



Operation Manual

SI Unit – Lightbus[®] compatible

PRODUCT NAME

EX250-SLB1-DE

MODE / Series

SMC Corporation

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Safety Instructions

This manual contains essential information for the protection of users and others from possible injury and property damage and to ensure correct handling.

Please confirm that you understand the definition of the following messages (signs) before going on to read the text, and always follow the instructions.

Please read and understand the operation manuals of related apparatus before use.

◆ Indications

IMPORTANT MESSAGES	
Read this manual and follow its instructions. Signal words such as WARNING, CAUTION and NOTE, will be followed by important safety information that must be carefully reviewed.	
▲WARNING	Indicates a potentially hazardous situation which could result in death or serious injury if you do not follow instructions.
▲CAUTION	Indicates a potentially hazardous situation which if not avoided, may result in minor injury or moderate injury.
NOTE	Gives you helpful information.

◆ 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 SI Unit.

◆ Usage Restrictions

- ◆ This product is designed for use in general equipment for factory automation. Never use this product with equipment or apparatus that directly concerns human lives*¹, or in which a malfunction or failure can cause a great loss.
 - *1: Equipment or apparatus that directly concerns human lives refers to the following:
 - Medical equipment such as life support systems or equipment used in operating rooms
 - Compulsory equipment required by law such as the Fire Prevention Law, Construction Law and etc.
 - Equipment or apparatus that conforms with those mentioned above.
- ◆ Contact our sales department when plans are made for the product to be used for a system*² or equipment that concerns itself with the safety of persons or that seriously affects the public. Such usage requires special consideration*³.
 - *2: A system or equipment that concerns the safety of persons or that seriously affects the public refers to the following:
 - Nuclear reactor control systems in nuclear power plants, safety protection systems or other systems important for safety in nuclear power facilities
 - Driving control systems of mass transportation systems, and flight control systems
 - Equipment or apparatus that comes into contact with foods or beverages
 - *3: Special consideration means discussing usage with our engineers to establish a safe system designed as fool-proof, fail-safe, redundant etc.
- ◆ Special consideration of safety or maintainability should be taken to prevent hazard or loss caused by a failure or malfunction that is likely to occur in certain probability due to environmental stress (deterioration). Special consideration means to fully review the equipment or apparatus during the design stage and to establish a backup system in advance, such as a redundant system or fail-safe system.

⚠WARNING

- ◆ The compatibility of pneumatic equipment is the responsibility of the person who designs the pneumatic system or decides its specifications.
Since the products specified here are used in various operating conditions, their compatibility with the specific pneumatic system must be based on specifications or after analysis and / or tests to meet your specific requirements.
 - ◆ Only trained personnel should operate pneumatically operated machinery and equipment.
Compressed air can be dangerous if an operator is unfamiliar with it. Assembly, handling or repair of pneumatic systems should be performed by trained and experienced operators.
 - ◆ Do not service machinery / equipment or attempt to remove components until safety is confirmed.
 1. Inspection and maintenance of machinery /equipment should only be performed after confirmation of safe locked-out control positions.
 2. When equipment is to be removed, confirm the safety process as mentioned above. Cut the supply pressure for the equipment and exhaust all residual compressed air in the system.
 3. Before machinery / equipment is re-started, take measures to prevent quick movements of the cylinder piston rod etc. (Supply air into the system gradually to create back-pressure.)
 - ◆ Contact SMC if the product is to be used in any of the following conditions:
 1. Conditions and environments beyond the given specifications, or if the product is used outdoors.
 2. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverage, recreation equipment, emergency stop circuits, press applications, or safety equipment.
 3. An application which has the possibility of having negative effects on people, property, or animals, requiring special safety analysis.
-
- ◆ Do not disassemble, modify (including change of printed circuit board) or repair.
An injury or failure can result.
-
- ◆ Do not operate the product outside of the specification range.
Fire, malfunction, or damage to the product can result.
Please use it after confirming the specification.
-
- ◆ Do not use the product in an atmosphere containing combustible, explosive or corrosive gas.
Fire, explosion or corrosion can result.
The product is not designed to be explosion-proof.
-
- ◆ The following instructions must be followed when using the product in an interlocking circuit:
 - Provide double interlocking using another system such as mechanical protection
 - Check the product regularly to ensure proper operationOtherwise malfunction can cause an accident.
-
- ◆ The following instructions must be followed while performing maintenance:
 - Turn off the power supply
 - Stop the air supply, exhaust the residual pressure and verify that the air is released to atmosphere before performing maintenanceOtherwise it can cause injury.

⚠ CAUTION

- ◆ Perform proper functional checks after maintenance.
Stop operation when an abnormality is observed or the product is not working properly.
Safety cannot be assured due to unexpected malfunction.
- ◆ Provide grounding for securing safety and noise resistance of the SI unit.
Individual grounding should be provided to the product with short distance cables.

