MANUAL INSTRUCTIONS | OPERATION | MAINTENANCE

# VALVE POSITIONER FOR ACTUATION AND CONTROL FY301







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# INTRODUCTION

The **FY301** is a smart 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 **FY301** enabled the choice of several types of flow characterizations, an easy interface between the field and the control room, not to mention several interesting features that considerably reduce the installation, operation, and maintenance costs.

The **FY301**, besides the normal functions offered by other smart positioners, offers the following functions:

\* **Table** - on top of the regular valve characterization curves like linear, equal percentage and quick opening (hyperbolic), the valve set point signal may be custom linearized according to a 16-point table, making it possible to achieve flow characterization being a combination of linear and equal percentage etc.

\* Local Adjustment - not only for travel adjustment, but also flow characterization, tuning, operation mode, indication, set point and PID parameters... as well.

- \* Password three levels for different functions.
- \* Operation Counter shows the number of changes in each function.
- \* Auto Setup automatic calibration of valve travel.
- \* Diagnostic permanently valve monitoring condition for preventive maintenance.

Get the best results of the FY301 by carefully reading the instructions of this manual.

#### WARNING

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

#### NOTE

This manual is compatible with version 4.XX, where 4 indicates software version and XX software release. The indication 4.XX means that this manual is compatible with any release of software version 4.

#### 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 measuring and control depends on several factors. In spite of the excellent performance, the positioner must be adequately installed so that it may work well.

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

Installing 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. If not possible to avoid it, consider using the remote position sensor version.

Use thermal isolation to protect the positioner from external heat sources, if necessary.

Humidity is fatal to electronic circuits. In areas subjected to high relative humidity, the O-rings for the electronic housing covers must be correctly placed and the covers must be completely closed by tighten them by hand until you feel the O-rings being compressed. Do not use tools to tight the covers. 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 the humidity.

The electronic circuit is protected by a humidity proof coating, but frequent exposures to humidity may affect the protection provided. It is also important to keep the covers tightened in place. Every time they are removed, the threads are exposed to corrosion, since painting cannot protect these parts. Sealing methods should be employed on conduit entering of the positioner.

#### IMPORTANT

Avoid to use thread sealant tapes on the air input and outputs connections, since small pieces of this type of sealant may block the air flow inside the positioner, affecting the overall equipment performance.

Although the positioner is practically vibration resistant, it is not recommended to install it near pumps, turbines or other equipment producing too much vibration. If not possible to avoid it, consider using of remote position sensor version.

## Mounting

The FY301 mounting depends on the type of actuator, its actions, single (with spring return) or double, and the movement characteristic (linear or rotary). It requires two mounting brackets: one for the magnet and another for the positioner. Smar supplies both according to the specified ordering code (see Page 6.4 for mounting bracket ordering code)

Additionally, a great variety of customized mounting brackets is available, covering several control valves models from different manufacturers.

Check the availability and select the most adequate mounting bracket to your need, by visiting our web page on the Internet: http://www.smar.com. Select "Valve Positioner" option to access the product specific page. After enter your login and password, click on the **Bracket for FY** link and choose the most appropriate mounting bracket to your application.

See below an example showing the Positioner with rotary and linear magnets.

#### IMPORTANT

Smar web site (www.smar.com) has options of mounting brackets available for several actuators of several manufacturers and models and the related dimensional drawings.



Figure 1.1 – Positioner with Rotary Actuator





Then, install the positioner bracket on the actuator. Usually, the actuator is designed according to the VDI/VDE 3845 standard, and, in this case, tighten the four screws with their lock washers on the proper bracket.

#### NOTE

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

When mounting the magnet, be sure that:

- 1. There is no attrict between the internal magnet face and the position sensor salience during the travel (rotary or linear), through the magnet.
- 2. The magnet and the salience of position sensor must not be distant.

A minimum distance of 2 mm and a maximum distance of 4mm 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.

Case the positioner installation or magnet change or if any other modification is done, the positioner will require a re-calibration. See Section 3 (Setup - for Auto Setup procedure).

See item "Pneumatic Connections" as recommended practice to install the positioner to the valve type.

#### **Linear Movement**

Install the magnet on the valve stem using its proper bracket, according to Figure 1.3.

Install the positioner bracket on the actuator. The fastening of the actuator bracket may follow the NAMUR/IEC 60534-6-1 standard or be in accordance with the user specified boring. Mount the positioner on the bracket by fastening the four screws in the holes of the pressure gauges opposite face. Use lock washers to avoid loosening the screws.

The linear magnet movement must be orthogonal in relation to the main axis of the position positioner. For example, if the linear magnet movement is vertical, the positioner main axis must be horizontal, as show in Figure 1.3.





NOTE	
Included in the package content the <b>centralizer device of linear magnet.</b> See figure 1.16.	



Figure 1.4 – Positioner on Linear Actuator with Remote Position

Make sure the bracket does not obstruct the exhaust outputs.

#### NOTE

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

When mounting the magnet, be sure that:

- 1. There is no attrict between the internal magnet face and the position sensor salience during the travel (rotary or linear), through the magnet.
- 2. The magnet and the salience of position sensor must not be distant.

A minimum distance of 2 mm and a maximum distance of 4mm 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.

Case the positioner installation or magnet change or if any other modification is done, the positioner will require a re-calibration. See Section 3 (Setup - for Auto Setup procedure).

## Pneumatic Connections

The **FY301** requires instrument air quality, following the best practices for pneumatic installations. Consult the American National Standard "Quality Standard for Instrument Air" (ANSI/ISA S7.0.01 - 1996) for detailed information.

The **FY301** comes with input and output stainless steel air filters, but these filters do not exclude the preliminary instrument air treatment. Periodical filter cleaning is recommended at every 6 months or less, if the air quality is not good. Please, check the maintenance section for clean the filters.

The **FY301** supply air pressure varies from 1.4 bar (20 psi) minimum, to 7.0 bar (100 psi) maximum. The actuator working pressure must follow these limits. Consider the use of boosters, if required. Pressure below this range shall affect the positioner performance. Pressure above this range may damage the positioner.

The two pneumatic outputs, marked as "OUT1" and "OUT2", work in opposite directions to open or close the valve.

#### IMPORTANT

If a failure occurs on the **FY301**, such as power loss (4-20 mA input signal), the output marked OUT1 goes to zero pressure and the output marked OUT2 goes to the air supply pressure value.

The positioner can have pressure gages (see the ordering code table) attached to the supply air input and in each output. The indications on gages are references only and does not have the same overall positioner accuracy.

The pneumatic connections are marked with IN for the air supply and OUT1 and OUT2 for Output1 and Output2, respectively. Use 1/4 NPT connections with sealing material for the NPT screw threads. Connect the air supply on the connection marked IN. Be sure the air supply does not exceed the maximum allowed pressure of the positioner or the actuator.

#### IMPORTANT

When using tape sealant type on the thread connections, be sure not spread small residues inside, since they may clog the air flow inside the positioner and even impair the equipment efficiency.

The **FY301** has five protected exhaust orifices with filters. Do not block any of these exhaust, as the air must circulate freely through them. If painting the positioner block, remove the filters before, to prevent them from being obstructed by paint. The orifices must be inspected on a regular basis to ensure they not blocked, granting the air to flow smoothly.

#### Double Action – Air to open (Close on failure)

Connect the positioner OUT1 output on the actuator connection marked with "OPEN" and connect the positioner OUT2 output on the actuator connection marked with "CLOSE".

#### Double Action - Air to close (Open on failure)

Connect the positioner OUT2 output on the actuator connection marked with "OPEN" and connect the positioner OUT1 output on the actuator connection marked with "CLOSE".

#### **Single Action**

Connect the positioner OUT1 output on the actuator input. Use a plug to block OUT2. Pay attention to the safe logic on the actuator for the specific process. If necessary, invert the connections. Take into consideration that in case of power failure the output marked OUT1 goes to zero pressure and the output marked OUT2 goes to the air supply pressure value.

## **Dimensional Drawing**



Note: Dimensions in mm (in)



Figure 1.5 – FY301 Dimensional Drawing

## **Electronic Housing Rotating**

The electronic housing can be rotated in order to offer a better to position the digital display and/or better access to the field connections. To rotate it, release the housing rotation set screw. See figure 1.6. The local indicator itself can also be rotated. See section 5, figure 5.2.



Figure 1.6 - Housing Rotation Set Bolt

Reach the wiring block by removing the electrical connection cover. This cover can be locked closed by the cover locking screw. To release the cover, rotate the locking screw clockwise. See figure 1.7.



Figure 1.7 - Cover Locking Bolt

## **Electric Wiring**

The access to the signal cables to the terminal wiring can be done through of one of the electronic housing orifices and can be connected to a conduit. The wiring block has screws on which fork or ring-type terminals can be fastened. See figure 1.8. Use a plug to block the electrical connection not used. Tight it well and use thread sealing tape.

If the user choose protection against noise induced by atmospheric discharges, overloads, weld machines and machines in general, it will be necessary to install a transient protector (Protector acquired separately).

Test and communication terminals allow, respectively, to measure the current in the 4 - 20 mA loop, without opening it, and to communicate with the transmitter. To measure it, connect a multimeter in the mA scale in the "-" and "+" terminals, and to communicate, use a Hart® configurator in the "COMM" and "-" terminals. For convenience, there are three ground terminals: one inside the cover and two externals, located close to the conduit entries.

