

# **SIGNAL ADDER CONVERTER XS-110**





# Introduction

Thank you for choosing our SIGNAL ADDER CONVERTER XS-110. To ensure its proper and efficient usage, it is important to read this manual thoroughly to understand how to operate the XS-110 before putting it into operation.

## About this Manual

1. This manual shall be delivered to the end user of the XS-110;
2. Contents are subject to change without notice;
3. All rights reserved. No part of this manual may be reproduced in any form without the written permission from DLG;
4. The specifications contained herein are limited to standard models and do not cover custom-made products;
5. All precautions were taken on preparing this manual, in order to guarantee the quality of its information.

## CAUTION!

The instrument described in this technical user manual is a device suitable for application in a specialized technical area. DLG products are submitted to a strict quality control process. However, industrial control electronic equipment can cause damage to machinery or controlled processes in the event of any failure or improper operations and may even endanger human lives. The user is responsible for selecting and setting values of the instrument parameters. The manufacturer warns of the risk of incidents with injuries to both people and goods, resulting from the incorrect use of the instrument.

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## Presentation

The XS-110 provides on its output a standard signal, proportional to the number of active sensors connected to its digital inputs.

The XS-110 has 10 optically isolated inputs, which can be connected to sensors with open collector output, dry contact or voltage level. It also provides a power supply for sensors with short circuit protection.



Among the possible applications, level measurement and control stands out.

The XS-110 is built in a plastic box for DIN rail mounting.

# Specification

XS-10 / ____ / ____	
<b>Enclosure:</b>	
1	Only the converter (XS-110)
6	Water-proof enclosure (XS-610)
<b>Power Source:</b>	
/ AC	Full-range power source from 85 to 264 Vac @ 60 Hz or 100 to 350 Vdc
/ DC	24 Vdc power source
<b>Triggering:</b>	
/ -	Default triggering comprises only the last triggered sensor.
/ S	Sequential triggering comprises triggered sensors in pairs.
/ I	Inverted* default triggering comprises only the last triggered sensor.

### Examples:

- **XS-110/AC** : Default triggering Signal Adder Converter. Output changes accordingly with the last triggered input sensor. Full-range power source from 85 to 264 Vac @ 60 Hz or 100 to 350 Vdc;
- **XS-110/AC/S**: Sequential triggering Signal Adder Converter. Except the first input channel, output changes only when input is triggered in pairs, i.e., accordingly with the last and penultimate triggered input sensor. Full-range power source from 85 to 264 Vac @ 60 Hz or 100 to 350 Vdc;
- **XS-610/DC** : Default triggering Signal Adder Converter built-in a waterproof box. Continuous current power source.

\*The operation of the inverted triggering Adder comprises similarly to the default triggering, it differs only at the analogic output, which will change from 20 to 4 mA (when 20 mA indicates no input sensor triggered and 4 mA indicates that all input sensors are triggered).

## Applications

Among the possible applications, level measuring and control working in tandem with the SC-100 or SC-500 stands out, such as:

- Sugar cane level measurement in Shut Donelly feeders, largely employed in sugar cane mills in ethanol plants;
- Level measurement in grains and cereals storage silos;
- Level measurement of solid products in food, ration, paints and paper industries.



## Technical specifications

Parameter	Characteristics
<b>Digital input</b>	NPN,PNP or dry contact – 2 mA (NPN) and 7 mA (PNP)
<b>Output</b>	0/4 ~ 20 mA - 800Ω; 0 ~ 10 Vdc – 20 mA
<b>Span</b>	1 – 10 digital inputs activated
<b>Error</b>	< 0.5% of range
<b>Sensors power supply</b>	14 Vdc / 300 mA
<b>Power consumption</b>	<b>XS_10/AC:</b> 17 VA
	<b>XS_10/DC:</b> 380 mA
<b>Isolation</b>	Galvanic
<b>Operating temperature</b>	0 °C – 50 °C
<b>Power source</b>	<b>XS_10/AC:</b> 85 - 264 Vac @ 60 Hz or 100 - 350 Vdc
	<b>XS_10/DC:</b> 20 to 30 Vdc
<b>Case</b>	ABS plastic case
<b>Mounting</b>	DIN rail
<b>Electrical connections</b>	Screw terminals
<b>IP protection</b>	IP-30
<b>Dimensions</b>	75 x 100 x 110 mm (height x width x length).
<b>Approx. weight</b>	0.3 kg

