

# SATRON VDtL Differential Pressure Transmitter

**SATRON VDtL differential pressure transmitter** belongs to V-transmitter family. The series V transmitters have both analog and smart properties. SATRON VDtL is used for 1.4 kPa...3 MPa ranges. It is a 2-wire transmitter with HART® standard communication. In pressure measuring applications SATRON VDtL transmitters are used for liquid level, pipeline pressure and density measurements. SATRON VDtL transmitter is equipped with an SOS (Silicon On Sapphire) sensing element. The rangeability is 25:1.

## TECHNICAL SPECIFICATIONS

### Measuring range and span

See Selection Chart.

### Zero and Span adjustment

Zero elevation: Calibrated span is freely selectable on the specified range depending from the desired option. This can be made by using external control shafts (analog option), keyboard (display option), HART®275/375 communicator.

### Damping

Time constant is continuously adjustable 0,01 to 60 s.

### Temperature limits

Process temperature:  
range **3**: +10 to +80 °C  
ranges **4, 5** and **6**: -30 to +120 °C  
Ambient temperature: -30 to +80 °C  
Shipping and storage: -30 to +80 °C.  
Operating temperature of display: 0 to +50°C (does not affect operation of the transmitter)

### Pressure limits

Withstands 40 bar static pressure and unequal pressure load without damage to the transmitter. Pressure class: see Process Connections. See the following table for minimum pressure limits.

Minimum process pressure:

T <sub>proc</sub> °C	Min. pressure for different fill fluids (kPa, abs.)	
	DC200 10 cSt	Inert oil
20	5.0	8.0
60	12.0	18.5
80	16.0	28.0
120	21.0	53.0

**Volume of negative-side process chamber:** 2.5 cm<sup>3</sup>.

**Process chamber's volumetric displacement for maximum span:** < 0.1 cm<sup>3</sup>

**Output** 2-wire (2W), 4-20 mA, user selectable for linear, square root, inverted signal or the transfer function (16 points) specified by the user

### Supply voltage and permissible load

See the load capacity diagram;  
4-20 mA output: 12-35 VDC.

### Humidity limits

0-100 % RH; freezing of condensed water not allowed in reference pressure channels.

### PERFORMANCE SPECIFICATIONS

Tested in accordance with IEC 60770: Reference conditions, specified span, no range elevation, horizontal mounting; AISI316L diaphragm, silicone oil fill.

### Accuracy

±0.07 % of calibrated span  
(span 1:1-7.5:1 /max.range).  
On the measuring ranges 7.5:1-25:1:

$$\pm[0.01+0.012 \times \left(\frac{\text{max.span}}{\text{calibrated span}}\right)]\% \text{ of calibrated span}$$

(incl. nonlinearity, hysteresis and repeatability)

### Long-term stability

±0.1 %/max. span for 12 months

### Temperature effect on compensated temperature range

Ambient: Zero and span shift: ±0.5 % of max. span.

Process: Zero error: ±0.5 % of max.span (ranges 4,5 and 6), ±1 mbar per 10 K (range 3)

### Static pressure effect on Zero

• ±0.5 % of max.span per 4 MPa

### Mounting position effect

Deviation from horizontal position causes a zero shift that can be calibrated out.

### Power supply effect

< ±0.01 % of calibrated span per volt.

### Insulation test voltage

500 V rms 50 Hz

## CONSTRUCTION AND CALIBRATION

### Materials

Diaphragms <sup>1)</sup>: AISI316L (EN 1.4435), Duplex (EN 1.4462), Hast. C276 (EN 2.4819), Nickel, Titanium Gr2 (EN 3.7035) or Tantalum.

Flanges <sup>1)</sup> and vent valves <sup>1)</sup>: AISI316, Duplex or Hast. C276.

O-ring on sensing element: PTFE.

Other sensing element materials:

AISI316, SIS 2343, SIS 2324.

Mounting bolts and nuts for sensor flanges: AISI316 (PN420: m.8.8.Zne)



### Fill fluid

Silicone oil (DC200, 10 cSt) or inert oil or food industry oil (Neobee M-20).

### Housing with PLUG connector, codes H and T

Housing: AISI316

Seals: Viton® and NBR

TEST jacks: MS358Sn/PVDF, protected with silicone rubber shield.

PLUG connector: PA6-GF30 jacket, Silicone rubber seal, AISI316 retaining screw.

### Housing with junction box/terminal strip, M and N

Housing: AISI303/316

Seals: Nitrile and Viton®

Nameplates: Polyester

### Connection hose between sensing element and housing

(codes L and K):

PTFE hose with AISI316 braiding.

