smar - FY302

OPERATION, MAINTENANCE
AND INSTRUCTION MANUAL

Fieldbus Valve Positioner

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FY302
VERSION 3

FOUNDATION™

FY302ME

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INTRODUCTION

The **FY302** is a Fieldbus valve positioner for Single (spring return) or Double acting Linear motion type control valves e. g. Globe, Gate, Diaphragm, Pinch or Clamp and Rotary motion type control valves e. g. Ball, Butterfly or Plug with pneumatic type actuators e. g. Diaphragm, Piston, Vane, or Bellows. It is based on a field-proven piezo flapper and non-contacting Hall-effect position sensor that provides reliable operation and high performance. The digital technology used in the **FY302** enabled the choice of several types of flow characterizations, an easy interface between the field and the control room and several interesting features that considerably reduce the installation, operating and maintenance costs.

The **FY302** is part of Smar's complete 302 line of 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.

The main requirements for Fieldbus were 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 there 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 **FY302**, 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 **FY302** by carefully reading these instructions.

WARNING
Throughout the operation of the positioner, including self-setup, do not touch the moving parts of valve/actuator/positioner assembly as they may unexpectedly move automatically. Make sure to disconnect supply air before touching any moving parts.

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

Waiver of responsibility

The contents of this manual abides by the hardware and software used on the current equipment version. Eventually there may occur divergencies between this manual and the equipment. The information from this document are periodically reviewed and the necessary or identified corrections will be included in the following editions. Suggestions for their improvement are welcome.

Warning

For more objectivity and clarity, this manual does not contain all the detailed information on the product and, in addition, it does not cover every possible mounting, operation or maintenance cases.

Before installing and utilizing the equipment, check if the model of the acquired equipment complies with the technical requirements for the application. This checking is the user's responsibility.

If the user needs more information, or on the event of specific problems not specified or treated in this manual, the information should be sought from Smar. Furthermore, the user recognizes that the contents of this manual by no means modify past or present agreements, confirmation or judicial relationship, in whole or in part.

All of Smar's obligation result from the purchasing agreement signed between the parties, which includes the complete and sole valid warranty term. Contractual clauses related to the warranty are not limited nor extended by virtue of the technical information contained in this manual.

Only qualified personnel are allowed to participate in the activities of mounting, electrical connection, startup and maintenance of the equipment. Qualified personnel are understood to be the persons familiar with the mounting, electrical connection, startup and operation of the equipment or other similar apparatus that are technically fit for their work. Smar provides specific training to instruct and qualify such professionals. However, each country must comply with the local safety procedures, legal provisions and regulations for the mounting and operation of electrical installations, as well as with the laws and regulations on classified areas, such as intrinsic safety, explosion proof, increased safety and instrumented safety systems, among others.

The user is responsible for the incorrect or inadequate handling of equipments run with pneumatic or hydraulic pressure or, still, subject to corrosive, aggressive or combustible products, since their utilization may cause severe bodily harm and/or material damages.

The field equipment referred to in this manual, when acquired for classified or hazardous areas, has its certification void when having its parts replaced or interchanged without functional and approval tests by Smar or any of Smar authorized dealers, which are the competent companies for certifying that the equipment in its entirety meets the applicable standards and regulations. The same is true when converting the equipment of a communication protocol to another. In this case, it is necessary sending the equipment to Smar or any of its authorized dealer. Moreover, the certificates are different and the user is responsible for their correct use.

Always respect the instructions provided in the Manual. Smar is not responsible for any losses and/or damages resulting from the inadequate use of its equipments. It is the user's responsibility to know and apply the safety practices in his country.

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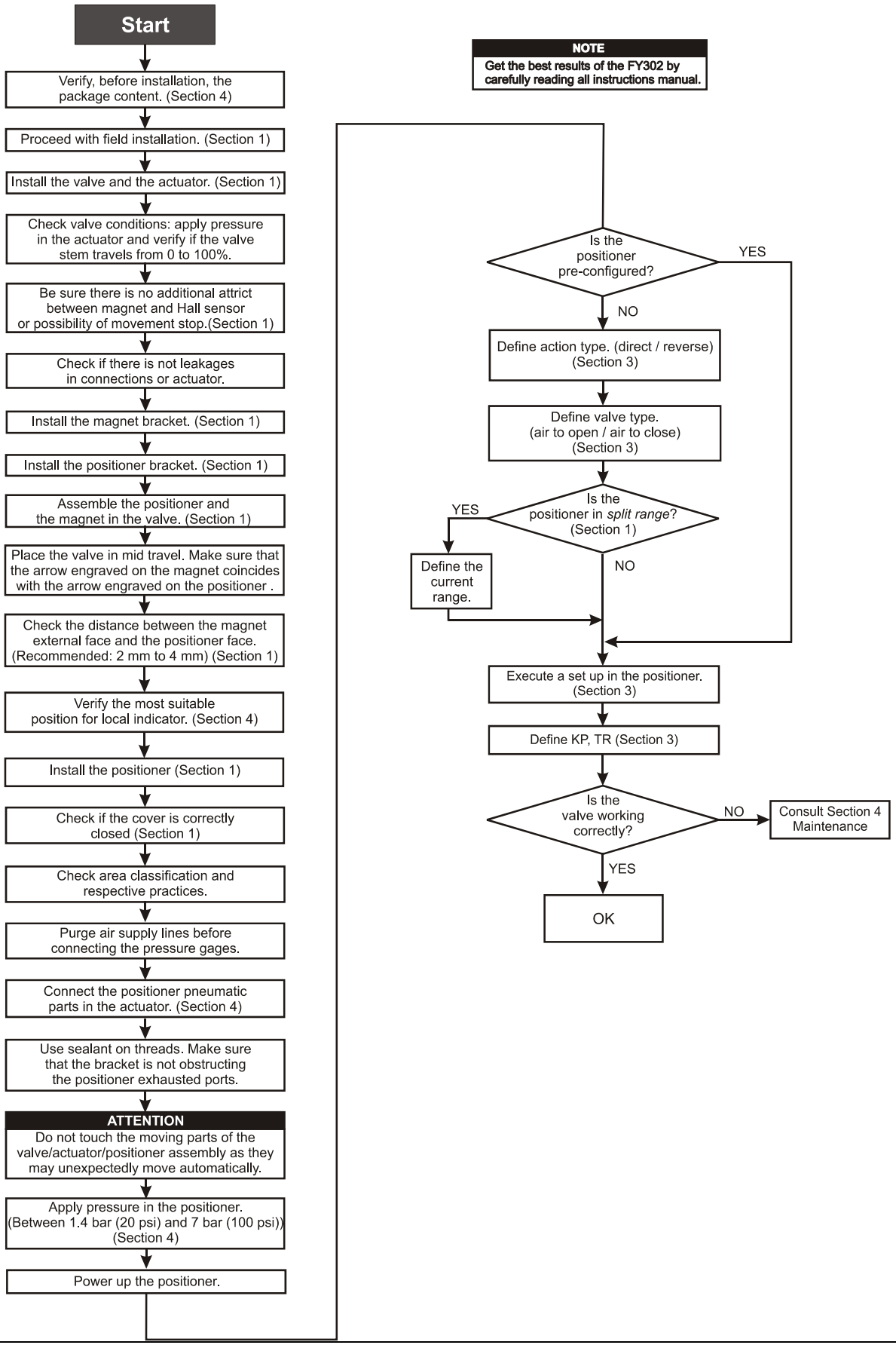
Installation Flowchart



Section 1

INSTALLATION

General

NOTE
The installation carried out in hazardous areas should follow the recommendations of the IEC60079-14 standard.

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

Among all factors, which may affect converter accuracy environmental conditions are the most difficult to control. There are, however, ways to reduce the effects of temperature, humidity and vibration.

The **FY302** has a built-in temperature sensor to compensate for temperature variations. At the field, this feature minimizes the temperature variation effect.

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

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

Use of sunshades or heat shields to protect the positioner 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 removed; the circuits are exposed to humidity. The electronic circuit is protected by a humidity proof coating, but frequent exposures to humidity may affect the provided protection. 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 positioner should be employed.

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

Mounting

The mounting of positioner will depend on actuator type, single (spring return) action or double action and on actuator movement, if it is linear or rotary. Two supports are required for mounting, one for the magnet and the other for the positioner itself. Smar may supply them both since they are specified in the order code. (See Table 5.2).

Rotary Movement

Install the magnet on the valve stem using the magnet support (See Figure 1.2).

Install the positioner support on the actuator. The actuator should be in accordance with standard VDI/VDE 5845, all you have to do is tighten the four screws with the lock washers on the standard support.

For special supports, refer to specify instructions. After installing the support on the actuator, it is possible to mount the positioner on the support by means of the four screws with lock washers.

Make sure that the arrow engraved on the magnet coincides with the arrow engraved on the positioner when the valve is in mid travel.

If the installation of the positioner or magnet should be altered, or if there should be any other modification, the positioner will require a recalibration. As to the type of valve action, refer to paragraph "Pneumatic Connections".

Linear Movement

Install the magnet on the valve stem using the magnet support (See Figure 1.3).

Install the positioner support on the actuator. The actuator support may be secured in place as per standard NAMUR/IEC 536-4 or in accordance with user specified boring. Install the positioner on the support and tighten the four screws in the threaded bores located on the side opposite to the pressure gages (See Figure 1.3). Use lock washers in order to prevent screw slackening.

Make sure that the support is not obstructing the exhaustion outlets.

NOTE
Make sure that arrow engraved on the magnet coincides with the arrow engraved on the positioner when the valve is in mid travel. The magnet mounting in relation to the hall sensor: 1. Must not have attrict between the internal magnet face and the hall sensor salience during the travel (rotary or linear), through the magnet. 2. The magnet and the salience of hall sensor must not be distant. A minimum distance of 2 mm and a maximum distance of 4 mm are recommended between the magnet external face and the positioner face. For that, a centralizer device (linear or rotary) must be used. The centralizer device is in the positioner packing.

If the installation of the positioner or magnet should be altered, or if there should be any other modification, the positioner will require a recalibration.

Pneumatic Connections

Air supplied to the positioner shall be quality instrument air, that is, dry, clean and non-corrosive. Refer to the American National Standard. “Quality Standard for Instrument Air” (ANSI/ISA S7.0.01 - 1996).
The **FY302** is supplied with input and outputs air filters; but these filters do not substitute a preliminary instrumentation air treatment. We recommend a periodic cleaning of such filters each 6 months or less, case the air instrument quality is not good.

Air supply pressure to the **FY302** shall be between 1.4 bar (20 psi) and 7 bar (100 psi). In case such requirements can not be fulfilled, the use of an air pressure regulator is acceptable.

Use sealant on threads. Sealants like PTFE (Teflon) tape shall be avoided because they may fragment and eventually obstruct internal parts.

The positioner may be supplied with pressure gages. There are taps available for IN, OUT1 and OUT2. Before connecting the pressure gages, make sure that all lines be completely purged.

Valve positioner has two pneumatic outputs. They work on opposite directions to open or close the valve.

WARNING
The **FY302** should fail, for example, because of a power failure. The output identified as OUT1 (output 1) goes to nearly zero; while the output identified as OUT2 (output 2) goes to nearly the air supply pressure.

Pneumatic connections are identified as IN (input) for the air supply, and OUT1 and OUT2 for Output 1 and Output 2 respectively. Use 1/4 NPT connections. Sealant may be used NPT threads. Connect the air supply tubing to the connection identified as IN. Make sure that the air supply pressure does not exceed the maximum rating accepted by the positioner or actuator. The tubing used to connect the positioner to the actuator shall be as short as possible. The manometer supply is optional.

NOTE
When ordering the positioner in stainless steel 316, combined with the local pressure gauges, the gauge case is in SS 316. For wet parts and threads in SS 316, please, consult Smar.

ATTENTION
Make sure that sealant does not enter the positioner.

There are six exhaust outputs in the **FY302**, all of them fitted with filters. It is very important that such outputs are neither blocked nor obstructed, because the air must circulate freely.

All filters shall be inspected to make sure they will not obstruct the outputs (Refer to Section 4 - Maintenance Procedures).

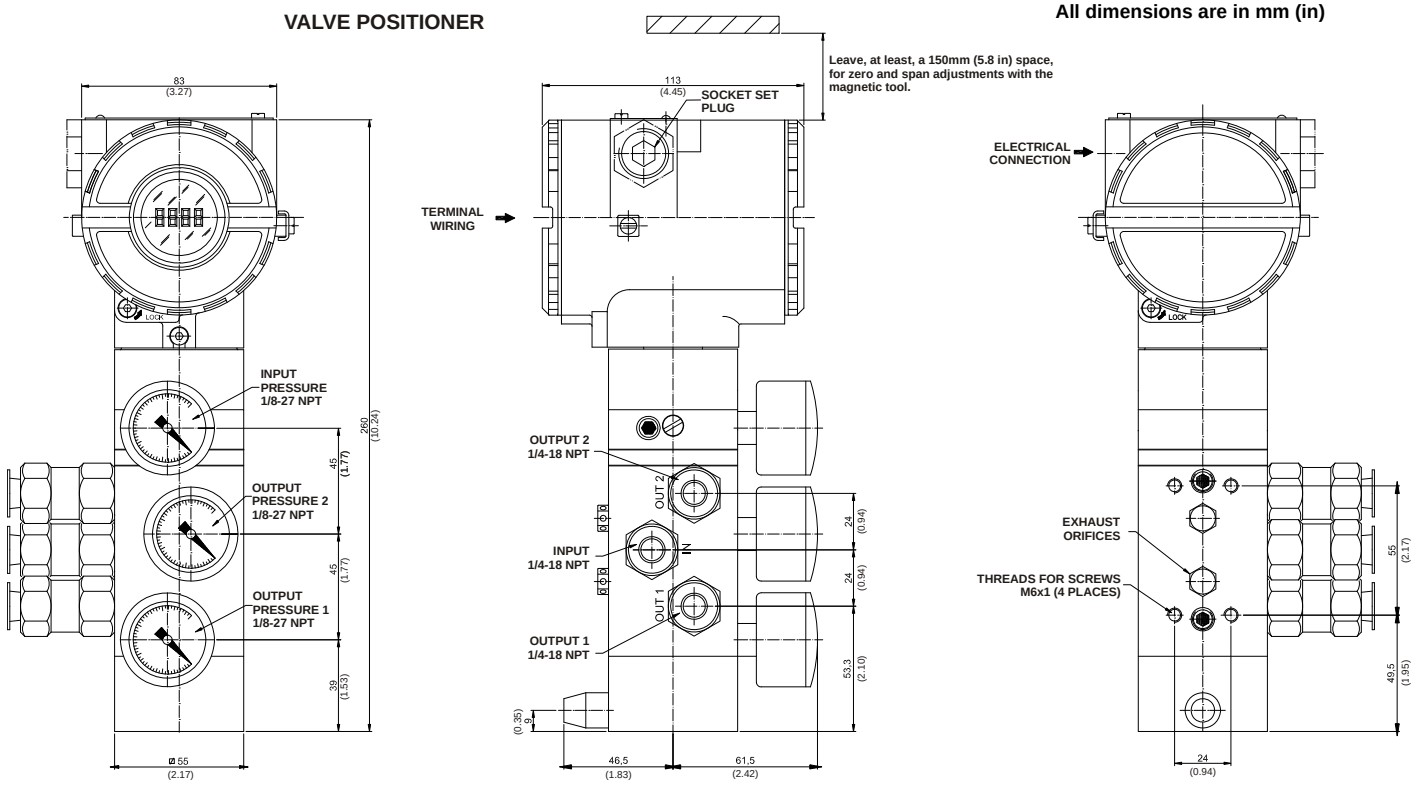
Double Action - Air to Open (Fail Close)
Connect Output 1 (OUT1) of the positioner to the input identified as OPEN in the actuator, and connect Output 2 (OUT2) of the positioner to the input CLOSE in the actuator.

Double Action - Air to Close (Fail Open)
Connect Output 2 (OUT2) of the positioner to the input identified as OPEN in the actuator, and connect Output 1 (OUT 1) of the positioner to the input CLOSE of the actuator.

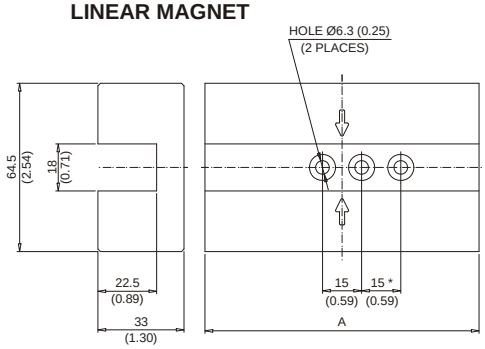
Single Action
Connect Output 1 (OUT1) of the positioner to the input of the actuator. Use a plug to block Output 2 (OUT2).

VALVE POSITIONER

All dimensions are in mm (in)



LINEAR MAGNET

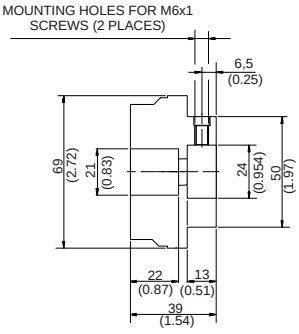


TRAVEL	DIMENSION A
UP TO 30 mm (1.18)	67 mm (2.64)
UP TO 50 mm (1.97)	105 mm (4.13)
UP TO 100 mm (3.94)	181 mm (7.12)

*ONLY FOR 50 AND 100 mm TRAVELS.

Note: Dimensions in mm (in)

ROTARY MAGNET



REMOTE HALL SENSOR

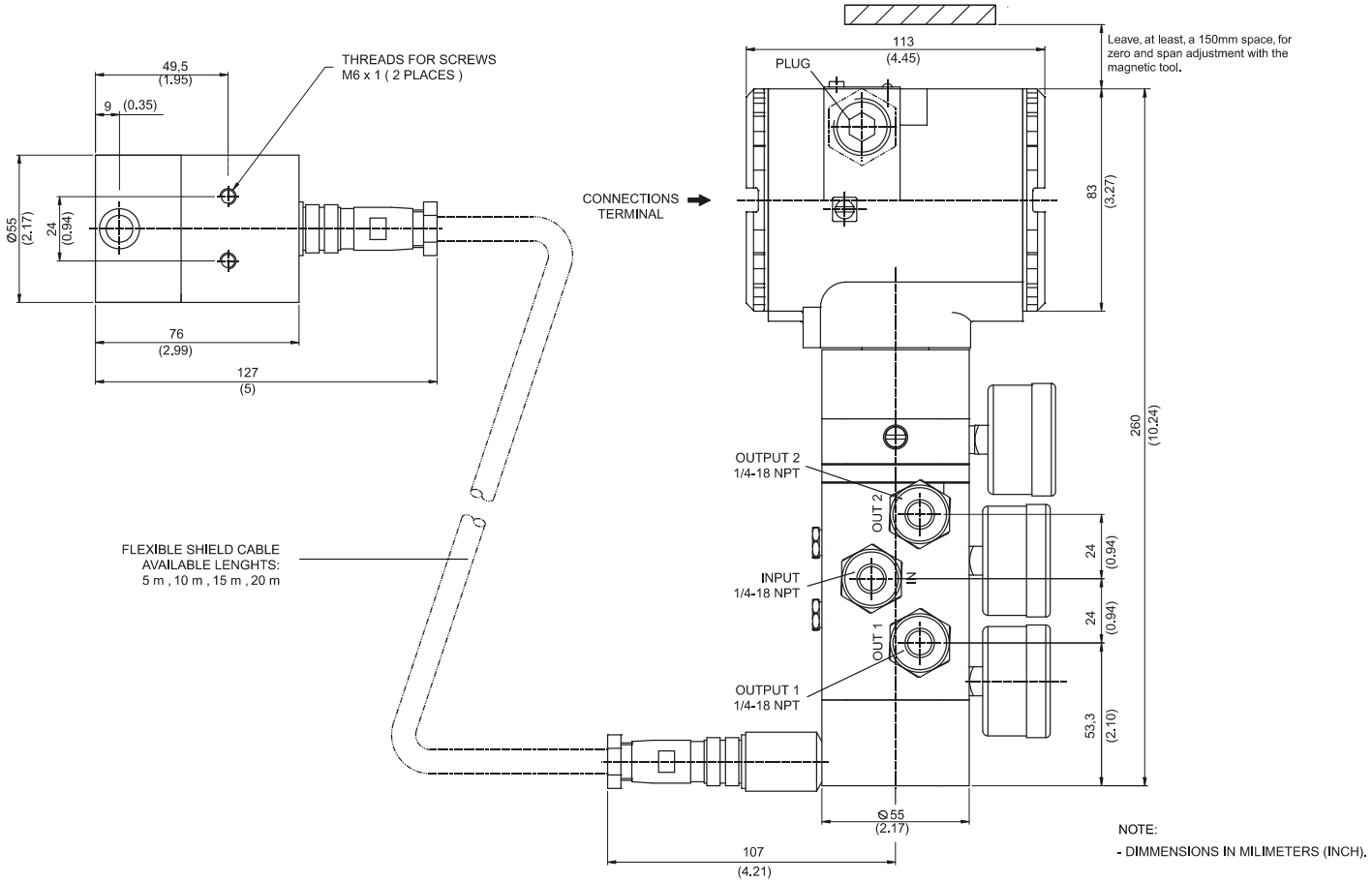


Figure 1.1 - FY302 Dimensional Drawing

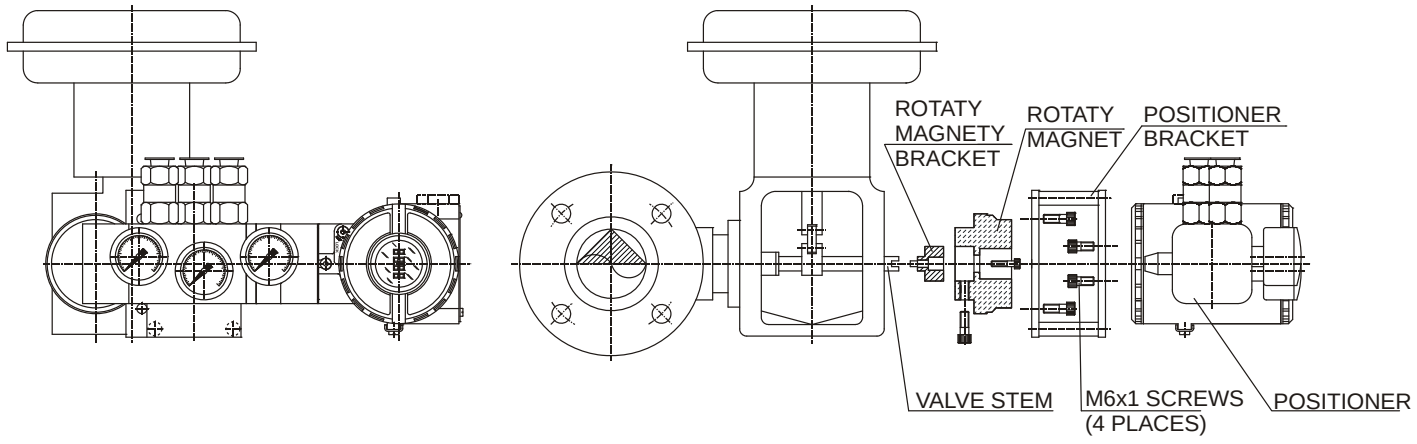


Figure 1.2 - Positioner on Rotary Actuator

NOTE
Included in the package content the **centralizer device of rotary magnet.** See figure 1.13.

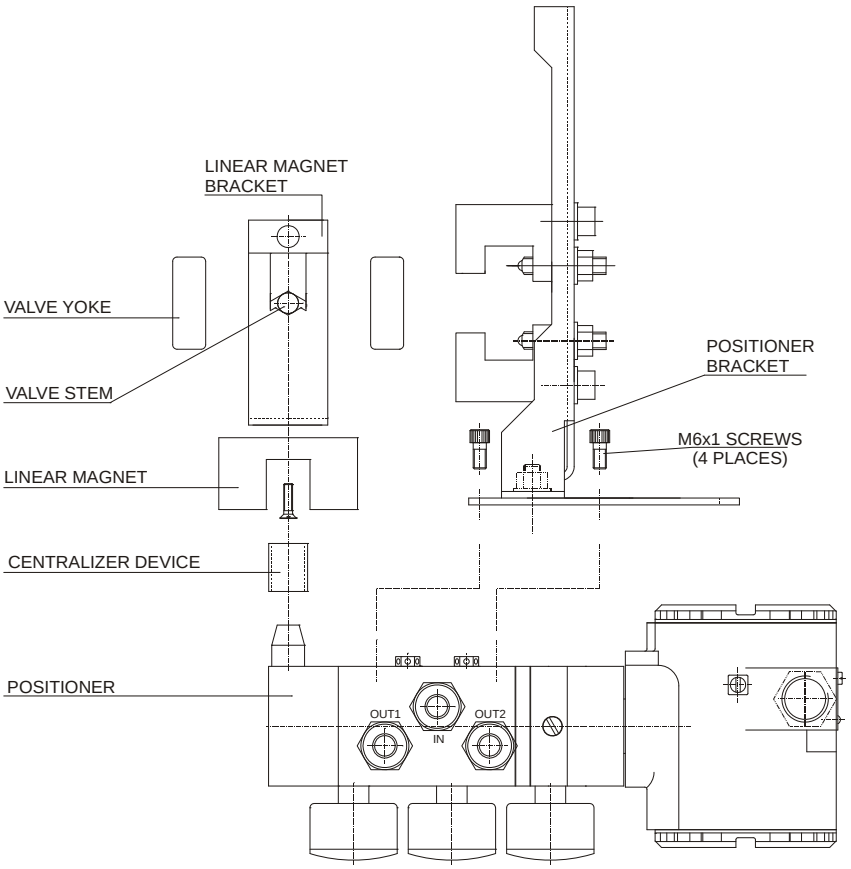


Figure 1.3 - Positioner on Linear Actuator

NOTE
Included in the package content the **centralizer device of linear magnet.** See figure 1.12.

Electronic Housing Rotating

The electronic housing can be rotated in order to have a better position of the digital display. To rotate it, use the housing rotation set screw. (See Figure 1.4).

The local indicator itself can also be rotated.

Electric Wiring

Reach the wiring block by removing the electrical connection cover. This cover can be locked by the cover locking screw. To release the cover, rotate the locking screw clockwise. The wiring block has screws on which fork or ring-type terminals can be fastened.

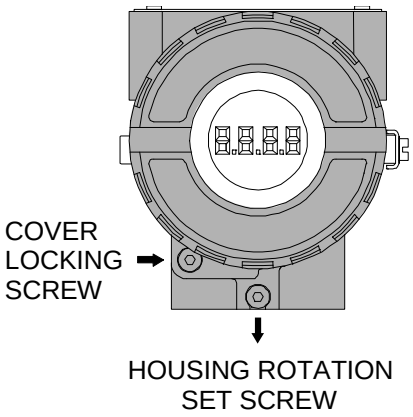


Figure 1.4 - Cover Locking and Housing Rotation Set Screw

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

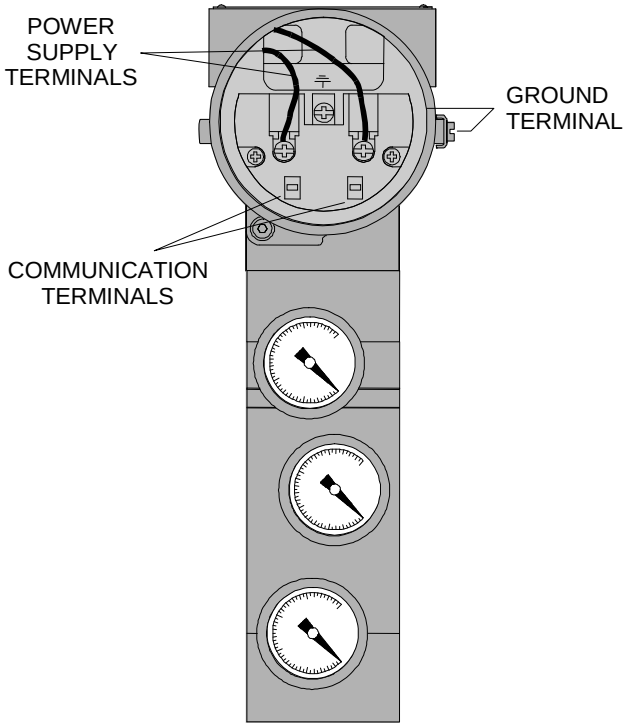


Figure 1.5 - Wiring Block

WARNING
In hazardous areas with explosion proof requirements, the covers must be tightened with at least 8 turns. In order to avoid the penetration moisture or corrosive gases, tighten the O-ring until feeling the O-ring touching the housing. Then, tighten more 1/3 turn (120°) to guarantee the sealing. Lock the covers using 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. The unused outlet connection should be plugged and sealed accordingly.
Should other certifications be necessary, refer to the certification or specific standard for installation limitations.

