

## DESCRIPTION

The Ellipse® Annular Flanged Hot-tap Flow Meter is a multi-ported, self-averaging differential pressure flow element for saturated and superheated steam. The Ellipse flow meter is designed with a series of ports facing the upstream velocity pressures and flow sensing ports strategically located ahead of the trailing edge flow separation.

## COMPONENTS

All sensors are furnished with 1/2 in. instrument valves, flanged mounting hardware (with the proper rating), flanged ball valve (with the proper rating), insert/retract mechanism with rods, and ID tag as standard equipment. Available options include integral 3-valve or 5-valve transmitter mount manifold and integral RTD temperature sensor.

## CONFIGURATION

The flow element has a two-piece construction: an elliptical shape and two 100% independent flow sensing chambers. This construction prevents signal degradation and mixing, and does not require dampening hardware or software. The impact velocity sensing holes (high pressure) are located along the leading edge and the true static sensing holes (low pressure) are on the exterior probe side. This does not generate any vortices or vacuum effects that impinge on the static pressure measurement sensing area and has a drag coefficient of 0.32 or less. Each flow sensor is complete with instrument shut off valves with provisions to accept a transmitter or direct indicating meter. An identification tag is supplied with specific flow station measurement information as required.



## FEATURES

- Patented elliptical design
- Single point pipe entry for DP, temperature and static pressure
- No dampening software required
- Low pressure loss (typically 3% of DP in a 12 in. (304 mm) line)
- Accuracy:  $\pm 0.75\%$  of reading, repeatability:  $\pm 0.1\%$  of reading
- Turndown Ratio: 17:1; no vacuum effects
- No moving part construction provides long, trouble-free service life
- True static pressure measurement rather than a calculated value
- Overcomes loss of accuracy caused by fluid separation at the sensor body

## SPECIFICATIONS

<b>Applications</b>	Saturated and superheated steam
<b>Pipe Size</b>	2...48 in. (50...1219 mm)
<b>Pressure</b>	Pressure and temperature depend on flange ratings, ANSI B16.5 standards
<b>Temperature</b>	800° F (427° C) Maximum
<b>Flow Range</b>	2.6...21,130 GPM
<b>Gear Drive</b>	Option available
<b>Accuracy</b>	±0.75% of reading
<b>Repeatability</b>	±0.1%
<b>Turndown Ratio</b>	17:1 with no vacuum effect
<b>Reynolds Number</b>	>75,000: Maintains most accurate flow measurements <75,000: Consult factory for estimated results

## STANDARD COMPONENTS

Component	Specifications
Head	T-type
Connection	316 SS 1/4 in. or 1/2 in. FNPT
Fitting	CS 3000 lb weld - ASTM A105
Instrument Valves	2 per sensor, 316/316L SS Ellipse
ID Tag	316 SS with wire
Sensor Flange	150 lb 316/316L SS
Packing Chamber	CS with molythane or graphite packing gland
Packing Chamber Flange	CS 150 lb with SS cap
Isolation Ball Valve	316 SS, NPT threaded
Nuts and Bolts	CS threaded
Nipples	CS, schedule 40
Diameter	7/8 in., 1-1/4 in. or 2-1/4 in. diameters

## OPTIONAL COMPONENTS

Component	Specifications
Rods, Bolts and Nuts	316 SS
Packing Chamber and Flange	316 SS
Spiral Wound Gasket	316 SS
300 lb., 600 lb. or Higher Flange Rating	CS or 316 SS ANSI B16.5
Temperature Port with RTD Output	—
Static Pressure Port	With SS plug

## PART NUMBER CONSTRUCTION

## Ellipse®

Annular Flanged Hot Tap  
7/8 in. DIAMETER

PAHF

**PIPE SIZE**

2 in.  
2-1/2 in.  
3 in.  
3-1/2 in.  
4 in.  
5 in.  
6 in.  
8 in.  
10 in.  
12 in.  
14 in.  
16 in.  
18 in.  
20 in.  
24 in.  
30 in.  
36 in.

A  
B  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P  
Q

**SCHEDULE**

STD  
20  
30  
40  
60  
80  
100  
120  
140  
160  
XH  
XXH  
5S  
10S  
40S  
80S

A  
B  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P

**PIPE ORIENTATION**

Horizontal  
Vertical

A  
B

**PROBE MATERIAL**

316/316L SS  
Monel®  
Inconel®  
Hastelloy®  
Other

1  
2  
3  
4  
X

**INSTRUMENT CONNECTION**

1/2 in. NPT  
1/2 in. Socket  
TT3 (Integral 3-Valve Trans Mount - Max Temp 225° F)  
TT5 (Integral 5-Valve Trans Mount - Max Temp 225° F)  
(RTD is not available with Integral 5-Valve Manifold. If RTD is required, select "E" Transmitter Flange Connection and the appropriate manifold valve under the Instrument Valve section below.)  
Transmitter Flange Connection

