Product Information TSMP **PHARMA**

Temperature Sensor Mini

PHARMadapt epa PHARMadapt esp

Application/Specified usage

- Temperature sensor in mini housing for pharma applications
- Temperature measuring in pipes and vessels
- Aseptic temperature process connections without product contact for inline, precise and fast measurement. Prefabricated thermowells and build-in systems avoid opening process.
- Demounting the sensor without opening the process and without electrical disconnection avoid downtime of the equipment at calibration and maintenance.

Application examples

- Monitoring of CIP-/SIP-process
- Safe temperature measurement in hot steam and pressurized pipes
- Temperature monitoring in pipes or vessels

Hygienic design/Process connection

- Hygienic process connection with CLEANadapt or PHARMadapt
- Versions available with EHEDG approval
- Versions available to conform to 3-A Standard 74-
- All wetted materials are FDA-conform
- Sensor completely made of stainless steel
- Complete overview of process connections: see order code
- The Anderson-Negele CLEANadapt and PHARMadapt system offers a flow-optimized, hygienic and easily sterilizable installation solution for sensors.

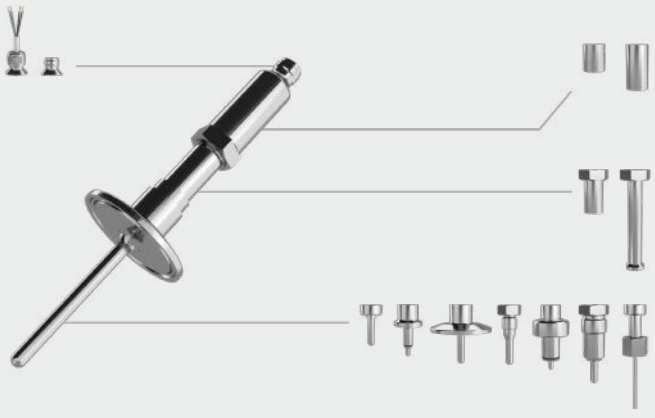
Features/Advantages

- High accuracy and high ambient temperature resistance
- Customer offset and slope adjustment
- Flex hybrid mode with digital IO-Link and analog 4...20 mA
- Process temperature range -50...250 °C / -58...482 °F

Options/Accessories

- 2x RTD
- Integrated transmitter
- Programmable transmitters TTM.H and TTM.I using IO-Link
- Different RTDs (Pt100, Pt1000) and classes of accuracy (A, AA, AAA)
- Fast response sensor tip ø 3 mm / 0.12 in
- Spacers for high process temperature up to 250 °C / 482 °F
- Pre-assembled connecting cable for M12 plug
- Hardwired cable in customer length and other material available
- IO-Link Master (IOM-1)
- Add-On Instructions are available at www.anderson-negele.com/aoi

Modular design



Communication

IO-Link 4...20 mA

Temperature sensor TSM with Tri-Clamp

Temperature sensor TSM for PHARMadapt ESP system

Temperature sensor		
Process connection	CLEANadapt PHARMadapt ESP G3/8" Sensor G3/8" PHARMadapt EPA Ingold (Fermenter) Tri-Clamp Thread Plain rod	M12, G1/2" Sensor with cap nut, sensor tip ø 3 mm Sensor with cap nut, sensor tip ø 4 mm 8, 18 46 mm, 52 mm 1/2", 3/4", DN10, 1", 1½", 2", 2½", 3" (DIN 32676) G1/4", sensor tip ø 3 mm (DIN ISO 228)
Tightening torque	CLEANadapt M12 CLEANadapt G1/2"	10 Nm 20 Nm
Dimensions	insertion length probe diameter sensor tip diameter	0...2000 mm / 0...78.74 in 3, 4, 6, 8, 10, 12 mm / 0.12, 0.16, 0.24, 0.31, 0.39, 0.47 in 3, 4, 6 mm / 0.12, 0.16, 0.24 in, see dimensional drawings
Materials	connecting head, spacer wetted parts sealing ring PHARMadapt EPA, Ingold (Fermenter)	stainless steel 1.4301 / AISI 304 stainless steel 1.4435 / AISI 316L EPDM, USP Class VI, FDA 21 CFR 177.2600
Operating pressure	CLEANadapt PHARMadapt EPA, Ingold (Fermenter)	50 bar / 725 psi maximum 10 bar / 14.5 psi maximum
Process temperature	standard range	-50...250 °C / -58...482 °F
Resistance Temperature Detector (RTD)	accuracy classes	Class A: ±(0.15 + 0.002 × | t |) °C Class AA / 1/3 DIN B: ±(0.1 + 0.0017 × | t |) °C Class AAA / 1/10 DIN B: ±(0.03 + 0.005 × | t |) °C
Electrical connection	plug connection hardwired cable hardwired cable	M12 plug 1.4301 / AISI 304 PVC LIYY 4x 0.25 mm² / AWG 23 (perm. process temp. ≤ 90 °C) PTFE 4x 0.14 mm² / AWG 26 (perm. process temp. ≤ 250 °C)
Protection class		IP 69 K (with electrical connection M12 plug)

