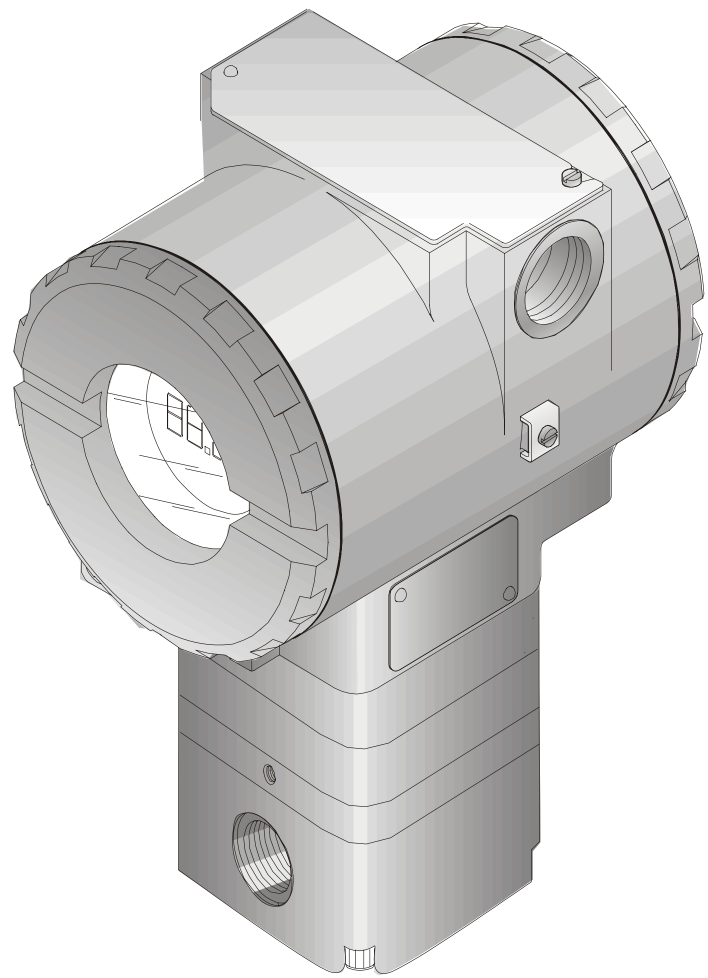
OPERATION & MAINTENANCE INSTRUCTIONS MANUAL

FP302

FIELDBUS TO PRESSURE CONVERTER



smar

FIRST IN FIELDBUS

MAR / 05

FP302

VERSION 3

FOUNDATION

F P 3 0 2 M E

smar

web: www.smar.com

Specifications and information are subject to change without notice.
For the latest updates, please visit the SMAR website above.

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INTRODUCTION

The **FP302** belongs to the first generation of Foundation Fieldbus devices. It is a converter mainly intended for interfacing a Fieldbus System to a Pneumatic valve or actuator. The **FP302** produces a 3-15psi of output proportional to the input received over the Fieldbus network. The digital technology used in the **FP302** enables an easy interface between the field and the control room and several interesting features that reduce considerably the installation, operation and maintenance costs.

The **FP302** is part of SMAR's complete 302 line of Foundation Fieldbus devices.

Fieldbus is not only a replacement for 4-20 mA or intelligent / smart transmitter protocols, it contains much more. Fieldbus is a complete system enabling distribution of the control function to equipment in the field.

Some of the advantages of bi-directional digital communications are known from existing smart transmitter protocols: Higher accuracy, multi-variable access, remote configuration and diagnostics, and multi-dropping of several devices on a single pair of wires.

Some of the disadvantages, in comparison to 4-20 mA technology, has also been seen: Communication speed too low for closed loop control, poor Inter-operability between devices of different type and manufacturer. Others: not possible to pass data direct from one field device to another (peer-to-peer communication).

The main requirement for Foundation Fieldbus was to overcome these problems. Closed loop control with performance like a 4-20 mA system requires higher speed. Since higher speed means higher power consumption, this clashes with the need for intrinsic safety. Therefore a moderately high communication speed was selected, and the system was designed to have a minimum of communication overhead. Using scheduling the system controls variable sampling, algorithm execution and communication so as to optimize the usage of the network, not loosing time. Thus, high closed loop performance is achieved.

Using Fieldbus technology, with its capability to interconnect several devices, very large control schemes can be constructed. In order to be user friendly, the function block concept was introduced (users of SMAR CD600 should be familiar with this, since it was implemented three years ago). The user may now easily build and overview complex control strategies. Another advantage is added flexibility; the control strategy may be edited without having to rewire or change any hardware.

The **FP302**, like the rest of the 302 family, has several Function Blocks built in, like PID controller, Input Selector and Splitter/Output Selector, eliminating the need for separate device. This takes to reduced communication and thereby less dead-time and tighter control, not to mention the reduction in cost.

The need for implementation of Fieldbus in small as well as large systems was considered when developing the entire 302 line of Fieldbus devices. They have the common features of being able to act as a master on the network and be configured locally using a magnetic tool, eliminating the need for a configurator or console in many basic applications.

Get the best result of the FP302 by carefully reading these instructions.

WARNING
This Manual is compatible with version 3.XX, where 3 denote software version and XX software release. The indication 3.XX means that this manual is compatible with any release of software version 3.

TABLE OF CONTENTS

INSTALLATION

General

The overall accuracy of control depends on several variables. Although the converter has an outstanding performance, proper installation is essential, in order to maximize it.

Among all factors that may affect converter accuracy, environmental conditions are the most difficult to control. However there are, ways of reducing the effects of temperature, humidity and vibration.

The **FP302** has a built-in temperature sensor for temperature compensation. At the field, the temperature variation effect is minimized by this feature.

Locating the converter in areas protected from extreme environmental changes can minimize temperature fluctuation effects.

In warm environments, the converter should be installed to avoid direct exposure to the sun, as much as possible. Installation close to lines and vessels subjected to high temperatures should also be avoided.

Use of sunshades or heat shields to protect the converter from external heat sources should be considered, if necessary.

Humidity is fatal to electronic circuits. In areas subjected to high relative humidity, the O-rings for the electronics cover must be correctly placed. Removal of the electronics cover in the field should be reduced to the minimum necessary, since each time it is re-moved, the circuits are exposed to the humidity. The electronic circuit is protected by a humidity proof coating, but frequent exposures to humidity may affect the protection provided. It is also important to keep the covers tightened in place. Every time they are removed, the threads are exposed to corrosion, since painting cannot protect these parts. Code approved sealing methods on conduit entering the converter should be employed.

Although the converter is virtually insensitive to vibration, installation close to pumps, turbines or other vibrating equipment should be avoided.

Mounting

The **FP302** housing has been designed for mounting on a valve, 2-inch pipe, wall or panel, as show on Figure 1.3 - Dimensional and Mounting Position for FP302.

The mounting may be done in several positions using the bracket.

Make sure that the **FP302** is mounted in such a way that dust and things alike can not clog the exhaust port.

The **FP302** has filters protecting the exhaust port. These must be kept clean, refer to Section 4 – Maintenance Procedures.

For better visibility, the digital indicator may be rotated in steps of 90° (See Section 4 – Maintenance Procedures).

Pneumatic Connections

The **FP302** air supply should be "instrument quality air": dry, clean and non-corrosive. Refer to the American National Standard "Quality Standard for Instrument Air" (ANSI/ISA S7.0.01 - 1996).

The **FP302** is supplied with third party filters. We recommend a periodic cleaning of such filters each 6 months or less, case the air instrument quality is not good.

Air supply pressure must be 1.2 kg/cm^2 (18 psi) minimum to achieve 1 kg/cm^2 (15 psi) output. For lower output spans the supply pressure 0.2 kg/cm^2 (3 psi) above maximum is sufficient. A flow capacity of 6.7 Nm^3/h (4 scfm) is required for full output capacity. For "no load" applications like interfacing to some instruments, a supply capacity equal to the **FP302** air consumption is sufficient.

The maximum supply pressure for the **FP302** is 1.5 Kg/cm^2 (24psi), if this condition cannot be met, an air pressure regulator may be used. The **FP302** can be supplied with third party regulator, on special request.

The air supply port is marked "IN" and the output signal port is marked "OUT" (See Figure 1.3 - Dimensional and Mounting Position for FP302).

Both the supply and the signal port have ¼ NPT connection. Before connecting pneumatics, blow out lines throughly.

There must be no leaks; especially in the output. Leak-test all fittings and tube connections.

Supply pressure in excess may cause damage.

The standard version of **FP302** has no output gauge port as output pressure may be indicated digitally by the optional display. An output gauge may be connected to the output using a "T" connection, or the **FP302** may be ordered with a special output gauge port.

The exhaust port is used to discharge air when the output pressure has to be reduced. The exhaust port is located behind the transducer nameplate (See Figure 1.3 - Dimensional and Mounting Position for FP302). The use of supply gas other than air can create a hazardous environment.

On loss of power the output will decrease to near 0 kg/cm^2 (0 psi) If power is maintained, but communication is lost and the output may be pre-configured to free or go to a safe value.

The adequate volume in output should be a minimum of 2 cubic inches (temperature range –20 ºC to 85 ºC) and a minimum of 6 cubic inches (temperature range –40 ºC to –20 ºC).

Network Wiring
Access the wiring block by removing the Electrical Connection Cover. This cover can be locked closed by the cover locking screw (See Figure 1.1 - Cover Locking). To release the cover, rotate the locking screw clockwise.

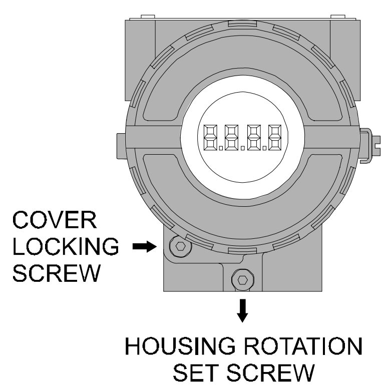


Figure 1.1 - Cover Locking

Cable access to wiring connections is obtained by one of the two conduit outlets. Conduit threads should be sealed by means of code-approved sealing methods.
The unused outlet connection should be plugged accordingly.

Conduit should be connected to prevent condensation from collecting in the instrument.

The wiring block has screws, on which terminal type fork or ring can be fastened (See *Figure 1.2 - Wiring Block*).

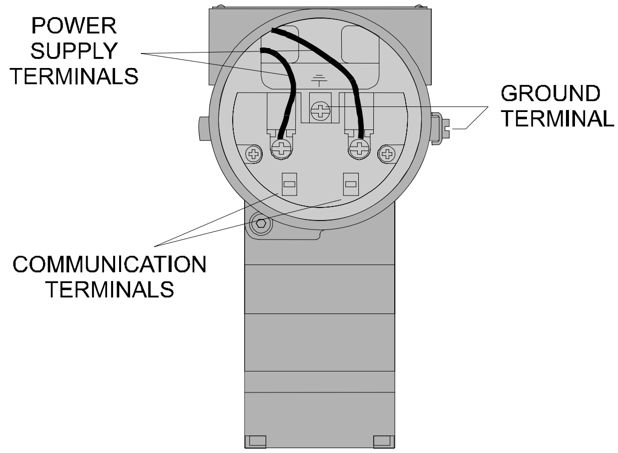


Figure 1.2 - Wiring Block

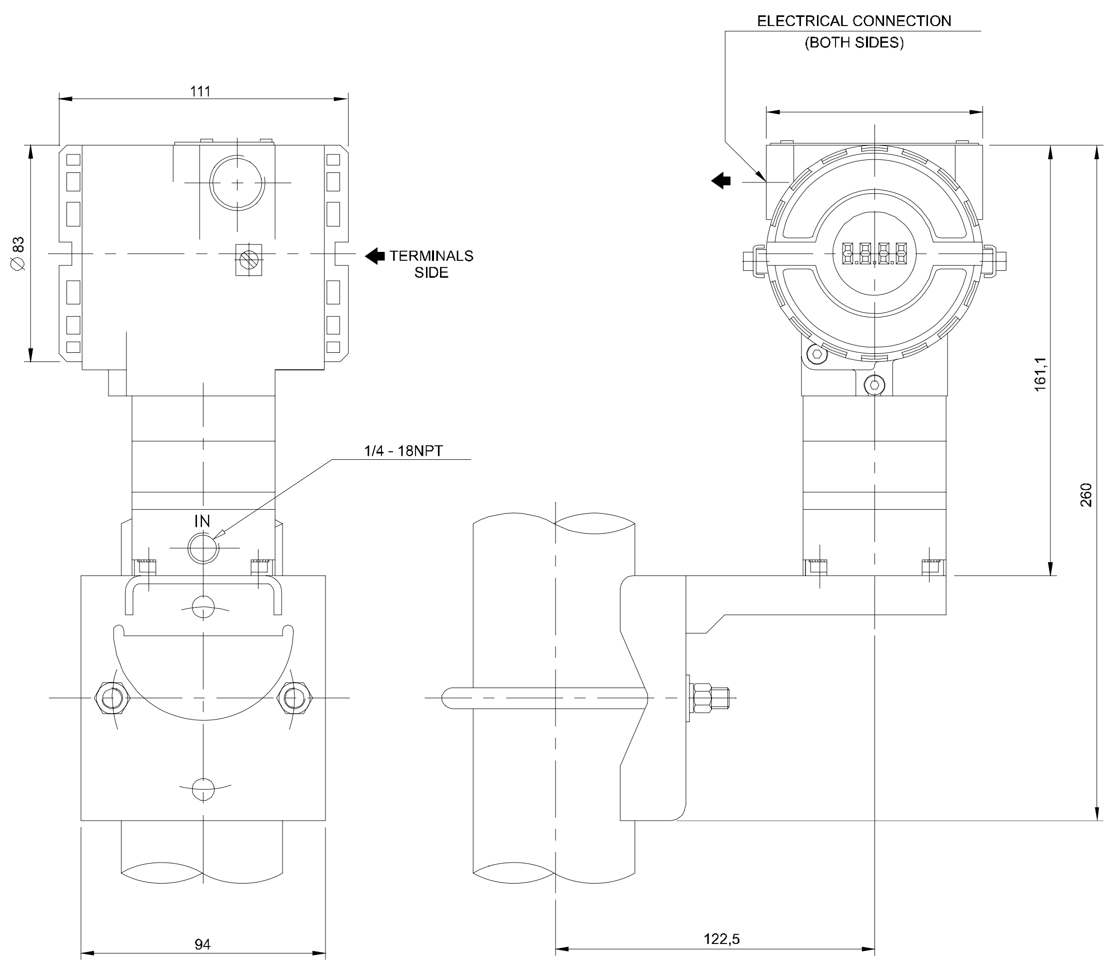


Figure 1.3 - Dimensional and Mounting Position for FP302

For convenience there are three ground terminals: one inside the cover and two external, located close to the conduit entries.

