

20026_RO_V100_MANUAL_ENG_010310



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BLX Sweden AB



1. INTRODUCTION

1.1 General.

BLX V100 is a compact, modular positioner for both rotary and linear actuators, double or single acting.

There are two basic types: V100P for a pneumatic signal and V100E for a current signal.

BLX V100 has independent zero and span adjustments, making calibration very simple. External access for zeroing is standard. BLX V100 corrosion resistant painting and sealing meet NEMA 4X as well as the sealing requirement IP 66.

BLX V100 is furnished standard with four connecttions for gauges and a threaded opening for venting the positioner's exhaust.

The BLX R100 feedback unit for the V100 is offered as an accessory (see separate manual).

1.2 Function

The V100 utilizes the force balance principal of operation.

The desired value, in the form of pressure, affects the membrane(1) with the force that is created transferred to the balance arm(2).

The opposing force, which represents the actual value, is provided by the feedback spring(5) and works in the opposite direction on the balance arm(2).

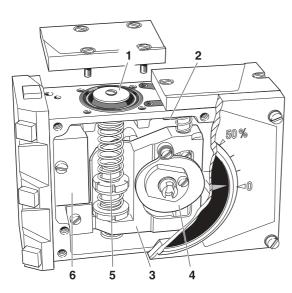
The feedback spring, resting on the guide arm(3), is positioned by the shape and response of the cam.

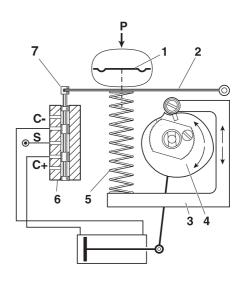
The cam(4) is connected to the cylinder's (actuator) piston rod via the drive.

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 or a change in the position of the piston rod occurs, the force balance is also changed and the spool moves. Air immediately begins to flow into the part of the cylinder (C+ or C-) which allows the feedback mechanism to return the spool to the neutral position.

The system is self-stabilizing and searches for equilibrium.



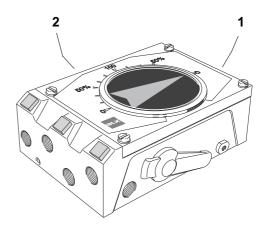


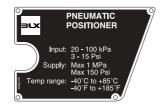


1.3 Product identification

The V100 has two identification tags, the serial number tag(1), and the product model tag(2). The latter contains information on control signal, maximum working pressure and temperature ranges.

Other information can be shown depending on the model.





The product model tag for V100P



The serial number tag

1.4 Air quality recommendations

Poor air quality is one of the causes of premature functional problems with pneumatic and electropneumatic equipment. The pilot valve and I/Pconverter 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 I/P converter, causing the unit to malfunction.

We strongly recommend the use of water separators with adequate capacity. Coalesing 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 I/P-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 I/P-converter. They can also cause the pilot valve to malfunction. The unit may completely fail.

To ensure normal operational safety with BLX positioner products, we recommend that a water separator and a <80 micrometer filter are mounted as close to the product as possible.

If larger amount of oil is 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 international standard ISA S7.3-81.



1.5 Safety Instructions





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 circuting 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 V100P: max. 145 PSI / 1 MPa V100E: 23 - 145 PSI / 0,15 -1 MPa

I_P − Input, pressure signal V100P: 3-15 PSI / 20-100 kPa V100E: Plugged

I_E – Input, current signal V100E: 4-20 mA (Ri max 250 ohm) V100P: Plugged

C+ - Cylinder connection + stroke **C-** - Cylinder connection – stroke

EXHAUST - All air from the cylinder, I/P and positioner is vented through this port.

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

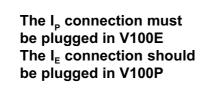
Gauge connections for male 1/8" NPT or G 1/8".

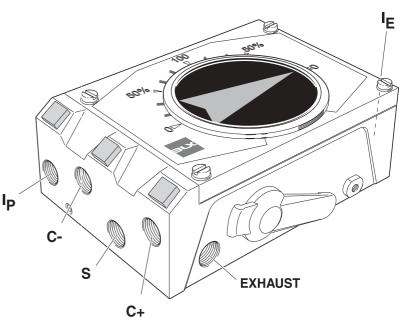
Cable entry for male 1/2" NPT, PG 13.5 or M20 cable fitting.

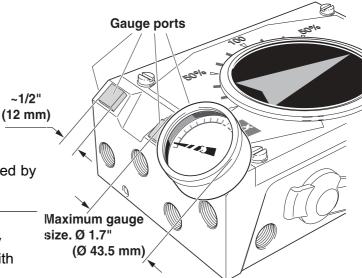
The appropriate threads are clearly indicated by the markings on the housing.

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

Liquid sealant for threads, Loctite or similar, is recommended for all air connections.









2.2 General mounting instructions.

The V100 has the ISO F05 hole pattern(1) for mounting kits.

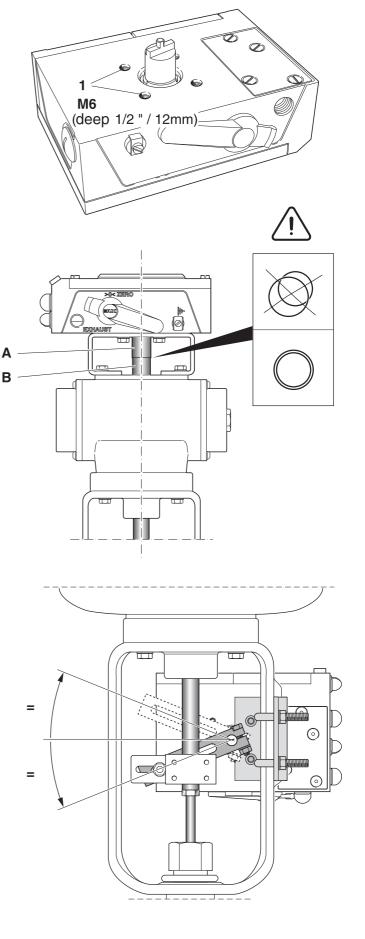
2.2.1 Rotary actuator

The BLX V100 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 in turn overload and in short time wear out even the very best drive shaft bearing.

