TI-P706-01
CTLS Issue 5

# SP7-10, SP7-11 and SP7-12 Smart Positioners

## Description

The SP7-1* smart positioner can control any valve that is actuated by a linear or rotary pneumatic actuator that conforms with NAMUR. It guarantees an exact proportionality between the stroke of the valve and the value of the electrical input signal (mA) into the positioner.
The SP7-1* has a cast aluminium housing that is also treated for outdoor installation. The unit can be mounted onto pneumatic actuators either rotary -57 to 57° or linear -28 to 28°.
The positioner can be supplied without a mounting kit or with a kit for rotary or linear actuators, the type must be specified when ordering.
The positioner can be supplied without a pressure gauge block or with a pressure gauge block, the type must be specified when ordering. The positioner is supplied for a control signal in mA and for an air supply pressure from 1.4 to 6 bar.
The SP7-1* positioner can also be used to reverse the action of the control signal.
The positioner has a local communication interface (LCI) as standard in the SP7-10. Additionally, a 'HART® communication' option for communication via the 20 mA signal is available. Both communications are based on the HART® Protocol. Alternatively, HART®5 or HART®7 are available.
Other available options are the SP7-11 with a PROFIBUS PA module or the SP7-12 with FOUNDATION Fieldbus module.
In addition to its input for the analog position set point, the positioner is equipped with a digital input which can be used to activate control system functions in the device. A digital output allows you to output collective messages (alarms/faults).

Throughout the document SP7-1* is written where the information is relevant to all versions; the SP7-10, SP7-11 and SP7-12. Where the information is specific it will be referenced as the version appropriate.

## Approvals

| | | |
|---|---|---|
| Ex | **ATEX rating** | II 2 G Ex ib IIC T6, T4...T1 Gb |
| CCC | **CCC** (China) | Ex d mb IIB T5 Gb |
| Ex NEPSI | **NEPSI rating** | EX d IIC T4/T5/T6 Gb |

## Air supply

The SP7-10 positioner must be provided with a high quality air supply to ISO 8573-1:2010 Class 3:3:3

## Applications

The SP7-1* can be used with any actuator that conforms to NAMUR, this includes all of the following Spirax Sarco pneumatic actuators:

- **BVA300 rotary**
- **PN1600 series**
- **PNS3000** and **PNS4000 series**
- **PN9000 series**
- **TN2000 series**



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## Materials

| Part | Material | Finish |
|---|---|---|
| Case and cover | Die cast aluminium | Case - Anti-corrosive paint, Black |
| | | Cover - Anti-corrosive paint to RAL9016 |
| Mouting kits | Stainless steel | - |
| Follower pin cone | Nylon | - |

## Technical data

| | |
|---|---|
| **Input signal** | 4-20 mA (split range minimum amplitude 8 mA) or PROFIBUS PA or FOUNDATION Fieldbus |
| **Impedance** | Max 485 +/- 15 Ω (for 4-20mA input signal only) |
| **Air supply** | 1.4 to 6.0 bar |
| **Air quality** | ISO 8573-1:2010 Class 3:3:3 |
| **Output pressure** | 0 to 100% supply pressure |
| **Actuator stroke** | 20 mm to 150 mm or 55 ° to 90 ° |
| **Action** | Single acting/fail vent/Double acting |
| **Operating temperature** | −40 to 85 °C |
| **Air connections** | ¼" NPT female |
| **Deviation** | ≤ 0.5 % |
| **Tolerance band** | 0.3 to 10 %, adjustable |
| **Configurable dead zone** | 0.1 to 10 %, adjustable for 4-20 mA, HART and PROFIBUS PA, 0.1 to 5 % for FOUNDATION Fieldbus |
| **Resolution (AD-conversion)** | > 16,000 steps |
| **Sampling frequency** | 20 ms (for 4-20 mA, HART and PROFIBUS PA only) |
| **Ambient temperature effect** | ≤ 0.5 % per 10 K |
| **Reference temperature** | 20 °C |
| **Influence of vibration** | ≤ 1 % to 10 g and 80 Hz |
| **Degree of protection** | IP65 |
| **Weight** | Linear mounting kit - 0.78 kg |
| | Rotary mounting kit - 0.4 kg |
| | Positioner (without mounting kits or gauge blocks) - 1.7 kg |
| **Basic positioner options** | SP7-10 - 4-20 mA or 4-20 mA with HART |
| | SP7-11 - Profibus PA |
| | SP7-12 - Foundation fieldbus |





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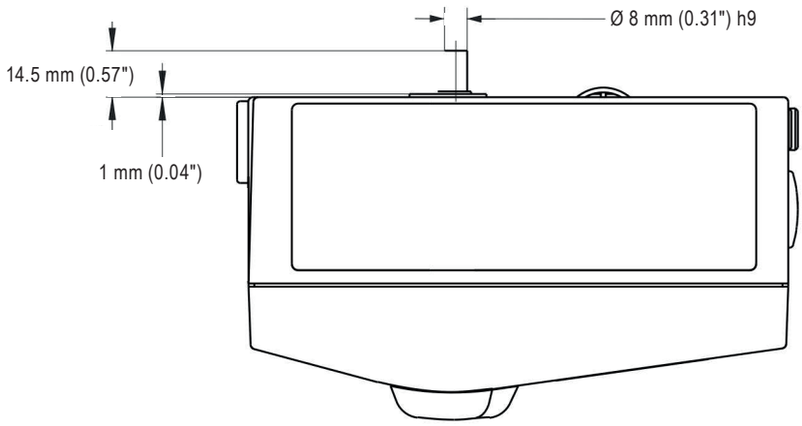
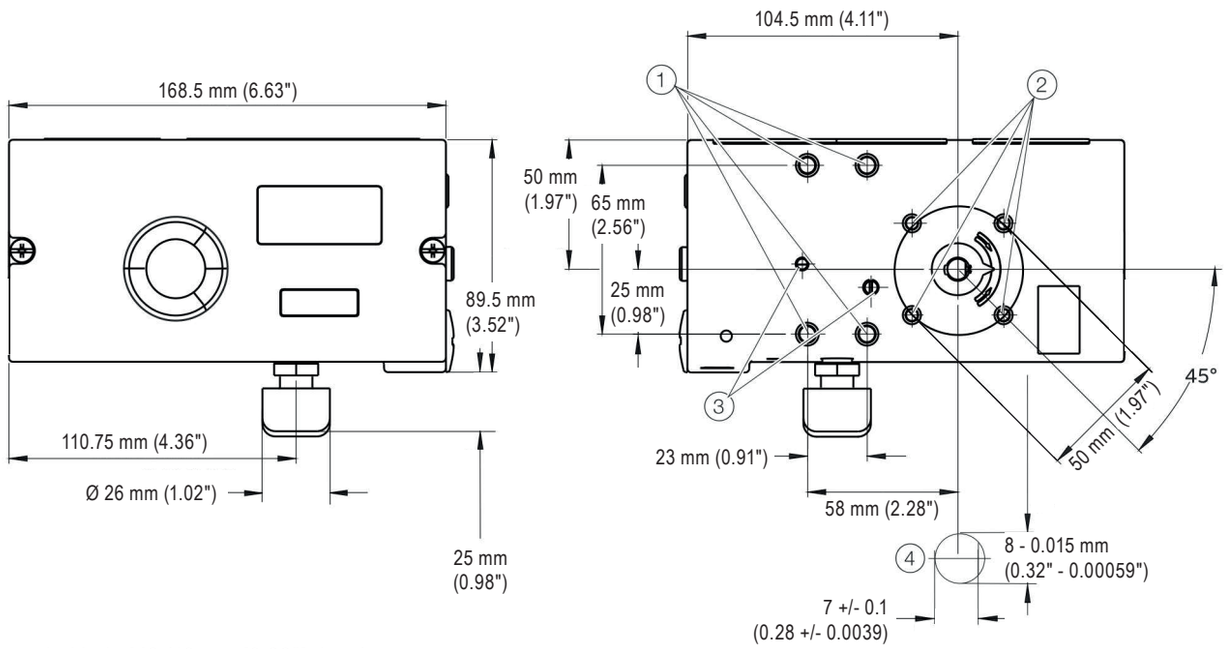
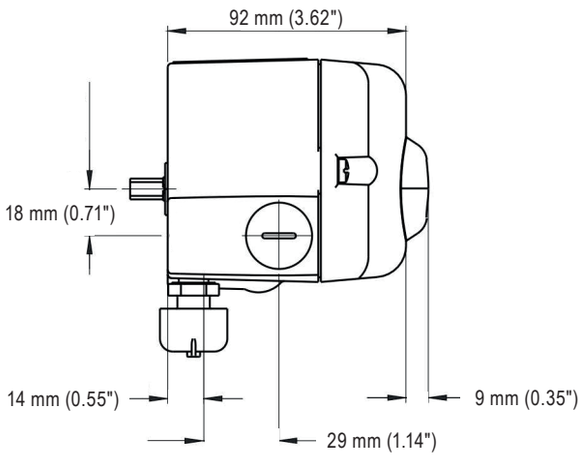
## Dimensions (approximate) in mm (and inches)

