

TI-P192-01

MI Issue 3

spirax

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TVA

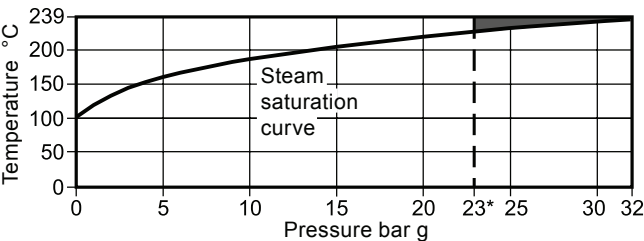
Flowmeter for

Saturated and Superheated Steam Service

Description

The Spirax Sarco TVA flowmeter is designed for use on saturated and superheated steam (with the dedicated pressure sensor kit) and operates on the target principle, by measuring the force produced on a moving cone by the fluid flow. This force is then converted into density compensated mass flowrate and is transmitted via a single loop powered 4-20 mA and pulsed output. TVA flowmeters also incorporate a totalised flow function and EAI 232C (RS 232) or EAI 485C (RS485) Modbus communications.

Pressure/temperature limits



The product should not be used in this region due to software limitations.

Maximum design pressure			32 bar g @ 239 °C
Maximum design temperature			239 °C
Minimum design temperature			0 °C (non-freezing)
Maximum operating pressure	Horizontal flow	Superheated steam	23 bar g @ 239 °C
		Saturated steam	32 bar g @ 239 °C
	Vertical flow	Saturated steam only	7 bar g @ 170 °C
Minimum operating pressure			0.6 bar g
Maximum operating temperature (saturation)			239 °C
Minimum operating temperature			0 °C (non-freezing)
Maximum electronics ambient temperature			55 °C
Maximum electronics humidity level		90% RH (non-condensing)	
Designed for a maximum cold hydraulic test pressure of 52 bar g			

High pressure syphon tube assembly

Maximum design pressure		80 bar g
Maximum design temperature		450 °C
Maximum working conditions		60 bar g @ 450 °C

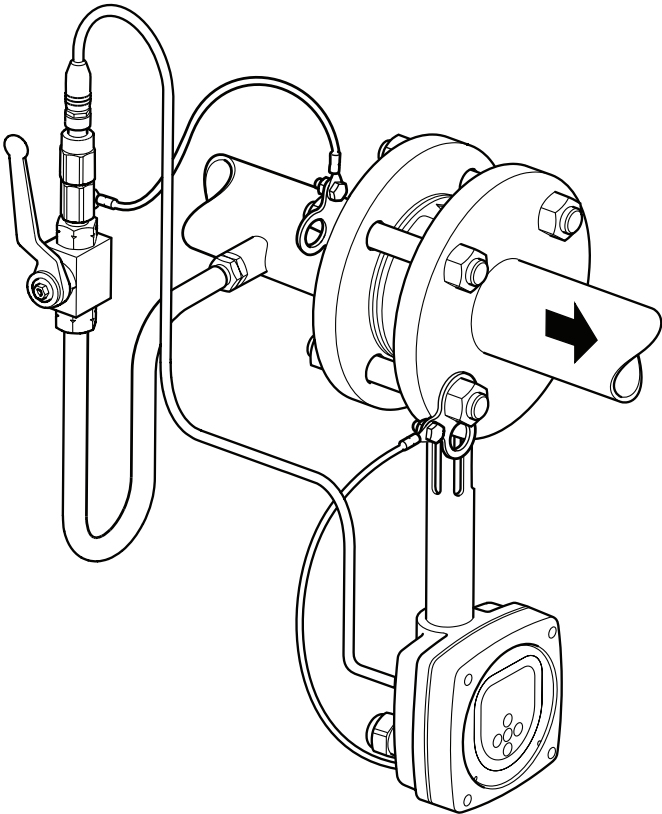
Pressure sensing kit

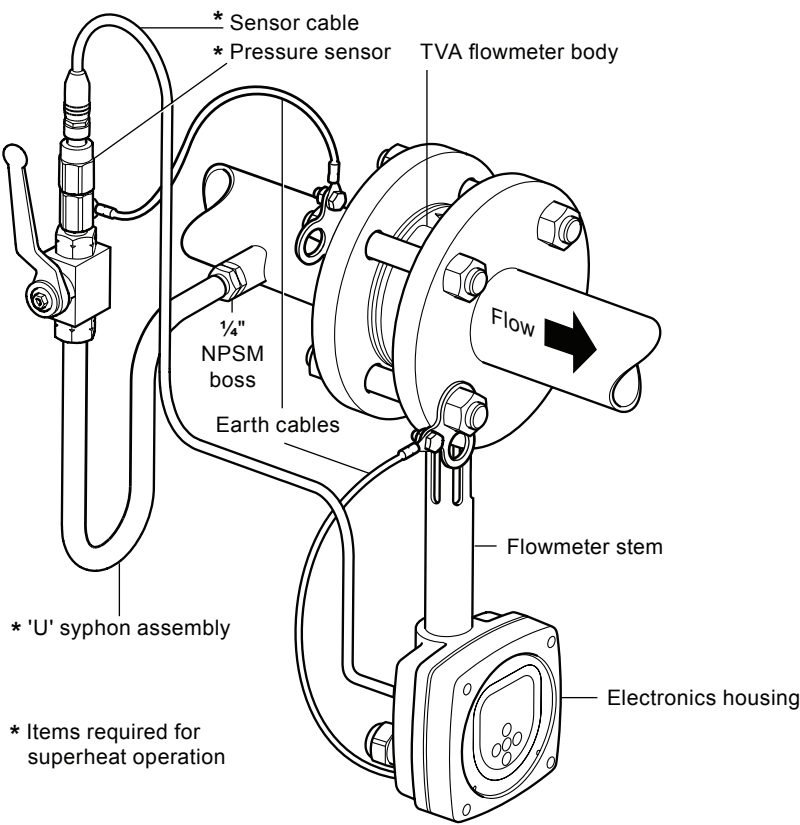
Maximum operating temperature		125 °C
Minimum operating temperature		0 °C (non-freezing)
Maximum operating pressure		50 bar g
Maximum ambient temperature (cable+connector)		70 °C