The **FP302** is using the 31.25 kbit/s baud rate option for the physical signaling. All other devices on the same bus must use the same signaling. All devices are connected in parallel along the same pair of wires.

Various types of Fieldbus devices may be connected on the same bus.

The **FP302** is powered via the bus, the limit for such devices is 15 in one bus, for non-intrinsically safe installations.

In hazardous area, the number of devices may be limited by intrinsically safe restrictions.

WARNING

HAZARDOUS AREAS
In hazardous zones with explosion proof requirements the covers must be tightened with at least 7 turns. In order to avoid moisture or corrosive gases, hand tight the covers until the O-rings are compressed. Lock the covers closed with the locking screw.

In hazardous zones with intrinsically safe or non-incendive requirements, the circuit entity parameters and applicable installation procedures must be observed.

Cable access to wiring connections is obtained by the two conduit outlets. Conduit threads should be sealed by means of code-approved sealing methods.

Explosion proof, non-incendive and intrinsic safety Factory Mutual certification pending for **FP302** .

Should other certifications be necessary, refer to the certification or specific standard for installation limitations.

Avoid routing signal wiring close to power cables or switching equipment.

The **FP302** is protected against reverse polarity, and can withstand ±35 Vdc without damage.

Reverse polarity will not damage the it, but it will not operate.

Topology and Network Configuration

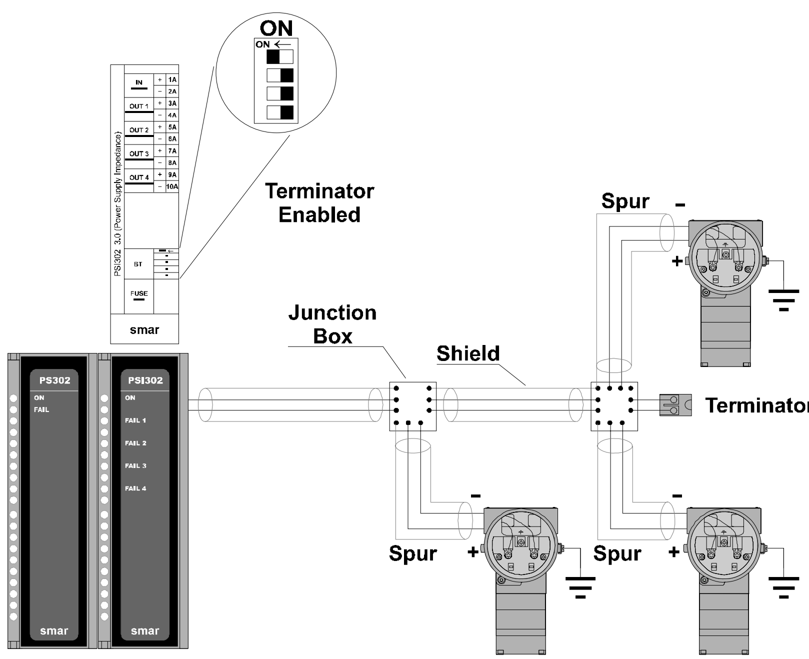


Figure 1.4 - Bus Topology

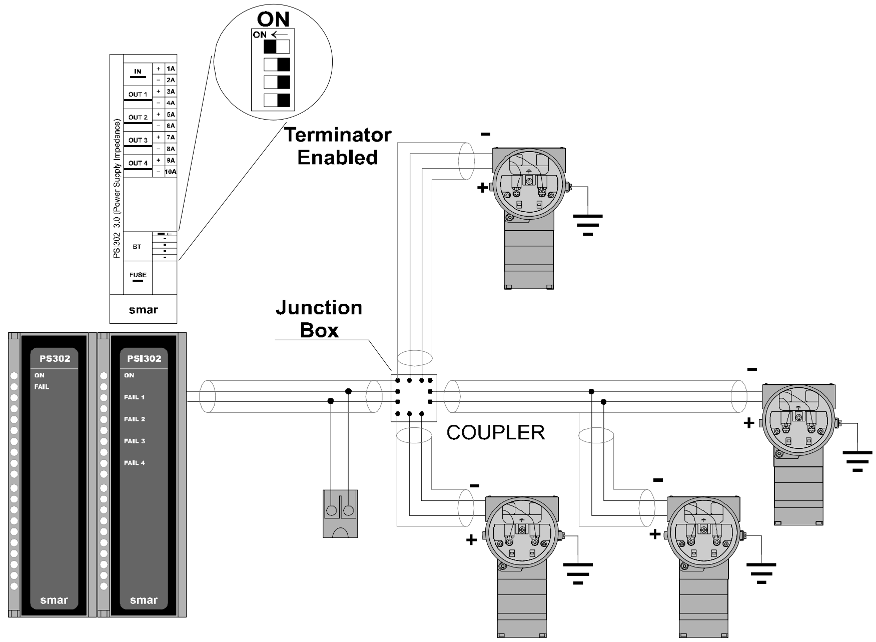


Figure 1.5 - Tree Topology

OPERATION

Functional Description Output Module

The main parts of the output module are the pilot, servo, pressure sensor and the output control circuit.

The **FP302** CPU receives the desired output level over the Fieldbus network. The CPU produces an electronic Setpoint signal to the control circuit. The control circuit also receives a feedback signal from a pressure sensor on the **FP302** output.

The pneumatic part is based on the well-known and widely used pilot tube and pneumatic relay technology (See *Figure 2.1 - Schematic Pneumatic Transducer*).

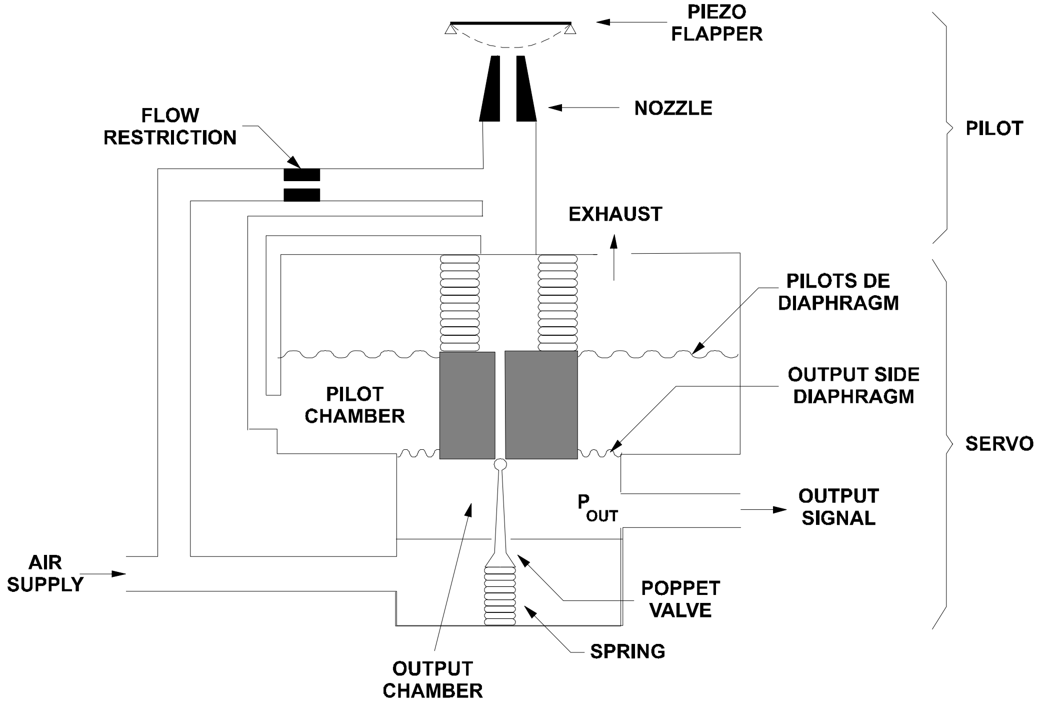


Figure 2.1 - Schematic Pneumatic Transducer

It is used a piezoelectric disk as flapper in the pilot stage. The flapper is deflected when the control circuit applies a certain voltage. A small stream of air flowing through the nozzle is obstructed causing an increase in pressure in the pilot chamber, this is called the pilot pressure. For a certain section the pilot pressure response is linear to the flapper deflection, this is the section used for operation.

The pilot pressure is far too low, and has no flow capacity. It must therefore be boosted. This is done in the servo section, which acts as a pneumatic relay.

The servo section has one diaphragm on the pilot chamber side, and another smaller diaphragm on the output chamber side. The pilot pressure applies a force to the pilot side diaphragm, which at steady state will be equal to the force that the output pressure applies on the output side diaphragm.

When an increase in pressure is demanded, pilot pressure decreases as explained for the pilot stage. The spring 1 forces the poppet valve down increasing the output pressure until a new equilibrium is reached.

If a decrease in pressure is demanded, pilot pressure increases. The poppet valve will be forced closed by the spring 2 and diaphragms will be pushed up by the greater force from the output and pilot pressure. The air in the system may now escape through the exhaust port, decreasing the output pressure until the equilibrium is once again reached.

Functional Description - Electronics

The function of each block is described, as following.

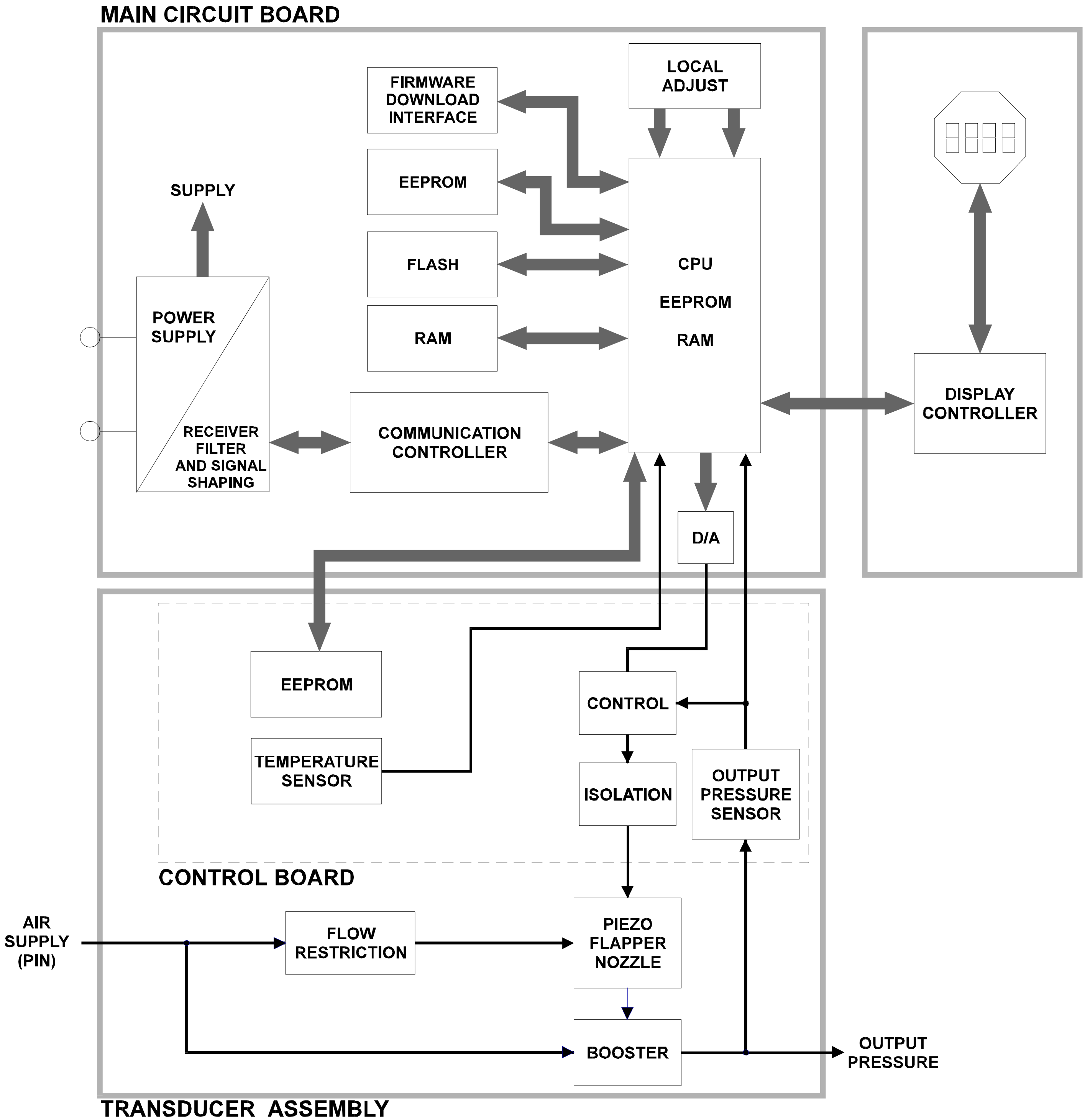


Figure 2.2 - FP302 Block Diagram

D/A
Receives the signal from the CPU and converts it to an analog voltage, used by the control.

Control
Controls the output pressure according the data received from the CPU and the pressure sensor feedback.

Output Pressure Sensor
Measures the output pressure and feedback the value to the control and CPU.

Temperature Sensor
Measures the temperature of the Transducer Assembly.

Isolation
Its function is to isolate the fieldbus signal from the piezoelectric.

EEPROM
Non volatile memory that keeps the data when the **FP302** is reseted.

(CPU) Central Processing Unit, RAM, PROM and EEPROM
The CPU is the intelligent portion of the converter, being responsible for the management and operation of block execution, self-diagnostics and communication. The program is stored in PROM. For temporary storage of data there is a RAM. The data in the RAM is lost if the power is switched off, however the device also has a nonvolatile EEPROM where data that must be retained is stored. Examples of such data are calibration, configuration and identification data.

Communication Controller
Monitors line activity, modulate and demodulate communication signals and inserts and deletes start and end delimiters.

Power Supply
Takes power of the loop-line to power the converter circuitry.

Display Controller
Receives data from the CPU and drives the Liquid Crystal Display.

Local Adjustment
Two switches that are magnetically activated. They can be activated by the magnetic tool without mechanical or electrical contact.

Piezo Flapper Nozzle
The unit flapper nozzle converts the movement of piezoelectric into a pneumatic signal to control pressure in the pilot chamber.

Restriction
The restriction and the nozzle form a pressure-divided circuit. Air is supplied to the nozzle through a restriction.

Booster
The booster is designed to convert pressure changes ahead of the restriction into much greater pressure changes with far larger volumes of air than can be passed through the restriction.

Section 3

CONFIGURATION

One of the many advantages of Foundation Fieldbus is that device configuration is independent of the configurator. The **FP302** may be configured by a third party terminal or operator console. Any particular configurator is therefore not addressed here. Anymore SMAR has a configurator called **SYSCON.** For more information contact your nearest representative.