2.2.2 Linear actuator

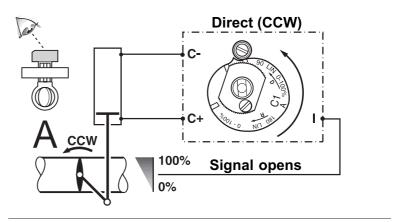
When mounting on linear actuators, the positioner should be attached in such a way that its drive is in the center of the actuator's stroke. Proper installation and alignment will minimize linearity error.

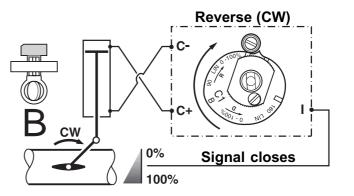


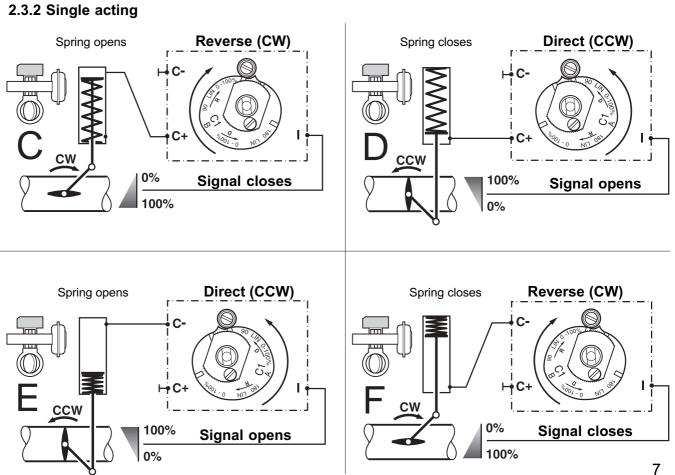


2.3 Installation instructions for rotary actuators

2.3.1 Double acting



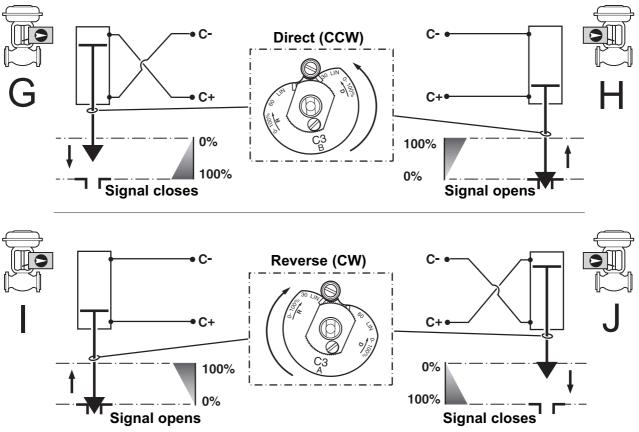




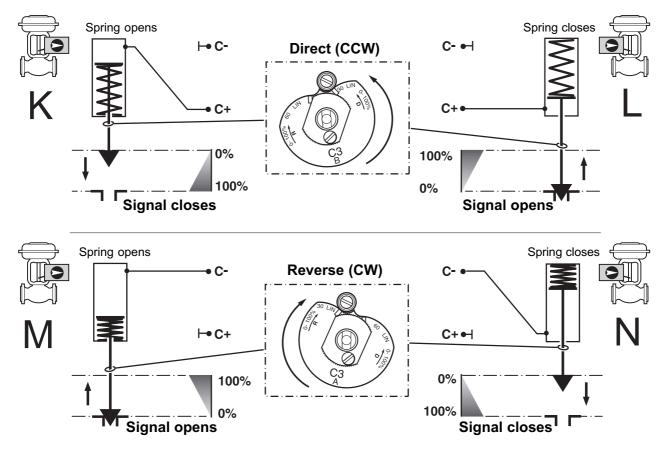


2.4 Installation instructions for linear actuators

2.4.1 Double acting



2.4.2 Single acting





2.5 Cam

The V100 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 12)

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

2.5.2 Cam specifications C1

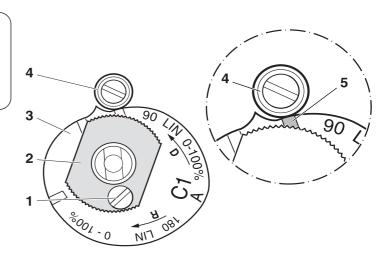
Index mark / Starting point of rotation *

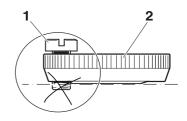
- 5. 90° Linear 0-100% CCW
- 6. 180° Linear 0-100% CW
- 6. 90° Linear 0-50% CW split range
- 7. 90° Linear 50-100% CW split range
- 8. 90° Linear 0-100% CW
- 9. 180° Linear 0-100% CCW
- 9. 90° Linear 0-50% CCW split range
- 10. 90° Linear 50-100% CCW split range

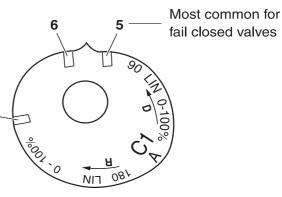
*Increasing signal rotation

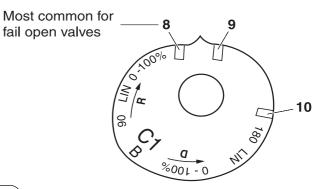
Most valves rotate CW to close / CCW to open

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











2.6 4-20 mA connection

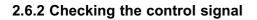
2.6.1 Connecting the control signal

Remove the front cover and indicator. (see page 12)

Loosen the screw(1) enough so that the connection card can be lifted. Secure the connection card into the small slot(2).

