文書 No.EX※※-OME0011-D

Operation Manual

Reduced wiring system
(CC-Link compliant SI unit)

PRODUCT NAME

EX140-SMJ1 *Series*

MODEL/ Series

SMC Corporation

Table of Contents

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), Japan Industrial Standards (JIS)[*1)] and other safety regulations[*2)].

*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 10218-1992: Manipulating industrial robots -Safety.
JIS B 8370: General rules for pneumatic equipment.
JIS B 8361: General rules for hydraulic equipment.
JIS B 9960-1: Safety of machinery - Electrical equipment of machines. (Part 1: General requirements)
JIS B 8433-1993: Manipulating industrial robots - Safety.
etc.
*2) Labor Safety and Sanitation Law, etc.

⚠ 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

1. 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 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 catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. 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.

3. 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.

4. 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, combustion 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 specifications described in the product catalog.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
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.

⚠ Caution

1. 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.

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.[*3)]
   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 catalog for the particular products.

*3) 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

When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).

Operator

- This operation manual has been written for those who have knowledge of machinery and apparatus that use pneumatic equipment and have full knowledge of assembly, operation and maintenance of such equipment.
- Please read this operation manual carefully and understand it before assembling, operating or providing maintenance to the product.

■Precautions

⚠Warning

■Do not disassemble, modify (including changing the printed circuit board) or repair.
An injury or failure can result.

■Do not operate the product outside of the specifications.
Do not use for flammable or harmful fluids.
Fire, malfunction, or damage to the product can result.
Verify the specifications before use.

■Do not operate in an atmosphere containing flammable or explosive gases.
Fire or an explosion can result.
This product is not designed to be explosion proof.

■If using the product in an interlocking circuit:
- Provide a double interlocking system, for example a mechanical system.
- Check the product regularly for proper operation.

Otherwise malfunction can result, causing an accident.

■The following instructions must be followed during maintenance:
- Turn off the power supply.
- Stop the air supply, exhaust the residual pressure and verify that the air is released before performing maintenance.

Otherwise an injury can result.

⚠Caution

■After maintenance is complete, perform appropriate functional inspections.
Stop operation if the equipment does not function properly.
Safety cannot be assured in the case of unexpected malfunction.

■Provide grounding to assure the safety and noise resistance of the Serial System.
Individual grounding should be provided close to the product with a short cable.

■NOTE

○Follow the instructions given below when designing, selecting and handling the product.

●The instructions on design and selection (installation, wiring, environment, adjustment, operation, maintenance, etc.) described below must also be followed.

∗Product specifications

- The direct current power supply to combine should be UL1310 Class2 power supply when conformity to UL is necessary.
- The SI unit is a c UL us approved product only if they have a c UL us mark on the body.
- Use the specified voltage.
  Otherwise failure or malfunction can result.
- Reserve a space for maintenance.
  Allow sufficient space for maintenance when designing the system.
- Do not remove any nameplates or labels.
  This can lead to incorrect maintenance, or misreading of the operation manual, which could cause damage or malfunction to the product.
  It may also result in non-conformity to safety standards.

•Product handling

∗Installation

- Do not drop, hit or apply excessive shock to the fieldbus system.
  Otherwise damage to the product can result, causing malfunction.
- Tighten to the specified tightening torque.
  If the tightening torque is exceeded the mounting screws may be broken.
- Never mount a product in a location that will be used as a foothold.
  The product may be damaged if excessive force is applied by stepping or climbing onto it.

∗Wiring

- Avoid repeatedly bending or stretching the cables, or placing heavy load on them.
  Repetitive bending stress or tensile stress can cause breakage of the cable.
- Wire correctly.
  Incorrect wiring can break the product.
- Do not perform wiring while the power is on.
  Otherwise damage to the fieldbus system and/or I/O device can result, causing malfunction.
- Do not route wires and cables together with power or high voltage cables.
  Otherwise the fieldbus system and/or I/O device can malfunction due to interference of noise and surge voltage from power and high voltage cables to the signal line.
  Route the wires (piping) of the fieldbus system and/or I/O device separately from power or high voltage cables.
- Confirm proper insulation of wiring.
  Poor insulation (interference from another circuit, poor insulation between terminals, etc.) can lead to excess voltage or current being applied to the product, causing damage.
- Take appropriate measures against noise, such as using a noise filter, when the fieldbus system is incorporated into equipment.
  Otherwise noise can cause malfunction.

