



**GarrettCom®**

*Industrial Networking at Its Best™*

## Magnum 12KX



## **Substation-Hardened Gigabit Switch w/1588v2 Timing**

### **Hardware Installation and User Guide**

# Magnum™ 12KX Managed Switch

## Hardware Installation and User Guide

Part #: 84-00189Z (Rev. A)

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**Important:** The Magnum 12KX Managed Switch contains no user-serviceable parts. Attempted service by unauthorized personnel may render all warranties null and void. If problems are experienced with Magnum 12KX Switch products, contact your supplier for assistance or contact GarrettCom Customer Support.

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<b>Table of Contents</b>	<b>Page</b>
<b>Safety instructions .....</b>	<b>1</b>
<b>About this Manual .....</b>	<b>7</b>
<b>1.0 Introduction.....</b>	<b>8</b>
1.1 Ordering Information .....	9
1.2 Product Description .....	12
1.3 Description of model variants.....	14
1.3.1 12KX-2H, 12KX-2L, 12KX-1H, 12KX-1L .....	15
1.3.2 12KX-1H1POE, 12KX-1L1POE.....	16
1.3.3 12KXR-2H, 12KXR-2L, 12KXR-1H, 12KXR-1L.....	17
1.3.4 12KXR-1H1POE, 12KXR-1L1POE.....	18
1.3.5 PoE ports.....	19
1.3.6 Combo ports.....	19
<b>2.0 Installation and Set-up .....</b>	<b>20</b>
2.1 Installation .....	20
2.1.1 Unpacking and checking.....	20
2.1.2 Installing the SFP modules (optional).....	20
2.1.3 Connecting the power unit connections for supply voltage and signal contact .....	21
2.1.4 Installing the device and grounding.....	24
2.1.5 Startup procedure.....	28
2.1.6 Connecting the data lines .....	28
2.2 Display elements.....	30
2.3 Basic set-up.....	33
<b>3.0 Technical Specifications .....</b>	<b>35</b>
<b>4.0 Troubleshooting .....</b>	<b>40</b>
4.1 Before Calling for Assistance .....	40
4.2 When Calling for Assistance .....	41
4.3 Return Material Authorization (RMA) Procedure .....	41
4.4 Shipping and Packaging Information.....	42
<b>APPENDIX A: WARRANTY INFORMATION.....</b>	<b>42</b>

Revisions:

**Rev. A 09/11:** Initial Release

## Safety instructions

This documentation contains instructions which must be observed to ensure your own personal safety and to avoid damage to devices and machinery.

### ■ Certified usage

The device may only be employed for the purposes described in the catalog and technical description, and only in conjunction with external devices and components recommended or approved by the manufacturer. The product can only be operated correctly and safely if it is transported, stored, installed and assembled properly and correctly. Furthermore, it must be operated and serviced carefully.

### ■ Supply voltage

The supply voltage is electrically isolated from the housing.

- Use undamaged parts.
- The device does not contain any service components. Internal fuses are only triggered if there is a fault in the device. If the device is not functioning correctly, or if it is damaged, switch off the voltage supply and return the device to the plant for inspection.
- Only switch on the device when the housing is closed.
- Connect the protective conductor before you set up the other connections. When removing the connections, you remove the protective conductor last.
- Connect both protective conductors if your device is equipped with two power supply units.
- Make sure that the cross-section of the protective conductor cable is the same size as or bigger than the cross-section of the voltage supply cables.
- Only use connection cables that are permitted for the specified temperature range.

**Warning:**

– If the neutral conductor or the negative terminal of the supply voltage is not grounded.

– If you are using a DC voltage greater than 125 VDC for the supply voltage install a suitable input fuse.

For power supply units with product code “H”, use a slow-blow fuse with a nominal rating of 2.5 A for the voltage supply input.

For power supply units with product code “L”, use a slow-blow fuse with a nominal rating of 6.3 A.

With AC power supply, use a cable cross-section of at least 0.75 mm<sup>2</sup> (North America: AWG 18) for the current conductor at the voltage input.

With DC power supply, use a cable cross-section of at least 1.0 mm<sup>2</sup> (North America: AWG 16) for the current conductor at the voltage input.

- Relevant for North America:  
Only use copper wire/conductors of class 1, 60/75°C or 75°C.

**Warning:**

Only connect a supply voltage that corresponds to the type plate of your device. Power supply type “L”: 18 to 60 V DC

Power unit type “H”: 77 to 300 V DC or 90 to 265 V AC

**■ Shielding ground**

The shielding ground of the connectable twisted pairs lines is connected to the front panel as a conductor.

- Beware of possible short circuits when connecting a cable section with conductive shielding braiding.

**■ Housing**

Only technicians authorized by the manufacturer are permitted to open the housing. The device is grounded via a ground connection on the front panel of the device.

