



## VALVES ISO 5599/1 SERIES SAFE AIR®

Starting from a series of sturdy, reliable valves, such as those to ISO 5599/1, some special features have been added, such as the presence of a valve status diagnostic system and the creation of a double channel guaranteeing architecture redundancy.

The simplest version features one electropneumatically-operated 5/2 monostable valve. It is common knowledge that when this type of valve is in the idle state (coil not energized), port 1 is connected to port 2, and port 4 relieves. When the valve is operated (coil energized), port 1 is connected to port 4, and port 2 relieves. When the coil is de-energized again, the valve is returned to the idle state (so port 4 relieves) by means of a spring that returns the spool to the home position. In the event of a failure, the spool may remain in the actuating position, even with coil de-energized, leaving port 4 pressurized.

To offset this problem, we have added a Hall-effect sensor that reads the spool position. This means that when the valve is deactivated, the sensor is on, and when the valve is activated, the sensor is off. A status in which the sensor is off and the coil de-energized indicates a problem.

To reduce the probability of risk during plant maintenance, the manual actuator mounted on the Cnomo electric control is the monostable type. The sensor inside the valve is available in the standard version with a 2.5m three-wire cable (standard or ATEX certified) or with an M8 connector and a 300 mm cable.

This valve, which is available in 3 sizes for the ISO 5599/1 series, is a category 2 component according to ISO EN 13849 and is suitable for use in safety circuits up to PL=c.

For those requiring higher PLs, we have also developed a double-channel version (redundant) that requires the use of ISO 5599/1 valves with a monitored coil arranged so that ports 2 are in parallel and ports 4 are in series. If just one of the valves de-energizes, port 4 relieves, so, even if one of the two coils remains blocked, the other guarantees relief of the compressed-air circuit. In this case, too, the presence of spool position sensors can be used to monitor the status.

The double valve is also available in 3 sizes for the ISO 5599/1 series. It is a category 4 component according to ISO EN 13849 and is suitable for use in safety circuits up to PL=e.

Both the single- and the double-channel valve come with:

- a Type-Approval n° P13104/11/MC/nb issued by Bureau Veritas in accordance with EN ISO 13849
- a certificate of compliance examination to the Machinery Directive 2006/42/EC CV \*\*No. CV 002-10-2011 released by Bureau Veritas.



# SINGLE VALVE ISO 5599/1 SERIES SAFE AIR®

TECHNICAL DATA	ISO 1	ISO 2	ISO 3
Fluid	Filtered unlubricated air (50 µm); lubrication, if used, must be continuous		
Operation	5/2 monostable		
Operating pressure: bar	from 2.5 to 10		
• non-assisted	from vacuum to 10		
• pilot-assisted	2.5		
Minimum pilot pressure bar	from -10 to +60 (from -10 to +45 for Atex version)		
Operating temperature range °C			
Nominal diameter mm	7.5	12	15
Conductance C NI/min · bar	250	657	971
Critical ratio b bar/bar	0.36	0.43	0.43
Flow rate at 6.3 bar Δp 0.5 bar NI/min	700	1800	3200
Flow rate at 6.3 bar Δp 1 bar NI/min	1100	2700	4600
TRA/TRR at 6.3 bar ms/ms	24 / 50	39 / 60	50 / 120
Conductance C on relief NI/min · bar	267	817	1095
Critical ratio b on relief bar/bar	0.34	0.24	0.56
Flow rate on free exhaust at 6.3 bar NI/min	1850	4900	8000
Installation	any position		
Assembly	On single or manifold bases to ISO 5599/1 (*) to CNOMO		
Solenoid pilot	Monostable on solenoid pilot and valve body		
Manual actuator	ISO and UNI FD 22		
Recommended lubricant	See <b>chapter Z1</b>		
Compatibility with oils	30 mm side, Ø 8 hole – EN175301-803 connection, type A		
Coils	22 mm side, Ø 8 hole – EN175301-803 connection, type B		
	Certified EN 60204.1 and VDE 0580		
	Refer to the Accessories section for the electrical features page B1.123 (*)		
Class of protection	IP65 with coil and connector mounted		
Noise level	Max. 78 dBA with silenced relief		
Max coil ring nut torque Nm	1		
CE marking	In accordance with Machinery Directive, Annexe V (**)		
ATEX category (only for versions with an ATEX sensor)	Ⓢ II 3G Ex nA c IIC T4 Gc x -10°C<Ta<45°C Ⓢ II 3D Ex tc IIIC T1 35°C IP65 Dc		
Safety function	Cuts off the power supply and relieves the air circuit connected to port 4		
Type of sensor used	Hall effect (refer to page B1.153 for sensor details)		
B10d	50 x 10 <sup>6</sup> cycles		
Category - ISO EN 13849	2		
DC	Low (80 %)		
PL - ISO EN 13849	Suitable for use in safety circuits up to PL=c		

VALVES

VALVES ISO 5599/1 SERIES SAFE AIR®

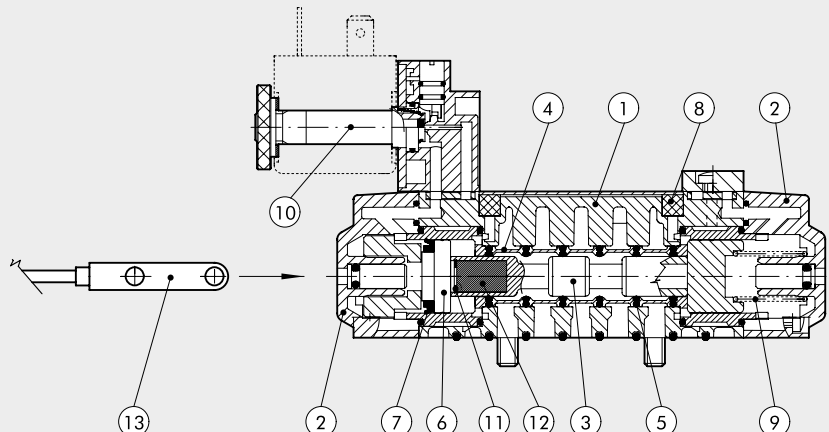
\* To avoid malfunctions, we recommend using Metal Work accessories