### Calibration

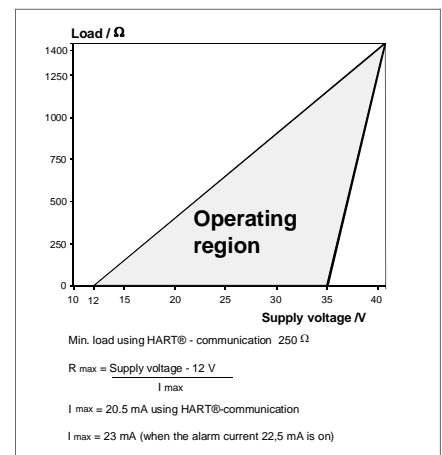
For customer-specified range with 1s. damping. (If range is not specified, transmitter is calibrated for maximum range.)

**Enclosure class:** IP66.

### Process connections

See Selection Table

<sup>1)</sup> Parts in contact with process medium.



## Electrical connections

Housing with PLUG connector, **H** and **T** :  
PLUG connector, connector type DIN 43650 model AF; Pg9 gland for cable; wire cross-section 0.5 to 1.5 mm<sup>2</sup>.

Housing with junction box/terminal strip, **M** and **N**:  
Inlet M20x1.5, 1/2-NPT; screw terminals for 0.5 to 2.5 mm<sup>2</sup> wires

## Product Certifications

### European Directive Information

#### Electro Magnetic Compatibility (EMC directive 2004/108/EC)

All differential pressure transmitters

#### Atex Directive (94/9/EC)

Satron Instruments Inc. complies with the ATEX Directive.

#### European Pressure Equipment Directive (PED) (97/23/EC)


All Differential Pressure Transmitters :  
- Sound Engineering Practice


### Hazardous Locations Certifications

#### European Certifications

ATEX Intrinsic Safety

Certification No. : DNV-2007-OSL-ATEX- 1346X

 II 1 GD T135°C EEx ia II C T4 -20°C ≤ Tamb ≤ 50°C

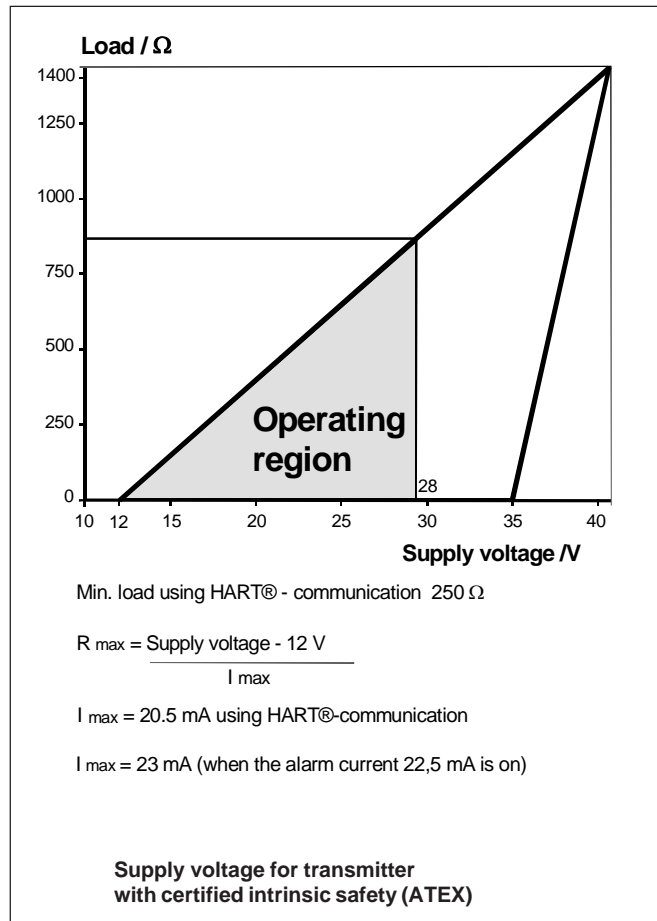
 II 2 GD T135°C EEx ia II C T4 -20°C ≤ Tamb ≤ 50°C

#### Input Parameters :

U<sub>i</sub> = 28 V  
I<sub>i</sub> = 93 mA  
P<sub>i</sub> = 0.651 W  
C<sub>i</sub> = 5 nF  
L<sub>i</sub> = 0.2 mH

#### Special Conditions for Safe Use (X) :

The enclosure with plastic window and the plastic DIN43650 connector must not be installed in potentially explosive atmosphere requiring category 1 apparatus. The non-conducting surface of the sensor element may be charged by the flow of non-conducting media, so there may be electrostatic hazard with IIC-gases. These units should be marked 2 GD. The equipment shall be installed and connected according to the manufacturers instructions.



