

# **Ethernet Switch – Value Line**

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## **IE-SW-VL16 Series**

### **Hardware Installation Guide**

**Sixth Edition, October 2012**  
**1243330000/05/10.12**

Please note:

This document and any further product information - if available - can be downloaded at the internet link:

**<http://www.weidmueller.com/downloads>**

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**Weidmüller** 

## Overview

The IE-SW-VL16 Series of 16-port smart Ethernet switches provides an economical solution for your Ethernet connections. As an added bonus, the built-in smart alarm function helps system maintainers monitor the health of your Ethernet network.

IE-SW-VL16 Series has an operating temperature range of 0 to 60°C (Standard models) or optional a extended operating temperature range from -40 to 75°C and is designed to withstand a high degree of vibration and shock. The rugged hardware design makes IE-SW-VL16 Series perfect for ensuring that your Ethernet equipment can withstand critical industrial applications, such as in hazardous locations (Class 1 Division 2/ Zone 2), and complies with FCC, TÜV, UL, and CE Standards.

## Package Checklist

The IE-SW-VL16 Series is shipped with the following items. If any of these items is missing or damaged, please contact your Weidmüller customer service for assistance.

- 1 Ethernet Switch
- Hardware Installation Guide
- Protective caps for unused ports

## Features

### *High Performance Network Switching Technology*

- 10/100BaseT(X) (RJ45), 100BaseFX (SC/ST type, Multi/Single mode)
- IEEE 802.3/802.3u/802.3x
- Store and Forward switching process type, with 4K address entries
- 10/100M, Full/Half-Duplex, MDI/MDIX auto-sensing

### *Industrial Grade Reliability*

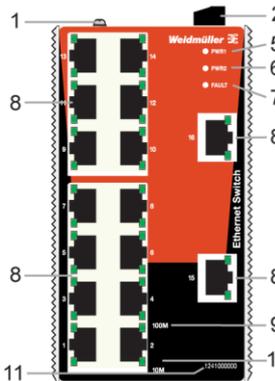
- Power failure, port break alarm by relay output
- Redundant dual DC power inputs

### *Rugged Design*

- Standard operating temperature range from 0 to 60°C or extended operating temperature of -40 to 75°C for (-T) models
- IP30, rugged high-strength case
- DIN-Rail or panel mounting ability

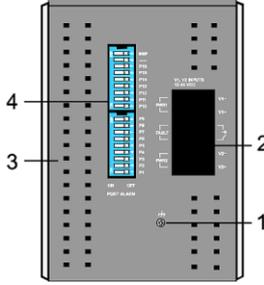
# Panel Layout of IE-SW-VL16-16TX

IE-SW-VL16-16TX  
Front Panel View

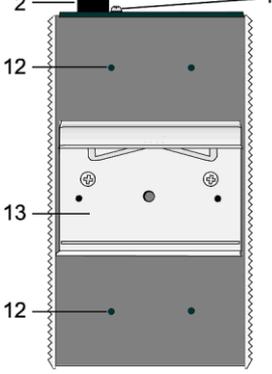


1. Grounding screw
2. Terminal block for power input (PWR1, PWR2) and relay output
3. Heat dissipation orifices
4. DIP switches (IE-SW-VL16 Series has 18 DIP switches in total; 2 DIP switches are reserved)
5. Power input PWR1 LED
6. Power input PWR2 LED
7. Fault LED
8. 10/100BaseT(X) Port
9. TP port's 100 Mbps LED
10. TP port's 10 Mbps LED
11. Article Number
12. Screw hole for wall mounting kit
13. DIN-Rail Kit