\*\* The declaration can be downloaded from [www.metalwork.it](http://www.metalwork.it)

**IMPORTANT:** Do not mount 2 or more SAFE AIR® valves in adjacent positions.  
Any ferromagnetic masses must be at least 30 mm from the sensor.  
Prevent magnetic fields from creating disturbance in the sensor area.

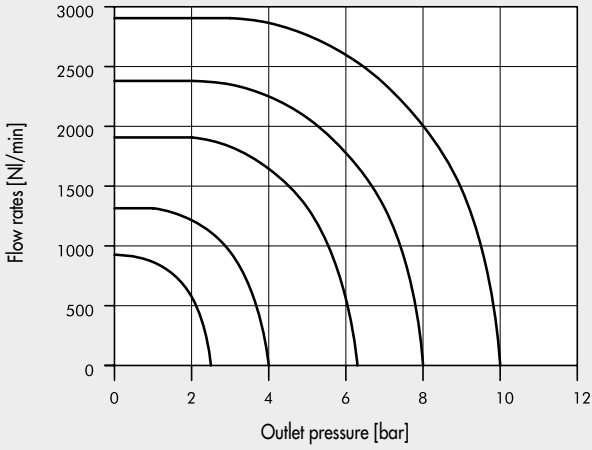
## COMPONENTS

- ① VALVE BODY: Aluminium
- ② END CAP: Hostaform®
- ③ SPOOL: chemically nickel-plated aluminium
- ④ DISTANCE PLATES: plastic
- ⑤ GASKETS: NBR
- ⑥ PISTONS: Hostaform®
- ⑦ PISTON GASKET: NBR
- ⑧ FILTER: sintered bronze
- ⑨ SPRINGS: special steel
- ⑩ OPERATOR: Brass pipe – Stainless steel core
- ⑪ LOCKING RING: special steel
- ⑫ MAGNET: Neodymium
- ⑬ SENSOR: Hall effect