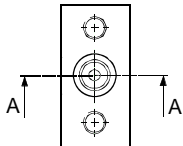
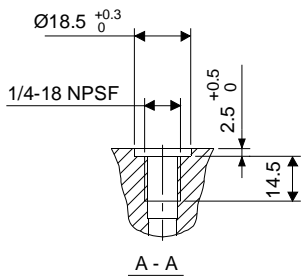
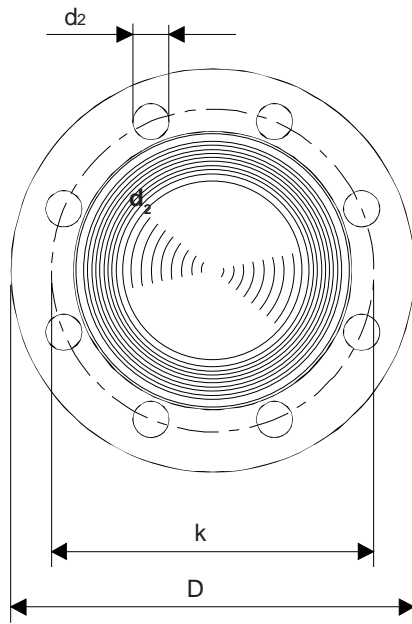
#### Weight (kg):

See the table; add 0,6 kg for transmitter with screwed cap housing and 0,7 kg for housing with display.

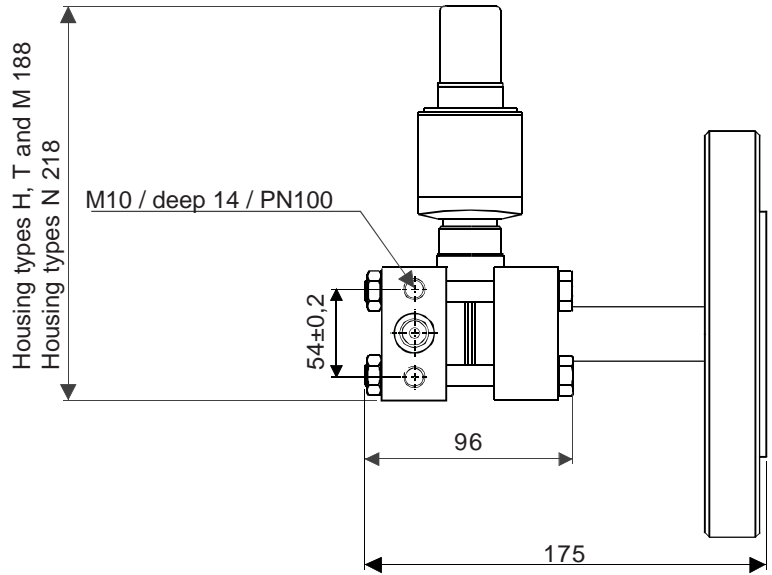
Type	Extension code			
	0	2	4	6
Ax, Dx, JX*	9.2	9.6	10	10.4
SA*		7.2	7.7	8.1

\* process connection code

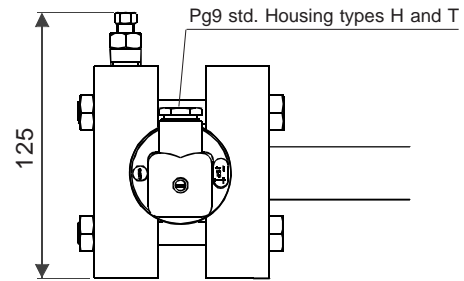
Dimensions (in mm)