Top Panel View

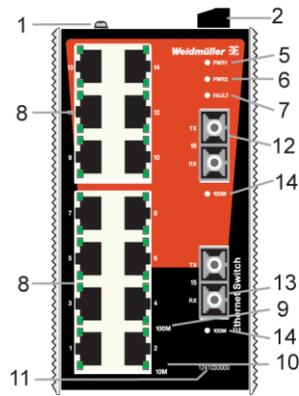


Rear Panel View



# Panel Layout of IE-SW-VL16-14TX-2SC (SC-type) and IE-SW-VL16-14TX-2ST (ST-type)

IE-SW-VL-14TX-2SC  
Front Panel View

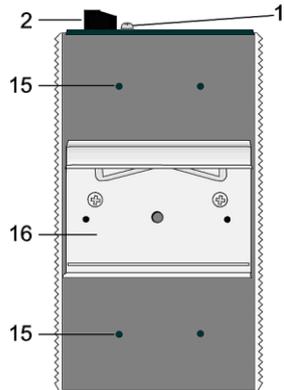
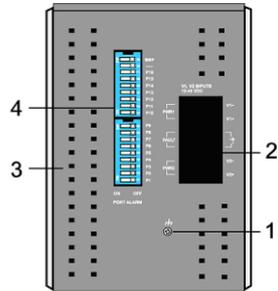


**NOTE:**

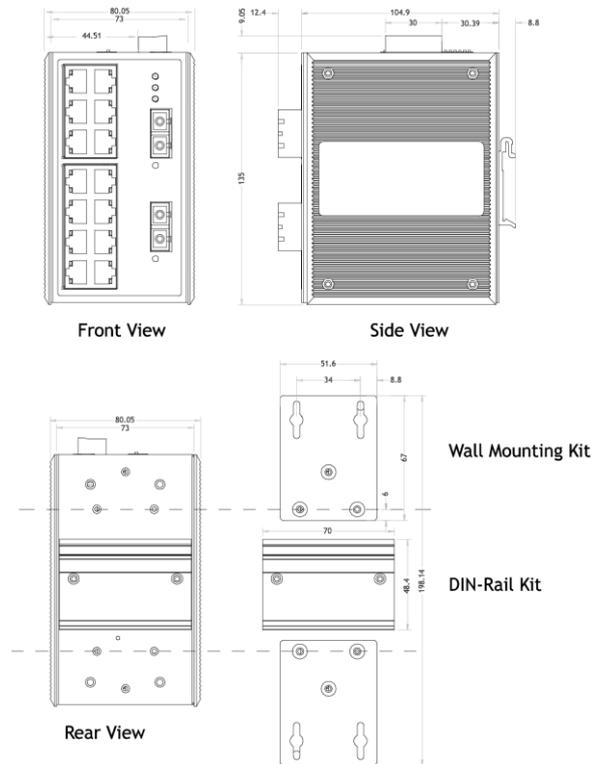
The appearance of models  
IE-SW-VL16-14TX-2SC and  
IE-SW-VL16-14TX-2ST are - apart  
from the optical connectors -  
identical.

1. Grounding screw
2. Terminal block for power input (PWR1, PWR2) and relay output
3. Heat dissipation orifices
4. DIP switches (IE-SW-VL16 Series has 18 DIP switches in total; 2 DIP switches are reserved)
5. Power input PWR1 LED
6. Power input PWR2 LED
7. Fault LED
8. 10/100BaseT(X) Port
9. TP port's 100 Mbps LED
10. TP port's 10 Mbps LED
11. Article Number
12. 100BaseFX Port
13. 100BaseFX Port
14. FX port's 100 Mbps LED
15. Screw hole for wall mounting kit
16. DIN-Rail Kit

Top Panel View



## Mounting Dimensions (unit = mm)

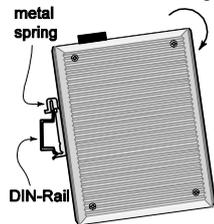


## DIN-Rail Mounting

The aluminum DIN-Rail attachment plate should already be fixed to the back panel of IE-SW-VL16 Series when you take it out of the box. If you need to reattach the DIN-Rail attachment plate, make sure the stiff metal spring is situated towards the top, as shown in the figures below.