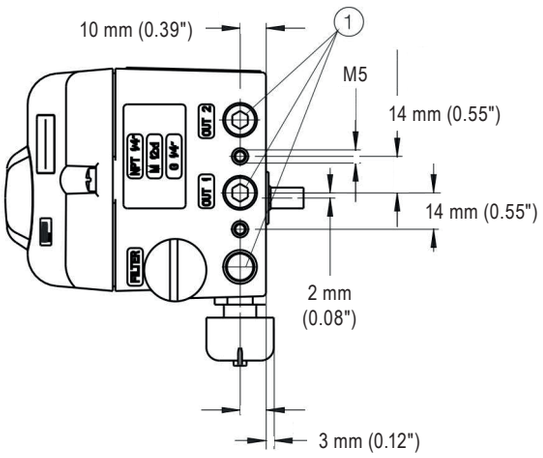



1. Threaded hole M8 (10 mm [0.39"] deep)
2. Threaded hole M6 (8 mm deep [0.31"])
3. Threaded hole M5 x 0.5 (air outputs for direct mount)
4. Sensor shaft (shown larger than scale)

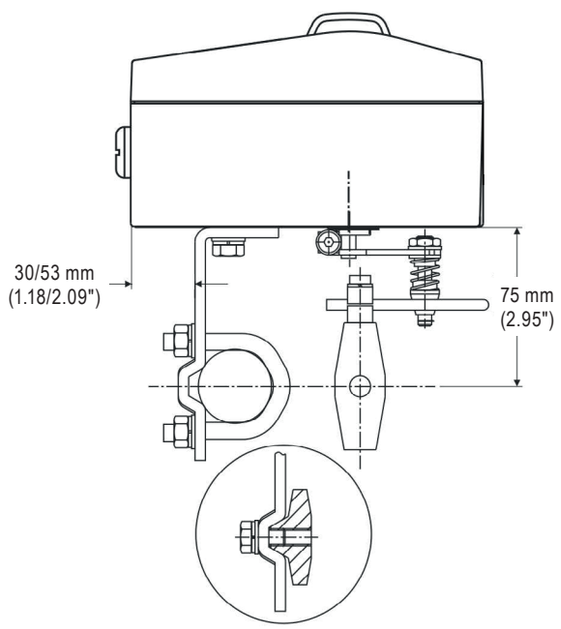
**Dimensions** **(approximate) in mm (and inches)**

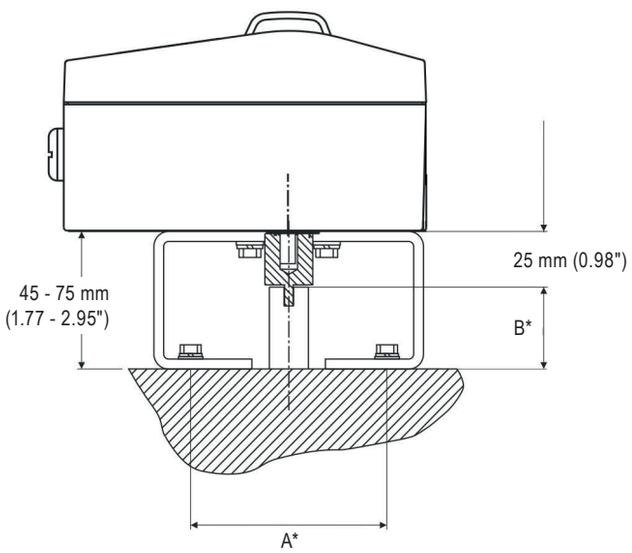



1 Pneumatic connections, NPT ¼ in-18






* Dimensions A and B depend on the rotary actuator

## Rotary positioner mounting kits

| Actuator mounting dimensions | Spirax kit nomenclature |
|---|---|
| 80/20 mm | AKR13 |
| 80/30 mm | AKR14 |
| 130/30 mm | AKR15 |
| 130/50 mm | AKR16 |

For BVA actuators the AKR14 mounting kit is required.



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## Positioner options for SP7-10 - 4-20 mA or 4-20mA with HART

| | | | |
|---|---|---|---|
| Standard | Case/Mounting | Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | 10 |
| | | Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | 20 |
| | | Remote sensor control unit (Note 1) | 70 |
| | Input/Communication Port | Input 4 ... 20 mA, two-wire, with connector plug for LKS adapter | 1 |
| | | Input 4 ... 20 mA, two-wire, with connector plug for LKS adapter and FSK module for HART communication | 2 |
| | Explosion Protection | Without | 0 |
| | | ATEX II 2 G Ex ib IIC T6, T4...T1 Gb | 1 |
| | | IECEx Ex ib IIC T6, T4...T1 Gb | 5 |
| | | NEPSI EX ib IIC T4/T6 Gb | V |
| | Output/Safe Position (in case of an electrical power failure) | Single acting, fail safe | 1 |
| | | Single acting, fail freeze | 2 |
| | | Double acting, fail safe (Note 2) | 4 |
| | | Double acting, fail freeze (Note 2) | 5 |
| | Connections | Cable: Thread ½-14 NPT, air pipe: Thread ¼-18 NPT | 2 |
| | | Cable: Thread M20 x 1.5, air pipe: Thread ¼-18 NPT | 5 |
| | Option Modules for Analog or Digital Position Feedback | Without | 0 |
| | | Plug-in module for analog position feedback, signal range 4 ... 20 mA, two-wire | 1 |
| | | Plug-in module for digital position feedback | 3 |
| | | Plug-in module for analog position feedback, signal range 4 ... 20 mA, two-wire, and digital position feedback | 5 |
| | Optional Mechanical Kit for Digital Position Feedback | Without | 00 |
| | | Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1) (Note 3) | 10 |
| | | Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note 4) | 50 |
| | Design (Varnish/Coding) | Standard | 1 |
| | | Higher Stiffness + Lower Air Capacity | H |
| | | Protection Class IP 66/NEMA 4X | P |
| | | Increased Corrosion Protection incl. Protection Class IP66 | S |

4.4
5

**Positioner options continued on next page**



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## Positioner options for SP7-10 - 4-20 mA or 4-20mA with HART (continued)

| | | | |
|---|---|---|---|
| Optional | Device Identification Label | Stainless steel 18.5 x 65 mm (0.73 x 2.56") (Note 7) | MK1 |
| | | Sticker 11 x 25 mm (0.43 x 0.98") | MK3 |
| | Remote Sensor | Basic unit (Note 8) | RS |
| | | Basic unit with position indicator (Note 8) | RD |
| | Remote Sensor Temperature Range | Extended ambient temperature range -40 ... 100 °C (-40 ... 212 °F) (Note 8) | RT |
| | Remote Sensor Vibration Resistance | Advanced vibration range 2 g @ 300 Hz (Note 8) | RV |
| | Remote Sensor Protection Class | Protection class IP 67 (Note 8) | RP |
| | Remote Sensor Cable | 5 m cable enclosed (Note 8) | R5 |
| | | 10 m cable enclosed (Note 8) | R6 |

