

“Sensing the pulse of industry”

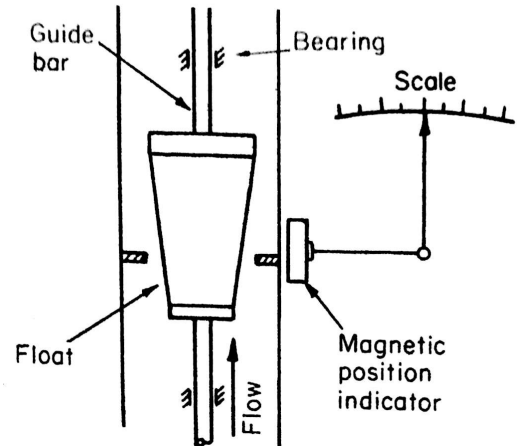
## tekVar TMV Series Metal Tubed Variable Area Flow Sensors

The **tekVar** TMV Series is a comprehensive range of variable area flow sensors, suitable for gases and low viscosity liquids. They embody metal flow tubes, upon which is a magnetically coupled, demountable, large, clear display unit.

The diagram shows a tapered float which moves vertically within an orifice. Alternatively, for lower pressure drops, a float moves vertically within a conical flow tube. The float is an inaccurate description, since its density is always larger than the media being measured. At no flow conditions the float rests at the bottom of the flow tube. Upward flowing media causes the float to rise to a position which maintains the pressure drop across it and in equilibrium with the effects of gravity and buoyancy forces acting upon it. Since the immersed mass of the float is constant within the media being measured, the pressure drop across it must also remain constant. As the flow rate increases, the float will rise to provide a larger annular area, through which the media passes. The height of the float is accordingly an indication of flow rate. The **tekVar** TMV is calibrated with USA NIST traceability

A comprehensive range of flow tube and float materials are available, as well as a flow tube lined with PTFE. Accordingly, the **tekVar** TMV is suitable for a wide range of corrosive or non-corrosive gases and low viscosity liquids.

**tekVar** options include an LCD digital rate of flow and totalizer and analog indicator, 4-20mA linear output proportional to flow rate, hi/lo alarms, 24Vdc or battery power.



### Features:

- + Metal flow tubes for pressures to 250 bar g (3623 psig) (size dependent)
- + Temperatures to 200° C (392° F)
- + Wide range of wetted part materials for corrosive and non-corrosive gases and liquids
- + Demountable display unit, magnetically coupled with the flow tube assembly.
- + No seals.
- + Calibration Certificates are traceable to USA National Institute of Standards and Technology (NIST)
- + Digital display and totalizer option
- + Large easy-to-read analog flow rate scales
- + Vertical or horizontal flow connections
- + Heated flow tube option
- + Display unit enclosures in stainless steel as standard
- + Optional 24V dc or battery supply
- + 4-20mA output
- + Meets European Directive EN61326 Electromagnetic Immunity
- + Meets European Pressure Directive – Sound Engineering Practice



**tekVar TMV Type T9**  
Flow Tube With Float and Orifice



**tekVar TMV Type T10**  
Conical Flow Tube With Float

## General Specification

High accuracy: ±1.5% full scale traceable to USA NIST

Max pressure ratings: 15 – 50mm (3/4") diameter: 40 bar g (580 psig)  
 80 – 100mm (3" – 4") diameter: 16 bar g (232 psig)

Media temperature: - 40 to +200° C (- 40 to + 392° F)

Max liquid viscosity: 15 mm (3/4"): 5 mPa.s (centiPoise)  
 25 mm (1"): 250 mPa.s (centiPoise)  
 50 – 150mm (2" – 6"): 300mPa.s centipoise)

Wetted part materials: AISI 304 stainless steel  
 AISI 316L stainless steel  
 AISI 316 stainless steel  
 Titanium  
 AISI 304 (non-wetted) with wetted PTFE liner

Connection flanges: AISI 304 stainless steel (non-wetted)

Display enclosure: stainless steel casting

Optional LCD Display: max rate of flow 0 – 60000 in units given in Flow Range table  
 max totals 0 – 99999999 x 5

Optional power supply: 2-wire 12 – 36Vdc, 4-20mA into 600 Ohms max

Battery supply: 12v dc

High/low alarm rating: 24V ac or DC, 0.3A

Cable connection: M20

Protection rating: IP 65 and NEMA 4X

Connection flanges: ANSI 150 rf, DIN2501 PN10, PN25, PN40, JIS 10k, JIS 25k, JIS 40k  
 Size dependent - see max pressure rating above

Flow tube types: T9 is a flow tube where the float moves with in orifice.  
 T10 is a float moving in a conical flow tube for lower pressure drops.