Terminal block screws are now easily accessible.

Connect the cables to its respective pole. Max cable area 2,5 mm², \sim AWG 13



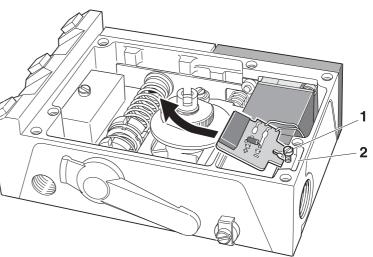
The control signal can be checked without having to break the signal loop. This is done by connecting a low ohmic ampere meter over the test points(3).

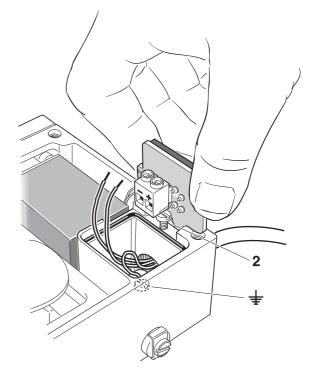
2.6.3 Bench test with the calibrator

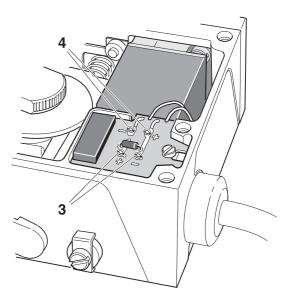
When bench testing, it is possible to connect the control signal over the points(4) without having to loosen the connection card.



The I/P-converter is factoryadjusted. No extra range or zeroing adjustments are necessary.









2.7 Calibration



The V100 is delivered factory calibrated 0-100 % ±1%.

Calibration procedure

Zero position

- 1. Set 0% input signal.
- 2. Wait until the valve has adjusted.
- Adjust the zero position by turning the zeroing screw(3), with a screwdriver from the outside or by using a slot(3a) on the yellow wheel.

Range

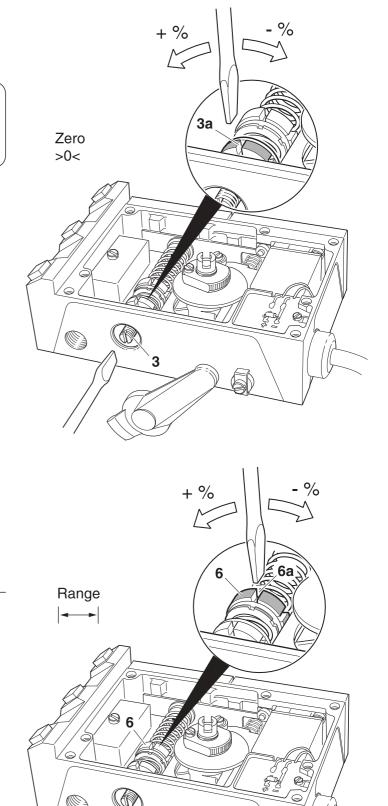
- 4. Increase to 100% input signal.
- 5. Wait until the valve has adjusted.
- 6. Adjust the range by turning the red range nut(6).

Check the zero position

Make fine adjustments if necessary.*

*With Split Range, where zeroing can be done by a signal other than 0%, the steps

1-6 must be repeated until the desired setting has been reached.





3. MAINTENANCE

3.1 Front cover and Indicator

Removing the front cover

Remove the four screws(1) and the front cover.

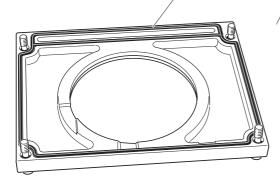
Changing the sealing in the front cover

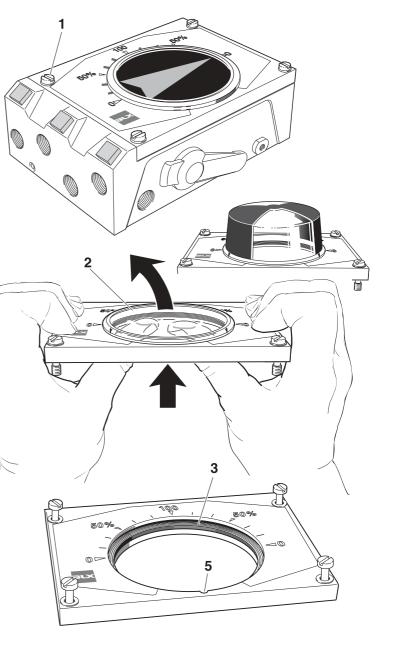
Remove the indicator cover(2) by pressing from the backside.(see sketch)

Remove the rubber gasket(3) and replace with a new gasket.

Remove the O-ring(4) on the backside of the front cover and replace with a new O-ring.

Mount the indicator cover by installing its tap into the groove(5) of the front cover and lock it in place.





6

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Removing the indicator Pull the indicator(6) straight up.

Important Note!

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

Mounting the indicator

Install the indicator in place over the drive shaft and press it straight down. Turn the indicator to the proper display position.



3.2 Pilot valve

Removal

Remove the front cover and indicator. (see page 12)

Loosen the pilot retaining screw(1).

Lift the pilot valve(2) straight up.

Cleaning

Remove the spool(3) from the valve housing.

Clean the parts with a soft cloth and pipe cleaner using alcohol, acetone or something similar.

Blow dry with clean, pressurized air. Install the spool back in the valve housing.

Check

Place the spool in its "working position". (all four pistons inside the housing) Slowly lift the pilot valve in one end. The spool should start to glide before the angle exceeds 20°.(see sketch)

If any of the parts show signs of wear, we recommend replacing with a new pilot valve assembly.

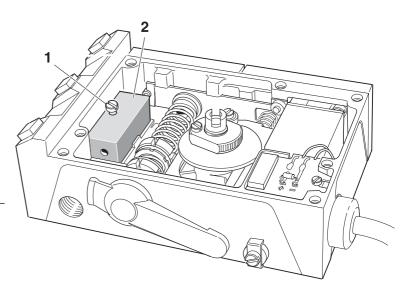
The pilot valve's parts are matched to attain the best possible performance. Mixing of parts can result in high excessive bleed and/or poor function.