NOTE

- Follow the instructions given below when selecting and handling the SI Unit:
 - The instructions on selection (installation, wiring, operating environment, adjustment, operation and maintenance) described below must also be followed.
- * **Product specifications**
 - Operate the SI Unit within the specified voltage.
Operation with a voltage outside of the specifications can cause malfunction or damage to the unit.
 - Reserve a space for maintenance
Remember to leave space for maintenance when designing the layout of the unit.
 - Do not remove labels.
This can lead to incorrect maintenance, or misreading operation manual could cause damage or malfunction to the unit. It may also result in non-conformity to safety standards.
- Instructions on handling
- * **Installation**
 - Do not drop, hit or apply excessive shock (1000 m/s^2) to the unit.
Otherwise it can result in damage to the unit causing failure or malfunction.
 - Follow the specified tightening torque.
Excessive tightening torque can break screws or connectors.
Refer to "Installation and Maintenance" for installation.
- * **Wiring (including plugging in/out of connector)**
 - Do not bend or apply tensile force to cables, or apply force by placing heavy load on them.
Wiring subjected to bending stress or tensile stress can cause breakage of the cables.
 - Connect wires and cables correctly.
Miswiring can damage the SI Unit depending on the miswired circuit.
 - Do not connect wires while the power is on.
Otherwise it can break the SI Unit or I/O devices causing damage or malfunction.
 - Do not lay wires or cables with power cable or high-voltage cable in the same wiring route.
Otherwise the wires to the SI Unit can be contaminated with noise or induced surge voltage from power lines or high-voltage lines causing malfunction.
Route the wires to the SI Unit and each I/O device to a wire duct or in a protective tube other than those for power lines or high-voltage lines.
 - Verify the insulation of wiring.
Poor insulation (interference with other circuit, poor insulation between terminals etc.) can introduce excessive voltage or current to the SI Unit or each I/O device causing damage.
 - Separate power lines for solenoid valves from power lines for Input and control unit.
Otherwise wires can be contaminated with noise or induced surge voltage causing malfunction.
 - Take proper measurements against noise such as noise filter when the SI Unit is incorporated in equipment or devices.
Otherwise contamination with noise can cause malfunction.

- Take special precautions with the installation of the fibre optic cables and connectors, as the SI Unit may be damaged by poor quality or incorrect connection. Refer to the optical fibre installation instructions published by Beckhoff (see <http://www.beckhoff.de>).

* 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 communication line connector and power cable M12 connector at both ends,
 2. The Input unit , Input block, SI Unit and manifold valves are installed properly.
Use a cover etc. when installing the unit in an environment where water splashes may occur.
- Take sufficient shielding measures when installing at the following places.
Insufficient measures can cause malfunction or failure.
Verify the effect of the measures after installation of the unit in equipment or devices:
 1. A place where noise due to static electricity is generated
 2. A place where electric field strength is high
 3. A place where there is radioactive irradiation
 4. A place near power lines
 5. A place where water splashes on the product.
 - Do not use the product near by a place where electric surges are generated.
Internal circuit elements of the SI Unit can deteriorate or break when equipment generating a large surge (electromagnetic lifter, high frequency induction furnace, motor, etc.) is located near the SI Unit. Provide surge protection, and avoid interference.
 - Use an SI Unit equipped with surge absorber when a surge-generating load such as a relay or solenoid valve is driven directly.
Direct drive of a load generating surge voltage can damage the SI Unit.
 - Prevent foreign matter such as remnant of wires from entering this product.
Take proper measures for the remnant not to enter the SI Unit in order to prevent failure or malfunction.
 - Do not expose the SI Unit to vibration and impact.
Otherwise it can cause failure or malfunction.
 - Keep within the specified ambient temperature range.
Otherwise it can cause malfunction.
 - Do not use the SI Unit in a place where temperature suddenly changes even if it stays within the specified range.
 - Do not expose the SI Unit to heat radiation from a heat source located nearby.
It can cause malfunction.

* Maintenance

- Before performing maintenance, make sure to turn off the power supply, stop supplied air, release the residual air in the piping into the atmosphere, and verify that the pneumatic system is open to the air.
Otherwise an unexpected operation of a system component can occur.
- Perform maintenance and check regularly
Otherwise an unexpected malfunction of the system can occur due to a malfunction of the unit.
Refer to Installation and Maintenance section for maintenance and checking methods.
- Perform a proper functional check.
Stop operation when an abnormality is observed such that the device does not work properly.
Otherwise an unexpected malfunction of the system component can occur.
- Do not use solvents such as benzene, thinner or similar to clean the SI Unit.
It can damage the surface of the body and erase the indication 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.

Names and Functions of Individual Parts

The EX250-SLB1-DE Serial Interface unit (hereinafter "SI unit") represents a passive Lightbus® slave unit of the I/O Lightbus® system. The SI unit connects SMC valve manifolds and SMC input units directly to the Lightbus® master.



Figure 1: SI unit provided with input block (left side) and valve manifold (right side).

The following is the component overview of the Lightbus® SI-unit.