## Flow Ranges

Nominal Size		Water Measuring Range		Air Measuring Range		Range
mm	inches	litres/hour	gpm	nm3/h	scfm	Number
15	3/4"	4.0 - 40	0.018 - 0.18			1
		6.3 - 63	0.028 - 0.28			2
		10 - 100	0.044 - 0.44			3
		16 - 160	0.07 - 0.70			4
		25 - 250	0.11 - 1.1	0.70 - 7.0	0.44 - 4.4	5
		40 - 400	0.18 - 1.8	1.0 - 10.0	0.63 - 6.3	6
		63 - 630	0.28 - 2.8	1.6 - 16.0	1.0 - 10.0	7
25	1"	40 - 400	0.18 - 1.8	1.6 - 16.0	1.0 - 10.0	8
		63 - 630	0.28 - 2.8	3.0 - 30.0	1.9 - 19.0	9
		100 - 1000	0.44 - 4.4	4.5 - 45.0	2.8 - 28.0	10
		160 - 1600	0.70 - 7.0	7.0 - 70.0	4.4 - 44.0	11
		250 - 2500	1.1 - 11	11 - 110	7.0 - 70.0	12
		400 - 4000	1.8 - 18			13
50	2"	400 - 4000	1.8 - 18	18 - 180	11 - 110	14
		630 - 6300	2.8 - 28	25 - 250	16 - 160	15
		1000 - 10000	4.4 - 44	40 - 400	25 - 250	16
		1600 - 16000	7.0 - 70			17
80	3"	1600 - 16000	7.0 - 70			18
		2500 - 25000	11 - 110			19
		4000 - 40000	18 - 180			20
100	4"	4000 - 40000	18 - 180			21
		6300 - 63000	28 - 280			22
		8000 - 80000	35 - 350			23

**Notes: Ranges in red apply to non-PTFE lined flow tubes only**  
**Ranges in blue apply to PTFE lined flow tubes only**  
**Ranges in black apply to all flow tube types**  
**Special ranges apply to 40mm (1 1/2") and 65mm (2 1/2"). Consult factory**

### Conversion Formulae for Media Other Than Water or Air

#### Liquids:

$$Q_0 = Q_1 \times \sqrt{\frac{\rho_1}{\rho_0}} \cdot \sqrt{\frac{P_0}{P_1}} \cdot \sqrt{\frac{T_1}{T_0}}$$

Q<sub>0</sub> = Water flow rate m<sup>3</sup>/h

Q<sub>1</sub> = non-water media flow rate m<sup>3</sup>/h

P<sub>1</sub> = media density kg/m<sup>3</sup>

P<sub>f</sub> = float density 7900 kg/m<sup>3</sup>

P<sub>0</sub> = water density at 20° C (68° F) = 998.2 kg/m<sup>3</sup>

Flow Range table provides equivalent gpm ranges

#### Gases:

$$Q_0 = Q_1 \times \sqrt{\frac{\rho_1 \times (\rho_f - \rho_0)}{\rho_0 \times (\rho_f - \rho_1)}}$$

Q<sub>0</sub> = Air flow rate nm<sup>3</sup>/h

Q<sub>1</sub> = non-air media flow rate nm<sup>3</sup>/h

ρ<sub>1</sub> = gas media density kg/m<sup>3</sup>

ρ<sub>0</sub> = air density at normal conditions 1.205 kg.m<sup>3</sup>

P<sub>1</sub> = gas media absolute pressure (bar g + 1.013)