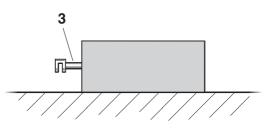
Install Pilot

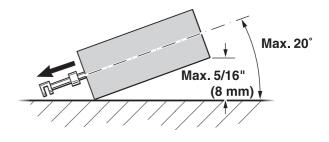
Check the pilot valve's O-rings.

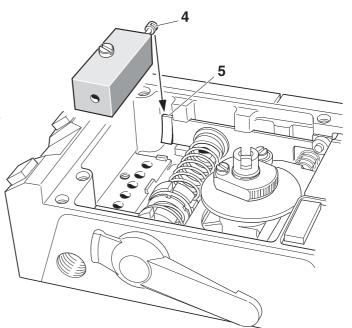
Be sure that the spool's "gap"(4) fits over the balance arm(5) and place the valve straight down into place.

Tighten the retaining screw(1).











3.4 Filter

Changing the filter

- 1. Remove the front cover and indicator. (See page 12)
- 2. Loosen the screw(1) and lift out the card.
- 3. Loosen the screws(3) and lift out the I/P-converter.
- 4. Loosen the screws(5) and remove the membrane cover(6).

Please Note! Be sure that the O-ring in the cover(6) is not removed.

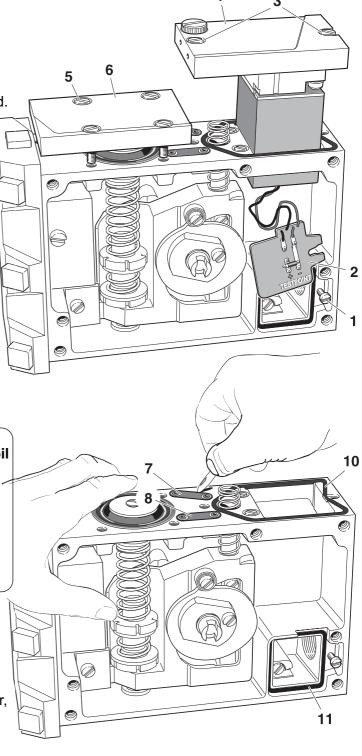
- Cautiously remove the filter cap(7 & 8) with a sharp pointed object e.g. a pocket knife.
- 6. Remove the filter(9) from its rubber envelope.

If the filter(9) shows traces of oil or water, check the water/ oil separator in the supply line.

Oil and water can cause functional problems in the I/P-converter.

- 7. Insert the new filter in the rubber envelope.
- Press the filter caps(9) into the housing. To make installation in the housing easier, a <u>small</u> amount of grease or oil can be applied to the rubber.
- 9. Install the other parts in reverse order.

Please Note! Also check the seals.(10 & 11) Replace if they are damaged.





V100 Positioner

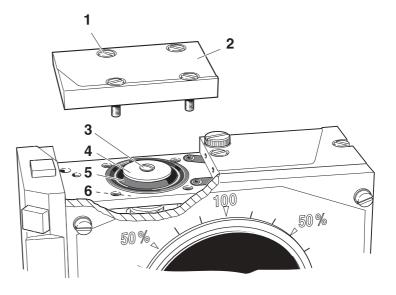
3.5 Membrane

Removal

Loosen the screws(1) and remove the membrane cover(2). Be cautious of the O-ring in the membrane cover.

Loosen the screw(3).

Remove the washer(4), membrane(5) and membrane piston(6).

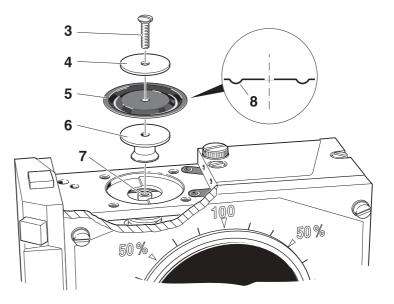


Mounting the membrane

Install the membrane piston(6) over the cylindrical dowel(7).

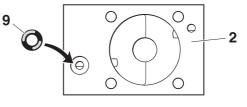
Place the membrane(5), with the bulge(8) hanging down towards the membrane piston(6).

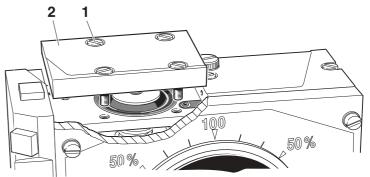
Place the washer(4) on top, put the screw(3) in the hole and turn it tightly.



Mounting the membrane cover

Check that the O-ring(9) is not damaged. Install the membrane cover(2) and tighten the screws(1) crosswise.







3.6 Feedback spring, changing

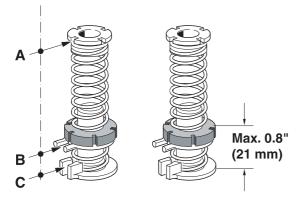
Removal

The feedback spring(1) can be removed by inserting a screwdriver between the upper spring coils and compressing it so that the upper spring socket is released from its seat.

Mounting

Before the feedback spring is replaced, a basic adjustment must be performed. The A, B, and C gaps must be aligned.

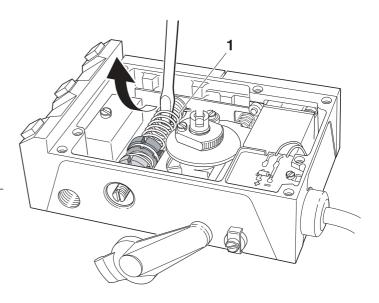
The distance between the lower edge of the lower spring support and the upper edge of the red range nut must be less than 0.8" / 21mm before mounting.