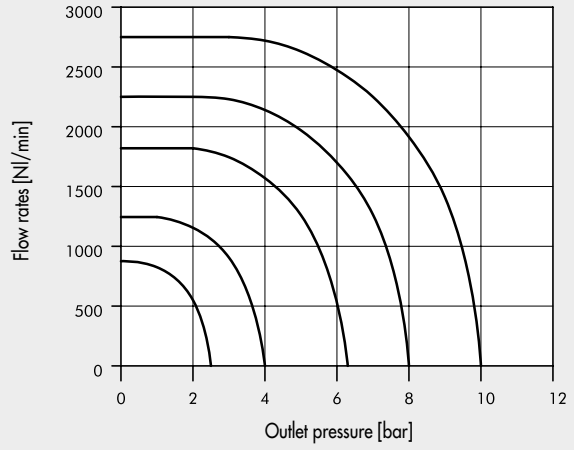


FLOW CHARTS - SINGLE VALVE

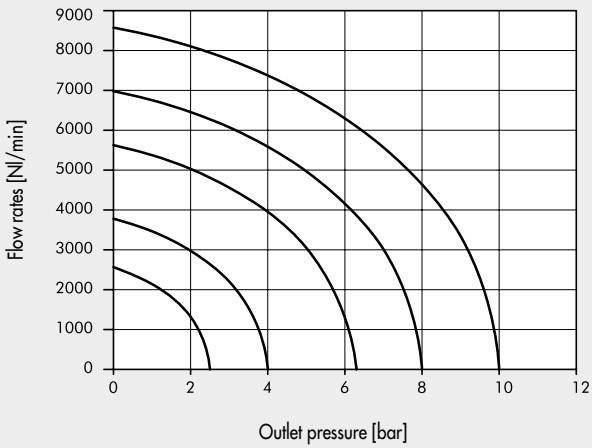
ISO 1 - ON DELIVERY



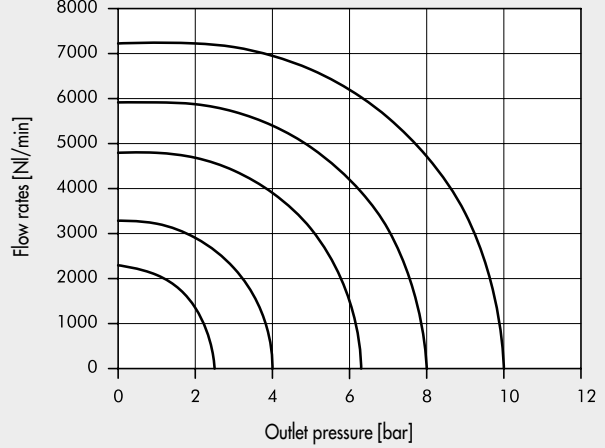
ISO 1 - ON RELIEF



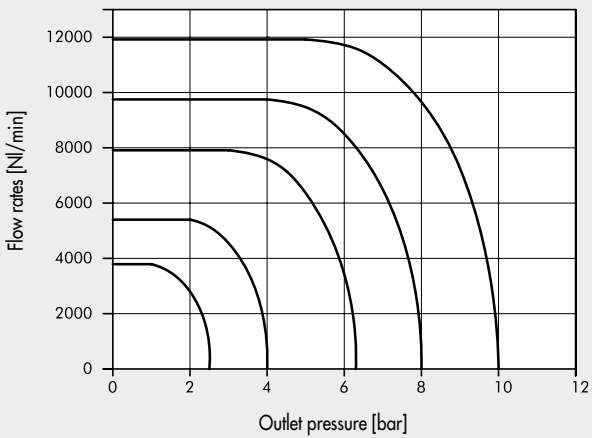
ISO 2 - ON DELIVERY



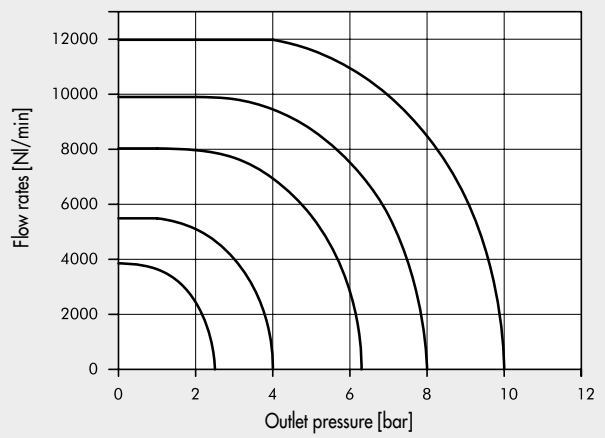
ISO 2 - ON RELIEF



ISO 3 - ON DELIVERY



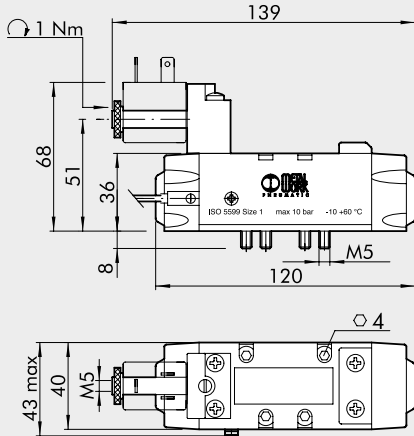
ISO 3 - ON RELIEF



SYNOPTIC, SIZES AND VERSIONS

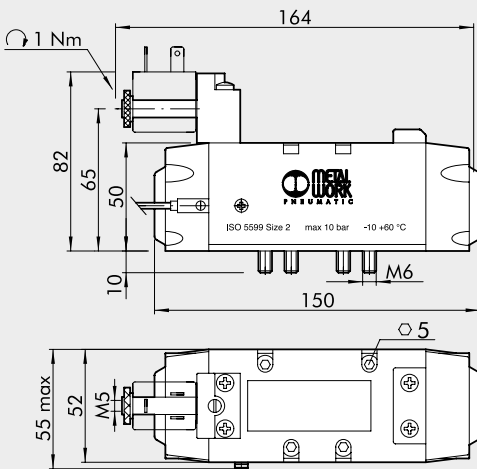
IS V		5		5		SO		S		OO		3 F	
FAMILY		DIMENSIONS		FUNCTION		OPERATORS 14		RESETTING 12		FURTHER DETAILS		SENSOR	
ISV	ISO solenoid/ pneumatic	5	ISO1	5	5/2	SO	solenoid/ pneumatic	S	mechanical springs	OO	5/2	3F	2.5 m
		6	ISO2			SE	electric					M8	0.3 m M8
		7	ISO3				pilot-assisted					AT	2 m ATEX

**5/2 MONOSTABLE - ISO 1**



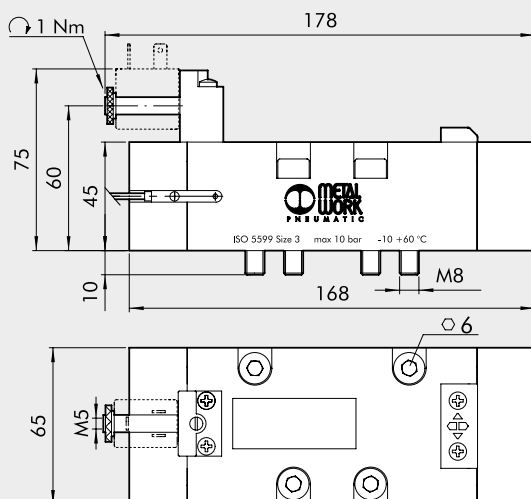
Symbol	Code	Abbrev.	Sensor	Weight [g]
	7057021100	ISV 55 SOS OO 3F	2.5 m 3 wires	380
	7057121100	ISV 55 SOS OO M8	0.3 m M8	350
	7057221100	ISV 55 SOS OO AT	2 m ATEX	370
	7057021400	ISV 55 SES OO 3F	2.5 m 3 wires	380
	7057121400	ISV 55 SES OO M8	0.3 m M8	350
	7057221400	ISV 55 SES OO AT	2 m ATEX	370

**5/2 MONOSTABLE - ISO 2**



Symbol	Code	Abbrev.	Sensor	Weight [g]
	7058021100	ISV 65 SOS OO 3F	2.5 m 3 wires	750
	7058121100	ISV 65 SOS OO M8	0.3 m M8	720
	7058221100	ISV 65 SOS OO AT	2 m ATEX	740
	7058021400	ISV 65 SES OO 3F	2.5 m 3 wires	750
	7058121400	ISV 65 SES OO M8	0.3 m M8	720
	7058221400	ISV 65 SES OO AT	2 m ATEX	740

**5/2 MONOSTABLE - ISO 3**



Symbol	Code	Abbrev.	Sensor	Weight [g]
	7059021100	ISV 75 SOS OO 3F	2.5 m 3 wires	1240
	7059121100	ISV 75 SOS OO M8	0.3 m M8	1210
	7059221100	ISV 75 SOS OO AT	2 m ATEX	1230
	7059021400	ISV 75 SES OO 3F	2.5 m 3 wires	1240
	7059121400	ISV 75 SES OO M8	0.3 m M8	1210
	7059221400	ISV 75 SES OO AT	2 m ATEX	1230

EXAMPLE OF A SAFETY CIRCUIT WITH A SINGLE VALVE

Below is an example of a wiring diagram for controlling Metal Work SAFE AIR® single valves using Pilz® components.

