Automat

... the level & gas people

ISO-9001 : 2008 CERTIFIED COMPANY

Bulletin No. 2000

Effective : March. 2012

- **DIFFERENTIAL PRESSURE / FLOW TRANSMITTERS**
- **ABSOLUTE PRESSURE TRANSMITTER**
- **HIGH STATIC PRESSURE / DIFFERENTIAL PRESSURE & FLOW TRANSMITTERS**
- **LEVEL TRANSMITTER**
- **REMOTE SEAL ABSOLUTE PRESSURE / DIFFERENTIAL / FLOW TRANSMITTERS**
- **PRESSURE TRANSMITTERS**

Features

- Increased flexibility and enhanced functions thanks to the adoption of microprocessor.
- Powerful self-diagnosis capability.
- No interaction between zero-setting and range adjustment.
- Remote Range , Zero & Span setting.
- Two-wire system in conformity with HART® protocol/FF protocol that enables digital communications and manual operating without Interfering with the output of the analog value.
- Built in non-loseble memory.
- High stability, high Accuracy, adjustable damping and strong ability on one-way overload protection.
- No mechanical transmission parts therefore less maintenance, sturdy and vibration proof.
- Easy to maintain with all general parts that guarantees the characteristics of the transmitter when sensor and/or electronic circuit board are interchanged.
- Optional materials for the diaphragm that contacts the medium.
- Proved excellent performance and reliability.

Description of Differential Pressure Transmitters

The medium pressure is transferred to the measuring diaphragm in the center of the chamber. The medium pressure is transferred to the measuring diaphragm which is elastic element used to check and measure the pressure acted on it. The displacement of the measuring diaphragm (Max.0.004 inch (0.10mm) is in direct proportion to the differential pressure. The position of the measuring diaphragm is detected by the fixed capacitive plates at two sides by means of direct digital capacitive circuit.

The electronic signal is ambient, temperature compensated and amplified by the differential amplifier. The signal pass filter dampens the effects of process turbulence and prevents saturation of the dc amplifier and the current driver. The dc amplifier provides non interacting Zero and Span adjustments.

We adopt the principle of replacing analog signal amplifying circuit and A/D conversion circuit with direct digital capacitive circuit, and meantime take the digital compensation technology to compensate temperature and static pressure, which greatly improves the measurement precision and reduces the temperature drift. The complete transmitter is characterized by its small size, high reliability and long-term stability. With extremely high performance this Microprocessor based digital smart transmitter is maintenance free & accurate. The circuit within the transmitter provides Reverse polarity protection, Transient power surge protection, and Electromagnetic interference protection. Apart from flow measurement, DP transmitter can also be used to measure level and pressure.

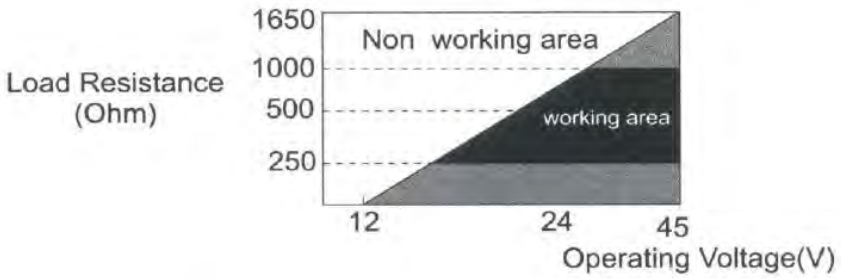
Technical Specifications

- **Application** : Liquid, Gas and Steam
- **Power Supply** : External Power Supply 24V DC (Power Range 12V~45V)
- **Output Signal** : 4~20mA Output Superimposed with HART® Protocol/ Digital Output (FF)
- **System** : 2 Wire
- **Load Resistance** : 600 ohm HART®/ 575 ohm FF
- **Fail safe/ Loop check** : Provided 3.8mA or 21.6mA
- **Zero /span adjustments** : Continuous with zero elevation and span supression
- **Relative Humidity** : 0~100%
- **Volume Deviation** : Less than 0.08 cm^3
- **Damping** : Adjustable between 0.2~32 sec
- **Warm up Time** : 3 sec
- **Display** : 5 Digit LCD
- **Stability** : with error of ±0.15% of maximum range for 36 months
- **Temperature Range** : Ambient Temperature: -20~85 C
  Process Temperature: -20~300 C
- **Electrical Connection** : ½" NPT (F)
- **Vibration Effect** : The error is ±0.05%/g of the maximum range in AXIS: X, Y, Z @ frequency of 150Hz
- **Power Supply effect** : Less than ±0.005%/V of the output range

