

**Automatic Volume Change  
SL780 and SL781**

Impact Test Equipment Ltd  
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User Guide  
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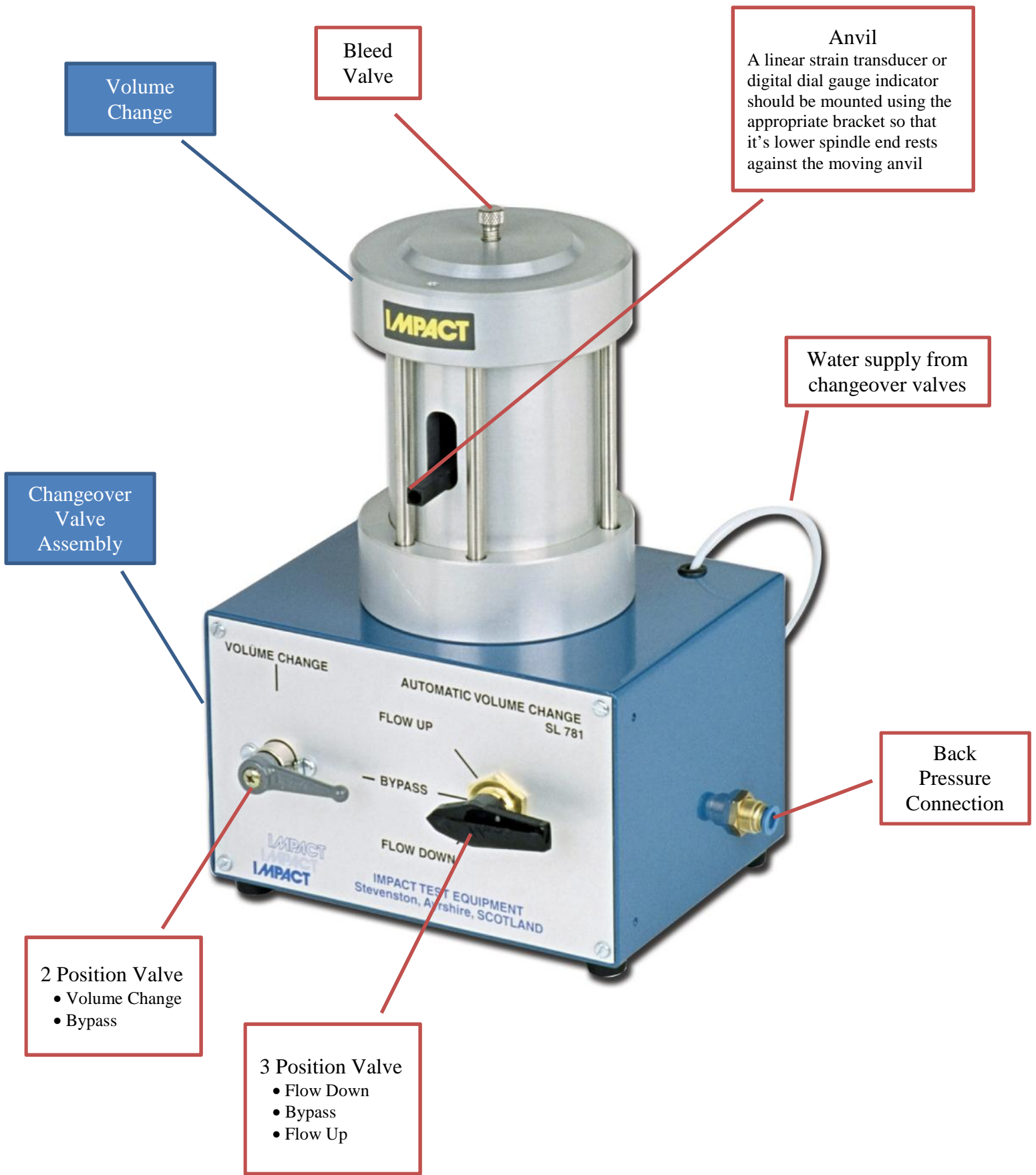
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Volume Change

Bleed Valve

**Anvil**  
A linear strain transducer or digital dial gauge indicator should be mounted using the appropriate bracket so that it's lower spindle end rests against the moving anvil

Water supply from changeover valves

Changeover Valve Assembly

Back Pressure Connection

**2 Position Valve**  
• Volume Change  
• Bypass

**3 Position Valve**  
• Flow Down  
• Bypass  
• Flow Up

VOLUME CHANGE  
AUTOMATIC VOLUME CHANGE SL 781  
FLOW UP  
BYPASS  
FLOW DOWN  
IMPACT  
IMPACT TEST EQUIPMENT  
Stevenston, Arshire, SCOTLAND

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## **INTRODUCTION**

SL780 Automatic volume change unit has an operating capacity of 100ml with an accuracy of at least  $\pm 0.05$  ml. When a greater volume than 100 ml is required, it is necessary to incorporate the SL781 change over valve box

## **INSPECTION**

Your automatic volume change was thoroughly inspected before it was shipped and should be ready to operate as soon as you have complete the set-up procedure. Notify Impact Test Equipment or your local agent and file a claim with any carriers involved if you find any damage to the machine.

