



Cert. No. LRQ 0963008

ISO 9001

# spirax sarco

## SP300

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 CH Issue 2

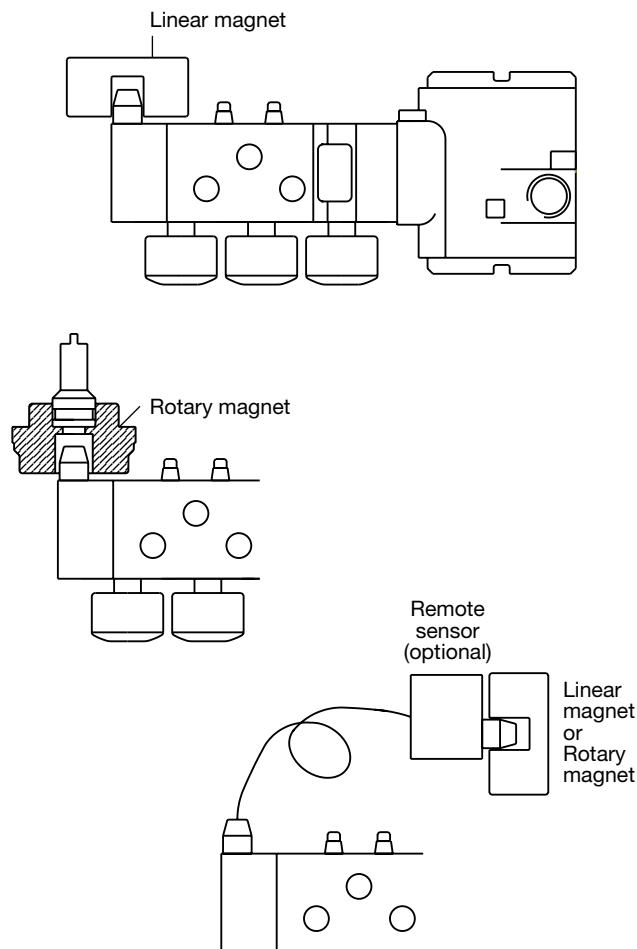
## Electropneumatic Smart (Fieldbus® Positioner)

### Description

The SP300 series is a microprocessor based positioner range that provides fast and accurate positioning of linear and rotary pneumatic actuated control valves. The instrument produces a pneumatic pressure output to accurately position the valve according to the input signal from an external controller (4-20 mA) or from a bus network (HART®, Foundation™ Fieldbus, PROFIBUS® PA). SP300 are compact and easy to maintain operate and maintain. Local calibration and parameter setting can be done without the need for external devices.

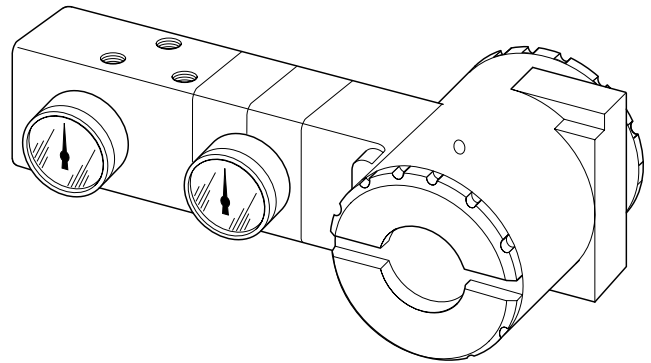
### Position feedback (Figure 1)

The position of the valve is accurately measured using a magnetic sensor based on the 'Hall effect', eliminating the need for feedback levers and potentiometers. This non contact feedback arrangement provides many advantages including improved reliability, safer operation, better accuracy and dead-band because there are less moving parts subject to wear.


**Fig. 1 Magnetic sensor**

The mounting arrangement for linear actuators complies with IEC 534-6  
 The mounting arrangement for rotary actuators complies with VDI/VDE 3845

The 'Hall effect' sensor can be remotely mounted up to 20 m from the instrument. This is particularly useful for applications subject to high ambient temperatures or heavy vibration.



