rotork®

Keeping the World Flowing
for Future Generations

# Solenoid Valves

# Instrumentation and control

**Rotork is a specialist manufacturer of products for flow control, pressure control, flow measurement and pressure measurement.**

Our solutions are trusted wherever there is a need for high precision and reliability, including pharmaceutical, oil and gas, biomedical and manufacturing industries.

We have production facilities throughout the world, complemented by a large network of distribution and support centres.

A full listing of our worldwide sales and service network is available on our website at **www.rotork.com**

Bifold® A rotork Brand

FAIRCHILD A rotork Brand precision pneumatic & motion control

MIDLAND-ACS™ A rotork Brand

M&M international A rotork Brand

SOLDO® CONTROLS A rotork Brand

## Worldwide Industry and Application Experience

With over 60 years of extensive knowledge and experience, Rotork has provided products and services worldwide for virtually every industrial actuator application.

Rotork offer a range of precision control and valve accessory products in partnership with our prestigious brands, including Fairchild, Soldo®, Midland-ACS™, Bifold®, M&M and Alcon:

### Instrument Valves

- Valve actuation accessories
- Solenoid valves
- Piston valves
- Instrument valves
- Medium pressure valves
- Subsea valves and connectors

### Controllers

- Valve positioners
- Rail systems
- I/P and E/P converters

### Measurement

- Valve position sensors
- Transmitters and switches

### Instrument Pumps

- Pumps
- Intensifiers and accumulators

Rotork is proud to offer a diverse range of products which serve many different duties in a wide variety of applications. We also offer a factory customisation service to create one-off units to meet specific needs.

# Introduction

Part of the Rotork Group, Alcon Solenoid Valves and M&M International are leading manufacturers of combustion, industrial, medical and laboratory gas control solenoid valves. Whether designing solutions for stand-alone valves or a customised OEM installation we have developed an enviable reputation for quality products, reliability and innovation.

With facilities based in the UK, Italy and the USA, and sales offices worldwide, we can provide solenoid valves to function in the most arduous of conditions and extreme temperatures, anywhere in the world.

Our product line covers a full range of valves for general and special-purpose including:

- Air
- Water
- Steam
- Automation
- Cryogenics
- Gases
- Oil & Fuel
- Actuation
- High Pressure
- Hazardous Area
- Aggressive Media
- Vacuum

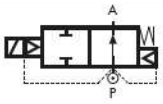
Our solenoid valves can be manufactured with increased safety electrical coils and enclosures covered by ATEX, UL, IECEx or CSA approvals, to meet application demands.

The advantages of solenoid valves manufactured by Alcon and M&M include:

- Robust construction for industrial applications featuring stainless steel orifice on most models
- Stainless steel operators with low residual magnetism according to 1.4105 EN 10088 (AISI 430F)
- High quality seal materials
  NBR, FKM, EPDM, PTFE, Sigodur (filled PTFE), Ruby, Kalrez®
- Fully interchangeable coils* with a wide range of AC and DC voltages. Coil orientation possible through 360°
- Coils tested 100% in compliance with the current EC directives compliance to RoHS directive and to relevant international standards upon request
- Development and realisation of special projects

*where applicable

# RD204/205/206/222 Series, Aggressive Fluids, Stainless Steel –
## 2/2 Normally Open

| Specifications | |
|---|---|
| Function (single acting) |  Flow direction overseat 1 → 2 |
| Maximum Viscosity | Max. 21cST (3 °E) |
| Body Material (Std) | Stainless steel AISI 316L (ASME SA351/351M GRADE CF3M |
| Flange Tube (seamless) | Stainless Steel AISI 303 (1.4305 EN 10088) |
| Plunger | Stainless Steel AISI 430F (1.4106 EN 10088) |
| Top Stop | Stainless Steel AISI 430F (1.4105 EN 10088) |
| Springs | Stainless Steel AISI 302 |
| Seal Material (Std) | FKM |
| Connection Type | NPT |
| Shading Ring | Silver |
| **Electrical Characteristics[1]** | |
| Standard Coil Voltage DC (=) | 24 V |
| Standard Coil Voltage AC 50 Hz (~) | 24 V, 110 V, 200 V, 230 V |
| Standard Coil Voltage AC 60 Hz (~) | 24 V, 120 V, 220 V, 240 V |
| Voltage Tolerance | +10% to -15% (AC) |
| | +10% to -5% (DC) |
| Duty Cycle | 100% ED |
| Enclosure Classification | NEMA type 4 (UL 50) and IP65 (EN 60529) with plug and gasket correctly fitted * |
| Electrical Connection | to EN 175301 - 803 - A (ex DIN 43650) |
| Coil Insulation Class | 180 (H) to EN 60730-1 |
| Power Rating (Standard) | AC 18 VA (holding)<br>AC 36 VA (inrush)<br>DC 14 W |

[1] These coils are not UL approved.

