MANUAL

INSTRUCTIONS | OPERATION | MAINTENANCE

VALVE POSITIONER FOR ACTUATION AND CONTROL FY302

FOUNDATION™

DEC/24 - VERSION 3

smar
Technology Company

FY302

Valve Positioner for Actuation and Control

FOUNDATION™

Consult our subsidiary

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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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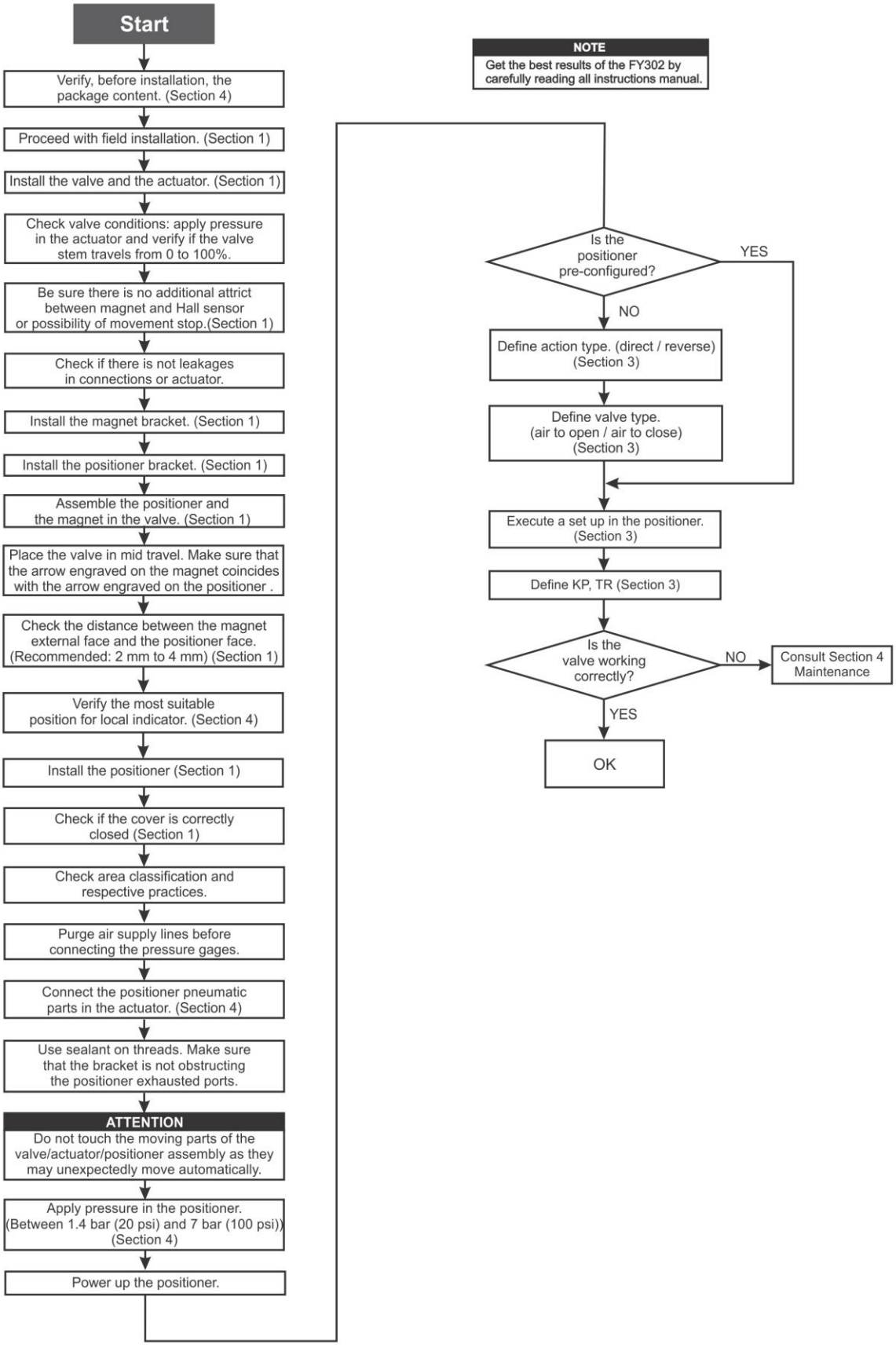
Installation Flowchart



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.

IMPORTANT
Avoid the use of thread sealing tape in the air inputs and outputs, as this type of material can release small residues and clog the inputs and outputs, thus compromising the efficiency of the equipment.

Although the positioner is virtually insensitive to vibration, installation close to pumps, turbines or other vibrating equipment should be avoided. If these vibrations cannot be avoided, is recommended to install the positioner with remote position sensor.

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).

Additionally, a wide variety of customized mounting brackets are available, covering a variety of control valve models and manufacturers.

Check availability and select the mounting bracket that meets the needs of your process. Visit the product page on the Smar website https://www.smar.com/brasil/produto/fy300series-posicionador-inteligente-de-valvulas.

Rotary Movement

Install the magnet on the valve stem using the magnet support (See Figure 1.1).

Install the positioner support on the actuator. The actuator should be in accordance with standard VDI/VDE 5845, thus 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".

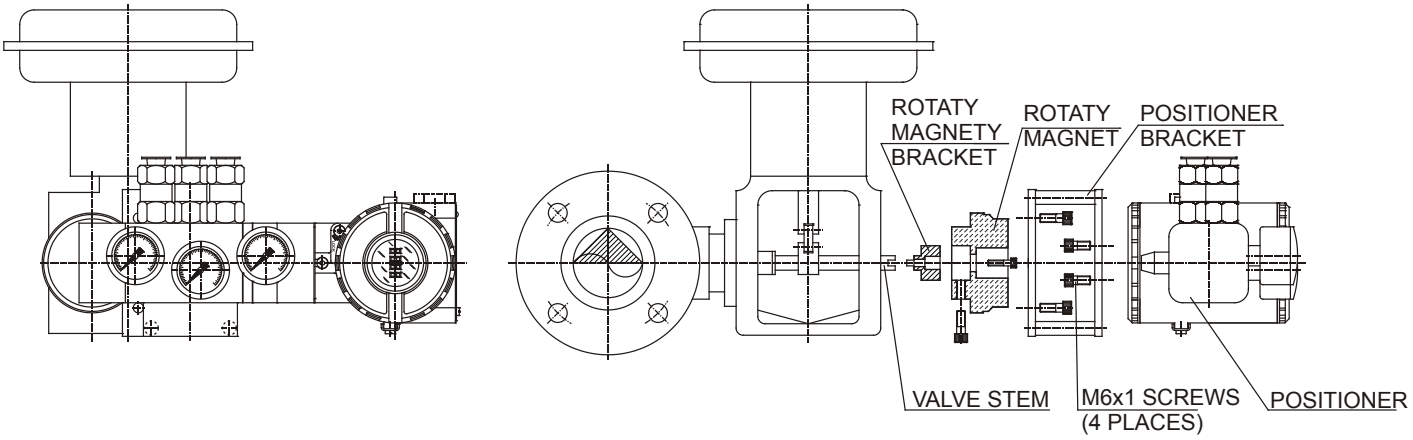


Figure 1.1 - Positioner on Rotary Actuator

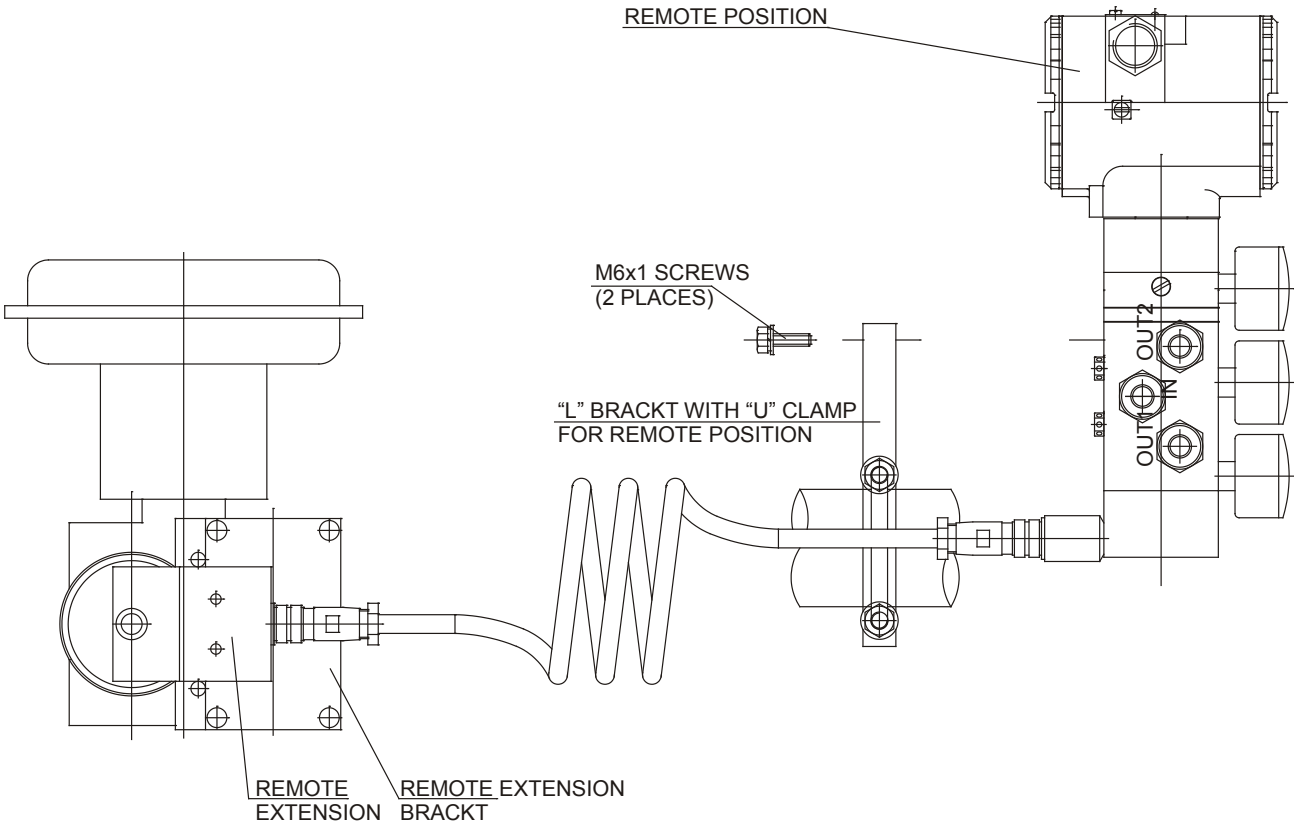


Figure 1.2 - Positioner on Rotary Actuator with Remote Position Sensor

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 outputs.

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.

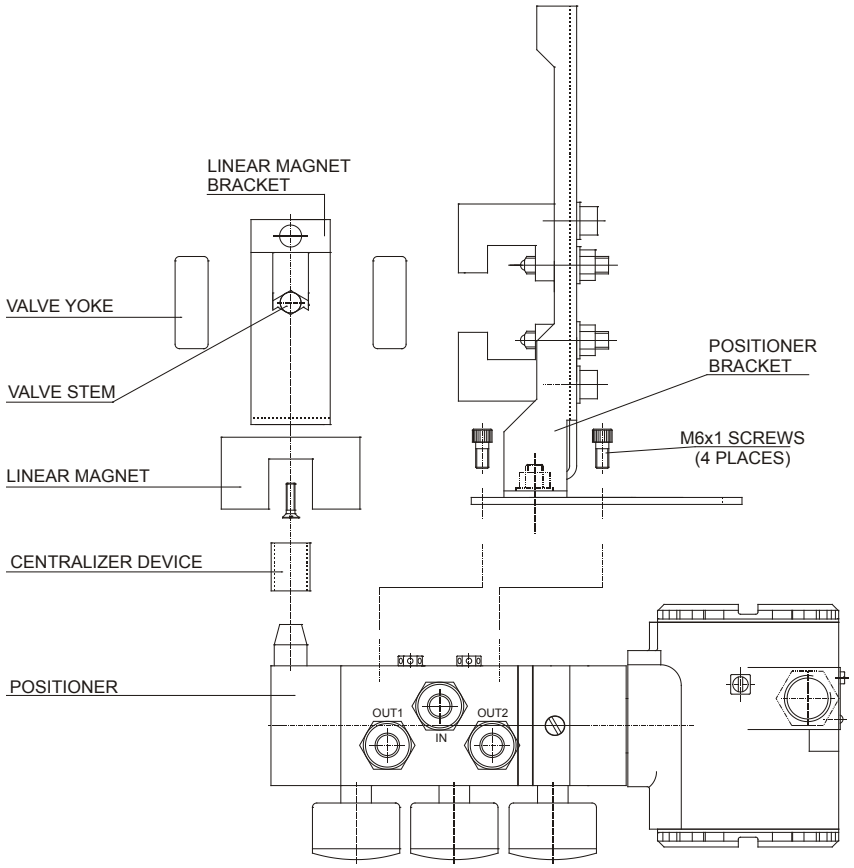


Figure 1.3 - Positioner on Linear Actuator

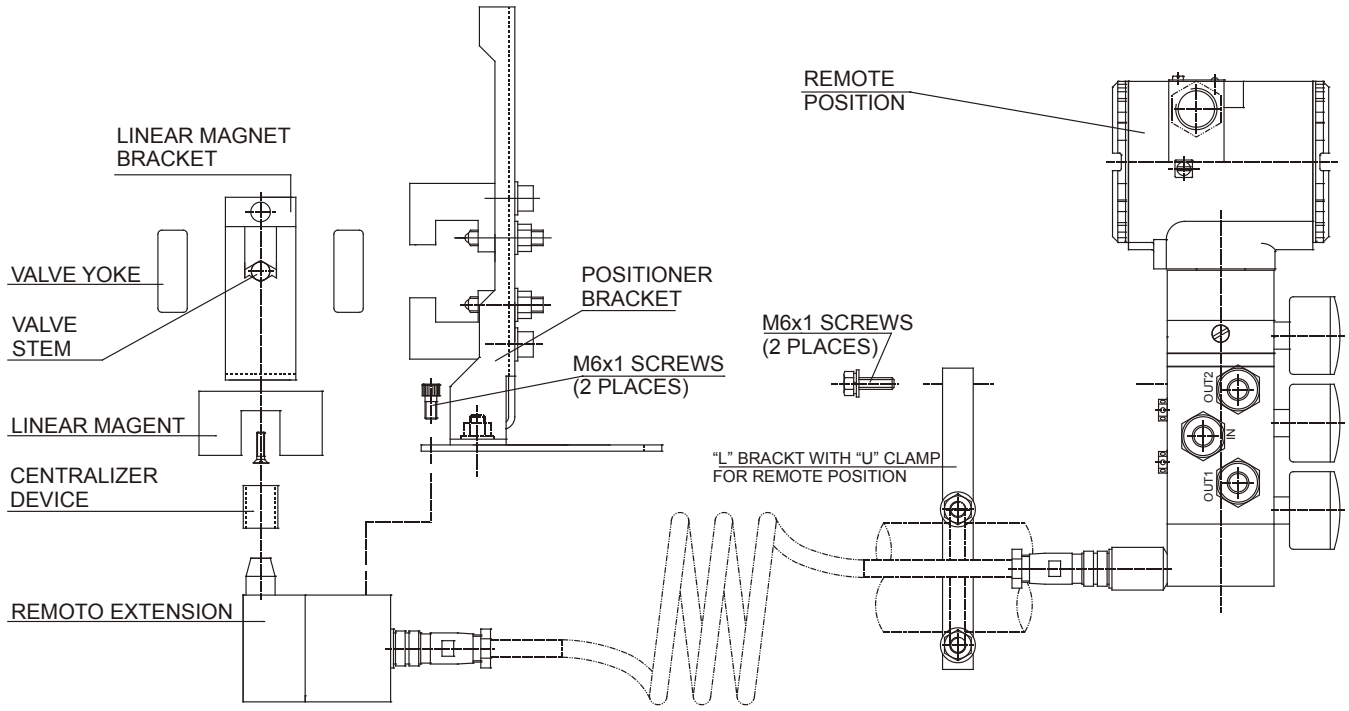


Figure 1.4 - Positioner on Linear Actuator with Remote Position Sensor

NOTES
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.

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 cannot 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. The indications of the gauges are only qualitative and therefore less accurate.

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.

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 five 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. In case of painting the Positioner block, remove the filters to prevent them from clogging with the paint

All filters shall be inspected to make sure they will not obstruct the outputs.

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.

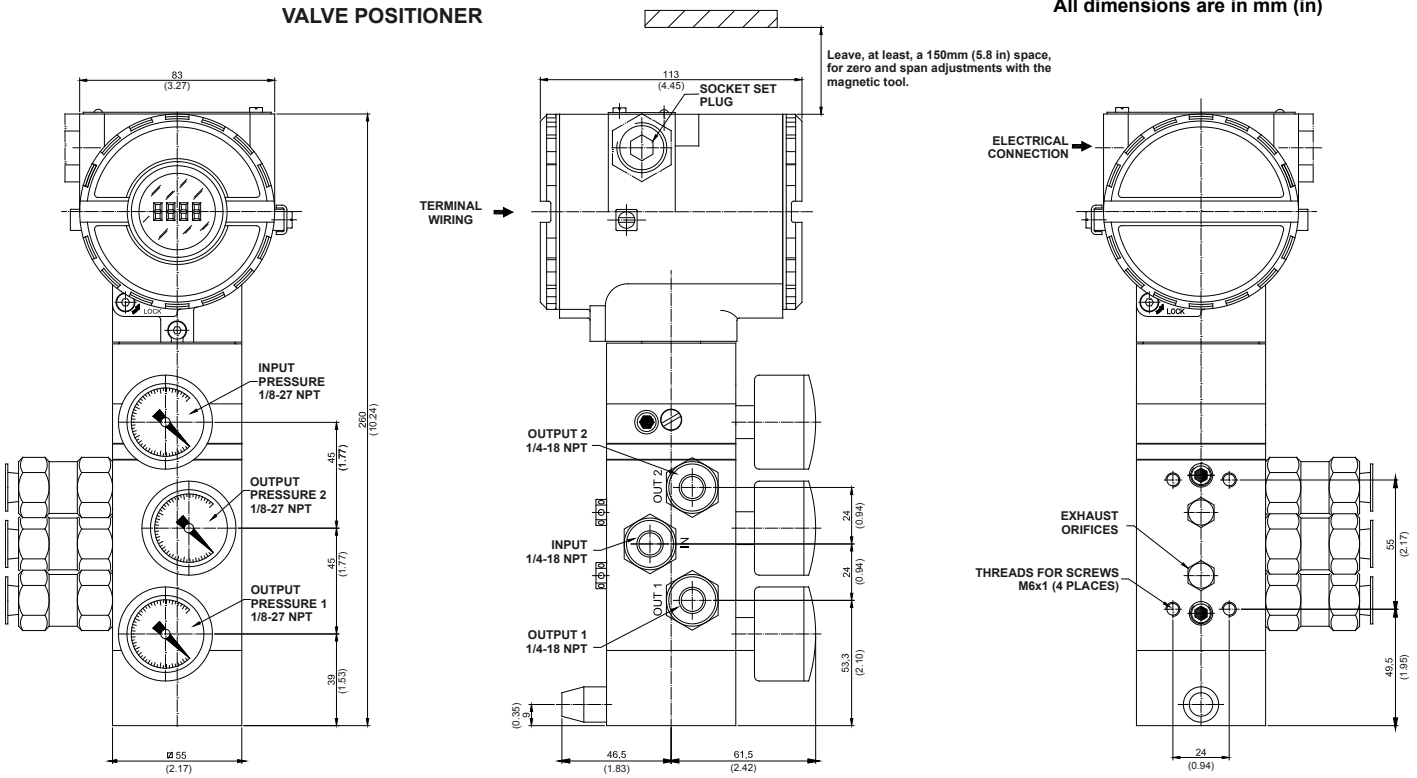
Double Action - Air to Close (Fail Open)
Connect Output 2 (OUT2) of the positioner to the input identified as OPEN in the actuator and connect Output 1 (OUT 1) of the positioner to the input CLOSE of the actuator.

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

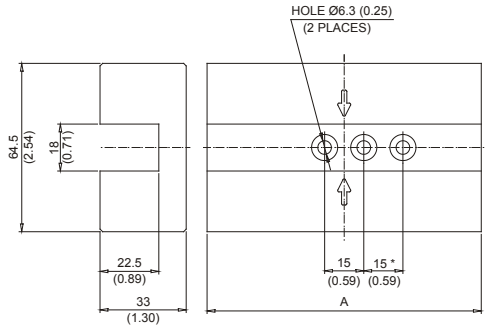
Dimensional Drawings

All dimensions are in mm (in)

VALVE POSITIONER



LINEAR MAGNET

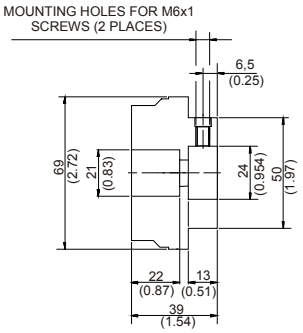


TRAVEL	DIMENSION A
UP TO 30 mm (1.18)	67 mm (2.64)
UP TO 50 mm (1.97)	105 mm (4.13)
UP TO 100 mm (3.94)	181 mm (7.12)

*ONLY FOR 50 AND 100 mm TRAVELS.

