

# V81 - Redundant valve manifold systems - Modular with bypass 1oo2 "Safety", 2oo2 "Availability" and 2oo3 "Safety and Availability"



- > **Modular design - Herion valves**
- > **Bypass function enables valve removal online**
- > **Stainless steel visual status indicators and exhaust guards as standard**
- > **Optional electrical position indicators for valves**
- > **SIL certified components and system**
- > **International approvals**
- > **Standard in aluminium, stainless steel on request**
- > **Utilizing industry proven technology**



## Technical features

### Medium:

Filtered, non-lubricated or dry compressed air, instrument air nitrogen and other non-flammable neutral dry fluids

### Operation:

3/2 Direct solenoid operated poppet valves

### Operating pressure:

1 ... 10 bar  
2 ... 8 bar (with 98025 Valves)

### Port size:

G1/4, 1/4 NPT, G1/2, 1/2 NPT

### Flow:

Standard valves 165 ... 240 l/min  
High flow valves 600 ... 720 l/min  
details see page 2

### Ambient/Media temperature:

Up to -40 ... +80°C, see option selector page 2  
Depending on solenoid system  
Air supply must be dry enough to avoid ice formation at temperatures below +2°C (35°F).  
For outdoor installations must be protected all connections against the penetration of moisture and a solenoid with IP66 protection must be used!

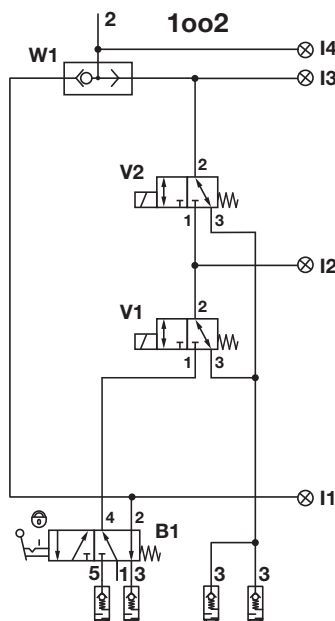
### Materials:

Manifold and valve body: Anodized aluminium or stainless steel  
Seal: NBR, VMQ  
Internal parts: stainless steel, brass

### Flow conversion:

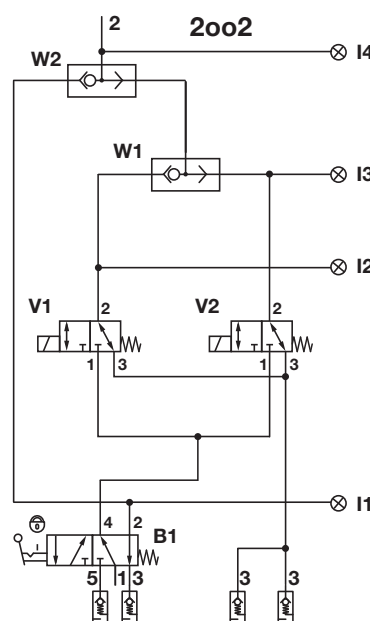
Cv US Gallon/min (water) = l/min (air) x 0,001  
Kv m³/h (water) = l/min (air) x 0,000906

## 1oo2 with bypass valve exhaust guards and indicators

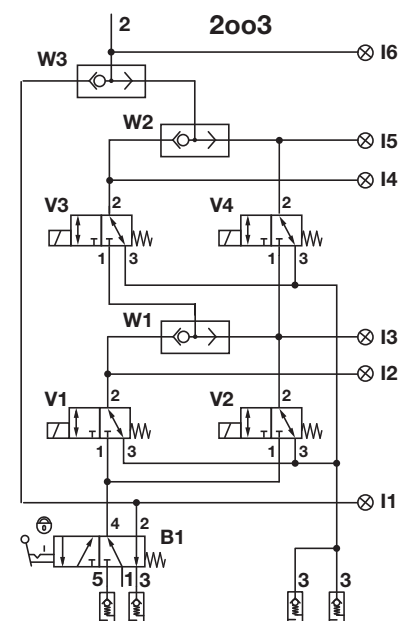


B Bypass valve  
I Indicators  
V Solenoid actuated valves  
W Shuttle valves ('OR' function)

## 2oo2 with bypass valve exhaust guards and indicators



## 2oo3 with bypass valve \*1) exhaust guards and indicators



\*1) for 2oo3  
V1 & V4 = channel 1  
V2 = channel 2  
V3 = channel 3

\*1) for 3oo4  
V1 = channel 1  
V2 = channel 2  
V3 = channel 3  
V4 = channel 4

Please have a look to instructions

**Option selector**
**V81\*\*\*\*\*4\*\*0000**

<b>Valve function</b>			<b>Substi- tute</b>	<b>Country of manufacture</b>			
1oo2 normally closed			<b>1</b>	Norgren internal use			
2oo2 normally closed			<b>3</b>	<b>Indicators*2)</b>		<b>Temperature / Pressure range</b>	
2oo3 normally closed			<b>5</b>	Visual valve status indicators stainless steel		-40°C ... +80°C / 2,5 ... 10 bar	
<b>Port sizes</b>			<b>Substi- tute</b>	<b>Silencers*2)</b>		<b>Temperature</b>	
G1/4 (Standard flow, 24011/24010)			<b>11</b>	Exhaust guard - included in the scope of supply		-55°C ... +80°C	
1/4 NPT (Standard flow, 24011/24010)			<b>12</b>	<b>Solenoids coil</b>			
G1/2 (High flow, 98015/98025)			<b>23</b>	<b>Temperature *3) Standard (°C)</b>	<b>EX- certificate</b>	<b>Substi- tute</b>	
1/2 NPT (High flow, 98015/98025)			<b>24</b>	<b>24011 series + 98015 *4)</b>			
<b>Valve type</b>			<b>Temperature *1)</b>				
<b>24011 series</b>							
Aluminium	-40°C ... +60°C		<b>011</b>	3824.024.00	-20 ... +60	FM/CSA	<b>02</b>
Stainless steel	-40°C ... +60°C		<b>022</b>	3825.120.60	-20 ... +60	FM/CSA	<b>03</b>
Aluminium with proximity sensor	-25°C ... +70°C		<b>033</b>	3826.024.00	-20 ... +60	FM/CSA	<b>04</b>
Stainless steel with proximity sensor	-25°C ... +70°C		<b>044</b>	3827.120.60	-20 ... +60	FM/CSA	<b>05</b>
Aluminium	-25°C ... +80°C		<b>053</b>	4270.024.00	-40 ... +65/55	ATEX/IECEX	<b>08</b>
Stainless steel	-25°C ... +80°C		<b>064</b>	4271.230.50	-40 ... +65/55	ATEX/IECEX	<b>09</b>
<b>98015 series</b>				4670.024.00	-40 ... +70/40	ATEX/IECEX	<b>14</b>
Aluminium	-25°C ... +60°C		<b>073</b>	4671.230.50	-40 ... +70/40	ATEX/IECEX	<b>15</b>
Stainless steel	-25°C ... +60°C		<b>084</b>	4672.024.00	-40 ... +70/40	ATEX/IECEX	<b>16</b>
Aluminium with proximity sensor	-25°C ... +60°C		<b>093</b>	4673.230.50	-40 ... +70/40	ATEX/IECEX	<b>17</b>
Stainless steel with proximity sensor	-25°C ... +60°C		<b>104</b>	4872.024.00	-40 ... +50/40	ATEX/IECEX	<b>18</b>
<b>24010 series</b>				4873.230.50	-40 ... +50/40	ATEX/IECEX	<b>19</b>
Aluminium	-25°C ... +60°C		<b>213</b>	<b>Intrinsically safe versions</b>			
Stainless steel	-25°C ... +60°C		<b>224</b>	<b>Series 24010</b>			
Aluminium with proximity sensor	-25°C ... +60°C		<b>233</b>	2003 -40...+70/55			
Stainless steel with proximity sensor	-25°C ... +60°C		<b>244</b>	<b>Series 98025*4)</b>			
<b>98025 series</b>				2050 -40...+60			
Aluminium	-25°C ... +60°C		<b>313</b>				
Stainless steel	-25°C ... +60°C		<b>324</b>				

\*2) Other indicators or silencers can be ordered separately, see page 3  
 \*3) Temperature depending on Ex classification, see pages 7 - 10  
 \*4) Other performance categories and currents see pages 7 - 10 or on request

\*1) Depending on solenoid system

**Flow rates and valve combinations**

Flow direction (port to port)	Standard flow systems (24011/24010)		High flow systems (98015/98025)	
	Bypass mode	Operation mode	Bypass mode	Operation mode
<b>1oo2</b>	97109	2 x 24011	97109	2 x 98015
<b>1 » 2 [l/min]*5)</b>	950	170	1450	620
<b>2 » 3 [l/min]*6)</b>	—	970 ... 2200	—	2800 ... 4600
<b>2oo2</b>	97109	2 x 24011	97109	2 x 98015
<b>1 » 2 [l/min]*5)</b>	950	240	1450	720
<b>2 » 3 [l/min]*6)</b>	—	950 ... 2200	—	2500 ... 4600
<b>2oo3</b>	97109	4 x 24011	97109	4 x 98015
<b>1 » 2 [l/min]*5)</b>	950	165	1450	600
<b>2 » 3 [l/min]*6)</b>	—	950 ... 2200	—	2500 ... 4600

\*5) Flow characteristics conforms to ISO6358 from port 1 (bypass valve) to port 2 (sub-base) [6 » 5 bar], see page 1

\*6) Flow characteristics conforms to ISO6358 from port 2 (sub-base) to port 3 (sub-base or bypass valve) [10 » 0 bar], see page 1

**Standard**

Port size	Valve type	Tempera- ture (°C)	Materi- als	Weight (kg)	Draw- ing	Model
1oo2 (SIL 3)						
1/4 NPT	2401109	-25...+80°C	Aluminium	9,5 kg	Page 4	V811120534**0000
1/2 NPT	9801595	-25...+60°C	Aluminium	9,8 kg	Page 6	V811240734**0000
2oo2 (SIL 2)						
1/4 NPT	2401109	-25...+80°C	Aluminium	9,6 kg	Page 4	V813120534**0000
1/2 NPT	9801595	-25...+60°C	Aluminium	9,9 kg	Page 6	V813240734**0000
2oo3 (SIL 3)						
1/4 NPT	2401109	-25...+80°C	Aluminium	15,7 kg	Page 5	V815120534**0000
1/2 NPT	9801595	-25...+60°C	Aluminium	15,9 kg	Page 7	V815240734**0000