The Figure 1 shows the correct installation of the conduit, in order to avoid penetration of water, or other substance, which may cause malfunctioning of the equipment.

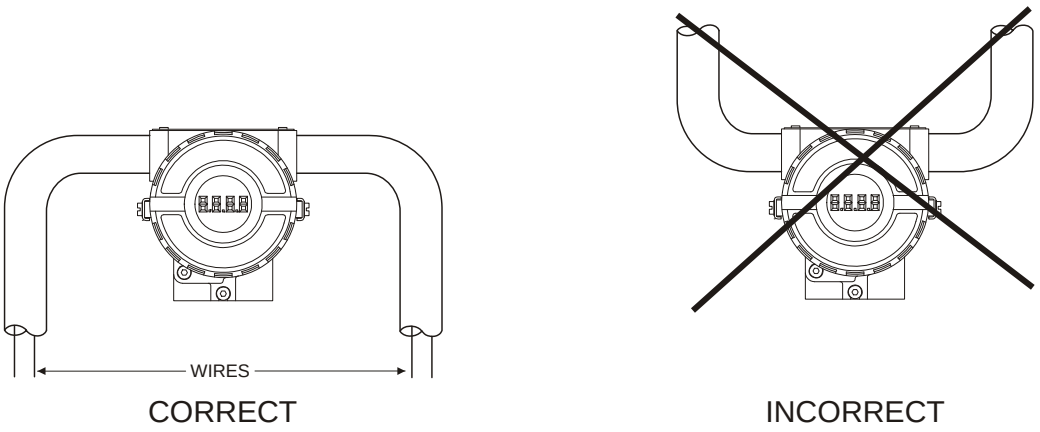


Figure 1.6 - Conduit Installation Diagram

NOTE
Please refer to the Fieldbus Installation Manual for more details.

Topology and Network Configuration

Bus topology (See Figure 1.7) and tree topology (See Figure 1.8) are supported. Both types have a trunk cable with two terminations. The devices are connected to the trunk via spurs. The spurs may be integrated in the device giving zero spur length. A spur may connect more than one device, depending on the length. Active couplers may be used to extend spur length.

Active repeaters may be used to extend the trunk length.

The total cable length, including spurs, between any two devices in the Fieldbus should not exceed 1900 m.

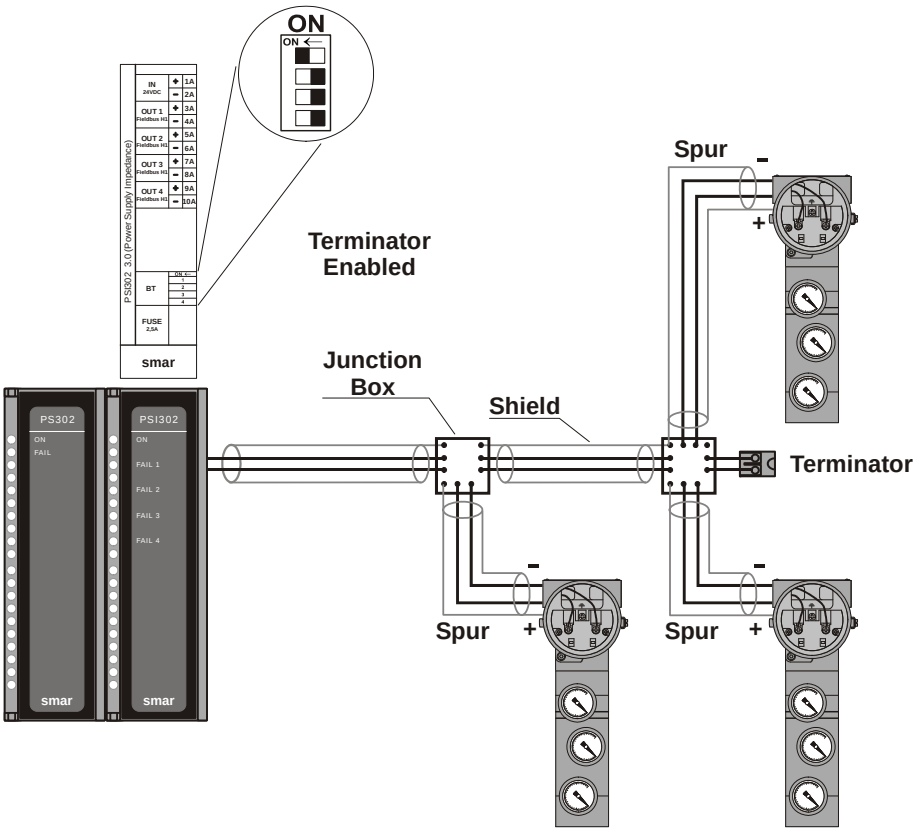


Figure 1.7 - Bus Topology

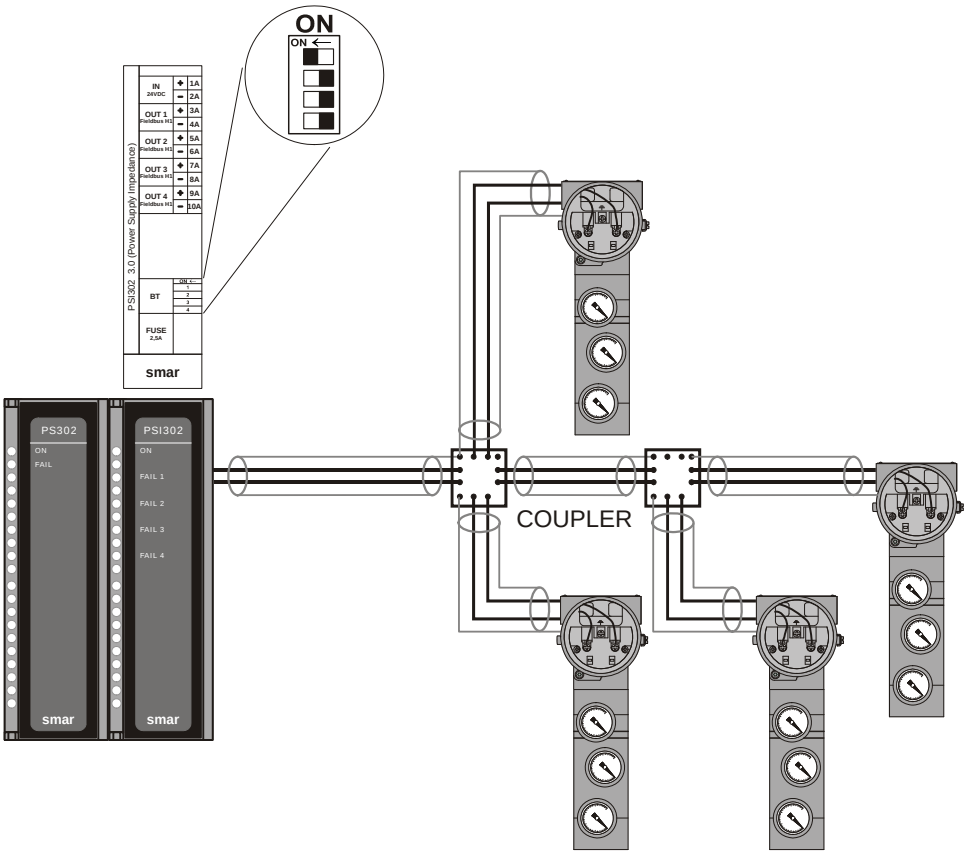


Figure 1.8 - Tree Topology

Intrinsic Safety Barrier

When the Fieldbus is in an area requiring intrinsic safety, a barrier must be inserted on the trunk between the power supply and the power supply end terminator.

Use of SB302 is recommended.

Jumper Configuration

In order to work properly, the jumpers J1 and W1 located in the **FY302** main board must be correctly configured.

J1	This jumper enables the simulation mode parameter in the AO block.
W1	This jumper enables the local adjustment programming tree.

Power Supply

The **FY302** receives power from the bus via the signal wiring. The power supply may come from a separate unit or from another device such as a controller or DCS.

The voltage should be between 9 to 32 Vdc for non-intrinsic safe applications.

A special requirement applies to the power supply used in an intrinsically safe bus and depends on the type of barrier used.

Use of PS302 is recommended as power supply.

Air Supply Requirements

Before the air supply is connected to the positioner, we recommend the hose is opened freely for 2 to 3 minutes to allow any contamination to be blown out. Direct the air jet into a large paper bag to trap any water, oil, or other foreign materials. If this indicates that the air system is contaminated, it should be properly cleaned.

As soon as the positioner is connected and started, internal air leakage will provide protection against corrosion and prevent the ingress of moisture. For this reason, the air supply pressure should always be kept on.

Recommendations for an Instrument Air System

Instrument air quality shall be superior to that of industrial compressed air. Humidity, airborne particles and oil may impair the instrument operation, either temporarily or permanently in case of internal parts wearing.

As per standard *ANSI/ISA S7.0.01 - 1996 - Quality Standard for Instrument Air*, instrument air shall the following characteristics:

Dew point	10°C below minimum instrument temperature
Size of particles (airborne)	40 µm (maximum)
Oil content	1 ppm w/w (maximum)
Contaminants	free from corrosive flammable gases

This standard recommends that the compressor intake be located in an area free from process spills and fitted with and adequate filter. It also recommends the use of non-lubricated type compressors, in order to prevent air contamination by lubricating oil. Where lubricated type compressors are adopted, there shall be used means to make the air oil free.

The figure 1.9 and 1.10 show a typical system for air supply and air quality conditioning.

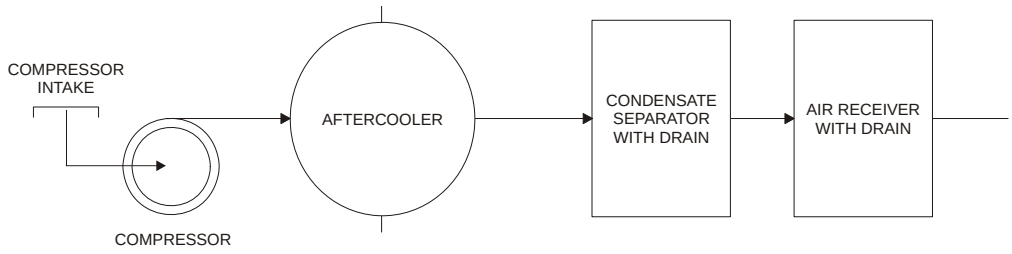


Figure 1.9 - Air Supply System

Figure 1.10 - Air Quality Conditioning System

Rotary and Linear Magnet

Magnet models are linear and rotary, for utilization on linear and rotary actuators.

Figure 1.11 – Linear and Rotary Magnet Models

Magnet Centralizer Device

NOTE
Centralizer device of linear magnet is used for all type of linear bracket.

Figure 1.12 – Centralizer device of linear magnet

NOTE
Centralizer device of linear magnet is used only for universal rotary bracket.

***Figure 1.13 - Centralizer* device of rotary magnet**

Remote Hall Sensor

The remote Hall magnetic sensor is an accessory recommended for high temperature and extreme vibration applications. It prevents excessive wear of the equipment and, consequently, the reduction of its useful time.

Figure 1.14 - Remote Hall Sensor

The electric signals on the remote sensor's connection to que equipment are of low intensity. Therefore, when installing the cable inside the conduit (maximum limit 20 meters length) keep it away from possible sources of induction and/or magnetic interference. The cable supplied by Smar is shielded for excellent protection against electromagnetic interference, but despite this protection avoid the cable sharing the same conduit with other cables.

The connector for remote Hall sensor is easy handling and simple installation.

See the installation procedure:

Figure 1.15 - Connecting the Cable to the Remote Hall Sensor

Figure 1.16 - Connecting the Cable to the Positioner

OPERATION

Functional Description - Output Module

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

The control circuit receives a digital setpoint signal from the CPU and a feedback signal from the Hall Effect sensor.

The pneumatic circuit is based on a well-known and widely adopted technology, which is described on item Nozzle-and-Vane and Spool.

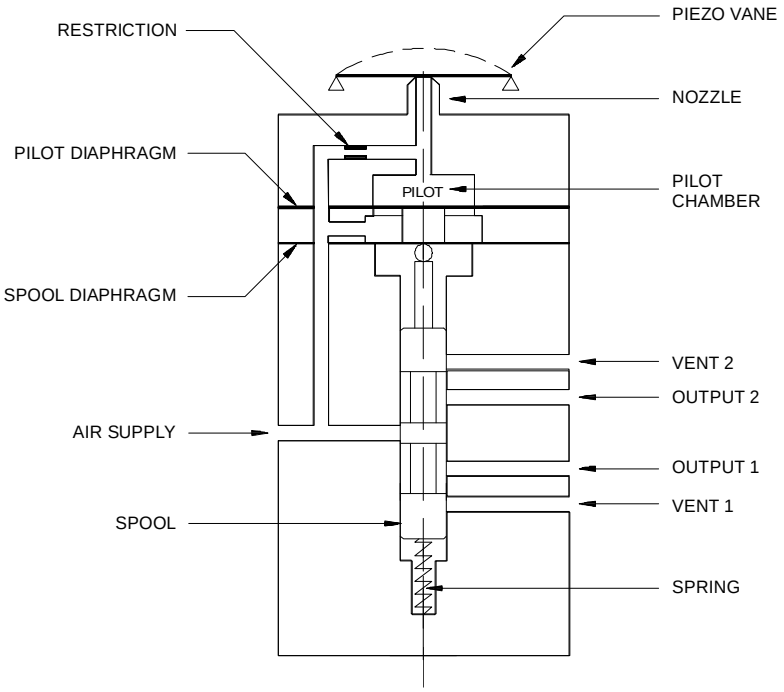


Figure 2.1 - Pneumatic Transducer Schematic

A piezoelectric disk functions as flapper in the pilot stage. The flapper is deflected when the control circuit applies a 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.

The pilot pressure is too low, with flowing capacity, and for this reason it must be amplified in the servo section. The servo section includes a diaphragm in the pilot chamber and a smaller one in the spool chamber. The pilot pressure applies a force at the pilot chamber's diaphragm which, in the equilibrium state, will be equal to the force applied by the spool valve at the smaller diaphragm which is in the spool chamber.

Therefore, upon every position change caused by the positioner, the pilot pressure increases or decreases as explained in the pilot stage section; such change in pilot pressure causes an upward or downward valve travel wich alters the pressure at output 1 and output 2 until a new equilibrium is reached, which results in a new valve position.

Functional Description - Electronics

Refer to the block diagram. The function of each block is described below.

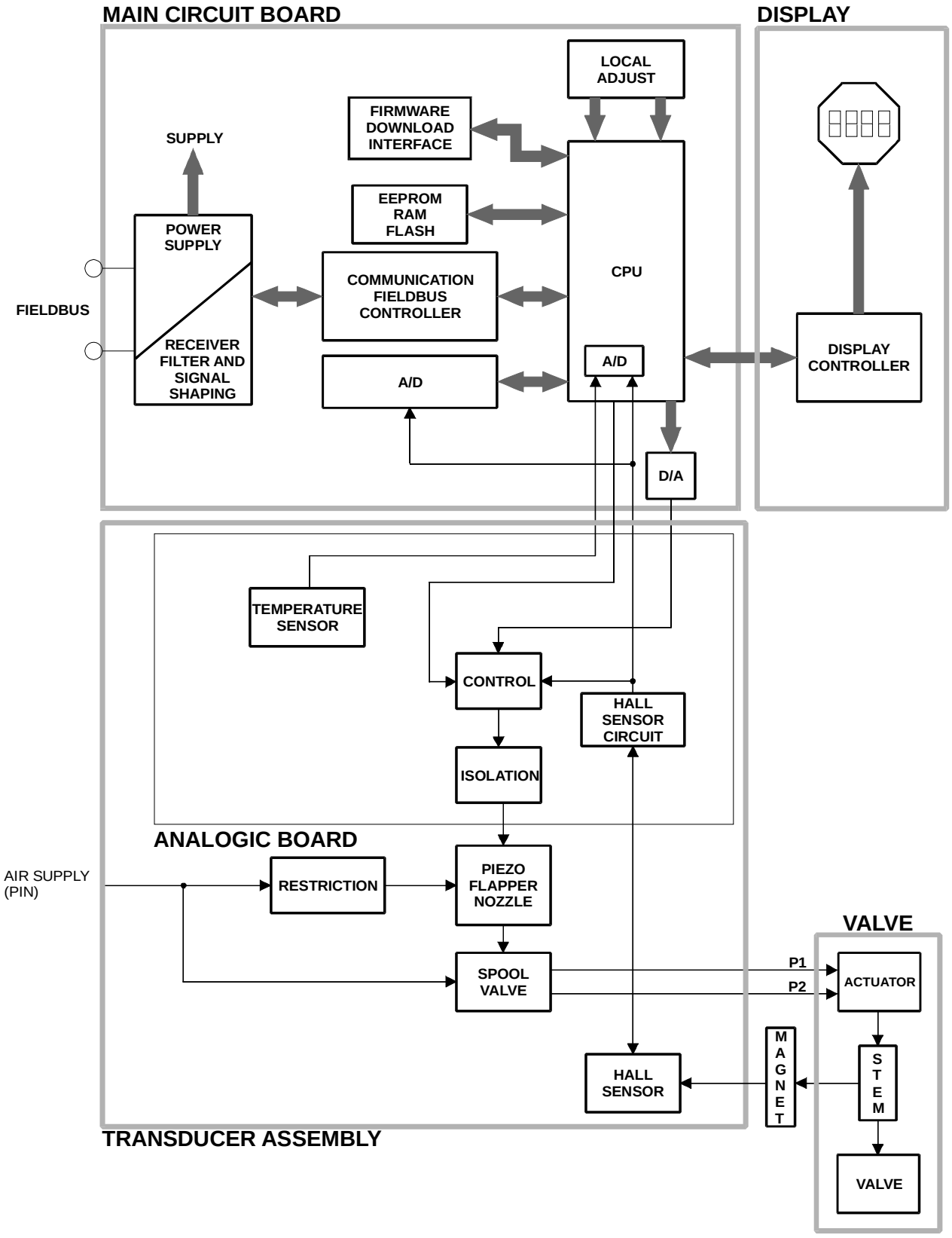


Figure 2.2 - FY302 Block Diagram

D/A

Receives the signal from the CPU and converts it to an analog voltage proportional the desired position, used by the control.

Control
Controls the valve position according to the data received from the CPU and the Hall effect sensor feedback.

A/D
Receives the signal from the Hall Sensor and converts it to a digital value proportional to the actual valve position.

Hall Effect Sensor
Measures the position actual and feedback 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
A non-volatile memory which stores configuration data as a backup.

Central Processing Unit (CPU), RAM, PROM and EEPROM
The CPU is the intelligent portion of the positioner, 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 and valve configuration.

Communication Controller
A monitor line activity, modulates and demodulates communication signals and inserts and deletes start and end delimiters.

Power Supply
The positioner circuit receives supply from a 9 to 32 Vdc power supply. Use of PS302 and PSI302 is recommended.

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

Local Adjustment
Local adjustment is provided by means of two magnetic naturally actuated switches with no external electric or mechanical contact, by using a magnetic screwdriver.

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.

Spool
The spool ensures a quick valve positioning by providing a greater air flow than one provided by the restriction.

Introduction to Fieldbus Application

From a Fieldbus point of view, the **FY302** is not an assembly of electronics, housing and sensor forming a positioner, but a network node containing function blocks.

Basically, it contains one output transducer block, one resource block and one display transducer block and various function blocks.

These blocks are models of the functionality that the **FY302** provides for a control system. They can loosely be said to make up part of the application that is performed in the **FY302**. Generally these blocks can be said to use an algorithm and contained parameters to process input parameters producing output parameters.

Function Blocks

Models the basic user configurable functionality of the device. Typically these functionality were previously available in individual devices, but now several are included in a single device. As example of function blocks available on each device are:

PID control block
This is block, which makes the PID controller operational, this enabling the **FY302** to function as a PID servo.

Analog output block
Provides the functionality of what is known as a positioner. It makes the Fieldbus signal available to the **FY302** output hardware. It also optionally performs output reversing.

Splitter/Output Selector block
Split range, sequencing and output selection applications are provided with this block.

Arithmetic block
Implements the most useful calculations used in an application.

Input Selector block
Selects one of three inputs according to an algorithm chosen by the user.

All information regarding to them and others are available on the Function Blocks Manual.

Transducer Blocks

These are responsible for the interface between the function blocks and the **FY302** output channel hardware.

Output transducer block
It is responsible for the processing of the output signal, such as output characterization and trim.

Display transducer block
It is responsible for the display and local adjustment.

Resource Block

It is responsible for monitoring the operation of the device. It also contains device information such as serial equipment number.

The Local Indicator

The local indicator is required for signaling and operation in local adjustment. The parameters desired by the user to be viewed on the LCD display should be configured in the display block.

Normal Indicator
During normal operation, the **FY302** remains in the monitoring mode and the display will always indicate the variable of monitoring configured in the display block. It is recommended configuring the position of the valve in % (percentage). The local programming mode is activated by the Magnetic tool, by inserting it in orifice Z.

The possible configuration and monitoring operation are shown on.

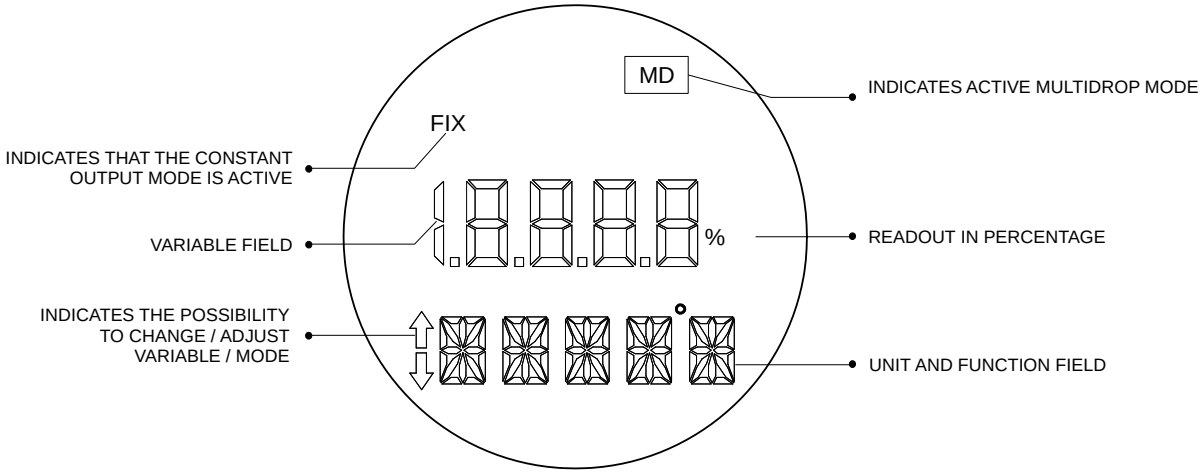


Figure 2.3 - Local Indicator

Upon receiving power, the **FY302** initializes the position indication on the display, by showing model **FY302** and its software version (X.XX).

Monitoring
During normal operation, **FY302** remains in the monitoring mode. The display simultaneously shows readout and some other information.

Normal displaying is interrupted when the magnetic tool is placed in orifice marked as “Zero” and the indicator “MD” is showed on the display. After this, withdraw the magnetic tool off the Z orifice and put it in the orifice marked with the “S” letter.

With the tool in the orifice, wait for 3 seconds. Withdraw again the magnet tool and wait for 3 seconds. Put it now in the S orifice and it will appear the message of “LOC ADJ“(Local Adjust). Withdraw the tool and put it in the Z orifice. After this, you can browse to all the parameters configured in the display block.

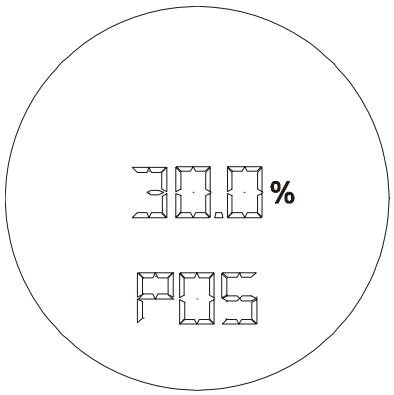


Figure 2.4 - Typical Indicator

CONFIGURATION

One of the many advantages of Fieldbus is that device configuration is independent of the configurator. A third party terminal or operator console may configure the **FY302**. Any particular configurator is therefore not addressed here.

The **FY302** contains one output transducer block, one resource block, one display transducer block and function blocks.

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.

Transducer Block Diagram

See transducer block diagram below.

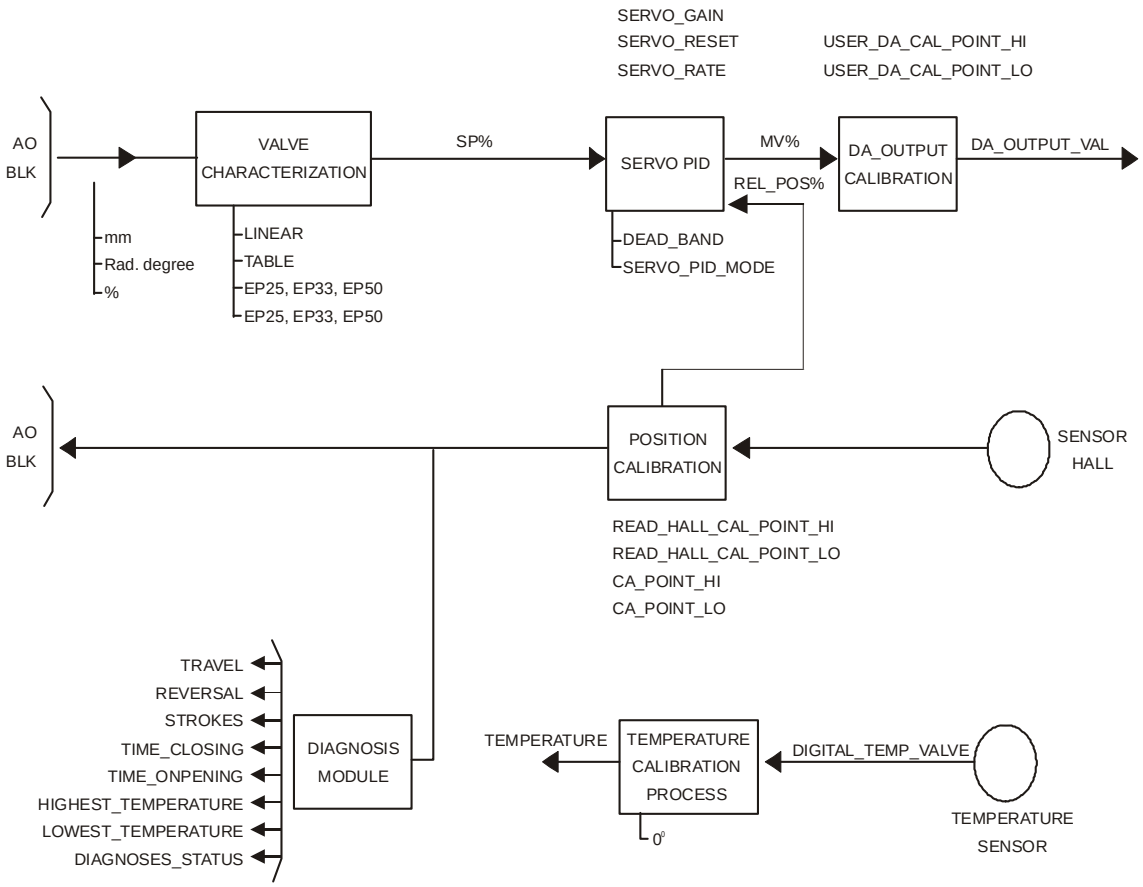


Table 3.1 – Transducer Block Diagram

Transducer

Description
The fieldbus positioner transducer receives the demanded valve position FINAL_VALUE from the AO block and uses it as a setpoint for a PID servo-positioning algorithm with adjustable gains SERVO_GAIN and SERVO_RESET. The transducer block also 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: for linear valve: % and mm, for rotary valve: %, °, rad.

After setting GAIN and RESET an automatic calibration should be done using SETUP to start the valve operation. 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 (if FINAL_VALUE is different from 0 or 100%).
- 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 (if FINAL_VALUE is different from 0 or 100%).