Note: Dimensions in mm (in)

ROTARY MAGNET



REMOTE HALL SENSOR

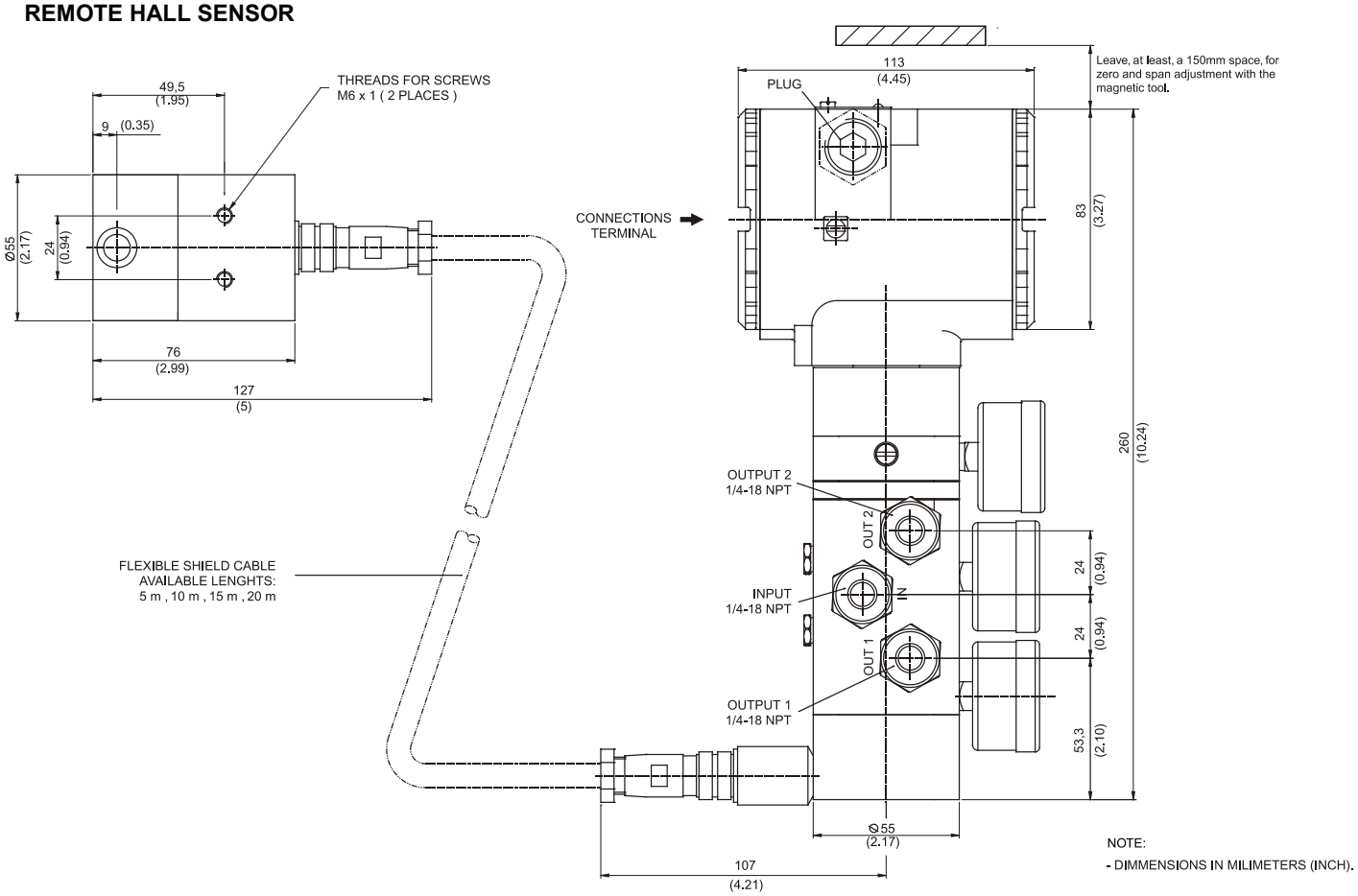


Figure 1.5 - FY302 Dimensional Drawings

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

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 1.6. The local indicator itself can also be rotated.

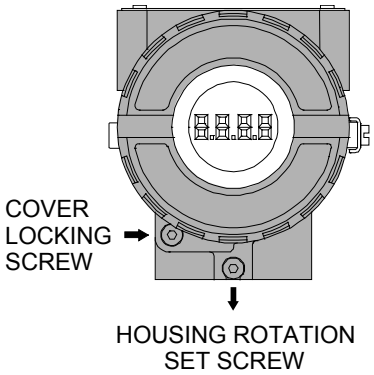


Figure 1.6 - Housing Rotation Set Screw

To reach the wiring block, remove the electrical connection cover. This cover can be locked by the cover locking screw. To release the cover, rotate the locking screw clockwise.

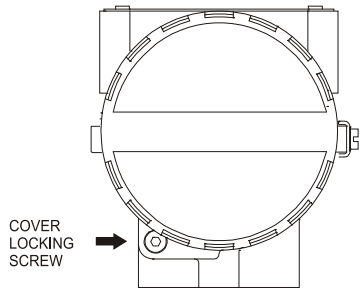


Figure 1.7 - Cover Locking Screw

Electric Wiring

The access of the signal cables to the connection terminals can be done through one of the entries in the housing, which can be connected to a conduit or cable gland. The wiring block has screws that can receive fork or ring-type terminals, See Figure 1.8. Use a plug in the electrical connection that is not to be used. Tighten securely and use thread sealant.

IMPORTANT
In case the user opts for protection against noise induced by atmospheric discharges, overloads, welding machines and machines in general, it will be necessary to install a transient protector. (Protector purchased separately).

For convenience there are three ground terminals: one inside, near the terminal block and two externals, located close to the conduit entries.

The FY302 uses 31.25 Kbits/s voltage mode with physical current modulation. All other equipment on the bus must use the same modulation type and be connected in parallel along the same wire pair. Several types of FIELDBUS devices can be used on the same bus.

The FY302 is powered via bus.

Make sure that the test terminals are not powered accidentally. This occurrence will cause damage to the equipment.

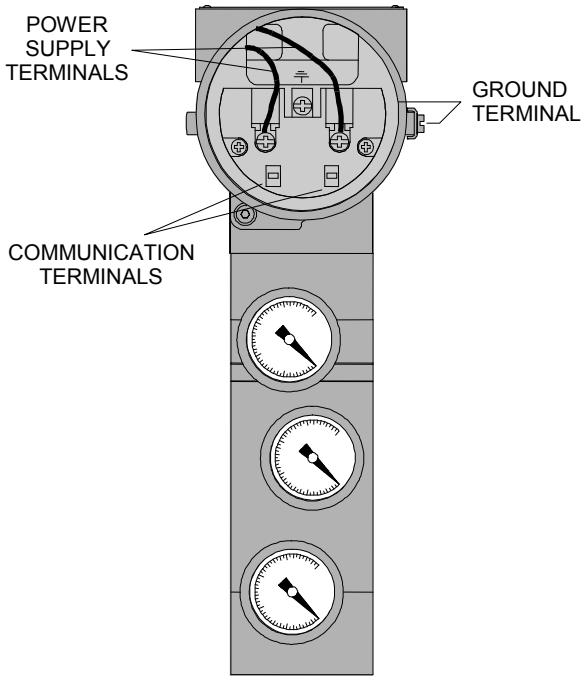


Figure 1.8 - Wiring Block

HAZARDOUS AREAS
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. 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 next figure shows the correct installation of the conduit, in order to avoid penetration of water, or other substance, which may cause malfunctioning of the equipment.

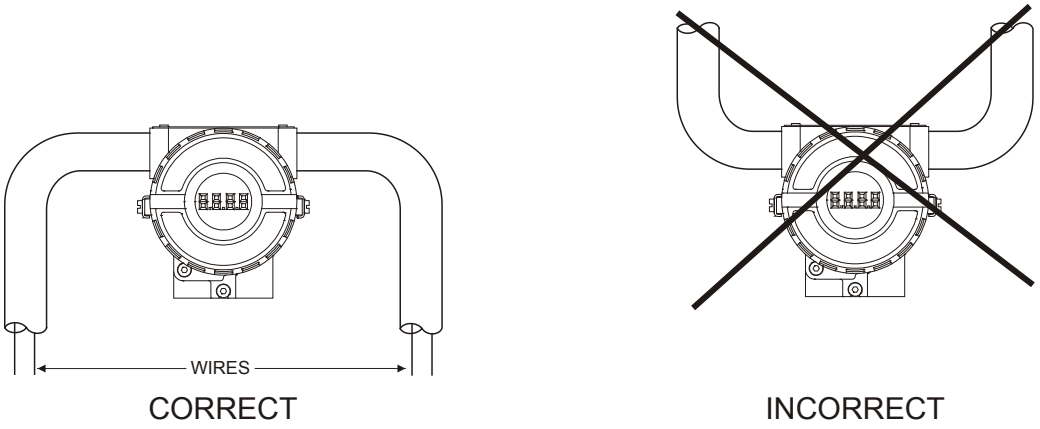


Figure 1.9 - Conduit Installation Diagram

NOTE
Please refer to the Foundation Fieldbus General Manual for further details.

The FY302 is reverse polarity protected and can support up to ±35 Vdc without damage, but it does not operate when polarity is reversed.

Topology and Network Configuration

Bus topology (See Figure 1.10) and tree topology (See Figure 1.11) 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.

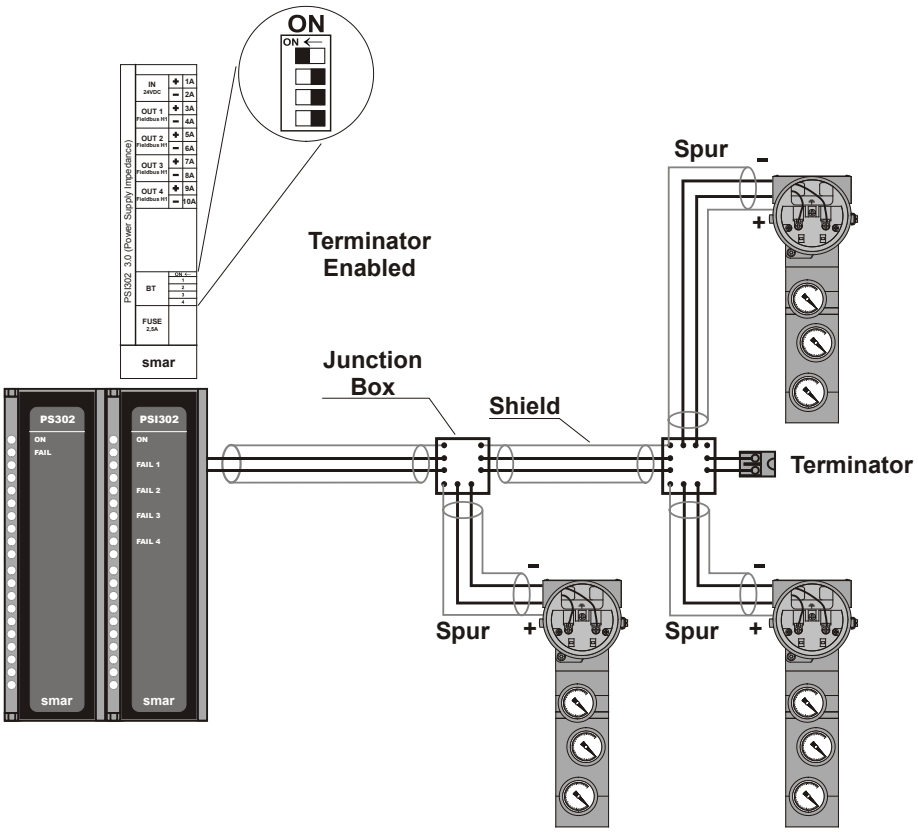


Figure 1.10 - Bus Topology

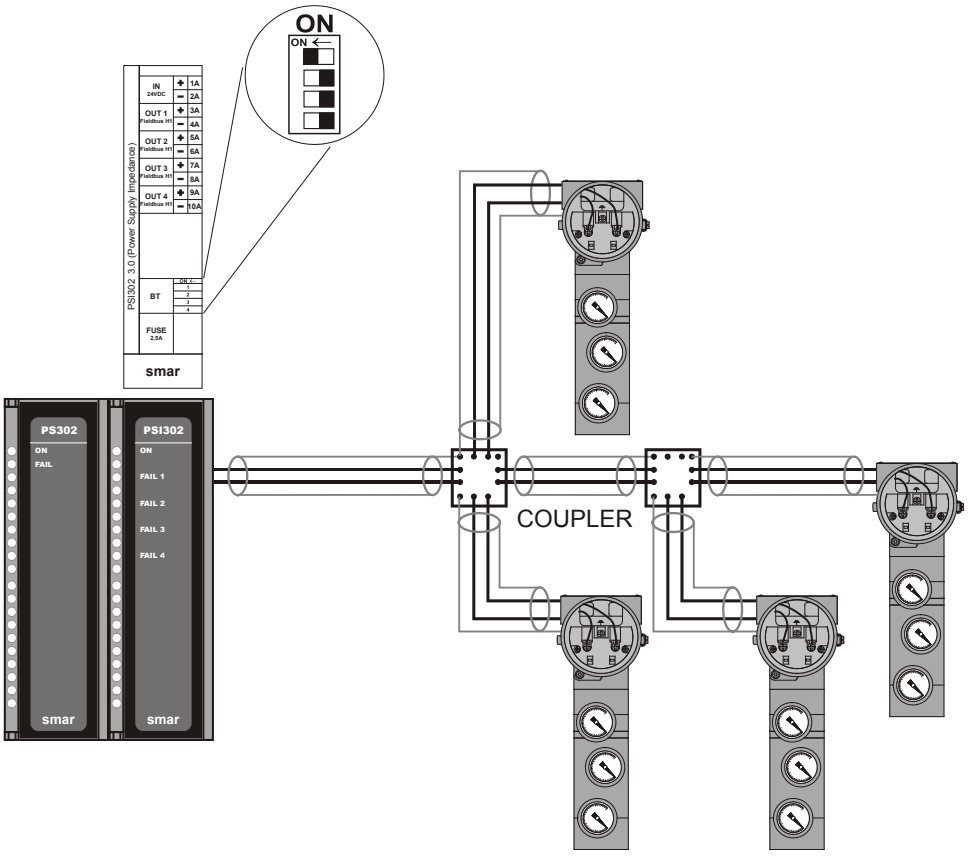


Figure 1.11 - Tree Topology

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 **DF47-17** is recommended.

Jumper Configuration

In order to work properly, the jumpers J1 and W1 located in the **FY302** main electronic 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 voltage should be between 9 to 32 Vdc for non-intrinsic safe applications.

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 or 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 following two figures show a typical system for air supply and air quality conditioning.

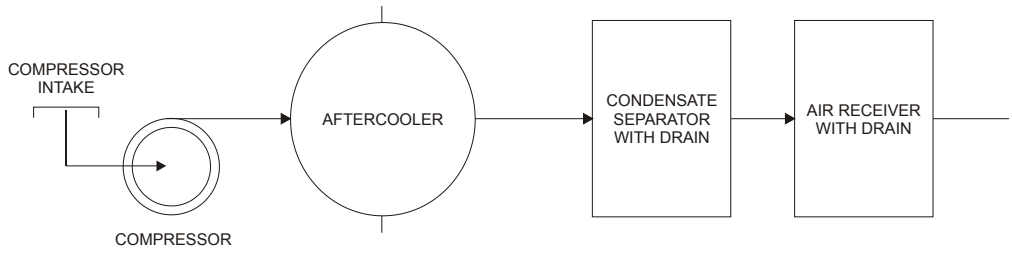


Figure 1.11 - Air Supply System

Figure 1.12 - Air Quality Conditioning System

Rotary and Linear Magnet

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

Figure 1.13 – Linear and Rotary Magnet Models

Magnet Centralizer Device

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

Figure 1.14 – Centralizer device of linear magnet

NOTE
Centralizer device for universal rotary bracket. It is only supplied with the universal rotating support; it is not packaged with the FY.

Figure 1.15 - 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 1.16 - 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 1.17 - Connecting the Cable to the Remote Hall Sensor

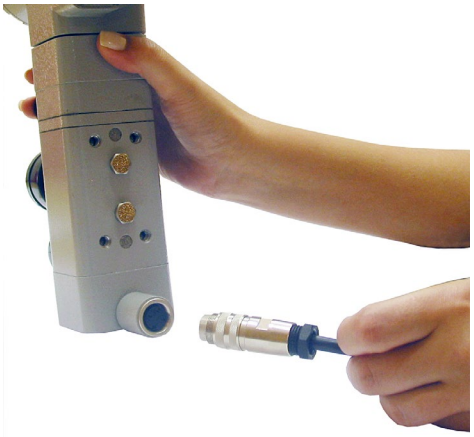


Figure 1.18 - Connecting the Cable to the Positioner

Installation in Hazardous Areas

Refer to Appendix A for certifications information.

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.

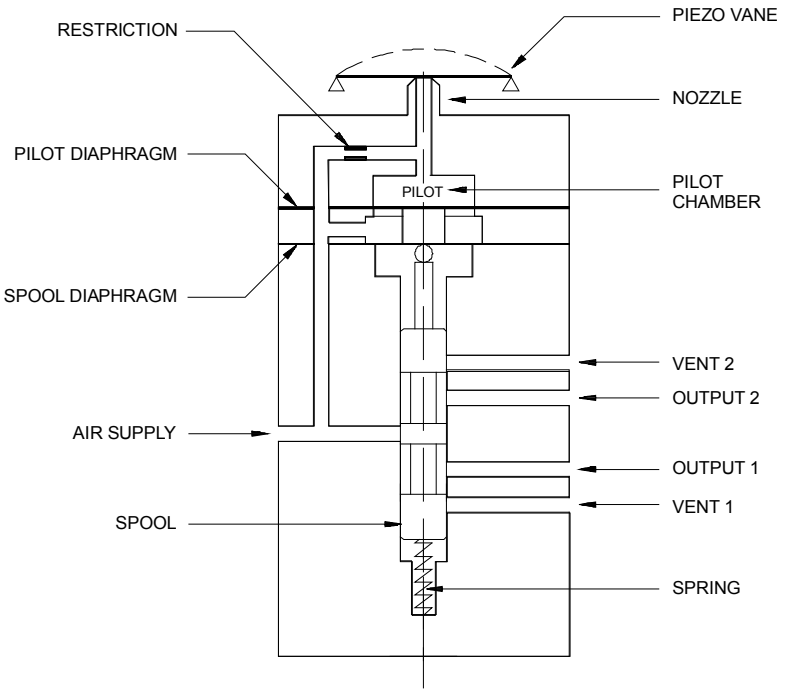


Figure 2.1 - Pneumatic Transducer Schematic

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.

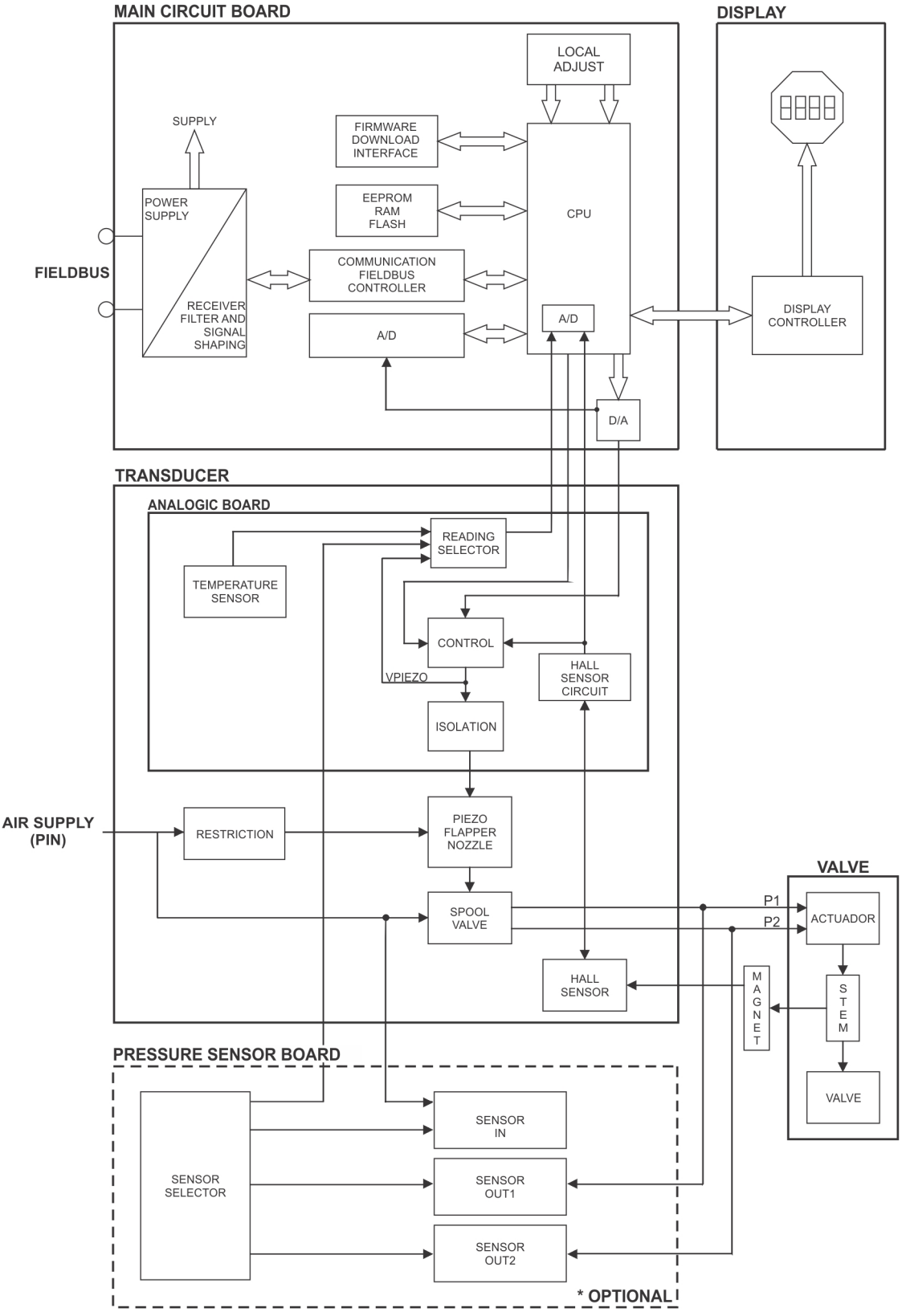


Figure 2.2 - FY302 Block Diagram

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. A special power supply on an intrinsically safe bus must be used. Smar has the DF52 (intrinsically safe) power supply for this application.

