TEKTROL
Technology Solutions

TEK-DP 1670A

Segmental Wedge Differential Pressure Flow Meters

FLOW

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Introduction

Tek-DP 1670A Segmental Wedge Flow Meter are Segmental Wedge type meters with no moving parts, making them virtually maintenance-free. They generally give repeatable readings in process flow applications. Therefore, Tek-DP 1670A Segmental Wedge Flow Meter can handle low flows using accurate transmitters, highly viscous flows, dirty or corrosive gas or liquid flows, and hot or cold flows with a small pressure loss. The Tek-DP 1670A Segmental Wedge Flow Meter provides bi-directional flow measurement. The welded construction and wide range of materials ensure a reliable and robust measurement under extreme pressure and temperature conditions or aggressive media. The Tek-DP 1670A Segmental Wedge Flow Meter design delivers a significant cost savings benefit since the profile is virtually immune to any wear or erosion, which requires very little maintenance and inspection.

Measuring Principle

The wedge flow meter consists of a measurement pipe with pressure taps in front and behind a Differential Pressure (ΔP) flow element (restriction), which has a wedge shape. The restriction is welded into the measurement pipe section between the top taps, as shown in Figure 1.

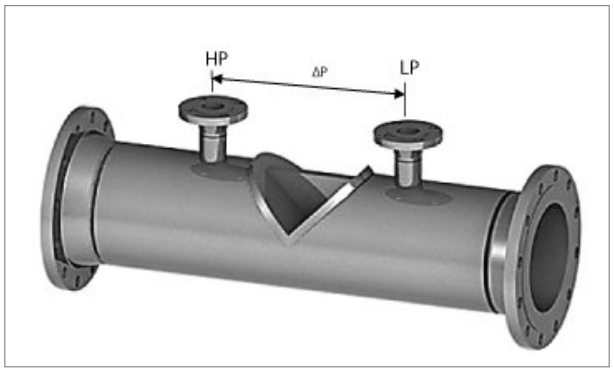

Fig 1: Tek-DP 1670A Wedge Meter Standard Design

The static pressure is measured in front of the wedge (high side) and behind the wedge, the low-pressure differential is taken (a low-pressure side).

Tek-DP 1670A Segmental Wedge Flow Meter usually have a (coefficient of discharge) C.d. = 0.79 approximately, which can be further defined from external calibration.

Venturi, Orifice and DP Cone Meters have a throat with a low-pressure tapping located at the maximum velocity area. A wedge Meter consists of the low-pressure tapping in the pipe wall, not in a throat.

They have been used with other DP meter types as part of a multiphase/wet gas meter. While the meter is not generally used for fiscal measurement, it can be used for slurries and areas where high contamination and particulates are in the fluid stream.

Comparison between Venturi, Orifice, Cone and Wedge Meters

The Venturi, Orifice, Cone and Wedge Meters are all geometrically different and it is not intuitively obvious how to compare them. The typical discharge coefficients (C.d.) versus beta ratios for all the major types of meters are shown in comparison with a Wedge Meter data shown in Figure 2.

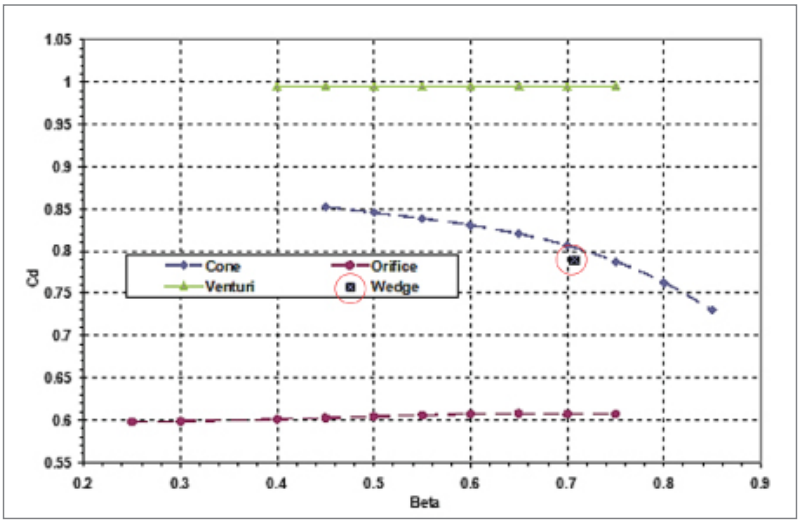

Fig 2: Typical DP Family Meter
Discharge Coefficients (per beta ratio)