## Dimensions

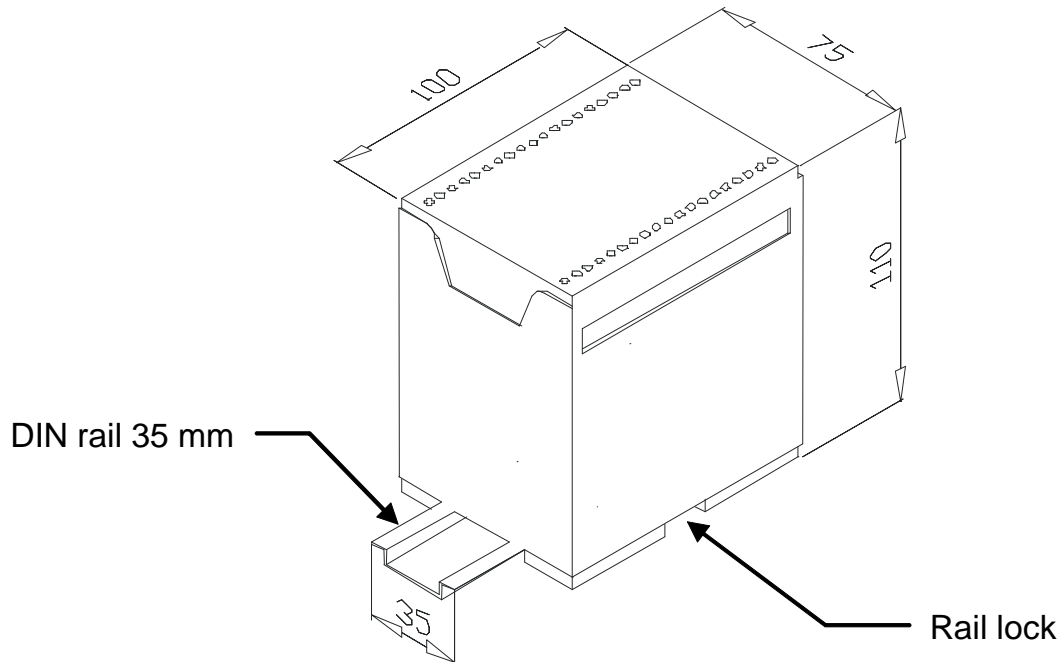


Figure 1 – Dimensions (mm)

## Operation

The output signal (0 / 4 ~ 20 mA or 0 ~ 10 Vdc) is proportional to the number of triggered inputs. Figure 2 shows operation with 6 inputs.