- Make sure that the electrical installation meets local or nationally applicable safety regulations.
- The ventilation slots must not be covered so as to ensure free air circulation.
- The clearance to the ventilation slots of the housing must be at least 10 cm (3.94 in).
- Do not touch the housing during operation or shortly after switching off the device. Hot surfaces can cause injury.

**Warning:**

Never insert sharp objects (small screwdrivers, wires, etc.) into the inside of the product. There is the risk of an electric shock.

- The device must be installed in the horizontal or upright position, either in the switch cabinet or on the wall (see on page 24, Installing the device and grounding“). The device is not intended for operation as a table unit.
- Operating the device in the maximum surrounding air temperature and stacking devices: When installing the device, make sure there is at least one free rack space (approx. 5 cm) above the device, because heat is discharged via the housing of the device.
- If you are operating the device in a 19" switch cabinet: install sliding/mounting rails for holding the device (see on page 24, Installing the device and grounding“).



**Warning:** Only install the device in locations accessible to trained maintenance personnel.

- If installed in a living area or office environment, the device must be operated exclusively in switch cabinets with fire protection characteristics in accordance with EN 60950-1.



**Warning:** Never insert sharp objects (small screwdrivers, wires, etc.) into the field connection terminals for the supply voltage, and do not touch the terminals! There is the risk of an electric shock.

**■ Environment**

The device may only be operated at the specified surrounding air temperature (temperature of the surrounding air at a distance of up to 5 cm (1.97 in) from the device) and relative air humidity specified in the technical data.

- Install the device in a location where the climatic threshold values specified in the technical data will be observed.
- Use the device only in an environment within the contamination level specified in the technical data.

**■ Qualification requirements for personnel**

Qualified personnel as understood in this manual and the warning signs, are persons who are familiar with the setup, assembly, startup, and operation of this product and are appropriately qualified for their job. This includes, for example, those persons who have been:

- trained or directed or authorized to switch on and off, to ground and to label power circuits and devices or systems in accordance with current safety engineering standards;
- trained or directed in the care and use of appropriate safety equipment in accordance with the current standards of safety engineering;
- trained in providing first aid.

## ■ **General safety instructions**

Electricity is used to operate this equipment. Comply with every detail of the safety requirements specified in the operating instructions regarding the voltages to apply (see page 1).

Non-observance of these safety instructions can therefore cause material damage and/or serious injuries.

- Only appropriately qualified personnel should work on this device or in its vicinity. These personnel must be thoroughly familiar with all the warnings and maintenance procedures in accordance with this operating manual.
- The proper and safe operation of this device depends on proper handling during transport, proper storage and assembly, and conscientious operation and maintenance procedures.
- Never start operation with damaged components.
- Only use the devices in accordance with this manual. In particular, observe all warnings and safety-related information.
- Any work that may be required on the electrical installation may only be carried out by personnel trained for this purpose.
- Please note that products recommended as accessories may have characteristics that do not fully correspond to those of the corresponding product. This may limit their possible usage in the overall system.

### **Note:**

LED or LASER components in compliance with IEC 60825-1 (2001):  
CLASS 1 LASER PRODUCT  
CLASS 1 LED PRODUCT

## ■ **National and international safety regulations**

- Make sure that the electrical installation meets local or nationally applicable safety regulations.

## ■ **CE marking**

The devices comply with the regulations contained in the following European directive(s):

2004/108/EG

Directive of the European Parliament and the council for standardizing the regulations of member states with regard to electromagnetic compatibility.

2006/95/EG

Directive of the European Parliament and the council for standardizing the regulations of member states with regard to electrical equipment to be used within specific voltage ranges.

In accordance with the above-named EU directive(s), the EU conformity declaration will be at the disposal of the relevant authorities at the following address:

GarrettCom, Inc.  
47823 Westinghouse Drive  
Fremont, CA. 94539  
USA  
Ph: (510) 438-9071

The product can be used in the industrial sector.

- Interference immunity: EN 61000-6-2:2005
- Emitted interference: EN 55022:2006 + A1:2007 Class A
- Safety: EN 60950-1:2006



**Warning:**

This is a class A device. This device can cause interference in living areas, and in this case the operator may be required to take appropriate measures.



**Warning:**

The assembly guidelines provided in these instructions must be strictly adhered to in order to observe the EMC threshold values.

■ **FCC note:**

This device complies with part 15 of FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference; (2) this device must accept any interference received, including interference that may cause undesired operation.



Appropriate testing has established that this device fulfills the requirements of a class A digital device in line with part 15 of the FCC regulations. These requirements are designed to provide sufficient protection against interference when the device is being used in a business environment. The device creates and uses high frequencies and can radiate same, and if it is not installed and used in accordance with this operating manual, it can cause radio transmission interference. The use of this device in a living area can also cause interference, and in this case the user is obliged to cover the costs of removing the interference.