### Operation

#### Output module (Figure 2)

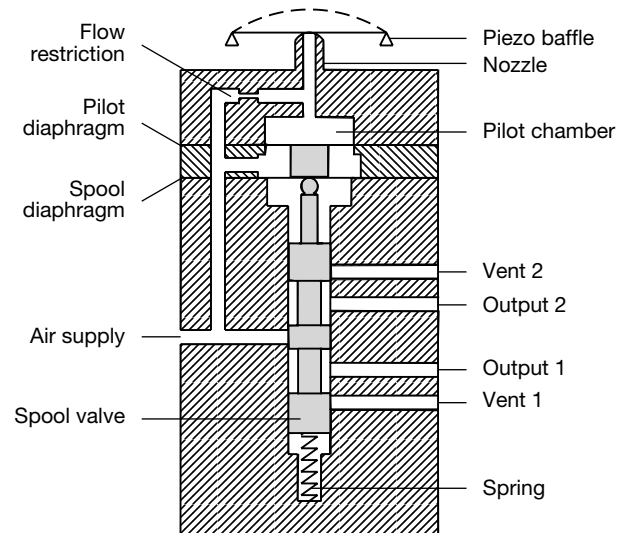
The main parts of the output module are: pilot, servo, Hall effect sensor and output control circuit.

The instrument CPU sends an electronic set point signal to the control circuit. The control circuit receives an actual valve position feedback signal from a 'Hall effect' sensor. By comparing the two signals the control circuit applies a voltage to the baffle (piezo) for the correct valve positioning.

The pneumatic section is based on the well known nozzle-baffle and spool valve technology.

A piezoelectric disk is used as a baffle in the pilot stage. The baffle is deflected upon receiving the voltage according to the required position change. A small variation of the air flow through the nozzle causes a change of pressure in the pilot chamber (pilot pressure). Because pilot pressure is too low, with no flow capacity, it has to be therefore boosted. This is done in the servo section which acts as a transducer. The servo section has one diaphragm in the pilot chamber, and another smaller diaphragm in the spool chamber. The pilot pressure applies a force to the pilot side diaphragm which, at steady state, will be equal to the force that the spool valve applies to the smaller diaphragm.

When a change in position is required, pilot pressure increases or decreases as explained for the pilot stage. A change in pilot pressure forces the spool valve up or down changing the output 1 and the output 2 pressure until the desired position is reached.


**Fig. 2 Output module**

## Models and Protocols

The communication protocols of all SP300 are industry standard, which means they are easily interfaced with the control system and therefore reduce installation and maintenance costs.

### SP301 4 - 20 mA + HART® valve positioner



The SP301 microprocessor based pneumatic valve positioner operating in a current loop system. It produces a pressure output as required to position a control valve according to a 4-20mA input signal. The communications of the SP301 are based on the HART® protocol.

Calibration and setting of parameters can be carried out via local adjustment or using portable equipment as a Palm with HART® interface or with a PC including HART® software.

### SP302 Foundation™ Fieldbus valve positioner



The SP302 is a Foundation™ Fieldbus device. It is a microprocessor based pneumatic valve positioner operating in a Fieldbus® system. The SP302 produces a pressure output as required to position a control valve according to an input received over the Fieldbus® network.

Calibration and setting of parameters can be carried out via local adjustment or using a remote configurator (e.g. Syscon)

### SP303 PROFIBUS® PA valve positioner



The SP303 is a Profibus® PA device. It is a microprocessor based pneumatic valve positioner operating in a Fieldbus® system. The SP303 produces a pressure output as required to position a control valve according to an input received over the Fieldbus® network.

Calibration and setting of parameters can be carried out via local adjustment or using a remote configurator (e.g. PDM Simatic).

## Specific technical features

### SP301

**Communication protocol** HART® (is superimposed on the current signal)

**Input signal** Two-wire, 4-20 mA controlled according to NAMUR NE43 specification, with superimposed digital communication (HART® Protocol)

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

**Voltage drop** 11 Vdc max / 20 mA (equivalent to 550 Ω)

**Minimum current** 3.8 mA

**Reverse polarity protection** Is provided to prevent internal circuit damage in the event of reversal of the 4-20 mA supply signal.

### SP302

**Communication protocol** Foundation™ Fieldbus.

**Input signal** digital only. Foundation™ Fieldbus, complies with IEC 1158-2 (H1): 31.25 Kbit/s and voltage mode with bus power.

