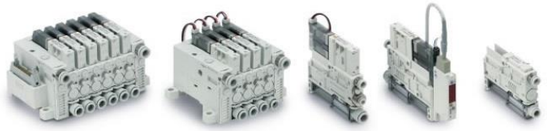
ORIGINAL INSTRUCTIONS

Instruction Manual
Vacuum Unit
Ejector / Vacuum Pump System
Series ZK2



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) *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.

- 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.

⚠ **Caution**	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
⚠ **Warning**	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ **Danger**	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 General Specifications

Ambient temperature range	-5 to 50ºC (Without pressure sensor and pressure switch, With pressure switch, With pressure switch with energy saving function) 0 to 50ºC (With pressure sensor) (No condensation)
Fluid	Air
Vibration Note 1) resistance	30m/s² (Without pressure sensor and pressure switch, With pressure sensor) 20m/s² (With pressure switch)
Impact Note 2, 3) resistance	150m/s² (Without pressure sensor and pressure switch, With pressure sensor) 100m/s² (With pressure switch)

Note 1) The characteristics are satisfied when tested for 2 hours in each of the X, Y and Z directions at 10 to 500 Hz without energization (Initial value).
Note 2) The characteristics are satisfied when tested one time in each of the X, Y and Z directions without energization (Initial value).
Note 3) For valve type R (Self-holding release valve linked), impact resistance is 50m/s².

2 Specifications - continued

2.2 Valve Specifications

Valve model Note 4)	ZK2-VA□ K□□□	ZK2-VA□R□□□	ZK2-VA□J □□□
Type of actuation Note 5)	Supply valve: N.C. Release valve:	Supply valve: Self-holding release valve linked Release valve: N.C.	Supply valve: N.C. Release valve: None
Valve configuration	Pilot operated dual 2 port		Pilot operated 2
Operating pressure range	0.3 to 0.6 MPa		
Valve construction	Poppet seal		
Manual override	Push type		
Rated voltage	24 VDC (ZK2-VA□□5□□) 12 VDC (ZK2-VA□□6□□)		
Power consumption	0.35 W (ZK2-VA□□□□)		
Lead wire (ZK2-LV□□-A)	Cross section: 0.2 mm² (AWG24)		
	Insulator O.D.: 1.4 mm		

Note 4) Refer to catalogue for the valve model number.
Note 5) ZK2-VA□R: When the supply valve is energized (20ms or more), the supply valve keep ON position even after energization is stopped. When release valve is energized, the supply valve is turned off in conjunction with the operation of the release valve.
ZK2-VA□K: Supply valve turns off when it is not energized. Select this type when pressure switch with energy saving function is used.

2.3 Noise Level (Reference values)

Model		ZK2 □07	ZK2 □10	ZK2 □12	ZK2 □15
Noise level [dB(A)]	ZK2G (High-noise reduction silencer exhaust)	46	55	63	69
	ZK2A (Silencer exhaust)	59	66	75	76

2.4 Ejector Specification

Model		ZK2 □07	ZK2 □10	ZK2 □12	ZK2 □15
Nozzle diameter (mm)		0.7	1.0	1.2	1.5
Max. suction flow Note 6)	Port exhaust (L/min(ANR))	34	56	74	89
	Silencer exhaust/ Complex exhaust (L/min(ANR))	29	44	61	67
	High-noise reduction silencer exhaust (L/min(ANR))	34	56	72	83
Air consumption Note 6) (L/min(ANR))		24	40	58	90
Max. vacuum pressure Note 6) (kPa)		-91			
Supply pressure range Note 7) (kPa)		0.3 to 0.6 (0.1 to 0.6)			
Standard supply pressure Note 8) (kPa)		0.35			0.4 (0.37)

Note 6) Values at the standard supply pressure. Values are based on standard of SMC measurements. They depend on atmospheric pressure (weather, altitude, etc.) and measurement method.
Note 7) The value in ( ) is for without valve.
Note 8) The value in ( ) is for without valve. For nozzle size 07 to 12, the value is common to the ejectors with valve and without valve.

