

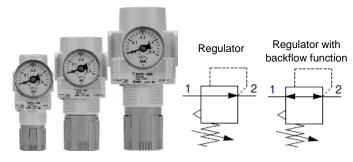
Instruction Manual

ORIGINAL INSTRUCTIONS



Refer to Declaration of Conformity for relevant Directives

Direct Operated Precision Regulator Series ARP20/30/40 & ARP20K/30K/40K



The intended use of ARP Direct Operated Precision Regulator is to use a locking adjustment knob to adjust and set the pressure for a pneumatic circuit. Backflow function is available for ARP20/30/40 series which exhausts the air pressure in the outlet side reliably and quickly.

Validated according to ISO 13849, see section 2.

This product conforms to the RoHS directive.

Refer to product catalogues for additional information.

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution", "Warning" or "Danger". They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) ^{*1}), and other safety regulations.

1) ISO 4414: Pneumatic fluid power - - General rules relating to

systems.

ISO 4413: Hydraulic fluid power - - General rules relating to systems.

IEC 60204-1: Safety of machinery - -Electrical equipment of machines. (Part 1: General requirements)

ISO 10218-1: Manipulating industrial robots - - Safety.etc.

This manual contains essential information for the protection of users and others from possible injury and/or equipment damage.

- Read this manual before using the product, to ensure correct handling, and read the manuals of related apparatus before use.
- Keep this manual in a safe place for future reference.
- To ensure safety of personnel and equipment the safety instructions in this manual must be observed, along with other relevant safety practices.

A	Caution	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
A	Warning	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
A	Danger	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Marning

- The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.
- Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The

1 Safety Instructions - continued

expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalogue information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

 Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly.

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

- Do not service or attempt to remove product and machinery/equipment until safety is confirmed.
- 1) The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
- 2) When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
- 3) Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.
- Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.
- 1) Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
- 2) Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustions and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specification described in the product catalogue.
- 3) An application which could have negative effects on people,

property, or animals requiring special safety analysis outside the scope of ISO 13849 described in this document.

4) Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

 Always ensure compliance with relevant safety laws and standards.

All electrical work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

↑ Caution

• The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries.

If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary. If anything is unclear, contact your nearest sales branch.

2 Specifications

2.1 General specification

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Model		ARP20(K)	ARP30(K)	ARP40(K)			
Port size		1/8, 1/4	1/4, 3/8	1/4, 3/8, 1/2			
Fluid		Air					
Proof pressure	е		1.2 MPa				
Max. operating	g pressure		0.7 MPa				
	For 0.4 MPa setting	0.005 to 0.4 MPa					
Set pressure range Note 1)	For 0.2 MPa setting	For 0.2 MPa setting 0.005 to 0.2 MPa					
range	For 0.6 MPa setting	0.008 to 0.6 MPa					
Sensitivity		Within 0.2% F.S.					
Repeatability	Note 2)	Within ±1% F.S. (or ±3 kPa)					
	For 0.4 MPs sotting	1 L/min (ANR) or less					
Air consumption	For 0.4 MPa setting	(at P2=0.4 MPa)					
	For 0.2 MPa setting	0.6 L/min (ANR) or less					
	rui u.z wra setting	(at P2=0.2 MPa)					

2 Specifica	itions – continue	ed					
Air	For 0.6 MPa setting	1.4 L/min (ANR) or less (at P2=0.6 MPa)					
Pressure port	size Note 3)	1/8	1/8	1/4			
Ambient and		-5 to +	60 °C (No fre	eezing)			
fluid temperature	1		-5 to +50 °C (No freezing)				
Construction		Bleed type					
Weight Note 4)		0.2 kg	0.3 kg	0.5 kg			
Flow-rate		Refer to section 2.2					
Vibration and i	impact resistance	Refer to section 3.2					
Filtration		5 µm filtration or smaller					
Maximum ope	rating frequency	1 cycles / sec					
Standards		Complies with the basic and well tried safety principles of EN ISC 13849-2:2012					
B ₁₀ Note 5)		3.5 million cycles	3.7 million cycles	1.5 million cycles			
B _{10D} Note 5)		7.0 million cycles	7.4 million cycles	3.0 million cycles			

