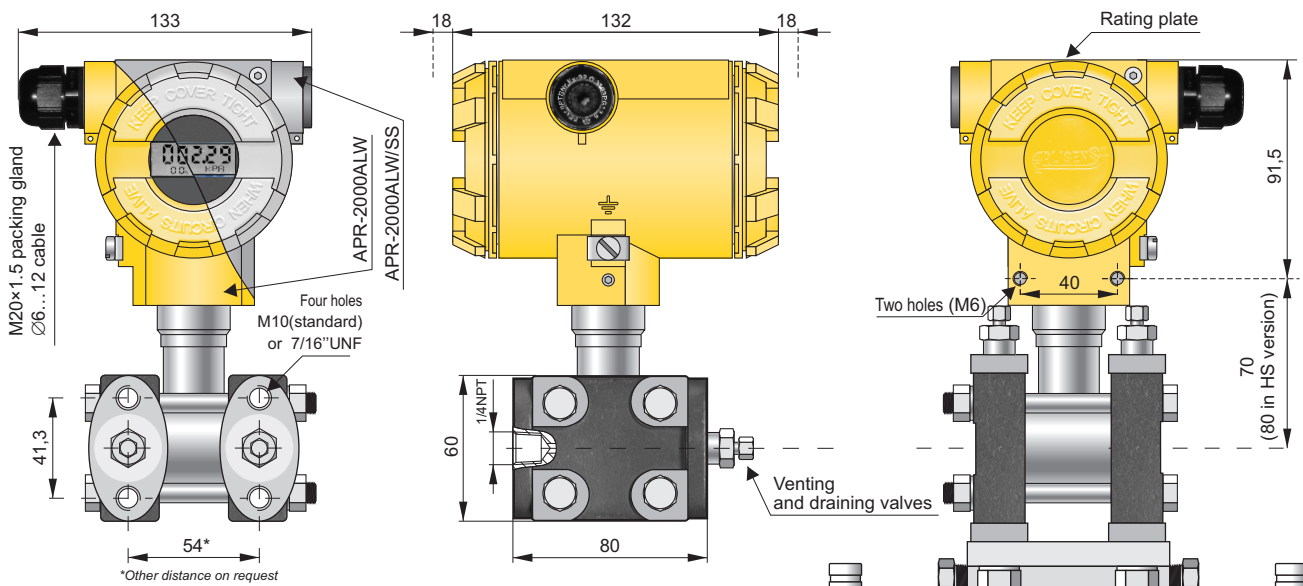


SMART DIFFERENTIAL PRESSURE TRANSMITTER APR-2000ALW



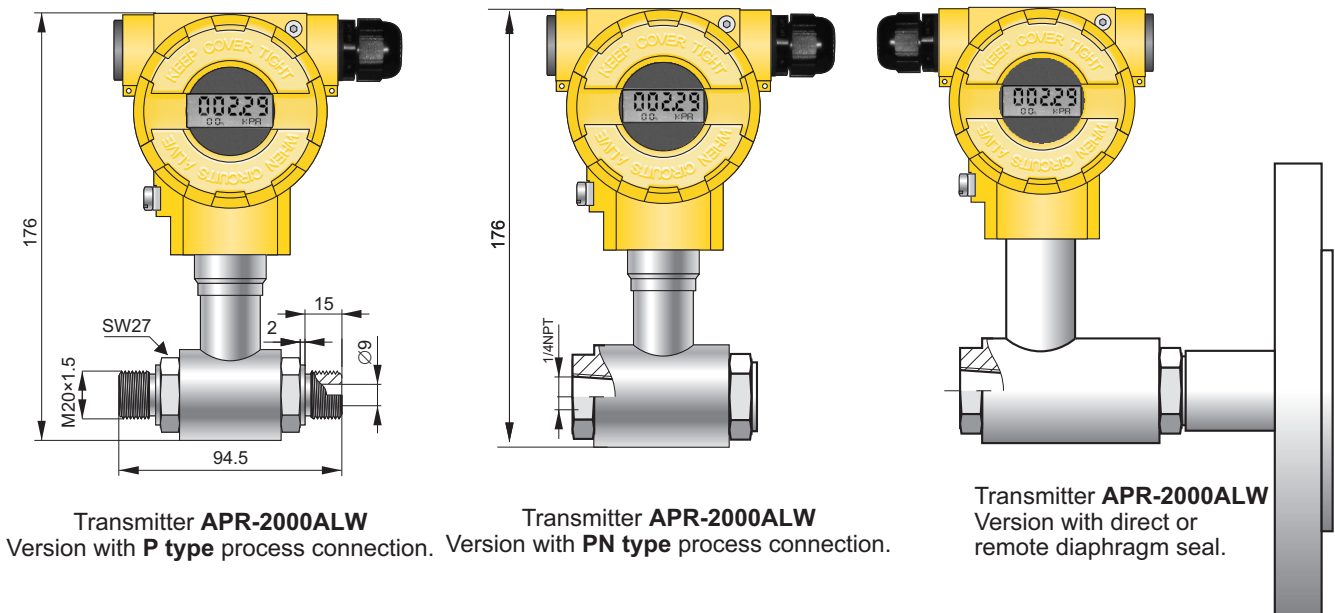
- ✓ 4...20 mA, 0...20 mA or 0...5 mA output signal + HART protocol
- ✓ Digital PROFIBUS PA signal
- ✓ Display with backlight
- ✓ SIL 2 certificate
- ✓ Intrinsic safety certificate (ATEX, IECEx)
- ✓ Explosion proof certificate (ATEX, IECEx)
- ✓ PED Conformity (97/23/EC)
- ✓ Programmable zero range, shift, characteristic and damping ratio with local panel keys
- ✓ Static pressure limit up to 420bar
- ✓ Accuracy 0,075% (0,05% on request)
- ✓ Marine certificate – DNV, BV
- ✓ Gold plated diaphragms
- ✓ Wetted parts material Hastelloy C276

now
5 years warranty



Transmitter **APR-2000ALW** – version with **type C** process connection to be mounted together with a valve manifold

Version with process connection rotated 90° →



Transmitter **APR-2000ALW**
Version with **P** type process connection.

Transmitter **APR-2000ALW**
Version with **PN** type process connection.

Transmitter **APR-2000ALW**
Version with direct or remote diaphragm seal.

Application and construction

The APR-2000ALW transmitter is applicable to the measurement of differential pressure of gases, vapours and liquids. The active element is a piezoresistant silicon sensor separated from the medium by separating diaphragms and a specially selected type of manometric fluid. The special design of the active sensing element ensures that it is able to withstand pressure surges and overloads of up to 250/320/420 bar. The casing is made of aluminium alloy cast or 316SS stainless steel, degree of protection IP66/IP67. The design of the casing enables the use of a local display, rotation of the display, rotation of the casing by 0–340° relative to the sensor, and a choice of cable direction.

Communication and configuration