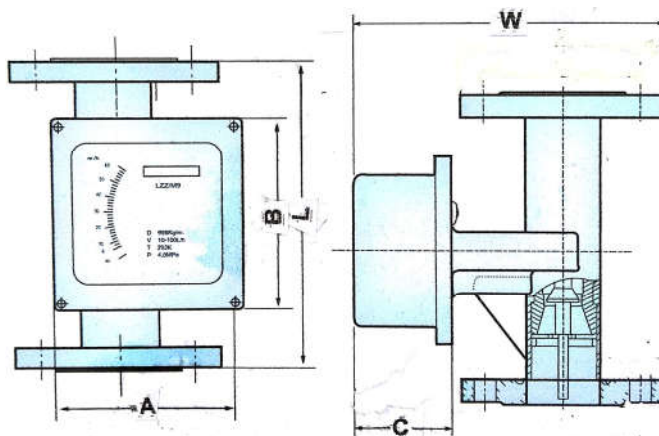
P<sub>0</sub> = gas media pressure at normal conditions 1,013 bar absolute

T<sub>1</sub> = gas media absolute temperature (° C + 273° K)

T<sub>0</sub> = absolute temperature at normal conditions 293° K)

Flow Range table provides equivalent scfm ranges

### Dimensional Drawing



Nominal Size	L		W		A		B		C		
	mm	ins	mm	ins	mm	ins	mm	ins	mm	ins	
15	3/4"	250	9.84"	208	8.19"	147	5.79"	150	5.91"	80	3.15"
25	1"	250	9.84"	218	8.58"	147	5.79"	150	5.91"	80	3.15"
50	2"	250	9.84"	240	9.45"	147	5.79"	150	5.91"	80	3.15"
80	3"	250	9.84"	258	10.2"	147	5.79"	150	5.91"	80	3.15"
100	4"	250	9.84"	268	10.6"	147	5.79"	150	5.91"	80	3.15"

### Pressure Drops

Nominal Size		Range Number	Pressure Drops @ Max Flow							
mm	inches		Orifice Types T9				Conical Type T10			
			Water		Air		Water		Air	
			bar g	psid	bar g	psid	bar g	psid	bar g	psid
15	3/4"	1	0.055	0.81			0.021	0.304		
		2	0.055	0.81			0.021	0.304		
		3	0.055	0.81			0.021	0.304		
		4	0.056	0.81			0.021	0.304		
		5	0.056	0.81	0.080	1.16	0.021	0.304	0.026	0.377
		6	0.058	0.81	0.108	1.57	0.021	0.304	0.026	0.377
		7	0.061	0.88	0.100	1.45	0.021	0.304	0.028	0.405
25	1"	8	0.057	0.83	0.072	1.04	0.024	0.348	0.032	0.464
		9	0.057	0.83	0.072	1.04	0.024	0.348	0.032	0.464
		10	0.059	0.86	0.077	1.12	0.024	0.348	0.033	0.478
		11	0.060	0.87	0.088	1.28	0.025	0.362	0.034	0.493
		12	0.068	0.99	0.120	1.74	0.026	0.377	0.038	0.551
50	2"	13	0.092	1.33	0.190	2.75	0.030	0.435	0.045	0.952
		14	0.068	0.99	0.086	1.25	0.033	0.478	0.074	1.07
		15	0.068	0.99	0.086	1.25	0.033	0.478	0.074	1.07
		16	0.094	1.36	0.104	1.51	0.038	0.551	0.077	1.12
80	3"	17	0.145	2.17	0.155	2.26	0.043	0.623	0.084	1.22
		18	0.069	1.00			0.036	0.522		
		19	0.069	1.00			0.036	0.522		
100	4"	20	0.080	1.16			0.046	0.667		
		21	0.085	1.23			0.058	0.841		
		22	0.088	1.28			0.064	0.928		
		23	0.099	1.43			0.066	0.957		

Note: For Range Number flow ranges see Flow Ranges table above

### Minimum Liquid Pressure Downstream (Above) Metal tekVar

#### Liquids:

To avoid cavitation (vapour discharge from liquids) the flow ranges prescribed for the **tekVar** should be observed, as well as ensuring a minimum downstream pressure is maintained. This can be accomplished by a downstream valve (above the **tekVar**)

The minimum downstream pressure may be ascertained by using the smaller value of the following formula:

$$P = (2.9 \times P) + (P_v + 3.45 \text{ kPa absolute or } 0.5 \text{ psi absolute})$$

OR

$$P = (2.9 \times P) + (1.3 \times P_v)$$

Where P = static pressure at 5 diameters downstream of **tekVar** (psig or kPa)

P = pressure loss across the **tekVar** (psi or kPa) as in Pressure Drop table above

P<sub>v</sub> = liquid vapour pressure at operating conditions (psi absolute or kPa absolute)

(For bar g (gauge) into bar absolute ADD 1.013 bar) x 100 = kPa absolute

#### Gases:

Ensure the downstream pressure (above the **tekVar**) is approx. 10% higher than the pressure drop at maximum flow rate.