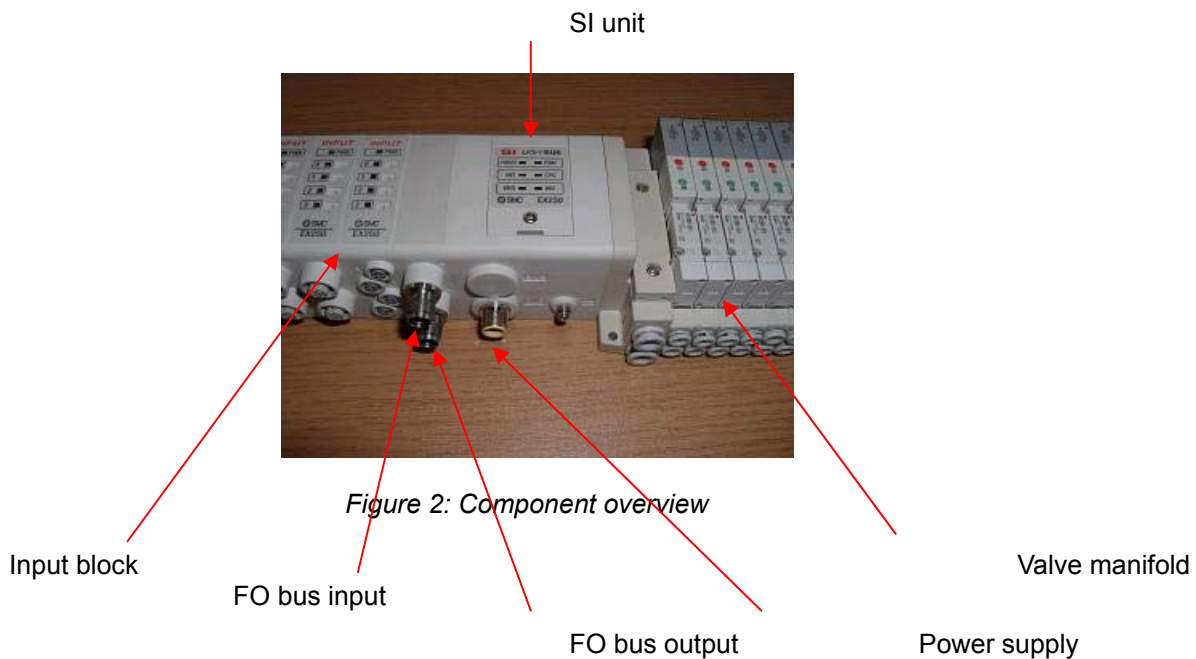


Figure 2: Component overview

LED Display

There are six LEDs located on the top of the SI unit:



Figure 6: LED indication

Description:

LED	Colour	Function
RUN	green	Power supply for the SI unit and the Input blocks. Light ON: +24V DC voltage is ok. Light OFF: +24V DC voltage is not ok (too low).
PWR(V)	green	Power supply for the Solenoid valves Light ON: +24V DC voltage is ok. Light OFF: +24V DC voltage is too low or missing.
CYC	green	Lightbus [®] cycle This LED illuminates (with a small hold time) after every received telegram from the master. In case of normal data exchange, the LED will be bright In case of small data exchange, the LED will be less bright.
ERR	red	Error Light ON: indicates there is at least one of the following errors: 1) At least one input unit has cut-off its +24VDC sensor power supply because of overload or short circuit. Check the fuse(s). 2) +24VDC valve voltage drop 3) Watch-Dog timer has detected an error Light OFF: there is no error from the above list (or it is not released by status bit)
WD	green	Watch-Dog Light ON: SI unit is receiving valid telegrams Light OFF: there is a communication error between master and SI unit Please note that the WD LED status is independent from the position of the WD switch (this switch sets safety fall back mode "clear" or "hold").
INT	orange	Transmission power (Intensity) This LED indicates the adjusted light transmission power of bus-out connector. Light ON: High Intensity Light OFF: Low Intensity (for bus-out cables, which are shorter than 10...15m) INT LED corresponds to the INT switch position.

Glossary

APF	All Plastic Fibre, type of fibre optic cable (optical waveguide)
CRC	Cyclic Redundancy Check
dBm	decibel unit $p [dmB] = 10 \lg (Px / 1mW)$
DI#, DO#	Digital Input byte, Digital Output byte No. # (# = 0, 1, 2 or 3)
EMC	Electromagnetic Compatibility
FO	Fibre optic
FPGA	Field Programmable Gate Array
hex	hexadecimal
HCS	Glass fiber optic cable
I/O	Input/Output
II/O®	Industrial Input/Output Lightbus® standard produced by Beckhoff
LED	Light Emitting Diode
MSB	Most Significant Bit
PCB	Printed Circuit Board
SI	Serial Interface (fieldbus unit for SMC valve control)
TwinCAT PLC	Control Software (Soft-PLC) produced by Beckhoff
VDC	Direct Current (DC) Voltage
VDE	"Verein Deutscher Ingenieure", Association of German Engineers

Wiring

- Power supply connector

The SI unit has one male 5 pin M12 connector for the connection of both +24V DC voltages ('SV power' = Solenoid Valve power supply, 'SI/SW' = Power supply of SI unit and input blocks).