Transducer Block Parameters - Default Values and Units

Index	Parameter	Valid Range	Default Value	Units
1	ST_REV	Positive	0	None
2	TAG_DESC		Null	Na
3	STRATEGY		0	None
4	ALERT_KEY	1-255	0	None
5	MODE_BLK		OOS	Na
6	BLOCK_ERR		Out of Service	E
7	UPDATE_EVT		*	Na
8	BLOCK_ALM		*	Na
9	TRANSDUCER_DIRECTORY		0	None
10	TRANSDUCER_TYPE		Positioner Valve	E
11	XD_ERROR		Default value set	None
12	COLLECTION_DIRECTORY		0	None
13	FINAL_VALUE		*	FVR
14	FINAL_VALUE_RANGE		100/0/%	FVR
15	FINAL_VALUE_CUTTOF_HI		100.0	FVR
16	FINAL VALUE_CUTTOF_LO		0.0	FVR
17	FINAL_POSITION_VALUE		*	FVR
18	SERVO_GAIN		20	None
19	SERVO_RESET		2	FVR/Sec
20	SERVO_RATE		0	FVR/Sec
21	ACT_FAIL_ACTION		Undefined	None
22	ACT_MAN_ID		*	None
23	ACT_MODEL_NUM		Null	None

Index	Parameter	Valid Range	Default Value	Units
24	ACT_SN		*	None
25	VALVE_MAN_ID		0	None
26	VALVE_MODEL_NUM		Null	None
27	VALVE_SN		0	None
28	VALVE_TYPE	Linear/Rotary	Liner	None
29	XD_CAL_LOC		Null	None
30	XD_CAL_DATE		Unspecified	None
31	XD_CAL_WHO		Null	None
32	CAL_POINT_HI	-10.0 - 110.0%	100	%
33	CAL_POINT_LO	-10.0 - 100.0%	0	%
34	CAL_MIN_SPAN		1	%
35	CAL_UNIT		*	E
35	CAL_METHOD		Factory	None
37	SECONDARY_VALUE		*	SVU
38	SECONDARY_VALUE_UNIT		*	E
39	BACKUP_RESTORE		None	
40	POS_PER		*	
41	SERVO_PID_BYPASS	True/False	Not bypass	
42	SERVO_PID_DEAD_BAND		0	%
43	SERVO_PID_ERROR_PER		*	%
44	SERVO_PID_INTEGRAL_PER		*	%
45	SERVO_PID_MV_PER		*	%
46	MODULE_SN		*	
47	SENSOR_PRESS _POL0	± INF	31811.5	None
48	SENSOR_PRESS _POL1	± INF	27251.5	None
49	SENSOR_PRESS _POL2	± INF	0	None
50	SENSOR_PRESS _POL3	± INF	0	None
51	SENSOR_PRESS _POL4	± INF	0	None
52	SENSOR_PRESS _POL5	± INF	0	None
53	SENSOR_PRESS _POL6	± INF	0	None
54	SENSOR_PRESS _POL7	± INF	0	None
55	SENSOR_PRESS _POL8	± INF	0	None
56	SENSOR_PRESS _POL9	± INF	0	None
57	SENSOR_PRESS _POL10	± INF	0	None
58	POLYNOMIAL_SENS_VERSION		0	None
59	USER_HALL_CAL_POINT_HI		*	%
60	USER_HALL_CAL_POINT_LO		*	%
61	READ_HALL_CAL_POINT_HI	0.0 - 65535.0	*	None
62	READ_HALL_CAL_POINT_LO	0.0 - 65535.0	*	None
63	COEFF_SENS_TEMP_POL0	± INF	*	None
64	COEFF_SENS_TEMP_POL1	± INF	*	None
65	COEFF_SENS_TEMP_POL2	± INF	*	None
66	COEFF_SENS_TEMP_POL3	± INF	*	None
67	COEFF_SENS_TEMP_POL4	± INF	*	None
68	POLYNOMIAL_SENS_TEMP_VERSION		*	None
69	CAL_TEMPERATURE		*	°C(1001)
70	CAL_DIGITAL_TEMPERATURE		*	None
71	CHARACTERIZATION_TYPE		Linear	None
72	CURVE _BYPASS	True/False	True	None
73	CURVE _LENGTH	2 to 8	10	None
74	CURVE _X		*	%
75	CURVE _Y		*	%
76	CAL_POINT_HI_ BACKUP		100.0	%
77	CAL_POINT_LO_ BACKUP		0.0	%

Index	Parameter	Valid Range	Default Value	Units
78	CAL_POINT_HI_FACTORY		100.0	%
79	CAL_POINT_LO_FACTORY		0.0	%
80	SETUP	Enable/Disable	Disable	None
81	FEEDBACK _CAL		0	%
82	CAL_CONTROL	Enable/Disable	Disable	None
83	RETURN		*	FVR
84	POT_KP		*	None
85	POT_DC		*	None
86	MAGNET_SIZE		*	None
87	ANALOG_LATCH TRD		*	None
88	MAIN_LATCH		*	None
89	DIGITAL_TEMPERATURE		*	None
90	PIEZO_ANALOG_VOLTAGE		*	Volts
91	PIEZO_DIGITAL_VOLTAGE		*	None
92	DA_OUTPUT_VALUE		*	None
93	USER_DA_CAL_POINT_HI		*	None
94	USER_DA_CAL_POINT_LO		*	None
95	DIGITAL_HALL_VALUE		*	None
96	SETUP_PROGRESS	0/100	*	None
97	HALL_OFFSET		*	None
98	ORDERING_CODE		Null	None
99	TRAVEL_ENABLE	True/False	False	None
100	TRAVEL_DEADBAND	± INF	2	None
101	TRAVEL_LIMIT	± INF	0	None
102	TRAVEL	± INF	*	None
103	REVERSAL_ENABLE	True/False	False	None
104	REVERSAL_DEADBAND	± INF	2	None
105	REVERSAL_LIMIT	± INF	0	None
106	REVERSAL	± INF	*	None
107	DEVIATION_ENABLE	True/False	False	None
108	DEVIATION_DEADBAND	± INF	2	None
109	DEVIATION_TIME	± INF	5	None
110	STROKES	± INF	*	None
111	TIME_CLOSING	± INF	*	None
112	TIME_OPENING	± INF	*	None
113	HIGHEST_TEMPERATURE	± INF	*	None
114	LOWEST_TEMPERATURE	± INF	*	None
115	DIAGNOSES_STATUS		*	None
116	SENSOR_PRESS_UNIT		*	E
117	SENSOR_CAL_SELECTED	In, Out1, Out2	In	None
118	SENSOR_CAL_POINT_HI	0 - 100 psi	100	PRESS_UNIT
119	SENSOR_CAL_POINT_LO	0 - 100 psi	0	PRESS_UNIT
120	SENSOR_PRESS_IN	0 - 100 psi	0	PRESS_UNIT
121	SENSOR_PRESS_OUT1	0 - 100 psi	0	PRESS_UNIT
122	SENSOR_PRESS_OUT2	0 - 100 psi	0	PRESS_UNIT
123	SENSOR_PRESS_LO_LIM	0 - 100 psi	0	PRESS_UNIT
124	SENSOR_PRESS_HI_LIM	0 - 100 psi	100	PRESS_UNIT
125	SENSOR_PRESS_INSTALLED	Not Installed/Installed	*	*
126	SENSOR_PRESS_STATUS		*	None

Table 3.1 – Transducer Block Parameters - Default Values and Units

Legend:
E = Enumerated Parameter
NA = Dimensionless parameter
FVR = Final value range
SR = Sensor Range
SVU = Secondary Value Range
Gray Background Index = Default Parameters of Syscon

Transducer Block Parameters - Description

Index	Parameter	Use	Description
1	ST_REV	**RO**	Indicates the level of static data.
2	TAG_DESC	**NE**	Description of Transducer Block.
3	STRATEGY	**NE**	This parameter is not checked and processed by Transducer Block.
4	ALERT_KEY		Number of identification in the plant.
5	MODE_BLK		Indicates the operation mode of Transducer Block.
6	BLOCK_ERR		Indicates the status associated with hardware or software in the Transducer.
7	UPDATE_EVT		It is the alert for any static data.
8	BLOCK_ALM		It is used for configuration, hardware and other fails.
9	TRANSDUCER_DIRECTORY		It is used to select several Transducer Blocks.
10	TRANSDUCER_TYPE		Indicates the type of Transducer according to its class.
11	XD_ERROR	**RO**	It is used to indicate calibration status.
12	COLLECTION_DIRECTORY	**RO**	Specifies the number of transducer index into Transducer Block.
13	FINAL_VALUE	**RO**	The desired valve position received from the AO block
14	FINAL_VALUE_RANGE	**RO**	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	FINAL_VALUE_CUTTOF_HI		If the FINAL_VALUE is higher than this value is forced to its maximum high value (fully opened).
16	FINAL VALUE_CUTTOF_LO		If the FINAL_VALUE is lower than this value is forced to its maximum low value (fully closed). That is, tight shut off.
17	FINAL_POSITION_VALUE		The actual valve position and status identical to READBACK_VALUE in the AO block.
18	SERVO_GAIN		Servo PID gain value.
19	SERVO_RESET		Servo PID reset value, in seconds.
20	SERVO_RATE		Not used.
21	ACT_FAIL_ACTION	**NE**	Specifies the action the actuator takes in case of failure.
22	ACT_MAN_ID	**NE**	Actuator manufacturer identification number.
23	ACT_MODEL_NUM	**NE**	Actuator model number.
24	ACT_SN	**NE**	Actuator serial number.
25	VALVE_MAN_ID	**NE**	Valve manufacturer identification number.
26	VALVE_MODEL_NUM	**NE**	Valve model number.
27	VALVE_SN	**NE**	Valve serial number.
28	VALVE_TYPE	**NE**	Type of the valve.
29	XD_CAL_LOC	**NE**	Location of the last positioned calibration. This describes the physical location at which the calibration was performed.
30	XD_CAL_DATE	**NE**	Date of last positioner calibration.
31	XD_CAL_WHO	**NE**	Name of the person responsible for the last positioner calibration.
32	CAL_POINT_HI		Highest calibrated point.
33	CAL_POINT_LO		Lowest calibrated point.
34	CAL_MIN_SPAN	**RO**	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.
35	CAL_UNIT	**RO**	Engineering units code for the calibration values.
36	CAL_METHOD	**RO**	Method of last sensor calibration.
37	SECONDARY_VALUE	**RO**	Ambient temperature.
38	SECONDARY_VALUE_UNIT	**RO**	Unit for the ambient temperature.
39	BACKUP_RESTORE		This parameter is used to do backup or to restore data in the output transducer module.
40	POS_PER	**RO**	Actual valve position.
41	SERVO_PID_BYPASS		Enable and disable the servo PID.
42	SERVO_PID_DEAD_BAND		Dead band error for servo PID.
43	SERVO_PID_ERROR_PER	**RO**	Percent error value for the servo PID.

44	SERVO_PID_INTEGRAL_PER	**RO**	Percent integral value for the servo PID.
45	SERVO_PID_MV_PER	**RO**	Internal value.
46	MODULE_SN	**RO**	Output transducer module serial number.
47	COEFF_HALL_POL0	**F**	Position sensor polynomial coefficient 0.
48	COEFF_HALL_POL1	**F**	Position sensor polynomial coefficient 1.
49	COEFF_HALL_POL2	**F**	Position sensor polynomial coefficient 2.
50	COEFF_HALL_POL3	**F**	Position sensor polynomial coefficient 3.
51	COEFF_HALL_POL4	**F**	Position sensor polynomial coefficient 4.
52	COEFF_HALL_POL5	**F**	Position sensor polynomial coefficient 5.
53	COEFF_HALL_POL6	**F**	Position sensor polynomial coefficient 6.
54	COEFF_HALL_POL7	**F**	Position sensor polynomial coefficient 7.
55	COEFF_HALL_POL8	**F**	Position sensor polynomial coefficient 8.
56	COEFF_HALL_POL9	**F**	Position sensor polynomial coefficient 9.
57	COEFF_HALL_POL10	**F**	Position sensor polynomial coefficient 10.
58	POLYNOMIAL_HALL_VERSION	**F**	Position sensor version.
59	USER_HALL_CAL_POINT_HI	**RO**	Highest calibrated point.
60	USER_HALL_CAL_POINT_LO	**RO**	Lowest calibrated point.
61	READ_HALL_CAL_POINT_HI	**RO**	Highest calibrated point for Position sensor.
62	READ_HALL_CAL_POINT_LO	**RO**	Lowest calibrated point for Position sensor.
63	COEFF_SENS_TEMP_POL0	**F**	Temperature polynomial coefficient 0.
64	COEFF_SENS_TEMP_POL1	**F**	Temperature polynomial coefficient 1.
65	COEFF_SENS_TEMP_POL2	**F**	Temperature polynomial coefficient 2.
66	COEFF_SENS_TEMP_POL3	**F**	Temperature polynomial coefficient 3.
67	COEFF_SENS_TEMP_POL4	**F**	Temperature polynomial coefficient 4.
68	POLYNOMIAL_SENS_TEMP_VERSION	**F**	Temperature compensation polynomial version.
69	CAL_TEMPERATURE		Value used to calibrate the temperature sensor.
70	CAL_DIGITAL_TEMPERATURE	**RO**	The cal digital temperature value.
71	CHARACTERIZATION_TYPE		Applied flow characterization ("soft cam").
72	CURVE _BYPASS		Enable and disable the custom applied characterization.
73	CURVE _LENGTH		The number of points in the custom applied flow characterization.
74	CURVE _X		Setpoint values for the custom applied flow characterization curve.
75	CURVE _Y		Flow values for the customer applied flow characterization curve.
76	CAL_POINT_HI_ BACKUP	**RO**	Backup for highest calibration point.
77	CAL_POINT_LO_ BACKUP	**RO**	Backup lowest calibration point.
78	CAL_POINT_HI_FACTORY	**RO**	Factory for highest calibration point.
79	CAL_POINT_LO_FACTORY	**RO**	Factory for lowest calibration point.
80	SETUP		Start and stop auto-calibration of the actual position feedback sensor (stroking).
81	FEEDBACK _CAL		Position value used to manually correct a calibration.
82	CAL_CONTROL		Enable and disable manual position sensor calibration.
83	RETURN	**RO**	Actual valve position and status also used at the READBACK_VALUE in the AO block.
84	POT_KP	**RO**	Servo gain value by hardware.
85	POT_DC		DC constant value for the piezo sensor.
86	MAGNET_SIZE		Features of Magnet.
87	ANALOG_LATCH		Analog Switch used by hardware.
88	MAIN_LATCH		Air to Open/Close.
89	DIGITAL_TEMPERATURE	**RO**	Raw temperature value.
90	PIEZO_ANALOG_VOLTAGE	**RO**	Piezo output drive signal.
91	PIEZO_DIGITAL_VOLTAGE	**RO**	Raw piezo drive signal.
92	DA_OUTPUT_VALUE	**RO**	Digital analog output value.

93	USER_DA_CAL_POINT_HI	**RO**	Digital analog value for output in a highest calibration point.
94	USER_DA_CAL_POINT_LO	**RO**	Digital analog value for output in a lowest calibration point.
95	DIGITAL_HALL_VALUE	**RO**	Raw actual position feedback value.
96	SETUP_PROGRESS		Shows the auto set up progress.
97	HALL_OFFSET	**RO**	The value after completing self offset actual position sensor calibration.
98	ORDERING_CODE		Ordering code for the product.
99	TRAVEL_ENABLE		Enables operational statistics accumulation of total valve travel.
100	TRAVEL_DEADBAND		Valve movement, in percent of ranged travel (full stroke), necessary to accumulate the travel.
101	TRAVEL_LIMIT		Limit at which travel alarm is triggered.
102	TRAVEL		Total accumulated travel in equivalent ranged travel (full strokes). The travel value is accumulated when the magnitude of the movement exceeds the travel dead band.
103	REVERSAL_ENABLE		Enables operational statistics collection for reversal counting.
104	REVERSAL_DEADBAND		Valve direction change, in percent of ranged travel (full stroke), necessary to increment the Reversal.
105	REVERSAL_LIMIT		It is the value of the Reversal, which, when exceeded, an Alert is generated. The alert is cleared by entering a new Reversal value lower than the Reversal Limit.
106	REVERSAL		It is the number of times the valve changes direction. The Reversal is incremented when there is a changing in the direction exceeding the Reversal Dead band.
107	DEVIATION_ENABLE		Enables the deviation alarm.
108	DEVIATION_DEADBAND		Maximum deadband deviation, in percent of ranged travel.
109	DEVIATION_TIME		It's the time in seconds that deviations must persist before the alert is generated.
110	STROKES		It is number of the times that the valve reached its maximum and minimum position.
111	TIME_CLOSING		Time in seconds it took to stroke the valve from fully open to fully closed.
112	TIME_OPENING		Time in seconds it took to stroke the valve from fully closed to fully open.
113	HIGHEST_TEMPERATURE		Indicates the highest ambient temperature.
114	LOWEST_TEMPERATURE		Indicates the lowest ambient temperature.
115	DIAGNOSES_STATUS		Show the device status (fails and warnings).
116	SENSOR_PRESS_UNIT		Pressure unit.
117	SENSOR_CAL_SELECTED		Selects one of the three sensor pressure for calibration.
118	SENSOR_CAL_POINT_HI		Highest calibrated point for the sensor pressure.
119	SENSOR_CAL_POINT_LO		Lowest calibrated point for the sensor pressure.
120	SENSOR_PRESS_IN	**RO**	Supply pressure.
121	SENSOR_PRESS_OUT1	**RO**	Pressure in actuator chamber 1.
122	SENSOR_PRESS_OUT2	**RO**	Pressure in actuator chamber 2 (only for double acting).
123	SENSOR_PRESS_LO_LIM		High limit for the supply pressure.
124	SENSOR_PRESS_HI_LIM		Low limit for the supply pressure.
125	SENSOR_PRESS_INSTALLED		Says if the pressure sensors installed (/K1 option).
126	SENSOR_PRESS_STATUS		Show the sensor pressure status.

Legend: **RO** = Read Only

F = Factory access only

NE = Has no effect on the operation of the device

Table 3.2 - Transducer Block Parameters - Description

Transducer Block Parameters - Attributes

Index	Parameter	Data Type	Store	Access
1	ST_REV	Unsigned16	S	R/W
2	TAG_DESC	VisibleString	S	R/W
3	STRATEGY	Unsigned16	S	R/W
4	ALERT_KEY	Unsigned8	S	R/W
5	MODE_BLK	DS-69	S	R/W
6	BLOCK_ERR	Bit String	D	R/W
7	UPDATE_EVT	DS-73	D	R/W
8	BLOCK_ALM	DS-72	D	R/W
9	TRANSDUCER_DIRECTORY	Array of Unsigned16	N	R/W
10	TRANSDUCER_TYPE	Unsigned16	N	R/W
11	XD_ERROR	Unsigned8	D	R
12	COLLECTION_DIRECTORY	Array of Unsigned 32	S	R
13	FINAL_VALUE	DS-65	D	R
14	FINAL_VALUE_RANGE	DS-68	S	R
15	FINAL_VALUE_CUTTOF_HI	Float	S	R/W
16	FINAL VALUE_CUTTOF_LO	Float	S	R/W
17	FINAL_POSITION_VALUE	DS-65	D	XD_SCALE
18	SERVO_GAIN	Float	S	None
19	SERVO_RESET	Float	S	
20	SERVO_RATE	Float	S	
21	ACT_FAIL_ACTION	Unsigned8	S	None
22	ACT_MAN_ID	Unsigned32	N	None
23	ACT_MODEL_NUM	VisibleString	N	None
24	ACT_SN	VisibleString	N	None
25	VALVE_MAN_ID	Unsigned32	N	None
26	VALVE_MODEL_NUM	VisibleString	N	None
27	VALVE_SN	VisibleString	N	None
28	VALVE_TYPE	Unsigned8	N	None
29	XD_CAL_LOC	VisibleString	S	none
30	XD_CAL_DATE	Time of Day	S	none
31	XD_CAL_WHO	VisibleString	S	none
32	CAL_POINT_HI	Float	S	R/W
33	CAL_POINT_LO	Float	S	R/W
34	CAL_MIN_SPAN	Float	S	R
35	CAL_UNIT	Unsigned16	S	R
36	CAL_METHOD	Unsigned8	S	R
37	SECONDARY_VALUE	DS-65	D	R
38	SECONDARY_VALUE_UNIT	Unsigned16	S	R
39	BACKUP_RESTORE	Unsigned8	S	R/W
40	POS_PER	DS-65	D	R
41	SERVO_PID_BYPASS	Unsigned8	S	R/W
42	SERVO_PID_DEAD_BAND	Float	S	R/W
43	SERVO_PID_ERROR_PER	DS-65	D	R
44	SERVO_PID_INTEGRAL_PER	DS-65	D	R
45	SERVO_PID_MV_PER	DS-65	D	R
46	MODULE_SN	Unsigned32	N	R/W
47	COEFF_HALL_POL0	Float	S	R/W
48	COEFF_HALL_POL1	Float	S	R/W
49	COEFF_HALL_POL2	Float	S	R/W
50	COEFF_HALL_POL3	Float	S	R/W
51	COEFF_HALL_POL4	Float	S	R/W
52	COEFF_HALL_POL5	Float	S	R/W
53	COEFF_HALL_POL6	Float	S	R/W
54	COEFF_HALL_POL7	Float	S	R/W
55	COEFF_HALL_POL8	Float	S	R/W
56	COEFF_HALL_POL9	Float	S	R/W
57	COEFF_HALL_POL10	Float	S	R/W
58	POLYNOMIAL_HALL_VERSION	Unsigned8	S	R/W
59	USER_HALL_CAL_POINT_HI	Float	S	R
60	USER_HALL_CAL_POINT_LO	Float	S	R
61	READ_HALL_CAL_POINT_HI	Float	S	R
62	READ_HALL_CAL_POINT_LO	Float	S	R
63	COEFF_SENS_TEMP_POL0	Float	S	R/W
64	COEFF_SENS_TEMP_POL1	Float	S	R/W

Index	Parameter	Data Type	Store	Access
65	COEFF_SENS_TEMP_POL2	Float	S	R/W
66	COEFF_SENS_TEMP_POL3	Float	S	R/W
67	COEFF_SENS_TEMP_POL4	Float	S	R/W
68	POLYN_SENS_TEMP_VERSION	Unsigned8	S	R/W
69	CAL_TEMPERATURE	Float	S	R/W
70	CAL_DIGITAL_TEMPERATURE	Float	S	R
71	CHARACTERIZATION_TYPE	Unsigned8	S	R/W
72	CURVE _BYPASS	Unsigned8	S	R/W
73	CURVE _LENGTH	Unsigned8	S	R/W
74	CURVE _X	Array of Float	S	R/W
75	CURVE _Y	Array of Float	S	R/W
76	CAL_POINT_HI_ BACKUP	Float	S	R
77	CAL_POINT_LO_ BACKUP	Float	S	R
78	CAL_POINT_HI_FACTORY	Float	S	R
79	CAL_POINT_LO_FACTORY	Float	S	R
80	SETUP	Unsigned8	N	R/W
81	FEEDBACK _CAL	Float	S	R/W
82	CAL_CONTROL	Unsigned8	S	R/W
83	RETURN	DS-65	D	R
84	POT_KP	Unsigned8	S	R
85	POT_DC	Unsigned8	S	R/W
86	MAGNET_SIZE	Unsigned8	S	R/W
87	ANALOG_LATCH	Unsigned8	S	R/W
88	MAIN_LATCH	Unsigned8	S	R/W
89	DIGITAL_TEMPERATURE	DS-65	D	R
90	PIEZO_ANALOG_VOLTAGE	DS-65	D	R
91	PIEZO_DIGITAL_VOLTAGE	DS-65	D	R
92	DA_OUTPUT_VALUE	DS-65	D	R
93	USER_DA_CAL_POINT_HI	Float	S	R
94	USER_DA_CAL_POINT_LO	Float	S	R
95	DIGITAL_HALL_VALUE	Unsigned16	D	R
96	SETUP_PROGRESS	Unsigned8	D	R/W
97	HALL_OFFSET	float	D	R
98	ORDERING_CODE	Array of Unsigned8	S	R/W
99	TRAVEL_ENABLE	Unsigned8	S	R/W
100	TRAVEL_DEADBAND	Float	S	R/W
101	TRAVEL_LIMIT	Float	S	R/W
102	TRAVEL	Float	D	R/w
103	REVERSAL_ENABLE	Unsigned8	S	R/W
104	REVERSAL_DEADBAND	Float	S	R/W
105	REVERSAL_LIMIT	Float	S	R/W
106	REVERSAL	Float	D	R/w
107	DEVIATION_ENABLE	Unsigned8	S	R/W
108	DEVIATION_DEADBAND	Float	S	R/W
109	DEVIATION_TIME	Float	S	R/W
110	STROKES	Float	D	R/W
111	TIME_CLOSING	Float	S	R/W
112	TIME_OPENING	Float	S	R/W
113	HIGHEST_TEMPERATURE	Float	S	R/W
114	LOWEST_TEMPERATURE	Float	S	R/W
115	DIAGNOSES_STATUS	Unsigned8	D	R/W
116	SENSOR_PRESS_UNIT	Unsigned16	S	R/W
117	SENSOR_CAL_SELECTED	Unsigned8	S	R/W
118	SENSOR_CAL_POINT_HI	Float	S	R/W
119	SENSOR_CAL_POINT_LO	Float	S	R/W
120	SENSOR_PRESS_IN	DS-65	D	R
121	SENSOR_PRESS_OUT1	DS-65	D	R
122	SENSOR_PRESS_OUT2	DS-65	D	R
123	SENSOR_PRESS_LO_LIM	Float	S	R/W
124	SENSOR_PRESS_HI_LIM	Float	S	R/W
125	SENSOR_PRESS_INSTALLED	Unsigned8	N	R/W
126	SENSOR_PRESS_STATUS	Unsigned8	D	R/W

Table 3.3 - Transducer Blocks Parameters - Attributes

How to Configure a Transducer Block

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 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.

Auto-Setup

This process is necessary to find the position values at which the valve is considered fully open or close. This operation can be done using the SYSCON or the local adjustment. The **FY302** automatically finds the fully open and closed positions of a valve, but the user may also set a narrower range of operation should he like to. Before making the Auto-Setup, select the type of valve through the Valve Type parameter choosing between "linear or rotary" options.

The setup operation can be started writing "enable" on the Setup parameter, so the positioner will execute immediately the operation of auto-setup for approximately 2 to 5 minutes depending on the type of valve, other configured parameters and function blocks used in the positioner. The process will be finished when the Setup parameter will indicate "disable" automatically during the reading operation.

NOTE
This operation should be performed off-line or with the process shut down to be sure that the plant operation is not disturbed, due the valve will be moved between the fully open and close points in order to reach the better adjustment.

After the Auto-Setup operation the user should adjust the zero and span positions, writing on the parameters CAL_POINT_LO and CAL_POINT_HI.

NOTE
In case of oscillation, decrease the gain of valve, acting on the SERVO_GAIN parameter. If the valve could be out-of-control after its operation, please, repeat the Auto-Setup operation again.

