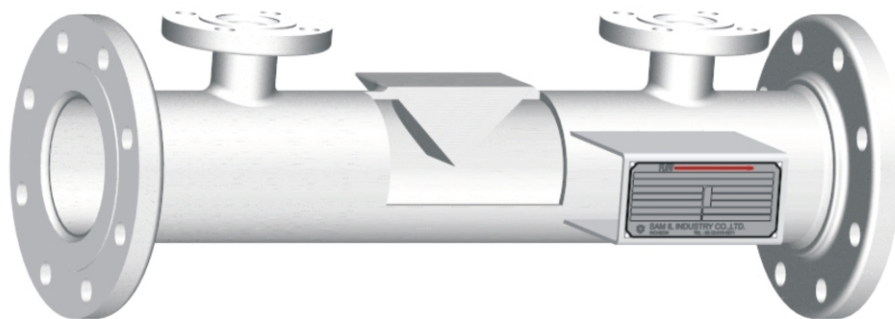# TAPER SEG TUBE - 6
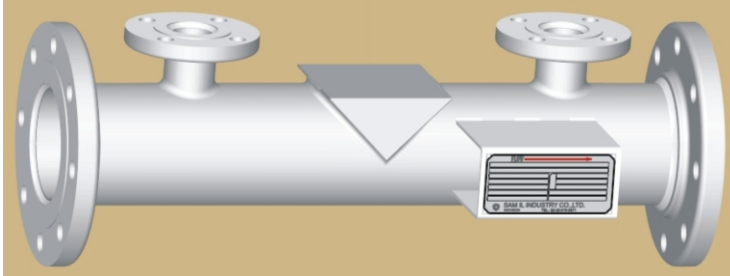
Here is introduce the measuring primary devices of fluid flow by means of the differential pressure that is Taper Seg Tube to use new delta-P[$\triangle$P] theory.
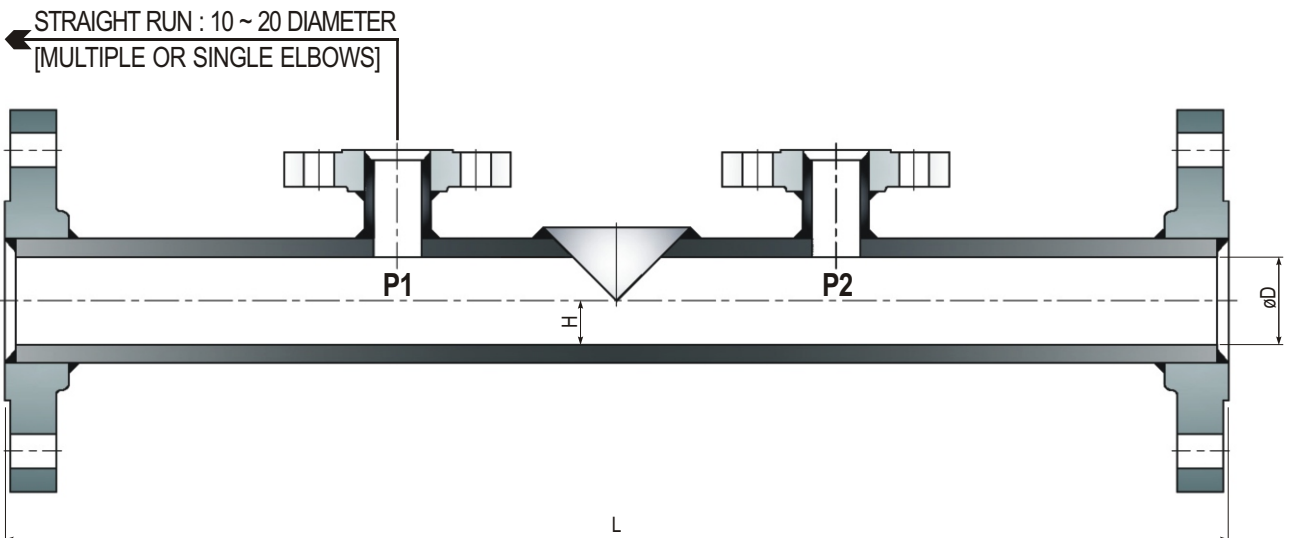
SAMIL INDUSTRY CO.,LTD.

STS

TAPER SEG FLOWMETER

⬡ **SAM IL INDUSTRY CO.,LTD.**

The Fig. on the right shows the basic appearance of the Taper Seg Tube meter. The fluid is diverted downward is similar fashion to a segmental shape as opposed to sharp edge. Pressure taps are located approximately one diameter upstream and downstream.
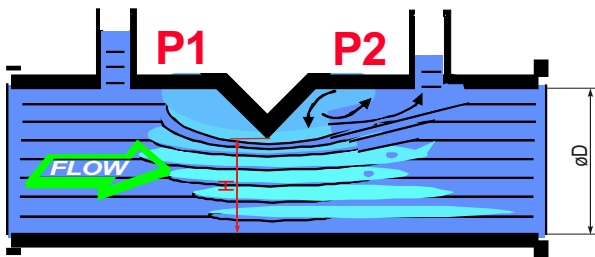
MAJOR FEATURES

- Available in standard sizes of 1/2 to 24 in.(Larger sizes available)
- Constant coefficient over a wide Reynolds Number range.
- Suitable for slurry, corrosive, abrasive, or clean liquid, gas or vapor flows.
- Low overall pressure loss.
- Integral Taper Seg tube elements connect directly to DP Transmitters.
- The product differential is a function of the ratio of segment height **H** to the meter body diameter **D**.