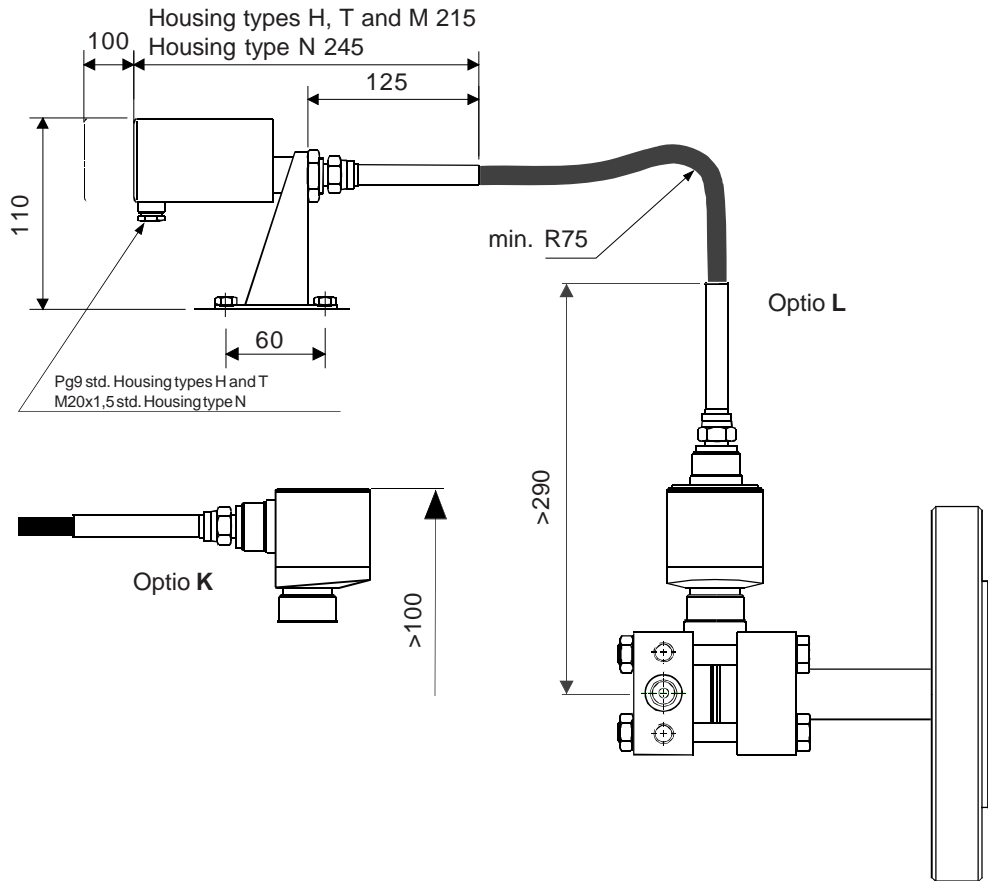
Process connection types Ax, Dx and Jx



Housing types H, T and M 188  
Housing types N 218



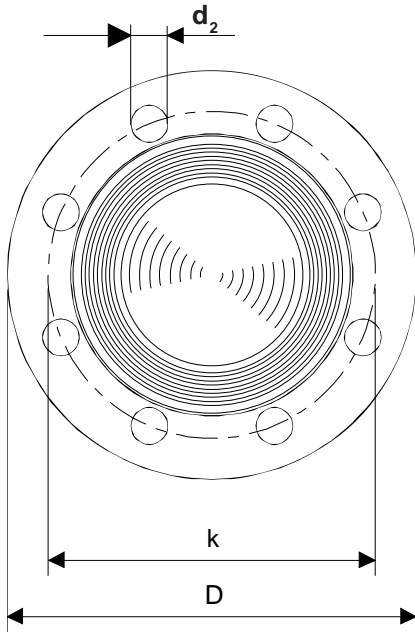
Notice!  
The flange dimensions on the last page!



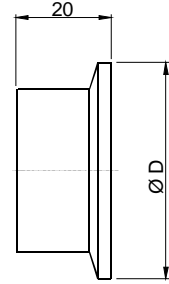
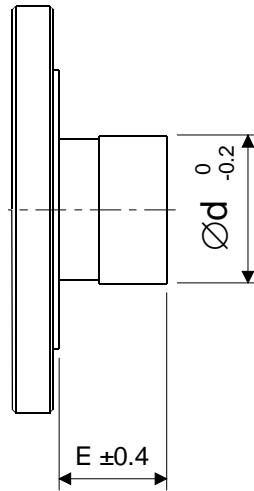
Optio K

Optio L

**Dimensions (mm)**



Notice!  
The flange dimensions on the last page!

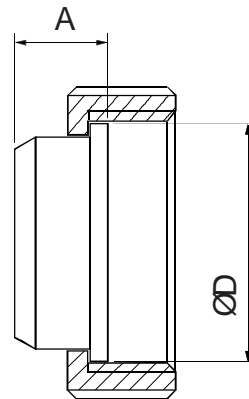
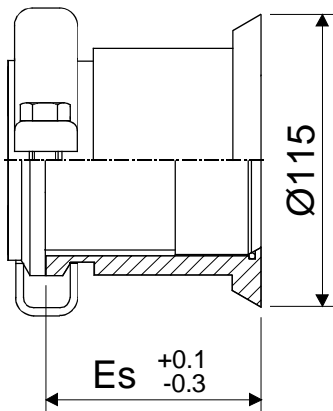


