**Diagnostic Module**

The diagnostic module interprets the diagnostic data of the whole chain of XCSRC-2M12 connected in series, and makes this information available into Modbus registers. It identifies which guards are opened or closed, prevents a new start of the machine in case of malfunctioning in the daisy-chain.

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**WARNING**

**IMPROPER UTILIZATION**

Do not use the Diagnostic module as a safety equipment. Diagnostic function is not part of safety function. Failure to follow these instructions can result in death, serious injury, or equipment damage.

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**IMPROPER CONNECTION**

The diagnostic module, every XCSRC-2M12, and the safety interface must be powered by the same SELV / PELV power supply. The power supply must meet the requirements of IEC 60204-1. The SELV Schneider Electric part number: ABL8RPS24-

Failure to follow these instructions can result in death, serious injury, or equipment damage.

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**Description**

1. Retractable mounting feet (panel mounting)
2. Diagnostic LED
3. Modbus LED
4. Six micro-switches for setting the number of XCSRC-2M12 connected in series
5. Clip-on lock for 35-mm DIN-rail
6. Five screw terminals for electrical wiring and the diagnostic signal (Inputs / Power supply Wiring)
7. Rotary switch with 16 positions for setting the Modbus address
8. Plug-in connector for Chain Error (free potential contact) - (CE (1): Chain Error contact / ESC: External Start Condition).
9. RJ45 sockets for Modbus communication.
10. RJ45 sockets for Modbus communication.

(1): CE does not provide information to stop the machine and is not part of the safety function. CE opens in the following cases:
- During the initialization state,
- In error state

Otherwise, CE is closed.

Once opened, CE cannot be closed until next power-up and restart cycle (if the configuration and the number of switches are consistent and if the XCSRC-2M12 are not in fail conditions).

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**Dimensions**

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**Mounting**

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Electrical equipment should be installed, operated and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

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Connections

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Description</th>
<th>Diag In (Diagnostic signal input)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CE1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CE2</td>
<td></td>
</tr>
</tbody>
</table>

MODBUS
1 2
1 0

Number of chained sensors

16 8 4 2 1

Diag IN
(Di)

MODBUS
1 2
1 0

Number of chained sensors

16 8 4 2 1

Wiring diagram

Di: Diagnostic signal input
Do: Diagnostic signal output
I1: Safety Input 1
I2: Safety Input 2
O1: Safety Output 1
O2: Safety Output 2
CE1 & CE2: Connections for Chain Error contact
(used as External Start Condition - ESC)

WARNING

IMPROPER CONNECTION
Controller or external display must be powered by the RJ45 (pin 7 & 8, Modbus CP5S).
Failure to follow these instructions can result in death, serious injury, or equipment damage.

LEDs States

Diagnostic LED (Diag) Description

<table>
<thead>
<tr>
<th>State</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>-</td>
<td>No diagnostic data received or no detected error or power OFF.</td>
</tr>
<tr>
<td>ON</td>
<td>Orange</td>
<td>Initialization state.</td>
</tr>
<tr>
<td>ON</td>
<td>Green</td>
<td>Run state: Correct diagnostic data frame received.</td>
</tr>
</tbody>
</table>
| ON    | Red   | Error state:
- Inconsistency between the number of XCSRC-2M12 physically connected in series and the value set on the micro-switches.
- The number of XCSRC-2M12 chained is greater than 20.
- XCSRZE Loopback device not connected.
- At least one XCSRC-2M12 is in failure mode.
- Detection of cable disconnection. |

Modbus LED (Com) Description

<table>
<thead>
<tr>
<th>State</th>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>-</td>
<td>No Modbus data received or no detected error or power OFF.</td>
</tr>
<tr>
<td>ON</td>
<td>Orange</td>
<td>Initialization state: Modbus auto baudrate detection function.</td>
</tr>
<tr>
<td>Blinking</td>
<td>Green</td>
<td>Run state: Correct Modbus data frame received.</td>
</tr>
<tr>
<td>Blinking</td>
<td>Red</td>
<td>Error state: Incorrect Modbus data frame received.</td>
</tr>
</tbody>
</table>
Diagnostic Module - Modbus Registers

A) Modbus Protocol

Main feature: The communication of the diagnostic data to a controller or an external display.

The only supported Modbus request is Read holding registers (code 03h).

The Modbus protocol is Remote Terminal Unit (RTU).

NOTE: Connection to a Modbus TCP/IP device is possible with the use of TSXETG100 gateway. Refer to the Modbus TCP/IP wiring example (next page).

The detection of the Modbus line configuration is automatic. The automatic detection is activated after a power-up during the initialization phase. The duration of the initialization phase is 5 s.

