



ORIGINAL INSTRUCTIONS

Instruction Manual

Large Size Vacuum Module

Series ZR



Single Unit



Manifold

The intended use of the vacuum unit is to generate vacuum and control the operation of suction and release.

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<sup>1)</sup>, and other safety regulations.

- <sup>1)</sup> 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.

- Refer to product catalogue, Operation Manual and Handling

Precautions for SMC Products for additional information.

- Keep this manual in a safe place for future reference.

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

**Warning**

- Always ensure compliance with relevant safety laws and standards.
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

2 Specifications

2.1 Vacuum Ejector Specifications (Max. vacuum pressure-84kPa)

Model	Nozzle dia. (mm)	Maximum suction flow rate (L/min (ANR))	Air consumption (L/min (ANR))	Weight (With bracket) (kg)
ZR1-W10S□	1.0	25	53	0.132
ZR1-W13S□	1.3	42	86	0.134
ZR1-W15S□	1.5	63	102	0.136
ZR1-W18S□	1.8	74	155	0.154
ZR1-W20S□	2.0	95	194	0.156

2 Specifications - continued

2.2 Vacuum Ejector Specifications (Max. vacuum pressure-53kPa)

Model	Nozzle dia. (mm)	Maximum suction flow rate (L/min (ANR))	Air consumption (L/min (ANR))	Weight (With bracket) (kg)
ZR1-W10L□	1.0	44	53	0.133
ZR1-W13L□	1.3	55	86	0.133
ZR1-W15L□	1.5	88	102	0.135
ZR1-W18L□	1.8	105	155	0.155
ZR1-W20L□	2.0	132	194	0.154

2.3 Ejector Unit Common Specifications

Supply pressure range	0.2 to 0.55MPa
Standard supply pressure	0.45MPa
Operating temperature range	5 to 50°C
Model (ejector exhaust method)*	Code 1: Built-in silencer- for unit and manifold Code 2: Individual exhaust- for unit and manifold
Standard accessory	Bracket (ZR1-OB)

\*How to order: Code 1 and 2 are the suffixes in the ordering number to indicate the exhaust method.

Note) Operation outside of the specified supply pressure and operating temperature range may cause a serious accident or damage.

2.4 Valve Unit Specifications

Valve unit no.	ZR1-V□□□□□-□-□	
Components	Supply valve	Release valve
Operating method	Pilot operated	
Combination of supply and release valve	Refer to the combination of supply and release valve below	
Supply pressure range of air pressure/vacuum pressure supply (PV) port	-0.1 to 0.6 MPa (PS port pressure or less)	
Supply pressure range of release pressure supply (PD) port	0.05 to 0.6 MPa (PS port pressure or less)	
Supply pressure range of pilot pressure supply (PS) port	0.25 to 0.6 MPa	
Supply pressure range of pilot pressure supply (PA, PB) ports for supply and release <sup>Note)</sup>	PS port pressure to 0.6 MPa	
Main valve effective area (mm <sup>2</sup> )	8.2	0.96
Main valve effective area (Cv)	0.45	0.053
Maximum operating frequency	5 Hz	
Operating temperature range	5 to 50°C	
Standard accessory	Bracket B (ZR1-OB)	

**Note)** Combination of supply and release valve: K3 and C2. The supply and release valves of this product have a structure which uses the pressure of the pilot pressure supply (PS) port to operate them. Be sure to supply a pressure that is the pressure of the pilot pressure supply (PS) port or more, and 0.6MPa or less to the pilot pressure supply (PA,PB) ports for supply and release.

2 Specifications - continued

2.5 Solenoid Valve Specifications

Solenoid	SYJ3133-□□□□, SYJ3233-□□□□-X126
Rated voltage	24, 12, 6, 5, 3 VDC, 100, 110 VAC ( 50/60Hz)
Electrical entry	L/M plug connector, Grommet
Light/surge voltage suppressor	Available, Not available (at grommet)
Manual operation	Non-locking push type, Locking slotted type

2.6 Combination of Supply and Release Valve

Combination symbol	Vacuum switch valve	Release valve	Weight (kg)
K1	Double SOL. (SYJ3233-X126)	N.C. (SYJ3133)	0.34
K2	N.C. (SYJ3133)	N.C. (SYJ3133)	0.27
K3	Air operated (SYJA3130)	Air operated (SYJA3130)	0.194
C1	N.C. (SYJ3133)		0.22
C2	Air operated (SYJA3130)		0.174
C3	N.C. (SYJ3133)		0.21

