

Product Information FTS-Series

PHARMA

Calorimetric Flow Switch

FTS-141P, FTS-741P



Application

- Monitoring of flowing liquids in pipes
- The monitor can be used to measure liquids that are aqueous (water content $\geq 50\%$), that do not contain oil and that have a medium temperature up to $100\text{ }^{\circ}\text{C}$ ($212\text{ }^{\circ}\text{F}$)

Application examples

- Flow monitoring in pipes from DN 25, e.g., as dry-run protection or for monitoring filters, agitators or cooling loops
- Also suitable for highly pure, aqueous media without particles or solids (e.g. ultra-filtered media, cola)

Hygienic design/Process connection

- The Anderson-Negele weld-in sleeve EMS-132 or weld-in pipe EHG-.../ 1/2" creates a flow-optimized, hygienic and easy-to-clean installation configuration
- CIP cleaning to $100\text{ }^{\circ}\text{C}$
- All materials in contact with the product are FDA-compliant
- Sensor made entirely of stainless steel
- Further connections to FTS-141P by using CLEANadapt adaptors: milk pipe, DRD, Varivent, APV Inline, BioControl
- Conformity to 3-A Standard with FTS-741P

Features

- Calorimetric measuring principle with pulsed heating
- Only one sensor tip, flow-optimized shape
- Insensitive toward temperature shocks, short response time
- Integrated sensor protection: automatic switch-off at $T > 100\text{ }^{\circ}\text{C}$ (switch on hysteresis at $T < 95\text{ }^{\circ}\text{C}$)
- Freely adjustable switch output $15\text{...}200/300\text{ cm/s} = 7\text{...}100\%$
- Indicator (within head), LED for switching state

Options/Accessories

- Preassembled cable for M12 plug

Authorisations



Flow switch FTS-741P



Flow switch FTS-141P

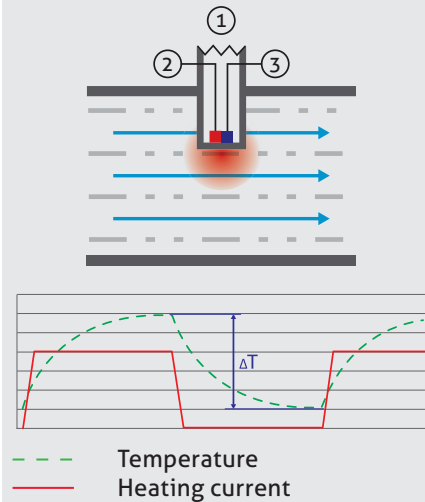


Functional principle

The functional principle of the FTS calorimetric flow monitor is based on a temperature sensor mounted on the sensor tip (1) that is periodically heated by a heating element (2). When the medium is stationary, a constant temperature difference ΔT arises between the heated and unheated state. When the medium flows, heat energy is withdrawn from the heated temperature sensor and the temperature difference changes in relation to the flow rate.

In contrast to designs with two separate temperature sensors, of which one is constantly being heated, the measuring principle of the FTS with only one sensor and periodic heating has a lower response time due to the optimized heat transfer and lower heat capacity.

The response time is also significantly influenced by the heat conductivity of the medium. In general, the lower the heat conductivity of the medium, the higher the medium flow rate must be for measurement to be possible.

Schematic drawing

Specification		
Process connection	thread Tri-Clamp	Hygienic G1/2" CLEANadapt tightening torque max. 20 Nm sizes: 1½", 2"
Materials	sensor head/ metal cap process connection (wetted parts) cap (plastic)	1.4308 (CF-8) 1.4435 (316L) Polycarbonate
Surface	product contacting	$R_a \leq 0.8 \mu\text{m}$ (0.8 microns; 32 micro-inch)
Temperature ranges	ambient process / CIP SIP	-20...70 °C (-4...158 °F) 0...100 °C (32...212 °F) 140 °C (284 °F) with no function / max. 60 min.
Operating pressure		max. 10 bar (CLEANadapt) max. 60 bar (Tri-Clamp)
Protection class		IP 69 K
Measuring range	FTS-141P FTS-741P	10...200 cm/s (6.5 ft/s; 78.7 in/s) 10...300 cm/s (9.8 ft/s; 118.1 in/s)
Response time reaction time	in case of temperature leap	5 s max. 10 s at 40 K
Accuracy*	in nominal width range	10 % of full scale DN25...DN100
Switch point	freely adjustable FTS-141P FTS-741P hysteresis	7...100 % / 15...200 cm/s (6.5 ft/s) 7...100 % / 15...300 cm/s (9.8 ft/s) 10 %
Indicator	7 segment red LED	in % of measuring range output switching state
Electrical connection	cable connector supply voltage current consumption	M12 connector 1.4301 16...32 V DC 60 mA (24 V DC)
Output		PNP, max. 200 mA short circuit proof and protected against reverse polarity
Weight	FTS-141P FTS-741P with Tri-Clamp 1½" FTS-741P with Tri-Clamp 2"	410 g 440 g 520 g