Main Meter Components and Usage of Tek-DP 1670A

Tek-DP 1670A Quality Wedge Meters can also be wet calibrated for the process application's flow range to provide a ±0.5% coefficient of discharge accuracy over the calibrated range. They are designed to measure a full pipe, highly viscous, particulate-laden flows. Typical applications include slurries, asphalt, chlorine, gas, steam (Certain defined applications), or air-entrained liquids.

Materials of construction can be varied design can be produced using any weldable materials depending upon the particular demands of the application. Current available manufacturing materials are: Carbon Steel, 316 & 316L Stainless Steel, 304 & 304L Stainless Steel , Duplex and Super Duplex steels, Hastelloy and Monel.

- Boiler and Pressure Vessel Code
- ASME B31.1 and 31.3 for ASME fluid meters
- MFC-3M-1985, ISO 16528, BS-7045 compliance if required.

Designed for use with Raised Face, Flat Face, Weld End, Ring Joint Flanges of any flange rating of either U.S. or overseas standards.

Benefits

- ±0.5 % calibrated accuracy.
- Robust design provides long-term accuracy.
- Low permanent pressure loss resulting in energy savings.
- No sharp edge to wear.
- Handles slurries and high solids content.
- Capable of bi-directional flow.
- Reliable and high performance down to Reynolds Number 500 (Viscous Fluids).
- Large potential flow range.
- Minimum upstream/downstream straight pipe needed.
- Handles non-ideal installations.

Applications

- Mining
- Industrial Fluids
- Petrochemical
- Oil and Gas
- Chemical
- Pulp and Paper

Specifications

Accuracy	±0.5% of the coefficient of discharge accuracy over calibrated Reynolds Number. (Wet calibration at approved laboratory) ±5.0% of actual flow rate (dry calibration based on geometry only)
Repeatability	±0.2%
Line Size	1" to 24" Nominal Diameter
End Connections	Flange ends, weld end, slip-on, RTJ joint, butt end
Fluid Capability	Gas or liquid – Pipe running full
Temperature	Dependent upon wetted material and gasket materials being used
Pressure	Maximum working pressure is per ANSI B16.5 Standards
Material	Carbon Steel, 316 SS, 316L SS, 304 SS, Super Duplex Steel, Hastelloy and Monel
Pipe Reynolds Number (ReD) Capability	Relatively low pipe Reynolds Numbers can be addressed with fair accuracy, the discharge coefficient being generally stable through the confirmed application ranges, Bi-directional usage is permitted using applicable pressure / differential pressure transmitters
Standards	ASME B31.1 and B31.3