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

Local Adjustment
Local adjustment is provided by two switches that are magnetically activated without any external electrical or mechanical contact, through 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.

Pressure sensors (optional)
They read the Positioner input and output pressures for diagnostic purposes.

NOTE
The pressure sensor board is optional (in ordering code, section 5, it is option K1).

Pressure Sensor Selector
Select the sensor to be read.
IN Sensor: Measures input pressure. (Air supply).
OUT1Sensor: Measures the pressure of Output 1.
OUT2 Sensor: Measures the pressure of Output 2.

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.

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.

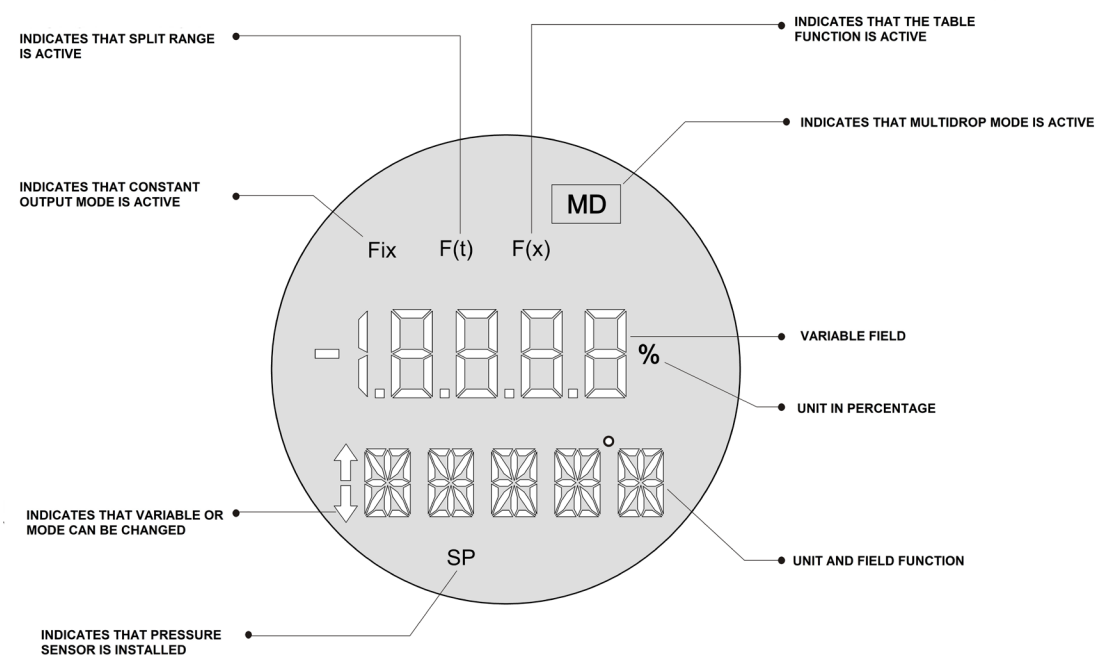


Figure 2.3 - Local Indicator

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 **Z** 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.

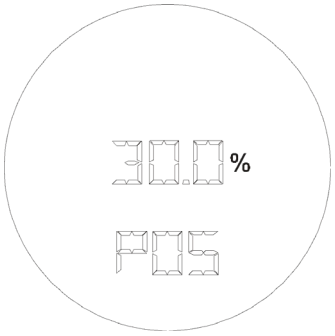


Figure 2.4 - Typical Indicator

Section 3

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.

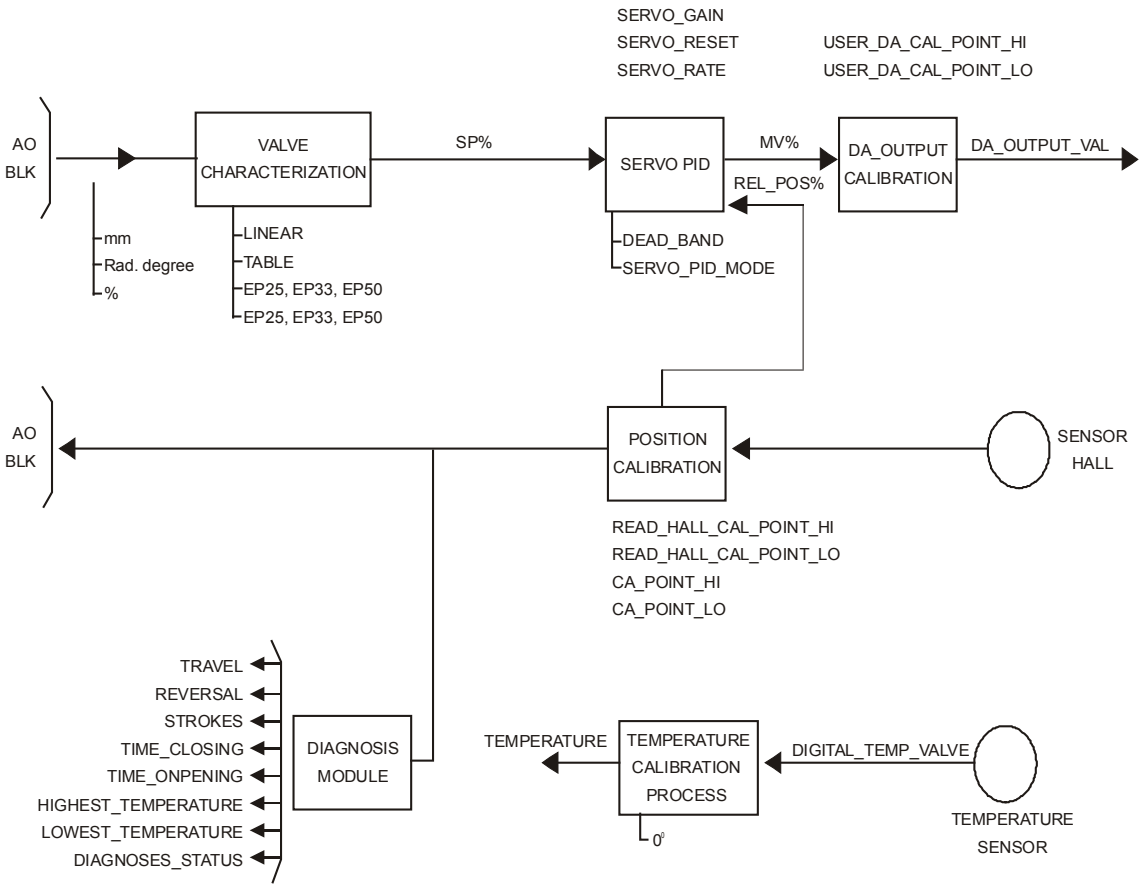


Figure 3.1 – Transducer Block Diagram

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 guideline 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.

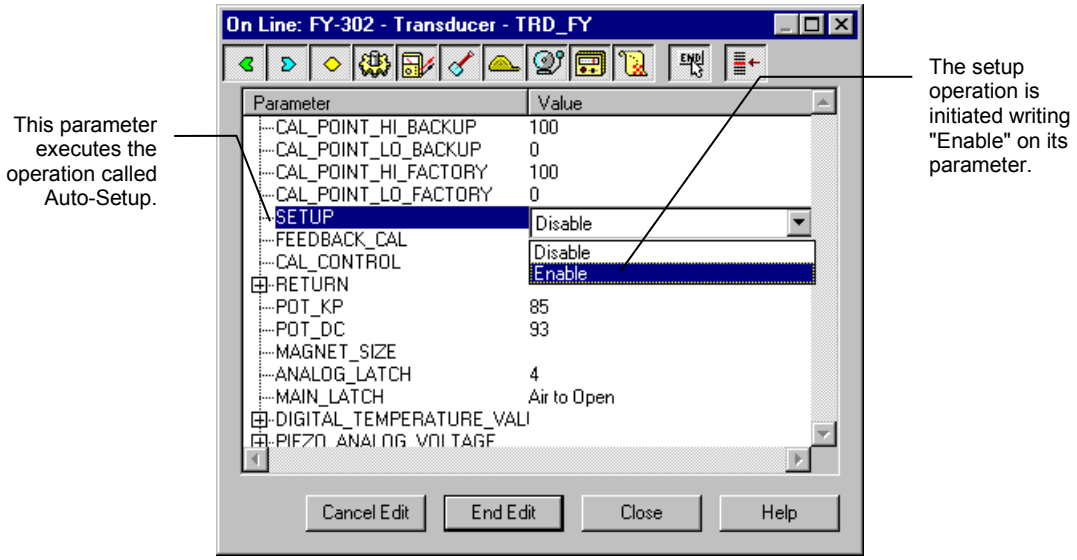


Figure 3.2 - Enabling the Auto-Setup Operation

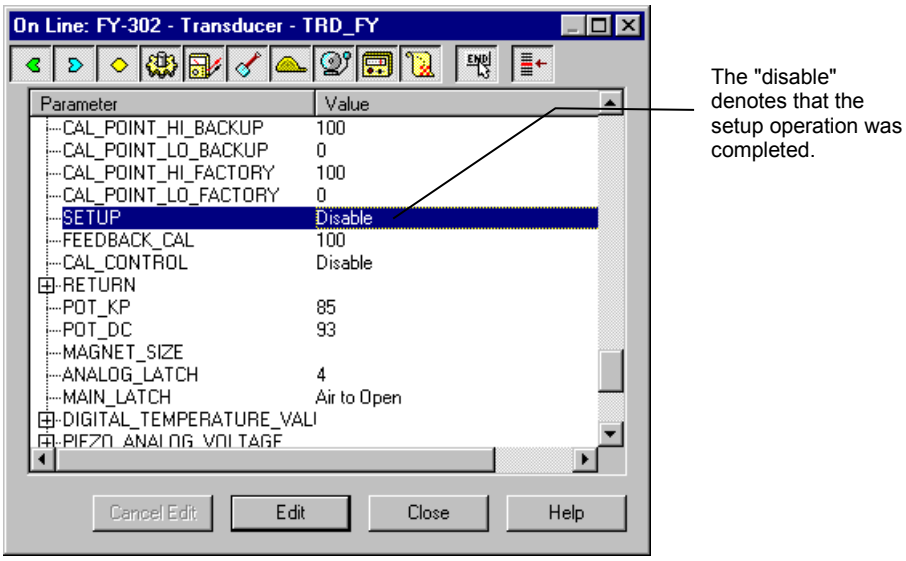


Figure 3.3 - Disabling the Auto-Setup Operation

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

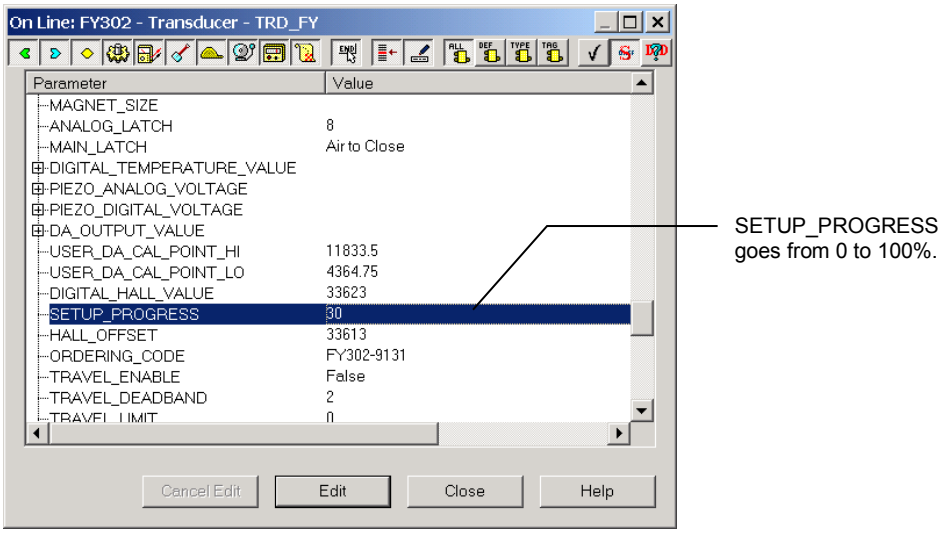


Figure 3.4 - Setup Progress

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, Linear or Rotary.

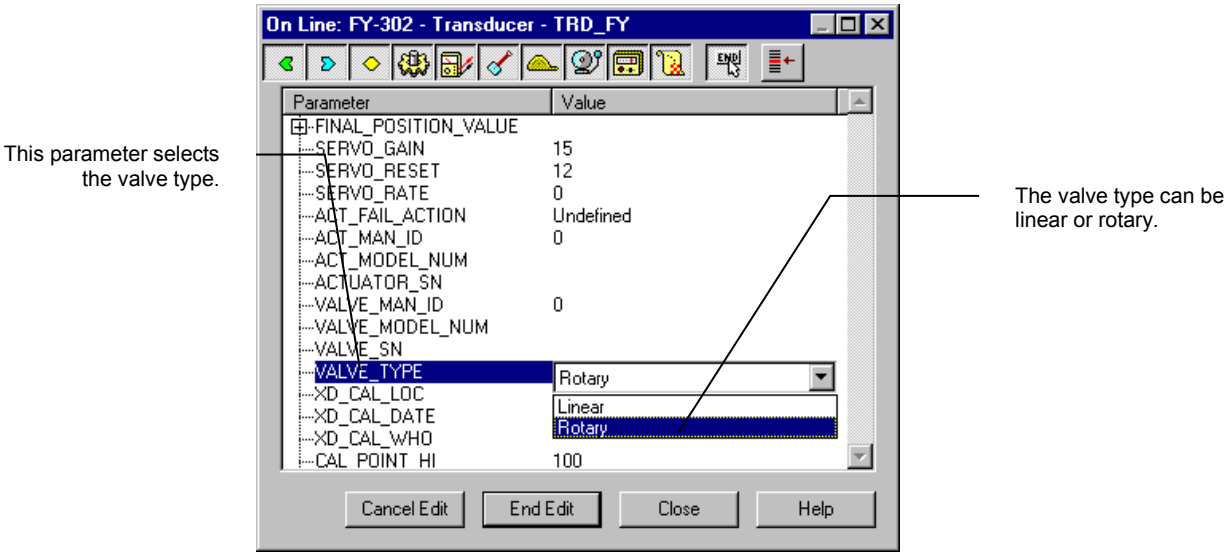


Figure 3.5 – Valve Type Configuration

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.

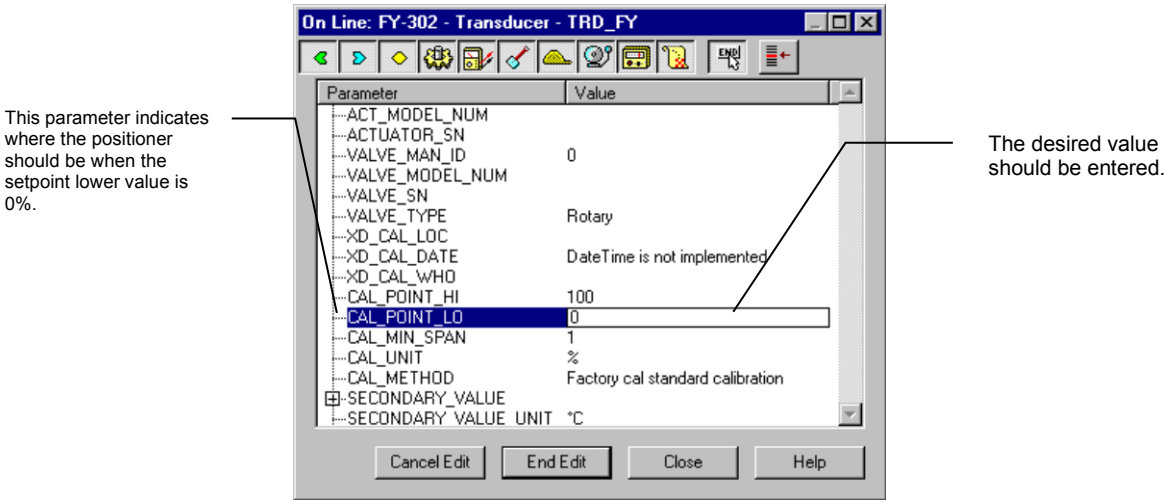


Figure 3.6 - Calibrating Low Range Value Point

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%.

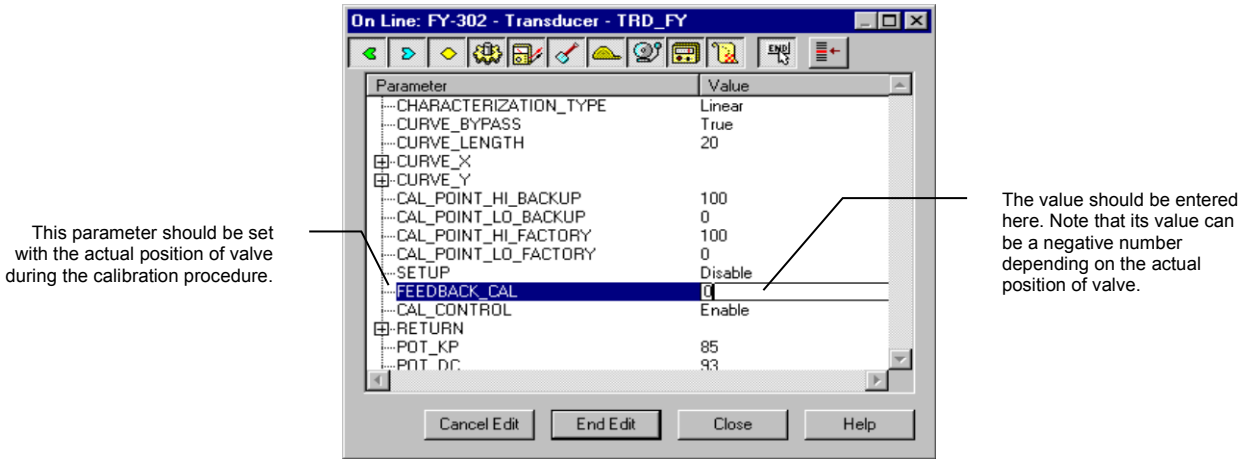


Figure 3.7 - Calibrating - Trim 0%

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

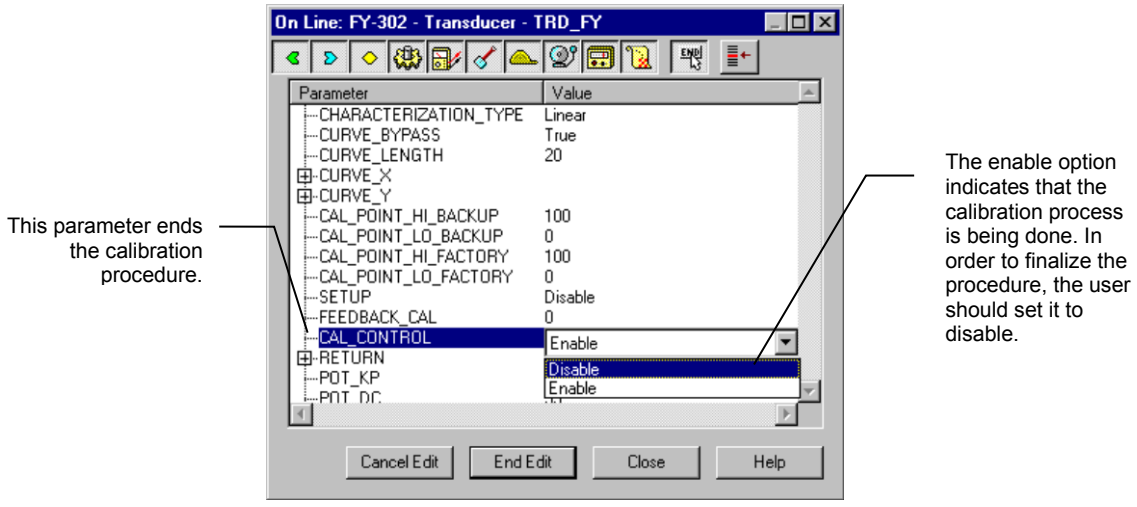


Figure 3.8 – Finishing Calibration Procedure

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.