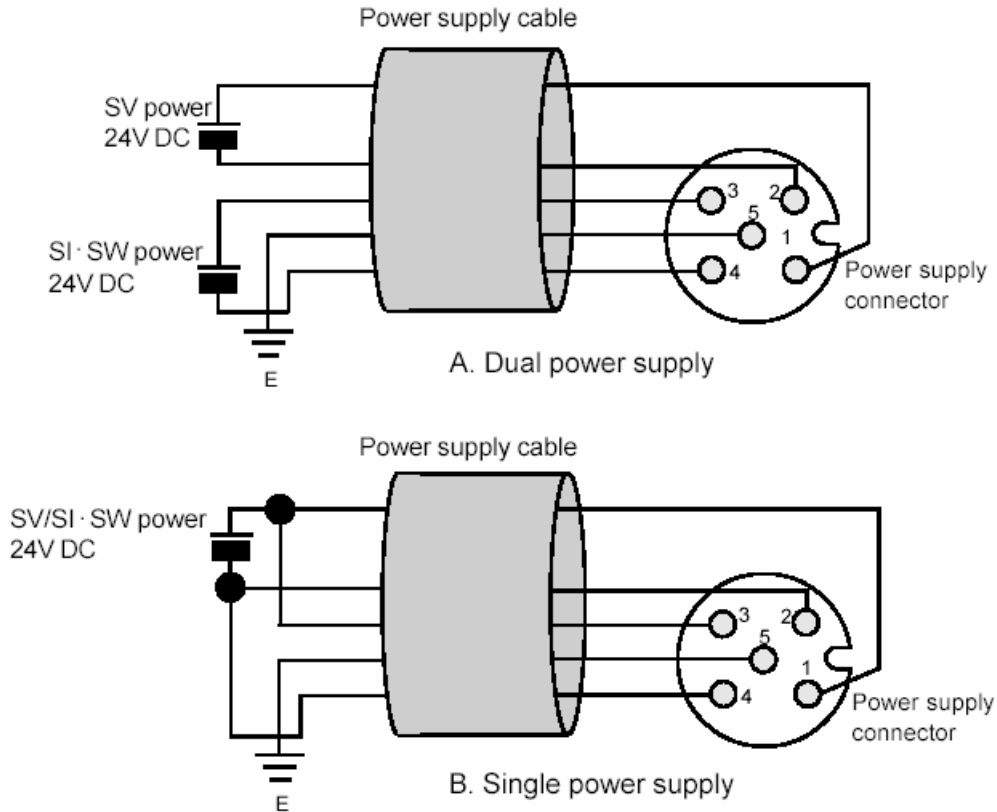


Figure 4: Power supply connector

Sensors are provided with a supply voltage via the connected input block.

Consider a voltage drop of maximum 1V inside the units for the sensor power supply.

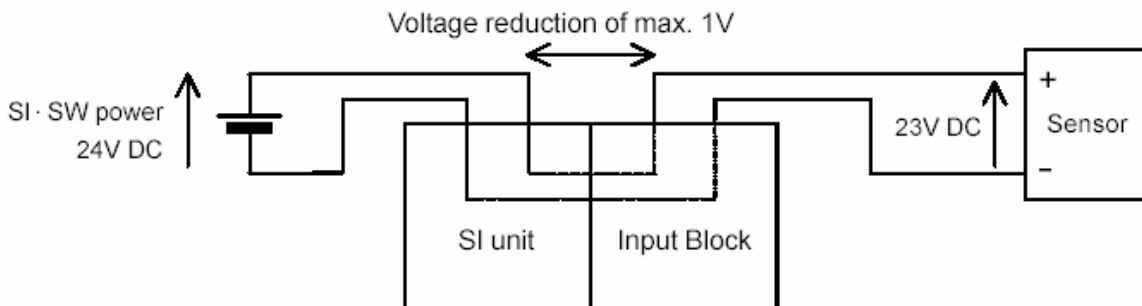


Figure 5: Voltage reduction

NOTE

For correct start up operation, ensure sufficient current supply by an appropriate power supply device for all connected Lightbus[®] slaves. Dual power supply is recommended (one for SI units and input blocks and the other for valves (load)).

Example of prepared cable + IP65 M12 (female) connector for power supply:

Order-No.: EX500-Apxxx-#

	#	Connector type:	
	A	90 ° offset	
	S	Straight line	
	xxx	Cable length:	
	010	1m	
	050	5m	

- Fibre Optic Bus connectors

The SI unit is provided with two round fibre optics bus connectors (compatible with type F-TNC, Harting ref. 20100016211, protection class: IP65).

One connector is for bus input (on top of the side view, marked "0") and the other for bus output (on bottom, marked "1").