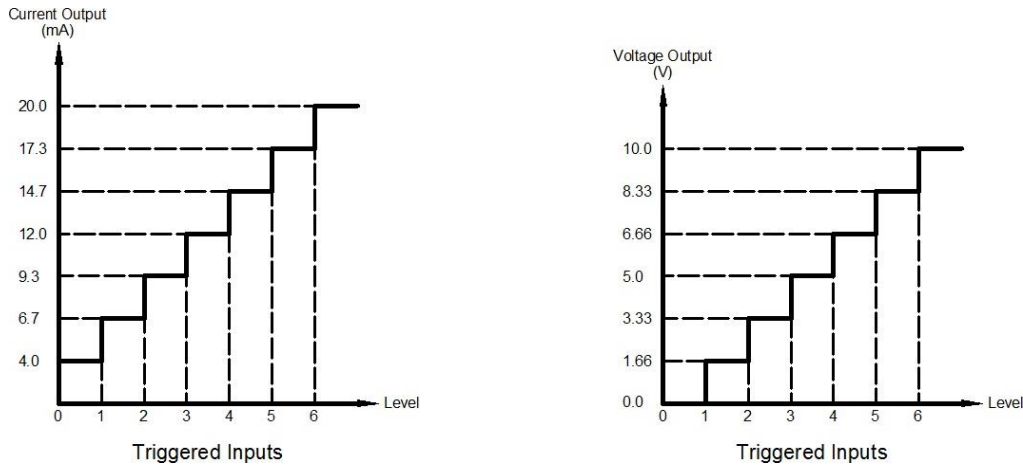


Figure 2 – 4-20 mA and 0-10 V outputs on a XS-110 with six inputs

Table 1 show the expected output (current and voltage) based on the number of triggered inputs for different XS-100 with 4, 6, 8, and 10 inputs.

Triggered input	Number of available inputs							
	4		6		8		10	
	mA	V	mA	V	mA	V	mA	V
<b>None</b>	4.0	0	4.0	0	4.0	0	4.0	0
<b>1<sup>st</sup></b>	8.0	2.5	6.7	1.66	6.0	1.25	5.6	1.0
<b>2<sup>nd</sup></b>	12.0	5.0	9.3	3.33	8.0	2.5	7.2	2.0
<b>3<sup>rd</sup></b>	16.0	7.5	12.0	5.0	10.0	3.75	8.8	3.0
<b>4<sup>th</sup></b>	20.0	10.0	14.7	6.66	12.0	5.0	10.4	4.0
<b>5<sup>th</sup></b>			17.3	8.33	14.0	6.25	12.0	5.0
<b>6<sup>th</sup></b>			20.0	10.0	16.0	7.5	13.6	6.0
<b>7<sup>th</sup></b>					18.0	8.75	15.0	7.0
<b>8<sup>th</sup></b>					20.0	10.0	16.8	8.0
<b>9<sup>th</sup></b>							18.4	9.0
<b>10<sup>th</sup></b>							20.0	10.0

Table 1 – Expected output signals.

The XS-110 has short-circuit protection of the sensor power supply. Whenever a short-circuit is detected, the power supply is immediately turned off. The sensors are thus protected from damage inflicted by the short-circuit.

## Default triggering

Default triggering turns the analog output a function of only the last sensor triggered. For instance, for a XS-110 configured for 10 inputs, the current output will be 20 mA only when the 10<sup>th</sup> input is triggered, regardless of the state of the other 9 inputs.

## Sequential triggering

The XS-110 works sequentially (in pairs), i.e., if only one input is triggered (except the first input), the output will not change. That means that the equipment will consider only the last two consecutive triggered inputs. As an example, for a XS-110 configured with 10 inputs, the output will be set to 20 mA only if the 10th AND 9th inputs are triggered. Taking the same case as another example, if all except the 9<sup>th</sup> inputs are triggered, the output will be 16.8 mA (or 8 V), because the last two consecutive triggered inputs are the 7<sup>th</sup> and the 8<sup>th</sup>.

### Mounting

The XS-110 shall be mounted in water, vapor and dust free areas. Its mounting position is irrelevant. A protection fuse must be provided.

Figure 3 illustrates the front panel and the electrical connections. Connections must be made with shielded wire for input signals, using exclusive metalling pipe, or twisted pair cable.

Figure 4 shows the most common application of the XS-110, which is level measurement using ten SC-100 or SC-500 capacitive sensors.

