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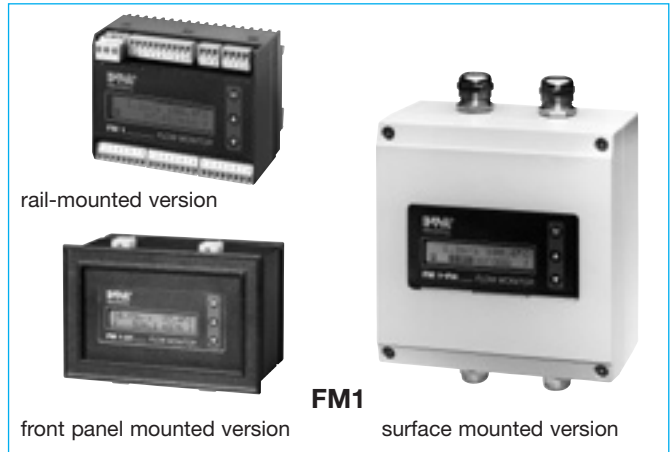
Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



## Description

Micro controller operated Flow Meter to monitor and display flow rates and temperature. Once correctly adjusted it can also be used for mass flow measurements. Factory pre-set for air and water.



rail-mounted version

front panel mounted version

FM1

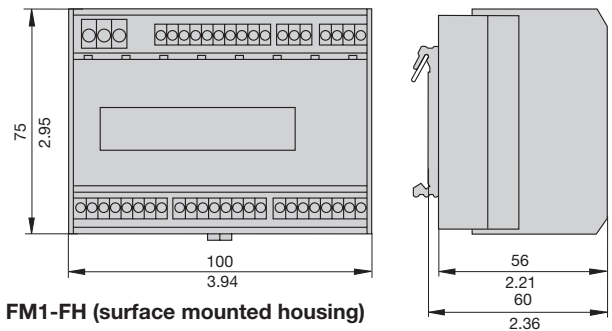
surface mounted version

## Features

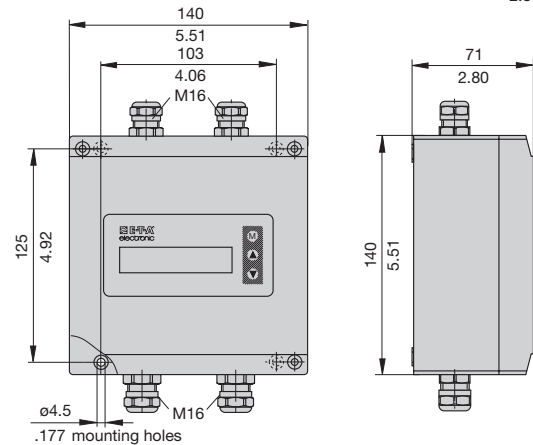
- Menu driven (keypads)
- LC display (2 x 16 digits) of:
  - actual flow rate, volume flow or mass flow, medium temperature;
  - bargraph status indication of limit contacts, actual flow rate/quantity or medium temperature
  - directions for parameter assignment, configuration, diagnosis and error correction;
  - base value indication
- Two scalable analogue outputs
- Peak memory (MIN + MAX)
- Two freely selectable limit contacts
- Quantity-related pulse output
- Versions for rail, front panel and surface mounting

## Dimensions

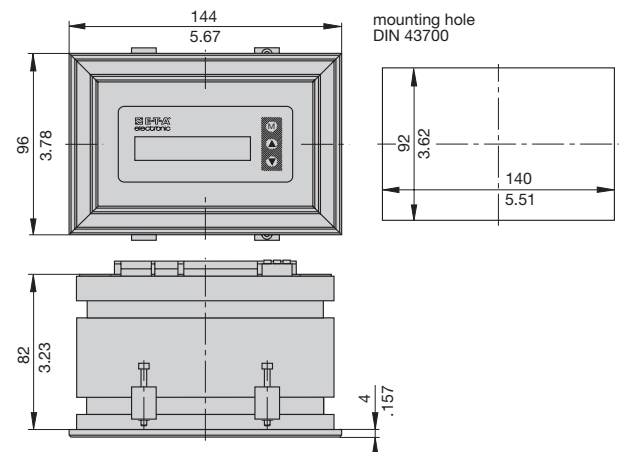
### FM1 (rail-mounted housing)



### FM1-FH (surface mounted housing)



### FM1-ST (front panel mounted housing)



## Ordering information

Type	
FM1	Flow Meter, in rail-mounted housing (standard software version)
FM1-FH	Flow Meter, in surface mounted housing (IP64)
FM1-ST	Flow Meter, in front panel mounted housing (IP65)
<b>Input voltage</b>	
U1	DC 19...32 V
<b>Signal outputs</b>	
R2	2 relay outputs (2 limit values)
T4	4 transistor outputs (2 limit value + 2 status, or 2 limit value + 1 status + 1 pulse output (menu-selected))
<b>Analogue outputs</b>	
V1	0/1- 5 V
V2	0/2-10 V
C1	0/4-20 mA (self-powered, physically isolated)
<b>Specification of medium</b>	
xxx	
FM1 - U1 R2 V1 - ...	ordering example

This is a metric design and millimeter dimensions take precedence ( $\frac{\text{mm}}{\text{inch}}$ )

## Technical data

Flow Meter FM1		with CST/CSF calorimetric monitoring heads	with TST turbine type sensors
<b>General data</b>			
Media		gases, liquids (oil etc.)	gases, clean and particle-free liquids
Measuring functions		flow rate/volume flow/mass flow/temperature	flow rate, volume flow
Display		2 x 16-digit LC display	
Parameter assignment, calibration by:		keypads	
Temperature range (electronic control unit) in circulating air		+10 °C...+50 °C *)	
<b>Electrical data</b>			
Input voltage		DC 24 V (19...32 V)	
Power consumption		DC 200 mA**)	DC 110 mA
Analogue outputs (flow and temperature) (temperature N/A with TST heads)		0/4-20 mA or 0/2-10 V or 0/1-5 V	
Signal outputs	2 relay outputs (2 limit values)	2 change over contacts AC/DC 50 V / 1 A / 50 W	
	4 transistor outputs (2 limit values + 2 status, or 2 limits values + 1 status + 1 pulse output)	open collector outputs DC 36 V/150 mA/1.5 W	
<b>Flow measurement</b>			
Measuring range (display range) (display range)	water	0.05...3 m/s (0...4 m/s)	0.1...5 m/s (0...5 m/s)
	air	0.1...20 m/s (0...100 m/s)	1...20 m/s (0...20 m/s)
Accuracy (related to the velocity available at sensor)	water	see failure diagram	± 1% of final value, ± 3% of measured value
	air	see failure diagram	± 1% of final value, ± 3% of measured value
Repeatability (1)	water	≤ 1% of measured value } (5% to 100% of final value)	≤ 0.5% of measured value } (5% to 100% of final value)
	air		
Temperature drift (electronic control unit) (4)	water	0.35 %/°K of final value	none
	air	0.1 %/°K of final value	none
Response delay	water (2)	2.5 s	1 s
	air (3)	3 s	1 s
<b>Temperature measurement</b>	measuring range	-40 °C...+130 °C	N/A
	accuracy	± 1% of measuring range	N/A
<b>Mechanical data (electronic control unit)</b>			
Degree of protection	rail-mounted:	IP20	
	surface mounted:	IP65	
	front panel mounted:	IP65	
Materials	rail-mounted:	acrylic vinyl/styrene/polycarbonate; heat sink aluminium	
	surface mounted:	aluminium/acrylic	
	front panel mounted:	aluminium black coated; display polyester foil	
Housing dimensions (LxWxH)		see dimension diagrams (overleaf)	
Mass	rail-mounted:	485 g	
	mounted:	1250 g	
	front panel mounted:	900 g	
Cables	voltage supply	3 x 0.75 mm <sup>2</sup> (AWG18)	
	to monitoring head	LifYCY 4 x 2 x 0.2 mm <sup>2</sup> (AWG 24)	LifYCY 3 x 0.35 mm <sup>2</sup> (AWG 22)
	analogue outputs	2 x LifYCY 2 x 0.25 mm <sup>2</sup> (AWG 24)	2 x LifYCY 2 x 0.25 mm <sup>2</sup> (AWG 24)
	limit value output	2 x LifYCY 3 x 0.38 mm <sup>2</sup> (AWG 22)	2 x LifYCY 3 x 0.38 mm <sup>2</sup> (AWG 22)
Max. cable length to monitoring head		200 m	200 m

\*) With output C1 the max. admissible ambient temperature for the rail-mounted version is limited to +40 °C.