*) Reference conditions in case of laminar flow profiles: calibration medium is water at ambient temperature.

Measurable media



The following media can be measured: aqueous liquids (water content $\geq 50\%$) and liquids that do not contain oil, such as water, milk, beer, fruit juice, CIP media, etc. Gases, oils and media containing oil cannot be measured with the FTS.

Notice



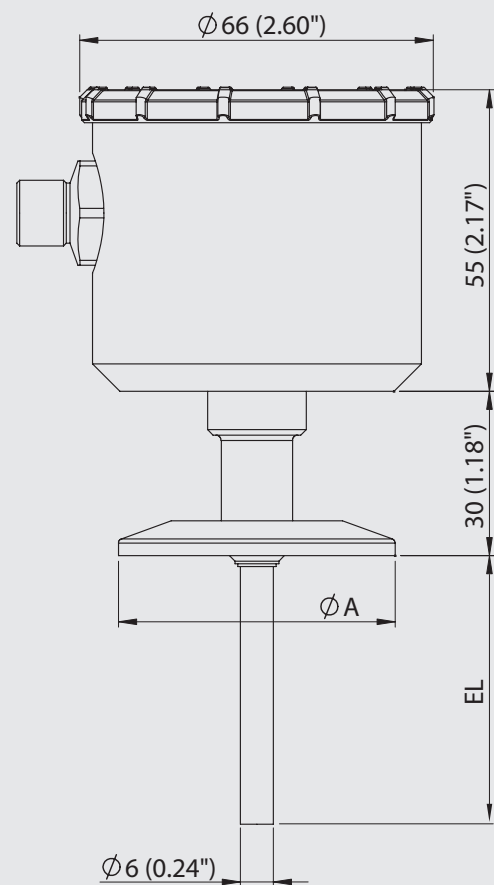
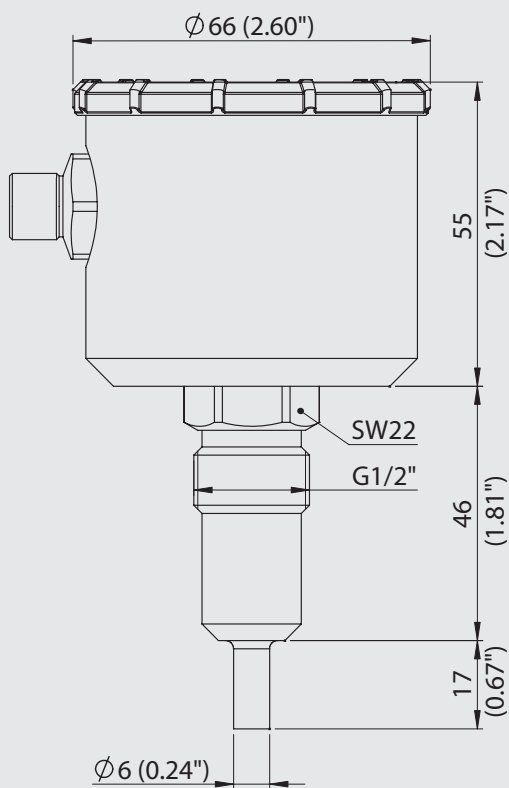
Flow monitor FTS has an integrated self-protection mechanism that prevents damage:
At medium temperatures over $100\text{ }^{\circ}\text{C}$, the sensor is automatically switched off with a hysteresis of $5\text{ }^{\circ}\text{C}$.
Three lines appear on the indicator.

Intended use



- Not suitable for applications in potentially explosive areas.
- Not suitable for applications in safety-relevant system parts (SIL).