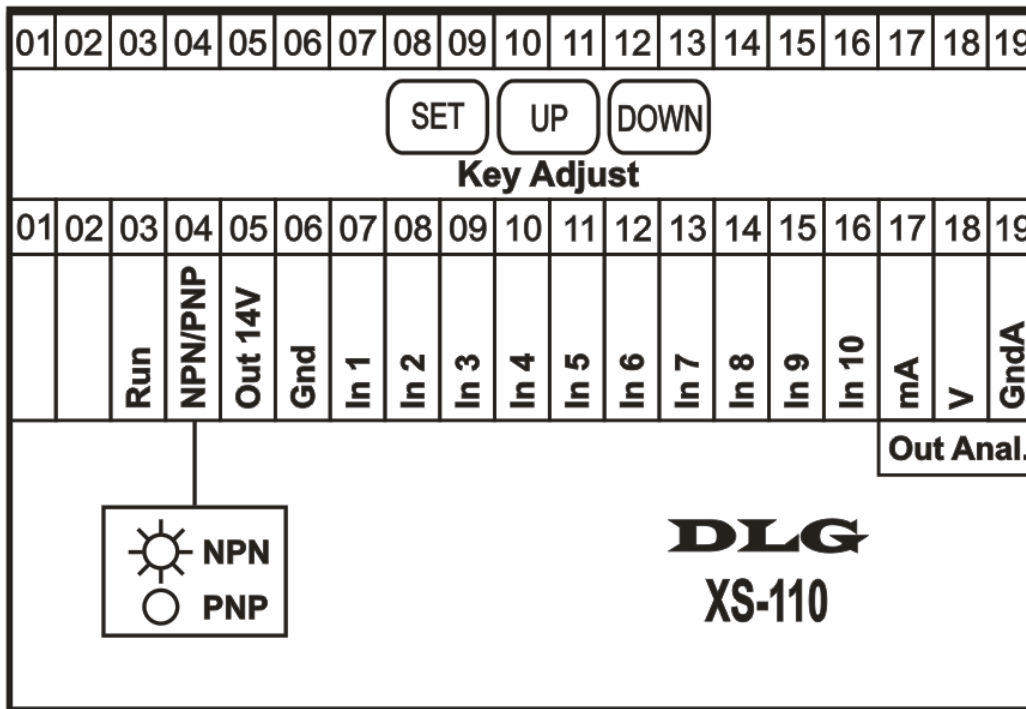


Figure 3 – Front panel and electrical connections

Terminal	Function	
1	AC: N / L	DC: +
2	AC: L	DC: -
3	Not connected	
4	Not connected	
5	Sensors power supply (14 Vdc / 300 mA)	
6	GND (sensors power supply)	
7	Sensor input 1	
8	Sensor input 2	
9	Sensor input 3	
10	Sensor input 4	

Terminal	Function
11	Sensor input 5
12	Sensor input 6
13	Sensor input 7
14	Sensor input 8
15	Sensor input 9
16	Sensor input 10
17	Current output
18	Voltage output
19	GND (analog output)