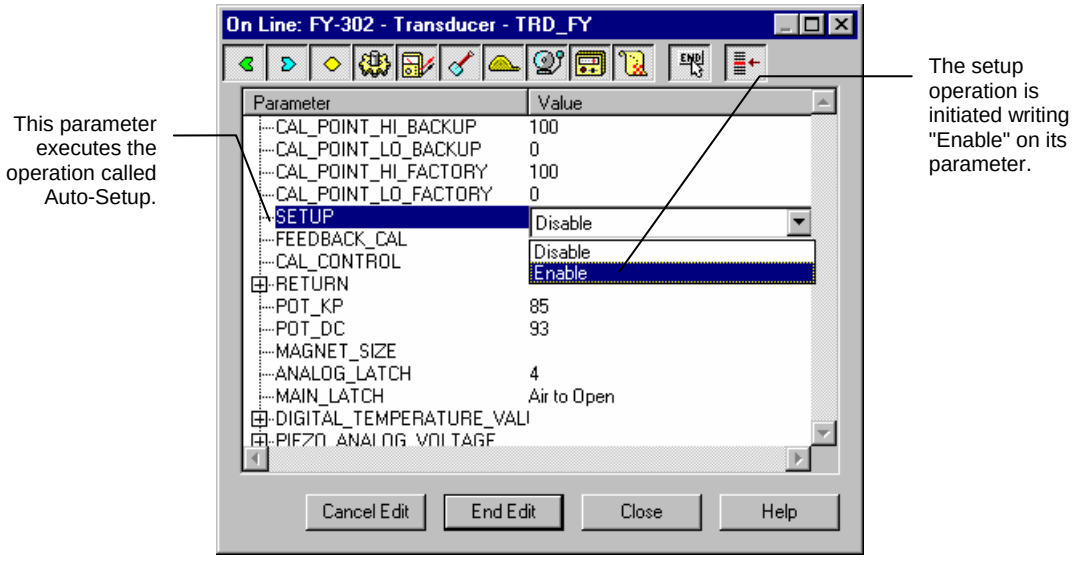


Figure 3.1 - Enabling the Auto-Setup Operation

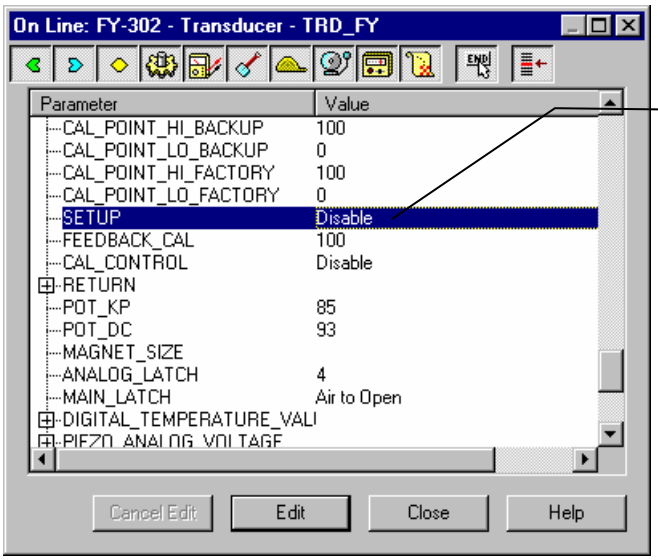


Figure 3.2 - Disabling the Auto-Setup Operation

The setup progress can be followed by watching the parameters SETUP_PROGRESS. It goes from 0 to 100%.

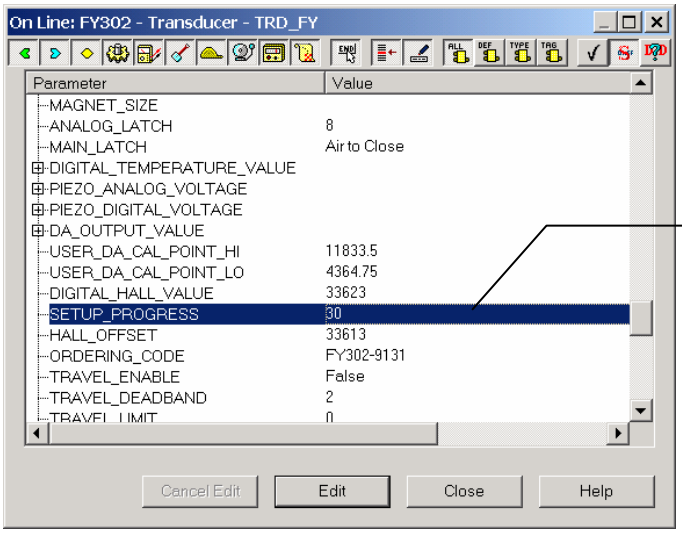


Figure 3.3 - Setup Progress

The setup process stuck sometimes because of wrong parameter configuration or a problem in the positioner assembly. Bellow there is a list of the maintenance procedures according to the SETUP_PROGRESS value.

Setup Progress	Probable Cause
40%	No air supply, spool stuck or too low proportional value
60%	Too low proportional value (SERVO_GAIN)
70%	Too high proportional value (SERVO_GAIN)
80%	Too high proportional value (SERVO_GAIN)

Also the display positioner can show some error messages.

Display Message	Probable Cause
Fail Press	No air supply, spool stuck or too low proportional value
Fail Mgnt	No magnet installed or it was not well assembly
Fail Hall	Problem with Hall sensor or flat cable disconnected

Calibration

It 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 desired 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.

NOTE
98% of the valves after setup process are well calibrated; therefore the calibration is not necessary.

Position Trim

Via SYSCON

First of all, the user must configure the valve type. Through the parameter “VALVE TYPE” the valve type can be selected.

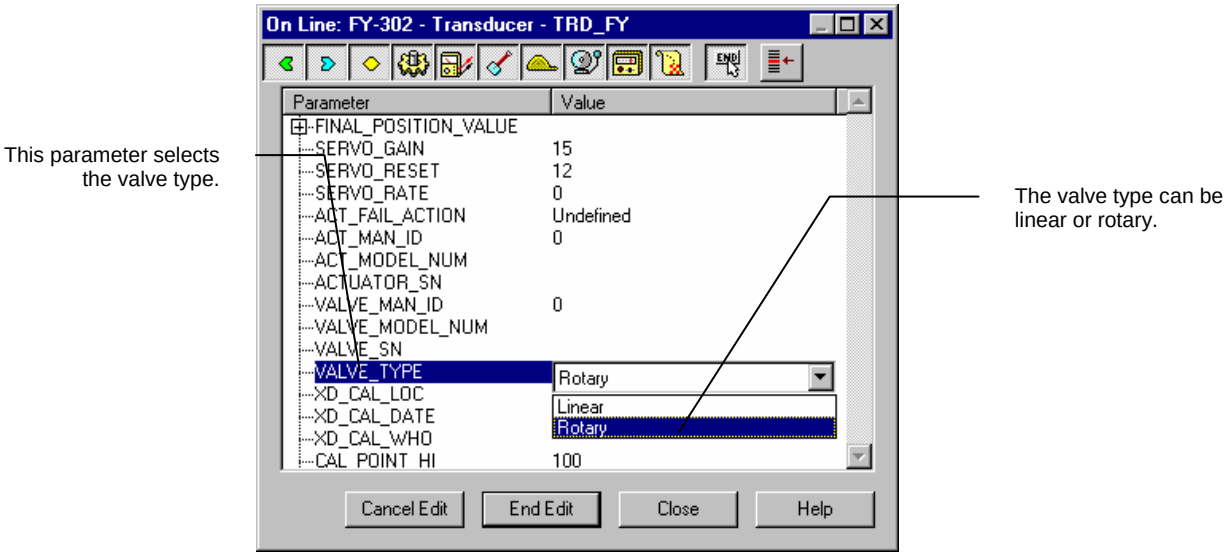


Figure 3.4 – Valve Type Configuration

It is possible to calibrate the positioner by parameters CAL_POINT_LO and CAL_POINT_HI. Let’s take the lower value as an example: Write 0% in parameter CAL_POINT_LO. For **FY302** it should be always 0%. Simply by writing in this parameter, the trim procedure is initialized.

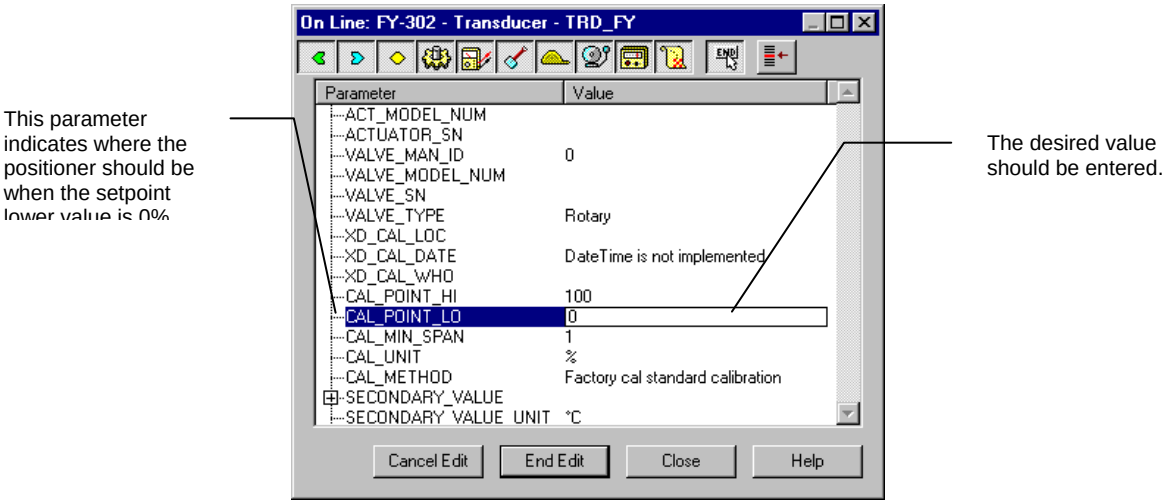


Figure 3.5 - Calibrating Low Range Value Point

Check the position showed in the local indicator. If it is different of 0%, write it in the parameter FEEDBACK_CAL. Repeat this operation until it reads 0%.

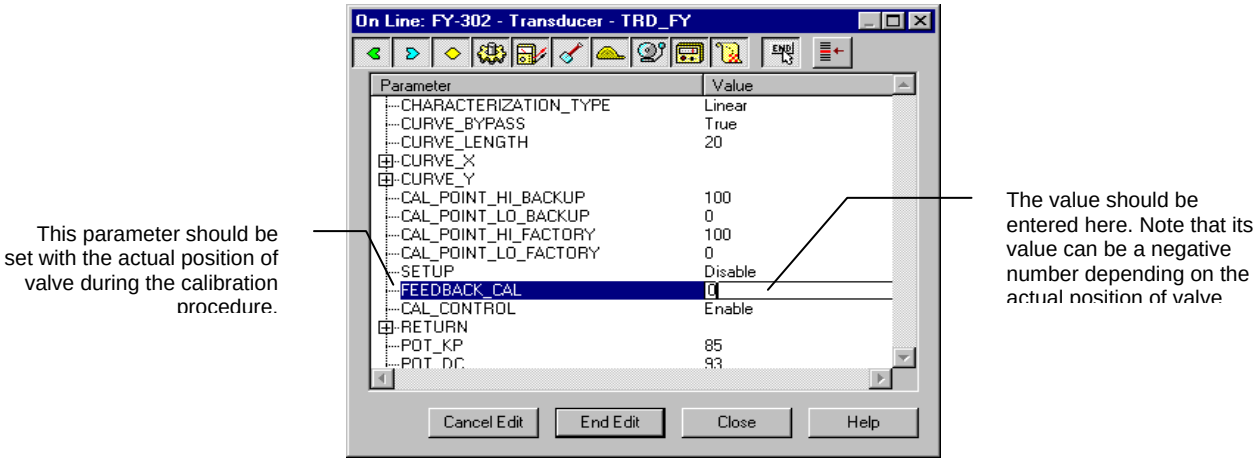


Figure 3.6 - Calibrating - Trim 0%

You should finalize the calibration method writing "Disable" in the parameter CAL_CONTROL.

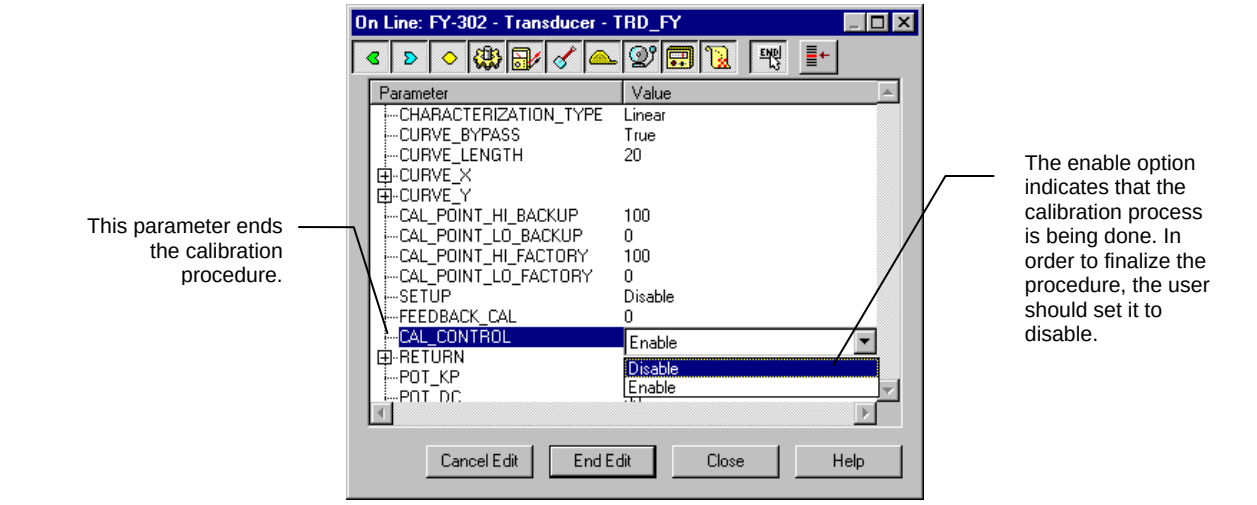


Figure 3.7 – Finishing Calibration Procedure

PRODEDURE TO MANUAL CALIBRATION (this procedure is described in the screens below)

To calibrate the high point (valve fully opened)
1. Write 100% to CAL_POINT_HI
2. Check the valve at the field to see the real position
3. Write this value in FEEDBACK_CAL
4. Select DISABLE to the CAL_CONTROL, to finish the procedure.

For the upper value, write 100% in parameter CAL_POINT_HI. For **FY302** it should be always 100%. Simply by writing in this parameter, the trim procedure is initialized.

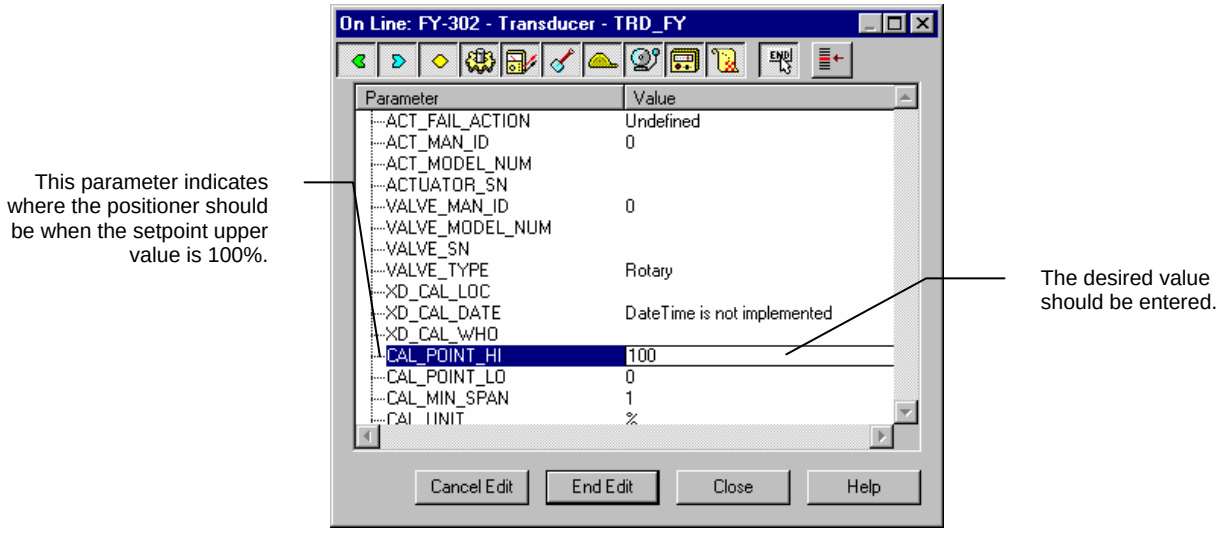


Figure 3.8 - Calibrating High Range Value Point

Check the position showed on the local indicator. If it is different of 100%, write it in the parameter FEEDBACK_CAL. Repeat this operation until it reads 100%.

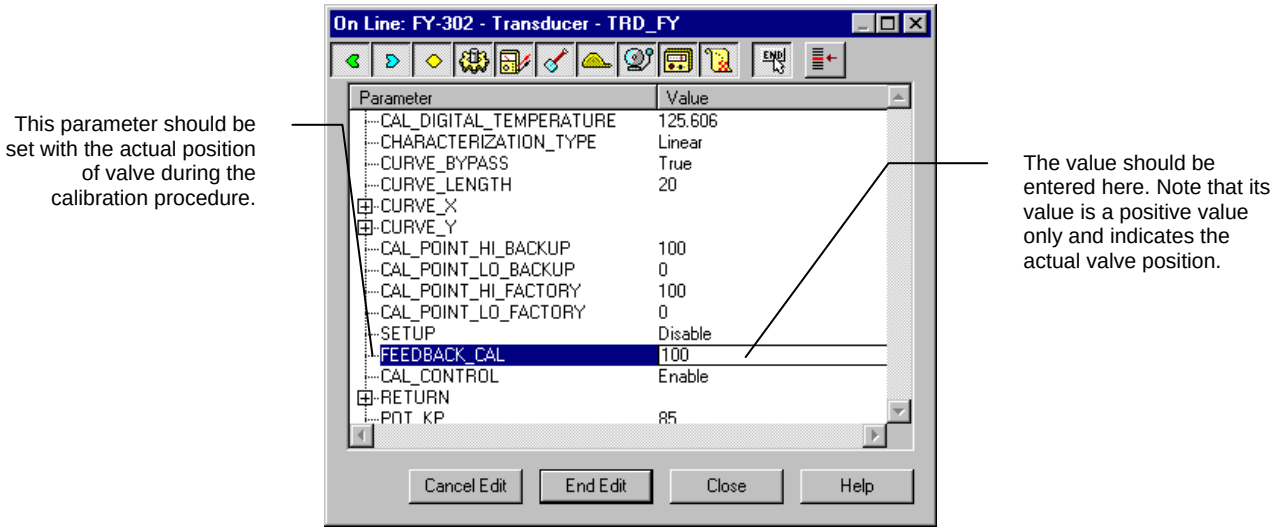


Figure 3.9 - 100% Trim Calibration

In order to end the trim procedure, select “DISABLE” in CAL_CONTROL parameter.

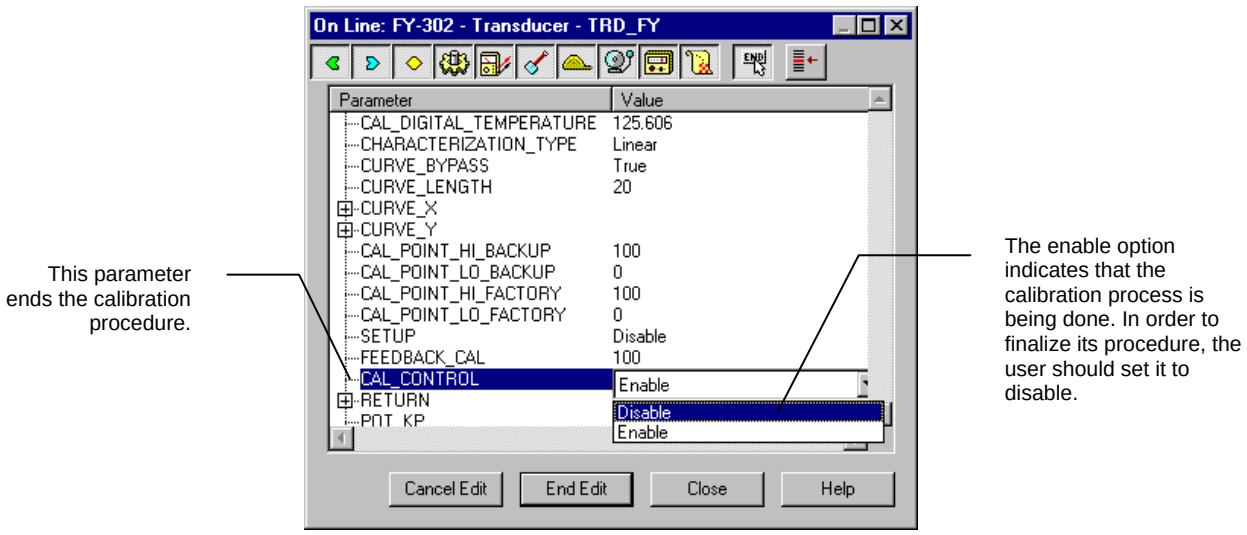


Figure 3.10 – End of Trim Procedure

NOTE
It is convenient to choose the unit to be used in parameter XD_SCALE of the Analog Output Block, considering that positioner limits shall be observed, it means 0% and 100%. It is also recommendable, for every new calibration, to save the existing trim data in the parameters CAL_POINT_LO_BACKUP and CAL_POINT_HI_BACKUP, by means of parameter BACKUP_RESTORE, using option LAST_CAL_ BACKUP.

Sensor Pressure

Some positioner has three sensors that work individually to monitor input and output pressures. Those pressure values can be used by a maintenance supervisory system, such as Asset View, for diagnosis procedure.

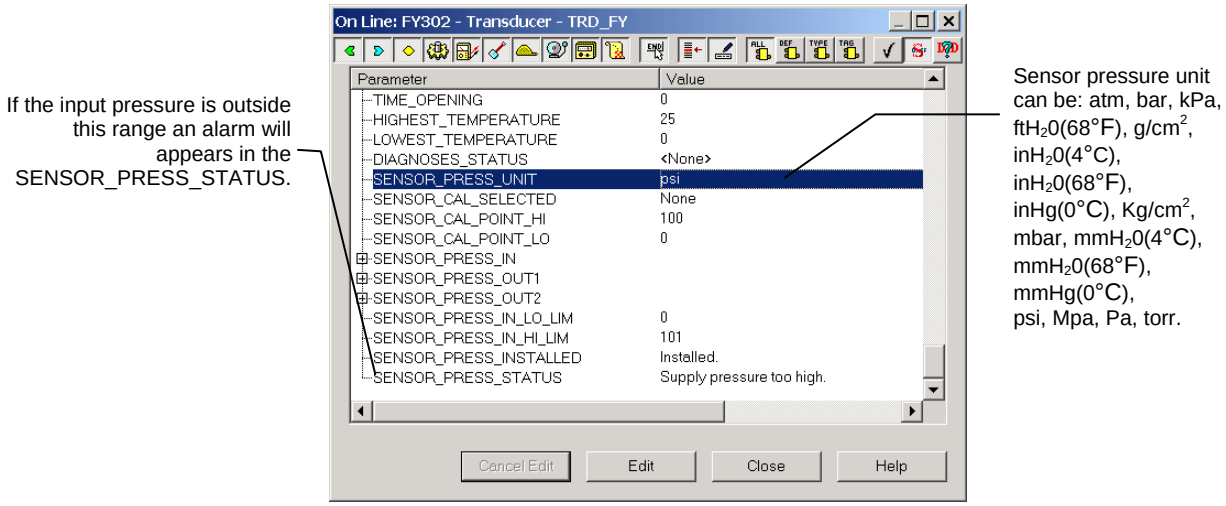


Figure 3.11 - Sensor Pressure Parameters

The sensor pressure trim is done through SENSOR_CAL_SELECTED, SENSOR_CAL_POINT_HI and SENSOR_CAL_POINT_LO parameters.

The SENSOR_CAL_SELECTED allow choosing among the three pressure sensor (input, out1 and out2). After the sensor selection the calibration is done using two points, one can be without pressure (CAL_POINT_LO) and the other using the system pressure.

In order to make a good calibration, the valve should be opened totally (out1 with maximum pressure for the sensor out1 trim) and the valve should be closed totally (out2 with maximum pressure for sensor out2 trim).

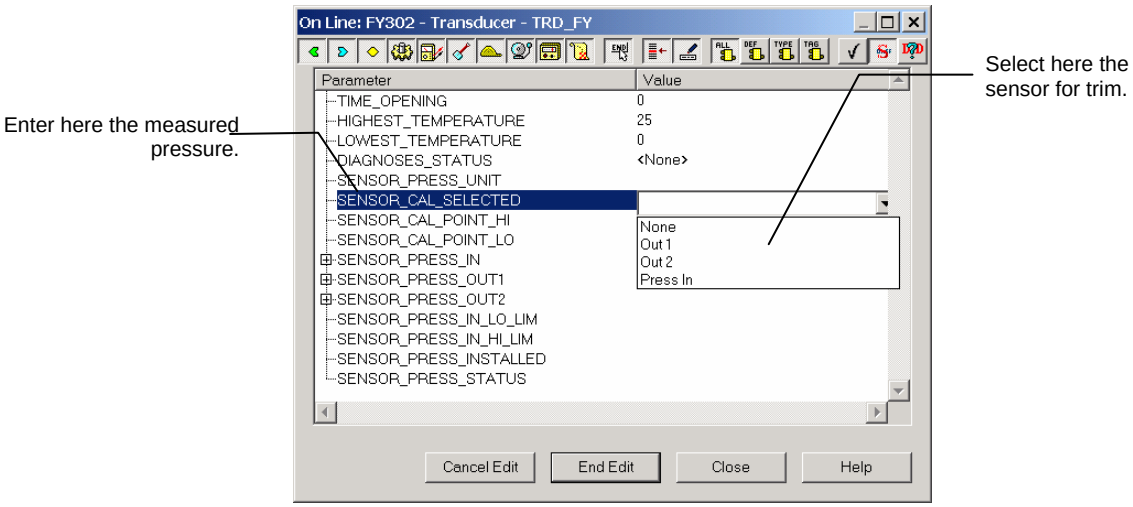


Figure 3.12 - Sensor Pressure Trim

Flow Characterization

The desired flow characteristics may be changed using this function. The options for applied flow characterization are: LINEAR, TABLE, EP25, EP33, EP50, QO25, QO33, and QO50.

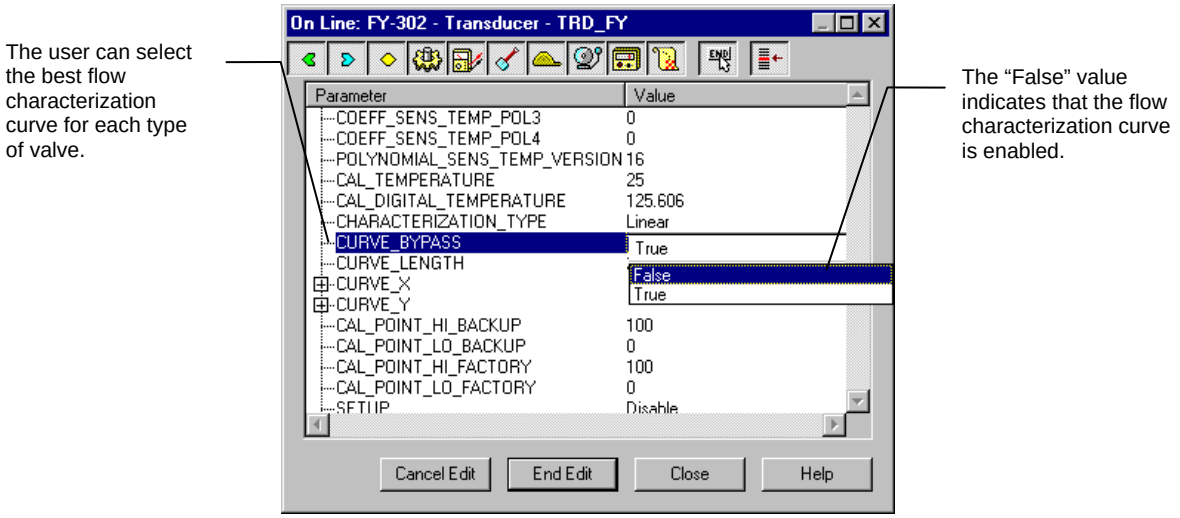


Figure 3.13 - Choosing the Flow Characterization Curve

In case of flow characterization selected to be TABLE, the user can configure up to 20 points in percentage. The number of points should be configured writing the parameter CURVE_LENGTH and its curve can be enabled by writing on the parameter CURVE_BYPASS.