- **Process Connection** : ¼" NPT (F)
  ½" NPT (F) with adapter

- **Housing Material** : Cast Aluminum Alloy

- **Load Effect :** No load effect in the load working area as long as the voltage applied to the transmitter is higher than 12V



- **Electromagnetic Radiation Test :**
  - Radiated Emission Test as per IEC 61000
  - Radiated Radio Frequency Electromagnetic Field Immunity Test as per IEC 61000
  - Conducted Immunity Test as per IEC 61000

Measuring Range

Range	Model					
	501D-DP	501D-DF	501D-AP	501D-HS	501D-LT	501D-RS
A	0-20~715 mmH₂O	0-20~715mmH₂O	.....	.....	.....	.....
B	0-96~3810 mmH₂O	0-96~3810 mmH₂O	0-96~3810 mmH₂O	0-96~3810 mmH₂O	0-96~3810 mmH₂O	0-96~3810 mmH₂O
C	0-0.047~1.90Kg/cm²	0-0.047~1.90Kg/cm²	0-0.047~1.90Kg/cm²	0-0.047~1.90Kg/cm²	0-0.047~1.90Kg/cm²	0-0.047~1.90Kg/cm²
D	0-0.18~7 Kg/cm²	0-0.18~7 Kg/cm²	0-0.18~7 Kg/cm²	0-0.18~7 Kg/cm²	0-0.18~7 Kg/cm²	0-0.18~7 Kg/cm²
E	0-0.25~21 Kg/cm²	0-0.25~21 Kg/cm²	0-0.25~21 Kg/cm²	0-0.25~21 Kg/cm²	.....	0-0.25~21 Kg/cm²
F	0-1.75~70 Kg/cm²	0-1.75~70 Kg/cm²	0-1.75~70 Kg/cm²	.....	.....	0-1.75~70 Kg/cm²

Differential Pressure / Flow Transmitters

Accuracy :

For range A , B & C ±0.1% of the calibration range for turn down ratio from 1:1 to 10:1

For range D , E & F ±0.075% of the calibration range for turn down ratio from 1:1 to 10:1

For Turn Down ratio from 10:1 to 100:1 =± $\left[0.025+0.005\left(\frac{\text{URL}}{\text{span}}\right)\right]$% of span.

Output Signal of 501D-DP

linear output : 4~20mA Output superposed with HART® protocol digital signal (two-wire system) or with foundation field bus output protocol

Output Signal of 501D-DF

Square root output: output and differential pressure are applied in square root relationship and input pressure form 1% to 100%, and are in linear relationship in divided sections at input pressure from to 0% to 100%. There is no saltus in 4-20mA DC output with HART® protocol digital signal (two-wire system). Then user can choose linear output or square root output according to the field conditions. or with foundation field bus output protocol

Construction Materials:

- Isolation Chaff and Drain Tap : 316 stainless steel, Hastelloy C, Monel alloy and Tantalum
- Filling Liquid : Silicone oil
- Flange and Coupling : 316 stainless steel, Hastelloy C and Monel
- Electrical Housing : Die cast Aluminium alloy

Over Pressure Limit : 120kg/cm^2

Over pressure Effect : The error is of ± 0.25% of the maximum range when the pressure of 140kg/cm² is applied which can be elimated by re -calibration.

Static Pressure Effect: : The Zero point error at Linear Output: After the static pressure of 140kg/cm² is applied, the zero point error for ranges of B & C is ±0.25% of the maximum range, and the zero point error for ranges of A,D,E & F ± 0.5% of the maximum range which can be elimated by re -calibration.

Temperature Effect:

For ranges of B, C, D, E & F

The Zero Point error is ± 0.25%/55ºC of the maximum range.

Note: The Temperature error is double for the ranges of A

Absolute Pressure Transmitters (501D-AP)

Accuracy :

For range B & C ±0.1% of the calibration range for turn down ratio from 1:1 to 10:1

For range D , E & F ±0.075% of the calibration range for turn down ratio from 1:1 to 10:1

For Turn Down ratio from 10:1 to 100:1 $=\pm\left[0.025+0.005\left(\frac{\text{URL}}{\text{span}}\right)\right]$% of span.

Output Signal of 501D-AP

linear output : 4~20mA Output superposed with HART® protocol digital signal (two-wire system) or with foundation field bus output protocol

Construction Materials:

- Isolation Chaff and Drain Tap :316 stainless steel, Hastelloy C, Monel alloy and Tantalum
- Filling Liquid : Silicone oil
- Flange and Coupling :316 stainless steel, Hastelloy C and Monel
- Electrical Housing : Die cast Aluminium alloy

Over Pressure Limit : 120kg/cm^2

Over pressure Effect : The error is of ± 0.25% of the maximum range when the pressure of 140kg/cm^2 is applied which can be elimated by re -calibration.

