

# Directional control valves – solenoid valves

## Ideal size for actuator control

Seal type, main valve	Valve series	Flow characteristics A, B→E (2 position/ monostable) Cv value <sup>3</sup>	Applicable cylinder													
			Ø6	Ø10	Ø16	Ø20	Ø25	Ø32	Ø40	Ø50	Ø63	Ø80	Ø100	Ø125	Ø140	Ø160
Rubber seal	VQD <sup>1</sup>	0.07				VQD1000										
	VK <sup>1</sup>	0.12				VK3000										
	SJ	0.08–0.12				SJ2000/3000										
	SYJ	0.12–0.74				SYJ3000	SYJ5000	SYJ7000								
	SX	0.18–0.82						SX3000	SX5000	SX7000						
	VQZ	0.32–1.2						VQZ1000	VQZ2000	VQZ3000						
	SV	0.28–1.6						SV1000	SV2000	SV3000	SV4000					
	VQ/ VQC	0.2–4.7						VQC1000	VQC2000	VQC4000	VQ5000					
	SY	0.26–2.5						SY3000	SY3000 PLUG-IN	SY5000	SY7000	SY9000	(see example 1)			
	VF	0.13–3				VF1000			VF3000	VF5000						
	VQ7	1.4–3.3									VQ7-6	VQ7-8				
	VFR	0.7–10.6								VFR2000	VFR3000	VFR4000	VFR5000			
	VP4	5.6–16.7												VP4050		
	Metal seal	VZS	0.33–0.53						VZS2000	VZS3000						
VQZ		0.17–0.74						VQZ1000	VQZ2000	VQZ3000						
VS4		1								VS4□10						
VQ/ VQC		0.18–3.4						VQC1000	VQC2000	VQC4000	VQ5000					
VQ7		1.1–3									VQ7-6	VQ7-8				
VFS		0.4–9							VFS1000	VFS2000	VFS3000	VFS4000	VFS5000			

1. Only available with single coil. 2. Number in parentheses stands for power saving circuit. 3. Multiply by 980 to get a  $Q_n$  value in  $l_n/min$ .

## Conditions

- Pressure: 0.5 MPa
- Tubing length: 1 m
- Load: 50%
- Stroke: 200 mm
- Speed: 100 mm/s or lower

## Seal type

**Rubber seal:** Resistant to dust when the seals between the spool and sleeve are made of rubber.

**Metal seal:** Long life thanks to the air bearing between metal spool and steel sleeve.

## Cylinder size and speed

**Example 1:** When using the valve series SY9000 (2500  $l_n/min$ ) for driving Ø40 to Ø100 cylinders, they will have an average speed under the following conditions.

# 5 port for pneumatics

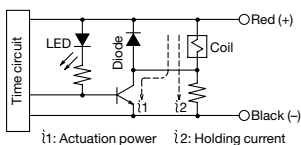
				Connection size		
Ø180	Ø200	Ø250	Ø300	Power consumption (W)	Threaded connection (G)	Push-in fitting (Ø) Applicable tubing size (mm)
				2	M5	4
				4	M5, 1/8	4, 6
				0.6	M3, M5	2, 4, 6
				0.35 (0.1) <sup>2</sup>	M3, M5, 1/8, 1/4	4, 6, 8
				0.6	M5, 1/8, 1/4, 3/8	4, 6, 8, 10
				0.4	M5, 1/8, 1/4, 3/8	3.2, 4, 6, 8, 10
				0.6	1/8, 1/4, 3/8, 1/2	4, 6, 8, 10, 12
				0.4	M5	3.2, 4, 6, 8, 10, 12
				0.35 (0.1) <sup>2</sup>	M5, 1/8, 1/4, 3/8, 1/2	4, 6, 8, 10, 12
				1.8	M5, 1/8, 1/4, 3/8, 1/2	—
				1	1/4, 3/8, 1/2, 3/4	6, 8, 10
				<b>VFR6000</b>	1/8, 1/4, 3/8, 1/2, 3/4, 1	—
				<b>VP4070</b>	3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2	—
				1.8	1/8, 1/4	4, 6, 8
				1	M5, 1/8, 1/4, 3/8	3.2, 4, 6, 8, 10
				5.5	1/8, 1/4, 3/8	—
				1	M5, 1/4, 3/8	3.2, 4, 6, 8, 10, 12
				1	1/4, 3/8, 1/2, 3/4	6, 8, 10, 12
				<b>VFS6000</b>	1/8, 1/4, 3/8, 1/2, 3/4, 1	—

## Power consumption

### Reduction of necessary power for the valve

*With power saving circuit:* The power consumption is reduced to one quarter of the standard product power consumption. (The effect occurs when the on time is greater than 62 ms and operated at rated voltage of 24 VDC.)