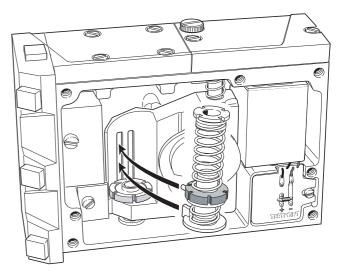


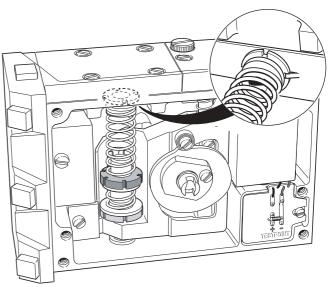
Fit the "gaps" B and C into the slots on the guided arm and at the same time install the lower spring support on the yellow zeroing wheel.

Compress the spring and flex it into the housing, securing the upper spring socket onto the stud on the balance arm.

Be sure that the upper spring socket and lower spring support lies flat with their respective contact surfaces and that the red range nut can be turned.









3.7 Feedback spring

Disassembling

- A.Remove the spring support(1) from the red range nut(3).
- B. Disassemble the spring support(1) and the spring(4).
- C.Hold the spring socket(5) and try to push the spring off the socket by pressing a screwdriver or similar against the end of the spring. (see sketch).

Please Note! The spring is self-locking to the socket and may be very secure.

В



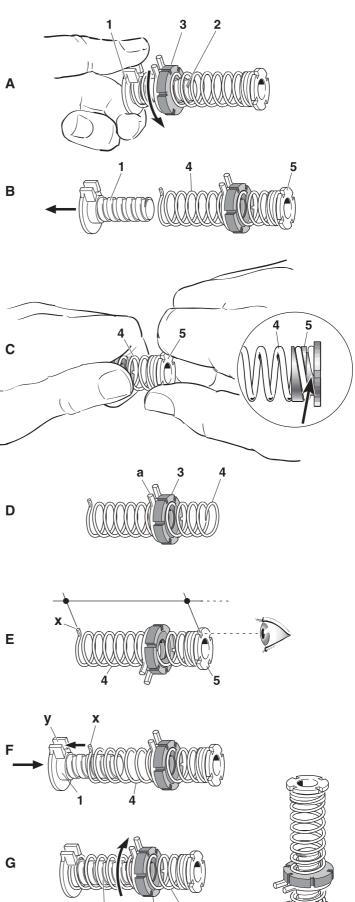
Reassembling

- D. Thread the range nut(3), with the friction spring(a) side first, onto the spring(4).
- E.Screw the upper spring socket(5) into the spring(4). The spring is self-locking on the socket and should sit very tight.

Turn the spring on to the socket as much as possible.

Note! One of the four grooves in the upper spring socket(5)must align with the dowel pin(x) on the spring.

- F. Install the spring dowel(x) into the crotch(y) in the spring support(1).
- G. Thread the range nut(3) onto the screw(2). If this is difficult, it may help to compress the spring(4) slightly.



2

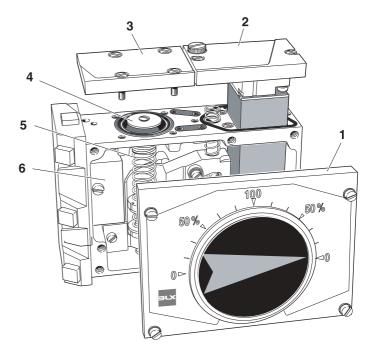
3



3.8 Balance arm

Removal

Before the balance arm can be removed, the front cover(1), I/P-converter or cover(2), membrane cover(3), membrane(4), feedback spring(5) and pilot valve(6) must all be removed.



Loosen the screws(7) and remove the balance arm(8).

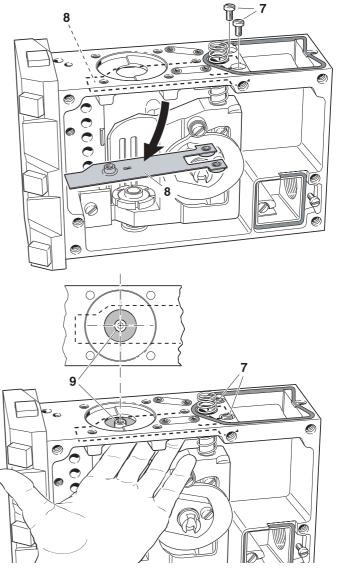
Mounting

Install the balance arm into the housing.

Center the dowel(9) with the hole in the housing.

Tighten the screws(7) and check the centering.

Install the remaining parts according to their respective instructions.





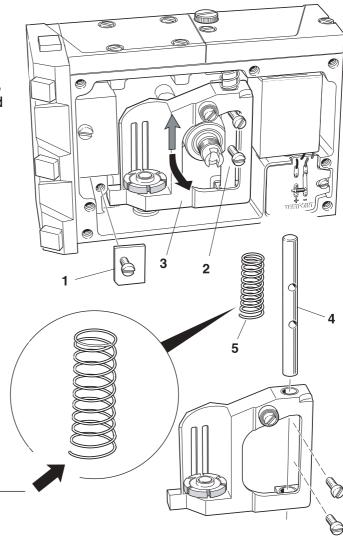
3.9 Guide arm, changing

Removal

Before the guide arm can be removed, the feedback spring (see page 17) and cam (see page 9) has to be removed.

Remove the stop washer(1).

Loosen the screws(2) and remove the arm(3) together with the guide pin(4) and spring(5).



Mounting

Insert the guide pin(4) into the bearings of the arm.

Install the spring(5) on to the upper end of the guide pin with the larger end towards the arm.

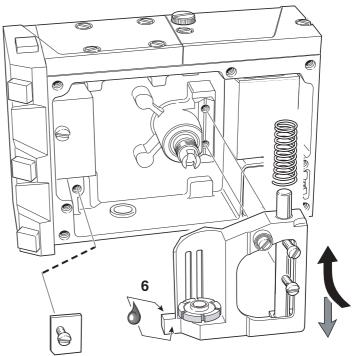
Secure the guided arm with the guide pin into the V-block.