▪ **Recycling note**

After usage, this product must be disposed of properly as electronic waste, in accordance with the current disposal regulations of your county, state and country.

- RoHS compliant

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## About this Manual

The “Installation” user manual contains a device description, safety instructions, a description of the display, and the other information that you need to install the device.

The MNS-12KS-L2 software provides you with additional options for smooth configuration and monitoring:

- Event log
- Configuration of “System Location” and “System Name”
- Configuration of the network address range and the SNMP parameters
- Saving the configuration on the device
- Simultaneous configuration of multiple devices
- Configuration of the port display color red for a connection error

With the MNS-12KS-L3 software, you increase your network security in industrial application areas:

- ETHERNET Early Warning System
- Easy monitoring of industrial networks
- Fast display
- Interface with diagnostic and configuration programs
- Low deployment cost

## 1.0 Introduction

The GarrettCom Magnum 12KX Gigabit Managed Switch provides 16 Gigabit combo ports with built-in SFPs – allowing a choice of fixed 10/100/1000 BASE-TX connectivity or fiber SFPs. The substation-hardened Magnum 12KX has a non-blocking switching fabric to provide wire-speed performance on all ports.

The Magnum 12KX is synchronized via SNTP or with precision timing using IEEE 1588v2 PTP on all ports which assures accuracy within 30ns. The unit is well-suited for different needs with environmental certifications including

IEC 61850, RoHS compliancy, high and low voltage power supply options, and optional PoE ports. Surveillance and security applications leverage the speed, PoE, multicast capabilities, media flexibility, power supply flexibility and more. Similarly, power utilities can further leverage the timing synchronization as well as redundancy capabilities available in the software.

Upholding GarretCom's product line of time-tested robust products, the switch is designed for heavy-duty industrial applications in harsh environments, with a temperature rating of -40° C to +85° C. Additionally the unit is convection-cooled (no fans), has a redundant power supply, is vibration resistant, ESD-immune, and is available with optional conformal coating.

Layer 3 software for the Magnum 12KX includes full wire speed IPv4 RIP-based routing, port based routing interfaces, static routing, VLAN-based router interface definitions, double VLAN tagging, protocol-based VLANs Multicast Routing (DVMRP, IGMPv1/v2/v3, Multicast routing and IGMP Unknown Multicast Filtering simultaneously, PIM-DM). Alternately, environments using OSPF can use OSPF v2 capabilities included in the software. The GarrettCom Magnum 12KX Gigabit managed switch along with the Magnum 10KT managed switch and Magnum 10ETS managed terminal server allow network architects to create networks encompassing features such as precision time synchronization, high-availability Layer 2 as well as Layer 3 devices, serial and Ethernet connectivity, routing flexibility such as RIP or OSPF and more.

For networks that do not need the Layer 3 software capability, the Magnum 12KX Gigabit managed switch is available with Layer 2 software offering simplicity and affordability.

## 1.1 Ordering Information

### Magnum 12KX Switches, models with Dual Internal Power Supplies

<u>MODEL</u>	<u>DESCRIPTION</u>
<b>Magnum 12KX-2H:</b>	Magnum 12KX Managed L2 or L3 Switch, front-mount, with two ACDC "high" internal Power Supplies for redundancy. Sixteen Gb ports, each of which are "combo" auto-negotiating RJ45 copper or SFP12KX for Gb or 100Mb fiber ports with IEEE 1588v2 Precision Timing. Heavy-duty case, convection cooled. Includes RJ11 console port, plus a USB interface for auto-configuration and saving, and an alarm contact for signaling power loss. Choose either Layer 2 software (default) or optional Layer 3 software, factory installed.
<b>Magnum 12KXR-2H:</b>	Same as Model 12KX-2H except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).
<b>Magnum 12KX-2L:</b>	Magnum 12KX Managed L2 or L3 Switch, front-mount, with two 24V-to-48V-nominal "low" DC internal Power Supplies for redundancy. Sixteen Gb ports, each of which are "combo" auto-negotiating RJ45 copper or SFP12KX for Gb or 100Mb fiber ports with IEEE 1588v2 Precision Timing. Heavy-duty case, convection cooled. Includes RJ11 console port, plus a USB interface for auto-configuration and saving, and an alarm contact for signaling power loss. Choose either Layer 2 software (default) or optional Layer 3 software, factory installed
<b>Magnum 12KXR-2L:</b>	Same as Model 12KX-2L except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