The communication standard for data interchange with the transmitter is the Hart protocol. The data interchange with the transmitter enables users to:

Communication with the transmitter is carried out with:

- a KAP-03, KAP-03Ex communicator
- some other Hart type communicators, (*)
- a PC using an HART/USB/Bluetooth converter and Raport 2 configuration software.

(*) .eddl files available on www.aplisens.com.

- identify the transmitter
- configure the output parameters:
 - measurement units and the values of the start points and end points at the measurement range
 - damping time constant
 - conversion characteristic (inversion, user's non-linear characteristic)
- read the currently measured pressure value of the output current and the percentage output control level
- force an output current with a set value
- calibrate the transmitter in relation to a model pressure

Installation

The transmitter with **P** or **PN** type process connection is not heavy, so can be installed without additional mounting bracket on application. For fitting in any desired position we recommend an universal Aplisens mounting bracket for 2" pipe (AL mounting bracket, see page IV/ 5). The version with **C** type process connections can be fitted directly to a 3- or 5- valve manifold. We recommend factory-mounted transmitters with VM type valve manifold (page IV/ 2). A transmitter without a valve manifold can be fitted in any position on a 2" pipe or on a wall using the C-2" mounting bracket (page IV/ 5). When the special process connections are required for the measurement of specific media levels in closed tanks (e.g. in the sugar and chemical industries) the transmitter is fitted with an Aplisens diaphragm seal. Sets of differential pressure transmitters with diaphragm seals are described in detail in the further part of the catalogue.