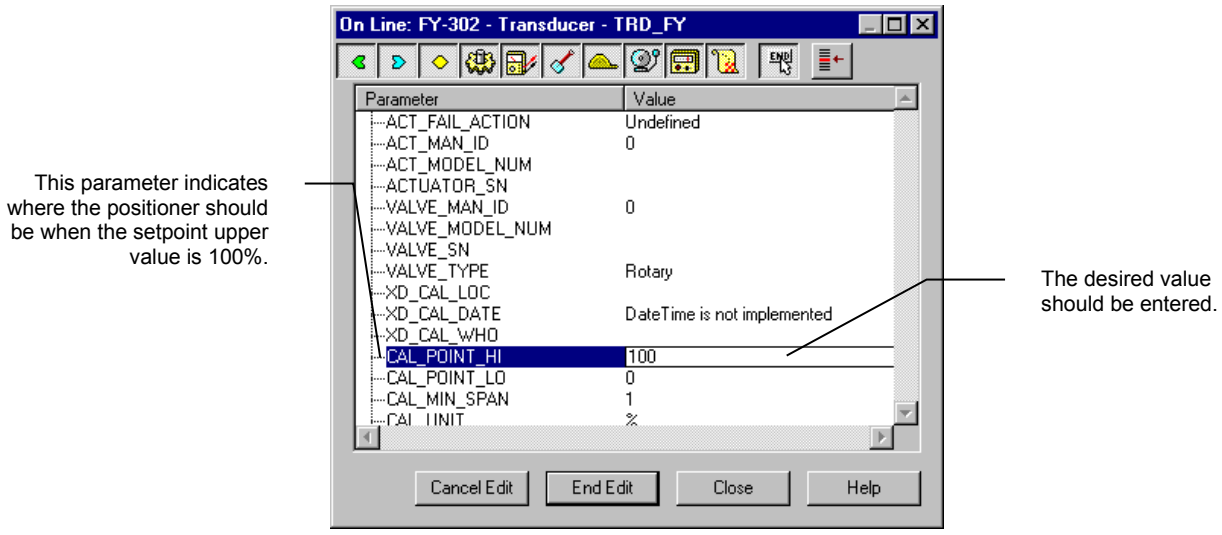


Figure 3.9 - Calibrating High Range Value Point

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%.

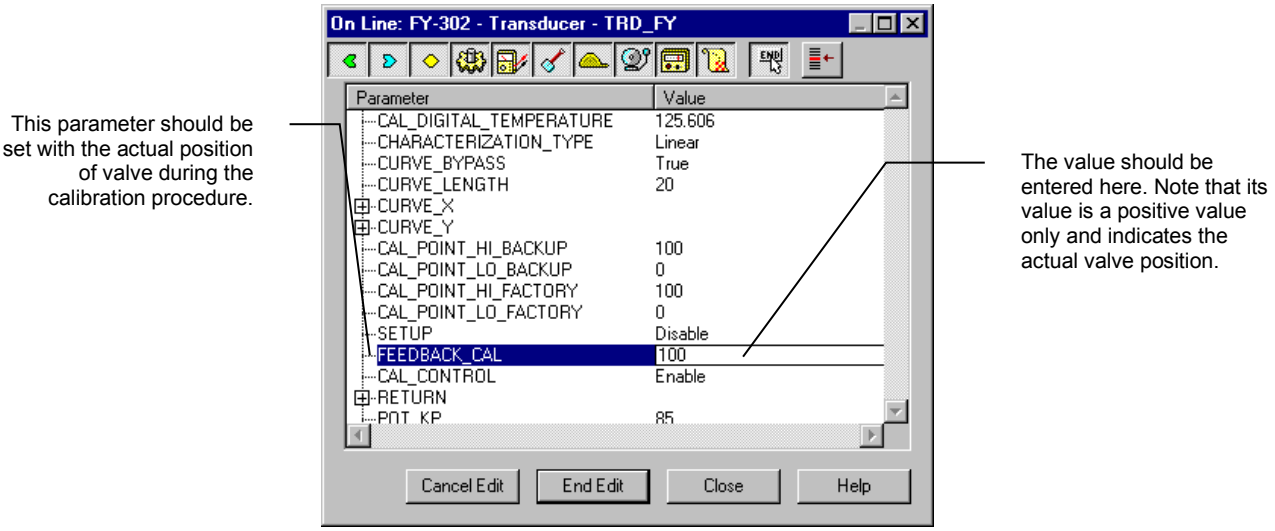


Figure 3.10 - 100% Trim Calibration

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

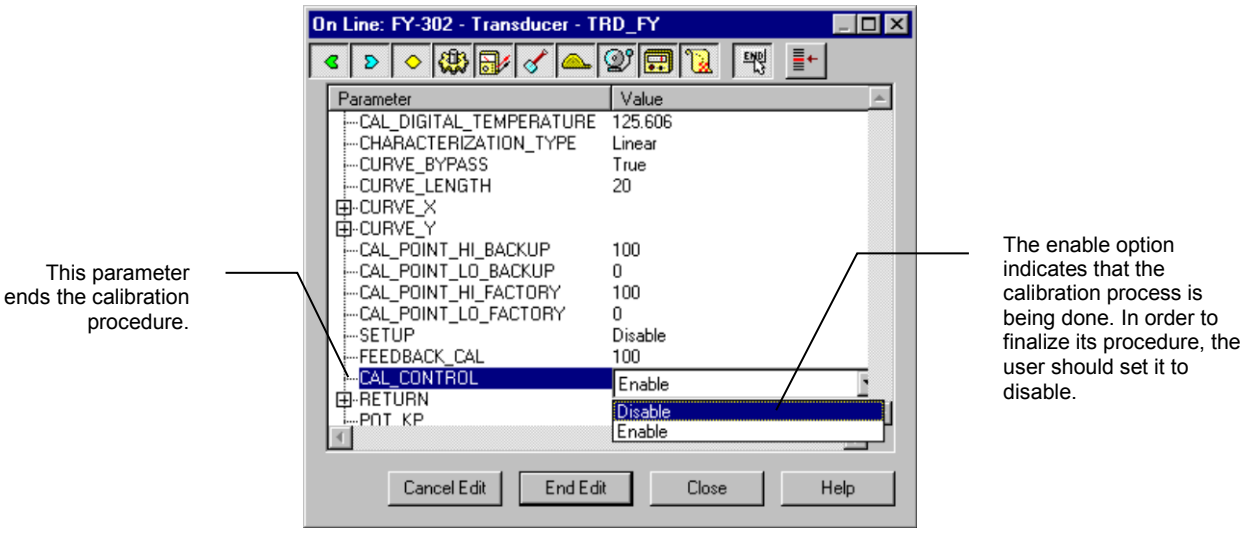


Figure 3.11 – End of Trim Procedure

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.

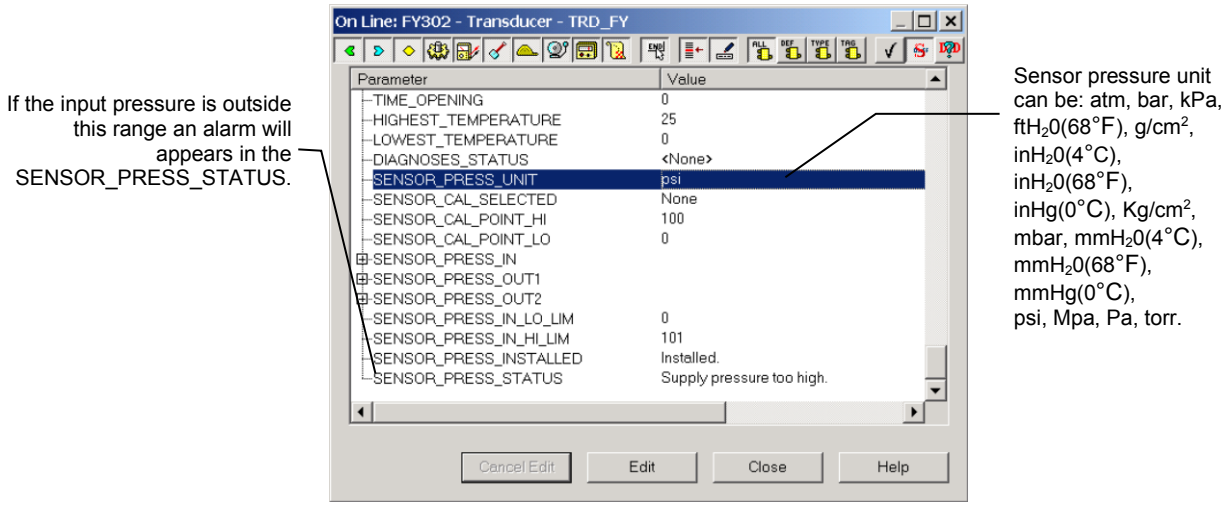


Figure 3.12 - Sensor Pressure Parameters

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 sensors (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).

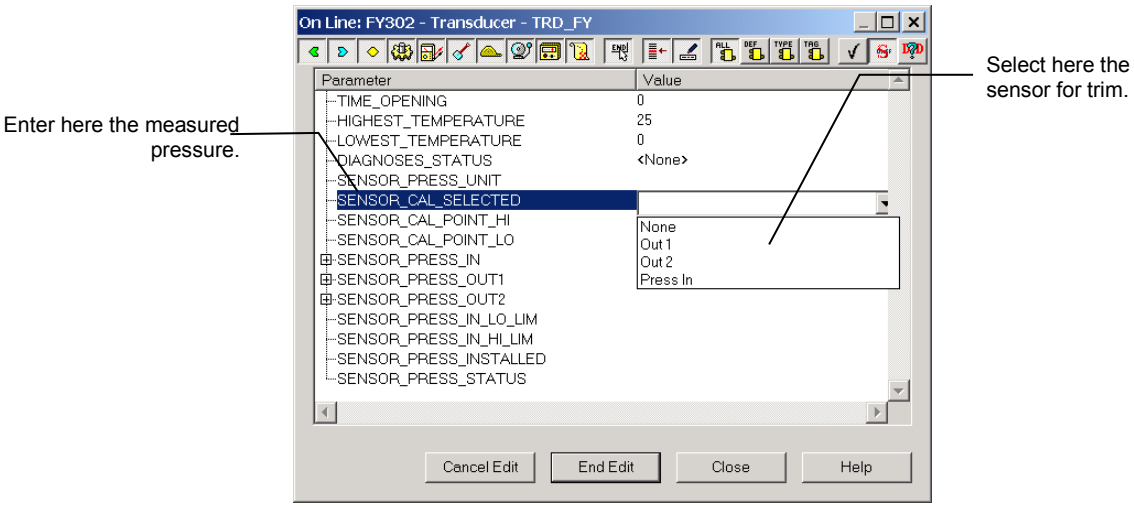


Figure 3.13 - Sensor Pressure Trim

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.

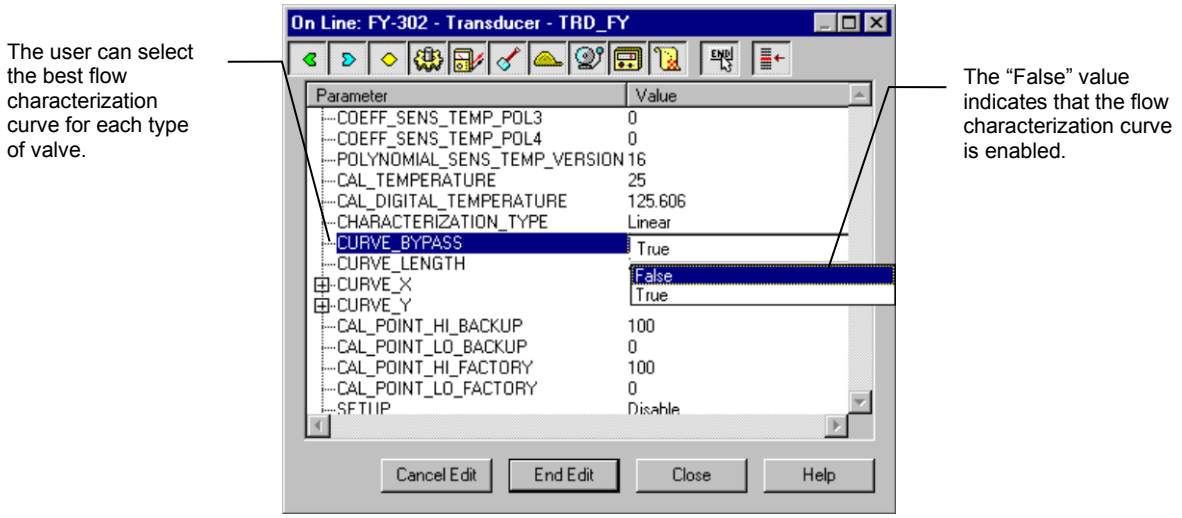


Figure 3.14 - Choosing the Flow Characterization Curve

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

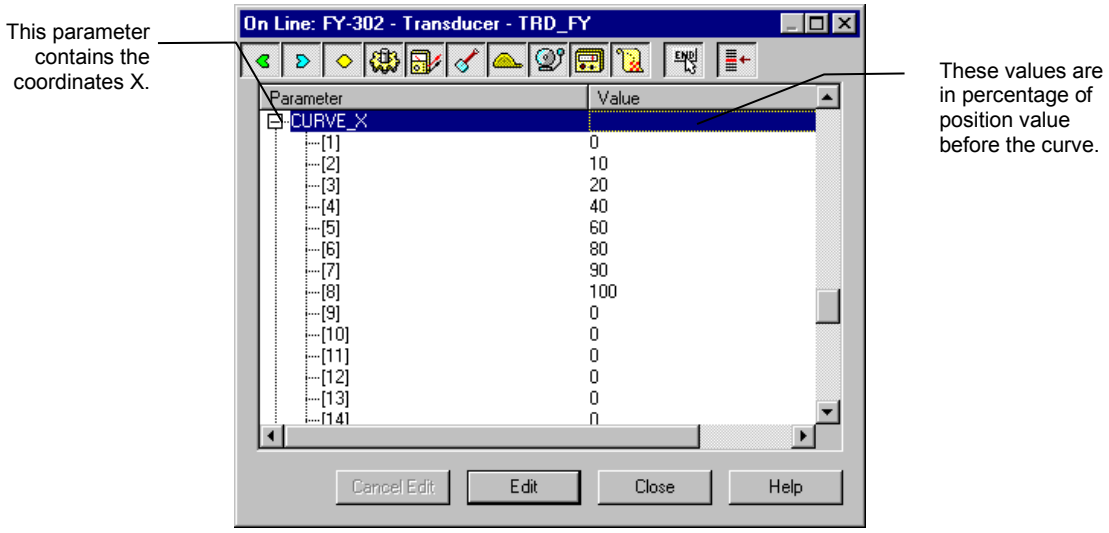


Figure 3.15 - Configuring the Table for Flow Characterization - X points

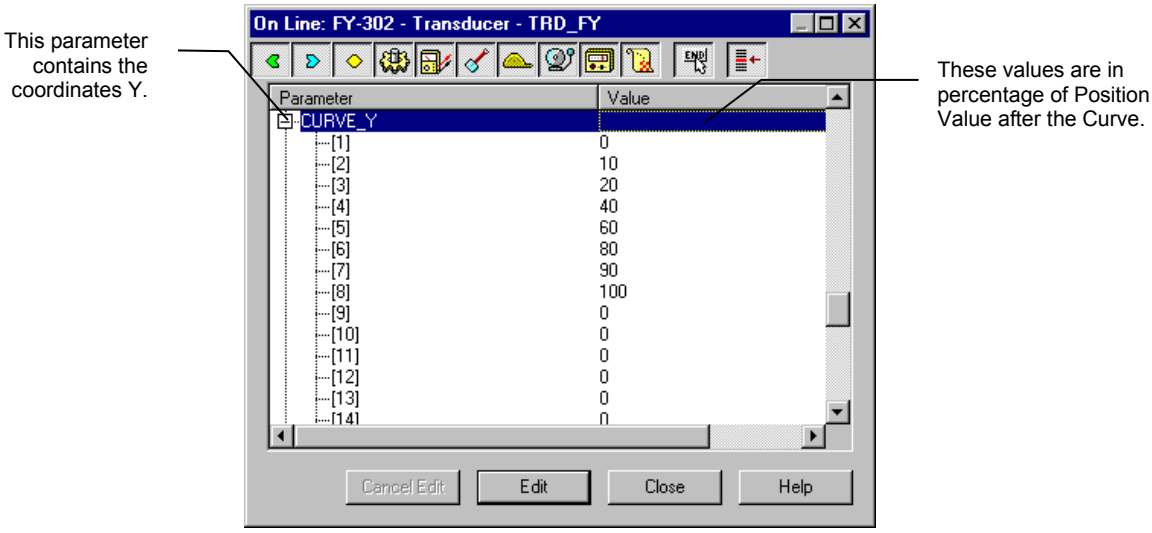


Figure 3.16 - Configuring the Table for Flow Characterization - Y points

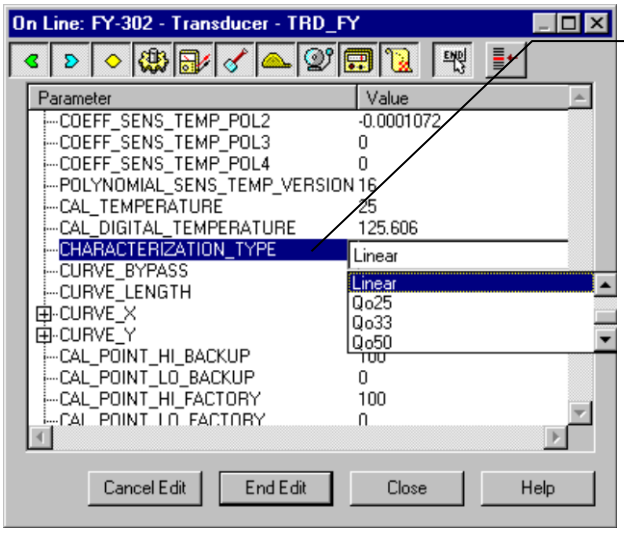


Figure 3.17 - Flow Characterization Type

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.

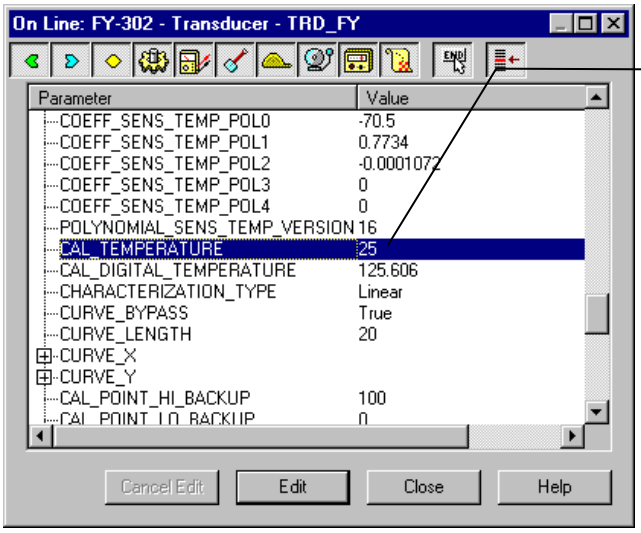


Figure 3.18 - Calibrating the Temperature Sensor

Display Transducer Block

The local adjustment is completely configured by **Syscon**. It means the user can select the best options to fit to the 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, will be capable to handle all kind of field devices from Smar.

All function block and transducers defined according to 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 to the Foundation Fieldbus specifications in order to be interoperable to other manufacturers.

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 3.19 and the figure 3.20 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 parameter.

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).