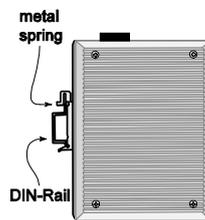
### STEP 1:

Insert the top of the DIN-Rail into the slot just below the stiff metal spring.



### STEP 2:

The DIN-Rail attachment unit will snap into place as shown below.



To remove Ethernet Switch from the DIN-Rail, simply reverse Steps 1 and 2 above.



## II 3G ATEX Information

1. Certificate number DEMKO 11 ATEX 150191X
2. Ambient range ( $-40^{\circ}\text{C} \leq T_{\text{amb}} \leq 75^{\circ}\text{C}$ )
3. Certification string (Ex nC nL IIC T4)
4. Standards covered (EN60079-0:2006, EN60079-15:2005)
5. The conditions of safe usage:
  - These products must be mounted in an IP54 enclosure.
  - Install in an area of pollution degree 2 or less.
  - A  $4\text{mm}^2$  conductor must be used when connection to the external grounding screw is utilized
  - Conductors suitable for use in an ambient temperature of  $93^{\circ}\text{C}$  must be used for the Power Supply Terminal.
  - PROVISIONS SHALL BE MADE, EITHER IN EXTERNAL TO THE APPARATUS, TO PREVENT THE RATED VOLTAGE BEING EXCEEDED BY THE TRANSIENTS DISTURBANCES OF MORE THAN 40 %



## Wiring Requirements



### WARNING

Do not disconnect modules or wires unless the power supply has been switched off or the area is known to be non-hazardous. The devices may only be connected to the supply voltage shown on the type plate.

The devices are designed for operation with a Safety Extra-Low Voltage. Thus, they may only be connected to the supply voltage connections and to the signal contact with the Safety Extra-Low Voltages (SELV) in compliance with IEC950/ EN60950/ VDE0805.



### WARNING

Substitution of components may impair suitability for Class I, Division 2, and Zone 2. These devices must be supplied by an SELV source as defined in Low Voltage Directive 73/23/EEC and 93/68/EEC.



### WARNING

This unit is a built-in type. When the unit is installed in another piece of equipment, the equipment enclosing the unit must comply with fire enclosure regulation IEC 60950/EN60950 (or similar regulation).

**WARNING****Safety First!**

Be sure to disconnect the power cord before installing and/or wiring your Ethernet Switch.

Calculate the maximum possible current in each power wire and common wire. Observe all electrical codes dictating the maximum current allowable for each wire size.

If the current goes above the maximum ratings, the wiring could overheat, causing serious damage to your equipment.

You should also pay attention to the following items:

- Use separate paths to route wiring for power and devices. If power wiring and device wiring paths must cross, make sure the wires are perpendicular at the intersection point.  
NOTE: Do not run signal or communications wiring and power wiring in the same wire conduit. To avoid interference, wires with different signal characteristics should be routed separately.
- You can use the type of signal transmitted through a wire to determine which wires should be kept separate. The rule of thumb is that wiring that shares similar electrical characteristics can be bundled together.
- Keep input wiring and output wiring separated.
- It is strongly advised that you label wiring to all devices in the system when necessary.

## Grounding the Ethernet Switch

Grounding and wire routing help limit the effects of noise due to electromagnetic interference (EMI). Run the ground connection from the ground screw to the grounding surface prior to connecting devices.

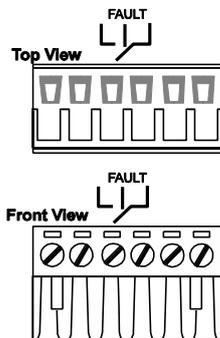
**ATTENTION**

This product is intended to be mounted to a well-grounded mounting surface, such as a metal panel.

