

rotork[®]
MIDLAND

Over Pressurisation Device



OPD

Redefining Flow Control

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Rotork is the global market leader in valve automation and flow control. Our products and services are helping organisations around the world to improve efficiency, assure safety and protect the environment.

We strive always for technical excellence, innovation and the highest quality standards in everything we do. As a result, our people and products remain at the forefront of flow control technology.

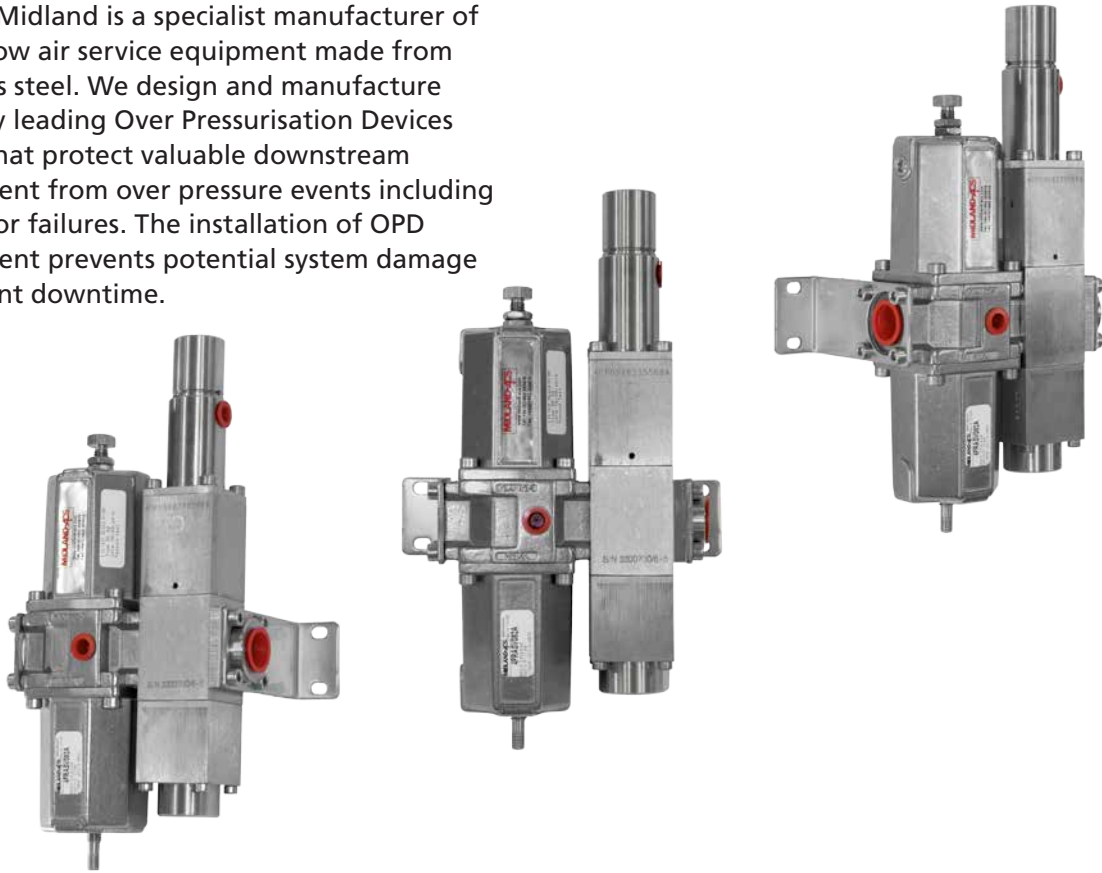
Uncompromising reliability is a feature of our entire product range, from our flagship electric actuator range through to our pneumatic, hydraulic and electro-hydraulic actuators, as well as instruments, gearboxes and valve accessories.

Rotork is committed to providing first class support to each client throughout the whole life of their plant, from initial site surveys to installation, maintenance, audits and repair. From our network of national and international offices, our engineers work around the clock to maintain our position of trust.

Rotork. Redefining flow control.

Introduction

Rotork Midland is a specialist manufacturer of large flow air service equipment made from stainless steel. We design and manufacture industry leading Over Pressurisation Devices (OPD) that protect valuable downstream equipment from over pressure events including regulator failures. The installation of OPD equipment prevents potential system damage and plant downtime.



rotork[®] MIDLAND

Since our founding in 1956, we have been known internationally as one of the oil & gas industries premier designers and manufacturers of 316L stainless steel control equipment. Over the years we have developed an enviable reputation for high quality products, reliability and innovation.

We have the ability to investigate problems and provide comprehensive solutions for the control of hydraulic and pneumatic actuated process control valves across a broad range of industries and markets. This, coupled with repeatedly delivering impressive results worldwide, sets us apart from our competitors.

rotork[®] Instruments

Rotork Instruments are experts in flow control, pressure control, flow measurement and pressure measurement.