### Magnum 12KX Switches, models with one Internal Power Supply

<u>MODEL</u>	<u>DESCRIPTION</u>
<b>Magnum 12KX-1H:</b>	Magnum 12KX Managed L2 or L3 Switch, front-mount, with one ACDC "high" internal Power Supply. Sixteen Gb ports, each of which are "combo" auto-negotiating RJ45 copper or SFP12KX for Gb or 100Mb fiber ports with IEEE 1588v2 Precision Timing. Heavy-duty case, convection cooled. Includes RJ11 console port, plus a USB interface for auto-configuration and saving, and an alarm contact for signaling power loss. Choose either Layer 2 software (default) or optional Layer 3 software, factory installed.
<b>Magnum 12KXR-1H:</b>	Same as Model 12KX-1H except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).
<b>Magnum 12KX-1L:</b>	Magnum 12KX Managed L2 or L3 Switch, front-mount, with one 24V-to-48V-nominal "low" DC internal Power Supply. Sixteen Gb ports, each of which are "combo" auto-negotiating RJ45 copper or SFP12KX for Gb or 100Mb fiber ports with IEEE 1588v2 Precision Timing. Heavy-duty case, convection cooled. Includes RJ11 console port, plus a USB interface for auto-configuration and saving, and an alarm contact for signaling power loss. Choose either Layer 2 software (default) or optional Layer 3 software, factory installed.
<b>Magnum 12KXR-1L:</b>	Same as Model 12KX-2L except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

## **MAGNUM 12KX Switches, models with one internal PS for the switch and one internal PoE Power Supply for 4 PoE ports**

### **MODEL**

### **DESCRIPTION**

**Magnum 12KX-1H1POE:** Magnum 12KX PoE Managed L2 or L3 Switch, front-mount, with one ACDC "high" internal Power Supply for the switch and one ACDC "high" power supply for powering four RJ45 PoE ports. Twelve other Gb ports, each of which are "combo" auto-negotiating RJ45 copper or SFP12KX for Gb or 100Mb fiber ports with IEEE 1588v2 Precision Timing. Heavy-duty case, convection cooled. Includes RJ11 console port, plus a USB interface for auto-configuration and saving, and an alarm contact for signaling power loss. Choose either Layer 2 software (default) or optional Layer 3 software, factory installed.

**Magnum 12KXR-1H1POE:** Same as Model 12KX-1H1POE except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

**Magnum 12KX-1L1POE:** Magnum 12KX PoE Managed L2 or L3 Switch, front-mount, with one 24V-to-48V-nominal "low" DC internal Power Supply for the switch and one ACDC "high" power supply for powering four RJ45 PoE ports. Twelve other Gb ports, each of which are "combo" auto-negotiating RJ45 copper or SFP12KX for Gb or 100Mb fiber ports with IEEE 1588v2 Precision Timing. Heavy-duty case, convection cooled. Includes RJ11 console port, plus a USB interface for auto-configuration and saving, and an alarm contact for signaling power loss. Choose either Layer 2 software (default) or optional Layer 3 software, factory installed.

**Magnum 12KXR-1L1POE:** Same as Model 12KX-1L1POE except chassis is a Reverse Mount unit. (All signal and power cables are in the rear).

## **MAGNUM 12KX Switch Gb Fiber SFPs (Small Form-factor Pluggable) Transceivers**

### **MODEL**

### **DESCRIPTION**

**SFP12KX-SX:** Gig Fiber Optic SFP transceiver for Magnum 12KX, rated -40 to 85°C, 1000Mb SX, 850nm wavelength, 550meters distance nominal, 2km per Power Budget

**SFP12KX-LX25:** Gig Fiber Optic SFP transceiver for Magnum 12KX, rated -40 to 85°C, 1000Mb LX, 1310nm wavelength, 20km distance nominal, 25km per Power Budget

**SFP12KX-ZX40:** Gig Fiber Optic SFP transceiver for Magnum 12KX, rated -40 to 85°C, 1000Mb ZX, 1550nm wavelength, 40km distance

**SFP12KX-ZX70:** Gig Fiber Optic SFP transceiver for Magnum 12KX, rated -40 to 85°C, 1000Mb ZX, 1550nm wavelength, 70km distance

## **MAGNUM 12KX Switch 100Mb Fiber SFPs (Small Form-factor Pluggable) Transceivers**

<u>MODEL</u>	<u>DESCRIPTION</u>
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**SFP12KX-FXMM2:** 100FX Fiber Optic SFP transceiver for Magnum 12KX, rated -40 to 85°C, multi-mode, 2km distance