\*\* Solenoid code

**Partnumbers for international approval**

Land/Approval	Magnetspole/Code	2003	205x	38xx	42xx	46xx	48xx
Europa/ATEX	Standard	x	x	—	x	x	x
International/IECEX	Standard	x	x	—	x	x	x
China/NEPSI	-01	—	x	—	x	x	—
Brasilien/INMETRO	-02	—	x	—	x	x	—
Korea/KOSHA	-03	x	x	—	x	x	x
Russland, Kasachstan & Weißrussland/TR-CU 012	-04	x	x	—	x	x	x
Indien/CCOE	Standard	—	x	—	x	x	—
Taiwan/ITRI	Standard	—	x	—	x	x	—
USA/FM	Standard	—	—	x	—	—	—
Kanada/CSA	Standard	—	—	x	—	—	—

Example: V815240734160003-02

(RVM System V815240734160003; Coil: 4672; Voltage 24V DC; Approval INMETRO)

# V81 series - Redundant valve manifold systems - Modular with bypass 1002 "Safety", 2002 "Availability" and 2003 "Safety and Availability"



- > Standard flow range (375 l/min)
- > For single acting actuators
- > TÜV-approval based on type examination DGRL 2014/68/EU and IEC 61508, multichannel up to SIL 3 (12 years)
- > Optional manual override or valve position sensors
- > Suited for outdoor use under critical environment conditions.
- > Variable valve solenoid combination



## Technical features

### Medium:

Neutral or aggressive, gaseous fluids which do not damage the product or affect the function (e.g. Compressed air, nitrogen). Based on ISO 8573-1- 2010 classification 1-2-3.

### Operation:

3/2 way solenoid operated poppet valve

### Operating pressure:

0 ... 10 bar (0 ... 145 psi)

### Orifice:

5 mm

### Flow:

Gaseous fluids: 375 l/min

### Port size:

Flanged  
NAMUR Interface

### Flow direction:

Optional

### Ambient/Media temperature:

NBR:

-25 ... +80°C (-13 ... +176°F)

VMQ:

-40... +60°C (-40 ... +140°F)

Depending on solenoid system

Air supply must be dry enough

to avoid ice formation at

temperatures below +2°C (35°F).

For outdoor installations must be

protected all connections against

the penetration of moisture and

a solenoid with IP66 protection

must be used!

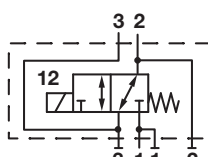
### Materials:

Body: Aluminium anodized or stainless steel 1.4404 (316 L)

Seal: NBR, VMQ

Inner parts: stainless steel, brass

## Technical data

Symbol	Temperature (°C)	Material seat seal	housing	Position sensor	Weight (kg)	Model	Solenoid group	Code
	-40 ... +60	VMQ	aluminium	without	0,55	1025390	A + B	011
	-40 ... +60	VMQ	stainless steel	without	1	1160007	A + B	022
	-25 ... +70	NBR	aluminium	integrated	0,62	1025352	A + B	033
	-25 ... +70	NBR	stainless steel	integrated	1,07	1160006	A + B	044
	-25 ... +80	NBR	aluminium	without	0,55	2401109	A + B	053
	-25 ... +80	NBR	stainless steel	without	1	1025212	A + B	064

# 24010 standard flow valve, 3/2 Direct solenoid actuated poppet valve



- > Standard flow range (375 l/min)
- > Main application: Single acting actuators in intrinsically safe circuits
- > TÜV-approval based on type examination IEC 61508, multichannel up to SIL 3
- > Solenoid valve also suitable for use in low power non hazardous areas
- > High operational reliability even after long periods of non-operation
- > Suited for outdoor use under critical environment conditions.
- > Optional manual override or valve position sensors



## Technical features

### Medium:

Neutral or aggressive, gaseous fluids which do not damage the product or affect the function (e.g.

Compressed air, nitrogen).

Based on ISO 8573-1- 2010 classification 1-2-3.

### Operation:

3/2 way solenoid operated poppet valve

### Operating pressure:

0 ... 10 bar (0 ... 145 psi)

### Orifice:

### Technical data

### Flow:

Gaseous fluids: 375 l/min

### Port size:

Flanged  
NAMUR Interface

### Flow direction:

Optional

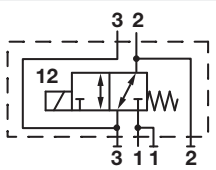
### Ambient/Media temperature:

-25 ... +80°C (-13 ... +176°F)

Depending on solenoid system  
Air supply must be dry enough to avoid ice formation at temperatures below +2°C (35°F).  
For outdoor installations must be protected all connections against the penetration of moisture and a solenoid with IP66 protection must be used!

### Materials:

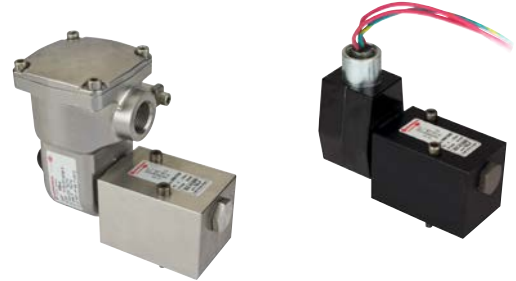
Body: Aluminium anodized or stainless steel 1.4404 (316 L)  
Inner parts: stainless steel, brass  
Solenoid housing: aluminium, anodized  
Seals: NBR

Symbol	Temperature (°C)	Material seat seal	housing	Position sensor	Weight (kg)	Dimension No.	Model	Solenoid group	Code
	-25 ... +60	NBR	aluminium	without	0,55	1	2401009.2003	C	213
	-25 ... +60	NBR	stainless steel	without	1,00	1	2401097.2003	C	224
	-25 ... +60	NBR	aluminium	integrated	0,62	2	1025353.2003	C	233
	-25 ... +60	NBR	stainless steel	integrated	1,07	2	2401098.2003	C	244

# 98015 high flow valve, 3/2 Direct solenoid actuated poppet valve



- > High flow range (950 l/min)
- > Main application: Single acting actuators
- > TÜV-approval based on type examination DGRL 2014/68/EU and IEC 61508, multichannel up to SIL 3
- > Optional manual override or valve position sensors
- > Suited for outdoor use under critical environment conditions
- > Variable valve solenoid combination



## Technical features

### Medium:

Neutral or aggressive, gaseous fluids which do not damage the product or affect the function (e.g. Compressed air, nitrogen). Based on ISO 8573-1- 2010 classification 1-2-3.

### Operation:

3/2 way solenoid operated poppet valve

### Operating pressure:

0 ... 10 bar (0 ... 145 psi)

### Orifice:

8 mm

### Flow:

Gaseous fluids: 950l/min

### Port size:

Flanged

### Flow direction:

Optional

### Ambient/Media temperature:

-40 ... +60°C (-40 ... +140°F)

-25 ... +60°C (-13 ... +140°F)

(SIL version)

Depending on solenoid system

Air supply must be dry enough

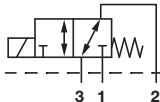
to avoid ice formation at temperatures below +2°C (35°F).

For outdoor installations must be protected all connections against the penetration of moisture and a solenoid with IP66 protection must be used!

### Materials:

Body: Aluminium anodized or stainless steel 1.4404 (316 L)  
Seals: NBR

## Technical data

Symbol	Temperature (°C)	Material seat seal	housing	Inductive limit sensor	Weight (kg)	Model	Solenoid group	Substitute
	-40 ... +60	NBR	aluminium	without	0,65	9801595	A	073
	-40 ... +60	NBR	stainless steel	without	1,50	9801795	A	084
	-25 ... +60	NBR	aluminium	integrated	0,72	9801594	A	093
	-25 ... +60	NBR	stainless steel	integrated	1,57	9801794	A	104

# 98025 high flow valve, 3/2 Indirect solenoid actuated poppet valve



- > High flow range (950 l/min)
- > Main application: Single acting actuators
- > TÜV-approval based on type examination DGRL 2014/68/EU and IEC 61508, multichannel up to SIL 3
- > Suited for outdoor use under critical environment conditions
- > Optional manual override or valve position sensors



## Technical features

### Medium:

Neutral or aggressive, gaseous fluids which do not damage the product or affect the function (e.g.

Compressed air, nitrogen). Based on ISO 8573-1- 2010 classification 1-2-3.

### Operation:

Indirect solenoid operated poppet valve.

### Operating pressure:

2 ... 8 bar (29 ... 116 psi) with internal air supply

### Flow:

Gaseous fluids: 950l/min

### Orifice:

8 mm

### Port size:

Flanged

### Flow direction:

Fixed

### Ambient/Media temperature:

-40 ... +60°C (-40 ... +140°F)

-25 ... +60°C (-13 ... +140°F)

(SIL version)

Depending on solenoid system

Air supply must be dry enough

to avoid ice formation at

temperatures below +2°C (35°F).

For outdoor installations must be

protected all connections against

the penetration of moisture and

a solenoid with IP66 protection

must be used!

