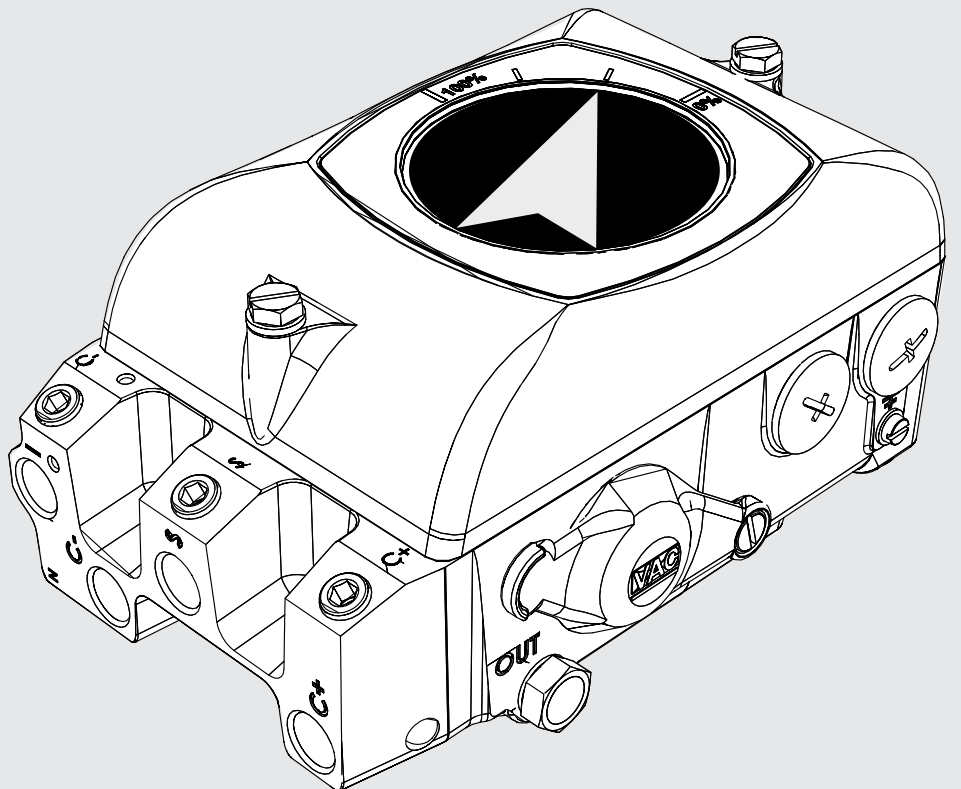




**Valve Accessories & Controls**

# **V200 POSITIONER**

**Installation,  
Operation and  
Maintenance  
Instruction**







# V200 POSITIONER

[www.vacaccessories.com](http://www.vacaccessories.com)

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# V200 POSITIONER

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## 1 INTRODUCTION

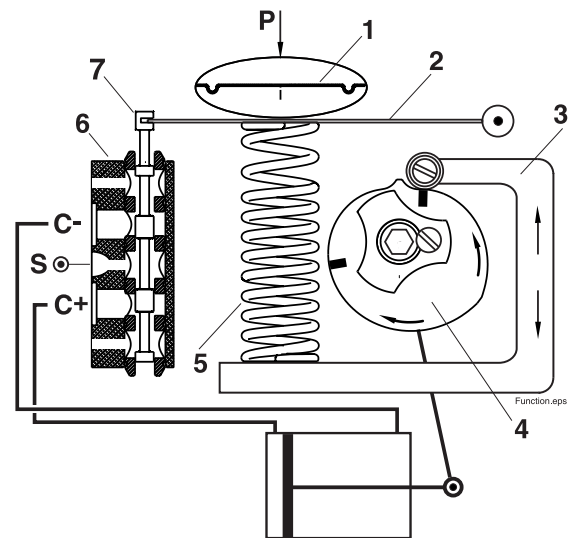
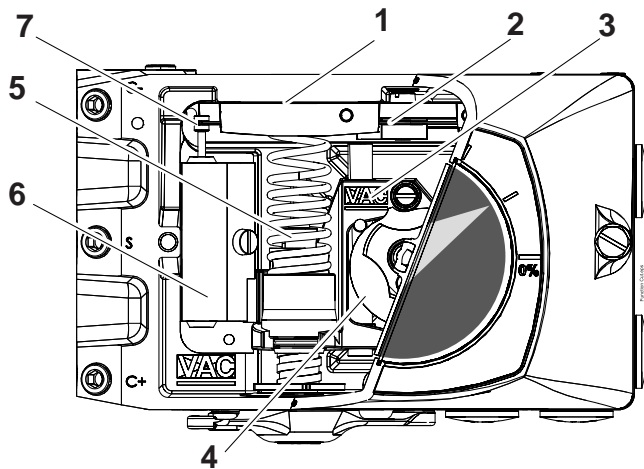
### 1.1 Principal of Operation

The V200 incorporates the force balance principal of operation. The desired value, in the form of pressure, affects the membrane(1)with the force that is created and transferred to the balance arm(2). The opposing force, which represents the actual control value, is provided by the feedback spring(5) and creating force in the opposite direction on the balance arm(2). The feedback spring, resting on the feedback arm(3), is positioned by the shape and response of the cam. The cam(4) is connected to the cylinder's (actuator) piston rod via the drive. The pilot valve(6) is connected to the balance arm and follows the balance arm's movement.

The system is stable when the spool(7) is in the neutral position and the forces that affect the balance arm is in equilibrium.

As soon as a signal change occurs or a change in the position of the valve/actuator package occurs, the "force balance" is also changed and the spool responds. Air immediately begins to flow into the part of the actuator (C+ or C-) which allows the feedback mechanism to return the spool to the neutral position.

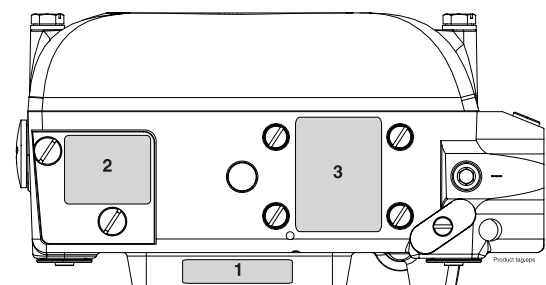
The system is self-stabilizing and searches for a steady state position.



### 1.2 Product identification

The V200 identification tags, Serial number tag(1), product model tag(2) and feedback option tag(3), are placed as shown.

The product model tag contains information on control signal, maximum working pressure and temperature ranges. Other information can be shown depending on the model.







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## 1.3 Air quality recommendations

Poor air quality is one of the main causes of premature functional problems with pneumatic and electro pneumatic equipment. The pilot valve and IP-converter are precision instruments, and are therefore the most sensitive parts of the positioner.

**a)** Water in the supply air is a natural occurrence. This happens when air is compressed. The compression heats the air and the natural degree of water in the air can remain as moisture. When the air cools in pipes etc. the moisture condenses and becomes liquid water. Large quantities can build and sometimes flood small water separators. This excess water will eventually reach the control valve and positioner. This can cause corrosion damage to the IP converter, causing the unit to malfunction.

We strongly recommend the use of water separators with adequate capacity. Coalescing filters from a reputable manufacturer is an inexpensive way to help prevent unit malfunctions or failures, and add life to the product. These filters remove particles and moisture from air lines.

**b)** Oil in the supply air usually is from the main compressor. Oil can clog the small nozzles and disturb the flapper in the IP-converter. It can also cause the spool to “drag” within the pilot valve. The result is poor control or in the worst case, failure.

**c)** Particles in the air usually occur because of corrosion. Dirt and particles can block the small nozzles of the IP-converter. They can also cause the pilot valve to malfunction. The unit may completely fail.

To ensure normal operational safety with VAC positioner products, we recommend that a water separator and a <80 micrometer filter are mounted as close to the product as possible. If large amounts of oil are present an oil separator should be installed as well.

To further increase operational safety, we recommend that the working air is clean, dry and free of moisture, water, oil, particles and other contaminants, in accordance with the ISA Standard ISA S7.3-81.

## 1.4 Safety Instructions



**CAUTION: Beware of moving parts when positioner is operated!**



**CAUTION: Beware of parts with live voltage!**

A voltage, which is normally not dangerous, is supplied to the positioner. Avoid touching live parts and bare wires as well as short circuiting live parts and the housing.



**CAUTION: Do not dismantle a pressurized positioner!**

Dismantling a pressurized positioner will result in uncontrolled pressure release. Always isolate the relevant part of the pipeline. Release the pressure from the positioner and the piping. Failure to do this may result in damage or personal injury.



**CAUTION: Do not exceed the positioner performance limitations!**

Exceeding the limitations marked on the positioner may cause damage to the positioner, actuator and valve. Damage or personal injury may result.