Measuring ranges

No.	Nominal measuring range (FSO)	Minimum set range	Rangeability	Overpressure limit/ static pressure limit
1	0...70 bar (0...7 MPa)	7 bar (700 kPa)	10:1	C-type: 250 / 320 / 420 bar (250 bar for PED version) P-type: 40 bar (for range no. 1: 70bar)
2	0...16 bar * (0...1,6 MPa)	1,6 bar (160 kPa)	10:1	
3	0...2,5 bar (0...250 kPa)	0,2 bar (20 kPa)	12,5:1	
4	0...1 bar * (0...100 kPa)	50 mbar (5k Pa)	20:1	
5	0...0,25 bar * (0...25 kPa)	10 mbar (1k Pa)	25:1	
6	-0,5...0,5 bar * (-50...50 kPa)	0,1 bar (10 kPa)	10:1	
7	-100...100 mbar * (-10...10 kPa)	10 mbar (1 kPa)	20:1	C-type: 200 bar (10 bar for PED version); P-type: 40 bar 20 bar
8	-5...70 mbar * (-0,5...7 kPa)	4 mbar (0,4 kPa)	18:1	
9	-25...25 mbar * (-2,5...2,5 kPa)	2 mbar (0,2 kPa)	25:1	
10	-7...7 mbar ** (-700...700 Pa)	1 mbar (0,1 kPa)	14:1	

* available also in HS version

** available only in HS version

HS version with Exd certificate available from Q3/2016

Technical data

Metrological parameters

Accuracy $\leq \pm 0,075\%$ of the calibrated range
($\leq \pm 0,1\%$ for range no. 10)
Special version: $\leq \pm 0,05\%$ of the calibrated range

Long term stability \leq accuracy for 3 years
(for the nominal measuring range) $\leq 2 \times$ accuracy for 5 years
HS version: \leq accuracy for 6 years

Thermal error $< \pm 0,05\%$ (FSO) / 10°C for ranges no. 1 - 9
 $< \pm 0,08\%$ (FSO) / 10°C for ranges no. 10
max. $\pm 0,25\%$ (FSO) in the whole compensation range
special version for ranges no 1-9:

$\leq \pm 0,03\%$ (FSO) / 10°C
max. $\pm 0,1\%$ (FSO) in the whole compensation range

Thermal compensation range -25...80°C

Zero shift error for static pressure

0,01% (FSO) / 10 bar for ranges no. 3, 4, 5, 6, 7, 9
0,03% (FSO) / 10 bar for range no. 8
0,06% (FSO) / 10 bar for ranges no. 1, 2
0,01% (FSO) / 10 bar for ranges no. 2, 8 in HS version
0,02% (FSO) / 10 bar for range no. 10

Zeroing the transmitter in conditions of static pressure can eliminate this error.

Response time 16...480ms (programmable)

Additional electronic damping 0...60 s

Error due to supply voltage changes 0,002% (FSO) / V

Electrical parameters

Power supply: 10...55 VDC
Safety (SIL2) and MID version: 12...55VDC
(Ex ia: 10,5...28 VDC; Ex d: 13,5...45 VDC)
model APR-2000ALE 12...36 VDC

Additional voltage drop
Output signal 4...20 mA, two wire transmission
APR-2000ALE: 0...20. 0...5, 4...20 mA

Load resistance (for standard version) $R[\Omega] \leq \frac{U_{sup}[V] - 10V}{0,0225A}$

Resistance required for communication min. 240 Ω

Materials

Wetted parts type P, PN process connection: SS316L
type P(H) process connection: SS316L or Hastelloy C276

type C process connection: SS316L

Diaphragms SS316L, Hastelloy C 276, Au

Casing Aluminium

Option: SS316

Material of window: polycarbonate glass, hardened glass

Operating conditions

Operating temperature range (ambient temp.) -25...85°C
 special version -40...85°C
 Exia version -25...80°C
 Exd version -25...75°C