### Materials:

Body: Aluminium anodized

(suitable for high humidity,

sulphuric, sodium chloride or

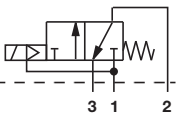
ammonia environments),

stainless steel 1.4404 (316 L)

Seal: NBR

Inner parts: stainless steel

## Technical data

Symbol	Temperature (°C)	Material seat seal	housing	Inductive limit sensor	Weight (kg)	Model	Solenoid group	Substitute
	-40 ... +60	NBR	aluminium	without	0,75	9802595	9802595	313
	-40 ... +60	NBR	stainless steel	without	1,70	9802795	9802795	324

# 97109 standard and high flow valve, 5/2 Manual actuated bypass spool valve



- > Port size: 1/4 & 1/2 (ISO G or NPT) NAMUR Interface
- > Crossover-free switching
- > Reliable operation even with minimal air flow
- > Lockable manual operator with detent in switching and normal position
- > Simple design of soft seal spool system
- > U-lock with two keys



## Technical features

### Medium:

Filtered, non-lubricated and dried compressed air, instrument air, nitrogen and other non-flammable neutral, dry fluids

### Operation:

Manual actuated spool valve

### Operating pressure:

0 ... 10 bar (0 ... 145 psi)

### Flow:

2600l/m

### Orifice:

8 mm

### Port size:

1/2 NPT

### Flow direction:

Fixed

### Ambient/Media temperature:

-40 ... +65°C (NBR) (-40 ... +149°F)

-25 ... +80°C (HNBR)

(-13 ... +176°F)

Air supply must be dry enough to avoid ice formation at temperatures below +2°C (35°F). For outdoor installation please protect all connections against the penetration of moisture.


### Materials:

Aluminium anodized or stainless steel 1.4404 (316 L)  
Seals: NBR or HNBR

## Technical data

Seals: NBR -40 ... +65°C (-40 ... +149°F)

Seals: HNBR -25 ... +80°C (-13 ... +176°F)

Symbol	Temperature (°C)	Materials Seals	Housing	Actuation/return	Weight (kg)	Drawing No.	Model
	-40 ... +60°C	NBR	Aluminium	Lever/spring	1,30	2	9710913
	-25 ... +80°C	HNBR	Aluminium	Lever/spring	1,30	2	9710921
	-40 ... +60°C	NBR	Stainless steel	Lever/spring	3,20	2	9710914
	-25 ... +80°C	HNBR	Stainless steel	Lever/spring	3,20	2	9710922

## Accessories

U-lock with two keys (brass)








0613633

U-lock with two keys (stainless steel)



0613836

**Solenoids operator, group A**

	Power consumption		Rated current		Protection class IP/NEMA	Ex-Protection (ATEX-Category)	Temperature Ambient/ Media (°C)	Electrical connection	Drawing No.	Circuit diagram No.	Model
	24 V d.c. (W)	230 V a.c. (VA)	24 V d.c. (mA)	230 V a.c. (mA)							
	8,9	—	369	—	IP66 (with cable gland)	II 2G Ex eb mb IIC T4/ T5 Gb  II 2D Ex tb IIIC T130°C Db	T4: -40 ... +65 T5: -40 ... +55 -40 ... +65	M20 x 1,5 *7)	9	21	4270
	—	10,0	—	43	IP66 (with cable gland)	II 2G Ex eb mb IIC T4/ T5 Gb  II 2D Ex tb IIIC T130°C Db	T4: -40 ... +65 T5: -40 ... +55 -40 ... +65	M20 x 1,5 *7)	9	16	4271
	8,9	—	369	—	IP66 (with cable gland)	II 2G Ex d mb IIC T4/T6 Gb II 2G Ex e mb IIC T4/T6 Gb II 2D Ex tb IIIC T130°C Db	T4: -40 ... +70 T6: -40 ... +40 -40 ... +70	1/2 NPT *7)	10	17	4670
	—	10,0	—	43	IP66 (with cable gland)	II 2G Ex d mb IIC T4/T6 Gb II 2G Ex e mb IIC T4/T6 Gb II 2D Ex tb IIIC T130°C Db	T4: -40 ... +70 T6: -40 ... +40 -40 ... +70	1/2 NPT *7)	10	18	4671
	8,9	—	369	—	IP66 (with cable gland)	II 2G Ex d mb IIC T4/T6 Gb II 2G Ex e mb IIC T4/T6 Gb II 2D Ex tb IIIC T130°C Db	T4: -40 ... +70 T6: -40 ... +40 -40 ... +70	M20 x 1,5 *7)	10	17	4672
	—	10,0	—	43	IP66 (with cable gland)	II 2G Ex d mb IIC T4/T6 Gb II 2G Ex e mb IIC T4/T6 Gb II 2D Ex tb IIIC T130°C Db	T4: -40 ... +70 T6: -40 ... +40 -40 ... +70	M20 x 1,5 *7)	10	18	4673
	8,9	—	369	—	IP66 (with cable gland)	II 2G Ex mb d IIC T4/T6 II 2G Ex mb e II T4/T6	T4: -40 ... +50 T6: -40 ... +40	M20 x 1,5 *7)	12	21	4872
	—	10	—	43	IP66 (with cable gland)	II 2G Ex mb d IIC T4/T6 II 2G Ex mb e II T4/T6	T4: -40 ... +50 T6: -40 ... +40	M20 x 1,5 *7)	12	17	4873
	13,6	—	567	—	4x	Cl. I, Div. 1, Gr. A - D Cl. II/III, Div. 1, Gr. E - G T3C (160°C)	-20 ... +60	Flying leads length 460 mm	11	20	3826
	—	15,7	—	68	4x	Cl. I, Div. 1, Gr. A - D Cl. II/III, Div. 1, Gr. E - G T3C (160°C)	-20 ... +60	Flying leads length 460 mm	11	15	3827

Standard voltages (±10%) 24 V d.c., 230 V a.c., other voltages on request. Design according to VDE 0580, EN 50014/50028. 100% duty cycle.

\*7) Connector/cable gland is not scope of delivery, see table »Accessories«




Attention: The protection class for coil series 46xx and 48xx is determined by the choice of cable gland. Example: if an ATEX-certified cable gland is used that has Ex d type of protection, the solenoid will have the protection class Ex d mb; if a cable gland with Ex e type of protection is used, the solenoid will have protection class Ex e mb.

**Approvals**

Model	Approvals ATEX	IECEX	FM	Datasheet
382x	—	—	CSA-LR 57643-6	7.1.575
42xx	KEMA 98 ATEX 4452 X	IECEX KEM 09.0068X	—	7.1.580
46xx	PTB 02 ATEX 2085 X	IECEX PTB 11.0094X	—	7.1.585
48xx	PTB 06 ATEX 2054 X	IECEX PTB 07.0039X	—	7.1.590



**Solenoids operator, group B**

	Power consumption		Rated current		Protecti- on class IP/NEMA	Ex-Protection (ATEX-Category)	Temperature Ambient/ Media (°C)	Electrical connec- tion	Drawing No.	Circuit diagram No.	Model
	24 V d.c. (W)	230 V a.c. (VA)	24 V d.c. (m A)	230 V a.c. (m A)							
	3,9	—	162	—	IP66 (with cable gland)	II 2G Ex eb mb IIC T4/ T6 Gb  II 2D Ex tb IIIC T130°C Db	T4: -40 ... +80 T6: -40 ... +55 -40 ... +80	M20 x 1,5 *7)	9	21	4260
	—	5,3	—	23	IP66 (with cable gland)	II 2G Ex eb mb IIC T4/ T6 Gb  II 2D Ex tb IIIC T130°C Db	T4: -40 ... +80 T6: -40 ... +55 -40 ... +80	M20 x 1,5 *7)	9	16	4261
	3,9	—	162	—	IP66 (with cable gland)	II 2G Ex d mb IIC T4/T6 Gb II 2G Ex e mb IIC T4/T6 Gb II 2D Ex tb IIIC T130°C Db	T4: -40 ... +80 T6: -40 ... +55 -40 ... +80	1/2 NPT *7)	10	17	4660
	—	5,3	—	23	IP66 (with cable gland)	II 2G Ex d mb IIC T4/T6 Gb II 2G Ex e mb IIC T4/T6 Gb II 2D Ex tb IIIC T130°C Db	T4: -40 ... +80 T6: -40 ... +55 -40 ... +80	1/2 NPT *7)	10	18	4661
	3,9	—	162	—	IP66 (with cable gland)	II 2G Ex d mb IIC T4/T6 Gb II 2G Ex e mb IIC T4/T6 Gb II 2D Ex tb IIIC T130°C Db	T4: -40 ... +80 T6: -40 ... +55 -40 ... +80	M20 x 1,5 *7)	10	17	4662
	—	5,3	—	23	IP66 (with cable gland)	II 2G Ex d mb IIC T4/T6 Gb II 2G Ex e mb IIC T4/T6 Gb II 2D Ex tb IIIC T130°C Db	T4: -40 ... +80 T6: -40 ... +55 -40 ... +80	M20 x 1,5 *7)	10	18	4663
	8,9	—	369	—	4x	Cl. I, Div. 1, Gr. A - D Cl. II/III, Div. 1, Gr. E - G T3C (160°C)	-20 ... +60	Flying leads length 460 mm	11	20	3824
	—	9,5	—	41	4x	Cl. I, Div. 1, Gr. A - D Cl. II/III, Div. 1, Gr. E - G T3C (160°C)	-20 ... +60	Flying leads length 460 mm	11	15	3825

Standard voltages (±10%) 24 V d.c., 230 V a.c., other voltages on request. Design according to VDE 0580, EN 50014/50028. 100% duty cycle.

\*7) Connector/cable gland is not scope of delivery, see table »Accessories«


Attention: The protection class for coil series 46xx and 48xx is determined by the choice of cable gland.

Example: if an ATEX-certified cable gland is used that has Ex d type of protection, the solenoid will have the protection class Ex d mb; if a cable gland with Ex e type of protection is used, the solenoid will have protection class Ex e mb.


