

**Blakeborough Control Valves**  
Installation, Operation & Maintenance Manual  
**SM1 Clipon Side Mounted Handwheel****SAFETY**

**Safety** - consult Blakeborough publication 'Safety' before starting any maintenance work.

The valve and actuator should be handled and installed with care. Consult publication 'Good Installation Practices' for details.

Before any maintenance work it is essential to ensure that the actuator is isolated and depressurised.

**GENERAL**

The A40 direct acting and A41 reverse acting diaphragm actuators for sizes 322,483 and 645 sq cm (50, 75 and 100in<sup>2</sup>), with stem travels up to 38mm (1 1/2") may be supplied with the SM1 side mounted handwheel. Alternatively SM1 units can be supplied separately and fitted to existing A40 or A41 actuators. Actuators with the SM1 equipment are designated A40S or A41S to distinguish them from the standard A40A and A41A types.

An A40S actuator with the stem in the upper position and handwheel adjusted to align the pointer (99) to the neutral position on the SM1 indicator plate (103) can be operated by air pressure on the diaphragm in the same way as the standard A40A actuator. The design allows the bellcrank lever to move about the fulcrum as the stem moves down or up in response to changes in the air pressure on the diaphragm.

The action with the A41S actuator commences with the stem in the lower position. With the pointer in the neutral position the stem movement responds to diaphragm air pressure changes in the same way as the A41A.

The side-mounted handwheel is designed to perform three basic functions:

- a) For manual operation of the actuator stem without air pressure on the diaphragm; turning the handwheel clockwise will move the stem downwards; turning the handwheel anticlockwise will move the stem upwards.
- b) Limit downward travel of the actuator stem.
- c) Limit upward travel of the actuator stem.

**FITTING SM1 TO A40 ACTUATORS**

The SM1 kit comprises an assembled unit and a container of loose parts required to connect the unit to the actuator. To fit the SM1 to the A40 actuator, proceed as follows:

1. Screw the two 8mm diameter studs (90) from the SM1 kit into the 8mm tapped holes on 57mm centres in the accessory mounting pads on the actuator yoke. When facing the correct pair of holes, the actuator leg with the slot will be on the right hand side and the leg with the fin for the travel indicator plate on the left.
2. Remove the four small screws (31), indicator pointer (30), nut (23) and screw (22) from the stem connector (21) of the standard A40A actuator. From the SM1 kit take the new connector screw (22), nut (23) and two steel connector screw bearings (93). Screw the stem connector assembly together with one of the bearings between the screw head and the side of the stem connector and the other bearing between the opposite side of the stem connector and the nut. When finger tight turn the stem connector until the nut end of the screw is in line with the yoke fin and the four – 4mm diameter tapped holes are facing the yoke side opposite to the side with the 8mm studs. Fix the new travel indicator pointer (30) using the two 4mm tapped holes nearest to the travel indicator plate fin.
3. Turn the SM1 handwheel until the indicator pointer (99) is about 5mm to the left of the neutral position to allow freedom of movement during assembly. Place the assembled unit on the actuator yoke. The lever fork ends should be positioned across the stem connector screw bearings and the 8mm studs in the yoke pads protruding into the 9mm diameter locating holes (on 57mm centres) in the SM1 backplate. Secure the unit with two 'U' bolts placed around the 112mm diameter of the yoke. The upper 'U' bolt (84) is positioned just below the top set of facing pads on the yoke and the lower 'U' bolt (85) fixed between the two lower sets of pads. Tighten the 'U' bolts evenly to ensure firm contact between the SM1 backplate and the six facing pads on that side of the yoke. The item numbers of the 'U' bolt nuts and washers are: 86,87,88 and 89. Tighten the stem connector screw and nut. Slots in the SM1 indicator plate and the stem

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travel plate on the yoke permit adjustment to align the indicator plate calibration marks with pointers.