Circuit components:

- a Pilz® safety module PNOZ® s3 for controlling the emergency stop button; terminal Y32 indicates the status of the module, which can be relayed to the machine control logic
- an emergency stop button S1 (Pilz® - PIT® es Set) linked to terminals S11-S12-S22-S23 of the PNOZ® s3
- a Metal Work SAFE AIR® solenoid valve, the 24 VDC coil of which is fed by terminal 14 of the PNOZ® s3 (the other terminal of the coil is 0 V); the valve's Hall-effect sensor is 24 VDC
- a start/reset button S2
- a relay K1, controlled by the valve sensor; an NO contact of the relay is in series with button S2 of the PNOZ® s3.

Expected behaviour with the system operating correctly:

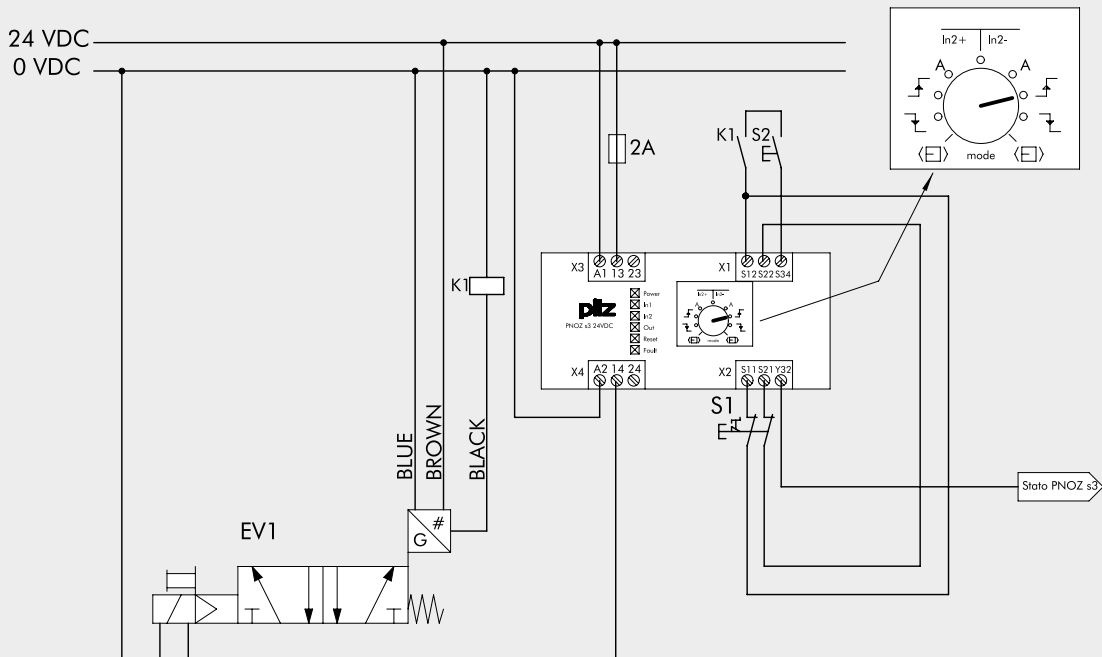
- system deactivated:
  - contact 14 is OFF
  - the coil is de-energized
  - the sensor is ON
  - relay K1 is energized
  - contact K1 is closed
  - contact Y32 is OFF
- with the system activated via the start/reset button:
  - contact 14 is ON
  - the coil is energized
  - the sensor is OFF
  - relay K1 is de-energized
  - contact K1 is open
  - contact Y32 is ON

In the event of a malfunction (e.g. spool jam), the coil is de-energized but the sensor remains OFF, relay K1 remains de-energized, contact K1 remains open (preventing subsequent restarts) and contact Y32 is OFF.

In the event of a valve fault, the circuit in the diagram below does not allow relief of the compressed air system. Sensor status must be monitored to assess valve operation. Contact Y32 indicates the status of the PNOZ® s3, not the status of the sensor.

All the electrical connections between the various components must comply with the applicable safety regulations.

If the emergency stop button is operated at a frequency of 1 actuation per hour, the circuit activates a safety function with PL = c (calculations made with the PASCAL programme by Pilz®). Responsibility for final checking that PL lies with the person assembling the circuit.