Electrical circuit (with energy saving circuit)



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## Ideal size for actuator control

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			Ø6	Ø10	Ø16	Ø20	Ø25	Ø32	Ø40	Ø50	Ø63	Ø80	Ø100	Ø125	Ø140	Ø160		
Rubber seal	VQD <sup>1</sup>	0.07	VQD1000 ●															
	VK <sup>1</sup>	0.12	VK3000 ●															
	SJ	0.08–0.12	SJ1000/2000 ●															
	SYJ	0.12–0.74	SYJ3000 ●		SYJ5000 ●		SYJ7000 ●											
	SX	0.18–0.82				SX3000 ●		SX5000 ●		SX7000 ●								
	VQZ	0.32–1.2				VQZ1000 ●		VQZ2000 ●		VQZ3000 ●								
	SV	0.28–1.6				SV1000 ●		SV2000 ●		SV3000 ●		SV4000 ●						
	VQ/ VQC	0.2–4.7				VQC1000 ●		VQC2000 ●		VQC4000 ●		VQ5000 ●						
	SY	0.26–2.5				SY3000 ●		SY3000 PLUG-IN		SY5000 ●		SY7000 ●		SY9000 (see example 1) ●				
	VF	0.13–3	VF1000 ●					VF3000 ●					VF5000 ●					
	VQ7	1.4–3.3							VQ7-6 ●			VQ7-8 ●						
	VFR	0.7–10.6							VFR2000 ●		VFR3000 ●		VFR4000 ●		VFR5000 ●		VFR6000 ●	
	VP4	5.6–16.7										VP4050 ●						
	Metal seal	VZS	0.33–0.53				VZS2000 ●		VZS3000 ●									
VQZ		0.17–0.74				VQZ1000 ●		VQZ2000 ●		VQZ3000 ●								
VS4		1							VS4□10 ●									
VQ/ VQC		0.18–3.4				VQC1000 ●		VQC2000 ●		VQC4000 ●		VQ5000 ●						
VQ7		1.1–3							VQ7-6 ●			VQ7-8 ●						
VFS		0.4–9				VFS1000 ●		VFS2000 ●		VFS3000 ●		VFS4000 ●		VFS5000 ●		VFS6000 ●		

1. Only available with single coil.

2. Number in parentheses stands for power saving circuit.

3. Multiply by 980 to get a  $Q_n$  value in  $l_r/min$ .

## Conditions

- Pressure: 0.5 MPa
- Tubing length: 1 m
- Load: 50%
- Stroke: 200 mm
- Speed: 300 mm/s or lower

## Seal type

**Rubber seal:** Resistant to dust when the seals between the spool and sleeve are made of rubber.

**Metal seal:** Long life thanks to the air bearing between metal spool and steel sleeve.

## Cylinder size and speed

**Example 1:** When using the valve series SY9000 (2500  $l_r/min$ ) for driving Ø40 to Ø100 cylinders, they will have an average speed under the following conditions.