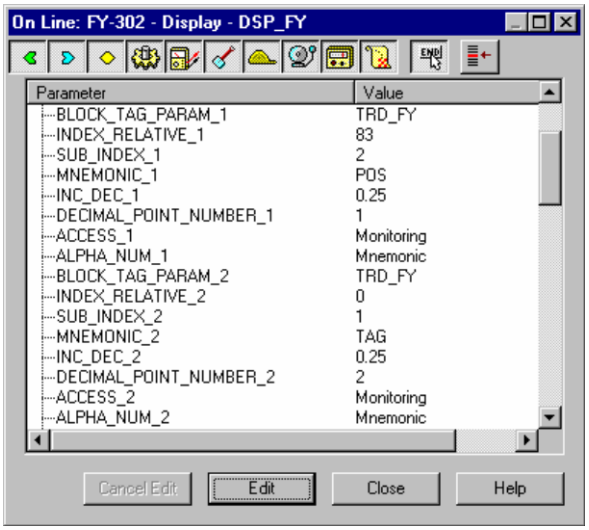


Figure 3.19 - Parameters for Local Adjustment Configuration

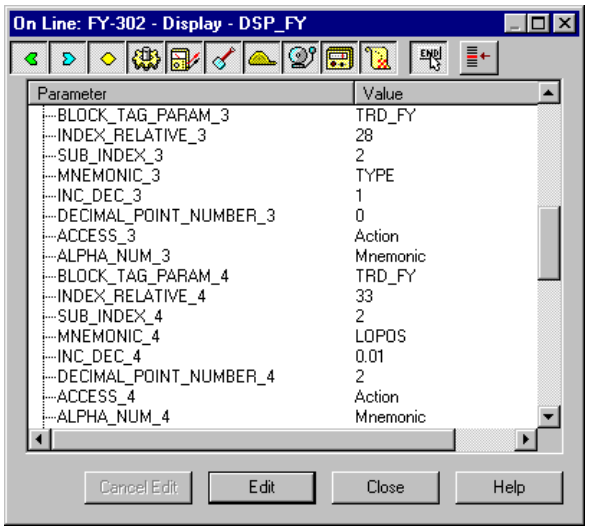


Figure 3.20 - Parameters for Local Adjustment Configuration

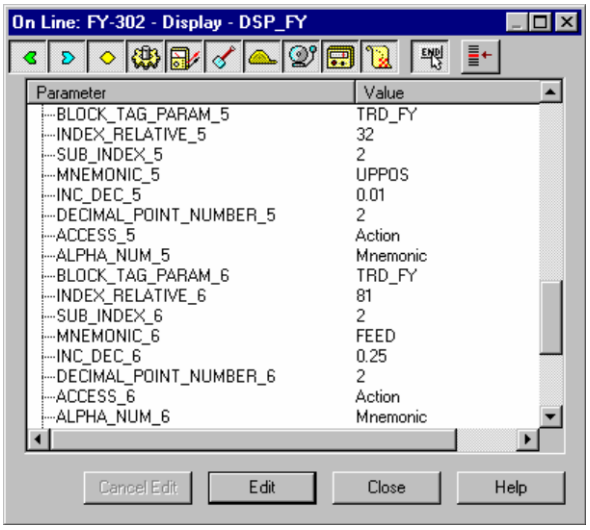


Figure 3.21 - Parameters for Local Adjustment Configuration

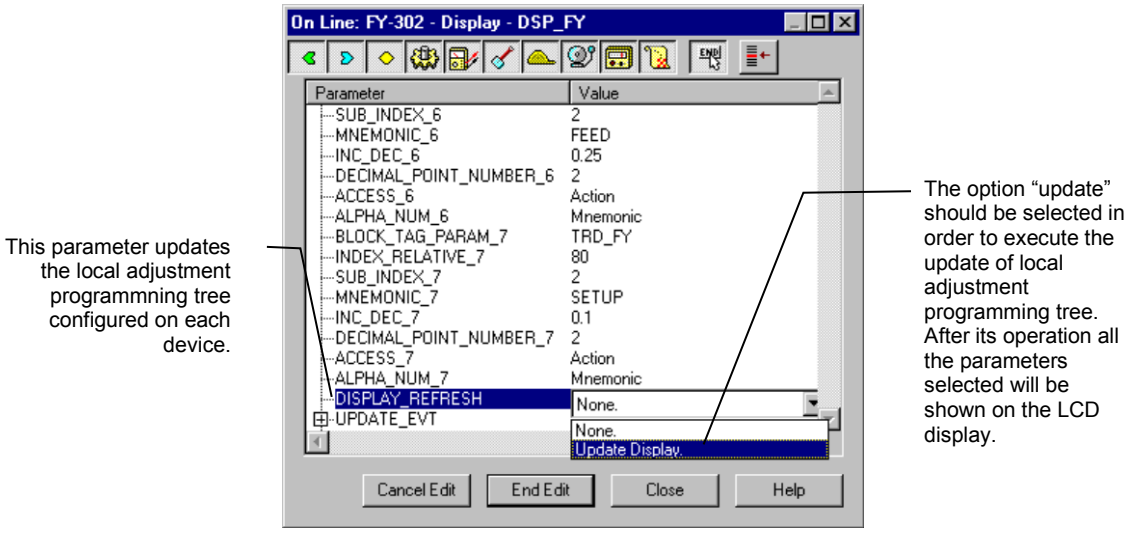


Figure 3.22 - Parameters for Local Adjustment Configuration

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.

Programming using Local Adjustment

The positioner has two holes for magnetic switches, located under the identification plate. 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.

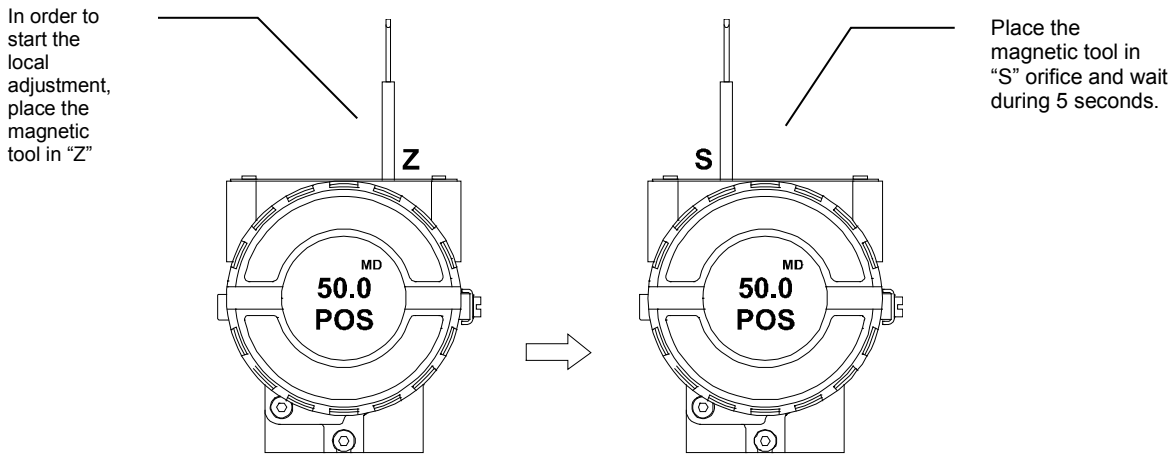


Figure 3.23 - Step 1 - FY302

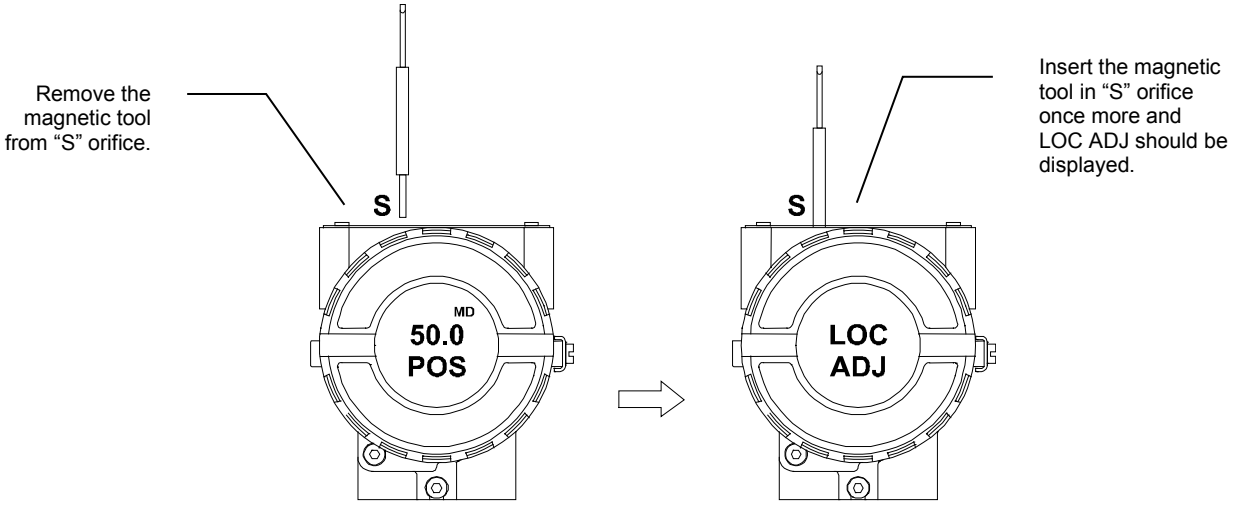


Figure 3.24 - Step 2 - FY302

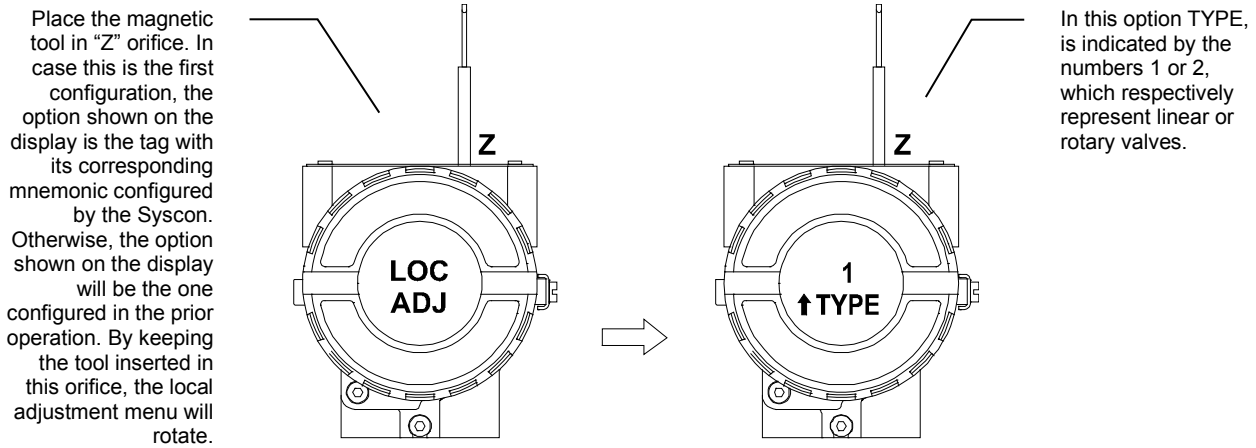


Figure 3.25 - Step 3 - FY302

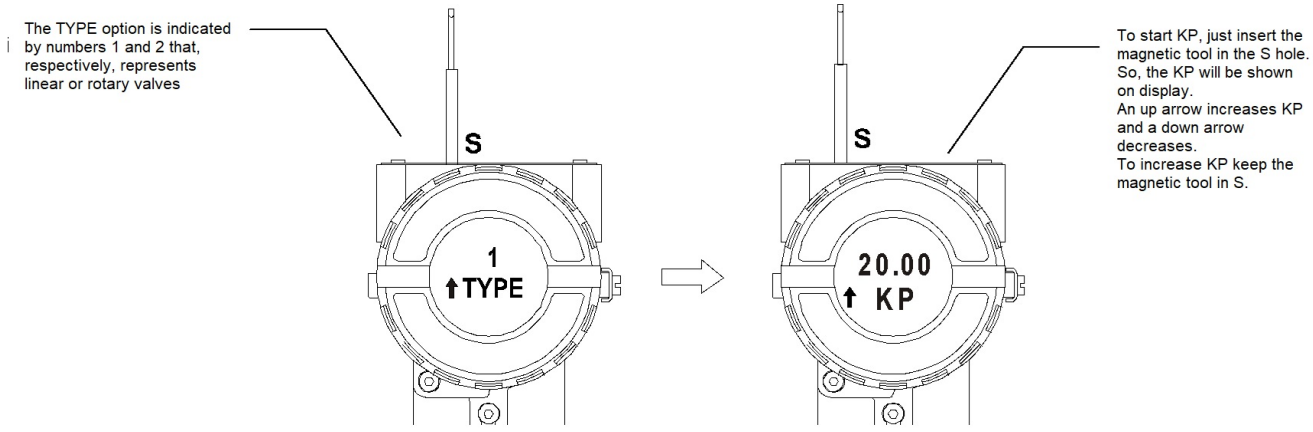


Figure 3.26 - Step 4 - FY302

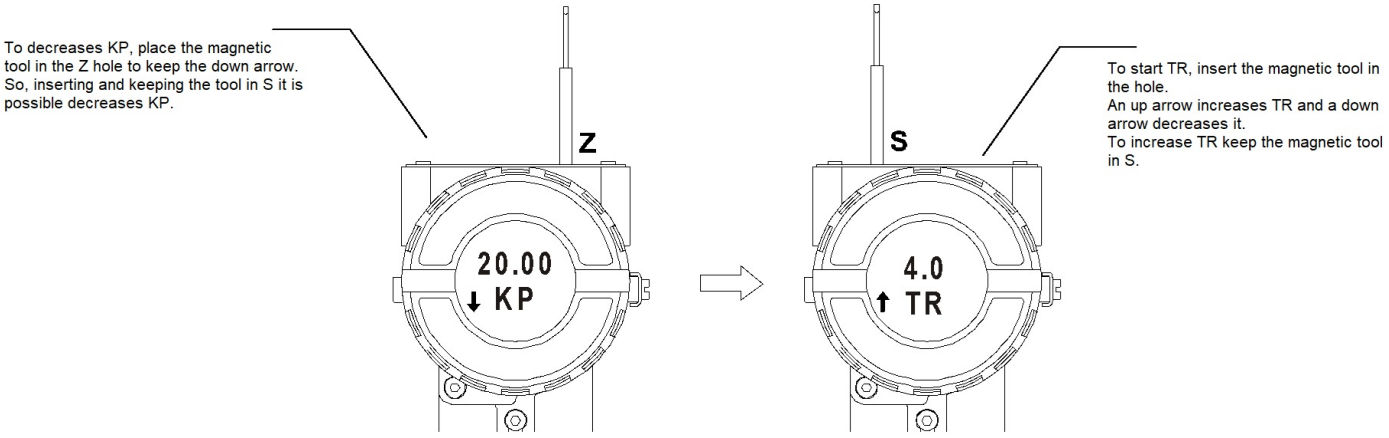


Figure 3.27 - Step 5 - FY302

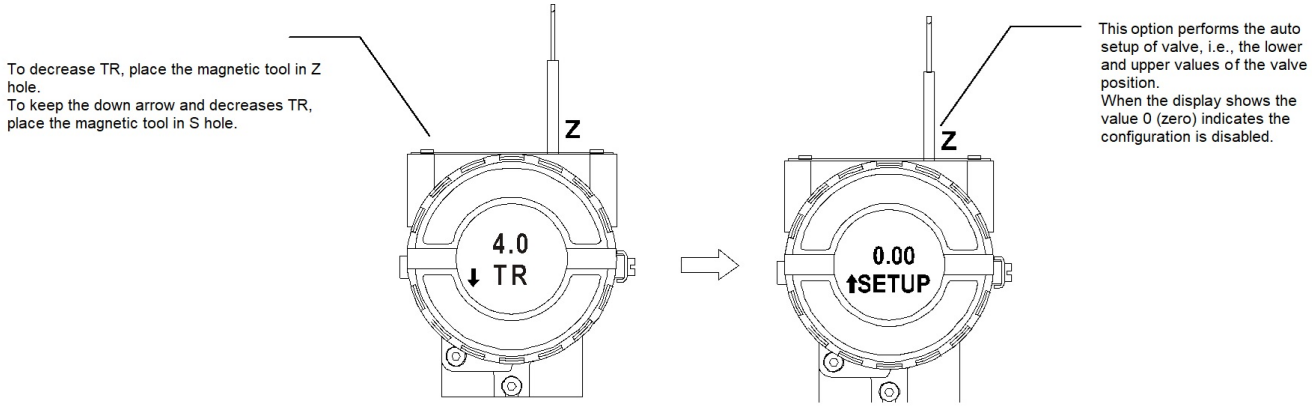


Figure 3.28 - Step 6 - FY302

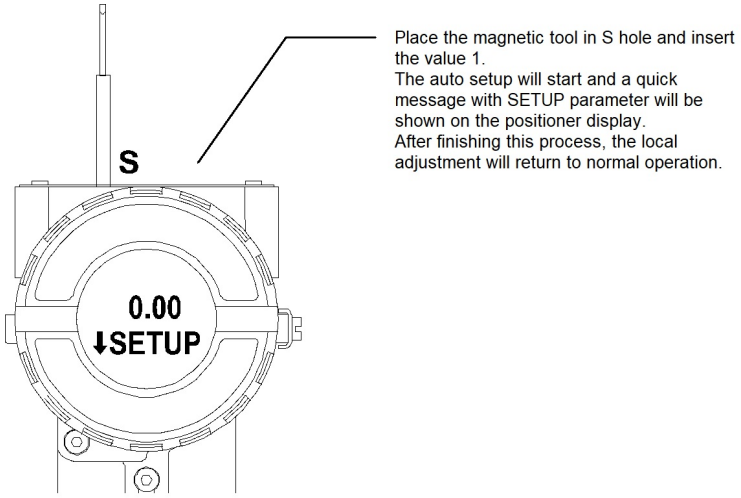


Figure 3.29 - Step 7 - FY302

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.

Carefully read 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

NOTE
Equipment installed in hazardous atmospheres must be inspected in compliance with the IEC60079-17 standard.

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.

The maintenance procedure is a set of techniques with the purpose to keep the positioners with higher time of use (useful life), to operate in safe conditions and to promote costs reduction. The different maintenance types are described during this section.

Recommendations for mounting Approved Equipment with the IP66 W certifications (use in saline atmospheres)

NOTE
This certification is valid for positioners manufactured in stainless steel or cooper free aluminum, approved with the certification IP66 W. All positioner external material, such as gauge (except wetted parts), plugs, connections etc., must be made in stainless steel. The electrical connection with 1/2” – 14NPT thread must use a sealant. A non-hardening silicone sealant is recommended. The instrument modification or replacement parts supplied by other than authorized representative of Smar is prohibited and will void the certification.

Corrective Maintenance for the Positioner

Maintenance not planned, with the purpose to locate and to repair problems in the positioners operating in continuous work, or either, specifically to suppress defects already presented by the equipment.

The diagnostic is a set of methods to detect, to locate and eventually to correct errors and problems or even verify fail effects in the positioner.

Diagnostics without Configurator

In order to carry out the diagnostics, refer to table 4.1.

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

Disassembly Procedure for Maintenance

1. Apply air pressure in the positioner input, without applying power supply. Verify if there is any air leakage in output 1 (OUT1). In case of air leakage in output 1, it is necessary to check the mechanical parts.
2. Remove the restriction. Verify if the restriction is not obstructed. (See restriction cleaning procedure).
3. Disassemble the equipment as shown:

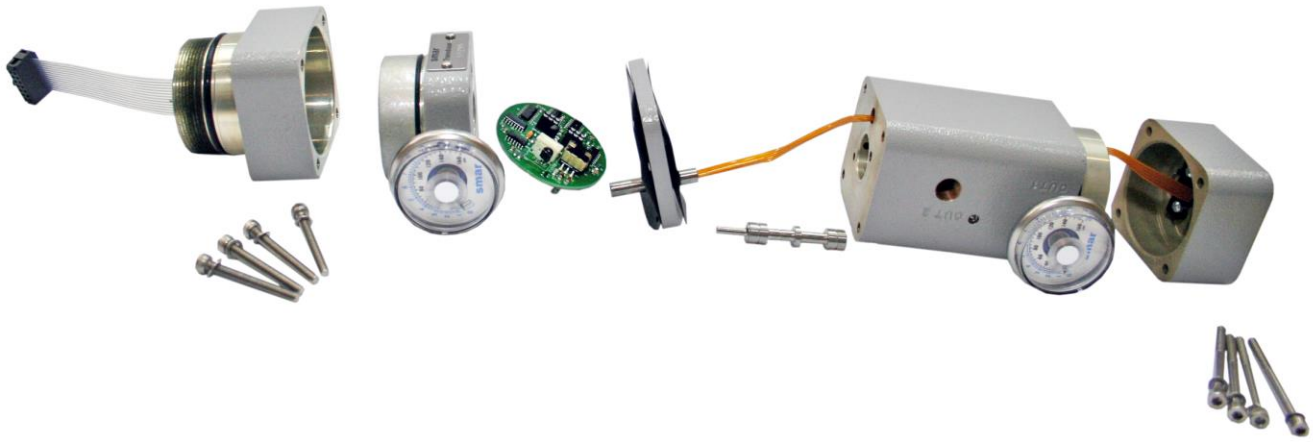


Figure 4.1 – FY301 Disassembled

Maintenance – Mechanical Parts

1. Verify if the spool valve is moving freely.
2. Verify if the spool valve is not obstructed with dirty.
3. Verify if there is any obstruction inside the FY pneumatic block and at the exhausts.
4. Verify if the diaphragm integrity.
5. Verify if the restriction is dirty.

Maintenance – Electronic Parts

Electronic Circuit

NOTE
The numbers indicated between parentheses refer to Figure 4.4 – Exploded View.

To remove the plate of the circuit (**5**) and the indicator (**4**), first release the cover locking bolt (**6**) from the side not marked "Field Terminals", and after that release the cover (**1**).

ATTENTION
The circuit boards have CMOS components that can be damaged by electrostatic discharges. Verify the correct procedures to manipulate CMOS components. Also, it is recommended to store the circuit boards in packs with electrostatic load proof.