**SP7-10**

Note 1: With standard characteristic curve, if delivered without remote sensor
Note 2: Not for for integral mounting
Note 3: Only for model with mechanical position indicator
Note 4: Not for explosion protected version and only for model with mechanical position indicator
Note 5: Details on request
Note 7: Plain text, max. 16 letters
Note 8: Only with remote sensor control unit



**Ordering Code Example:**

| SP7-10 | - | 20 | 1 | 0 | 1 | 5 | 0 | 00 | 1 |
|---|---|---|---|---|---|---|---|---|---|



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## Positioner options for SP7-11 - PROFIBUS PA

| | | | |
|---|---|---|---|
| **Standard** | **Case/Mounting** | Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | **10** |
| | | Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | **20** |
| | **Input/Communication Port** | PROFIBUS PA | **3** |
| | **Explosion Protection** | Without | **0** |
| | | ATEX II 2 G Ex ib IIC T6, T4...T1 Gb | **3** |
| | | IECEx Ex ib IIC T6, T4...T1 Gb | **M** |
| | | NEPSI EX ib IIC T4/T6 Gb | **V** |
| | **Output/Safe Position (in case of an electrical power failure)** | Single acting, fail safe | **1** |
| | | Single acting, fail freeze | **2** |
| | | Double acting, fail safe | **4** |
| | | Double acting, fail freeze | **5** |
| | **Connections** | Cable: Thread ½-14 NPT, air pipe: Thread ¼-18 NPT | **2** |
| | | Cable: Thread M20 x 1.5, air pipe: Thread ¼-18 NPT | **5** |
| | **Option Module for Shutdown Function** | Without | **0** |
| | **Optional Mechanical Kit for Digital Position Feedback** | Without | **00** |
| | | Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1) (Note: 1) | **10** |
| | | Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note: 2) | **50** |
| | **Design (Varnish/Coding)** | Standard | **1** |
| | | Higher Stiffness + Lower Air Capacity | **H** |
| | | Increased Corrosion Protection incl. Protection Class IP66 | **S** |
| **Optional** | **Device Identification Label** | Stainless steel 18.5 x 65 mm (0.73 x 2.56") (Note: 4) | **MK1** |
| | | Sticker 11 x 25 mm (0.43 x 0.98") | **MK3** |

**SP7-11**

Note 1: Only for model with mechanical position indicator
Note 2: Not for explosion protected version and only for model with mechanical position indicator
Note 3: (Details on request)
Note 4: Plain text, max. 16 letters

**Ordering Code Example:** | SP7-11 | - | 20 | 1 | 0 | 1 | 5 | 0 | 00 | 1 |



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## Positioner options for SP7-12- FOUNDATION Fieldbus

| | | | |
|---|---|---|---|
| Standard | Case/Mounting | Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | 10 |
| | | Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | 20 |
| | Input/Communication Port | FOUNDATION Fieldbus | 4 |
| | Explosion Protection | Without | 0 |
| | | ATEX II 2 G Ex ib IIC T6, T4...T1 Gb | 3 |
| | | IECEx Ex ib IIC T6, T4...T1 Gb | M |
| | | NEPSI EX ib IIC T4/T6 Gb | V |
| | Output/Safe Position (in case of an electrical power failure) | Single acting, fail safe | 1 |
| | | Single acting, fail freeze | 2 |
| | | Double acting, fail safe | 4 |
| | | Double acting, fail freeze | 5 |
| | Connections | Cable: Thread ½-14 NPT, air pipe: Thread ¼-18 NPT | 2 |
| | | Cable: Thread M20 x 1.5, air pipe: Thread ¼-18 NPT | 5 |
| | Option Module for Shutdown Function | Without | 0 |
| | Optional Mechanical Kit for Digital Position Feedback | Without | 00 |
| | | Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1) (Note: 1) | 10 |
| | | Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note: 2) | 50 |
| | Design (Varnish/ Coding) | Standard | 1 |
| | | Higher Stiffness + Lower Air Capacity | H |
| | | Increased Corrosion Protection incl. Protection Class IP66 | S |
| | CCC Certification | 3CC for Ex i & CCC for Ex d | CCC |
| Optional | Device Identification Label | Stainless steel 18.5 x 65 mm (0.73 x 2.56") (Note: 4) | MK1 |
| | | Sticker 11 x 25 mm (0.43 x 0.98") | MK3 |

**SP7-12**

Note 1: Only for model with mechanical position indicator
Note 2: Not for explosion protected version and only for model with mechanical position indicator
Note 3: (Details on request)
Note 4: Plain text, max. 16 letters

**Ordering Code Example:** SP7-12 - 20 1 0 1 5 0 00 1

## Safety information, installation and maintenance

Full details are contained in the SP7-1* digital positioner Installation and Maintenance Instructions.

## Mounting/linkage kit : Positioner mounting kits will be supplied for central mounting as standard.

| Actuator Model | Valve Models | Valve Sizes | Spirax kit Nomenclature |
|---|---|---|---|
| **PN9100** | Spira-trol two port and QL three port | DN15 to DN50 | AKL10 |
| **PN9200** | | DN15 to DN100 | AKL10 |
| **PN9300** | | DN15 to DN100 | AKL10 |
| **PN9400** | | DN125 to DN300 | AKL17 |
| **TN2150** | Spira-trol two port and QL three port | DN15 to DN100 | AKL10 |
| **TN2300** | | DN125 to DN300 | AKL17 |
| | | DN125 to DN300 | AKL17 |
| **TN2400** | Spira-trol two port and QL three port | DN125 to DN300 | AKL17 |
| | | DN125 to DN300 | AKL17 |
| **TN2270** | | DN125 to DN300 | AKL17 |
| | | DN125 to DN300 | AKL17 |
| **PN3000 Sprg Ext** | LE, LEA and Steri-trol | DN15 to DN100 | AKL10 |
| **PN4000 Sprg Ret** | | DN15 to DN100 | AKL10 |
| **PN5000** | KE, KEA, LE and LEA | DN15 to DN100 | AKL10 +UBC |
| **PN6000** | | DN15 to DN100 | AKL10 + UBC |
| **PN5000** | QL three port | DN125 to DN200 | AKL11 + UBC |
| **PN6000** | | DN125 to DN200 | AKL11 + UBC |
| **PN1600** | 'C' series | DN65 to DN100 | AKL11 |
| **PN1600** | | DN125 to DN200 | AKL11 |
| **PN1600** | Spira-trol | DN125 to DN300 | AKL11 |



## Gauge blocks

| | | Spirax Nomenclature | Weight |
|---|---|---|---|
| **6 bar/87 psi NPT ¼"** | Single acting | GBS6A | 0.28 kg |
| | Double acting | GBD6A | 0.32 kg |
| **0.6 MPa/87 psi NPT ¼"** | Single acting | GBS06A | 0.28 kg |
| | Double acting | GBD06A | 0.32 kg |

## How to order

**Example:** 1 off Spirax Sarco SP7-10-2010150001 Smart positioner with AKL10 mounting kit and GBS6A gauge block..
**Caution:** The SP7-1* positioner must have a high quality air supply to ISO 8573-1:2010 Class 3:3:3.



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# 4 Control systems
## Positioners and controllers

TI-P706-04
CTLS Issue 3

# SP7-20, SP7-21 and SP7-22 Smart Positioner

## Description

The SP7-2* is an electronically configurable positioner with communication capabilities designed for mounting on pneumatic linear or rotary actuators. It features a small and compact design, a modular construction, and an excellent cost-performance ratio. Fully automatic determination of the control parameters and adaptation to the positioner allow for considerable time savings as well as optimum control behaviour.

The positioner has a local communication interface (LCI) as standard in the SP7-20. Additionally, a 'HART® communication' option for communication via the 20 mA signal is available. Both communications are based on the HART® Protocol. Alternatively, HART®5 or HART®7 are available.