**Voltage drop** Bus powered: 9 to 32 Vdc.  
Quiescent current consumption 12 mA

#### Function blocks:

RES - Resource	TRD - Transducer
DSP - Display transducer	DIAG - Diagnostics transducer
PID - PID control	EPID - Enhanced PID
AO - Analog output	ARTH - Arithmetic
INTG - Integrator	ISEL - Input selector
CHAR - Signal characterizer	SPLT - Splitter
AALM - Analog alarm	SPG - Set ramp generator
TIME - Timer	LLAG - Lead-lag
OSDL - Output selector / Dynamic limiter	CT - Constant

### SP303

**Communication protocol** PROFIBUS® PA.

**Input signal** digital only. PROFIBUS® PA, complies with IEC 1158-2 (H1): 31.25 Kbit/s and voltage mode with bus power.

**Power supply** bus powered: 9 to 32 Vdc / Quiescent current consumption 12 mA.  
Output impedance (from 7.8 to 39 kHz).

#### Function blocks:

PHY - Physical	TRD - Transducer
DSP - Display	AO - Analog output

## Common technical features

### Functional specifications

#### Travel

Linear motion: 3 to 100 mm

Rotary motion: 3 to 120° Rotation angle

#### Output signal

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

#### Pressure supply

1.4 to 7 bar (20 to 100 psi).

Free of oil, dust and water.

#### Indication

4 1/2-digit LCD indicator and 5 alphanumeric characters.

#### Hazardous location certification

Explosion proof, weather proof and intrinsically safe from ATEX, CSA, FM.

3.8 mA

#### Temperature limits

Operation: -40 to 85°C (-40 to 185°F)

Storage: -40 to 90°C (-40 to 194°F)

Display: -10 to 60°C (14 to 140°F) operation

-40 to 85°C (-40 to 185°F) without damage.

#### Humidity limits

0 to 100% RH.

#### Turn-on time

Approximately 10 seconds

#### Update time

Approximately 0.2 seconds

#### Flow characterization

Linear, Equal Percentage, Quick Opening, 16 freely selectable points.  
Through software or locally adjustable.

#### Gain

Through software or locally adjustable.

#### Travel time

Through software or locally adjustable.

#### Actual position sensing

Magnet sensor (non contact) via Hall effect.

## Performance specifications

#### Sensitivity / resolution

≤ 0.1% F.S. (Full scale)

#### Repeatability

≤ 0.1% F.S. (Full scale)

#### Hysteresis

≤ 0.1% F.S. (Full scale)

#### Consumption

0.25 Nm<sup>3</sup>/h (0.15 SCFM) at 1.4 bar (20 psi) supply.

0.70 Nm<sup>3</sup>/h (0.40 SCFM) at 5.6 bar (80 psi) supply.

#### Output capacity

46.7 Nm<sup>3</sup>/h (28 SCFM) at 5.6 bar (80 psi) supply.

#### Ambient temperature effect

0.8% / 20°C of span.

#### Supply pressure effect

Negligible.

#### Vibration effect

±0.3% / g of span during the following conditions:

5 to 15 Hz at 4 mm constant displacement;

15 to 150 Hz at 2g;

150 to 2000 Hz at 1g.

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

#### Electro-magnet interference effect

Designed to comply with IEC 61326: 2000.

## Physical specifications

#### Electrical connections

½" – 14 NPT, Pg 13.5 or M20 x 1.5.

#### Pneumatic connections

Supply and output: ¼" – 18 NPT.

Gauge: ⅛" – 27 NPT.

#### Material of construction

Injected low copper aluminium with polyester painting or 316 stainless steel housing, with Buna N 'O' rings on cover (NEMA 4x, IP 67)

#### Weight

Without display and mounting bracket: 5.8 kg (316 stainless steel)

2.7 kg (aluminium)

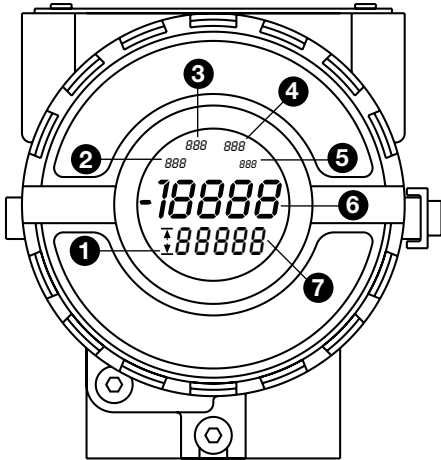
Add, for digital display:

0.1 kg

### Local display drawing

All SP300 positioners are fitted with a digital indicator that allows you to:

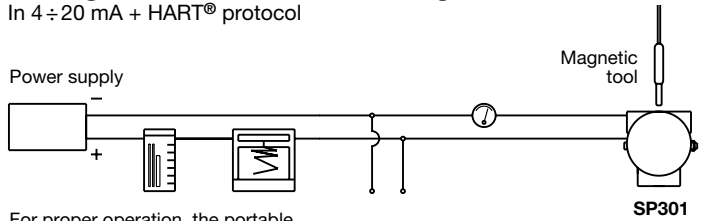
- read the parameters
- set the parameters
- read the diagnostic messages
- read measured values.



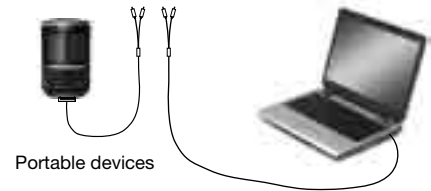
- 1 Indicates possibility to adjust change variable mode
- 2 Indicates that communication is active
- 3 Indicates that the device is answering for master requests
- 4 Indicates active local adjustment operation
- 5 Indicates active eepron saving operation
- 6 Variable field
- 7 Mnemonic field

### Configuration / connection diagram

In 4 ÷ 20 mA + HART® protocol

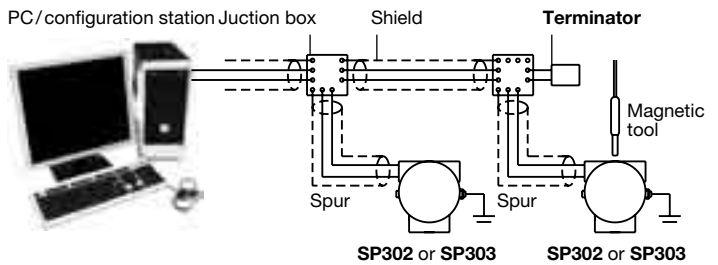


For proper operation, the portable equipment requires a minimum load of 250 Ohms between the power supply and transmitter



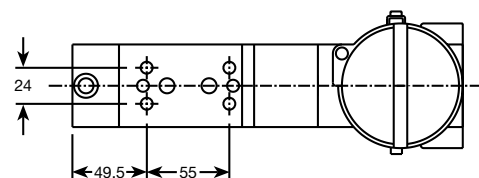
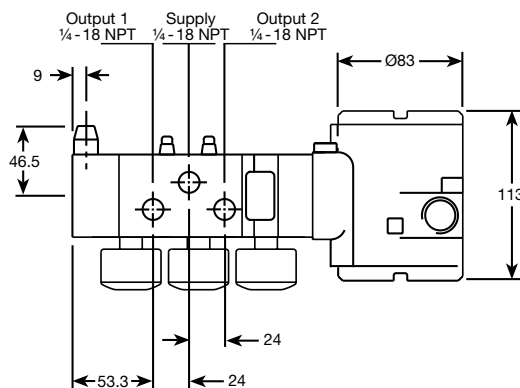
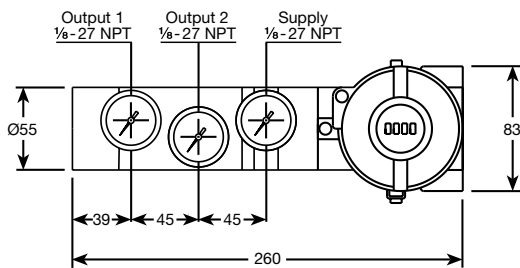
### Configuration / connection diagram

In Foundation™ Fieldbus or PROFIBUS® PA configuration

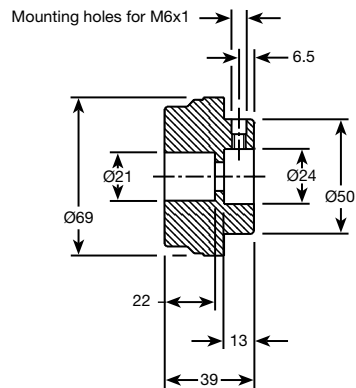


### Dimensions (approximate) in millimetres

#### Valve positioner

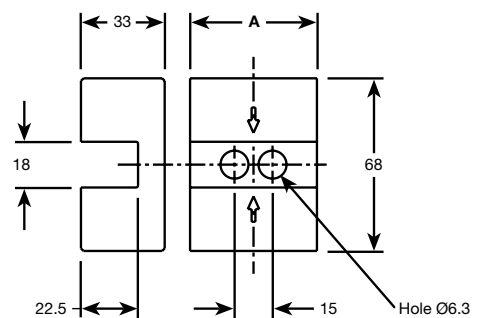


#### Rotary magnet



#### Linear magnet

Travel	Dimension A
Up to 15 mm	44 mm
Up to 30 mm	50 mm
Up to 50 mm	109 mm
Up to 100 mm	185 mm