STRAIGHT RUN : 10 ~ 20 DIAMETER
[MULTIPLE OR SINGLE ELBOWS]

P1   P2

H

øD

L

STS

TAPER SEG FLOWMETER

SAM IL INDUSTRY CO.,LTD.

MEASURING PRINCIPLE

The line fluid flow is downward similar to a segmental orifice plate, however it is guided along a slopping " Taper Seg" shape rather than a sharp edge. The pressure taps are located upstream and downstream of the taper seg.

The differential produced by the device is a function of the ratio between the taper seg opening, "H", and the diameter of the body, "D".

THE TAPER SEG FLOW METER

Flow Transmitter

Capillary Conduit

Sealed Sensers / Flanged Tap Con

STS

Reforcing pad for HP

Typical Taper Seg Meter Installation Arrangement
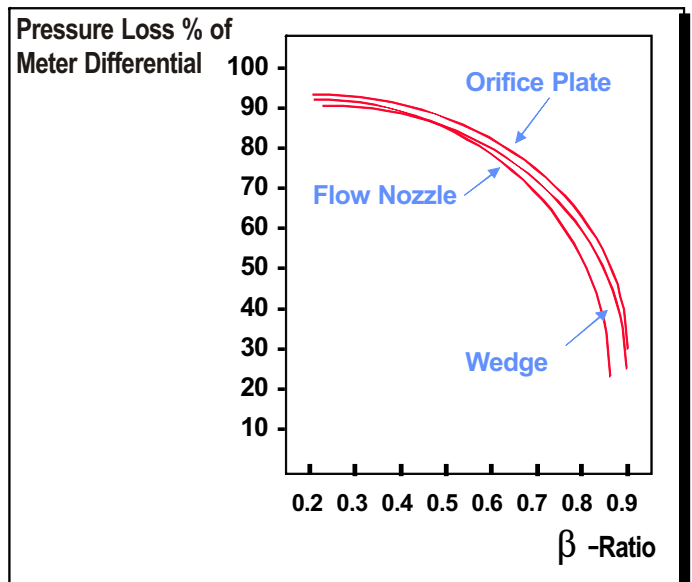
P1 **P2**

FLOW

øD
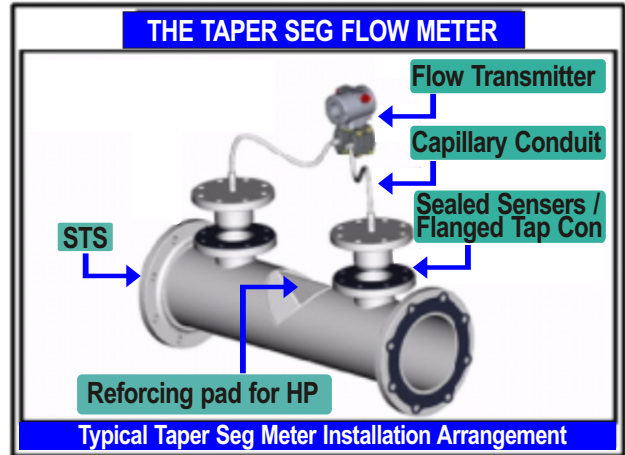
- No Critical Surface Dimension
- Slanted upstream and downstream faces
- Minimal upstream/downstream piping required
- Bi-Directional Flow
- Simple Design : Easy to understand.
- No internal Moving Parts.

$$Q \sim Sqrt(\triangle P)$$

$$\beta_{wedge} = \frac{d}{D} = \left(\frac{1}{\pi} \left\{ \arccos\left(1 - \frac{2H}{D}\right) - 2\left(1 - \frac{2H}{D}\right)\left[\frac{H}{D} - \left(\frac{H}{D}\right)^2 \right]^{1/2} \right\} \right)^{1/2}$$

Lower permanent pressure losses than orifice plate mean lower pumping costs for the life of the installation.

Pressure Loss % of Meter Differential

Orifice Plate

Flow Nozzle

Wedge

| 100, 90, 80, 70, 60, 50, 40, 30, 20, 10 |

0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9

β -Ratio

STS

TAPER SEG FLOWMETER

SAM IL INDUSTRY CO.,LTD.

WHEN TO USE THE STS

- Chemical Industry   : Blending, Mixing Dyes and Viscous Fluids.

- Petrochemicals   : High Viscosity and Black Liquors

- Oil and Gas   : Water Injection, Custody Transfer

- Paper and Pulp   : Hi concentration stocks. Timber Industry usage

- Metals and Mining   : Powered or magnetic slurries. Abrasive Flows.