Examples:

1. Lightbus[®] fibre optic connectors manufactured by Beckhoff

Type	Description
Z1002	Standard connector for 1000 µm/5.5 mm plastic fibre, IP 65
Z1022	Standard socket for 1000 µm/5.5 mm plastic fibre, IP 65

2. Lightbus[®] fibre optic cable, provided with both connectors by vendor TR-Systemtechnik

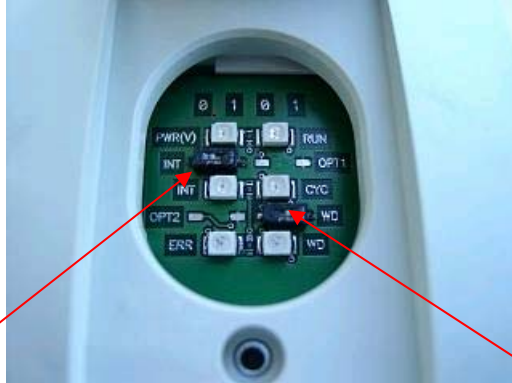
Complete Lightbus[®] cable with connectors on both ends:

TRS-KAB-LWL-MM-5.0-M-000 (...-5.0-... e.g. for 5m cable length), Order No.: 790-10042

Setting

The SI unit is provided with 2x two position sliding switches under the cover plate.

Position: "0" = left, "1" = right



INT switch

Figure 7: Switches

WD switch

1. Transmitter power (INT switch)

The INT switch is for the adjustment of the transmission power (intensity) of bus-out fibre optics signal.

Intensity	Switch position (mark on PCB)	Status/Error register bit "INT_SW" (DI2.0= bit 0, of input byte DI2, of first diagnostics telegram)	INT LED
low	left ("0")	logical 0 (low)	Light OFF
high	right ("1")	logical 1 (high)	Light ON

2. Error behaviour (WD switch)

The WD switch is for the adjustment of the safety fall back mode (clear or hold).

Safety fall back mode for valve outputs in case of error	Switch position	Status/Error register bit "CI/Hold_SW" (DI2.1= bit 1, of input byte 2, of first diagnostics telegram)
Mode: "CLEAR", in case of error all valves will go to OFF state	left (or mark "0")	logical 0 (low)
Mode: "HOLD", in case of error the last valid ON/OFF valve status will remain	right (or mark "1")	logical 1 (high)

Please note, that the WD LED does not indicate the position of WD switch!

WD LED and WD switch are fully independent from each other.

If WD LED is OFF, it indicates data communication error.

The WD switch sets the safety fall back mode of valve outputs.

NOTE

Use appropriate plastic tool for INT and WD switch adjustment. E.g. do not use electrically conductive tools that may damage the switches or the PCB !

Trouble Shooting

Behaviour	Possible cause and the proposed countermeasure
RUN LED Light OFF	+24 VDC for the SI-unit and the input modules is too low. <i>+24VDC voltage supply (M12, pin 3 and 4) should be checked.</i>
PWR(V) LED Light OFF	+24 VDC for the valves is too low or is missing. <i>+24VDC voltage supply (M12, pin 1 and 2) should be checked.</i>
CYC LED Light OFF or Dim	a) CYC LED Light OFF SI-unit does not receive telegrams from master. <i>The initialization and the I/O process data image should be checked.</i> b) CYC LED Light Dim There is a relatively low data transfer between the SI-unit and the master. <i>This does not necessarily mean an error and depends on the amount of data from the master.</i>
ERR LED Red Light ON	The sum error bit of the status register has been activated. There is at least one of the following errors: - No initialization with the master - Wrong adjustment of the INT switch - Short circuit at the inputs - Too low or no valve voltage supplied - Communication error (Watch-Dog is activated) <i>The error bits of the status register should be checked.</i>
WD LED Light OFF	The SI-unit does not receive valid telegrams, i.e. there is a communication error. <i>The data connection between the master and the SI-unit should be checked.</i>
Valve outputs oscillate	Especially in case of the switch adjustment 'CLEAR'. <i>Valve power supply should be checked and if necessary stabilized. The mask register bit EN_SOL_VPW should be activated.</i>
CRC Error counter is not zero	<i>The incoming fibre optic cable (bus-input of the SI-unit) should be checked. Are there too many loops (too small bending radius or too high attenuation values, bad fibre optic connections etc.)?</i>
CRC Error counter of the next participant (or of the master) is not zero	<i>The fibre optic cable on the bus output connector should be checked. Are there too many loops (too small bending radius or too high attenuation values, bad fibre optic connections etc.)?</i> <i>The position of the INT switch should be checked. In case of doubts (10...15m) it should be started with the low intensity (transmission power), not to overdrive the next participant (or the master).</i>
The valve outputs are not set to OFF in case of an error, but the WD switch is set to 'CLEAR'	<i>The 'Hold per bus' bit of the mask register should be set to 0.</i>
ERR LED Light OFF in case of an error	<i>The Error Reset bit of the second diagnostic telegram should be set to 0.</i>