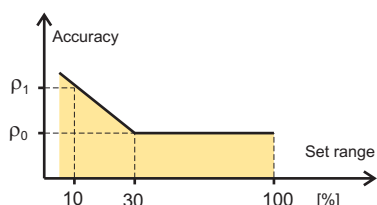
Medium temperature range -25...120°C

over 120°C – measurement with use an impulse line or diaphragm seals

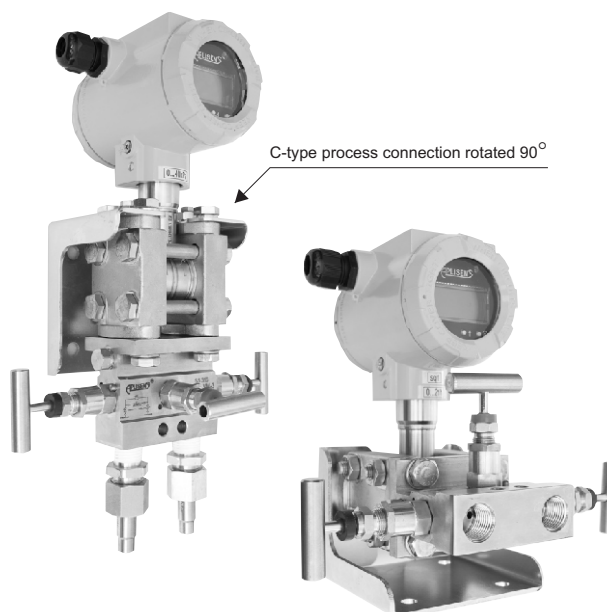
up to 100°C - PED version

CAUTION: the medium must not be allowed to freeze in the impulse line or close to the process connection of the transmitter

Accuracy depending on the set range



p_0 – error for nominal measuring range (0...100% FSO)
 p_1 – error for range 0...10% FSO
 $p_1 = 2 \times p_0$
 Numerical error values are given in the technical data under metrological parameters



SMART DIFFERENTIAL PRESSURE TRANSMITTER APR-2000AL with Profibus PA protocol

Application and construction

The transmitter electronic system performs the digital processing of measurement and generates the output signal with the communication module according to Profibus PA standard. The transmitter function performance bases on profile 3. The measuring ranges, according to the table, page II/ 3.

Communication

The communication with the transmitter is achieved in two ways:

- ♦ cyclic – the transmitter sends primary measured value (4 bytes IEEEE754) and status containing the information on the current state of transmitter and measurement validity (1 byte).
- ♦ acyclic – this way of communication is used to device configuration and to read both primary measured value and the status

Configuration

Full configuration of transmitter settings, adjustment of the display mode, transmitter zeroing and calibration in relation to pressure standards proceeds with the PDM (Process Device Manager) software, by Siemens. The EED program library, worked out by Aplisens for cooperation with this transmitter, is helpful in the configuration.

Other commercial configuration software (e.g. Commuwin by Endress and Hauser, DTM/FDT tools) make transmitter configuration possible in the range of basic commands.

Enclosed to APR-2000AL/Profibus PA is GSD file comprising the description of the transmitter basic properties such as transmission rate, type and format of input data, list of additional functions. GSD file is necessary for the software

serving as a device for network configuration and makes the correct

connection the appliance to Profibus network possible. The universal file GSD, designed for standard pressure transmitters made according to profile at revision 3 Profibus standard, may also be applicable to APR-2000AL/Profibus PA. The pressure transmitter APR-2000AL/Profibus PA does not have the hardware address switch. This address may be adjusted with accessible configuration software.

Measurements in the areas under explosion hazard

For pressure measurements in the areas under explosion hazard the ATEX intrinsically safe transmitters are available.

Ex II 1/2G Ex ia IIB T5 Ga/Gb

Technical data

Metrological parameters, measuring range, materials of process connection, diaphragms and casing, and operating conditions – see the description pages II/ 3, II/ 4.