**SFP12KX-FXSM25:** 100FX Fiber Optic SFP transceiver for Magnum 12KX, rated -40 to 85°C, single-mode, 25km distance

**SFP12KX-FXSM100:** 100FX Fiber Optic SFP transceiver for Magnum 12KX, rated -40 to 85°C, single-mode, 100km distance

## **MAGNUM 12KX MANAGED NETWORK SWITCH SOFTWARE and OTHER OPTIONS**

<u>MODEL</u>	<u>DESCRIPTION</u>
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**MNS-12KS-L2-LIC:** MNS-12KS licensed Layer 2 software for use on one Magnum 12KX Switch. License cost included with each Magnum 12KX Switch base unit that is factory configured for Layer 2 Switch operation. MNS-12K Release 1.1 includes support for CLI and scripts, MSTP, RSTP 802.1w and MRP, event log file, Syslog, SNMPv1, v2, SNMPv3 for access authentication, RMON, port mirroring, address conflict detection, network error detection, SFP speed-sensing and diagnostics (temperature, optical power), port security, SSL, SSH, RADIUS authentication per 802.1x, QoS 4 classes, port priority per IEEE 802.1D/p, VLANs per IEEE 802.1q, multicast support for IGMP snooping/querier, unknown multicast detection, broadcast/unicast/multicast limiter, GMRP IEEE 802.1d, flow control 802.3x. Documentation and updates via Internet and GCI FTP Server.

**MNS-12KS-L3-LIC:** MNS-12KS licensed Layer 3 software for use on one Magnum 12KX Switch. License cost included with each Magnum 12KX Switch base unit that is factory configured for Layer 3 Switch operation. Provides Layer 2 software features plus additional Layer 3 features, including full wire-speed IPv4 routing with low latency Multi-netting (Aliasing), Net-directed broadcasts, QoS 8 classes, Port-based Router interfaces, Proxy ARP, Static routing with ECMP (Equal Cost Multiple Path), VLAN-based router interfaces, CIDR (Classless Inter-Domain Routing), ICMP Router Discovery (IRDP), Double VLAN Tagging, Protocol-based VLANs Multicast Routing (DVMRP, IGMPv1/v2/v3, Multicast routing and IGMP Unknown Multicast Filtering, PIM-DM), Router Redundancy (VRRP, VRRP tracking, Interface Tracking), OSPFv2, Ping Tracking, RIPv1, RIPv2, and Tracking of static routes. Documentation and updates via Internet and GCI FTP Server.

**CONSOLE-CBL-12KX:** Magnum 12KX console attachment cable, serial configuration cable.

**ACA21-USB-12KX:** Magnum 12KX USB auto-configuration adapter for local configuration management.

**CONFORM05-12KX:** Conformal coating, for protection against moisture. Coats interior PCBs, power supply, and modules of one Magnum 12KX Managed Switch product.

**Please use this URL: for the complete Configuration Guide for the Magnum 12KX.**  
[http://www.garrettcom.com/techsupport/insertion\\_guides/12kxcg.pdf](http://www.garrettcom.com/techsupport/insertion_guides/12kxcg.pdf)

## 1.2 Product Description

The Magnum 12KX family provides you with a range of Switch variants. You can set up your device individually based on different criteria:

- Media type
- Temperature range
- Voltage range
- Software variant

The Magnum 12KX devices are designed for the special requirements of industrial automation. They meet the relevant industry standards, provide very high operational reliability, even under extreme conditions, and also long-term reliability and flexibility.

The devices allow you to set up switched industrial ETHERNET networks that conform to the IEEE 802.3 and 802.3u standards using copper wires or optical fibers in a line or ring structure.

The devices work without a fan.

If required, the devices are PoE capable.

For devices without PoE, the voltage supply can be redundant if required.

Mount the devices by

- 19" switch cabinet
- Flat surface mounting

You can choose various media to connect terminal devices and other infrastructure components:

- twisted pair cable
- multimode F/O
- singlemode F/O

The twisted pair ports support:

- Auto crossing
- Auto negotiation
- Auto polarity

There are a number of convenient options for managing the device.

Administer your devices via:

- a Web browser
- Telnet or ssh for Layer 3
- management software (e.g. MNS-12KS...)
- a V.24 interface (locally on the Switch)

Depending on the software you choose, the 12KX switch provides you with a large range of functions:

- Redundancy functions
  - Rapid Spanning Tree Protocol (RSTP)
  - Redundant coupling
  - Link aggregation
  - For devices without PoE: Redundant power supply
- Protection from unauthorized access
- Routing
- Synchronized system time in the network
- Network load control
- Operation diagnosis
- Diagnostics (hardware self-testing)
- Reset
- Priority
- VLAN
- Topology Discovery
- Web-based Interface
- Command Line Interface CLI
- SNMP
- 802.1x port authentication
- IEEE 1588v1 and v2
- SNTP time synchronization
- other features described on page 11



### 1.3 Description of model variants

The models differ with regard to the range of software functions, the number of interfaces, and the media type for connecting segments.

- The Magnum 12KX devices are Substation hardened Switches with 16 Gigabit combo ETHERNET ports (10/100/1000 Mbit/s, can be connected optically or with TX). These ports are suitable for the connection of terminal devices or network segments according to the standards IEEE 802.3 100/ 1000BASE-FX (SFP slot) and IEEE 802.3 1000BASE-T / 100BASE-TX / 10BASE-T (RJ45 socket). A plugged SFP module switches the TX port off.