∗Environment

- Select the proper type of protection according to the environment of operation.
  In case of IP20, avoid use in the place where water and oil scatter.
- Do not use the product in an environment where corrosive gases or fluids could be splashed.
  Otherwise damage to the product and malfunction can result.
- Do not use in an area where surges are generated.
  If there is equipment which generates a large amount of surge (solenoid type lifter, high frequency induction furnace, motor, etc.) close to the fieldbus system, this may cause deterioration or breakage of the internal circuit of the fieldbus system. Avoid sources of surge generation and crossed lines.
- When a surge-generating load such as a relay or solenoid is driven directly, use an fieldbus system with a built-in surge absorbing element.
  Direct drive of a load generating surge voltage can damage the fieldbus system.
- The product is CE marked, but not immune to lightning strikes. Take measures against lightning strikes in the system.
- Prevent foreign matter such as remnant of wires from entering the fieldbus system to avoid failure and malfunction.
- Mount the product in a place that is not exposed to vibration or impact.
  Otherwise failure or malfunction can result.
- Do not use the product in an environment that is exposed to temperature cycle.
  Heat cycles other than ordinary changes in temperature can adversely affect the inside of the product.
- Do not expose the product to direct sunlight.
  If using in a location directly exposed to sunlight, shade the product from the sunlight.
  Otherwise failure or malfunction can result.
- Keep within the specified ambient temperature range.
  Otherwise malfunction can result.
- Do not operate close to a heat source, or in a location exposed to radiant heat.
  Otherwise malfunction can result.

∗Adjustment and Operation

- Set the switches by using a sharp-pointed screwdriver etc.
  It may damage set switches.
- Perform settings suitable for the operating conditions.
  Incorrect setting can cause operation failure.
  For details of each setting, refer to page 10 of this manual.
- Please refer to the PLC manufacturer's manual etc. for details of programming and addresses.
  For the PLC protocol and programming refer to the relevant manufacturer's documentation.

∗Maintenance

- Turn off the power supply, stop the supplied air, exhaust the residual pressure and verify the release of air before performing maintenance.
  There is a risk of unexpected malfunction.
- Perform regular maintenance and inspections.
  There is a risk of unexpected malfunction.
- After maintenance is complete, perform appropriate functional inspections.
  Stop operation if the equipment does not function properly.
  Otherwise safety is not assured due to an unexpected malfunction or incorrect operation.
- Do not use solvents such as benzene, thinner etc. to clean the each unit.
  They could damage the surface of the body and erase the markings on the body.
  Use a soft cloth to remove stains.
  For heavy stains, use a cloth soaked with diluted neutral detergent and fully squeezed, then wipe up the stains again with a dry cloth.

Model indication and How to Order

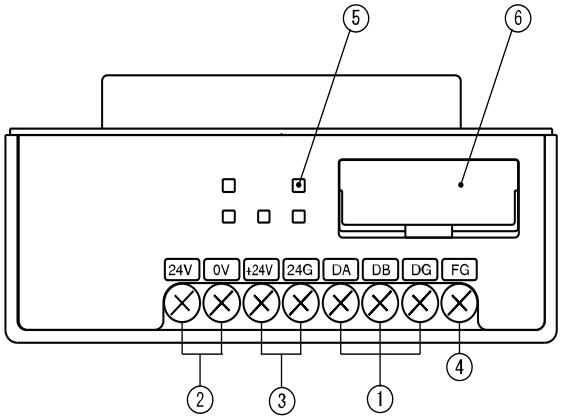
•SI unit series EX140

EX140-S MJ1

• Applicable network, output point specification

MJ1	CC-Link type, output 16 points

Names and functions of Product



No.	Parts	Purpose
1	Communication terminal (DA,DB,DG)	To connect the CC-Link line with a CC-Link-dedicated cable.
2	Power supply terminal (24 V,0 V)	To supply power to solenoid valves.
3	Power supply terminal (+24 V,24 G)	To supply power to the SI unit controller.
4	FG terminal	Used for functional ground.
5	Display	The status of the unit is indicated with LED.
6	Setting switch area	The station number and transmission speed are set.