Sizes and pipe connections

DN50, DN80 and DN100
The TVA flowmeter is of wafer design, suitable for fitting between the following flanges:
EN 1092 PN16, PN25 and PN40
BS 10 Table H
ASME B 16.5 Class 150 and Class 300
Japanese Industrial Standard JIS 20
Korean Standard KS 20

Note: Spirax Sarco TVA flowmeters should be installed in pipework manufactured to BS 1600, ASME B 36.10 Schedule 40 or EN 10216-2 / EN 10216-5 equivalent. For systems with different standards/schedules, please contact Spirax Sarco.





Materials

Unit	Part		Material
TVA	Flowmeter body		Stainless steel S.316 1.4408 CF8M
	Internals		431 S29/S303/S304/S316
	Spring		Inconel X750 or equivalent
	Flowmeter stem		Stainless steel 300 series
	Electronics housing		Aluminium LM25
Pressure sensing kit	Cable		Polyvinyl chloride (PVC)
	Sensor housing		AISI 304 Stainless steel 1.4301
	Sensor		AISI 630 Stainless steel 1.4542
	'O' ring		Nitrile Butadiene Rubber (NBR)
	Adaptor		AISI 431 Stainless steel 1.4057
High pressure syphon tube assembly	Tube		Carbon steel BS 3602: Part.1 1987 CFS 360 (zinc plated/passivated)
	Valve	Body	Carbon steel
		Seat	PEEK/ Polymain

Technical data

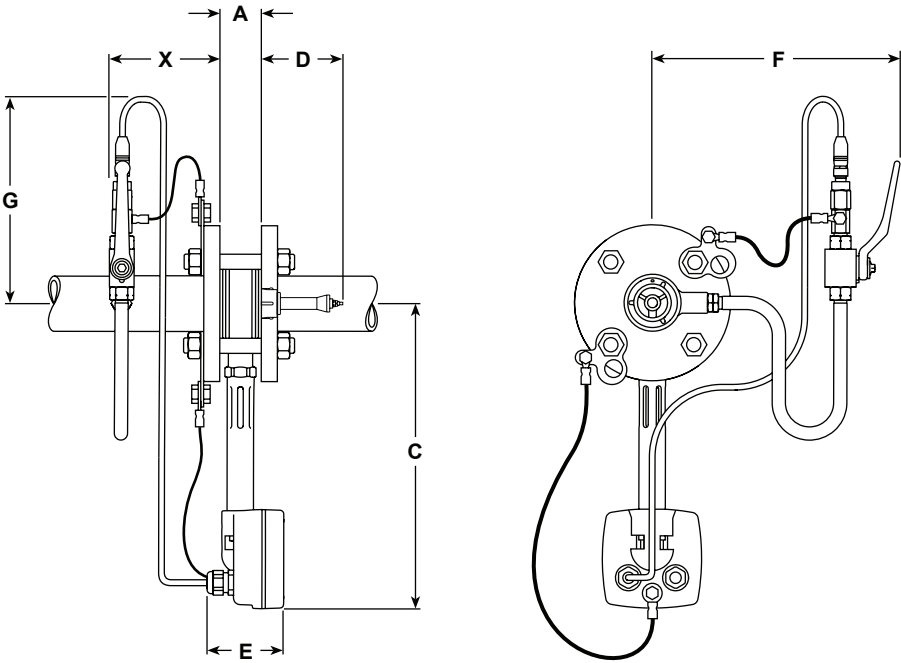
IP rating	IP65 with correct cable glands
Power supply	Loop powered
	with optional RS485: 24VDC
Outputs	4-20mA (not available with RS485 option)
	Pulsed output (V_{max} 28 Vdc R_{min} 10 k Ω)
Communication port	Modbus EIA 232C (RS 232C)
	with optional RS485: EIA 485 (RS 485C)

Dimensions/weights (approximate) in mm and kg

Size	A	Flowmeter OD	C	D	E	F	G	X	TVA	Weight Superheat kit	'U' syphon
DN50	35	103	322	125	65	250	160	300	2.67	0.3	0.5
DN80	45	138	334	115	65	270	160	300	4.38	0.3	0.5
DN100	60	162	344	155	65	280	160	300	7.28	0.3	0.5

Note:

Dimension 'X' is a recommended minimum distance between the pressure tapping and the flowmeter. However it can be installed at any distance provided the cable allows (Standard cable length is 1 m).