4. The SM1 unit is fitted to the A41 actuator in a similar manner to the A40 but in this case the lever fork is connected to the stem connector assembly in the lower position. The handwheel should be turned to move the pointer about 5mm to the right of the neutral position to allow freedom of movement during assembly.

**A40S AND A41S WITH ACCESSORIES**

When an actuator with instruments is converted to fit the SM1 handwheel the mounting will have to be modified to suit differences between the instrument arm used with the standard actuator and that used with the A40S/A41S.

**SM1 DISASSEMBLY**

To disassemble the SM1 unit turn the handwheel until the pointer (99) is in the neutral position and proceed as follows:

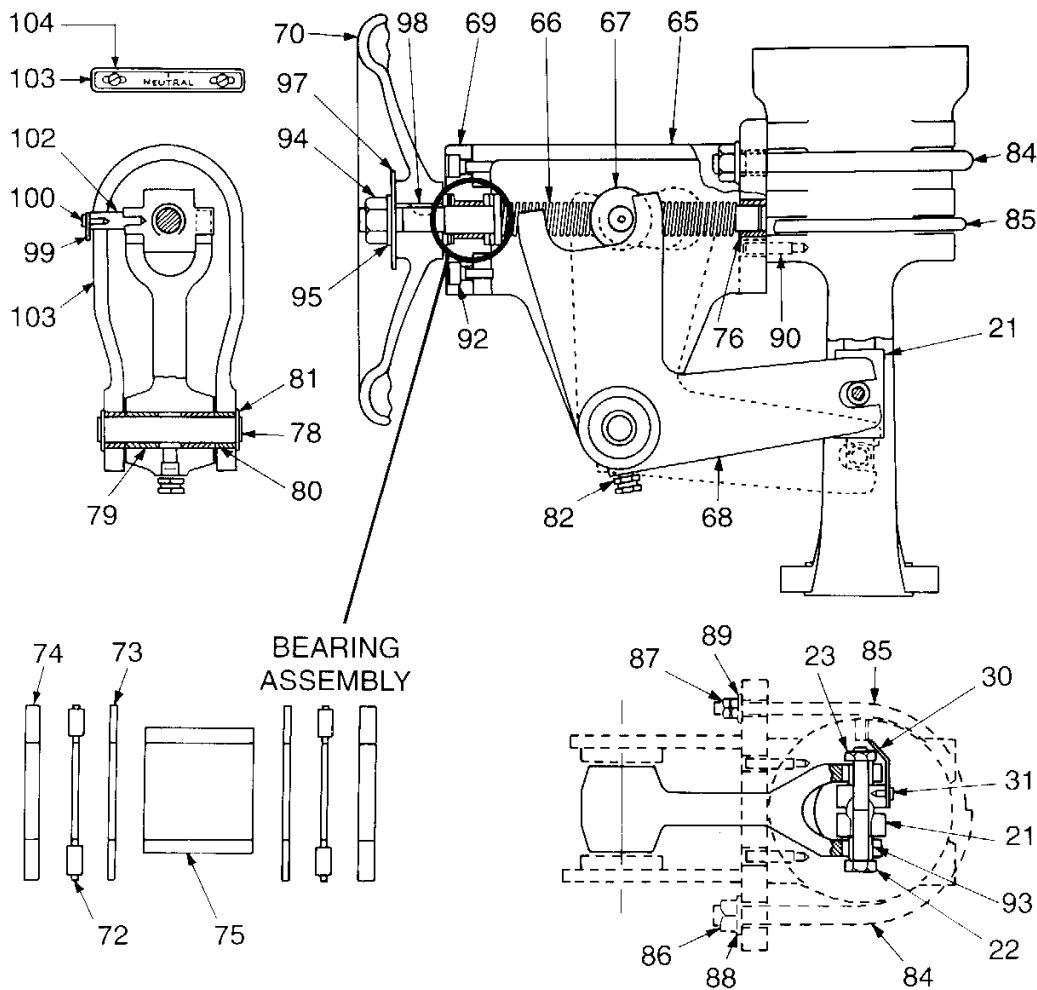
1. Remove the 'U' bolt nuts, washers and 'U' bolts and withdraw the SM1 assembly from the actuator.
2. Take off the circlips (81) and withdraw the fulcrum pin (78). The bellcrank lever (68) with lubricator (82) can now be taken from the body.
3. Remove the pointer screw (100), pointer (99) and pointer arm (102) from the jacking nut (67) and the handwheel stem nut (94), washer (95) indicator plate (97) and slide the handwheel off the stem. The woodruff key (98) and front thrust bearing assembly (72,73 and 74) can now be taken out. Unscrew the four cap screws (92) which secure the bearing housing.
4. Hold the jacking nut (67) (accessible through the lever space) and turn the handwheel stem clockwise until it has screwed out of the jacking nut which can then be withdrawn (the stem and jacking nut have 20mm diameter left hand threads).
5. The bearing housing with the stem and rear bearing assembly (72,73 and 74) can now be taken out of the SM1 body and the parts separated for inspection.