### Features and Benefits

- Pilot operated
- Robust construction for industrial applications
- Stainless steel AISI 430F operators with low residual magnetism
- Choice of high quality seal materials
- Response time 50 to 500 ms

| Pipe Size | Cv (gpm) | Kv ($m^3/h$) | OPD psi (bar) | | Orifice inches (mm) | Seal Material | Valve Code |
|---|---|---|---|---|---|---|---|
| | | | AC Voltages | DC Voltages | | | |
| 3/8 | 3.86 | 3.30 | 4 - 232 (0.3 - 16) | 4 - 232 (0.3 - 16) | 33/64 (13) | FKM | RD204DVZIN |
| | | | | | | NBR | RD204DBZIN |
| | | | | | | EPDM | RD204DEZIN |
| 1/2 | 4.42 | 3.78 | | | 33/64 (13) | FKM | RD205DVZIN |
| | | | | | | NBR | RD205DBZIN |
| | | | | | | EPDM | RD205DEZIN |
| 3/4 | 9.83 | 8.40 | | | 63/64 (25) | FKM | RD206DVYIN |
| | | | | | | NBR | RD206DBYIN |
| | | | | | | EPDM | RD206DEYIN |
| 1 | 11.23 | 9.60 | | | 63/64 (25) | FKM | RD222DVYIN |
| | | | | | | NBR | RD222DBYIN |
| | | | | | | EPDM | RD222DEYIN |

### Options Available

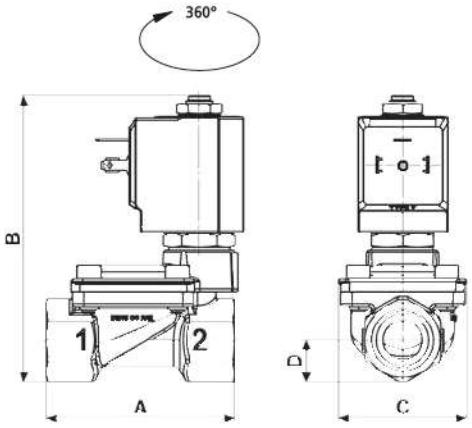
| Valve Options (see coding chart) |
|---|
| G parallel thread (ISO 228-1) |
| Anticorrosion treatment recommended with aggressive fluids |

| Seal Material[2] and Media Temperature Range | Media | Ambient Temperature Range | |
|---|---|---|---|
| | | Min | Max |
| NBR 14 °F to 194 °F (-10 °C to +90 °C) | Water, oil, air | 14 °F (-10 °C) | 122 °F (+50 °C) |
| FKM 14 °F to 266 °F (-10 °C to +130 °C) | Water, oil, air, aggressive fluids | 14 °F (-10 °C) | 122 °F (+50 °C) |
| EPDM 14 °F to 248 °F (-10 °C to +120 °C) | Water, hot water | 14 °F (-10 °C) | 122 °F (+50 °C) |

[2] See corrosion reference guide and sealing solutions for material compatability.

# RD204/205/206/222 Series, Aggressive Fluids, Stainless Steel –
## 2/2 Normally Open

Coil Rotation




Preferred Valve Mounting Options

| Pipe Size | A | B | C | D | Weight Lb (kg) |
|---|---|---|---|---|---|
| 3/8 - 1/2 | 2.64 (67) | 3.94 (100) | 1.80 (45.6) | 0.59 (15) | 1.08 (0.49) |
| 3/4 - 1 | 3.78 (96) | 4.84 (123) | 2.83 (72) | 0.91 (23) | 2.43 (1.1) |

Dimensions inches (mm)

### Solenoid enclosures

#### 7--1 Type Coil - Insulation class H

External material: PPS (glass fiber & mineral filled)
Electrical connection: DIN EN 175301-803 form A
Winding insulation: Class H (E180)
Enclosure classification: Conforms to NEMA type 4 (UL 50) and IP65 (according to EN 60529) with plug and gasket correctly fitted*

* Plug and gasket not supplied as standard, must be ordered separately.