■Definition and terminology

No.	Term	Definition
1	Total of station	Total number of occupied stations among all slaves connected by the CC-Link.
2	Station number	Numbers from 1 to 64, assigned to the slave stations. No. 0 is assigned to the master CC-Link. Slave stations must be assigned numbers according to the number of occupied stations so they are not duplicated.
3	Slave station	General term for any station except the master station.
4	Number of occupied slaves	Number of networked stations in use by a slave. Depending on the data, one to four stations can be set. The remote I/O only occupies one station.
5	Remote I/O	A station which can only use digital data. Occupies only one station. (Example: digital units, solenoid valves, sensors, etc)

Mounting and Installation

■Communication wiring

The connection between a CC-Link-dedicated cable and an SI unit communication terminal for CC-Link is shown below.

(1) Be sure to connect a signal line to its dedicated terminal. (Refer to Fig.1)
The applicable screwdriver is a Phillips head screwdriver with end size of #2 and diameter of φ6 or less. Tighten it securely with a torque of 0.5 to 0.6 [Nm].

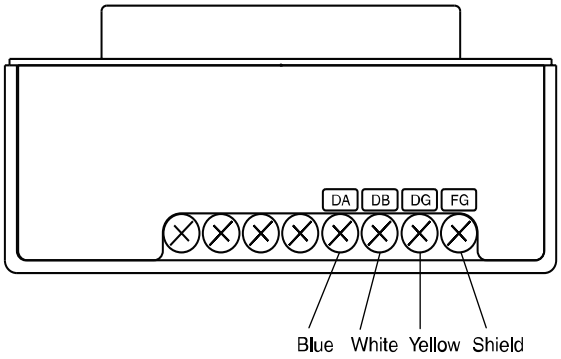


Fig.1

(2) Be sure to connect a terminating resister between “DA” and “DB” at both ends of the CC-Link system (Refer to Fig.2). Use a cable with the same specifications as a CC-Link-dedicated cable. If a cable with any other specifications is used, normal data transmission cannot be guaranteed.

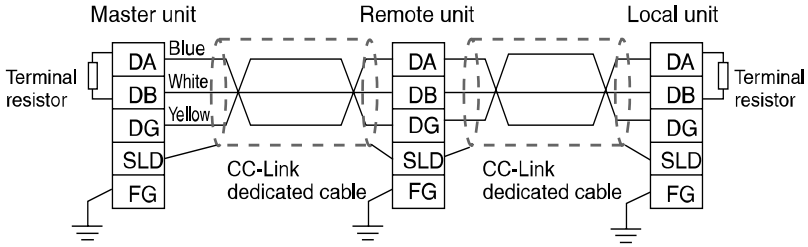


Fig.2

(3) The appropriate terminal resistor differs depending on the CC-Link cable used (Refer to the table and Fig. 3 below.)
The CC-Link-dedicated cable’s shield line should be connected to the “FG” terminal of the SI unit.

Cable type	Terminal resistor
CC-Link detected cable	110 Ω 1/2 W (Brown, Brown, Brown)
CC-Link dedicated cable compatible to Ver.1.10	
CC-Link dedicated high performance cable	130 Ω 1/2 W (Brown, Orange, Brown)