# 5 port for pneumatics

Ø180	Ø200	Ø250	Ø300	Power consumption (W)	Connection size	
					Threaded connection (G)	Push-in fitting (Ø) Applicable tubing size (mm)
				2	M5	4
				4	M5, 1/8	4, 6
				0.6	M3, M5	2, 4, 6
				0.35 (0.1) <sup>2</sup>	M3, M5, 1/8, 1/4	4, 6, 8
				0.6	M5, 1/8, 1/4, 3/8	4, 6, 8, 10
				0.4	M5, 1/8, 1/4, 3/8	3.2, 4, 6, 8, 10
				0.6	1/8, 1/4, 3/8, 1/2	4, 6, 8, 10, 12
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				1.8	M5, 1/8, 1/4, 3/8, 1/2	—
				1	1/4, 3/8, 1/2, 3/4	6, 8, 10
				1.8	1/8, 1/4, 3/8, 1/2, 3/4, 1	—
				12	3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2	—
				1.8	1/8, 1/4	4, 6, 8
				1	M5, 1/8, 1/4, 3/8	3.2, 4, 6, 8, 10
				5.5	1/8, 1/4, 3/8	—
				1	M5, 1/4, 3/8	3.2, 4, 6, 8, 10, 12
				1	1/4, 3/8, 1/2, 3/4	6, 8, 10, 12
				1.8	1/8, 1/4, 3/8, 1/2, 3/4, 1	—

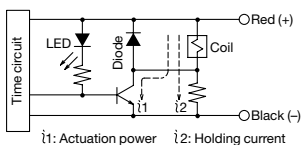
**VP4070**

## Power consumption

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	VQ7	1.4–3.3	VQ7-6		VQ7-8												
	VFR	0.7–10.6	VFR2000		VFR3000		VFR4000	VFR5000	VFR6000								
	VP4	5.6–16.7	VP4050		VP4070												
	Metal seal	VZS	0.33–0.53	VZS2000		VZS3000											
VQZ		0.17–0.74	VQZ1000		VQZ2000		VQZ3000										
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VQ7		1.1–3	VQ7-6		VQ7-8												
VFS		0.4–9	VFS1000		VFS2000	VFS3000	VFS4000		VFS5000	VFS6000							

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				1.8	M5, 1/8, 1/4, 3/8, 1/2	—
				1	1/4, 3/8, 1/2, 3/4	6, 8, 10
				1.8	1/8, 1/4, 3/8, 1/2, 3/4, 1	—
				12	3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2	—
				1.8	1/8, 1/4	4, 6, 8
				1	M5, 1/8, 1/4, 3/8	3.2, 4, 6, 8, 10
				5.5	1/8, 1/4, 3/8	—
				1	M5, 1/4, 3/8	3.2, 4, 6, 8, 10, 12
				1	1/4, 3/8, 1/2, 3/4	6, 8, 10, 12
				1.8	1/8, 1/4, 3/8, 1/2, 3/4, 1	—

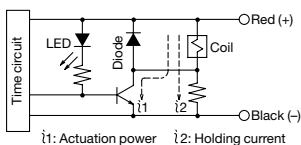
4

## Power consumption

### Reduction of necessary power for the valve

*With power saving circuit:* The power consumption is reduced to one quarter of the standard product power consumption. (The effect occurs when the on time is greater than 62 ms and operated at rated voltage of 24 VDC.)

Electrical circuit (with energy saving circuit)



# SMC's metal seal valves

Valves in high-frequency use often suffer from wear on the seals. SMC's metal seal valves resist such wear and have superior life time.

4

A valve spool change position inside the valve when it is affected manually, with spring force, or when power is applied to the coil. The spool position determines which ports are pressurised and exhausted.

Many valves have a so called rubber seal, which can be compared to a rubber O-ring. This type of seal works very well and is found in many of SMC's valves.

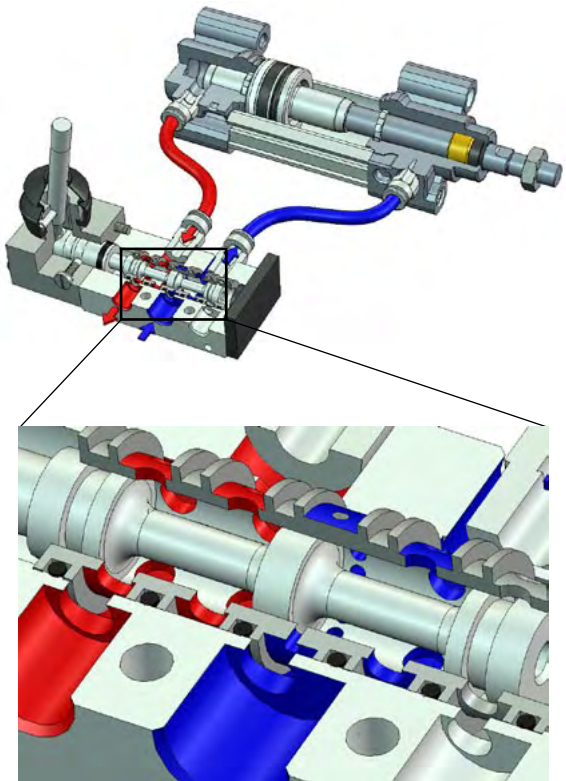
In some applications, for example high-frequency applications, rubber seal can wear out, and the valves need to be replaced regularly.