## DOUBLE VALVE ISO 5599/1 SERIES SAFE AIR®

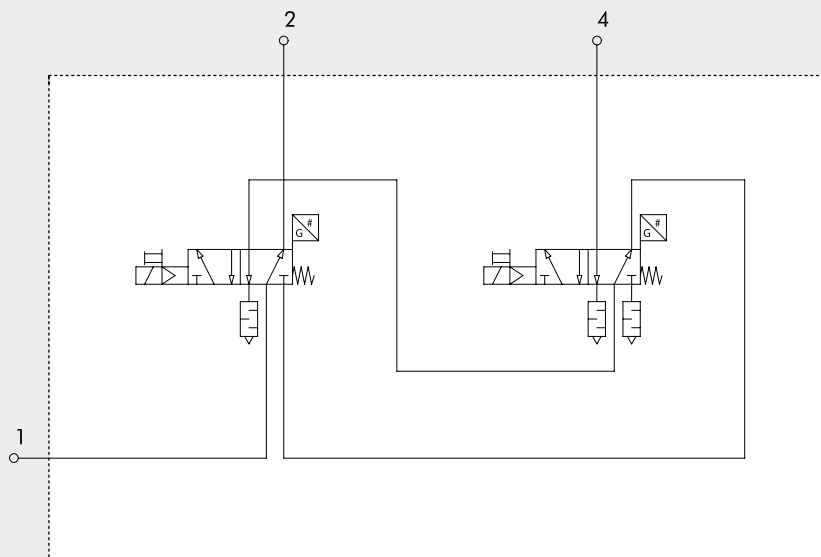
TECHNICAL DATA	ISO 1	ISO 2	ISO 3	
Fluid	Filtered unlubricated air (50µm); lubrication, if used, must be continuous			
Operation	double 5/2 monostable			
Operating pressure:	bar			
• non-assisted	from 2.5 to 10			
• pilot-assisted	from vacuum to 10			
Minimum pilot pressure	bar			
Operating temperature range	°C			
Conductance C	Nl/min · bar	228	498	720
Critical ratio b	bar/bar	0.40	0.24	0.44
Flow rate at 6.3 bar Δp 0.5 bar	Nl/min	770	1250	2500
Flow rate at 6.3 bar Δp 1 bar	Nl/min	1050	1750	3400
Conductance C on relief	Nl/min · bar	222	554	724
Critical ratio b on relief	bar/bar	0.30	0.02	0.41
Flow rate on free exhaust at 6.3 bar	Nl/min	1600	4000	5300
TRA/TRR at 6.3 bar	ms/ms	24 / 50	39 / 60	50 / 120
Installation	any position			
Solenoid pilot	to CNOMO			
Manual actuator	monostable on solenoid pilot and valve body			
Recommended lubricant	ISO and UNI FD 22			
Compatibility with oils	See <b>chapter Z1</b>			
Coils	30 mm side, ø 8 hole – EN175301-803 connection, form A 22 mm side, ø 8 hole – EN175301-803 connection, form B Certified EN 60204.1 and VDE 0580 Refer to the Accessories section for electrical features page B1.123 (*) IP65 with coil and connector mounted Max. 78 dBA with silenced relief in accordance with Machinery Directive, Annexe V (**) ⊕ II 3G Ex nA c IIC T4 Gc x -10°C<Ta<45°C ⊕ II 3D Ex tc IIIC T1 35°C IP65 Dc			
Class of protection	1			
Noise level	cuts off the power supply and relieves the air circuit connected to port 4			
CE marking	Hall effect (refer to page B1.153 for sensor details)			
ATEX category (only for versions with an ATEX sensor)	50x10 <sup>6</sup> cycles			
Max coil ring nut torque	4			
Safety function	High (≥ 99 %)			
Type of sensor used	80			
B10d	Suitable for use in safety circuits up to PL=e			
Category - ISO EN 13849				
DC				
CCF				
PL - ISO EN 13849				

\* To avoid malfunctions, we recommend using Metal Work accessories

\*\* The declaration can be downloaded from [www.metalwork.it](http://www.metalwork.it)

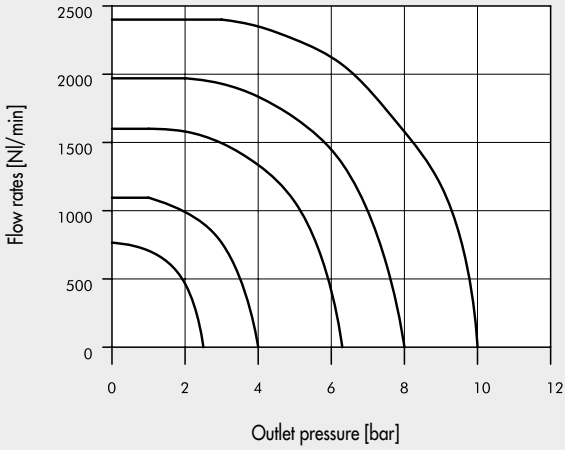
**IMPORTANT:** Any ferromagnetic masses must be at least 30 mm from the sensor.  
Prevent magnetic fields from creating disturbance in the sensor area.