Temperature Effect : The Zero Point error is ± 0.25%/55°C of the maximum range.

High Static Pressure / Differential Pressure & Flow Transmitters

(501D-HS-PT / 501D-HS-DP / 501D-HS-FT)

Accuracy :

For range B & C ±0.1% of the calibration range for turn down ratio from 1:1 to 10:1

For range D & E ±0.075% of the calibration range for turn down ratio from 1:1 to 10:1

For Turn Down ratio from 10:1 to 100:1 $= \pm \left[0.025+0.005\left(\frac{URL}{span}\right)\right]$% of span.

Output Signal of 501D-HS-PT & 501D-HS-DP

linear output : 4~20mA Output superposed with HART® protocol digital signal (two-wire system) or with foundation field bus output protocol

Output Signal of 501D-HS-FT

Square root output: output and differential pressure are applied in square root relationship and input pressure form 1% to 100%, and are in linear relationship in divided sections at input pressure from to 0% to 100%. There is no saltus in 4-20mA DC output with HART® protocol digital signal (two-wire system). Then user can choose linear output or square root output according to the field conditions. or with foundation field bus output protocol

Construction Materials:

- Isolation Chaff and Drain Tap :316 stainless steel, Hastelloy C, Monel alloy and Tantalum
- Filling Liquid : Silicone oil
- Flange and Coupling :316 stainless steel, Hastelloy C and Monel
- Electrical Housing : Die cast Aluminium alloy

Static pressure & Over Pressure Limit : Max Operating Static Pressure Limit 300kg/cm²
Max Safety Static Pressure Limit 400kg/cm²
Max One way Pressure Limit 150kg/cm²

Over pressure Effect : The changes in zero setting when the pressure of 300kg/cm² is applied which can be elimated by re -calibration.

- Range B. less then ± 1.0% of the maximum range
- Range C. less then ± 2.0% of the maximum range
- Range D & E. less then ± 5.0% of the maximum range

Static pressure Effect : The zero point error at linear output : The zero point error is less then ± 2.0% of the maximum range after the static pressure of 300kg/cm² is applied which can be elimated by re -calibration.

Temperature Effect : The Zero Point error is ± 0.25%/55°C of the maximum range.

Level Transmitters (501D-LT)

Accuracy :

For range B, C & D ±0.75% of the calibration range for turn down ratio from 1:1 to 10:1

For Turn Down ratio from 10:1 to 100:1 $=\pm\left[0.025+0.005\left(\frac{URL}{span}\right)\right]$% of span.

Output Signal of 501D-LT:

linear output : 4~20mA Output superposed with HART® protocol digital signal (two-wire system) or with foundation field bus output protocol

Construction Materials:

- Isolation Chaff and Drain Tap :316 stainless steel, Hastelloy C, Monel alloy and Tantalum
- Filling Liquid : Silicone oil
- Flange and Coupling :316 stainless steel, Hastelloy C and Monel
- Electrical Housing : Die cast Aluminium alloy

Over Pressure Limit : 150 lb Flange : 150kg/cm^2

300 lb Flange : 300kg/cm^2

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Temperature Effect : The Zero Point error is ± 0.25%/55ºC of the maximum range.

Inserted Chaff depth : 2",4" and 6"

Ordering Information

1 Model No. + Range

Range	Models				
	501D-DP	**501D-DF**	**501D-AP**	**501D-HS**	**501D-LT**
A	0-20~715 mmH$_2$O	0-20~715mmH$_2$O	.....	.....	.....
B	0-96~3810 mmH$_2$O	0-96~3810 mmH$_2$O	0-96~3810 mmH$_2$O	0-96~3810 mmH$_2$O	0-96~3810 mmH$_2$O
C	0-0.047~1.90Kg/cm^2	0-0.047~1.90Kg/cm^2	0-0.047~1.90Kg/cm^2	0-0.047~1.90Kg/cm^2	0-0.047~1.90Kg/cm^2
D	0-0.18~7 Kg/cm^2	0-0.18~7 Kg/cm^2	0-0.18~7 Kg/cm^2	0-0.18~7 Kg/cm^2	0-0.18~7 Kg/cm^2
E	0-0.25~21 Kg/cm^2	0-0.25~21 Kg/cm^2	0-0.25~21 Kg/cm^2	0-0.25~21 Kg/cm^2	.....
F	0-1.75~70 Kg/cm^2	0-1.75~70 Kg/cm^2	0-1.75~70 Kg/cm^2	.....	.....
G	.....	.....	.....	.....	.....
H	.....	.....	.....	.....	.....