Dimensional drawing FTS-141P

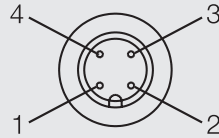


Dimension Table on FTS-741P

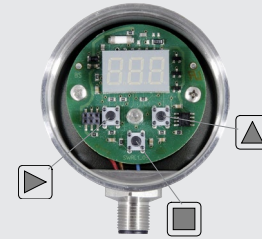
Order code	Clamp size A [mm / inch]	Immersion length EL [mm / Inch]	Suitable for pipe diameter	Pipe style
FTS-741P/C10...	50.5 / 1½"	49 / 1.93	DN 25...40 ISO 14...25 1½"	DIN 11866 series A DIN 11866 series B / ISO 1127 DIN 11866 series C / ASME-BPE
FTS-741P/C20...	64 / 2"	59 / 2.32	DN 50 2"	DIN 11866 series A DIN 11866 series C / ASME-BPE

Electrical connection FTS

- 1: + power supply 16...32 V DC
- 2: Not assigned
- 3: 0 V supply voltage (GND)
- 4: Switch output active



Inside view and key assignment



Operation FTS

1. Starting up

- Install the FTS and make the electrical connections
- Initialization phase: Indicator displays "888" (flashing) for approx. 20 s
- Then the flow rate is displayed as a % of the measuring range
- The switch output is adjusted according to the set value

2. Menu guidance

- Open the operating mode: Key combination 2x [right arrow], 2x [up arrow], 2x [square] press within 10 s
- Main menu level "SP" (switch point setting) appears on the indicator
- Navigation in the menu field:
 - [right arrow] to the right,
 - [up arrow] upward, changing the values
 - [square] to the left, accepting the new parameter settings, leaving the operating mode

3. Setting the switch point

- Under "SP" in the main menu level, select the editing mode with [right arrow]
- Move to the first digit with [right arrow]; the digit flashes
- Enter the desired value with [up arrow]
- Edit the next digit with [right arrow]; the digit flashes, etc.
- Accept the switch point with 2x [square]
- Leave the menu mode with 1x [square]

4. Setting the switch output

- Default setting: normally open contact
- If the normally closed function is to be set, proceed as follows:
 - In the main menu level, select "O-C" with [up arrow]
 - Open the editing mode with [right arrow]; the indicator shows "n.o." (normally open contact, default setting)
 - 1x [up arrow], the indicator shows "n.c." (normally closed contact)
 - 2x [square]: accept the setting
 - [square]: leave the menu mode

FTS-741P Setpoint by Line Size and Velocity

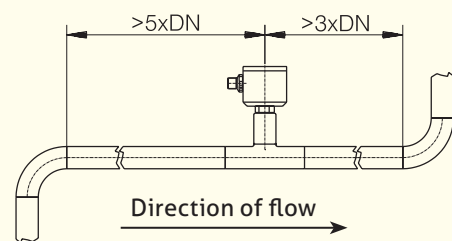
Line Size	Velocity m/sec (ft/sec)									
	0.3 (1.0)	0.6 (2.0)	0.9 (3.0)	1.2 (4.0)	1.5 (5.0)	1.9 (6.0)	2.1 (7.0)	2.4 (8.0)	2.7 (9.0)	3.0 (10.0)
1"	7.2 (1.9)	14.4 (3.8)	21 (5.6)	28 (7.5)	35 (9.4)	43 (11)	50 (13)	57 (15)	64 (17)	72 (19)
1.5"	18 (4.6)	36 (9.2)	52 (14)	70 (19)	87 (23)	105 (28)	123 (32)	140 (37)	158 (42)	180 (46)
2"	33 (8.6)	66 (17)	98 (26)	130 (34)	163 (43)	195 (52)	228 (60)	261 (69)	293 (77)	330 (86)
2.5"	52 (14)	104 (28)	159 (42)	212 (56)	265 (70)	318 (84)	366 (97)	418 (110)	470 (124)	520 (140)
3"	76 (20)	152 (40)	228 (60)	303 (80)	383 (101)	459 (121)	536 (142)	613 (162)	689 (182)	760 (200)
4"	140 (37)	280 (74)	420 (74)	557 (147)	696 (184)	835 (221)	974 (257)	1113 (294)	1252 (331)	1400 (370)
FTS-741P Display / Setpoint	10	20	30	40	50	60	70	80	90	100