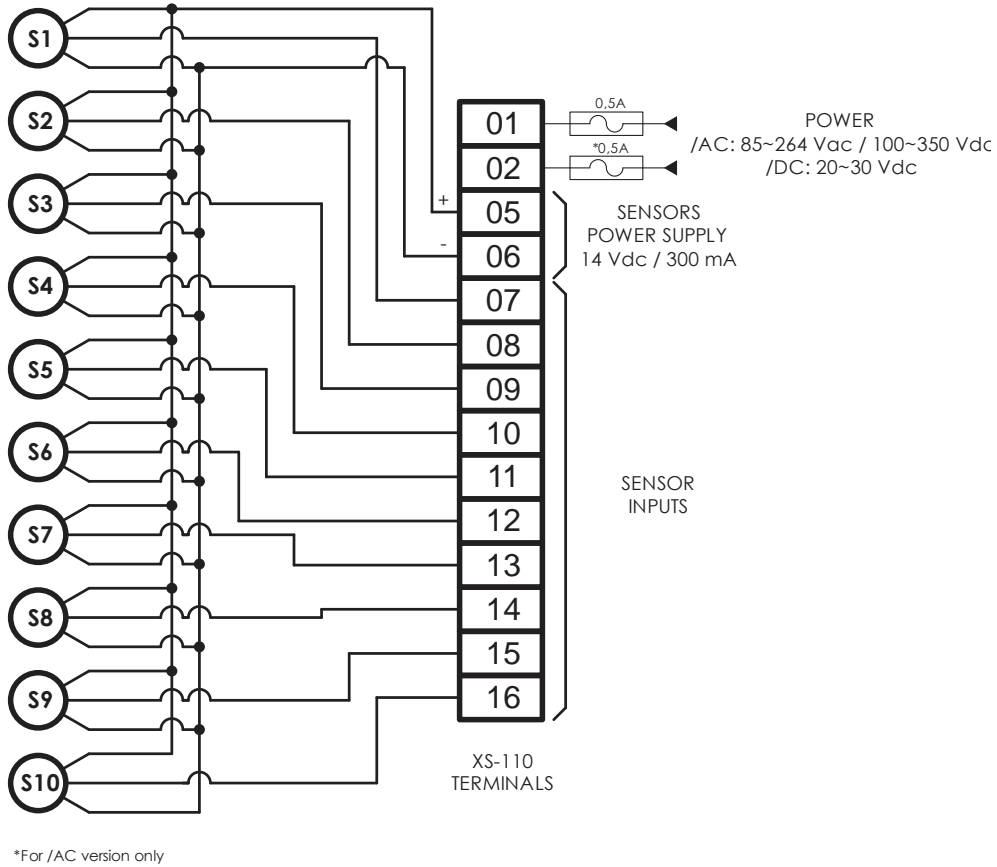


Figure 4 – Level measurement with ten SC-100/SC-500 capacitive sensors

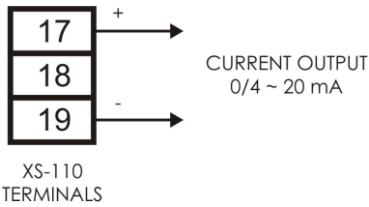


Figure 5 – Current output connections

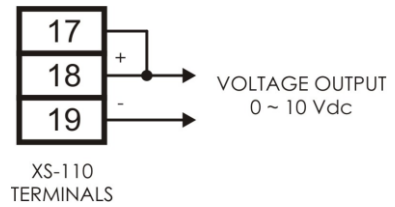


Figure 6 – Voltage output connections

## Front panel settings

### Keys

#### SET

Used to set the type of sensor connected to the inputs (NPN or PNP)

#### UP and DOWN

Sets the output signal value. Press UP to increase or DOWN to decrease the value and set it to the desired level.

The output may only be set using the UP and DOWN keys if there are no connections to the input terminals (terminals 7 through 16).

### LEDs

#### Green

The green LED blinks indicating that the controller is operating properly. If the LED stops blinking, it is an indication that the controller has stopped operating and will no longer behave as expected.

When in ramp mode setting, the rise time corresponds to the time that the green LED remains lit, and the fall time corresponds to the time that the green LED remains off.

#### Red

The red LED indicates the type of sensor (NPN or PNP) that should be connected to the inputs. When lit, it indicates that a NPN sensor should be used; otherwise, a PNP sensor should be used.

## Settings

### Default triggering

#### NPN sensor

Connect the **NEGATIVE** terminal of the sensor power supply (terminal 6) to the last used sensor input. Hold the SET key for 5 seconds until the green LED starts blinking.

#### PNP sensor

Connect the **POSITIVE** terminal of the sensor power supply (terminal 5) to the last used sensor input. Hold the SET key for 5 seconds until the green LED starts blinking.

If the type of sensor is not set, the red LED will blink.

### Ramp rise time setting

The ramp rise time is set first by setting the number of sensors to be less than 9, then triggering the sensor input 9, connecting terminals 6 and 15 (for NPN sensors) or terminals 5 and 15 (for PNP sensors). Using the UP and DOWN keys, adjust the required rise time which is the time that the green LED stays lit. The minimum rise time is 0.1 seconds and the maximum is 10 seconds.

### Ramp fall time setting

The ramp fall time is set first by setting the number of sensors to be less than 9, then triggering the sensor input 10, connecting terminals 6 and 16 (for NPN sensors) or terminals 5 and 16 (for PNP sensors). Using the UP and DOWN keys, adjust the required fall time which is the time that the green LED stays off. The minimum fall time is 0.1 seconds and the maximum is 20 seconds.



## Sequential triggering

### NPN sensor

Connect the **NEGATIVE** terminal of the sensor power supply (terminal 6) to the last and penultimate sensor input of the sequence. Hold the SET key for 5 seconds until the green LED starts blinking.

### PNP sensor

Connect the **POSITIVE** terminal of the sensor power supply (terminal 5) to the last and penultimate sensor input of the sequence. Hold the SET key for 5 seconds until the green LED starts blinking.