Table 1

Notes:

- Note 1) When a product with backflow function (ARP20K to 40K) is chosen, set the inlet pressure 0.05 MPa or higher than the set pressure.
- Note 2) For the type set to 0.2 MPa only, repeatability will be within ±3 kPa.
- Note 3) Port thread is not provided for products with square embeddedtype pressure gauges.
- Note 4) Weight shown is for product without any options.
- Note 5) Under SMC test conditions. The B_{10} figure is estimated from SMC life tests. The B_{10D} figure is derived from B_{10} using the assumption in EN ISO 13849-1:2015 Annex C. Contact SMC for details.

2 Specifications – continued

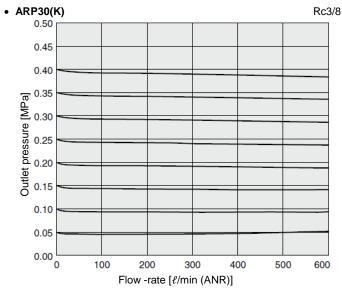


Figure 2

2.2 Flow characteristics (Representative values)

Condition: Inlet pressure 0.7 MPa

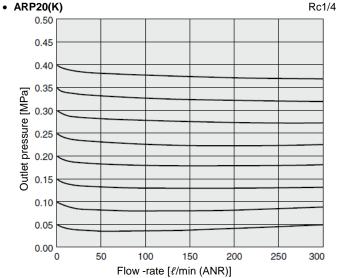


Figure 1

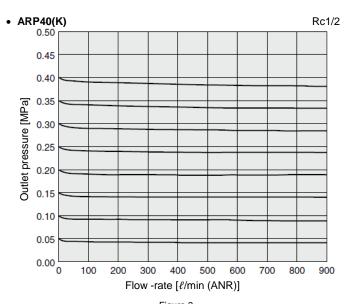


Figure 3

2 Specifications - continued

2.3 Pressure characteristics (Representative values)

ARP20(K)

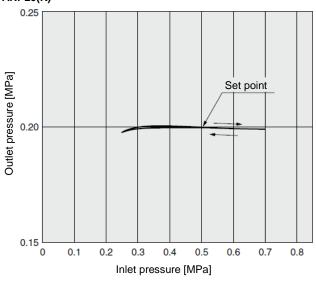
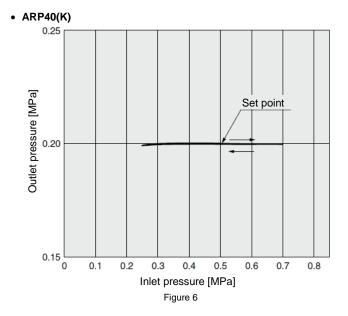
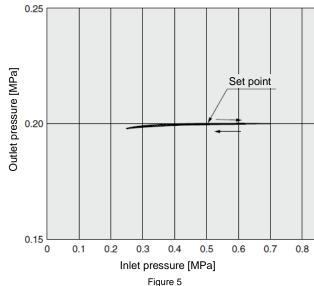


Figure 4

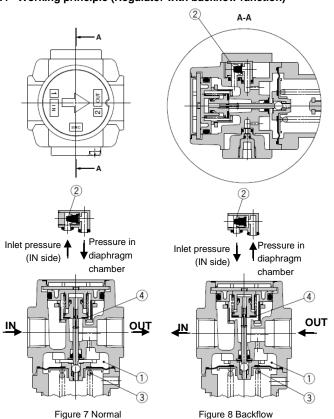
2 Specifications - continued



ARP30(K)



2.4 Working principle (Regulator with backflow function)



2 Specifications - continued

When the inlet pressure is higher than the set pressure, the check valve ② closes and operates as a normal regulator (Figure 7). When the inlet pressure is shut off and released, the check valve ② opens and the pressure in the diaphragm chamber ① is released to the inlet side (Figure 8).

