M&M international

Solenoid Valves

chemical industry

vacuum

general purpose

dry armature

automation

steam

atex

high pressure

aggressive fluids

QUALITY STANDARDS:

COMPANY WITH MANAGEMENT SYSTEM CERTIFIED BY DNV
= ISO 9001 =
= ISO 14001 =

DNV is an independent classification society. Since 1998 it has certified the compliance of **M&M International**'s quality management system, emphasizing the effort to implement continuous improvement processes aimed at developing the business in a logic of sustainability and customer satisfaction.

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 equiment 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). A list of M&M valves available in the ATEX version can be found on page 37 of this catalogue.

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.
M&M manufactures and resells 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. Since 2006 M&M has been marking the compliance of coils with the RoHS directive with the letter 'R' before the batch number.

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 M&M products are listed on page 51.

REACH: Ask M&M Sales Department for your Declaration of compliance to EC Regulation no. **1907/2006**.

MISCELLANEOUS:

Upon request (to be specified at the time of the Purchase Order) M&M can provide the following inspection documents, which are also related to requirements of the **PED Directive 97/23/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 97/23/EC ANNEX I, art. 4.3).
- ✓ For all products the **Test Report 2.2** according to the standard EN 10204, relevant for products in category I or SEP.

2/2 WAY PILOT OPERATED SOLENOID VALVE, G 1/4" ÷ G 1/2"

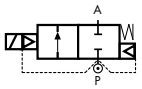
COMMON FEATURES

Media: water, oil, air
Ambient temperature: -10°C ÷ +50°C
Body material: brass (CW617N EN 12165)
Operator material: stainless steel
Protection class: IP 65 (with connector and gasket)

OPTIONS

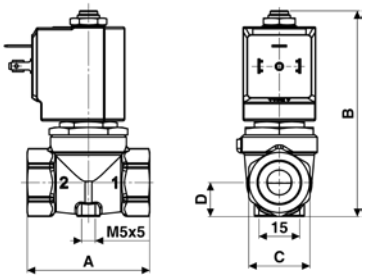
EPDM seal, temperature max. 120°C (e.g. code D266DEU)
NPT connection on request, minimum batch may be required (e.g. code D264DBUN)

TYPE: D264/265/266



Normally Closed

DIMENSIONS & WEIGHTS		D264	D265	D266
G connection	[ISO 228]	1/4"	3/8"	1/2"
A	[mm]	54	54	54
B	[mm]	89	89	89
C	[mm]	HEX 27	HEX 27	HEX 27
D	[mm]	15	15	15
weight	[kg]	0.45	0.4	0.4



Flow direction overseat 1 → 2

VALVE	nominal Ø	flow rate Kvs	OPD min.	OPD max. AC	OPD max. DC
code	[mm]	[l/min]	[barg]	[barg]	[barg]
D264DBU	10.5	21	0	16	7
D265DBU	10.5	24	0	16	7
D266DBU	10.5	25	0	16	7

COILS	
code	[Volts/Hz]
7250	24V DC
7200	24V 50/60Hz
7400	110V 50Hz - 120V 60Hz
7600	200V 50Hz - 220V 60Hz
7700	230V 50Hz - 240V 60Hz

D264/265/266 - NBR seal, NC -

Media temperature: -10°C ÷ +90°C
Operator seal and diaphragm material: NBR
Coil power: AC 18VA (holding)
AC 36VA (inrush)
DC 14W