\*Weight includes Bracket B. (Solenoid valve: 24 VDC, M plug connector type)

2.7 Suction Filter Unit Specifications

Unit no.	ZR1-F□□□□□-□	
Suction filter	Rated pressure range/set pressure range	-100 to 100 kPa
	Proof pressure	500 kPa
	Operating temperature range	5 to 50°C
	Filtration degree	30 μm
	Filtration material	PVF
Pressure switch for vacuum	Refer to vacuum pressure switch specifications	
Standard option	Bracket A (ZR1-OBA)	

Note) If not operated within the specified range of pressure and temperature, trouble may be caused.

2.8 Vacuum Pressure Switch (ZSE2) Specifications

Model	ZSE2	
	For vacuum	
Rated/set pressure range	0 to -101 kPa	
Proof pressure	500 kPa	
Fluid	Air/non-corrosive, non-flammable gas	
Power supply voltage	12 to 24 VDC±10%. Ripple (P-P) 10% or less (with power supply polarity protection)	
Current consumption	17mA or less at 24 VDC	
Response time	5 ms or less	
Repeatability	±1% F.S or less	
Resistance	Enclosure	IP40
	Operating temperature range	0 to 60°C. Stored: -10 to 60°C (no condensation or freezing)
	Operating humidity range	Operating/stored: 35 to 85%RH (no condensation)

2 Specifications - continued

Vacuum Pressure Switch (ZSE2) Specifications - continued

Temperature characteristics (based on 25°C)	±3%F.S or less	
Withstand voltage	1000VAC for 1 min (between terminals and housing)	
Insulation resistance	50MΩ or more (500VDC measured) between terminals and housing	
Port size	01: R1/8, M5x0.8. T1:NPTF 1/8, M5x0.8. 0X: with suction filter (for mounting on ZX unit). 0R: Base mount type (mounting on ZR unit)	
Weight	35g including 0.6m lead wire	
Lead wire	Grommet type	Oilproof heavy duty vinyl cable. 3 cores, Ø3.4. Conductor area: 0.2mm <sup>2</sup> . Insulator O.D: 1.1mm
	Connector type	Heat resistant vinyl electric wire. 3 cores. Conductor area: 0.31mm <sup>2</sup> . Insulator O.D: 1.55mm

2.9 Vacuum Pressure Switch (ZSE2) Output Specifications

Model	Nil	55
Switch output	NPN open collector 30V, 80mA or less	PNP open collector 80mA or less
Residual voltage	1V or less (with load current of 80mA)	
Number of outputs	1	
Hysteresis	3% F.S or less (fixed)	
Indicator light	ON: when output is on (red)	
Trimmer adjustment	200°	

2.10 Vacuum Pressure Switch (ZSE30A) Specifications

Model	ZSE30A	
	For vacuum	
Rated pressure range	0 to -101 kPa	
Display/set pressure	10 to -105 kPa	
Withstand pressure	500 kPa	
Display/minimum unit setting	0.1 kPa	
Applicable fluid	Air, non-corrosive, non-flammable gas	
Power supply voltage	12 to 24 VDC±10%. Ripple (P-P) 10% or less (with power supply polarity protection)	
Current consumption	40mA or less	
Switch output	NPN or PNP open collector. 1 output, NPN or PNP open collector 2 outputs	
	Maximum load current	80 mA
	Maximum applied voltage	28 V (at NPN output)
	Residual voltage	1 V or less (with load current of 80 mA)
	Response time	2.5 ms or less (with anti-chattering function: 20,100,500,1000,2000ms)
Short circuit protection	Yes	
Repeatability	±0.2%F.S. ±1 digit	
Hysteresis	Hysteresis mode	Variable ( 0 or above) <sup>Note1)</sup>
	Window comparator mode	