If the type of sensor is not set, the red LED will blink.

## Ramp rise time setting

The ramp rise time is set first by setting the number of sensors to be less than 9, then triggering the sensor input 9, connecting terminals 6, 14 and 15 (for NPN sensors) or terminals 5, 14 and 15 (for PNP sensors). Using the UP and DOWN keys, adjust the required rise time which is the time that the green LED stays lit. The minimum rise time is 0.1 seconds and the maximum is 10 seconds.

## Ramp fall time setting

The ramp fall time is set first by setting the number of sensors to be less than 9, then triggering the sensor input 10, connecting terminals 6, 15 and 16 (for NPN sensors) or terminals 5, 15 and 16 (for PNP sensors). Using the UP and DOWN keys, adjust the required fall time which is the time that the green LED stays off. The minimum fall time is 0.1 seconds and the maximum is 20 seconds.

## Configuration examples

### Default triggering

#### Configuring for 8 NPN sensors

- 1st. Set the number of sensors: close with a jumper terminals 6 (GND) and 14 (sensor input 8), hold the SET key for 5 seconds until the green LED starts blinking, indicating that the XS-110 is configured for 8 sensors.
- 2nd. Set the ramp rise time: close with a jumper terminals 6 (GND) and 15 (sensor input 9), then set the ramp rise time with the UP and DOWN keys, watching the period of time that the green LED stays **lit**.
- 3rd. Set the ramp fall time: close with a jumper terminals 6 (GND) and 16 (sensor input 10), then set the ramp fall time with the UP and DOWN Keys, watching the period of time that the green LED stays **off**.

#### Configuring for 10 PNP sensors

- 1st. Set the number of sensors to be less than 9 (for instance 6, 7 or 8 sensors): close with a jumper terminals 5 (sensor power supply), 12 (sensor input 6, for 6 sensors), or 13 (sensor inputs 7, for 7 sensors), or 14 (sensor inputs 8, for 8 sensors), hold the SET key for 5 seconds until the green LED starts blinking, indicating that the XS-110 is configured for 6, 7 or 8 sensors.
- 2nd. Set the ramp rise time: close with a jumper terminals 5 (sensor power supply), and 15 (sensor input 9), then set the ramp rise time with the UP and DOWN keys, watching the period of time that the green LED stays **lit**.
- 3rd. Set the ramp fall time: close with a jumper terminals 5 (sensor power supply), and 16 (sensor input 10), then set the ramp fall time with the UP and DOWN keys, watching the period of time that the green LED stays **off**.
- 4th. Set the number of sensors: close with a jumper terminals 5 (sensor power supply), and 16 (sensor input 10), hold the SET key for 5 seconds until the green LED starts blinking, indicating that the XS-110 is configured for 10 sensors.

If the XS-110 is configured for 9 or 10 sensors, and the ramp rise or fall time needs to be changed, it is necessary to reconfigure following the steps described above.

## Sequential triggering

### Configuring for 8 NPN sensors

- 1st. Set the number of sensors: close with a jumper terminals 6 (GND), 13 (sensor input 7) and 14 (sensor input 8), hold the SET key for 5 seconds until the green LED starts blinking, indicating that the XS-110 is configured for 8 sensors.
- 2nd. Set the ramp rise time: close with a jumper terminals 6 (GND), 14 (sensor input 8) and 15 (sensor input 9), then set the ramp rise time with the UP and DOWN keys, watching the period of time that the green LED stays **lit**.
- 3rd. Set the ramp fall time: close with a jumper terminals 6 (GND), 15 (sensor input 9) and 16 (sensor input 10), then set the ramp fall time with the UP and DOWN Keys, watching the period of time that the green LED stays **off**.