#### Type 600 011- Plug

Rated Voltage (max.): 250 VAC / 300 DC
Nominal Current: 10A (rated) / 16A (max)
Wire cross-section: 0.0023 inch² max (1.5 mm² max)
Cable Entry: PG9 (0.24 to 0.31 inch / 6 to 8 mm)
Enclosure classification: Conforms to IP65 (according to EN 60529) with supplied gasket
Insulation class: group C- VDE 0110
Housing colour: black
UL approved, file No: E205538

### Coding chart

#### Main Valve Assembly

| Pipe Size | |
|---|---|
| 04 | 3/8 |
| 05 | 1/2 |
| 06 | 3/4 |
| 22 | 1 |

| Seals | |
|---|---|
| V | VKM |
| E | EPDM |
| B | NBR |

| Orifice[1] | |
|---|---|
| Z | 33/64 |
| Y | 63/64 |

| Thread Pipe | |
|---|---|
| N | NPT |
| | GAS |

#### Coil options

| Voltage / Frequency - Class H | |
|---|---|
| 7251 | 24 VDC |
| 7201 | 24 V / 50/60 Hz |
| 7401 | 110 V / 50 Hz - 120 V / 60 Hz |
| 7601 | 200 V / 50 Hz - 220 V / 60 Hz |
| 7701 | 230 V / 50 Hz - 240 V / 60 Hz |

#### Plug

| Plug | |
|---|---|
| | w/o plug |
| 0A1 | c/w plug |

| RD | 2 | • | • | D | • | • | I | N | • | • | • | • | • | • | • |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

[1] DN 33/64 for RD204 and RD205, DN 63/64 for RD206 and RD222.
Contact supplier for options.

### Product coding example:

RD204DVZIN 7251
3/8 NPT, auto operation, stainless steel body, FKM seals, 33/64 orifice, 24 VDC, without plug.

# Modes of Operation

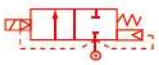
## Valve Selection

A solenoid valve should be chosen whenever the following conditions are met:

- ✓ Media without dirt particles
- ✓ Moderate flow volumes
- ✓ Average differential pressures
- ✓ High speed in operation
- ✓ Media with a viscosity not higher than 21 cST(3°E)

**2/2 N/C Normally Closed**

*Solenoid Operated*
*Direct Acting*



*Solenoid*
*Pilot Operated*

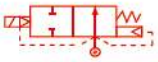
2 way, normally closed, energise to open, on/off operation (de-energise to close), with one inlet and one outlet connection. There are 2 types of valve operation – Direct Acting and Pilot Operated.

a) Direct Acting – The coil supplies all the power to open the valve and the valve will operate from zero pressure.

b) Pilot Operated – this can either be diaphragm or piston operated. These valves have a pilot hole which is opened/closed by the coil acting upon a plunger and diaphragm or piston used to control the main orifice. The operation relies on the media pressure difference between the inlet and outlet and a minimum operating pressure is required to operate these valves unless stated as zero.

**2/2 N/O Normally Open**

*Solenoid*
*Direct Acting*



*Solenoid*
*Pilot Operated*

2 way, normally open, energise to close, de-energise to open, with one inlet and one outlet connection. Can be either direct acting or pilot operated.

**3/2 N/C Normally Closed**

Valve open when energised, closed when de-energised. This valve operates on the same principle as the 2/2 N/C version except the valve has 3 connections, 2 orifices, one permanently open, one permanently closed. The use of these are for operation of actuators for large valves where single cylinder spring return system is employed.

**3/2 N/O Normally Open**

Valve open when de-energised, closed when energised.

**3/2 UNI Universal**

Valve may be used as normally closed, normally open or diversion/selector valve.

**5/2**

These valves are available in 2 forms;

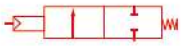
a) Single Solenoid – 2 position, spool and sleeve type, which is based on an air pilot return mechanism. When de-energised, the valve allows one inlet and one outlet to be connected, exhausting the other inlet/outlet connection through an exhaust port. On energisation, the action reverses.

b) Dual Solenoid Valves – these spool and sleeve type solenoid valves are momentary contact type. When one coil is energised, one inlet is connected to one outlet, with the other inlet/outlet connection connected to an exhaust port, when the coil is de-energised and other coil energised, the action is reversed.