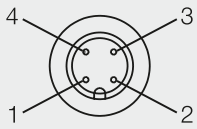
Transmitter TTM.I, TTM.H		
Temperature ranges	ambient storage	-40...95 °C / -40...203 °F -55...90 °C / -67...194 °F
Measuring ranges		standard °C: -10...40, 0...50 / 100 / 150 / 200 °C standard °F: 0...100, 0...150, 0...200, 30...230, 0...250 °F custom ranges programable
Accuracy	input repeatability	≤ 0.1 K (at ambient ≤ 85 °C / 185 °F) ≤ 0.05 K
Temperature drift	typical maximum	5 mK/K (at 25 °C / 77 °F) 10 mK/K (at 25°C / 77 °F)
Adjustments	damping offset slope	0...120 s ≤ ±10 K ≤ ±25 %
Digital output	 digital resolution master cycle time power supply	IO-Link 0.01 K ≤ 51.2 ms 18...30 V DC according to IO-Link
Analog output (TTM.H only)	signal accuracy temperature drift typical temperature drift max. effect of supply voltage variations maximum load resistance power supply	4...20 mA, 2-wire ≤ 0.05% of upper range limit 0.0005%/K (at 25 °C / 77 °F) 0.003%/K (at 25 °C / 77 °F) < 0.001% / V (at 24 V DC) R ≤ (V DC - 12 V) : 0.024 A (at 25 °C / 77 °F), see diagram 12...30 V DC

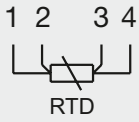
Accuracy classes of temperature sensors | Tolerances for Pt100 acc. to DIN EN 60751			
Pt100	**Class A**	**Class AA / 1/3 DIN B**	**Class AAA / 1/10 DIN B**
0 °C / 100 Ω	±0.15 K / ±0.06 Ω	±0.10 K / ±0.04 Ω	±0.03 K / ±0.01 Ω
100 °C / 138.5 Ω	±0.35 K / ±0.13 Ω	±0.27 K / ±0.10 Ω	±0.08 K / ±0.03 Ω

Accuracy classes of temperature sensors | Tolerances for Pt1000 acc. to DIN EN 60751			
Pt1000	**Class A**	**Class AA / 1/3 DIN B**	**Class AAA / 1/10 DIN B**
0 °C / 1000 Ω	±0.15 K / ±0.6 Ω	±0.10 K / ±0.4 Ω	±0.03 K / ±0.1 Ω
100 °C / 1385.1 Ω	±0.35 K / ±1.3 Ω	±0.27 K / ±1.0 Ω	±0.08 K / ±0.3 Ω

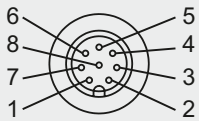
Electrical connection without transmitter

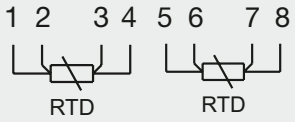
1x RTD with M12 plug





2x RTD with M12 plug





Hardwired cable | PVC (LIYY)