This lowers the pressure in the diaphragm chamber ① and the force generated by the pressure regulator spring ③ pushes down the diaphragm. Valve ④ opens through the stem, and the outlet pressure is released to the inlet side (Figure 8).

⚠ Caution

Special products might have specifications different from those shown in this section. Contact SMC for specific drawings. These drawings will give the appropriate specification details and compliance with the safety principles of ISO 13849, if applicable.

3 Installation

3.1 Installation

⚠ Warning

 Do not install the product unless the safety instructions have been read and understood.

3.2 Environment

⚠ Warning

- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact. Check the product specifications.
- Do not mount in a location exposed to radiant heat.

3.3 Piping

A Caution

- Before piping make sure to clean up chips, cutting oil, dust etc.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1.5 to 2 threads exposed on the end of the pipe/fitting.
- To screw piping materials into components, tighten with a recommended tightening torque while holding the female thread side. If the minimum tightening torque is not observed, this can cause a looseness and seal failure. On the other hand, excess tightening torque can cause damage to the threads. Furthermore, tightening without holding the female thread side can cause damage due to the excess force that is applied directly to the piping bracket.

Recommended Tightening Torque

recommended righte	recommended rightening forque										
Connection thread	1/8	1/4	3/8	1/2							
Torque [N·m]	7 to 9	12 to 14	22 to 24	28 to 30							

Table 2

 Avoid excessive torsional moment or bending moment other than those caused by the equipment's own weight as this can cause damage.

Support external piping separately.

 Piping materials without flexibility such as steel tube piping are prone to be affected by excess moment load and vibration from the piping side. Use flexible tubing in between to avoid such an effect.

3.4 Lubrication

A Caution

- SMC products have been lubricated for life at manufacture, and do not require lubrication in service.
- If a lubricant is used in the system, use turbine oil Class 1 (no additive), ISO VG32. Once lubricant is used in the system, lubrication must be continued because the original lubricant applied during manufacturing will be washed away.

3 Installation - continued

3.5 Air Supply

A Warning

- Use a mist separator on the inlet side of the product.

 If the supplied air contains condensate or dust, the bleed mechanism can malfunction.
- Do not use a lubricator on the inlet side of the product, as the bleed mechanism can malfunction.

3.6 Design and Selection

⚠ Warning

- Be sure to install a safety device to prevent damage or malfunction of the outlet side components when the output pressure exceeds the set pressure value.
- Please consult with SMC if the intended application calls for absolutely zero leakage due to special atmospheric requirements, or if the use of a fluid other than air is required.
- The mineral grease used on internal sliding parts and seals may run down to outlet side components.
- Please consult with SMC if this is not desirable.
- Residual pressure release (outlet pressure release) is not complete by releasing the inlet pressure.
- To release residual pressure, select a model with a backflow function. Using a model without a backflow function makes for inconsistent residual pressure release (i.e., residual pressure may or may not be released) depending upon the operating conditions.
- Please contact SMC if air will not be consumed in the system for a long period of time, or if the outlet side will be used with a sealed circuit and a balanced circuit, as this may cause the set pressure of the outlet side to fluctuate.
- Set the regulating pressure range for the outlet pressure of the regulator in a range that is 90% or less of the inlet pressure.
 If set to above 90%, the outlet pressure will be easily affected by
- fluctuations in the flow rate and inlet pressure, and become unstable.

 A safety margin is calculated into the maximum regulating pressure

The outlet pressure may exceed the set pressure.

range appearing in the catalogue's specification table.

 Please contact SMC when a circuit requires the use of a regulator having relief sensitivity with high precision and setting accuracy.

