

## Installation and Operation of Pressure Control Equipment



### General Safety Note

Pressurized components that may contain hazardous media, are potentially dangerous items of equipment, if not operated and maintained in the correct manner. All users of such equipment must be trained and competent to carry out their work. Instructions assume a level of competence by user staff. Attention must be paid to relevant regulatory requirements and Codes of Practice.

All necessary notifications should be made and measures taken for the protection of personnel. If there are any doubts or ambiguities concerning correct procedures, contact your supplier or Bryan Donkin RMG Canada who will be pleased to advise you or provide competent service or instructions. **DO NOT TAKE RISKS.**

### Types of Gas Pressure Regulators



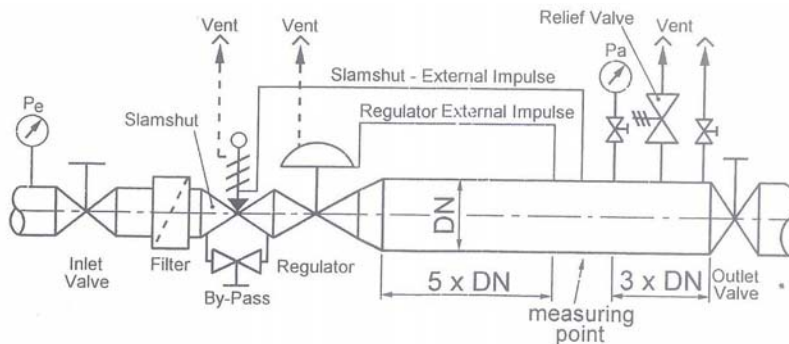
Low Pressure Service

Removable Cartridge

Lever Operated (with Slamshut)

Pilot Operated (with Slamshut)

**Installation:** Typical schematic arrangement of direct acting regulator with inlet filter and slamshut



Care should be taken during installation to ensure the equipment is not subjected to excessive loads, that would over stress the product and may result in a failure when the product is commissioned. To avoid excessive stresses, pipe work should be adequately supported and carefully aligned. Additional equipment should not be bolted onto the regulator without due attention to the effect of the extra weight on flanges or other loadings. Check the equipment is suitable for systems pressures, it is installed with the correct direction of flow and that gas velocity limits in the pipe work will not be exceeded. Use new fasteners, gaskets or other sealing materials. Check that adequate space is provided for maintenance and removal/replacement of elements. For best performance install with the diaphragm casing horizontal with the spring housing vertically upwards, inverted installation will reduce the outlet pressure range, spring horizontal installations are not recommended. External control line (ECL) type regulators, the impulse connections should be made from 10mm pipe connected either on top or side of

the outlet pipe (never on the underside). To assist with commissioning & maintenance impulse connections should be fitted with ancillary isolation valve(s). To function, the regulator has to breathe to atmosphere. Refer to the codes of practice for the need to pipe the breather to a safe area, the breather will pass gas if the diaphragm is ruptured, or in the case of integral relief functions, when the relief set pressure is exceeded.

**Regulators may pass a very small amount of gas when closed therefore to avoid over-pressure occurring a relief valve must be fitted in the downstream pipe upstream of any isolating valve.** All relief valve outlet (gas discharge to atmosphere) must be piped away to a safe area.

### Commissioning (direct operating regulators)

Carry out a final check that fasteners, plugs, cover, etc. are present and tight. Carry out purging, if required by operating codes. The maximum working pressure of the diaphragm casing of differential strength regulators is less than the body; take this into account when considering test or operational procedures. If there is any doubt regarding the set outlet pressure of the regulator remove the cap and unwind the spring adjuster to reduce the loading of the spring.

Introduce pressures into the system slowly. Adjust the spring loading to achieve the required outlet pressure, a flow of gas through the system will improve the accuracy of this operation, replace the cap. Slowly close the main outlet valve and observe the regulator closing to the 'lockup' condition, the outlet pressure should not rise more than 10 –30% above the set outlet pressure dependant on the regulator accuracy.

**Pilot controlled regulators follow the same principles, however fault finding identification maybe more complex.**

### Fault Finding – Direct Control Regulators

Fault	Location	Possible Cause	Remarks
No outlet pressure control	Regulator	Check type of regulator ICL – Internal Control Line ECL – External Control Line	If ECL type, connect impulse line downstream
		Installed in pipeline with body arrow pointing in wrong direction	Install regulator with body arrow pointing in right direction
		Regulator internals damaged	Check and replace regulator internals – if necessary
Closing pressure is too high	Regulator main valve or middle sealing diaphragm	Defective diaphragm	Fit new diaphragm – consider Spares Kit
Valve does not close		Valve seat damaged or worn	Check valve/orifice and valve seat – replace where necessary
		Worn or damaged seal(s)	Fit new seals
Pulsating/oscillating outlet pressure	Regulator main valve	Regulator valve operating near closed position e.g. chattering	Check for correct sizing of regulator
	Diaphragm assembly	Diaphragm acting too fast against outlet pressure fluctuations	Consider fitting a restrictor/jet in the atmospheric vent or External Control Line – to dampen down
Excessive control deviations	Pressure sensing point	Incorrect Impulse location in outlet pipe work	Check for correct positioning of ECL. If the pipe is expanded ECL must be fitted into the larger sized pipe.

### Maintenance (WARNING)

Before undertaking any maintenance work the system should be isolated and vented down in accordance with current safety codes and health and safety at works regulations. If may be necessary to purge the installation with an inert gas, such as nitrogen. Special precautions are necessary for gases such as oxygen or chlorine and the user must ensure that adequate procedures are prepared and implemented. After venting it is wise to assume that high-pressure gas may be present when removing covers and plugs.

Clean the unit externally before commencing dismantling. Reduce the load on loading springs by winding back the spring adjuster as far as possible. In certain cases, residual load will still be present that may cause the spring housing to jump up when fasteners are removed. In some cases, heavy residual spring loads are present even when the spring is relaxed to its maximum with the confines of the spring housing. In such a case special dismantling screws are provided and it is imperative they are gradually and evenly slackened in turn to allow the spring to fully extend to its free length. Failure to use these dismantling screws may result in damage or personal injury.

Smaller type regulators, having removed the spring, proceed by removing the outer ring of fasteners on the diaphragm housing, life off the housing and if present, remove the plug from the bottom of the body. Cartridge type regulators: remove the diaphragm/valve cartridge from the body by releasing 4 fasteners on the body, this enables replacement of the complete cartridge or further maintenance can be carried out on the bench. Lever type regulators, remove the diaphragm casing as a cartridge from the body, having removed the top half of the diaphragm casing lift the diaphragm and carefully unhook it as a sub-assembly off the lever. The valve and spindle assembly is disassembled by holding the spindle or nut at one end and removing the fastener at the other end. Record the sequence in which components are removed from the assembly (digital photographs are useful). Clean all parts, examine for any grooves or imperfections. Replace any soft parts if necessary. Apply small amounts of sealant to all centre parts of subassembly. Grease o-rings but do not apply to the diaphragm. Re-assemble in reverse order to disassembly, check fasteners are tight, carry out leak test remembering that the diaphragm casing can be of a lower pressure rating than the body.