Specification

• General specification

Item	Specification
Operation ambient temperature	+5 °C to +45 °C
Operation ambient humidity	35 to 85% RH (no dew condensation)
Vibration proof	10 to 57Hz, 0.35mm (constant amplitude) 57 to 160Hz, 50m/s ² (constant acceleration)
Impact proof	150m/s ² (peak), 11ms x three times in each direction: ±X, Y and Z
Noise immunity	Normal mode: ±1500V, pulse duration 1µs Common mode: ±1500V, pulse duration 1µs Radiation: ±1000V, pulse duration 1µs
Withstand voltage	500V AC for 1 min.
Insulation resistance	500V DC min. 10 MΩ
Operating environment	No corrosive gas and no dust
EMC, Electromagnetic Compatibility	SI unit complies with the following EMC standards: - Emission according to EN61000-6-3 - Immunity according to EN61000-6-2 (EN61000-4-2, -4-3, -4-4, -4-5, -4-6)
Fiber optic cable	APF (All Plastic Fibre) thermoplastic insulated fibre optic cable maximum 25m between each Lightbus [®] participant Note: -15...-27dBm transmission power on the bus input should be assured.
Min. bending radius of fibre optic cable	3 cm (APF)
Protection class	IP65
Weight	approximately 280 g
Dimensions	84.0 x 85.9 x 59.8 mm (length x width x height)

• Electrical Specification

Item	Specification																																				
Power supply	<p>Separate voltage supplies for valves and SI-unit electronics. Both voltages are supplied via M12 connector (5 pin, male type).</p> <p>1. For SI unit and input block: +24VDC +/-10%*</p> <p>2. For Solenoid valves +24VDC +/-10% (with protection circuit for +24VDC and 1.5W or less surge)</p> <p>Output driver type: P-channel MOS-FET, open drain, minus common Insulation type: Opto coupler type Residual voltage: < 650 mV</p> <p>Pin assignment of 5-pin M12 (male) connectors:</p> <table border="0"> <tr> <td>Pin-No.</td> <td>Voltage:</td> <td>For:</td> </tr> <tr> <td>1</td> <td>+24VDC,</td> <td>Valves(load)</td> </tr> <tr> <td>2</td> <td>0V,</td> <td>Valves (load)</td> </tr> <tr> <td>3</td> <td>+24VDC,</td> <td>SI unit and input modules</td> </tr> <tr> <td>4</td> <td>0V,</td> <td>SI unit and input modules</td> </tr> <tr> <td>5</td> <td>Shield</td> <td>Shield with limited shielding effect, since via pin (i.e. not extensive area, not low-inductive)</td> </tr> </table>	Pin-No.	Voltage:	For:	1	+24VDC,	Valves(load)	2	0V,	Valves (load)	3	+24VDC,	SI unit and input modules	4	0V,	SI unit and input modules	5	Shield	Shield with limited shielding effect, since via pin (i.e. not extensive area, not low-inductive)																		
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Current consumption	<p>Current consumption of the SI unit and the input block depends on the number and specification of connected valves, input units and sensors.</p> <p>For relatively High wattage valves (e.g. VQC type) only up to 24 single solenoid valves can be connected. For Low wattage valves (e.g. SV type) all 32 outputs can be used</p> <p><u>Example:</u></p> <p>Power consumptions of valve series: SV series: 0.65W (with LED), i.e. typ. 0.65W/24V=27mA VQC series: 1W (metal seal), i.e. typ. 1W/24V=42mA</p> <p>Total current consumption =</p> <table border="0"> <tr> <td>SI unit (32 I/O)</td> <td>+</td> <td>24 VQC solenoid valves</td> <td>+</td> <td>32 sensors</td> <td></td> </tr> <tr> <td>SI unit (32 I/O)</td> <td>+</td> <td>32 SV solenoid valves</td> <td>+</td> <td>32 sensors</td> <td></td> </tr> </table> <p>a) typical current consumption during operation</p> <table border="0"> <tr> <td>100 mA</td> <td>+</td> <td>24 x 42 mA (VQC)</td> <td>+</td> <td>32 x 30mA</td> <td>= 2.1A</td> </tr> <tr> <td>100 mA</td> <td>+</td> <td>32 x 27 mA (SV)</td> <td>+</td> <td>32 x 30mA</td> <td>= 2.0A</td> </tr> </table> <p>b) maximum current consumption during operation</p> <table border="0"> <tr> <td>105 mA</td> <td>+</td> <td>24 x 100 mA</td> <td>+</td> <td>32 x 60mA</td> <td>= 4.42A</td> </tr> <tr> <td>105 mA</td> <td>+</td> <td>32 x 100 mA</td> <td>+</td> <td>32 x 60mA</td> <td>= 5.23A</td> </tr> </table> <p>For proper operation and in addition to a) and b) Lightbus[®] chip (FPGA) start-up current of min. 500mA should be considered.</p>	SI unit (32 I/O)	+	24 VQC solenoid valves	+	32 sensors		SI unit (32 I/O)	+	32 SV solenoid valves	+	32 sensors		100 mA	+	24 x 42 mA (VQC)	+	32 x 30mA	= 2.1A	100 mA	+	32 x 27 mA (SV)	+	32 x 30mA	= 2.0A	105 mA	+	24 x 100 mA	+	32 x 60mA	= 4.42A	105 mA	+	32 x 100 mA	+	32 x 60mA	= 5.23A
SI unit (32 I/O)	+	24 VQC solenoid valves	+	32 sensors																																	
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105 mA	+	32 x 100 mA	+	32 x 60mA	= 5.23A																																
Galvanic isolation	Yes, between voltage supplies of valves and SI-unit electronics.																																				