SMC offer an optional metal seal for these applications. This option extends the life time of the valve and your application.

A metal seal spool moves in a fixed sleeve, which in turn is rubber sealed against the valve body. The fit between spool and sleeve is very precise.

- At least 200 million cycles life time. There are documented cases where more than *1 billion* cycles have been achieved.
- Less sensitive to impurities than conventional rubber seal valves.
- Friction free.
- Air gap between spool and sleeve.
- Highest precision, surface finish, and small gap (1 µm).
- Minimum leakage (slightly more than rubber seal valve).

Valve series available with metal seal: EVS, SQ, SY, VQ1000/2000/4000, VQ7, VQC and VSS.



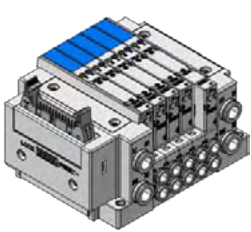
*Detail of the metal spool inside its sleeve.*

# SY3000 & -5000 – overview

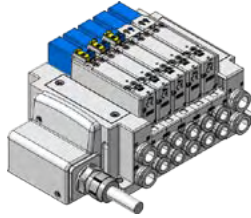


- SMC's new SY3000 and SY5000 series is extremely flexible and versatile.
- The high flow rate version enables you in many cases to use a smaller valve than usually.
- See below for an overview of some series with unique advantages.