## 2. INSTALLATION

### 2.1 Connections

**S** – Supply air

V200P: max. 145 PSI / 1 MPa

V200E: 23 - 145 PSI / 0,15 -1 MPa

**I** – Input, pressure signal

V200P: 3-15 PSI / 20-100 kPa

V200E: Plugged

**I<sub>E</sub>** – Input, current signal

V200E: 4-20 mA (Ri max 250 ohm)

V200P: Plugged

**C+** - Actuator connection + stroke

**C-** - Actuator connection - stroke

Optional air outlet, (normally plugged)

**C+ (2)** - Actuator connection + stroke

**C+ (2)** - Actuator connection - stroke

**OUT** - All air from the actuator, IP and positioner is vented through this port.  
Standard equipped with a bug screen/silencer

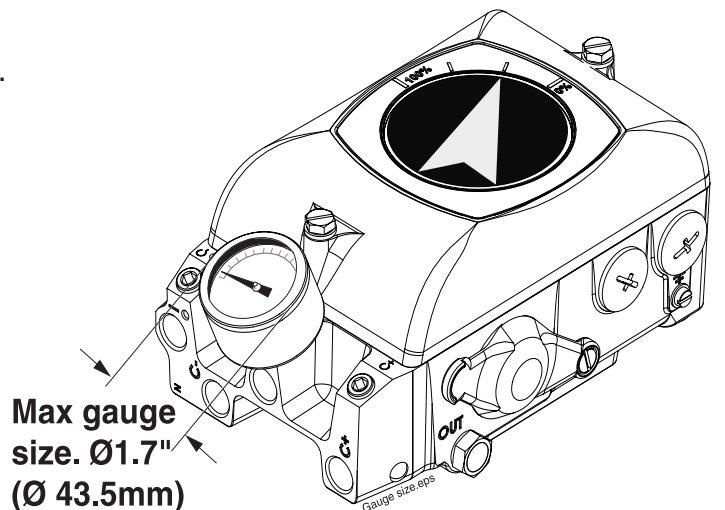
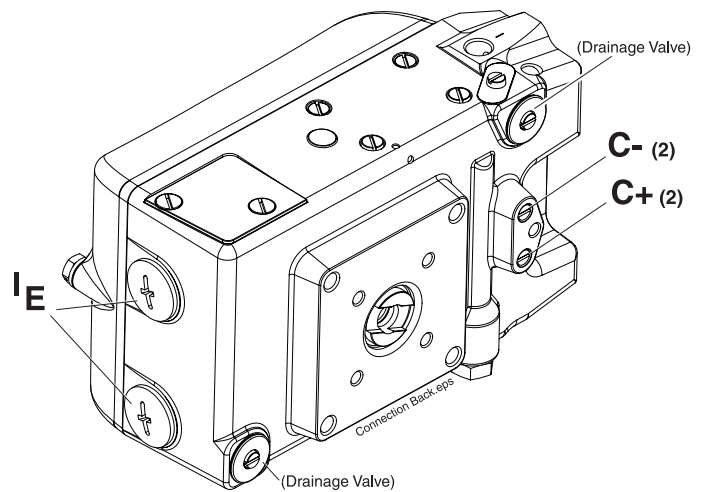
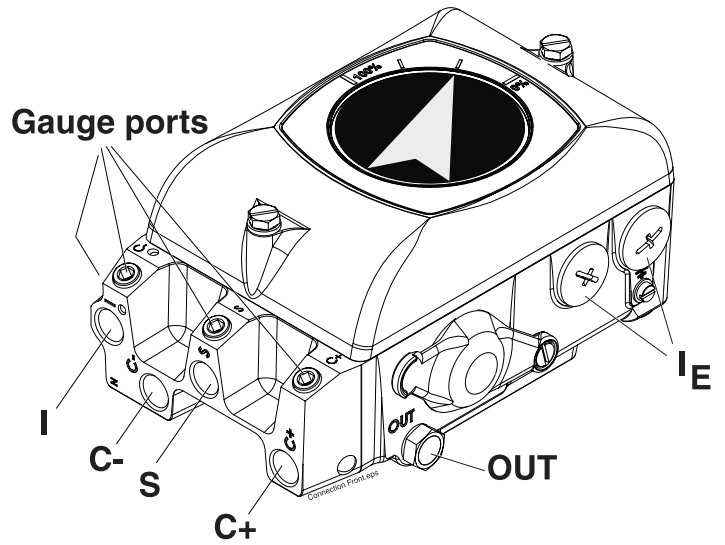
Air connections for male 1/4" NPT or G 1/4".

Gauge connections for male 1/8" NPT or G1/8".

Cable entry for male 1/2" NPT or M20 cable fittings.

The appropriate threads are indicated by a N (NPT) or G on the air connection side of the positioner.

Gauge ports I, C+, C- and S are factory plugged.  
Remove plugs and replace with gauges.



The **I<sub>p</sub>** connection must be plugged in V200E.  
The **I<sub>E</sub>** entries should be plugged in V200P

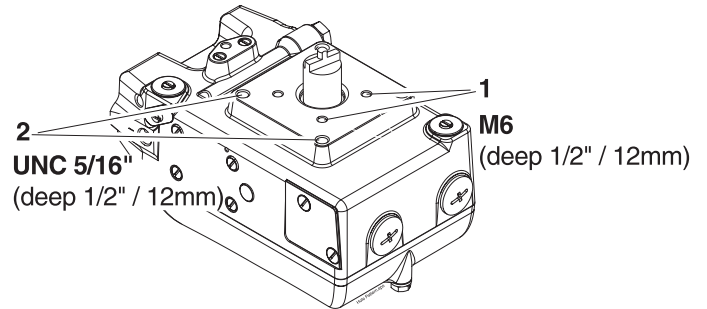


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## 2.2 General mounting instructions.

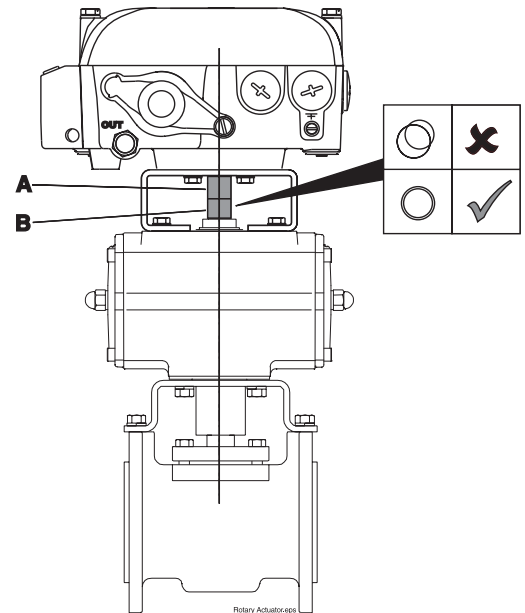
The V200 has the ISO F05 hole pattern(1) and 2¼" x 2¼" hole pattern(2) for mounting kits.



### 2.2.1 Rotary actuator

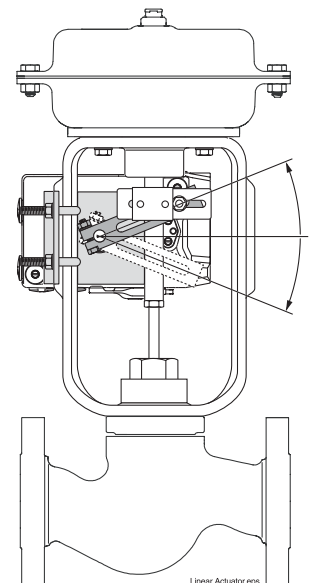
The VAC V200 has a very stable and properly sized drive shaft bearing. However, the positioner drive(A) should be aligned properly to the rotary actuator spindle(B).

A relatively small error combined with a rigid coupling can create very powerful radial forces, which can overload and cause premature wear.



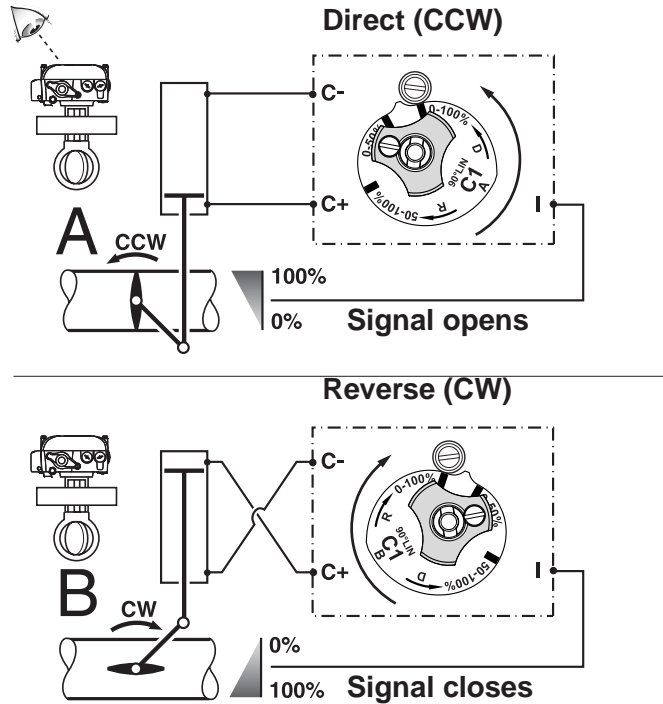
### 2.2.2 Linear actuator

When mounting to linear actuators, the positioner should be attached in such a way that its drive is in the center (mid stroke) of the actuator's stroke. Proper installation and alignment will minimize linearity error.