**SM1 ASSEMBLY**

Examine all parts including the self lubricated bronze bearings (75, 76, 79 and 80) and replace if necessary. Clean all parts to be reused and lubricate where necessary.

1. Grease the 20mm diameter threads on the SM1 body from the front and the jacking nut into the body through the lever space. Screw the stem through the nut until the end of the stem is in the backplate bearing (76) with the jacking nut in the centre of the body.
2. Ensure that the jacking nut lug with the 6mm tapped hole is on the same side as the slot in the body and the 6mm tapped hole for the tool is at the bottom.
3. Place one thrust washer (74) 2.75mm thick on the 17mm diameter of the handwheel stem against the 30mm diameter flange. Locate the thrust bearing (72) on the stem. Fit the bearing housing (69) recess over the rear bearing assembly and the bearing housing spigot into the 40mm diameter hole at the front of the SM1 body. Secure with the four capscrews (92) evenly tightened.
4. Fit the 1mm thick thrust washer (73), thrust bearing (72) and 2.75mm thick thrust washer (74) on the 17mm diameter of the stem and into the front recess of the bearing housing in that order.
5. Place the woodruff key (98) into the stem keyway and slide the handwheel on the 16mm diameter with the wheel keyway engaged on the key. Press the handwheel firmly against the front thrust bearing assembly. Add the indicator plate (97), washer (95) and secure with nut.
6. Place the larger fork of the bellcrank lever into the body to engage with the lugs on the jacking nut. Retain the lever with the fulcrum pin and two circlips. Screw the pointer arm (102) into the jacking nut and add the pointer screw. Apply grease through the lubricator.
7. Fit the assembled SM1 unit into the actuator as described above.

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**PARTS LIST**

21	Stem connector	82	Lubricator
22	Stem connector screw	84	'U' bolt (upper)
23	Stem connector nut	85	'U' bolt (lower)
30	Indicator pointer	86	'U' bolt nuts (upper)
31	Pointer screws	87	'U' bolt nuts (lower)
65	SM1 body	88	'U' bolt washers
66	Handwheel stem	89	'U' bolt washers
67	Jacking nut	90	Locating studs
68	Bellcrank lever	92	Bearing housing screw
69	Bearing housing	93	Connector screw bearing
70	Handwheel	94	Stem nut
72	Thrust bearing	95	Stem nut
73	Thrust washers	97	Handwheel indicator plate
74	Thrust washers	98	Woodruff key
75	Stem bearing (front)	99	Indicator pointer
76	Stem bearing (rear)	100	Pointer screw
78	Fulcrum pin	102	Pointer arm
79	Leaver bearings	103	Indicator plate
80	Pin bearings	104	Indicator plate screw
81	Pin circlips		