We manufacture products and components that are trusted for applications where high precision and reliability are required.

Rotork Instruments has manufacturing facilities in USA, Italy, Brazil, India, China and Singapore.

The Rotork global sales and service network supports all Rotork Instruments products. This network is the biggest global actuation support organisation in the world with direct sales offices and agents in all industrialised countries.

Customer service and field support provides quick and effective response to customer requirements.

The Rotork Site Services network is represented throughout the world and provides valuable service and assistance to all industries.

Over Pressurisation Device (OPD)

A 316L stainless steel unit providing protection to downstream equipment from over pressure events.

Features and Benefits

- Protection of equipment from regulator failure and over pressure events
- Specifically designed for severe environments
- Manifold mounted option
- Auto shut-off
- ¼ turn actuator and on/off valve protection
- Linear actuator and control valve protection
- System instrumentation equipment protection
- Process valve stem and seat saver
- Easy installation
- 316L stainless steel construction
- Compliments and protects Emergency Shutdown (ESD) and safety instrumented system equipment
- Ambient temperature range -20 to +80 °C (-4 to +176 °F)

Regulated Outlet Pressure Range

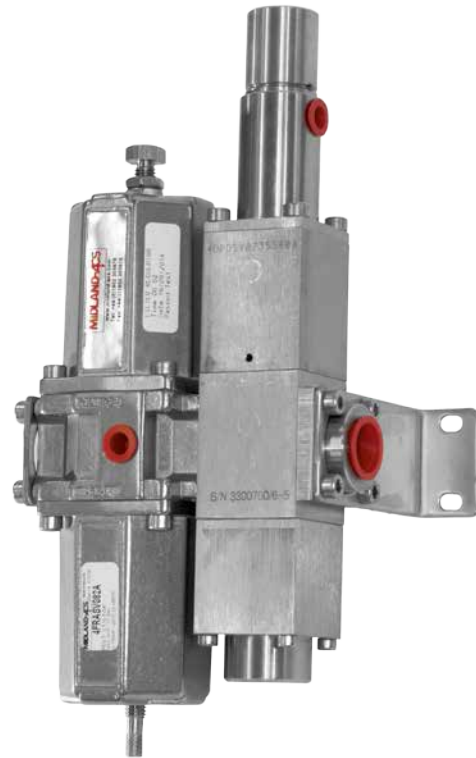
- 4 - 8 bar

Trip Pressure Range

- 4.5 - 8.5 bar (4 - 8 bar)

Maximum Response Time

- 30 ms (4 - 8 bar)



Temperature Range

- Standard: -20 to +80 °C (-4 to +176 °F)
- Low Temp: -50 °C (-58 °F optional)

Maximum Inlet Pressure

- Manual drain: 20 bar
- Auto drain: 17 bar

Product Code (Manual Drain)	Product Code (Auto Drain)	Size	Weight kg
4OPDSVX23XX XXA	4OPASVX23XX XXA	½"	3.3

Customer to specify trip pressure
 Customer to specify set pressure
 Factory to determine via customer set & trip pressure

Over Pressurisation Device (OPD)

General Description

The purpose of the OPD is to protect downstream equipment from over pressure events including regulator failure, thus preventing potential damage and downtime. Applications include the protection of Emergency Shutdown (ESD) and Safety Instrumented Systems (SIS) including positioners, actuators and process valve stems. The device includes a pressure regulator with a protection valve and sensor system.

Increases in outlet pressure can occur for many reasons, including failure of key regulator components or misadjustment. Should this occur the device will automatically failsafe within 30 milliseconds. The protection valve will be triggered to shut-off the outlet and vent the downstream pressure.

When the protection valve has deployed, the reset button protrudes from the housing, providing a positive indication that a fault has occurred. The OPD reduces the potential for damage occurring from increased torque, thrust or pressure values within the downstream system.

Once the fault has been corrected the unit can be reset by pushing the reset button on the unit. In line with today's requirements for space saving, weight reduction and efficiency the system is all close coupled within a compact body.



Development

Failure of pressure regulators can result in the over pressurisation of the downstream line, as the self-relieving capacity of the regulator is insufficient to cope with major failures. Usually a relief valve of sufficient capacity is fitted into the system to hold the pressure down to an acceptable level.

However, a relief valve flow is sized on a pressure differential between set pressure and over pressure - usually 10%.

Thus, on a set pressure of 4.5 barg, a pressure rise to 4.95 barg would have to flow sufficiently to hold the pressure at 4.95 barg, against the flow through a failed pressure regulator. At 10 barg supply pressure the flow through the failed pressure regulators will be driven by a 10 to 4.95 (i.e. 5.05) barg pressure drop.