Attention to prevent the accidental feeding of the test terminals. This occurrence will cause damages in 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 of humidity 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 bolts.

Conduit threads should be sealed by means of code-approved sealing methods.

Explosion proof, non-incendive and intrinsic safety certification are standards for FY301.

For a complete list of available certificates, please consult <u>http://www.smar.com</u>.

The figure 1.9 - Conduit installation diagram shows the correct installation of the conduit, in order to avoid penetration of water or other substance, which may cause malfunctioning of the equipment.



CORRECT

INCORRECT

Figure 1.9 - Conduit Installation Diagram

Use of twisted pair (22 AWG or greater than) cables is recommended.

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

The **FY301** is protected against reverse polarity, and can withstand up to 50 mA and power supply of  $\pm$  60 Vdc without damage.

The **FY301** connection could be done according to the figures 1.10, 1.11 and 1.12.

It is also recommended to ground the shield of shielded cables at one end only. The non-grounded end must be carefully isolated.

The configurator can be connected to the communication terminals of the positioner or at any point of the signal line by using the interface HPI311-M5P with "alligator" clips.



Figure 1.10 - FY301 Wiring Diagram



#### Figure 1.11 - FY301 Wiring Diagram - Connected in the Smar Transmitter

The **FY301** has an equivalent impedance of 550 Ohms. Make sure that the current supply or analog output of DCS, CLP or single loop controller powering the positioner is capable to handle a voltage drop of 11 V for each positioner ( $550 \times 0.02 = 11$  Volts).

NOTE
If you are using two positioners in series as e. g., working in split range, the resulting impedance will be 1.100 Ohms. Therefore, the analog output should be capable to handle a voltage drop of 22 Volts.

Connection of the **FY301** in multidrop configuration should be done as in figure 1.12. Note that a maximum of two positioners can be connected on the same line and that they should be connected in series.



Figure 1.12 - FY301 Wiring Diagram in Multidrop Configuration (Split Ranges)

## 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 towel 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 powered, internal air leakage will provide protection against corrosion and prevent moisture inside. For this reason, it is strongly recommended to keep the positioner pressurized as much as possible.

## **Recommendations for Instrument Air Supply System**

Instrument air quality shall be superior to that of industrial compressed air. Humidity, suspended 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 have the following characteristics:

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

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





Figure 1.14 - Air Quality Conditioning System

## Rotary and Linear Magnet

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



Figure 1.15 – Linear and Rotary Magnet Models

## Magnet Centralizer Device



Figure 1.16 – Centralizer device of linear 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 1.18 - Remote Hall Sensor

The electric signals on the remote sensor's connection to 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 1.19 – Connecting the Cable to the Remote Hall Sensor

Figure 1.20 – Connecting the Cable to the Positioner

## Special Option K2 (For Current Position Feedback)

The FY301, special option K2, with current position feedback, has the following characteristics:

- 4-20mA signal (open collector) built-in to the terminal block;
- 16bit resolution / Accuracy <0.1%;
- Output signal (power supply voltage 12-45Vdc) isolated from the current supply of the positioner;



Figure 1.21 - FY301 Wiring Diagram - K2

- Self-tuning of control parameters;
- Fully digital control: Kp, Tr and Td;
- Terminal block with 4 terminals;
- Electronic circuits not compatible with FY301 K0 (standard).



Figure 1.22 - FY301 Wiring Diagram - K2

## Installation in Hazardous Areas

WARNING
Explosions could result in death or serious injury, besides financial damage. Installation of this instrument in an explosive environment must be in accordance with the national standards and according to the local environmental protection method. Before proceeding with the installation check the certificate parameters according to the environmental classification.
The instrument modification or replaced parts supplied by any other supplier than the authorized representative of Smar Equipamentos Industriais Ltda is prohibited and will void the Certification.
The positioners are marked with options of the protection type. The certification is valid only when the protection type is indicated by the user. Once a particular type of protection is selected, any other type of protection can not be used.
The electronic housing installed in hazardous areas must have a minimum of 6 fully engaged threads. Lock the housing using the locking screw (Figure 1.6).
Tighten the cover with at least 8 turns to avoid the penetration of humidity or corrosive gases.
Tighten the cover until it touches the housing. Then, tighten more 1/3 turn (120°) to guarantee the sealing. Lock the covers using the locking screw (Figure 1.6).
Consult the Appendix A for further information about certification.

## **Explosion/Flame Proof**

WARNING
The electric connection's entries must be connected or closed using the appropriate Ex-d metal cable gland and/or metal blanking plug with certified IP66 rating.
The standard plugs provided by Smar do not have an Ex-d/XP certification. For Explosion proof applications a certified plug must be used. Consult Smar for certified plugs.
The electrical connection with NPT thread must use waterproofing sealant. A non-hardening silicone sealant is recommended.
Do not remove the positioner covers when power is ON.
Do not remove the positioner covers when power is ON.

## **Intrinsically Safe**

# WARNING In hazardous zones with intrinsically safe or non-incendive requirements, the circuit entity parameters and applicable installation procedures must be observed. To protect the application, the positioner must be connected to a barrier. Match the parameters between barrier and the equipment (Consider the cable parameters). Associated apparatus ground bus shall be insulated from panels and mounting enclosures. Shield is optional. If used, 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 (see appendix "A" for Ci and Li values). For free access to the Hart bus in the explosive environment, ensure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices. Use only Ex Hart communicator approved according to the type of protection Ex-i (IS) or Ex-n (NI). It is not recommended to remove the positioner cover when the power is ON.

# **OPERATION**

## Transducer Functional Description

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

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

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



Figure 2.1 - Schematic Pneumatic Transducer

A piezoelectric disk is the 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 a small 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.

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, which alters the pressure at Output 1 and Output 2, until a new balance is reached (new valve position).

## Electronics Functional Description

Refer to the block diagram (Figure 2.2). The function of each block is described below.

#### A/D

Receives the 4 - 20 mA signal and converts it in the digital format for the CPU.

#### D/A

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

#### Control

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

#### **Position Sensor**

Measures the actual position and feedback to the control and CPU.

#### **Temperature Sensor**

Measures the temperature of the Transducer Circuit.

#### Isolation

Isolates the 4 - 20 mA signal from the piezoelectric signal.

#### EEPROM

A non-volatile memory that stores configuration data as a backup if the **FY301** main board be replaced.

#### 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.

#### HART Modem

The function of this system is to make possible the information exchange between Smar programmer and the positioner, over digital communication using Hart<sup>®</sup> protocol. Modulates and demodulates digital information transmitted by Smar programmer on the current line. A "1" is represented by 1200 Hz and "0" by 2200 Hz. The frequency signal is symmetrical and does not affect the DC-level of the 4 - 20 mA signal.

#### **Power Supply**

The positioner circuit receives supply from a 4 - 20 mA power supply or takes power of Loop Line to power the positioner circuit that is limited to 3.8 mA to work properly.

#### **Display Controller**

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

#### Local Adjustment

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

#### Piezo Flapper Nozzle

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

#### Restriction

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

#### Spool

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

#### **Pressure Sensors**

Measure the pressures of air pressure supply, pressure at Output 1 and Output 2. Available for  ${\sf Hart}^{\circledast}$  reading.



Figure 2.2 - FY301 Block Diagram

## The Local Indicator

The LCD-Local Indicator is required for signaling and for operation in local adjustment.

#### **Normal Indicator**

During normal operation, the **FY301** remains in the monitoring mode and the display indicates the valve position, either as a percentage or as a current readout. The magnetic tool activates the local programming mode, by inserting it in orifice "Z" on the housing.

The possible configuration and monitoring operation are shown on figure 2.3.

Upon receiving power, the **FY301** initializes the position indication on the display, by showing model **FY301** and its software version (X.XX).



Figure 2.3 - Local Indicator

#### Monitoring

During normal operation, **FY301** remains in the monitoring mode. Figure 2.4 shows the positioning in percentage.

The display simultaneously shows readout and some other information.

Normal displaying is interrupted when the magnetic tool is placed in orifice "Z" (Local Adjustment), entering the programming mode local adjustment.

The above mentioned figure shows the result of tool insertion in orifices Z and S, which inform, respectively, movement and actuation of the selected options.



Figure 2.4 - Typical Indicator

# CONFIGURATION

The FY301 Smart Valve Positioner is a digital instrument with the most up-to-date features a controlling device can possibly have. The Hart<sup>®</sup> digital communication protocol enables the instrument to be connected to a computer, in order to be configured in a very simple and complete way. Such computers connected to the positioners, are called host computers. They can be either primary or secondary masters. Even though Hart<sup>®</sup> is a master-slave type of protocol, it is possible to work with up to two masters in a bus. Usually, the primary host, plays the supervisory role and the secondary host plays the configurator role.

The positioners may be connected in a point-to-point or multidrop type network. In a point-to-point connection, the equipment's address must be "0". In a multidrop network, if the devices are recognized by their addresses, the positioners should be configured with a network address between "1" and "15". In this case, the positioners' output current is kept constant, at 4 mA each if the acknowledgement is via Tag, the positioners addresses may be "0", and even in a multidrop configuration.