Tighten the two screws(2).

Apply a small amount of grease on the arm support's(6) sliding surfaces.

Mount the stop washer(1).

Make sure the arm moves freely.



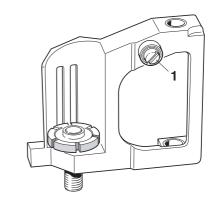


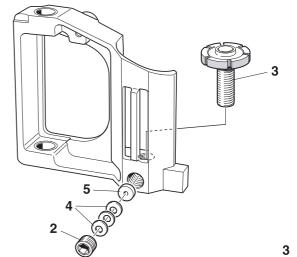
3.10 Guide arm, disassembly

Ball bearing, changing

Loosen the screw(1) and remove the ball bearing.

Mount the new ball bearing with Loctite in the M4-hole on the arm and tighten the screw securely.





Zeroing screw, removal.

Loosen the socket set screw(2).

Remove the three spring washers(4) and the friction block(5).

The friction block may be difficult to remove and doesn't necessarily need to be removed to be able to unscrew the zeroing screw(3).

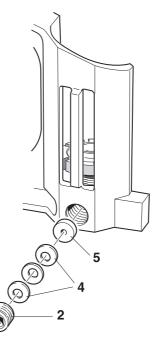
Mounting

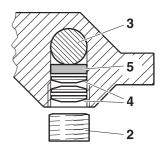
Install the zeroing screw(3) to the middle position.

Mount the friction block(5) and the spring washers(4).

Screw in the socket set screw(2) tightly.

Loosen the screw 1/8 turn and check that the zeroing screw has proper turning friction.





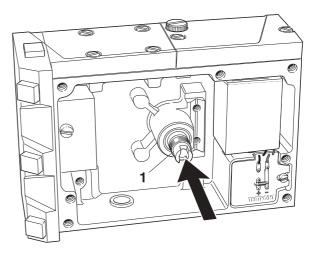


3.11 Drive shaft

Removal

Before the drive shaft can be loosened, the cam must be removed.

Remove the drive shaft(1) by hand from the inside. If necessary replace defective O-rings(2 & 3).

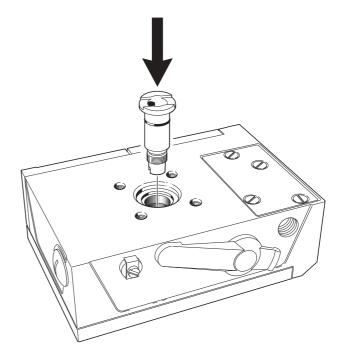


Mounting

Apply a small amount of oil to the drive shaft's surface and O-rings.

Install the drive shaft and press into place.

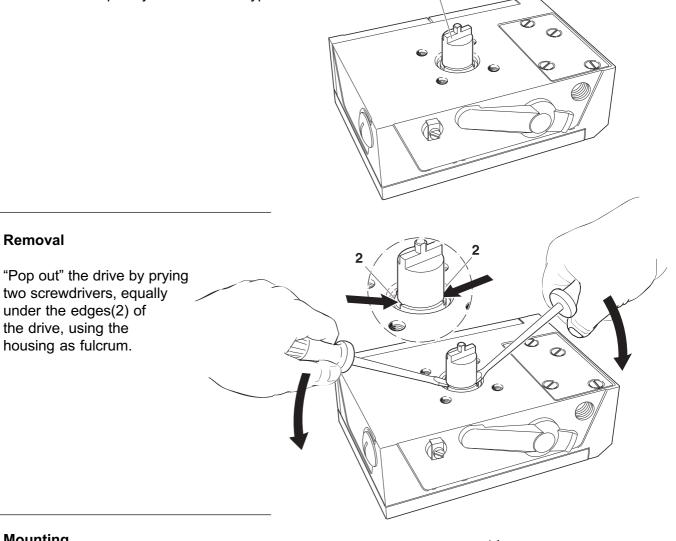






3.12 Drive

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

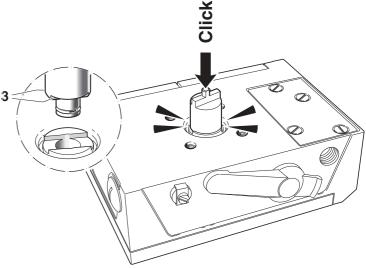


Mounting

Press the drive down into the drive shaft hole.

Turn the flats(3) into place and press down. $_3$

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





3.13 Safety valve

Removal

Loosen the screws(1).

Remove the tightening cover(2) and the gasket(3).

Lift out the safety valve(6).

Safety valve, assembly

The safety valve is designed with a weak spring(4) and a rubber plug(5).

For proper functioning, the spring and the rubber plug need to be mounted together.

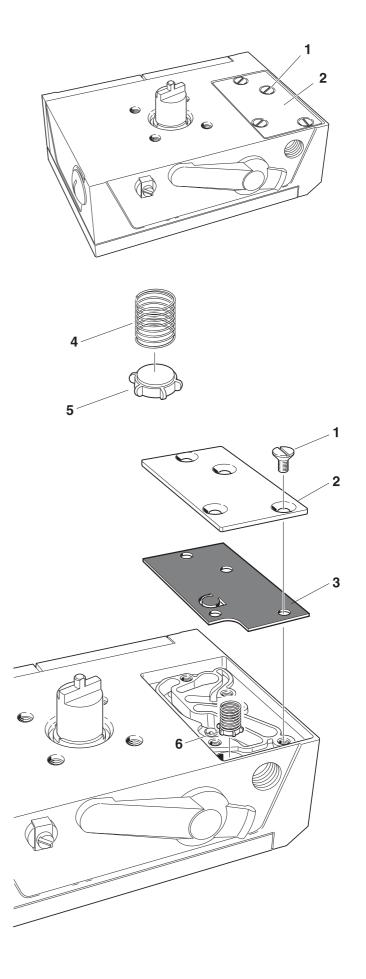
The spring turns firmly on the rubber plug's cylindrical section.