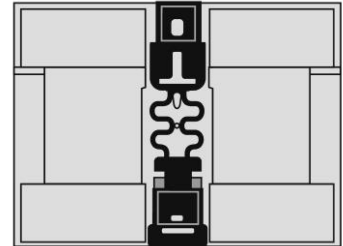
### Configuring for 10 PNP sensors

- 1st. Set the number of sensors to be less than 9 (for instance 6, 7 or 8 sensors): close with a jumper terminals 5 (sensor power supply), 11 and 12 (sensor inputs 5 and 6, for 6 sensors), or 12 and 13 (sensor inputs 6 and 7, for 7 sensors), or 13 and 14 (sensor inputs 7 and 8, for 8 sensors), hold the SET key for 5 seconds until the green LED starts blinking, indicating that the XS-110 is configured for 6, 7 or 8 sensors.
- 2nd. Set the ramp rise time: close with a jumper terminals 5 (sensor power supply), 14 (sensor input 8) and 15 (sensor input 9), then set the ramp rise time with the UP and DOWN keys, watching the period of time that the green LED stays **lit**.
- 3rd. Set the ramp fall time: close with a jumper terminals 5 (sensor power supply), 15 (sensor input 9) and 16 (sensor input 10), then set the ramp fall time with the UP and DOWN keys, watching the period of time that the green LED stays **off**.
- 4th. Set the number of sensors: close with a jumper terminals 5 (sensor power supply), 15 (sensor input 9) and 16 (sensor input 10), hold the SET key for 5 seconds until the green LED starts blinking, indicating that the XS-110 is configured for 10 sensors.

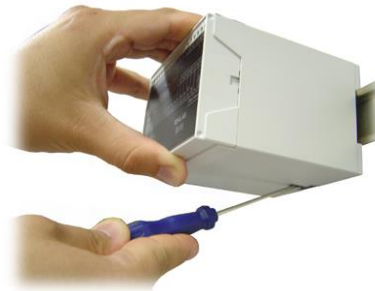
If the XS-110 is configured for 9 or 10 sensors, and the ramp rise or fall time needs to be changed, it is necessary to reconfigure following the steps described above.

## Mechanical installation

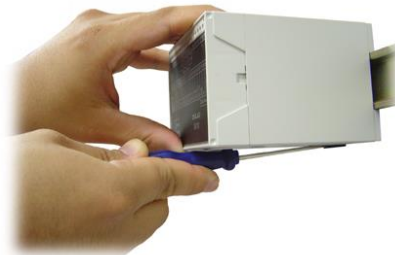
Place the equipment on the top side of the DIN rail.



Pull the lock located at the bottom with a screwdriver.



Attach the bottom of the equipment to the DIN rail.







Release the lock. Make sure that the equipment is properly locked to the rail.



### Recommendations

It is recommended to use only appropriate tools for the XS-110 installation and maintenance.

<p>It is necessary to use a “terminal” type screwdriver for terminal connection or 1/8 with 3 mm maximum diameter, as it is the ideal format and will not damage the connector aperture.</p>	 <p><b>Inappropriate screwdriver</b></p>	 <p><b>Recommended screwdriver</b></p>
<p>It is recommended to crimp all the wires that will be connected to the XS-110 with a pre-isolated “needle” or “eyelet” type terminal for 0.5 – 1.5 mm<sup>2</sup> cables.</p>	<p>Needle terminal</p> 	<p>Eyelet terminal</p> 

## Warranty

The manufacturer assures to the equipment owners, identified by the purchase invoice, a 1 (one) year warranty as follows:

1. The warranty period begins with the invoice issue;
2. Within the warranty period, labor and parts used for repairing damage inflicted in normal use are free;
3. For repairs send the equipment along with the shipping invoices to our factory in Sertãozinho, Sao Paulo state, Brazil. DLG's address is available at the end of this manual;
4. The owner is responsible for transportation costs and risks;
5. Warranty will be automatically suspended if changes are made to the equipment by non-authorized personnel, defects caused by mechanical shock, exposure to conditions unfit for use or tampering with the product;
6. DLG disclaims any charge related to unauthorized repairs or replacements due to failures caused by agents external to the equipment, the improper use of them and as a result of unforeseeable circumstances or major forces;
7. DLG ensures full operation of the equipment described herein and all existing operations.

# Notes



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SIGNAL ADDER CONVERTER  
XS-110

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