**Approvals**

Model	Approvals ATEX	IECEX	FM	Datasheet
382x	—	—	CSA-LR 57643-6	71.575
42xx	KEMA 98 ATEX 4452 X	IECEX KEM 09.0068X	—	71.580
46xx	PTB 02 ATEX 2085 X	IECEX PTB 11.0094X	—	71.585

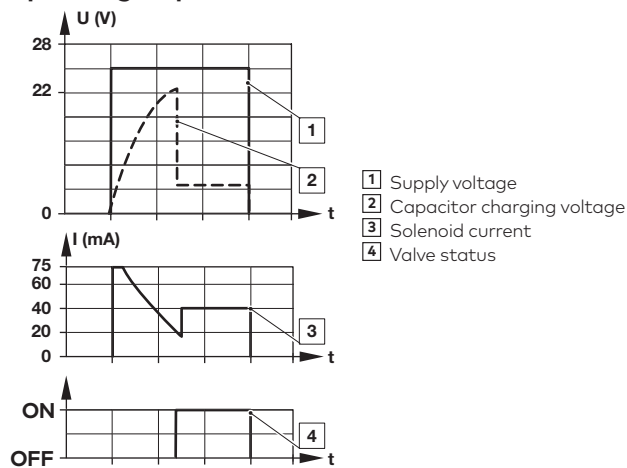
**Solenoid parameters for use in non hazardous locations, group C**

	Switch-on voltage (V)	Allowed current (mA)	Holding current (mA)	Power consumption (W)	Pick-up delay typical *8) (s)	Protection class IP	Ex-Protection (ATEX-Category)	Temperature Ambient/Fluid (°C)	Weight (kg)	Drawing Nr.	Circuit diagram Nr.	Model
	22 ... 26,4	< 75	> 40	1,8 at 24 V	0,3 ... 2	IP66 (cable gland (cable Ø 5 ... 10 mm) is in scope of delivery	-	-40 ... +80	0,85	14	22	2003

**Solenoids operator für eigensichere Stromkreise, group C**

	Switch-on voltage (V)	Holding current (mA)	Holding voltage (V)	Pick-up delay typical *8) (s)	Protection class IP	Ex-Protection (ATEX-Category)	Temperature Ambient/Fluid (°C)	Weight (kg)	Drawing Nr.	Circuit diagram Nr.	Model
	22 ... 28	> 40	~ 5	0,3 ... 5	IP66 with cable gland (cable Ø 5 ... 10 mm) is in scope of delivery	II 2G Ex ia IIC T5/T6 II 2D Ex tD IP66 T95°C	T5: -40 ... +70 T6: -40 ... +55 -40 ... +70	0,85	14	22	2003

\*8) depending on intrinsic current supply

**Operating sequence**

**Approvals**

Model	Approvals ATEX	IECEX	Datasheet
2003	PTB 04 ATEX 2010	IECEX PTB 05.0020	7.1.530


**Function of solenoid drive**

To switch the direct operated valve, a certain energy is required. This energy is stored in a capacitor. The charging voltage is 22 V. The higher the supply voltage, the shorter the charging time. As soon as the charging voltage has been reached, the valve switches. The small current now flowing through the coil is sufficient to hold the valve in the open position. At least 40 mA are required for this.

**Current supply units:**

Intrinsically safe power supply units can be chosen in a list of compatibility in [www.norgren.com](http://www.norgren.com). When selecting an intrinsically safe power supply, it is important to observe the maximum permissible values acc. to the EC-Modele-Examination Certificate PTB 04 ATEX 2010 respectively IECEX PTB 05.0020 U<sub>i</sub> 28 V, I<sub>i</sub> 110 mA, P<sub>i</sub> 1,5 W. The effective internal capacities C<sub>i</sub> and inductivities L<sub>i</sub> of the solenoid are negligibly low.

**Solenoids operator für eigensichere Stromkreise, group D**

	Nennwiderstand RN Spule (Ω)	Min. erforderlicher Schaltstrom (mA)	Widerstand Rw 60 Spule (Ω)	Erf. Klemmen- spannung Rw 60 (V)	Schutz- klasse IP	Ex-Schutz (ATEX-Kategorie)	Temperature Ambient/ Media (°C)	Drawing No.	Circuit diagram No.	Model
	200	33	240	8	IP66 (with cable gland)	II 2G Ex ia IIC T4/T6 Gb II 2D Ex ia IIIC T80°C Db II 2D Ex ia IIIC T100°C Db	T4: -40 ... +80 T6: -40 ... +60 -40 ... +60 -40 ... +80	13	19	2050
	391	24	460	11	IP66 (with cable gland)	II 2G Ex ia IIC T4/T6 Gb II 2D Ex ia IIIC T80°C Db II 2D Ex ia IIIC T100°C Db	T4: -40 ... +80 T6: -40 ... +60 -40 ... +60 -40 ... +80	13	19	2051
	736	17	880	15	IP66 (with cable gland)	II 2G Ex ia IIC T4/T6 Gb II 2D Ex ia IIIC T80°C Db II 2D Ex ia IIIC T100°C Db	T4: -40 ... +80 T6: -40 ... +60 -40 ... +60 -40 ... +80	13	19	2052
	1220	13	1460	19	IP66 (with cable gland)	II 2G Ex ia IIC T4/T6 Gb II 2D Ex ia IIIC T80°C Db II 2D Ex ia IIIC T100°C Db	T4: -40 ... +80 T6: -40 ... +60 -40 ... +60 -40 ... +80	13	19	2053

Cable gland (cable Ø 5 ... 10 mm) is in scope of delivery

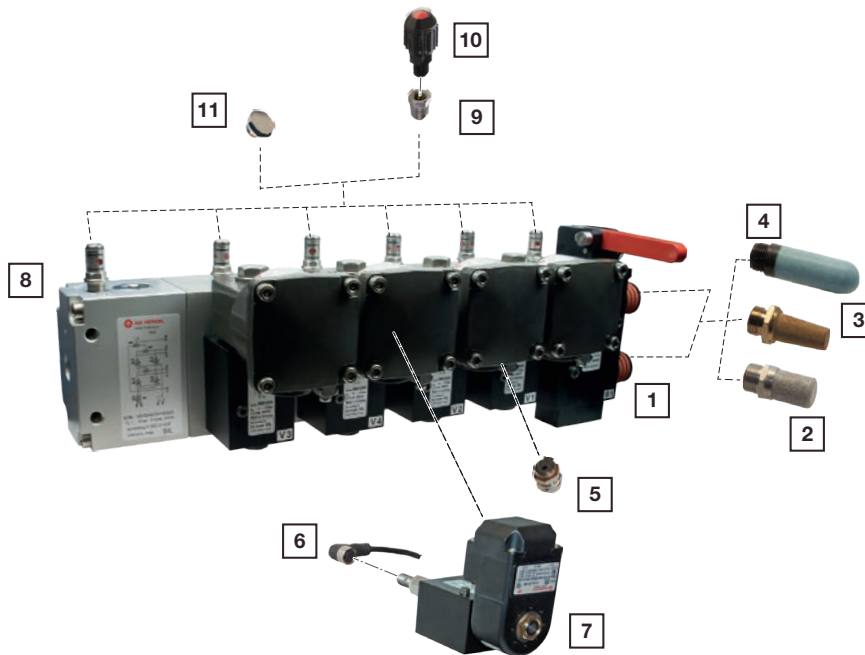
When selecting an intrinsically safe power supply, the permissible maximum values according to the Certificate of Conformity should be taken into account.



U<sub>i</sub> = 45 V, I<sub>i</sub> = 500 mA according to Tab. A. 1, EN 60079-11

P<sub>i</sub> = 2,0 W, L<sub>i</sub> and C<sub>i</sub> can be ignored.

**Approvals**




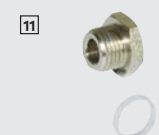


Model	Approvals ATEX	IECEX	Datasheet
205x	PTB 07 ATEX 2019	IECEX PTB 07.0017	71.535

**Standard and optional accessories**

**Accessories - Standard  
(Included in the scope of supply)**

Exhaust guard *7)	Visual indicators (stainless steel)
	
Page 25	Page 25
0613422 (G1/4, 1/4 NPT)	74749-61 (G1/4)
—	74749-60 (1/4 NPT)
0613423 (G1/2, 1/2 NPT)	—

\*7) For outdoors use, opening pressure ~ 0,2 bar

**Accessories - can be ordered separately  
Other silencers, plastic indicator and plugs**

Silencer (stainless steel) *8)	Silencer (brass) *8)	Silencer (plastic) *8)	Plug plus Sealing washer	Connector M12 x 1 (straight)	M12 x 1 (90°)
					
Page 25	Page 25	Page 25	Page 25	Page 26	Page 26
0014613 (G1/4)	T40C2800 (G1/4)	M/S2 (G1/4)	0663943 (G1/4, plug)	0523055 (without cable)	0523056 (90°, without cable)
0613678 (1/4 NPT)	MS002A (1/4 NPT)	C/S2 (1/4 NPT)	0682082 (1/4 NPT, plug)	0523057 (cable length 2 m)	0523058 (90°, cable length 2 m)
0014813 (G1/2)	T40C4800 (G1/2)	M/S4 (G1/2)	0660835 (Sealing washer)	0523052 (cable length 5 m)	0523053 (90°, cable length 5 m)
0613679 (1/2 NPT)	MS004A (1/2 NPT)	C/S4 (1/2 NPT)			