A Caution

- Select a model that is suitable for the desired cleanliness by referring to the SMC's Best Pneumatics catalogue.
- Components cannot be used for applications that are outside the range of the specifications.
- Please consult with SMC when you anticipate using the component outside the range of its specifications (such as temperature and pressure)
- Even when the product is used in the specified range, it may chatter depending on the operating conditions. Please contact SMC for the details of this chattering.

3.7 Mounting

A Caution

- To avoid reversed connections of the air inlet/outlet, make connections after confirming the "IN/OUT" mark or arrows that indicate the direction of air flow. Reversed connections can cause malfunction.
- Leave a space of 100 mm or more for maintenance on the valve guide side (opposite side from the knob).
- When the product is installed between a solenoid valve and an actuator, select a backflow function type.

3.8 Adjustment

M Warning

- Set the regulator while verifying the displayed values of the inlet and outlet pressure gauges.
 Turning the knob excessively can cause damage to the internal parts.
- Do not use a tool on the pressure regulator knob as this can cause damage. It must be operated manually.

3 Installation - continued

Caution

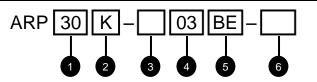
- Be sure to check the inlet pressure before setting the outlet pressure.
- Be sure to unlock the knob before adjusting the pressures and lock it after setting the pressure.
- Failure to follow this procedure can cause damage to the knob and the outlet pressure may fluctuate.
- Pull the pressure regulator knob to unlock. (You can visually verify this with the "orange mark" that appears in the gap.)
- Push the pressure regulator knob to lock. When the knob is not easily locked, turn it left and right a little and then push it (when the knob is locked, the "orange mark", i.e., the gap will disappear).



Figure 9

- To set the pressure using the knob, turn the knob in the direction that
 increases pressure and lock the knob after the pressure is set.
 If this is done in the direction that decreases pressure, the pressure
 may drop from the original set pressure. Turning the knob clockwise
 increases the outlet pressure and turning it counter clockwise
 reduces the pressure.
- Do not apply pressure exceeding the range of specifications. It can damage the pressure gauge.
- The product consumes a small amount of fluid from the bleed port.
 The product is designed to have a bleed mechanism for highly accurate pressure adjustment, and consumes a small amount of fluid from the bleed port. This should not be considered abnormal.

4 How to Order



- Option /Semi-standard: Select one each for a to f.
 Option / Semi-standard symbol: Enter them alphanumerically.
 - Example) ARP30K-03BE-1RY

								0	
				Symbol	Description	1	20 E	30 Size	40
							-		
2	2 With backflow function		K	Without backflow function		•	•	•	
			K	With backflow function	L	•	•	•	
				_	Rc		•	•	•
8	Thread type		read type	N	NPT		•	•	•
				F	G		•	•	•
				01	1/8		•	_	_
			D t t t t t t t	02	1/4		•	•	•
4		Port size			3/8		_	•	•
				04	1/2		_	_	•
				_	Without mounting option	ΙΓ	•	•	•
		а	Mounting	B Note 2)	With bracket	l	•	•	•
		-		Н	With set nut (For panel mount)		•	•	•
	_ =				Milkout management and the	I Г	•	•	
	N Sot		Pressure gauge	 E	Without pressure gauge	-	•	•	•
6	<u>io</u>			G	Square embedded type pressure gauge (with limit indicator) Round type pressure gauge (with limit indicator)	-	•	•	
	Option Note 1)	b		E1 Note 3)	Output: NPN output / Electrical entry: Wiring bottom entry	-	•	•	•
		0	Digital pressure	E2 Note 3)	Output: NPN output / Electrical entry: Wiring bottom entry Output: NPN output / Electrical entry: Wiring top entry	┞	•	•	
			switch	E3 Note 3)	Output: PNP output / Electrical entry: Wiring bottom entry	┞	•	•	•
			OWITOT	E4 Note 3)	Output: PNP output / Electrical entry: Wiring bottom entry		•	•	•
						l L			
				1 Note 4)	0.005 to 0.4 MPa setting		•	•	•
		С	Set pressure	3 Note 4)	0.005 to 0.2 MPa setting		•	•	•
				3 1000 4)	0.008 to 0.6 MPa setting	L	•	•	•
	ard	-1	Flow direction	_	Flow direction: Left to right		•	•	•
	au	d	Flow direction	R	Flow direction: Right to left		•	•	•
6	-st			_	Downward facing knob	Г	•	•	•
	Semi-standard	е	Knob	Υ	Upward facing knob		•	•	•
	0)				· • •	, <u>,</u>			
			Drogouro unit	Z Note 5)	Name plate and pressure gauge in imperial units: MPa		Note 7)	Note 7)	Note 7)
		f	Pressure unit	ZA Note 6)	Name plate and pressure gauge in imperial units: psi Digital pressure switch: With unit conversion function	l ⊢	Note 8)	Note 8)	Note 8)
				LA	Digital pressure switch. With unit conversion function	L			