FTS-141P Setpoint by Line Size and Velocity

Line Size	Velocity m/sec (ft/sec)					
	0.3 (1.0)	0.6 (2.0)	0.9 (3.0)	1.2 (4.0)	1.5 (5.0)	1.9 (6.0)
	Flow rate l/min (gal/min)					
1"	7.2 (1.9)	14.4 (3.8)	21 (5.6)	28 (7.5)	35 (9.4)	43 (11)
1.5"	18 (4.6)	36 (9.2)	52 (14)	70 (19)	87 (23)	105 (28)
2"	33 (8.6)	66 (17)	98 (26)	130 (34)	163 (43)	195 (52)
2.5"	52 (14)	104 (28)	159 (42)	212 (56)	265 (70)	318 (84)
3"	76 (20)	152 (40)	228 (60)	303 (80)	383 (101)	459 (121)
4"	140 (37)	280 (74)	420 (74)	557 (147)	696 (184)	835 (221)
FTS-141P Display / Setpoint	15	30	45	60	75	95

Mechanical connection/Installation

- Ensure that the pipe in which the sensor is installed is completely filled with liquid. Installation in a rising pipe is recommended (in which the direction of flow is upward)
- Note the inlet and outlet dimensions (see drawing DN = pipe cross section)



Conditions for a measuring point according to 3-A Sanitary Standard 74-06

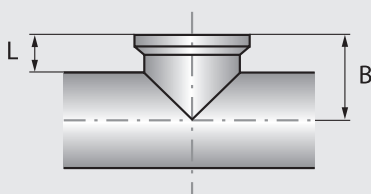
- Only the FTS-741P is suitable for applications requiring 3-A compliant equipment.
- The sensors are designed for CIP-/ SIP-cleaning. Maximum 140 °C / 60 min.
- Only with 3-A conforming Tri-Clamp connection.
- Mounting position must allow for self draining to be in accordance to current 3-A Sanitary Standard.



Pipe T dimensions for FTS-741P

Tri-Clamp size [inch]	Pipe [inch]	Pipe [mm]	T-Short Extract	
			B [mm]	L [mm]
1½	1½	38.1 x 1.65	34.9	15.9
2	2	50.8 x 1.65	41.3	15.9
2	2½	63.5 x 1.65	47.6	15.9

Pipe T



Note

The Flow Switch FTS-741P is specially designed to work with pipe Ts that have a short extract.



Adapter for FTS-141P

G1/2"		Adapter for FTS-141P	
Diameter		EHG	Varivent
DN25	1"	EHG-DIN2-25/1/2"	AMV-132/25
DN40	1½"	EHG-DIN2-40/1/2"	AMV-132/40
DN50	2"	EHG-DIN2-50/1/2"	AMV-132/50
DN65	2½"	EHG-DIN2-65/1/2"	AMV-132/65

Transport/storage

- Do not store outside
- Store in an area that is dry and dust-free
- Do not expose to corrosive media
- Protect against solar radiation
- Avoid mechanical shock and vibration
- Storage temperature 0...40 °C
- Relative humidity max. 80 %

Notice on conformity

- Applicable directives:
- Electromagnetic Compatibility Directive 2004/108/EC
 - The CE label confirms compliance of this product with the applicable EC directives.
 - You have to guarantee the compliance of all guidelines applicable for the entire equipment.

Disposal

- This instrument is not subject to the WEEE directive 2002/96/EC and the respective national laws.
- Give the instrument directly to a specialized recycling company and do not use the municipal collecting points.

Reshipment

- Sensors and process connection must be clean and must not be contaminated with hazardous media and/or heat-conductive paste. Note the cleaning information!
- To avoid damage of the equipment, use suitable transport packaging only.

Standards and guidelines

- Compliance with the applicable regulations and directives is mandatory.

Cleaning/maintenance

- When using a pressure washer, do not point the nozzle directly at the electrical connections.