\*8) For indoors use

**Electrical connection, please order separatly**

**Cable gland**  
**Protection class Ex e, Ex d (ATEX)**  
**Nickel plated brass/  
 Stainless steel**

**6**



Page 24

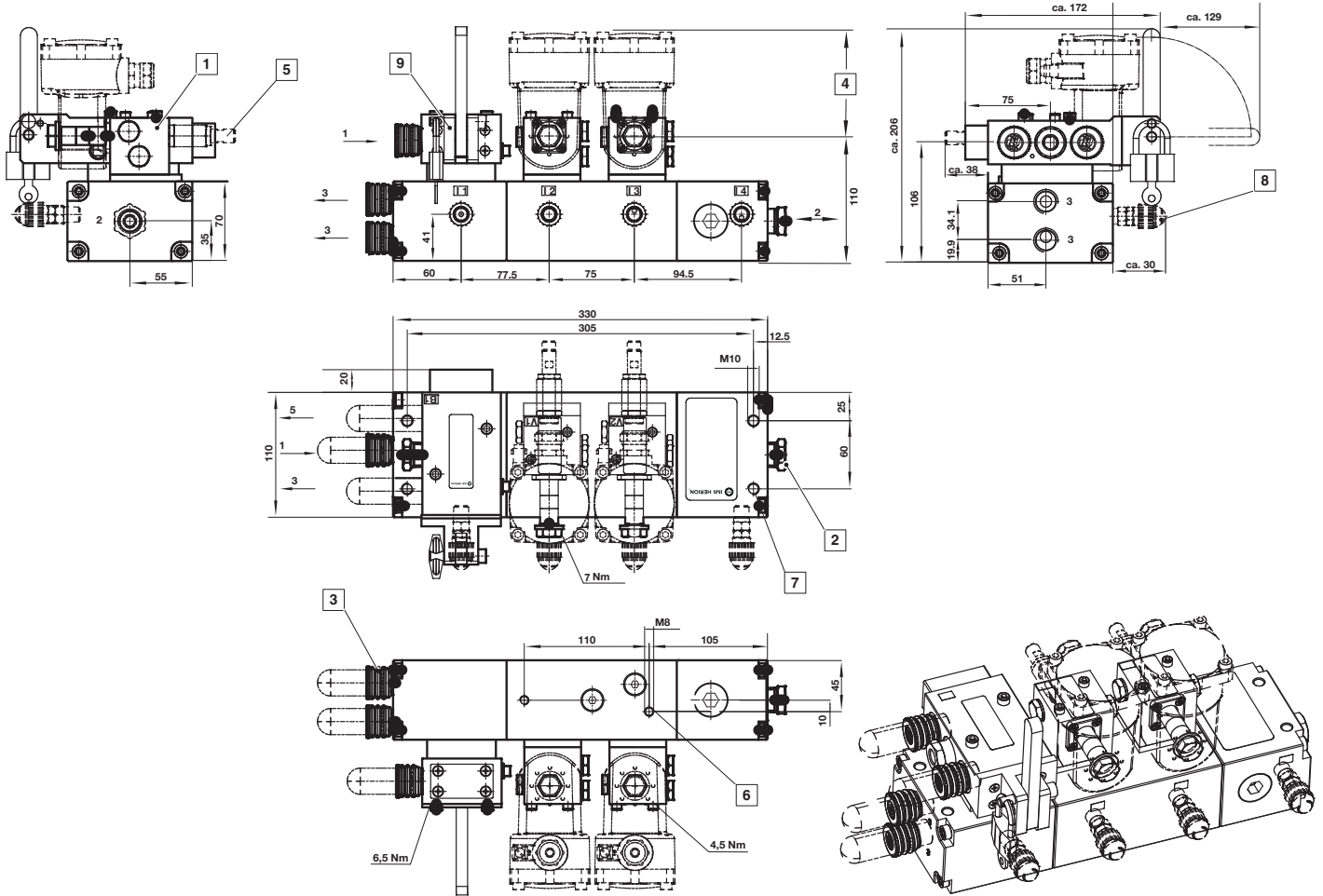
For sole-noid	Thread	Cable Ø (mm)	Material	Protection class (ATEX)	Ambient temperatur limitation *1)	Model
42xx	M20 x 1,5	7,0 ... 12,0	Plastic	II 2G Ex e / II 2D Ex t	See table	0589735
42xx	M20 x 1,5	10,0 ... 14,0	Plastic	II 2G Ex e / II 2D Ex t	See table	0589736
42xx	M20 x 1,5	6,0 ... 12,0	Plastic	II 2G Ex e / II 2D Ex t	See table	0589737
42xx	M20 x 1,5	5,0 ... 10,0	Plastic	II 2G Ex e / II 2D Ex t	See table	0589739
46xx	M20 x 1,5	5,0 ... 8,0	Nickel plated brass	II 2G Ex e / II 2D Ex t	-	0589654
46xx	M20 x 1,5	10,0 ... 14,0	Nickel plated brass	II 2G Ex d / II 2D Ex t	-	0588851
46xx	1/2 NPT	7,5 ... 11,9	Nickel plated brass	II 2G Ex d / II 2D Ex t	-	0588925
46xx, 48xx	M20 x 1,5	9,0 ... 13,0	Stainless steel 1.4571	II 2G Ex e / II 2D Ex t	-	0589385
46xx, 48xx	M20 x 1,5	7,0 ... 12,0	Stainless steel 1.4404	II 2G Ex d / II 2D Ex t	-	0589395
46xx, 48xx	M20 x 1,5	10,0 ... 14,0	Stainless steel 1.4404	II 2G Ex d / II 2D Ex t	-	0589387

\*9) The limitation of the temperature range to the mentioned range is due to the self-heating of the solenoid.

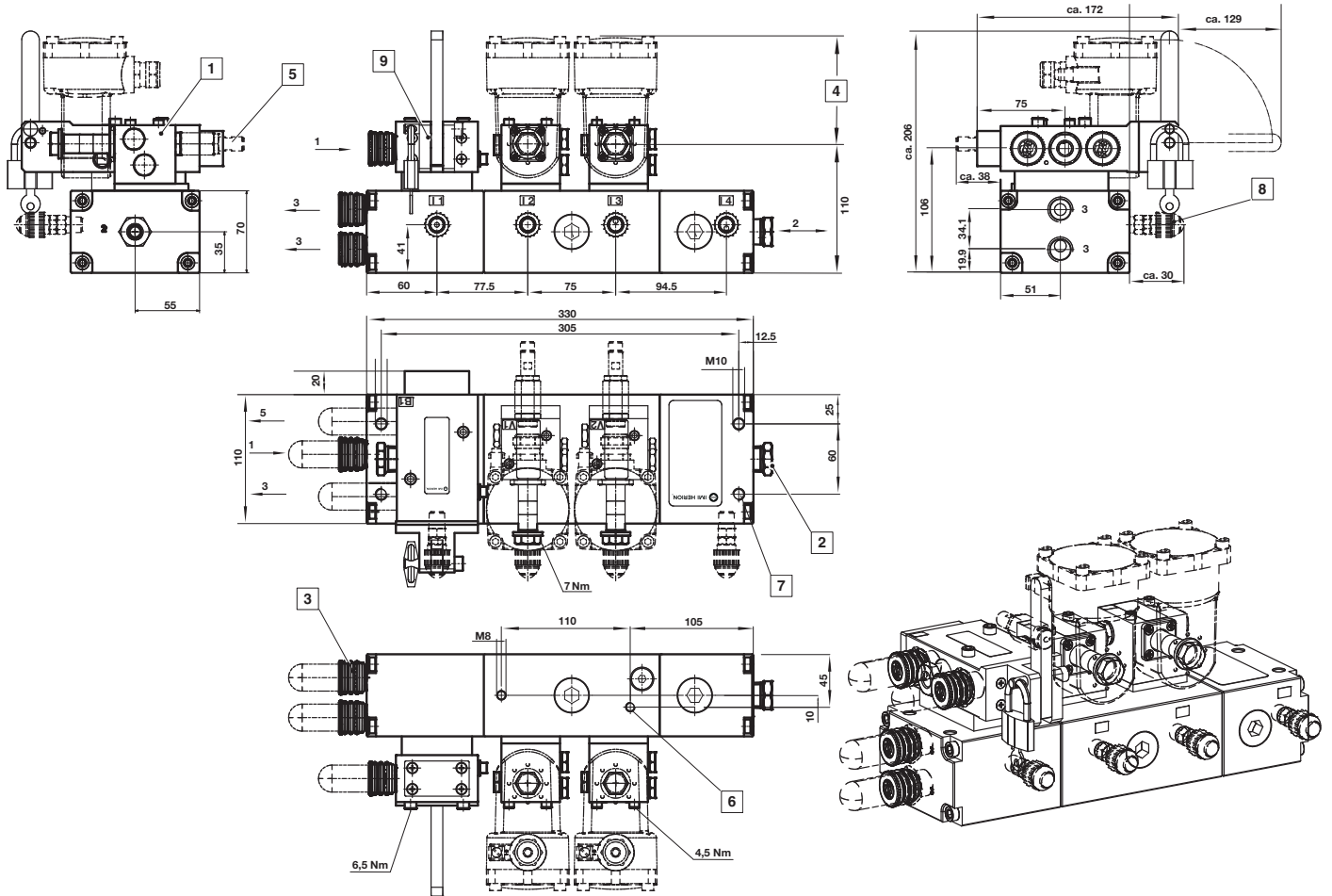
For sole-noid	Ambient temperatur limitation solenoid 42xx			
	0589735 & 0589736 *10)	0589737	0589739 *10)	
421x/426x	T4 & Dust Ex: -35°C ... + 80°C	T4 & Dust Ex: -40°C...+ 65°C	T4 & Dust Ex: -40°C...+ 78°C	
	T6: -35°C ... + 55°C	T6: -40°C...+ 55°C	T6: -40°C...+ 55°C	
422x/427x	T4 & Dust Ex: -35°C +65°C	T4 & Dust Ex: -40°C...+ 62°C	T4 & Dust Ex: -40°C...+ 65°C	
	T5: -35°C + 55°C	T5: -40°C + 55°C	T5: -40°C + 55°C	

\*10) The limitation of the temperature range to the mentioned range is due to the self-heating of the solenoid..

**1002 with bypass (standard flow)**
**Weight: 6,8 kg aluminium (18,4 kg stainless steel) sub-base only, valves and accessories see refer page**