The equation resulting from its curve is:

Y[%] = (100*(X[%]/100))/(L+(1-L)*(X[%]/100)),

Where:

Y[%] = Value after the flow characterization curve calculation
X[%] = Position value before entering in the curve calculation

L = Characterization Factor

TYPE	L
LINEAR	1.0
EP25	3.5
EP33	4.1
EP50	5.1
QO25	0.27
QO33	0.24
QO50	0.19

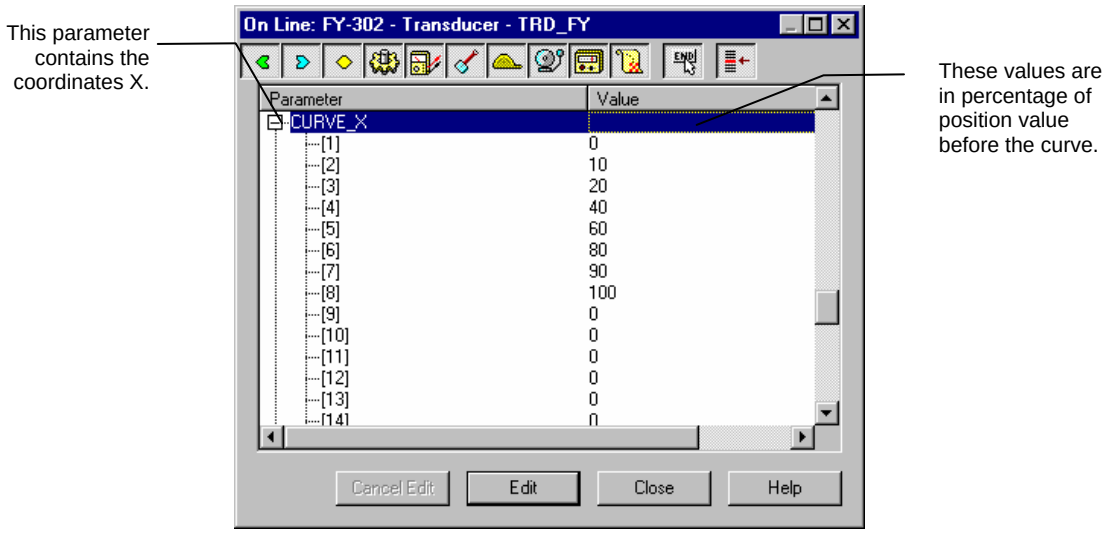


Figure 3.14 - Configuring the Table for Flow Characterization - X points

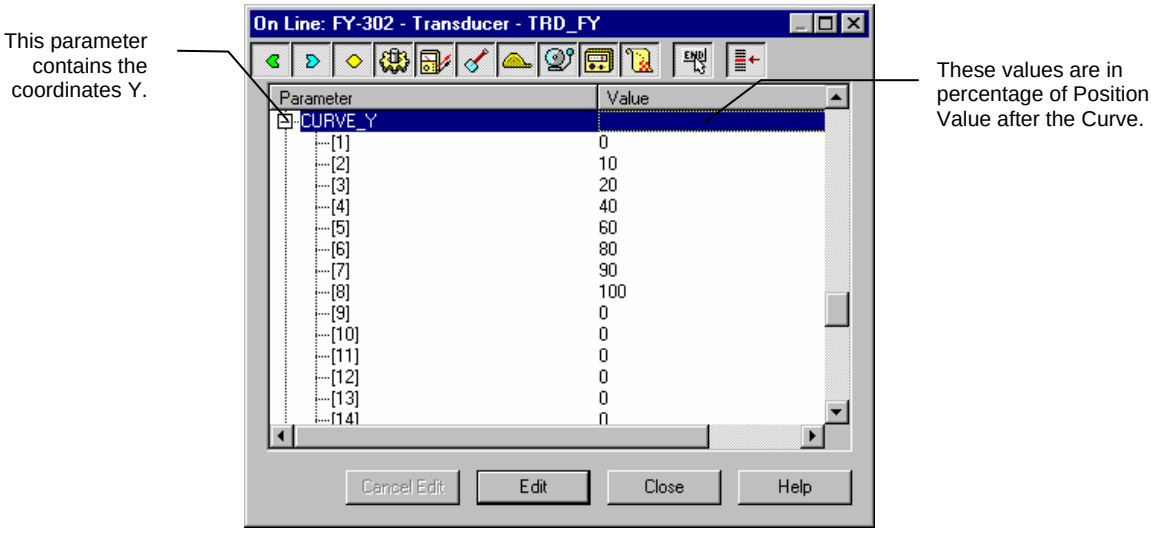


Figure 3.15 - Configuring the Table for Flow Characterization - Y points

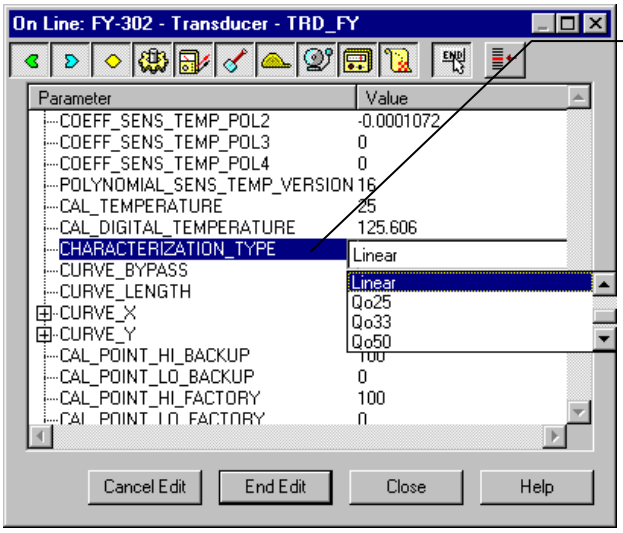


Figure 3.16 - Flow Characterization Type

Temperature Calibration

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.

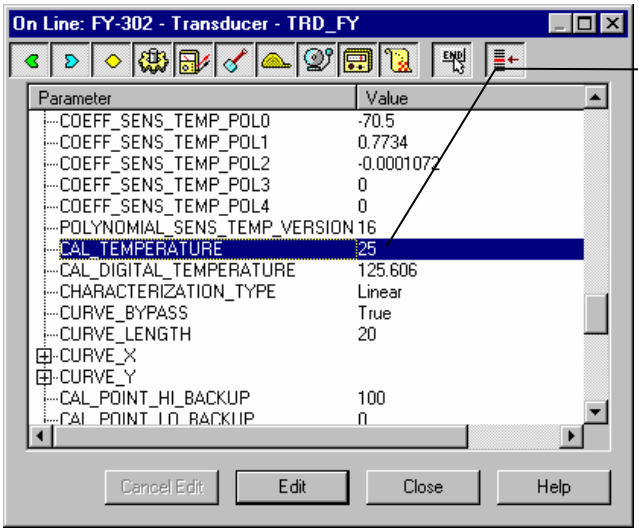


Figure 3.17 - Calibrating the Temperature Sensor

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 users is described very detailed on this manual. Please, read carefully 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 have 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 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 configurator 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 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 3.18 and the figure 3.19 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 by the user in order to enable, a possible configuration 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 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 opening the desired block.

Sub_Index
In case you want 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 type, or integer, when the parameter is an integer type.

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).

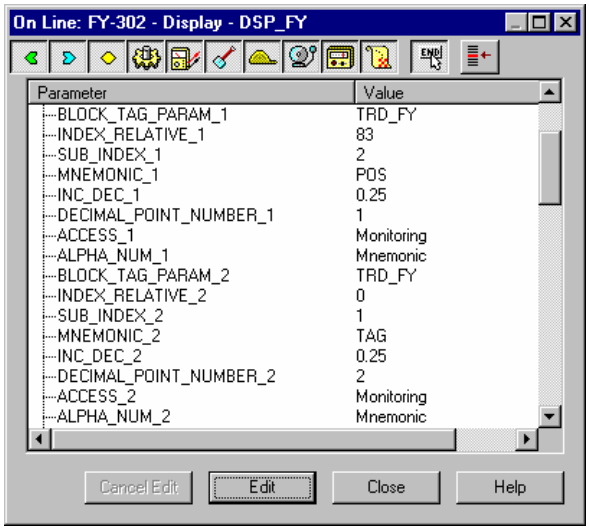


Figure 3.18 - Parameters for Local Adjustment Configuration

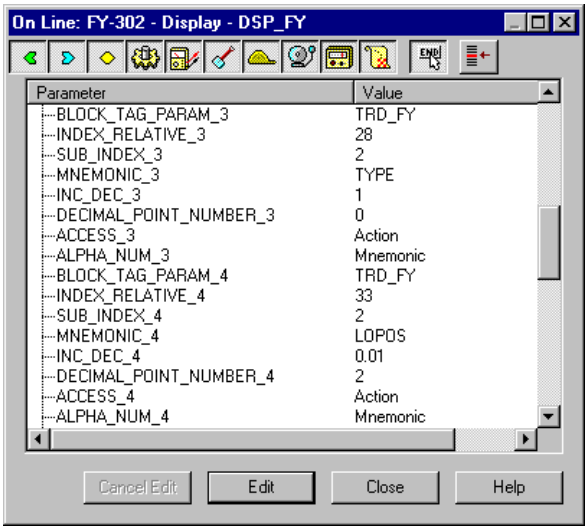


Figure 3.19 - Parameters for Local Adjustment Configuration

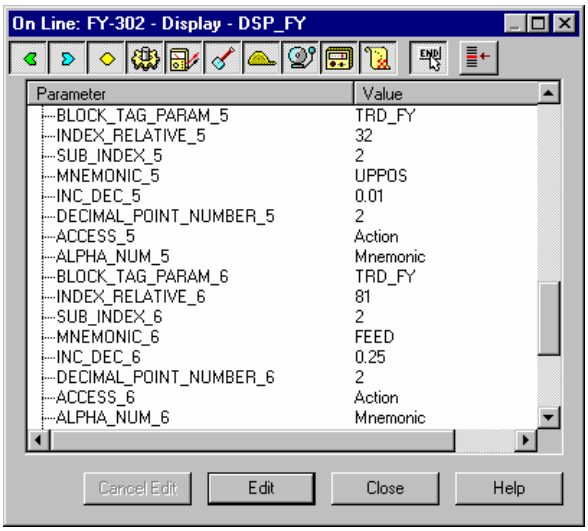


Figure 3.20 - Parameters for Local Adjustment Configuration

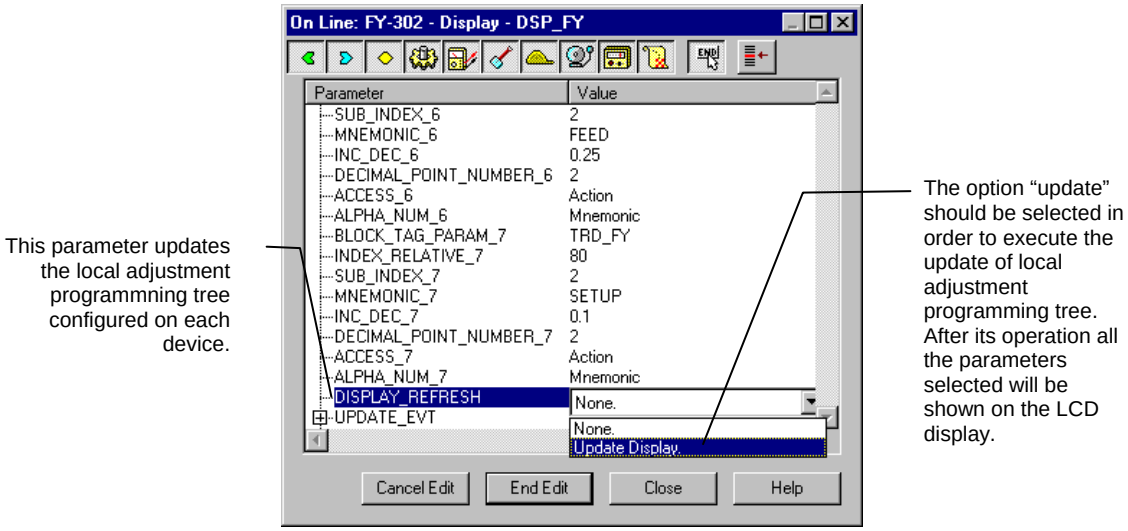


Figure 3.21 - Parameters for Local Adjustment Configuration

Calibrating using Local Adjustment

The positioner has two holes for magnetic switches, located under the identification plate (See the section "Programming Using Local Adjustment"). These magnetic switches are activated by one magnetic tool.

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 positioner must be fitted with the digital display for access to the local adjustment. Without the display the local adjustment is not possible.

In order to enter the local adjustment mode, place the magnetic tool in orifice “Z” until flag “MD” lights up in the display. Removes 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 approximately 5 seconds 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 “LOPOS”. After that in order to start the calibration, the user shall activate parameter “LOPOS” with the help of the magnetic tool placed in “S”. For example, it is possible to enter 0%. 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 value obtained from the position reference.

The user shall continue to write in this parameter until it reads 0% or the desired lower position value. Browse to parameter “UPPOS”. After that, in order to start the calibration, the user shall actuate parameter “UPPOS” by placing the magnetic tool in “S”. For example, it is possible to enter 100%. When the magnetic tool is removed from “S”, the output will be set to a value close to the desired value. The user shall them 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.

The user shall write in this parameter until it reads 100% or the desired upper position value.

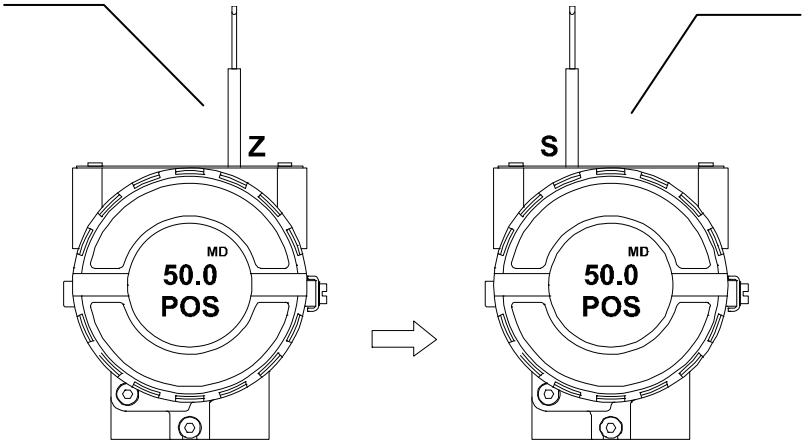
The LOWER and UPPER should be different.

LIMIT CONDITIONS OF CALIBRATION	
LOPOS (Lower Position)	Always equal 0%
UPPOS (Upper Position)	Always equal 100%
FEED	- 10% =< FEED =< 110%, otherwise XD_ERROR = 22

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

Programming using Local Adjustment

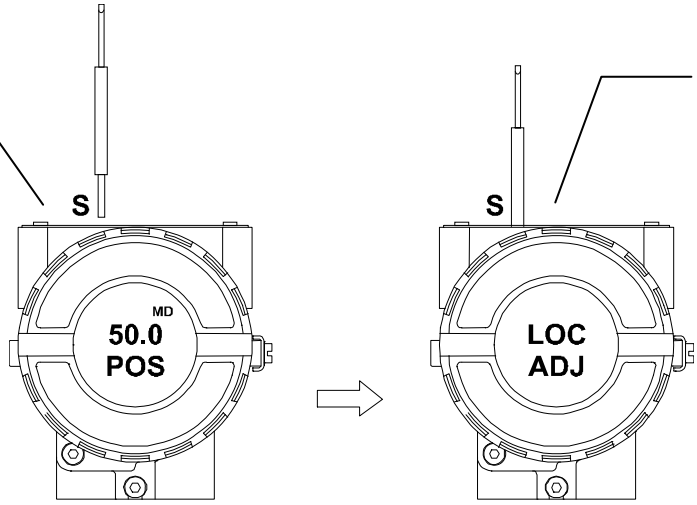
In order to start the local adjustment, place the magnetic tool in “Z” orifice and wait until letters MD are displayed.



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

Figure 3.22 - Step 1 - FY302

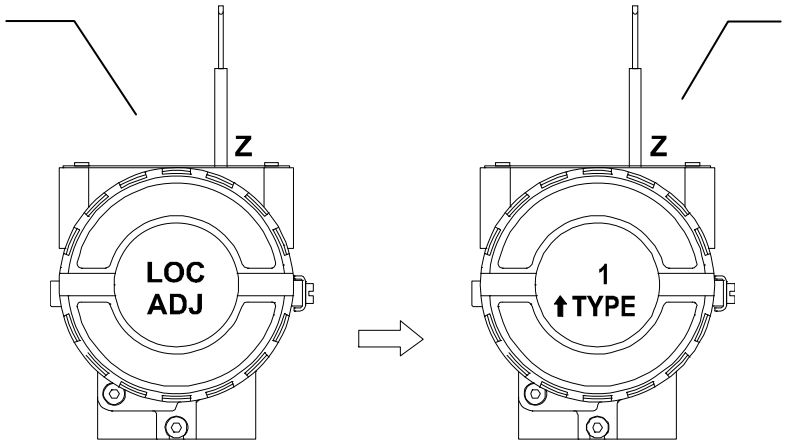
Remove the magnetic tool from “S” orifice.



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

Figure 3.23 - Step 2 - FY302

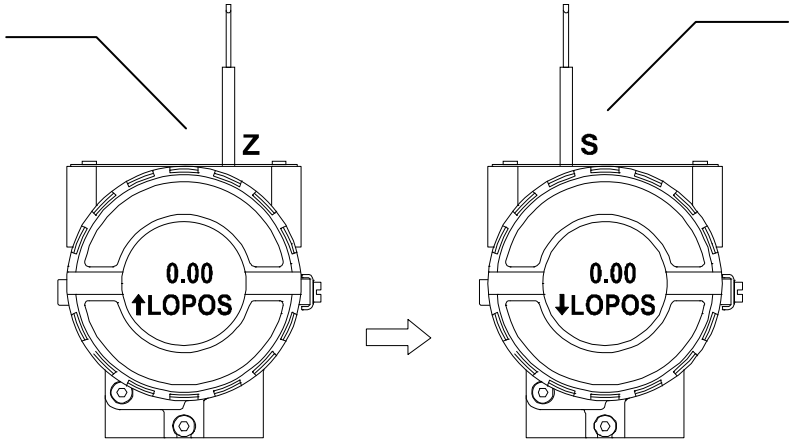
Place the magnetic tool in “Z” orifice. In case this is the first configuration, the option shown on the display is the tag with its corresponding mnemonic configured by the Syscon. Otherwise, the option shown on the display will be the one configured in the prior operation. By keeping the tool inserted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



In this option TYPE, is indicated by the numbers 1 or 2, which respectively represent linear or rotary valves.

Figure 3.24 - Step 3 - FY302

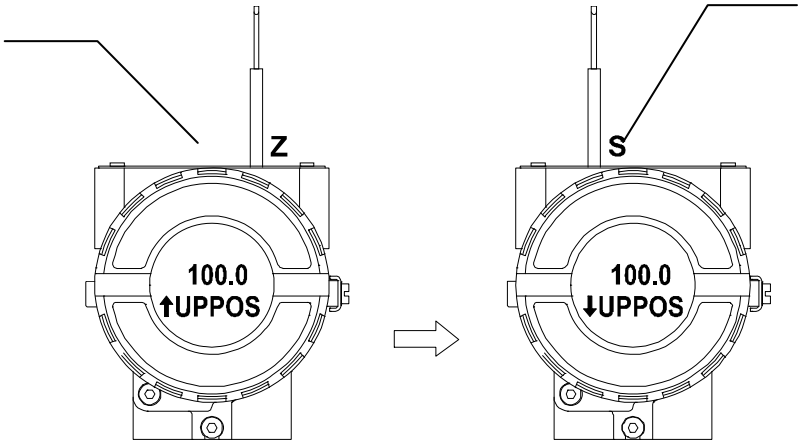
In order to start the LOPOS, simply insert the magnetic tool in “S” orifice as soon as LOPOS is shown on the display. An arrow pointing upward (↑) increments the value and an arrow pointing downward (↓) decrements the value. In order to increment the lower position valve, keep the tool inserted in S.



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

Figure 3.25 - Step 4 - FY302

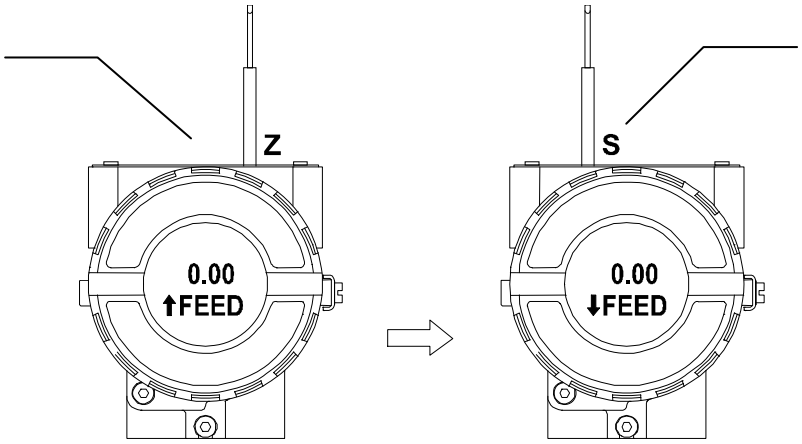
In order to start the UPPOS, simply insert the magnetic tool in “S” as soon as UPPOS is shown on the display. An arrow pointing upward (↑) increments the value and an arrow pointing downward (↓) decrements the value. In order to increment the upper position value, keep the tool inserted in “S”.



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

Figure 3.26 - Step 5 - FY302

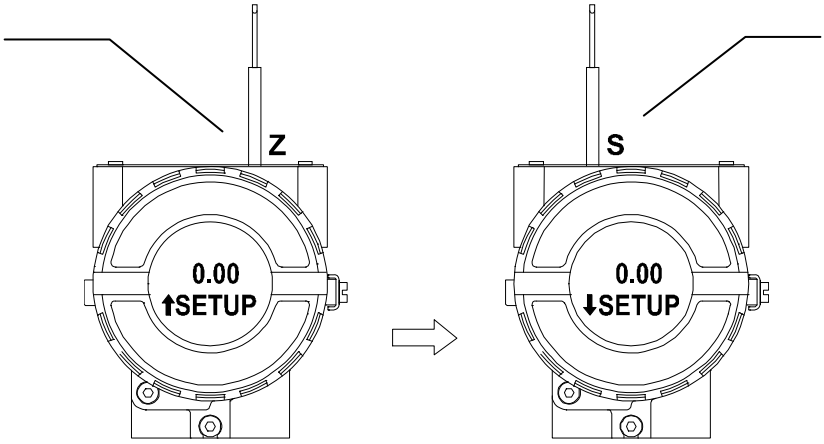
Option FEED allows the user to correct the valve calibration. In order to implement the correction, read the value indicated by the valve and enter it in this option. This option makes it possible to correct LOPOS as well as UPPOS. An arrow pointing upward increments the position value.



Place the magnetic tool in "S" orifice to shift the arrow to the downward position and decrement the calibration valve in accordance with the valve readout value. An arrow pointing downward decrements the position value.

Figure 3.27 - Step 6 - FY302

This option implements the auto setup of the valve, that is, the lower and upper position points of the valve. When setup displays 0 (zero), it indicates that the setup is disabled.



Insert the magnetic tool in "S" and enter the value. After this, the auto setup will be started and a flashing message with the word SETUP will show in the display of the positioner. After this process finishes, the local adjustment returns to normal operation.

Figure 3.28 - Step 7 - FY302

NOTE
Every time the Auto-Setup is used it is necessary to save it via Syscon, and to write in the Backup-Restore parameter of the transducer block the sensor Data Backup option. This local adjustment configuration is only a suggestion. The user may choose configuration via Syscon, simply configuring the display block (refer to paragraph Display Transducer Block).

Block Type Availability and Initial Block Set

The table below shows how powerful and flexible the Smar devices are. For example, the user may instantiate up to 20 blocks selected from 17 block types (algorithms) in a field device as FY302. Indeed it means that almost all control strategy may be implemented using only the Smar field devices.

Read carefully the notes in order to fully understand the information in this table.

Block Class	Block Type	FY302	Execution Time (ms)
Resource	RS (1)	1	0
Transducer Blocks	DIAG (1)	1	
	DSP (1)	1	
Control and Calculation Function Blocks	PID	1	67
	EPID	0	
	APID	0	
	ARTH	1	59
	SPLT	0	52
	CHAR	1	47
	AALM	1	42
	ISEL	1	25
	SPG	0	51
	TIME	0	37
	LLAG	0	34
	OSDL	0	54
Output Function Blocks	AO(*)	1	120
Output Transducer Blocks	TRD-FY (1)	1	

Note 1 – The column “Block type” indicates which block type is available for each type of device.
Note 2 – The number associated to the block type and the device type is the number of instantiated blocks during the factory initialization.
Note 4 – Field devices and FB700 have a capability of 20 blocks, including resource, transducers and function blocks.
Note 6 – The column Block type shows the mnemonics, if it is followed by a number between Parentheses, it indicates the maximum number of block instances. If it is followed by “*”, it indicates the maximum number depends on the device type.

Section 4

MAINTENANCE PROCEDURES

General

FY302 Fieldbus to Valve Positioners are extensively tested and inspected before delivery to the end user. Nevertheless, during their design and development, 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.

DIAGNOSTICS	
SYMPTOM	**PROBABLE ERROR SOURCE**
POSITION SHOWN ON DISPLAY	*Positioner Connections* Check wiring polarity and continuity. *Power Supply* Check the minimum voltage signal equal 9 Volts. *Electronics Failure* Check circuit boards for bad connections and replace them for spare boards.
NO COMMUNICATION	*Network Connection* Check network connections: equipment, power supply, terminators. *Network Impedance* Check network impedance (power supply and terminators impedance). *Positioner Configuration* Check the configuration of the positioner communication parameters. *Network Configuration* Check the network communication configuration. *Electronics Failure* Try spare parts in the positioner circuits.
NO RESPONSE TO INPUT SIGNAL	*Pressure Output Connections* Check up on air leaks. *Air Supply Pressure* Check the air supply pressure. The input pressure to positioner shall be between 20 psi and 100 psi. *Calibration* Check the positioner calibration points. *Obstructed Restriction and/or Blocked Output* Observe the following procedures described in this Manual: Output Connections and Restriction Cleaning.
OSCILLATING ACTUATOR	*Calibration* Adjust parameter Kp. Adjust parameter Tr.
SLOW ACTUATOR RESPONSE	*Adjustment Parameters are Too Low* Adjust parameter Kp.
TOO FAST ACTUATOR RESPONSE	*Adjustment Parameters are Too High* Adjust parameter Kp.

Table 4.1 - FY302 Diagnostics

If the problem is not presented in the table above follow the note below:

Disassembly Procedure

Make sure to disconnect power supply and supply pressure 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 positioners have a stopper that can be released to allow the transducer to rotate more than one turn.

WARNING
Do not rotate the electronic housing more than 270º without disconnecting the electronic circuit from the power supply.

Figure 4.1 - Transducer Rotation

NOTE
The numbers indicated between parentheses refer to Exploded View.

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 anchor the indicator and the main circuit board. Gently pull out the indicator, and then the main board (5).

Reassembly 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.

Restriction Cleaning Procedure

The air flows to the nozzle through a restriction. Verify from time to time the restriction cleaning to assure a positioner 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-ring again and screw the restriction in the positioner.

8. The equipment can be supplied with air again.

Change of the Filter Elements

Change the positioner filter elements with a minimum stated period of 1 (one) year.

The instrumentation air supply must be clean, dry and non-corrosive, following standards indicated for 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 positioner filter elements more frequently.

EXHAUST PORT
Air is vented to the atmosphere through one exhaust port located behind the transducer nameplate and 4 exhaust outputs on the opposite side of the manometers. A foreign object interfering or blocked exhaust port provides a way to increase the output. Clean by spraying it with a solvent.

NOTE
Never use oil or grease in the spool; otherwise the positioner performance will be impaired.

Electronic Circuit

Plug transducer connector and power supply connector to main board (**5**). Attach the display to the main board. Observe the four possible mounting positions (Figure 5.2). The ▲ mark indicates up position.

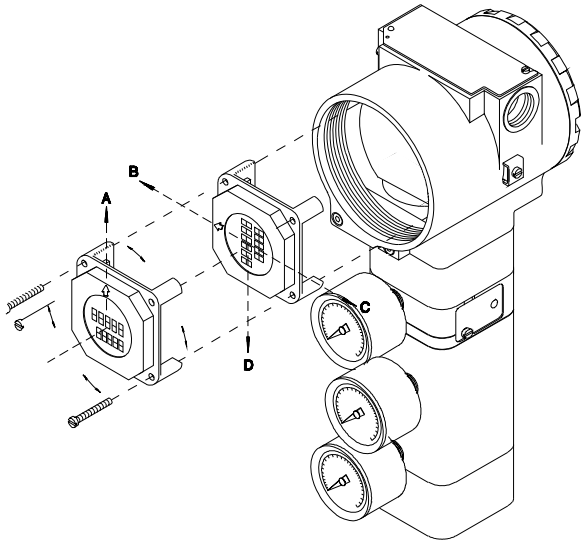


Figure 4.2 - Four Possible Positions of the Local Indicator

Anchor the main board and indicator with their screws (**3**). After tightening the protective cover (**1**), mounting procedure is complete. The positioner is ready to be energized and tested.