**SP300 electropneumatic selection guide (\* Standard):**

<b>Model type</b>	<b>SP30</b> = Positioner with digital display	<b>SP30</b>
<b>Protocol</b>	*1 = 4 - 20 mA + HART® *2 = Foundation™ Fieldbus *3 = PROFIBUS® PA	<b>1</b>
<b>Bracket mounting kit</b>	*0 = Without kit *1 = With kit (see KMS separate bracket + magnet kit code)	<b>1</b>
<b>Electrical connections</b>	<b>0</b> = ½ - 14 NPT * <b>A</b> = M20 x 1.5 <b>B</b> = Pg 13.5 DIN	<b>0</b>
<b>Type of Actuator</b>	<b>1</b> = Rotary - Single action * <b>2</b> = Rotary - Double action <b>3</b> = Linear - Single action * <b>4</b> = Linear - Double action <b>5</b> = Other to be specified	<b>3</b>
<b>Indication gauge</b>	<b>0</b> = Without gauge <b>1</b> = With gauge input <b>2</b> = With gauge output <b>3</b> = With 2 gauges (Input and Output) * <b>4</b> = With 3 gauges <b>Z</b> = Other to be specified	<b>3</b>
<b>Options</b>	<b>H1</b> = 316 stainless steel housing * <b>R1</b> = Remote sensor with 5 m cable (No approval available) * <b>12</b> = Explosion proof ATEX label (see Note 1) * <b>13</b> = Intrinsically safe ATEX label * <b>14</b> = CSA label * <b>15</b> = FM label * <b>SZ</b> = Special: to be specified <b>J1</b> = Tag on stainless steel plate	<b>12</b>

**Note 1:** Positioners are always Explosion Proof, Intrinsically Safe, FM and CSA certified; 12-13-14-15 suffix are for label identification. If not specified otherwise, Explosion Proof label version (12) is provided.

**Selection example:**

<b>SP30</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>12</b>
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**Typical positioner model:**

4-20 mA signal + HART® protocol - ½" NPT electrical connection - single action linear valve - 2 gauges - digital indicator - Explosion Proof (ATEX) label. Stock Code (G.P.C.) 3700590. Please ask for the available list of Spirax Sarco stock codes.

**Bracket and Magnet selection (\* Standard):**

<b>Model type</b>	<b>KMS</b> = Bracket/magnet kit	<b>KMS</b>
<b>Bracket</b>	<b>0</b> = Without positioner bracket * <b>1</b> = Universal rotary valves <b>2</b> = Universal linear valves (Yoke and Pillar) * <b>3</b> = Spirax Sarco linear valves <b>Z</b> = Other to be specified	<b>3</b>
<b>Magnet</b>	* <b>0</b> = Rotary * <b>1</b> = Linear up to 15 mm stroke * <b>2</b> = Linear up to 30 mm stroke * <b>3</b> = Linear up to 50 mm stroke * <b>4</b> = Linear up to 100 mm stroke <b>Z</b> = Other to be specified	<b>2</b>
<b>Mounting</b>	* <b>C</b> = Carbon steel bracket * <b>1</b> = 316 stainless steel bracket <b>Z</b> = Other - specify	<b>1</b>
<b>Options</b>	<b>SYZ</b> = Special to be specified	<b>000</b>

**Selection example:**

<b>KMS</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>000</b>
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**Typical kit model:**

Stainless steel bracket for a Spirax Sarco linear valve - magnet for up to 30 mm valve stroke - Yoke & Pillar mounting, right side. Stock Code (G.P.C.) 3700500. Please ask for the available list of Spirax Sarco stock codes.

**How to order example:**

1 off Spirax Sarco SP301 1033 12 complete with KMS 321 000 bracket and magnet.