	NOTE
In case of strictly ob:	a multidrop network configuration for classified areas, the entity parameters allowed for the area shall be served. Therefore, the following shall be checked:
	$Ca \ge \Sigma Ci_j + Cc$ $La \ge \Sigma Li_j + Lc$
	Voc ≤ min [Vmax <sub>i</sub> ] Isc ≤ min [Imax <sub>i</sub> ]
Where: <b>Ca, La =</b>	Allowed capacitance and inductance on the bus
$Ci_j, Li_j =$	Non protected internal capacitance/Inductance of positioner $j$ ( $j = up$ to 15)
Cc, Lc =	Cable capacitance and inductance
V <sub>oc</sub> =	Barrier open circuit voltage
I <sub>sc</sub> =	Barrier short circuit current
Vmax <sub>j</sub> =	Maximum allowable voltage to be applied to the instrument j
Imax <sub>j</sub> =	Maximum allowable current to be applied to the instrument j

The FY301 Smart Valve Positioner includes a very encompassing set of Hart® command functions that make it possible to access the functionality of what has been implemented. Such commands according to the Hart® protocol specifications, and are grouped as universal commands, common practice controls commands and specific commands. A detailed description of such commands may be found in the manual entitled Hart® command specification - FY301 Smart Valve Positioner.

Smar developed two types of configurators for its Hart<sup>®</sup> devices: CONF401 configurator and HPC401 configurator, CONF401 supports Windows platform (95, 98, 2000, XP and NT) and UNIX. It provides a simple configuration, field device monitoring, and ability to analyze data and modify field device performance. The HPC401, is the most up-to-date technology in Palm platform Handheld portable computers.

The operation and use characteristics of each one of the configurators are in their specific manual.

The figures below show the front of the Palm based configurator and CONF401 screen with active advanced configuration.



Figure 3.1 - Smar Configurator

Maintenance	Trim	Graphics	Multidrop	Factory	Diagnost	tio Y	Concor Drocours	
Informacao	Inform	acao do equipa	amento	Monitor	Specific Monitor	Device Status	Configuração	Tabl
/alve Type:	Linear Direct	Rotany	•		Air To: Open	Close		
		Split Range L	<b>o:</b> 4.0	mA	Č	TSO DeadBan	<b>id:</b> 1.0	%
		Split Range H	<b>li:</b> 20.0	mA	i-	Tight Shut O	<b>ff:</b> -5.0	%
		SP Low Li	mit: 0.0	<u> </u>		Dev Dead Ba	and: 2.0	_
		SP High Li	mit: 100.0	) %		Dev Tim	<b>1e:</b> 5.0	s

Figure 3.2 - CONF 401 Screen - Active Advanced Configuration

The TSO stands for "Tight Shut Off", which assure the valve is totally closed, avoiding leakage on the valve seat. If the TSO value is 5% the valve will only start moving from the close position (for instance) on 5% of the controller signal. The TSO D stands for "Tight Shut Off Deadband". When the value is 1%, the valve will start to move from the close position on 6%. On 4% the valve shall close totally.

## **Configuration Resources**

By means of the Hart<sup>®</sup> Configurator, the **FY301** firmware allows the following configuration features to be accessed:

- Positioner's Identification and Manufacturing Data;
- ✓ Remote movement;
- ✓ Special characterization function according to a 16-point configurable curve;
- ✓ Flow characterization (Linear, equal percentage and quick opening);
- ✓ Monitoring of all device variables: input, setpoint, deviation and modulated output temperature;
- ✓ Diagnostic (Preventive maintenance);
- Positioner diagnostic and fail determination;
- ✓ PID Controller Configuration;
- Device Configuration;
- ✓ Device Maintenance.

The operations between the configurator and the positioner, do not interrupt the valve positioning, and do not disturb the positioner operation. The configurator can be connected to the same pair of wires as the 4-20 mA signal, up to 2 kilometers away from the positioner.

## Identification and Manufacturing Data

The following information about the FY301 manufacturing and identification data is available:

- ✓ TAG 8-character alphanumeric field for identification of the positioner.
- DESCRIPTION 16-character alphanumeric field for additional identification of the positioner. May be used to identify service or location.
- MESSAGE 32-character alphanumeric field for any other information, such as the name of the person who made the last calibration, some special care to be taken, or if a ladder is needed for physical access to the positioner.
- DATE The date may be used to identify a relevant date, such as the last calibration, the next calibration or the installation. The date is presented in the American standard e.g. (Example: Oct 30, 2003) is automatically assumed after the choice of these items.
- UNIQUE ID Used to identify the device and in construction of Hart<sup>®</sup> long address.
- DEVICE INFORMATION This button allows to read device identification and data recorded in the factory.

NOTE

These information items cannot be modified. They are read directly from the circuit memory.

## Monitoring

This function allows remote monitoring up to 4 different of positioner variables at the same time. The time to start the reading is around 5 seconds. The values are always updated. Altogether, 20 items could be monitored. These items are: valve actual position in percentage, input in percentage of adjusted current range (before the limits and flow linearization), input current in mA or %, device temperature in Celsius and in Fahrenheit degrees, etc..

## Device Configuration

Besides the configuration services for equipment operation, the **FY301** allows self-configuration. Services from this group are related to: write protection, security position, flow characterization function, local indication and table configuration.

- ✓ WRITE PROTECTION: The configurator only shows that the writing is authorized if the W2 jumper from main board is connected to the pins under the word DOWN.
- ✓ CHARACTERIZATION FUNCTION It changes the valve flow characteristics. For example, if equal percentage flow characterization is applied to a valve with linear flow characteristics, it will work as an equal percentage valve. Manufacturer documentation contains the valve inherent characteristic. The options for applied flow characterization are:

LINEAR	UNALTERED
Equal percentage	1:25
Equal percentage	1:33
Equal percentage	1:50
Quick opening	1:25 (Hyperbolic)
Quick opening	1:33 (Hyperbolic)
Quick opening	1:50 (Hyperbolic)
Table	16 pairs (X, Y)

LOCAL INDICATIONS - The FY301 local indicator has three well-defined fields: information field with icons informing the active status of the configuration, 4 ½ numerical digit field to value indication and alphanumeric field with 5-digit for status information and units.

The **FY301** accepts up to two local indicator configurations, showed with a 2 second pause between each one. The parameters that can be selected to visualization are showed below:

PARAMETERS	DESCRIPTION
PV %	Process variable in percentage.
PV (mm)	Process variable in mm.
SP %	Setpoint in percentage.
SP(mm)	Setpoint in mm.

**TABLE CONFIGURATION** - Through the Table button, a flow characterization curve with up to 16 points can be configured. This allows the construction of a special flow characterization curve, like linear combinations and equal percentage or other characterizations.



Table 3.1 - Valve Characteristic Curve

## Advanced Configuration

This function affects valve advanced configurations. With advanced configuration is possible to configure the valve type, if it is air-to-open or air-to-close, valve action, setpoint limits and split-range.

## Device Maintenance

This group includes maintenance services, related to obtainment of necessary information to the device maintenance and performance test. Some of the available services are: position adjustment and valve performance test, general information about the actuator and the valve, operations count, password level, code number model and performance.

## Trim

There are two trim operations: Current trim and Temperature trim. Current trim allows to calibrate the positioner input current reading and Temperature trim is the temperature reference to the positioner temperature sensor.

There are two current trims available:

- **4 mA TRIM:** is used to adjust the input current reading correspondent to 0%.
- 20 mA TRIM: is used to adjust the input current reading correspondent to 100%.

Setup

This function allows to calibrate the value travel automatically (Auto Setup), the points of the totally opened or totally closed travel with higher precision (lower and higher position), to adjust the opening and closing times and the proportional and integral actions of PI control, the state of air supply, the magnet, the sensor Hall, setup and the piezo voltage conditions.

During the setup process, the local display, if installed, will show the setup progress, in which the positioner takes the following steps:

10% - It opens or closes the valve, depending on the initial value of the piezo voltage;

**20%** - The positioner checks if the flat cable is connected, or if the position sensor is working properly. In case of error, the message "HALL" will appear at local indicator;

30% - The positioner checks whether the magnet is used linear or rotary valve;

**40%** - At this point, the positioner opens or closes the valve, depending on the initial position. Case the spool is obstructed or if the positioner has no air supply, the message "FAIL MOVE" will appear in the local indicator.

**50%** - At this moment, the positioner checks if the magnet is connected to the valve. If not, the message "MGNT" will appear in the local indicator;

**60%** - The positioner places the valve to 50%. The setup process could remain at this step if the Kp value is low;

**70%** - At this moment, the value is close to 50%. The setup process could remain at this step, if the Kp value is high;

**80%** - The positioner adjusts its internal references to place the valve in 50%. The setup process could remain at this step, if the Kp value is high;

**90%** - The positioner checks if the magnet is correctly mounted (arrow in arrow). If not, the message "MGNT" will appear in the local indicator;

100% - End of setup;

## Multidrop Configuration

ADDRESSING - FY301 contains a variable that define the device address in a Hart<sup>®</sup> network. Hart<sup>®</sup> addresses assume values from "0" to "15", the addresses "1" to "15" are specific addresses to multidrop connection. When FY301 is configured to multidrop, it means that the local indicator is showing "MD" and the address is an value from "1" to "15".

FY301 is factory configured with address "0".