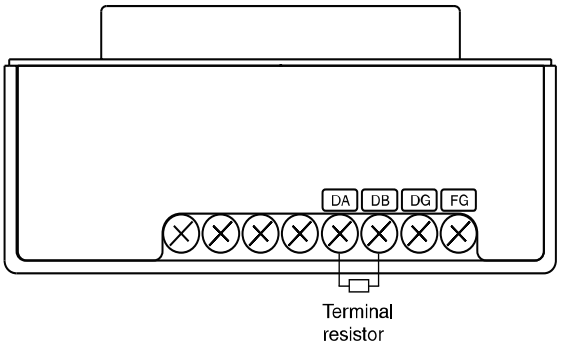


Fig.3

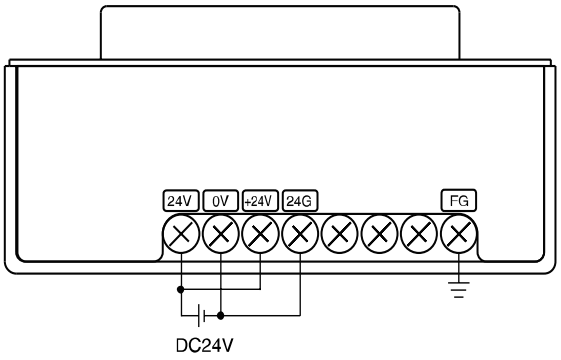
■Power supply wiring

Connect the power wiring to the SI unit's solenoid valve and communication power supply terminals.
Though the power supply consists of two systems, it can operate with either a single or separate power supplies. Be sure to connect the power to the dedicated terminal (Refer to Fig. 4).
The applicable screwdriver is a Phillips head screwdriver with end size of #2 and diameter of φ6 or less.Tighten it securely with a torque of 0.5 to 0.6 [Nm].

*Note

D-type Ground (3rd type ground) for the FG terminal
(the SLD and FG terminals in CC-Link are connected within the SI units.)

A.For single power supply use



B.For dual power supply use

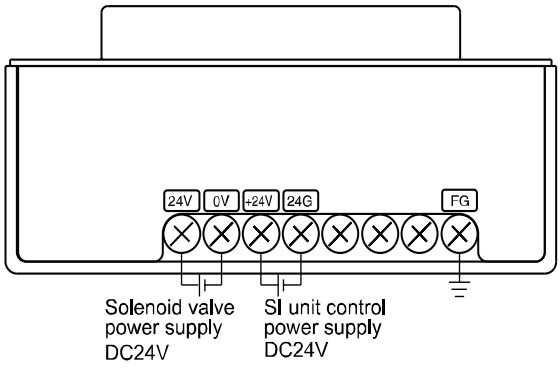
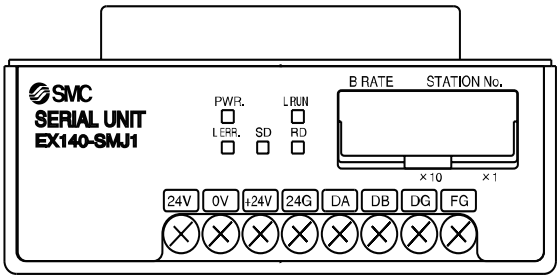


Fig.4

Setting

•Settings for display

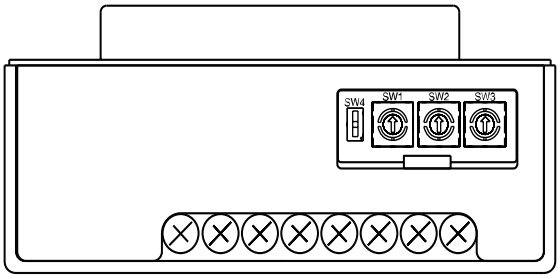


Display	Meaning
PWR.	It lights up when the communication power is ON
L RUN	Check whether SI unit is communicating with the master station correctly. It lights up when SI unit is receiving normal data from the master station. It goes out for time-out.
SD	It lights up when data is being sent.
RD	It lights up when data is being received.
L ERR.	It illuminates during communication errors (CRC errors). It illuminates during a time-out (the L RUN light extinguishes). It illuminates for station no. setting and communication speed setting errors (the light extinguishes when the setting has been corrected and power has been restored). It blinks when the station no. and communication speed settings have changed during the communication. (the L RUN light illuminates and the SI unit operates according to the station no. and communication speed settings input when power is applied.)