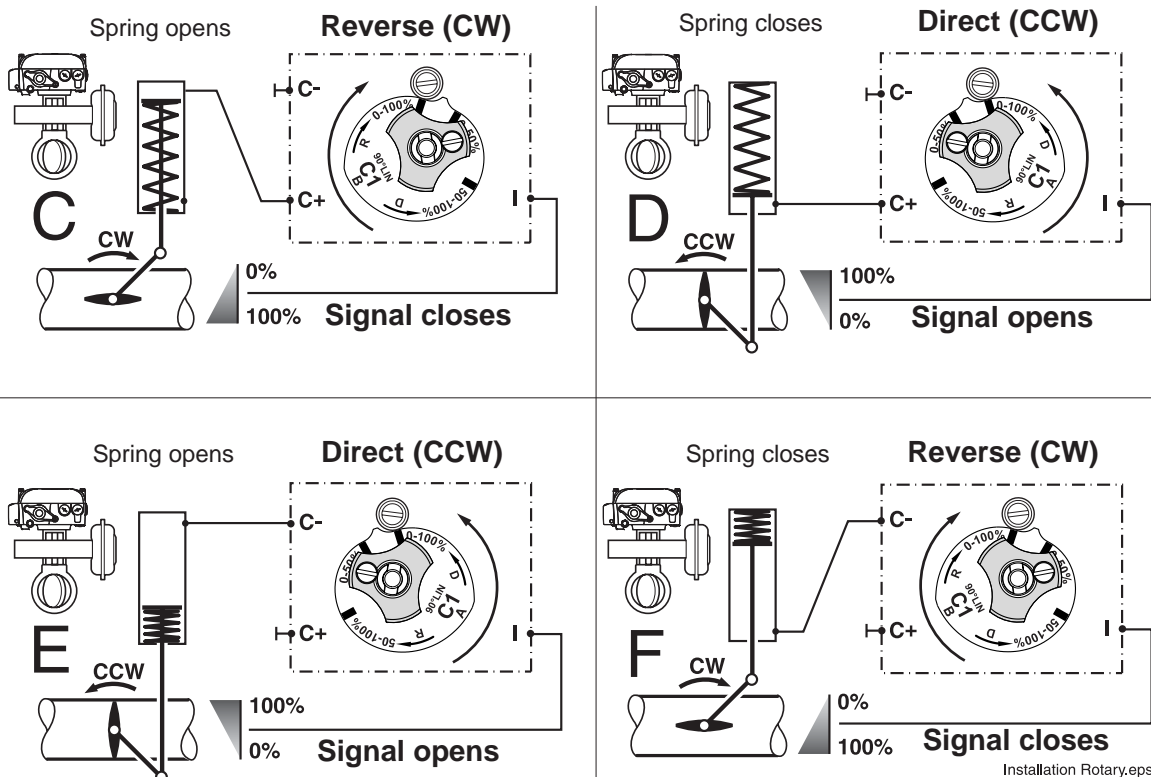


## 2.3 Installation instructions for rotary actuators

### 2.3.1 Double acting

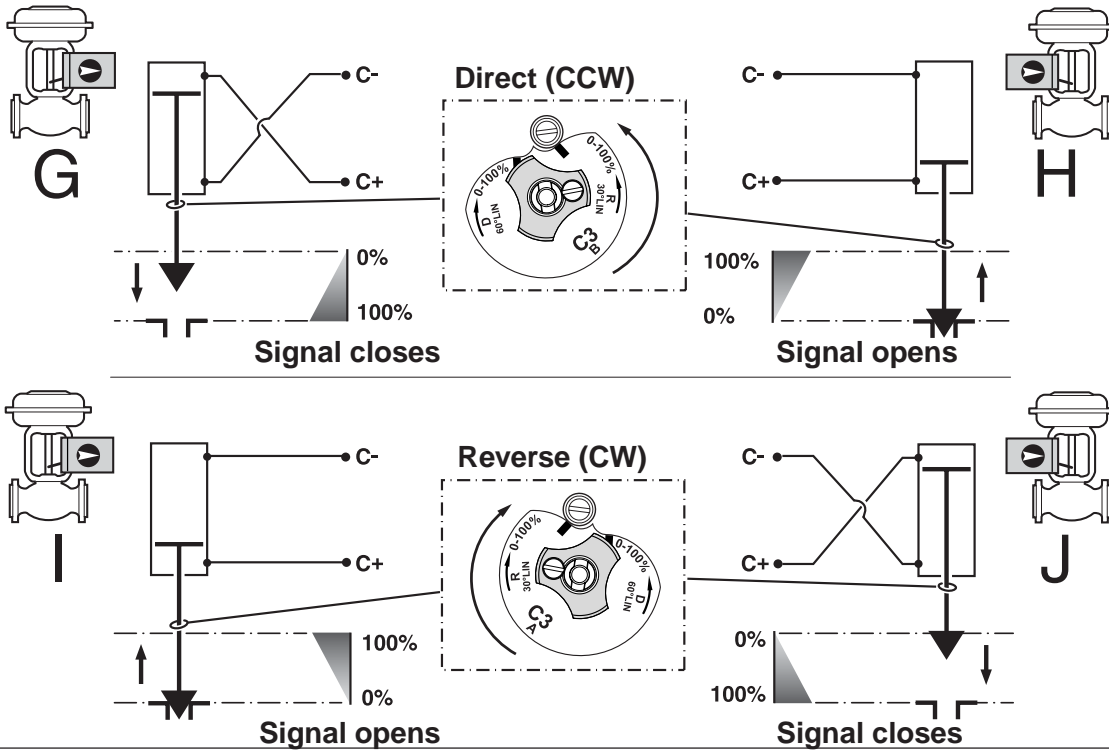


### 2.3.2 Single acting

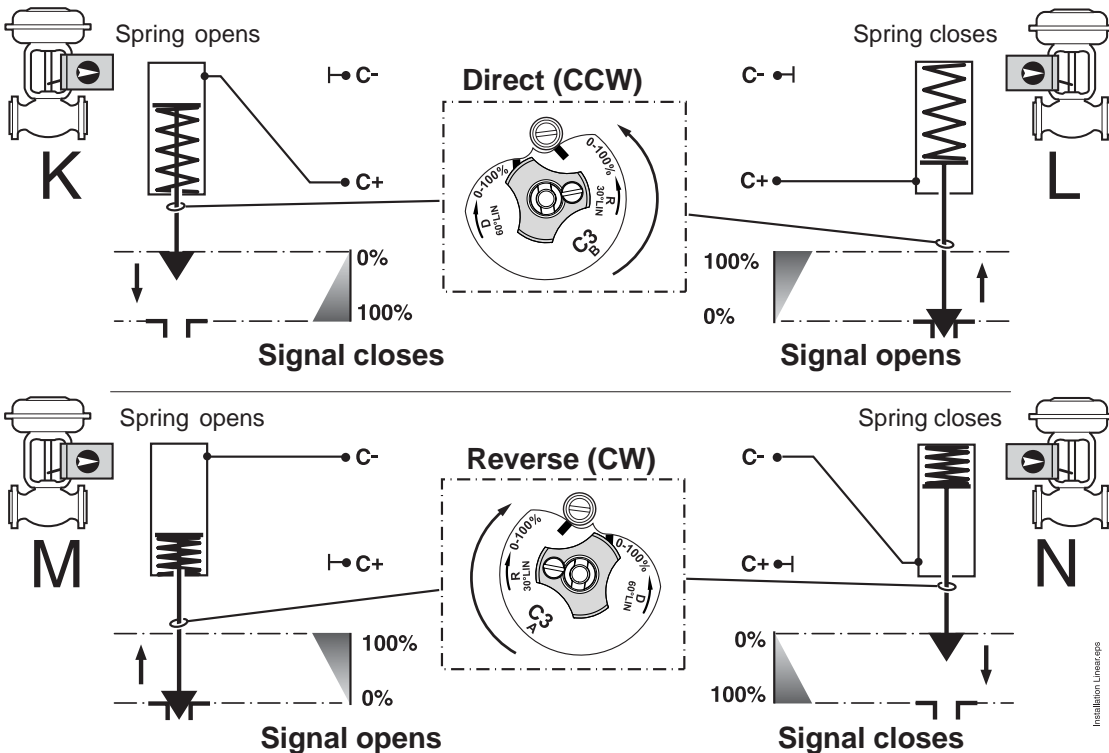


## 2.4 Installation instructions for linear actuators

### 2.4.1 Double acting



### 2.4.2 Single acting



## 2.5 Cam

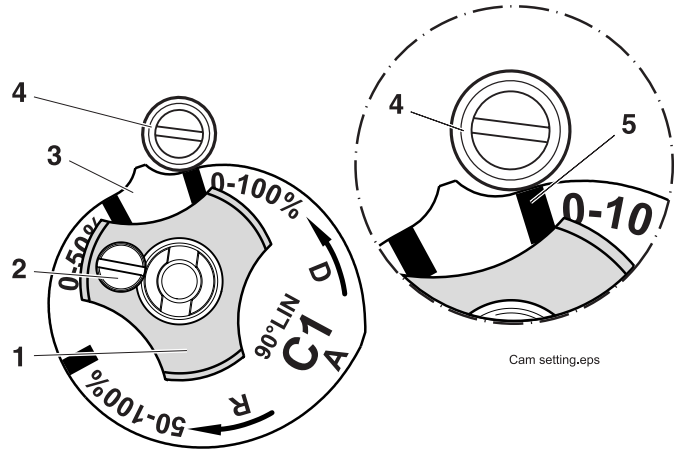


The V200 is standard shipped with the C1-cam, factory set for 90° ±1°, direct (CCW) turning.