The **FP302** contains one output transducer block, one resource block, one display transducer block and others function blocks can also be instantiated.

Transducer Block

Transducer block insulates function block from the specific I/O hardware, such as sensors, actuators. Transducer block controls access to I/O through manufacturer specific implementation. This permits the transducer block to execute as frequently as necessary to obtain good data from sensors without burdening the function blocks that use the data. It also insulates the function block from the manufacturer specific characteristics of certain hardware.
By accessing the hardware, the transducer block can get data from I/O or passing control data to it. The connection between Transducer block and Function block is called channel. These blocks can exchange data from its interface.
Normally, transducer blocks perform functions, such as linearization, characterization, temperature compensation, control and exchange data to hardware.

How to Configure a Transducer Block

Each time when you select a field device on **SYSCON** by instantiating on the Operation menu, automatically you instantiate one transducer block and it appears on screen.
The icon indicates that one transducer block has been created and by clicking twice on the icon, you can access it.

The transducer block has an algorithm and a set of contained parameters.
The algorithm describes the behavior of the transducer as a data transfer function between the I/O hardware and other function block. The set of contained parameters, it means, you are not able to link them to other blocks and publish the link via communication, defines the user interface to the transducer block. They can be divided into Standard and Manufacturer Specific.
The standard parameters will be present for such class of device, as pressure, temperature, actuator, etc., whatever is the manufacturer. Oppositely, the manufacturers specific ones are defined only for its manufacturer. As common manufacturer specific parameters, we have calibration settings, material information, linearization curve, etc.
When you perform a standard routine as a calibration, you are conducted step by step by a method. The method is generally defined as guide line to help the user to make common tasks. The **SYSCON** identifies each method associated to the parameters and enables the interface to it.

FP302 - Fieldbus Pressure Transducer

Description
The fieldbus pressure transducer block is a basic positioner transducer, which means that it is actually only a direct output, without positioning algorithm. The transducer block receives the demanded pneumatic signal output FINAL_VALUE from the AO block and makes the corrected actual position sensor reading RETURN available to the AO block. The engineering unit and the final value range are selected from the XD_SCALE in the AO block. The units allowed are: Pa, KPa, MPa, bar, mbar, torr, atm, psi, g/cm², kg/cm², inH20 a 4°C, inH2O a 68°F, mmH20 a 68°F, mmH20 a 4°C, ftH20 a 68°F, inHg a 0°C, mmHg a 0°C. The XD_SCALE range must be inside the range in the unit selected (3-30 psi). The supported mode is OOS and AUTO. As the transducer block runs together with AO block, the transducer block goes to AUTO only if the AO mode block is different from OOS. The sensor module temperature may be read from the SECONDARY_VALUE parameter.
Warning messages may appear in Return status or in the Block Error in certain condition as explain below.

Supported Modes
OOS and AUTO.

BLOCK_ERR
The BLOCK_ERR of the transducer block will reflect the following causes:

- Block Configuration – When the XD_SCALE has an improper range or unit.

- Output Failure – When mechanic module is disconnected from main electronic board or no air supply.
- Out of Service – When the block is in OOS mode.

Return Status

The RETURN status of the transducer block will reflect the following causes:
Bad::NonSpecific:NotLimited – When mechanic module is disconnected from main electronic board or no air supply.

Parameters

Idx	Parameter	Data Type	Valid Range	Initial/ Default Value	Units	Store	Description
1	ST_REV	Unsigned16	Positive	0	None	S	Indicates the level of static data.
2	TAG_DESC	VisibleString		Null	Na	S	Description of Transducer Block.
3	STRATEGY	Unsigned16		0	None	S	This parameter is not checked and processed by Transducer Block.
4	ALERT_KEY	Unsigned8	1-255	0	Na	S	Number of identification in the plant.
5	**MODE_BLK**	**DS-69**		**O/S,AUTO**	**None**	**S**	**Indicates the operation mode of Transducer Block.**
6	**BLOCK_ERR**	**Bit String**			**E**	**D**	**Indicates the status associated with hardware or software in the Transducer.**
7	UPDATE_EVT	DS-73			Na	D	It is the alert for any static data.
8	BLOCK_ALM	DS-72			Na	D	It is used for configuration, hardware and others failures.
9	TRANSDUCER_DIRECTORY	Array of Unsigned16			None	N	It is used to select several Transducer Blocks.
10	TRANSDUCER_TYPE	Unsigned16		65535	None	N	Indicates the type of Transducer according to its class.
11	XD_ERROR	Unsigned8		16	None	D	It is used to indicate calibration status.
12	COLLECTION_DIRECTORY	Array of Unsigned 32			None	S	Specifies the number of transducer index into Transducer Block.
13	**FINAL_VALUE**	**DS-65**			**FRV**	**D**	**It is the pressure value and status that comes from AO block.**
14	**FINAL_VALUE_RANGE**	**DS-68**			**FRV**	**S**	**The High and Low range limit values, the engineering unit code and the number of digits to the right of the decimal point to be used for Final Value.**
15	CAL_POINT_HI	Float	12.0-16.0 psi	15.0	CU	S	The highest calibrated point.
16	CAL_POINT_LO	Float	2.5-5.0 psi	3.0	CU	S	The lowest calibrated point.
17	CAL_MIN_SPAN	Float		7.0	CU	S	The minimum calibration span value allowed. This minimum span information is necessary to ensure that when calibration is done, the two calibrated points (high and low) are not too close together.
18	CAL_UNIT	Unsigned16		1141(psi)	E	S	Engineering units code for the calibration values.
19	CONV_SN	Unsigned32		0	None	S	The converter serial number.
20	CAL_METHOD	Unsigned8		Factory	None	S	The method of last sensor calibration.
21	ACT_FAIL_ACTION	Unsigned8		0	None	S	Specifies the action the actuator takes in case of failure.
22	ACT_MAN_ID	Unsigned32		0	None	N	The actuator manufacturer identification number.
23	ACT_MODEL_NUM	VisibleString		NULL	None	N	The actuator model number.
24	ACT_SN	VisibleString		0	None	N	The actuator serial number.
25	VALVE_MAN_ID	Unsigned32		0	E	N	The valve manufacturer identification number.
26	VALVE_MODEL_NUM	VisibleString		NULL	None	N	The valve model number.
27	VALVE_SN	VisibleString		0	None	N	The valve serial number.

Idx	Parameter	Data Type	Valid Range	Initial/ Default Value	Units	Store	Description
28	VALVE_TYPE	Unsigned8			E	N	The type of the valve.
29	XD_CAL_LOC	VisibleString		NULL	None	S	The location of the last device calibration.
30	XD_CAL_DATE	Time of Day			None	S	The date of last device calibration.
31	XD_CAL_WHO	VisibleString		NULL	None	S	The name of the person responsible for the last calibration.
32	SECONDARY_VALUE	DS-65		0	SUV	D	The secondary value related to the sensor.
33	**SECONDARY_VALUE_UNIT**	**Unsigned16**		**°C(1001)**	**E**	**S**	**The engineering units to be used with the secondary value related to the sensor.**
34	**SENSOR_RANGE**	**DS-68**		**3.0-15.0 psi**	**FRV**	**S**	**The high and low range limits values, the engineering unit and the number of digits to the right of the decimal for the sensor.**
35	**BACKUP_RESTORE**	**Unsigned8**		**0**	**None**	**S**	**This parameter is used to do backup or to restore configuration data.**
35	COEFF_PRESS_POL0	Float	± INF	-7.78630E-3	None	S	The coefficient of pressure 0.
37	COEFF_PRESS_POL1	Float	± INF	0.118645	None	S	The coefficient of pressure 1.
38	COEFF_PRESS_POL2	Float	± INF	-1.2996E-4	None	S	The coefficient of pressure 2.
39	COEFF_PRESS_POL3	Float	± INF	1.2045E-6	None	S	The coefficient of pressure 3.
40	COEFF_PRESS_POL4	Float	± INF	-2.05803E-9	None	S	The coefficient of pressure 4.
41	COEFF_PRESS_POL5	Float	± INF	1.04282E-6	None	S	The coefficient of pressure 5.
42	COEFF_PRESS_POL6	Float	± INF	-1.50E-5	None	S	The coefficient of pressure 6.
43	COEFF_PRESS_POL7	Float	± INF	0.0	None	S	The coefficient of pressure 7.
44	COEFF_PRESS_POL8	Float	± INF	0.0	None	S	The coefficient of pressure 8.
45	COEFF_PRESS_POL9	Float	± INF	0.0	None	S	The coefficient of pressure 9.
46	COEFF_PRESS_POL10	Float	± INF	0.0	None	S	The coefficient of pressure 10.
47	POLYNOMIAL_PRESS_VERSION	Unsigned8		11H	None	S	The pressure polynomial version.
48	COEFF_SENS_PRESS_POL0	Float	± INF	-8.83725E-3	None	S	The coefficient of pressure sensor 0.
49	COEFF_SENS_PRESS_POL1	Float	± INF	8.2531E-2	None	S	The coefficient of pressure sensor 1.
50	COEFF_SENS_PRESS_POL2	Float	± INF	1.06854E-4	None	S	The coefficient of pressure sensor 2.
51	COEFF_SENS_PRESS_POL3	Float	± INF	-9.99245E-7	None	S	The coefficient of pressure sensor 3.
52	COEFF_SENS_PRESS_POL4	Float	± INF	1.8581E-9	None	S	The coefficient of pressure sensor 4.
53	COEFF_SENS_PRESS_POL5	Float	± INF	-6.73231E-6	None	S	The coefficient of pressure sensor 5.
54	COEFF_SENS_PRESS_POL6	Float	± INF	0.0	None	S	The coefficient of pressure sensor 6.
55	COEFF_SENS_PRESS_POL7	Float	± INF	0.0	None	S	The coefficient of pressure sensor 7.
56	POLYNOMIAL_SENS_PRESS_VERSION	Unsigned8		10H	None	S	The polynomial version for the pressure sensor.
57	CAL_POINT_HI_SENSOR_PRES	Float		15.0	psi	S	The highest calibration point for the pressure sensor.
58	CAL_POINT_LO_SENSOR_PRES	Float		3.0	psi	S	The lowest calibration point for the pressure sensor.
59	COEFF_SENS_TEMP_POL0	Float	± INF	-7.05E1	None	S	The coefficient of temperature sensor 0.
60	COEFF_SENS_TEMP_POL1	Float	± INF	7.734E-1	None	S	The coefficient of temperature sensor 1.
61	COEFF_SENS_TEMP_POL2	Float	± INF	-1.072E-4	None	S	The coefficient of temperature sensor 2.
62	COEFF_SENS_TEMP_POL3	Float	± INF	0.0	None	S	The coefficient of temperature sensor 3.
63	COEFF_SENS_TEMP_POL4	Float	± INF	0.0	None	S	The coefficient of temperature sensor 4.
64	POLYNOMIAL_SENS_TEMP_VERSION	Unsigned8		10H	None	S	The polynomial version for the temperature sensor.
65	RETURN	DS-65		0	FRV	D	The actual pressure value and status that goes too Readback_Value in an AO Block.
66	CHARACTERIZATION_TYPE	Unsigned8		255	None	S	Indicates the type of characterization curve.

Idx	Parameter	Data Type	Valid Range	Initial/ Default Value	Units	Store	Description
67	CURVE_BYPASS	Unsigned8	True/False	True	None	S	Enable and disable the characterization curve.
68	CURVE_LENGTH	Unsigned8	2 to 8	8	None	S	Indicates the length of characterization curve.
69	CURVE_X	Array of Float		%	%	S	Input points of characterization curve.
70	CURVE_Y	Array of Float		%	%	S	Output points of characterization curve.
71	FEEDBACK _CAL	Float			FRV	S	The measured pressure value used by the calibration method.
72	CAL_CONTROL	Unsigned8	En/Dis	Disable	None	D	After enter in a calibration method CAL_CONTROL is used to return to the normal operation before the calibration.
73	CAL_POINT_HI_BACKUP	Float		15	CU	S	Indicates the backup for highest calibration point.
74	CAL_POINT_LO_ BACKUP	Float		3	CU	S	Indicates the backup for lowest calibration point.
75	CAL_POINT_HI_FACTORY	Float		15	CU	S	Indicates the factory for highest calibration point.
76	CAL_POINT_LO_FACTORY	Float		3	CU	S	Indicates the factory for lowest calibration point.
77	PWM_CAL_POINT_HI	Float		12450	None	S	The pwm value for the highest calibration point.
78	PWM_CAL_POINT_LO	Float		2490	None	S	The pwm value for the lowest calibration point.
79	OUT_POLYN_CAL_POINT_HI _PRES	Float		1.90	None	S	The polynomial output value for the highest calibration point.
80	OUT_POLYNCAL_POINT_LO_PRES	Float		0.38	None	S	The polynomial output value for the lowest calibration point.
81	OUT_POLYNOMIAL_PRESS	DS-65		0	psi	D	The polynomial output value when in normal operation.
82	SENSOR_PRESSURE	DS-65		0	psi	D	The value and status for the pressure sensor.
83	DIGITAL_PRESSURE	DS-65		0	None	D	The digital value and status for the pressure sensor.
84	OUT_POLYNOMIAL_SENS_PRESS	DS-65		0	psi	D	The polynomial output value for the pressure sensor when in normal operation.
85	DIGITAL_VOLTAGE	DS-65		0	None	D	The digital value and status for the piezo.
86	VOLTAGE	DS-65		0	VOLTS	D	The value and status for the piezo.
87	PWM_VALUE	Unsigned16		0	None	D	The value pwm to actual pressure in the process.
88	SENSOR_TEMPERATURE	DS-65		0	°C	D	The value and status for temperature sensor.
89	DIGITAL_TEMPERATURE	DS-65		0	None	D	The digital value and status for temperature sensor.
90	CAL_TEMPERATURE	Unsigned8	-40/85 °C	25 °C	°C	S	The calibration point for the temperature sensor.
91	CAL_DIGITAL_TEMPERATURE	Float		125.606	None	S	The digital calibration point for the temperature sensor.
92	ORDERING_CODE	VisibleString		NULL	None	S	Indicates information about the sensor and control from factory production.

Legend: E – Enumerated parameter; Na – Admensional parameter; RO – Read only; D – dynamic; N – non-volatile; S – Static
CU: CAL_UNIT; FVR: FINAL_VALUE_RANGE; SR: SENSOR_RANGE; SVU: SECONDARY_VALUE_RANGE
Gray Background Line: Default Parameters of Syscon

Calibration

There is a specific method to make the calibration operation. It is necessary to match the source of reference applied to or connected to the device with the wished value. At least four parameters should be used to configure this process: CAL_POINT_HI, CAL_POINT_LO, CAL_MIN_SPAN, and CAL_UNIT. Those parameters define the highest and lowest calibrated values for this device, the minimum allowable span value for calibration (if necessary) and the engineering unit selected for calibration purposes.