## Wiring the Alarm Contact

The Alarm Contact consists of the two middle contacts of the terminal block on Ethernet Switch top panel. You may refer to the next section for detailed instructions on how to connect the wires to the terminal block connector, and how to attach the terminal block connector to the terminal block receptor.

In this section, we explain the meaning of the two contacts used to connect the Alarm Contact.



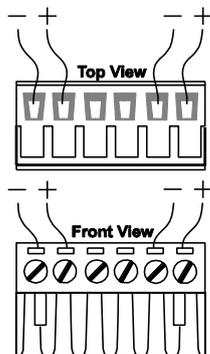
**FAULT:** The two middle contacts of the 6-contact terminal block connector are used to detect both power faults and port faults. The two wires attached to the Fault contacts form an open circuit when:

1. Ethernet Switch has lost power from one of the DC power inputs.
- OR
2. The PORT ALARM DIP Switch for one of the ports is set to ON, but the port is not connected properly.

If neither of these two conditions is satisfied, the Fault circuit will be closed.

## Wiring the Redundant Power Inputs

The top two contacts and the bottom two contacts of the 6-contact terminal block connector on Ethernet Switch top panel are used for Ethernet Switch two DC inputs. Top and front views of one of the terminal block connectors are shown here.



**STEP 1:** Insert the negative/positive DC wires into the V-/V+ terminals.

**STEP 2:** To keep the DC wires from pulling loose, use a small flat-blade screwdriver to tighten the wire-clamp screws on the front of the terminal block connector.

**STEP 3:** Insert the plastic terminal block connector prongs into the terminal block receptor, which is located on Ethernet Switch top panel.



### ATTENTION

Before connecting Ethernet Switch to the DC power inputs, make sure the DC power source voltage is stable.

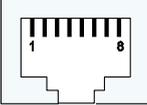
# Communication Connections

IE-SW-VL16 models have 14 or 16 10/100BaseT(X) Ethernet ports, and 2 or 0 (zero) 100BaseFX (SC/ST-type connector) fiber ports.

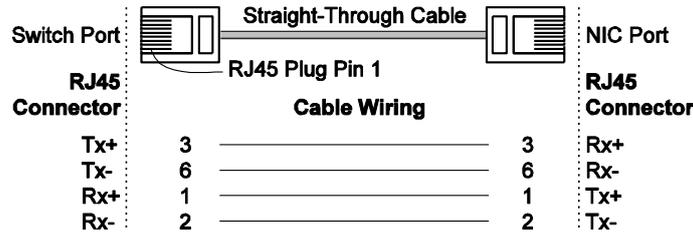
## 10/100BaseT(X) Ethernet Port Connection

The 10/100BaseT(X) ports located on the front panel are used to connect to Ethernet-enabled devices.

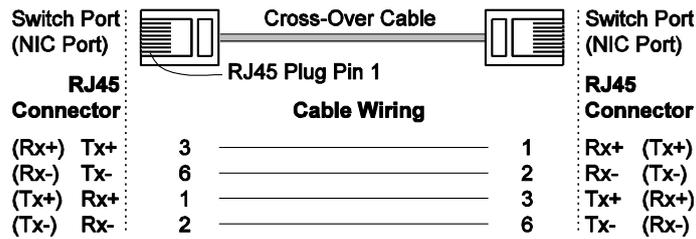
Below we show pinouts for both MDI (NIC-type) ports and MDI-X (HUB/Switch-type) ports, and also show cable wiring diagrams for straight-through and cross-over Ethernet cables.