Mounting

Install the safety valve(6) with the rubber plug facing the housing.

Insert the gasket(3) and the tightening cover(2).

Mount the screws(1).





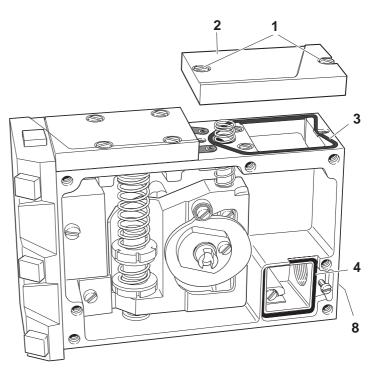
4. CONVERTING

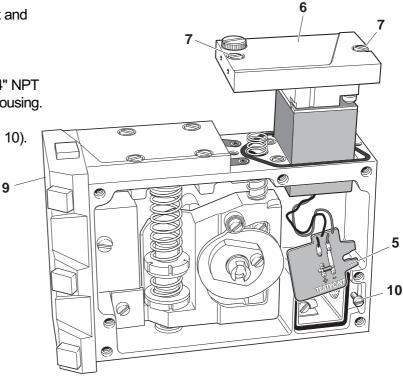
4.1 Converting from V100P to V100E

- 1. Remove the front cover and indicator. (see page 12)
- 2. Loosen the screws(1) and remove the cover(2).
- 3. Unscrew the protective plug from the $I_{\rm F}$ -connection(8).

Please Note! Check the seals(3 & 4). Replace if they are damaged.

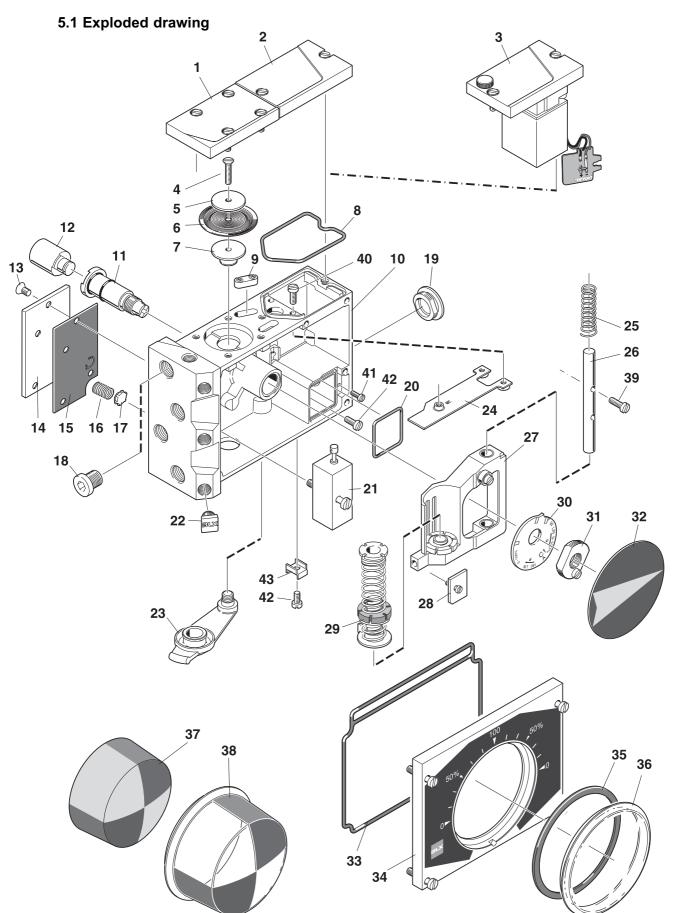
- 4. Insert the connection card(5) and the I/Pconverter(6) through the square hole in the housing.
- 5. Secure the I/P-converter with the screws(7).
- 6. Install the connection card in its seat and secure with the locking screw(10).
- Plug the port(9) marked I_p. Threading requirements G 1/4" or 1/4" NPT is indicated by the markings on the housing.
- 8. Connect the control signal (see page 10).







5. SPARE PARTS





5.2 Spare parts list

1 Membrane cover 10066 1 Screw MCS bx14-5 SS 10061 (V100P only) 2 Correw MCS 5x12-5 SS 10061 (V100P only) 3 UP-convert EA1 10160 1 (V100E only) - Screw MCS 5x12-5 SS 10012 1 - Screw MCS 5x12-5 SS 10012 1 - Screw MCS 5x12-5 SS 10112 1 - Screw MCS 5x12-5 SS 1 1 - Screw MCS 5x14-5 SS 1 1 - Membrane sher 10019 1 - Membrane sher 10016 1 - Membrane sher 10002 1 1	ltem	Description	Part	no	Qty
- Mylar washer 10095 4 2. Cover plate 10061 1 (V100P only) - Screw MCS 5x12-5 SS 1 - Mylar washer 10061 1 (V100E only) - Resider norm 10061 1 (V100E only) - Resider norm 10047 1 - Cornection card 10012 1 - Screw MCS 5x12-5 SS 1 1 - Screw MCS 5x14-5 SS 1 1 - Membrane washer 10018 1 - Membrane washer 10003 1 - Membrane washer 10002 1 - Dring Ø15x2 NBR 1 1 - Oring Ø15x2 NBR 1 1 - Oring Ø15x2 NBR 1 1 - Orin	1				
- O-ring Ø 5x2 NBR 1 2 Cover plate 1 - Screw MCS 5x14-5 SS 1 - Mylar washer 10095 2 3 UP-converter EA1 10160 1(V100E only) - Restictor nozzle 10047 1 - Connection card 10012 1 - Screw MCS 5x12-S SS 1 1 - Mylar washer 10095 2 - Wiler washer 10019 1 - Cornig Ø 5x12 S NBR 1 1 - Membrane washer 10019 1 1 - O-ring Ø 5x2 S NBR 1 1 1 - P. Hitler cap 20030 2 1 - Rubber channel nitrile 100092 1 1 - O-ring Ø 15x1 S NBR 1 1 1 1 - O-ring Ø 15x2 NBR 1 1 1 1 - O-ring Ø 15x2 NBR 1 1 1 1 - O-ring Ø 15x2 NBR 1 1 1 1					
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- Screw MCS 5x12-5S 1 Where the EA1 10160 1 (V100E only) - Resistor nozzle 10047 1 - Screw MCS 5x14-5SS 1 1 - Screw MCS 5x14-5SS 1 1 - Screw MCS 5x14-5SS 1 1 - Mylar washer 10019 1 - Screw MCS 5x14-5SS 1 1 - Membrane washer 10019 1 - Membrane washer 10018 1 - Oring Ø4x2.5 NBR 10008 1 - Filter cap 20300 2 - Nubber channel nitrile 10008 1 - Oring Ø12x1.5 NBR 1 10022 1 - Oring Ø12x1.5 NBR 10079 1 3 Screw MFS 5& S S 10079 1 - Spring circlip 10017 1 1 1 1 1 1 - Oring Ø12x1.5 NBR 10017 1 1 1 1 1 1 1 1 1 1 1 1 1 </td <td>2</td> <td></td> <td></td> <td></td> <td></td>	2				
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42 Screw MSCS 4x8 SS 2					
43 Grounding clamp 10067 1	42	Screw MSCS 4x8 SS			2
	43	Grounding clamp	10067		1