COMPRESSED AIR

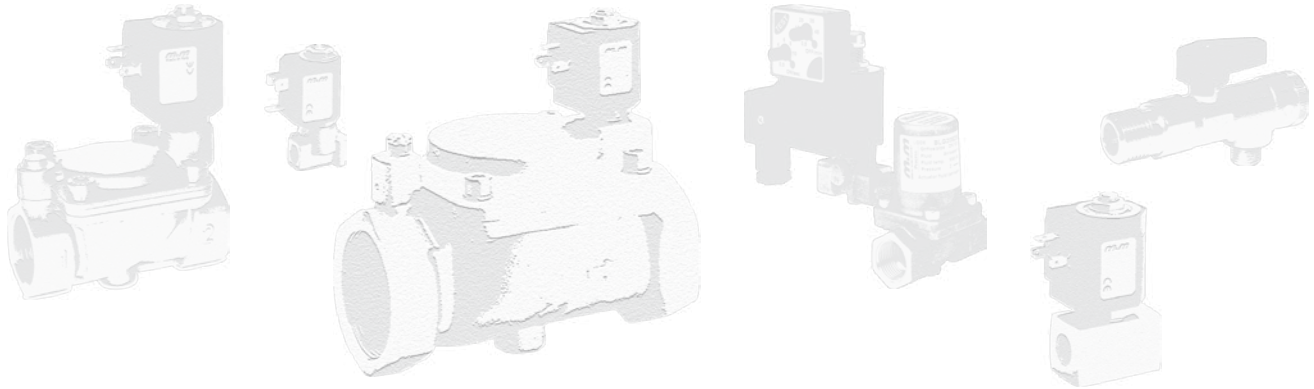
VALVE	nominal Ø	flow rate Kvs	OPD min.	OPD max. AC	OPD max. DC
code	[mm]	[l/min]	[barg]	[barg]	[barg]
D264DVU	10.5	21	0	16	7
D265DVU	10.5	24	0	16	7
D266DVU	10.5	25	0	16	7

COILS	
code	[Volts/Hz]
7250	24V DC
7200	24V 50/60Hz
7400	110V 50Hz - 120V 60Hz
7600	200V 50Hz - 220V 60Hz
7700	230V 50Hz - 240V 60Hz

D264/265/266 - FKM seal, NC -

Media temperature: -10°C ÷ +130°C
Operator seal and diaphragm material: FKM
Coil power: AC 18VA (holding)
AC 36VA (inrush)
DC 14W

GENERAL PURPOSE



VALVE SELECTION

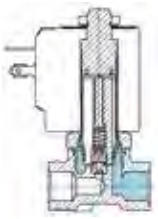
A solenoid valve should be chosen whenever the following conditions are met:

- ✓ **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)**

VALVE TYPES

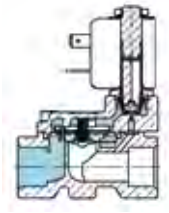
✓ **Direct acting solenoid valves 2/2 and 3/2 way NC or NO**

When energized the coil electrically generates a magnetic force attracting the armature towards the fixed core. Inside the armature is a seal that acts upon the main orifice, either when the coil is de-energised (normally closed) or when the coil is energised (normally open). By revealing the orifice allows the fluid to pass. Average response time 5 ÷ 25 ms.



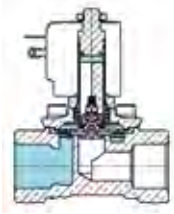
✓ **Pilot operated solenoid valves 2/2 way NC or NO**

This solenoid valve uses the force of the fluid to operate the valve via a suitable integral pilot valve. The inlet pressure must always be at least the same as the minimum ΔP figure shown on the datasheets. Using the same coils as direct acting valves much higher fluid volumes and pressures can be controlled with this solenoid valve. Average response time 50 ÷ 500 ms.



✓ **Pilot operated solenoid valves with assisted lift 2/2 way NC**

These solenoid valves are a combination of the pilot operated valves and the direct acting valves. The armature is mechanically connected to the diaphragm on which there is a pilot office. With minimal pressures the solenoid valve acts like a direct acting valve. Total opening as well as full flow do not occur at low pressures. With higher pressures it works as a pilot operated valve with full opening. Average response time 50 ÷ 500 ms.



FUNCTION TYPES

2/2 way function indicates valves with inlet and outlet connections, whilst valves with 3/2 way functions have 3 connections and 2 flow passages. One orifice always remains open and one closed. Connections and flow direction are shown in the symbols on each technical datasheet (DIN-ISO 1219).

At rest valves can be either normally closed (NC) or normally open (NO):

- Normally closed (NC): the valve opens when the coil is energised.
- Normally open (NO): the valve closes when the coil is energised.

OPTIONAL FEATURES

✓ **Manual Override (M)**

Normally closed direct acting and pilot operated solenoid valves can be supplied with a manual override which allows the valve to be opened independently of electrical current.