• **Communication Specification**

Bus protocol	II/O Lightbus [®] by company Beckhoff								
Number of process data bytes per standard telegram	1 Lightbus standard telegram with maximum 4 bytes sensor inputs and maximum 4 bytes valve outputs								
Number and length of diagnostics telegrams	2 diagnosis telegrams. Each diagnosis telegram consists of 4 bytes input (data from slave to master) and 4 bytes output data (data from master to slave).								
Participant	Passive Lightbus [®] slave								
Number of slaves	maximum 254 slaves (or SI units) per one Lightbus [®] master								
Bus topology	Fiber optic data ring								
Lightbus [®] protocols	<table border="0"> <tr> <td>READ</td> <td>Read SI data (sensor data)</td> </tr> <tr> <td>READ/WRITE</td> <td>Read (sensor data) / Write (valve data)</td> </tr> <tr> <td>ADDRESS INIT</td> <td>Address assignment during initialization</td> </tr> <tr> <td>ADDRESS CHECK & COUNT</td> <td>Address setting via protocol</td> </tr> </table>	READ	Read SI data (sensor data)	READ/WRITE	Read (sensor data) / Write (valve data)	ADDRESS INIT	Address assignment during initialization	ADDRESS CHECK & COUNT	Address setting via protocol
READ	Read SI data (sensor data)								
READ/WRITE	Read (sensor data) / Write (valve data)								
ADDRESS INIT	Address assignment during initialization								
ADDRESS CHECK & COUNT	Address setting via protocol								
Baud rate (transmission speed)	2 Mbps, 32 Bit process data in 25 μ s								
Number of sensor inputs	maximum 32, due to IEC1131-2 standard								
Number of valve outputs	maximum 32 single or maximum 16 double solenoid valves								
Two diagnostics telegrams	<p>1) <u>1st diagnostics telegram</u> (4 input bytes DI3...DI0 and 4 output bytes DO3...DO0)</p> <p>1a) Input byte DI2: Status/Error register (8 bits: DI2.7...DI2.0) Bit DI2.4: DI_CHK, Sensor overload (check the EX250IE# fuse) Bit DE2.3: SOL_VPW, Valve power supply drop (if <24V-10%) * Bit DE2.2: SUM_ERR, Summarized Error (if 1, red ERR-LED is on) Bit DE2.1: CI/Hold_SW, Safety fall back mode (position of WD switch) Bit DE2.0: INT_SW, Transmission power (position of INT switch)</p> <p>* SOL_VPW bit detection Low threshold: approximately 21.8V +/- 200mV hysteresis to avoid oscillation of valve outputs in case of error.</p> <p>1b) Output byte DO3: Mask register (8 bits: DO3.7...DO3.0) Bit DO3.5: EN_CRC_Err, Enable** CRC Error counter Bit DO3.4: EN_DI_CHK, Enable** DI_CHK Status bit Bit DO3.3: EN_SOL_VPW, Enable** SOL_VPW Status bit Bit DO3.2: EN_WD, Enable** Watch-Dog Timer (is always enabled) Bit 'Hold per Bus', Mode 'Hold' per Bus (independent from the WD switch)</p> <p>** Enable means here: This error causes the adjusted error behaviour (Clear/Hold) of the valves. If the EN_SOL_VPW Bit is activated (recommended), than the Status bit SOL_VPW (and SUM_ERR) will be latched until the error reset. The Watch-Dog timer is internally always enabled, independent from EN_WD.</p> <p>1c) Output byte DO1 Bit DO1.7: 'high' active write pulse for the mask register.</p> <p>1d) Output byte DO0 Sub address of the 1th diagnostics telegram: FE hex</p> <p>2) <u>2nd diagnostics telegram</u> (4 input bytes DI3...DI0 and 4 output bytes DO3...DO0)</p> <p>2a) Input byte DI3: firmware version 2b) Input byte DI2: CRC error counter of the SI-Unit 2c) Output byte DO1, bit DO1.7: 'high' active error reset pulse *** 2d) Output byte DO0, sub address of the 2nd diagnostics telegram: FF hex</p> <p>*** After reset of error bits this bit should be set back to logic 0!</p> <p>Above mentioned bits are 'high' active. All other bits of the 1th and 2nd diagnostics telegram are not used and have no meaning.</p>								