## Ordering Code

**Example:**            tekVar **TMV-025-C-WU-1-A-T10-2-H-1-N** water 0.28-2.8 gpm

**Basic type** \_\_\_\_\_

**Nominal Size:** \_\_\_\_\_

- 15mm (3/4") = 015
- 25mm (1") = 025
- 50mm (2") = 050
- 80mm (3") = 080
- 100mm (4") = 100

**Display and Outputs:** \_\_\_\_\_

- Flow rate display only = A
- Flow rate display and 4-20mA = B
- Flow rate display, 4-20mA and totals = C

**Max Flow Range and Units Examples:** \_\_\_\_\_

- Water metric = WM
- Water USA = WU
- Air metric = AM
- Air USA = AU
- Other liquid metric = LM
- Other liquid USA = LU
- Other gas metric = GM
- Other gas USA = GU

**Note: Flow range and other media to be stated after ordering code**

**FlowTube and Wetted Parts Material:** \_\_\_\_\_

- AISI 304 stainless steel = 1
- AISI 316L stainless steel = 2
- AISI 316Ti stainless steel = 3
- Titanium = 4
- AISI 304 stainless steel with PTFE liner = 5

**Flanged Process Connections:** \_\_\_\_\_

- ANSI 150 rf = A
- DIN2501 PN10 = B, PN25 = C, PN40 = D
- JIS 10k = E, JIS 25K = F, JIS 40K = G
- (PN25 / JISk 25, PN40 / JIS40k for 15 - 50mm / 3/4" - 2" only)

**Indicator and Flow Tube Type:** \_\_\_\_\_

- Float in orifice type flow tube = T09
- Low pressure loss conical flow tube = T10

**Power Supply:** \_\_\_\_\_

- No power supply (no outputs) = 1
- 24V dc power supply for 4-20mA and totalizer = 2
- 24v dc internal battery for 4-20mA and power supply = 3

**Alarms:** \_\_\_\_\_

- No alarms = N
- High flow rate alarm = H
- Low flow rate alarm = L

**Flow Direction:** \_\_\_\_\_

- Vertical flow bottom to top = 1
- Horizontal flow right to left = 2
- Horizontal flow left to right = 3

**Trace Heating (With Electrical Power)** \_\_\_\_\_

- No trace heating = N
- With trace heating = T



## Technical Data Sheet & General Specifications

### tekVar Variable Area Flow Sensor Enquiry Form

Please fill out as much as possible. e-mail to [info@tekflosensors.com](mailto:info@tekflosensors.com) or Authorised Distributor

Customer's Name, Project Name, & Location:						
Detail	Sensor 1	Sensor 2	Sensor 3	Sensor 4	Sensor 5	Sensor 6
Quantity						
<b>Media Type</b> ADD any special notes, such as Dirty (D), Clean (C) For liquid solutions please provide density or specific gravity or % solutions by weight.....						
Typical Flow Rate With Units						
Min & Max Flow Rate With Units						
For Gases Confirm Normal (NTP) or Standard Conditions (STP) or Actual Conditions (ATP)						
Confirm : Flow vertically up (Yes / No) Flow horizontal right to left (Yes/NO) Flow Horizontal left to right (Yes/No)						
Pressure Range and Units						
Temperature Range and Units						
Viscosity (Liquids Only) and Units						
Explosive Atmosphere (Yes/No)						
Nominal Pipe Size (N) or ID ( I ) Specify mm or inches OR:						
Pipe Schedule or Wall Thickness Specify mm or inches						
Straight Pipe Runs Available						
Pipe Material						
Other Requirements: Flow rate only (Yes/No) Flow rate and 4-20mA (Yes/No) Flow Rate, Totaliser, 4-20mA (Yes/No) Internal Battery (B) or ext 24V dc						
High Alarm (Yes/No) Low Alarm (Yes/No) High/Low Alarm (Yes/No)						

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