✓ **Waterhammer Control (V)**

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 (1 1/4", 1 1/2" 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.

TECHNICAL INFORMATION

The following points should be considered to ensure a correct choice of valve:

✓ **Connections and Nominal Diameters**

Threaded connections are either "G"- inches (ISO 228) or metric. Nominal diameters (DN) are expressed in millimetres and correspond to the diameter of the valve's main orifice.

✓ **Performances (OPD)**

Stands for operating pressure differential, meaning the pressure difference between the inlet and the outlet.
Pressure values shown in this catalogue are expressed in barg as difference between inlet and outlet. For 3/2 way solenoid valves the pressure range can vary when used in other functions or systems. The maximum working pressure (PN) that the valve can bear is generally equal to 1.5 times the maximum value of the operating pressure differential (OPD).

✓ **Pressure (units of measurement)**

The SI unit of pressure is the pascal (Pa), defined as 1 newton of force per square metre (1 N/m^2).
As Pa is such a small unit, the kPa (1 kilonewton/m^2) or MPa (1 Meganewton/ m^2) tend to be more appropriate to fluid engineering.
However, probably the most commonly used metric unit for pressure measurement in fluid engineering is the bar. This is equal to 10^5 N/ m^2, and approximates to 1 atmosphere. This unit is used throughout this publication.
Other units often used include lb/in^2 (PSI), kg/cm^2, atm in H_2O (atmosphere) and mm Hg. Conversion factors are readily available from many sources.

Absolute pressure (bar a)

This is the pressure measured from the datum of a perfect vacuum: i.e. a perfect vacuum has a pressure of 0 bar a.

Gauge pressure (bar g)

This is the pressure measured from the datum of the atmospheric pressure. Although in reality the atmospheric pressure will depend upon the climate and the height above sea level, a generally accepted value of 1.013 25 bar a (1 atm) is often used.
This is the average pressure exerted by the air of the earth's atmosphere at sea level.

Gauge pressure = Absolute pressure - Atmospheric pressure

Pressure above atmospheric will always yield a positive gauge pressure. Conversely a vacuum or negative pressure is the pressure below that of the atmosphere. A pressure of -1 bar g corresponds closely to a perfect vacuum.

✓ **Differential pressure**

This is simply the difference between two pressures. When specifying a differential pressure, it is not necessary to use the suffixes 'g' or 'a' to denote either gauge pressure or absolute pressure respectively, as the pressure datum point becomes irrelevant. Therefore the difference between two pressures will have the same value whether these pressures are measured in gauge pressure or absolute pressure, as long as the two pressures are measured from the same datum.

✓ **Flow**

The flow is the quantity of fluid that passes through the valve's main orifice which has the nominal diameter (DN) shown in the tables.
The flow is given with a constant Kv value (according to VDI/VDE 2173) that shows how many litres of water, at a temperature of 20°C, flow through the valve in one minute with a pressure difference of one barg across the valve.

To determine the flow at higher pressures, multiply the Kv value by the square root of the differential pressure. Flow values shown in the selection tables are subject to a tolerance of ± 15%.

✓ **Viscosity**

Viscosity of a fluid (liquid or gas) is its resistance to flow freely in a duct.
This phenomenon is also called internal friction and depends on existing cohesion forces among the fluid molecules.
The viscosity of liquids decreases as the temperature rises; the viscosity of gases grows if the volume does not change.
According to the International System of Units (SI), the physical quantities are: force **F** ⇨ in newton **N**, distance **h** ⇨ in meters **m**, area **A** ⇨ in square meters **m²**, speed **u** ⇨ in meters per second **m/s**, the unit of measurement of the **dynamic viscosity** ris Pascal per second (Pa•s) or Newton multiplied by second per square meter ($N \cdot s/m^2$).
Dividing the dynamic viscosity of the liquid by its density, you can obtain the **kinematic viscosity**. Its unit of measurement is expressed in square meter per second (m^2/s).
Since the given numerical values are too small, the most common used unit is 10.000 times smaller: the stokes (stox) **St**,