## Diagnostic

This function allows engineering unit configuration, the parameters for diagnostic purposes and shows positioner general conditions. See parameters:

- Dead zone (0 to 100%)
- Odometer Curse (mm/rad)
- Ddometer Value Maximun (mm/rad)
- Engineering Unit (mm/rad or %)
- Dead zone Reversal (%)
- Reversal Limit (uni)

## Backup

Data transference from transducer to main board must be done immediately after the assembly when there is a transducer or main board substitution.

This process is automatically done when the positioner is powered. If necessary, the user could force transference using the option Read from Sensor.

The option Write on Sensor could be used to record changes previously made, for example, in Kp, Tr, etc., in transducer memory. The previous values for Kp, Tr, etc. will be lost.

## **Pressure Sensor**

This function allows pressure trim adjustment, to view applied pressure status and to configure positioner input pressure in order to activate the alarm via Hart<sup>®</sup> communication, in case the applied input pressures are not in accordance with configured values.

## Factory

This option is used only in the factory, and the user cannot access it.

# PROGRAMMING USING LOCAL ADJUSTMENT

Move Jumper "W1" to position "ON" to enable the local adjustment. This jumper is located on top of the main electronic circuit board.

There are two orifices on the positioner, under the nameplate, identified by "S" and "Z" respectively, which provide access to two magnetic switches actuated by means of a magnetic tool (Refer to Figure 4.1).



Figure 4.1 - Local Adjustment Orifices

Table indicates the results for the actions on orifices "Z" and "S" in FY301.

ORIFICE	ACTION
Z	Function browsing.
S	Selects the displayed function.

The digital display is required in order to show the programming performed via local adjustment.

## W1 and W2 Jumpers Connection

#### W1 Jumper connected in ON

If W1 Jumper is connected in ON, adjustment local enabled, the parameters of the programming tree can be modified.

#### W2 Jumper connected in DOWN

With W2 Jumper connected in this mode, write protected, the positioner protects the configuration against improper modifications.

#### NOTE

Writing must be enabled during the configuration and after configuration must be disabled again.



Figure 4.2 - Jumpers W1 and W2

## Local Programming Tree

The programming tree is a tree shaped structure with a menu of all available software functions, as shown on figure 4.3.

While in local adjustment, it is possible to browse through all configuration options by keeping the magnetic tool in orifice "Z". Upon choosing the option as described, place the tool in orifice "S" in order to actuate.

By keeping the tool in orifice "S" it is possible to continuously actuate the selected parameter, since this is a numeric value. Actions by increment are performed by repeatedly placing and removing the magnetic tool until reaching the desired valve.



Figure 4.3 - Local Programming Tree

#### NOTE The user shall perform every parameter actuation judiciously, since actuation writes configuration parameters on a permanent basis and does not require confirmation. Once an actuation is performed it is assumed to be

The user shall perform every parameter actuation judiciously, since actuation writes configuration parameters on a permanent basis and does not require confirmation. Once an actuation is performed it is assumed to be the desired configuration.
## Adjustable Parameters

#### **TYPE - Valve Type**

This parameter enables the user to configure valve type as well as the type of action associate to the valve. These are the options:

Lind: Linear and Direct; Linr: Linear and Reverse; Rotd: Rotary and Direct; Rotr: Rotary and Reverse.

#### **CHAR - Valve Characterization Curve**

This parameter allows the user to configure the type of valve characterization curve. Options are as follows:

Lin: Linear; EP50: Equal Percentage 50%; HY: Hyperbolic. Tab: 16 points - table (Configurable).

#### **MODE - Operation Mode**

This parameter allows the user to choose operation mode. Upon turning the positioner on, it will always be in automatic mode, but it is possible to choose the operation mode. During operation there are the following options:

Auto - Automatic Mode

During automatic mode the positions is set in accordance with the input 4 to 20 mA current signal. While in automatic mode, local actuation in the SP% parameter is not allowed.

#### Man - Manual Mode

During manual mode the position is set in accordance with the SP% parameter value, independently from the input current. This is the only mode in which the SP% parameter can be actuated.

#### SP % - Set Point

This parameter represents the desired position value. While in "Manual" mode, it is possible to actuate this parameter remotely, independently from the input current. While in automatic, it is calculated from the input current level.

#### **LOPOS - Lower Position**

This parameter allows the lower position calibration as per the input current, usually 4 mA unless it is in split range operation. During calibration, notice if the control becomes saturated, that is, if the valve no longer moves in the desired direction. Should such a situation occur, the user shall actuate in the opposite direction to the valves movement. Calibration is performed in terms of percentage.

#### **UPPOS - Upper Position**

This parameter allows the upper position calibration as per the input current, usually 20 mA unless it is in split range operation. During calibration, notice if the control becomes saturated, that is, if the valve no longer moves in the desired direction. Should such a situation occur, the user shall actuate in the opposite direction to the valves movement. Calibration is performed in terms of percentage.

#### **TIME - Setpoint Variation Time**

This allows the configuration of the setpoint variation rate. The unit is expressed in seconds. It is adjustable in the following range: 1 to 60.

TIME close to 60 causes the setpoint variation to be slower.

TIME close to 1 causes the setpoint variation to be faster.

#### **KP** - Proportional Gain

This parameter makes it possible to adjust the servo control proportional gain. It is adjustable within the following range: 0.5 to 45. For linear valves, typical KP values are between 35 and 45.

For rotary valves, typical KP values are between 55 and 4 For rotary valves, typical KP values are around 8.

#### TR - Integral Time

This parameter makes possible to adjust the servo control integral time. It is adjustable within the following range: 0 to 999 minutes/repetition.

For linear valves, typical TR values are around 2 minutes/repetition. For rotary valves, typical TR values are around 8 minutes/repetition.

#### Setup - Auto Positioning

After configuring the valve type by means of parameter TYPE, the AUTO SETUP parameter shall be actuated. During the adjustment procedure the positioner will be in a state of auto positioning and the message "SETUP" will be flashing on the display. During this process the control parameters are determined and the 0% and 100% trim is performed. This operation lasts approximately 4 minutes. While configuring the valve type as described above, the user shall browse up to parameter SETUP (tool in orifice Z) and place the tool in orifice S in order to initiate the previous auto positioning of the valve.

#### Air to Close / Air to Open (AIR\_T)

This option configures the air pressure effect on the positioner.

If the positioner operates in "direct action":

- It should be configured for AIR\_OPEN, if the air is to open the valve
- It should be configured for AIR\_CLOSED, if the air is to close the valve
  - In case the positioner is operating in "reverse action":
  - It should be configured for AIR\_OPEN, if the air is to close the valve
- It should be configured for AIR\_CLOSED, if the air is to open the valve

## **Procedure for Valve Calibration**

#### STEP 1

Select valve type by means of the menu TYPE, browsing at least once through the options (Lind, Linr, Rotd, and Rotr).

#### STEP 2

Setup

In order to start self-calibration, browse up to the parameter SETUP and insert the tool in S.

#### NOTE

In most cases, steps 1 and 2 are sufficient to provide a good calibration.

#### STEP 3

Set the KP so as to lower the value overshoot (the overshoot will require adjustment after the TIME as adjusted). The lower the KP is, the lower the overshoot will be, but valve positioning will be slower. Set TR in a value where the position does not oscillate and control is capable of quickly reaching the final position.

#### STEP 4

#### Time Adjustment (TIME)

Perform TIME adjustment for quick valves in order to increase the time and decrease the overshoot.

#### STEP 5

#### Zero Adjustment by means of LOPOS (Lower Position)

At this moment, current shall be in the position which corresponds to 0% as, for example, 4 mA. A more practical way of performing this adjustment is to place the tool in orifice S, thus allowing the parameter to be continually actuated (increased or decreased). Upon noticing the valve action around the desired point, remove the tool from orifice S and slowly change its value on an increment by increment basis, that is, by repeatedly placing and removing the tool in orifice S until reaching the desired point. At a certain point, it is more convenient to perform the adjustment on an increment by increment basis so as to avoid the risk of exceeding beyond the desired value.

#### STEP 6

#### Span Adjustment by means of UPPOS (Upper Position)

At this moment, current shall be in the position which corresponds to 100% as, for example, 20 mA. The procedure is similar to the one described for zero adjustment.

#### STEP 7

#### Air to Close / Air to Open (AIR\_T)

This option configures the air pressure effect on the positioner.

If the positioner operates in "direct action":

- It should be configured for AIR\_OPEN, if the air is to open the valve.
- It should be configured for AIR\_CLOSED, if the air is to close the valve.
- In case the positioner is operating in "reverse action":
- It should be configured for AIR\_OPEN, if the air is to close the valve.
- It should be configured for AIR\_CLOSED, if the air is to open the valve.

# **MAINTENANCE PROCEDURES**

## **General Information**

NOTE

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

**FY301** Valve Positioners are extensively tested and inspected before delivered 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 are 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 5.1.

DIAGNOSTICS						
SYMPTOM	SYMPTOM PROBABLE ERROR SOURCE					
	Positioner Connections Check wiring polarity and continuity.					
POSITION	Power Supply must be a current source					
SHOWN ON DISPLAY	Check signal input current. Minimum current for positioner operation is 3.8 mA.					
	Electronics Failure Check circuit boards for bad connections and replace them for spare boards.					
	Pressure Output Connections					
	Check up on air leaks.					
NO RESPONSE TO INPUT SIGNAL	<i>Air Supply Pressure</i> Check the air supply pressure. The input pressure to positioner shall be between 20 psi and 100 psi.					
	Calibration					
	Check the positioner calibration points.					