- Note 1) Options B, G, H are shipped together, (but not assembled).
- Note 2) Set nut is included for bracket.
- Note 3) When choosing with H (panel mount), the installation space for the lead wires will not be secured. In this case, select "wiring top entry" for the lead wire entry. (Select "wiring bottom entry" when the semi-standard Y is chosen simultaneously.)
- Note 4) The only difference from the standard specifications is the pressure regulator spring.
 - It does not restrict the setting of 0.2 MPa/0.6 MPa or more.
 - When the pressure gauge is attached, a 0.2 MPa pressure gauge for a 0.2 MPa setting will be fitted, and a 0.7 MPa pressure gauge for a 0.6 MPa setting will be fitted.
 - When a digital pressure switch is attached, the pressure display is fixed to 1.0 MPa.
- Note 5) For thread type: NPT. This product is for overseas use only according to the new Measurement Law. (The SI unit type is provided for use in Japan.) The digital pressure switch will be equipped with the unit conversion function, setting to psi initially.
- Note 6) For options: E1, E2, E3, E4. This product is for overseas use only according to the new Measurement Law. (The SI unit is provided for use in Japan.)
- Note 7) ○: For thread type: NPT only
- Note 8) △: Combination available for options E1, E2, E3, E4.

5 Outline Dimensions (mm)

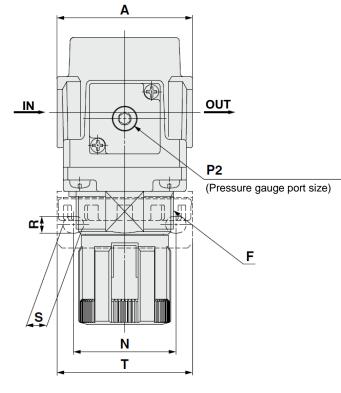


Figure 10

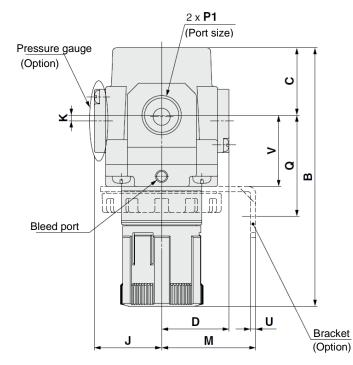


Figure 11

5 Outline Dimensions (mm) - continued

Panel fitting dimension

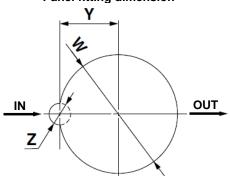
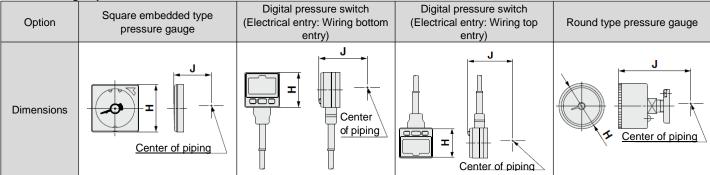