Process connection types **TA**,  
**TB** and **TC**  
- Tri-clamp DN38 ... 63,5

DN	ØD
38	50,5
51	64
63,5	77,5

Process connection types **Ax**, **Dx** and **Jx**, with extension

	Extension code			
	0	2	4	6
Dim. E	0	51	102	152

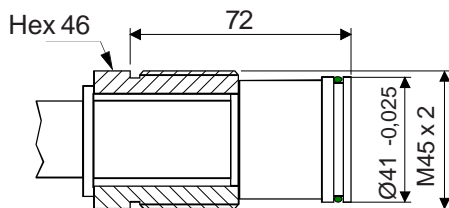


Process connection types **VA** and **VB**  
- SMS38 and SMS51

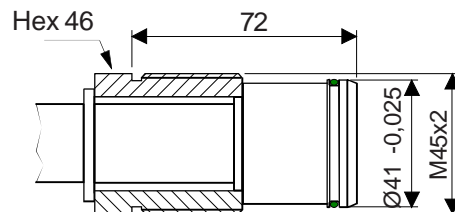
Process connection type **SA**

	Extension code		
	2	4	6
Dim. Es	54.5	105	156

Size	Dimensions		Thread
	ØD	A	
38	54	21	Rd 60 x 1/6
51	64	23	Rd 70 x 1/6

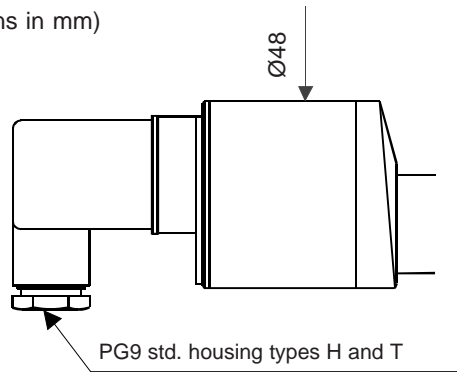


Process connection **BA**  
- M45x2

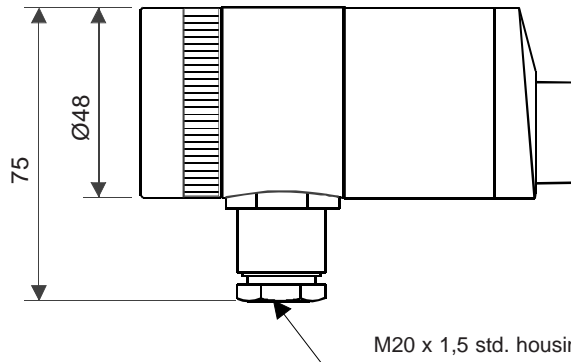


Process connection **BB**  
- M45x2 with tapered

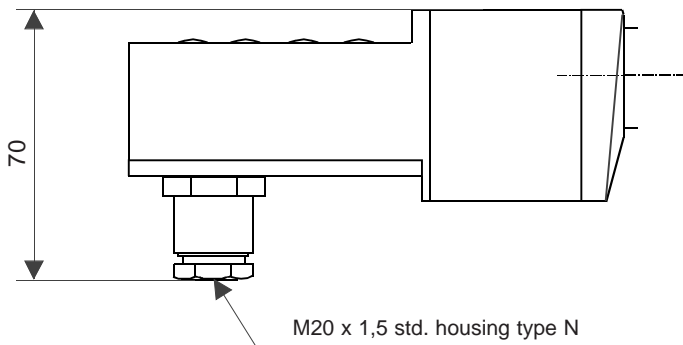
Dimensional drawings (dimensions in mm)



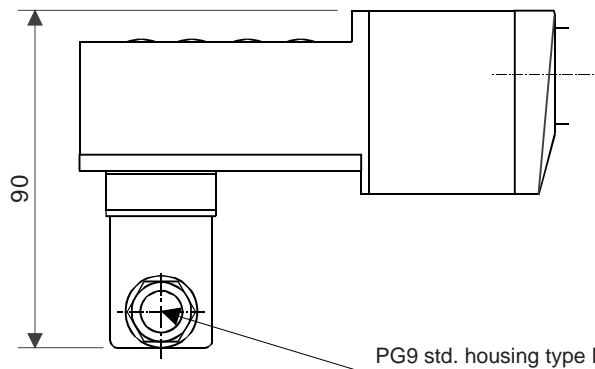
Housing with plug-connector, DIN 43650, codes H and T



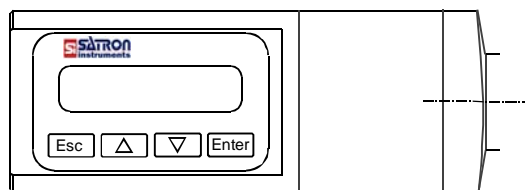
Housing with junction box/terminal strip, code M