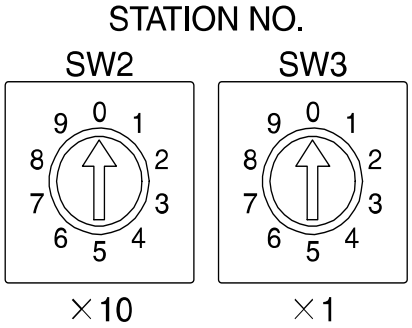
If data link is correct, "PWR.", "LRUN", "SD", and "RD" light up.

•Switch setting

•The setting for station no. and communication speed can be done with rotary switches in SI unit cover. The setting for HOLD/CLEAR can be done with DIP switch in SI unit cover. The setting shall be done when the power for SI unit is turned off.



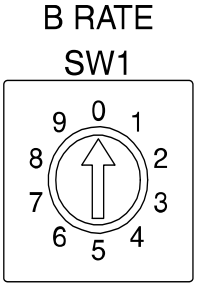
•Station number setting



Seting	Setting range
×10	0 to 6
×1	0 to 9

∗The station no. should be any of the numbers from 01 to 64. When numbers 00 or 65 or more is set, “L ERR” will light up.
∗The station no.cannot duplicate. It will cause mounting condition error.
∗The setting at shipment is 00.

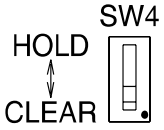
•Setting of transmitting speed



Seting	Transmitting speed
0	156 kbps
1	625 kbps
2	2.5 Mbps
3	5 Mbps
4	10 Mbps

∗The setting for communication speed should be in range from 0 to 4.
If the setting is out of the range, “L ERR” will light up.
After turning the power off, correct the number.
∗Set the same communication speed as the master station.
∗The setting at shipment is 0 (156 kbps).

•HOLD/ CLEAR settiing



HOLD/CLEAR	Function
CLEAR	Clear the output when errors occur.
HOLD	Hold the output when errors occur.

∗The setting at shipment is CLEAR.

Maintenance

•Mounting and wiring

Item to inspect	Criteria	Countermeasure
Are SI unit terminals (for communication and power supply) securely connected?	No looseness.	Tighten the connector. (Refer to “Mounting/ Installation”)
Are the terminating resistance securely connected to the both ends of the network (in case this system is at the end of the network)	Terminating resistors are connected.	Connect suitable terminating resistors to cables (Refer to “Mounting /Installation”).
Isn’t the connecting cable broken.	No apparent breaks	If any visible breaks are found, replace the cable.

•Replacement parts

Item to inspect	Criteria	Countermeasure
CC-Link dedicated cable	No appearance error	If any visible breaks are found, replace the cable.
SI unit	No error in operation and display	If it does not operate as intended, or the display indicates errors, replace the unit.

•Power supply

Item to inspect	Criteria	Countermeasure
Measure voltage at both ends of the SI unit controller's power supply to ensure it is within the specified range.	15 VDC〜30 VDC	Investigate into the cause of voltage fluctuation, and take a countermeasure against it.
Measure voltage of the solenoid valve’s power supply to ensure it is within the specified range.	24 VDC+10%/-5%	Investigate into the cause of voltage fluctuation, and take a countermeasure against it.

