gray)	A30
Han 8U plug (instead of Han 7D)	A31
Sealing screws(1/4-18 NPT)with valve in material of process flange	A40
Rating plate inscription (instead of German)	
•English	B11
•French	B12
• Spanish	B13
•Italian	B14
Manufacturer's test certificate M to DIN 55 350 part 18 and to ISO8402	C11
Acceptance test certificate B to DIN 50 049/EN 10 204-3 1B	C12
Factory certificate to DIN 50-49-2.2/ EN 10 204-2.2	C14
Setting of upper limit of output signal to 22.0mA	D05
Acid gas version to NACE (only together with seal diaphragm made of Hasteloy and process screws made of stainless steel)	
Process flange screws made of stainless steel	D09
Process flange screws made of stainless steel	
IP68(not together with Han 7D/Han 8U plug,Pg 13.5 screwed gland)	D12
Use in zone O (basic unit EExia)	E02
Interchanging of process connection side	H01
Vant on side for gas measurements	H02
Stainless steel process flanges for vertical differential pressure lines(not together with K01 or K02)	H03
Additional information	
Please add "Z"to Order No.and specify Order code(s) and plain text.	
Measuring range to be set specify in Plain text:	
• With linear characteristic:	
Y01:...to... psi,inches H20,feet H20...	Y01
• With square-rooted characteristic:	
Y02:...to... psi,inches H20,feet H20...	Y02
Measuring point number/identification (max.16 characters),specify in plian text	
Y15:.....	Y15
Moasuring-point text(max.27 characters), specify in plain text	
Y16:.....	Y16
Setting for digital display, specify in plain text:	
Y21:psi,inches H20,feet H20...	Y21

Example for ordering:

- 1)Only together with max spans 100".240".2000"H20 and 435psi max.Static 4565 psi with stainless process flange screws.
- 2)Without cable gland.
- 3)Not together with type of protection "Explosion-proof"

Only the settings for "Y01","Y21"and "D05" can be made in the factory.

Transmitter Model Selection



Ordering data		INT 433-	
Transmitter for differential pressure and flow two-wire system, Series DS III, PN 32/160			
Meas. cell filling	Meas. cell cleaning	1	
Silicone oil	normal	3	
Inert filling liquid	grease-free		
PN 32, span	1 to 20 mbar ¹⁾		B
PN 160, span	1 to 60 mbar		C
	2.5 to 250 mbar		D
	6 to 600 mbar		E
	16 to 1.600 mbar		F
	50 to 5.000 mbar		G
	300 to 30.000 mbar		H
Wetted parts material (Process flanges made of stainless steel)			
Seal diaphragm	Meas. Cell parts		A
Stainless steel	Stainless steel		B
Hastelloy	Stainless steel		C
Hastelloy	Hastelloy		E
Tantalum ²⁾	Tantalum		H
Monel ²⁾	Monel		L
Gold ^{2),3)}	Gold		Y
Design for remote seals			
Process connection			
Female thread 1/4-18 NPT and flange connection to DIN 19 213			
Sealing screw oppsite process connection			0
- Mounting thread M 10			2
- Mounting thread 7/16-20 UNF			
Sealing screw at side on process flange			4
- Mounting thread M 10			6
- Mounting thread 7/16-20 UNF			
non-wetted parts material			
Process flange screw	Electronic housing		2
Stainless steel	Die-cast aluminium		3
Stainless steel	St. Steel precision casting		
Design for remote seals			
Standard version			1
International version (available soon), English lable inscriptions, documentation in 5 languages on CD			2
Explosion protection			
without explosion protection			A
with explosion protection (CENELEC)			B
- Type of protection "Intrinsic safty" (EEx Ia)			D
- Type of protection "explosion-proof" (EEx d) ⁴⁾			P
- Type of protection "Intrinsic safety and explosion-proof (EEx ia+EEx d) ⁴⁾ (planned)			E
Use in zone 2 (planned)			
with explosion protection (FM und CSA) (in planned)			
- intrinsic safety and explosion-proof (is+xp) ⁴⁾			NC
Electric connection/cable inlet			
Screw gland PG 13.5 ⁵⁾			A
Female thread M20 x 1.5			B
Female thread 1/2-14 NPT			C
Han 7D plug ⁵⁾			D
Indicator			
Without indicator (digital display hidden, setting: mA)			1
With indicator (digital display visible, setting: mA)			6
With indicator (digital display visible, setting as specified) order code Y21 required			7

Transmitter Model Selection



Ordering data		INT 433-	
Transmitter for differential pressure and flow two-wire system, Series DS III, PN 32/160		1	
Meas. cell filling	Meas. cell cleaning	3	
Silicone oil	normal		
Inert filling liquid	grease-free		
PN 32, span	1 to 20 mbar ¹⁾		B
PN 160, span	1 to 60 mbar		C
	2.5 to 250 mbar		D
	6 to 600 mbar		E
	16 to 1.600 mbar		F
	50 to 5.000 mbar		G
	300 to 30.000 mbar		H
Wetted parts material (Process flanges made of stainless steel)			
Seal diaphragm	Meas. Cell parts		A
Stainless steel	Stainless steel		B
Hastelloy	Stainless steel		C
Hastelloy	Hastelloy		E
Tantalum ²⁾	Tantalum		H
Monel ²⁾	Monel		L
Gold ^{2),3)}	Gold		Y
Design for remote seals			
Process connection			
Female thread 1/4-18 NPT and flange connection to DIN 19 213			
Sealing screw oppsite process connection			0
- Mounting thread M 10			2
- Mounting thread 7/16-20 UNF			
Sealing screw at side on process flange			4
- Mounting thread M 10			6
- Mounting thread 7/16-20 UNF			
non-wetted parts material			
Process flange screw	Electronic housing		2
Stainless steel	Die-cast aluminium		3
Stainless steel	St. Steel precision casting		
Design for remote seals			
Standard version			1
International version (available soon), English lable inscriptions, documentation in 5 languages on CD			2
Explosion protection			
without explosion protection			A
with explosion protection (CENELEC)			B
- Type of protection "Intrinsic safty" (EEx Ia)			D
- Type of protection "explosion-proof" (EEx d) ⁴⁾			P
- Type of protection "Intrinsic safety and explosion-proof (EEx ia+EEx d) ⁴⁾ (planned)			E
Use in zone 2 (planned)			
with explosion protection (FM und CSA) (in planned)			
- intrinsic safety and explosion-proof (is+xp) ⁴⁾			NC
Electric connection/cable inlet			
Screw gland PG 13.5 ⁵⁾			A
Female thread M20 x 1.5			B
Female thread 1/2-14 NPT			C
Han 7D plug ⁵⁾			D
Indicator			
Without indicator (digital display hidden, setting: mA)			1
With indicator (digital display visible, setting: mA)			6
With indicator (digital display visible, setting as specified) order code Y21 required			7