Pressure Trim - FP302

It is possible to calibrate the transmitter by means of parameters CAL_POINT_LO and CAL_POINT_HI.

First of all, a convenient engineering unit should be chosen before starting the calibration. This engineering unit is configured by CAL_UNIT parameter. After its configuration the parameters related to calibration will be converted to this unit.

Through the parameters CAL_POINT_LO and CAL_POINT_HI the device can be calibrated. The CAL_UNIT, it means the engineering unit for calibration operation should be choosen as one of the following below:

InH2O @ 68 ºF:	1148
InHg @ 0 ºC:	1156
ftH2O @ 68 ºF:	1154
mmH2O @ 68 ºF:	1151
mmHg @ 0 ºC:	1158
psi:	1141
bar:	1137
mbar:	1138
g/cm2:	1144
k/cm2:	1145
Pa:	1130
kPa:	1133
torr:	1139
atm:	1140
MPa:	1132
inH2O @ 4 ºC:	1147
mmH2O @ 4 ºC:	1150

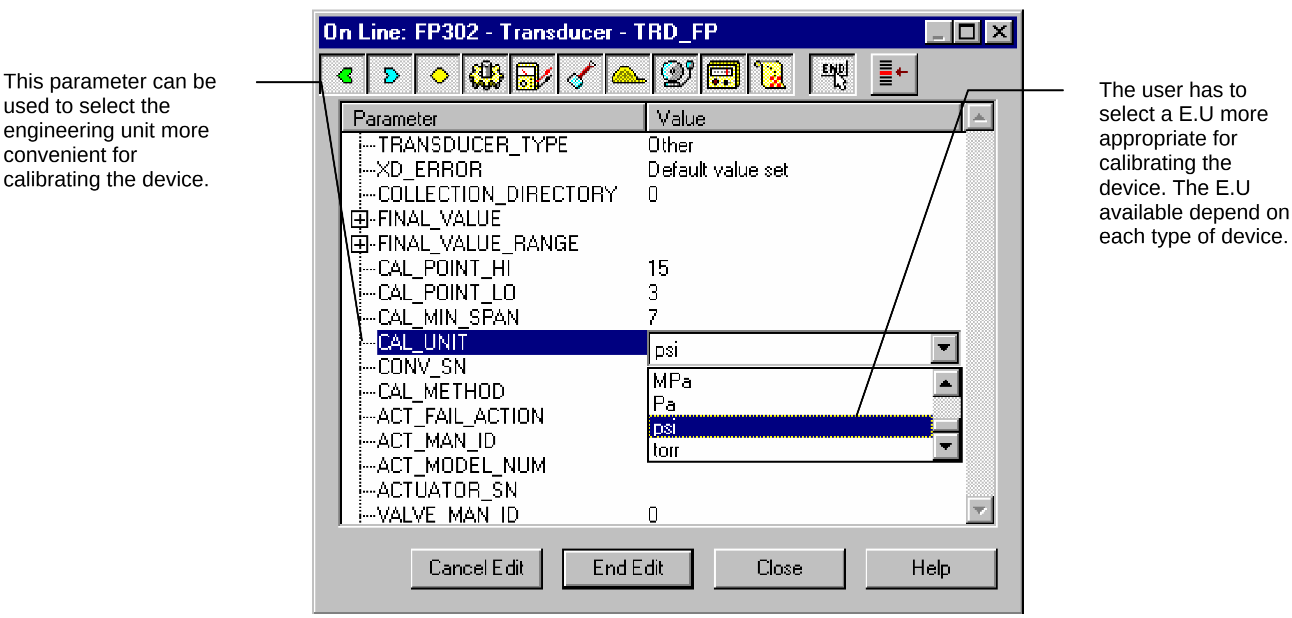
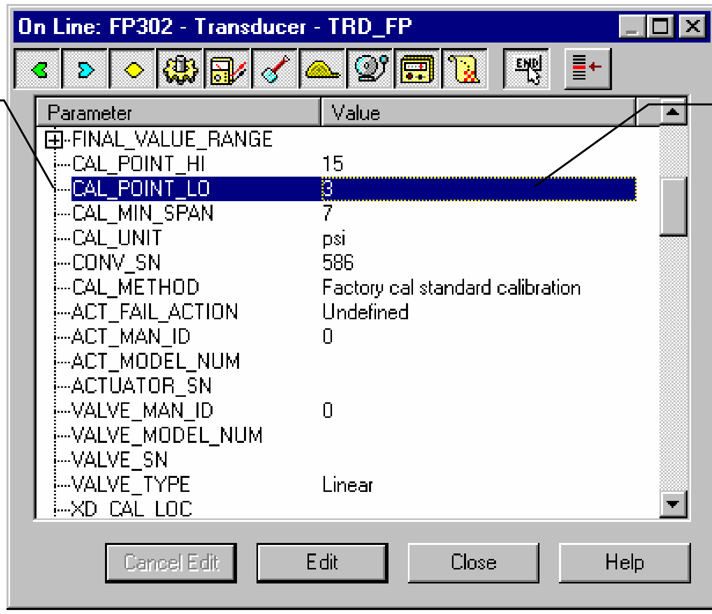


Figure 3.1 - Choosing Eng. Unit for Calibration – FP302

Let's take the lower value as an example:
Write 3 psi or the lower value in parameter CAL_POINT_LO. Simply by writing in this parameter, the trim procedure is initialized.

This parameter indicates where the converter should be when the setpoint lower value is 0%.

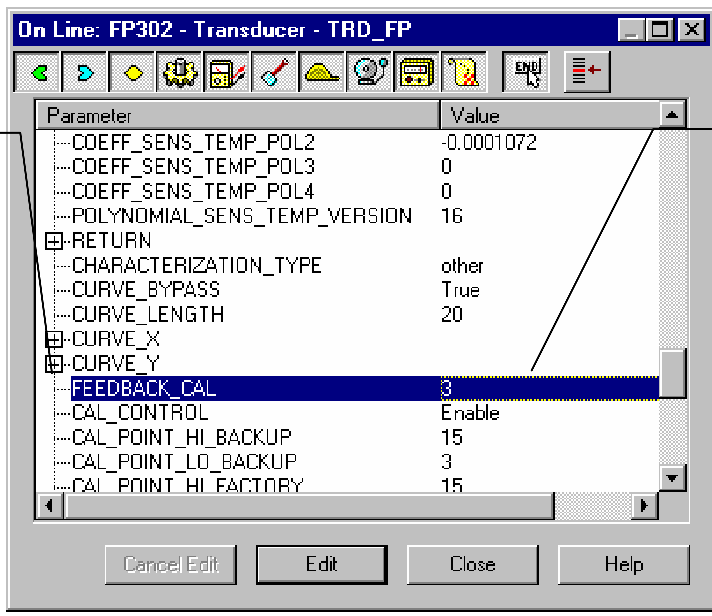


The desired value should be entered.

Figure 3.2 - Adjusting the Calibration Point Low - FP302

Check the pressure meter readout and write that value in parameter FEEDBACK_CAL. Write in this parameter until it reads 3.0 psi or the lower value readout of the pressure meter.

This parameter should be set with the actual output pressure during the calibration procedure.

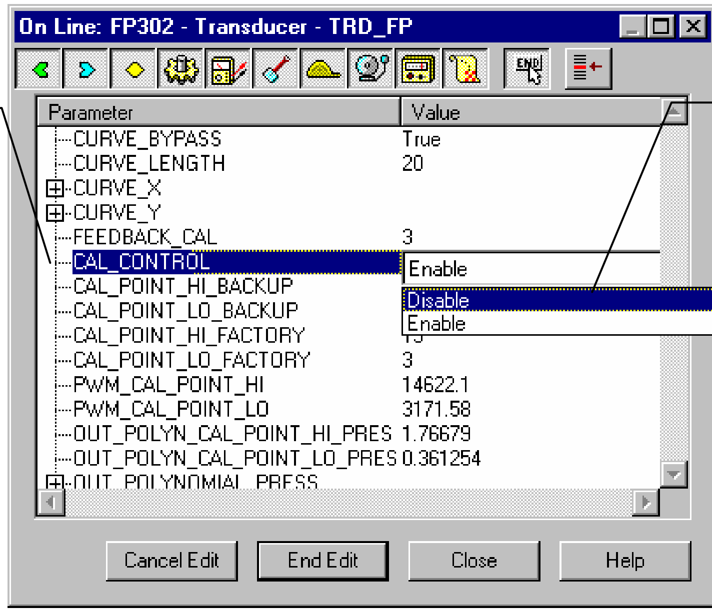


The value should be entered here.

Figure 3.3 - Feedback Cal Point Low - FP302

In order to end the trim procedure, write disable (0) in the parameter CAL_CONTROL.

This parameter ends the calibration procedure.

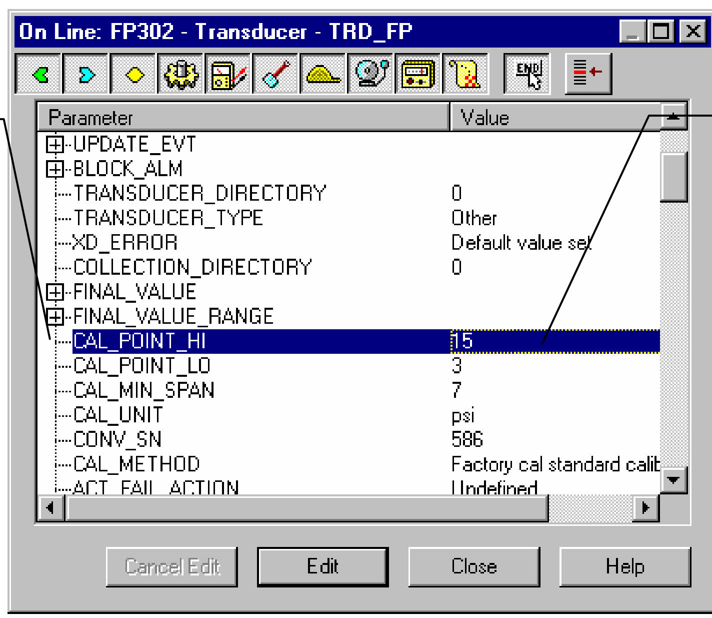


The enable option indicates that the calibration process is being done. In order to finalize its procedure, the user should set it to disable.

Figure 3.4 - Closing the Calibration Procedure

Let's take the upper value as an example: Write 15.0 psi or the desired upper value in parameter TRD-CAL_POINT_HI.

This parameter indicates where the converter should be when the setpoint is 100%.



The desired value should be entered.

Figure 3.5 - Adjusting the Calibration Point High - FP302

Always keep in mind that, simply by writing in this parameter, the trim procedure is initialized. Check the pressure by means of a pressure reference and write that value in parameter FEEDBACK_CAL.

Write in this parameter the value obtained by means of the pressure reference until it reads 15.0 or the desired upper value in psi.

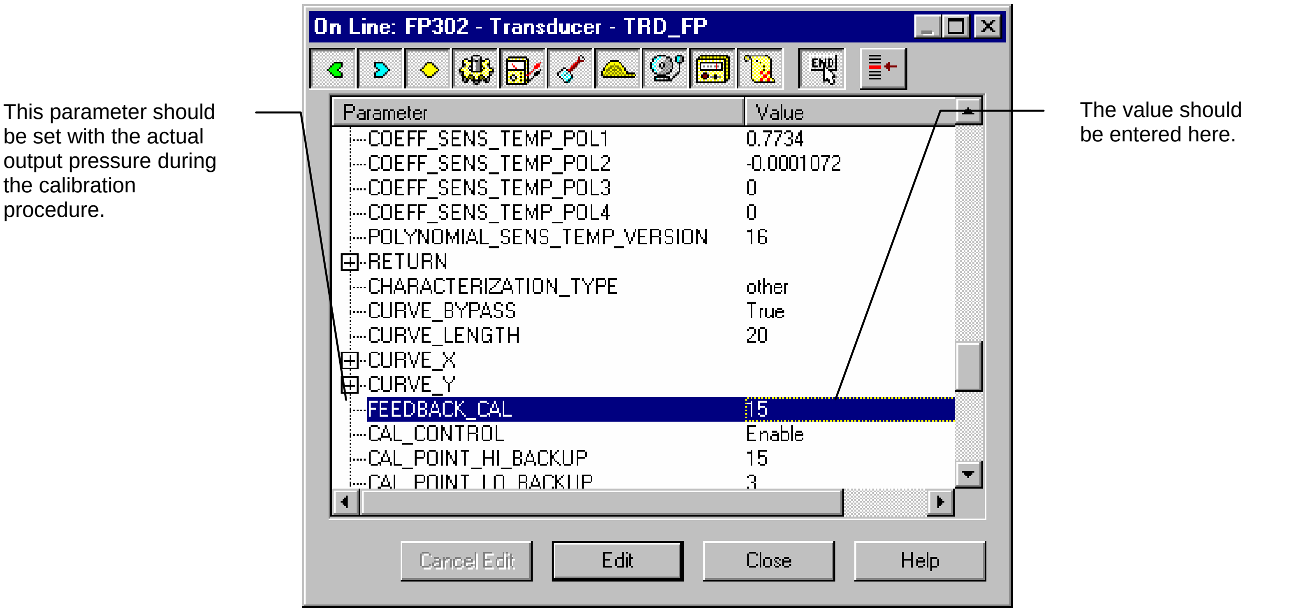


Figure 3.6 - Feedback Cal Point High – FP302

In order to end the trim procedure, write disable (0) in the parameter CAL_CONTROL.