2 Output

1	4~20mA DC linear output with Hart protocol
2	4~20mA DC linear output with Field Bus (FF)
3	4~20mA DC Square root output with Hart protocol
4	4~20mA DC Square root output with Field Bus (FF)

3 Material of Constructions

(Isolation Chaff + Liquid + Flange & Coupling)

Description		**Materials**		
Isolation Chaff & Drain Tap	**A**	**B**	**C**	**D**
	Stainless Steel	Hastelloy C	Monel Alloy	Tantalum
Liquid	**S**			
	Silicone Oil			
Flange & coupling	**J**	**K**	**L**	**M**
	Stainless Steel	Hastelloy C	Monel Alloy	Tantalum

★4

Process Connection Details

1	¼" NPT(F)
2	½ " NPT(F)
3	2" ANSI Class 150
4	2" ANSI Class 300
5	3" ANSI Class 150
6	3" ANSI Class 300
7	Others

★5

Fitting

M	2" mounting bracket
N	Without mounting bracket

★6

Accessories

1	2 way manifold valve
2	3 way manifold valve
3	5 way manifold valve
4	None

★7

Electrical Connection

O	½" NPT
P	Others

★8

Housing

5	Die Cast Aluminum
6	Others

★9

Protection

W	Weather Proof
E	Explosion Proof
I	Intrinsically Safely

Model No.

501D-	★1	★2	★3	★4	★5	★6	★7	★8	★9

Remote Seal Absolute Pressure / Differential / Flow Transmitter

(501D-RS-AP / 501D-RS-DP / 501D-RS-FT)

Summary

501-RS can be used in order to avoid the direct contact between the Isolation chaff and the measured medium.

Remote Transmission Transmitter is applicable in the following condition.

- High temperature medium are required to be isolated.
- The measured medium is corrosive to sensing elements.
- The measured medium can solidify or crystallize as a result of the temperature change of conditions or flow.
- The probe is required to be strictly cleaned when measured medium is changed.
- The probe is required to be kept clean.

Accuracy :

For range B & C ±0.1% of the calibration range for turn down ratio from 1:1 to 10:1

For range D , E & F ±0.075% of the calibration range for turn down ratio from 1:1 to 10:1

For Turn Down ratio from 10:1 to 100:1 $=\pm\left[0.025+0.005\left(\frac{URL}{span}\right)\right]$% of span.

Output Signal of 501D-RS-AP / 501D-RS-DP:

linear output : 4~20mA Output superposed with HART® protocol digital signal (two-wire system) or with foundation field bus output protocol

Output Signal of 501D-RS-FT

Square root output: output and differential pressure are applied in square root relationship and input pressure form 1% to 100%, and are in linear relationship in divided sections at input pressure from to 0% to 100%. There is no saltus in 4-20mA DC output with HART® protocol digital signal (two-wire system). Then user can choose linear output or square root output according to the field conditions. or with foundation field bus output protocol

Construction Materials:

- Isolation Chaff and Drain Tap :316 stainless steel, Hastelloy C, Monel alloy and Tantalum
- Filling Liquid : Silicone oil / Inert Liquid
- Flange and Coupling :316 stainless steel, Hastelloy C and Monel
- Electrical Housing : Die cast Aluminium alloy

Operating Temperature : Silicone oil: -29°C ~ 150°C
Inert liquid: -18°C~ 250°C

Pressure Limit : The rated pressure of the flange.

Start Time : Warm-up free. The time to response is relevant to temperature, pressure, remote transmission style, length of capillary, diameter and filling liquid.

Ordering Information

1 Model No. + Range

Range	Model
	501D-RS-AP / 501D-RS-DP / 501D-RS-FT
B	0-96~3810 mmH₂O
C	0-0.047~1.90Kg/cm²
D	0-0.18~7 Kg/cm²
E	0-0.25~21 Kg/cm²
F	0-1.75~70 Kg/cm²

2 Output

1 4~20mA DC linear output with Hart protocol

2 4~20mA DC linear output with Field Bus (FF)

3 4~20mA DC Square root output with Hart protocol

4 4~20mA DC Square root output with Field Bus (FF)

3 Material of Constructions

(Isolation Chaff + Liquid + Flange & Coupling)

Description		Materials		
Isolation Chaff & Drain Tap	A	B	C	D
	Stainless Steel	Hastelloy C	Monel Alloy	Tantalum
Liquid	S		I	
	Silicone Oil		Inert	
Flange & coupling	J	K	L	M
	Stainless Steel	Hastelloy C	Monel Alloy	Tantalum