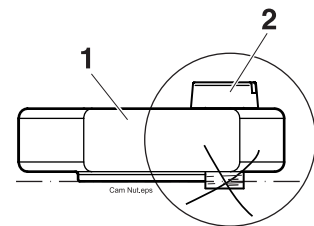
### 2.5.1 Adjustments

Remove the front cover and indicator.  
(see page 15)

- Loosen the locking screw(2) and the cam nut(1).
- Stroke the valve/actuator to the stop/end position at 0% input.
- Turn the cam(3) so that the index mark(5) for the selected curve aligns with the ball bearing(4). A small gap between the roller and the cam tip is desirable.
- Tighten the cam nut by hand(1).  
Check that the locking screw(2) is still loose.  
(if not, loosen the locking screw slightly and tighten the nut again).
- Tighten the locking screw(2).  
Do not tighten cam nut with screw(2) down.



Cam setting.eps



Cam Nut.eps

### 2.5.2 Cam specifications C1

Index mark / Starting point of rotation \*

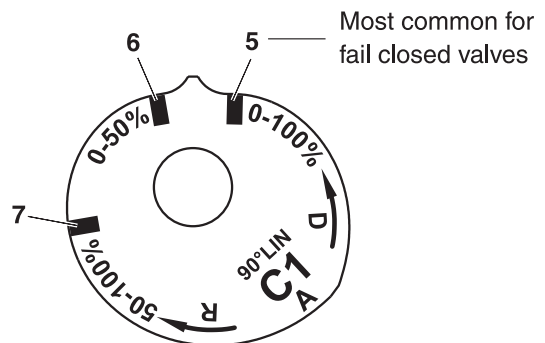
- 90° Linear 0-100% CCW
- 180° Linear 0-100% CW
- 90° Linear 0-50% CW split range
- 90° Linear 50-100% CW split range
- 90° Linear 0-100% CW
- 180° Linear 0-100% CCW
- 90° Linear 0-50% CCW split range
- 90° Linear 50-100% CCW split range

\*Increasing signal rotation.

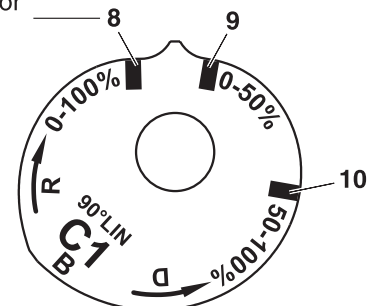
Most valves rotate CW to close / CCW to open



When field reversing action of positioner tubing must be reversed as well (see page 7 and 8)



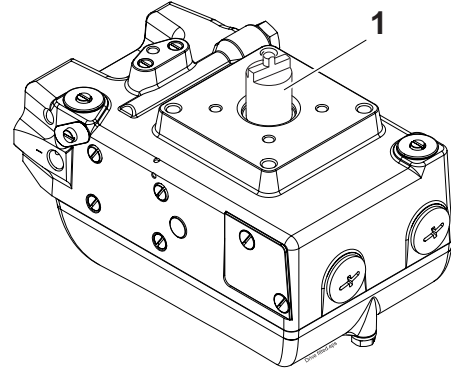
Most common for fail open valves



Cam Marking.eps

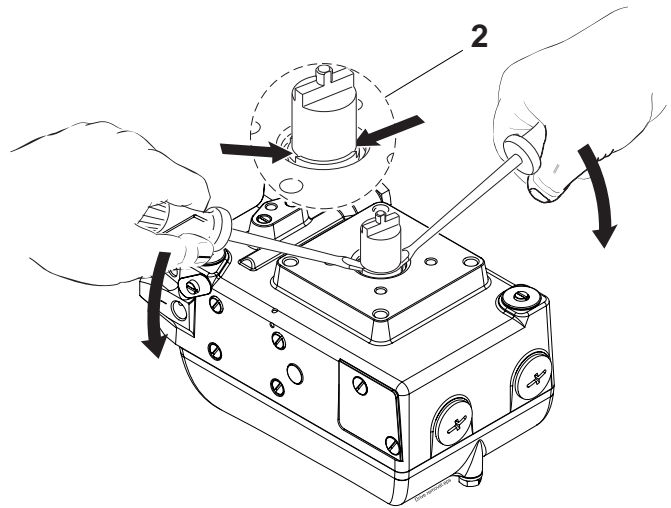
## 2.6 Spindle (Drive)

VAC offers a variety of spindles/drives(1), suitable for the most frequently used actuator types.



### 2.6.1 Spindle Removal

Release the spindle/drive by prying with two screwdrivers, equally under the edges(2) of the spindle/drive, using the housing as fulcrum. The spindle has a snap ring that is “released” with the equal pressure.



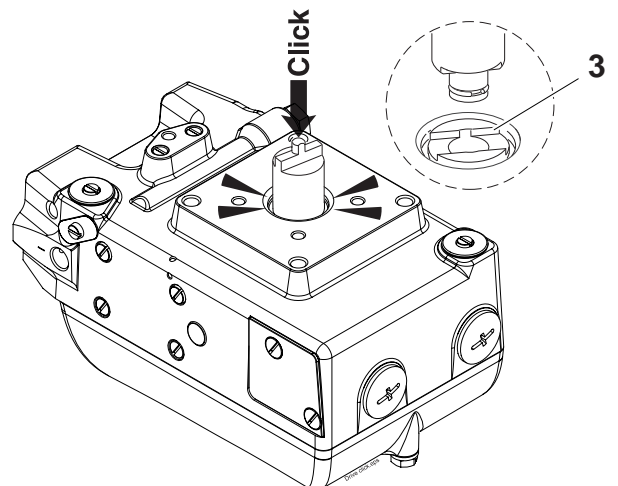
### 2.6.2 Spindle Mounting

Press the spindle down into the spindle shaft hole.

Turn the flats(3) into place and press down.

Check to see that the spindle/drive is set securely in place.

To install the spindle correctly will result in two “snaps” of the spindle into the housing.



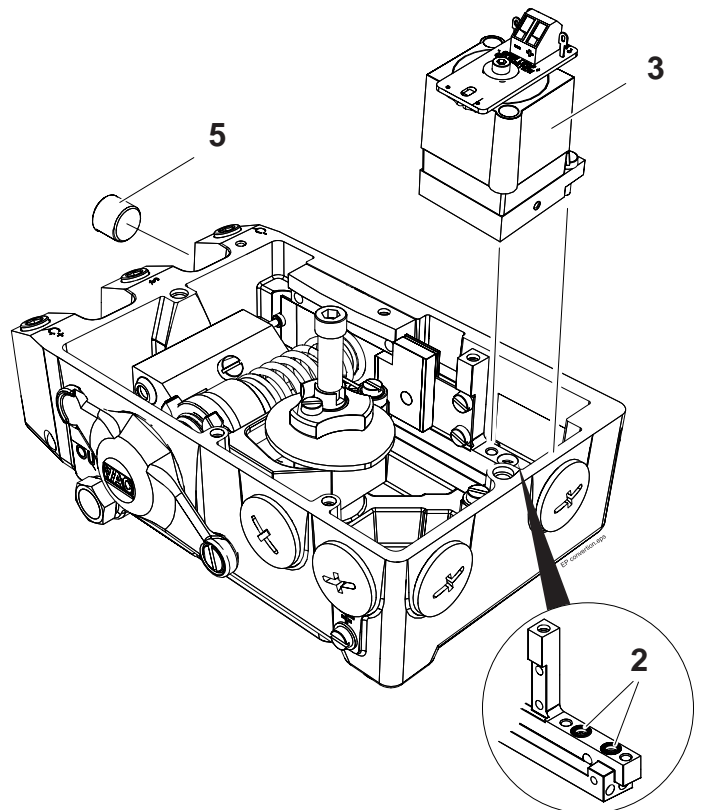
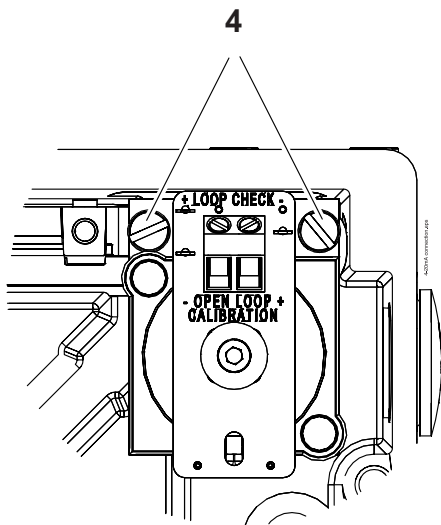
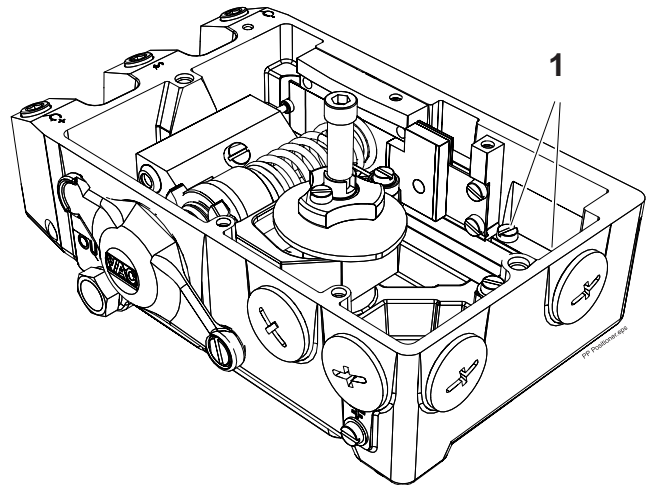


## 2.7 Installing IP converter

### 2.7.1 Internal IP Converter

Remove the front cover and indicator.  
(see page 15)

1. Loosen the two screws that secure the pneumatic sealing plate(1) and remove the plate.
2. Make sure the two O-rings(2) are still in the positioner housing.
3. Install the IP converter(3) and tighten the screws(4).
4. Install the 1/4" plug(5) in the port marked I.