### WIRING DIAGRAM

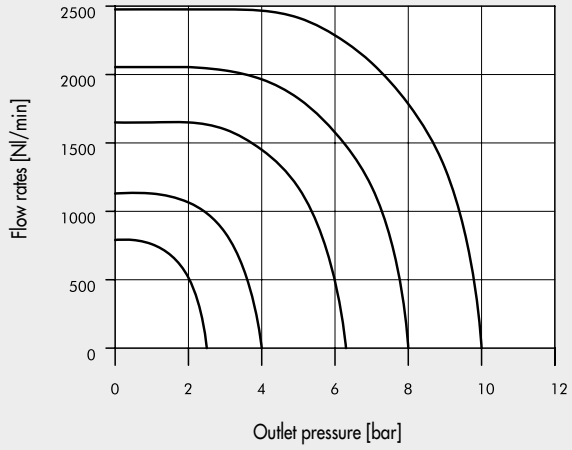


**FLOW CHARTS - DOUBLE VALVE**

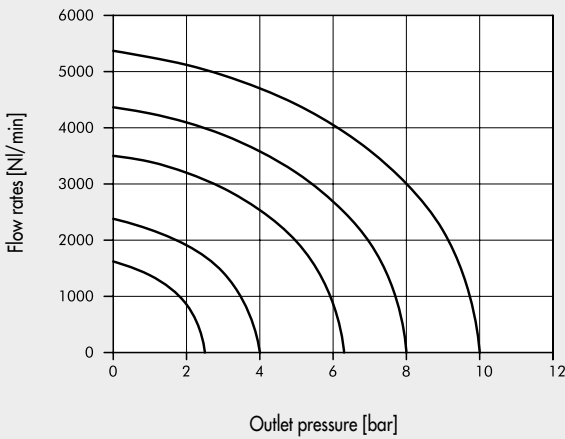
ISO 1 - ON DELIVERY



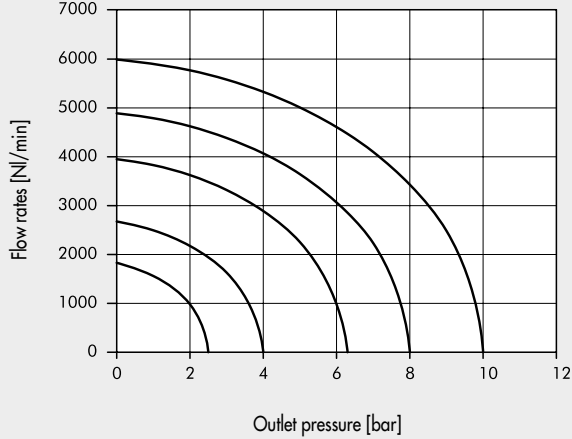
ISO 1 - ON RELIEF



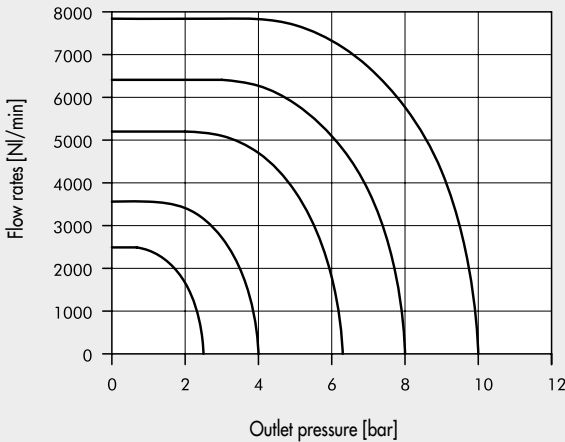
ISO 2 - ON DELIVERY



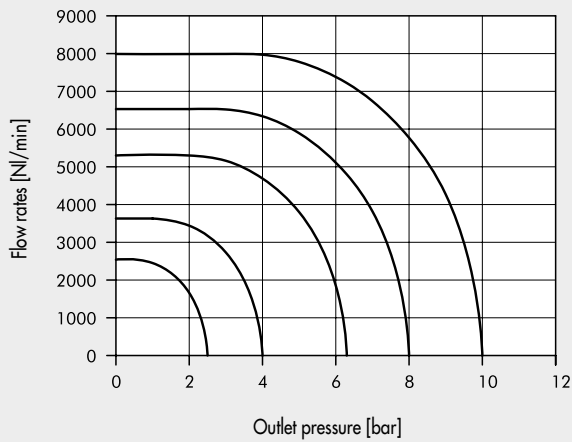
ISO 2 - ON RELIEF



ISO 3 - ON DELIVERY



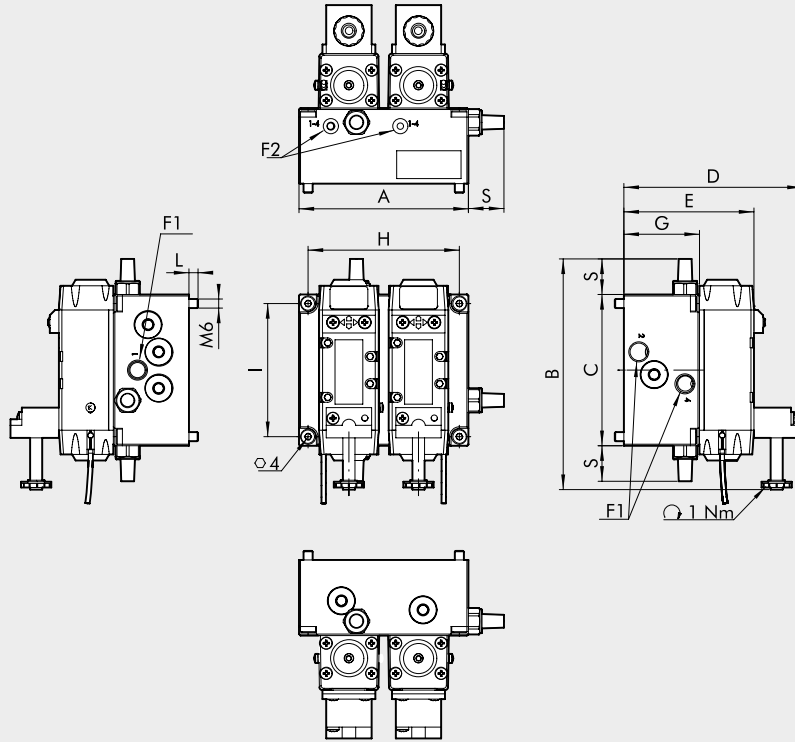
ISO 3 - ON RELIEF



**SYNOPTIC, SIZES AND VERSIONS**

ISV FAMILY		5 DIMENSIONS		5 FUNCTION		SO OPERATORS 14		S RESETTING 12		DD FURTHER DETAILS		3 F SENSOR	
ISV	ISO solenoid/ pneumatic	5	ISO1	5	5/2	SO	solenoid/ pneumatic	S	mechanical springs	DD	double 5/2	3F	2.5 m
		6	ISO2			SE	electric					M8	0.3 m M8
		7	ISO3				pilot-assisted					AT	2 m ATEX