DIAGNOSTICS				
SYMPTOM	SYMPTOM PROBABLE ERROR SOURCE			
	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	Adjustment Parameters are Too Low			
RESPONSE	Adjust parameter Kp or Time to Open or Time to Close.			
TOO FAST ACTUATOR	Adjustment Parameters are Too High			
RESPONSE	Adjust parameter Kp or Time to Open or Time to Close.			

#### Table 5.1 - FY301 Diagnostics without the Configurator

## **Diagnostic with Configurator**

If the positioner is on and with the communication circuit and the processing unit working, the configurator can be used for diagnostic, in case of problems with the positioner. The configurator should be connected to the positioner according to the wiring diagrams show on Section 1.

#### **Error Messages**

The error messages inform the diagnostic through the self diagnostic of errors and malfunctioning. When the configurator is communicating with the positioner, the user is informed on any problem found, through the self diagnostic. At the **FY301** positioner, the error messages always alternate with the information on the top line of the configurator's display. Table 5.2 lists the error messages and more details on corrective action.

ERROR MESSAGES	POTENTIAL SOURCE OF PROBLEM
PARITY ERROR	- The line resistance is not according to the technical characteristics.
OVERRUN ERROR	- Excessive noise or ripple.
CHECK SUM ERROR	- Low level signal.
	- Interface damaged.
FRAMING ERROR	<ul> <li>Power supply or battery voltage of the configurator lower than 9 V.</li> </ul>
	- Positioner line resistance is not according to technical characteristics.
	- Positioner not powered.
	- Positioner not connected or damaged.
NO RESPONSE	- Positioner configured in multidrop mode being accessed by ON LINE SINGLE UNIT.
	<ul> <li>Positioner reversibly powered (polarity is reversed).</li> </ul>
	- Interface damaged.
	<ul> <li>Power supply or battery voltage of the configurator lower than 9 V.</li> </ul>
LINE BUSY	- Other device using the line.
CMD NOT IMPLEMENTED	- Software version not compatible between configurator and positioner.
DEVICE BUSY	- Positioner carrying out an important task, e.g., local adjustment.
	- Voltage to pressure transducer disconnected.
POSITIONER MALFUNCTION	- Voltage to pressure transducer failure.
COLD START	- Start-up or reset due to power supply failure.
	- Operating in local mode with fix position.
OUTPOT FIXED	- Connected in burnout.
OUTPUT SATURATED	- Position out of calibrated span or in fail-safe (Output current in 3.9 or 21 mA).
	- Temperature out of operating limits.
	- Temperature sensor damaged.
	- Position out of operation valve range.
1 OUT OF LIMITS	- Voltage to pressure transducer damaged or not connected.
	- Positioner with error configuration.
LOWER RANGE VALUE TOO HIGH	<ul> <li>The lower range value &gt; (Upper limit of minimum span range).</li> </ul>
LOWER RANGE VALUE TOO LOW	- The lower range value < (Upper limit of range).
UPPER RANGE VALUE TOO HIGH	- The upper range value > 110 % x (Upper limit of range).
UPPER RANGE VALUE TOO LOW	- The upper range value < - 10 % (Lower limit of range).

ERROR MESSAGES	POTENTIAL SOURCE OF PROBLEM
UPPER AND LOWER RANGE VALUES OUT OF LIMITS	- Both the upper and lower points are outside the positioner range limit.
SPAN TOO SMALL	<ul> <li>The difference, between the upper and lower points, is less than the allowed by the positioner.</li> </ul>
ACTUAL POSITION	- The actual valve position was above of the upper range limit.
ACTUAL POSITION	- The actual valve position was below of the lower range limit.
PASSED PARAMETER TOO LARGE	- Parameter above operating limits.
PASSED PARAMETER TOO SMALL	- Parameter below operating limits.
CONTROL LOOP SHOULD BE IN MANUAL	- Indicates that the operation could affect the output.
CONTROL LOOP MAY BE RETURNED TO AUTO	<ul> <li>After the operation is complete, you are reminded to return the loop to automatic control.</li> </ul>

#### Table 5.2 – FY301 Diagnostics with the Configurator

## **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 5.1 – 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 nozzle is dirty.

### Maintenance – Electronic Parts

#### **Electronic Circuit**

NOTE	
The numbers indicated between parentheses refer to Figure 5.4 – 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).

Verify the firmware version; must be version 2.12, 2.13 or higher. Mount the equipment; apply pressure supply of 30 PSI and power on the equipment. 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. Case the equipment initializes, replace the analog circuit board (18) or the analog circuit board for pressure sensors GLL1204, if this replacement does not solve the problem, it is necessary to replace the main circuit board (5).

Perform the auto-setup. After the setup, verify if the positioner is working properly. For that, apply 12mA input and be sure that the valve goes to the position correspondent to the 50% travel. If it does not occur, do the following:

- 1. Connect the Smar configurator to the input electric wires; select "Monitoring" option on the menu screen;
- 2. Apply 4 mA and verify through the configurator if SP% is equal to 0%;
- 3. Apply 20 mA and verify through the configurator if SP% is equal to 100%;
- 4. If the values above were different, execute the 4 mA and 20 mA current trim;
- 5. Verify the Hall position sensor reading through the configurator. Apply pressure directly to the valve actuator and verify if there is change in the Hall position sensor reading (65000 means that the position sensor is not being read) and the defect can be at the analog circuit board or analog circuit board for pressure sensors (18) or the position sensor set (35); replace the boards and perform the step 2 through step 4 again;
- 6. Verify the piezo voltage at the configurator;
- 7. The piezo voltage value must be between 30 and 70 Volts.

To verify the Hall position sensor value and the piezo voltage, do the following:

- 1. Set the valve in 50% travel;
- 2. With the configurator, go to the "monitoring" mode and choose two parameters: Hall value and piezo voltage;
- 3. The piezo voltage values must be the most closed possible to 26000 to 38000;
- 4. The piezo voltage values must be between 30 and 70 Volts. If the voltage is not between these values, proceed with the piezo calibration by using the FYCAL calibration device (check at www.smar.com for more details on the FYCAL).

## 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**

#### Voltage to Pressure Transducer

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

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

#### CAUTION

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



Figure 5.2 – Transducer Rotation

NOTE	
The numbers indicated between parentheses refer to Figure 5.4 – Exploded View.	

- Remove the flat cable cover (17) by releasing the Allen screws (15). When removing this cover (17), take care to do not damage the internal board: disassembly it with care. (This part can not be washed);
- 2. Remove the analog board (18);
- 3. Remove the electric piezo base (24) (This part can not be washed);
- 4. Remove the restriction (20) for cleaning;
- 5. Remove the intermediate set (27) and check the diaphragms integrity; if necessary, clean the diaphragms with water and neutral detergent; after that, wash them with alcohol, dry before mounting;
- 6. Remove the spool valve (**29**); the cleaning is made with water and neutral detergent; after that, wash it with alcohol, dry before mounting. Do not use lubricant of any kind in this part;
- 7. The pneumatic block (**31**) can be completely washed with water and neutral detergent, after that, wash it with alcohol and verify if it is completely clean, without dust or any kind of impurity. For that, apply dry compressed air in all block orifices;
- 8. Verify if the position sensor cover (**33**) does not have indication of water or humidity. (This part can not be washed);
- 9. Verify if the position sensor flat cable is damaged, twisted, cut or oxidate.

### **Piezo Electric Calibration - FYCAL**

#### NOTE

To perform the calibration of the electric piezo of the Positioner, refer to the manual of the FYCAL - Calibration Device for Pressure Transducer, available at HTTP://www.smar.com

## **Restriction Cleaning Procedure**

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

1. Be sure that the air supply is not pressurizing the equipment.



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





3. Remove the restriction screw using an adequate tool;



- 4. Remove the o-ring's with an appropriate tool;
- 5. Dive the part in petroleum base solvent and dry it with dry 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-rings 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

Replace the positioner filter elements (28) with a minimum stated period of 1 (one) year.

The instrument 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 instrument air does not comply with the above mentioned standards, the user has to consider replacing the positioner filter elements more frequently.

## Exhausts Ports

Air is vented to the atmosphere through the two exhausts ports located behind the transducer nameplate and 4 outputs in the opposite side from gage. Any strange object interfering or blocking the exhaust port may degrade the positioner performance. Clean the exhausts periodically by spraying it with a solvent.

#### ATTENTION

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 5.2). The  $\checkmark$  mark on the display indicates up position.



Figure 5.3 – Four Possible Positions for 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.

## Package Content

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

- 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

 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.
 The quantity supplied must be in accordance with the number of positioners.