1x RTD

WH YE BN GN

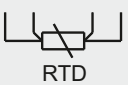
2x RTD

WH YE BN GN 1st RTD
RD BU PK GY 2nd RTD

Hardwired cable | PTFE

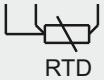
1x RTD

RD RD WH WH



2x RTD

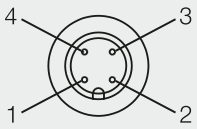
RD RD WH 1st RTD
VT VT YE 2nd RTD



Electrical connection with transmitter

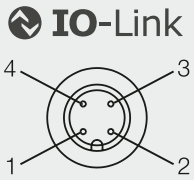
1x RTD with M12 plug for analog operation

1: + power supply
2: - power supply 4...20 mA
3: not connected
4: not connected

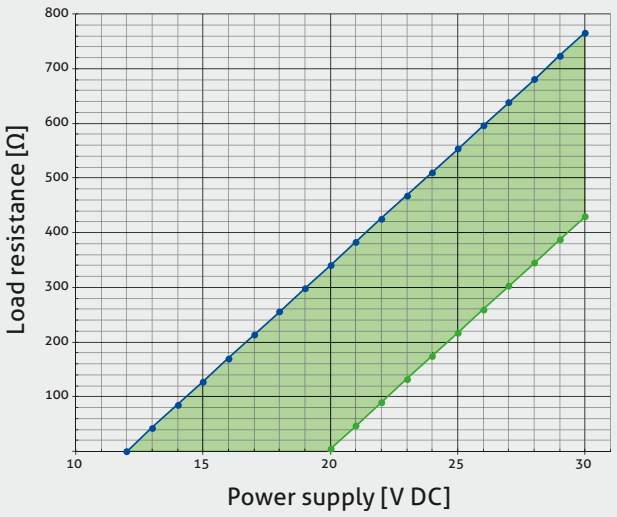


1x RTD with M12 plug for IO-Link operation

1: + power supply 24 V DC
2: not connected
3: - power supply
4: IO-Link



Load resistance diagram at ambient temperature 85 °C / 185 °F



R_{max}

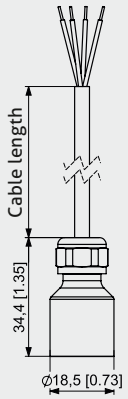
R_{min} (85 °C / 185 °F ambient temperature)

Modular design

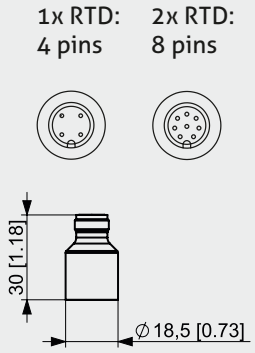
Electrical connection | Head | Spacer extension | Process connection

Electrical connection | Head

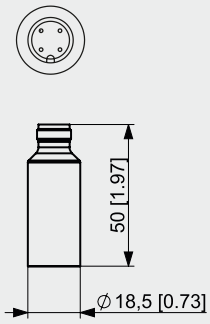
Hardwired cable



M12 plug 4 pins / 8 pins
without transmitter

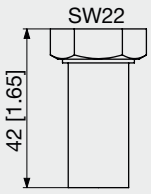


M12 plug 4 pins
with transmitter

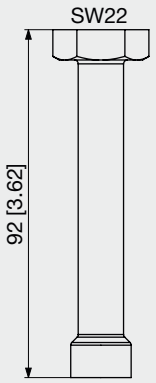


Spacer extension

Short

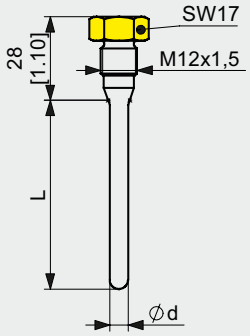


Long

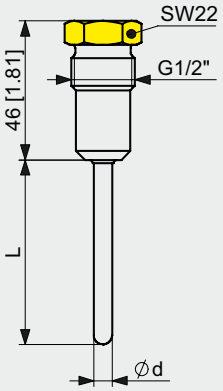


Process connection

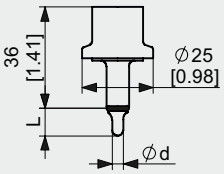
C01 | CLEANadapt M12



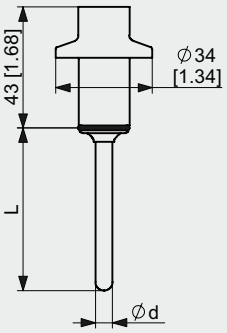
C02 | CLEANadapt G1/2"