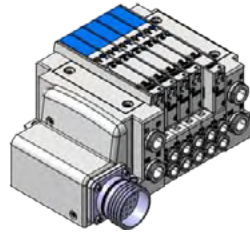
## Cable interface



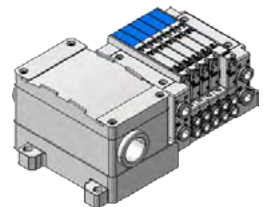
*D-sub/flat cable*



*L connection*

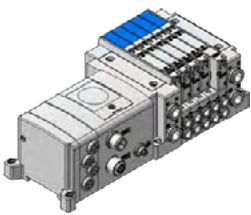


*Circular multipole*

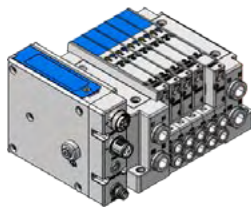


*Terminal box*

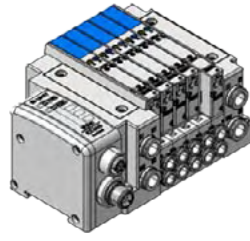
## Fieldbus interface



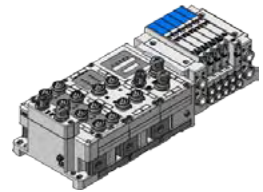
*EX250*



*EX260*

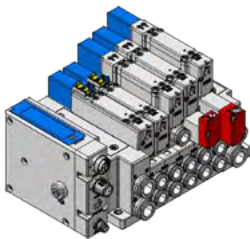


*EX500*

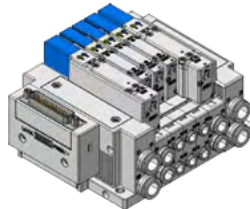


*EX600*

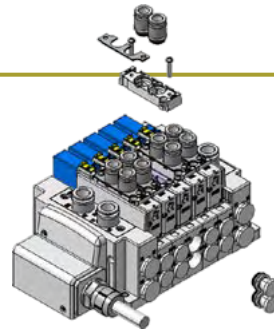
## Flexibility



*Function modules in sandwich format*



*Mix SY3000 and SY5000 on the same manifold*



*Easy to change port mode*

**Also available in hygienic design. Contact SMC for more information.**





# SY3000 – solenoid valve, plug-in

<b>Medium</b>	Air (dry)
<b>Degree of filtration</b>	5 µm
<b>Max. working pressure</b>	0.7 MPa (7 bar); high pressure type: 1 MPa (10 bar)
<b>Min. working pressure</b>	5/2 monostable: 0.15 MPa (1.5 bar); 5/2 bistable: 0.1 MPa (1 bar); 5/3 with center position: 0.2 MPa (2 bar); double 3/2: 0.15 MPa (1.5 bar); metal seal (not double 3/2): 0.1 MPa (1 bar)
<b>Operating temperature</b>	-10 to 50 °C
<b>Voltage/power</b>	Standard: 24 VDC ±10% (12 VDC on request)/0.4 W (energy saving 0.1 W)
<b>Flow</b>	470 l <sub>v</sub> /min
<b>Enclosure</b>	IP40/IP67 depending on choice of electrical connection



■ Unmatched flexibility and easy configuration because of new internal connector technology and the ability to mix different sizes in the same manifold

## Valve – plug-in, 24 VDC

Part number	Type	Weight
SY3100-5U1	5/2 monostable, rubber seal	74 g
SY3100R-5U1	5/2 monostable, rubber seal, external pilot	74 g
SY3101K-5U1	5/2 monostable, metal seal, high pressure	76 g
SY3101R-5U1	5/2 monostable, metal seal, external pilot	76 g
SY3200-5U1	5/2 bistable, rubber seal	83 g
SY3200R-5U1	5/2 bistable, rubber seal, external pilot	83 g
SY3201K-5U1	5/2 bistable, metal seal, high pressure	86 g
SY3201R-5U1	5/2 bistable, metal seal, external pilot	86 g
SY3300-5U1	5/3 closed center, rubber seal	87 g
SY3400-5U1	5/3 exhausted center, rubber seal	87 g
SY3500-5U1	5/3 pressurized center, rubber seal	87 g
SY3301K-5U1	5/3 closed center, metal seal, high pressure	90 g
SY3401K-5U1	5/3 exhausted center, metal seal, high press.	90 g
SY3501K-5U1	5/3 pressurized center, metal seal, high press.	90 g
SY3A00-5U1	Double 3/2 NC/NC, rubber seal	83 g
SY3B00-5U1	Double 3/2 NO/NO, rubber seal	83 g
SY3C00-5U1	Double 3/2 NC/NO, rubber seal	83 g

All versions available with external pilot supply. Contact SMC for delivery times.



Valve, plug-in



Valve manifold, fieldbus



Valve manifold, D-sub



Sub plate, side ported



Sub plate, bottom ported

## Valve manifold for fieldbus – circular and L connection, Ø6 mm, add valves and electrical connector

Part number	Valve stations	Type
SS5Y3-10S0-02D-C6	2	Side ported
SS5Y3-10S0-04D-C6	4	Side ported
SS5Y3-10S0-06B-C6	6	Side ported
SS5Y3-10S0-08B-C6	8	Side ported
SS5Y3-10S0-10B-C6	10	Side ported
SS5Y3-10S0-12B-C6	12	Side ported

## Valve manifold for D-sub connection

– Ø6 mm, add valves and D-sub cable

Part number	Valve stations	Type
SS5Y3-10F1-02D-C6	2	Side ported
SS5Y3-10F1-04D-C6	4	Side ported
SS5Y3-10F1-06B-C6	6	Side ported
SS5Y3-10F1-08B-C6	8	Side ported
SS5Y3-10F1-10B-C6	10	Side ported
SS5Y3-10F1-12B-C6	12	Side ported

## Metal sub plate for D-sub connection

– Ø6 mm, add valves and D-sub cable

Part number	Valve stations	Type
SS5Y3-50F1-04D-C6F	4	Side ported
SS5Y3-50F1-06B-C6F	6	Side ported
SS5Y3-50F1-08B-C6F	8	Side ported
SS5Y3-50F1-10B-C6F	10	Side ported
SS5Y3-50F1-12B-C6F	12	Side ported
SS5Y3-51F1-04D-C6F	4	Bottom ported
SS5Y3-51F1-06D-C6F	6	Bottom ported
SS5Y3-51F1-08D-C6F	8	Bottom ported
SS5Y3-51F1-10D-C6F	10	Bottom ported
SS5Y3-51F1-12D-C6F	12	Bottom ported