*Cams with other ranges, Front labels with other scale readings and Drive's suitable for the most frequently used actuator types, are available. **Only Spool valves marked: 10039-R0-WA1, 10071-R0-WA2, 10071-R1-WA2, 10090-R0-WA3 and 10090-R1-WA3



6. TECHNICAL INFO

6.1 Specifications

	V100P		V100E	
Input range: Supply pressure: Linearity error: Hysteresis: Repeatability:	3-15 PSI <145 PSI <0.7% f.s <0.4% f.s <0.3% f.s	х ,	4-20 mA 21.8-145 P <1.0% f.s <0.6% f.s <0.5% f.s	(Ri<250ohms) SI (0.15-1MPa)
Pressure Gain: @87 PSI (600kPa) acc. to ISA S75.13	750 P _{out} / 49 %P _{out} /	P _{in} ′ %P _{in}	750 P _{out} / P 49 %P _{out} / 9	ⁱⁿ P _{in}
Air Capacity:	SCFM	(SLPM)	SCFM	(SLPM)
@29 PSI (200kPa)	9.5	(270)	9.5	(270)
@87 PSI (600kPa)	28.3	(800)	28.3	(800)
@145 PSI (1MPa)	47.1	(1350)	47.1	(1350)
Bleed Rate:	SCFM	(SLPM)	SCFM	(SLPM)
@29 PSI (200kPa)	0.18	(5)	0.2	(5.7)
@87 PSI (600kPa)	0.53	(15)	0.6	(17.0)
@145 PSI (1MPa)	0.88	(25)	1.0	(28.3)
Weight:	3.5 lbs	(1.6kg)	3.8 lbs	(1.7kg)
Weight with gauges:	4.0 lbs	(1.8kg)	4.2 lbs	(1.9kg)

Temp range:	-40° to +185° Fahrenheit -40° to +85° Celsius		
Air connectors: Gauges: Cable entry:	1/4" NPT (optional G threads) 1/8" NPT (optional G threads) 1/2" NPT (optional M20x1.5 or PG 13.5)		
Ingress & corrosion protection:	NEMA 4X and IP66		
Coating:	Powder Polyester		

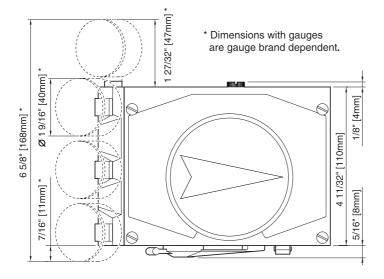
Options: Feedback Spring for 6-30 PSI (40-200kPa) input signal. Gauges.

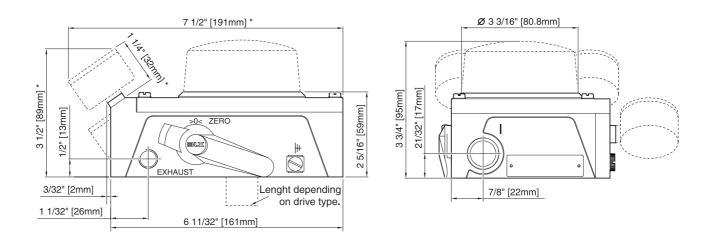
Pilot Valves:

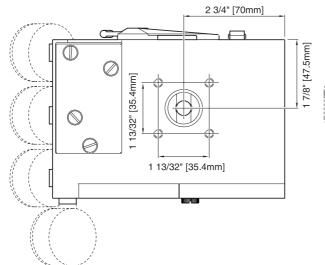
- W1 Low Gain-Medium Flow-Low Bleed for better stability and lower bleed.
 Pressure gain @87 PSI =300
 Bleeds approx. 33% < than W3
 Air capacity =10% < W3 (above chart)
- W2 High Gain-High Flow-High Bleed For faster response and better accuracy. Pressure gain @87 PSI >1000 Bleeds approx. 33% > than W3 Air capacity = W3 (above chart)
- W3 Medium Gain-High Flow-Medium Bleed For "average" capacity and bleed Standard Pilot Assembly Specifications shown in above chart

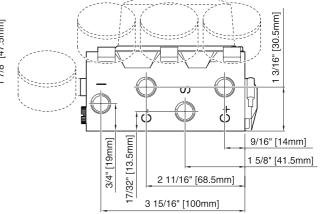


6.2 Dimensions











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