Electrical parameters

Power supply (from DP/PA coupler)

10,5...28 VDC

12,5...28 VDC when display illumination switched on

Current consumption

14mA

Output parameters

Output signal

Digital communication signal Profibus – PA (according to EN 50170)

PA function

slave

Physical layer

IEC61158-2

Transmission range

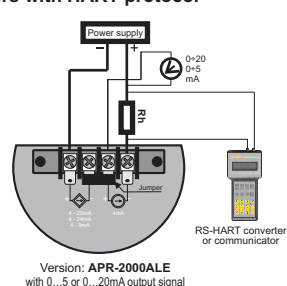
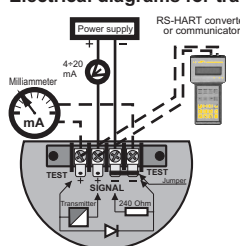
31,25kBit/S

Modulation

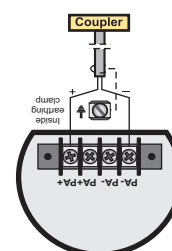
Manchester II

Electrical diagrams

Electrical diagrams for transmitters with HART protocol



Transmitters with Profibus PA



Ordering procedure

Model	Code	Description																						
APR-2000		Smart differential pressure transmitter																						
Casing, output signal	/ALW.....	Aluminum housing, IP66 with display, output 4-20mA + Hart																						
	/ALE.....	Aluminum housing, IP66 with display, 0-20mA, 0-5mA + Hart Exia and Exd version not available																						
	/AL/Profibus PA/W.....	Aluminum housing, IP66 with display, output Profibus PA Exd version not available																						
	/ALW/SS.....	Stainless steel housing, IP66, with display, output 4-20mA + Hart																						
Versions, certificates	/Exia.....	<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;"> </div> <div> II 1/2G Ex ia IIC T4/T5 Ga/Gb IECEEx Ex ia IIC T4/T5 Ga/Gb </div> </div>																						
	/Exia (Da).....	<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;"> </div> <div> II 1/2G Ex ia IIB T5 Ga/Gb (for Profibus PA version) II 1/2G Ex ia IIC T4/T5 Ga/Gb II 1 D Ex ia IIIC T105°C Da I M1 Ex ia I Ma (only version with SS housing) IECEEx Ex ia IIC T4/T5 Ga/Gb Ex ia IIIC T105°C Da Ex ia I Ma (only version with SS housing) </div> </div>																						
	/Exd.....	<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;"> </div> <div> II 1/2G Ex ia/d IIC T5/T6 Ga/Gb II 1/2D Ex ia/t IIIC T85°C/T100°C Da/Db I M2 Exd ia I Mb IECEEx Ex ia/d IIC T5/T6 Ga/Gb Ex ia/t IIIC T85°C/T100°C Da/Db Exd ia I Mb </div> <div style="margin-left: 10px; font-size: small;"> } Packing gland available on request </div> </div>																						
	/Exd (2G).....	<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 10px;"> </div> <div> II 2G Ex ia/d IIC T6/T5 Gb II 2D Ex ia/t IIIC T85°C/T100°C Db IECEEx Ex ia/d IIC T6/T5 Gb Ex ia/t IIIC T85°C/T100°C Db </div> <div style="margin-left: 10px; font-size: small;"> } Packing gland available on request </div> </div>																						
	/SA.....	Surge arrester for Exia version																						
	/Safety.....	SIL2 - Functional Safety certificate according to PN-EN 61508-1:2010; PN-EN 61508-2:2010; PN-EN 61508-3:2010; PN-EN 61511-1:2007; PN-EN 62061:2008+A1																						
	/PED.....	European Pressure Equipment Directive N° 97/23/EC, category IV																						
	/HS.....	Ultra stable version (only ranges no. 2, 4+10)																						
	/0,05%.....	Accuracy ≤ ±0,05%																						
	/MR.....	Marine certificate – DNV, BV																						
/Tlen.....	For oxygen service (sensor filled with Fluorolube fluid)																							
/320 bar.....	Static pressure 320 bar, only for C process connection, not available in PED version																							
/420 bar.....	Static pressure 420 bar, only for C process connection, not available in PED version																							
/IP67.....	Protection class IP67																							