**2 Specifications - continued****Vacuum Pressure Switch (ZSE30A) Specifications - continued**

Analog output	Voltage output <sup>Note2)</sup>	Output voltage (rated pressure range)	1 to 5V±2.5% F.S.
		Linearity	±1% F.S.
	Output impedance	Approx. 1KΩ	
Current output	Current output <sup>Note3)</sup>	Output current (rated pressure range)	4 to 20mA ±2.5 F.S.
		Linearity	±1% F.S.
	Load impedance	Max. load impedance: power supply voltage 12V: 300Ω. Power supply voltage 24V: 600Ω. Min. load impedance: 50Ω	
Display		4-digit, 7-segment, 2-colour LCD (red, green)	
Display accuracy		±2%F.S. ±1 digit (ambient temp. of 25±3°C)	
Indicator light		Lights when switch is turned ON. OUT1: Green, OUT2: Red	

**Vacuum Pressure Switch (ZSE30A) Specifications - continued**

Environment	Enclosure	IP40
	Operating temperature range	0 to 50°C. Stored: -10 to 60°C (no condensation or freezing)
	Operating humidity range	Operating/stored: 35 to 85%RH (no condensation)
	Withstand voltage	1000VAC for 1 min (between terminals and housing)
	Insulation resistance	50MΩ or more (500VDC measured) between terminals and housing
Temperature characteristics		±2%F.S (25°C reference)
Lead wire with connector		Oilproof heavy-duty vinyl cable. 3 cores Ø3.5, 2m. 4 cores. Conductor area: 0.15mm <sup>2</sup> (AWG26), insulator O.D 1mm

Note 1) If applied pressure fluctuates near the set valve, set the hysteresis above the fluctuation range to prevent chattering.

Note 2) When analog voltage output is selected, analog current output cannot be used.

Note 3) When analog current is selected, analog voltage cannot be used.

**3 Installation****3.1 Installation****Warning**

- Do not install the product unless the safety instructions have been read and understood.
- When mounting the product, tighten it with the recommended tightening torque (M3: 0.28~0.34Nm, M4: 0.7~0.9Nm, M5: 1.4~1.6Nm)
- When installing the product, secure the space required for maintenance and inspection of the product
- Do not drop, hit, or apply excessive impact to the product.

**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 in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications
- The suction filter used in this product is a simple one. If there is a lot of dust in the usage environment, please consider using a suction filter (ZFC series, etc.).
- Do not use in place where static electricity build-up can occur.
- Do not use in an environment where surges occur.

**3.3 Air Supply****Caution**

- Do not use air containing chemicals, synthetic oils containing organic solvents, salts, or corrosive gases.
- Recommended quality of the supplied air be equivalent to the compressed air cleanliness grade "2: 6: 3" according to ISO8573-1: 2010.
- Do not supply the pressure in excess of the product's specifications.

**3.4 Piping****Caution**

- Before connecting piping make sure to clean up chips, cutting oil, dust, etc.
- When piping a joint to each port, fix the part where the port is attached and use the recommended torque (M5: 1.0~1.5Nm, 1/8: 3~5Nm, 1/2: 20~25Nm).

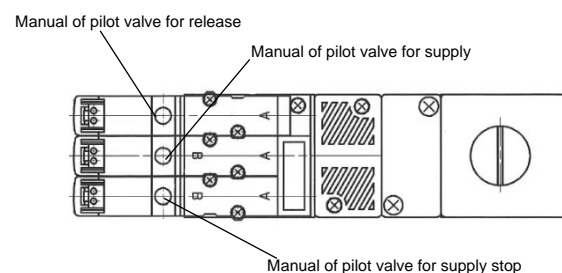
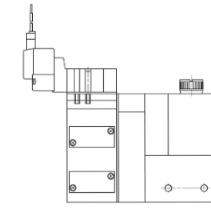
**3.5 Wiring to the solenoid valve and pressure switches**

Refer to the operation manual of solenoid valve (SYJ3000 series) and pressure switch (ZSE2, ZSE30A series). Manuals can be found by the links below:

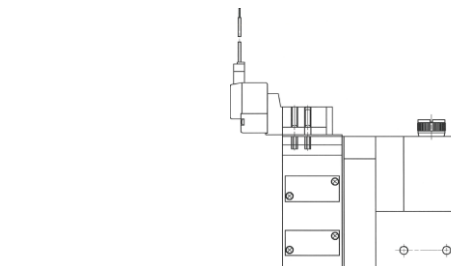
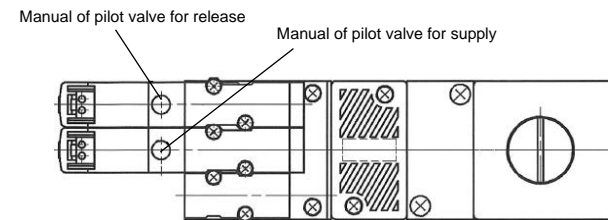
SYJ3000: <https://www.smcworld.com/manual/en-jp/?k=SYJ3000>