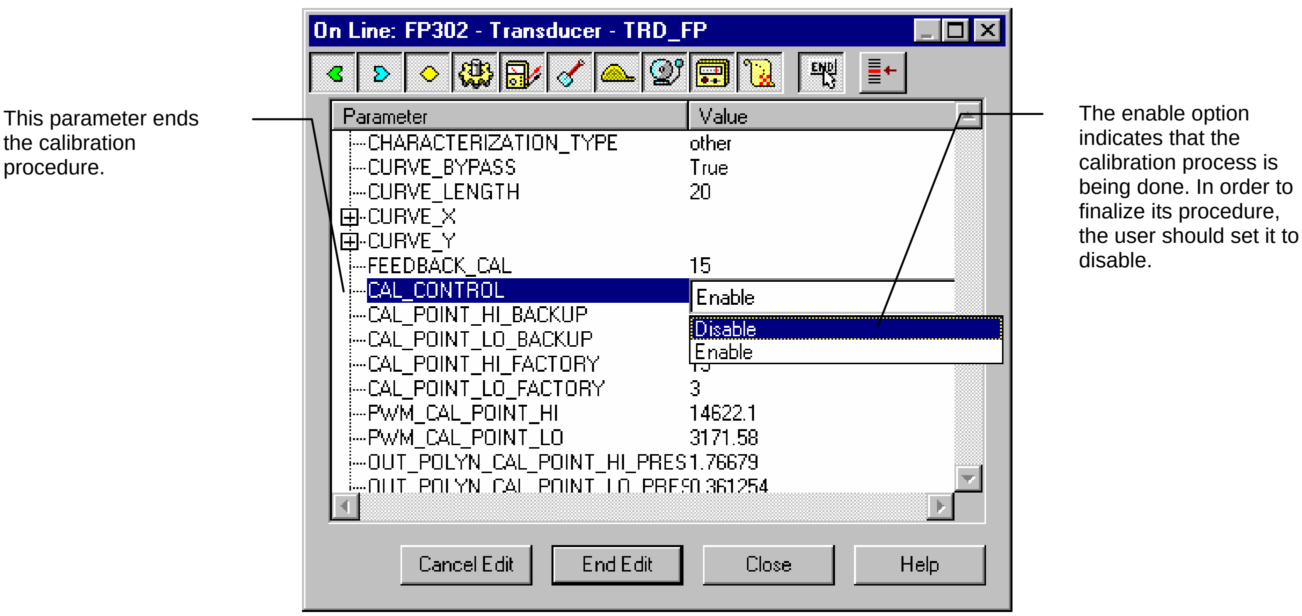


Figure 3.7 - Pressure Trim - FP302

It is convenient to choose the unit to be used in parameter XD_SCALE of the Analog Output block, considering that sensor limits at 100% and at 0% shall be observed.

It is also recommendable, for every new calibration, save the existing trim data in parameter CAL_POINT_LO_BACKUP and CAL_POINT_HI_BACKUP, by means of parameter BACKUP_RESTORE, using option LAST_TRIM_BACKUP, via local adjustment:

In order to enter the local adjustment mode place the magnetic tool in orifice “Z” until flag “MD” lights up in the display. Remove the magnetic tool from “Z” and place it in orifice “S”. Remove and reinsert the magnetic tool in “S” until the message “**Loc Adj**” is displayed. The message will be displayed during approximated 5 sec. After the user removes the magnetic tool from “S”. By placing the magnetic tool in “Z” the user will be able to access the local adjustment/monitoring tree.

Browse to parameter “LOWER”. After that, in order to start the calibration, the user shall actuate parameter “LOWER” with the help of the magnetic tool placed in “S”. For example, it is possible to enter 3.0 psi or the lower value. When the magnetic tool is removed from “S”, the output will be set to a value close to desired value. The user shall then browse the tree up to parameter FEED (FEEDBACK_CAL), and actuate this parameter by placing the magnetic tool in “S” until reaching the value obtained from the pressure reference.

The user shall continue to write in this parameter until it reads 3.0 psi or the lower pressure value.

Browse up to parameter “UPPER”. Then, in order to start the calibration, the user shall actuate parameter “UPPER” by placing the magnetic tool in “S”.

For example, it is possible to enter 15.0 psi or the upper value. When the magnetic tool is removed from “S”, the output will be set to a value close to the desired value. The user shall then browse the tree up to parameter FEED (FEEDBACK_CAL), and actuate this parameter by placing the magnetic tool in “S” until reaching the desired value obtained from the pressure reference.

The user shall write in this parameter until it reads 15.0 psi or the desired upper pressure value in psi.

NOTE
Trim mode exit via local adjustment occurs automatically. Should the magnetic tool not be used during approximately 16 seconds

Limit Conditions for Calibration:

Lower:
2.50 psi < NEW_LOWER < 5.0 psi. Otherwise, XD_ERROR=22

Upper:
12.0 psi < NEW_LOWER < 16.0 psi. Otherwise, XD_ERROR=22.

NOTE
Codes for XD_ERROR: … 16: Default Value Set … 22: Out of Range … 26: Invalid Calibration Request … 27: Excessive Correction

Display Transducer Block

The local adjustment is completely configured by SYSCON. It means, the user can select the best options to fit his application. From factory, it is configured with the options to set the Upper and Lower trim, for monitoring the input transducer output and check the Tag. Normally, the transmitter is much better configured by SYSCON, but the local functionality of the LCD permits an easy and fast action on certain parameters, since it does not rely on communication and network wiring connections. Among the possibilities by Local Adjustment, the following options can be emphasized: Mode block, Outputs monitoring, Tag visualization and Tuning Parameters setting.

The interface between the user is described very detailed on the "*General Installation, Operation and Maintenance Procedures Manual*". Please take a detailed look at this manual in the chapter related to "*Programming Using Local Adjustment*". It is significantly the resources on this transducer display, also all the Series 302 field devices from SMAR has the same methodology to handle with it. So, since the user has learned once, he is capable to handle all kind of field devices from SMAR.

All function block and transducers, which are defined according *Foundation Fieldbus™* have a description of their features written on binary files, by the *Device Description Language*. This feature permits that third parties configurators enabled by *Device Description Service* technology can interpret these features and make them accessible to configure. The Function Blocks and Transducers of Series 302 have been defined rigorously according to the Foundation Fieldbus specifications in order to be interoperable to other parties.

In order to enable the local adjustment using the magnetic tool, it is necessary to previously prepare the parameters related with this operation via SYSCON (System Configuration).

The *Figure 3.8 - Parameters for Local Adjustment Configuration* and the *Figure 3.9 - Parameters for Local Adjustment Configuration* show all parameters and their respective values, which shall be configured in accordance with then necessity of being locally adjusted by means of the magnetic tool. All values shown on the display are default values.

There are seven groups of parameters, which may be pre-configured in SYSCON by the user in order to enable the configuration of seven parameters by means of the local adjustment. As an example, let's suppose that you don't want to show some parameters; in this case, simply write an invalid Tag in the parameter, Block_Tag_Param_X. Doing this, the device will not take the parameters related (indexed) to its Tag as a valid parameters.

Definition of Parameters and Values

Block_Tag_Param
This is the tag of the block to which the parameter belongs. Use up to a maximum of 32 characters.

Index_Relative
This is the index related to the parameter to be actuated or viewed (0, 1, 2…). Refer to the Function Blocks Manual to know the desired indexes, or visualize them on the SYSCON by opening the desired block.

Sub_Index
In case you wish to visualize a certain tag, opt for the index relative equal to zero, and for the sub-index equal to one (refer to paragraph Structure Block in the Function Blocks Manual).

Mnemonic
This is the mnemonic for the parameter identification (it accepts a maximum of 16 characters in the alphanumeric field of the display). Choose the mnemonic, preferably with no more than 5 characters because, this way, it will not be necessary to rotate it on the display.

Inc_Dec
It is the increment and decrement in decimal units when the parameter is Float or Float Status time, or integer, when the parameter is in whole units.

Decimal_Point_Numb.
This is the number of digits after the decimal point (0 to 3 decimal digits).

Access
The access allows the user to read, in the case of the "Monitoring" option, and to write when "action" option is selected, then the display will show the increment and decrement arrows.

Alpha_Num
These parameters include two options: value and mnemonic. In option value, it is possible to display data both in the alphanumeric and in the numeric fields; this way, in the case of a data higher than 10000, it will be shown in the alphanumeric field.
In option mnemonic, the display may show the data in the numeric field and the mnemonic in the alphanumeric field.

In case you wish to visualize a certain tag, opt for the index relative equal to zero, and for the sub-index equal to one (refer to paragraph Structure Block in the Function Blocks Manual).

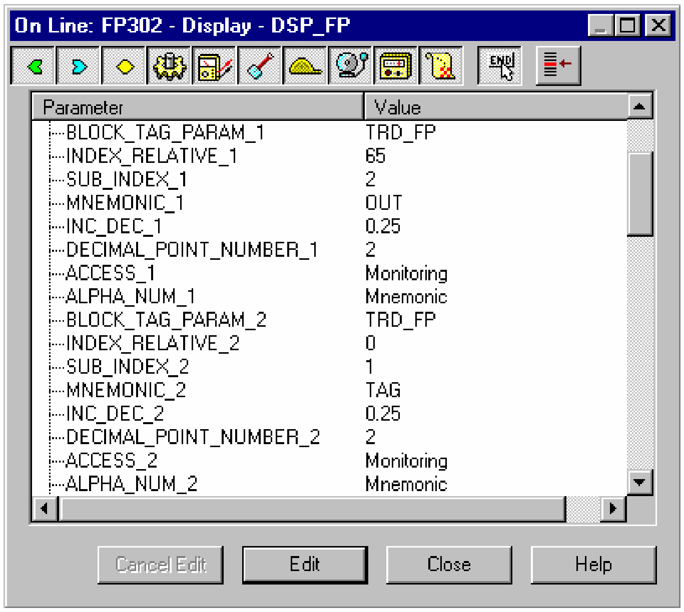


Figure 3.8 - Parameters for Local Adjustment Configuration

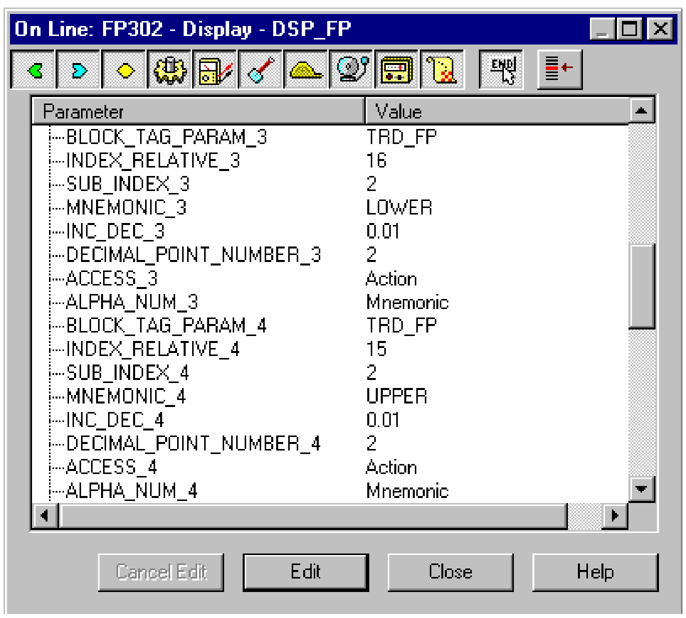


Figure 3.9 - Parameters for Local Adjustment Configuration

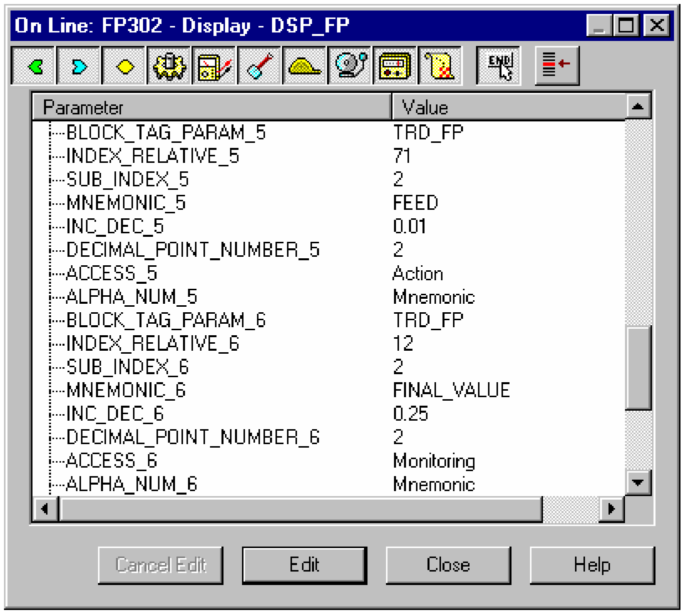


Figure 3.10 - Parameters for Local Adjustment Configuration

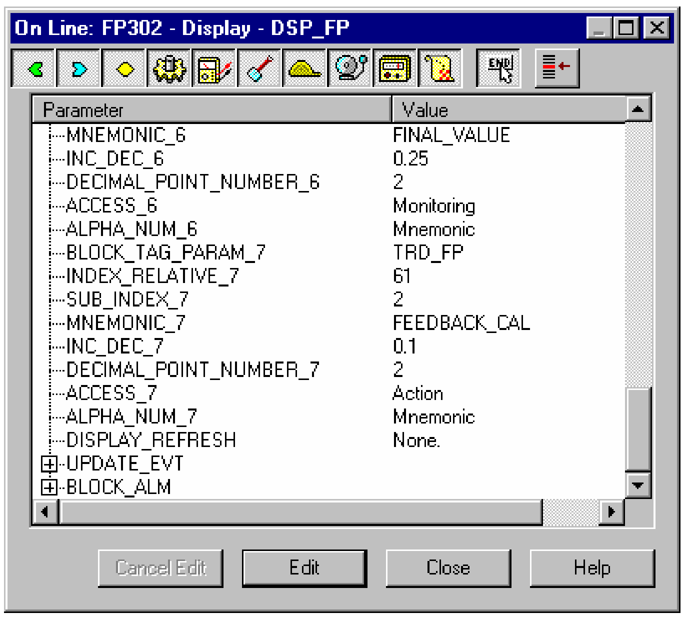
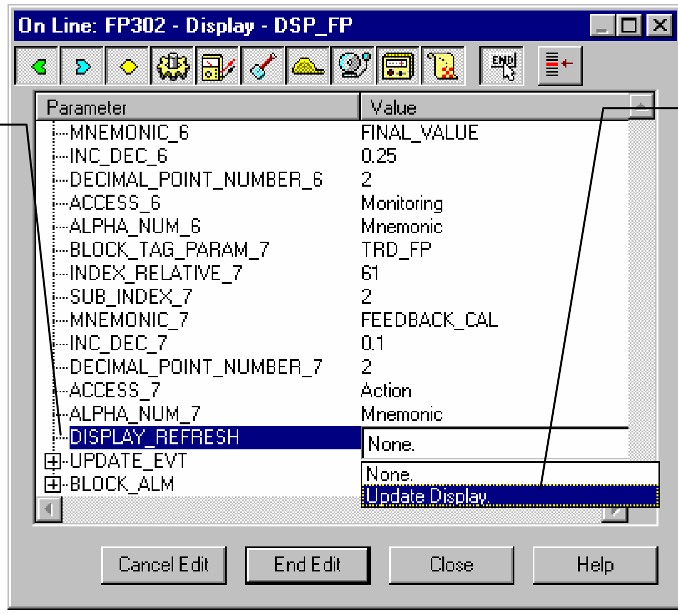


Figure 3.11 - Parameters for Local Adjustment Configuration

This parameter updates the local adjustment programming tree configured on each device.