Conversion table m/s to l/min

DN	DN 25	DN 40	DN 50	DN 65	DN 80	DN 100
Flow [m/s]	[l/min]	[l/min]	[l/min]	[l/min]	[l/min]	[l/min]
0.1	2.9	7.5	11.8	19.9	30	47
0.2	5.9	15.1	23.6	39.8	60	94
0.4	11.8	30.1	47.1	79.6	121	188
0.6	17.7	45.2	70.7	119.4	181	283
0.8	23.6	60.3	94.2	159.2	241	377
1.0	29.4	75.4	117.8	199.0	301	471
1.2	35.3	90.4	141.3	238.8	362	565
1.4	41.2	105.5	164.9	278.6	422	659
1.6	47.1	120.6	188.4	318.4	482	754
1.8	53.0	135.6	212.0	358.2	543	848
2.0	58.9	150.7	235.5	398.0	603	942
2.2	64.8	165.8	259.1	437.8	663	1 036
2.4	70.7	180.9	282.6	477.6	723	1 130
2.6	73.6	188.4	294.4	497.5	754	1 178
2.8	82.4	211.0	329.7	557.2	844	1 319
3.0	88.3	226.1	353.3	597.0	904	1 413

Conversion table in/s to gal/min

DN		1"	1½"	2"	3"	4"
Flow [in/s]	[m/s]	[gal/min]	[gal/min]	[gal/min]	[gal/min]	[gal/min]
4.0	0.10	0.82	1.84	3.26	7.34	13.05
8.0	0.20	1.63	3.67	6.53	14.68	26.10
16.0	0.41	3.26	7.34	13.05	29.36	52.20
24.0	0.61	4.89	11.01	19.58	44.05	78.30
32.0	0.81	6.53	14.68	26.10	58.73	104.41
40.0	1.02	8.16	18.35	32.63	73.41	130.51
48.0	1.22	9.79	22.02	39.15	88.09	156.61
56.0	1.42	11.42	25.69	45.68	102.77	182.71
64.0	1.63	13.05	29.36	52.20	117.46	208.81
72.0	1.83	14.68	33.03	58.73	132.14	234.91
80.0	2.03	16.31	36.71	65.25	146.82	261.01
88.0	2.24	17.94	40.38	71.78	161.50	287.12
96.0	2.44	19.58	44.05	78.30	176.18	313.22
104.0	2.64	21.21	47.72	84.83	190.87	339.32
112.0	2.84	22.84	51.39	91.36	205.55	365.42
120.0	3.05	24.47	55.06	97.88	220.23	391.52

Order code CLEANadapt G1/2" process connection

FTS-141P Calorimetric Flow Sensor with switch output, CLEANadapt G1/2" process connection material 1.4435 incl. 3.1 material certificate

Cap

- X** (Plastic without window)
- P** (Plastic with control window)
- M** (Metal without control window)
- W** (Metal with control window)

FTS-141P / X

Order code direct process connection in one piece design

FTS-741P Calorimetric Flow Sensor with switch output, direct process connection material 1.4435 incl. 3.1 material certificate

Process connection

- C10** (Tri-Clamp 1½")
- C20** (Tri-Clamp 2")

Cap

- X** (Plastic without window)
- P** (Plastic with control window)
- M** (Metal without control window)
- W** (Metal with control window)

Surface finish

- XX** (0.8 µm / 0.8 microns)

FTS-741P / C20 / X / XX

Accessories

PVC cable with M12 connection made of 1.4305, IP 69 K, unshielded

- M12-PVC / 4-5 m** PVC cable 4-pin, length 5 m
- M12-PVC / 4-10 m** PVC cable 4-pin, length 10 m
- M12-PVC / 4-25 m** PVC cable 4-pin, length 25 m

PVC cable with M12 connection, nickel-plated brass, IP 67, shielded



- M12-PVC / 4G-5 m** PVC cable 4-pin, length 5 m
- M12-PVC / 4G-10 m** PVC cable 4-pin, length 10 m
- M12-PVC / 4G-25 m** PVC cable 4-pin, length 25 m

CERT / 2.2 / FTS factory certificate 2.2 acc. to EN10204 (product-contacting surface only)

PVC cable with M12 connection



Accessories for FTS-741P (not part of standard scope of supply)

Tri-Clamp size	Clamp size A [mm] (see page 3)		
		Clamp ring Tri-Clamp	Sealing ring Tri-Clamp (EPDM)
1"	50.5	SRC-25	DRC-1"
2"	64.0	SRC-50	DRC-50