2 Specifications - continued

2.5 Suction Filter

Filtration rating	30 µm
Filtration area	510 mm²

2.6 Pressure Sensor

Model (Sensing unit: Standard model number)		ZK2-PS1-A (PSE541)	ZK2-PS3-A (PSE543)
Rated pressure range		0 to -101 kPa	-100 to 100 kPa
Proof pressure		500 kPa	
Output voltage		1 to 5 VDC	
Output impedance		Approx. 1 kΩ	
Power supply voltage		12 to 24 VDC ±10%, Ripple (P-P) 10% or less	
Current consumption		15 mA or less	
Accuracy		±2% F.S. (Ambient temperature at 25ºC)	
Linearity		±0.4% F.S.	
Repeatability		±0.2% F.S.	
Effect of power supply voltage		±0.8% F.S.	
Environmental resistance	Ambient temperature	Storage: -20 to 70 ºC (No condensation or freezing)	
	Ambient humidity	Operation, Storage: 35 to 85% RH (No condensation)	
Temperature characteristics		±2% F.S. (Ambient temperature: 25ºC reference)	
Material	Case	Resin case: PBT	
	Pressure sensing section	Sensor pressure receiving area: Silicon, O-ring: HNBR	
Lead wire		Oilproof heavy-duty vinyl cable, 3 wires, Oval 2.7 x 3.2 mm, 3m, Conductor cross section 0.15 mm², Insulator O.D.: 0.9 mm	

For more details, refer to the PSE series online catalogue and the Operation Manual.

2.7 Pressure Switch for Vacuum

Model (Switch unit: Standard model number)		ZK2-ZSE□□□-A (ZSE10)	ZK2-ZSF□□□-A (ZSE10F)
Rated pressure range		0 to -101 kPa	-100 to 100 kPa
Set / Display pressure		10 to -105 kPa	-105 to 105 kPa
Proof pressure		500 kPa	
Minimum setting unit		0.1 kPa	
Power supply voltage		12 to 24VDC ±10%, Ripple(P-P) 10% or less (Protected against reverse connection)	
Current consumption		40 mA or less	
Switch output	Output type	NPN or PNP open collector 2 outputs (To be selected)	
	Maximum load current	80 mA	
	Maximum applied voltage	28 V (NPN output)	
	Residual voltage	2 V or less (at 80 mA load current)	
	Response time	2.5 ms or less (response time available for anti-chattering function: 20, 100, 500, 1000 or 2000 ms)	
	Short circuit protection	Provided	
Repeatability		±0.2% F.S. ±1 digit	
Hysteresis	Hysteresis	Variable from 0 Note 9)	
	Window comparator		

2 Specifications - continued

Pressure Switch for Vacuum - continued

Display type		3 1/2 digits, 7-segment LED 1-color display (Red)
Display accuracy		±2% F.S. ±1 digit (at ambient temperature 25 ± 3 ºC)
Indication LED		Lights up when output is turned on. OUT1: Green, OUT2: Red
Environmental resistance	Enclosure	IP40
	Ambient temperature	Storage: -10 to 60 ºC (No condensation or freezing)
	Ambient humidity	Operation, Storage: 35 to 85 % RH (No condensation)
	Withstand voltage	1000 VAC for 1 minutes between terminals and housing
	Insulation resistance	50 MΩ or more between terminals and housing (with 500 VDC megger)
Temperature characteristics		±2% F.S. (Ambient temperature: 25 ºC reference)
Lead wire		Oilproof heavy-duty vinyl cable, 5 wires, ø3.5, 2 m, Conductor cross section 0.15 mm² (AWG26), Insulator O.D.: 1.0 mm

Note 9) If the applied voltage fluctuates around the set value, the hysteresis must be set to a value more than the fluctuating width, otherwise chattering will occur

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2.8 Pressure Switch for Vacuum with energy saving function

Model		ZK2-ZSV□□□-A
Rated pressure range		-100 to 100 kPa
Set / Display pressure range		-105 to 105 kPa
Proof pressure		500 kPa
Minimum setting unit		0.1 kPa
Power supply voltage		12 to 24VDC ±10%, Ripple(P-P) 10% or less (Protected against reverse connection)
Current consumption		40 mA or less
Switch output	Output type	NPN or PNP open collector OUT1: General purpose, OUT2: Valve control
	Maximum load current	80 mA
	Maximum applied voltage	26.4 VDC
	Residual voltage	2 V or less (at 80 mA load current)
	Response time	2.5 ms or less (response time available for anti-chattering function: 20, 100, 500, 1000 or 2000 ms)
	Short circuit protection	Provided
Repeatability		±0.2% F.S. ±1 digit
Hysteresis	Hysteresis mode	Variable from 0 Note 10)
Display type		3 1/2 digits, 7-segment LED 1-color display (Red)
Display accuracy		±2% F.S. ±1 digit (at ambient temperature 25 ± 3 ºC)
Indication LED		Lights up when output is turned on. OUT1: Green, OUT2: Red