Wedges Designs

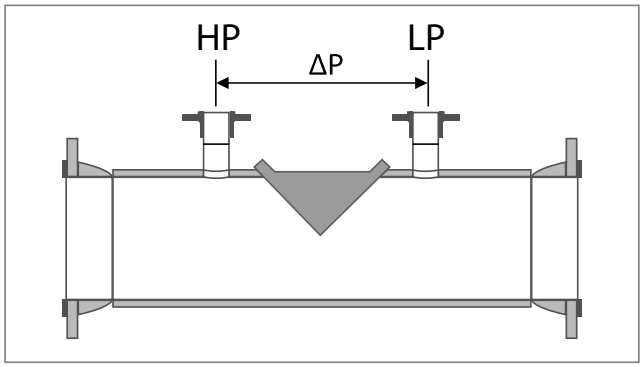

Fig 3: Flangged Hub

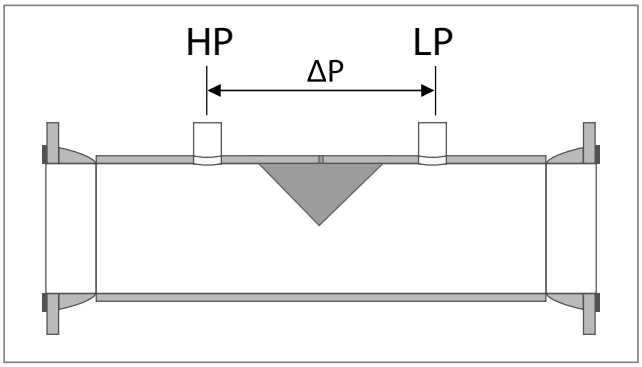

Fig 4: Threaded Taps

Dimensional Drawings

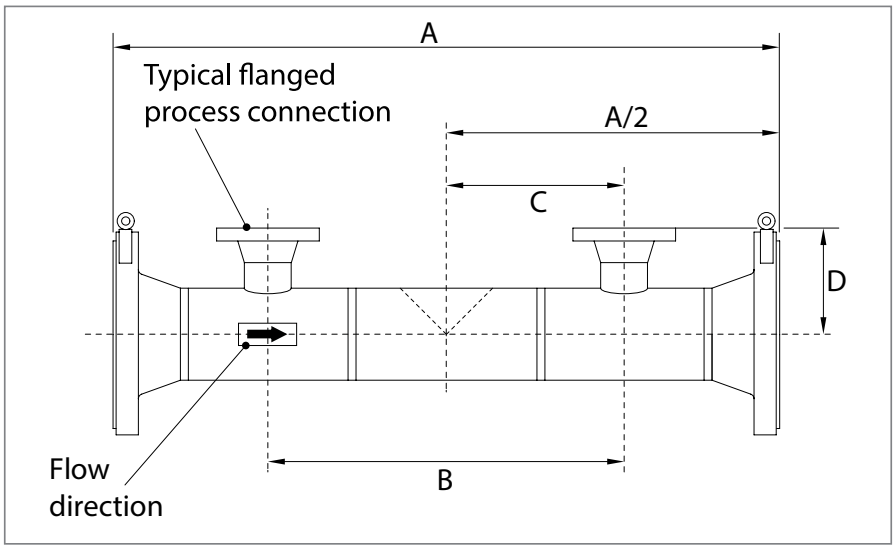

Fig 5: Tek-DP 1670A With Flanged Tappings
and RFWN End Flanges (1 ½", 2 and 3")

***Note:** Flow direction may be Bi -Directional.

Size in (mm)	A ± ¼"(±4.58mm) in (mm)			B in (mm)	C in (mm)	D in (mm)			Approximate Weight kg (lbs.)		
	Flange Rating					Flange Rating			Flange Rating		
	150	300	600			150	300	600	150	300	600
1 ½" (40)	21 ¼" (530)	21 ¾" (543)	22 ¼" (559)	11 ¾" (292)	5 ¾" (146)	8 ¼" (207)	8 ½" (214)	8 ½" (212)	25 (55)	28 (61)	32 (71)
2"(50)	21 ¾" (546)	22 ¼" (559)	23" (575)	11 ¾" (292)	5 ¾" (146)	8 ¾" (216)	8 ¾"(222)	9 ¼"(231)	28 (62)	32 (70)	38 (84)
3"(80)	25 ¾" (645)	25 ¾" (641)	26 ½"(660)	12 ½" (311)	6 ¼" (155)	6 ¼" (155)	6 ¾"(166)	7"(175)	35 (78)	42 (92)	46 (102)