B) Modbus Registers

<table>
<thead>
<tr>
<th>Address</th>
<th>Register</th>
<th>Word</th>
<th>Description</th>
<th>Bit used</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x0000</td>
<td>1</td>
<td>Word 0</td>
<td>Error description</td>
<td>0…4</td>
</tr>
<tr>
<td>0x0001</td>
<td>2</td>
<td>Word 1</td>
<td>State of the first sixteen XCSR2M12</td>
<td>0…15</td>
</tr>
<tr>
<td>0x0002</td>
<td>3</td>
<td>Word 2</td>
<td>State of the last four XCSR2M12</td>
<td>0…3</td>
</tr>
<tr>
<td>0x0003</td>
<td>4</td>
<td>Word 3</td>
<td>Position of cable disconnection or XCSR2M12 in failure mode.</td>
<td>0…4</td>
</tr>
<tr>
<td>0x0004</td>
<td>5</td>
<td>Word 4</td>
<td>Number of XCSR2M12 in the chain set on the micro-switches.</td>
<td>0…4</td>
</tr>
</tbody>
</table>

Diagnostic Module Operating

A) Installation State

1. Configure the Modbus slave address with the rotary switch (the address 0 is reserved).

   You can set the Modbus address at any time and during any operating mode. There are 15 possible Modbus addresses (1…15).

2. Configure the number of XCSR2M12 present on the safety chain with the micro-switches:

   This value must be set before powering-up the product. Example: the value set on the picture above is 14(dec), binary code equal to: 1110 = 8 + 4 +2.

3. Wire the diagnostic module.

4. Power up the diagnostic module.

B) Initialization State

During this state:
- The two LEDs are orange
- The contact Chain Error is opened

At power-up, the following initialization steps are automatically performed:

1. Acquisition of the number of XCSR2M12 on the chain set on the micro-switches.  
   Note: Once in operation, the micro-switches cannot be changed. The micro-switch changes are taken into account after a power cycle only. If you change this value, the diagnostic module falls into error. This error is blocking and a restart is mandatory. To change this value, power off the module, reconfigure it and then restart.

2. Acquisition of the Modbus slave address set previously on the rotary switch.  
   Note: You can set the Modbus address at any time and during any operating mode.

3. Modbus register initializations (by default).

4. The diagnostic module goes to Run state.

C) Run State

This step follows the initialization step of diagnostic function and Modbus function.

At each reception of diagnostic data, Modbus registers are updated.

Diagnostic function:
If no diagnostic frame is received within a timeout of 3 s or diagnostic frame are incorrect, the diagnostic module enters in error state.

The error suppression and a new start are necessary to leave the error state.

The status of the diagnostic function is indicated by the diagnostic LED.

For more details, refer to the Diagnostic LED description.

Modbus function (Modbus line configuration detection):
The reception of a Modbus frame is indicated by flashing of Modbus LED.

In case of Modbus communication detected error, no restart is required. If the detected error is canceled, the communication resumes automatically.

A Modbus detected error never affects the state of Chain Error contact.

For more details, refer to the Modbus LED description.
Modbus TCP/IP Wiring Example

Diagnostic Module Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approvals</td>
<td>CE, cULus, EAC, RCM</td>
</tr>
<tr>
<td>Conforming to standards</td>
<td>EN 60947-1, EN 61326-2-1, UL 508, CSA C22.2</td>
</tr>
<tr>
<td>Power supply</td>
<td>The power supply must meet requirements of IEC 60204-1 relative to SELV / PELV power supply.</td>
</tr>
<tr>
<td>Operating supply voltage</td>
<td>+24 Vdc (+10%, -20%) = [+19.2 Vdc, +26.4 Vdc]</td>
</tr>
<tr>
<td>Power consumption</td>
<td>≤ 300 mA</td>
</tr>
<tr>
<td>Power on delay</td>
<td>&lt; 5 s</td>
</tr>
<tr>
<td>Reverse polarity protection</td>
<td>Yes (excluding RJ45)</td>
</tr>
<tr>
<td>Input signal</td>
<td>Compatible with XCSRC2M12 diagnostic signal.</td>
</tr>
<tr>
<td>Protection</td>
<td>External fuse</td>
</tr>
<tr>
<td>Relay</td>
<td>Type: Mechanical</td>
</tr>
<tr>
<td></td>
<td>Current: &lt; 200 mA</td>
</tr>
<tr>
<td></td>
<td>Voltage: +24 Vdc</td>
</tr>
<tr>
<td></td>
<td>TON: 1 ms / 3 ms</td>
</tr>
<tr>
<td></td>
<td>TOFF: 1 ms / 3 ms</td>
</tr>
<tr>
<td>Output power (RJ45)</td>
<td>Voltage: +24 Vdc</td>
</tr>
<tr>
<td></td>
<td>Current: &lt; 200 mA</td>
</tr>
<tr>
<td>EMC immunity withstand</td>
<td>Conforming to EN 61326-2-1</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP20</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>15 gn / 11 ms Conforming to EN/IEC 60068-2-27</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>Conforming to EN/IEC 60068-2-6: +/- 3.5 mm (0.138 in) 5...8.4 Hz / 1 g (8.4…150 Hz)</td>
</tr>
<tr>
<td>Impact</td>
<td>IK04</td>
</tr>
<tr>
<td>Temperatures</td>
<td>Operating: 0...60 °C (32...140 °F)</td>
</tr>
<tr>
<td></td>
<td>Storage: -40...+85 °C (-40...185 °F)</td>
</tr>
</tbody>
</table>