★4

Flange size/ Rating

5	1"	ASA/DIN
6	2"	ASA/DIN
7	3"	ASA/DIN
8	Others (Please Specify)	

★5

Material and size of capillary

(Armoured 316ss with PVC coating)

I	316L SST, inside diameter 0.71mm
J	316L SST, inside diameter 1.09mm

★6

LENGTH OF CAPILLARY

1	5 Feet
2	15 Feet
3	25 Feet
4	Others (Please Specify)

★7

REMOTE TRANSMISSION QUANTITY

L	One remote transmission device
M	Two remote transmission device

★8

Fitting

N	2" mounting bracket
O	Without mounting bracket

★9

Electrical Connection

P	½ " NPT
Q	Others

★10

Housing

1	Die Cast Aluminum
2	Others

★11

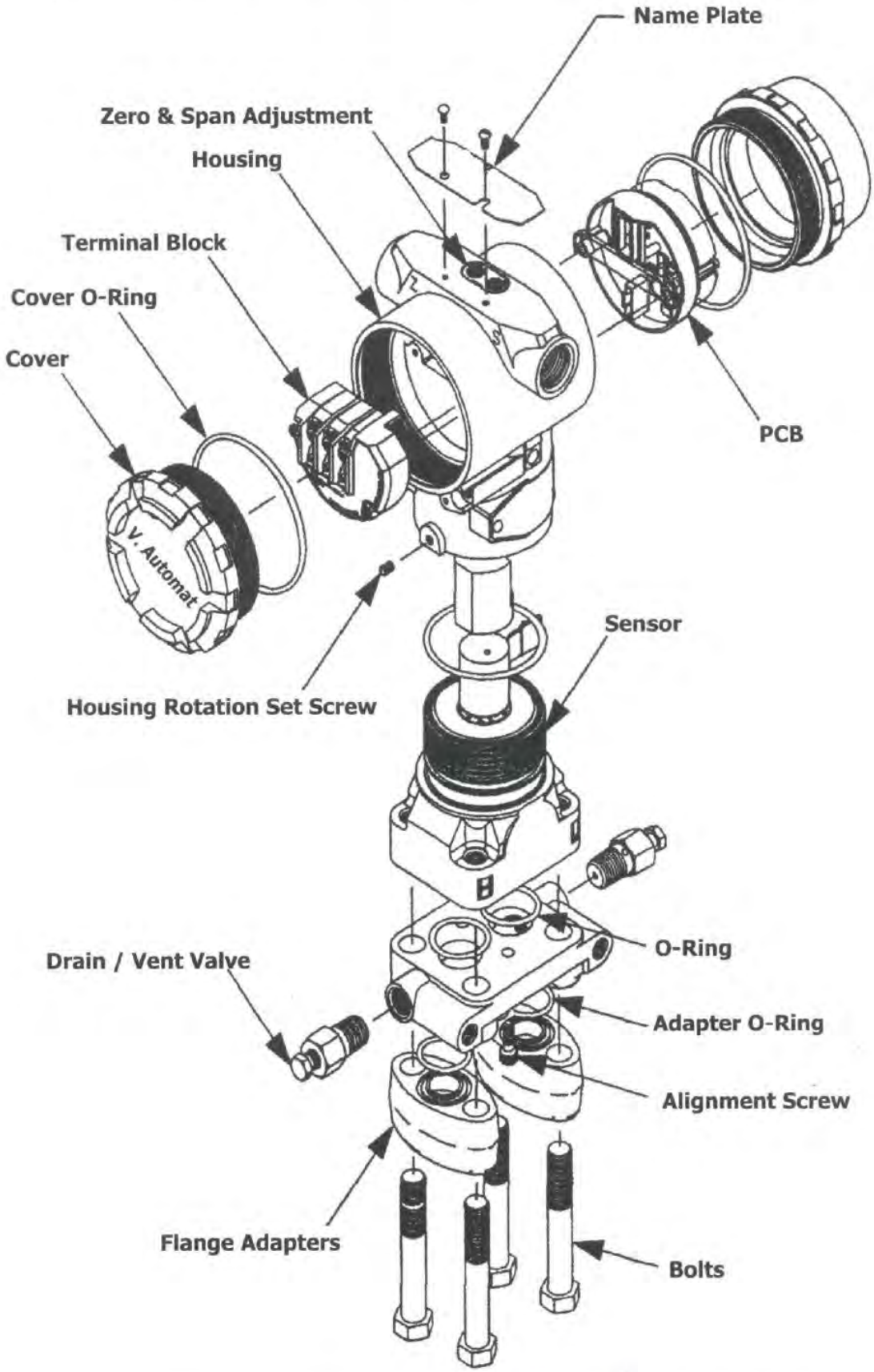
Protection

W	Weather Proof
E	Explosion Proof
I	Intrinsically Safely

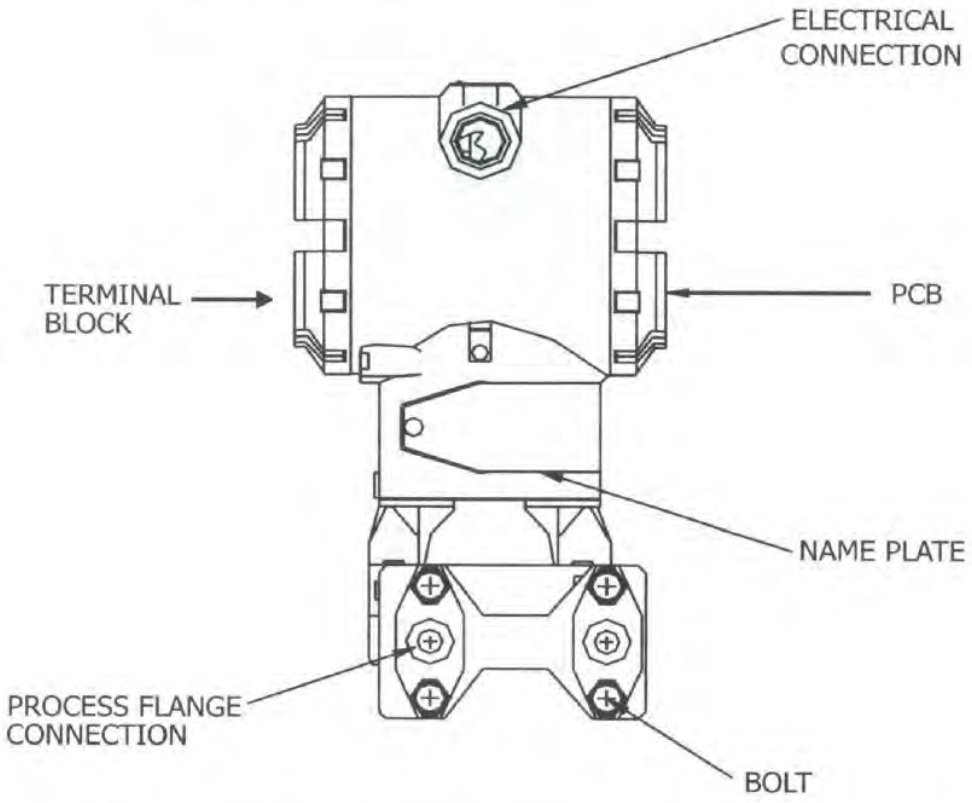
Model No.

501D-RS-	★1	★2	★3	★4	★5	★6	★7	★8	★9	★10	★11

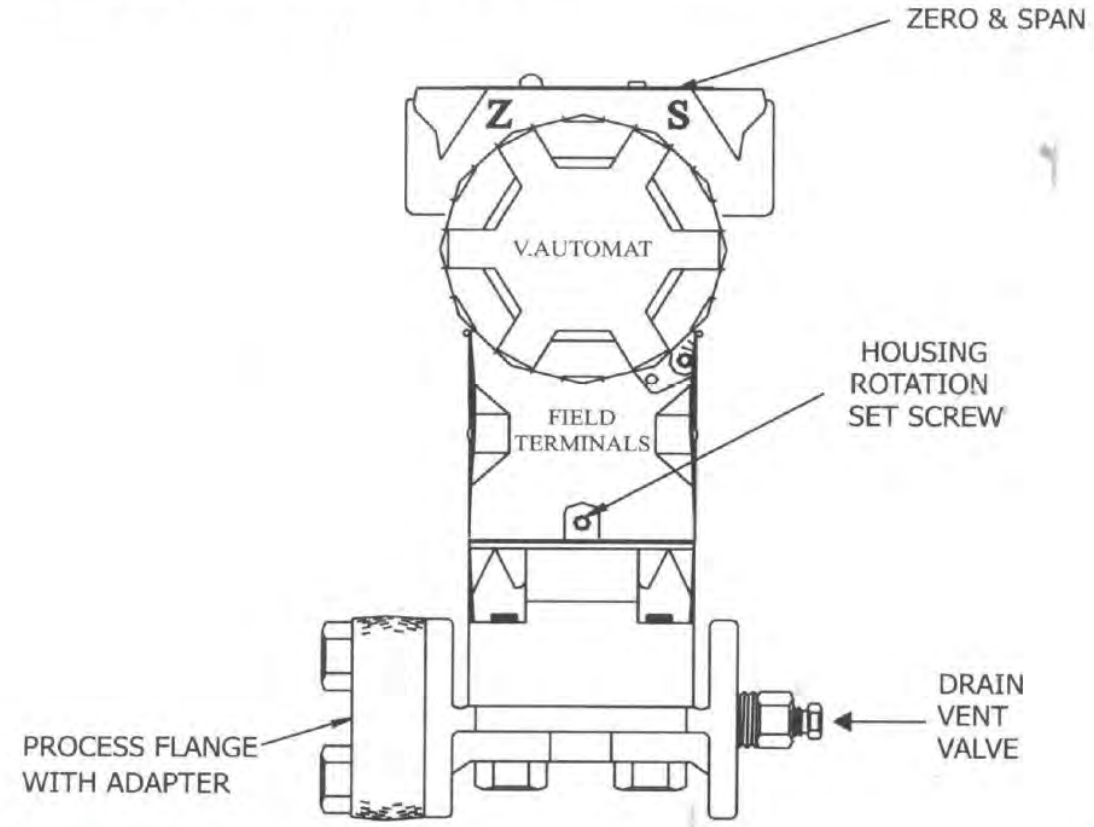
Exploded View of Differential Pressure Transmitter