2 Specifications - continued

Pressure Switch for Vacuum with energy saving function - continued

Environmental resistance	Enclosure	IP40
	Withstand voltage	1000 VAC for 1 minutes between terminals and housing
	Insulation resistance	50 MΩ or more between terminals and housing (with 500 VDC megger)
Temperature characteristics		±2% F.S. (Ambient temperature: 25 ºC reference)
Lead wire		5 wires, ø3.5, 2 m, Conductor cross section 0.15 mm^2 (AWG26), Insulator O.D.: 1.0 mm

Note 10) If the applied voltage fluctuates around the set value, the hysteresis must be set to a value more than the fluctuating width, otherwise chattering will occur.

3 Installation

3.1 Installation

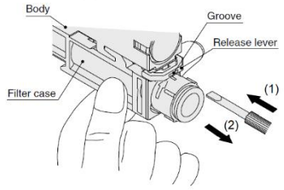
Warning

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

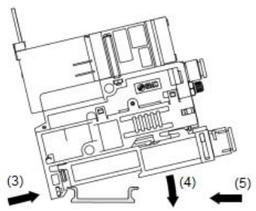
3.1.1 Single Unit

(A) DIN rail mounting

1) Insert a precision screwdriver into the groove of the release lever and push in direction (1), and slide the filter case in direction (2).

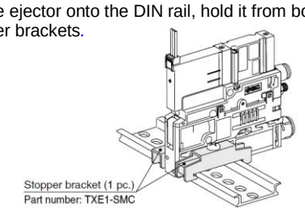


2) Hook the ejector onto the DIN rail from direction (3) and mount the ejector onto the DIN rail by pushing it down in direction (4).



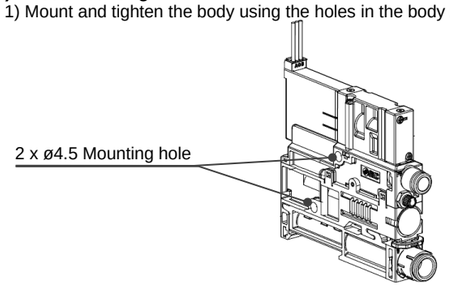
3) Push the filter case assembly in direction (5) until it is locked.

4) To hold the ejector onto the DIN rail, hold it from both sides using the stopper brackets.



(B) Direct mounting

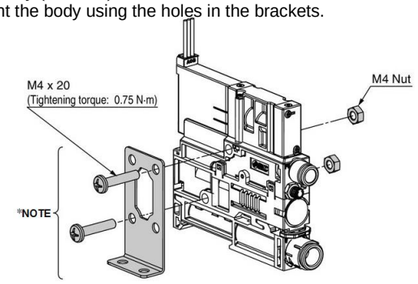
1) Mount and tighten the body using the holes in the body (2 x ø4.5).



3 Installation - continued

(C) Bracket mounting

1) Fix the body with the brackets before mounting, using the holes in the body (2 x ø4.5).
2) Mount the body using the holes in the brackets.



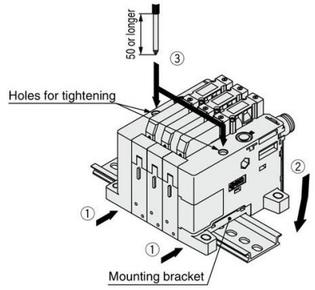
Note) Mounting bracket for single unit (Option) [Nuts and bolts are included.] Part number: ZK2-BK1-A

3.1.2 Manifold

(A) DIN rail mounting (Option)

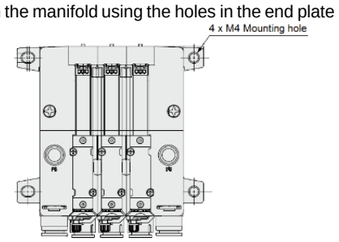
1) Hook the mounting bracket of the end plate to DIN rail from direction (1)
2) Mount the ejector onto the DIN rail by pushing it down in direction (2)
3) Use a 50 mm or longer Phillips screwdriver to tighten the mounting bracket (3) (Tightening torque: 0.9 ±0.1 Nm)

Removal should be performed by following the mounting procedure in reverse.



(B) Direct mounting

1) Mount and tighten the manifold using the holes in the end plate (4xM4).



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.

3.3 Piping

Caution

- Before connecting 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 thread exposed on the end of the pipe/fitting.
- Tighten fittings to the specified tightening torque.