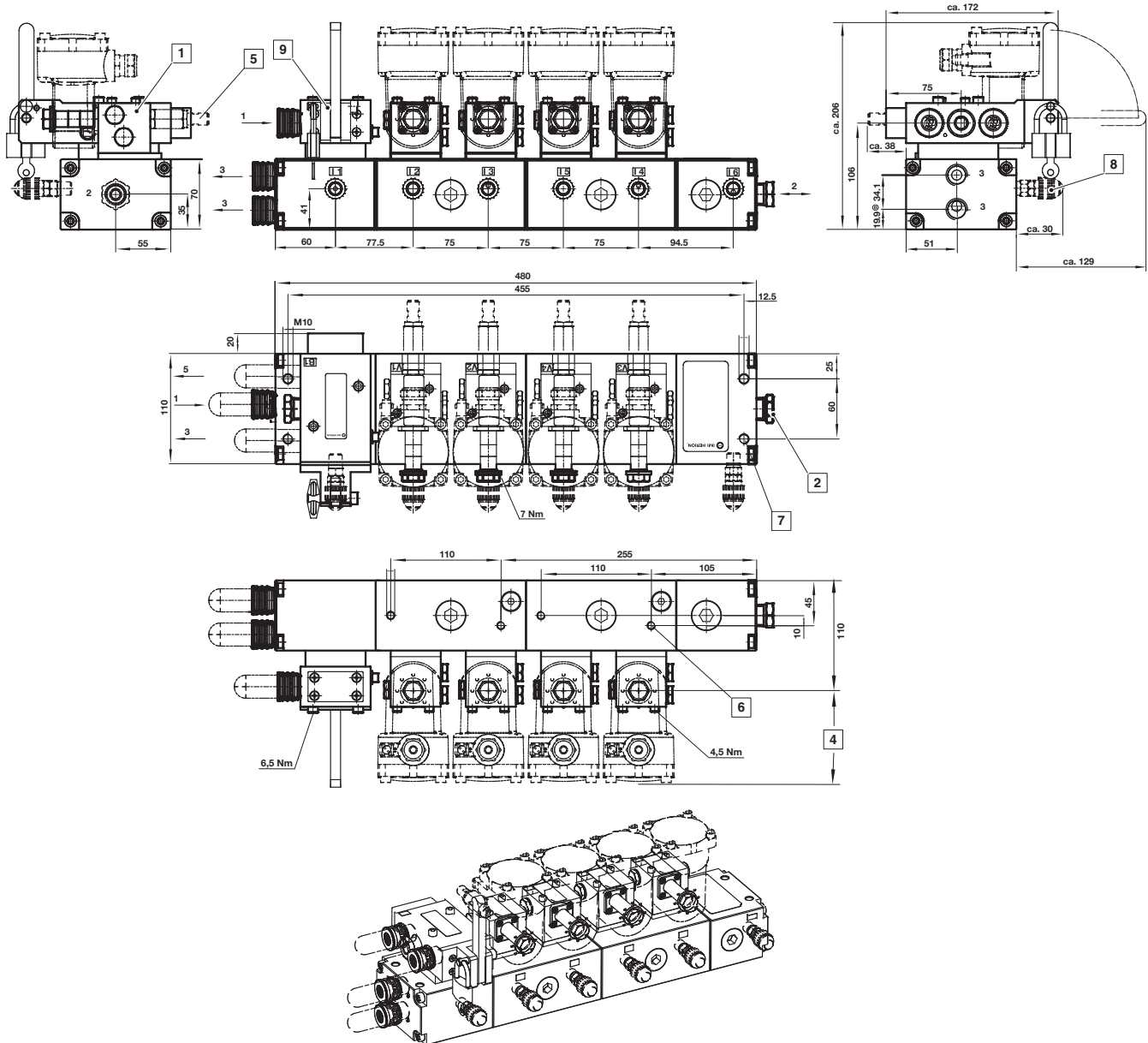
 Dimensions in mm  
 Projection/First angle


- 1 Valve 24011 and 24010 series
- 2 Adapter 1/2 NPT to 1/4 NPT or G1/4
- 3 Exhaust guard/Silencer
- 4 Dependent on solenoid models
- 5 Proximity switch optional
- 6 Mounting threads
- 7 Mounting holes M10 x 20 threads for transport lug
- 8 Visual indicator
- 9 Bypass valve 97109 series


**2oo2 with bypass (standard flow)**
**Weight: 6,8 kg aluminium (18,4 kg stainless steel) sub-base only, valves and accessories see refer page**


- 1 Valve 24011 and 24010 series
- 2 Adapter 1/2 NPT to 1/4 NPT or G1/4
- 3 Exhaust guard/Silencer
- 4 Dependent on solenoid models
- 5 Proximity switch optional
- 6 Mounting threads
- 7 Mounting holes M10 x 20 threads for transport lug
- 8 Visual indicator
- 9 Bypass valve 97109 series

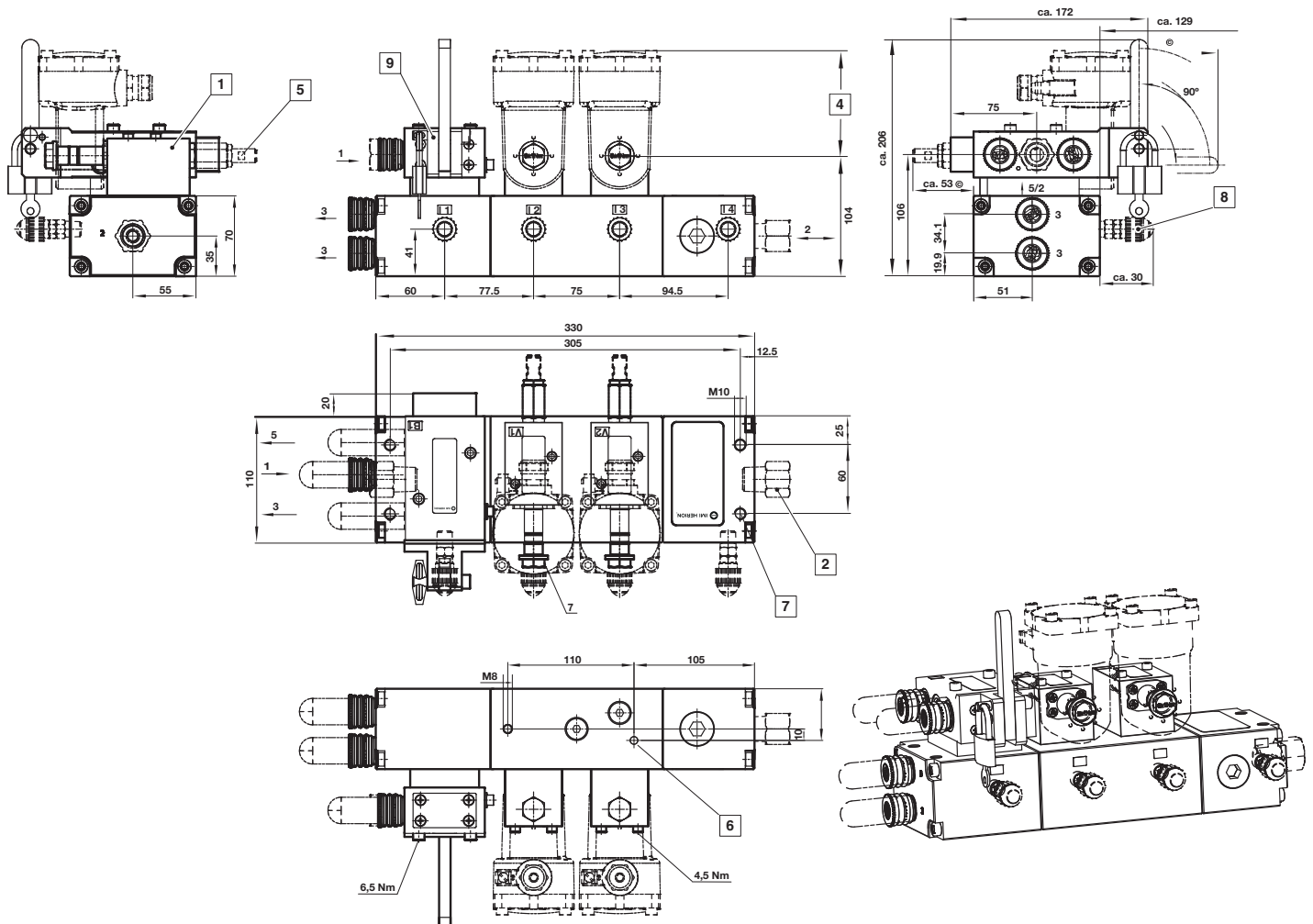
**2003 with bypass (standard flow)**
**Weight: 10,3 kg aluminium (27,5 kg stainless steel) sub-base only, valves and accessories see refer page**

 Dimensions in mm  
 Projection/First angle


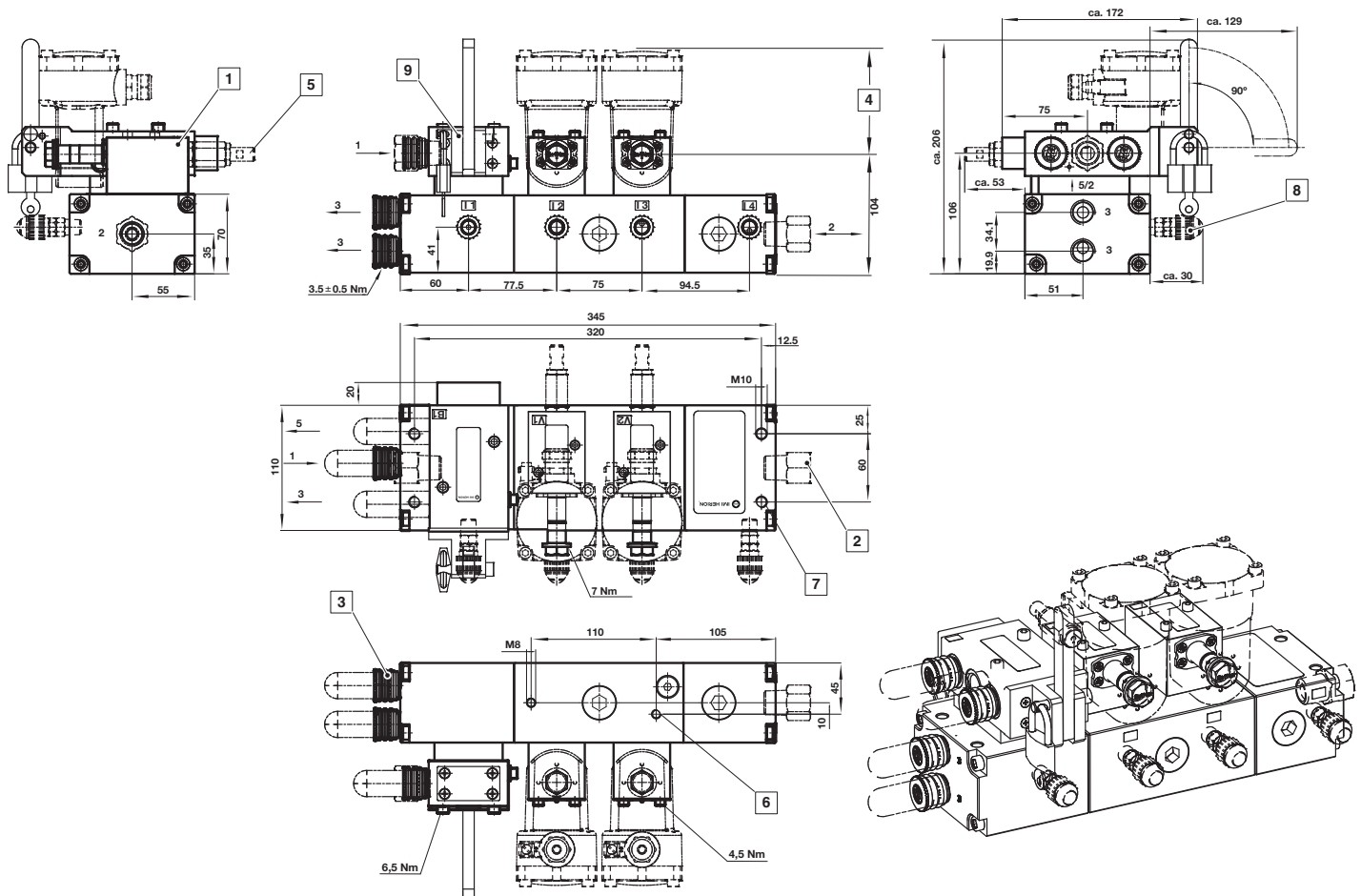
- 1 Valve 24011 and 24010 series
- 2 Adapter 1/2 NPT to 1/4 NPT or G1/4
- 3 Exhaust guard/Silencer
- 4 Dependent on solenoid models
- 5 Proximity switch optional
- 6 Mounting threads
- 7 Mounting holes M10 x 20 threads for transport lug
- 8 Visual indicator
- 9 Bypass valve 97109 series