\*\*\*) With output C1, power consumption may be up to 300 mA ±10 %.

(1) of the set value, at constant temperature and flow conditions, and stable thermal conductivity.

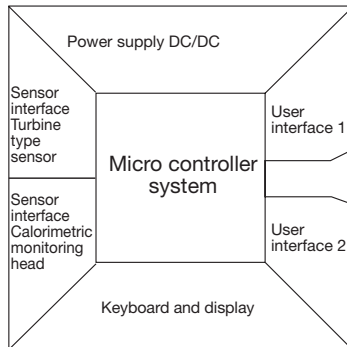
(2) Delay with the switch point set to 1 m/s and the flow at 2 m/s, after a sudden complete stop.

(3) Delay with the switch point set to 10 m/s and the flow at 20 m/s, after a sudden complete stop.

(4) Warm-up time to full accuracy: 15 minutes.



## Block diagram



Input voltage: DC 19...32 V

Keyboard/display: keypads  
LC display  
2 x 16 digits

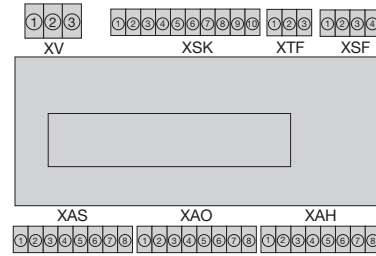
User interface 1: relay outputs: 2 limit values  
transistor outputs: 2 limit values +  
1 error indication +  
1 busy or pulse output  
(software selected)

User interface 2: analogue outputs  
current or voltage

Controller system: signal processing  
I/O - controlling  
monitoring  
parameter memory

Sensor interfaces: calorimetric monitoring head  
and turbine type sensor

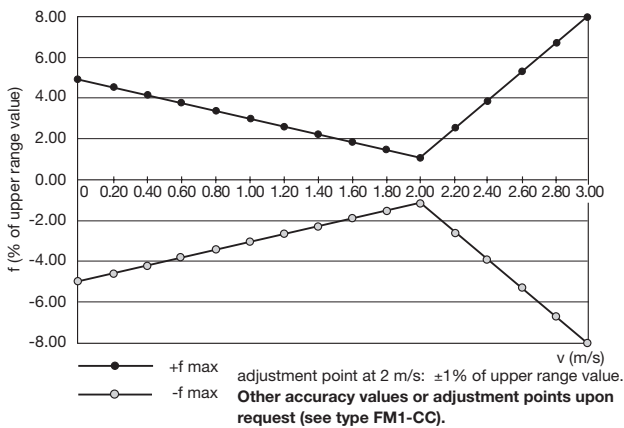
## Connection diagram



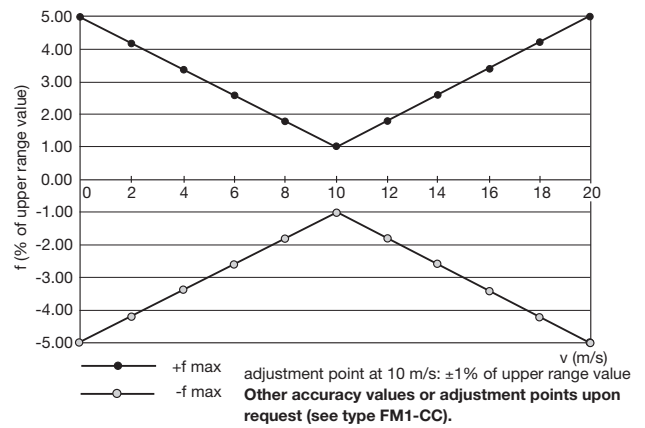
Wire size: 0.14 mm<sup>2</sup> to 1.5 mm<sup>2</sup> single or stranded conductor  
Strip length: 6.5 mm  
Clamping screw: M2 (nickel-plated brass)  
Contact material: pre-tinned tin bronze

XV: power supply  
XSK: calorimetric monitoring head  
XTF: keyboard release  
XSF: turbine-type sensor  
XAS: not released for user  
XAO: analogue outputs  
XAH: signal outputs