## SY3000 – solenoid valve, plug-in

### Replacement & extension parts



Manifold bottom plate



End plate D-side, fieldbus



End plate D-side, D-sub



End plate U-side

#### Manifold bottom plate – side ported

Part number	Type
SY30M-2-1SA-C4	Single solenoid, Ø4 mm
SY30M-2-1SA-C6	Single solenoid, Ø6 mm
SY30M-2-1DA-C4	Double solenoid, Ø4 mm
SY30M-2-1DA-C6	Double solenoid, Ø6 mm

#### End plate D-side for fieldbus – circular and L connection, with supply and exhaust, side ported, Ø8 mm

Part number	Type
SY30M-1-1A-C8	–
SY30M-1-1AS-C8	Built-in silencer
SY30M-1-1AR-C8	External pilot

#### End plate D-side for D-sub connection

– with supply and exhaust, side ported, Ø8 mm

Part number	Type
SY30M-1-11A1-C8	–
SY30M-1-11AS1-C8	Built-in silencer
SY30M-1-11AR1-C8	External pilot

#### End plate U-side – with supply and exhaust, side ported, Ø8 mm

Part number	Type
SY30M-3-1A-C8	–
SY30M-3-1AS-C8	Built-in silencer
SY30M-3-1AR-C8	External pilot



Individual P-supply



Individual exhaust

#### Individual P-supply – for individual valve

Part number	Type
SY30M-38-1A-C6	Ø6 mm

#### Individual exhaust – for individual valve

Part number	Type
SY30M-39-1A-C6	Ø6 mm



Blanking plate



DIN rail mount

#### Blanking plate – for unused valve stations

Part number	Type
SY30M-26-1A	For valve manifold
SY30M-26-2A	For metal sub plate

#### DIN rail mount – for manifold, 1 mount per pack

Part number
SY30M-15-1A

## SY3000 – solenoid valve, plug-in

### Replacement & extension parts



P-shut-off



Check valve



Double check module



Sealing disc

4

**P-shut-off** – for individual valve

Part number
SY30M-50-1A

**Check valve** – for exhaust channels

Part number
SY30M-24-1A

**Double check module**

– maintains correct position during long stops

Part number
SY30M-60-1A

**Sealing disc**

Part number	Type
SY30M-40-1A	For P-supply (2 different pressures in manifold)
SY30M-40-2A	For exhaust (2 different exhausts in manifold)

### Electrical connections

**L connector cable – 34 wire**

Part number	Type
SY30M-14-4A-1-2	Connector with 1,5 m cable
SY30M-14-4A-1-3	Connector with 3 m cable
SY30M-14-4A-1-4	Connector with 5 m cable
SY30M-14-4A-1-6	Connector with 10 m cable

**L connector cable – 17 wire**

Part number	Type
SY30M-14-4A-2-3	Connector with 3 m cable

**L connector cable – 9 wire**

Part number	Type
SY30M-14-4A-3-3	Connector with 3 m cable

**Circular connector – 26-pin (IP67)**

Part number	Type
SY30M-14-5A	Circular connector
AXT100-MC26	Connector only
AXT100-MC26-015	Connector with 1,5 m cable
AXT100-MC26-030	Connector with 3 m cable
AXT100-MC26-050	Connector with 5 m cable
AXT100-MC26-080	Connector with 8 m cable

**D-sub cable with connector – 25-pin, in accordance with MIL-norm (0,3 mm<sup>2</sup>)**

Part number	Type
VVZS3000-21A-2*	Connector with 3 m cable
VVZS3000-21A-3*	Connector with 5 m cable
VVZS3000-21A-4*	Connector with 8 m cable

**Terminal box – suitable for same manifolds as fieldbus connection**

Part number	Type
VQC1000-T0-1	20 connections (IP67)



L connector cable



Circular connector



Circular connector, connector only



Circular connector, connector with cable



D-sub cable with connector

**Fieldbus** – all SI-units can be used with manifolds for fieldbus, see chapter 5

For other versions, contact SMC.