Optional interrupts	<p>Alternative to diagnostics telegrams the following two (of four reserved) interrupts can be used:</p> <ol style="list-style-type: none"> 1. +24VDC solenoid voltage drop interrupt (1 of 4) This interrupt corresponds to error bit SOL_VPW. 2. Watch Dog Interrupt (2 of 4) SI unit has not received valid protocol during defined Watch Dog Time. <p>Note:</p> <p>Due to future compatibility and where possible it is recommended to use SI diagnostic features instead of these interrupts.</p>										
Watch-Dog Timer	<p>Watch-Dog Time = approximately 100 ms; Watch-Dog Timer error is activated if, during the last 100ms, there has not been a valid protocol received by the SI unit (communication error).</p>										
Lightbus [®] Master PC cards	<table border="0"> <tr> <td>Examples by Beckhoff:</td> <td>Examples by TR-Systemtechnik:</td> </tr> <tr> <td>PCI-Interfaces FC2001/FC2002</td> <td>PC104-Version, CM31</td> </tr> <tr> <td>ISA-Interfaces C1200/C1220</td> <td>PC104-Version, extended type CM32</td> </tr> <tr> <td>VME-Interface C1300</td> <td>ISA-Version, type CM33</td> </tr> <tr> <td>SIMATIC S5/115/135/155 modules and others</td> <td></td> </tr> </table>	Examples by Beckhoff:	Examples by TR-Systemtechnik:	PCI-Interfaces FC2001/FC2002	PC104-Version, CM31	ISA-Interfaces C1200/C1220	PC104-Version, extended type CM32	VME-Interface C1300	ISA-Version, type CM33	SIMATIC S5/115/135/155 modules and others	
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- Applicable Solenoid valves

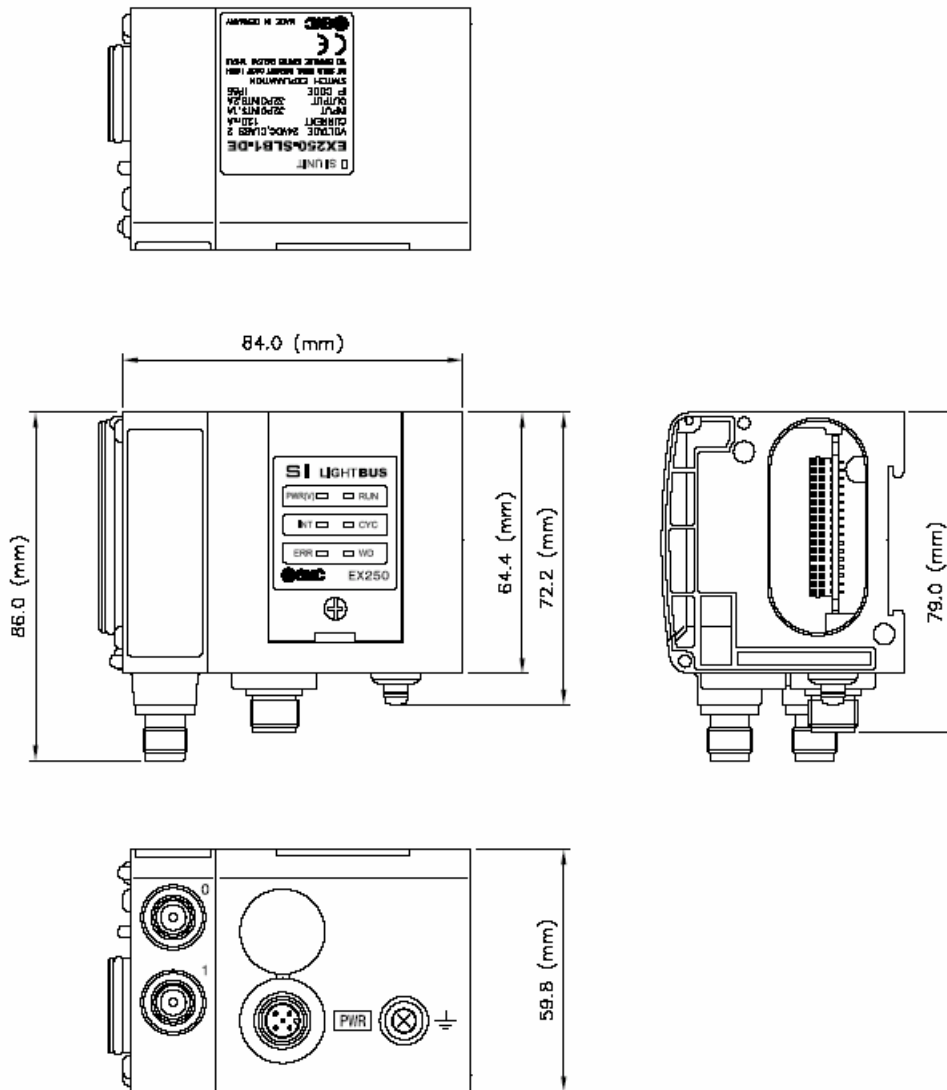
The following SMC valve manifolds are applicable.

Valve series	Applicable valve series (Protection class IP65)
VQC series	VQC1000, VQC2000, VQC4000
SV series	SV1000, SV2000, SV3000 (tie-rod based manifold)

- Applicable Input units

Module	Maximum number of digital input bits = 32 Bit				
	Number of modules	x	number of connectors	x	number of bits per connector
EX250-IE1	8 = 32 bit		2 (M12)		2
EX250-IE2	16 = 32 bit		2 (M12)		1
EX250-IE3	8 = 32 bit		4 (M8)		1

• Dimensions



• Contacts

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