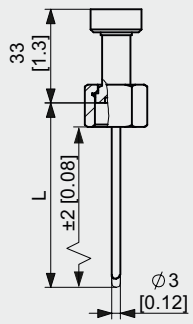
E08 | PHARMadapt EPA-8



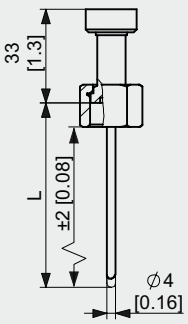
E18 | PHARMadapt EPA-18



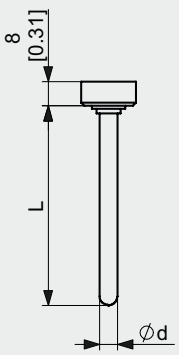
M01 | PHARMadapt ESP G3/8" cap nut, ø 3 mm



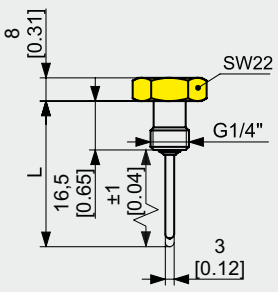
M04 | Sensor G3/8" cap nut, ø 4 mm



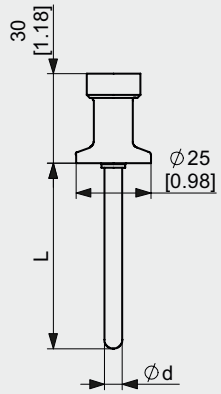
N01 | Plain rod



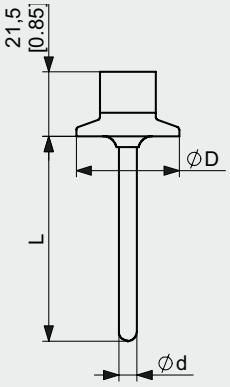
G03 | Thread G1/4", ø 3 mm



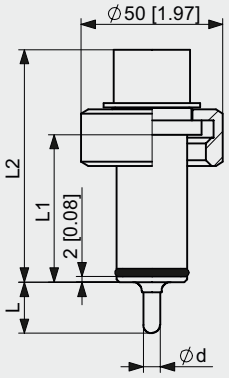
T05 | Tri-Clamp 1/2", 1/4"



Txx | Tri-Clamp



Ixx | Ingold



Advice

Tighten the sensor only at the lower, marked in yellow spanner flat!

Tri-Clamp size	
Type	**ø D [mm / inch]**
T10	34.0 / 1.34
TC1	50.5 / 1.99
TC2	64.0 / 2.52
T25	77.5 / 3.05
TC3	91.0 / 3.58

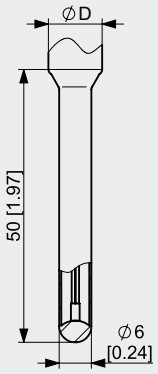
Dimensions table Ingold (Fermenter)			
Type	**Ingold**	**L1 [mm / inch]**	**L2 [mm / inch]**
I46	Ingold 46	46.0 / 1.81	76.0 / 2.99
I52	Ingold 52	52.0 / 2.05	82.0 / 3.23

Sensor tip diameter and response time

All temperature sensors are available with smaller sensor tips, to ensure a shorter response time. The mentioned times were measured by emersing a temperature sensor from room temperature into boiling water.
The response times given are typical measured values and may vary due to factors such as process connection, immersion length and medium.