Troubleshooting

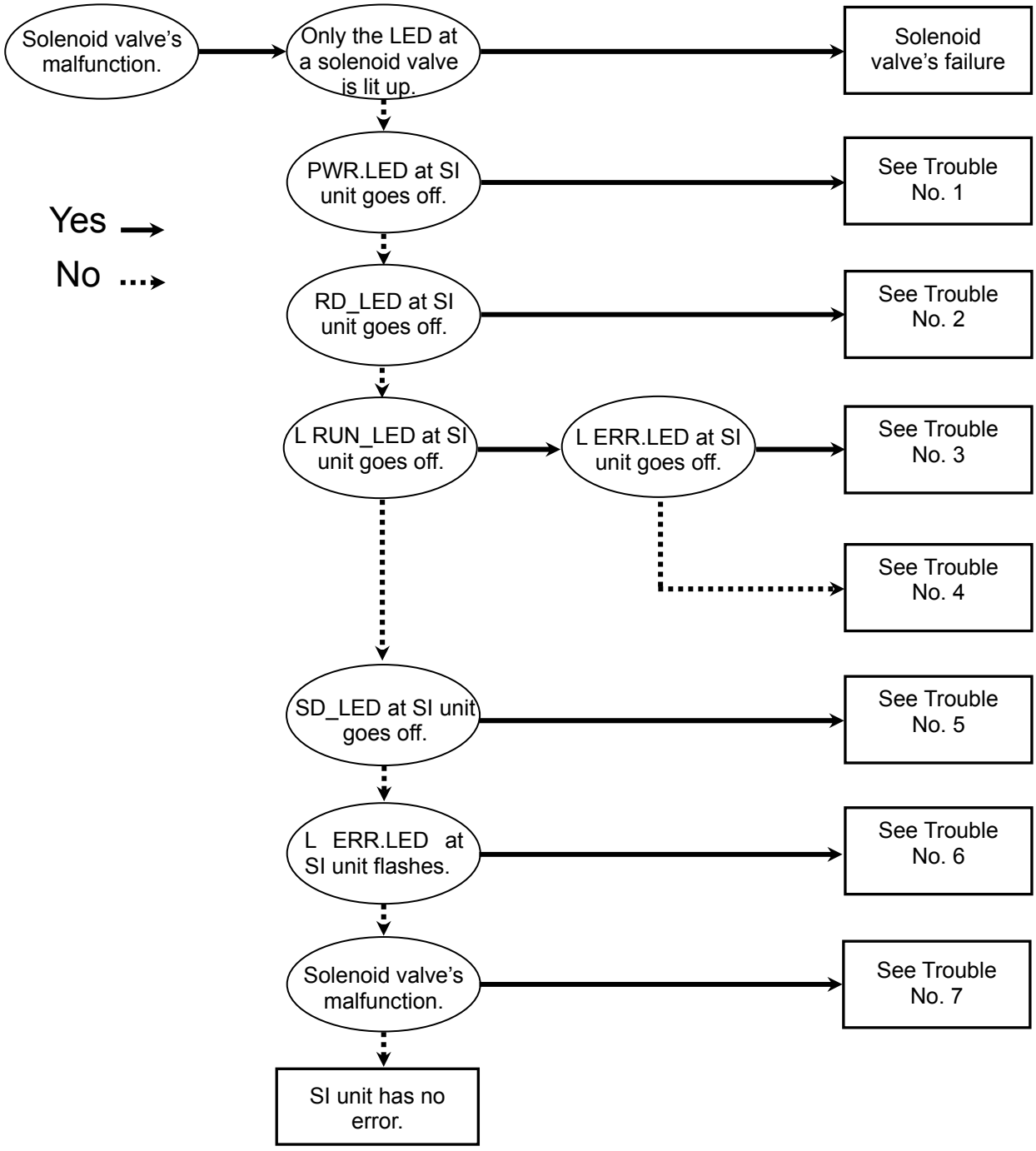
•Troubleshooting

Applicable model :EX140-SMJ1

If a SI unit gets an operation failure, look for the problem using the following flow chart.

If any cause of the problem cannot be found, and a new SI unit can operate well after replaced with the old one, the failure of SI unit is conceivable. As the failure of SI unit may happen due to the operation environment (network construction etc), consult us about the countermeasure against that case.

If neither cause of the problem nor failure of SI unit can be found, inconsistency between parameter setting and the network construction at the master station is conceivable. In this case, refer to “Troubleshooting” in a user’s manual (CC-Link system) by Mitsubishi.