MDI Port Pinouts		MDI-X Port Pinouts		8-pin RJ45
Pin	Signal	Pin	Signal	
1	Tx+	1	Rx+	
2	Tx-	2	Rx-	
3	Rx+	3	Tx+	
6	Rx-	6	Tx-	

### RJ45 (8-pin) to RJ45 (8-pin) Straight-Through Cable Wiring



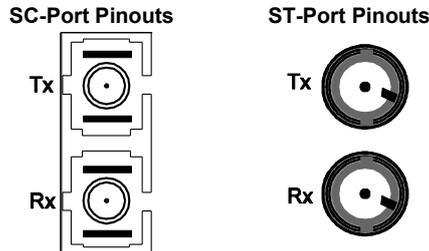
### RJ45 (8-pin) to RJ45 (8-pin) Cross-Over Cable Wiring



## 100BaseFX Ethernet Port Connection

The concept behind the SC/ST port and cable is very straightforward. Suppose you are connecting devices I and II. Contrary to electrical signals, optical signals do not require a circuit in order to transmit data. Consequently, one of the optical lines is used to transmit data from device I to device II, and the other optical line is used to transmit data from device II to device I, for full-duplex transmission.

All you need to remember is to connect the **Tx (transmit)** port of device I to the **Rx (receive)** port of device II, and the **Rx (receive)** port of device I to the **Tx (transmit)** port of device II.



### ATTENTION

This is a Class 1 Laser/LED product. To avoid causing serious damage to your eyes, do not stare directly into the Laser Beam.

## Redundant Power Inputs

Both power inputs can be connected simultaneously to live DC power sources. If one power source fails, the other live source acts as a backup, and automatically supplies all of the switch power needs.

## Alarm Contact

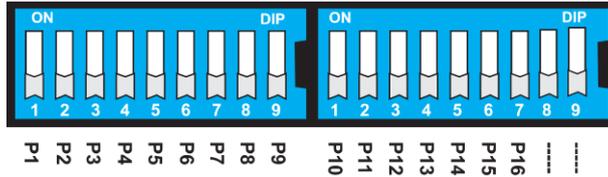
The Ethernet Switch has one Alarm Contact located on the top panel. For detailed instructions on how to connect the Alarm Contact power wires to the two middle contacts of the 6-contact terminal block connector, see the Wiring the Alarm Contact section on page 7. A typical scenario could be to connect the Fault circuit to a warning light located in the control room. The light can be set up to switch on when a fault is detected.

The Alarm Contact has two terminals that form a Fault circuit for connecting to an alarm system. The two wires attached to the Fault contacts form an open circuit when (1) Ethernet Switch has lost power from one of the DC power inputs, or (2) The PORT ALARM DIP Switch for one of the ports is set to ON, but the port is not connected properly.

If neither of these two conditions occurs, the Fault circuit will be closed.

# DIP Switch Settings

## IE-SW-VL16 Series DIP Switches



ON: Enables the corresponding PORT Alarm. If the port's link fails, the relay will form an open circuit and the fault LED will light up.

Off: Disables the corresponding PORT Alarm. The relay will form a closed circuit and the Fault LED will never light up.

Note that the switches of the IE-SW-VL16 Series has 18 DIP switches in total; 2 DIP switches are reserved.

## LED Indicators

The front panel of Ethernet Switch contains several LED indicators. The function of each LED is described in the table below.