DOUBLE 5/2 MONOSTABLE



Code	Size	Abbrev.	A	B	C	D	E	F1	F2	G	H	I	L	S	Sensor	Weight [g]
7057021110	ISO 1	ISV 55 SOS DD 3F	112	152.5	100	118	86	G 1/4"	M5	50	100	88	6	23.5	2.5 m 3 wires	2100
7057121110	ISO 1	ISV 55 SOS DD M8	112	152.5	100	118	86	G 1/4"	M5	50	100	88	6	23.5	0.3 m M8	2100
7057221110	ISO 1	ISV 55 SOS DD AT	112	152.5	100	118	86	G 1/4"	M5	50	100	88	6	23.5	2 m ATEX	2100
7057021410	ISO 1	ISV 55 SES DD 3F	112	152.5	100	118	86	G 1/4"	M5	50	100	88	6	23.5	2.5 m 3 wires	2100
7057121410	ISO 1	ISV 55 SES DD M8	112	152.5	100	118	86	G 1/4"	M5	50	100	88	6	23.5	0.3 m M8	2100
7057221410	ISO 1	ISV 55 SES DD AT	112	152.5	100	118	86	G 1/4"	M5	50	100	88	6	23.5	2 m ATEX	2100
7058021110	ISO 2	ISV 65 SOS DD 3F	146	176	116	145	113	G 3/8"	G 1/8"	63	134	104	13	29	2.5 m 3 wires	4000
7058121110	ISO 2	ISV 65 SOS DD M8	146	176	116	145	113	G 3/8"	G 1/8"	63	134	104	13	29	0.3 m M8	4000
7058221110	ISO 2	ISV 65 SOS DD AT	146	176	116	145	113	G 3/8"	G 1/8"	63	134	104	13	29	2 m ATEX	4000
7058021410	ISO 2	ISV 65 SES DD 3F	146	176	116	145	113	G 3/8"	G 1/8"	63	134	104	13	29	2.5 m 3 wires	4000
7058121410	ISO 2	ISV 65 SES DD M8	146	176	116	145	113	G 3/8"	G 1/8"	63	134	104	13	29	0.3 m M8	4000
7058221410	ISO 2	ISV 65 SES DD AT	146	176	116	145	113	G 3/8"	G 1/8"	63	134	104	13	29	2 m ATEX	4000
7059021110	ISO 3	ISV 75 SOS DD 3F	186	188	116	155	123	G 1/2"	G 1/8"	78	174	104	9	31.5	2.5 m 3 wires	5300
7059121110	ISO 3	ISV 75 SOS DD M8	186	188	116	155	123	G 1/2"	G 1/8"	78	174	104	9	31.5	0.3 m M8	5300
7059221110	ISO 3	ISV 75 SOS DD AT	186	188	116	155	123	G 1/2"	G 1/8"	78	174	104	9	31.5	2 m ATEX	5300
7059021410	ISO 3	ISV 75 SES DD 3F	186	188	116	155	123	G 1/2"	G 1/8"	78	174	104	9	31.5	2.5 m 3 wires	5300
7059121410	ISO 3	ISV 75 SES DD M8	186	188	116	155	123	G 1/2"	G 1/8"	78	174	104	9	31.5	0.3 m M8	5300
7059221410	ISO 3	ISV 75 SES DD AT	186	188	116	155	123	G 1/2"	G 1/8"	78	174	104	9	31.5	2 m ATEX	5300

NOTES



## EXAMPLE OF A SAFETY CIRCUIT WITH A DOUBLE VALVE

Below is an example of a wiring diagram for controlling double valves SAFE AIR® a Metal Work using Pilz® components.

Circuit components:

- a Pilz® PNOZ® mm 0.1p modular safety system
- an emergency stop button S1 (Pilz® - PIT® es Set) linked to terminals T0-T1-I8-I9 of the PNOZ® mm 0.1p
- a Metal+ Work double solenoid valve SAFE AIR®, the 24 VDC coils of which are fed by terminals O0 (SV1) and O1 (SV2) of the PNOZ® mm 0.1p (the other terminals of the coils are OV); the valves' Hall-effect sensors are 24 VDC
- the sensor signals are relayed to terminals 16 (SV1) and 17 (SV2) of the PNOZ® mm 0.1p
- a start/reset button S2

Expected behaviour with the system operating correctly:

- system deactivated:
  - contacts O0 and O1 are OFF
  - the coils are de-energized
  - the sensors are ON (and hence signals to terminals 16 and 17)
  - if one of the sensors is OFF, the Pilz® module does not allow subsequent start/reset
- with the system activated via the start/reset button:
  - contacts O0 and O1 are ON
  - the coils are energized
  - the sensors are OFF (and hence signals to terminals 16 and 17)

The PNOZ® mm0.1p module is programmed so that:

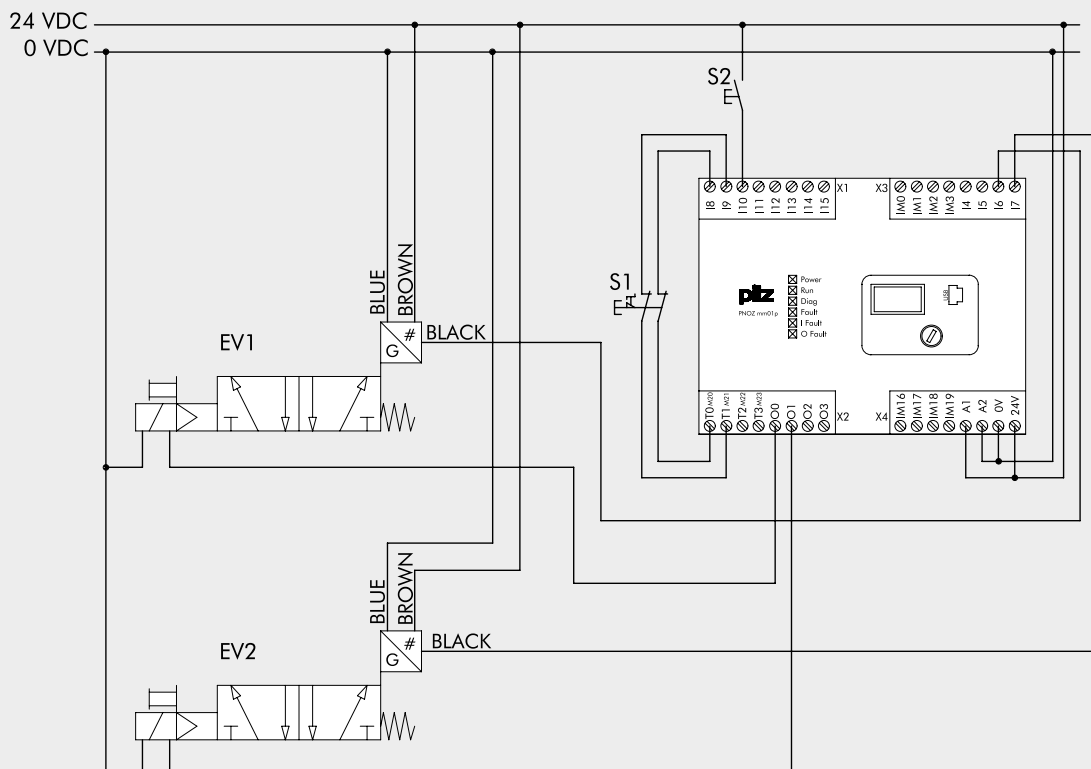
- when either sensor is OFF, and the coils are de-energized, the module does not allow subsequent restarts.
- when the valves are energized, the 2 sensors must go off within the valve actuation time (24 ms for ISO1s, 39 ms for ISO2s and 50 ms for ISO3s), otherwise the 2 valves are switched off again.

The programme can be downloaded from [www.metalwork.it](http://www.metalwork.it) (the licence for programming Pilz® modules is not included).

All the electrical connections between the various components must comply with the applicable safety regulations.

If the emergency button is operated at a frequency of 1 actuation per hour, the circuit activates a safety function with PL = e (calculations made with the PAScal programme by Pilz®).

Responsibility for final checking that PL lies with the person assembling the circuit.

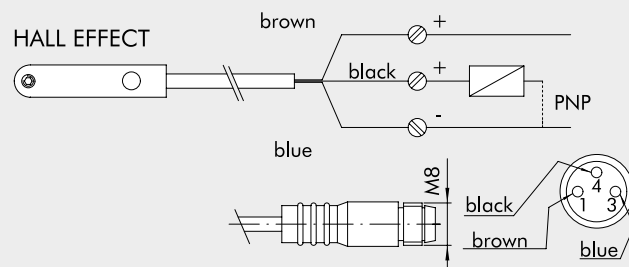


TECHNICAL DATA SENSOR		EFFECT HALL	ATEX
Type of contact		EFFECT HALL	EFFECT HALL
Switch		N.O.	N.O.
Supply voltage (Ub)	V	PNP	PNP
Power	W	from 10 to 30 DC	from 18 to 30 DC
Voltage variation		3	≤ 1.7
Voltage drop	V	≤ 10% of Ub	≤ 10% of Ub
Input current	mA	≤ 2	≤ 2.2
Output current	mA	≤ 10	≤ 10
Switching frequency	Hz	≤ 100	≤ 70
Short-circuit protection		≤ 5000	1000
Over-voltage suppression		Yes	Yes
Polarity inversion protection		Yes	Yes
EMC		Yes	Yes
LED display		EN 60 947-5-2	EN 60 947-5-2
Magnetic sensitivity		Yellow	Yellow
Repeatability		2.8 mT ± 25%	2.6 mT
Degree of protection (EN 60529)		≤ 0.1 mT	≤ 0.1 mT (Ub and ta fixed)
Vibration and shock resistance		IP 67	IP 68, IP 69K
Operating life		30 g, 11 ms, from 10 to 55 Hz, 1 mm	30 g, 11 ms, from 10 to 55 Hz, 1 mm
Temperature range	°C	10 <sup>9</sup> impulses	10 <sup>9</sup> impulses
Sensor capsule material		from -25 to +75	from -20 to +45
2.5 m/2 m connecting cable		PA66 + PA6I/6T	PA
Connecting cable with M8x1		PVC; 3 x 0.14 mm <sup>2</sup>	PVC; 3 x 0.12 mm <sup>2</sup>
Wire NO.		Polyurethane; 3 x 0.14 mm <sup>2</sup>	-
Category ATEX		3	3
Certifications		-	II 3G Ex nA op is IIC T4 Gc X II 3D Ex tc IIIC T135°C Dc IP67 X

VALVES

VALVES ISO 5599/1 SERIES SAFE AIR®

**WIRING DIAGRAM SENSOR**



**ACCESSORIES**

Refer to page B1.123 for coils and connectors



**NOTES**

NOTES

VALVES

Blank lined area for notes.