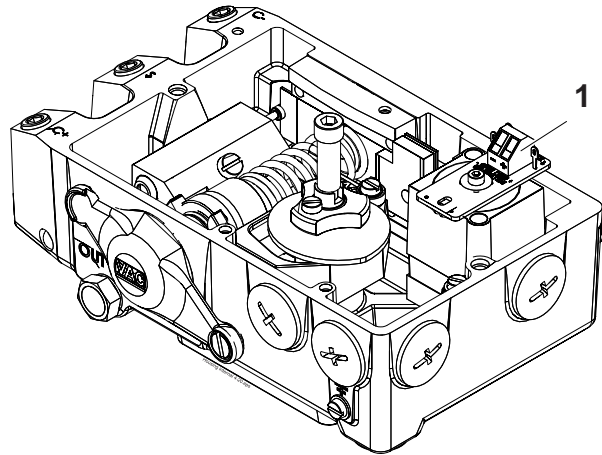
## 2.8 4-20 mA connection

### 2.8.1 Connecting the control signal

Remove the front cover and indicator.  
(see page 15)

Terminal block(1) is now easily accessible. Connect the cables to their respective pole.

Maximum cable size AWG 13 (2,5 mm<sup>2</sup>)



### 2.8.2 Checking the control signal

The control signal can be checked without having to break the signal loop. This is done by connecting a low ohmic ampere meter over the test points(2).

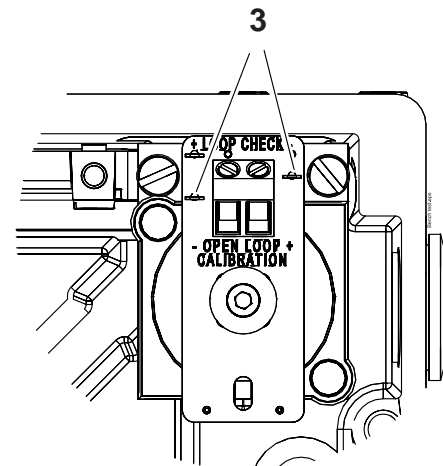
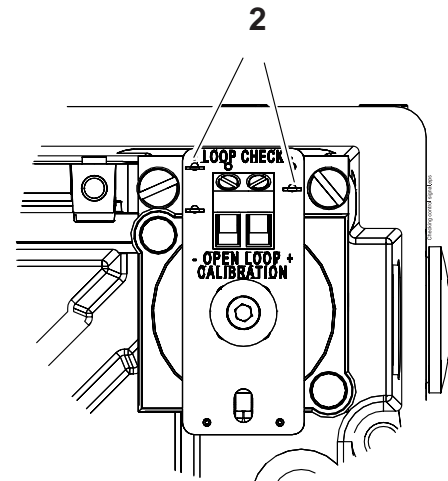
### 2.8.3 Bench test with the calibrator

When bench testing, it is possible to connect the control signal (signal generator clips) to the two points(3), thus eliminating the need for temporary leads.

### 2.8.4 Checking the IP internal circuit

With an ohm meter connected over the two test points(3) it is possible to check the IP's internal circuit.

At room temperature the meter should read ~150 - 200 Ohms. No reading indicates an internal circuit break and the IP converter needs replacement.



**The IP converter is factory-adjusted. No extra range or zero adjustments are necessary.**

## 2.9 Calibration



The V200 is delivered factory calibrated 0-100 %  $\pm 1\%$ .

### Calibration procedure

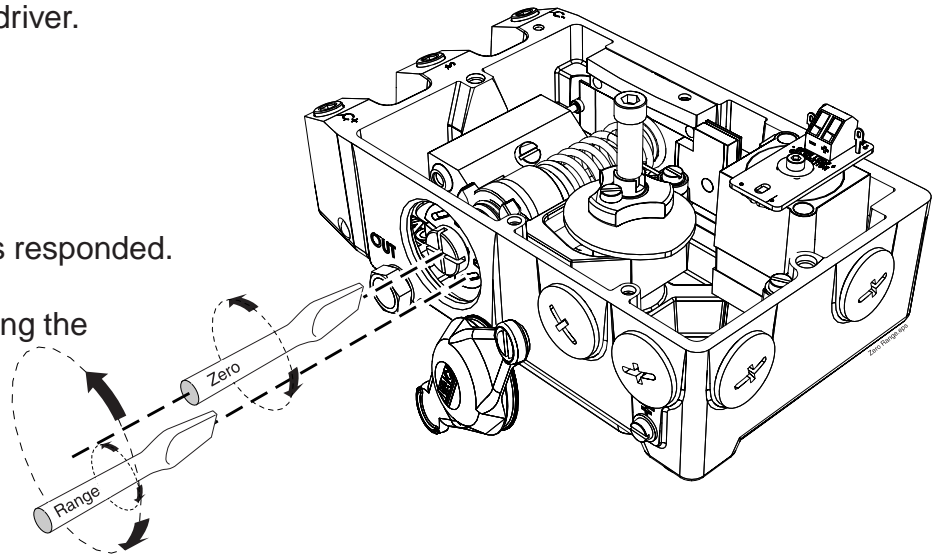
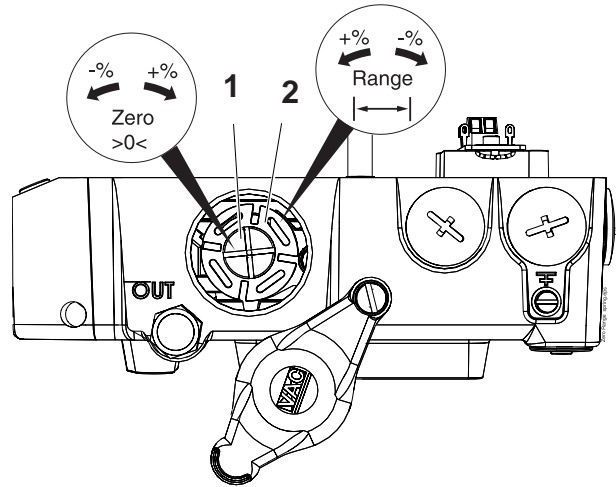
#### Zero position

Note: Always set zero first!

1. Set 0% input signal.
2. Wait until the valve/actuator has responded.
3. Adjust the zero position by turning the zero screw(1), with a screwdriver.

#### Range (Span)

4. Increase to 100% input signal.
5. Wait until the valve/actuator has responded.
6. Adjust the range (span) by turning the range wheel(2).



### Check the zero position

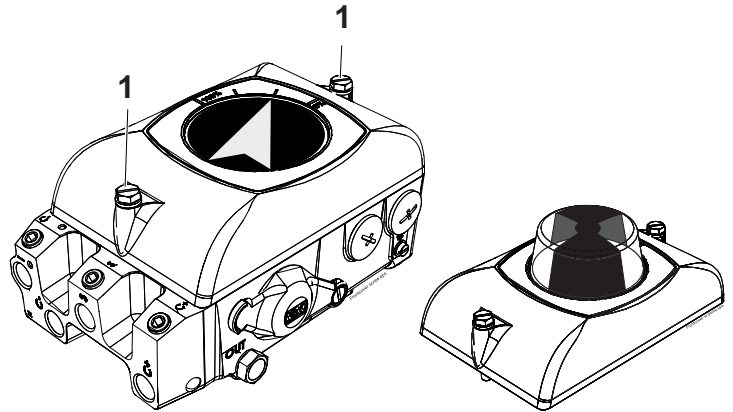
Make fine adjustments if necessary.\*

\*When split ranging, where zero can be a signal other than 0%, the steps 1-6 must be repeated until the desired setting has been reached.

## 2.10 Front cover and indicator

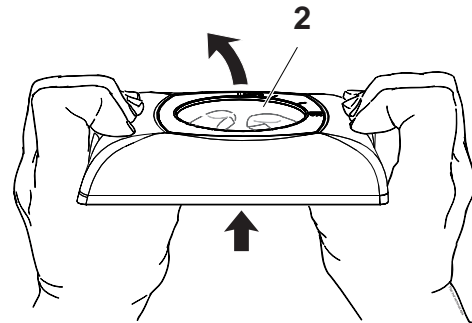
### 2.10.1 Removing the front cover

Loosen the two screws(1) and remove the front cover.



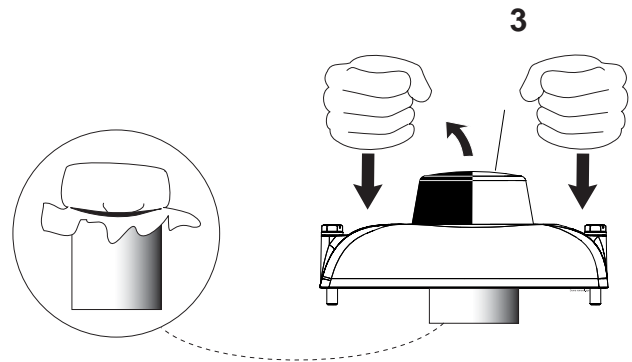
### 2.10.2 Removing flat indicator cover

With the main cover removed, the indicator cover(2) (clear cover) can be removed with pressure from the backside.