***Note**: Slip on, full face and RTJ flange connection are also available. Contact Tek-Trol for length details.

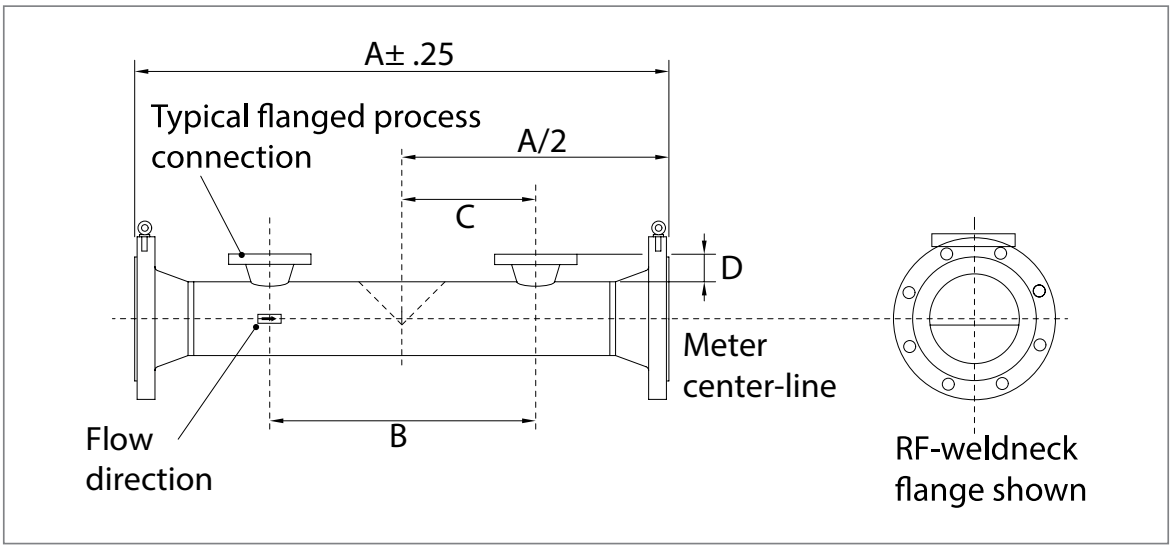

Fig 6: Tek-DP 1670A With Flanged Tapping's
and RFWN End Flanges (4" to 24")

***Note:** Flow direction may be Bi -Directional.

Size in (mm)	A ± ¼"(±4.58mm) in (mm)			B in (mm)	C in (mm)	D in (mm)			Approximate Weight kg (lbs.)		
	Flange Rating					Flange Rating			Flange Rating		
	150	300	600			150	300	600	150	300	600
4" (100)	36" (900)	36 ¾" (920)	39 ½" (990)	15 ¼" (381)	7 ½" (190)	2 ¾" (70)	3" (80)	3 ½" (89)	61 (135)	68 (150)	79 (175)
6" (150)	41" (1028)	42" (1047)	44" (1100)	18 ¼" (457)	9" (225)	2 ¾" (70)	3" (80)	3 ½" (89)	73 (160)	95 (210)	122 (270)
8" (200)	43 ¾" (1092)	44 ½" (1111)	46 ¾" (1168)	20 ¾" (521)	10 ½" (260)	2 ¾" (70)	3" (80)	3 ½" (89)	95 (210)	120 (265)	166 (365)
10" (250)	45 ¾" (1143)	47" (1175)	50 ¼" (1257)	24" (600)	12" (300)	2 ¾" (70)	3" (80)	3 ½" (89)	122 (270)	156 (345)	238 (525)
12" (300)	52 ¾" (1321)	54" (1350)	56 ¾" (1416)	27" (675)	13 ½" (336)	2 ¾" (70)	3" (80)	3 ½" (89)	159 (350)	181 (400)	
14" (350)	56" (1400)	57" (1425)	59 ½" (1485)	29 ½" (736)	14 ¼" (356)	2 ¾" (70)	3" (80)	3 ½" (89)	186 (410)	277 (610)	
16" (400)	59" (1475)	60 ½" (1511)	63 ½" (1587)	31" (775)	15 ½" (387)	2 ¾" (70)	3" (80)	3 ½" (89)	227 (500)	342 (755)	
18" (450)	63" (1574)	64 ½" (1613)	67" (1675)	34" (850)	16 ½" (413)	2 ¾" (70)	3" (80)	3 ½" (89)	227 (500)	395 (870)	
20" (500)	67 ½" (1686)	68 ¾" (1720)	71 ½" (1790)	37 ½" (940)	18 ¾" (470)	2 ¾" (70)	3" (80)	3 ½" (89)	318 (700)	499 (1100)	
24" (600)	74 ¼" (1854)	75 ½" (1886)	78 ¾" (1968)	42 ¾" (1066)	21 ¼" (533)	2 ¾" (70)	3" (80)	3 ½" (89)	433 (955)	594 (1310)	

