No.EX※※-OMT1010-A

Operation Manual

PRODUCT NAME

SI unit for IO-Link device

MODEL / Series / Product Number

EX260-SIL1-X207
EX260-SIL1-X210
EX260-SIL3-X207

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)*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 10218-1992: Manipulating industrial robots -Safety.
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.

Safety Instructions

⚠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,whichever is first.∗2)
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.

∗2) 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 govemed by the relevant security laws and regulation of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules goveming that export are known and followed.

Operator

- ♦This operation manual is intended for those who have knowledge of machinery using pneumatic equipment, and have sufficient knowledge of assembly, operation and maintenance of such equipment. Only those persons are allowed to perform assembly, operation and maintenance.
- ♦Read and understand this operation manual carefully before assembling, operating or providing maintenance to the product.

■Safety Instructions

⚠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 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

- •When conformity to UL is required, the SI unit should be used with a UL1310 Class 2 power supply.
- •The SI unit is a UL 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.
IP67 protection cannot be guaranteed if the screws are not tightened to the specified torque.

•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.

•Separate the power line for output devices from the power line for control.
Otherwise noise or induced surge voltage can cause malfunction.

∗Environment

•Select the proper type of protection according to the environment of operation.
IP67 protection is achieved when the following conditions are met.
(1) The units are connected properly with fieldbus cable with M12 connector and power cable with M12 (M8) connector.
(2) Suitable mounting of each unit and manifold valve.
If using in an environment that is exposed to water splashes, please take measures such as using a cover.

•Do not use in a place where the product could be splashed by oil or chemicals.
If the product is to be used in an environment containing oils or chemicals such as coolant or cleaning solvent, even for a short time, it may be adversely affected (damage, malfunction etc.).

•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
•Perform settings suitable for the operating conditions.
Incorrect setting can cause operation failure.
•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.
•The surface on the product may be hot.

∗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 Numbers

EX260-SIL 1 -X207

IO-Link port type

X207	IO-Link port Class A type
X210	IO-Link port Class B type

Connector type, output specification

1	M12 connector, 32 outputs, PNP (negative common) / source
3 *	M12 connector, 16 outputs, PNP (negative common) / source

*: EX260-SIL3-X207 only

Fieldbus

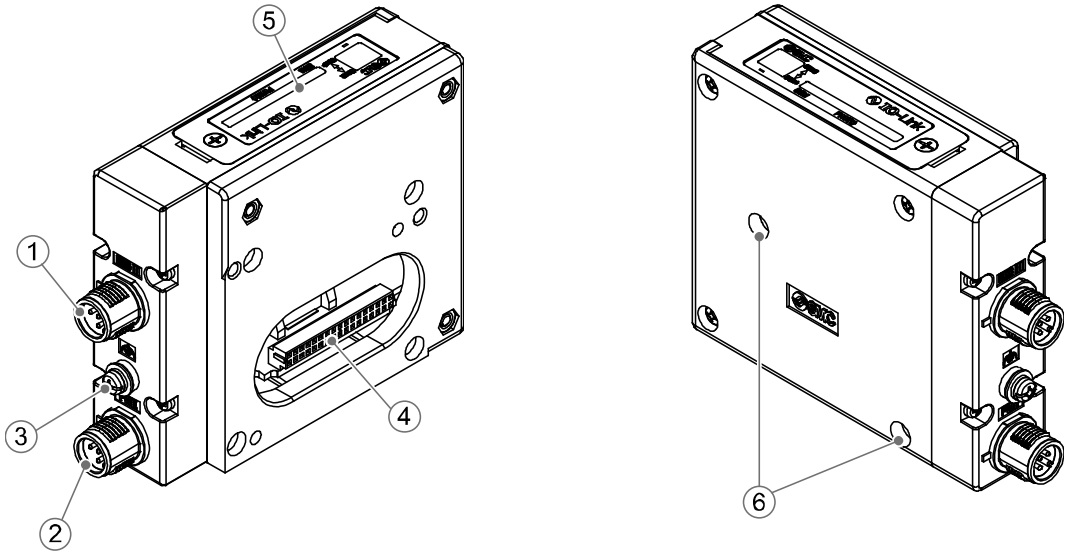
IL	IO-Link *

*: IO-Link is the first standardized IO technology worldwide (IEC 61131-9) for the communication with sensors and also actuators and it is being disseminated under a dedicated word mark/logo, IO-Link

Summary of Product

■Summary of product elements

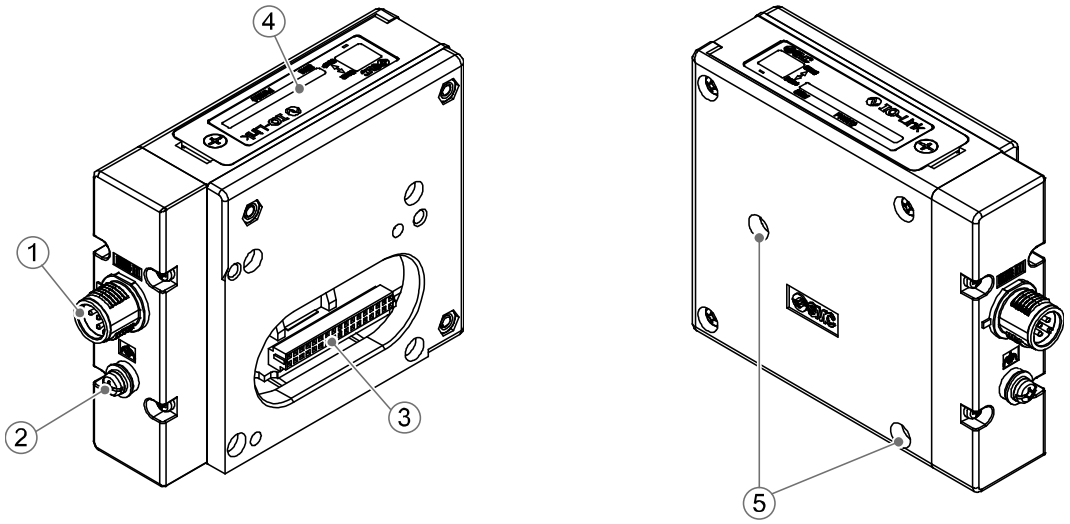
<EX260-SIL1/-SIL3-X207>



No.	Element	Description
1	IO-Link communication connector	IO-Link communication interface for the 3-wire connection (Port Class A) (M12 4-pin plug, A-coded)
2	Power supply connector	Power supply for valves (M12 5-pin plug, A-coded)
3	Ground terminal	Functional earth (M3 screw)
4	Output connector	Output signal interface for valve manifold
5	LED and switch	LED display to indicate the status of the SI unit * Switch for setting of data transmission rate (COM2 or COM3)
6	Mounting hole	Mounting hole for connection to the valve manifold

*: Refer to page 15 for the LED Indication and Switch setting.