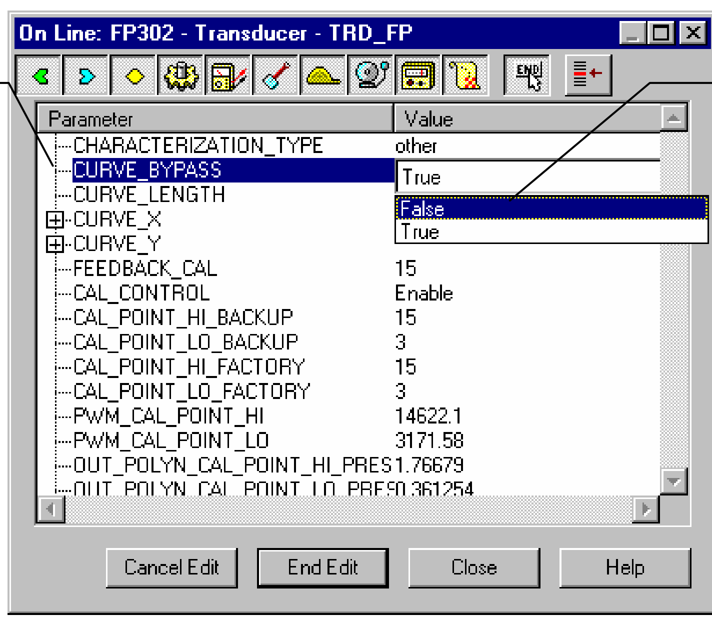
The option “”update” should be selected in order to execute the update of local adjustment programming tree. After its operation all the parameters selected will be show on the LCD display.

Figure 3.12 - Parameters for Local Adjustment Configuration

Characterization Curve

The transducer block also has a characterization curve, used to give a determined profile to the output. This is useful, for example, when the **FP302** is controlling a valve with a non-linear characteristic. Characterization curve, when used, is applied to the input signal, before it is converted by the output scale parameter. Use of the curve is defined by the Curve Bypass parameter. When Curve Bypass is true (Bypass), the curve is not used and the input value is passed directly to the output scale conversion. When Curve Bypass is false (No Bypass), curve is used.

The user can select the best flow characterization curve for each type of valve.



The value of “False” indicates that the Flow Characterization curve is enable.

Figure 3.13 - Choosing the Flow Characterization Curve

The characterization curve has 20 points. Each point has two coordinates (X and Y). These two coordinates define the location of the point in a X-Y space, and the 20 points form a curve. The curve is formed by connecting two adjacent points with a linear segment. Outside extreme points, the curve follows the last linear segment.

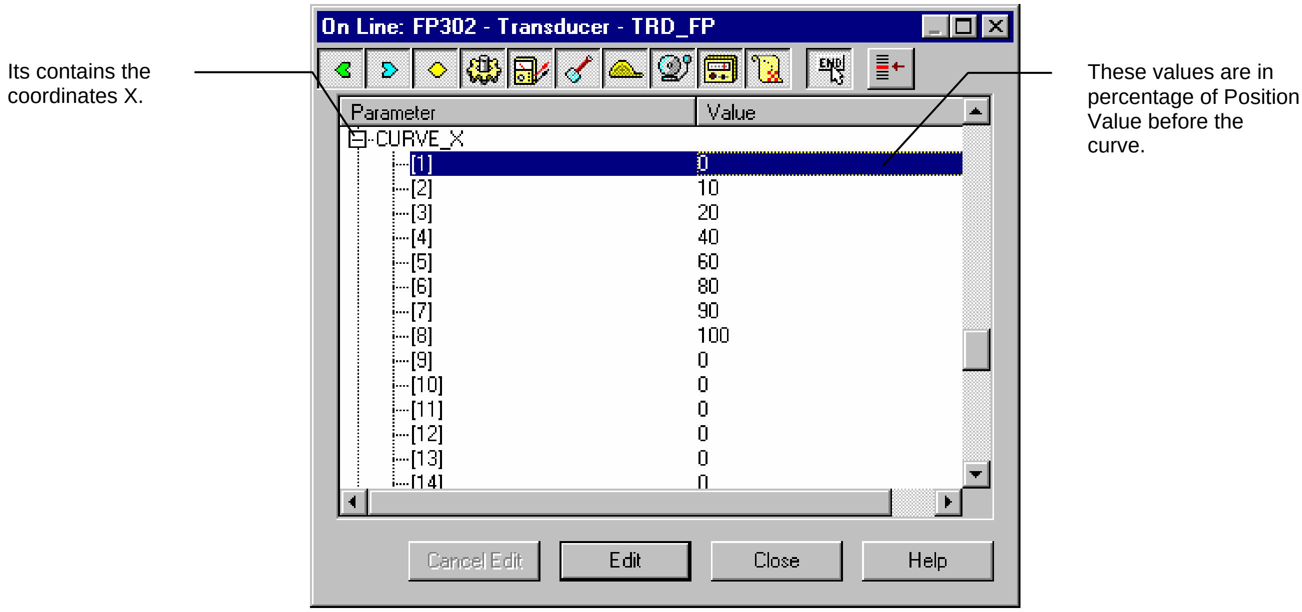


Figure 3.14 - Configuring Table for Flow Characterization - X points

Those 20 points are numbered from 1 to 20, and are contained in the Curve_X (In coordinates) and Curve_Y (Out coordinates) parameters. Curve_X parameter requires succeeding points being greater than preceding points, or parameter won't be accepted. Curve_Y parameter doesn't require this, so a non-monotone curve is allowed.

When writing to Curve parameters, remember to put the point coordinates in the correct order.

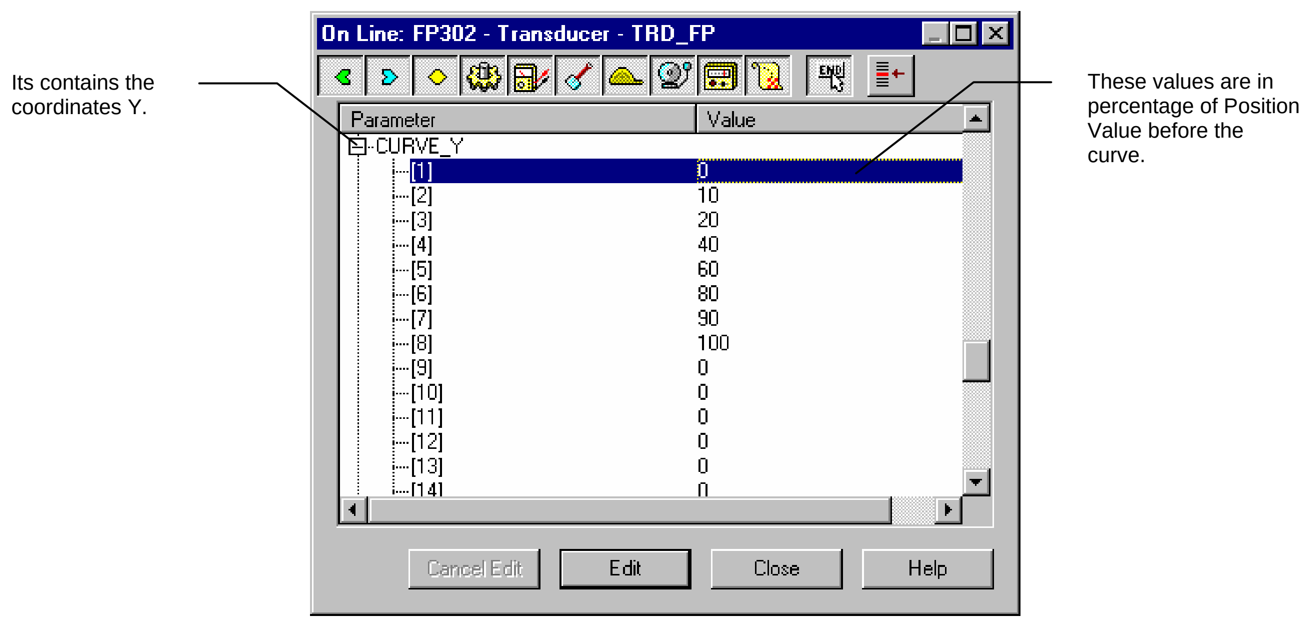


Figure 3.15 - Configuring Table for Flow Characterization - Y points

Temperature Compensation

The parameter CAL_TEMPERATURE can be used to trim the temperature sensor located at the body of positioner in order to improve the accuracy of temperature measurement done by its sensor. The range accepts from -40°C to +85 °C. The parameter SECONDARY_VALUE indicates the value of such measurement.

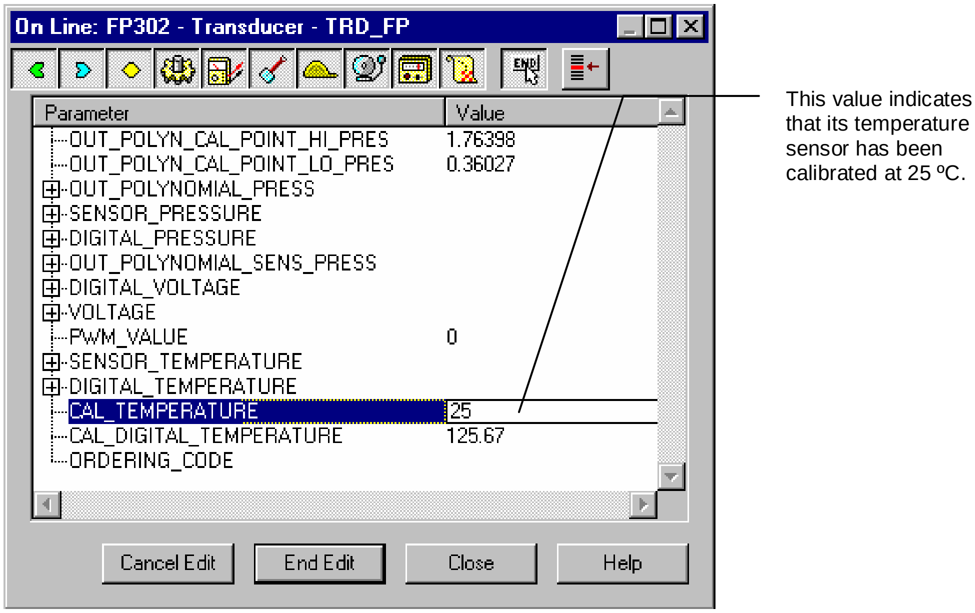


Figure 3.16 - Calibrating the Temperature Sensor

Programming Using Local Adjustment

The converter has two holes for magnetic switches, located under the identification plate (See

Figure *3.17 - Local Adjustment* Switches). These magnetic switches are activated by one magnetic tool.

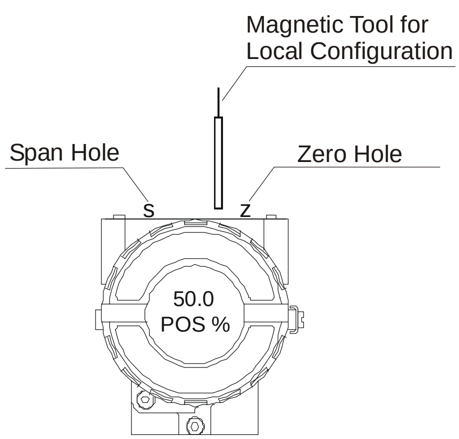
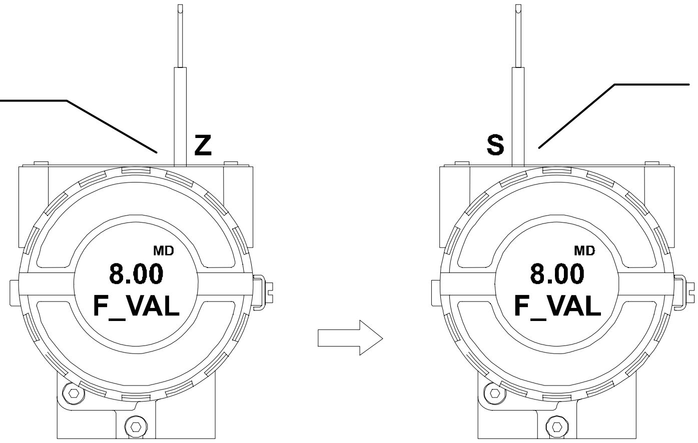


Figure 3.17 - Local Adjustment Switches

This magnetic tool enables adjustment of the most important parameters of the blocks. It also enables pre-configuration of the communication.

The jumper J1 on top of the main circuit board must be in place and the converter must be fitted with the digital display for access to the local adjustment. Without display, the local adjustment is not possible.

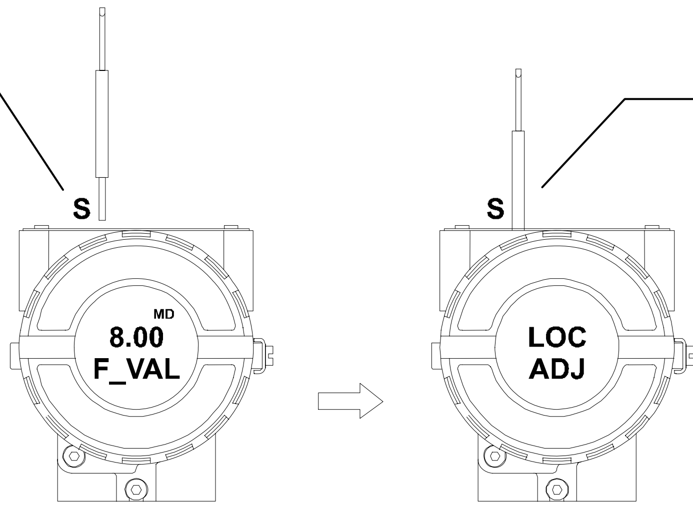
In order to start the local adjustment, place the magnetic tool in orifice **Z** and wait until letters **MD** are displayed.



Place the magnetic tool in orifice **S** and wait during 5 seconds.

Figure 3.18 - Step 1 - FP302

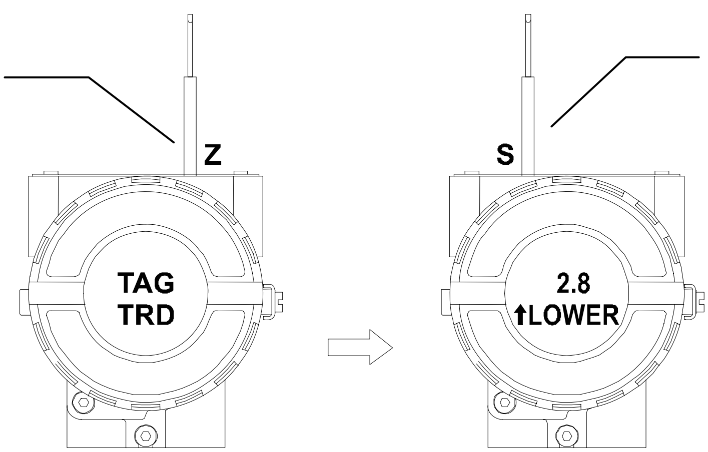
Remove the magnetic tool from orifice **S**.