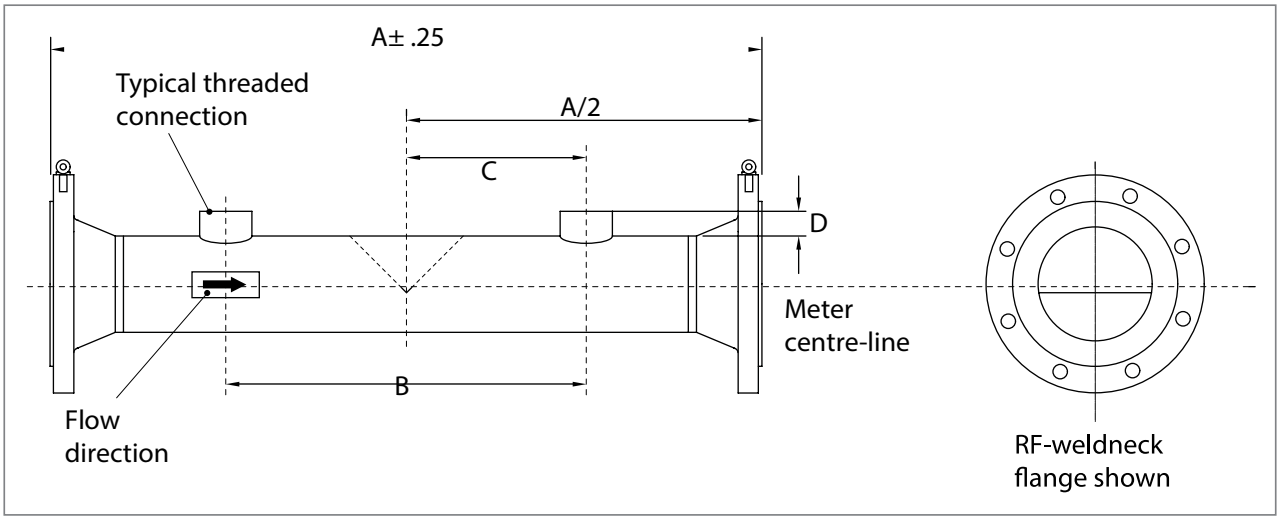

Fig 7: Tek-DP 1670A with Threaded Connection

***Note:** Flow direction may be Bi -Directional.

Size in (mm)	A ± ¼"(±4.58mm) in (mm)			B in (mm)	C in (mm)	D in (mm)	Approximate Weight kg (lbs.)		
	Flange Rating						Flange Rating		
	150	300	600				150	300	600
8" (200)	43 ¾"(1092)	44 ½" (1111)	46 ¾"(1168)	20 ¾" (520)	10 ½"(260)	1" (25)	52 (115)	79 (175)	129 (285)
10"(250)	45 ¾"(1143)	47"(1175)	50 ¼"(1257)	24"(600)	12"(300)	1" (25)	75 (165)	127 (280)	204 (450)
12"(300)	52 ¾"(1320)	54" (1350)	56 ¾" (1416)	27" (675)	13 ½"(336)	1" (25)	107 (235)	172 (380)	
14"(350)	56" (1400)	57"(1425)	59 ½"(1485)	29 ½"(736)	14 ¼"(356)	1" (25)	140 (310)	283 (625)	