#### Maintenance Procedures

## Exploded View



Figure 5.4 – Exploded View

## Accessories

ACCESSORIES				
ORDERING CODE DESCRIPTION				
SD-1	Magnetic tool for local adjustment.			
HPI311-M5P*	Just the Hart® interface.			
400-0726	Needle cleaning device for the restriction.			
400-1176	Teflon guide for linear magnet			
400-1177	Teflon guide for rotary magnet			

## Spare Parts List

SPARE PARTS LIST				
PARTS DESCRIPTION	POSITION	CODE	CATEGORY (NOTE 4)	
HOUSING (NOTE 1)	8	400-1314-3 ( <b>NOTE 6</b> )	-	
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	-	
O-rings Cover (NOTE 2)	2	204-0122	В	
Local Adjustment Protection Cover	10	204-0114	-	
DIGITAL INDICATOR GLL1438 (for old electronic main board GLL1011) DIGITAL INDICATOR (for new main boards GLL1443 and 1451)	4	(NOTE 8)	А	
TERMINAL INSULATOR		400-0058		
	11		^	
TERMINAL INSULATOR FOR 4-20mA POSITION FEEDBACK (packaged	11		A	
with 6 units) (NOTE 7)		400-1329		
MAIN ELECTRONIC CIRCUIT BOARD (include digital indicator and mounting kit)	5	(NOTE 8)	А	
TERMINAL HOLDING BOLT HOUSING	12	204-0119	В	
MOUNTING KIT FOR MAIN ELECTRONIC BOARD (new boards GLL1443	3	400-0560	В	
and 1451), (2 bolts with spacers and retention washers)				
CONNECTION COVER	15,16 and 17	400-1320 ( <b>NOTE 6</b> )	А	
. Connection Cover Bolt	15	400-0073	-	
. Buna-N Neck O-ring (NOTE 2)	16	204-0113	В	
ANALOG BOARD without Pressure Sensor GLL1012 (version K0)	18	400-0060	-	
ANALOG BOARD for Pressure Sensor GLL1204 (version K1)	18	400-0840	-	
ANALOG BOARD for Position Feedback GLL1456 (version K2)	18	400-1341	-	
PIEZO BASE SET	19,20,21,22, 23,24 and 25	400-1318 ( <b>NOTE 6</b> )	A	
	10	100 0005	<b>D</b>	
. Base and Block O-ring (NOTE 2)	19	400-0085	D D	
Restriction External Oring (NOTE 2)	20	344-0105	D B	
Restriction Internal O-ring (NOTE 2)	21	344-0155	R	
Syntherized Bushing	23	400-0033	R	
Analog indicator (Gage - Stainless Steel and Brass) (NOTE 5)	25	400-1120	B	
ASSEMBLED DIAPHRAGM (include hall tube, mechanical part and	20			
O-rings)	27	400-1321 ( <b>NOTE 6</b> )	В	

SPARE PARTS LIST				
PARTS DESCRIPTION	POSITION	CODE	CATEGORY (NOTE 4)	
PNEUMATIC BLOCK SET	19,23,25,28,29,30,31 and 32	400-1317 ( <b>NOTE 6</b> )	A	
. Base & Block O-ring (NOTE 2) . Syntherized Bushing Analog indicator (Gage - Staipless Steel and Brase) (NOTE 5)	19 23 25	400-0085 400-0033 400-1120	-	
. Filtering Element . Spool valve	28 29	400-0655 400-0653	- A	
. Spool valve Spring . Stainless steel Filter- 1/4" NPT - includes filtering element . Vent Plug - Stainless Steel	40 30 32	400-0787 400-1383 400-0654	- -	
HALL COVER SET	33 (or 36), 34 and 35	400-1319 ( <b>NOTE 6</b> )	-	
. Hall Cover Bolt . Hall Support + Hall Sensor + Flat cable	34 35	400-0092 400-0090	-	
REMOTE EXTENSION SET	38	400-1322 ( <b>NOTE 6</b> )	-	
CABLE SET + CONNECTOR	37	400-1325 ( <b>NOTE 6</b> )	-	
1/2" NPT (Ex d) INTERNAL SOCKET SET PLUG IN BICHROMATIZED CARBON STEEL 1/2" NPT (Ex d) INTERNAL HEXAGONAL PLUG IN 316 SST	39 39	400-0808 400-1484 <b>(NOTE 9)</b>	-	
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 PG13.5 (Ex d) EXTERNAL SOCKET SET PLUG IN 316 SST	39 39	400-0810 400-0811	-	
3/4" NPT (Ex d) ADAPTER IN 316 SST	39	400-0812	-	
TRANSDUCER SET	NOTE 3	400-1316 ( <b>NOTE 6</b> )	A	
MAGNETS		400.0740		
Linear magnet 30mm	-	400-0748	-	
Linear magnet 50mm	-	400-0035	-	
Rotary magnet	-	400-0030	-	
MOUNTING BRACKET SCREW FOR POSITIONER ASSEMBLY (packaged with 12 units)	-	400-1190	-	

#### NOTES

Includes terminal isolator, bolts (cover locking, ground, and terminal isolator) and identification plate without certification.
 O-rings are packaged with 12 units.

3) Includes all transducer's spare parts.

a) For category A it is recommended to keep in stock 25 parts installed for each set and 50 for category B.
b) The pressure gauges for supply pressure, output 1 or output 2, will be supplied with the wet parts in brass.
c) For code detailed, use the tables below.
c) Use only with K2 Positioner version.

 9) Social with the relation of the second sec copper free aluminum or SST316). With or without CEPEL certificate.

## Detailed Code When Ordering of Spare Parts



\* Choose the desired option

		DETAILED CODE WHEN ORDERING OF SPARE PARTS						
CODE		DESCRIPTION						
400-1307	Cover							
	Option	Туре						
	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						

			DETA	LED CODE WHEN (	PRDERING OF SPARE PARTS
CODE					DESCRIPTION
400-1316	Transdu	cer Set; FY30X			
	Option	Indication Gag	е		
	0	Without Gage			
	6	01 Gage - Input			
	7	01 Gage – Outp	out 1		
	8	02 Gage – Inpu	t and Output	1	
	9	02 Gage – Outp	out 1 and 2		
	A	03 Gage			
		Option Action	n of Position	er	
		C Single	Action		
		D Doubl	e Action		
		Optic	on 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 Manufactu	ring Standard
				S0 Smar	
				Option H	all Remote Sensor
				R0 S	tandard Mounting (Without Hall Remote Sensor)
				R9 R	emote Mounting (adapted for Remote Sensor)
				C	ption Special Sensor
					K0 Without Special Sensor (compatible w/ main board up to version 4)
					With Pressure Sensors for Diagnostic (compatible w/ main board up
					to version 3)
					K2 With 4-20mA Position Feedback (compatible w/ main board version 5)
400-1316	*	* *	*	* *	* TYPICAL ORDERING CODE

\* Choose the desired option.





\* Choose the desired option.

	DETAILED CODE WHEN ORDERING OF SPARE PARTS							
CODE		DESCRIPTION						
400-1319	Hall Cover	Set; FY30X						
	Option M	laterial						
	H0 A	luminum (IP/Tነ	ΈE)					
	H1 St	tainless Steel (	IP/TYPE)					
	0	ption Paintin	ng					
		P0 Gray M	lunsell N 6,	5				
		P8 Withou	t Painting					
		P9 Safety Blue Epoxy - Electrostatic Painting						
		Option Manufacturing Standard						
		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 Cov	er; FY30X					
	Option Material						
	H0 Aluminu	m (IP/TYPE)					
	H1 Stainles	s Steel (IP/TYPE)					
	Option	Painting					
	P0	Gray Munsell N 6,5					
	P8	Without Painting					
	P9	Safety Blue Epoxy - Electrostatic Painting					
		Option Manufacturing Standard					
		S0 Smar					
400-1320	* *	TYPICAL ORDERING CODE					

	DETAILED CODE WHEN ORDERING OF SPARE PARTS						
CODE		DESCRIPTION					
400-1321	Assemb	led Diapl	nragm; FY30X				
	Option	Material					
	H0	Aluminu	n (IP/TYPE)				
	H1	Stainles	s Steel (IP/TYPE)				
		Option	Painting				
		P0	Gray Munsell N 6,5				
		P8	Without Painting				
		P9	Safety Blue Epoxy - Electrostatic Painting				
			Option Manufacturing Standard				
			S0 Smar				

400-1321 \* \* \*

#### TYPICAL ORDERING CODE

\* Choose the desired option.

	DETAILED CODE WHEN ORDERING OF SPARE PARTS							
CODE			DESCRIPTION					
400-1322	Remote	Extensio	n Set; FY30X					
	Option	Material						
	H0	Aluminur	n (IP/TYPE)					
	H1	Stainless	s Steel (IP/TYPE)					
		Option	Painting					
		P0	Gray Munsell N 6,5					
		P8	Without Painting					
		P9	Safety Blue Epoxy - Electrostatic Painting					
			Option Manufacturing Standard					
			S0 Smar					
400-1322	*	*	TYPICAL ORDERING CODE					

\* Choose the desired option.

	DETAILED CODE WHEN ORDERING OF SPARE PARTS							
CODE		DESCRIPTION						
400-1325	Cable Set	t and Connectors for Hall Remote Sensor; FY30X						
	Option C	Cable Length						
	1 5	5 m						
	2 1	10 m						
	3 1	15 m						
	4 2	20 m						
	ZS	Special						

400-1325 \* TYPICAL ORDERING CODE

## 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.



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

6. If the value obtained by the megohimmeter is below  $2G\Omega$ , 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.

# **TECHNICAL CHARACTERISTICS**

## **Functional Specifications**

#### Travel

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

#### Input Signal

4 - 20 mÅ, 2 wires.