$$1\ St = 1 \cdot 10^{-4}\ m^2/s \text{ or } 10.000\ St = 1\ m^2/s$$

as well as the additional unit centistokes **cSt**

$$1\ cSt = 1 \cdot 10^{-2}\ St$$

✓ **General Information on frequently used seal materials**

Consideration of the media should be made when selecting seal and body types.
NBR should be used for air, water, neutral gases, diesel and in general it is resistant to oils and grease from -10° C to +90°C.
EPDM for hot water and steam. It is resistant to bases and acids in weak concentrations from -40°C to +140°C. EPDM seals should not be used for media containing oil.
FKM combines most of the characteristics of NBR and EPDM and is particularly suitable for hot water and hydrocarbons from -10°C to +140°C.
PTFE is practically resistant to all media. It is rigid and is used from -20°C to +180°C.
SIGODUR (filled PTFE) and **RUBY** are stiff materials particularly suitable for heavy duty applications.
KALREZ® Spectrum ™ 6375 is a compound specifically designed for the chemical process industry. This compound has excellent broad chemical resistance, good mechanical properties, and outstanding hot-air aging properties. Kalrez® 6375 is well suited for use in mixed process streams because of its excellent resistance to acids, bases and amines. It is also recommended for use in hot water, steam pure ethylene oxide and propylene oxide.

✓ **Coil power supply**

It is important that the exact voltage and frequency of the coil is used for the valve to operate correctly. Provided the coil is fitted correctly on the operator and that the armature is not obstructed, the valve can be operated for an indefinite time within the temperature limitations indicated. All solenoid valves have a copper shading ring to reduce vibrations caused by alternating currents. **Remark: The same valve fitted with coils of different power may have different pressure ratings then standard combinations indicated in this catalogue (e.g. UL coils or high power coils).**

✓ **Media and Ambient Temperatures**

Temperature limits for the media in the datasheets and should be used as a guide to valve selection. Normally the maximum ambient temperature can reach +50°C for solenoid valves with coils in class "F", +70°C for class "H". For applications outside these limits please contact our Technical Department.

✓ **General purpose solenoid valves**

Solenoid valves shown in this catalogue, either normally open or normally closed, are intended to control the flow of fluids and cannot be used as safety valves.

VALVE INSTALLATION

To ensure proper valve function please observe following instructions:

✓ **Water hammer or fluid hammer**

Water hammer (or, more generally, fluid hammer) is a pressure surge or wave resulting when a fluid (usually a liquid but sometimes also a gas) in motion is forced to stop or change direction suddenly (momentum change).

Water hammer commonly occurs when a valve is closed suddenly at an end of a pipeline system, and a pressure wave propagates in the pipe. It may also be known as hydraulic shock.
When using liquid fluids water-hammer can occur at pressure of 6 barg or higher.
This pressure wave can cause major problems, from noise and vibration to pipe collapse. It is possible to reduce the effects of the water hammer pulses with accumulators and other features.
Mitigating measures:

- **Air vessels** typically have an air cushion above the fluid level, which may be regulated or separated by a bladder. Sizes of air vessels may be up to hundreds of cubic meters on large pipelines.
  They come in many shapes, sizes and configurations. Such vessels often are called accumulators or expansion tanks.
- **Water Hammer Arrestors** are hydropneumatic devices similar to shock absorbers that can be installed between the water pipe and the machine to absorb the shock and stop the banging.

✓ **Safety**

This product is not a safety device and must not be used as sole device to prevent the over-pressure of some parts of the plant or the containment of dangerous fluids.
Always connect the coil's earth terminal to ground to ensure the safety of the user and installation. The coil provides the basic insulation only. Install the product in a protected place to prevent electric shocks.
The coil should not be energized if it is not fitted onto a valve or without a plunger inside the valve, as it would overheat and get damaged. Do not touch the energized coil: risk of high temperature.
Do not use the tubes for conveying fluid to ground electrical devices.
Before disconnecting or disassembling the valve, make sure that there is no pressure inside the tubing or the valve itself.
Accidental shocks due to fall or collision may damage the operator and/or the integrity of the coil encapsulation thus causing malfunctions such as loss of insulation, seizure of the moving parts and overheating.