### 2.10.3 Removing Dome indicator cover

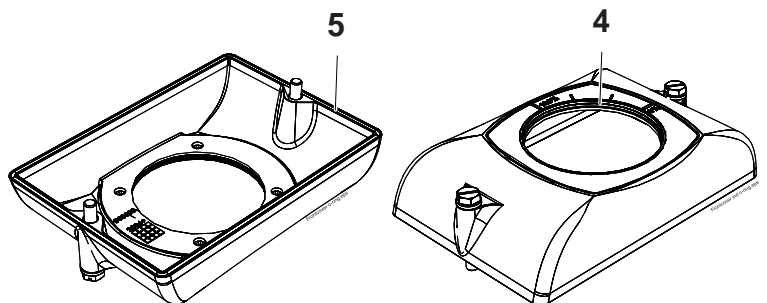
Due to the combined depth of the dome indicator and V200 cover, care should be exercised when removing the dome. It is recommended that something sturdy and protective be placed under the dome and equal pressure applied to the cover. The dome should release without damage.



### 2.10.4 Changing the sealing in the front cover

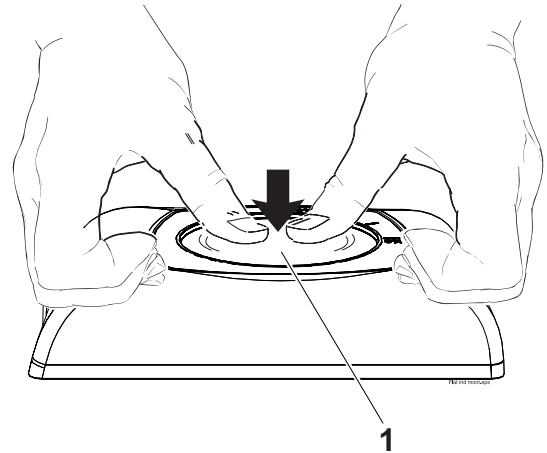
Remove the O-ring(4) and replace if needed.

Check the O-ring(5) on the backside of the front cover and replace if needed.



## 2.10.5 Installing flat indicator cover

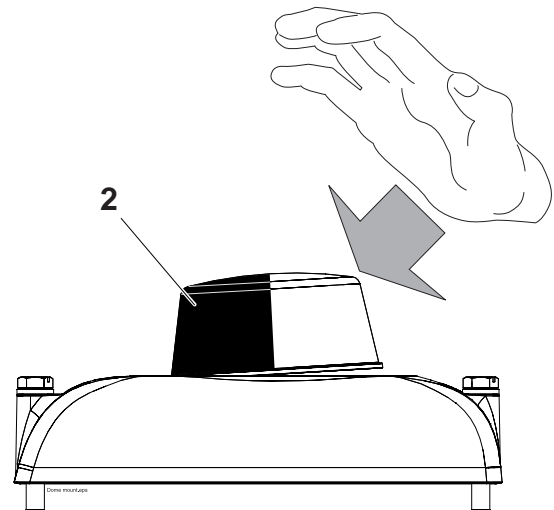
Place the indicator cover(1) with its rounded side facing down toward the front cover. Press in the center of the indicator cover until it snaps into place.



## 2.10.6 Installing Dome Indicator cover

Place the dome indicator cover(2) so that it is aligned with its seat in the front cover on one side. Use inside of palm and give the indicator cover a hard distinctive punch.

Adjust the display position by turning the indicator cover(2) to its desired position-it is a reasonably tight friction fit.



## 2.10.7 Removing the indicator

Pull the indicator(6) straight up; it is a friction fit.

### Important Note!

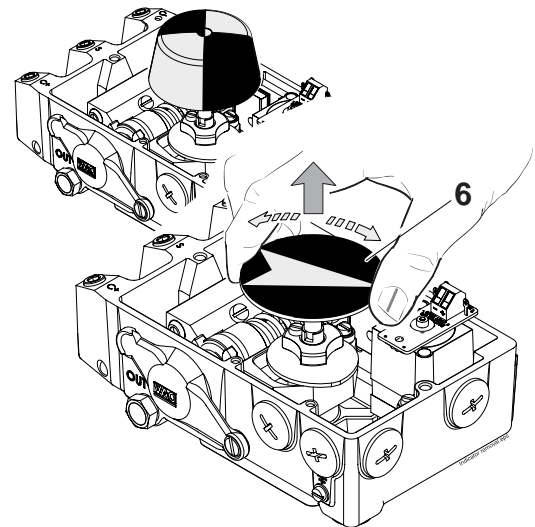
Note the indicator's position so it can be installed in the same position.

### Installing the indicator

Install the indicator in place over the drive shaft and press it straight down.

Be sure to press the indicator completely down so that it does not interfere with the indicator cover (clear cover).

Turn the indicator to the proper display position.



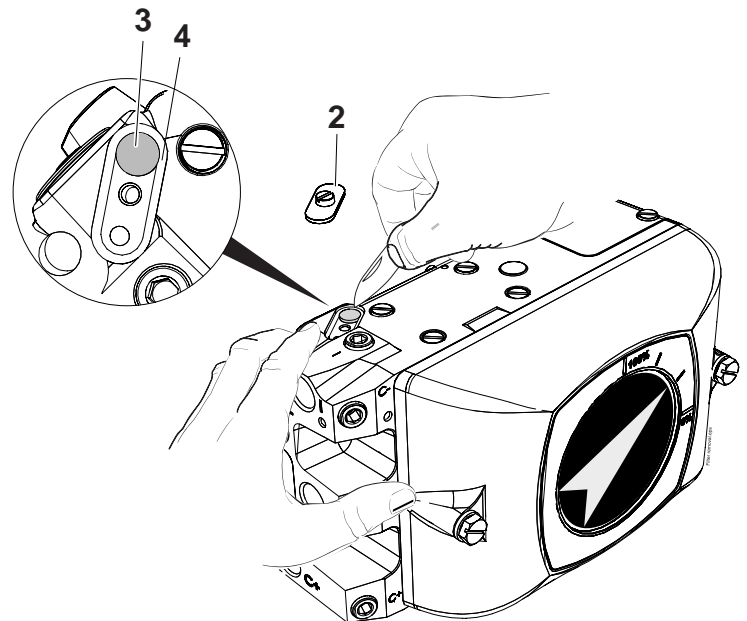
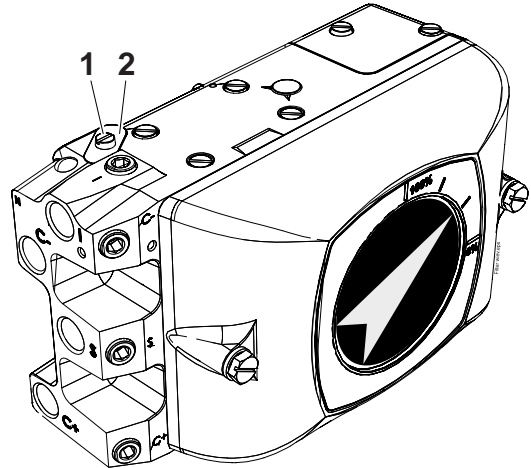
## 2.11 Main supply filter for IP converter

### Changing the filter

1. Turn off or disconnect the main air supply.

Should air supply not be disconnected or turned off, the pressure may cause the filter cover to eject from the unit.

2. Loosen the screw(1) and remove filter cover(2)
3. Cautiously remove the filter (3) with a sharp pointed object e.g. a pocket knife.
4. Press the new filter(3) into the housing.
5. Check the O-ring(4) and replace if needed.
5. Install the filter cover(2) and tighten the screw(1)