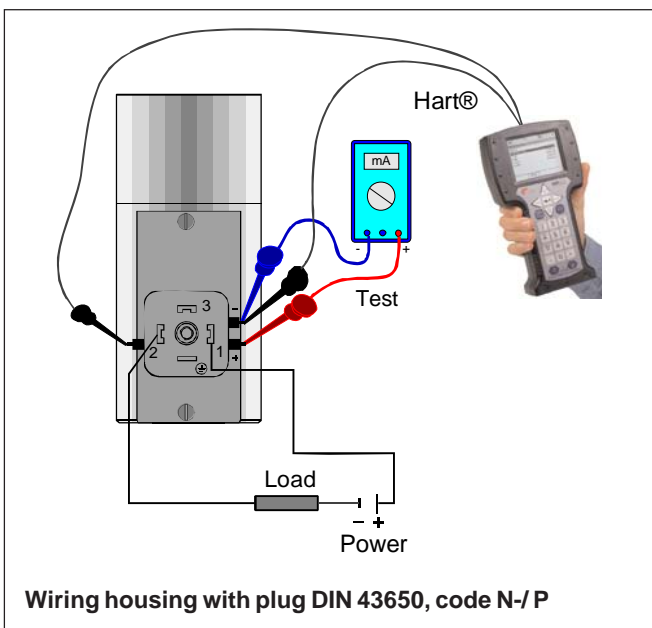
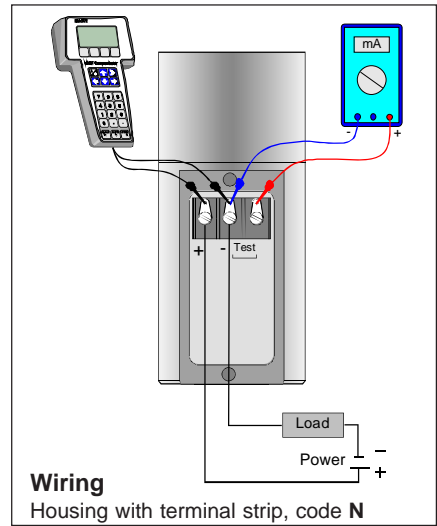
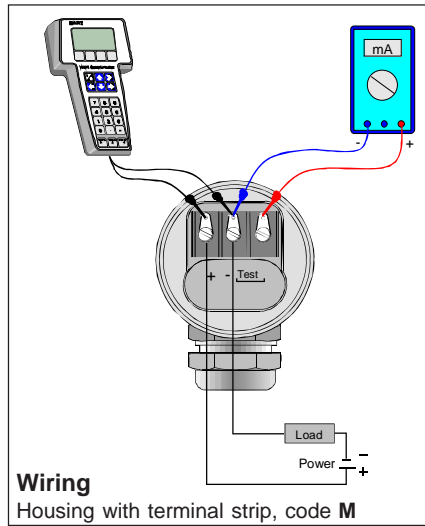
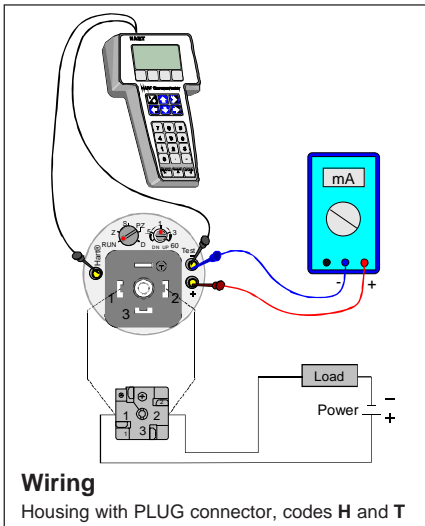


Housing with junction box/terminal strip, with display, code N



Housing with junction box/terminal strip, with display and plug-connector DIN 43650, code N- / P

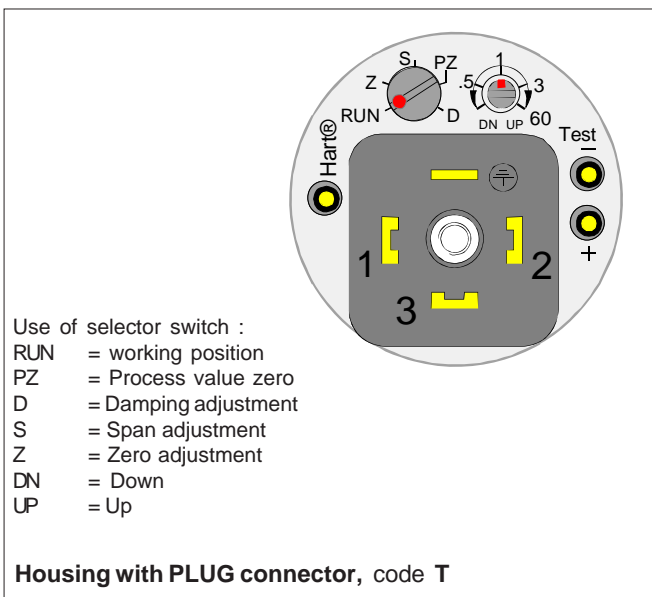




**Keyboard :**

- Esc = Press **Esc** move back towards the top of the main menu.
- ▲ = Use the **UP** arrow key to move up on the current menu level or to increase the selected parameter value.
- ▼ = Use the **DOWN** arrow key to move down on the current menu level or to decrease the selected parameter value.
- Enter = Press **ENTER** to move to a lower level in a menu or to accept a command or parameter value.