Other available options are the SP7-21 with a PROFIBUS PA module or the SP7-22 with FOUNDATION Fieldbus module.

In addition to its input for the analog position set point, the positioner is equipped with a digital input which can be used to activate control system functions in the device. A digital output allows you to output collective messages (alarms/faults).

Throughout the document SP7-2* is written where the information is relevant to all versions; the SP7-20, SP7-21 and SP7-22. Where the information is specific it will be referenced as the version appropriate.

## Air supply

The SP7-2* positioner must be provided with a high quality air supply to ISO 8573-1:2010 Class 3:3:3

## Approvals

| | | |
|---|---|---|
| Ex | **ATEX rating** | II 2 G Ex db IIC T4/T5/T6 Gb |
| | **IECEx rating** | Ex db IIC T4/T5/T6 Gb |
| CCC | **CCC** (China) | Ex d mb IIB T5 Gb |
| Ex NEPSI | **NEPSI rating** | EX d IIC T4/T5/T6 Gb |

## Applications

The SP7-2* can be used with any actuator that conforms to NAMUR, this includes all of the following Spirax Sarco pneumatic actuators:

- **BVA300 rotary**
- **PN1600 series**
- **PNS3000** and **PNS4000 series**
- **PN9000 series**
- **TN2000 series**



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## Materials

| Part | Material | Finish |
|---|---|---|
| Case and cover | Die cast aluminium | Case - Anti-corrosive paint, Black |
| | | Cover - Anti-corrosive paint to RAL9016 |
| Mounting kits | Stainless steel | - |
| Follower pin cone | Nylon | - |

## Technical data

| | | |
|---|---|---|
| **Input signal** | 4-20 mA (split range minimum amplitude 8 mA) or PROFIBUS PA or FOUNDATION Fieldbus | |
| **Impedance** | Max 485 +/- 15 Ω (for 4-20mA input signal only) | |
| **Air supply** | 1.4 to 6.0 bar | |
| **Air quality** | ISO 8573-1:2010 Class 3:3:3 | |
| **Output pressure** | 0 to 100% supply pressure | |
| **Actuator stroke** | 20 mm to 150 mm or 55 ° to 90 ° | |
| **Action** | Single acting/fail vent/Double acting | |
| **Operating temperature** | −40 to 85 °C | |
| **Air connections** | ¼" NPT female | |
| **Deviation** | ≤ 0.5 % | |
| **Tolerance band** | 0.3 to 10 %, adjustable | |
| **Configurable dead zone** | 0.1 to 10 %, adjustable for 4-20 mA, HART and PROFIBUS PA, 0.1 to 5 % for FOUNDATION Fieldbus | |
| **Resolution (AD-conversion)** | > 16,000 steps | |
| **Sampling frequency** | 20 ms (for 4-20mA input signal only). | |
| **Ambient temperature effect** | ≤ 0.5 % per 10 K | |
| **Reference temperature** | 20 °C | |
| **Influence of vibration** | ≤ 1 % to 10 g and 80 Hz | |
| **Degree of protection** | IP65 | |
| **Weight** | Linear mounting kit - 0.78 kg | |
| | Rotary mounting kit - 0.4 kg | |
| | Positioner (without mounting kits or gauge blocks) - 3.0 kg | |
| **Basic positioner options** | SP7-20 | 4-20 mA or 4-20 mA with HART |
| | SP7-21 | PROFIBUS PA |
| | SP7-22 | FOUNDATION Fieldbus |


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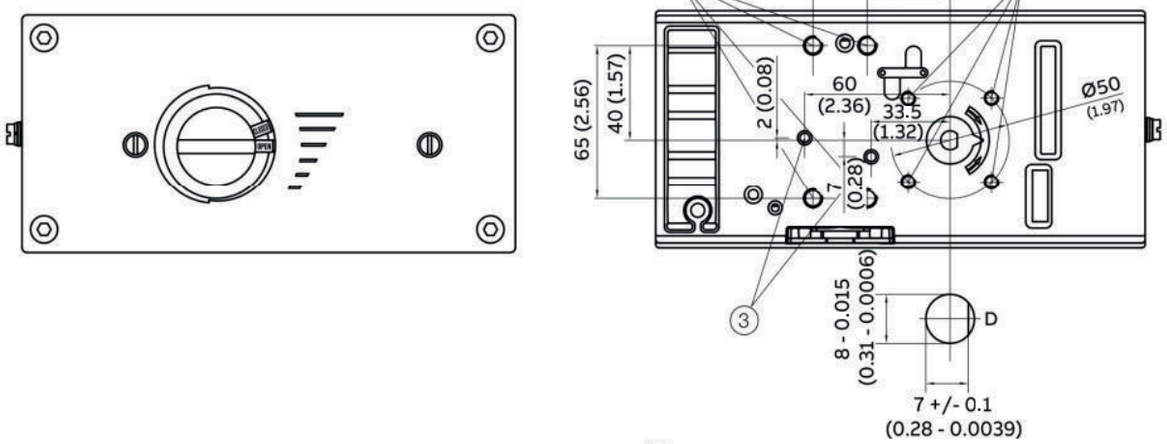
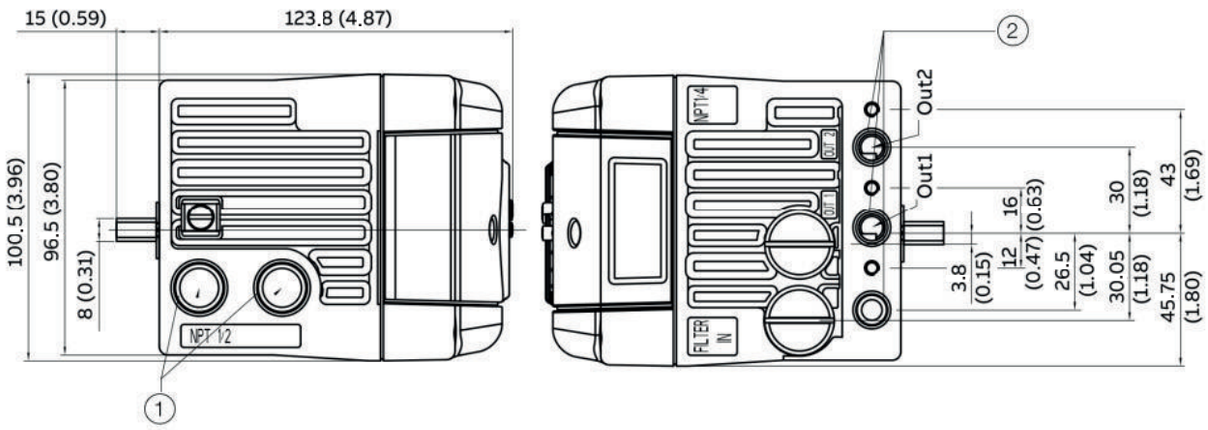
## Dimensions (approximate) in mm (and inches)




1. Threaded hole M8 (10 mm (0.39") deep)
2. Threaded hole M6 (8 mm (0.31") deep)
3. Threaded hole M5 x 0.5 (air outputs for integral mount)