Release the two screws (**3**) that fix the main board circuit and the indicator. Pull out the indicator, then the main board (**5**).

If the equipment does not initialize and the display does not light on, proceed to the following steps:

1. Disconnect the analog board from the digital board (**17**);
2. Re-energize the positioner and check for signal on the display (4). If the display lights up, the problem is in the Transducer, it can be the Analog Board (18) or excessive humidity in the Piezo Base (24), causing low insulation.

If there is no signal on the display even after disconnecting the flat cable, the problem is on the Digital Board, or even on the terminal block transient suppressor (11), which may be burnt.

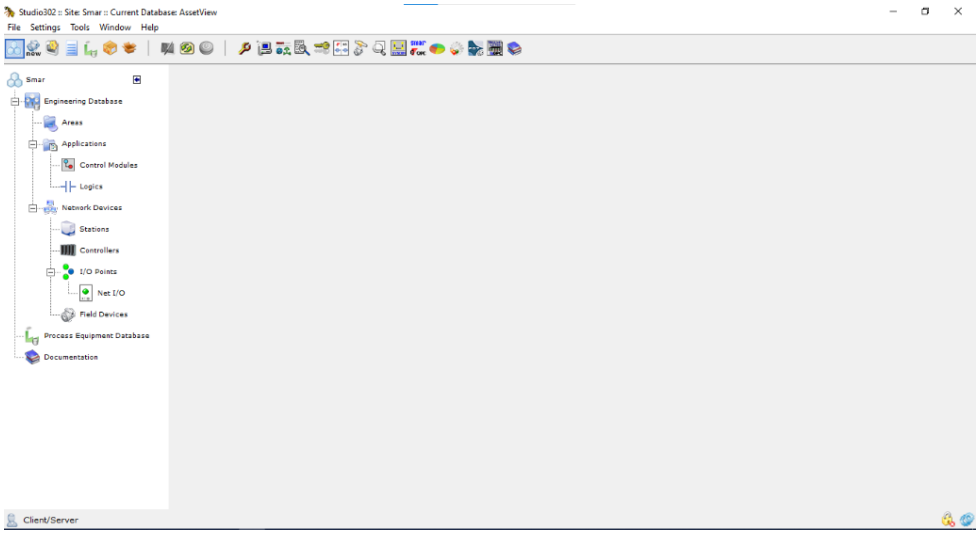
To check the hall value and piezo voltage do the following:

Mount the positioner on the bench test valve. Apply supply pressure respecting the actuator limit, energize the equipment and perform **SETUP**.

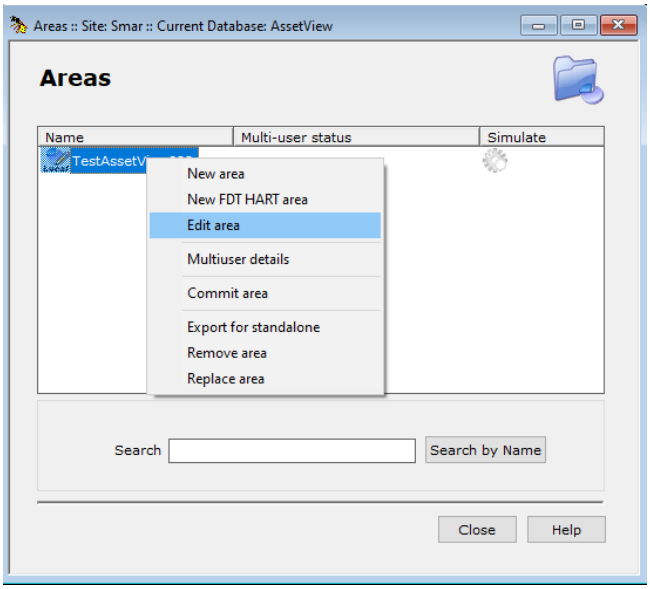
1. 1. Place the valve at 50% of the opening or closing stroke;

2. At **Syscon** the values of **DIGITAL_HALL_VALUE** and **PIEZO_ANALOG_VOLTAGE** parameters can be verified;

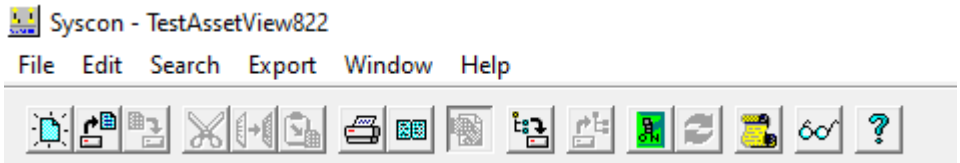
3. Run **Studio302**. The following interface will be shown:



4. 1. On the left side of the window, select **Areas** and right click the area you want to edit. Then, select **Edit Area**.

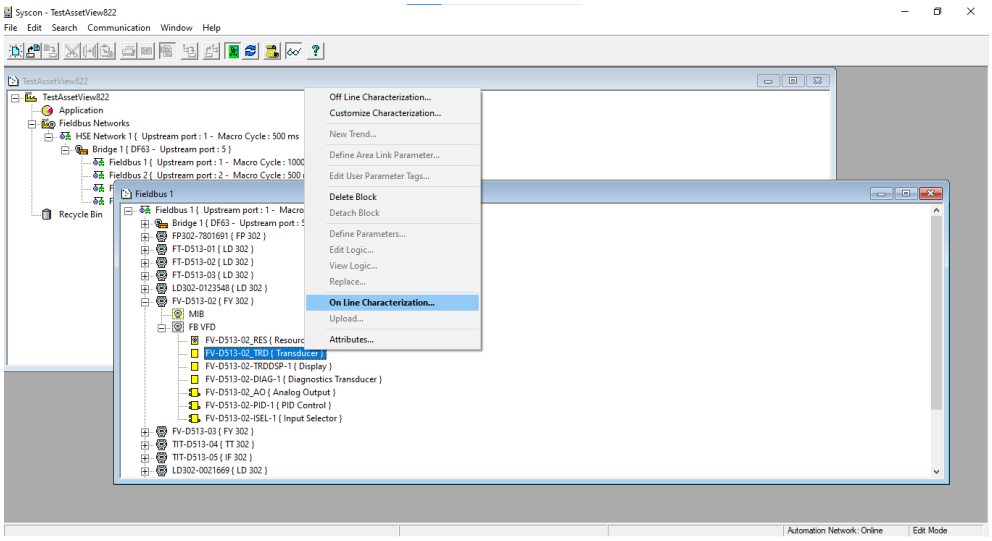


5. In your area, on the toolbar, select the options **Online Mode** (**ON** icon) and **Details** (glasses icon).

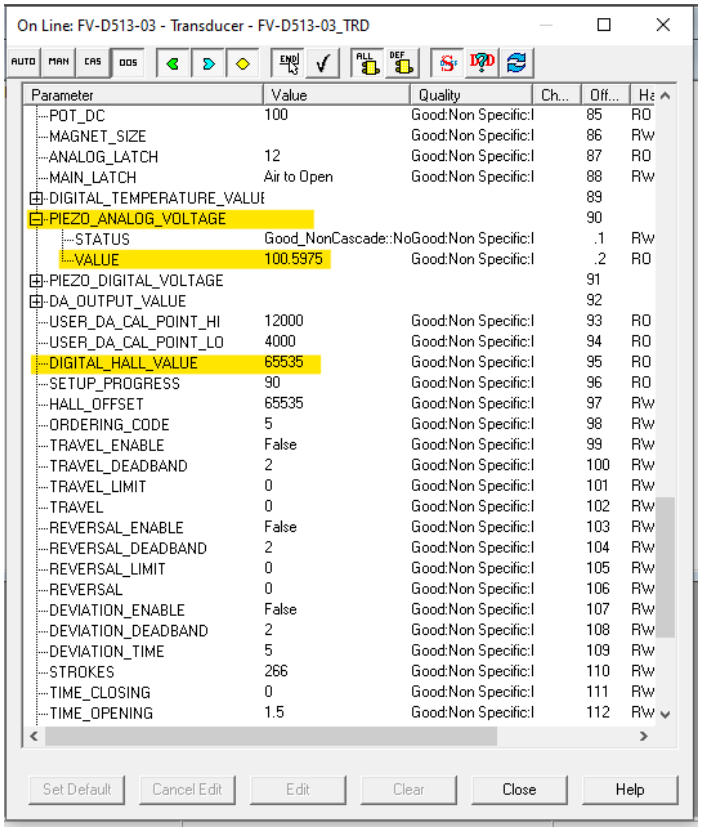


After that, still on the toolbar, select the **Search** option and then **Find**. Locate the desired **FY302** equipment tag.

6. After locating the device, click the **+** symbol beside it until you find the **Transducer** option. Right-click it and select **Online Characterization**.



7. Find the **DIGITAL HALL-VALUE** and **PIEZO_ANALOG _VOLTAGE, VALUE** parameters.



8. Hall values should be as close as possible to 32768 to ±2000;

If values are outside this range, realign the magnet.

If the setup is not completed and the Hall value is around 65000, it is not being read, the defect may be in the Hall position sensor or in the Analog Board.

9. The piezo voltage values should be between 30 and 70 Volts. If the voltage is not between these values, the setup may not finish, proceed with the piezo calibration. (Use the FYCAL device).

NOTE
To perform the calibration of the piezoelectric of the Positioner, refer to the manual of the FYCAL - Calibration Device for Pressure Transducer, available at https://www.smar.com/en/.

Preventive Maintenance for the Positioner

Planned Maintenance, consists in the set of procedures and anticipated actions to keep the device functioning, is effectuate with the special objective to prevent the occurrence of fail. Through adjustments, proves and measures according to the specified values, made before the appearing of defects. The preventive maintenance is recommended in the maximum period of one year, or when the process stops.

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 twisted.

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

Figure 4.2 - Transducer Rotation

NOTE
The numbers indicated between parentheses refer to Exploded View.

1. Remove the flat cable cover **(17)** by loosening the cover screws with an Allen wrench **(15).** When removing the cover, be careful not to damage the internal boards, disassemble carefully. (This piece cannot be washed);

2. Remove the analog circuit board (**18**);
3. Remove the base of the piezoelectric (**24**). (This piece cannot be washed);
4. Remove the restriction (**20**) from piezo for cleaning;
5. Remove the diaphragm (**27**) for analysis and cleaning, if necessary, wash with water and neutral detergent; wash afterwards with alcohol, dry well before assembling.
6. Remove the spool valve (**29**); cleaning is done with water and neutral detergent, then wash with alcohol and dry well, this part must be assembled without any lubrication;
7. The pneumatic block (**31**) can be completely washed in water and neutral detergent, then wash with alcohol, check if there is no internal dirt. For this, apply compressed air in all its holes;
8. Check if the position sensor cover (**33**) has no signs of water infiltration; (This piece cannot be washed);
9. Check if the GLL1019 (Hall flat cable) is damaged, bent, broken, or oxidized.

Calibration of piezoelectric

NOTE
To perform the calibration of piezoelectric of the Positioner, refer to the manual of the FYCAL - Calibration Device for Pressure Transducer, available at https://www.smar.com/en/.

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. Turn off the positioner and remove the instrumentation air pressure.

2. With an appropriate tool, remove the plate that protects the restriction screw. (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;

RESTRICTION - Old model, with orifice in the tip

RESTRICTION – New model, with side orifice (replaces the old model)

Restriction and Needle for Restriction Cleaning

Cleaning Procedure

7. Mount the o-ring again and screw the restriction in the positioner.
8. Apply instrument air into the equipment and it shall work normally.

Change of the Filter Elements

Change the positioner filter elements (**28**) 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.

Exhausts Ports

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. Any strange object interfering or blocking the exhaust port may degrade the positioner performance. Clean by spraying it with a solvent.

NOTE
Never use oil or grease in the spool valve; lubricants may degrade the positioner performance.

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 4.3). The ▲ mark indicates up position.

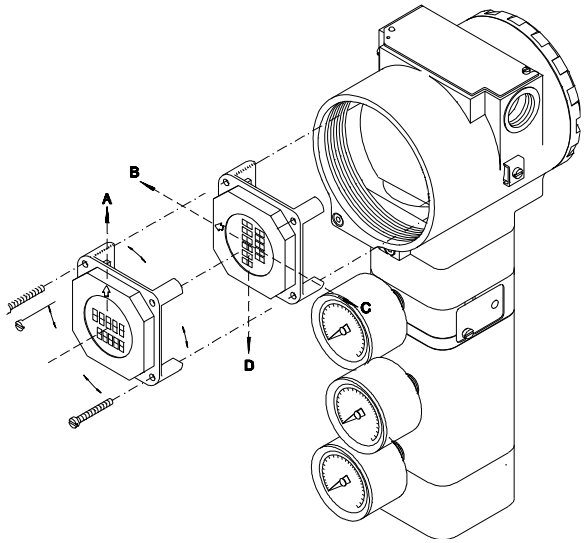


Figure 4.3 - Four Possible Positions of the Local Indicator

Attach the main board and indicator with their screws (**3**). After tightening the protective cover (**1**), mounting procedure is complete. The positioner is ready for powering and testing.

Electrical Connections
The plug must obligatorily be installed in the electric connection not used, preventing the humidity entrance. We suggest its use together with a sealant over the thread followed by a firm tightening. Also make sure the two large housing covers are securely tightened.

WARNING
The standard plug provided with Smar positioner do not have an Ex-d certification.

Package Content

When receiving the equipment, verify the package content.

- Positioner (1)
- Positioner mounting screws
- Magnet
- Magnetic tool for local adjustment (2)
- Centralizer device for magnet (2)
- Cleaning device for the restriction (2)
- Operation, maintenance, and instructions manual (2)

NOTES
1) When choosing the Remote Sensor version, an additional "L" form support for a 2" tube will be included for fixing the FYRemote (if the FY301 is specified WITH the Fixing Support option). To fix the Remote Sensor to the actuator, it is necessary to specify the BFY according to the ordering code in this manual. **2)** The quantity supplied must be in accordance with the number of positioners.

Accessories and Related Products

ACCESSORIES AND RELATED PRODUCTS	
CODE	**DESCRIPTION**
400-0726	Needle cleaning Device for the restriction
400-1176	Teflon guide for linear magnet.
400-1177	Teflon guide for rotary magnet.
BT302	Terminator
PCI	Process Control Interface
PS302P/DF52	Power Supply
DF53/DF98	Power Supply Impedance
SD1	Magnetic Tool for Local Adjustment
SYSCON	System Configurator

Exploded View

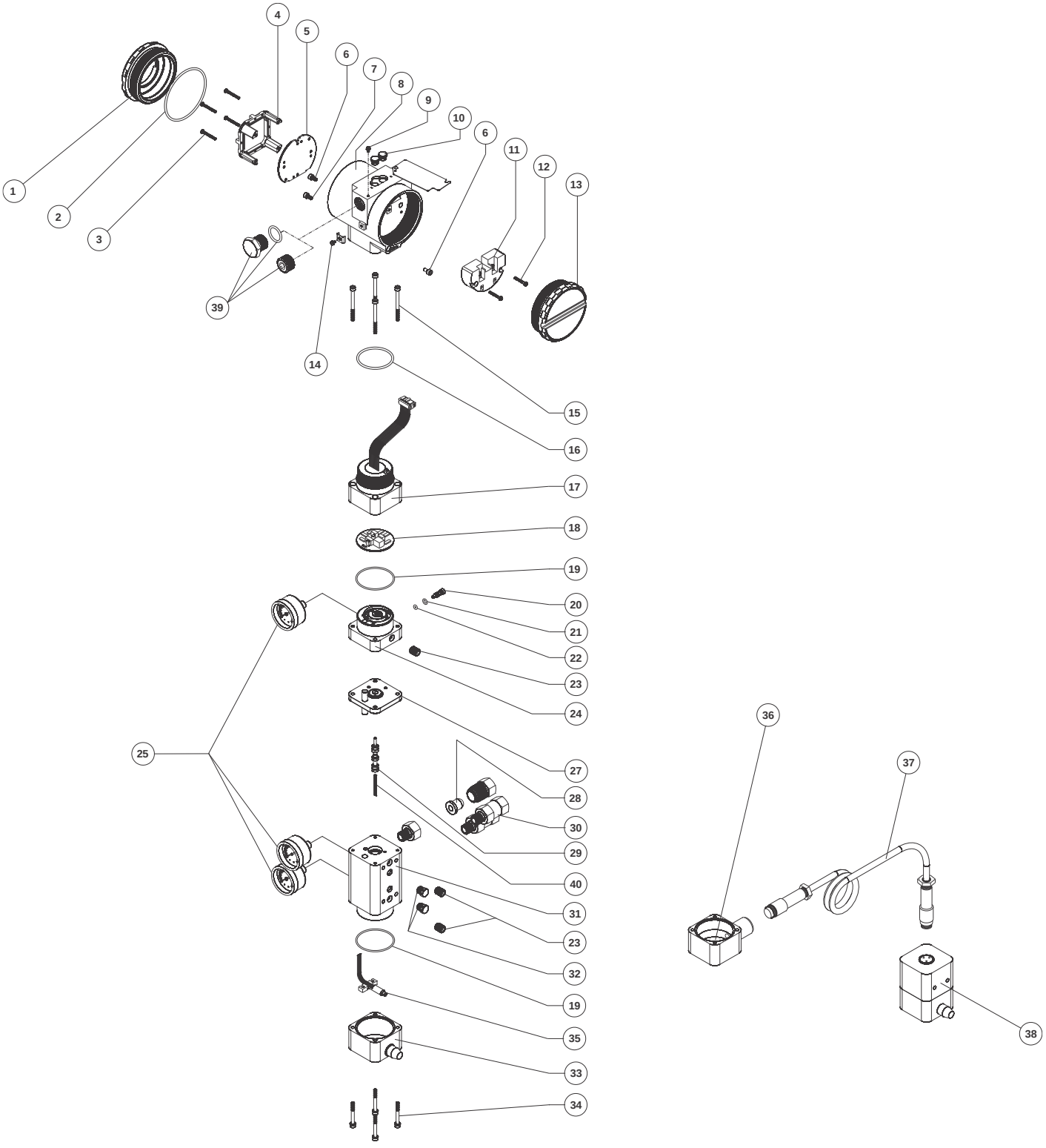


Figure 4.4 - Exploded View

Spare Parts List

SPARE PARTS LIST			
PARTS DESCRIPTION	**POSITION**	**CODE**	**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	(**NOTE 7**)	A
TERMINAL INSULATOR	11	400-0058	A
MAIN ELECTRONIC CIRCUIT BOARD (include digital indicator and mounting kit)	5	**(NOTE 7)**	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**	**CODE**	**CATEGORY (NOTE 4)**
1/2" NPT (Ex d) INTERNAL SOCKET SET PLUG IN BICHROMATIZED CARBON STEEL	39	400-0808	-
INTERNAL HEXAGONAL PLUG 1/2" NPT SST316 BR-Ex-d	39	400-1484 (**NOTE 8**)	-
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

NOTES

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.
7) Access https://www.smar.com/en/support, in General Support, look for Compatibility Note and consult the document
8) The spare part 400-1484, Internal Hexagonal Plug 1/2" NPT SST316 BR-Ex-d, was standardized in SST316 material and will be used in all line of housings (aluminum, copper free aluminum or SST316). With or without CEPEL certificate.

Detailed Code When Ordering of Spare Parts

DETAILED CODE WHEN ORDERING OF SPARE PARTS	
CODE	**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	
CODE	**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	
CODE	**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	
CODE	**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	
CODE	**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	
CODE	**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	
CODE	**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	
CODE	**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	
CODE	**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	
CODE	**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.

Isolation Test on Equipment Housing

1. Power off the equipment in the field, remove its back cover and disconnect all field cables from the transmitter terminal block, isolating them safely.

2. It is not necessary to remove the main board and display.

3. Jumper (connect) the power terminals (positive and negative) with the cable coming from the Megohmmeter (megger).

4. Configure the megohmmeter for 500 Vdc scale and check the isolation between the housing and the cable that short-circuits all the terminals.

ATTENTION
 Never test with a voltage greater than 500 Vdc.

5. The value obtained must be greater than or equal to 2GΩ and the voltage application time must be at least 1 second and at most 5 seconds.

6. If the value obtained by the megohmmeter is below 2GΩ, the possibility of moisture entering the electrical connection compartment must be analyzed.

7. It is possible to loosen the two screws that secure the terminal block to the housing and carry out a superficial cleaning and dry the surface well. Afterwards, the isolation can be tested again.

8. If the isolation test still shows that the isolation has been compromised, the housing must be replaced and sent to Nova Smar S.A. for analysis and retrieval.

IMPORTANT
a) For equipment certified Exd and Exi (Explosion Proof and Intrinsically Safe) the standards advise not to carry out repairs in the field of the housing electronic components, only at Nova Smar S.A.
b) In normal use, the housing components must not cause failures that affect its isolation. For this reason, it is important to verify whether there are traces of water entering the housing and, if so, an assessment of the electrical installations and the sealing rings of the covers must be carried out. Nova Smar S.A. has a team ready to support the assessment of facilities, if necessary.

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 Area Certifications
See Appendix A.

European Directives Information
See Appendix A.

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.

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.

Electromagnetic Interference Effect
According to the IEC61326-1 standard.