Performance

The TVA flowmeter has inbuilt electronics which give a density compensated output. An LCD display is incorporated within the electronics head. The M750 display unit can be used to provide a remote display function if required, utilising the 4 - 20 mA output.

System uncertainty, to 95% confidence (2 STD):
(in accordance with ISO 17025)

±2% of measured value from 10% to 100% of maximum rated flow.

±0.2% FSD, from 2% to 10% of maximum rated flow.

Turndown : up to 50:1

As the TVA flowmeter is a self contained unit, the uncertainty quoted is for the complete system. Many flowmeters claim a pipeline unit uncertainty and for a true system uncertainty, the individual uncertainty values of any associated equipment, such as DP cells, need to be added to the pipeline value.

Pressure drop

The pressure drop across the TVA is nominally 750 mbar (300 ins water gauge) at maximum rated flow for the DN50, and 500 mbar (200 inches water gauge) for the DN80 and DN100.

TVA flowmeter flow capacities and pressure drops

Flowmeter type	QE litres / min		Maximum DP	
	Maximum	Minimum	Wg	m bar
DN50	300	3	300	750
DN80	770	8	200	498
DN100	1 200	12	200	498

Flowmetering
Target flowmeters

Sizing the TVA flowmeter for saturated steam (kg/h) (Horizontal orientation)
Maximum flowrates in kg/h at different pressures (bar g).

- Notes:
- 1 - Maximum steam flowrates are calculated at maximum differential pressure.
 - 2 - For vertical capacities please contact Spirax Sarco.
 - 3 - The table below is a guide only.
 - 4 - For superheated capacities please use the sizing software on our website www.spiraxsarco.com

Size	Steam pressure bar g		1	3	5	7	10	12	15	20	25	30	32	bar g
DN50	Q _E = 300	Max. flow	619	859	1 042	1 196	1 395	1 513	1 676	1 918	2 135	2 335	2 409	kg/h
		Min. flow	12	17	21	24	28	30	33	38	43	47	60	kg/h
DN80	Q _E = 770	Max. flow	1 588	2 204	2 674	3 070	3 581	3 885	4 301	4 922	5 480	5 994	6 183	kg/h
		Min. flow	32	44	53	61	72	78	86	98	110	120	128	kg/h
DN100	Q _E = 1 200	Max. flow	2 475	3 435	4 167	4 784	5 581	6 054	6 703	7 671	8 540	9 341	9 637	kg/h
		Min. flow	49	69	83	96	112	121	134	153	171	187	192	kg/h

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions (IM-P192-02) supplied with the product.

The following main points are given for guidance only:

1. The TVA flowmeter should be mounted with a minimum of 6 straight pipe diameters upstream and 3 downstream. No valves, fittings or cross sectional changes are permitted within these pipe lengths. Where an increase in nominal pipe diameter is required, upstream of the flowmeter, the length of straight pipe should be increased to 12 diameters. Similarly, where a Spirax Sarco TVA is installed downstream of two 90° bends in two planes, a pressure reducing valve or a partly open valve, 12 upstream pipe diameters should be allowed.
2. It is important that the internal upstream and downstream diameters of pipe are smooth. Ideally seamless pipes should be used and there should be no intrusive weld beads on the internal diameter. It is also recommended that slip-on flanges are used to avoid this.
3. Care should be taken to install the TVA flowmeter concentrically in the line. If this is not done, flow measurement errors may occur.
4. The TVA flowmeter can be installed in any orientation up to a line pressure of 7 bar g whilst conditions are saturated. When conditions are superheated then the TVA flowmeter can only be installed in horizontal pipework, with the electronics below the pipeline.
5. As for all steam flowmetering installations, good basic steam engineering practices should be followed:
 - Correct line drainage through adequate trapping.
 - Good alignment and support of associated pipework.
 - Line size changes achieved by the use of eccentric reducers.
 - Do not lag (insulate) the TVA body or the mating flanges.
6. The TVA flowmeter must not be installed outside where it can be subjected to driving rain or where it is liable to freeze.

How to order

Saturated Service Example: 1 off Spirax Sarco DN100 TVA flowmeter for installation between EN 1092 PN40 flanges for use on saturated steam at 10 bar g - Maximum flow 5 581 kg/h.

Superheated Service Example: 1 off Spirax Sarco DN100 TVA flowmeter, Pressure sensing kit and 'U' syphon, for installation between EN 1092 PN40 flanges for use on superheated steam at 10 bar g.

Note: For details of the optional remote display see the relevant Spirax Sarco M750 literature.

Spare parts and accessories

- Spare electronics front panel (with standard RS 232C Communications)
- Spare electronics front panel (with RS485 Communications converter)