A  
B  
C  
D  
E

**INSERTION MECHANISM / ISOLATION BALL VALVE**

150# CS Cage Nipple & Rods  
300# CS Cage Nipple & Rods  
600# CS Cage Nipple & Rods  
150# SS Cage Nipple & Rods  
300# SS Cage Nipple & Rods  
600# SS Cage Nipple & Rods  
150# CS Gear Drive, Cage Nipple & Rods  
300# CS Gear Drive, Cage Nipple & Rods  
600# CS Gear Drive, Cage Nipple & Rods  
150# SS Gear Drive, Cage Nipple & Rods  
300# SS Gear Drive, Cage Nipple & Rods  
600# SS Gear Drive, Cage Nipple & Rods  
NOTE: SS Gear Drive - SS for Housing and Wetted Parts Only  
Other

A  
B  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
X

**PACKING MATERIAL**

Molythane (-65...200° F, 140° F in water and high water-based fluids)  
Viton®/Fluorocarbon (-20...400° F)  
Graphoil (1200° F)  
EPDM (-65...300° F, 400° F in steam)  
Fluoromyl® (-65...300° F)  
Other

1  
2  
3  
4  
5  
X

**PIPE MOUNTING\***

A105 CS 3000#  
316/316L SS 3000#  
Supplied Separately by Preso  
Not Required

1  
2  
3  
Z

**INSTRUMENT VALVE**

1/2 in. Needle CS  
1/2 in. Needle SS  
1/2 in. Gate CS  
1/2 in. Gate SS  
Not Required  
ONLY AVAILABLE WITH OPTION "E" UNDER INSTRUMENT CONNECTION  
Fig x Fig 3-Valve Manifold CS - Max Temp 225° F  
Fig x Fig 3-Valve Manifold SS - Max Temp 225° F  
Fig x Fig 5-Valve Manifold CS - Max Temp 225° F  
Fig x Fig 5-Valve Manifold SS - Max Temp 225° F  
Customer Supplied Valve Manifold

A  
B  
C  
D  
Z  
E  
F  
G  
H  
I

**RTD (Max Temp 480° F, consult factory for higher temp options).**

100 Ohm RTD 3-Wire w/Explosion Proof Head  
100 Ohm RTD 3-Wire, Integral w/Aluminum Head  
Not Required

1  
2  
Z

Stainless Steel ID Tag supplied as standard.

Tag information must be included with order.

NOTE: Make sure that DP and Resonance are within acceptable limits. (See chart in the Ellipse Brochure)  
\*Double Supports are not recommended for Hot Tap / Wet Tap models.

## Ellipse®

Annular Flanged Hot Tap  
1-1/4 in. DIAMETER

PAHF1

**PIPE SIZE**

12 in.	J
14 in.	K
16 in.	L
18 in.	M
20 in.	N
24 in.	O
30 in.	P
36 in.	Q
42 in.	R
48 in.	S
60 in.	T
72 in.	U

**SCHEDULE**

STD	A
20	B
30	C
40	D
60	E
80	F
100	G
120	H
140	I
160	J
XH	K
XXH	L
5S	M
10S	N
40S	O
80S	P

**PIPE ORIENTATION**

Horizontal	A
Vertical	B

**PROBE MATERIAL**

316/316L SS	1
Monel®	2
Inconel®	3
Hastelloy®	4
Other	X

**INSTRUMENT CONNECTION**

1/2 in. NPT	A
1/2 in. Socket	B
TT3 (Integral 3-Valve Trans Mount - Max Temp 225° F)	C
TT5 (Integral 5-Valve Trans Mount - Max Temp 225° F)	D
(RTD is not available with Integral 5-Valve Manifold. If RTD is required, select "E" Transmitter Flange Connection and the appropriate manifold valve under the Instrument Valve section below.)	
Transmitter Flange Connection	E

**INSERTION MECHANISM / ISOLATION BALL VALVE**

150# CS Cage Nipple & Rods	A
300# CS Cage Nipple & Rods	B
600# CS Cage Nipple & Rods	C
150# SS Cage Nipple & Rods	D
300# SS Cage Nipple & Rods	E
600# SS Cage Nipple & Rods	F
150# CS Gear Drive, Cage Nipple & Rods	G
300# CS Gear Drive, Cage Nipple & Rods	H
600# CS Gear Drive, Cage Nipple & Rods	I
150# SS Gear Drive, Cage Nipple & Rods	J
300# SS Gear Drive, Cage Nipple & Rods	K
600# SS Gear Drive, Cage Nipple & Rods	L
NOTE: SS Gear Drive - SS for Housing and Wetted Parts Only	
Other	X

**PACKING MATERIAL**

Molythane (-65...200° F, 140° F in water and high water-based fluids)	1
Viton®/Fluorocarbon (-20...400° F)	2
Graphoil (1200° F)	3
EPDM (-65...300° F, 400° F in steam)	4
Fluoromylite (-65...300° F)	5
Other	X

**PIPE MOUNTING\***

A105 CS 3000#	1
316/316L SS 3000#	2
Supplied Separately by Preso	3
Not Required	Z