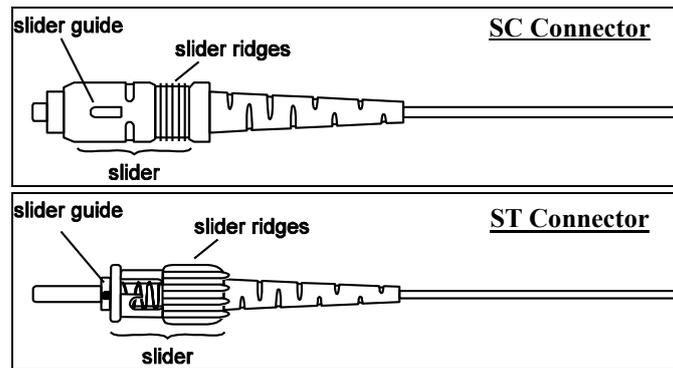
LED	Color	State	Description
PWR1	AMBER	On	Power is being supplied to power input PWR1
		Off	Power is <b>not</b> being supplied to power input PWR1
PWR2	AMBER	On	Power is being supplied to power input PWR2
		Off	Power is <b>not</b> being supplied to power input PWR2
FAULT	RED	On	When the corresponding PORT alarm is enabled, and the port's link is inactive.
		Off	When the corresponding PORT alarm is enabled and the port's link is active, or when the corresponding PORT alarm is disabled.
10M	GREEN	On	TP port's 10 Mbps link is active
		Blinking	Data is being transmitted at 10 Mbps
		Off	TP Port's 10 Mbps link is inactive
100M (TP)	GREEN	On	TP port's 100 Mbps link is active
		Blinking	Data is being transmitted at 100 Mbps
		Off	100BaseTX Port's link is inactive
100M (FX)	GREEN	On	FX port's 100 Mbps is active
		Blinking	Data is being transmitted at 100 Mbps
		Off	100BaseFX port is inactive

## Auto MDI/MDI-X Connection

The Auto MDI/MDI-X function allows users to connect 10/100BaseTX ports to any kind of Ethernet device, without needing to pay attention to the type of Ethernet cable being used for the connection. This means that you can use either a *straight-through* cable or *cross-over* cable to connect IE-SW-VL16 switches to other Ethernet devices.

## Fiber Ports

Fiber switched ports operate at a fixed 100 Mbps speed and full-duplex mode to provide the best performance. The fiber ports are factory-built as either a multi-mode or single-mode SC/ST connector. Consequently, you should use fiber cables that have SC/ST connectors at both ends. When plugging the connector into the port, make sure the slider guide is positioned to the right side so that it fits snugly into the port.



The 100 Mbps fiber ports are switched ports, and perform as a domain, providing a high bandwidth backbone connection that supports long fiber cable distances (up to 5 km for multi-mode) for installation versatility.

## Dual Speed Functionality and Switching

Switched 10/100 Mbps RJ45 ports automatically negotiates with the connected device for the fastest data transmission rate supported by both devices. All models of Ethernet Switch are plug-and-play devices, so that software configuration is not required at installation, or during maintenance. The half/full duplex mode for the switched RJ45 ports is user dependent and changes (by auto-negotiation) to full or half duplex, depending on which transmission speed is supported by the attached device.

## Switching, Filtering, and Forwarding

Each time a packet arrives at one of the switched ports, a decision is made to either filter or forward the packet. Packets with source and destination addresses belonging to the same port segment will be filtered, constraining those packets to one port, and relieving the rest of the network from the need to process them. A packet with destination address on another port segment will be forwarded to the appropriate port, and will not be sent to the other ports where it is not needed. Packets that are used in maintaining the operation of the network (such as the occasional multi-cast packet) are forwarded to all ports.

IE-SW-VL16 Switches operate in the store-and-forward switching mode, which eliminates bad packets and enables peak performance to be achieved when there is heavy traffic on the network.

## Switching and Address Learning

IE-SW-VL16 Switches have an address table that can hold up to 4K node addresses, which makes it suitable for use with large networks. The address tables are self-learning, so that as nodes are added or removed, or moved from one segment to another, the switch automatically keeps up with new node locations. An address-aging algorithm causes the least-used addresses to be deleted in favor of newer, more frequently used addresses. To reset the address buffer, power down the unit and then power it back up.

## Auto-Negotiation and Speed Sensing

All of the RJ45 Ethernet ports independently support auto-negotiation for speeds in the 10BaseT and 100BaseTX modes, with operation according to the IEEE 802.3u standard. This means that some nodes could be operating at 10 Mbps, while at the same time other nodes are operating at 100 Mbps.

Auto-negotiation takes place when an RJ45 cable connection is made, and then each time a LINK is enabled. An IE-SW-VL16 Switch advertises its capability for using either 10 Mbps or 100 Mbps transmission speeds, with the device at the other end of the cable expected to similarly advertise. Depending on what type of device is connected, this will result in agreement to operate at a speed of either 10 Mbps or 100 Mbps.