#### Power

Supplied by the 4-20 mA current loop. No external supply required.

## Input Impedance 550 $\Omega$ .

Minimum Current 3.8 mA.

#### **Communication Protocol**

HART® Communication Protocol (is superimposed on the current signal).

#### **Protection against Reverse Polarity**

No damage occurs from reversal of normal supply current (4 - 20 mA) or from misapplication of up to 50 mA.

#### Output

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

#### Pressure Supply

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

#### Indication

4 <sup>1</sup>/<sub>2</sub> numerical digits and 5 alphanumerical digits (Liquid Cristal Display).

## Hazardous Area Certifications See appendix "A".

#### **European Directive Information**

See appendix "A".

#### **Temperature Limits**

Operation:	-40	to	85°C	(-40	to	185°F).
Storage:	-40	to	90°C	(-40	to	194°F).
Display:	-10	to	75°C	(14	to	167°F) operation.
	-40	to	85°C	(-40	to	185°F) without damage.
Remote Sensor:	-40	to	105° C	(-40	to	221°F) operation.

#### **Humidity Limits**

0 to 100% RH.

#### Flow Characterization

Linear, Equal Percentage, Quick Opening, 16 freely selectable points.

#### 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.

### Repeatability

≤ 0.1% F.S.

#### **Hvsteresis**

≤ 0.1% F.S.

#### Consumption

0.35 Nm<sup>3</sup> /h (0.20 SCFM) at 1.4 bar (20 psi) supply. 1.10 Nm<sup>3</sup> /h (1.65 SCFM) at 5.6 bar (80 psi) supply.

#### **Output Capacity**

13.6 Nm<sup>3</sup> /h (8 SCFM) at 5.6 bar (80 psi) supply.

#### **Ambient Temperature Effect**

0.8%/20°C of span

#### **Supply Pressure Effect** Negligible

#### Vibration Effect

 $\pm 0.3\%$ /g of span during the following conditions:

- 5 15 Hz at 4 mm constant displacement. •
- 15 150 Hz at 2g. •
- 150 2000 HZ at 1g.

Reference SAMA PMC 31.1 - 1980, Sec. 5.3, Condition 3, Steady State.

#### **Electro-Magnetic Interference Effect**

See appendix "A".

## **Physical Specifications**

#### **Electrical Connection**

1/2 - 14 NPT, Pg 13.5 or M20 x 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 covers (NEMA 4X, IP66).

#### Weight

Without display and mounting bracket: 2.7 kg. (Aluminum)

5.8 kg. (Stainless Steel)

Add for digital display: 0.1 kg.

Remote Sensor: 550 g. Cable: 100 g. (For connectors plus 45 g/m)

## **Ordering Code**

MODEL	SMART	VALVE P	SITIONER				
FY301	HART <sup>®</sup> &	4 to 20 mA					
	COD. Loc	al Indicato					
	0 With 1 With	nout Indicat n Digital Ind	r cator				
	COD	. Mounting	Bracket				
	0	Without E With Brac	acket				
		COD. Ele	trical Connections				
i		0 1/2	- 14 NPT <b>(4)</b>		3	1/2" - 14 NPT X 1/2 BSP (31	6 SS) - with adapter (3)
		1 1/2'	- 14 NPT X 3/4 NPT (316 SS) - with - 14 NPT X 3/4 BSP (316 SS) - with	adapter (5)	A R	M20 X 1.5 (4) PG 13 5 DIN (3)	
		COL	. Type of Actuator			1010.0 Dirt (0)	
		1	Rotary - Single Action		8	Linear Stroke Up to 100 mm.	- Double Action
i		2	Rotary - Double Action	le Action	A	Linear Stroke Up to 30 mm.	- Single Action
		6	Linear Stroke Up to 50 mm Dout	ble Action	c	Without magnet (for linear act	tuator) - Single Action
		7	Linear Stroke Up to 100 mm Sing	gle Action	D	Without magnet (for linear act	tuator) - Double Action
					2	Special	
			COD. Indication Gage		<u> </u>	9 With 2 Gage (Staipless	steel and watted parts in brass)
		i i	6 With 1 Gage (Stainless steel	and wetted parts in brass) - Input	t	Output 1 and 2	
1			7 With 1 Gage (Stainless steel With 2 Gage (Stainless steel	and wetted parts in brass) - Output and wetted parts in brass) - Input	ut 1 and	Z Special	steel and wetted parts in brass)
	i i		Output 1				
			SPECIAL OPTIONS (Le	eave it blank for no optional iten	ns)		
i			H0 Aluminum (IP/Type)		н	316 Stainless Steel for sa	line atmosphere (IPW/Type X) (2)
			H1 316 Stainless Steel	(IP/Type)	н	4 Copper Free Aluminum (I	PW/Type X) <b>(2)</b>
			H2 Aluminum for saline at	tmosphere (IPW/Type X) (2)			
ł			LI EM: XP IS NI	Plate		16 Without certificat	ion
-			13 CSA: XP, IS, N	NI, DI (CANADIAN)		IO CEPEL (INMETR	RO - DUST)
	i i		I4 EXAM: EX-IA,	NEMKO: EX-D (ATEX-GAS) EX-IA (INMETRO-GAS)			
-			COD Painting				
i			P0 Gray Mu	Insell N 6.5 Polyester			
			P8 Without I	Painting			
			P8 Without I P9 Blue Safe PD Blue smo	Painting ety Epoxy – Electrostatic Paintin ooth diamond RAL5010 - Epoxy	ng /		
			P8 Without I P9 Blue Saf PD Blue smo	Painting ety Epoxy – Electrostatic Paintii ooth diamond RAL5010 - Epoxy G Plate	ng ⁄		
			P8 Without I P9 Blue Saf PD Blue smo COD. TA J0 With	Painting ety Epoxy – Electrostatic Paintin ooth diamond RAL5010 - Epoxy G Plate 1 TAG	ng y	J1 Blank J2 Ac	cording to user's notes
			P8 Without P9 Blue Saf PD Blue sm COD. TA J0 With	Painting ety Epoxy – Electrostatic Paintin ooth diamond RAL5010 - Epoxy G Plate n TAG D. Sensor Mounting (1)	ng y	J1 Blank J2 Ac	cording to user's notes
			P8 Without P9 Blue Saf PD Blue sm COD. TA J0 With COD	Painting iety Epoxy – Electrostatic Paintin poth diamond RAL5010 - Epoxy G Plate n TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable	ng y	J1 Blank J2 Ac	cording to user's notes
			P8 Without P9 Blue Saf PD Blue smo COD. TA J0 With COU R0 R1 R2	Painting fety Epoxy – Electrostatic Painti- coth diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable	ng y	J1 Blank J2 Ac	cording to user's notes
			P8 Without P9 Blue Saf PD Blue smu COD. TA J0 With COD R0 R1 R2 R3 R3 R4	Painting fety Epoxy – Electrostatic Painti poth diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable Remote sensor - 15 m cable Remote sensor - 20 m cable	ng y	J1 Blank J2 Ac	cording to user's notes
			P8 Without P9 Blue Saf PD Blue sm COD. TA J0 With COD. TA COD. TA COD. TA R0 R1 R2 R3 R3 R4 R5	Painting fety Epoxy – Electrostatic Painti poth diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable Remote sensor - 15 m cable Remote sensor - 20 m cable Remote Mounting (adapted f	ing y , , , , for Re	J1 Blank J2 Ac	cording to user's notes
			P8 Without P9 Blue Saf PD Blue smo COD. TA J0 With CO R0 R1 R2 R3 R4 R9 R2	Painting fety Epoxy – Electrostatic Painti both diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable Remote sensor - 15 m cable Remote sensor - 20 m cable Remote Mounting (adapted f Special (*)	ing y } } for Re	J1 Blank J2 Ac	cording to user's notes
			P8 Without P9 Blue Saf PD Blue smo COD. TA J0 With COD R0 R1 R2 R3 R4 R5 R2 R3	Painting fety Epoxy – Electrostatic Painti ooth diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable Remote sensor - 10 m cable Remote sensor - 20 m cable Remote Mounting (adapted 1 Special (*) COD. Special Sensor K0 Without special sensor	ing y , , , , for Re	J1 Blank J2 Ac	cording to user's notes
			P8 Without P9 Blue Saf PD Blue sm COD. TA J0 With COD. TA R0 R1 R2 R3 R4 R5 R2	Painting fety Epoxy – Electrostatic Painti ooth diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) p Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable Remote sensor - 20 m cable Remote Mounting (adapted f Special (*) COD. Special Sensor K0 Without special sensor With pressure sensors	ing y } for Re	J1 Blank J2 Ac emote Sensor, without cable a	cording to user's notes
			P8 Without P9 Blue Saf PD Blue smu COD. TA J0 With R2 R3 R4 R9 R2	Painting fety Epoxy – Electrostatic Painti ooth diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable Remote sensor - 10 m cable Remote sensor - 20 m cable Remote Mounting (adapted for Special (*) COD. Special Sensor K0 Without special sensor K1 With 4-20 mA Position	ing y } for Re for dia for dia	J1 Blank J2 Ac emote Sensor, without cable a iagnostic iback (open collector)	cording to user's notes
			P8 Without P9 Blue Saf PD Blue smo COD. TA J0 With R1 R2 R3 R4 R9 R2	Painting fety Epoxy – Electrostatic Painti ooth diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable Remote sensor - 10 m cable Remote sensor - 20 m cable Remote Mounting (adapted f Special (*) COD. Special Sensor K0 Without special sensor K2 With 4-20 mA Position COD. Special COD. Special COD. Special	y y for Re for Re For dia Feed	J1 Blank J2 Ac emote Sensor, without cable a iagnostic lback (open collector)	cording to user's notes
			P8 Without   P9 Blue Saf PD Blue sm COD. TA J0 With COD. TA R0 R1 R2 R3 R4 R5 R2	Painting fety Epoxy – Electrostatic Painti ooth diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable Remote sensor - 10 m cable Remote sensor - 20 m cable Remote Sensor - 20 m cable Remote Sensor - 20 m cable Remote Mounting (adapted f Special (*) COD. Special Sensor K0 Without special sensor K2 With 4-20 mA Position COD. Special	r y for Re r r Deedl r no oj	J1 Blank J2 Ac emote Sensor, without cable a iagnostic lback (open collector)	cording to user's notes
Evan			P8 Without P9 Blue Saf PD Blue smu COD. TA J0 With COD. TA J0 With R0 R1 R2 R3 R3 R4 R5 R2 R2	Painting fety Epoxy – Electrostatic Painti ooth diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable Remote sensor - 15 m cable Remote sensor - 20 m cable Remote Mounting (adapted for Special (*) COD. Special Sensor K0 Without special sensor K1 With pressure sensors K2 With 4-20 mA Position COD. Special ZZ Leave it blank for	ing y } for Re i for dia i Feed r no op	J1 Blank J2 Ac emote Sensor, without cable a iagnostic iback (open collector)	nd remote extension set)
FY301	1 2	5 1	P8 Without P9 Blue Saf Blue smo COD. TA J0 With CO R0 R2 R3 R4 R9 R2 R2	Painting fety Epoxy – Electrostatic Painti ooth diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable Remote sensor - 10 m cable Remote sensor - 20 m cable Remote Mounting (adapted is Special (*) COD. Special Sensor K0 Without special sensor K1 With pressure sensors K2 With 4-20 mA Position COD. Special ZZ Leave it blank for * *	y y for Re for dia i Feedl r no oj	J1 Blank J2 Ac emote Sensor, without cable a liagnostic liback (open collector) optional items	nd remote extension set)
FY301	1 0	9	P8 Without I P9 Blue Saf PD Blue Saf Blue smo COD. TA J0 With CO R0 R2 R3 R4 R5 R2 R2	Painting fety Epoxy – Electrostatic Painti ooth diamond RAL5010 - Epoxy G Plate h TAG D. Sensor Mounting (1) Full Mounting Remote sensor - 5 m cable Remote sensor - 10 m cable Remote sensor - 10 m cable Remote sensor - 20 m cable Remote sensor - 20 m cable Remote Mounting (adapted f Special (*) COD. Special Sensor K0 Without special sensors K2 With 4-20 mA Position COD. Special ZZ Leave it blank for * *	ing y i for Re i For di r no op	J1 Blank J2 Ac emote Sensor, without cable a iagnostic iback (open collector) optional items TYPICAL MODEL NU	Ind remote extension set)