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 mounting bracket: 2.7 kg. (Aluminum)
5.8 Kg. (Stainless Steel)

Remote Sensor:
0.58 kg in Aluminum;
1.5 kg in Stainless Steel.

Cable and conectors of remote sensor:
0.045 kg/m of cable;
0.05 kg for each conector.

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 SST) - with adapter **(5)**	A	M20 X 1.5 **(4)**
2	1/2" - 14 NPT X 3/4 BSP (316 SST) - with adapter **(3)**	B	PG 13.5 DIN **(3)**

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	With 2 Gage (Acrylic, SST and wetted parts in brass) - Output 1 and 2
6	With 1 Gage (Acrylic, SST and wetted parts in brass) - Input	A	With 3 Gage (Acrylic, SST and wetted parts in brass)
7	With 1 Gage (Acrylic, SST and wetted parts in brass) - Output 1	Z	Others Specify
8	With 2 Gage (Acrylic, SST 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 (USA)	ID	NEPSI: Ex-ia, Ex-d (PROFIBUS PA)
I3	CSA: XP, IS, NI, DI (CANADIAN)	IO	CEPEL: Ex-tb (INMETRO - DUST)
I4	EXAM (DMT): Ex-ia, NEMKO: Ex-d (GAS)		
I5	CEPEL: Ex-d, Ex-ia (GAS)		
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) (6)

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) Certification Ex-d for FM, ATEX, IECEx and INMETRO.
(5) Certification Ex-d for INMETRO.
(6) When choosing the Remote Sensor version, an additional "L" form support for a 2" tube will be included for fixing the FYRemote. To fix the Remote Sensor to the actuator, it is necessary to specify the BFY according to the ordering code.

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 Smar website: https://www.smar.com/brasil/produto/fy300series-posicionador-inteligente-de-valvulas

Appendix A

CERTIFICATIONS INFORMATION

European Directive Information

Consult www.Smar.com for the EC declarations of conformity and certificates.

Authorized representative/importer located within the Community:
Smar Europe BV De Oude Wereld 116 2408 TM Alphen aan den Rijn Netherlands

ATEX Directive 2014/34//EU - "Equipment for explosive atmospheres"
The EC-Type Examination Certificate is released by DNV Product Assurance AS (NB 2460) and DEKRA Testing and Certification GmbH (NB 0158).
Designated certification body that monitors manufacturing and released QAN (Quality Assurance Notification) is UL International Demko AS (NB 0539).

LVD Directive 2014/35/EU – "Low Voltage"
According the LVD directive Annex II, electrical equipment for use in an explosive atmosphere is outside the scope of this directive.
According to IEC standard: IEC 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.

PED Directive 2014/68/EU - "Pressure Equipment"
This product is in compliance with Article 4 paragraph 3 of the Pressure Equipment Directive 2014/68/EU and was designed and manufactured in accordance with the sound engineering practice. This equipment cannot bear the CE marking related to PED compliance. However, the product bears the CE marking to indicate compliance with other applicable European Community Directives.

ROHS Directive 2011/65/EU - "Restriction of the use of certain hazardous substances in electrical and electronic equipment"
For the evaluation of the products the following standards were consulted: EN IEC 63000.

EMC Directive 2014/30/EU - "Electromagnetic Compatibility"
For products evaluation, the standard IEC 61326-1 were consulted and to comply with the EMC directive the installation must follow these special conditions:
Use shielded, twisted-pair cable for powering the instrument and signal wiring.
Keep the shield insulated at the instrument side, connecting the other one to the ground.

Hazardous locations general information

Ex Standards:
IEC 60079-0 General Requirements
IEC 60079-1 Flameproof Enclosures "d"
IEC 60079-7 Increased Safe "e"
IEC 60079-11 Intrinsic Safety "i"
IEC 60079-18 Encapsulation "m"
IEC 60079-26 Equipment with Separation Elements or combined Levels of Protection
IEC 60079-31 Equipment dust ignition protection by enclosure "t"
IEC 60529 Classification of degrees of protection provided by enclosures (IP Code)
IEC 60079-10 Classification of Hazardous Areas
IEC 60079-14 Electrical installation design, selection and erection
IEC 60079-17 Electrical Installations, Inspections and Maintenance
IEC 60079-19 Equipment repair, overhaul and reclamation
ISO/IEC 80079-34 Application of quality systems for equipment manufacture

Warning:
Explosions could result in death or serious injury, besides financial damage.
Installation of this instrument in hazardous areas must be in accordance with the local standards and type of protection. Before proceedings with installation make sure that the certificate parameters are in accordance with the classified hazardous area.

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

Marking Label
The instrument is marked with type of protection options. The certification is valid only when the type of protection is indicated by the user. Once a particular type of protection is installed, do not reinstall it using any other type of protection.

Intrinsic Safety / Non Incendive application
Only connect the equipment with the "Intrinsic safety" protection type to a circuit intrinsically safe. If the equipment has already been used in circuits not intrinsically safe or if the electrical specifications have not been respected, the safety of the equipment is no longer guaranteed for "Intrinsic Safety" installations.
In hazardous areas with intrinsic safety or non-incendive requirements, the circuit entity parameters and applicable installation procedures must be observed.
The instrument must be connected to a proper intrinsic safety barrier. Check the intrinsically safe parameters involving the barrier and equipment including the cable and connections. Associated apparatus ground bus shall be insulated from panels and mounting enclosures. Shield is optional, when using shielded cable, be sure to insulate the end not grounded.
Cable capacitance and inductance plus Ci and Li must be smaller than Co and Lo of the Associated Apparatus.
It is recommended do not remove the housing covers when powered on.

Explosionproof / Flameproof application
Only use Explosionproof/Flameproof certified Plugs, Adapters and Cable glands.
The electrical connections entries must be connected using a conduit with sealed unit or closed using metal cable gland or metal blanking plug with at least IP66.
Do not remove the housing covers when powered on.

Enclosure
The electronic housing and sensor threads installed in hazardous areas must have a minimum of 6 fully engaged threads.
The covers must be tightening with at least 8 turns, to avoid the penetration of humidity or corrosive gases, and until it touches the housing. Then, tighten more 1/3 turn (120º) to guarantee the sealing.
Lock the housing and covers using the locking screw.
The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction.
Care must be taken during installation and use to prevent impact or friction.

Degree of Protection of enclosure (IP)
IPx8: Second numeral meaning continuous immersion in water under special condition defined as 10m for a period of 24 hours (Ref: IEC60529).
IPW/ TypeX: Supplementary letter W or X meaning special condition defined as saline environment tested in saturated solution of NaCl 5% w/w at 35ºC for a period of 200 hours (Ref: NEMA 250/ IEC60529).
For enclosure with IP/IPW/TypeX applications, all NPT threads must apply a proper water-proof sealant (a non-hardening silicone group sealant is recommended).

Hazardous Locations Approvals

FM Approvals
FM 3D9A2.AX
IS Class I, II, III Division 1, Groups A, B, C and D, E, F, G
XP Class I, Division 1, Groups A, B, C, D
DIP Class II, III Division 1, Groups E, F, G
NI Class I, Division 2, Groups A, B, C, D
T4; Ta = -25°C < Ta < 60°C; Type 4 or 4X
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

Drawing 102A-0440, 102A-1208, 102A-1331, 102A-1775, 102A-1776

IECEx DNV
Explosion Proof (IECEx DNV 24.0131X)
Ex db IIC T6 Gb
Ambient Temperature: -20ºC ≤ Ta ≤ +60ºC
Working Pressure: 20-100 psi
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:
IEC 60079-0:2017 General Requirements
IEC 60079-1:2014 Flameproof Enclosures “d”

Drawing 102A-2273, 102A-2274

ATEX DNV
Explosion Proof (DNV 24 ATEX 43322X)
II 2G Ex db IIC T6 Gb
Ambient Temperature: -20ºC ≤ Ta ≤ +60ºC
Working Pressure: 20-100 psi
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 IEC 60079-0:2018 General Requirements
EN 60079-1:2014 Flameproof Enclosures “d”

Drawing 102A-1413, 102A-1495

DEKRA
Intrinsic Safety (DMT 01 ATEX E 011)
II 2G Ex db [ia] IIC T6 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”
Drawing 102A-1413, 102A-1495

INMETRO NCC
Segurança Intrínseca (NCC 24.0145)
Ex db ia IIC T* Gb
Ex tb IIIC T* Db
Ui = 24 V Ii = 380 mA Pi = 5,32 W Ci = 5 nF Li = desp
Tamb: -20 °C a +65 °C para T4 ou T135 °C
Tamb: -20 °C a +50 °C para T5 ou T100 °C
Tamb: -20 °C a +40 °C para T6 ou T85 °C
IP66 ou IP66W

Prova de Explosão (NCC 24.0172)
Ex db IIC T6 Gb
Ex tb IIIC T85 ºC Db
Tamb: -20 °C a +40 °C
IP66 ou IP66W

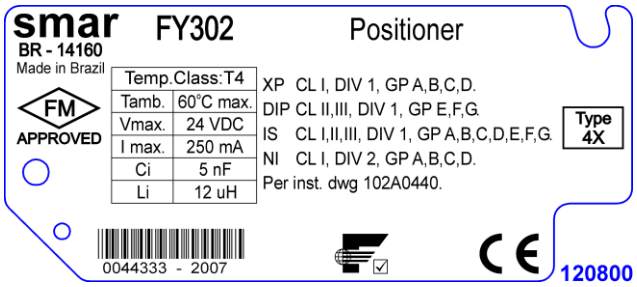
Observações:
O produto adicionalmente marcado com a letra suplementar "W" indica que o equipamento foi ensaiado em uma solução saturada a 5% de NaCl p/p, à 35 °C, pelo tempo de 200 h e foi aprovado para uso em atmosferas salinas, condicionado à utilização de acessórios de instalação no mesmo material do equipamento e de bujões de aço inoxidável ASTM-A240, para fechamento das entradas roscadas não utilizadas.
Os planos de pintura P1 são permitidos apenas para equipamento fornecido com plaqueta de identificação com marcação para grupo de gás IIB.
Este certificado é válido apenas para os produtos dos modelos avaliados. Qualquer modificação nos projetos, bem como a utilização de componentes ou materiais diferentes daqueles definidos pela documentação descritiva dos produtos, sem a prévia autorização, invalidará este certificado.
As atividades de instalação, inspeção, manutenção, reparo, revisão e recuperação dos equipamentos são de responsabilidade dos usuários e devem ser executadas de acordo com os requisitos das normas técnicas vigentes e com as recomendações do fabricante.

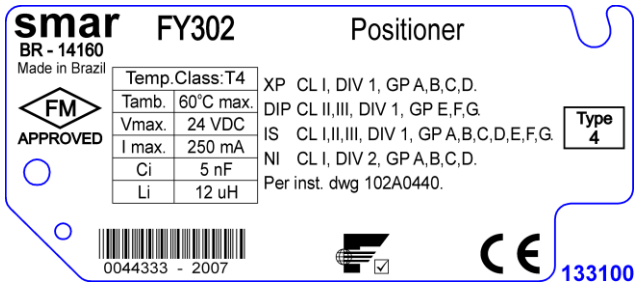
Normas Aplicáveis:
ABNT NBR IEC 60079-0:2020 Atmosferas explosivas - Parte 0: Equipamentos – Requisitos gerais
ABNT NBR IEC 60079-1:2016 Atmosferas explosivas - Parte 1: Proteção de equipamento por invólucro à prova de explosão “d”
ABNT NBR IEC 60079-11:2013 Atmosferas explosivas - Parte 11: Proteção de equipamento por segurança intrínseca "i"
ABNT NBR IEC 60079-31:2022 Atmosferas explosivas - Parte 31: Proteção de equipamentos contra ignição de poeira por invólucros “t”
ABNT NBR IEC 60529:2017 Graus de proteção providos por invólucros (Código IP)

Desenhos 102A1244, 102A1366, 102A1788, 102A2009, 102A2010

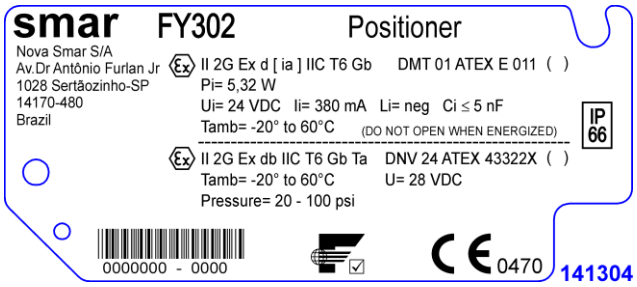
Identification Plate

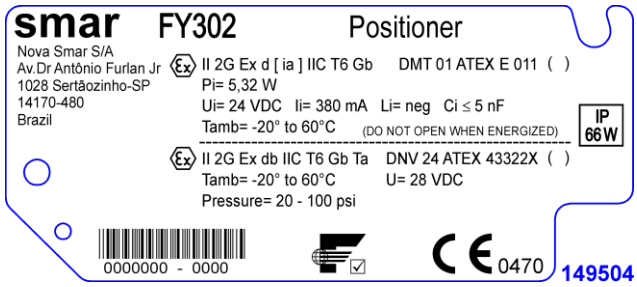
FM Approvals

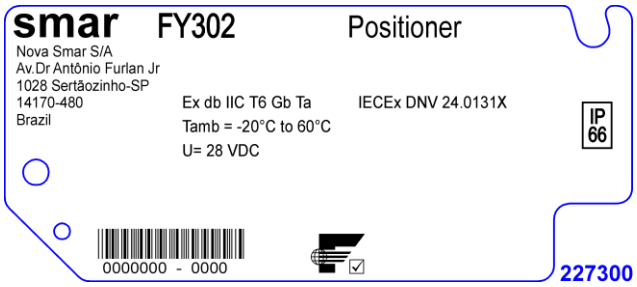


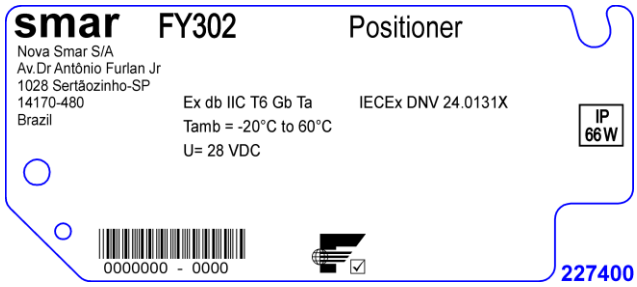


ATEX / IECEx

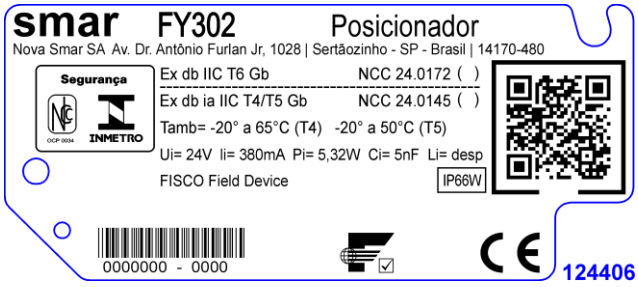


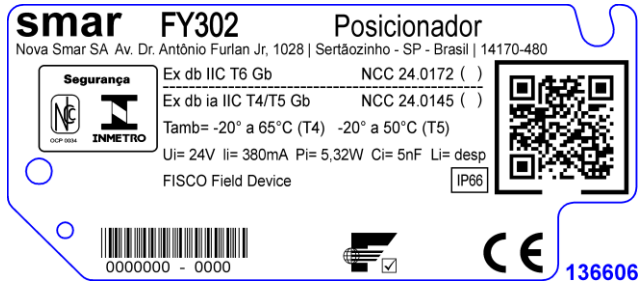


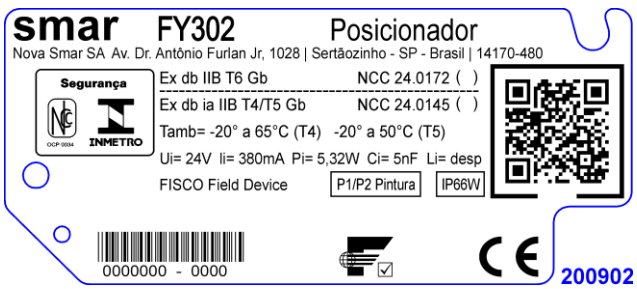


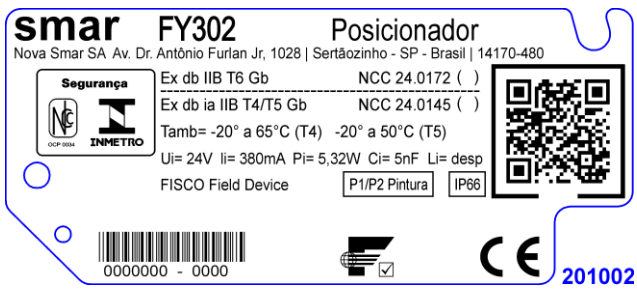


INMETRO NCC



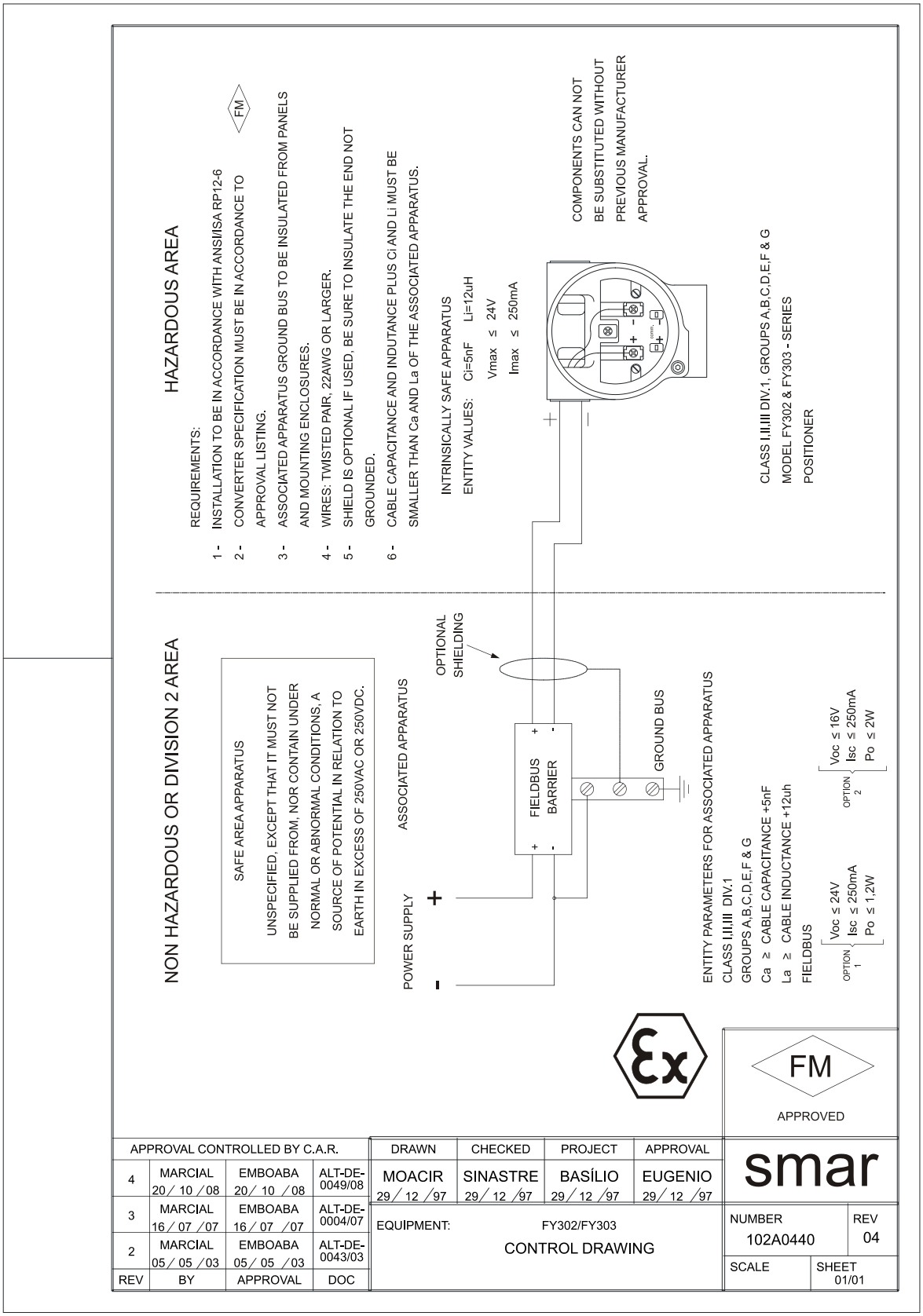







smar FY302 Posicionador
Nova Smar SA Av. Dr. Antônio Furlan Jr, 1028 | Sertãozinho - SP - Brasil | 14170-480
Segurança
INMETRO
Ex tb IIIC T85°C Db NCC 24.0172 ( )
Ex tb IIIC T135/T100/T85°C Db NCC 24.0145 ( )
Tamb= -20° a 65°C (T135°C)
-20° a 50°C (T100°C)
-20° a 40°C (T85°C)
IP66
0000000 - 0000
178803

FM Approvals



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 ( ) Eletrocmagnetic ( ) 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 can be found on https://www.smar.com/en/support

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.