Reverse mount switches, such as 12KXR-2H, have an additional V.24 port on the front of the device that you can use for diagnosis and configuration purposes.

- The PoE devices support PoE (Power over Ethernet) in accordance with IEEE 802.3af. The PoE ports are the Gigabit ETHERNET ports 1 to 4.
- The Reverse mount devices, all the cable outlets are at the back, i.e. the ports are on the back of the device. The devices also provide you with the following options for selecting the variant you desire:

#### Voltage range:

Power unit 1 and optional power unit 2:

- 18 V DC to 60 V DC
- 77 V DC to 300 V DC
- 90 V AC to 265 V AC

The voltage supply connection is clampable.

In devices with PoE, power supply unit 2 is the PoE power supply unit. You can choose the connections to power supply unit 1.

#### Software variant:

Layer 2 Professional (default)

Layer 3 Professional (optional)

The devices comply with the specifications of the standard(s):

- ISO/IEC 8802-03 10BASE-T/100BASE-TX/1000BASE-T
- ISO/IEC 8802-03 100BASE-FX
- ISO/IEC 8802-03 1000BASE-SX/LX

The Magnum 12KX device contains all the function units, such as: Switch function, management function, redundancy function, voltage connection, and management connection.

- Specific functions of TP/TX interface
  - Link Control

- Auto Polarity Exchange
- Auto negotiation
- Auto crossing (device may be connected with a crossed-over or an un-crossed cable)
- Specific functions of fiber optic interface
  - Link Down monitoring

The Magnum 12KX devices are Switches with a fixed configuration.

### 1.3.1 12KX-2H, 12KX-2L, 12KX-1H, 12KX-1L with 16 Gigabit ports

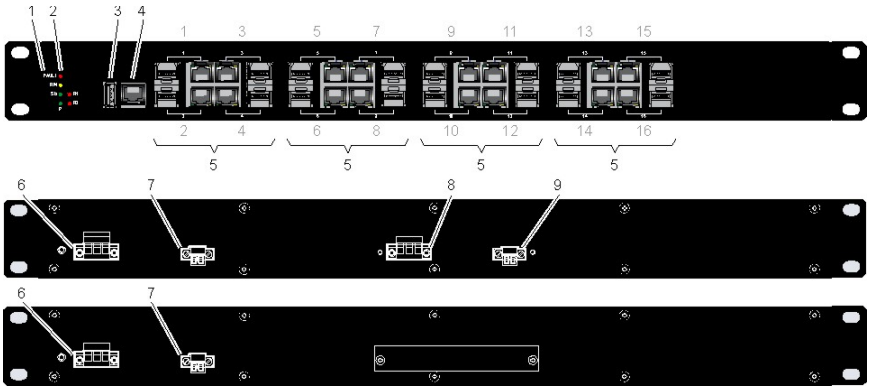


Figure 1: 1 – 12KX switch

2 - LED display elements

3 - USB interface

4 - V.24 connection for external management

5 - 4 x Gigabit ETHERNET combo ports: 100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/1000 Mbit/s twisted pair, RJ45 connections

Back of device:

6 - P1: Connection for the voltage supply

7 - Relay 1: signal contact

Back of device for device variants with 2 power supply units:

8 - P2: Connection for redundant voltage supply

9 - Relay 2: signal contact

### 1.3.2 12KX-1H1POE, 12KX-1L1POE with 16 Gigabit ports and PoE

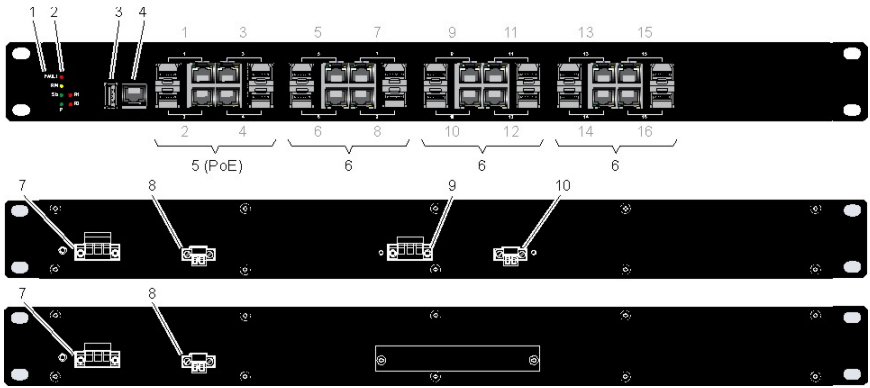


Figure 2: 1 – 12KX PoE switch

2 - LED display elements

3 - USB interface

4 - V.24 connection for external management

5 - 4 x Gigabit ETHERNET combo ports with Power over Ethernet (PoE):