ZSE2: <https://www.smcworld.com/manual/en-jp/?k=ZSE2>

ZSE30A: <https://www.smcworld.com/manual/en-jp/?k=ZSE30A>

**4 Settings****4.1 Manual Override (With supply valve and release valve)****4 Settings - continued**

Combination of supply and release valve: K1



Combination of supply and release valve: K2

Refer to the operation manual of the solenoid valve SYJ3000 series for the manual operation method.

**4.2 Release flow adjusting needle**

When the release valve is turned on, vacuum release air is let out.

The release flow adjusting needle allows to control the vacuum break air flow rate.

For products with locknut, loosen the locknut and use a flat-blade screwdriver to adjust the release flow rate adjustment needle at the back of the lock nut.

The breaking flow rate adjustment needle can be turned clockwise to reduce the release flow rate, and counterclockwise to increase the release flow rate.

For products with locknut, after adjusting the release flow rate adjustment needle, tighten the locknut to fix the adjustment position.

**5 How to Order**

Refer to the catalogue for 'How to Order'.

**6 Outline Dimensions (mm)**

Refer to the catalogue for outline dimensions.

**7 Maintenance****7.1 General Maintenance****Caution**

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

**7 Maintenance - continued**

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
- Implement the maintenance and check shown below to use the space saving vacuum unit safely and in an appropriate way for a long period of time.
- Drain the air filter and mist separator regularly.
- Replace the sound absorbing material (silencer) built into the ejector regularly.
- Refer to the online operation manual for replacement parts.
- Do not use benzene or thinner for cleaning.

**7.2 Sound absorbing material replacement method**

- Single Unit
  - Loosen the two assembly screws of the silencer case and remove the silencer case assembly.
  - Replace the sound absorbing material in the silencer case.
  - Assemble the silencer case assembly with the sound absorbing material being replaced and assemble it with screws (recommended tightening torque: 0.11 to 0.13 Nm).

**7.3 Filter element replacement method**

- Loosen the tension bolt and remove the filter case.
- Replace the filter element built into the filter case.
- Assemble the filter case with tension bolts (recommended tightening torque: 0.33 to 0.35 Nm).

**8 Limitations of Use****8.1 Limited warranty and Disclaimer/Compliance Requirements**

Refer to Handling Precautions for SMC Products.

**Caution****Exhaust from large size vacuum module**

- For the silencer exhaust type, make sure that there is no obstruction around the exhaust port.
- In the case of port exhaust type, exhaust resistance may be affected depending on the pipe diameter and length, so make sure that the back pressure is 1 kPa or less.
- Do not block the exhaust port.

**Ejector exhaust noise**

When the vacuum ejector generates a vacuum, an intermittent noise (abnormal noise) may be generated from the exhaust section near the standard supply pressure where the vacuum pressure peaks, and the vacuum pressure may not be constant. There is no problem in use as long as the vacuum pressure range is sufficient for adsorption, but if you are concerned about the sound or affect the setting of the pressure switch, slightly change the supply pressure and reduce the range of the intermittent sound. Please avoid it.

**About the release flow rate adjusting needle**

- Leakage cannot be reduced to zero when the needle is fully closed.
- The breaking flow rate adjustment needle changes from the fully closed state to the fully open state after two rotations. If it is turned more than that, it may come off, so please do not turn it more than 2 times.
- For products with locknut, when tightening the locknut, tighten it by hand to about 15 to 30 degrees, and be careful not to damage it due to overtightening.
- About solenoid valve and pressure switch**  
For the solenoid valve (SYJ3000 series) and pressure switch (ZSE2, ZSE30A series), refer to each instruction manual.

**9 Product disposal**

This product should not be disposed of as municipal waste. Check your local regulations and guidelines to dispose this product correctly, in order to reduce the impact on human health and the environment

**10 Contacts**

Refer to [www.smcworld.com](http://www.smcworld.com) or [www.smc.eu](http://www.smc.eu) for your local distributor/importer.

**SMC Corporation**

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Template DKP50047-F-085M