## Failure diagram for water

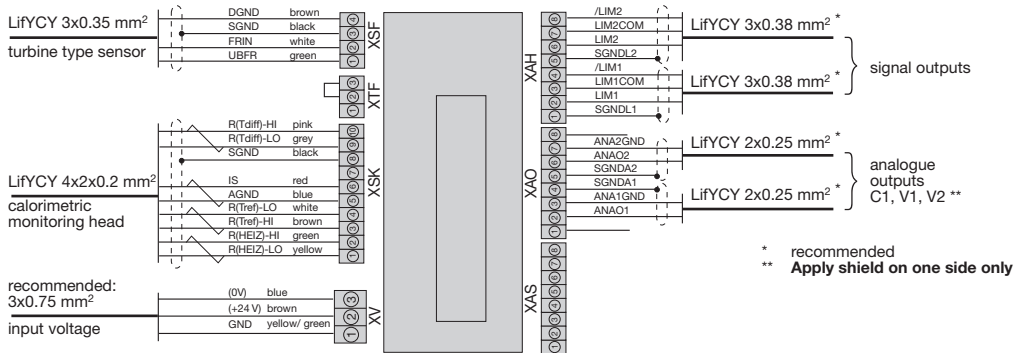


## Failure diagram for air

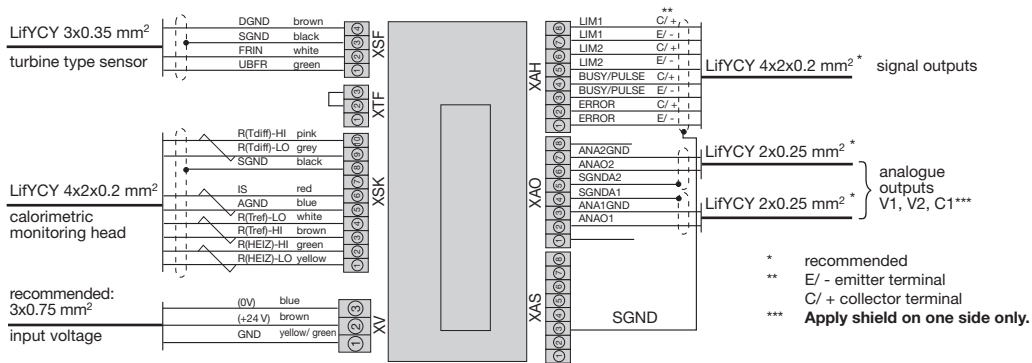


**Connection diagrams**

**FM1 with relay outputs**

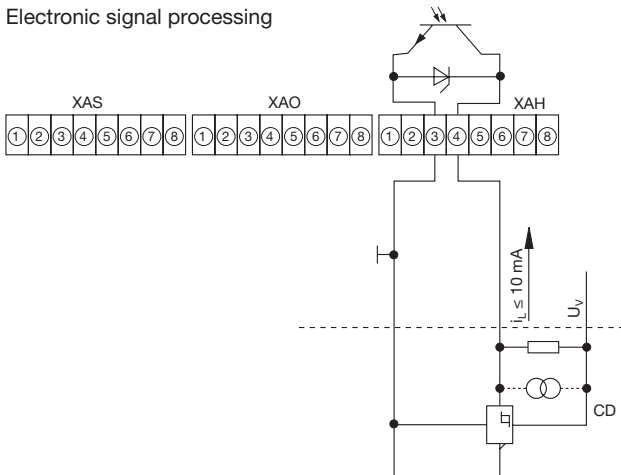


**FM1 with transistor outputs**

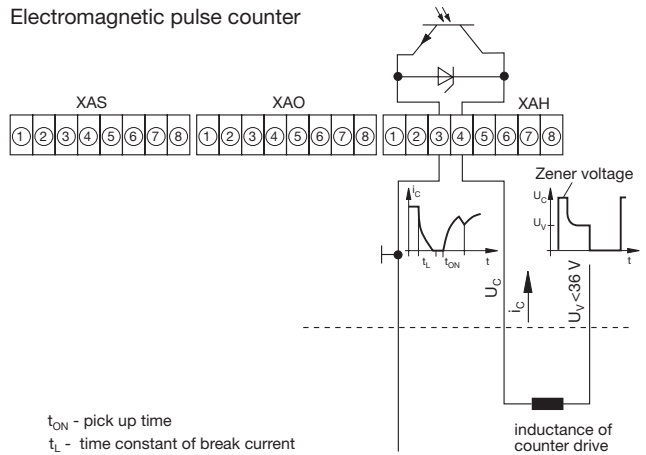


**FM1 - Recommended connection of pulse output**

**Electronic signal processing**



**Electromagnetic pulse counter**



All dimensions without tolerances are for reference only. In the interest of improved design, performance and cost effectiveness the right to make changes in these specifications without notice is reserved. Product markings may not be exactly as the ordering codes. Errors and omissions excepted.

## Description

Thread-mounted calorimetric monitoring head for Flow Meter FM1, suitable for general industry applications.

## Features

- Suitable for installation in welding bushes
- Medium temperature -40 °C...+130 °C
- Material: stainless steel 1.4571/AISI 316 Ti, or Hastelloy alloy C4 2.4610

## Ordering information

### Type No.

**CST** Thread-mounted monitoring head with calorimetric sensors

### Process connection

**01** thread size G1/2A (FM1-standard)

### Medium

**A** air

**W** water

### Material of areas exposed to medium

**M1** stainless steel 1.4571/AISI 316 Ti (standard)

**M2** nickel-based alloy Hastelloy alloy C4 2.4610

### Length of shank/thread

**L10** 36 mm (standard)

### Electrical connection

**E10** round connector with tinned contacts (plug and cable to separate order)

### Certification

**T0** without certificate (standard)\*

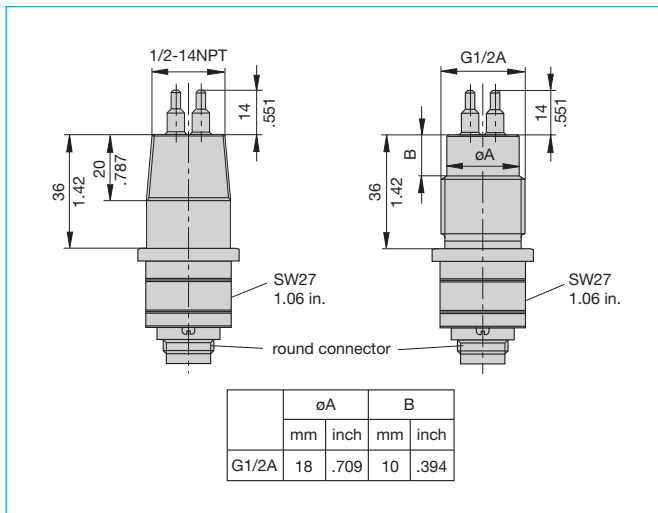
### Specification of medium

**xxx**

**CST - 01 W M1 L10 E10 T0 - ...** ordering example

\*) for detailed information please see section 0.

## Dimensions



This is a metric design and millimeter dimensions take precedence ( $\frac{mm}{inch}$ )

## Thread-mounted calorimetric monitoring head



CST-...

## Technical data

Type of head	thread-mounted
Nominal thread dia.	G1/2A
Length of shank	36 mm
Length of sensor	14 mm
Suitable for	all media, depending on material resistance
Temperature range *) (of medium)	-40...+130 °C
Temperature drift of monitoring head	$\pm < 0.05 \text{ } \frac{\%}{\text{K}}$ /measuring range (in the range between +20 °C and +80 °C)
Measuring ranges	air: 0...20 m/s water: 0...3 m/s
Pressure resistance <sup>(1)</sup>	100 bar / 1470 PSI
Degree of protection	connector <sup>(2)</sup> : IP67
Material	stainless steel 1.4571/AISI 316 Ti Hastelloy alloy C4 2.4610

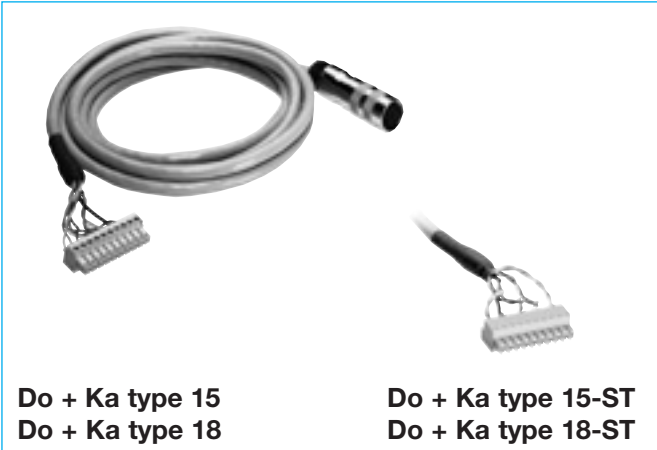
Cable to LifYCY 4x2x0.2 mm<sup>2</sup> (AWG 24) electronic control unit

<sup>(1)</sup> Admissible operating pressure DIN 2401, measured at max. temperature (= max. medium temperature)

<sup>(2)</sup> with mating connector

\*) max. +85 °C in the connector area

## Cable types 15/18 with connectors



**Do + Ka type 15**  
**Do + Ka type 18**

**Do + Ka type 15-ST**  
**Do + Ka type 18-ST**

## Technical data

### Cable type 15 and 15-ST

**Features:** highly flexible, paired, fully shielded, electrical and thermal properties at +20 °C

Conductor resistance:	< 92 Ω/km
Insulation resistance:	> 200 MΩ/km
Operating voltage:	max. 100 V AC
Withstand voltage:	AC 800 V
Max. load:	0.5 A
Temperature range:	-10 °C...+80 °C (processing and operation) -30 °C...+80 °C (transport and storage)

### Cable type 18 and 18-ST

**Features:** non-halogenous, highly flexible, cold- and heat resistant, paired, fully shielded, electrical and thermal properties at +20 °C

Conductor resistance:	< 80 Ω/km
Insulation resistance:	> 200 MΩ/km
Operating voltage:	< 300 V AC
Withstand voltage:	1500 V / 50 Hz / 1 min
Max. load:	3 A
Temperature range:	-60 °C...+200 °C

## Ordering information

<b>Typ</b>	between calorimetric monitoring heads <b>CST</b> and <b>FM1, FM1-FH</b>
<b>Do + Ka type 15</b>	<b>PVC</b> insulated cable, type LifYCY 4x2x0.2 mm <sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector
<b>Do + Ka type 18</b>	<b>silicone</b> insulated cable, type 4x2x0.2 mm <sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector

### Available cable lengths

...m	2 m, 3 m, 5 m, 8 m, 10 m, 15 m, 20 m, 25 m, 30 m, 40 m, 50 m, 60 m, 70 m, 80 m, 90 m, 100 m, 110 m, 120 m, 130 m, 140 m, 150 m, 160 m, 170 m, 180 m, 190 m, 200 m
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**Do + Ka type 15 - 2 m** ordering example

<b>Typ</b>	between calorimetric monitoring heads <b>CST</b> and <b>FM1-ST</b>
<b>Do + Ka type 15-ST</b>	<b>PVC</b> insulated cable, type LifYCY 4x2x0.2 mm <sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector
<b>Do + Ka type 18-ST</b>	<b>silicone</b> insulated cable, type 4x2x0.2 mm <sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector

### Available cable lengths

...m	2 m, 3 m, 5 m, 8 m, 10 m, 15 m, 20 m, 25 m, 30 m, 40 m, 50 m, 60 m, 70 m, 80 m, 90 m, 100 m, 110 m, 120 m, 130 m, 140 m, 150 m, 160 m, 170 m, 180 m, 190 m, 200 m
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**Do + Ka type 15-ST - 2 m** ordering example

## Description

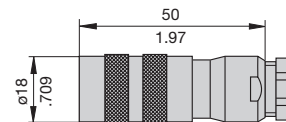
Cable between Flow Meter FM1-xxx and calorimetric monitoring head type CST.