Line Diagram Of Differential Pressure Transmitter



Line Diagram Of Differential Pressure Transmitter with Adapter



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Pressure Transmitters
(501-P)

Description of Pressure Transmitter

501P Automat Pressure Transmitter is the part of series 501P, consisting of certified electronics. This assembly along with piezoresistive pressure element makes the complete Pressure Transmitter. This Microprocessor based digital smart Pressure Transmitter is maintenance free & accurate. 501P series SMART Pressure Transmitters are microprocessor-based instruments that combine the analog signal advantages (4-20 mA) together with the flexibility of digital communication using HART® protocol & Field bus(FF). Pressure Transmitter can be configured by using universal Hand Held HART communicator (HHC) or by Computer(PC) with dedicated software. The facility of Automat design is such that it is easy to calibrate by any of the two different methods i.e. HHC as well as by PC with dedicated software.

Technical Specifications

- **Application** : Liquid, Gas and Steam
- **Power Supply** : External Power Supply 24V DC (Power Range 12V~45V)
- **Output Signal** : 4~20mA Output Superimposed with HART® Protocol/ Digital Output (FF)
- **System** : 2 Wire
- **Accuracy** : ± 0.1% of span for>1/10th URL
- **Output Action** : Direct: Increasing input increases output or
  Reverse Increasing input decreases output.
- **Zero /span adjustments** : Continuous with zero elevation and span suppression
- **Relative Humidity** : 0~100%
- **Over Range Limit** : 1.2 times of Maximum range
- **Damping** : Adjustable between 0.2~32 sec
- **Fail safe/ Loop check** : Provided 3.8mA or 21.6mA
- **Display** : 5 Digit LCD
- **Load Resistance** : 600 ohm HART®/ 575 ohm FF

- **Stability** : with error of±0.15% of maximum range for 36 months

- **Temperature Range** : Ambient Temperature: -20~70 C
  Process Temperature: -20~80 C
  Note: For High Temperature use cooling fins

- **Electrical Connection** : ½" NPT (F)

- **Power Supply effect** : Less than ±0.005%/V of the output range

- **Vibration Effect** : The error is ±0.05%/g of the maximum range in AXIS: X, Y, Z @ frequency of 150Hz

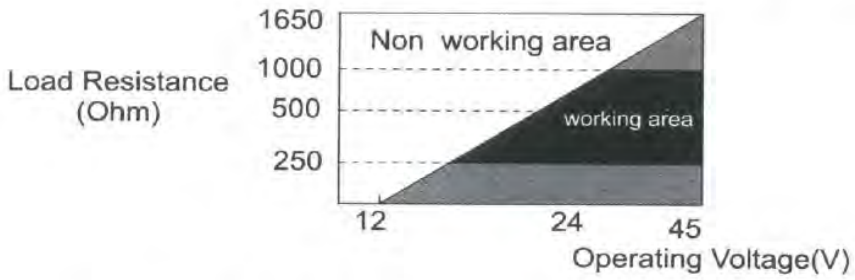
- **Process Connection** : ½" NPT (M) or ½" NPT (F)

- **Response Time** : Less than 100mili second.