Insert the magnetic tool in orifice **S** once more and **LOC ADJ** should be displayed.

Figure 3.19 - Step 2 - FP302

Place the magnetic tool in orifice **Z**. In this case of first time configuration, the option shown on the display is the **TAG** with its corresponding mnemonic configured by the SYSCON. Otherwise, the option shown on the display will be the one configured in the prior operation. By keeping the tool inserted in this orifice, the local adjustment menu will rotate.

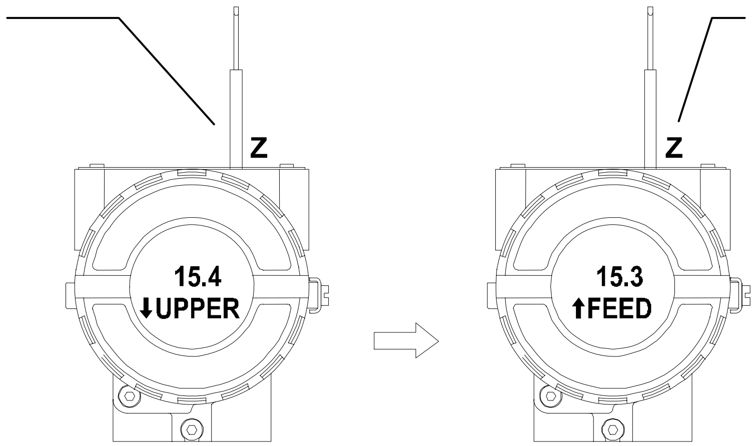


This parameter is used to calibrate the lower pressure point. In order to range the lower value, simply insert the magnetic tool in orifice **S** as soon as lower is shown on the display. An arrow pointing upward (↑) increment the value and an arrow pointing downward (↓) decrement the value.

Write 3.0 psi, for example, to lower parameter. Connect a gage in FP302 and read the measured pressure value and enter in Feed parameter and correct your desired pressure.

Figure 3.20 - Step 3 - FP302

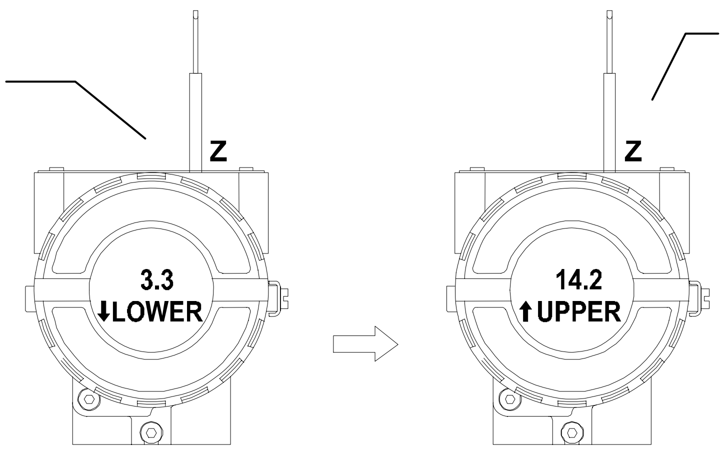
In order to decrement the lower value, place the magnetic tool in orifice **Z** to shift the arrow to the downward position and then, by inserting and keeping the tool in orifice **S**, it is possible to decrement the lower value.



Option **FEED** allows the user to correct the pressure calibration. In order to implement the correction, read the measured pressure on the gage and enter with this value. This option makes it possible to correct lower and upper pressure calibration points. An arrow pointing upward increments the current.

Figure 3.21 - Step 4 - FP302

In order to decrement the lower value, place the magnetic tool in orifice **Z** to shift the arrow to the downward position and then, by inserting and keeping the tool in orifice **S**, it is possible to decrement the lower value.



This parameter is used to calibrate the upper current point. In order to range the upper value, simply insert the magnetic tool in orifice **S** as soon as upper is shown on the display. An arrow pointing upward (↑) increment the value and an arrow pointing downward (↓) decrement the value. Write 15.0 psi, for example, to upper parameter. Connect a gage in **FP302** and read the measured pressure value and enter in Feed parameter and correct your desired

Figure 3.22 - Step 5 - FP302

Place the magnetic tool in orifice **S** to shift the arrow to the downward position and decrement the calibration pressure in accordance with the measured pressure value on gage. An arrow pointing downward decrements the value.

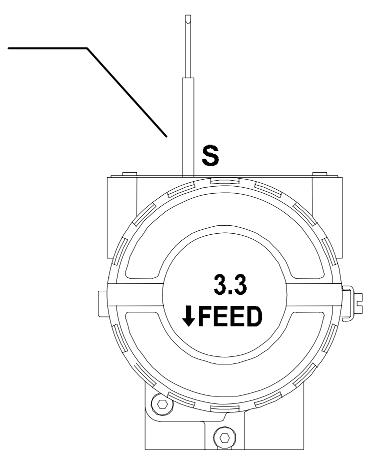


Figure 3.23 - Step 6 - FP302

NOTE
This Local adjustment configuration is a suggestion only. The user may choose his preferred configuration via SYSCON, simply configuring the display block (refer to paragraph Display on page Block).

Section 4

MAINTENANCE PROCEDURES

General

SMAR **FP302** Fieldbus to Pressure Converters are extensively tested and inspected before delivered to the end user. Nevertheless, during their design and development, a consideration was given to the possibility of repairs by the end user, if necessary.

In general, it is recommended that the end user do not try to repair printed circuit boards. Instead, he should have spare circuit boards, which may be ordered from SMAR whenever necessary.

TROUBLESHOOTING	
SYMPTOM	**PROBABLE SOURCES OF TROUBLE**
NO QUIESCENT CURRENT	Converter Fieldbus Connections Check wiring polarity and continuity. Power Supply Check power supply output. The voltage at the **FP302** Fieldbus terminals must be between 9 and 32 VDC. Electronic Circuit Failure Check the boards for defect by replacing them with spare ones.
NO COMMUNICATION	Network Connection Check network connections: devices, power supply and terminators. Network Impedance Check network impedance (power supply impedance and terminators). Converter Configuration Check configuration of communication parameters of converter. Network Configuration Check communication configuration of the network. Electronics Circuit Failure Try to replace the converter circuit with spare parts.
INCORRECT PRESSURE OUTPUT	Output Terminals Connections Check if there is any pressure leakage. Power Supply Check power supply. The **FP302** input pressure must be between 18 and 24 psi. Calibration Check calibration of converter. Clogged restriction or blocked exhaust port. Use the procedures in the following CLEANING RESTRICTION AND EXHAUST PORT in this section.
OUTPUT OSCILLATES	Inadequate Volume in Output Check volume in output: Minimum of 2 cubic inches for temperaure range (-20 ºC to 85 ºC). Minimum of 6 cubic inches for temperaure range (-40 ºC to -20 ºC).

Disassembly Procedure

Refer to *Figure 4.2 - Exploded View*. Make sure that power and air supply are disconnected before disassembling the transmitter.

Transducer

To remove the transducer from the electronic housing, the electrical connections (in the field terminal side) and the main board connector must be disconnected.

Loosen the hex screw (6) and carefully unscrew the electronic housing from the transducer, observing that the flat cable is not excessively twisted.

NOTE
The converters have a stopper that can be released to allow the transducer to rotate more than one tum.

WARNING
Do not rotate the electronic housing more than 180º without disconnecting the electronic circuit from the power supply.

Electronic Circuit

To remove the circuit board (5) and indicator (4), first loose the cover locking (13) on the side not marked “Field Terminals”, then unscrew the cover (1).

WARNING
The boards have CMOS components, which may be damaged by electrostatic discharges. Observe correct procedures for handling CMOS components. It is also recommended to store the circuit boards in electrostatic-proof cases.

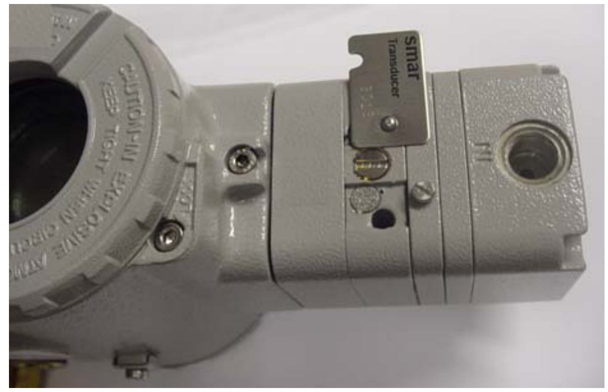
Loosen the two screws (3) that anchors the indicator and the main circuit board. Gently pull out the indicator, and then the main board (5).

Restriction Cleaning Procedure

The air flows to the nozzle through a restriction. Verify from time to time the restriction cleaning to assure a converter good performance.

1. Be sure that the air supply of the equipment is blocked.

2. With an appropriate tool, remove the transducer serial number plate. (New models have the plate placed on the opposite side of the transducer).



3. Remove the restriction screw using an adequate tool;

4. Remove the o-ring’s with an appropriate tool;

5. Dive the part in petroleum base solvent and dry it with compressed air (apply the compressed air directly in the smaller orifice for the air to get out through the bigger orifice).

6. Introduce the appropriate tool (PN 400-0726) into the restriction orifice to prevent any possible obstruction;

7. Mount the o’rings again and screw the restriction in the converter.

8. The equipment can be supplied with air again.

Reassemble Procedure

Transducer

Mount the transducer to the housing turning clockwise until it stops. Then turn it counterclockwise until it faces the square of electronic housing to the square of transducer. Tighten the hex screw (6) to lock the housing to the transducer.

Exhaust Port

Air is vented to the atmosphere through the two exhausts ports located behind the transducer nameplate. A foreing object interfering or blocked exhaust port provides a way to increase the output.

Cleaning by spraying it with a solvent.

Filter – Change of Filter Element

In the **FP302** package is included a filter element for installation in the converter. Client must install this filter element in the field.

Change the converter filter element with a minimum stated period of 1 (one) year. The instrumentation air supply must be clean, dry and non-corrosive, as per the American National Standard “Quality Standard for Instrument Air" - (ANSI/ISA S7.0.01 - 1996).

If the instrumentation air does not comply with the above mentioned standards, the user has to consider changing the converter filter element more frequently.

Electronic Circuit

Plug transducer connector and power supply connector to main board.

Attach the display to the main board. Observe the four possible mouting positions (See *Figure 4.1 - Four Possible Positions of the Display*). The ↑ mark indicates up position.

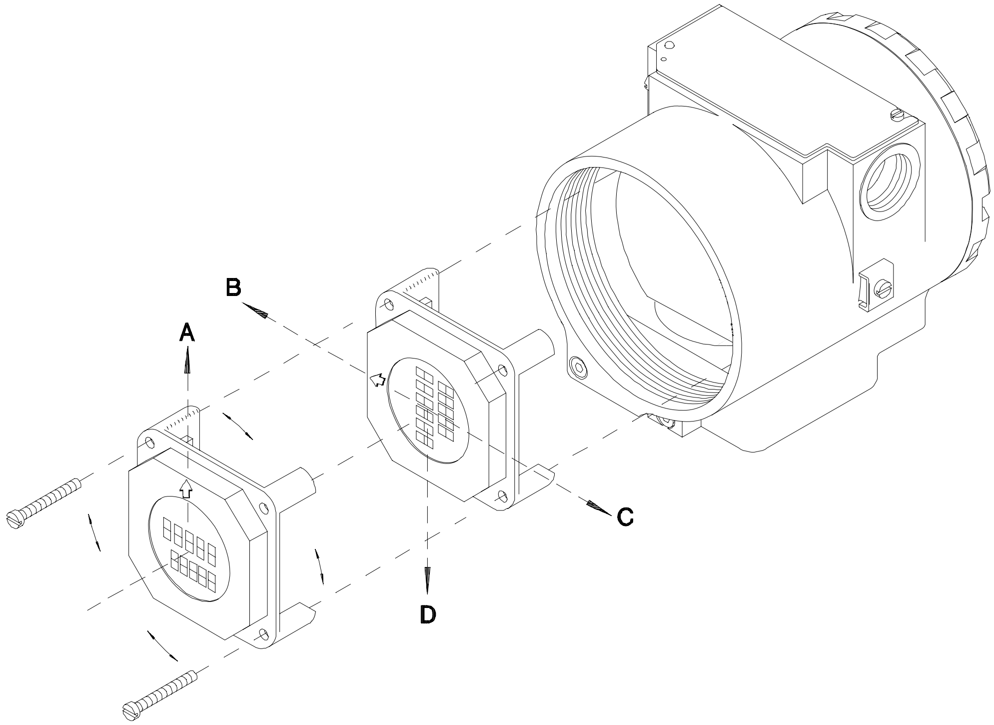


Figure 4.1 - Four Possible Positions of the Display

Anchor the main board and indicator with their screws (3).

After tightening the protective cover (1), mounting procedure is complete. The converter is ready to be energized and tested.

Interchangeability

Main board can be changed and operate with the transducer. There is an EEPROM in the transducer part that keeps the trim.

Returning Materials

Should it become necessary to return the converter to SMAR, simply contact your local agent or SMAR office, informing the defective instrument's serial number, and return it to our factory.

In order to expedite analysis and solution of the problem, the defective item should be returned with a description of the failure observed, with as many details as possible. Other information concerning to the instrument operation, such as service and process conditions, is also helpful.