- Connection to monitoring head by means of 8-pole round connector
- Connection to FM1-xxx by means of 10-pole clamping connector (XSK)

## Accessories

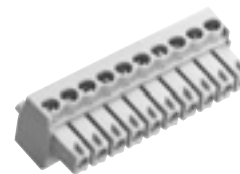
### 8-pole round connector

(without cable, for individual wiring by customer)  
**OZ112Z003124**



### 10-pole clamping connector for cable types 15 and 18

(without cable, for individual wiring by customer)  
**OZ112Z000167**



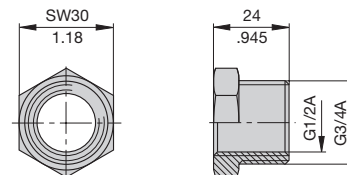
### 10-pole clamping connector for cable types 15-ST and 18-ST

(without cable, for individual wiring by customer)  
**OZ112Z000205**



### Reducing piece

from G3/4 to G1/2  
Material: stainless steel 1.4571/AISI Ti 316  
**OZ032Z000149**



This is a metric design and millimeter dimensions take precedence (  $\frac{\text{mm}}{\text{inch}}$  )

**Caution:** Standard warranty cover will be invalidated if the correct E-T-A monitoring head/control unit connecting cable is not used.

## Description

Extended calorimetric monitoring head for Flow Meter FM1, suitable for use in air-conditioning systems (variable immersion depth).

- Caution:**
- Calibration to flow velocity, therefore do not use with FM1-CA.
  - Fix with locking set 01 (see accessories).

## Features

- Medium temperature range: -40 °C...+130 °C
- Material: stainless steel 1.4571/AISI 316 Ti

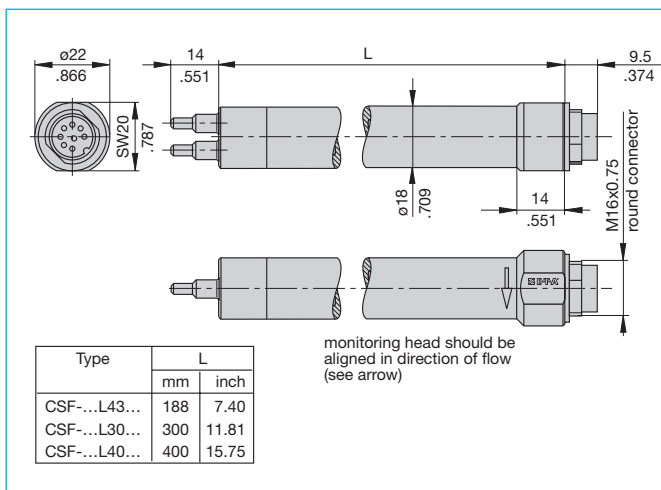
## Ordering information

<b>Type</b>	
<b>CSF</b>	Extended monitoring head with calorimetric sensors
<b>Monitoring head design</b>	
<b>01</b>	Monitoring head with variable immersion depth
<b>Medium</b>	
<b>A</b>	air
<b>W</b>	water
<b>Material of areas exposed to medium</b>	
<b>M1</b>	stainless steel 1.4571/AISI 316 Ti
<b>Process connection</b>	
<b>00</b>	without flange; see accessoires for cable gland**)
<b>Length of shank/thread</b>	
<b>L43</b>	188 mm (standard with process connection 00) other lengths upon request
<b>Electrical connection</b>	
<b>E10</b>	round connector with tinned contacts (plug and cable to separate order)
<b>Certification</b>	
<b>T0</b>	without certificate standard *)
<b>Specification of medium</b>	
<b>xxx</b>	
<b>CSF - 01 A M1 00 L43 E10 T0 - ...</b>	ordering example

\*) for detailed information please see section 0.

\*\*\*) see next page.

## Dimensions



This is a metric design and millimeter dimensions take precedence ( $\frac{\text{mm}}{\text{inch}}$ )

## Monitoring head CSF



## Technical data

Type of head	push-in
Nominal shank dia.	18 mm
Length of shank	188 mm (standard)
Length of sensor	14 mm
Suitable for	air (please enquire for other gases)
Temperature range*) (of medium)	-40...+130 °C / stainless steel
Temperature drift of sensor	± < 0.05 %/°K/measuring range (in the range between +20 °C and +80 °C)
Measuring ranges:	air: 0...20 m/s (atmospheric pressure) water: 0...3 m/s
Pressure resistance (1) of sensor DIN 2401	100 bar / 1470 PSI
Pressure resistance of installation	depending on threaded installation bush 2 bar/16 bar (29.4 PSI/235.2 PSI), see next page
Degree of protection	connector(2): IP67
Material	stainless steel 1.457/AISI 316 Ti
Cable to electronic unit	LifYCY 4x2x0.2 mm <sup>2</sup> (AWG 24)

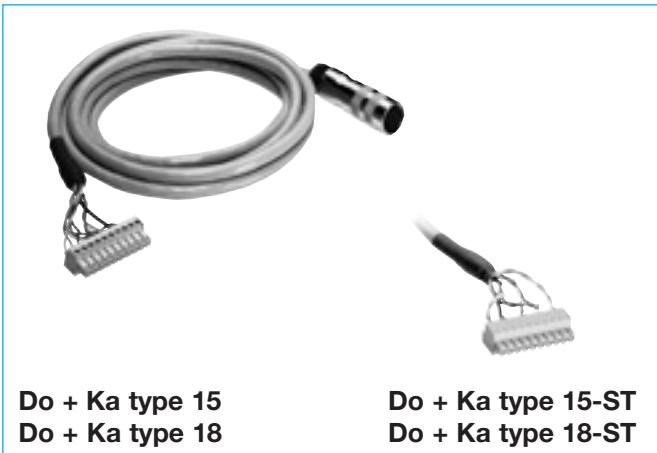
(1) Admissible operating pressure DIN 2401, measured at max. temperature (= max. medium temperature)

(2) with mating connector

\*) max. +85 °C in the connector area



## Cable types 15/18 with connectors



**Do + Ka type 15**  
**Do + Ka type 18**

**Do + Ka type 15-ST**  
**Do + Ka type 18-ST**

## Technical data

### Cable type 15 and 15-ST

**Features:** highly flexible, paired, fully shielded, electrical and thermal properties at +20 °C

Conductor resistance:	< 92 Ω/km
Insulation resistance:	> 200 MΩ/km
Operating voltage:	max. 100 V AC
Withstand voltage:	AC 800 V
Max. load:	0.5 A
Temperature range:	-10 °C...+80 °C (processing and operation) -30 °C...+80 °C (transport and storage)

### Cable type 18 and 18-ST

**Features:** non-halogenous, highly flexible, cold- and heat resistant, paired, fully shielded, electrical and thermal properties at +20 °C

Conductor resistance:	< 80 Ω/km
Insulation resistance:	> 200 MΩ/km
Operating voltage:	< 300 V AC
Withstand voltage:	1500 V / 50 Hz / 1 min
Max. load:	3 A
Temperature range:	-60 °C...+200 °C

## Description

Cable between Flow Meter FM1-xxx and calorimetric monitoring head type CSF.