<EX260-SIL1-X210>



No.	Element	Description
1	IO-Link communication and power supply connector	IO-Link communication interface for the 5-wire connection (Port Class B) including power supply for valves (M12 5-pin plug, A-coded)
2	Ground terminal	Functional earth (M3 screw)
3	Output connector	Output signal interface for valve manifold
4	LED and switch	LED display to indicate the status of the SI unit * Switch for setting of data transmission rate (COM2 or COM3)
5	Mounting hole	Mounting hole for connection to the valve manifold

*: Refer to page 15 for the LED Indication and Switch setting.

Accessories

Hexagon socket head cap screw	2 pcs. M3 x 30 screw for connection to the valve manifold

■Summary of product function

•I/O function

The device can control 16 outputs or 32 outputs for solenoid valve control.

•Failsafe output setting

Several output states for the IO-Link communication error can be set by parameter, either Clear Output, Force Output or Hold Last State.

•Output switching counter

The device can count the number of output switching cycles on each single output and the count value can be automatically stored in the device every hour.

∗: When the power for SI unit is turned off within one hour from the last storing to the next storing, the count value within one hour will not be stored and will return to the previously stored value.

•Device condition (diagnosis) monitoring

The device can provide information about the device condition (diagnosis) over the IO-Link.
The device can detect various error status, such as internal hardware fault and output open/short circuit.
The device can detect various warning status, such as solenoid power over-run/under-run and device temperature over-run.
Also, the device can notify when the output switching count reaches the upper limit value set by the user arbitrarily.

•Data Storage function

Data Storage is a function which enables a consistent and up-to-date set of device parameters to be stored in the Master. The main purpose of the IO-Link Data Storage mechanism is to ease the replacement of defect devices without using configuration, parameterization, or other tools.

When the user has assigned parameter values with the help of engineering tools, they are downloaded into the device and become active parameters. Upon a system command, these parameters are uploaded (copied) into the Data Storage within the Master.
The stored (saved) set of back-up parameters overwrite the active parameters (e.g. factory settings) within the compatible replacement device.

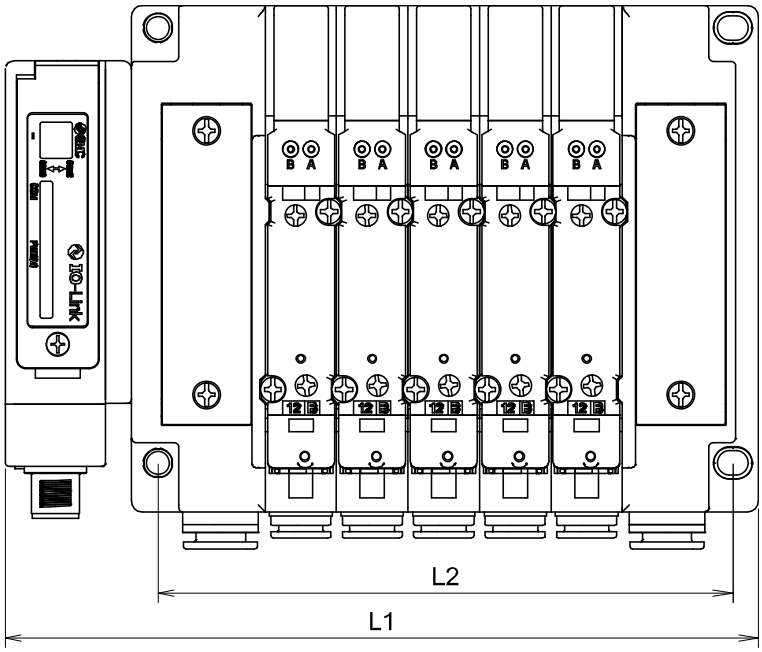
Data Storage provides three different "Backup Levels" of parameters to be defined on the Master port using engineering tools, Commissioning ("Disable"), Production ("Backup/Restore") and Production ("Restore").
"Backup" means that upload is enabled and "Restore" means that download is enabled.

Installation and Wiring

■Installation

Connect valve manifold to the SI unit.

•Dimensions for installation



n: number of valve stations

L \ n	1	2	3	4	5	6	7	8
L1		120.7	136.7	152.7	168.7	184.7	200.7	216.7
L2		80	96	112	128	144	160	176
L \ n	9	10	11	12	13	14	15	16
L1	232.7	248.7	264.7	280.7	296.7	312.7	328.7	344.7
L2	192	208	224	240	256	272	288	304

(mm)

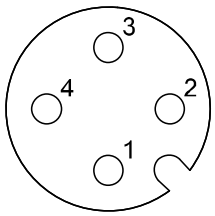
The above table shows dimensions as an example for the SY5000 series valve manifold.

■Wiring

Select the appropriate cables to mate with the connectors mounted on the SI unit.

<EX260-SIL1/SIL3-X207>

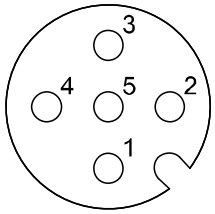
●IO-Link communication connector layout (Port Class A)



BUS IN: M12 4-pin plug, A-coded

No.	Designation	Description
1	L+	Power supply (+): +24 V for SI unit
2	-	NC
3	L−	Power supply (-): 0 V for SI unit
4	C/Q	IO-Link communication line

●Power supply connector layout

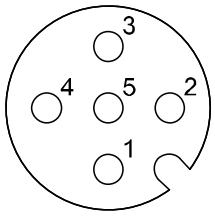


PWR: M12 5-pin plug, A-coded

No.	Designation	Description
1	-	NC
2	SV24 V	+24 V for solenoid valve
3	-	NC
4	-	NC
5	SV0 V	0 V for solenoid valve

<EX260-SIL1-X210>

●IO-Link communication and power supply connector layout (Port Class B)



BUS IN: M12 5-pin plug, A-coded

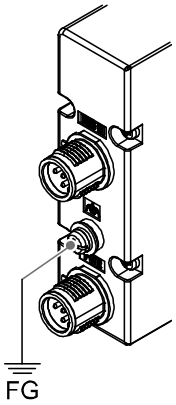
No.	Designation	Description
1	L+	Power supply (+): +24 V for SI unit
2	SV24 V	+24 V for solenoid valve
3	L-	Power supply (-): 0 V for SI unit
4	C/Q	IO-Link communication line
5	SV0 V	0 V for solenoid valve

Power-supply line for solenoid valve and power-supply line for SI unit operation are isolated.
Be sure to supply power, respectively.
Either single-source power or two different power supplies can be used.

The M12 connector cable has two types, SPEEDCON compatible and non-compatible. If both plug and socket sides have connectors for SPEEDCON, the cable can be inserted and connected by turning it a 1/2 of a rotation, leading to reduction in work hour.
A non-compatible connector can be connected to a compatible connector as well as an M12.

●Ground terminal

Connect the ground terminal to ground.
Resistance to ground should be 100 ohms or less.