**If the filter(3) shows traces of oil or water, check the water/oil separator in the supply line.**

**Oil and water can cause functional problems in the IP converter.**

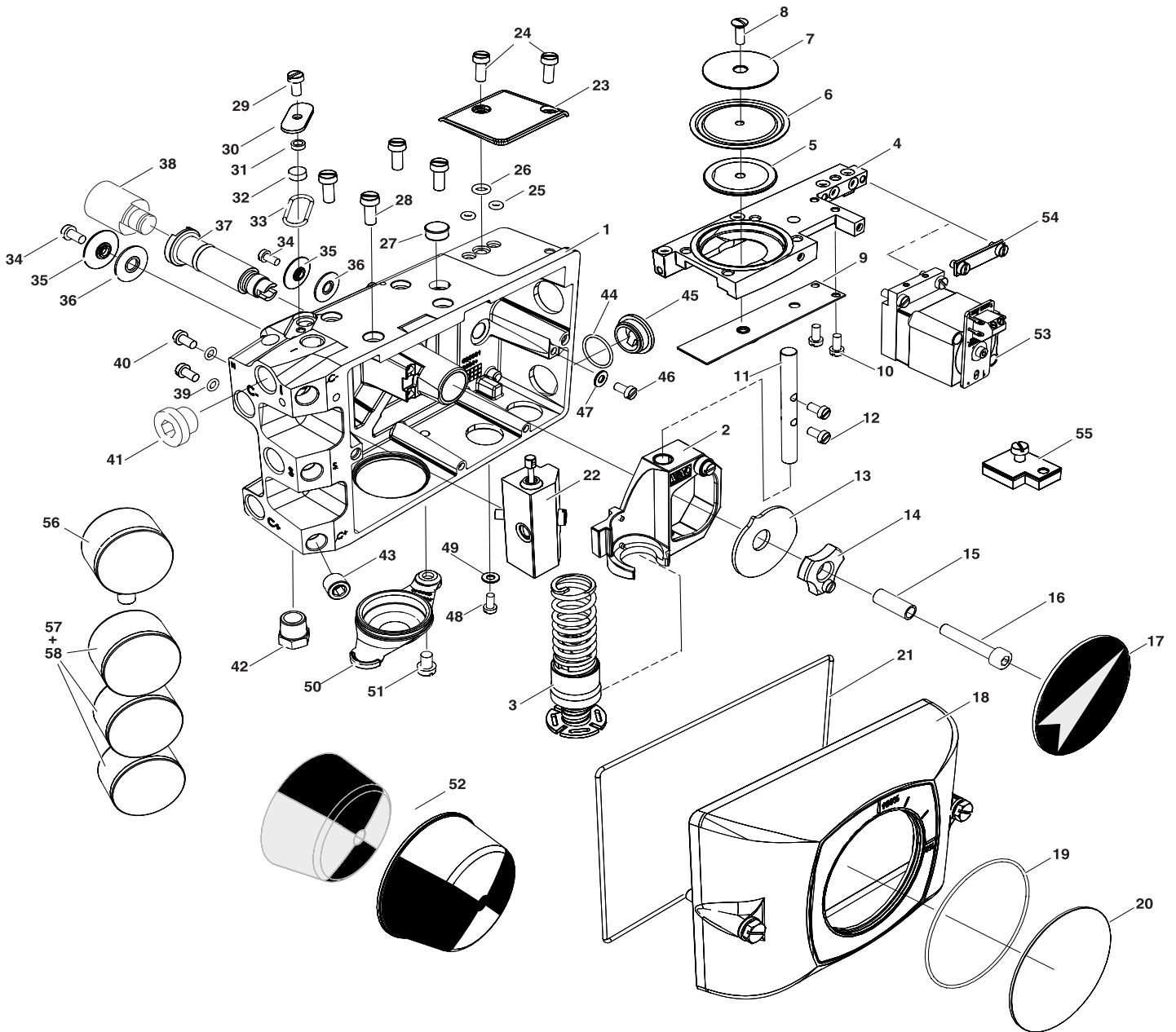


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## 3. SPARE PARTS

### 3.1 Exploded drawing







# V200 POSITIONER

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## 3.2 Spare parts list

Item	Description	Material	Part no	Qty	Item	Description	Material	Part no	Qty
1	Housing	Aluminum, painted	n/a	1	34	Screw ISO 1207 M4x8	Stainless Steel	1207040808	2
	- Bearing 15x8		171508	2	35	Relief Valve Washer	Aluminum, Anodized	90034	2
2	Feedback Arm Assembled		91002	1	36	Rubber Washer	Silicone Rubber	90035	2
	- Feedback Arm	Aluminum, painted	90006	1	37	Drive Shaft	Stainless Steel	90029	1
	- Ball Bearing	Stainless Steel	100404	1		- O-ring Ø12x2 NBR70	Nitrile Rubber	OR12x2NBR	1
	- Screw ISO1207 M4x12	Stainless Steel	1207040812	1		- O-ring Ø15x2 NBR70	Nitrile Rubber	OR15x2NBR	1
	- Bearing 8x8		100808	2	38	Spindle*	Stainless Steel	90092	1
3	Feedback Spring Assembled		91018	1		- Circlip spindle	Stainless Steel	90093	1
	- Spring Nut	Aluminum, Anodized	90012	1	39	O-ring Ø4x1,5 NBR70	Nitrile Rubber	OR4x1,5NBR	2
	- Wrist Pin	Stainless Steel	90013	1	40	Screw ISO 1207 M4x8	Stainless Steel	1207040808	2
	- Range Screw	Aluminum, Anodized	90014	1	41	Plug 1/4"	Plated Brass	261014	1
	- Range Nut	Aluminum, Anodized	90015	1	42	Bug Screen / Silencer	Plated Brass	400148	1
	- Span Wheel	Stainless Steel	90016	1	43	Plug 1/8" DIN906	Stainless Steel	90618	4
	- Zero Wheel	Aluminum, Anodized	90017	1	44	O-ring Ø18,1x1,6 NBR70	Nitrile Rubber	OR18,1x1,6NBR	4
	- Feedback Spring	Stainless Steel	90018	1	45	Plug NPT1/2" / M20	Plastic <PA>	92017	4
	- Screw ISO 1207 M4x50	Stainless steel	1207045050	1	46	Screw ISO 1207 M4x8	Stainless Steel	1207040808	1
	- O-ring Ø15x1 NBR70	Nitrile Rubber	OR15x1NBR	1	47	Washer ISO 7089-4	Stainless Steel	70894	1
	- Retaining Ring AV12	Steel	91050041	1	48	Screw ISO 1207 M4x8	Stainless Steel	1207040808	1
	- Washer DIN 6904-5,4	Steel	6904054	1	49	Washer ISO 7089-4	Stainless Steel	70894	1
	- Washer DIN 7089-4	Stainless Steel	70894	1	50	Zero Plug	Nitrile Rubber	90037	1
4	Membrane Plate	Aluminum, Anodized	90007	1	51	Screw ISO 1207 M6x8	Stainless Steel	1207060808	1
	- O-ring Ø3x2 NBR70	Nitrile Rubber	OR3x1NBR	6	52	Dome Indicator B/Y Kit		93008	1
5	Membrane piston	Aluminum, Anodized	90010	1		- Dome Indicator B/Y	Plastic <PC>	92062	1
6	Membrane	Nitrile Rubber	90022	1		- Circlip DIN 47112	Stainless Steel	47112	1
7	Membrane Washer	Stainless Steel	90009	1		- Dome Indicator Cover	Plastic <PC>	90044	1
8	Screw ISO 2010 M4x12	Stainless Steel	2010041212	1	53	IP converter		91006	1
9	Balance Arm	Stainless Steel	91003	1		- Screw ISO 1207 M4x12	Stainless Steel	1207041212	2
10	Screw ISO 1207 M4x8	Stainless Steel	1207040808	2	54	V200 E to P Conversion Plate		91000	1
11	Guide Pin	Stainless Steel	90024	1		- Sealing plate	Aluminum, Anodized	90023	1
12	Screw ISO 1207 M4x14	Stainless Steel	1207041414	2		- Screw ISO 1207 M4x8	Stainless Steel	1207040808	2
13	Cam*	Stainless Steel	92031	1	55	Stability Kit**		93027	1
14	Cam Nut	Aluminum, Anodized	90030	1		- Stability Plate Upper	Aluminum, Anodized	90039	1
	- Screw ISO 1207 M4x8	Stainless Steel	1207040808	1		- Stability Plate Lower	Aluminum, Anodized	90040	1
15	Indicator Screw Spacer	Aluminum, Anodized	90053	1		- Screw ISO 1207 M5x12	Stainless Steel	1207051212	1
16	Screw ISO 4762 M6x35	Stainless Steel	4762063535	1	56***	Gauge 0-30psi Bottom mount	Aluminum	400502	1
17	Indicator Arrow	Plastic <PC>	90049A	1	57***	Gauge 0-30psi Back mount	Aluminum	400500	1
	Indicator Flag	Plastic <PC>	90049F	1	58***	Gauge 0-160psi Back mount	Aluminum	400501	3
	- Circlip DIN 47112	Stainless Steel	47112	1					
18	Front Cover Assembled		91001	1					
	- Front Cover	Aluminum, painted	90004	1					
	- Screw ISO 4017 M6x40	Stainless Steel	4017064040	2					
	- Washer ISO 7089-6	Stainless Steel	708906	2					
	- O-ring Ø5x1,5 NBR70	Nitrile Rubber	OR5x1,5NBR	2					
	- Front label 0-90-0 (std)*	Plastic <PC>	92018	1					
19	O-ring Ø70x1,5 NBR70	Nitrile Rubber	OR70x1,5NBR	1					
20	Indicator cover	Plastic <PC>	90038	1					
21	O-ring Ø160x2 NBR70	Nitrile Rubber	OR160x2NBR	1					
22	Pilot Valve Std		91010	1					
	Pilot Valve HG		91008	1					
	Pilot Valve SHG		91009	1					
	-O-ring Ø8x1,5 NBR70	Nitrile rubber	OR8x1,5NBR	5					
	- Screw ISO 1207 M5x30	Stainless Steel	1207053030	1					
23	Cover plate	Aluminum, painted	90080	1					
24	Screw ISO 1207 M5x14	Stainless Steel	1207051414	1					
	- Mylar Washer	Plastic <PA>	90048	1					
25	O-ring Ø3x2 NBR70	Nitrile Rubber	OR3x2NBR	2					
26	O-ring Ø5x2 NBR70	Nitrile Rubber	OR5x2NBR	1					
27	Rubber plug	Nitrile Rubber	90036	1					
28	Screw ISO 1207 M5x14	Stainless Steel	1207051414	4					
	- Mylar Washer	Plastic <PA>	90048	4					
29	Screw ISO 1207 M4x8	Stainless Steel	1207040808	1					
30	Filter Cover	Stainless Steel	90032	1					
31	Plastic Spacer	Plastic <PA>	90091	1					
32	Main Filter	Plastic <PP>	90033	1					
33	O-ring Ø17,5x1,5 NBR70	Nitrile Rubber	OR17,5x1,5NBR	1					

\*Cam with other ranges, front labels with other scale readings and spindles suitable for the most frequently used actuator types, are available.