- Connection to monitoring head by means of 8-pole round connector
- Connection to FM1-xxx by means of 10-pole clamping connector (XSK)

## Ordering information

**Type** between calorimetric monitoring heads **CSF** and **FM1, FM1-FH**

**Do + Ka type 15** **PVC** insulated cable, type LifYCY 4x2x0.2 mm<sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector

**Do + Ka type 18** **silicone** insulated cable, type 4x2x0.2 mm<sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector

### Available cable lengths

...m 2 m, 3 m, 5 m, 8 m, 10 m, 15 m, 20 m, 25 m, 30 m, 40 m, 50 m, 60 m, 70 m, 80 m, 90 m, 100 m, 110 m, 120 m, 130 m, 140 m, 150 m, 160 m, 170 m, 180 m, 190 m, 200 m

**Do + Ka type 15 - 2 m** ordering example

**Type** between calorimetric monitoring heads **CSF** and **FM1-ST**

**Do + Ka type 15-ST** **PVC** insulated cable, type LifYCY 4x2x0.2 mm<sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector

**Do + Ka type 18-ST** **silicone** insulated cable, type 4x2x0.2 mm<sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector

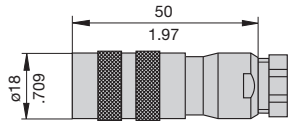
### Available cable lengths

...m 2 m, 3 m, 5 m, 8 m, 10 m, 15 m, 20 m, 25 m, 30 m, 40 m, 50 m, 60 m, 70 m, 80 m, 90 m, 100 m, 110 m, 120 m, 130 m, 140 m, 150 m, 160 m, 170 m, 180 m, 190 m, 200 m

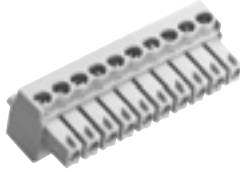
**Do + Ka type 15-ST - 2 m** ordering example

**Accessories**

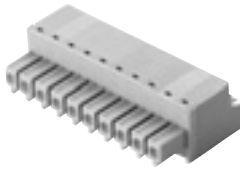
**8-pole round connector**  
(without cable, for individual wiring by customer)  
**OZ112Z003124**



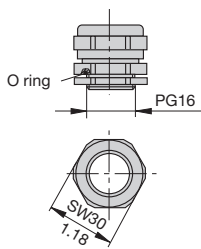
**10-pole clamping connector for cable types 15 and 18**  
(without cable, for individual wiring by customer)  
**OZ112Z000167**



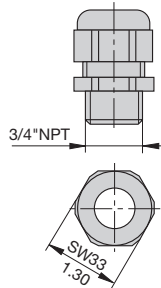
**10-pole clamping connector for cable types 15-ST and 18-ST**  
(without cable, for individual wiring by customer)  
**OZ112Z000205**



**PG16 nickel-plated brass**  
(standard)  
**OZ122Z000128**

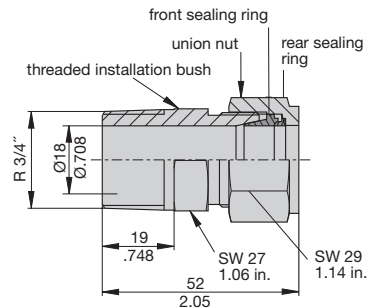


**NPT3/4" moulded, black**  
**OZ122Z000131**



**Threaded installation bush**  
**OZ122Z000196**

**Teflon sealing ring**  
**OZ122Z000197**

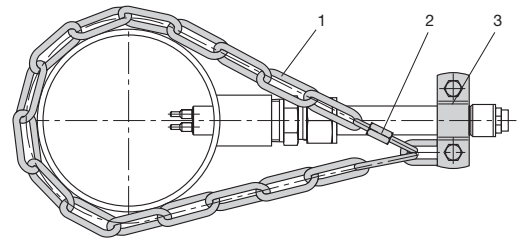


Suitable up to 25 bar/2.5 M Pascal if used with stainless steel CSF-01 monitoring head.  
(Observe instructions for installation.)

**Caution:** Stainless steel ring is designed to cut into monitoring head.  
Pressure resistant to 25 bar/367.5 PSI.  
Teflon ring can only be used from 0 to 2 bar (29.4 PSI).

Please observe user manual!

**Locking set 01**  
**OZ122Z000204**



- 1 chain 4 x 32 DIN 5685 (approx. 1 m)
- 2 catch for chain NG 5
- 3 clip with screw and nuts DN15 to DIN 11850

**1**

This is a metric design and millimeter dimensions take precedence (mm/inch)

**Caution:** Standard warranty cover will be invalidated if the correct E-T-A monitoring head/control unit connecting cable is not used.

## Flange-mounted calorimetric monitoring head



**CSF-03**  
Tri-Clamp<sup>®</sup>

## Technical data

Type of head	flange-mounted monitoring head
Process connection	DIN 32676 Tri-Clamp <sup>®</sup> DN 1
Shank dia.	18 mm
Length of shank	15 mm
Length of sensor	14 mm
Suitable for	all media, depending on material resistance
Temperature range *) (of medium)	-40 °C...+130 °C
Temperature drift of monitoring head	± < 0.05 %/°K/measuring range (in the range between +20 °C and +80 °C)
Measuring range	water: 0...3 m/s
Pressure resistance <sup>(1)</sup>	40 bar/588 PSI
Degree of protection	connector <sup>(2)</sup> IP67
Material	stainless steel 1.4571/AISI 316 Ti
Cable to electronic control unit	LifYCY 4x2x0.2 mm <sup>2</sup> (AWG 24)

<sup>(1)</sup> Admissible operating pressure DIN 2401, measured at max. temperature

(= max. medium temperature)

<sup>(2)</sup> with mating connector

<sup>\*)</sup> max. +85 °C in the connector area

## Description

Flange-mounted calorimetric monitoring head for Flow Meter FM1. Recommended for food-processing (Tri-Clamp<sup>®</sup>).

## Features

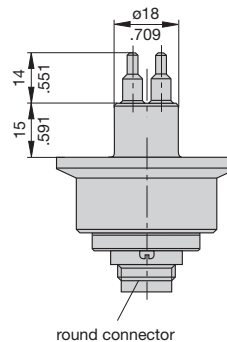
- Medium temperature range: -40 °C...+130 °C
- Material: stainless steel 1.4571/AISI 316 Ti

## Ordering information

<b>Type</b>	flange-mounted monitoring head with calorimetric sensors
<b>CSF</b>	flange-mounted monitoring head with calorimetric sensors
<b>Monitoring head design</b>	
<b>03</b>	monitoring head with flange DIN 32676
<b>Medium</b>	
<b>W</b>	water
<b>Material of areas exposed to medium</b>	
<b>M1</b>	stainless steel 1.4571/AISI 316 Ti
<b>Process connection</b>	
<b>91</b>	flange DIN 32676-Tri-Clamp <sup>®</sup> DN1
<b>Length of shank/thread</b>	
<b>L90</b>	15 mm (standard)
<b>Electrical connection</b>	
<b>E10</b>	round connector with tinned contacts (plug and cable to separate order)
<b>Certification</b>	
<b>T0</b>	without certificate (standard) *)
<b>Specification of medium</b>	
<b>xxx</b>	
<b>CSF - 03 W M1 91 L90 E10 T0 - ...</b>	ordering example

\*) for detailed information please see section 0.

## Dimensions



This is a metric design and millimeter dimensions take precedence (  $\frac{\text{mm}}{\text{inch}}$  )

## Description

Cable between Flow Meter FM1-xxx and calorimetric monitoring head type CSF-03.