3.4 Lubrication

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, refer to catalogue for details.

4 How to Order

Refer to the catalogue for 'How to Order'.

5 Outline Dimensions (mm)

Refer to the catalogue for outline dimensions.

6 Maintenance

6.1 General Maintenance

Caution

- 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.
  Implement the maintenance and checks shown below in order to use the ejector and the vacuum pump system safely and in an appropriate way for a long period of time.
- Maintenance should be performed according to the procedure indicated in the Operation Manual. Improper handling can cause damage and malfunction of equipment and machinery.
- Maintenance work
  Compressed air can be dangerous when handled incorrectly. Therefore, in addition to observing the product specifications, replacement of elements and other maintenance activities should be performed by personnel with sufficient knowledge and experience pertaining to pneumatic equipment.
- Draining
  Remove condensate from air filters and mist separators regularly. If the collected drainage is drained to the downstream side, it can stick inside of the product, causing operation failure and failure to reach the specified vacuum pressure.
- Replace the filter element built into the ejector and the vacuum pump system and the silencer regularly (refer to the replacement procedure in Operational Manual available on www.smcworld.com).
  It is recommended to replace the filter element and the silencer when the pressure drop reaches 5kPa as a guideline. The replacement cycle varies depending on the operating conditions, operating environment and supply air quality.
  However, if there is a vacuum pressure drop and/or delay in the vacuum (adsorption) response time which causes problem with the settings during operation, stop the operation of the product and replace the element regardless of the above mentioned replacement guideline.
- Operation in an environment where there is a lot of dust in the air.
  The processing capacity of the filter element built into the product may be insufficient. It is recommended to use SMC's air suction filter (ZFA, ZFB, ZFC series) in order to avoid problems beforehand.
- Check before and after the maintenance work.
  When the product is to be removed, turn off the power supply, and be sure to cut off the supply pressure and exhaust the compressed air. Confirm that the air is released to atmosphere.
  When mounting the product after the maintenance work, supply compressed air, connect to the power, check if it functions properly and have a leakage inspection. Especially for valve type R, be sure to check that the supply valve is OFF in the initial condition because it is possible that it is ON due to vibration.
- Do not disassemble or modify the product, other than the replacement of parts specified in the operation manual.
- Tighten to the specified tightening torque.
- f the tightening torque is exceeded, the product, the mounting screws, brackets and the pressure switch can be broken. Insufficient torque can cause displacement of the product and the pressure switch from each proper position and loosening of the mounting screws.
- Be sure to ground the frame ground (FG) terminal when using a commercially available switching power supply.
- Eliminate any dust left in the piping by using a blast of air before connecting the piping to the product.
  Otherwise, failure or malfunction may occur.
- If the fluid contains foreign matter, install and connect a filter or mist separator to the inlet.
  Otherwise, failure, malfunction or inaccurate measurements from the pressure switch may occur.

7 Limitations of Use

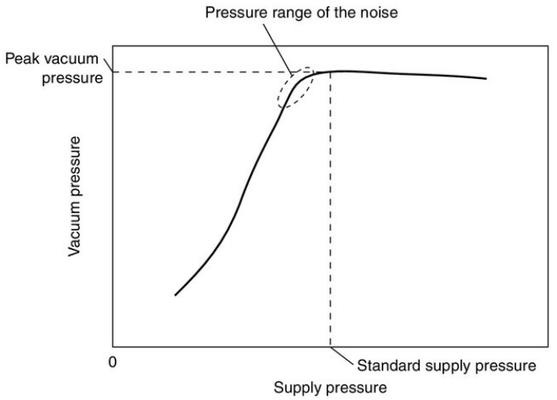
7.1 Limited warranty and Disclaimer/Compliance Requirements

Refer to Handling Precautions for SMC Products.

Caution

Exhaust Noise

When vacuum ejector generates vacuum, noise can be heard from the exhaust port when the standard supply pressure is close to the pressure that generates peak vacuum pressure making vacuum pressure unstable. If the vacuum pressure range is adequate for adsorption, there should not be a problem. If the noise causes a problem or affects the setting of the pressure switch, change the supply pressure slightly to avoid the pressure range of the noise.



8 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.

9 Contacts

Refer to www.smcworld.com or www.smc.eu for your local distributor/importer.

SMC Corporation

URL : https:// www.smcworld.com (Global) https:// www.smc.eu (Europe)
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan
Specifications are subject to change without prior notice from the manufacturer.

Template DKP50047-F-085M