Electrical Connections
The plug must obligatorily be installed in the electric connection not used, preventing the humidity entrance.

WARNING
The standard plug provided with Smar positioner do not have an E-xd certification.

Interchangeability

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

Package Content

When receiving the equipment, verify the package content. The number for items marked with (*) must be in accordance with the number of positioners.

- Positioner
- Adequate Mounting Brackets
  - For the positioner
  - For the magnet
- Magnetic Tool for Local Adjustment (*)
- Centralizer Transmitter Device (*)
- Cleaning Device for the Restriction (*)
- Operation, Maintenance and Instructions Manual (*)

ACCESSORIES	
ORDERING CODE	**DESCRIPTION**
SD1	Magnetic Tool for Local Adjustment
SYSCON	System Configurator
PS302P	Power Supply
PSI302P	Power Supply Impedance
BT302	Terminator
PCI	Process Control Interface
400-0726	Needle cleaning Device for the restriction
400-1176	Teflon guide for linear magnet.
400-1177	Teflon guide for rotary magnet.

Exploded View

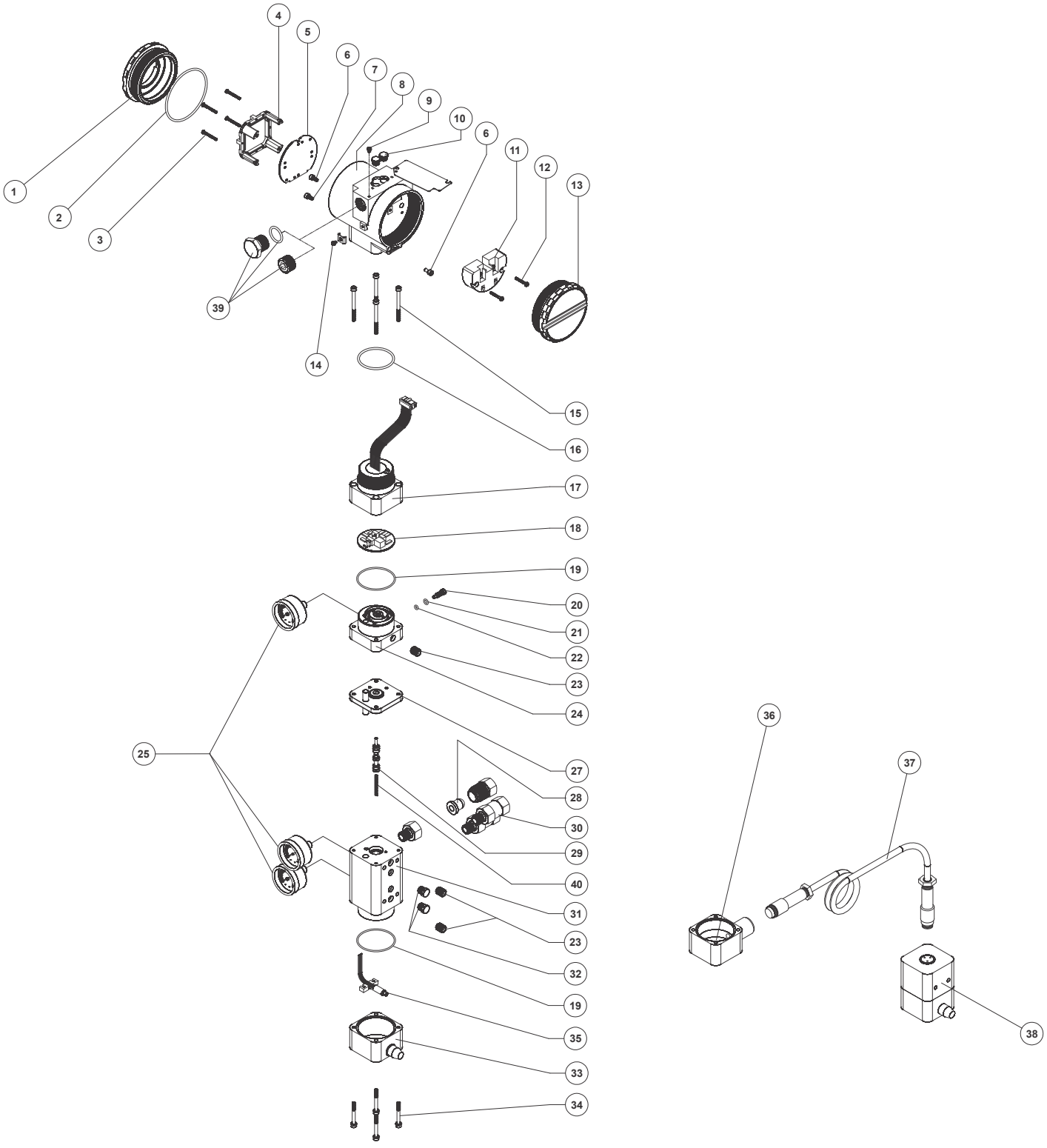


Figure 4.3 - Exploded View

Spare Parts List

SPARE PARTS LIST			
PARTS DESCRIPTION	**POSITION**	**CÓDE**	**CATEGORY (NOTE 4)**
HOUSING (**NOTE 1**)	8	400-1314-3F (**NOTE 6**)	-
COVER (INCLUDES O-RING)	1 and 13	400-1307 (NOTE 6)	-
Cover Locking Bolt	6	204-0120	-
Sensor Locking Bolt (M6 Without Head Screw)	7	400-1121	-
External Ground Bolt	14	204-0124	-
Identification Plate Fixing Bolt	9	204-0116	-
Orings Cover (**NOTE 2**)	2	204-0122	B
Local Adjustment Protection Cover	10	204-0114	-
DIGITAL INDICATOR GLL1438 (for old electronic main board GLL1034) DIGITAL INDICATOR (for new main boards GLL1461)	4	400-1305 400-1310	A
TERMINAL INSULATOR	11	400-0058	A
MAIN ELECTRONIC CIRCUIT BOARD (include digital indicator and mounting kit)	5	400-1350	A
TERMINAL HOLDING BOLT HOUSING	12	204-0119	B
MOUNTING KIT FOR MAIN ELECTRONIC BOARD (new board GLL1461), (2 bolts with spacers and retention washers)	3	400-0560	B
CONNECTION COVER	15,16 and 17	400-1320 (**NOTE 6**)	A
. Connection Cover Bolt	15	400-0073	-
. Buna-N Neck O-ring **(NOTE 2)**	16	204-0113	B
ANALOG BOARD without Pressure Sensor GLL1012 (version K0)	18	400-0060	-
ANALOG BOARD for Pressure Sensor GLL1204 (version K1)	18	400-0840	-
PIEZO BASE SET	19,20,21,22, 23,24 and 25	400-1318 (**NOTE 6**)	A
. Base and Block O-ring **(NOTE 2)**	19	400-0085	B
. Restriction	20	344-0165	B
. Restriction External O-ring **(NOTE 2)**	21	344-0155	B
. Restriction Internal O-ring **(NOTE 2)**	22	344-0150	B
. Syntherized Bushing	23	400-0033	B
. Analog indicator (Gage - Stainless Steel and Brass) **(NOTE 5)**	25	400-1120	B
ASSEMBLED DIAPHRAGM (include hall tube, mechanical part and O-rings)	27	400-1321 (**NOTE 6**)	B
PNEUMATIC BLOCK SET	19,23,25,28,29,30,31 and 32	400-1317 (**NOTE 6**)	A
. Base & Block O-ring **(NOTE 2)**	19	400-0085	-
. Syntherized Bushing	23	400-0033	-
. Analog indicator (Gage - Stainless Steel and Brass) **(NOTE 5)**	25	400-1120	-
. Filtering Element	28	400-0655	-
. Spool valve	29	400-0653	A
. Spool valve Spring	40	400-0787	-
. Stainless steel Filter- 1/4" NPT - includes filtering element	30	400-1383	-
. Vent Plug - Stainless Steel	32	400-0654	-
HALL COVER SET	33 (or 36), 34 and 35	400-1319 (**NOTE 6**)	-
. Hall Cover Bolt	34	400-0092	-
. Hall Support + Hall Sensor + Flat cable	35	400-0090	-
REMOTE EXTENSION SET	38	400-1322 (**NOTE 6**)	-
CABLE SET + CONNECTOR	37	400-1325 (**NOTE 6**)	-

SPARE PARTS LIST			
PARTS DESCRIPTION	**POSITION**	**CÓDE**	**CATEGORY (NOTE 4)**
1/2" NPT (Ex d) INTERNAL SOCKET SET PLUG IN BICHROMATIZED CARBON STEEL	39	400-0808	-
1/2" NPT (Ex d) INTERNAL SOCKET SET PLUG IN 304 SST	39	400-0809	-
1/2" NPT INTERNAL SOCKET SET PLUG IN BICHROMATIZED CARBON STEEL	39	400-0583-11	-
1/2" NPT INTERNAL SOCKET SET PLUG IN 304 SST	39	400-0583-12	-
M20 X 1.5 (Ex d) EXTERNAL SOCKET SET PLUG IN 316 SST	39	400-0810	-
PG13.5 (Ex d) EXTERNAL SOCKET SET PLUG IN 316 SST	39	400-0811	-
3/4" NPT (Ex d) ADAPTER IN 316 SST	39	400-0812	-
TRANSDUCER SET	**NOTE 3**	400-1316 (**NOTE 6**)	A
MAGNETS			
. Linear magnet 30mm	-	400-0748	-
. Linear magnet 50mm	-	400-0035	-
. Linear magnet 100mm	-	400-0036	-
. Rotary magnet	-	400-0037	-
MOUNTING BRACKET SCREW FOR POSITIONER ASSEMBLY (packaged with 12 units)	-	400-1190	-

Table 4.2 - Spare Parts List

NOTE
1) Includes terminal isolator, bolts (cover locking, ground and terminal isolator) and identification plate without certification.
2) O-rings are packaged with 12 units.
3) Includes all transducer's spare parts.
4) For category **A** it is recommended to keep in stock 25 parts installed for each set and 50 for category **B**.
5) The pressure gauges for supply pressure, output 1 or output 2, will be supplied with the wet parts in brass.
6) For code detailed, use the tables below.

Detailed Code When Ordering of Spare Parts

DETAILED CODE WHEN ORDERING OF SPARE PARTS				
CÓDE	**DESCRIPTION**			
400-1314-3F	**HOUSING; FY302**			
	Option	**Electrical Connection**		
	0	½ NPT		
	A	M20 X 1,5		
	B	PG13,5		
		Option	**Material**	
		H0	Aluminum (IP/Type)	
		H1	Stainless Steel (IP/Type)	
		H2	Aluminum - for saline atmospheres (IPW/Type X)	
		H4	Aluminum Copper Free (IPW/Type X)	
			Option	**Painting**
			P0	Gray Munsell N 6,5
			P8	Without Painting
			P9	Safety Blue Epoxy - Electrostatic Painting

400-1314-3F	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option

DETAILED CODE WHEN ORDERING OF SPARE PARTS				
CÓDE	**DESCRIPTION**			
400-1307	**Cover**			
	Option	**Type**		
	0	Without window for display		
	1	With window for display		
		Option	**Material**	
		H0	Aluminum (IP/TYPE)	
		H1	Stainless Steel (IP/TYPE)	
			Option	**Painting**
			P0	Gray Munsell N 6,5
			P8	Without Painting
			P9	Safety Blue Epoxy - Electrostatic Painting

400-1307	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**DESCRIPTION**
400-1316	**Transducer Set; FY30X**

Option	Indication Gage
0	Without Gage
6	01 Gage - Input
7	01 Gage – Output 1
8	02 Gage – Input and Output 1
9	02 Gage – Output 1 and 2
A	03 Gage

Option	Action of Positioner
C	Single Action
D	Double Action

Option	Material
H0	Aluminum (IP/TYPE)
H1	Stainless Steel (IP/TYPE)

Option	Painting
P0	Gray Munsell N 6,5
P8	Without Painting
P9	Safety Blue Epoxy - Electrostatic Painting

Option	Standard of Manufacture
S0	Smar

Option	Hall Remote Sensor
R0	Standard Mounting (Without Hall Remote Sensor)
R9	Remote Mounting (adapted for Remote Sensor)

Option	Special Sensor
K0	Without Special Sensor
K1	With Pressure Sensors for Diagnostic

400-1316	*	*	*	*	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**DESCRIPTION**
400-1317	**Pneumatic Block Set; FY30X**

Option	Indication Gage
0	Without Gage
7	01 Gage – Output 1
9	02 Gage – Output 1 and 2

Option	Action of Positioner
C	Single Action
D	Double Action

Option	Material
H0	Aluminum (IP/TYPE)
H1	Stainless Steel (IP/TYPE)

Option	Painting
P0	Gray Munsell N 6,5
P8	Without Painting
P9	Safety Blue Epoxy - Electrostatic Painting

Option	Standard of Manufacture
S0	Smar

Option	Special Sensor
K0	Without Special Sensor
K1	With Pressure Sensor for Diagnostic

400-1317	*	*	*	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**DESCRIPTION**
400-1318	**Piezo Base Set; FY30X**

Option	Indication Gage
0	Without Gage
6	01 Gage – Input

Option	Material
H0	Aluminum (IP/TYPE)
H1	Stainless Steel (IP/TYPE)

Option	Painting
P0	Gray Munsell N 6,5
P8	Without Painting
P9	Safety Blue Epoxy - Electrostatic Painting

Option	Standard of Manufacture
S0	Smar

400-1318	*	*	*	*

TYPICAL ORDERING CODE

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**DESCRIPTION**
400-1319	**Hall Cover Set; FY30X**

Option	Material
H0	Aluminum (IP/TYPE)
H1	Stainless Steel (IP/TYPE)

Option	Painting
P0	Gray Munsell N 6,5
P8	Without Painting
P9	Safety Blue Epoxy - Electrostatic Painting

Option	Standard of Manufacture
S0	Smar

Option	Hall Remote Sensor
R0	Standard Mounting (Without Hall Remote Sensor)
R9	Remote Mounting (adapted for Remote Sensor)

Option	Special Sensor
KA	For Pneumatic Block without Pressure Sensors
KB	For Pneumatic Block with Pressure Sensors

400-1319	*	*	*	*	*

TYPICAL ORDERING CODE

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**DESCRIPTION**
400-1320	**Connection Cover; FY30X**

Option	Material
H0	Aluminum (IP/TYPE)
H1	Stainless Steel (IP/TYPE)

Option	Painting
P0	Gray Munsell N 6,5
P8	Without Painting
P9	Safety Blue Epoxy - Electrostatic Painting

Option	Standard of Manufacture
S0	Smar

400-1320	*	*	*

TYPICAL ORDERING CODE

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**DESCRIPTION**
400-1321	**Assembled Diaphragm; FY30X**

Option	Material
H0	Aluminum (IP/TYPE)
H1	Stainless Steel (IP/TYPE)

Option	Painting
P0	Gray Munsell N 6,5
P8	Without Painting
P9	Safety Blue Epoxy - Electrostatic Painting

Option	Standard of Manufacture
S0	Smar

400-1321	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**DESCRIPTION**
400-1322	**Remote Extension Set; FY30X**

Option	Material
H0	Aluminum (IP/TYPE)
H1	Stainless Steel (IP/TYPE)

Option	Painting
P0	Gray Munsell N 6,5
P8	Without Painting
P9	Safety Blue Epoxy - Electrostatic Painting

Option	Standard of Manufacture
S0	Smar

400-1322	*	*	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CÓDE	**DESCRIPTION**
400-1325	**Cable Set and Connectors for Hall Remote Sensor; FY30X**

Option	Cable Length
1	5 m
2	10 m
3	15 m
4	20 m
Z	Special

400-1325	*	**TYPICAL ORDERING CODE**

***** Choose the desired option.

Section 5

TECHNICAL CHARACTERISTICS

Functional Specifications

Travel
Linear Motion: 3 - 100 mm.
Rotary Motion: 30 - 120°

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

Output
Output to actuator 0 -100% supply air pressure. Single or double-action.

Power Supply
Bus powered: 9-32 Vdc.
Output impedance (@ 7.8 kHz to 39 kHz):

- Intrinsical safety: ≥ 400 Ω (with IS barrier in the power supply);
- Non-intrinsic safety: ≥ 3 kΩ.

Pressure Supply
1.4 - 7 bar (20-100 psi) free of oil, dust and water.

Indication
Optional 4 ½ - digit numerical and 5-character alphanumerical LCD indicator.

Hazardous Location Certification
Explosion proof, weather proof and intrinsically safe CEPEL, FM, CSA, NEMKO and DMT standards (pending).

Temperature Limits

Operation:	-40	to	85ºC	(-40	to	185ºF).
Storage:	-40	to	90ºC	(-40	to	194ºF).
Display:	-10	to	75ºC	(14	to	167ºF) operation.
	-40	to	85ºC	(-40	to	185ºF) without damage.
Remote Hall							
Operation:	-40	to	105ºC	(-40	to	221ºF).

Humidity Limits
0 to 100% RH.

Turn-on Time
Approximately 10 seconds.

Update Time
Approximately 0.5 second.

Flow Characterization
Linear, equal percentage, quick opening or customer configuration through fieldbus communication from e.g., a PC or by the local adjustment switches.

Gain
Through software. Locally adjustable.

Travel Time
Through software. Locally adjustable.

Actual Position Sensing
Magnet (Non-contact) via Hall Effect.

Performance Specifications

Resolution
≤ 0.1% F.S.

Repeatibility
≤ 0.1% F.S.

Hysteresis
≤ 0.1% F.S.

Consumption
0.35 Nm/h (0.20 SCFM) at 1.4 bar (20 psi) supply.
1.10 Nm/h (1.65 SCFM) at 5.6 bar (80 psi) supply.

Output Capacity
13.6 Nm^3/h (8 SCFM) at 5.6 (80 psi) supply.

Ambient Temperature Effect
0.8%/20 ºC of span

Supply Pressure Effect
Negligible

Vibration Effect
±0.3%/g of span during the following conditions:
5-15 Hz at 4 mm constant displacement.
15-150 Hz at 2g.
150-2000 Hz at 1g.
Reference SAMA PMC 31.1 - 1980, Sec. 5.3, Condition 3, Steady State.

Electro-Magnetic Interference Effect
Designed to comply with IEC 801 and European Standards EN50081 and EN50082.

Physical Specifications

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

Pneumatic Connections
Supply and output: 1/4 - 18 NPT
Gage: 1/8 - 27 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, IP66).

Weight
Without display and mounting bracket: 2.7 kg. (Aluminum)
5.8 Kg. (Stainless Steel)
Add for digital display: 0.1 kg.
Remote Sensor: 550g.
Cable: 100g. (Connectors) plus 45g/m.

Ordering Code

MODEL	SMART VALVE POSITIONER
FY302	FOUNDATION™ fieldbus

COD. Local Indicator

COD.	
0	Without Indicator
1	With Digital Indicator

COD. Mounting Bracket

COD.	
0	Without Bracket
1	With Bracket

COD. Electrical Connections

COD.		COD.	
0	1/2" - 14 NPT **(4)**	3	1/2" - 14 NPT X 1/2 BSP (316 SS) - with adapter **(3)**
1	1/2" - 14 NPT X 3/4 NPT (316 SS) - with adapter **(5)**	A	M20 X 1.5 **(6)**
2	1/2" - 14 NPT X 3/4 BSP (316 SS) - with adapter **(3)**	B	PG 13.5 DIN **(7)**

COD. Type of Actuator

COD.		COD.	
1	Rotary - Single Action	A	Linear Stroke Up to 30 mm. - Single Action
2	Rotary - Double Action	B	Linear Stroke Up to 30 mm. - Double Action
5	Linear Stroke Up to 50 mm. - Single Action	C	Without magnet (for linear actuator) - Single Action
6	Linear Stroke Up to 50 mm. - Double Action	D	Without magnet (for linear actuator) - Double Action
7	Linear Stroke Up to 100 mm. - Single Action	Z	Others Specify
8	Linear Stroke Up to 100 mm. - Double Action		

COD. Indication Gage

COD.		COD.	
0	Without Gage	9	Whit 2 Gage (Acrylic, Stainless steel and wetted parts in brass) - Output 1 and 2
6	With 1 Gage (Acrylic, Stainless steel and wetted parts in brass) - Input	A	With 3 Gage (Acrylic, Stainless steel and wetted parts in brass)
7	With 1 Gage (Acrylic, Stainless steel and wetted parts in brass) - Output 1	Z	Others Specify
8	With 2 Gage (Acrylic, Stainless steel and wetted parts in brass) - Input and Output 1		

SPECIAL OPTIONS (Leave it blank for no optional items)

COD. Housing

COD.		COD.	
H0	Aluminum (IP/Type)	H3	316 Stainless Steel for saline atmosphere (IPW/Type X) **(2)**
H1	316 Stainless Steel (IP/Type)	H4	Copper Free Aluminum (IPW/Type X) **(2)**
H2	Aluminum for saline atmosphere (IPW/Type X) **(2)**		

COD. Identification Plate

COD.		COD.	
I1	FM: XP, IS, NI, DI	ID	NEPSI: Ex-ia, Ex-d
I3	CSA: XP, IS, NI, DI	IO	CEPEL: Ex-tb (explosive dust - Zone 21)
I4	EXAM (DMT): Ex-ia, NEMKO: Ex-d		
I5	CEPEL: Ex-d, Ex-ia		
I6	Without certification		

COD. Painting

COD.	
P0	Gray Munsell N 6.5 Polyester
P8	Without Painting
P9	Blue Safety Epoxy – Electrostatic Painting
PD	Blue smooth diamond RAL5010 - Epoxy

COD. TAG Plate

COD.		COD.		COD.	
J0	With TAG	J1	Blank	J2	According to user's notes

COD. Sensor Mounting (1)

COD.	
R0	Full Mounting
R1	Remote sensor - 5 m cable
R2	Remote sensor - 10 m cable
R3	Remote sensor - 15 m cable
R4	Remote sensor - 20 m cable
R9	Remote Mounting (adapted for Remote Sensor, without cable and remote extension set)
RZ	Specify (*)

COD. Special Sensor

COD.	
K0	Without special sensor
K1	With pressure sensors for diagnostic

COD. Special

COD.	
ZZ	Leave it blank for no optional items

FY302	1	0	0	1	0	*	*	*	*	*	*	*

TYPICAL MODEL NUMBER

NOTES

(1) Consult Smar for applications in classified areas.
(2) IPW/TYPEX tested for 200 hours according to NBR 8094 / ASTM B 117 standard.
(3) Options not certified for hazardous locations.
(4) Certificate for use in Hazardous Locations (CEPEL, NEMKO, NEPSI, EXAM, FM, CSA).
(5) Certificate for use in Hazardous Locations (CEPEL, FM, CSA).
(6) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM, FM).
(7) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM).

BFY	BRACKET (1)

CODE	Positioner Mounting Bracket (2)
0	Without Bracket
1	Universal Rotary
2	Universal Linear - Yoke and Pillar Type
3	Linear - Yoke Type
4	Linear - Pillar Type
Z	Others - Specify

CODE	Magnet Mounting Bracket
0	Without Bracket
1	Rotary
2	Linear up to 30 mm.
3	Linear up to 50 mm.
4	Linear up to 100 mm.
Z	Others - Specify

COD.	Positioner Mounting Bracket Material
7	Carbon Steel Bracket and Accessories in SST
C	Carbon Steel Bracket
I	Stainless Steel Bracket
N	Not applicable
Z	Others - Specify

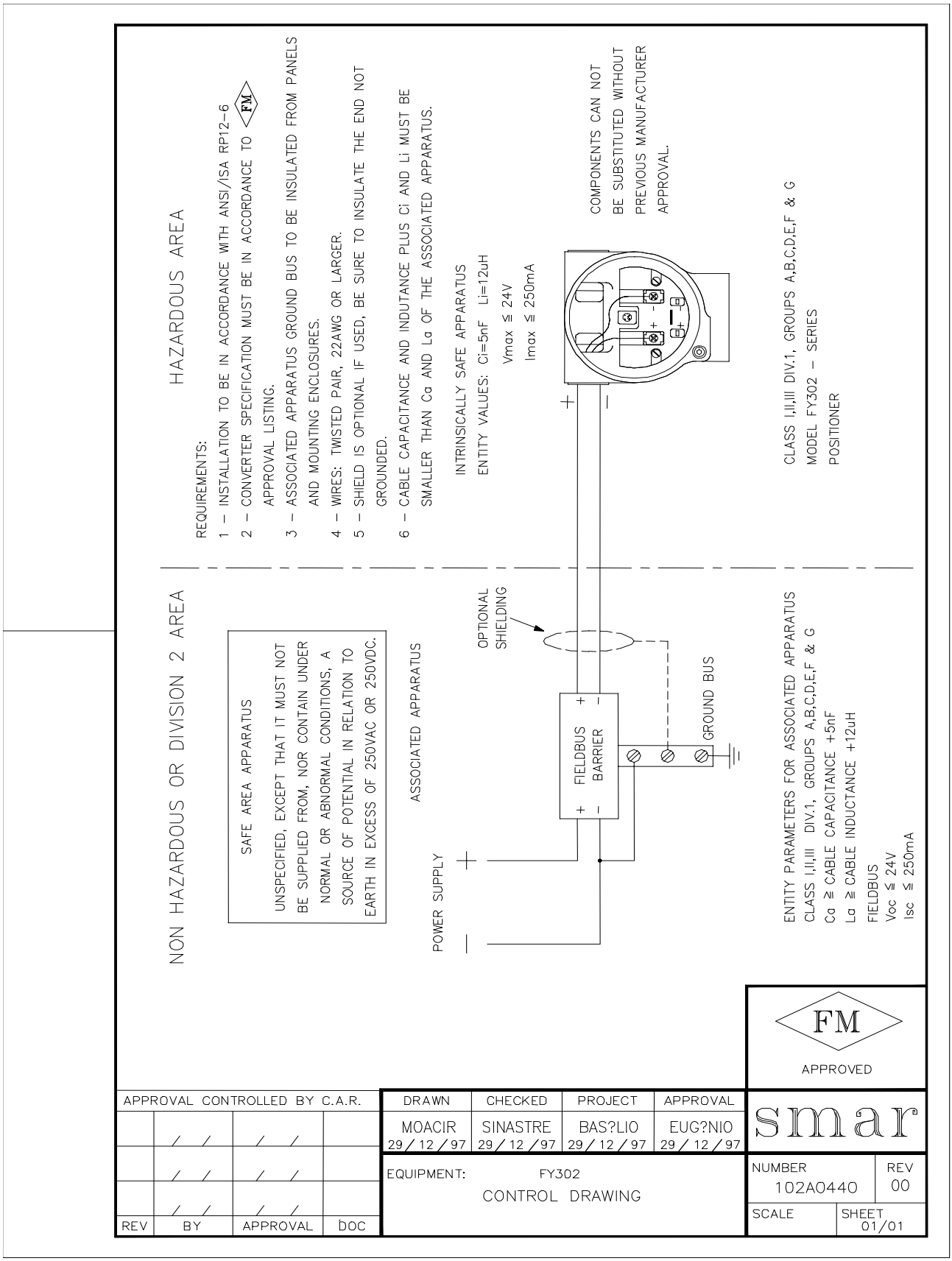
COD.	Magnet Bracket Material
C	Carbon Steel Bracket
I	Stainless Steel Bracket
N	Not applicable
Z	Others - Specify

COD.	Optional Items
ZZ	Leave it blank for no optional items

BFY	-	1	0	7	C	.	*

TYPICAL MODEL NUMBER

(1) When choosing the remote sensor version, an additional “L” shape bracket is included, for 2” tube mounting.
(2) For customized mounting bracket, for different brands and models, please, consult www.smar.com .


HAZARDOUS 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 FY302 – SERIES
POSITIONER
NON HAZARDOUS OR DIVISION 2 AREA
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
OPTIONAL SHIELDING
FIELDBUS BARRIER
GROUND BUS
POWER SUPPLY
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
FIELDBUS
Voc ≤ 24V
Isc ≤ 250mA
FM
APPROVED
APPROVAL CONTROLLED BY C.A.R.
REV BY APPROVAL DOC
DRAWN MOACIR 29/12/97
CHECKED SINASTRE 29/12/97
PROJECT BAS?LIO 29/12/97
APPROVAL EUG?NIO 29/12/97
EQUIPMENT: FY302
CONTROL DRAWING
smar
NUMBER 102A0440
REV 00
SCALE
SHEET 01/01

Appendix A

CERTIFICATIONS INFORMATION

European Directive Information

Consult www.smar.com for the EC declarations of conformity for all applicable European directives and certificates.