- Connection to monitoring head by means of 8-pole round connector
- Connection to FM1-xxx by means of 10-pole clamping connector (XSK)

## Cable types 15/18 with connectors



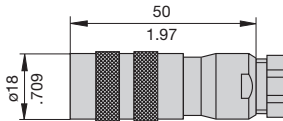
**Do + Ka type 15**  
**Do + Ka type 18**

**Do + Ka type 15-ST**  
**Do + Ka type 18-ST**

## Accessories

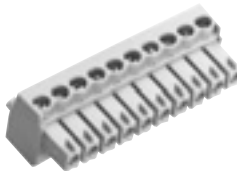
### 8-pole round connector

(without cable, for individual wiring by customer)  
**OZ112Z003124**



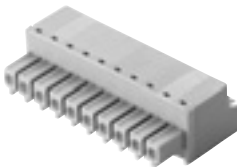
### 10-pole clamping connector for cable types 15 and 18

(without cable, for individual wiring by customer)  
**OZ112Z000167**



### 10-pole clamping connector for cable types 15-ST and 18-ST

(without cable, for individual wiring by customer)  
**OZ112Z000205**



This is a metric design and millimeter dimensions take precedence ( $\frac{\text{mm}}{\text{inch}}$ )

**Caution:** Standard warranty cover will be invalidated if the correct E-T-A monitoring head/control unit connecting cable is not used.

## Technical data

### Cable type 15 and 15-ST

**Features:** highly flexible, paired, fully shielded, electrical and thermal properties at +20 °C

Conductor resistance: < 92 Ω/km

Insulation resistance: > 200 MΩ/km

Operating voltage: max. 100 V AC

Withstand voltage: AC 800 V

Max. load: 0.5 A

Temperature range: -10 °C...+80 °C (processing and operation)  
-30 °C...+80 °C (transport and storage)

### Cable type 18 and 18-ST

**Features:** non-halogenous, highly flexible, cold- and heat resistant, paired, fully shielded, electrical and thermal properties at +20 °C

Conductor resistance: < 80 Ω/km

Insulation resistance: > 200 MΩ/km

Operating voltage: < 300 V AC

Withstand voltage: 1500 V / 50 Hz / 1 min

Max. load: 3 A

Temperature range: -60 °C...+200 °C

## Ordering information

Typ	between calorimetric monitoring heads <b>CSF</b> and <b>FM1</b> , <b>FM1-FH</b>
<b>Do + Ka type 15</b>	<b>PVC</b> insulated cable, type LifYCY 4x2x0.2 mm <sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector
<b>Do + Ka type 18</b>	<b>silicone</b> insulated cable, type 4x2x0.2 mm <sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector

### Available cable lengths

...m	
2 m, 3 m, 5 m, 8 m, 10 m, 15 m, 20 m, 25 m, 30 m, 40 m, 50 m, 60 m, 70 m, 80 m, 90 m, 100 m, 110 m, 120 m, 130 m, 140 m, 150 m, 160 m, 170 m, 180 m, 190 m, 200 m	

**Do + Ka type 15 - 2 m** ordering example

Typ	between calorimetric monitoring heads <b>CSF</b> and <b>FM1-ST</b>
<b>Do + Ka type 15-ST</b>	<b>PVC</b> insulated cable, type LifYCY 4x2x0.2 mm <sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector
<b>Do + Ka type 18-ST</b>	<b>silicone</b> insulated cable, type 4x2x0.2 mm <sup>2</sup> (AWG 24) 8-pole round connector + 10-pole clamping connector

### Available cable lengths

...m	
2 m, 3 m, 5 m, 8 m, 10 m, 15 m, 20 m, 25 m, 30 m, 40 m, 50 m, 60 m, 70 m, 80 m, 90 m, 100 m, 110 m, 120 m, 130 m, 140 m, 150 m, 160 m, 170 m, 180 m, 190 m, 200 m	

**Do + Ka type 15-ST - 2 m** ordering example

**Monitoring head with turbine-type sensor**



**TST-..HM2**

**Technical data**

Type of head	thread-mounted monitoring head	
Nominal thread dia.	G1/2A	
Length of shank	36 mm	
Length of sensor	19 mm	
Suitable for	water air	
Temperature range		
Medium:	0...+250 °C air *)	
Monitoring head (to medium):	0...+250 °C	
(to electrical connection):	0...+250 °C	
Preamplifier:	-10...+50 °C	
Measuring range	air:	1...20 m/s
	water:	0.1...5 m/s
Pressure resistance <sup>(1)</sup>	10 bar/147 PSI (please enquire for higher pressure)	
Degree of protection		
Monitoring head/cable	IP68	
Monitoring head/cable connector	IP67	
Preamplifier	IP65	
Material fitting	stainless steel 1.4571/AISI 316 Ti	
Materials of wetted parts		
- housing and turbine:	chrome nickel/molybdenum steel VJA	
- bearings:	jewel bearing	sapphire
	pivot bearing	Nivadur
Cable to electronic control unit	LifYCY 3 x 0.35 mm <sup>2</sup> (AWG 24)	

(1) Admissible operating pressure to DIN 2401, measured at max. temperature (= max. medium temperature)  
 (2) with mating connector  
 \*) Please observe that ice build up on the sensor at water temperatures ≤ 0 °C will destroy the sensor.

**Description**

Thread mounted monitoring head with turbine-type sensor for Flow Meter FM1. Recommended for high medium temperature applications. The unit consists of the turbine HM2 and a pre-amplifier which is connected with the HM2 by means of a 2 m cable.

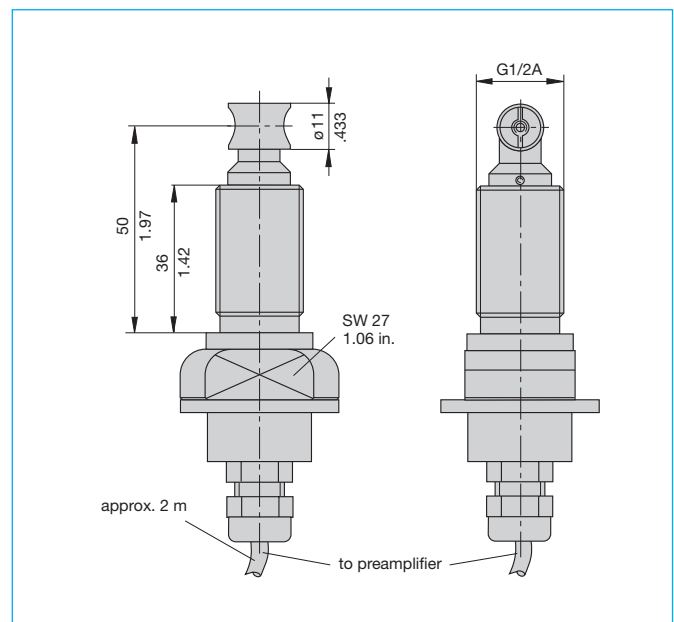
**Features**

- Medium temperature 0 °... +250 °C

**Ordering information**

<b>Type</b>	thread-mounted monitoring head with turbine-type sensor
<b>TST</b>	thread-mounted monitoring head with turbine-type sensor
<b>Process connection</b>	
<b>01</b>	G1/2A thread
<b>Application range - Material of the area exposed to medium</b>	
<b>HM2</b>	+250 °C, air 20 m/s, water 5 m/s - stainless steel, jewel bearing, hardened tips, incl. 2 m connecting cable to the pre-amplifier
<b>Length of shank/thread</b>	
<b>L10</b>	36 mm (standard)
<b>Accuracy</b>	
<b>0</b>	±1 % of final value, ±3 % of measured value (standard)
<b>Electrical connection to FM 1</b>	
<b>E10</b>	round connector with tinned contacts (plug and cable to separate order)
<b>TST - 01 HM2 L10 0 E10</b>	ordering example