1. NPT ½" or M20 x 1.5
2. Pneumatic connections, NPT ¼" - 18 oder G¼"





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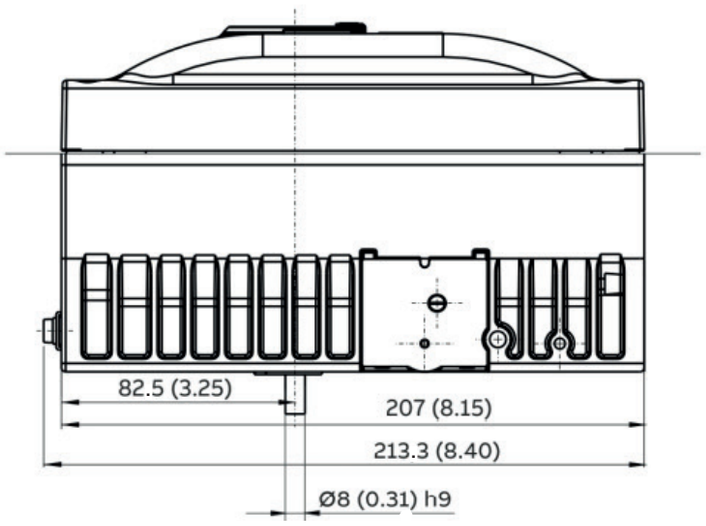
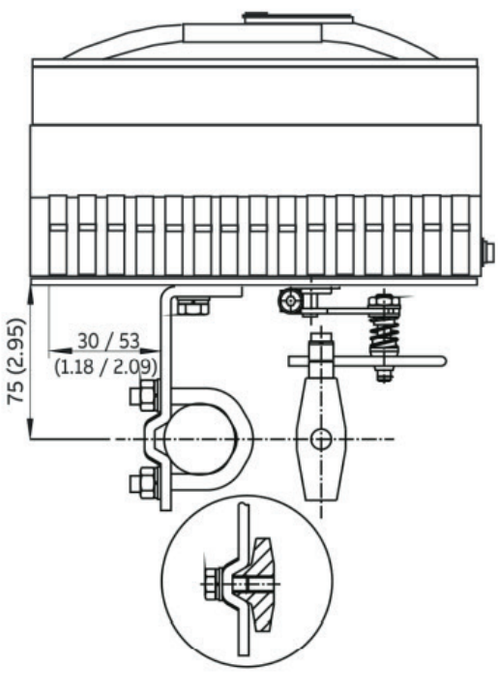
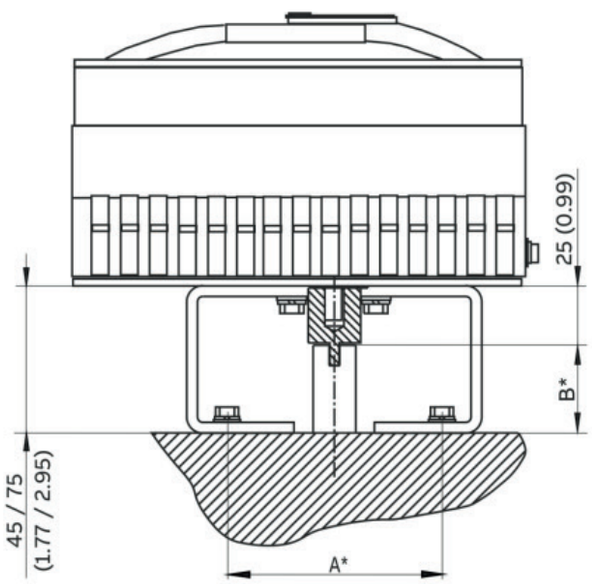
**Dimensions** (approximate) in mm (and inches)






* Dimensions A and B depend on the rotary actuator

## Rotary positioner mounting kits

| Actuator mounting dimensions | Spirax kit nomenclature |
|---|---|
| 80/20 mm | AKR13 |
| 80/30 mm | AKR14 |
| 130/30 mm | AKR15 |
| 130/50 mm | AKR16 |

For BVA actuators the AKR14 mounting kit is required.



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## Positioner options - SP7-20 - 4-20mA or 4-20 mA with HART

| | | | |
|---|---|---|---|
| Standard | Case/Mounting | Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | 10 |
| | | Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | 20 |
| | Operation | With operator panel and display integrated in the enclosure cover | 1 |
| | Explosion Protection | ATEX II 2G Ex db II C T4/T5/T6 Gb | 1 |
| | | IECEx Ex db II C T4/T5/T6 Gb | 6 |
| | | NEPSI EX d IIC T4/T5/T6 Gb | X |
| | Output/Safe Position (in case of an electrical power failure) | Single acting, fail safe | 1 |
| | | Single acting, fail freeze | 2 |
| | | Double acting, fail safe | 3 |
| | | Double acting, fail freeze | 4 |
| | Connections | Cable: Thread M20 x 1.5, air pipe: Thread 1/4-18 NPT | 2 |
| | | Cable: Thread 1/2-14 NPT, air pipe: Thread 1/4-18 NPT | 3 |
| | Option Modules for Analog or Digital Position Feedback | Without | 0 |
| | | Plug-in module for analog position feedback, signal range 4 ... 20 mA, two-wire | 1 |
| | | Plug-in module for digital position feedback | 3 |
| | | Plug-in module for analog position feedback, signal range 4 ... 20 mA, two-wire, and digital position feedback | 4 |
| | Optional Mechanical Kit for Digital Position Feedback | Without | 0 |
| | | Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1) | 1 |
| | | Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note 2) | 3 |
| | Parameter Setting/Bus Address | Factory setting for HART devices | 1 |
| | Design (Varnish/Coding) | Standard | 1 |
| | | Higher Stiffness + Lower Air Capacity | H |
| | | Protection Class IP 66 | P |
| | Device Identification Label | Without | 0 |
| | | Label (Note 3) | 1 |
| | | Stainless steel 18.5 x 65 mm (0.73 x 2.56 in.) (Note 3) | 2 |
| Optional | SIL2 - Declaration of Conformity | SIL2 - Declaration of Conformity (Note 4) | CS2 |
| | CCC Certification | 3CC for Ex i & CCC for Ex d | CCC |

**SP7-20**

Note 1: Only with cable connection NPT thread
Note 2: Only for Ex d version
Note 3: Plain text, max. 16 letters
Note 4: With single acting, fail safe pneumatic only

**Ordering Code Example:** SP7-20 | 10 | 1 | 1 | 3 | 2 | 0 | 1 | 1 | 1 | 2



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## Positioner options - SP7-21 - PROFIBUS PA

| | | | |
|---|---|---|---|
| Standard | Case/Mounting | Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | 10 |
| | | Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | 20 |
| | Operation | With operator panel and display integrated in the enclosure cover | 1 |
| | Explosion Protection | ATEX II 2G Ex db II C T4/T5/T6 Gb | 1 |
| | | IECEx Ex db II C T4/T5/T6 Gb | 6 |
| | | NEPSI EX d IIC T4/T5/T6 Gb | X |
| | Output/Safe Position (in case of an electrical power failure) | Single acting, fail safe | 1 |
| | | Single acting, fail freeze | 2 |
| | | Double acting, fail safe | 3 |
| | | Double acting, fail freeze | 4 |
| | Connections | Cable: Thread M20 x 1.5, air pipe: Thread 1/4-18 NPT | 2 |
| | | Cable: Thread 1/2-14 NPT, air pipe: Thread 1/4-18 NPT | 3 |
| | Option Module for Shutdown Function | Without | 0 |
| | Optional Mechanical Kit for Digital Position Feedback | Without | 03 |
| | | Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1) | 13 |
| | | Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note 2) | 33 |
| | Design (Varnish/Coding) | Standard | 1 |
| | | Higher Stiffness + Lower Air Capacity | H |
| | | Protection Class IP 66 | P |
| | Device Identification Label | Without | 0 |
| | | Label including text, with separate sticker (Note 3) | 1 |
| | | Stainless steel 18.5 x 65 mm (0.73 x 2.56 in.) (Note 3) | 2 |
| Optional | CCC Certification | 3CC for Ex i & CCC for Ex d | CCC |

**SP7-21**

Note 1: Only with cable connection NPT thread
Note 2: Only for Ex d version
Note 3: Plain text, max. 16 letters