- Cement Industry   : Problematic slurry flows.

- Power and Utilities   : Fuel oil and steam flows. Boiler feeds.

ADVANTAGE

- Lower Reynolds No.

- Better Rangeability

- Accuracy not dependent on sharp edge

- Lower Energy Costs

- Viscous Fluid Applications

- Less upstream piping required

- Dirty Service(Slurries, Fluids with Solids in Suspension)

DISADVANTAGE

- Less Application History

- Initial Installed cost

STS

TAPER SEG FLOWMETER

SAM IL INDUSTRY CO.,LTD.

SPECIFICATION

Specifications	Taper Seg Meter	Orifice
- Accuracy	- 0.5%	- 0.75% to 1.5%
- Turn Down	- 5 : 1	- 5 : 1
- Reynolds No.	- > 500	- >30000
- Output	- Square Root	- Square Root
- Sizes	- 1/2" - > 24"	- > 1"
- Straight Upstream Piping (Multiple or Single Elbows Upstream & other disturbances are neglible at	- 10 to 20 Diameters	- 10 to 36 Diameters

INSTALLATION

Recommended Installation Orientation

The proper operation of the Taper Seg Flow Meter is relatively forgiving of the specific installation arrangement imposed. Nevertheless, to achieve the best results, the recommended installation parameters enumerated below should be observed and incorporated. The adverse results arising from failure to properly install the flow element can include plugging of impulse lines and/or tap holes, air(gas or unwanted secondary phase) entrapment in the taps and/or impulse lines, introduction of a minor hydrostatic head effect(in a vertically oriented installation) or Kd^2 shift(i.e. Accuracy impairment)

Meter orientation a horizontal orientation is preferred and typical for most installation.
The element should be rotated between 45 to 90 degree resulting the tap locations that substantially allow any undissolved solids to easily pass beneath the Taper Seg without build-up and also minimizes air(or gas) entrapment at tap locations.
Vertical installations may result in a hydrostatic head effect due to the elevation difference of the individual impulse lines. This can be corrected by adjusting the transmitter.

◬ **SAM IL INDUSTRY CO.,LTD.**
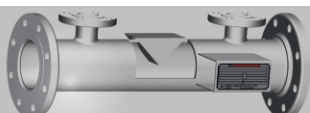
TABLE -1 Recommended Straight Length

Upstream disturber	Upstream Straight Length	Downstream Straight Length
Partially Opened Gate Valve	20 D	5 D
Concentric Expander	10 D	5 D
Concentric Reducer	10 D	5 D
One(1) elbow	10 D	5 D
Two(2) elbow close coupled in plane	10 D	5 D
Two(2) elbow closed coupled out of plane	20 D	5 D

CALCULATION RESULT

Purchaser	:	YEOCHUN NCC CO.,LTD.		SHEET :	OF
Project Name	:	#3 NCC		DATE :	
Job No.	:	-		Rev. :	0

****

TAPER SEG FLOWMETER SIZING CALCULATION

****

Steam/Gas Mass Flow

Fluid Name	:	STEAM(S)	
Service	:	SAMPLE	

1)	Tag No.		FE-SAMPLE
2)	Pipe Inside Diameter (D)		102.2604
3)	Taper Seg Element Ratio(H/D)		0.4565881
4)	Taper Seg Flow Coefficient(kd^2)		5.4696895
5)	Specific Volume of Steam/Gas	in m3/kg	0.298801804
6)	Gas Expansion Factor		1.0
7)	Viscosity in Centipoises(μ)	in cP	0.017
8)	Flowing Process Temperature	in °C	210
9)	Flowing Process Pressure	in kg/cm2g	6.3
10)	Thermal Expansion Factor of Wedge Assembly(Fa)		1.006
11)	Flow Range	in kg/hr	4000
12)	Differential Pressure at Flow Range(h)	mmH2O at 60 degF	2500
13)	Max. Flow Rate (q)	in kg/hr	3500
14)	Differential Pressure at Max. Flow(h)	mmH2O at 60 degF	1911.516
15)	Nor. Flow Rate	kg/hr	2335
16)	Differential Pressure at Nor. Flow(h)	mmH2O at 60 degF	848.7284
17)	Permanent Pressure Loss at Flow Scale	mmH2O at 60 degF	1166.724

Reynolds No. at Flow Scale	690106.4
Reynolds No. at Max. Flow	603843.1
Reynolds No. at Nor. Flow	402849.6

CALCULATED BY SAMIL INDUSTRY CO.,LTD.   MODEL : STS

Flange Size & Rating	: 4" ANSI 300# SO-RF
Taps Con'n & Rating	: 3" ANSI 300# SO-RF
Wedge Mat'l	: A105
Line Mat'l	: A106 GR.B

NOTE : 1. PPLOSS at Max. Flow(3500 kg/hr) : 889.9606 mmH2O @ 60 degF
       2. PPLOSS at Nor. Flow(2335 kg/hr) : 393.4759 mmH2O @ 60 degF

◬ SAMIL

*Calculation report forms may be changed on the program upgrade.