100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/ 1000 Mbit/s twisted pair, RJ45 connections

6 - 4 x Gigabit ETHERNET combo ports: 100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/1000 Mbit/s twisted pair, RJ45 connections

Back of device:

7 - P1: Connection for the voltage supply

8 - Relay 1: signal contact

Back of device for device variants with 2 power supply units:

9 - P2: Connection for the PoE voltage supply

10 - Relay 2: signal contact

### 1.3.3 12KXR-2H, 12KXR-2L, 12KXR-1H, 12KXR-1L with 16 Gigabit ports, ports on rear



Figure 3: Back of device:

1 – 12KXR switch

2 - LED display elements

3 - USB interface

4 - V.24 connection for external management

5 - 4 x Gigabit ETHERNET combo ports: 100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/1000 Mbit/s twisted pair, RJ45 connections

6 - P1: Connection for the voltage supply

7 - Relay 1: signal contact

For device variants with 2 power supply units:

8 - P2: Connection for redundant voltage supply

9 - Relay 2: signal contact

Front of device:

10 - LED device status display elements

11 - LED port status display elements

12 - LED service port display element

13 - Service port

### 1.3.4 12KXR-1H1POE, 12KXR-1L1POE with 16 Gigabit ports and PoE, ports on rear

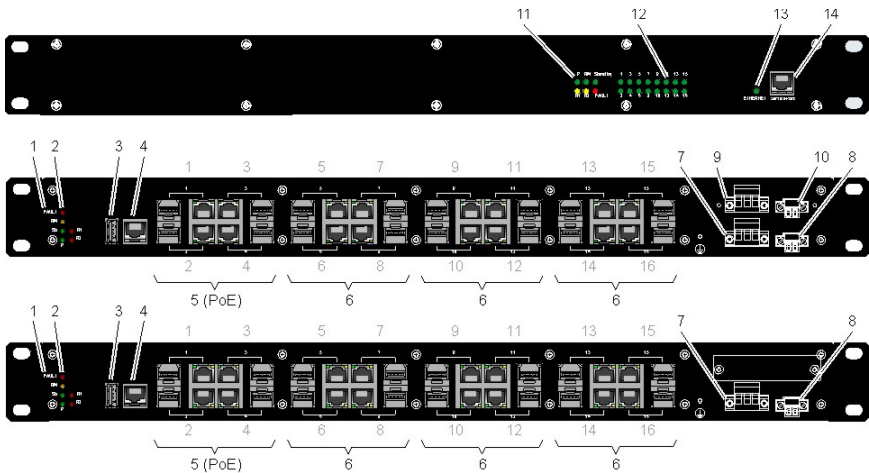


Figure 4: Back of device:

1 – 12KXR PoE switch

2 - LED display elements

3 - USB interface

4 - V.24 connection for external management

5 - 4 x Gigabit ETHERNET combo ports with Power over Ethernet (PoE):  
100/1000 Mbit/s fiber optic SFP slots. Alternative connections: 10/100/ 1000  
Mbit/s twisted pair, RJ45 connections

6 - 4 x Gigabit ETHERNET combo ports: 100/1000 Mbit/s fiber optic SFP  
slots. Alternative connections: 10/100/1000 Mbit/s twisted pair, RJ45  
connections

7 - P1: Connection for the voltage supply

8 - Relay 1: signal contact

For device variants with 2 power supply units:

9 - P2: Connection for redundant voltage supply

10 - Relay 2: signal contact

Front of device:

11 - LED device status display elements

12 - LED port status display elements

13 - LED service port display element

14 - Service port

The device variants of the Magnum 12KXR with ports on the rear panel have the following characteristics:

- The display LEDs are on the front of the device. There are 16 LEDs for displaying the status of the Gigabit ETHERNET ports and 6 LEDs for displaying the device status.
- The supply voltage connection and the ports are on the back of the device. The device has 16 Gigabit ETHERNET ports and an additional Fast ETHERNET port on the front of the device that you can use for diagnosis purposes.

### 1.3.5 PoE ports

The Magnum 12KX PoE and reverse mount 12KXR PoE models support Power over Ethernet (PoE) in accordance with IEEE 802.3af on ports 1 to 4.

They allow the connection and remote supply of, for example, IP telephones (Voice over IP), webcams, sensors, printer servers and WLAN access points via 10BASE-T/100BASE-TX/1000BASE-T. With PoE, these terminal devices are powered by the twisted-pair cable.

The 12KX PoE and 12KXR PoE provide four 10BASE-T/100BASE-TX/1000BASE-T ports (RJ45 sockets) for connecting network segments or PoE terminal devices (PD, Powered Device) for all IEEE802.3af classes up to a maximum power output of 15.4 W.