**Ordering Code Example:** SP7-21 | 20 | 1 | 1 | 2 | 2 | 0 | 0 | 3 | 1 | 0



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## Positioner options - SP7-22 - FOUNDATION Fieldbus

| | | | |
|---|---|---|---|
| Standard | Case/Mounting | Case made of aluminium, varnished, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | 10 |
| | | Case made of aluminium, varnished, with mechanical position indicator, for mounting to linear actuators acc. DIN/IEC 534/NAMUR or to rotary actuators acc. VDI/VDE 3845 | 20 |
| | Operation | With operator panel and display integrated in the enclosure cover | 1 |
| | Explosion Protection | ATEX II 2G Ex db II C T4/T5/T6 Gb | 1 |
| | | IECEx Ex db II C T4/T5/T6 Gb | 6 |
| | | NEPSI EX d IIC T4/T5/T6 Gb | X |
| | Output/Safe Position (in case of an electrical power failure) | Single acting, fail safe | 1 |
| | | Single acting, fail freeze | 2 |
| | | Double acting, fail safe | 3 |
| | | Double acting, fail freeze | 4 |
| | Connections | Cable: Thread M20 x 1.5, air pipe: Thread 1/4-18 NPT | 2 |
| | | Cable: Thread 1/2-14 NPT, air pipe: Thread 1/4-18 NPT | 3 |
| | Option Modules for Shutdown Function | Without | 0 |
| | Optional Mechanical Kit for Digital Position Feedback | Without | 04 |
| | | Mechanical kit for digital position feedback with proximity switches SJ2-SN (NC or logical 1) | 14 |
| | | Mechanical kit for digital position feedback with 24 V AC/DC microswitches (change-over contacts) (Note 2) | 34 |
| | Design (Varnish/Coding) | Standard | 1 |
| | | Higher Stiffness + Lower Air Capacity | H |
| | | Protection Class IP 66 | P |
| | Device Identification Label | Without | 0 |
| | | Label including text, with separate sticker (Note 3) | 1 |
| | | Stainless steel 18.5 x 65 mm (0.73 x 2.56 in.) (Note 3) | 2 |
| Optional | CCC Certification | 3CC for Ex i & CCC for Ex d | CCC |

**SP7-22**

Note 1: Only with cable connection NPT thread
Note 2: Only for Ex d version
Note 3: Plain text, max. 16 letters

**Ordering Code Example:** SP7-22 | 10 | 1 | 1 | 3 | 2 | 0 | 34 | P | 2





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## Mounting/linkage kit : Positioner mounting kits for central mounting

| Actuator Model | Valve Models | Valve Sizes | Spirax kit Nomenclature |
|---|---|---|---|
| **PN9100** | Spira-trol two port and QL three port | DN15 to DN50 | AKL10 |
| **PN9200** | | DN15 to DN100 | AKL10 |
| **PN9300** | | DN15 to DN100 | AKL10 |
| **PN9400** | | DN125 to DN300 | AKL17 |
| **TN2150** | Spira-trol two port and QL three port | DN15 to DN100 | AKL10 |
| **TN2300** | | DN125 to DN300 | AKL17 |
| | | DN125 to DN300 | AKL17 |
| **TN2400** | Spira-trol two port and QL three port | DN125 to DN300 | AKL17 |
| | | DN125 to DN300 | AKL17 |
| **TN2270** | | DN125 to DN300 | AKL17 |
| | | DN125 to DN300 | AKL17 |
| **PN3000 Sprg Ext** | LE, LEA and Steri-trol | DN15 to DN100 | AKL10 |
| **PN4000 Sprg Ret** | | DN15 to DN100 | AKL10 |
| **PN5000** | KE, KEA, LE and QL three port | DN15 to DN100 | AKL10 +UBC |
| **PN6000** | | DN15 to DN100 | AKL10 + UBC |
| **PN5000** | QL three port | DN125 to DN200 | AKL11 + UBC |
| **PN6000** | | DN125 to DN200 | AKL11 + UBC |
| **PN1600** | ''C' series | DN65 to DN100 | AKL11 |
| **PN1600** | | DN125 to DN200 | AKL11 |
| **PN1600** | Spira-trol | DN125 to DN300 | AKL11 |



### BVA actuators

For BVA actuators the AKR14 mounting kit is required.

### Gauge blocks

| | | Spirax Nomenclature | Weight |
|---|---|---|---|
| **6 bar/87 psi NPT¼"** | Single acting | GBS6A | 0.28 kg |
| | Double acting | GBD6A | 0.32 kg |
| **0.6 Mpa/87 psi NPT¼"** | Single acting | GBS06A | 0.28 kg |
| | Double acting | GBD06A | 0.32 kg |

### How to order

**Example:** 1 off Spirax Sarco SP7-20-10113201112 Smart positioner with AKL10 mounting kit and GBS6A gauge block.
**Caution:** The SP7-20 positioner must have a high quality air supply to ISO 8573-1:2010 Class 3:3:3.



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TI-P707-02
CTLS Issue 1

# SP8-10
# Smart Positioner

## Description

The SP8-10 is an electronically configurable positioner with communication capabilities designed for mounting on pneumatic linear or rotary actuators. It features a small and compact design, a modular construction, and an excellent cost-performance ratio. Fully automatic determination of the control parameters and adaptation to the positioner allow for considerable time savings as well as optimum control behavior.
An I/P module with subsequent pneumatic amplifier is used to control the pneumatic actuator. The well-proven I/P module proportionally converts the permanent electrical set point signal from the CPU into a pneumatic signal used to adjust a 3/3-way valve. Dosing of the air flow for pressurizing or depressurizing the actuator is continuously adjusted. As a result, excellent control results are achieved. When reaching the set point, the 3/3-way valve is closed in centre position to minimize the air consumption. The pneumatic system can be supplied in four versions: for single acting and double acting actuators and each with the 'fail-safe' / 'fail-freeze' safety function.
In addition to its input for the analogue position set point, the positioner is equipped with a digital input which can be used to activate control system functions in the device. A digital output allows you to output collective messages (alarms / faults).

## Applications

The SP8-10 can be used with any actuator that conforms to NAMUR, this includes all of the following Spirax Sarco pneumatic actuators:

| |
|---|
| **BVA300 rotary** |
| **PN1600 series** |
| **PNS3000** and **PNS4000 series** |
| **PN9000 series** |
| **TN2000 series** |

## Materials

| Part | Material | Finish |
|---|---|---|
| Case and cover | Die cast aluminium | Case - Anti-corrosive paint, Black |
| | | Cover - Anti-corrosive paint to RAL9016 |
| Mouting kits | Stainless steel | - |
| Follower pin cone | Nylon | - |



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## Technical data

| | |
|---|---|
| **Input signal range** | 4-20 mA (split range minimum amplitude 8 mA) |
| **Impedance** | 485 ohms at 20mA |
| **Output pressure** | 0 to 10 bar (0 to 145 psi) |
| **Actuator stroke** | Min. and max. limits, freely configurable in range 0 to 100 % |
| **Action** | Single acting/fail vent/Double acting |
| **Operating temperature** | −40 to 85 °C |
| **Air connections** | ¼" NPT female |
| **Deviation** | ≤ 0.5 % |
| **Tolerance band** | 0.3 to 10 %, adjustable |
| **Configurable dead zone** | 0.1 to 10 %, adjustable |
| **Resolution (AD-conversion)** | > 16,000 steps |
| **Sampling frequency** | 20 ms |
| **Ambient temperature effect** | ≤ 0.5 % per 10 K |
| **Reference temperature** | 20 °C |
| **Influence of vibration** | ≤ 1 % to 10 g and 80 Hz |
| **Degree of protection** | IP65 |
| **Weight** | Linear mounting kit - 0.78 kg |
| | Rotary mounting kit - 0.4 kg |