Size in (mm)	A ± ¼"(±4.58mm) in (mm)			B in (mm)	C in (mm)	D in (mm)	Approximate Weight kg (lbs.)		
	Flange Rating						Flange Rating		
	150	300	600				150	300	600
16"(400)	59"(1475)	60 ½"(1511)	63 ½" (1587)	31"(775)	15 ½"(387)	1" (25)	186 (410)	290 (640)	
18"(450)	63"(1575)	64 ½" (1612)	67" (1675)	34"(850)	17" (425)	1" (25)	226 (500)	367 (810)	
20"(500)	67"(1675)	68 ¾" (1720)	71 ½"(1790)	37 ½"(940)	18 ¾" (470)	1" (25)	286 (630)	455 (1005)	
24"(600)	74 ¼"(1854)	75 ½" (1886)	78 ¾"(1968)	42 ¾"(1066)	21 ¼" (533)	1" (25)	394 (870)	539 (1190)	

Dimensions are subject to vary at time of manufacturing based on final Beta selected. Dimensional drawing with a final engineering sizing sheet will be provided within 1-2 weeks of order acceptance

Installations

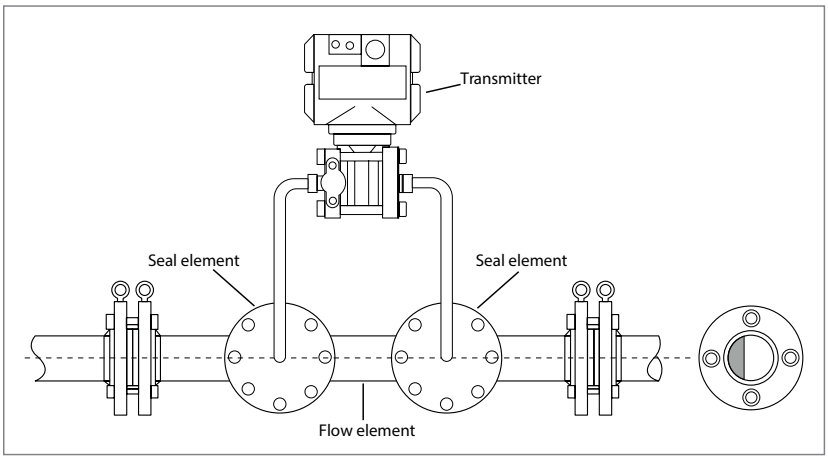

Fig 8: Horizontal Installations

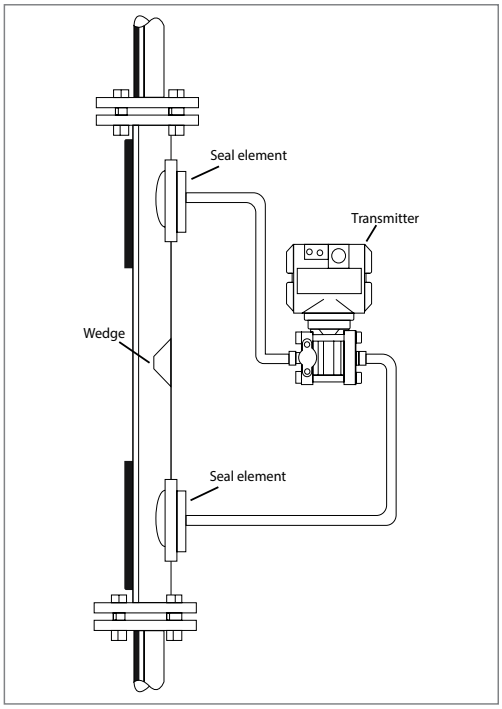

Fig 9: Vertical Installations

Straight Pipe Run Requirements

- As with most flow elements, proper operation and performance are dependent on the required lengths of available upstream and downstream piping.
- The recommended minimum length of the upstream side of the Wedge flow element depends on the fittings at the end of the straight runs and respective pipe configuration.
- Minimum upstream and downstream lengths are as follows:
    - Upstream requirements as a general rule: 10 nominal pipe diameters.
    - Downstream requirements as a general rule: 2 nominal pipe diameters.