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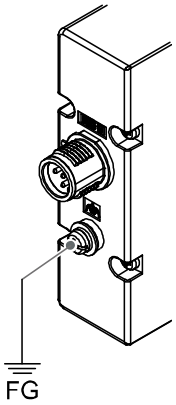
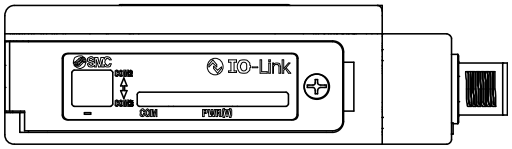
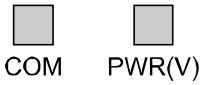


<EX260-SIL1-X210>

LED Indication, Settings and Status Monitoring



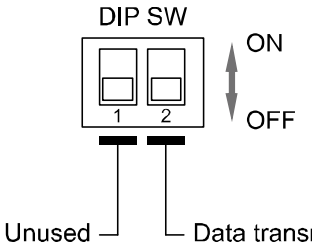
■LED indication



LED	LED Status	Description
COM	Green ON	Power ON, IO-Link communication inactive
	Green OFF	Power OFF
	Flashing Green	IO-Link communication active
PWR(V)	Green ON	Power for the solenoid valve is supplied
	OFF	Power for the solenoid valve is not supplied or outside the tolerance range (19 V or less)

■Switch setting (Data transmission rate setting)

The switch should only be set with the power supply turned off.
Open the cover and set the DIP switch with a small flat blade screwdriver.



COM2/COM3	No.2	Description
COM2	ON	COM2 (38.4 kbps)
COM3	OFF	COM3 (230.4 kbps)

∗: Default setting is COM3 (OFF).

■Parameter settings and status monitoring

●IODD file

An IODD (I/O Device Description) is a file that provides all the necessary properties to establish communication and the necessary parameters and their boundaries to establish the desired function of a sensor or actuator.
It is the set of files of the main IODD file and image files such as a vendor log, device picture and device icon.
The corresponding IODD files of each product are as follows.

	Product Number	Data Transmission rate	IODD File *
1	EX260-SIL1-X207	COM3 (230.4 kbps)	SMC-EX260-SIL1-X_COM3-yyyymmdd-IODD1.1
2	EX260-SIL1-X210		
3	EX260-SIL3-X207		SMC-EX260-SIL3-X_COM3-yyyymmdd-IODD1.1
4	EX260-SIL1-X207	COM2 (38.4 kbps)	SMC-EX260-SIL1-X_COM2-yyyymmdd-IODD1.1
5	EX260-SIL1-X210		
6	EX260-SIL3-X207		SMC-EX260-SIL3-X_COM2-yyyymmdd-IODD1.1

*: "yyyymmdd" in the file name indicates data of file creation, where yyyy is the year, mm is the month and dd is the day.

●Parameter data

The following table defines the parameters, the so-called Direct Parameter Page with a simplified access method and the ISDU parameter for complex parameters and commands.

●Data Storage

When a single parameter (Index and Subindex) is changed and the changed parameters need to be uploaded (copied) to the Master, a SystemCommand "ParamDownloadStore" needs to be sent to the Master by the user to finalise parameterization.
When entire parameters are set in the device using "block parameter" from the IO-Link Tool, a SystemCommand "ParamDownloadStore" will be sent automatically as a part of the block parameter transmission sequence.

The stored (saved) set of back-up parameters can overwrite the active parameters (e.g. factory settings) within a compatible replacement device.

Direct Parameter Page 1

DPP1 Address	Access	Parameter Name	Value
0x07	R	Vendor ID	131
0x08			
0x09	R	Device ID	289: EX260-SIL1-X207 (for COM3) EX260-SIL1-X210 (for COM3) 290: EX260-SIL1-X207 (for COM2) EX260-SIL1-X210 (for COM2) 291: EX260-SIL3-X207 (for COM3) 292: EX260-SIL3-X207 (for COM2)
0x0A			
0x0B			

ISDU Parameters

ISDU		Access	Parameter Name	Value
Index (dec)	Sub-Index			
0x0002 (2)	0	W	SystemCommand	Refer to page 18 "Coding of System Command" for details
0x000C (12)	0	R/W	Device Access Locks	Refer to page 19 "Device Access Locks" for details
0x0010 (16)	0	R	Vendor Name	SMC Corporation
0x0011 (17)	0	R	Vendor Text	www.smcworld.com
0x0012 (18)	0	R	Product Name	e.g. EX260-SIL1-X207_COM3
0x0013 (19)	0	R	Product ID	e.g. EX260-SIL1-X207
0x0014 (20)	0	R	Product Text	SI unit
0x0015 (21)	0	R	Serial Number	"xxxxxxxxxxxxxxxx" *1
0x0016 (22)	0	R	Hardware Revision	HW-Vx.y *2
0x0017 (23)	0	R	Software Revision	FW-Vx.y *2
0x0018 (24)	0	R/W	Application Specific Tag	" ******************************** " *3
0x0024 (36)	0	R	Device Status	Refer to page 19 "Device Status parameter" for details
0x0025 (37)	1..8	R	Detailed Device Status	Refer to page 19 "Detailed Device Status parameter" for details

∗1: The data type is a character string with a fixed length of 16 octets.

∗2: Where "x" is the major revision number, "y" is the minor revision number.

∗3: The data type is a character string with a length from 16 to 32 octets.

Coding of SystemCommand (index 2)

For ParamDownloadStore, Device reset, Application reset, Restore factory settings or Output switching count value reset, the ISDU Index 0x002 (SystemCommand) should be used.
The coding of SystemCommand is specified in the following table.
The buttons, a command interface to the Device, labelled with the following command name (except ParamDownloadStore) are displayed in the IO-Link Tool. Each command is sent to the Device when the button is clicked.

Command (dec)	Command name	Definition
0x05 (5)	ParamDownloadStore	Device initiates a new Data Storage upload to the Master
0x80 (128)	Device reset	Device to perform a "warm start". Device is reset to an initial state such as power-on
0x81 (129)	Application reset	All outputs switching count value are cleared
0x82 (130)	Restore factory settings	All parameter values are restored to factory default setting and all output count values are cleared
0xA0 (160)	OUT0 count value reset	Output 0 count value is cleared
0xA1 (161)	OUT1 count value reset	Output 1 count value is cleared
0xA2 (162)	OUT2 count value reset	Output 2 count value is cleared
⋮	⋮	⋮
0xAA (170)	OUT10 count value reset	Output 10 count value is cleared
⋮	⋮	⋮
0xAF (175)	OUT15 count value reset	Output 15 count value is cleared
⋮	⋮	⋮
0xBE (190)	OUT30 count value reset	Output 30 count value is cleared
0xBF (191)	OUT31 count value reset	Output 31 count value is cleared

Device Access Locks (index 12)

For Device Access Locks, the following Device locking possibilities are specified.

Value	Definition
0	unlocked
1	parameter (write) access locked
2	data storage locked
3	parameter (write) access locked and data storage locked

Parameter (write) access:
If the "Parameter (write) access" bit is set in the Device, write access to all Device parameters over the IO-Link communication is inhibited for all read/write parameters of the Device except the parameter Device Access Locks. The Device responds with the negative service response - access denied - to a write access, if the parameter access is locked.
Read access is not affected.

Note that the parameter (write) access lock does not block downloads of the Device Storage mechanism.

Data Storage:
If the "Data storage" bit is set in the Device, the Data Storage mechanism is disabled. In this case, the Device responds with a negative service response – access denied - to a write access.
Read access to its Data Storage Index is not affected.

Device Status parameter (index 36)

For Device status, the following Device conditions are specified.