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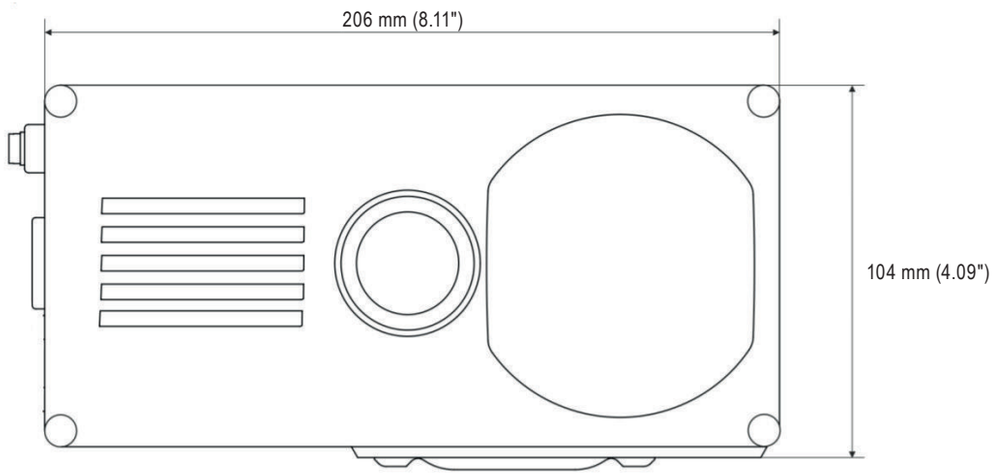
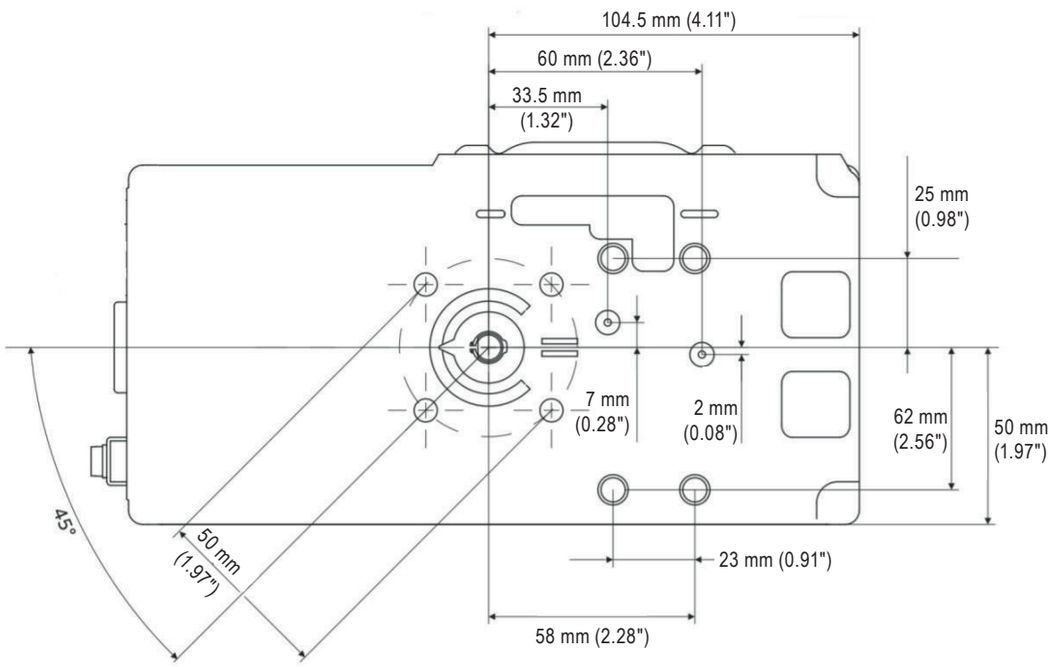
## Dimensions (approximate) in mm (and inches)



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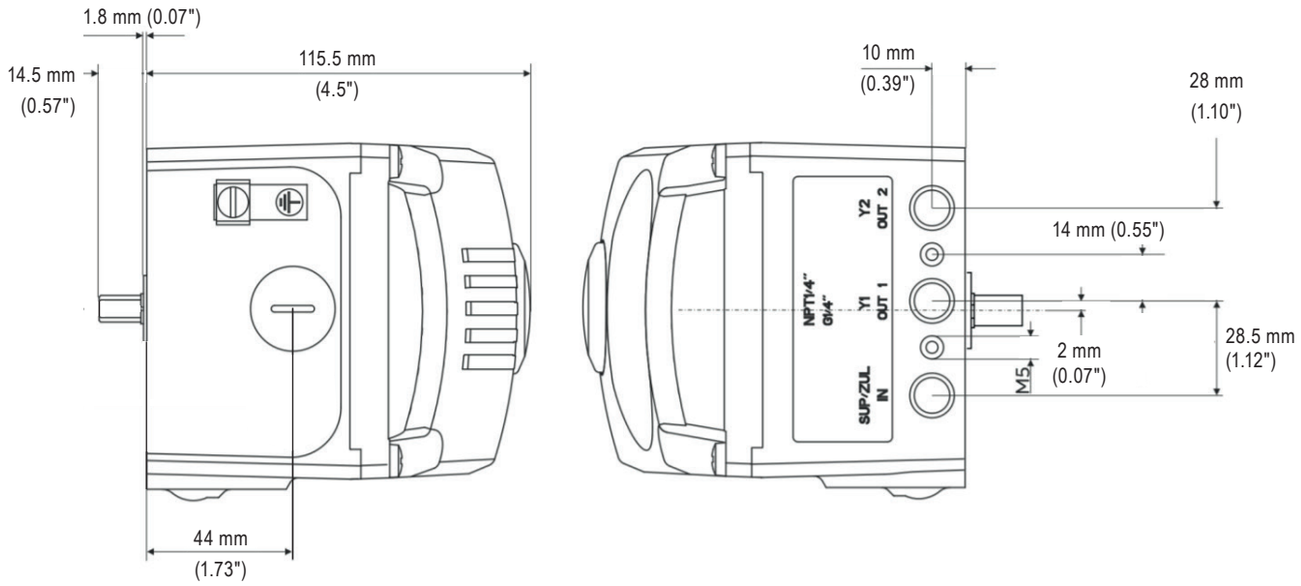
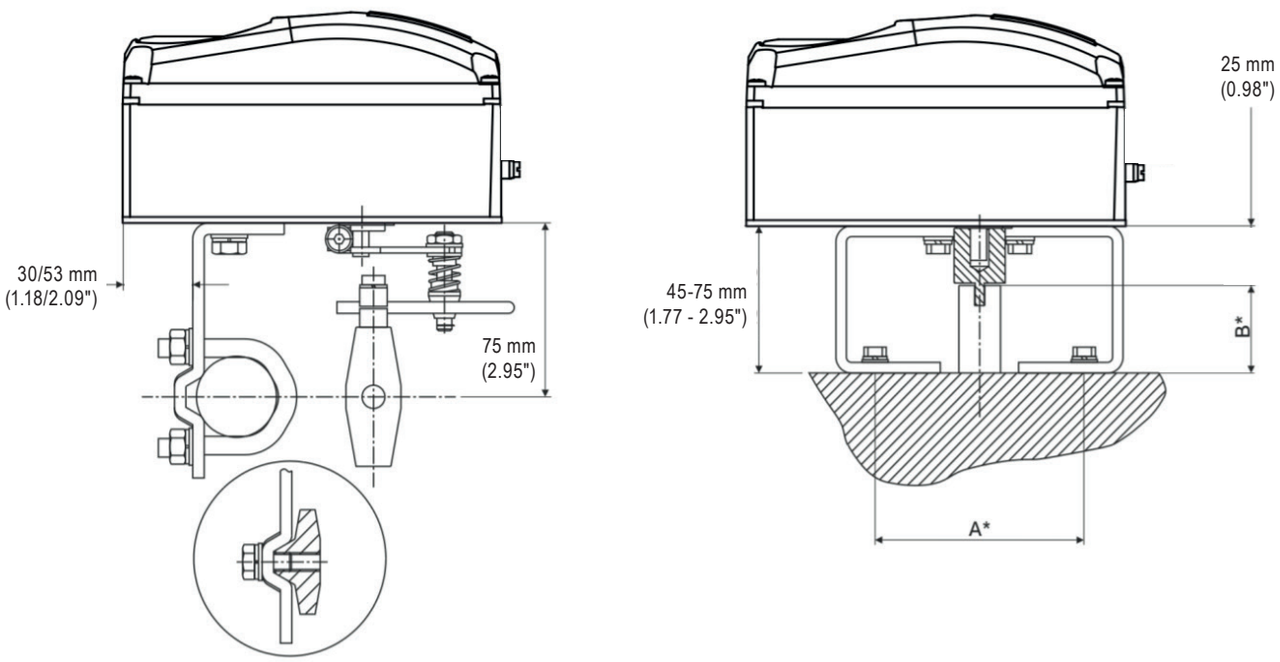
# Control systems

## Positioners and controllers

**Dimensions** **(approximate) in mm (and inches)**






### Rotary positioner mounting kits

| Actuator mounting dimensions | Spirax kit nomenclature |
|---|---|
| 80/20 mm | AKR13 |
| 80/30 mm | AKR14 |
| 130/30 mm | AKR15 |
| 130/50 mm | AKR16 |

For BVA actuators the AKR14 mounting kit is required.