ATEX Directive (94/9/EC) – "Electrical equipment and protective system intended for use in potential explosive atmospheres"
The EC-Type Examination Certificate had been released by Nemko AS (CE0470) and/or DEKRA EXAM GmbH (CE0158), according to European Standards.
The certification body for Production Quality Assurance Notification (QAN) and IECEx Quality Assessment Report (QAR) is Nemko AS (CE0470).

Hazardous Locations General Information

Ex Standards:
IEC 60079-0 General Requirements
IEC 60079-1 Flameproof Enclosures "d"
IEC 60079-11 Intrinsic Safety "i"
IEC 60079-26 Equipment with equipment protection level (EPL) Ga
IEC 60529 Classification of degrees of protection provided by enclosures (IP Code)

Customer responsibility:
IEC 60079-10 Classification of Hazardous Areas
IEC 60079-14 Electrical installation design, selection and erection
IEC 60079-17 Electrical Installations, Inspections and Maintenance

Warning:
Explosions could result in death or serious injury, besides financial damage.
Installation of this instrument in an explosive environment must be in accordance with the national standards and according to the local environmental protection method. Before proceeding with the installation match the certificate parameters according to the environmental classification.

General Notes:
Maintenance and Repair
The instrument modification or replaced parts supplied by any other supplier than authorized representative of Smar Equipamentos Industriais Ltda is prohibited and will void the Certification.

Marking Label
Once a device labeled with multiple approval types is installed, do not reinstall it using any other approval types. Scratch off or mark unused approval types on the approval label.

For Ex-i protection application
- Connect the instrument to a proper intrinsically safe barrier.
- Check the intrinsically safe parameters involving the barrier, equipment including the cable and connections.
- Associated apparatus ground bus shall be insulated from panels and mounting enclosures.
- When using shielded cable, isolate the not grounded cable end.
- Cable capacitance and inductance plus C_i and L_i must be smaller than C_o and L_o of the Associated Apparatus.

For Ex-d protection application
- Only use Explosion Proof/Flameproof certified Plugs, Adapters and Cable glands.
- In an Explosion-Proof/Flame-Proof installation, do not remove the instrument housing covers when powered on.

- Electrical Connection
In Explosion-Proof installations the cable entries must be connected through conduit with sealed unit or closed using metal cable gland or closed using metal blanking plug, all with at least IP66 and Ex-d certification. For enclosure with saline environment protection (W) and ingress protection (IP) applications, all NPT thread parts must apply a proper water-proof sealant (a non-hardening silicone group sealant is recommended).

For Ex-d and Ex-i protection application
- The transmitter has a double protection. In this case the transmitter shall be fitted with appropriate certified cable entries Ex-d and the electric circuit supplied by a certified diode safety barrier as specified for the protection Ex-ia.

Environmental Protection
- Enclosure Types (Type X): Supplementary letter X meaning special condition defined as default by Smar the following: Saline Environment approved - salt spray exposed for 200 hours at 35ºC. (Ref: NEMA 250).
- Ingress protection (IP W): Supplementary letter W meaning special condition defined as default by Smar the following: Saline Environment approved - salt spray exposed for 200 hours at 35ºC. (Ref: IEC60529).
- Ingress protection (IP x8): Second numeral meaning continuous immersion in water under special condition defined as default by Smar the following: 1 Bar pressure during 24hours. (Ref: IEC60529).

Hazardous Locations Approvals

CSA (Canadian Standards Association)

Class 2258 02 – Process Control Equipment – For Hazardous Locations (CSA1078546)
Class I, Division 1, Groups B, C and D
Class II, Division 1, Groups E, F and G
Class III, Division 1
Class I, Division 2, Groups A, B, C and D

Class 2258 03 – Process Control Equipment – Intrinsically Safe and Non-Incendive Systems - For Hazardous Locations (CSA 1078546)
Ex n Class I, Division 2, Groups A, B, C and D

Model FY302 Valve Positioners; input supply 12-42V dc, 4-20mA; Enclosure Type 4/4X; non-incendive with Fieldbus/FNICO
Entity parameters at terminals "+" and "-" of :
Vmax = 24 V, Imax = 570mA, Pmax = 9,98 W, Ci = 5 nF, Li = 12 µH,
when connected as per SMAR Installation Drawing 102A0836; T Code T3C @ Max Ambient 40 Deg C; MWP 100 psi.

Class 2258 04 – Process Control Equipment – Intrinsically Safe Entity – For Hazardous Locations (CSA 1078546)
Class I, Division 1, Groups A, B, C and D
Class II, Division 1, Groups E, F and G
Class III, Division 1
FISCO Field Device

Model FY302 Valve Positioners; input supply 12-42V dc, 4-20mA; Enclosure Type 4/4X; intrinsically safe with Fieldbus/FISCO
Entity parameters at terminals "+" and "-":
Vmax = 24 V, Imax = 250 mA, Pmax = 5.32 W, Ci = 5 nF, Li = 12 uH, when connected as per Smar Installation Drawing 102A0836; T Code T3C @ Max Ambient 40 Deg C; MWP 100 psi.
Note: Only models with stainless steel external fittings are Certified as Type 4X.

Special conditions for safe use:
Temperature Class T3C
Maximum Ambient Temperature: 40ºC (-20 to 40 ºC)
Maximum Working Pressure: 100 psi

FM Approvals (Factory Mutual)

Intrinsic Safety (FM 3D9A2.AX)
IS Class I, Division 1, Groups A, B, C and D
IS Class II, Division 1, Groups E, F and G
IS Class III, Division 1

Explosion Proof (FM 3007267)
XP Class I, Division 1, Groups A, B, C and D

Dust Ignition Proof (FM 3D9A2.AX)
DIP Class II, Division 1, Groups E, F and G
DIP Class III, Division 1

Non Incendive (FM 3D9A2.AX and 3015629)
NI Class I, Division 2, Groups A, B, C and D

Environmental Protection (FM 3007267, 3D9A2.AX and 3015629)
Option: Type 4X or Type 4

Special conditions for safe use:
Entity Parameters Fieldbus Power Supply Input (report 3015629):

Vmax = 24 Vdc, Imax = 250 mA, Pi = 1.2 W, Ci = 5 nF, Li = 12 uH

Vmax = 16 Vdc, Imax = 250 mA, Pi = 2 W, Ci = 5 nF, Li = 12 uH
Temperature Class T4
Maximum Ambient Temperature: 60ºC (-20 to 60 ºC)

NEMKO (Norges Elektriske MaterielKontroll)

Explosion Proof (NEMKO 00ATEX305X)
Group II, Category 2 G, Ex d, Group IIC, Temperature Class T6, EPL Gb

Ambient Temperature: -20ºC ≤ Ta ≤ +60ºC
Working Pressure: 20-100 psi

Environmental Protection (NEMKO 00ATEX305X)
Options: IP66W or IP66

Special conditions for safe use:
Repairs of the flameproof joints must be made in compliance with the structural specifications provided by the manufacturer. Repairs must not be made on the basis of values specified in tables 1 and 2 of EN/IEC 60079-1.

The Essential Health and Safety Requirements are assured by compliance with:
EN 60079-0:2012 General Requirements
EN 60079-1:2007 Flameproof Enclosures “d”

EXAM (BBG Prüf - und Zertifizier GmbH)

Intrinsic Safety (DMT 01 ATEX E 011)
Group II, Category 2 G, Ex d [ia], Group IIC, Temperature Class T6, EPL Gb

FISCO Field Device
Supply circuit for the connection to an intrinsically safe FISCO fieldbus-circuit
Ui = 24Vdc, Ii = 380 mA, Pi = 5.32 W, Ci ≤ 5 nF, Li = neg
Parameters of the supply circuit comply with FISCO model according to Annex G EN 60079-11:2012, replacing EN 60079-27: 2008.

Ambient Temperature: -20ºC ≤ Ta ≤ +60ºC

The Essential Health and Safety Requirements are assured by compliance with:
EN 60079-0:2009 + A11:2013 General Requirements
EN 60079-1:2007 Flameproof Enclosures “d”
EN 60079-11:2012 Intrinsic Safety “i”

CEPEL (Centro de Pesquisa de Energia Elétrica)

Intrinsic Safety (CEPEL 00.0017)
Ex d ia, Group IIC, Temperature Class T4/T5/T6, EPL Gb

FISCO Field Device
Entity Parameters:
Pi = 5.32 W, Ui = 24V, Ii = 380 mA, Ci = 5 nF, Li = Neg

Ambient Temperature:
-20 to 65 ºC for T4
-20 to 50 ºC for T5
-20 to 40 ºC for T6

Protection by enclosure (CEPEL 00.0017)
Ex tb, Group IIIC, Temperature Class T135ºC/T100ºC/T85ºC, EPL Db

Ambient Temperature:
-20 to 65 ºC for T135ºC
-20 to 50 ºC for T100ºC
-20 to 40 ºC for T85ºC

Explosion Proof (CEPEL 98.0008)
Ex d, Group IIC, Temperature Class T6, EPL Gb

Maximum Ambient Temperature: 40ºC (-20 to 40 ºC)

Protection by enclosure (CEPEL 98.0008)
Ex tb, Group IIIC, Temperature Class T85ºC, EPL Db

Maximum Ambient Temperature: 40ºC (-20 to 40 ºC)

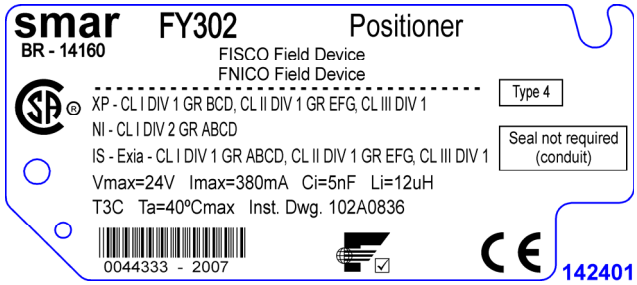
Environmental Protection (CEPEL 00.0017 AND CEPEL 98.0008)
Options: IP66W or IP66

The Essential Health and Safety Requirements are assured by compliance with:

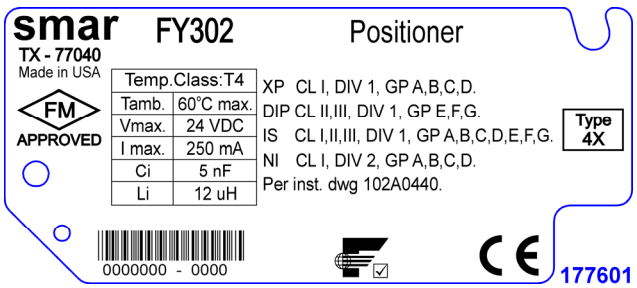
ABNT NBR IEC 60079-0:2008 General Requirements
ABNT NBR IEC 60079-1:2009 Flameproof Enclosures “d”
ABNT NBR IEC 60079-11:2009 Intrinsic Safety “i”
IEC 60079-27:2008 Fieldbus intrinsically safe concept (FISCO)
ABNT NBR IEC 60529:2009 Classification of degrees of protection provided by enclosures (IP Code)
ABNT NBR IEC 60079-31:2011 Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"

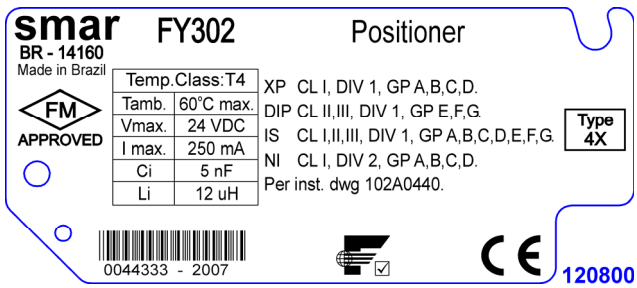
Identification Plate

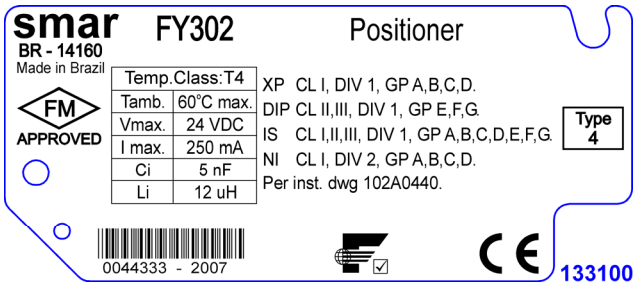
CSA (Canadian Standards Association)

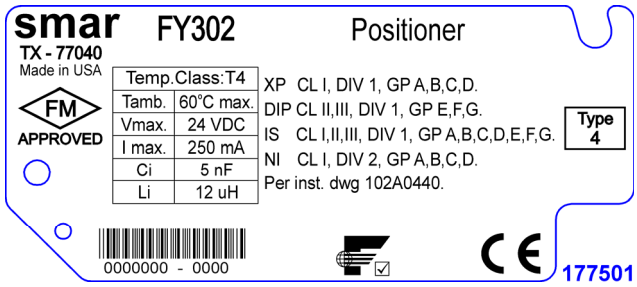


FM Approvals (Factory Mutual)

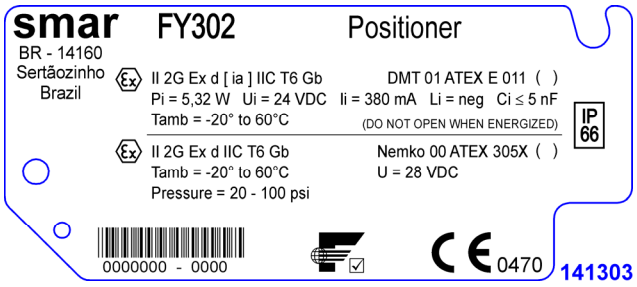


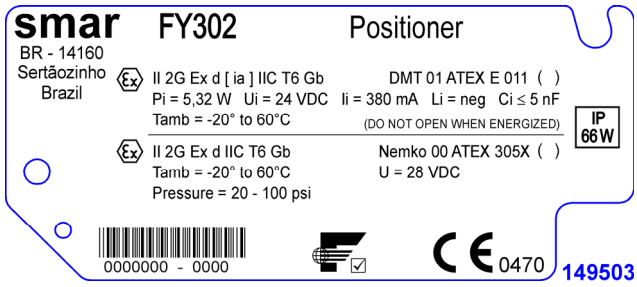




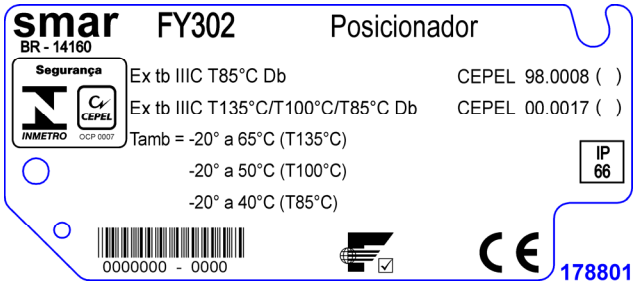


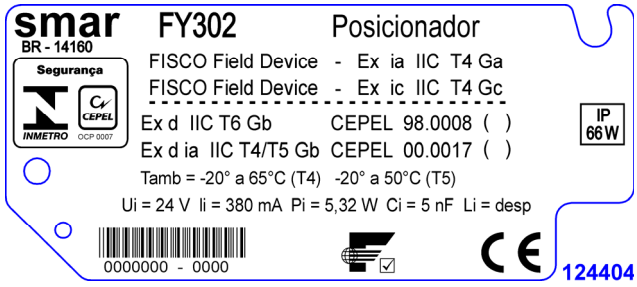
NEMKO (Norges Elektriske MaterielKontroll) / EXAM (BBG Prüf - und Zertifizier GmbH)





CEPEL (Centro de Pesquisa de Energia Elétrica)

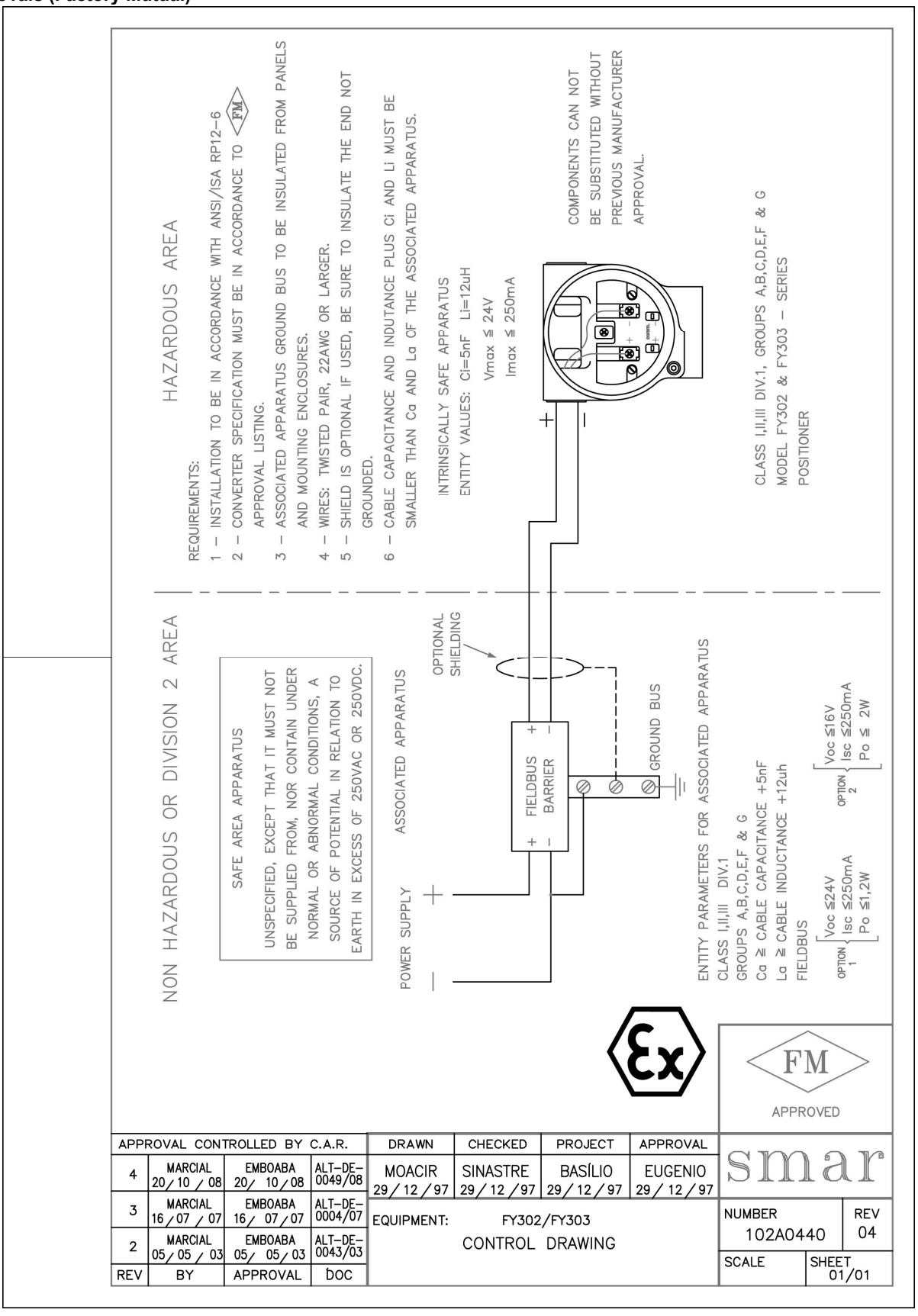




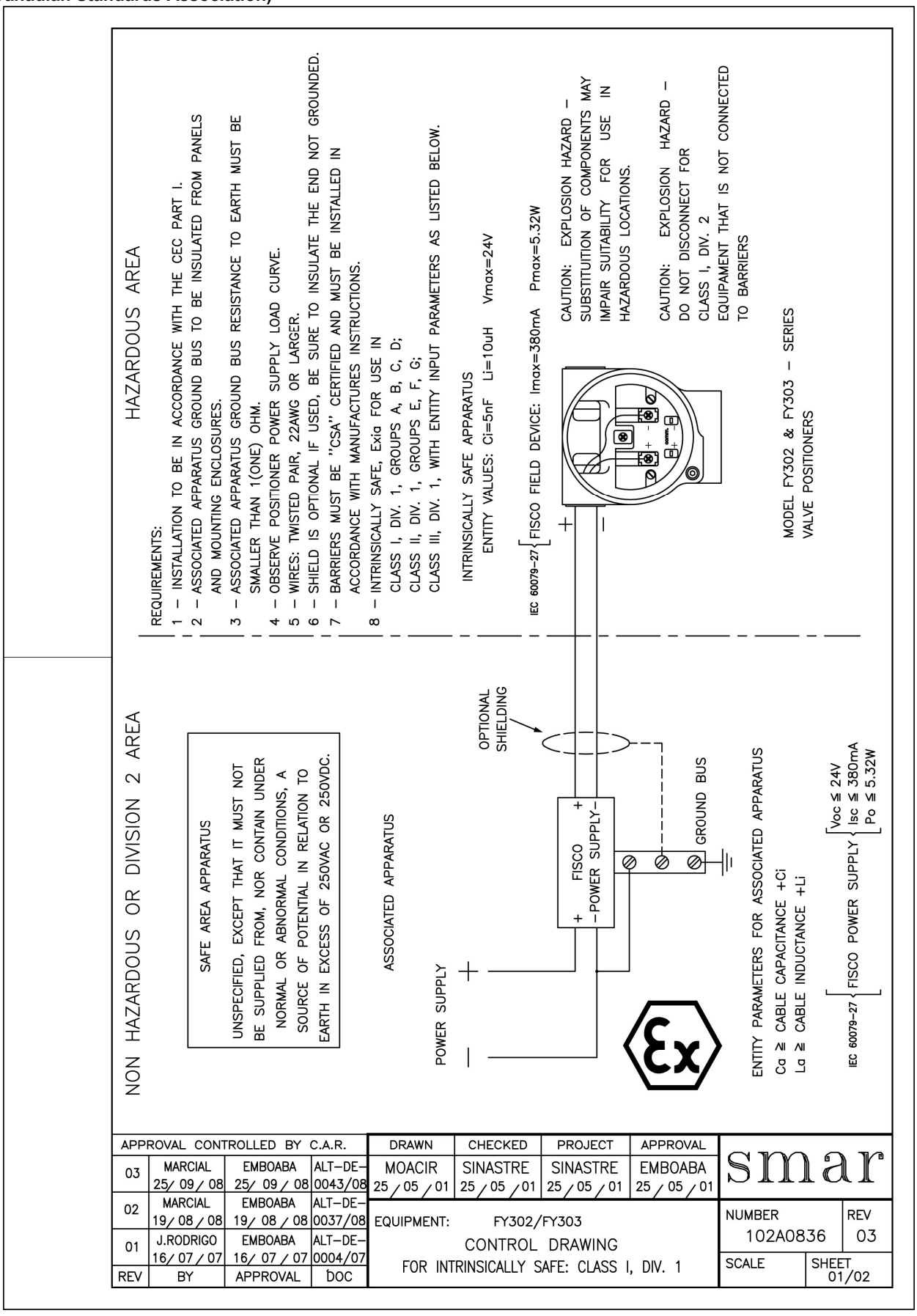

smar
BR - 14160
FY302
Posicionador
Segurança
INMETRO
OCP 0007
CEPEL
FISCO Field Device - Ex ia IIC T4 Ga
FISCO Field Device - Ex ic IIC T4 Gc
Ex d IIC T6 Gb CEPEL 98.0008 ( )
Ex d ia IIC T4/T5 Gb CEPEL 00.0017 ( )
IP 66
Tamb = -20° a 65°C (T4) -20° a 50°C (T5)
Ui = 24 V Ii = 380 mA Pi = 5,32 W Ci = 5 nF Li = desp
0000000 - 0000
136604

Control Drawing

FM Approvals (Factory Mutual)



CSA (Canadian Standards Association)

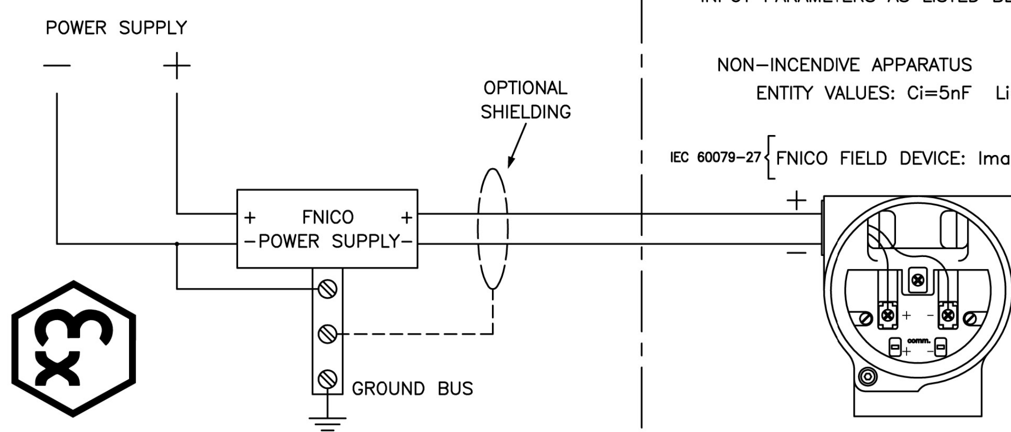


NON HAZARDOUS OR DIVISION 2 AREA

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



ENTITY PARAMETERS FOR ASSOCIATED APPARATUS

Ca ≥ CABLE CAPACITANCE +Ci

La ≥ CABLE INDUCTANCE +Li

IEC 60079–27 FNICO POWER SUPPLY: Voc ≤ 24V; Isc ≤ 570mA; Po ≤ 9.98W

HAZARDOUS AREA

REQUIREMENTS:

1 – INSTALLATION TO BE IN ACCORDANCE WITH THE CEC PART I.
2 – ASSOCIATED APPARATUS GROUND BUS TO BE INSULATED FROM PANELS AND MOUNTING ENCLOSURES.
3 – ASSOCIATED APPARATUS GROUND BUS RESISTANCE TO EARTH MUST BE SMALLER THAN 1(ONE) OHM.
4 – OBSERVE POSITIONER POWER SUPPLY LOAD CURVE.
5 – WIRES: TWISTED PAIR, 22AWG OR LARGER.
6 – SHIELD IS OPTIONAL IF USED, BE SURE TO INSULATE THE END NOT GROUNDED.
7 – BARRIERS MUST BE "CSA" CERTIFIED AND MUST BE INSTALLED IN ACCORDANCE WITH MANUFACTURES INSTRUCTIONS.
8 – NON–INCENDIVE FOR CLASS I, DIV. 2, GROUPS A, B, C, D, WITH NON–INCENDIVE FIELD WIRING INPUT PARAMETERS AS LISTED BELOW.

NON–INCENDIVE APPARATUS
ENTITY VALUES: Ci=5nF Li=10uH Vmax=24V

IEC 60079–27 FNICO FIELD DEVICE: Imax=570mA Pmax=9.98W

CAUTION: EXPLOSION HAZARD – SUBSTITUITION OF COMPONENTS MAY IMPAIR SUITABILITY FOR USE IN HAZARDOUS LOCATIONS.

CAUTION: EXPLOSION HAZARD – DO NOT DISCONNECT FOR CLASS I, DIV. 2 EQUIPAMENT THAT IS NOT CONNECTED TO BARRIERS

MODEL FY302 & FY303 – SERIES VALVE POSITIONERS

APPROVAL CONTROLLED BY C.A.R.