If an RJ45 Ethernet port is connected to a non-negotiating device, the default values 10 Mbps speed and half-duplex mode will be set, as required by the IEEE 802.3u standard.

## Specifications

### Technology

Standards	IEEE802.3, 802.3u, 802.3x
Forward and Filtering Rate	148810 pps (100M), 14881 pps (10M)
Packet Buffer Memory	1.25 MB
Processing Type	Store and Forward, with IEEE802.3x full duplex, back pressure flow control
Address Table Size	4K uni-cast addresses

### Interface

RJ45 Ports	10/100BaseT(X) auto negotiation speed, F/H duplex mode, and auto MDI/MDI-X connection
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Fiber Ports	100BaseFX ports (SC/ST connector)
LED Indicators	Power, Fault, 10/100M
DIP Switch	Port break alarm mask
Alarm Contact	One relay output with current carrying capacity of 1A @ 24 VDC

#### Optical Fiber

	Multi mode	Single mode (Option)
Distance, km	5	40
Wavelength, nm	1300	1310
Min. TX Output, dBm	-20	-5
Max. TX Output, dBm	-14	0
Sensitivity, dBm	-34 to -30	-36 to -32
Recommended Diameter (Core/Cladding) $\mu\text{m}$	50/125	9/125
	(1 dB/km, 800 MHz $\times$ km)	

#### Power

Input Voltage	12 to 45 VDC, redundant inputs
Input Current @ 24VDC	0.27 A: IE-SW-VL16-16TX 0.44 A: IE-SW-VL16-14TX-2SC/ST
Connection	Removable "6-pin" Terminal Block
Overload Current Protection	1.6 A
Reverse Polarity Protection	Present

#### Mechanical

Casing	IP30 protection, metal case
Dimensions	80.5 x 135 x 105 mm (W x H x D)
Weight	1.14 kg
Installation	DIN-Rail, Wall Mounting

#### Environmental

Operating Temperature	0 to 60°C (32 to 140°F) -40 to 75°C (-40 to 167°F) for -T models
Storage Temperature	-40 to 85°C (-40 to 185°F)
Ambient Relative Humidity	5 to 95% (non-condensing)

#### Regulatory Approvals

Safety	UL60950 (E212360), UL 508, CSA C22.2 No. 60950, EN60950
Hazardous Location	UL/cUL Class I, Division 2, Groups A, B, C and D ATEX Class I, Zone 2, Ex nC nL IIC T4
EMI	FCC Part 15, CISPR (EN55022) class A
EMS	EN61000-4-2 (ESD), Level 3 EN61000-4-3 (RS), Level 3 EN61000-4-4 (EFT), Level 3 EN61000-4-5 (Surge), Level 3 EN61000-4-6 (CS), Level 3
Shock	IEC60068-2-27
Free Fall	IEC60068-2-32
Vibration	IEC60068-2-6

**WARRANTY** 5 years

Weidmüller gives a 5 year warranty on this product in accordance with the warranty terms as described in the general conditions of sale of the Weidmüller company which has sold the products to you. Weidmüller warrants to you that such products the defects of which have already existed at the time when the risk passed will be repaired by Weidmüller free of charge or that Weidmüller will provide a new, functionally equivalent product to replace the defective one. Safe where expressly described otherwise in writing in this catalogue/product description, Weidmüller gives no warranty or guarantee as to the interoperability in specific systems or as to the fitness for any particular purpose. To the extent permitted by law, any claims for damages and reimbursement of expenses, based on whatever legal reason, including contract or tort, shall be excluded. Where not expressly stated otherwise in this warranty, the general conditions of purchase and the expressive liability commitments therein of the respective Weidmüller company which has sold the products to you shall be applicable.

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