**INSTRUMENT VALVE**

1/2 in. Needle CS	A
1/2 in. Needle SS	B
1/2 in. Gate CS	C
1/2 in. Gate SS	D
Not Required	Z
ONLY AVAILABLE WITH OPTION "E" UNDER INSTRUMENT CONNECTION	
Fig x Fig 3-Valve Manifold CS - Max Temp 225° F	E
Fig x Fig 3-Valve Manifold SS - Max Temp 225° F	F
Fig x Fig 5-Valve Manifold CS - Max Temp 225° F	G
Fig x Fig 5-Valve Manifold SS - Max Temp 225° F	H
Customer Supplied Valve Manifold	I

**RTD (Max Temp 480° F. consult factory for higher temp options)**

100 Ohm RTD 3-Wire w/Explosion Proof Head	1
100 Ohm RTD 3-Wire, Integral w/Aluminum Head	2
Not Required	Z

Stainless Steel ID Tag supplied as standard.

Tag information must be included with order.

NOTE: Make sure that DP and Resonance are within acceptable limits. (See chart in the Ellipse Brochure)

\*Double Supports are not recommended for Hot Tap / Wet Tap models.

**Ellipse®**Annular Flanged Hot Tap  
2-1/4 in. DIAMETER

PAHF2

**PIPE SIZE**12 in.  
14 in.  
16 in.  
18 in.  
20 in.  
24 in.  
30 in.  
36 in.  
42 in.  
48 in.  
60 in.  
72 in.J  
K  
L  
M  
N  
O  
P  
Q  
R  
S  
T  
U**SCHEDULE**STD  
20  
30  
40  
60  
80  
100  
120  
140  
160  
XH  
XXH  
5S  
10S  
40S  
80SA  
B  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P**PIPE ORIENTATION**Horizontal  
VerticalA  
B**PROBE MATERIAL**316/316L SS  
Monel®  
Inconel®  
Hastelloy®  
Other1  
2  
3  
4  
X**INSTRUMENT CONNECTION**1/2 in. NPT  
1/2 in. Socket  
TT3 (Integral 3-Valve Trans Mount - Max Temp 225° F)  
TT5 (Integral 5-Valve Trans Mount - Max Temp 225° F)  
(RTD is not available with Integral 5-Valve Manifold. If RTD is required, select "E" Transmitter Flange Connection and the appropriate manifold valve under the Instrument Valve section below.)  
Transmitter Flange ConnectionA  
B  
C  
D  
E**INSERTION MECHANISM / ISOLATION BALL VALVE**150# CS Cage Nipple & Rods  
300# CS Cage Nipple & Rods  
600# CS Cage Nipple & Rods  
150# SS Cage Nipple & Rods  
300# SS Cage Nipple & Rods  
600# SS Cage Nipple & Rods  
150# CS Gear Drive, Cage Nipple & Rods  
300# CS Gear Drive, Cage Nipple & Rods  
600# CS Gear Drive, Cage Nipple & Rods  
150# SS Gear Drive, Cage Nipple & Rods  
300# SS Gear Drive, Cage Nipple & Rods  
600# SS Gear Drive, Cage Nipple & Rods  
NOTE: SS Gear Drive - SS for Housing and Wetted Parts Only  
OtherA  
B  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
X**PACKING MATERIAL**Molythane (-65...200° F, 140° F in water and high water-based fluids)  
Viton®/Fluorocarbon (-20...400° F)  
Graphoil (1200° F)  
EPDM (-65...300° F, 400° F in steam)  
Fluoromyl® (-65...300° F)  
Other1  
2  
3  
4  
5  
X**PIPE MOUNTING\***A105 CS 3000#  
316/316L SS 3000#  
Supplied Separately by Preso  
Not Required1  
2  
3  
Z**INSTRUMENT VALVE**1/2 in. Needle CS  
1/2 in. Needle SS  
1/2 in. Gate CS  
1/2 in. Gate SS  
Not Required  
ONLY AVAILABLE WITH OPTION "E" UNDER INSTRUMENT CONNECTION  
Fig x Fig 3-Valve Manifold CS - Max Temp 225° F  
Fig x Fig 3-Valve Manifold SS - Max Temp 225° F  
Fig x Fig 5-Valve Manifold CS - Max Temp 225° F  
Fig x Fig 5-Valve Manifold SS - Max Temp 225° F  
Customer Supplied Valve ManifoldA  
B  
C  
D  
Z  
E  
F  
G  
H  
I**RTD (Max Temp 480° F, consult factory for higher temp options)**100 Ohm RTD 3-Wire w/Explosion Proof Head  
100 Ohm RTD 3-Wire, Integral w/Aluminum Head  
Not Required1  
2  
ZStainless Steel ID Tag supplied as standard.  
Tag information must be included with order.NOTE: Make sure that DP and Resonance are within acceptable limits. (See chart in the Ellipse Brochure)  
\*Double Supports are not recommended for Hot Tap / Wet Tap models.

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