- **Sensor Diaphragm Material** : Stainless Steel SS-316

- **Housing Material** : Cast Aluminum Alloy

- **Load Effect** : No load effect in the load working area as long as the voltage applied to the transmitter is higher than 12V



- **Electromagnetic Radiation Test :**
  - Radiated Emission Test as per IEC 61000
  - Radiated Radio Frequency Electromagnetic Field Immunity Test as per IEC 61000
  - Conducted Immunity Test as per IEC 61000

Ordering Information

1 **501-P + Range**

Measuring Range								
A	B	C	D	E	F	G	H	I
-1~1 kg/cm²	0~1 kg/cm²	0~7 Kg/cm²	0~21 Kg/cm²	0~70 Kg/cm²	0~210 Kg/cm²	0~350 Kg/cm²	0~400 Kg/cm²	0~600 Kg/cm²

2 **Output**

1	4~20mA DC linear output with Hart protocol
2	4~20mA DC linear output with Field Bus (FF)

3 **Process Connection Details**

3	½" NPT(M)
4	½ " NPT(F)
5	2" ANSI Class 150
6	2" ANSI Class 300
7	3" ANSI Class 150
8	3" ANSI Class 300
9	Others

4 **Fitting**

J	2" mounting bracket
K	Without mounting bracket

5 **Accessories**

1	2 way manifold valve
2	None

6 **Housing**

1	Die Cast Aluminum
2	Others

7 **Electrical Connection**

L	½ " NPT
M	Others

★

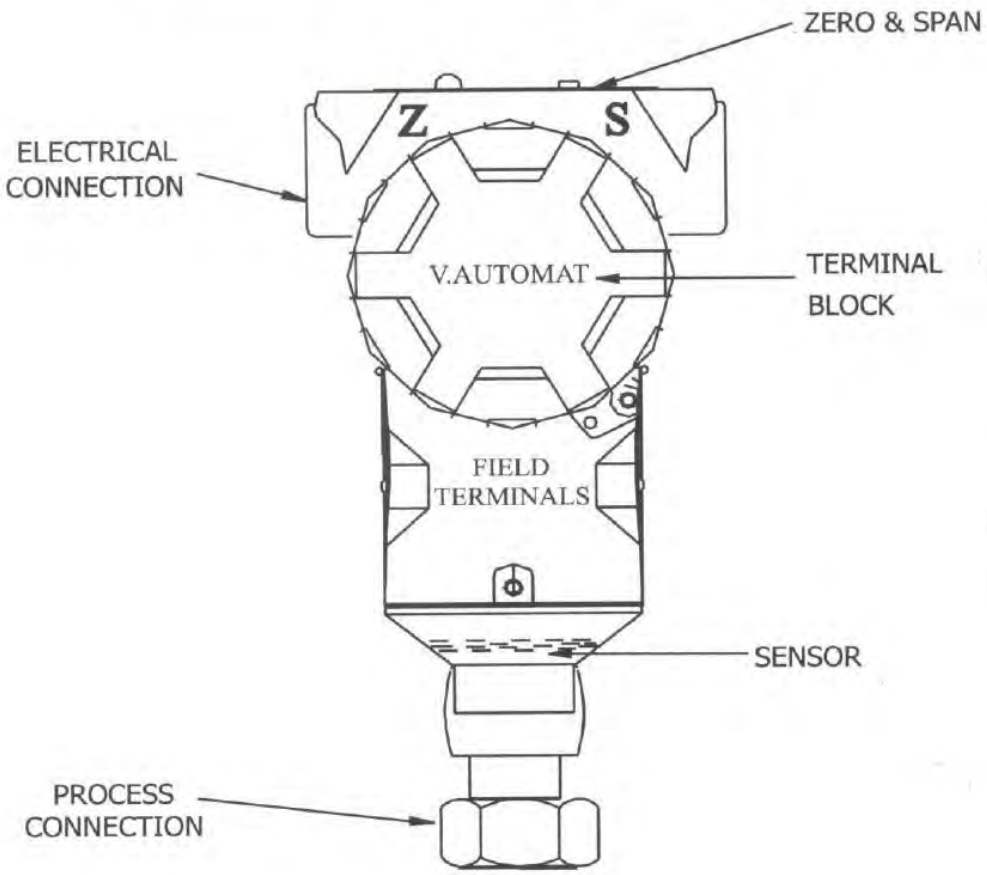
Protection

W	Weather Proof
E	Explosion Proof
I	Intrinsically Safely

Model No.

501-P	★ 1	★ 2	★ 3	★ 4	★ 5	★ 6	★ 7	★ 8

Line Diagram Of Pressure Transmitter



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(See Website for address)

Specifications Subject to change without prior notice