•Cross-reference troubleshooting

Trouble No.	Problem	Possible cause	Investigation method	Countermeasure
1	PWR.LED at SI unit goes off.	SI unit controller's power supply wiring failure.	Check the SI unit controller power supply cables for breaks. Also check the terminal between the power supply cable and connector for looseness. Avoid repetitive bending and pulling of the cable, which causes breakage.	Connect the power supply cable correctly.
		SI unit controller's power supply failure.	Check the SI unit controller's power supply wiring for any error.	Correct the wiring.
			Check the SI unit controller's power supply for supply voltage.	Supply 24 VDC +10%/-5% to SI unit controller's power supply.
2	PWR.LED at SI unit is lit up. RD_LED at SI unit goes off.	Communication line wiring failure.	Check the communication line cable for breaks. Also check the terminal between the communication cable and the connector for looseness. Avoid repetitive bending and pulling of the cable, which causes breakage.	Connect the power supply cable correctly.
			Check the communication line wiring for any error.	Correct the wiring.
3	L RUN_LED at SI unit goes off. L ERR.LED at SI unit goes off.	Master station's power supply failure.	Check the power is supplied to the master station.	Check the power is supplied to the master station.
		Communication failure.	Check the existence of equipment and high voltage line, which cause noise, around the communication and power supply lines.	Separate the communication and power supply cables from the noise sources.
		Station number setting failure.	Ensure there is no difference betwen the SI unit station number setting and the station data at the master station.	Correct the setting.
		Communication speed setting failure.	Ensure there is no difference between the SI unit and master station communication speed settings.	

Trouble No.	Problem	Possible cause	Investigation method	Countermeasure
4	L RUN_LED at SI unit goes off. L ERR.LED at SI unit is lit up.	Station number setting failure. Station number duplicating failure.	Ensure there are no errors or duplications of the station numbers.	Correct the setting. To review the setting method, see "Settings".
		Communication speed setting failure.	Ensure the communication speed is set correctly.	
5	L RUN_LED at SI unit is lit up. SD_LED at SI unit goes off.	Communication speed setting failure.	Check there is no difference between the set communication speed at SI unit and the set communication speed at the master station.	Correct the setting.
		Station number setting failure. Station number duplicating failure.	Check that the set station numbers contain no errors or duplication.	
6	L RUN_LED at SI unit is lit up. L ERR.LED at SI unit flashes.	Failure in changing communication speed	Check that the communication speed setting has not changed after supplying power to the SI unit controller.	Cut the SI unit controller's power supply, and supply the power again after correcting the setting.
		Changed station number setting.	Check that the station number setting has not changed after supplying power to the SI unit controller.	
		Communication failure.	Check the existence of equipment and high voltage line, which cause noise, around the communication and power supply lines.	Separate the communication and power supply cables from the noise sources.

Trouble No.	Problem	Possible cause	Investigation method	Countermeasure
7	Solenoid valve malfunction.	Solenoid valve failure.	Check the operation with another solenoid valve, or check the troubleshooting for a solenoid valve.	Check the troubleshooting for a solenoid valve, or consult our responsible division.
		Connection failure between SI unit and manifold solenoid valves.	Check the connector between SI unit and manifold solenoid valves for the connection failure such as a bent pin	Correct the connection between SI unit and manifold solenoid valves.
		Solenoid valves whose total output points are 16 or more malfunction.	Check the total output points of the solenoid valves connected to a manifold are 16 or less.	As EX140-SMJ1, max. output points are 16, the output points must be 16 or less.