These valves are for use on double acting cylinder applications.

# Modes of Operation

**2/2 N/C Normally Closed Pneumatic**

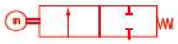


2 way, normally closed, pressurise to open, de-pressurise to close with the aid of a return spring, having one inlet and one outlet connection. Can be direct acting air operated against a return spring. Note: These valves are operated via a 3 way solenoid valve which is always required.

**2/2 N/O Normally Open Pneumatic**

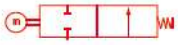
2 way, normally open, pressurise to close, de-pressurise to open with the aid of a return spring, having one inlet and one outlet connection. Can be direct acting air operated against a return spring. Note: These valves are operated via a 3 way solenoid valve which is always required

**2/2 N/C Normally Closed Motorised**



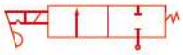
2 way, normally closed, energise to open – (slow opening) de-energise to close – (quick closing) with one inlet and one outlet connection. Motor driven against a return spring.

**2/2 N/O Normally Open Motorised**



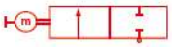
2 way, normally open, energise to close – (slow closing) de-energise to open – (quick opening).

**2/2 N/C Normally Closed Manual Reset (Solenoid)**



These valves operate on the same principle as 2/2 N/C direct acting version except – once the coil is energised the valve will not open until manually opened by either a lever or push reset device.

**2/2 N/C Normally Closed Manual Reset (Motorised)**



The operation is similar to 2/2 N/C Normally Closed Manual Reset (Solenoid) except, once the motor is energised the valve will not open till a manual reset/relay button is operated, either remote or integral to the actuator. General use is for both manual reset or safety systems where knowledge of an electrical failure is required.

## Optional Features

### Manual Override

Normally closed direct acting and pilot operated solenoid valves (only versions specified in each datasheet) can be supplied with a manual override which allows the valve to be opened independently of electrical current.