Nominal measuring ranges	/0+70 bar.....	<table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th style="width: 30%;">Range</th> <th style="width: 30%;">Min. set range</th> </tr> </thead> <tbody> <tr> <td>0+70 bar (0+7000 kPa)</td> <td>7 bar (700 kPa)</td> </tr> <tr> <td>0+16 bar (0+1600 kPa)</td> <td>1,6 bar (160 kPa)</td> </tr> <tr> <td>0+2,5 bar (0+250 kPa)</td> <td>0,2 bar (20 kPa)</td> </tr> <tr> <td>0+1 bar (0+100 kPa)</td> <td>50 mbar (5 kPa)</td> </tr> <tr> <td>0+0,25 bar (0+25 kPa)</td> <td>10 mbar (1 kPa)</td> </tr> <tr> <td>-0,5+0,5 bar (50+50 kPa)</td> <td>0,1 bar (10 kPa)</td> </tr> <tr> <td>-0,1+0,1 bar (-10+10 kPa)</td> <td>10 mbar (1 kPa)</td> </tr> <tr> <td>-5+70 mbar (0,5+7 kPa)</td> <td>4 mbar (0,4 kPa)</td> </tr> <tr> <td>-25+25 mbar (-2,5+2,5 kPa)</td> <td>2 mbar (0,2 kPa)</td> </tr> <tr> <td>-7+7 mbar (-0,7+0,7 kPa)</td> <td>1 mbar (0,1 kPa)</td> </tr> </tbody> </table>	Range	Min. set range	0+70 bar (0+7000 kPa)	7 bar (700 kPa)	0+16 bar (0+1600 kPa)	1,6 bar (160 kPa)	0+2,5 bar (0+250 kPa)	0,2 bar (20 kPa)	0+1 bar (0+100 kPa)	50 mbar (5 kPa)	0+0,25 bar (0+25 kPa)	10 mbar (1 kPa)	-0,5+0,5 bar (50+50 kPa)	0,1 bar (10 kPa)	-0,1+0,1 bar (-10+10 kPa)	10 mbar (1 kPa)	-5+70 mbar (0,5+7 kPa)	4 mbar (0,4 kPa)	-25+25 mbar (-2,5+2,5 kPa)	2 mbar (0,2 kPa)	-7+7 mbar (-0,7+0,7 kPa)	1 mbar (0,1 kPa)
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/-0,1+0,1 bar.....																								
/-5+70 mbar.....																								
/-25+25 mbar.....																								
/-7+7 mbar.....																								
Measuring set range	/...+... [required units]	Calibrated range in relation to 4mA and 20mA output																						
Process connections	/C.....	Thread 1/4NPT F on the cover flanges cover flanges material SS316. Allows mounting with a valve manifold. Process connection of cover flange: M10 (option /C(7/16) - 7/16"UNF acc. to IEC 61518)																						
	/CR.....	C-type process connection rotated 90°																						
	/P.....	Thread M20x1,5 (male)																						
	/PN.....	Thread 1/4"NPT (female)																						
Process connection C available with NACE MR-01-75 certificate	/code of diaphragm seal.....	Diaphragm seal (see chapter of diaphragm seals) mounted on Hi side of transmitter, Lo side 1/4NPT Female																						
Material of diaphragms (refers only to C, CR, P, PN process connection)	(without marking).....	Diaphragms material SS316L																						
	/H.....	Diaphragms material Hastelloy C276 (/P and /PN – all wetted parts in Hastelloy C276 on request)																						
	/Au.....	Gold plated diaphragms (not available for transmitters in HS version)																						
Gasket (refers only to C, CR process connection)	(without marking).....	FPM Viton																						
	/NBR.....	NBR (for oxygen service)																						
	/PTFE.....	PTFE																						
Electrical connection	(without marking)	Packing gland M20x1,5																						
	/US.....	Thread 1/2"NPT Female																						
Accessories	/C-2".....	Mounting bracket for 2" pipe (to C process conn.), mat. zincd steel																						
	/C-2"(SS).....	Mounting bracket for 2" pipe (to C process conn.), mat. Stainless Steel																						
	/FI25.....	Mounting bracket for 2" pipe (to P process conn.), mat. Stainless Steel																						
	/RedSpaw P.....	Connector to weld impulse pipes dia. 12 and 14 mm, material 15HM(SO) or SS316(S). Only process connection P type																						
	/RedSpaw C.....	Connector to weld impulse pipes dia. 12 and 14 mm, material 15HM. Only process connection C type.																						
	/Red d/P 1/2".....	Adapter for differential pressure transmitters with C type process connection, output thread 1/2NPT F. Material SS316L																						
	/ST.....	Stainless Steel plate riveted to the housing																						
	/MT.....	Stainless Steel Tag plate mounted on wire																						
Other specification	/I.....	Description of required parameters (e.g. IP66/67)																						