\*\* Certain valve/actuator packages may need additional field stability, which can be accomplished with the stability kit (100% to 300% depending on orientation of the kit).

\*\*\*Gauges available as an option. Also available in stainless steel.

- ..... 0-30 psi for I port
- ..... 0-160 psi for C+, C- and S port



# V200 POSITIONER

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## 4. SPECIFICATIONS

### 4.1 Specifications V200

	Pneumatic <b>V200P</b>	Electropneumatic <b>V200E</b>	Electropneumatic Intrinsically Safe <b>V200IS</b>
Input Signal:	3-15 PSI	4-20mA (Max:Ri 250 Ohm)	4-20mA (Max:Ri 250 Ohm)
Supply Pressure:	<145 PSI (<1MPa)	21.8-145 PSI (0.15-1MPa)	21.8-145 PSI (0.15-1MPa)
Linearity error:	<0.7% f.s	<1.0% f.s	<1.0% f.s
Hysteresis:	<0.4% f.s	<0.6% f.s	<0.6% f.s
Repeatability:	<0.3% f.s	<0.5% f.s	<0.5% f.s
Temperature range:	-40° to +185 F -40° to +85°C	-40° to +185 F -40° to +85°C	-40° to +185 F * -40° to +85°C* *Temp.range depending on certification
Pressure gain: @87 PSI (600kPa)	300:1	300:1	300:1
Bleed Rate: @87PSI (600kPa)	SCFM (SLPM) 0.35 (9,9)	SCFM (SLPM) 0.40 (11,32)	SCFM (SLPM) 0.40 (11.32)
Air Delivery @87 PSI (600kPa)	SCFM (SLPM) 28.3 (800)	SCFM (SLPM) 28.3 (800)	SCFM (SLPM) 28.3 (800)
Air connections:	1/4" NPT (optional G threads)	1/4" NPT (optional G threads)	1/4" NPT (optional G threads)
Gauges:	1/8" NPT (optional G threads)	1/8" NPT (optional G threads)	1/8" NPT (optional G threads)
Cable entry:	1/2" NPT (optional M20x1.5)	1/2" NPT (optional M20x1.5)	1/2" NPT (optional M20x1.5)
Ingress & corrosion protection:	NEMA 4X and IP66	NEMA 4X and IP66	NEMA 4X and IP66
Standard coating:	Polyester	Polyester	Polyester
Weight:	3.2 lbs (1,45kg)	3.8 lbs (1.7kg)	3.8 lbs (1.7kg)
Weight with gauges:	3.4 lbs (1,54kg)	4.2 lbs (1.9kg)	4.2 lbs (1.9kg)

Valve types			Normal Gain	High Gain	Super High Gain
Pressure Gain:	@ 29 PSI (0.2MPa)	Poutput / Pinput	100	270	370
	@ 87 PSI (0.6MPa)	Poutput / Pinput	300	800	1100
	@ 145 PSI (1.0MPa)	Poutput / Pinput	500	1330	1830
Pressure Gain: Acc. to ISA S75.13	Any	%Poutput / %Pinput	20	52	72
Air Delivery:	@ 29 PSI (0.2MPa)	SCFM/(SLPM)	9.4 / (270)	10.6 / (300)	10.6 (300)
	@ 87 PSI (0.6MPa)	SCFM/(SLPM)	28.3 / (800)	31.8/ (900)	31.8 (900)
	@ 145 PSI (1.0MPa)	SCFM/(SLPM)	47.1 / (1330)	53.0 / (1500)	53.0 (1500)
Bleed Rate:	@ 29 PSI (0.2MPa)	SCFM/(SLPM)	0.12 / (3.4)	0.18 / (5.0)	0.24 (6.7)
	@ 87 PSI (0.6MPa)	SCFM/(SLPM)	0.35 / (10.0)	0.53/ (15.0)	0.71 (20.0)
	@ 145 PSI (1.0MPa)	SCFM/(SLPM)	0.59 / (16.7)	0.88 / (25.0)	1.18 (33.3)

Options: Feedback Spring for 6-30 PSI (40-200kPa) input signal.  
Gauges. Stability kit, feedback modules



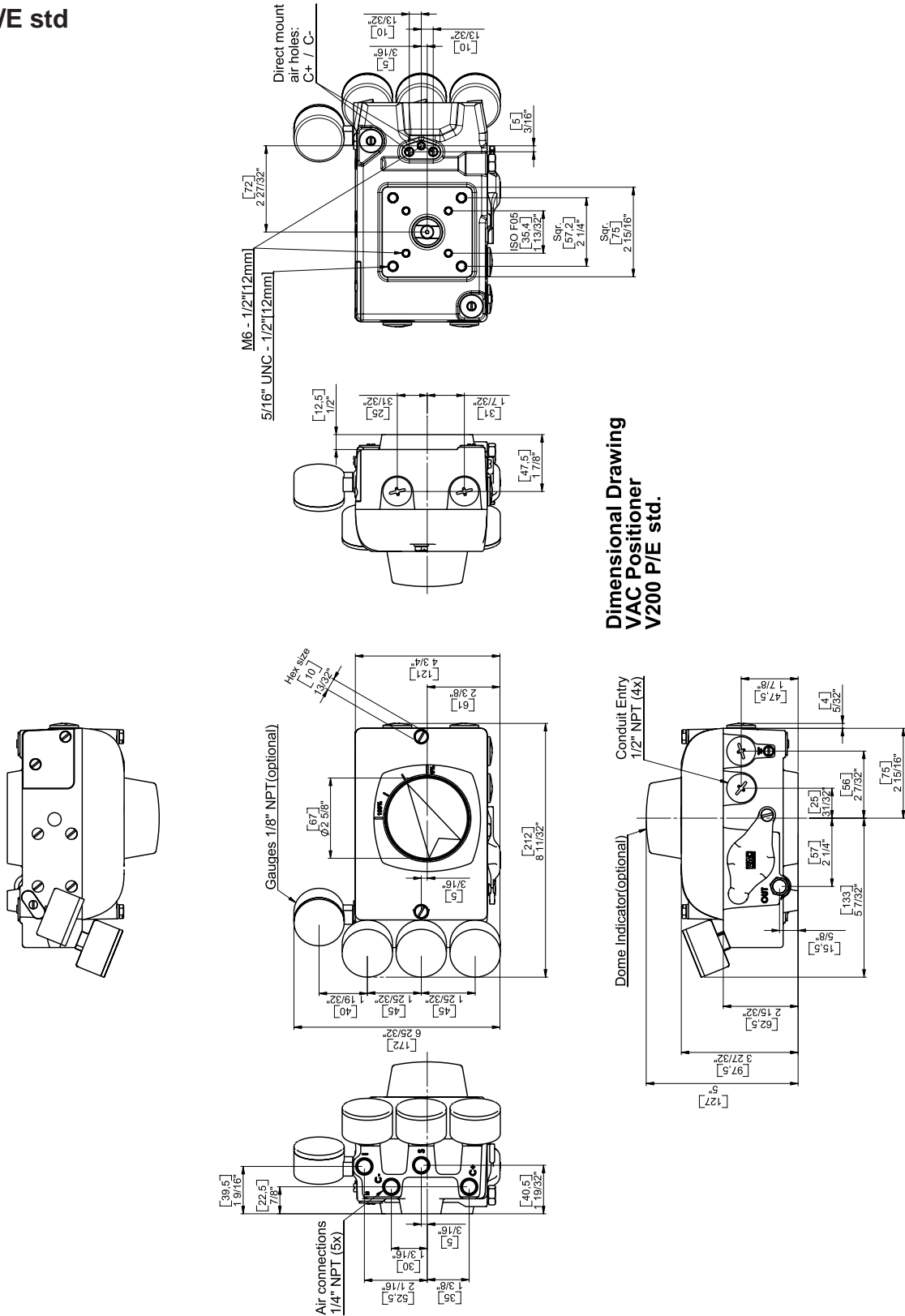


# V200 POSITIONER

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## 5. DIMENSIONS

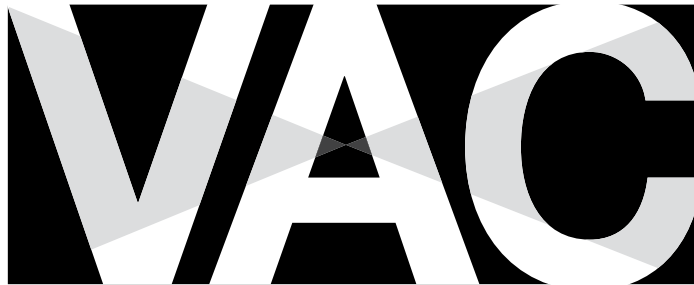
### 5.1 V200P/E std



Dimensional Drawing  
VAC Positioner  
V200 P/E std.







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**Valve Accessories & Controls, Inc.**

200 Jade Park

Chelsea, AL 35043

TEL: (11) 205-678-0507 • FAX: (11) 205-678-0510

[vacaccessories.com](http://vacaccessories.com)