Specification

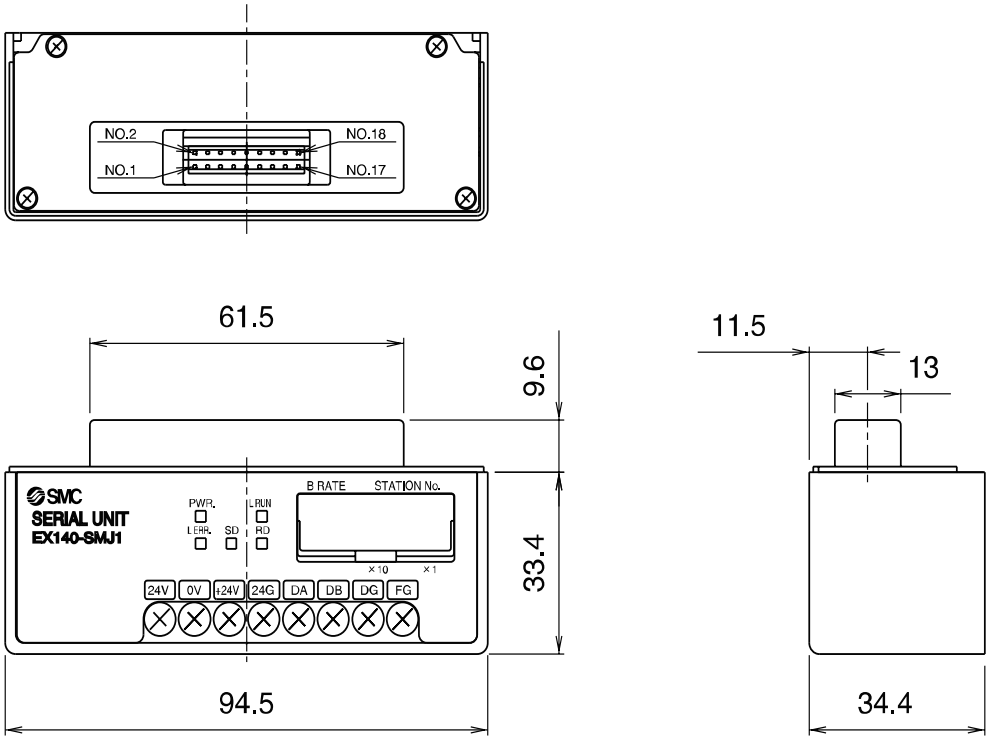
■Specifications

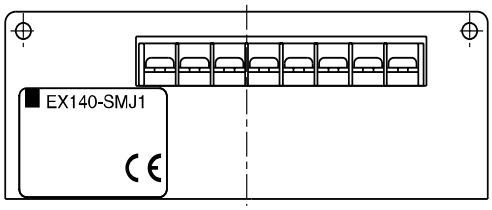
Item		Specifications				
Communication specification	Applicable system	CC-Link Ver.1.10				
	Occupied station	1 station				
	Station number setting range	1 to 64 (Set with a rotary switch)				
	Station type	Remote I/O				
	Communication speed	156 kbps	625 kbps	2.5 Mbps	5 Mbps	10 Mbps
	Cable length between stations	20cm or more				
	Max. cable length	1200 m	900 m	400 m	160 m	100 m
Communication power voltage		15 VDC to 30 VDC				
Solenoid valve voltage		24 VDC +10%/-5%				
Output channel		16 points				
Output style		NPN (positive common)				
Current consumption		Com./internal power supply: 24 VDC/0.1 A or less Solenoid valve power supply: 24 VDC /1.4 A or less				
Environ. resistance	Enclosure	IP20				
	Withstand voltage	1500 VAC 1min. (Between FG and external terminal)				
	Insulation resistance	2 MΩ or more (500 VDC between FG and external terminal)				
	Ambient temperature	Operating temperature: 0°C to +55 °C (when 8 points are on) 0 °C to +50 °C (when 16 points are on) Storage: -10 °C to 60 °C				
	Ambient humidity	35% to 85%RH (No due condensation)				
	Operation atmosphere	No corrosive gas				
Standard		CE marking				
Weight		80 g or less				

•Applicable solenoid valve series

Representative series	Applicable series
SQ series	SQ1000,2000 series
SZ series	SZ3000 series

■Dimensions


NO.2
NO.18
NO.1
NO.17
61.5
9.6
33.4
94.5
11.5
13
34.4
SMC
SERIAL UNIT
EX140-SMJ1
PWR.
L ERR.
SD
L RUN
RD
B RATE
STATION No.
× 10
× 1
24V
0V
+24V
24G
DA
DB
DG
FG


EX140-SMJ1

Revision history
B: New format C: Error correction D Add the precotions and chang into the latest format.

SMC Corporation

Akihabara UDX 15F,
4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, JAPAN
Phone: +81 3-5207-8249 Fax: +81 3-5298-5362
URL http://www.smcworld.com

No.EX※※-OME0011-D