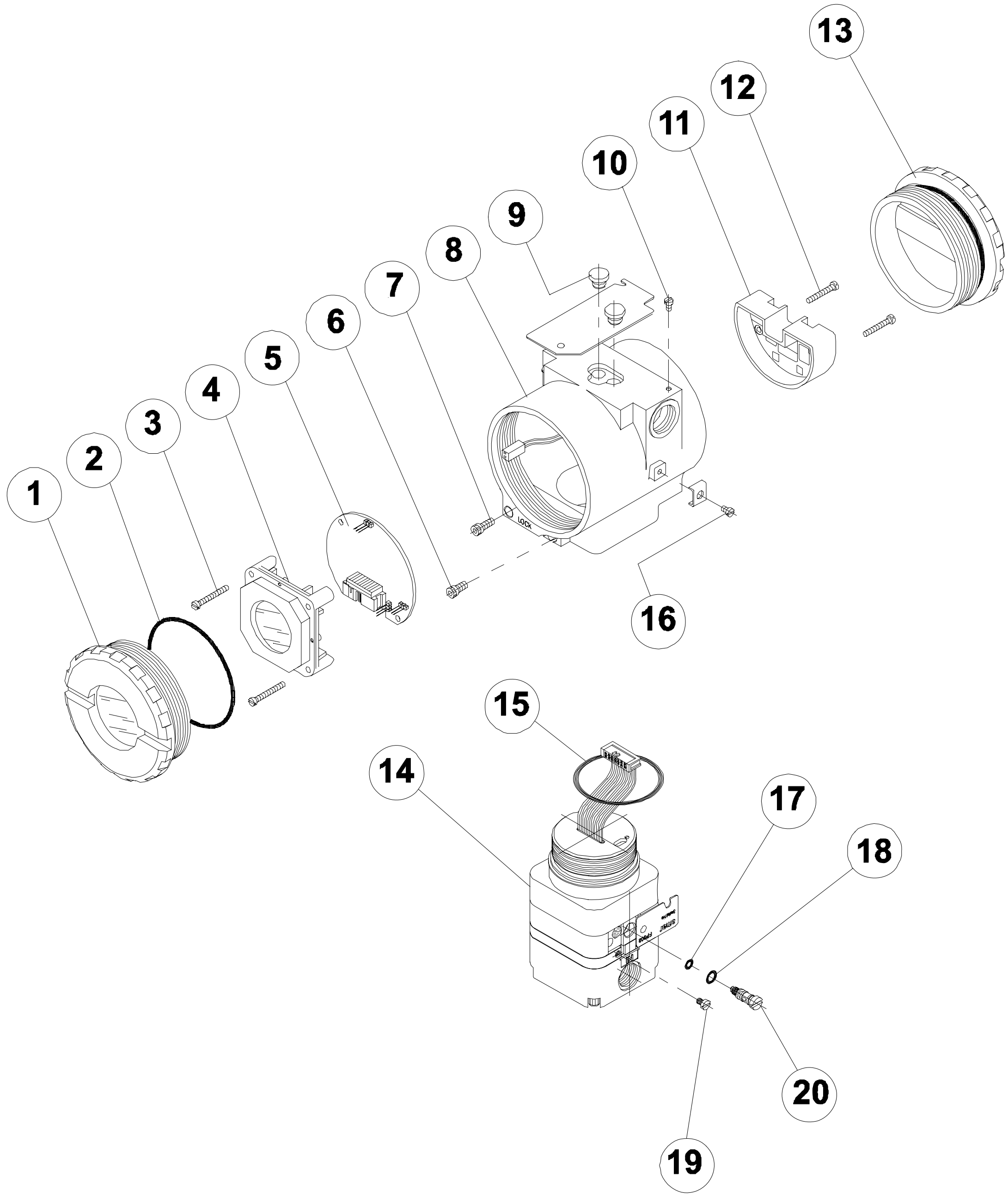


Figure 4.2 - Exploded View

ACCESSORIES	
ORDERING CODE	**DESCRIPTION**
SD1	Magnetic Tool for Local Adjustment
SYSCON	System Configurator
PS302	Power Supply
BT302	Terminator
PCI	Process Control Interface
PSI302	Power Supply Conditioner
400-0726	Needle cleaning device for the restriction

SPARE PARTS LIST		
DESCRIPTION OF PARTS	**POSITION**	**CODE**
HOUSING, Aluminum (NOTE 1)		
½ - 14 NPT	8	304-0190
M20 x 1.5	8	304-0191
PG 13.5 DIN	8	304-0192
HOUSING, 316 SS (NOTE 1)		
½ - 14 NPT	8	304-0193
M20 x 1.5	8	304-0194
PG 13.5 DIN	8	304-0195
COVER (INCLUDES O'RING)		
Aluminum	1 and 13	204-0102
316 SS	1 and 13	204-0105
COVER WITH WINDOW FOR INDICATION (INCLUDES O’RING)		
Aluminum	1	204-0103
316 SS	1	204-0106
COVER LOCKING SCREW	7	204-0120
SENSOR LOCKING SCREW	6	204-0121
EXTERNAL GROUND SCREW	16	204-0124
IDENTIFICATION PLATE FIXING SCREW	10	204-0116
DIGITAL INDICATOR	4	214-0108
TERMINAL INSULATOR	11	400-0059
MAIN ELECTRONIC CIRCUIT BOARD	5	344-0135
O’RINGS (NOTE 2)		
Cover, Buna-N	2	204-0122
Neck, Buna-N	15	204-0113
TERMINAL HOLDING SCREW		
Housing in Aluminum	12	304-0119
Housing in 316 Stainless Steel	12	204-0119
MAIN BOARD SCREW HOUSING IN ALUMINUM		
Units With Indicator	3	304-0118
Units Without Indicator	3	304-0117
MAIN BOARD SCREW HOUSING IN 316 STAINLESS STEEL		
Units With Indicator	3	204-0118
Units Without Indicator	3	204-0117
MOUNTING BRACKET FOR 2” PIPE MOUNTING (NOTE 3)		
Carbon Steel	-	344-0140
Stainless Steel 316	-	344-0141
Carbon Steel Bolts, Nuts, Washers and U-clamp in Stainless Steel	-	344-0142

SPARE PARTS LIST		
DESCRIPTION OF PARTS	**POSITION**	**CODE**
TRANSDUCER	14	344-0145
RESTRICTION INTERNAL O'RING	17	344-0150
RESTRICTION EXTERNAL O'RING	18	344-0155
TRANSDUCER IDENTIFICATION PLATE FIXING SCREW	19	344-0160
RESTRICTION	20	344-0165
LOCAL ADJUSTMENT PROTECTION CAP	9	204-0114

NOTE

1. It includes Terminal holder insulator, bolts (cover lock, grounding and terminal holder insulator) and identification plate without certification.
2. O_Rings are packaged in packs of 12 units.
   Including U-clamp, nuts, bolts and washers. Spare Parts List.

Section 5

TECHNICAL CHARACTERISTICS

Functional Specifications

Adjustable Range.
Between 3 – 30 psi (0.2 – 2.1 kg/cm^2).

Output Signal
3 15 psi (0,2 1,0 kg/cm^2).

Input Signal
Digital only. Fieldbus, 31.25 Kbit/s voltage mode with bus power.

Power Supply
Bus powered: 9-32 Vdc.
Output impedance (from 7.8 kHz - 39 kHz):
Non-intrinsic safety: 3 kΩ .
Intrinsic safety: 400 Ω (assuming an IS barrier in the power supply).

Indication
Optional 4½ digit LCD indicator.

Hazardous Location Certification
Explosion proof, weather proof and intrinsically safe CENELEC and FM standards.

Temperature Limits

Operation:	-40 to 85 ºC (-40 to 185 ºF)
Storage:	-40 to 90 ºC (-40 to 194 ºF)
Display:	-10 to 60 ºC (-14 to 140 ºF) operation
	-40 to 85 ºC (-40 to 185 ºF) without damage.

Humidity Limits
0 to 100% RH.

Turn-on Time
Approximately 10 seconds.

Update Time
Approximately 0.5 second.

Performance Specifications

Reference conditions 3-15 psi output, 20 psi supply, clean dry air 25 ºC.

Accuracy
0.4% of span.

Supply Pressure
18-22 psi (1,2 -1,5 kg/cm^2)

Consumption
0.24 Nm^3/h (0.14 scfm).

Output Capacity
6.7 Nm^3/h (4 scfm).

Ambient Temperature Effect
±0.10% / ºC.

Supply Pressure Effect
Negligible.

Vibration Effect
Meets SAMA PMC 31.1.

Electro-Magnetic Interference Effect
Designed to comply with IEC 801.

Physical Specifications

Electrical Connection
1/2-14 NPT, Pg 13.5 or M20 x 1.5.

Pneumatic connections
(Supply and output).
¼ -18 NPT

Material of Construction
Injected low copper aluminum with polyester painting or 316 Stainless Steel housing, with Buna N O-rings on cover (NEMA 4X, IP67).

Mounting
With an optional bracket can be installed on a 2" pipe or fixed on a wall or panel.

Weight
Without display and mounting bracket: 1.8 Kg.
Add for digital display: 0.13 Kg.
Add for mounting bracket: 0.60 Kg.

MODEL FP302	FIELDBUS TO PNEUMATIC SIGNAL CONVERTER

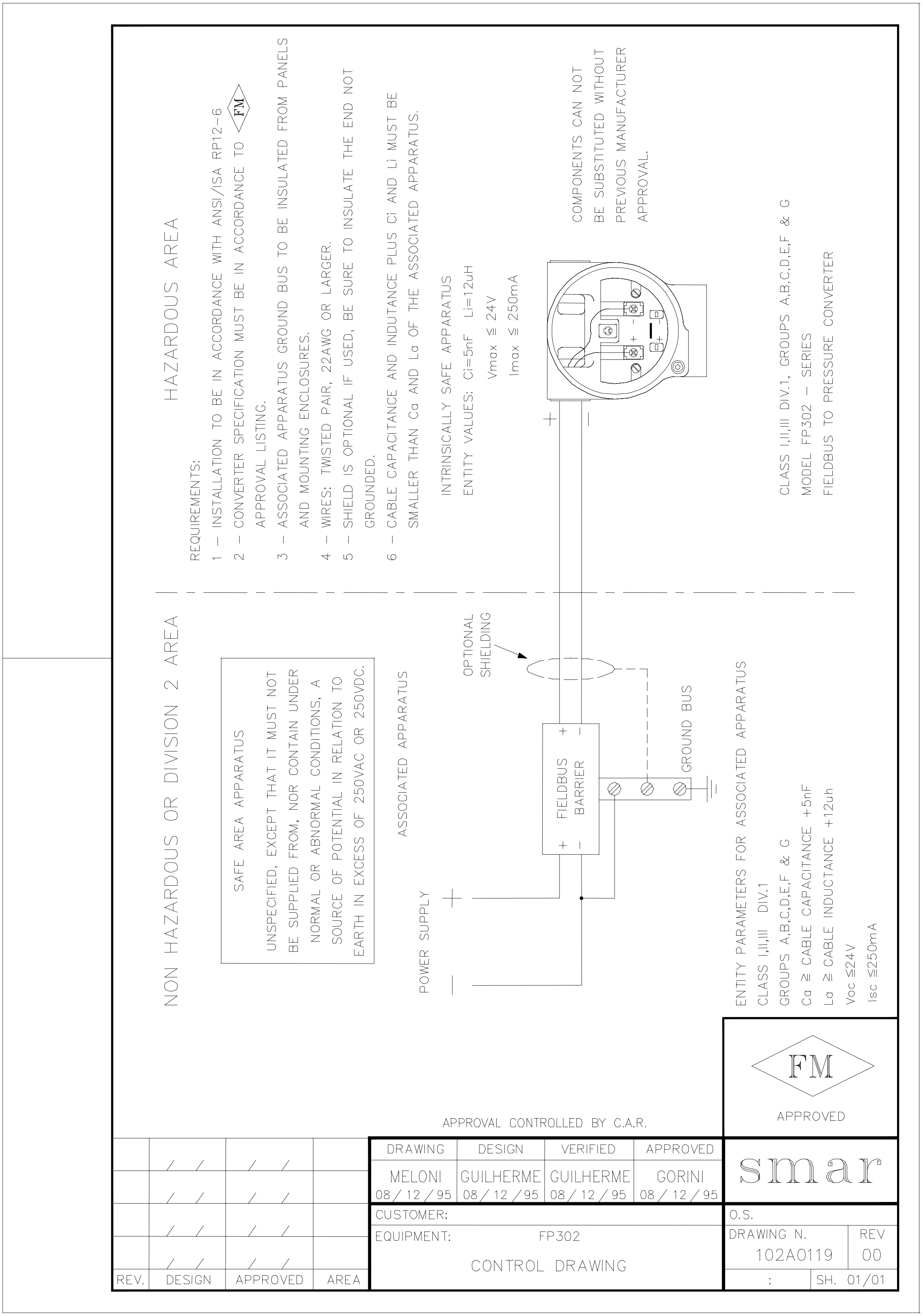
CODE	Local Indicator
0	Without Indicator
1	With Digital Indicator

CODE	Mounting Bracket for 2" Pipe Mounting
0	Without Bracket
1	Carbon Steel Bracket
2	316 SST Bracket

CODE	Electrical Connections
0	1/2-14 NPT
A	M20 x 1.5
B	Pg 13.5 DIN

CODE	Options
H1	316 SST Housing
A1	316 SST Bolts
ZZ	Special Options - Specify

FP302	1	1	0	H1/A1


HAZARDOUS AREA
NON HAZARDOUS OR DIVISION 2 AREA
REQUIREMENTS:
1 – INSTALLATION TO BE IN ACCORDANCE WITH ANSI/ISA RP12-6
2 – CONVERTER SPECIFICATION MUST BE IN ACCORDANCE TO FM APPROVAL LISTING.
3 – ASSOCIATED APPARATUS GROUND BUS TO BE INSULATED FROM PANELS AND MOUNTING ENCLOSURES.
4 – WIRES: TWISTED PAIR, 22AWG OR LARGER.
5 – SHIELD IS OPTIONAL IF USED, BE SURE TO INSULATE THE END NOT GROUNDED.
6 – CABLE CAPACITANCE AND INDUTANCE PLUS Ci AND Li MUST BE SMALLER THAN Ca AND La OF THE ASSOCIATED APPARATUS.
INTRINSICALLY SAFE APPARATUS
ENTITY VALUES: Ci=5nF Li=12uH
Vmax ≤ 24V
Imax ≤ 250mA
COMPONENTS CAN NOT BE SUBSTITUTED WITHOUT PREVIOUS MANUFACTURER APPROVAL.
CLASS I,II,III DIV.1, GROUPS A,B,C,D,E,F & G
MODEL FP302 – SERIES
FIELDBUS TO PRESSURE CONVERTER
SAFE AREA APPARATUS
UNSPECIFIED, EXCEPT THAT IT MUST NOT BE SUPPLIED FROM, NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS, A SOURCE OF POTENTIAL IN RELATION TO EARTH IN EXCESS OF 250VAC OR 250VDC.
ASSOCIATED APPARATUS
POWER SUPPLY
OPTIONAL SHIELDING
FIELDBUS BARRIER
GROUND BUS
ENTITY PARAMETERS FOR ASSOCIATED APPARATUS
CLASS I,II,III DIV.1
GROUPS A,B,C,D,E,F & G
Ca ≥ CABLE CAPACITANCE +5nF
La ≥ CABLE INDUCTANCE +12uh
Voc ≤24V
Isc ≤250mA
FM
APPROVED
APPROVAL CONTROLLED BY C.A.R.
DRAWING
DESIGN
VERIFIED
APPROVED
MELONI 08/12/95
GUILHERME 08/12/95
GUILHERME 08/12/95
GORINI 08/12/95
smar
CUSTOMER:
EQUIPMENT: FP302
CONTROL DRAWING
O.S.
DRAWING N. 102A0119
REV 00
SH. 01/01
REV.
DESIGN
APPROVED
AREA