Value	Status definition	Details
0	In normal operation	-
1	Maintenance-Required	Output Switching counter value over-run
2	Out-of-Specification	Solenoid power voltage over-run Solenoid power voltage under-run
3	Functional-Check	N/A
4	Failure	- Device hardware fault - Device other internal fault - Output short circuit - Output open circuit

Detailed Device Status parameter (index 37)

For Detailed Device status, the following events are specified.

Sub-index	Event definition	Event category	Event code
1	Device hardware fault	Error	0x5000
2	Non volatile memory loss	Error	0x5011
3	Output short circuit	Error	0x7710
4	Output open circuit	Error	0x1810
5	Solenoid power supply voltage over-run	Warning	0x1820
6	Solenoid power supply voltage under-run	Warning	0x1821
7	Device internal temperature over-run	Warning	0x4210
8	Output switching count value over-run	Notification	0x1830

Application Specific Parameters

Index (dec)	Sub-index	Access	Parameter name	Type	Default	Description
0x40 (64)	1,2	R/W	Failsafe Output	U16[2]	{0,0}	The failsafe behavior for every output signal OUT0 to OUT15.
0x41 (65)	1,2	R/W	Failsafe Output	U16[2]	{0,0}	The failsafe behavior for every output signal OUT16 to OUT31.
0x44 (68)	1..32	R	Output Switching Counts	U32[32]	{0,0…}	Counts the number of switching events of each output and the count value can be automatically stored in the device every hour. * If a counter reaches the maximum 4,294,967,295, it is locked at this value and does not return to zero.
0x46 (70)	0	R/W	Output Open Circuit Detection	U16	{0}	The output open circuit detection setting for every output line OUT0 to OUT15. 0: disabled 1: enabled
0x47 (71)	0	R/W	Output Open Circuit Detection	U16	{0}	The output open circuit detection setting for every output line OUT16 to OUT31. 0: disabled 1: enabled
0x49 (73)	1,2	R	Output Wire Status	U16[2]	{0,0}	The output wire status for every output signal OUT0 to OUT15, the sub-index1 indicates the open circuit status and sub-index2 indicates the short circuit status. 0: normal 1: open circuit, short circuit
0x4A (74)	1,2	R	Output Wire Status	U16[2]	{0,0}	The output wire status for every output signal OUT16 to OUT31, the sub-index1 indicates the open circuit status and sub-index2 indicates the short circuit status. 0: normal 1: open circuit, short circuit
0x4B (75)	0	R/W	Output Switching Counts Set Point	U32	4294967295	The set point of output switching counts between 0 to 4294967295. Once the set point is reached, a notification event "Output switching count value over-run" is generated.

*: Output switching is counted under the following condition.

•Output is switched from low to high, or

•Solenoid valve power is switched from OFF to ON while output is ON

When the device is in an error state such as Device hardware fault, Output open/short circuit or solenoid power over-run/under-run, output switching will not be counted.

Structure of Failsafe Output parameter (index 64)

The Failsafe output parameter (index 64) consists of two sub-indices that represent bit fields with a size of 16 bits each. Bit 0 in the bit field corresponds to output line 0, Bit 1 to output line 1 and so on.
Thus every output line has two bits. The coding of the two bits is shown in the table below:

Sub-index 1	Sub-index 2	Failsafe state
0	0	Clear (OFF)
0	1	Set (ON)
1	x	Hold Last State

The following table shows an example of failsafe output setting for Output 0 to Output 15:

When the failsafe state of each output is set, sub-index1 and sub-index2 will be as follows
OUTPUT 0..3: Clear
OUTPUT 4..7: Set
OUTPUT 8..11: Clear
OUTPUT 12..15: Hold Last State
Sub-index 1: F0 00
Sub-index 2: 00 F0

OUTPUT																	
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**		
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Bit in Word**	
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	F0 00	Sub-index 1
0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	00 F0	Sub-index 2
Hold				Clear				Set				Clear				Failsafe state	

Structure of Failsafe Output parameter (index 65)

Similar to index 64, parameter index 65 consists of two sub-indices that represent bit fields with a size of 16 bits each. Bit 0 in the bit field corresponds to output line 16, Bit 1 to output line 17 and so on.
Thus every output line has two bits. The coding of the two bits is shown in the table below:

The following table shows an example of failsafe output setting for Output 16 to Output 31:

When the failsafe state of each output is set, sub-index1 and sub-index2 will be as follows
OUTPUT 16..19: Clear
OUTPUT 20..23: Set
OUTPUT 24..27: Clear
OUTPUT 28..31: Hold Last State
Sub-index 1: F0 00
Sub-index 2: 00 F0

OUTPUT																	
31	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**		
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Bit in Word**	
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	F0 00	Sub-index 1
0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	00 F0	Sub-index 2
Hold				Clear				Set				Clear				Failsafe state	

Structure of Output Switching Counts (index68)

The output switching count parameter consists of thirty-two sub-indices that represent bit fields with a size of 32 bits each. Sub-index 1 corresponds to output line 0 cycle count, Sub-index 2 to output line 1 cycle count and so on.
The following table shows an example of switching cycle count value 10.000.000 cycles:
10.000.000(dec) = 00 98 96 80(hex)

Output Switching Counts																Sub-index "n"
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Bit in lower two bytes**
1	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	96 80
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Bit in upper two bytes**
0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	00 98

For details of conditions that output switching count, refer to note out of the table in page 20.

Structure of Output Open Circuit Detection parameter (index 70)

The Output open circuit detection parameter (index70) represent bit fields with a size of 16 bits.
Bit 0 in the bit field corresponds to output line 0, Bit 1 to output line 1 and so on.
The coding of this bit is shown in the table below:

The following table shows an example of output open circuit detection setting for Output 0 to Output 15:

When set the output open circuit detection setting is as follows,
OUTPUT 0..11: Disabled
OUTPUT 12..15: Enabled
Value: F0 00

OUTPUT																
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Bit in Word**
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	F0 00
Enabled				Disabled				Disabled				Disabled				Enabled / Disabled

Structure of Output Open Circuit Detection parameter (index 71)

Similar to index 70, parameter index 71 represents bit fields with a size of 16 bits.
Bit 0 in the bit field corresponds to output line 16, Bit 1 to output line 17 and so on.
The coding of this bit is shown in the table below:

The following table shows an example of output open circuit detection setting for Output 16 to Output 31:

When set the output open circuit detection setting is as follows,
OUTPUT 16..27: Disabled
OUTPUT 28..31: Enabled
Value: F0 00

OUTPUT																
31	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**	
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Bit in Word**
1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	F0 00
Enabled				Disabled				Disabled				Disabled				Enabled / Disabled

Structure of Output Wire Status parameter (index 73)

The Output wire status parameter (index 73) consists of two sub-indices that represent bit fields with a size of 16 bits each. Bit 0 in the bit field corresponds to output line 0, Bit 1 to output line 1 and so on.
Thus every output line has two bits. The coding of the two bits is shown in the table below:

Sub-index	value	status
Sub-index 1 (Output open circuit)	0	Normal
	1	Failed
Sub-index 2 (Output short circuit)	0	Normal
	1	Failed