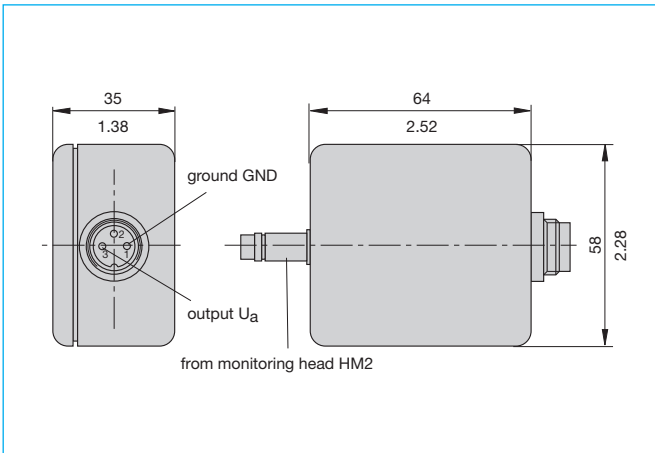
**Dimensions of monitoring head TST-..HM2**



This is a metric design and millimeter dimensions take precedence (mm / inch)



## Preamplifier for monitoring head TST-..HM2



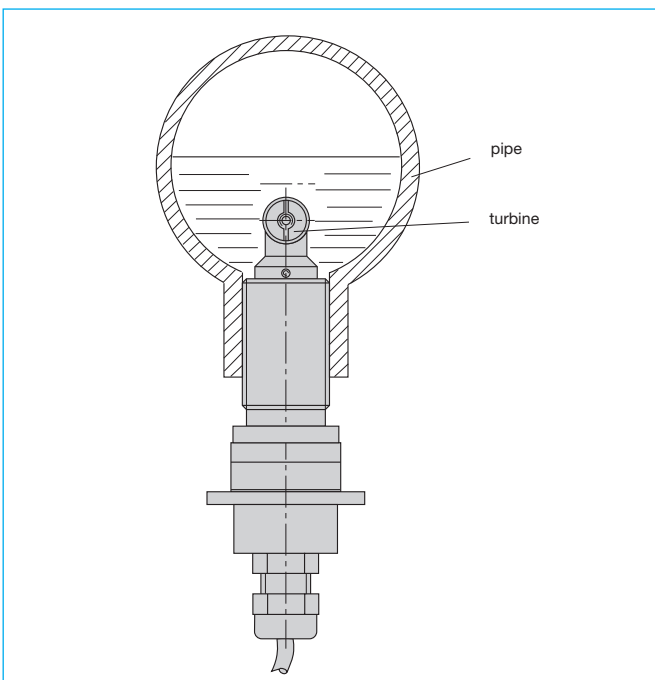
## Description

Electronic flow meters with mechanical sensing rely upon a turbine mounted in the pipeline. The rotational speed of the turbine in the flowstream is proportional to the flow rate. Turbine rotation is remotely measured by an inductive proximity switch and transmitted as a frequency signal to the electronic control unit.

### Mechanical sensing by means of turbine-type sensors is recommended:

- where temperatures may be above the temperature range of the calorimetric heads (>130 °C),
- where the media may change,
- where the properties (thermal conductivity) of the medium may vary significantly,
- for media with air bubbles,
- where an immediate response to flow rate changes is required.

## Monitoring head with turbine-type sensor



## Advantages of mechanical flow rate sensing

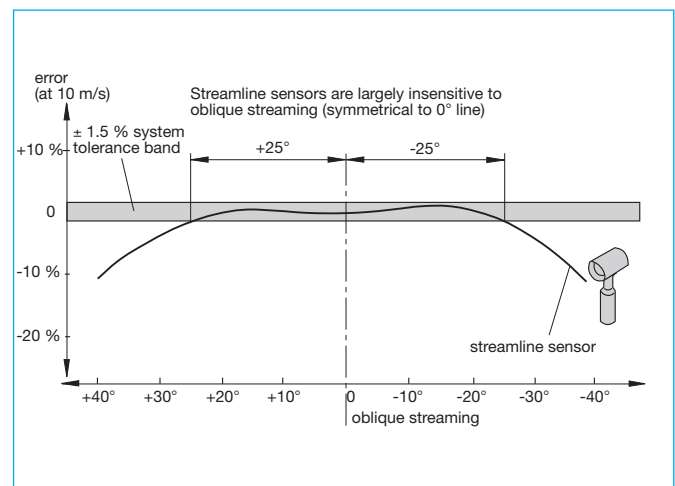
- Wide medium temperature range: 0 °C to +250 °C, independent of temperature variations
- Short reaction time

### Limitations:

- not suitable for media with solid particles
- can be overloaded only to a limited extent
- measuring signals depend on the viscosity of the medium
- shock-sensitive

## Installation of monitoring head

Flow monitoring is often necessary in places that are not accessible and where practical difficulties may prevent the correct alignment of the sensors with respect to flow direction. The special aerodynamic shape of the E-T-A sensors reduces this danger. The following diagram clearly shows that the "streamlined" E-T-A sensors have a very good alignment angle.



## Cable type 16 with connectors



## Technical data

### Cable type 16

**Features:** highly flexible, paired, fully shielded, electrical and thermal properties at +20 °C

Conductor resistance:	< 92 Ω/km
Insulation resistance:	> 200 MΩ/km
Operating voltage:	max. 100 V AC
Withstand voltage:	800 V ~
Max. load:	0.5 A
Temperature range:	-10 °C...+80 °C (processing and operation) -30 °C...+80 °C (transport and storage)

## Ordering information

<b>Type</b>	between monitoring head <b>TST</b> and <b>FM1</b>
<b>Do + Ka type 16</b>	<b>PVC</b> insulated cable, type LifYCY 3x0.35mm <sup>2</sup> (AWG 18) 3-pole round connector + 4-pole clamping connector

### Available cable lengths

...m 2 m, 3 m, 5 m, 8 m, 10 m, 15 m, 20 m, 25 m, 30 m, 40 m, 50 m, 60 m, 70 m, 80 m, 90 m, 100 m, 110 m, 120 m, 130 m, 140 m, 150 m, 160 m, 170 m, 180 m, 190 m, 200 m

**Do + Ka type 16 - 2 m** ordering example

## Description

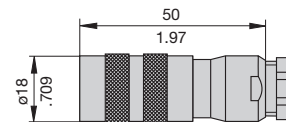
Cable between turbine-type monitoring head TST and Flow Meter FM1.

- Connection to monitoring head by means of 3-pole round connector
- Connection to FM1 by means of 4-pole clamping connector (XSK)

## Accessories

### 3-pole round connector

(without cable, for individual wiring by customer)  
**OZ112Z000138**



### 4-pole clamping connector

(without cable, for individual wiring by customer)  
**Y 306 245 03**



This is a metric design and millimeter dimensions take precedence ( $\frac{\text{mm}}{\text{inch}}$ )

**Caution:** Standard warranty cover will be invalidated if the correct E-T-A monitoring head/control unit connecting cable is not used.

## Description

Thread-mounted monitoring head with turbine-type sensor for Flow Meter FM1.

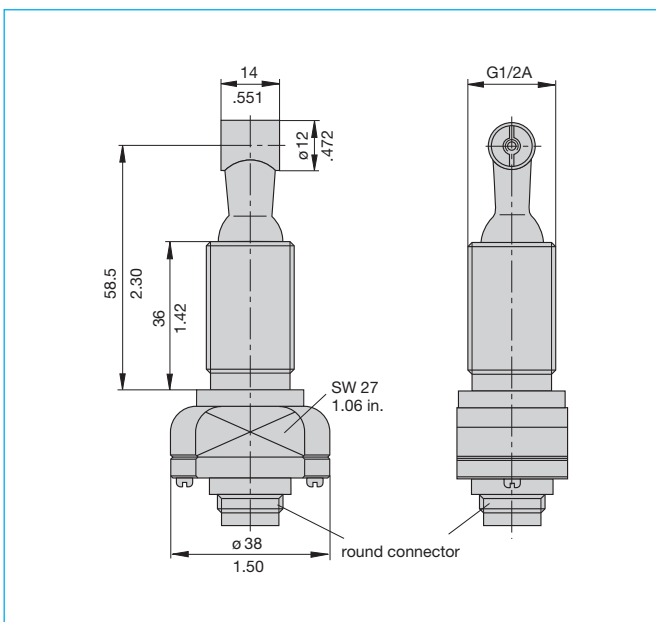
## Features

- Medium temperature range:  
 TST-..WM1 water: +5...+80 °C  
 TST-..AM1 air: -30...+140 °C