**1002 with bypass (high flow)**
**Weight: 6,8 kg aluminium (18,5 kg stainless steel) sub-base only, valves and accessories see refer page**

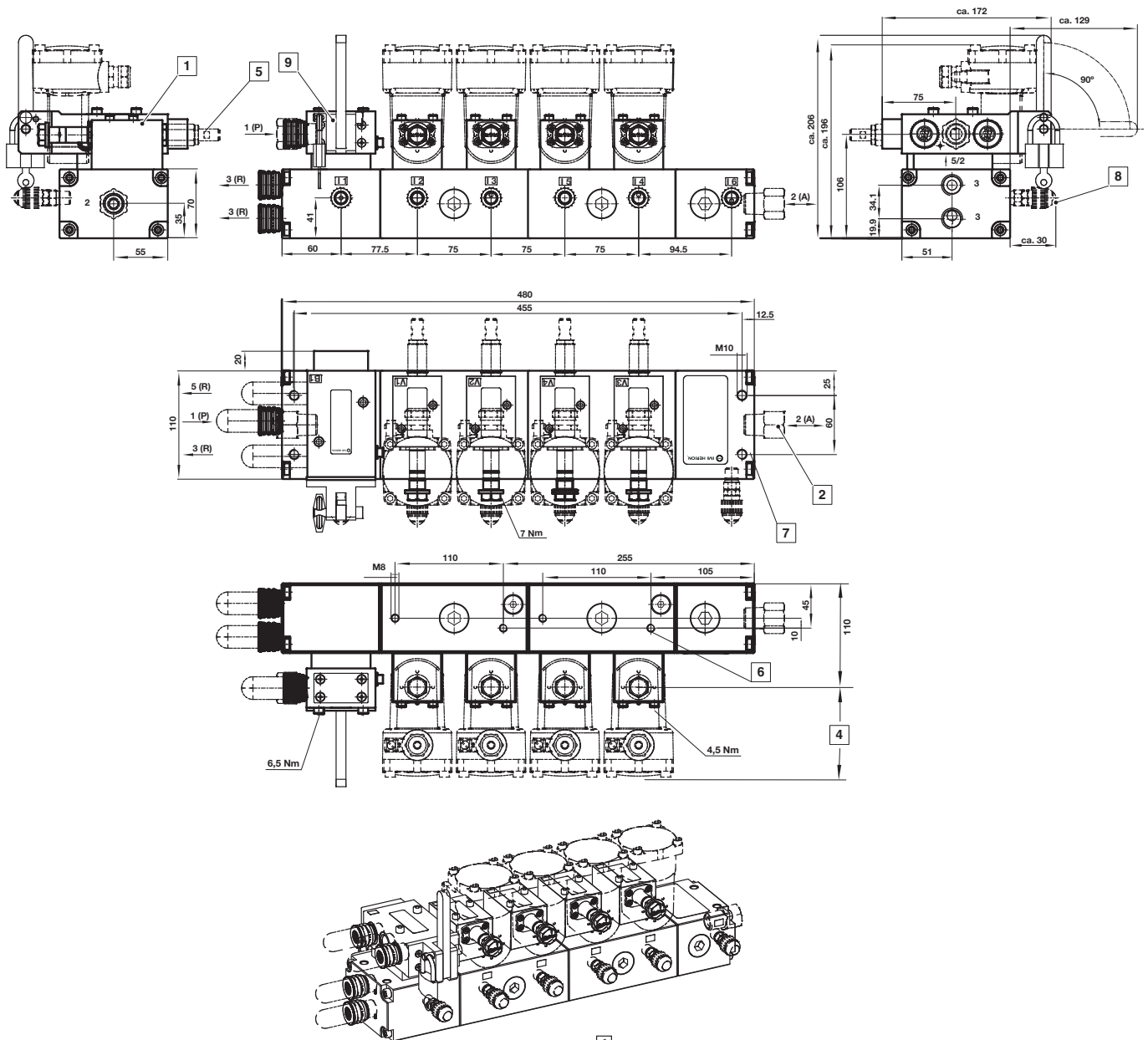
 Dimensions in mm  
 Projection/First angle


- 1 Valve 24011 and 24010 series
- 2 Adapter 1/2 NPT to G1/2
- 3 Exhaust guard/Silencer
- 4 Dependent on solenoid models
- 5 Proximity switch optional
- 6 Mounting threads
- 7 Mounting holes M10 x 20 threads for transport lug
- 8 Visual indicator
- 9 Bypass valve 97109 series

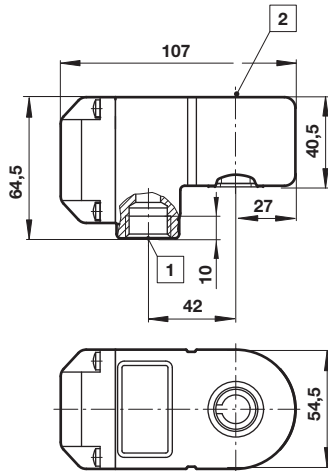
**2002 with bypass (high flow)**
**Weight: 6,8 kg aluminium (18,5 kg stainless steel) sub-base only, valves and accessories see refer page**


- 1 Valve 24011 and 24010 series
- 2 Adapter 1/2 NPT to G1/2
- 3 Exhaust guard/Silencer
- 4 Dependent on solenoid models
- 5 Proximity switch optional
- 6 Mounting threads
- 7 Mounting holes M10 x 20 threads for transport lug
- 8 Visual indicator
- 9 Bypass valve 97109 series

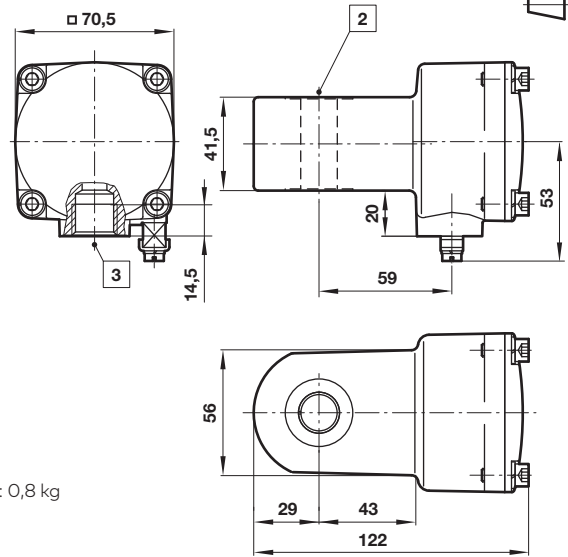
**2003 with bypass (high flow)**
**Weight: 9,9 kg aluminium (26,6 kg stainless steel) sub-base only, valves and accessories see refer page**

 Dimensions in mm  
 Projection/First angle


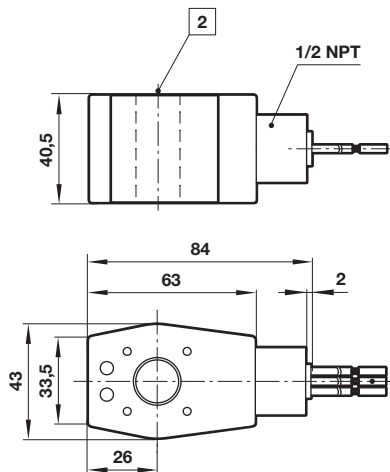
- 1 Valve 98015 series
- 2 Adapter 1/2 NPT to G1/2
- 3 Exhaust guard/Silencer
- 4 Dependent on solenoid models
- 5 Proximity switch optional
- 6 Mounting threads
- 7 Mounting holes M10 x 20 threads for transport lug
- 8 Visual indicator
- 9 Bypass valve 97109 series