The following table shows an example of output wire status for Output 0 to Output 15:

When each output wire status is as follows, sub-index1 and sub-index2 will be as follows
OUTPUT 0, 1: short circuit
OUTPUT 2..13: normal
OUTPUT 14, 15: open circuit (wire brake)
Sub-index 1: C0 00
Sub-index 2: 00 03

OUTPUT																	
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**		
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Bit in Word**	
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C0 00	Sub-index 1
opened		normal		normal				normal				normal				Wire status (open)	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	00 03	Sub-index 2
normal				normal				normal				normal		shorted		Wire status (short)	

Structure of Output Wire Status parameter (index 74)

Similar to index 73, parameter index 74 consists of two sub-indices that represent bit fields with a size of 16 bits each. Bit 0 in the bit field corresponds to output line 16, Bit 1 to output line 17 and so on.
Thus every output line has two bits. The coding of this two bits is shown in the table below:

The following table shows an example of output wire status for Output 16 to Output 31:

When each output wire status is as follows, sub-index1 and sub-index2 will be as follows
OUTPUT 16, 17: short circuit
OUTPUT 18..29: normal
OUTPUT 30, 31: open circuit (wire brake)
Sub-index 1: C0 00
Sub-index 2: 00 03

OUTPUT																	
31	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**		
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Bit in Word**	
1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	C0 00	Sub-index 1
opened		normal		normal				normal				normal				Wire status (open)	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	00 03	Sub-index 2
normal				normal				normal				normal		shorted		Wire status (short)	

Structure of Output Switching Counts Set Point (index75)

The Output switching count set point parameter represents a bit field with a size of 32 bits.
Any number of output switching count set points, which is a common number to all outputs, up to 4,294,967,295 (0x FFFFFFFF) can be set in a 32 bit field.
Once the count value reaches the set point, a notification event "Output switching count valve over-run" is generated.

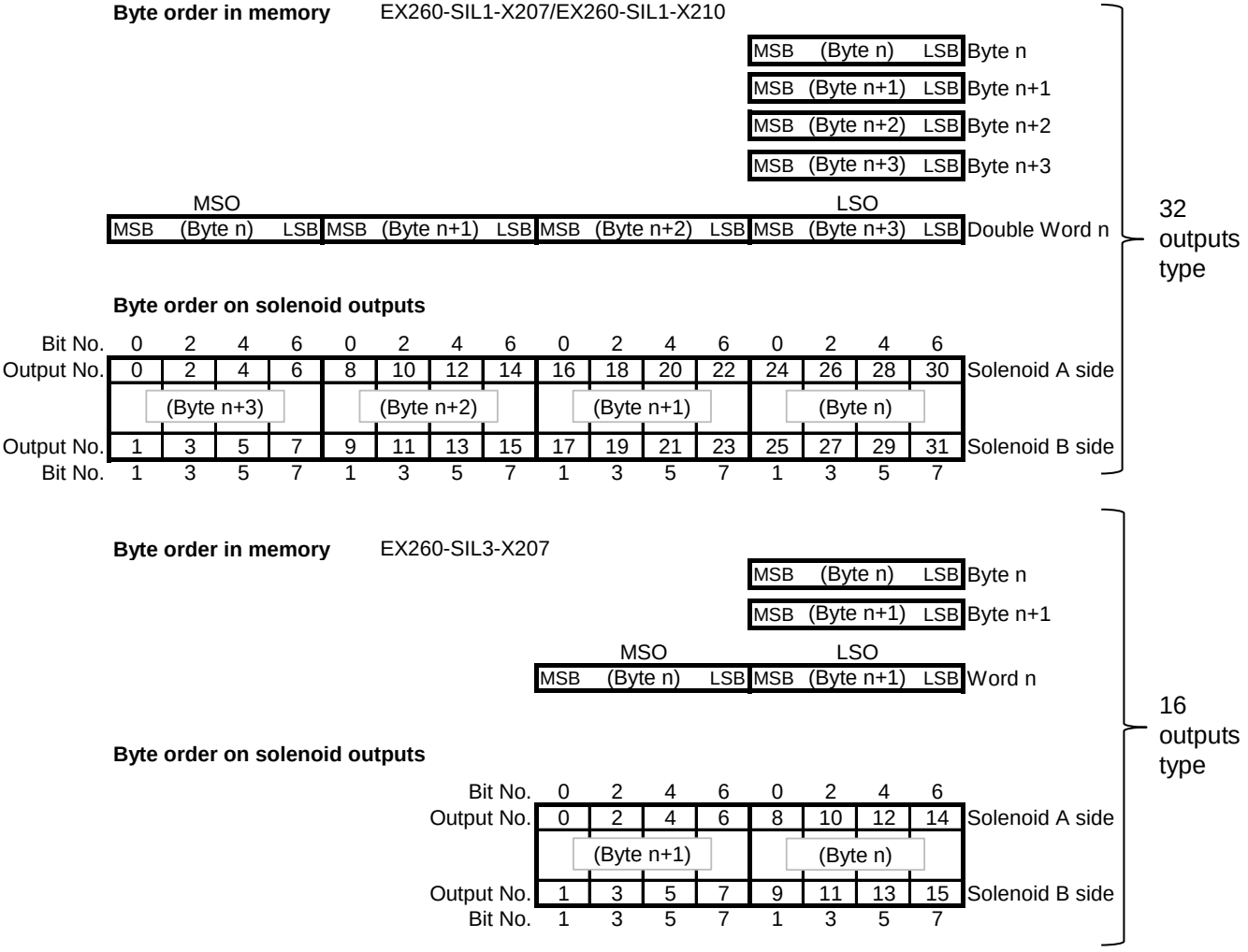
The following table shows an example of a switching count set point with 50.000.000 cycles:
50.000.000(dec) = 02 FA F0 80(hex)

Output Switching Counts Set Point																
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Bit in lower two bytes**
1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	F0 80
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	**Bit in upper two bytes**
0	0	0	0	0	0	1	0	1	1	1	1	1	0	1	0	02 FA