Consult Smar for applications in classified areas.
 IPW/TYPEX tested for 200 hours according to NBR 8094 / ASTM B 117 standard.
 Options not certified for Hazardous Locations.
 Certification Ex-d for FM, ATEX, IECEx and INMETRO.

#### FY301 – Operation, Maintenance and Instructions Manual

BFY	BRACK	ET		
1	CODE	Positio	ner Mounting Bracket (1)	
	0	Without	Bracket	
Ì	1	Universa	al Rotary	
i i	2	Universa	al Linear - Yoke and Pillar Type	
	3	Linear -	Уоке Туре	
-	4	Linear -	Pillar Type	
-	Z	Others -	- Specify	
	i i	CODE	Magnet Mounting Bracket	
į	i	0	Without Bracket	
i i	1	1	Rotary	
ł	1	2	Linear up to 30 mm	
		3	Linear up to 50 mm	
ł	i i	4	Linear up to 100 mm	
Ì		Z	Others - Specify	
i	ł		COD. Positioner Mounting Bracket Material	
į	ł		7 Carbon Steel Bracket and Accessories in SS1	
ł		i	C Carbon Steel Bracket	
		i	Net repliced	
			Z Othern Specify	
			2 Otters - Specify COD Magnet Bracket Material	
i		1	COD. Magnet Diacket Material	
i		i	C Galbon Steel Blacket	
ł				
		ł	7 Others - Specify	
	i i			
	i		ZZ Leave it black for no ontional items	
i		i i		
i		i		
BFY	- 1	1	TYPICAL MODEL NUMBER	

(1) For customized mounting bracket, for different brands and models, please, consult www.smar.com.

# **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 60079-1 Flameproof Enclosures "d" IEC 60079-1 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 (120°) 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 35°C 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 3009955 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 =  $-25^{\circ}$ C < Ta <  $60^{\circ}$ C; Type 4 or 4X Entity Parameters: Vmax = 30 Vdc, Imax = 110 mA, Ci = 8 nF, Li = 12 uH

Drawing 102A-0439, 102A-1207, 102A-1330, 102A-1773, 102A-1774

#### **IECEx DNV**

Explosion Proof (IECEx DNV 24.0131X) Ex db IIC T6 Gb Ambient Temperature:  $-20^{\circ}C \le Ta \le +60^{\circ}C$ 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-2271,102A-2272

#### ATEX DNV

Explosion Proof (DNV 24 ATEX 43322X) II 2G Ex db IIC T6 Gb Ambient Temperature:  $-20^{\circ}C \le Ta \le +60^{\circ}C$ 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-1412, 102A-1494

#### ATEX DEKRA

Intrinsic Safety (DMT 01 ATEX E 012) II 2G Ex db [ia] IIC T6 Gb

Supply and signal circuit for the connection to an intrinsically safe 4-20mA current loop Ui = 28 Vdc, Ii = 93 mA, Pi = 700 mW, Ci  $\leq$  5 nF Li = Neg Ambient Temperature: -20°C  $\leq$  Ta  $\leq$  +60°C

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

Drawing 102A-1412, 102A-1494

#### **INMETRO NCC**

Segurança Intrínseca (NCC 24.0145) Ex db ia IIC T\* Gb Ex tb IIIC T\* db Ui =  $30 \vee$  Ii =  $100 \text{ mA Pi} = 0,7 \vee$  Ci = 6,4 nF Li = despTamb: - $20 \degree$ C a + $65 \degree$ C T5 ou T100 °C Tamb: - $20 \degree$ C a + $40 \degree$ C T6 ou T85 °C IP66 ou IP66W

Prova de Explosão (NCC 24.0172) Ex db IIC T6 Gb Ex tb IIIC T85 °C 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 102A1242, 102A1365, 102A1787, 102A2007, 102A2008

## **Identification Plates**

#### **FM Approvals**



#### **INMETRO NCC**



#### FY301 – Certifications Information



#### **FM Approvals**



sm	ar		SI	RF –	Servi	ce R	eques	t Forr	n	
3110					FY	Positio	ner			
				GENE	RAL DA	ТА				
Model:	FY290()	Firmware \	/ersion:			FY301 (	) Firmware V	ersion:		
	FY302()	Firmware \	/ersion:			FY303 (	) Firmware V	ersion:		
	FY400()	Firmware \	/ersion:							
Serial Number:					_ Sensor N	lumber: _				
TAG: Remote										
Position	Yes()		No ( )							
Sensor? Pressure										
Sensor?										
Action: Travel:	Rotary ()		Linear ()		50 mm ( )		100 mm (	)	Other	mm
Configuration:	Magnetic T	ool (	Palm ( )	Psion (	) PC	C ( )	Software:	)	Version:	
g				ONTR						
Type:	Valve + Act	tuator (		Pneumatio	Cvlinder (AC			ther:		
Size:						., ( )				
Travel:										
Manufacturer:										
Model:										
				AIR	SUPPLY	1				
Conditions:	Dry and Cle	ean ( )	Oil()	Wa	ter ( )	Othe	er:			
Work Pressure:	20 PSI ( )		60 PSI (	) 100	PSI()	Othe	er:	PSI		
Hazardous Area				PROC	ESS DA	IA				
Calssification	Non-Classi	fied()	Chemical (	)	Explosive (	)	Other:			
Interference	Vibration (	)	Temperatur	e()	Flectromag	inetic (	Others:			
Types		,		- ( )						
			SITU	ATION	DESCR		N			
			8EL		SUCCE	INOITS				
Adjustment (		Cleaning				otenance (	)	Updat	e / Up-grade	( )
Other:		Cloaning	( )			tionanoo (	,	opuu	or op glado	
			119							
Company:			0			FIGIN				
Contoot										
i itie:										
Section:										
Phone:							E	xtension:		
E-mail:							D	ate:	//	
		For warra Fu	inty or non-wa urther informa	arranty rep ation on ht	oair, please co tps://www.sm	ontact you ar.com/en	r representativ /support.	/e.		

## **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 Uclamps 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.







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

3 – Fasten the hex screw.

**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.