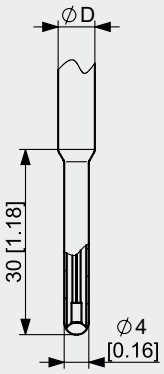
ø 6 mm

$t_{50} \leq 1.8$ s
$t_{90} \leq 5.2$ s
D: 8, 10, 12 mm



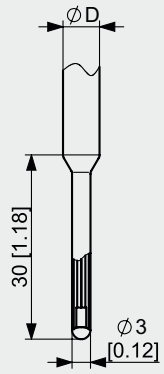
ø 4 mm

$t_{50} \leq 1.2$ s
$t_{90} \leq 3.5$ s
D: 6, 8, 10 mm



ø 3 mm

$t_{50} \leq 0.8$ s
$t_{90} \leq 2.2$ s
D: 6 mm



Note on 3-A Sanitary Standard 74-

Information on installation according to 3-A standard is available on our website:
www.anderson-negele.com/3A74.pdf

Click on the PDF icon to download the document.

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Note on EHEDG Hygienic Standard Type EL Class I

Information on installation according to EHEDG standard is available on our website:
www.anderson-negele.com/EHEDG.pdf

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Mechanical connection/Installation

· Use Negele CLEANadapt or PHARMadapt system for safe operation of measuring point!

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 -55...90 °C / -67...194 °F
· Relative humidity max. 98 %

Cleaning/Maintenance

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

Reshipment

· Sensors shall be clean and free of media or heat-conductive paste and must not be contaminated with dangerous media!
· Use suitable transport packaging only to avoid damage of the equipment!

Conventional usage

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

Standards and guidelines

· Compliance with the applicable regulations and directives is mandatory.

Note on CE

· Applicable directives:
Electromagnetic Compatibility Directive 2014/30/EU
· Compliance with the applicable EU directives is identified by the CE label on the product.
· The operating company is responsible for complying with the guidelines applicable to the entire installation.

Disposal

· Electrical devices should not be disposed of with household trash. They must be recycled in accordance with national laws and regulations.
· Take the device directly to a specialized recycling company and do not use municipal collection points.

IOM-1, PVC-cable with M12-connection

Accessories

PVC-cable with M12 connection made of 1.4305 / AISI 303, IP 69 K, unshielded

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

TPE-cable with M12 connection made of 1.4571 / AISI 316Ti, IP 69, shielded

M12-TPE / 8-5 m	8 pin, length 5 m
M12-TPE / 8-10 m	8 pin, length 10 m

IOM-1	Anderson-Negele USB IO-Link Master for IO-Link Sensors incl. power supply, USB cable, M12 connection cable (1.5 m/59.1 inch)
M12-EVK	M12 plug screw cap made of stainless steel (1.4305 / AISI 303) with o-ring

Order code

TSMP Temperatur Sensor Mini for Pharma Applications, material wetted parts 1.4435 / AISI 316L

Standard temperature range (-50...250 °C / -58...482 °F)

Process connection (Ⓐ: 3-A conform, Ⓔ: EHEDG approval)

T05	Tri-Clamp 1/2" and 3/4" (Ⓐ and Ⓔ only for 3/4")
T10	Tri-Clamp DN10
TC1	Tri-Clamp 1" and 1½" Ⓐ Ⓔ
TC2	Tri-Clamp 2" Ⓐ Ⓔ
T25	Tri-Clamp 2½" Ⓐ Ⓔ
TC3	Tri-Clamp 3" Ⓐ Ⓔ
C01	CLEANadapt M12
C02	CLEANadapt G1/2"
N01	Plain rod
I46	Ingold 46 mm (Fermenter)
I52	Ingold 52 mm (Fermenter)
E08	PHARMadapt EPA-8 Ⓐ
E18	PHARMadapt EPA-18 Ⓐ

Process connection without media contact

G03	Thread G1/4", sensor tip ø 3 mm, spring loaded
M01	PHARMadapt ESP G3/8" with cap nut, sensor tip ø 3 mm, spring loaded
M04	Sensor G3/8" with cap nut, sensor tip ø 4 mm, spring loaded

Spacer extension

X	Without spacer (permanent process temperature ≤ 100 °C / 212 °F)
S	Short spacer (permanent process temperature ≤ 150 °C / 305 °F)
H	Long spacer (permanent process temperature ≤ 250 °C / 482 °F)