- Output number layout

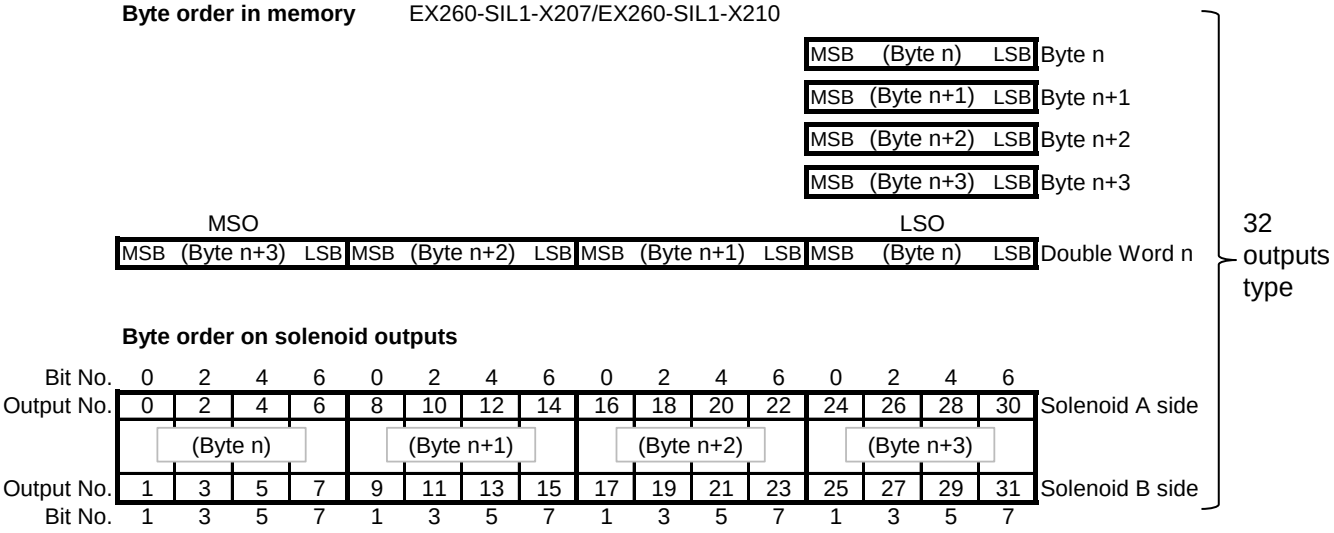
The product is designed in a 16 bit length (WORD based data type) or 32 bit length (Double WORD based data type) for the process data, so the byte order on the solenoid output depends on the PLC memory type, either big endian or little endian.
The following illustration shows the byte order in each case.

For PLC with the Big Endian byte order memory



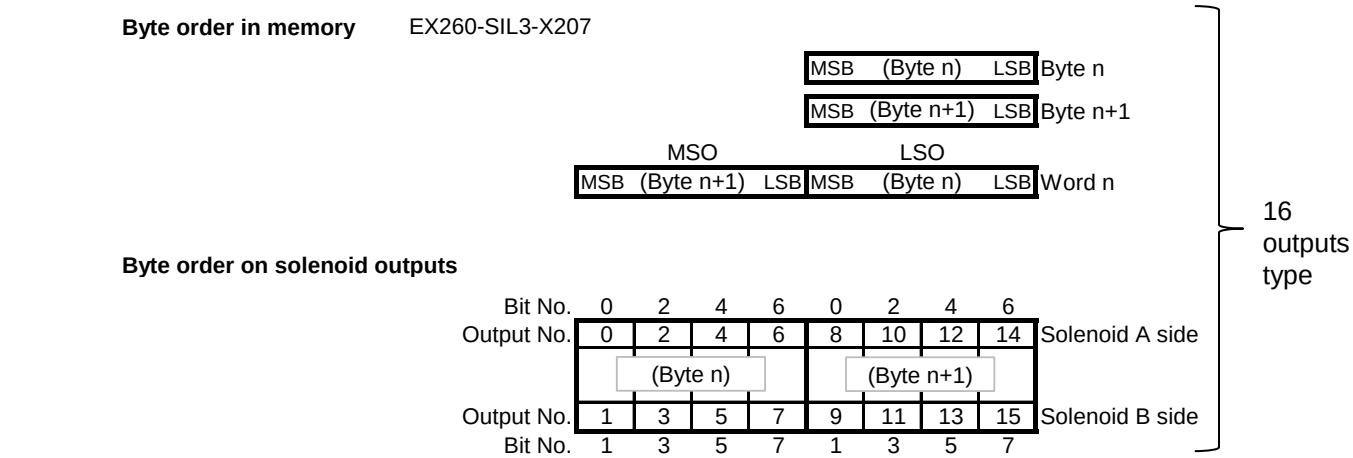
For PLC with the Little Endian byte order memory

Byte order in memory EX260-SIL1-X207/EX260-SIL1-X210



Byte order on solenoid outputs

Byte order in memory EX260-SIL3-X207



Byte order on solenoid outputs

The output numbering refers to the solenoid position on the manifold and starts at zero.
Standard wiring of the manifold is for a double-solenoid valve. The output number starts at the A side and then B side in that order as shown in figure a.
If a single-solenoid valve is mounted on the standard wiring manifold, the output number for the B side valve is skipped.
Custom wiring for the mixed mounting single-solenoid valves and the double-solenoid-valves can be specified with a Wiring Specification Sheet. Example wiring is shown in figure b.
Bit status "0" and "1" in the data corresponds to solenoid valve status OFF and ON (0: OFF, 1: ON), and the output number starts at zero from LSB (least significant bit).