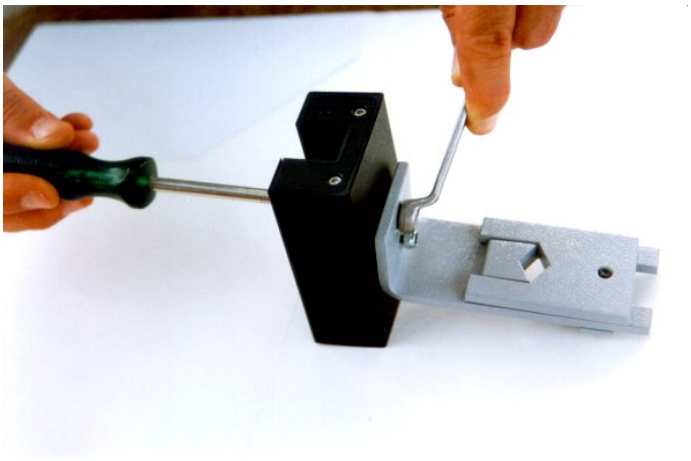
To speed up analysis and solution of the problem, the defective item should be returned with a description of the failure observed, with as much details as possible. Other information concerning the instrument operation, such as service and process conditions, is also helpful.

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

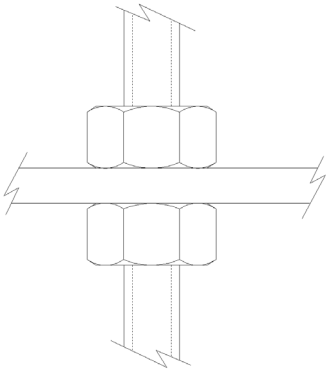
APPENDIX

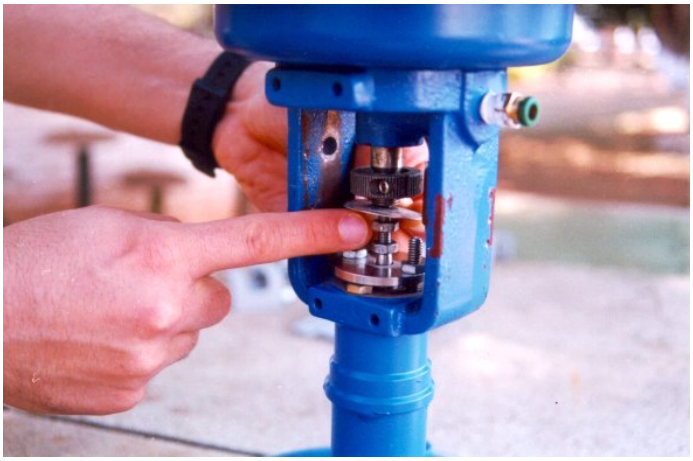
MOUNTING BRACKET FOR POSITIONER – LINEAR STROKE VALVE MOUNTING INSTRUCTIONS

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.



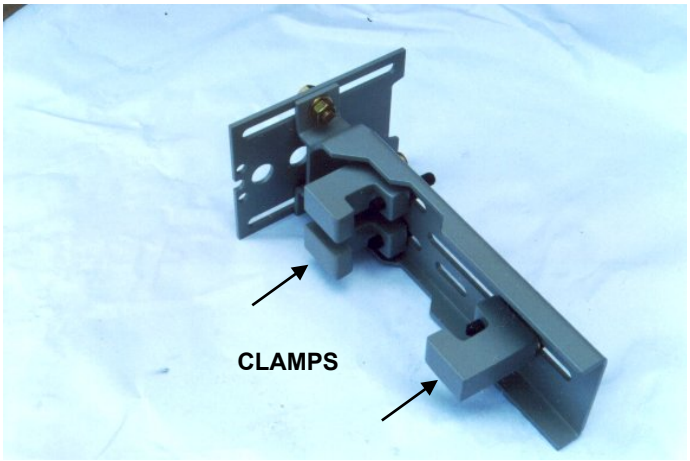


3 – Mount the magnet assembly using the nuts of the valve stem. The mounting bracket has two parts that should be mounted to the stem.

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.

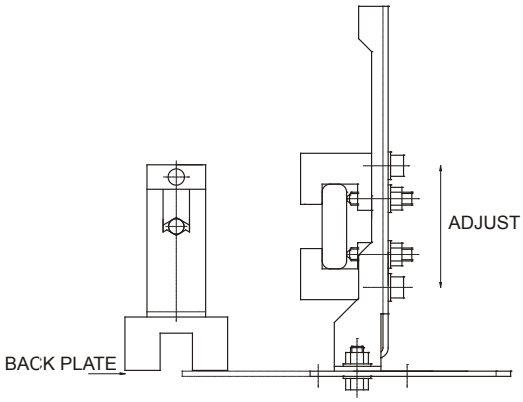
6 – Attach the “clamps” to the positioner bracket.
If your actuator is pillar type, go to step 15 to see the instructions.

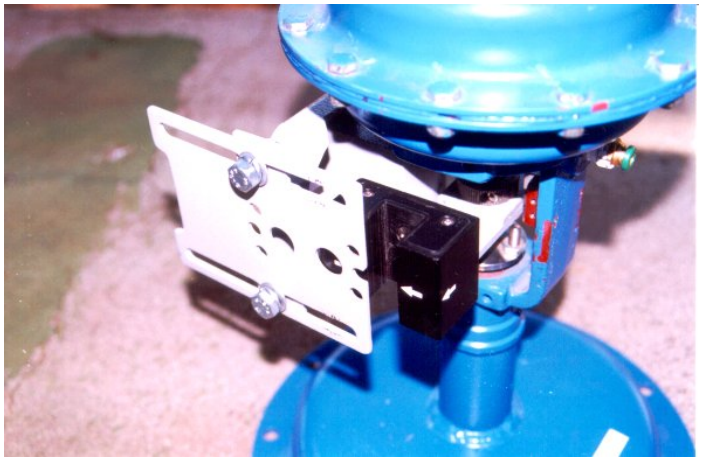


7 – Adjust the clamps according to the width of the yoke and tighten the bolts finger tight.

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.

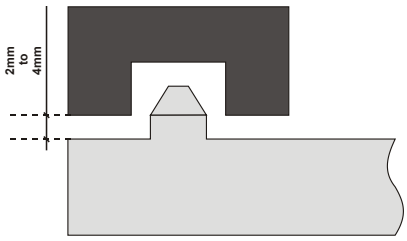


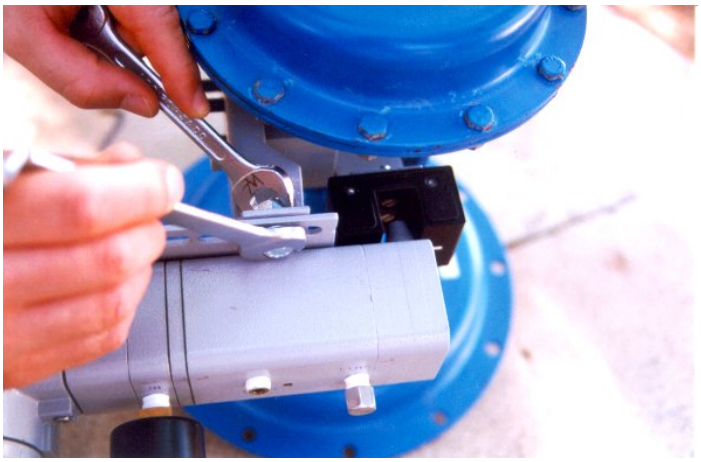


10 – Fasten the nuts to fix the positioner bracket to the yoke.
If the actuator is pillar type, fasten the U-clamp nuts.

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.

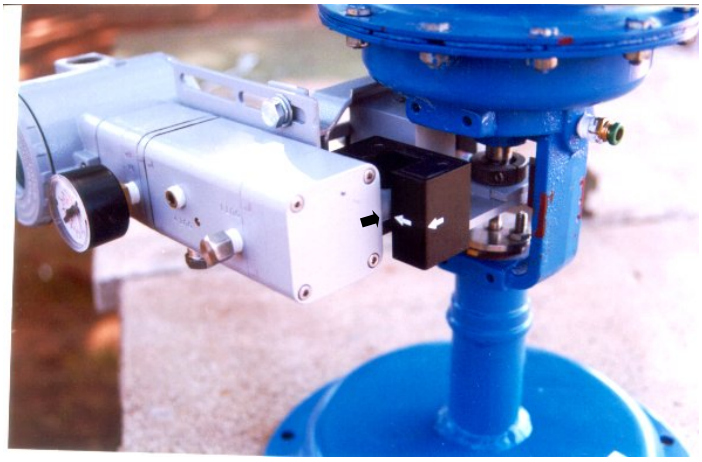




ATTENTION:

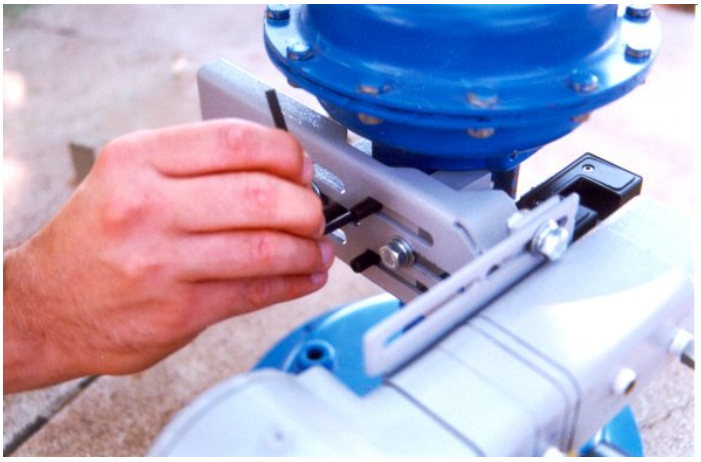
A minimum distance of 2mm and a maximum distance of 4mm is recommended between the magnet external face and the positioner face. For that, a centralizer device (linear or rotary) must be used. The centralizer device is in the positioner packing.

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.



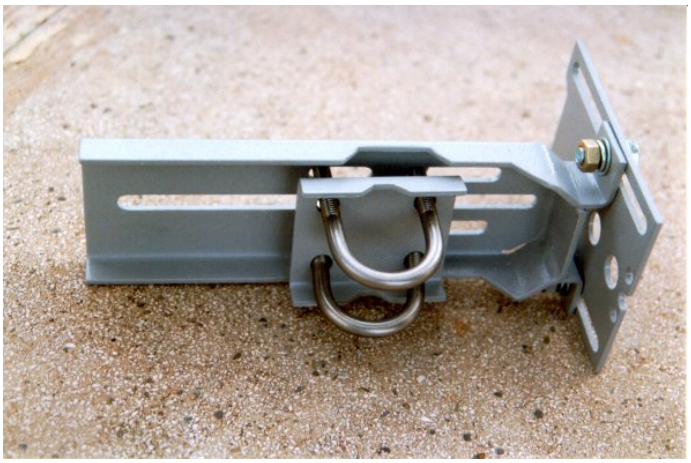
14 - Tighten the bolts to fasten the clamps to the yoke.

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.

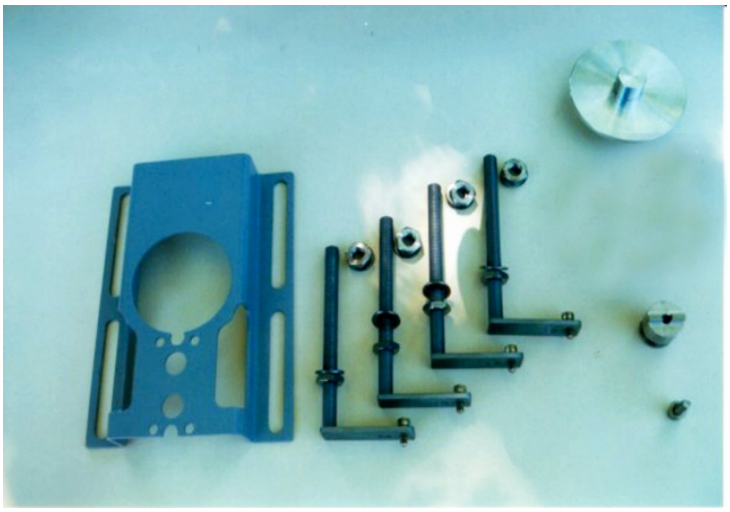


16 – After assembling the U-clamps, follow the steps 8 to 13.

ROTARY VALVE POSITIONER BRACKET

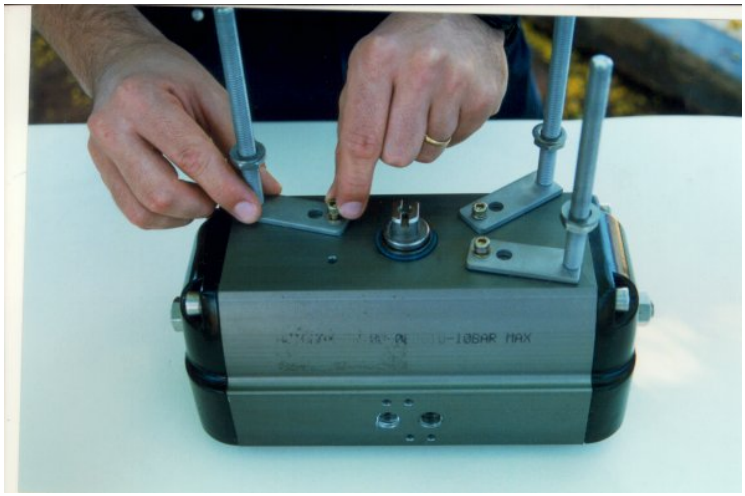
MOUNTING INSTRUCTIONS

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.



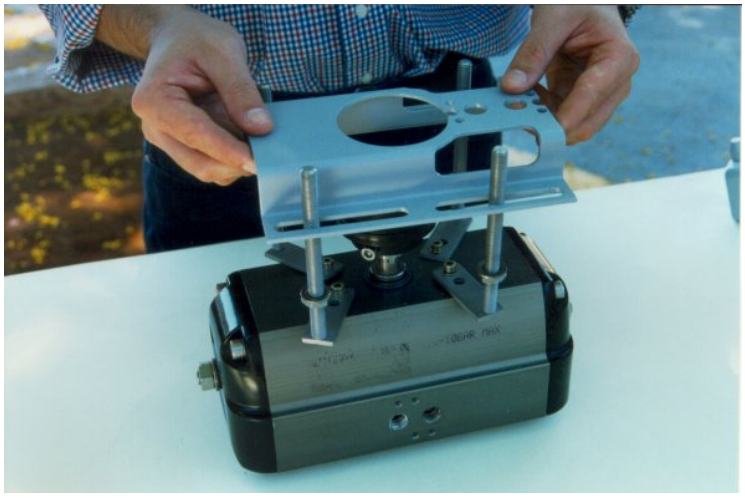
2- Attach the magnet bracket to the Actuator extremity (NAMUR).

The end the valve shaft must comply with Namur Standard.

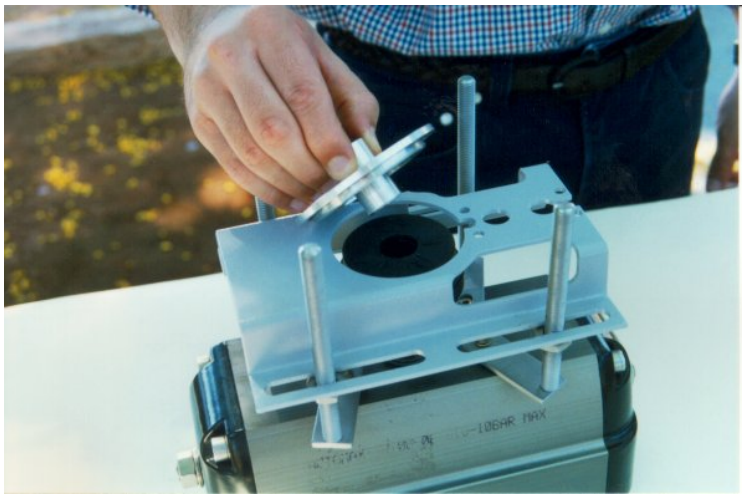
3 – Fasten the hex screw.

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.



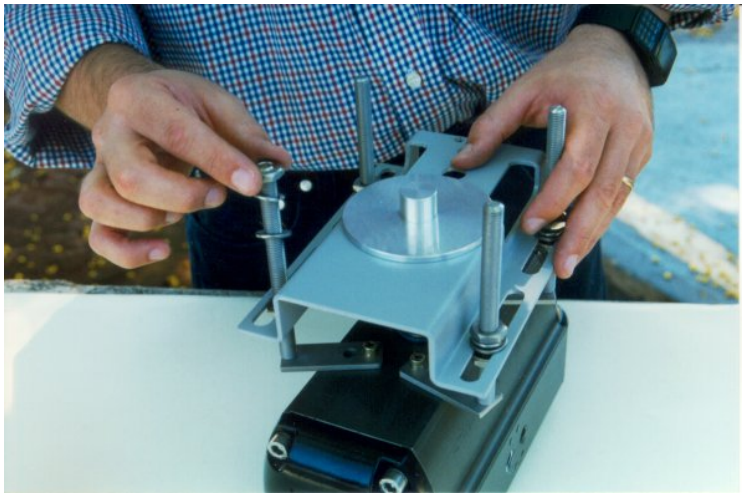
6 – Use the centralizer gadget to get the bracket centralized with the magnet.



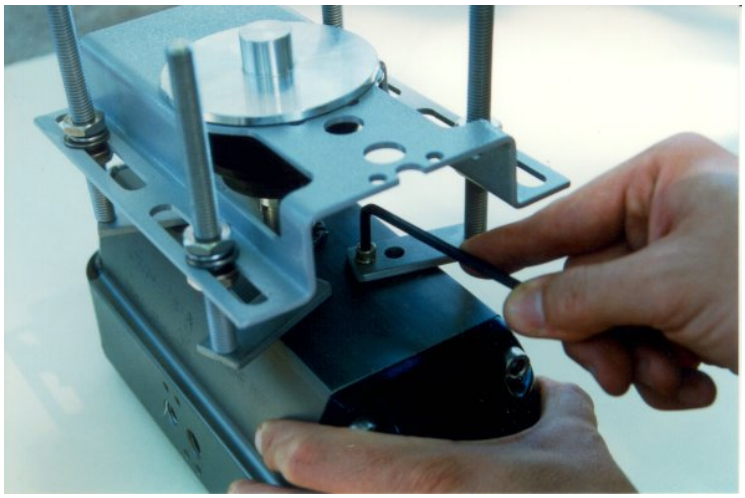
7 – Adjust the positioner bracket using the centralizer gadget and the nuts to get the height.

8 – Place the nut and washers.

Do not fasten the nuts completely.

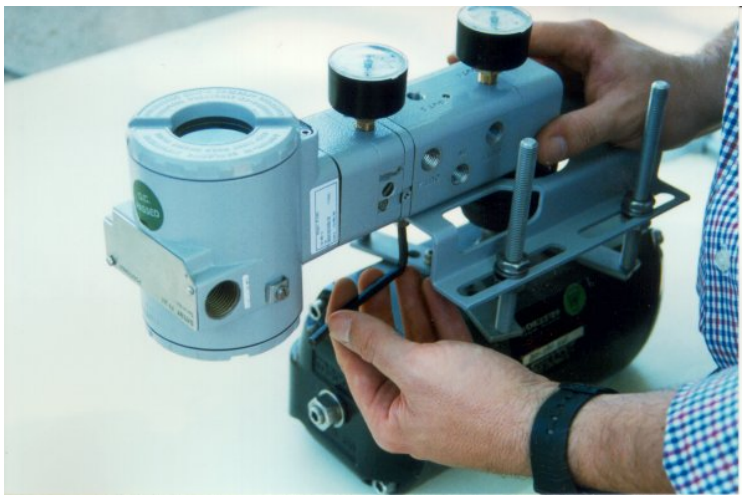


9 – Tighten the clamp bolts to fasten them to the actuator.

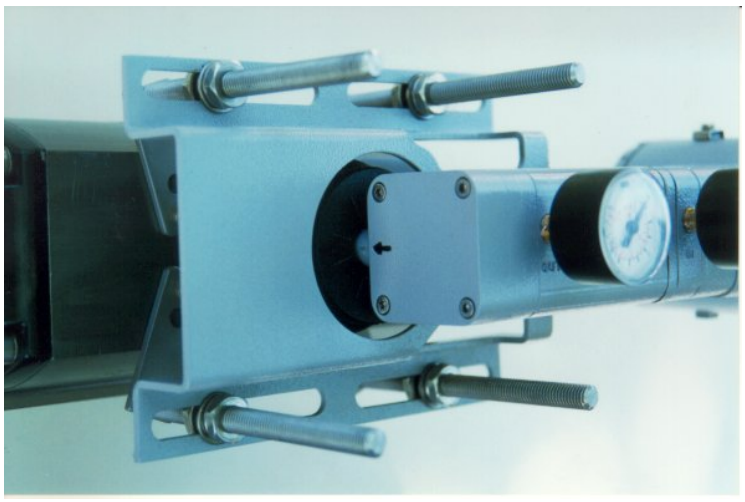


10 – Fasten the positioner bracket bolts to the clamps fastening.

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.