In many cases this would result in damage to sensitive and expensive equipment such as positioners, actuator diaphragms and process valve stems. An alternative is to fit an excessively large relief valve(s), which in itself could cause serious problems by dumping all of the systems air and starving other equipment resulting in plant shutdown and potential compressor damage.

Considered Regulator Failure modes

Failure modes are common to all manufacturers' regulators unless specific design changes have been made to cope with them. Therefore, to overcome these difficulties the Over Pressurisation Device was designed and engineered.

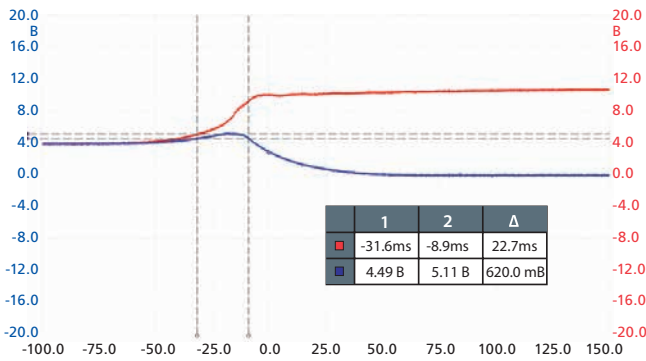
Typical Regulator Failure Modes

- Misuse and maladjustment during installation and commissioning
- Rupture of diaphragm leading to total loss of pressure regulation
- Failure of regulator seat leading to partial or total loss of pressure regulation
- Blocking of the regulator relief port leading to total loss of pressure regulation

Over Pressurisation Device – Performance Characteristics

Performance Characteristics

Response times are dependant upon the actual pressures within the system at the point of failure; all times stated within the specification section are maximums taken at the lowest extreme of the pressure range (worst case).



The magnitude of any pressure spikes exceeding the trip pressure which occur during deployment of the valve are dependant upon the system downstream volume: a larger system volume decreases the likelihood of the system pressure exceeding the trip pressure (see graphs). Any pressure spikes which do occur will only do so for a fraction of a second (less than the time taken for the device to operate).

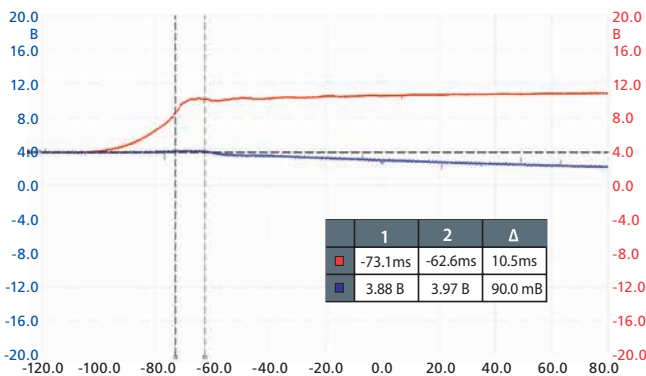
Small actuator test results

- 4 - 8 bar OPD; outlet connected to a volume of 0.2 litres

Trigger Test:

- **Blue** = Simulated actuator pressure (bar)
- **Red** = Supply pressure (bar)

The graph to the left is an overpressure test result with a small 0.2 litre reservoir to simulate the actuator. An overpressure signal is applied allowing the 11 barg supply pressure to bypass the regulator, simulating a ruptured diaphragm. The response time of the device is measured as the time between the pressure within the device reaching the trip pressure and the actuator pressure returning to below the regulated pressure (see dashed lines on graph and right hand column of table).



Larger actuator test results

- 4 - 8 bar OPD; outlet connected to a volume of 3 litres

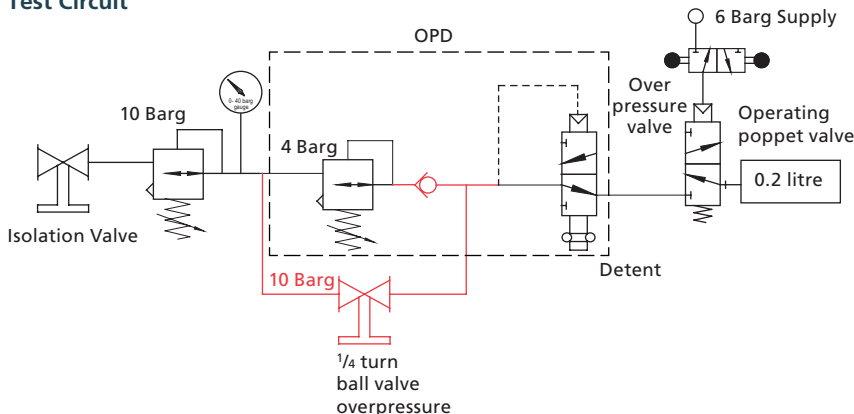
Trigger Test:

- **Blue** = Actuator pressure (bar)
- **Red** = Supply pressure (bar)

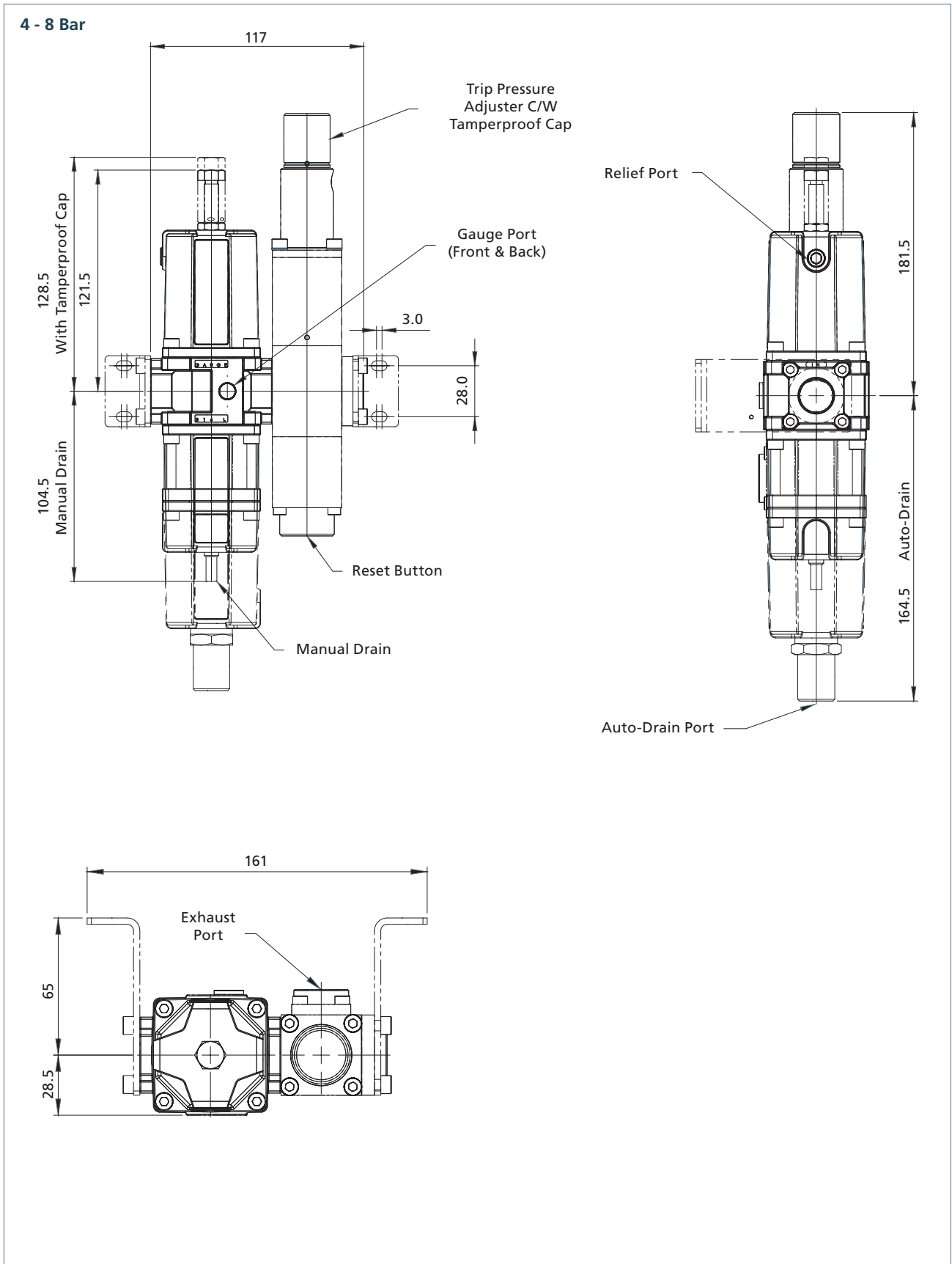
The graph opposite is an overpressure test result with a larger 3 litre reservoir to simulate the actuator. An overpressure signal is applied, allowing the 11 barg supply pressure to bypass the regulator and simulating a ruptured diaphragm. The response time of the device is measured as the time between the pressure within the device reaching the trip pressure and the actuator pressure returning to below the regulated pressure (see dashed lines on graph and right column of table).

Note: During this test the actuator pressure does not exceed the trip pressure value.

Test Circuit



Over Pressurisation Device – Engineering Drawings



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A full listing of our worldwide sales and service network is available on our website.

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