Plate thickness ARP20(K), ARP30(K): Max. 3.5 ARP40(K): Max. 5

Pressure Gauge Option



Model Standard specification									
iviodei	P1	P2	Α	B Note 1)	С	D	F	J	K
ARP20(K)	1/8, 1/4	1/8	40	98	27	28.5	M28 x 1	28.5 Note 2)	2
ARP30(K)	1/4, 3/8	1/8	53	117	29	29.5	M38 x 1.5	29.5	2.5
ARP40(K)	1/4, 3/8, 1/2	1/4	70	148	41	34	M42 x 1.5	34	1

Table 3

Note 1) The total length of B dimension is the length when the filter regulator knob is unlocked.

Note 2) For ARP20(K) only, the position of the pressure gauge is above the center of the piping.

		Optional specifications															
Model	Square embedded type pressure gauge		Digital pres	sure switch	Round type pressure gauge		Bracket mount dimension				n	Panel mount			t		
	I	J	Н	J	Н	J	М	Ν	Q	R	S	Т	U	٧	W	Υ	Ζ
ARP20(K)	□28	29.5	□27.8	40	Ø37.5	66	30	34	47	5.4	15.4	55	2.3	28	28.5	14	6
ARP30(K)	□28	30.5	□27.8	41	Ø37.5	67	41	40	44	6.5	8	53	2.3	31	38.5	19	7
ARP40(K)	□28	35	□27.8	45	Ø42.5	74	50	54	54	8.5	10.5	70	2.3	35.5	42.5	21	7

Table 4

6 Maintenance

6.1 General Maintenance

When discountly or installation is require

- When disassembly or installation is required during the maintenance, repair or replacement of a device, be sure to follow the instructions provided in the operation manual or safety instruction in the catalogue.
- When using the regulator with backflow function between a solenoid valve and an actuator, check the pressure gauge periodically.
 Sudden pressure fluctuations may shorten the durability of the pressure gauge. A digital pressure gauge is recommended for such situation or as deemed necessary.

A Caution

• Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.

6 Maintenance - continued

- If handled improperly, compressed air can be dangerous.
 Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

6 Maintenance - continued

 For emergency action in the event of setting failure or leakage from the relief port, refer to "Trouble-shooting" in the operation manual of this product.

7 Limitations of Use

7.1 Limited warranty and Disclaimer/Compliance Requirements

• The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements". Read and accept them before using the product.

· Limited warranty and Disclaimer

- 1) The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first⁽¹⁾. Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
- 2) For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3) Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

(1) Vacuum pads are excluded from this 1 year warranty.

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

- 1) The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
- 2) The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of

the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

A Caution

 SMC products are not intended for use as instruments for legal metrology.

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.

Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

Marning

Any use in an ISO 13849 system must be within the specified limits and application conditions. The user is responsible for the specification, design, implementation, validation and maintenance of the safety system (SRP/CS).

8 Contacts

AUSTRIA	SMC Pneumatik GmbH,Girakstrasse 8, AT-2100
	Korneuburg, Austria
BELGIUM	SMC Pneumatics N.V./S.A. Nijverheidsstraat 20, B-2160
DELOION	Wommelgem, Belgium
DIII OADIA	SMC Industrial Automation Bulgaria EOOD, Business
BULGARIA	Park Sofia, Building 8-6th floor, BG-1715 Sofia, Bulgaria
	SMC IndustrijskaAutomatikad.o.o. ZagrebačkaAvenija
CROATIA	104,10 000 Zagreb
	SMC Industrial Automation CZ s.r.o. Hudcova 78a, CZ-
CZECH REP.	61200 Brno, Czech Republic
	SMC Pneumatik A/S,Egeskovvej 1, DK-8700 Horsens,
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	Estonia
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	Lithuania

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