RTD type

0	1x Pt100 A, 2-wire (probe length ≤ 250 mm)
1	1x Pt100 AA, 2-wire (probe length ≤ 150 mm)
2	2x Pt100 A, 2-wire (probe length ≤ 250 mm)
3	2x Pt100 AA, 2-wire (probe length ≤ 150 mm)
4	1x Pt100 A, 4-wire (probe length ≥ 50 mm)
5	1x Pt100 AA, 4-wire (probe length ≥ 50 mm)
6	1x Pt100 AAA, 4-wire (probe length ≥ 50 mm)
7	2x Pt100 A, (3) 4-wire (probe length ≥ 50 mm, 3-wire with sensor tip ø 3 mm)
8	2x Pt100 AA, (3) 4-wire (probe length ≥ 50 mm, 3-wire with sensor tip ø 3 mm)
9	2x Pt100 AAA, 4-wire (probe length ≥ 50 mm)
A	1x Pt1000 A, 2-wire
B	1x Pt1000 AA, 2-wire
C	2x Pt1000 A, 2-wire
D	2x Pt1000 AA, 2-wire

Variable probe length [mm]

10...50	In steps of 5 mm
51...150	In steps of 5 mm
151...250	In steps of 10 mm
251...2000	In steps of 10 mm, 251 up to 500 mm 50 mm, 501 up to 1000 mm 100 mm, 1001 up to 2000 mm
intermediate lengths	Not for G03, M01, M04, E08, E18 (Minimum order quantity: 3 pieces)

Probe length for process connection [mm]

G03	M01	M04	E08	E18
36	**37**	**68**	**10**	**20**
61	**59**	**148**	**25**	**50**
75	**83**	**198**	**50**	
93	**97**	**234**	**100**	
100	**160**	**238**		
105		**249**		
115				
120				
130				
140				
160				

Probe diameter

03	3 mm (standard for G03, M01)
04	4 mm (standard for M04)
06	6 mm (not for E08)
08	8 mm (not for T05, C01, E08, E18)
10	10 mm (not for C01, E08, E18)
12	12 mm (not for C01, E08, E18)

Sensor tip diameter, only for probe length ≥ 50 mm

X	Without reduction (standard for G03, M01, M04)
3	For probe diameter 6 mm
4	For probe diameter 6, 8, 10 mm
6	For probe diameter 8, 10, 12 mm

Order code

Material

0 1.4404 / AISI 316L without certificate (standard for G03, M01, M04)
3 1.4435 / AISI 316L incl. material certificate (standard for Txx, Cxx, Ixx, Exx, N01)

Surface finish

0 $R_a \leq 0.8$ µm / 32 µin (standard for G03, M01, M04)
1 $R_a \leq 0.8$ µm / 32 µin electro-polished
2 $R_a \leq 0.6$ µm / 24 µin mechanically polished
3 $R_a \leq 0.6$ µm / 24 µin electro-polished
4 $R_a \leq 0.4$ µm / 16 µin mechanically polished
5 $R_a \leq 0.38$ µm / 15 µin electro-polished

Transmitter

0 Without transmitter
I TTM.I (IO-Link only)
H TTM.H (hybrid: analog and IO-Link)

Measurement range

000 Without transmitter
00C Unit °C (only for TTM.I)
00F Unit °F (only for TTM.I)
00K Unit K (only for TTM.I)
04C -10...40 °C
05C 0...50 °C
10C 0...100 °C
15C 0...150 °C
20C 0...200 °C
25C 0...250 °C
10F 0...100 °F
15F 0...150 °F
20F 0...200 °F
23F 30...230 °F
25F 0...250 °F
M00 TTM custom configuration

Electrical connection with transmitter

4 M12 plug (4 pin)

Electrical connection without transmitter

4 M12 plug (4 pin) 1x RTD
8 M12 plug (8 pin) 2x RTD
P PVC-cable (≤ 90 °C / 194 °F)
T PTFE-cable (≤ 250 °C / 482 °F)

Cable length [m] (with hardwired cable only)

1...50

TSMP /	C01 /	X /	0 /	100 /	06 /	4 /	0 /	0 /	0 /	000 /	P /	12

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