**Housing with display, code N**




# SATRON VDtL Differential Pressure Transmitter


BLVT830

15.2.2013

## Selection Chart

VDtL Differential Pressure Transmitter																																													
<b>Adjustability ( ± )</b>		<b>Span, min.</b>			<b>Span, max.</b>			<b>Measuring range</b>																																					
3		1,4 kPa (14 mbar)			35 kPa (350 mbar)			-35...+35 kPa (-350...+350 mbar)																																					
4		4 kPa (40 mbar)			100 kPa (1000 mbar)			-100...+100 kPa (-1000...+1000 mbar)																																					
5		26,5 kPa (265 mbar)			500 kPa (5000 mbar)			-500...+500 kPa (-5000...+5000 mbar)																																					
6		145 kPa (1,45 bar)			3 MPa (30 bar)			-3...+3 MPa (-30...+30 bar)																																					
<b>Output S 4-20mA DC/HART® -protocol</b>																																													
<b>Process connections</b>			<b>JE</b> JIS 10K 100 JIS B 2220			<b>TA</b> Tri-clamp DN38 PN40 ISO 2852																																							
<b>DB</b> DN50 PN40 ISO 2084-1974			<b>JF</b> JIS 40K 100 JIS B 2220			<b>TB</b> Tri-clamp DN51 PN40 ISO 2852																																							
<b>DC</b> DN80 PN40 ISO 2084-1974			<b>AC</b> ANSI 2" 150 lbs ANSI B16-5			<b>TC</b> Tri-clamp DN63.5 PN40 ISO 2852																																							
<b>DD</b> DN100 PN40 ISO 2084-1974			<b>AD</b> ANSI 2" 300 lbs ANSI B16-5			<b>SA</b> Sandvik DN70 PN64																																							
<b>JA</b> JIS 10K 50 JIS B 2220			<b>AE</b> ANSI 3" 150 lbs ANSI B16-5			<b>VA</b> SMS 38																																							
<b>JB</b> JIS 40K 50 JIS B 2220			<b>AF</b> ANSI 3" 300 lbs ANSI B16-5			<b>VB</b> SMS 51																																							
<b>JC</b> JIS 10K 80 JIS B 2220			<b>AG</b> ANSI 4" 150 lbs ANSI B16-5			<b>BA</b> M45x2 PN160																																							
<b>JD</b> JIS 40K 80 JIS B 2220			<b>AH</b> ANSI 4" 300 lbs ANSI B16-5			<b>BB</b> M45x2 PN160 with tapered																																							
<b>Extension length/mm</b>			Process connections DC, AE and AF			Process connection SA																																							
0			0			-																																							
2			51			54,5																																							
4			102			105																																							
6			152			156																																							
<b>Wetted materials</b>																																													
<b>(-)flange</b>		<b>(+)diaphragm</b>		<b>(-)diaphragm</b>		<b>Extension</b>		<b>(-)diaphragm coating</b>																																					
Code	Material	Code	Material	Code	Material	Code	Material	Code	Material																																				
2	AISI316L	1	Nickel (*)	2	AISI316L/317L	2	AISI316L	9	gold/Rhodium																																				
3	Hast.C 276	2	AISI316L	3	Hast.C 276	3	Hast.C 276	(Do not enter code if diaphragm not coated)																																					
		3	Hast. C276	5	Tantalum	8	Duplex																																						
		5	Tantalum	8	Duplex																																								
		6	Titanium Gr2 (*)																																										
		8	Duplex (EN 1.4462)																																										
<b>Fill fluid S</b> Silicone oil <b>A</b> Oil for food Industry (Neobee M-20) <b>G</b> Inert oil																																													
<b>(-)side process connection</b>				<b>D</b> M10, PN100, ranges 3 to 6, IEC 61518. <b>U</b> 7/16-20 UNF, PN100, ranges 3, 4, and 5 only. <b>F</b> Screwed flange adapters, PN100, IEC 61518. <b>V</b> Connection through hydraulic seal (not recommended for ranges 3 and 4).																																									
<b>Housing type</b>																																													
<b>H</b> Housing with PLUG-connector, DIN43650, no display, inlet PG9																																													
<b>T</b> Housing with PLUG-connect.with manual adjust, DIN43650, no display, inlet PG9, no ATEX																																													
<b>M</b> Housing with junction box/terminal strip, no display, inlet M20x1,5																																													
<b>N</b> Housing with junction box/terminal strip, with display, inlet M20x1,5																																													
<b>Explosion proof 0</b> No explosion proof <b>1</b> Atex Intrinsic Safety,  II 1 GD T135°C (**)																																													
<table border="1"> <tr> <td colspan="2"><b>Process coupling</b></td> <td colspan="2"><b>Material</b></td> </tr> <tr> <td><b>0</b> No coupling</td> <td><b>2</b></td> <td>AISI316L (EN 1.4404)</td> <td></td> </tr> <tr> <td><b>A</b> With coupling</td> <td><b>3</b></td> <td>Hast.C276 (EN 2.4819)</td> <td></td> </tr> <tr> <td></td> <td><b>8</b></td> <td>Duplex (EN 1.4462)</td> <td></td> </tr> </table>										<b>Process coupling</b>		<b>Material</b>		<b>0</b> No coupling	<b>2</b>	AISI316L (EN 1.4404)		<b>A</b> With coupling	<b>3</b>	Hast.C276 (EN 2.4819)			<b>8</b>	Duplex (EN 1.4462)																					
<b>Process coupling</b>		<b>Material</b>																																											
<b>0</b> No coupling	<b>2</b>	AISI316L (EN 1.4404)																																											
<b>A</b> With coupling	<b>3</b>	Hast.C276 (EN 2.4819)																																											
	<b>8</b>	Duplex (EN 1.4462)																																											
<table border="1"> <tr> <td colspan="2"><b>Process thread on flange adapter</b></td> <td colspan="2"><b>Thread type</b></td> <td colspan="2"><b>Thread size</b></td> </tr> <tr> <td>Code</td> <td>Type</td> <td>Code</td> <td>Size</td> <td></td> <td></td> </tr> <tr> <td>(only specify for (-)-side process conn. F)</td> <td><b>R</b> straight R thread</td> <td><b>2</b></td> <td>1/4</td> <td></td> <td></td> </tr> <tr> <td></td> <td><b>N</b> NPS thread</td> <td><b>3</b></td> <td>3/8</td> <td></td> <td></td> </tr> <tr> <td></td> <td><b>P</b> taper R thread</td> <td><b>4</b></td> <td>1/2</td> <td></td> <td></td> </tr> <tr> <td></td> <td><b>T</b> NPT thread</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>										<b>Process thread on flange adapter</b>		<b>Thread type</b>		<b>Thread size</b>		Code	Type	Code	Size			(only specify for (-)-side process conn. F)	<b>R</b> straight R thread	<b>2</b>	1/4				<b>N</b> NPS thread	<b>3</b>	3/8				<b>P</b> taper R thread	<b>4</b>	1/2				<b>T</b> NPT thread				
<b>Process thread on flange adapter</b>		<b>Thread type</b>		<b>Thread size</b>																																									
Code	Type	Code	Size																																										
(only specify for (-)-side process conn. F)	<b>R</b> straight R thread	<b>2</b>	1/4																																										
	<b>N</b> NPS thread	<b>3</b>	3/8																																										
	<b>P</b> taper R thread	<b>4</b>	1/2																																										
	<b>T</b> NPT thread																																												
<b>Special size of electrical inlet N</b> 1/2NPT <b>G</b> Pg13.5 <b>P</b> Plug DIN 43650																																													
<b>Special features</b>																																													
<b>Special electronics</b> (specify only if housing connected with hose to sensing element)																																													
<b>- connecting cable with protection hose</b>																																													
<b>L</b> Hose protected with PTFE/AISI316 braiding, straight																																													
<b>K</b> Hose protected with PTFE/AISI316 braiding, angle of 90°																																													
<b>Length of cable between sensing element and housing</b>																																													
(specify only if housing connected with cable to sensing element)																																													
<b>2</b> 2 m cable <b>3</b> 3 m cable etc. (max. 10 m)																																													
<b>Mounting parts for remote electronics for Ø51 mm tube</b>																																													
<b>0</b> No mounting parts <b>1</b> Mounting parts																																													
<b>Documentation</b>																																													
<b>Calibration Certificate</b>				<b>AE</b> English																																									
<b>Installation and Operating Instructions</b>				<b>IE</b> English		<b>IF</b> Finnish																																							
<b>Material Certificates</b>																																													
<b>0</b> No material certificate																																													
<b>MC1</b> Raw materials certificate without appendices, in accordance with SFS-EN 10204-2.1 (DIN 50049-2.1) standard																																													
<b>MC2</b> Raw materials certificate for wetted parts with appendices, in accordance with SFS-EN 10204-2.2 (DIN 50049-2.2) standard																																													
<b>MC3</b> Raw materials certificate for wetted parts with appendices, in accordance with SFS-EN 10204-3.1B (DIN 50049-3.1B) standard																																													