**Solenoids**
**9**


Weight: 0,6 kg

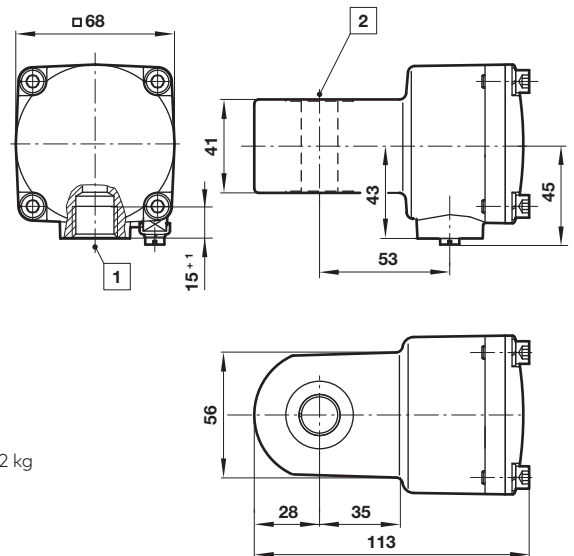
**10**


Weight: 0,8 kg

**11**


Weight: 0,5 kg

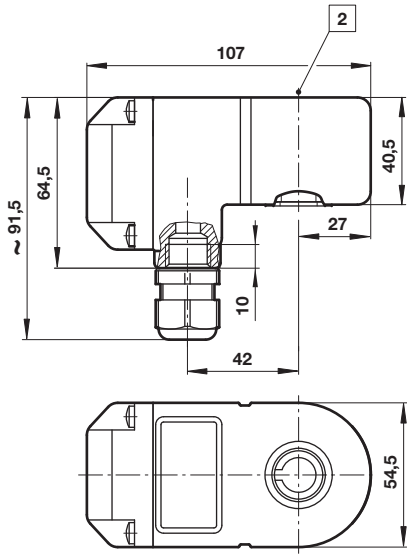
- 1 M20 x 1,5r
- 2 Ø 16
- 3 M20 x 1,5 or 1/2 NPT

**12**


Weight: 1,2 kg

 Dimensions in mm  
 Projection/First angle

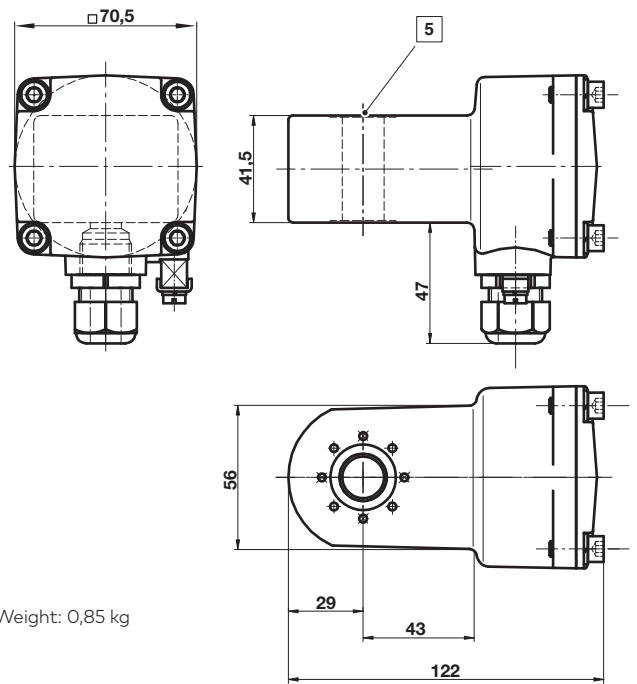

13



- 2 Ø 13 (with spacer tube)
- 5 Ø 16 (with spacer tube)

Weight: 0,85 kg

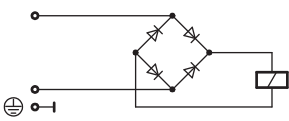
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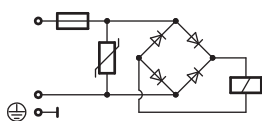
Weight: 0,85 kg

**Circuit diagrams**

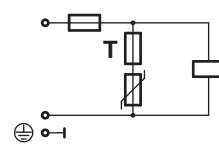
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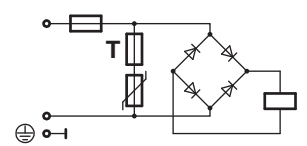
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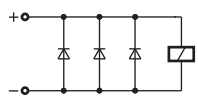
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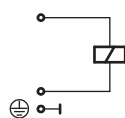
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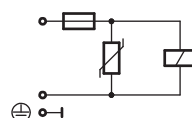
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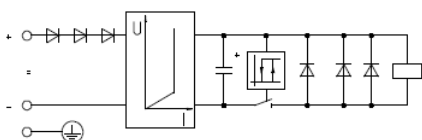
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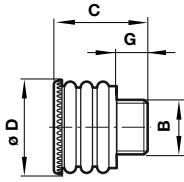
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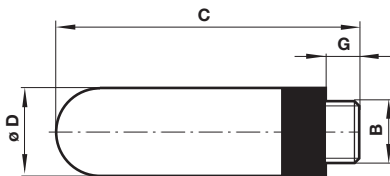
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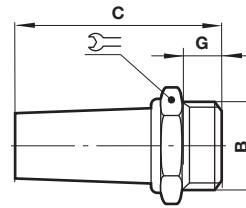
**Accessories**
**Exhaust guard (plastic) - standard option**

 Dimensions in mm  
 Projection/First angle


B	Suitable for	G	C	Ø D	Weight (g)	Model
1/4"	G 1/4, 1/4 NPT	10	26,5	21	5	0613422
1/2"	G1/2, 1/2 NPT	12	33,5	29	11	0613423

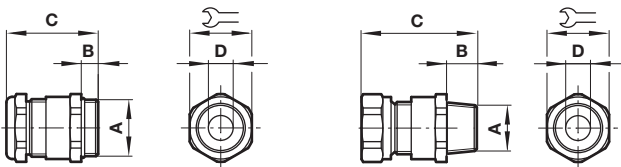
**Silencer**


B	G	C	Ø D	Weight (g)	Model
G 1/4	7	35,5	15,5	2,9	M/S2
1/4 NPT	7	35,5	15,5	2,9	C/S2
G1/2	12	67	23	11,5	M/S4
1/2 NPT	12	67	23	11,5	C/S4

**Silencer (brass or stainless steel)**


B	C	G	Symbol	Weight (g)	Model
G 1/4	33	8	17	18	T40C2800
1/4 NPT	35	8	9/16	18	MS002A
G 1/4	36	8	16	23	0014613 *1)
1/4 NPT	36	8	16	67	0613678 *1)
G 1/2	56	12	27	63	T40C4800
1/2 NPT	48	12	7/8	63	MS004A
G 1/2	49	12	24	81	0014813 *1)
1/2 NPT	49	12	24	235	0613679 *1)

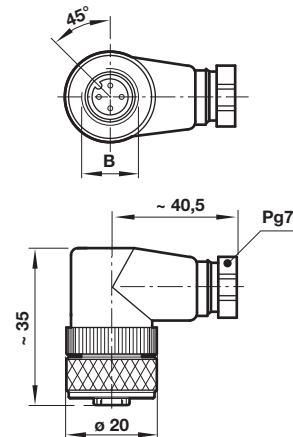
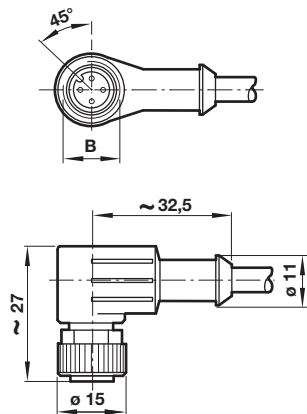
\*1) Stainless steel

**Cable gland**


0588925 only

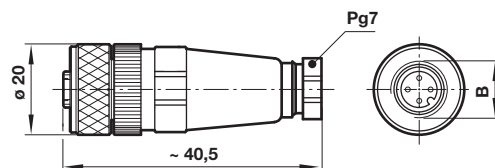
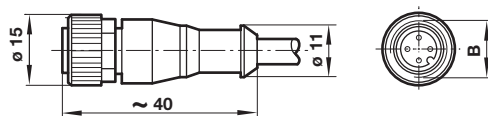
A	B	C	Ø D	Symbol	Model
M20 x 1,5	9	36	5 ... 8	22	0589654
M20 x 1,5	6,5	27,5	9 ... 13	22	0589385
M20 x 1,5	14	39	10 ... 14	24	0588851
1/2 NPT	15	58	7,5 ... 11,9	24	0588925
M20 x 1,5	14	39	7 ... 12	24	0589395
M20 x 1,5	10	34	10 ... 14	24	0589387

**Connector - valve position sensor**  
**90°, 4 pin, with cable**
**90°, 4 pin, without cable**

 Dimensions in mm  
 Projection/First angle


B	Cable Wire x dim.	Cable Material	Cable length	Weight (g)	Model
M12 x 1,5	4 x 0,34 mm <sup>2</sup>	PUR	2 m	90	0523058
M12 x 1,5	4 x 0,34 mm <sup>2</sup>	PUR	5 m	180	0523053

B	Weight (g)	Model
M12 x 1,5	30	0523056

**straight, 4 pin, with cable**
**straight, 4 pin, without cable**


B	Cable Wire x dim.	Cable Material	Cable length	Weight (g)	Model
M12 x 1,5	4 x 0,34 mm <sup>2</sup>	PUR	2 m	80	0523057
M12 x 1,5	4 x 0,34 mm <sup>2</sup>	PUR	5 m	200	0523052

B	Weight (g)	Model
M12 x 1,5	26	0523055

**Proximity switch**
**Supply voltage (U<sub>b</sub>):**

7,7 ... 9 V DC

**Ripple:**

15%

**Frequency of operating cycles:**

1000 Hz

**Protection class:**

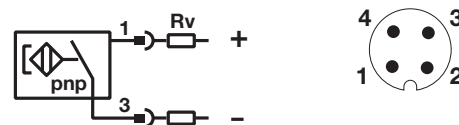
IP68

**Pressure-resistant:**

500 bar

**Ambient temperature:**

-25 ... +70°C


**Warning**

These products are intended for use in industrial compressed air and fluid systems only. Do not use these products where pressures and temperatures can exceed those listed under »**Technical features/data**«. Before using these products with fluids other than those specified, for non-industrial applications, life-support systems, or other applications not within published specifications, consult IMI Precision Engineering, Norgren Co., Ltd.

Through misuse, age, or malfunction, components used in fluid power systems can fail in various modes.

The system designer is warned to consider the failure modes of all component parts used in fluid power systems and to provide adequate safeguards to prevent personal injury or damage to equipment in the

event of such failure.

System designers must provide a warning to end users in the system instructional manual if protection against a failure mode cannot be adequately provided.

System designers and end users are cautioned to review specific warnings found in instruction sheets packed and shipped with these products.

**Functional safety (SIL):**

Suitable for certain applications can only be evaluated through examination of each safety-related overall system with regard to the requirements of IEC 61508/61511.