## **SPECIFICATION**

Piston Area	40.97 cm <sup>2</sup>
Distance of stroke	25 mm
Capacity of standard unit	100 ml

## **INSTALLATION OF AUTOMATIC VOLUME CHANGE.**

The back pressure line from the triaxial set-up should be connected to the right hand side of the reversing control module box, when viewed from the front. The left hand side connection on the control module box should be connected to the back pressure valve situated in the base of the triaxial cell.

The linear strain transducer or digital dial gauge indicator should be mounted using the appropriate bracket so that its lower spindle end rests against the moving anvil protruding from the side of the volume change cell.

The unit must now be slowly filled using de-aired water by setting the left hand valve on the module, to the VOLUME CHANGE position, as marked, and the right hand valve to the FLOW UP position. Any entrapped air can then be bled from the unit by releasing the bleed cell valve located in the centre of the top of the cell chamber, as the de-aired water is fed into the cell. When water exudes from the bleed valve in the upper plate of the cell, tighten the screw to seal the upper chamber. It is then necessary to repeat the procedure for the lower chamber; the apparatus must be lifted off the reversing control box and inverted to remove the air. It will be necessary to reverse the water flow direction of FLOW DOWN using the flow valve, in order to fill both sides of the apparatus.

After removing the air, it is advisable to leave the apparatus overnight, or for a least eight hours, with an internal pressure of approximately 70 kPa. This will allow any remaining trapped air to be absorbed into the solution. After this period, the apparatus should be carefully flushed out using new de-aired water, and thus displacing the aerated water. This flushing procedure must be carried out in both upper and lower chambers. It may be necessary to repeat this procedure once more, if any signs of air pockets occur during the first two days of operation.

## **CONTROL MODULE VALVE POSITIONS**

The reversing control module SL781 which forms the base of the auto volume change, has the following controls and operating positions.

These are two valves:

The one on the left hand side of the box which has two positions:

### **Volume change and Bypass.**

The other valve is situated on the right hand side of the box and has three positions:

**Flow down**  
**Bypass**  
**Flow up**

In order to bypass the automatic volume change apparatus both valves must be in the Bypass position which will then allow the water to flow directly through the triaxial cell without going through the volume change apparatus.

To measure the actual volume change the left hand side valve must be set to the Volume Change position and the right hand side to either the Flow up or Flow down positions.

If during a test the apparatus is nearing its maximum volume change (100cc), the range of the apparatus can be increased by changing the flow direction using the right hand side valve. If used in this manner certain precautions are needed when calibrating the apparatus which are explained later in this manual.

## **CALIBRATION**

The unit is easily calibrated, whether using the linear strain transducer or the digital dial gauge. Both devices measure from zero to full scale electrically and do not have a centre zero point. Thus the user can calibrate the device from zero to 100 ml in engineering units (cc).

The transducer and digital dial gauge should be connected to the appropriate readout device.

Allow water to flow into the volume change unit so that it moves the transducer spindle to its downwards maximum travel point. The digital displacement on the readout device (or the digital dial gauge), must then be adjusted to read zero.

Reverse the water flow into the volume change apparatus using the flow valve until the maximum upward movement has been achieved. The amount of water flowing into the volume change unit during this process should be measured accurately either by allowing the flowing out water to collect in a

measuring cylinder or a pre-weighed beaker. Knowing the original weight of the beaker, the weight of displaced water can be accurately determined and thereby the volume. As an alternative to this, a precision burette could be used to measure the displaced water. When this actual volume has been determined, the dial gauge reading should be adjusted to show the volume displaced and/or the display on the readout device should be adjusted to the same volume. Because of the need for accuracy this calibration procedure should be carried out three times or until an acceptable agreement between the measured volumes and the digital displays has been achieved.

**Please note that you should attempt to calibrate in one direction only.**

If you wish to use the volume change apparatus in both directions during a test, you must check the reverse direction readings against the calibrated readings in the original direction then use correction factors (if necessary) to overcome any small hysteresis in the transducer or dial gauge. Such procedures as shown above reduce any backlash in the apparatus to a minimum for small volume changes or research level work.

#### **AUTOMATIC VOLUME CHANGE**

When using the automatic volume change device without a reversing module which must be connected to the users own valve or plumbing system, the unit includes a length of tubing for this purpose. The unit must then be reversed using the existing system of valves plumbed into the users system. It is because this approach can result in a large and complex pipework network, that we supply the control module as an optional extra.

If the unit is used directly in your pressure line without any provision for reversing flow, it is necessary to apply a second pressure in the opposite direction to move the internal diaphragm back to its original set rate position.