✓ **Installation**

Check for the operating conditions on product label and on the technical documents.
Check for compatibility between medium and valve materials. In case of doubt, please contact the manufacturer.
Keep the valve operator in a vertical position, facing upwards. This prevents limescale or dirt particles in the operator tube which could restrict the armature or create excessive noise whilst operating.
Whilst tightening or unscrewing the valve must be held or revolved only and exclusively by the hexagon or the frame set (in order to avoid damage to its components such as coil, armature tube, etc.).
The recommended **tightening torque of the coil nut is 0,5 Nm maximum**, a higher torque may cause damage to the valve armature tube.
The recommended **tightening torque of the connector screw is 0,5 Nm maximum**, a higher torque may cause an excessive yield stress with consequent damages to the coil rivet and/or plastic encapsulation.

✓ **Connections**

To ensure that the solenoid valve works properly, do not connect to pipework with an internal diameter less than the nominal diameter (DN) of the valve. Clean all pipework before connection to the solenoid valve: care should be taken to prevent foreign bodies – dirt or material chips – from entering the valve during the assembly phase.
Use suitable seal material on the valve threads. Where liquid sealants are used, it is important to prevent them from entering the valve and block the movement.

✓ **Flow Direction**

Respect the direction of flow across the valve, shown with an arrow or by numbers on the valve body, depending on the model type.

✓ **Filtration**

If the fluid contains dirt particles it is necessary to install a filter upstream of the solenoid valve. Dirt is the most frequent cause of malfunction.

✓ **Environment**

Coils fitted with suitable connectors have a protection class of IP65. However, it is advisable not to use the solenoid valve outside or in very damp conditions without adequate protection. Provide sufficient ventilation for the solenoid valve. **During continuous service the coil of the solenoid valve becomes hot and should not be touched.**

CE MARKING

The CE mark indicates that the product satisfies all the regulations governing safety laid down by the European Community. Products displaying this mark can be freely distributed within the markets of the European Community.

✓ **EC Directives**

EC directives for product safety were issued to unify regulations and working practices in force in the countries of the community prior to the constitution of the European Union. The following three directives concern electrical appliances and machines in general:

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.

✓ **M&M International products conforming to the EC directives**

Products subject to the Low Voltage Directive are given a certification by the European Community.
M&M International issues declarations of conformity such as in the attached form "Declaration of conformity to EC".

We believe that our products are components and as such do not form a part of the range of products subject to the EMC directive. However, conformity of M&M International products to the EMC directive could change depending on the function of the product's use, of the configuration (for example the use of connectors with passive electronic components, LED etc.), or the conditions of the electrical connection. For this reason it is recommended that you check the compliance of the final product with the EMC Directive.

DECLARATION OF CONFORMITY TO CE

M&M international
A Spirax-Sarco Engineering plc company

DECLARATION OF CONFORMITY CE

We, M&M International S.r.l. registered office via A. Appiani 12 – 20121 Milano - Italy, declare under our sole responsibility that the products:

2/2 WAY AND 3/2 WAY DIRECT ACTING AND PILOT OPERATED SOLENOID VALVES FOR GENERAL PURPOSES

equipped with encapsulated coils identified by M&M series "2", "7", "8", "9", "B" and "D"

to which this declaration relates are in conformity with the following harmonized standards

EN 60730-1

EN 60529

The above-referenced products comply with the essential requirements of the Directive:

2006/95/EC (ex 73/23/EC) **and amendment 93/68/EC**

The above-referenced products are developed and constructed in compliance with the requirements of the Pressure Equipment Directive

97/23/EC, Art. 3.3 Pressure Equipment Directive

Orio al Serio, Italy, April 2012

The General Manager
Maurizio Farno

ATTENTION!

The attention of the purchaser, installer or user is drawn to special measures and limitations to use that must be observed when the product is used, installed or taken into service. Details of these special measures and limitations to use are available on request and are also contained in the product label and in the Installation, Maintenance and User Instructions provided together with the product.

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Cap.Soc.: € 2.000.000,00 i.v. – C.F.: 0249760 016 9 P.IVA: 0322288 096 9 – Int'l VAT N. IT03222880969 • R.E.A. MILANO n. 1658695 — Iscr. Registro Imprese Milano al n. 02497600169
Società soggetta all'attività di direzione e coordinamento di Spirax-Sarco Engineering plc