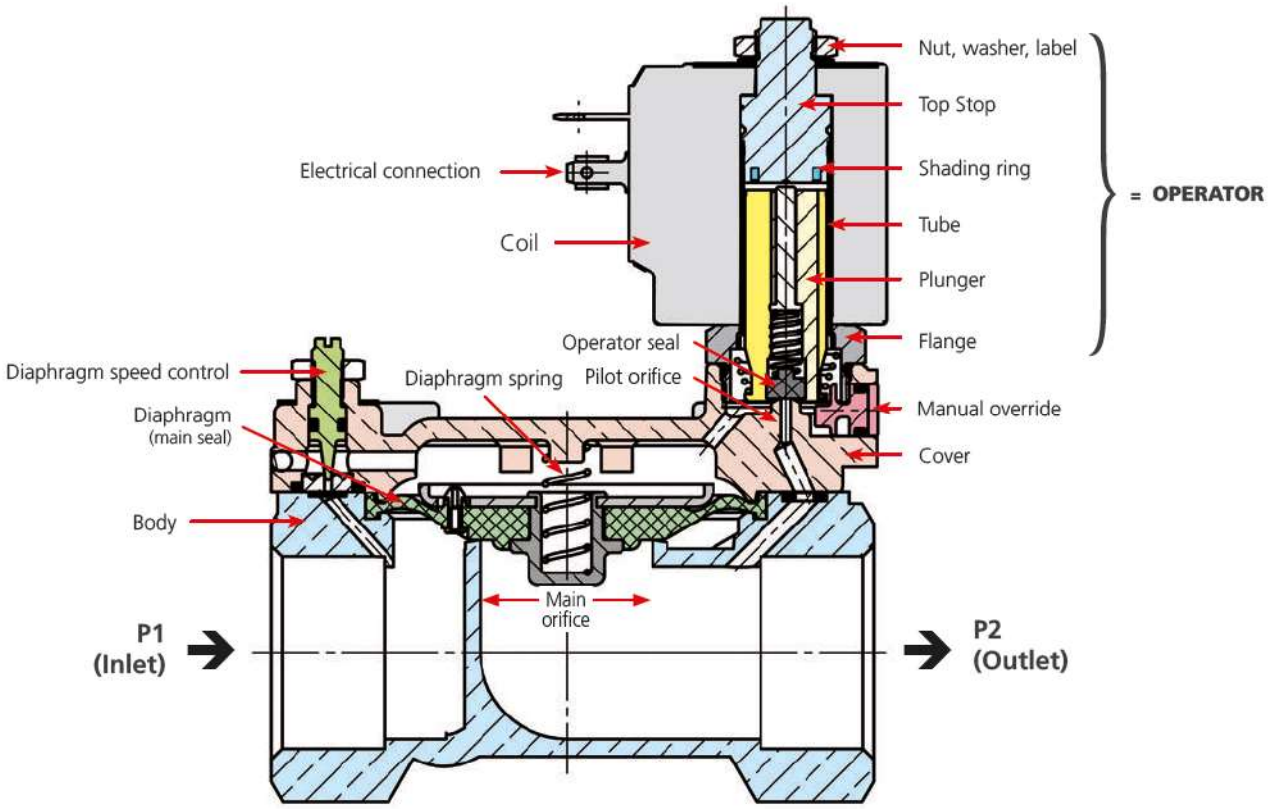
### Waterhammer Control

Pilot operated solenoid valves (only versions specified in each datasheet) can be supplied with a system that regulates the closing speed of the diaphragm in order to control waterhammer.

The seal closing speed is operated by the adjusting screw: by screwing it clockwise (in the "+" direction) when using liquid, the valve will close slower reducing any waterhammer effect that may occur in the solenoid valve and the upstream pipes.

In the case of larger valves (1¼", 1½" and 2"), please adjust the anti-waterhammer screw to ensure that that valve closes as slowly as possible in order to avoid causing any damage that may affect the functioning of the equipment and valve due to the waterhammer effect.

## Scheme of Components of Solenoid Valves



# Quality Standards

Rotork has a management system certified to ISO 9001, ISO 14001 & OHSAS 18001.

### Certifications and approvals

The Ex mark signifies that a product complies with the ATEX Directive 94/9/EC (applicable up to 20th April 2016 but already implemented by Directive 2014/34/EU, effective from 18th April 2014).

The ATEX Directive sets the safety requirements of protection equipment and systems to be used in an environment with a potentially explosive atmosphere.

The Ex mark on a product enables its free movement within the European market (EEA).

Underwriters Laboratories Quality Certificate

The UL Listing mark on a product signifies that the product meets UL's Standards for Safety. The UL Listing mark appears on products and components suitable for factory and field installation.

All of the products carrying a UL Listing mark are covered by UL's Follow-up services program to verify that the products continue to be manufactured in compliance with UL's Safety Requirements.

We manufacture and resell valve coils and timers complying with UL 429 and 746C.

The cURus Listing mark on the products indicates that the compliance is accepted both in USA and Canada.

## RoHS

The Restriction of Hazardous Substances Directive (RoHS) 2011/65/EU regards the restriction of the use of Lead (Pb), Cadmium (Cd), Mercury (Hg), Hexavalent chromium (Cr6+), Polybrominated biphenyls (PBB) and Polybrominated diphenyl ether (PBDE) in electrical and electronic equipment sold in the European Union.

RoHs is meant to prevent the release of these substances into the environment and protect the human, animal and environmental health, especially during the waste treatment. The CE mark on a product guarantees the compliance with the RoHS Directive.

European Community Conformity

The CE marking was introduced in 1993 upon establishment of the European Economic Area. It regulates the entire life cycle of a product: design, manufacturing, placing on the market, disposal and enables its free movement within the European market (EEA).

CE marking signifies that the product conforms with the essential applicable EC requirements, such as safety, public health, consumer protection, and gives the product the presumption of conformity.

By affixing the CE mark on a product, manufacturers and importers are declaring, at their sole responsibility, conformity with all of the legal requirements of the Directive. EC directives that apply to our products are:

Machinery directive

EMC Directive

Low Voltage Directive (2006/95/EC)

The directive 97/23/EC concerns safety of pressure bearing equipment.

The directive 2011/65/EU (RoHS) limits the use of dangerous substances in electrical and electronic equipment.

### Miscellaneous

Upon request (to be specified at the time of the Purchase Order) we can provide the following inspection documents, which are also related to requirements of the PED Directive 2014/68/EC as additional evidence of the technical requirements of supplies:

For metal parts in stainless steel AISI 316L or 304L the inspection certificate 3.1 according to the standard EN 10204 (this certificate is mandatory only for products in categories above I, see PED 2014/68/EC ANNEX I, art. 4.3).

For all products the Test Report 2.2 according to the standard EN 10204, is relevant for products in category I or SEP.