fig.a

	No.	Station No.	
Double	4	3	5
Single	2	2	3 free
Double	0	1	1

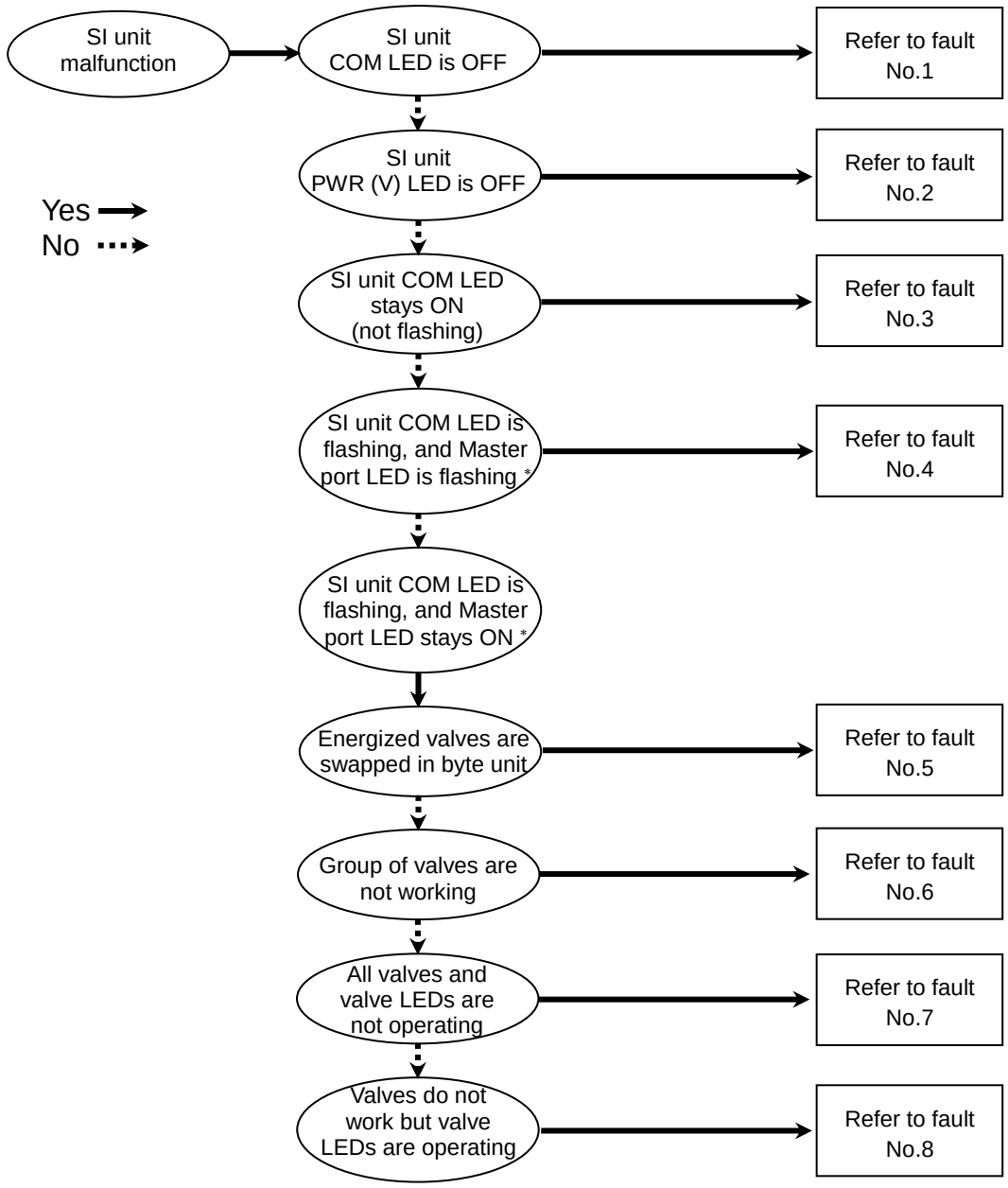
fig.b

	No.	Station No.	
Double	3	3	4
Single	2	2	-
Double	0	1	1

Troubleshooting and Maintenance

○Troubleshooting chart

When any malfunction is observed, it is recommended to perform the following troubleshooting.



∗: Depending on the master, the behavior of the port LED may be different. For details, please check the specifications of your master.

○Troubleshooting table

Fault No.1

Fault	Probable cause	Recommended error handling	Recommended action
SI unit COM LED is OFF	Defective IO-Link cable wiring for SI unit operation	Check the condition of the IO-Link cable wiring to the SI unit.	Re-tighten the IO-Link cable. (Replace the cable if it is broken)
			Correct the IO-Link cable wiring layout.
	SI unit operating voltage is not supplied from the IO-Link Master	Check the condition of the supply voltage on the IO-Link Master.	Supply 20 VDC to 30 VDC to the IO-Link Master.

Fault No.2

Fault	Probable cause	Recommended error handling	Recommended action
SI unit PWR (V) LED is OFF	Defective power cable wiring for the solenoid valve	Check the condition of the power cable wiring for the valve.	Re-tighten the power cable. (Replace the cable if it is broken)
			Correct the power cable wiring layout.
	Load voltage for the valve is not supplied	Check the condition of the supply voltage for the valve.	Supply 24 VDC +10%/−5% to the valves.

Fault No.3

Fault	Probable cause	Recommended error handling	Recommended action
SI unit COM LED stays ON (not flashing)	IO-Link communication is inactive	If the Master port LED in which the SI unit is connected is flashing Green, * Check the IO-Link cable connection.	Make sure there is no broken wire between the Master and the SI unit. (Replace the cable if it is broken) Correct the IO-Link wiring layout. Tighten the IO-Link connector correctly.
		If the Master port LED in which the SI unit is connected is OFF, * Check the IO-Link port configuration on the Master.	Configure pin 4 to IO-Link for the IO-Link port of the IO-Link master.
			Configure process data length properly for the IO-Link port of the IO-Link master. (Process data length of IO-Link port of the master should be larger than that of the connected SI unit)

∗: Depending on the master, the behavior of the port LED may be different. For details, please check the specifications of your master.

Fault No.4

Fault	Probable cause	Recommended error handling	Recommended action
SI unit COM LED is flashing, and Master port LED is flashing *	Master port has rejected the Device due to incompatible Device identification	If the inspection level of the Master port in which the SI unit is connected is TYPE_COMP, Check the Device ID of the SI unit.	Connect the SI unit with a Device ID that matches the ID configured in the Master port.
		If the inspection level of the Master port in which the SI unit is connected is IDENTICAL, Check the Serial Number of the SI unit.	Connect the SI unit with a Serial Number that matches the Serial Number configured in the Master port.
	IO-Link communication is active, but not in Operate mode	Check the parameter setting of the Data Storage Device Access Locks in the SI unit and the parameter setting of the Data Storage Backup Level in the Master.	Unlock the parameter for Data Storage Device Access Locks in the SI unit, or Disable the parameter for Data Storage Download of the Master port.

*: Depending on the master, the behavior of the port LED may be different. For details, please check the specifications of your master.

Fault No.5

Fault	Probable cause	Recommended error handling	Recommended action
Energized valves are swapped in the byte unit	Incorrect output assignment of the PLC programming	Check the PLC type of storing Words in memory, either big endian type or little endian type.	Assign the output on the PLC programming based on an endian type of PLC memory. Refer to page 25 and 26 of this document for details.

Fault No.6

Fault	Probable cause	Recommended error handling	Recommended action
Group of valves not working	Too many valves	Check if solenoid count does not exceed the allowable number. This depends on the SI unit model and valve series. Allowable solenoid number by valve series: SY/SV/S0700 series: 32 points VQC series: 24 points	Keep the number of mounted solenoid valves within specification.

Fault No.7

Fault	Probable cause	Recommended error handling	Recommended action
All valves and valve LEDs are not operating	Poor connection between SI unit and valve manifold	Check if there are any loose screws making the connection between the SI unit and the valve manifold.	Tighten the screws with the specified tightening torque (i.e. 0.6 Nm) and make sure there is no gap between the SI unit and the valve manifold.
	Mismatch polarity between solenoid valve and SI unit output	Check if the solenoid valve common specification matches the output polarity of the SI unit.	Match polarity between solenoid valve and SI unit output.
	Defective solenoid valve	Follow the troubleshooting for the solenoid valve.	Same as left.

Fault No.8

Fault	Probable cause	Recommended error handling	Recommended action
Valves do not work but valve LEDs are operating	Mismatch polarity between solenoid valve and SI unit output	Check if the solenoid valve common specification matches the output polarity of the SI unit.	Match polarity between solenoid valve and SI unit output.

■Maintenance

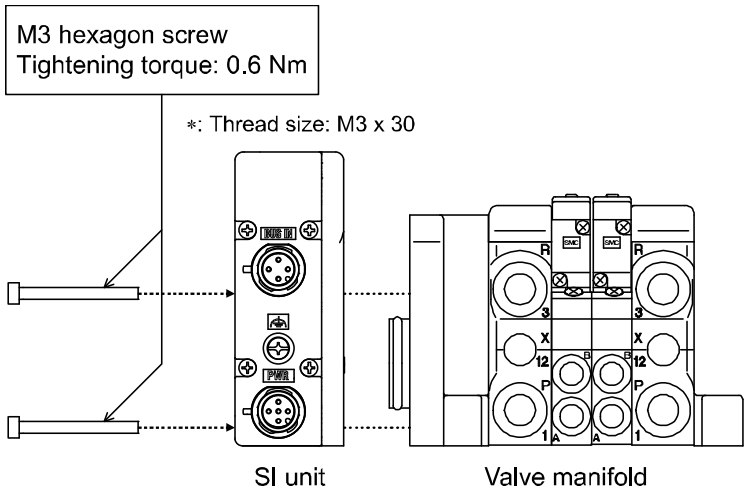
Replacement of the SI unit

•Remove the M3 hexagon screws from the SI unit and release the SI unit from the valve manifold.
•Replace the SI unit.
•Tighten the screws with the specified tightening torque. (0.6 Nm)

Precautions for maintenance

(1) Be sure to switch off the power.
(2) Check there is no foreign matter inside the SI unit.
(3) Check there is no damage and no foreign matter on the gasket.
(4) Be sure to tighten the screws with the specified torque.
If the SI unit is not assembled properly, inside PCBs may be damaged or liquid and/or dust may enter into the unit.