(\*) = only with flange

(\*\*) = Housing H and N :  II 2 GD T135°C

Flange size	Flange dimensions			Holes			Extension
	b	D	Ød <sub>4</sub>	pcs	d <sub>2</sub>	k	Ød -0.2
ISO DN50 PN40	20	165	102	4	18	125	51
ISO DN80 PN40	24	200	138	8	18	160	73
ISO DN100 PN40	24	235	162	8	22	190	73
ANSI 2" 150 lbs	23	152	92	4	20	120.6	51
ANSI 2" 300 lbs	25	165	92	8	20	127	51
ANSI 3" 150 lbs	26	191	127	4	20	152.4	73
ANSI 3" 300 lbs	31	210	127	8	23	168.3	73
ANSI 4" 150 lbs	26	229	157	8	20	190.5	73
ANSI 4" 300 lbs	34	254	157	8	23	200	73
JIS 10K-50	16	155	96	4	19	120	51
JIS 40K-50	26	165	105	8	19	130	51
JIS 10K-80	18	185	126	8	19	150	73
JIS 40K-80	32	210	140	8	23	170	73
JIS 10K-100	18	210	151	8	19	175	73
JIS 40K-100	36	250	165	8	25	205	73

### Process connection types Ax, Dx and Jx



Satron Instruments Inc., P.O.Box 22, FI-33901 Tampere, Finland  
Tel. +358 207 464 800, Telefax +358 207 464 801, [www.satron.com](http://www.satron.com)

We reserve the right for technical modifications without prior notice.  
HART® is a registered trademark of HART Communication Foundation.  
Viton® is the registered trademark of DuPont Down Elastomers.  
Hastelloy® is the registered trademark of Haynes International.  
Teflon® is the registered trademark of E.I. du Pont de Nemours & Co