REV	BY	APPROVAL	DOC
03	MARCIAL 25/ 09/ 08	EMBOABA 25/ 09 / 08	ALT–DE–0043/08
02	MARCIAL 19/ 08 / 08	EMBOABA 19/ 08 / 08	ALT–DE–0037/08
01	J.RODRIGO 16/ 07 / 07	EMBOABA 16/ 07 / 07	ALT–DE–0004/07

DRAWN	CHECKED	PROJECT	APPROVAL
MOACIR 25 / 05 / 01	SINASTRE 25 / 05 / 01	SINASTRE 25 / 05 / 01	EMBOABA 25 / 05 / 01

EQUIPMENT: FY302/FY303
CONTROL DRAWING
FOR NON INCENDIVE: CLASS I, DIV. 2

smar

NUMBER	REV
102A0836	03
SCALE	SHEET 02/02

Appendix B

smar

SRF – Service Request Form

FY Positioner

GENERAL DATA

Model: FY290 ( ) Firmware Version: _____ FY301 ( ) Firmware Version: _____
FY302 ( ) Firmware Version: _____ FY303 ( ) Firmware Version: _____
FY400 ( ) Firmware Version: _____

Serial Number: _____ **Sensor Number:** _____

TAG: _____

Remote Position Sensor? Yes ( ) No ( )

Pressure Sensor? Yes ( ) No ( )

Action: Rotary ( ) Linear ( )

Travel: 15 mm ( ) 30 mm ( ) 50 mm ( ) 100 mm ( ) Other: _____ mm

Configuration: Magnetic Tool ( ) Palm ( ) Psion ( ) PC ( ) Software: _____ Version: _____

FINAL CONTROL ELEMENT DATA

Type: Valve + Actuator ( ) Pneumatic Cylinder (ACP) ( ) Other:_____

Size: _____

Travel: _____

Manufacturer: _____

Model: _____

AIR SUPPLY

Conditions: Dry and Clean ( ) Oil ( ) Water ( ) Other: _____

Work Pressure: 20 PSI ( ) 60 PSI ( ) 100 PSI ( ) Other: _____ PSI

PROCESS DATA

Hazardous Area Calssification Non-Classified ( ) Chemical ( ) Explosive ( ) Other: _____

Interference Types Vibration ( ) Temperature ( ) Eletromagnetic ( ) Others: _____

SITUATION DESCRIPTION

_____
_____
_____
_____

SERVICE SUGGESTION

Adjustment ( ) Cleaning ( ) Preventive Maintenance ( ) Update / Up-grade ( )

Other: _____

USER INFORMATION

Company: _____

Contact: _____

Title: _____

Section: _____

Phone: _____ _____ _____ _____ **Extension:**_____

E-mail: _____ **Date:** _____/ _____/ _____

For warranty or non-warranty repair, please contact your representative.
Further information about address and contacts can be found on www.smar.com/contactus.asp.

Returning Materials

Should it become necessary to return the positioner and/or configurator to SMAR, simply contact our office, informing the defective instrument serial number, and return it to our factory.

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

Instruments returned or to be revised outside the guarantee term should be accompanied by a purchase order or a quote request.

Appendix C

SMAR WARRANTY CERTIFICATE

1. SMAR guarantees the equipment of its own manufacture for a period of 24 (twenty four) months, starting on the day the invoice is issued. The guarantee is effective regardless of the day the product was installed. Third-party equipment and software are not included in this Term of Guarantee and Smar does not offer any guarantee or declaration in the name of the manufacturer. Any guarantees related to these products are the supplier or licenser responsibility.

2. SMAR products are guaranteed against any defect originating from manufacturing, mounting, whether of a material or manpower nature, provided that the technical analysis reveals the existence of a quality failure liable to be classified under the meaning of the word, duly verified by the technical team within the warranty terms.

3. Exceptions are proven cases of inappropriate use, wrong handling or lack of basic maintenance compliant to the equipment manual provisions. SMAR does not guarantee any defect or damage caused by an uncontrolled situation, including but not limited to negligence, user imprudence or negligence, natural forces, wars or civil unrest, accidents, inadequate transportation or packaging due to the user's responsibility, defects caused by fire, theft or stray shipment, improper electric voltage or power source connection, electric surges, violations, modifications not described on the instructions manual, and/or if the serial number was altered or removed, substitution of parts, adjustments or repairs carried out by non-authorized personnel; inappropriate product use and/or application that cause corrosion, risks or deformation on the product, damages on parts or components, inadequate cleaning with incompatible chemical products, solvent and abrasive products incompatible with construction materials, chemical or electrolytic influences, parts and components susceptible to decay from regular use, use of equipment beyond operational limits (temperature, humidity, etc.) according to the instructions manual. In addition, this Warranty Certificate excludes expenses with transportation, freight, insurance, all of which are the customer's responsibility.

4. For warranty or non-warranty repair, please contact your representative.

   Further information about address and contacts can be found on www.smar.com/contactus.asp

5. In cases needing technical assistance at the customer's facilities during the warranty period, the hours effectively worked will not be billed, although SMAR shall be reimbursed from the service technician's transportation, meals and lodging expenses, as well dismounting/mounting costs, if any.

6. The repair and/or substitution of defective parts do not extend, under any circumstance, the original warranty term, unless this extension is granted and communicated in writing by SMAR.

7. No Collaborator, Representative or any third party has the right, on SMAR's behalf, to grant warranty or assume some responsibility for SMAR products. If any warranty would be granted or assumed without SMAR's written consent, it will be declared void beforehand.

8. Cases of Extended Warranty acquisition must be negotiated with and documented by SMAR.

9. If necessary to return the equipment or product for repair or analysis, contact us.
   See item 4.

10. In cases of repair or analysis, the customer must fill out the Revision Requisition Form (FSR) included in the instructions manual, which contains details on the failure observed on the field, the circumstances it occurred, in addition to information on the installation site and process conditions. Equipments and products excluded from the warranty clauses must be approved by the client prior to the service execution.

11. In cases of repairs, the client shall be responsible for the proper product packaging and SMAR will not cover any damage occurred in shipment.

12. In cases of repairs under warranty, recall or outside warranty, the client is responsible for the correct packaging and packing and SMAR shall not cover any damage caused during transportation. Service expenses or any costs related to installing and uninstalling the product are the client´s sole responsibility and SMAR does not assume any accountability before the buyer.

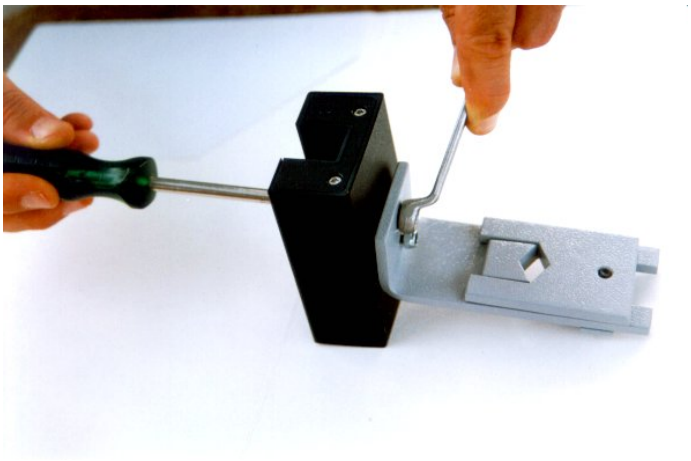
13. It is the customer's responsibility to clean and decontaminate products and accessories prior to shipping them for repair, and SMAR and its dealer reserve themselves the right to refuse the service in cases not compliant to those conditions. It is the customer's responsibility to tell SMAR and its dealer when the product was utilized in applications that contaminate the equipment with harmful products during its handling and repair. Any other damages, consequences, indemnity claims, expenses and other costs caused by the lack of decontamination will be attributed to the client. Kindly, fill out the Declaration of Decontamination prior to shipping products to SMAR or its dealers, which can be accessed at www.smar.com/doc/declarationofcontamination.pdf and include in the packaging.

14. This warranty certificate is valid only when accompanying the purchase invoice.

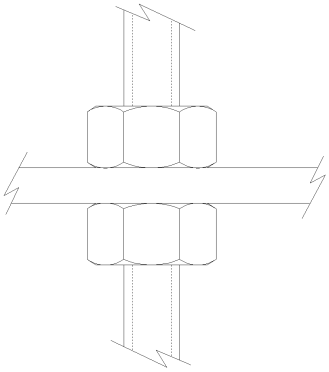
APPENDIX

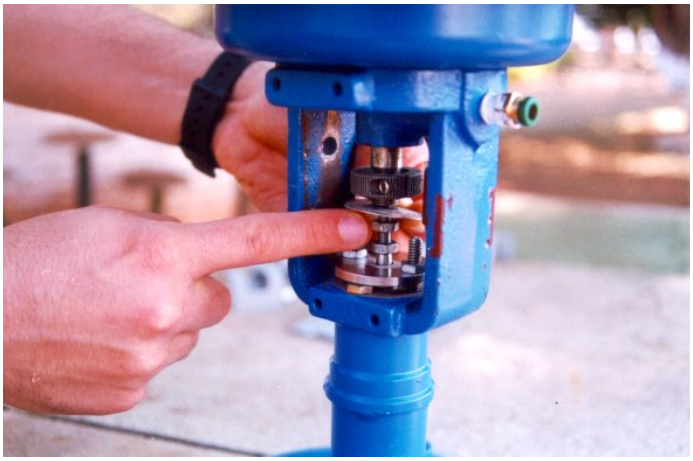
MOUNTING BRACKET FOR POSITIONER – LINEAR STROKE VALVE MOUNTING INSTRUCTIONS

1 –Attach the magnet to the magnet bracket support before connect them to the valve stem.



2 - The stem nuts should be used to fasten the magnet bracket.



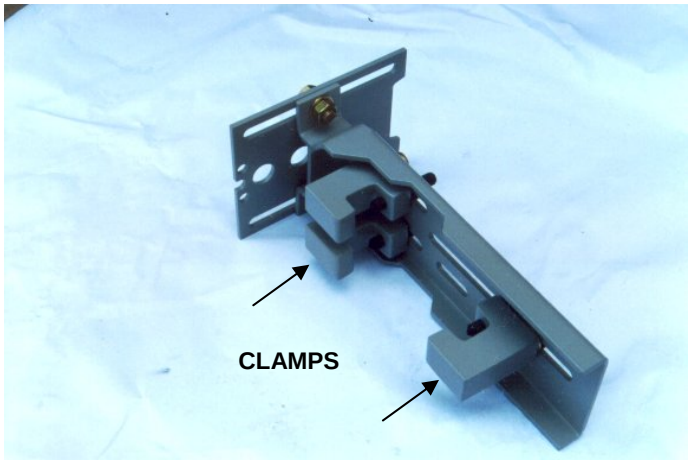


3 – Mount the magnet assembly using the nuts of the valve stem. The mounting bracket has two parts that should be mounted to the stem.

4 – Tighten the hex screw that join the two parts of the magnet bracket. It will avoid sliding of the two parts of the bracket during the fastening of the stem nuts.

5 – Tighten the stem nuts.

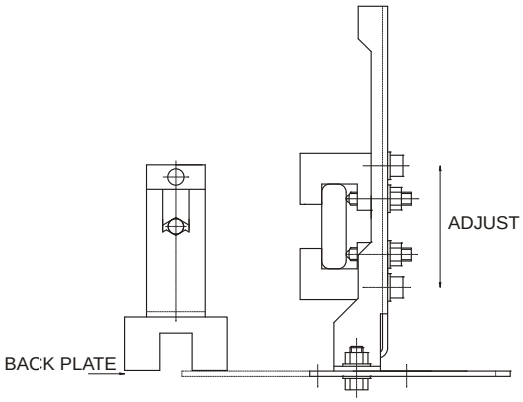
6 – Attach the “clamps” to the positioner bracket.
If your actuator is pillar type, go to step 15 to see the instructions.

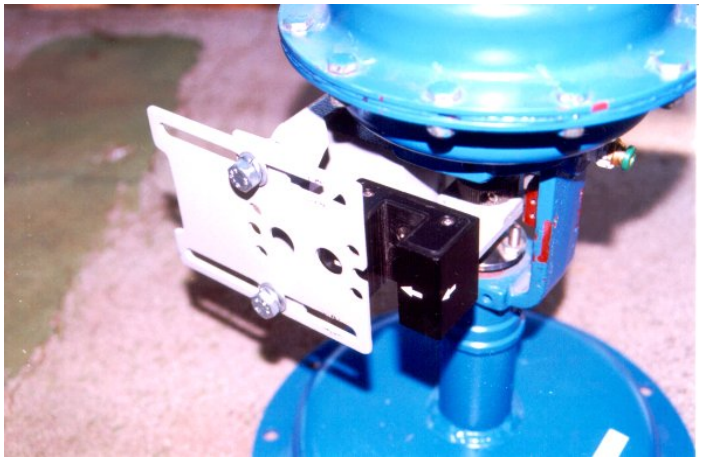


7 – Adjust the clamps according to the width of the yoke and tighten the bolts finger tight.

8 – Mount the positioner back plate. Tighten the nuts finger tight.

9 – Use the plate as a guidance to adjust the position of the positioner so that the back plate is about 1 mm apart from the magnet.

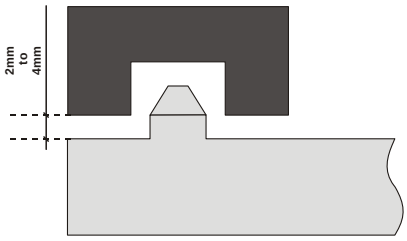


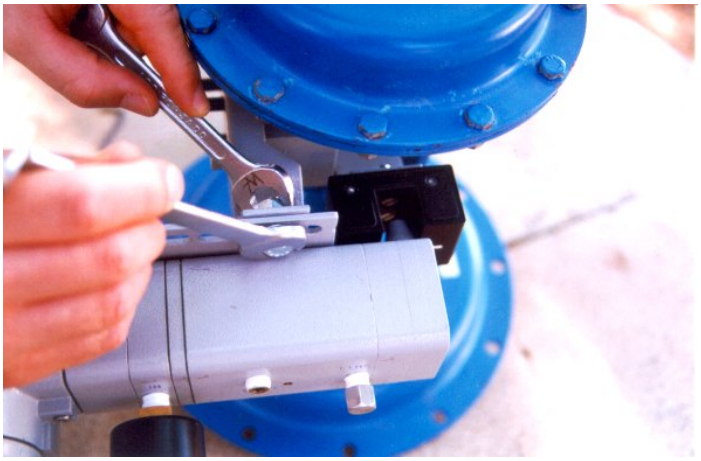


10 – Fasten the nuts to fix the positioner bracket to the yoke.
If the actuator is pillar type, fasten the U-clamp nuts.

11 – Mount the positioner to the plate and tighten the hex screws. You can take the back plate apart to facilitate the assembling.

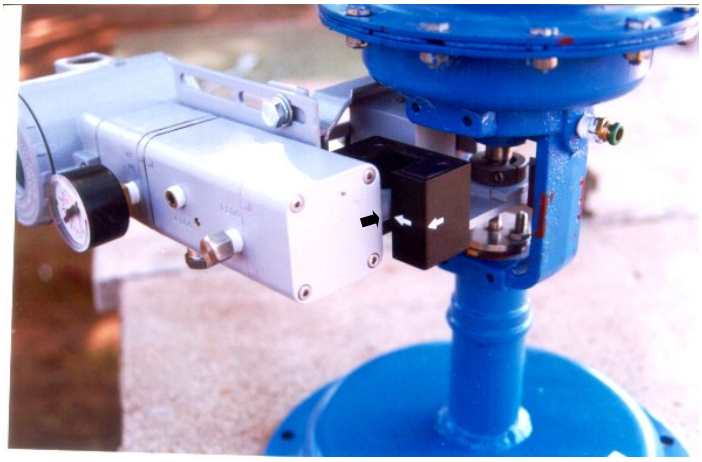
12 – Move the positioner as to adjust the Hall sensor tip in the center of the magnet. Tighten the nuts after the adjustment.





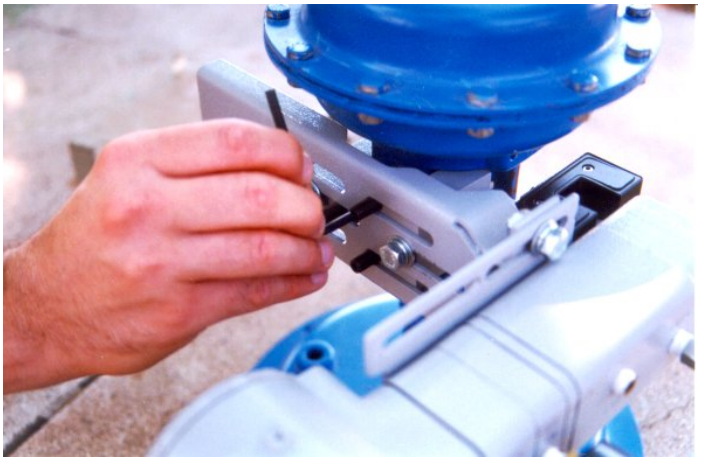
ATTENTION:
A minimum distance of 2mm and a maximum distance of 4mm is recommended between the magnet external face and the positioner face. For that, a centralizer device (linear or rotary) must be used. The centralizer device is in the positioner packing.

13 – Put the pressure equivalent to the half of the stem travel and adjust the height of the bracket assembly to have the arrows matching.



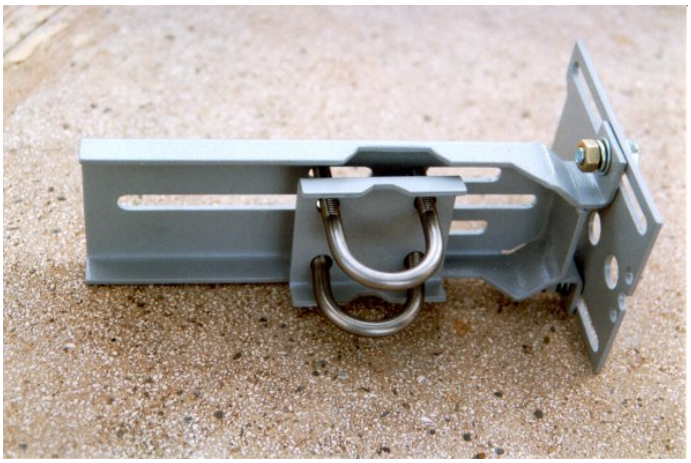
14 - Tighten the bolts to fasten the clamps to the yoke.

If the actuator is pillar type, fasten the U-clamp nuts.



MOUNTING DETAILS FOR THE PILLAR TYPE ACTUATOR

15 - This is the mounting bracket using U-clamps to be mounted on pillar type actuators.

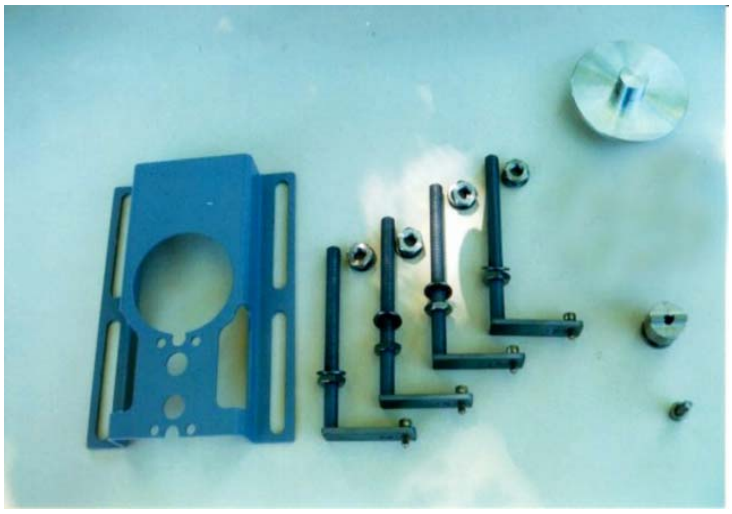


16 – After assembling the U-clamps, follow the steps 8 to 13.

ROTARY VALVE POSITIONER BRACKET

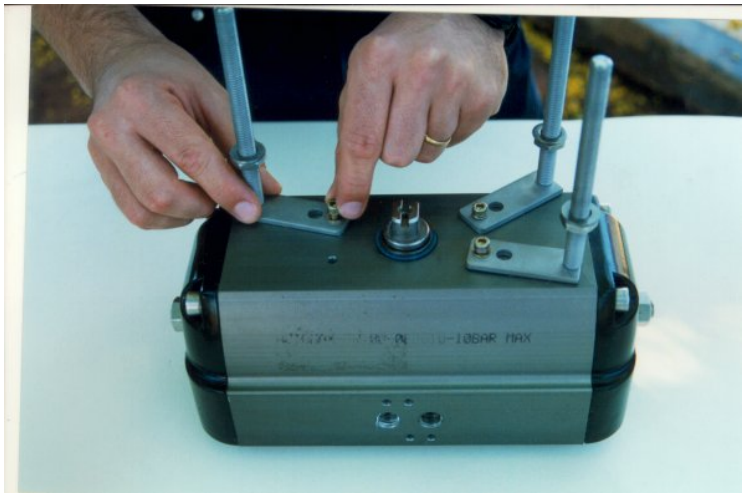
MOUNTING INSTRUCTIONS

Rotary Valve Positioner Bracket Parts.



1- Attach the clamps to the threaded orifices existent on the actuator.
Do not tight them completely.

The bolts are not supplied with the mounting bracket and they must be in accordance with size and thread of the actuator holes.



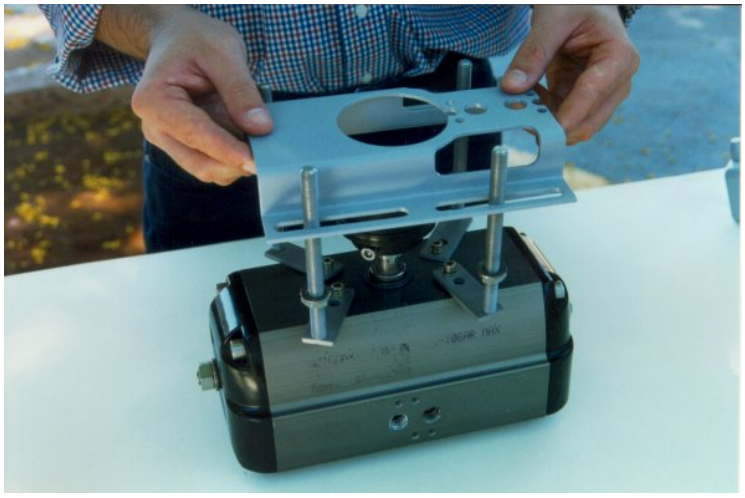
2- Attach the magnet bracket to the Actuator extremity (NAMUR).

The end the valve shaft must comply with Namur Standard.

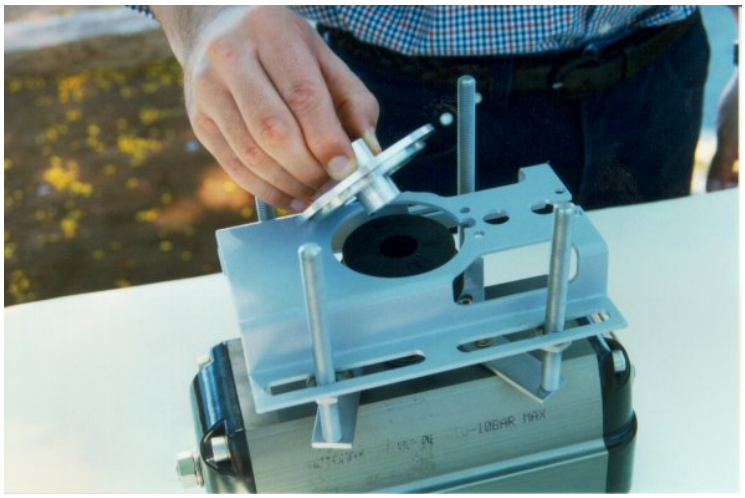
3 – Fasten the hex screw.

4 – Attach the magnet to the NAMUR adapter.
Do not fasten the bolts completely, allowing the magnet rotation.

5 – Mounting the positioner bracket through the threaded rods.



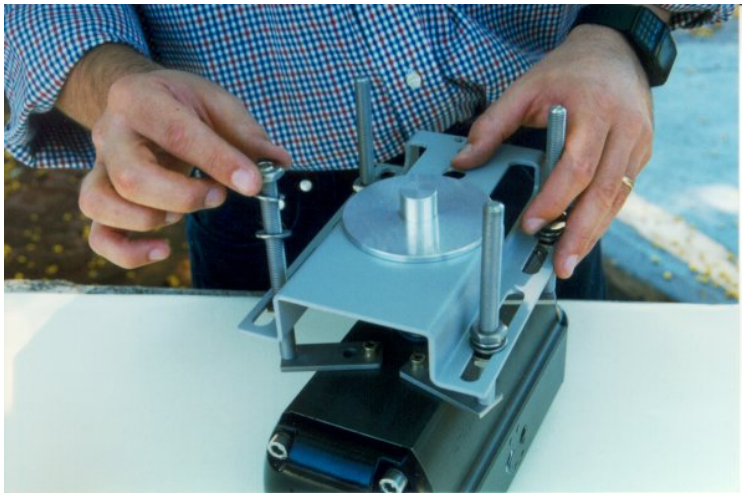
6 – Use the centralizer gadget to get the bracket centralized with the magnet.



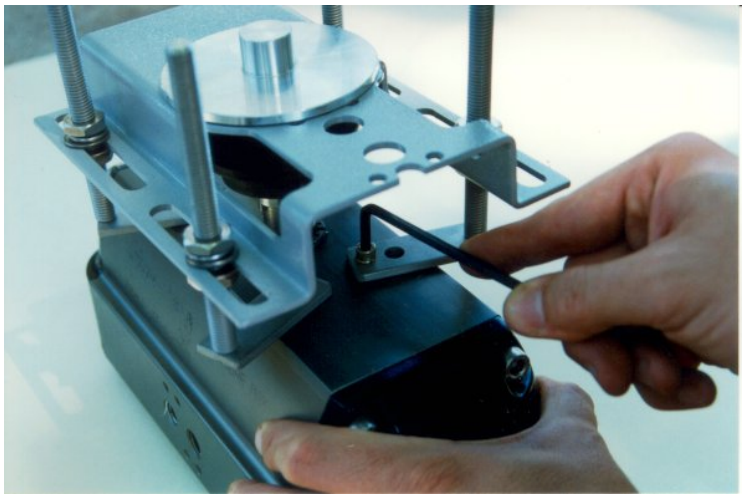
7 – Adjust the positioner bracket using the centralizer gadget and the nuts to get the height.

8 – Place the nut and washers.

Do not fasten the nuts completely.

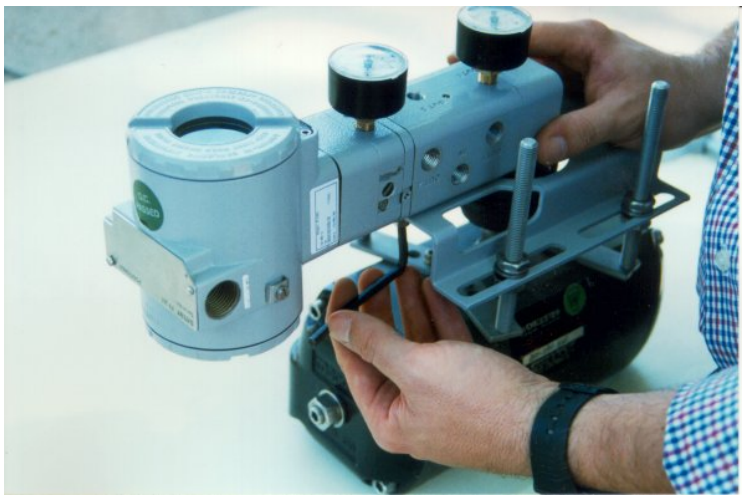


9 – Tighten the clamp bolts to fasten them to the actuator.

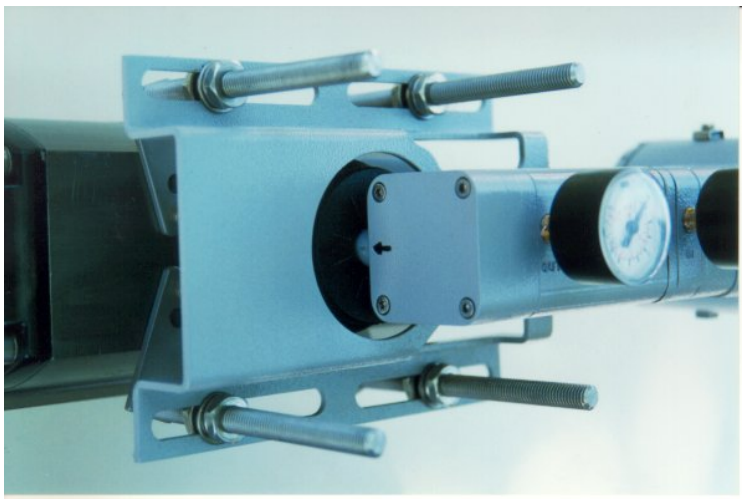


10 – Fasten the positioner bracket bolts to the clamps fastening.

11 – Remove the centralizer gadget and fasten the positioner to the positioner bracket.



12 – Put the pressure equivalent to the half of the stem and adjust the magnet position to have the arrows matching.



13 – Tighten the bolts to fasten the magnet to the magnet bracket.