Fittings	Recommended		Minimum	
	Upstream	Downstream	Upstream	Downstream
3 Elbows close coupled	15D	5D	15D	3D
2 Elbows close coupled out of plane	10D	5D	10D	3D
2 Elbows close coupled in plane	10D	5D	5D	3D
1 Elbow	10D	5D	5D	3D
Tee-bull plugged	10D	5D	5D	3D
Tee-run plugged	10D	5D	5D	3D
Tee-flow in bull and run	10D	5D	5D	3D
Y-run plugged	10D	5D	5D	3D
Concentric reducer	10D	5D	5D	3D
Concentric expander	10D	5D	5D	3D
Partially open gate valve	10D	5D	10D	3D

Model Chart

Example	**Tek-DP 1670A**	**0050**	**A**	**01**	**A**	**01**	**W0**	**A**	**00**	**03**	**01**	**A**	**MTR**	**Tek-DP 1670A-0050-A-01-A-01-W0-A--00-03-01-A-MTR**
Series	Tek-DP 1670A													Segmental Wedge Differential Pressure Flow Meters
Size		0025												1″
		0050												2"
		0065												2 ½"
		0080												3"
		0100												4"
		0150												6"
		0200												8"
		0250												10"
		0300												12"
		0350												14"
		0400												16"
		0450												18"
		0500												20"
		0600												24"
Meter Body			A											Carbon Steel (Standard)
			B											Low Temp CS
			C											304L SS
			D											316L SS
Meter Body			E											Duplex 2205
			F											Duplex 2507
			G											Chromemoly CrMo P11
			H											Chromemoly CrMo P22
			I											Inconel Cladding
			X											Special

Pipe Schedule				01										Standard (Tek-Trol's Standard)
				02										10S
				03										10
				04										20
				05										30
				06										40S
				07										40
				08										80S
				09										80
				10										120
				11										160
				12										Extra Strong
				13										XX Strong
				XX										Special
Process Connection					A									RF Slip On
					B									RF Weld Neck
					C									RTJ Slip On
					D									RTJ Weld Neck
					E									Hubs
					F									API
					G									Beveled End
					H									Socket
					I									NPTF (Up to 3" Only)
					W									Wafer Style (Up to 4" Only)
					U									Union
					X									Special
Pressure Rating						01								150#
						02								300#
						03								600#
						04								900#
						05								1500#
						06								2500#
						07								3000# (NPT)
						08								10K(API/Hubs)
						09								15K (API/Hubs)
						XX								Special
Wedges Type							W0							Flanged Hub (Used for Liquids)
							W1							Threaded Taps (Used for Gases)
							XX							Special

Wedges Material of Construction								A						Carbon Steel
								B						Low Temp CS
								C						304L SS (Standard Option)
								D						316L SS
								E						Duplex 2205
								F						Duplex 2507
								G						Chromemoly CrMo P11
								H						Chromemoly CrMo P22
								I						Inconel Cladding
								X						Special
Tap Location									00					Standard
									01					Pipe Taps
									X					Special
Beta										01				0.45
										02				0.5
										03				0.55
										04				0.6
										05				0.65
										06				0.7
										07				0.75
										XX				Special
Flow Transmitters/ Computers											01			None (Customer Supplied)
											02			Tek-Bar 3110 (Liquids) - Smart DP
											03			Tek-Bar 3800 (MVT Steam and Compressed Gases)
											04			Tek-FC 8000 (Natural Gas - Flow Computer)
											05			TekValsys DPRO (Insitu Flow Validation)
											06			TekValsys DPRO WFGM (Wet Gas)
											XX			Special
Calibration												A		Dry (ISO 5167)
												B		Water
												C		Air
												D		Multiphase
												X		Special
Options													MTR	Material Test Report EN3.1
													MC	Material Cert EN2.1
													PMI	Positive Material Identification (NDE)
													COC	Certificate of Conformity
													HYD	Hydro Test
													XRT	X-Ray
													DPT	Dye Penetrant
													MPT	Magnetic Particle Testing
													O2C	O2 Cleaned
													TAG	SS TAG PLATE
													UMR	Upstream Meter Run - 1PC
													DMR	Downstream Meter Run - 1PC
													FMR	Meter Run with Flow Conditioner Plates- 2PC
													CDE	Certified Drawing Electronic (As Built)
													MRB	Manufacturing Record Book
													DFT	Dry Film Thickness - Custom Paint Spec
													CPC	Custom Product Code

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