○Assembly and disassembly of the SI unit



Specification

■Specifications

General specifications

Item	Specifications
Ambient temperature	−10 to +50 ºC
Ambient humidity	35 to 85%RH (No condensate)
Ambient temperature for storage	−20 to +60 ºC
Withstand voltage	500 VAC applied for 1 minute
Insulation resistance	500 VDC, 10 MΩ or more
Operating atmosphere	No corrosive gas
Enclosure	IP67
Weight	200 g or less

Electrical specifications

Item		Specifications
Current consumption in power supply voltage range	SI unit power supply	18 to 30 VDC 0.1 A max.
	Solenoid valve power supply	22.8 to 26.4 VDC 2.0 A or less (EX260-SIL1-X207 and X210)/1.0 A or less (EX260-SIL3-X207), according to the solenoid valve station specification
Solenoid valve connecting specification	Output type	PNP (negative common) / source
	Connected load	Solenoid valve with surge voltage suppressor of 24 VDC and 1.5 W or less (manufactured by SMC)
	Insulation type	Photo coupler insulation type
	Residual voltage	0.4 VDC or less

IO-Link communication specifications

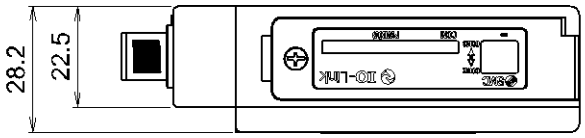
Item		Specifications
Protocol		IO-Link version 1.1
Data transmission rate		230.4 Kbps (COM3) or 38.4 kbps (COM2) selectable
Process data minimum cycle time	EX260-SIL1-X207 (COM3) EX260-SIL1-X210 (COM3)	0.8 ms
	EX260-SIL1-X207 (COM2) EX260-SIL1-X210 (COM2)	3.4 ms
	EX260-SIL3-X207 (COM3)	0.5 ms
	EX260-SIL3-X207 (COM2)	2.5 ms
Process data length	EX260-SIL1-X207 EX260-SIL1-X210	4 bytes OUT
	EX260-SIL3-X207	2 bytes OUT
Number of outputs	EX260-SIL1-X207 EX260-SIL1-X210	32 outputs
	EX260-SIL3-X207	16 outputs
Vendor ID		83 hex
Device ID	EX260-SIL1-X207 (COM3)	121 hex
	EX260-SIL1-X210 (COM3)	
	EX260-SIL1-X207 (COM2)	122 hex
	EX260-SIL1-X210 (COM2)	
	EX260-SIL3-X207 (COM3)	123 hex
	EX260-SIL3-X207 (COM2)	124 hex

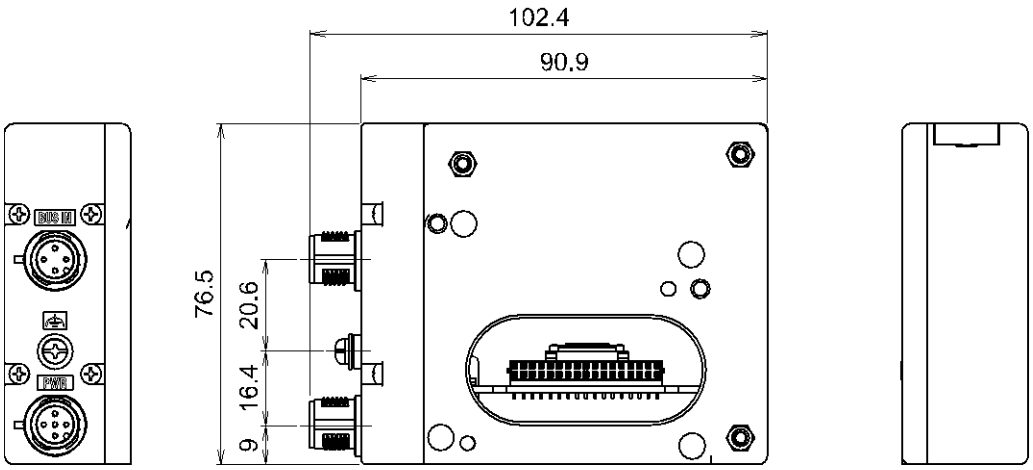
Applicable valve series

Valve Series	
SY series	SY3000, SY5000, SY7000
VQC series	VQC1000, VQC2000, VQC4000
SV series	SV1000, SV2000, SV3000 (10 type tie-rod base)
S0700 series	S0700

■Dimensions

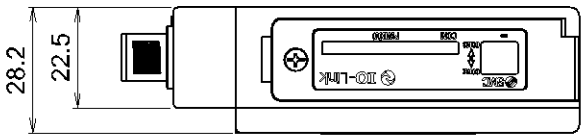
<EX260-SIL1-X207/ EX260-SIL3-X207>

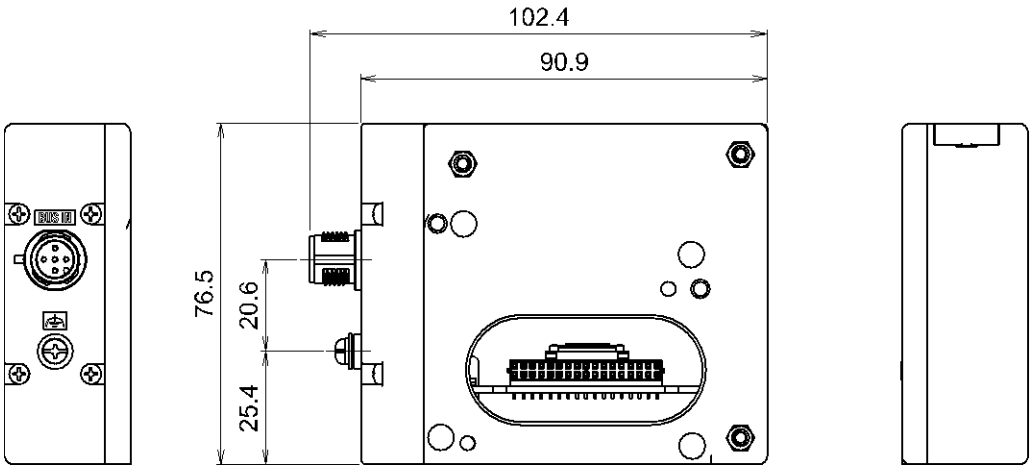




•If a fieldwireable connector is used for the power supply connection, and the SI unit is installed directly to a valve manifold, the connector should be ϕ16 mm or less.
If the connector is a larger diameter it will interfere with the clamping face.

<EX260-SIL1-X210>





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