## Ordering information

<b>Type</b>	
TST	thread-mounted monitoring head with turbine-type sensor
<b>Process connection</b>	
01	G1/2A thread
<b>Application range - Material of the area exposed to medium</b>	
AM1	+140 °C, air 20 m/s; PSU, beryllium support, hardened tips
WM1	+80 °C, water 5 m/s PSU, beryllium support, hardened tips
<b>Length of shank/thread</b>	
L10	36 mm (standard)
<b>Accuracy</b>	
0	±1 % of final value, ±3 % of measured value (standard)
<b>Electrical connection</b>	
E10	round connector with tinned contacts (plug and cable to separate order)
TST - 01 AM1 L10 0 E10 ordering example	

## Dimensions of monitoring heads TST-..-AM1/WM1



This is a metric design and millimeter dimensions take precedence ( $\frac{\text{mm}}{\text{inch}}$ )

## Monitoring heads with turbine-type sensor



TST-..-AM1/WM1

## Technical data

Type of head	thread-mounted	
	TST-AM1	TST-WM1
Length of shank	36 mm	
Length of sensor	28.5 mm	
Suitable for	air	water
Temperature range *) (of medium)	-30...+140 °C	+5...+80 °C
Measuring range	air: water:	1...20 m/s 0,1...5 m/s
Pressure resistance (1)	10 bar/147 PSI	
Degree of protection connector (2)	IP67	
Material fitting	stainless steel 1.4571/AISI 316	
Materials of wetted parts		
- turbine housing PSU:	TK-PSU, polysulfone, Udel	
- turbine:	aluminium	
- bearings: jewel bearing	Berivac (bronze-beryllium-alloy)	
- pivot bearing	Nivadur	
Cable to electronic unit	LifYCY 3 x 0.35 mm <sup>2</sup> (AWG 24)	

(1) Admissible operating pressure DIN 2401, measured at max. temperature (= max. medium temperature)

(2) with mating connector

\*) max. +85 °C in the connector area

## Description

Electronic flow meters with mechanical sensing rely upon a turbine mounted in the pipeline. The rotational speed of the turbine in the flow stream is proportional to the flow rate. Turbine rotation is remotely measured by an inductive proximity switch and transmitted as a frequency signal to the electronic control unit.

### Mechanical sensing by means of turbine-type sensors is recommended:

- where temperatures may be above the temperature range of the calorimetric heads (>130 °C),
- where the media may change,
- where the properties (thermal conductivity) of the medium may vary significantly,
- for media with air bubbles,
- where an immediate response to flow rate changes is required.

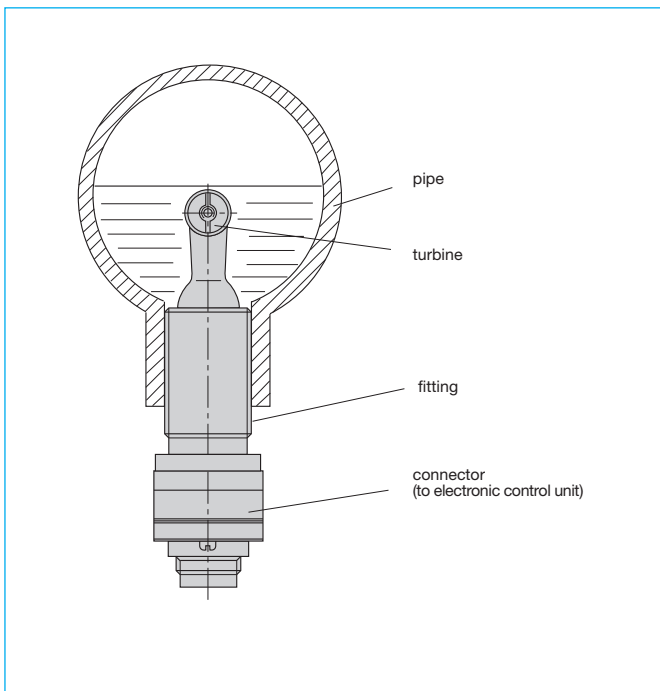
## Advantages of mechanical flow rate sensing

- Wide medium temperature range:
  - water: +5...+80 °C
  - air: -30...+140 °C
- independent of temperature variations
- Short reaction time

### Limitations:

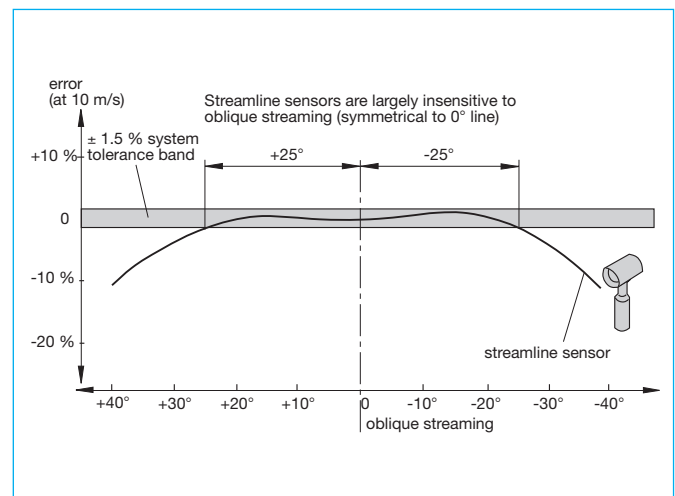
- not suitable for media with solid particles
- can be overloaded only to a limited extent
- measuring signals depend on the viscosity of the medium
- shock-sensitive

## Monitoring head with turbine-type sensor



## Installation of monitoring head

Flow monitoring is often necessary in places that are not accessible and where practical difficulties may prevent the correct alignment of the sensors with respect to flow direction. The special aerodynamic shape of the E-T-A sensors reduces this danger. The following diagram clearly shows that the “streamlined” E-T-A sensors have a very good alignment angle.



## Description

Cable between turbine-type monitoring head TST and Flow Meter FM1.

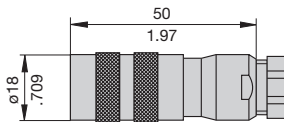
- Connection to monitoring head by means of 3-pole round connector
- Connection to FM1 by means of 4-pole clamping connector (XSK)

## Cable type 16 with connectors



## Accessories

**3-pole round connector**  
(without cable, for individual wiring by customer)  
**OZ112Z000138**



**4-pole clamping connector**  
(without cable, for individual wiring by customer)  
**Y 306 245 03**



This is a metric design and millimeter dimensions take precedence ( $\frac{\text{mm}}{\text{inch}}$ )

**Caution:** Standard warranty cover will be invalidated if the correct E-T-A monitoring head/control unit connecting cable is not used.

## Technical data

### Cable type 16

**Features:** highly flexible, paired, fully shielded, electrical and thermal properties at +20 °C

Conductor resistance:	< 92 Ω/km
Insulation resistance:	> 200 MΩ/km
Operating voltage:	max. 100 V AC
Withstand voltage:	800 V ~
Max. load:	0.5 A
Temperature range:	-10 °C...+80 °C (processing and operation) -30 °C...+80 °C (transport and storage)

## Ordering information

<b>Type</b>	between monitoring head <b>TST</b> and <b>FM1</b>
<b>Do + Ka type 16</b>	<b>PVC</b> insulated cable, type LifYCY 3x0.35 mm <sup>2</sup> (AWG 22) 3-pole round connector + 4-pole clamping connector
	<b>Lieferbare Kabellängen</b>
<b>...m</b>	2 m, 3 m, 5 m, 8 m, 10 m, 15 m, 20 m, 25 m, 30 m, 40 m, 50 m, 60 m, 70 m, 80 m, 90 m, 100 m, 110 m, 120 m, 130 m, 140 m, 150 m, 160 m, 170 m, 180 m, 190 m, 200 m
<b>Do + Ka type 16 - 2 m</b>	ordering example