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## Positioner options for SP8-10

| | | | |
|---|---|---|---|
| Standard | Explosion Protection Certification | Without | Y0 |
| | | ATEX II 1G Ex ia IIC / II 1D Ex ia IIIC | A1 |
| | | ATEX II 3G Ex nA IIC | B2 |
| | | ATEX II 2D Ex tb IIIC | B3 |
| | | FM / CSA Intrinsically Safe Class I, II, III Div. 1 Groups A, B, C, D, E, F, G | F1 |
| | | IECEx Ex ia IIC Ga / Ex ia IIIC Da | M1 |
| | | IECEx Ex nA IIC Gc | N2 |
| | | IECEx Ex tb IIIC Db | N3 |
| | | NEPSI - EX ia II C T4/T6 Ga | S1 |
| | | KOSHA Korea - Ex ia II C T6 | S5 |
| | | UKCA Ex ia IIC Ga / Ex ia IIIC Da | U1 |
| | | UKCA Ex nA IIC Gc | U2 |
| | | UKCA Ex tb IIIC Db | U3 |
| | Input Signal / Communication Port | 4 ... 20 mA | A |
| | | HART digital communication and 4 ... 20 mA | H |
| | Pneumatic Output Type | Single acting | 1 |
| | | Double acting | 2 |
| | Safe Position | Fail-safe | S |
| | | Fail-freeze | F |
| | Air Pipe Connection | Thread 1/4-18 NPT female (Note: 1) | 2 |
| | Cable Conduits | Thread M20 x 1.5 female | C |
| | | Thread NPT 1/2 in. female (Note: 1) | D |
| Optional | Option Module Slot 1 | Analogue feedback output | A1 |
| | | Digital feedback output | A2 |
| | | Analogue universal input | A3 |
| | Option Module Slot 2 | Analogue feedback output | B1 |
| | | Digital feedback output | B2 |
| | | Analogue universal input | B3 |
| | | Emergency shutdown module | B4 |
| | Option, Air Power | 50kg/h | L5 |
| | Usage Certifications | SIL 2 - Declaration of Conformity (Note: 2) | CS |
| | CCC Certification | CCC- approval for Ex i | CC |
| | Position Indicator | Visual Indicator, integrated into cover | D1 |
| | Limit Switches | Microswitches (Note: 3) | F1 |
| | | Proximity switches (NC) SJ2-SN (Note: 4) | F2 |
| | Housing Material | Stainless steel | H1 |
| | Position Sensor Type | With integrated (contactless) position sensor | K1 |
| | | Control Unit for remote position sensor (Note: 3) | K2 |

When the stainless steel housing material is selected, gauge blocks will automatically be S/S

**Positioner options for SP8-10 continued on next page**



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## Positioner options for SP8-10 (continued)

| | | | |
|---|---|---|---|
| **Optional** | **Special Applications** | EDP300 ON / OFF available from Q2 /2020 | P7 |
| | | Operation with natural gas (Note: 5) | P8 |
| | | Operation with natural gas (Housing Material: Stainless steel) (Note: 5) | P8 |
| | | With noise reduction | P9 |
| | **Pressure Gauge Block Type** | 0 ... 1 MPa (0 ... 10 bar, 0 ... 145 psi) | R3 |
| | | 0 ... 1 MPa (0 ... 10 bar, 0 ... 145 psi) (Housing Material: Stainless steel) | R3 |
| | **Diagnosis Module** | Pressure sensors | S3 |
| | **Additional TAG Plate** | Stainless steel 18.5 mm x 65 mm (0.73 in. x 2.5 in.) | T1 |
| | | Sticker 11 mm x 25 mm (0.44 in. x 1 in.) (Note: 3) | T3 |
| | **Mounting Options** | Prepared for integral mounting | V1 |
| | **Remote Sensor** | Basic unit | RS |
| | | Basic unit (Housing Material: Stainless steel) | RS |
| | **Remote Sensor Temperature Range** | Extended ambient temperature range -40 ... 100 °C (-40 ... 212 °F) | RT |
| | **Remote Sensor Vibration Resistance** | Advanced vibration range 2 g @ 300 Hz | RV |
| | **Remote Sensor Protection Class** | Protection class IP 66 | RP |
| | **2Remote Sensor Cable** | 5 m cable enclosed | R5 |
| | | 10 m cable enclosed | R6 |

**SP8-10**

Note 1: Needed for FM / CSA certification
Note 2: With single acting, fail safe pneumatic only
Note 3: Not for Ex-versions
Note 4: Not for IECEx-versions
Note 5: Only with Explosion protection

**Ordering Code Example:** | SP8-10 | Y0 | H | 2 | F | 2 | C |



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## Safety information, installation and maintenance

Full details are contained in the SP8-10 digital positioner Installation and Maintenance Instructions.

## Mounting/linkage kit : Positioner mounting kits will be supplied for central mounting as standard.

| Actuator Model | Valve Models | Valve Sizes | Spirax kit Nomenclature |
|---|---|---|---|
| **PN9100** | Spira-trol two port and QL three port | DN15 to DN50 | AKL10 |
| **PN9200** | | DN15 to DN100 | AKL10 |
| **PN9300** | | DN15 to DN100 | AKL10 |
| **PN9400** | | DN125 to DN300 | AKL17 |
| **TN2150** | Spira-trol two port and QL three port | DN15 to DN100 | AKL10 |
| **TN2300** | | DN125 to DN300 | AKL17 |
| | | DN125 to DN300 | AKL17 |
| **TN2400** | Spira-trol two port and QL three port | DN125 to DN300 | AKL17 |
| | | DN125 to DN300 | AKL17 |
| **TN2270** | | DN125 to DN300 | AKL17 |
| | | DN125 to DN300 | AKL17 |
| **PN3000 Sprg Ext** | LE, LEA and Steri-trol | DN15 to DN100 | AKL10 |
| **PN4000 Sprg Ret** | | DN15 to DN100 | AKL10 |
| **PN5000** | KE, KEA, LE and LEA | DN15 to DN100 | AKL10 +UBC |
| **PN6000** | | DN15 to DN100 | AKL10 + UBC |
| **PN5000** | QL three port | DN125 to DN200 | AKL11 + UBC |
| **PN6000** | | DN125 to DN200 | AKL11 + UBC |
| **PN1600** | 'C' series | DN65 to DN100 | AKL11 |
| **PN1600** | | DN125 to DN200 | AKL11 |
| **PN1600** | Spira-trol | DN125 to DN300 | AKL11 |



## Gauge blocks

| | Material | Spirax Nomenclature | Weight |
|---|---|---|---|
| **1,0 MPa/145 psi NPT¼"** | Aluminium | GBS1A | 0.28 kg |
| | | GBD1A | 0.32 kg |
| | | GBS1S | 0.50 kg |
| | | GBD1S | 0.52 kg |

| | Material | Spirax Nomenclature | Weight |
|---|---|---|---|
| **10 bar/145 psi NPT¼"** | Stainless steel | GBS10A | 0.28 kg |
| | | GBD10A | 0.32 kg |
| | | GBS10S | 0.50 kg |
| | | GBD10S | 0.52 kg |

## How to order

**Example:** 1 off Spirax Sarco SP8-10-Y0H2F2C Smart positioner with AKL10 mounting kit and GBS6A gauge block.
**Caution:** The SP8-10 positioner must have a high quality air supply to ISO 8573-1:2010 Class 3:3:3.

# 4 Control systems
## Positioners and controllers