The 4 PoE-capable ports are the 4 first ports on the device (ports 1 to 4, see fig. 2 and fig. 4). The current is supplied on wire pairs transmitting the signal (pins 1, 2, 3 & 6). The individual ports are not electrically insulated from each other. (see page 28 „10/100/1000 Mbit/s twisted pair connection“)

The following conditions are met in accordance with IEEE 802.3af:

- Endpoint PSE
- Alternative A

### 1.3.6 Combo ports

At the four Gigabit ETHERNET combo ports (see fig. 1 to fig. 4) you can connect either F/O (via SFP modules) or twisted pair port (via RJ45).

- SFP modules: SFP modules are optical transceivers (Fast ETHERNET and Gigabit ETHERNET SFP modules, see pages 10-11). SFP stands for Small Form-factor Pluggable and is also frequently referred to as mini-GBIC (GigaBit Interface Converter).

The SFP modules are plugged into the SFP slots of the Magnum 12KX device in order to obtain an F/O port. The 12KX has 16 TP interfaces and 16 slots for inserting SFP modules (100/1000 Mbit/s). By inserting the SFP module you deactivate the corresponding TP interface.

**Note:** Only use GarrettCom SFP modules (see pages 10-11).

## 2.0 Installation and Set-up

The devices have been developed for use in Substations. The installation process is correspondingly simple.

On delivery, the device is ready for operation.

The following procedure has been proven to be successful for the installation of the device:

- Unpacking and checking
- Installing the SFP modules (optional)
- Connecting the power unit connections for supply voltage and signal contact
- Installing the device and grounding
- Startup
- Connecting the data lines

### 2.1 Installation

#### 2.1.1 Unpacking and checking

- Check that the contents of the package are complete:
  - Magnum 12KX unit
  - 2x brackets
  - Connectors for power supply and relay contact
- Check the individual parts for transport damage.

#### 2.1.2 Installing the SFP modules (optional)



*Figure 5: Fast ETHERNET (100Mb) fiber optic SFP module  
or Gigabit ETHERNET fiber optic SFP module*

- Push the SFP module with the lock closed into the socket until it latches audibly in place.

**Note:** Only use GarrettCom SFP modules (see pages 10-11).

### 2.1.3 Connecting the power unit connections for supply voltage and signal contact

- Connect the power supply and signal lines.

**Note:** Note the safety instructions (see on page 1, Supply voltage<sup>64</sup>) and only connect a supply voltage that corresponds to the type plate of your device. Make sure that the contact load capability of the signal contact is not exceeded (see on page 36, Technical data<sup>64</sup>).

The voltage supply is connected via a 3-pin terminal block with screw locking.

The signal contact is connected via a 2-pin terminal block with screw locking (1 or 2 locks, depending on the device design).

For device variants without PoE: The supply voltage in 12KX and reverse mount 12KXR device types can be connected redundantly with two power units. Both inputs are uncoupled.

The supply voltage is electrically isolated from the housing.

#### ■ Magnum 12KX models without PoE

Magnum 12KX models without PoE (Power over Ethernet) are, depending on the device type, equipped with one or two power units of the following type:

- Type “L” (18 VDC to 60 VDC, see ordering information starting on page 9 and/or
- Type “H” (77 VDC to 300 VDC or 90 VAC to 265 VAC, see ordering information starting on page 9

**Note:** For models without PoE: For models with two power units, if there is non-redundant voltage supply, the device reports the failure of one supply voltage. You can prevent this message by applying the supply voltage via both inputs, or by changing the configuration in the Management.

#### ■ Magnum 12KX models with PoE

Magnum 12KX models with PoE (Power over Ethernet) are equipped with two power units.

- Power unit 2 is a PoE power unit; see ordering information starting on page 9.
- You can choose the connections to power unit 1; see ordering information starting on page 9.



## ■ Connecting the supply voltage



**Warning:** Never insert sharp objects (small screwdrivers, wires, etc.) into the terminal block for the supply voltage, and do not touch the terminals! There is the risk of an electric shock.



**Note:** Note the safety instructions (see on page 1, Supply voltage“) and only connect a supply voltage that corresponds to the type plate of your device. Make sure that the contact load capability of the signal contact is not exceeded (see on page 36, Technical data“).

**Note:** Relevant for North America:

The tightening torque of the terminal block screws is 3 lb in. (0.34 Nm).

- Pull the terminal block(s) off the switch and connect the voltage supply lines as follows:
- First connect the protective conductor to the protective conductor terminal.
- Connect the supply voltage via the 3-pin terminal block. Pay attention to the +/L and -/N connections.
- If the neutral conductor or the minus terminal of the supply voltage is not grounded, install a suitable fuse in the input line.

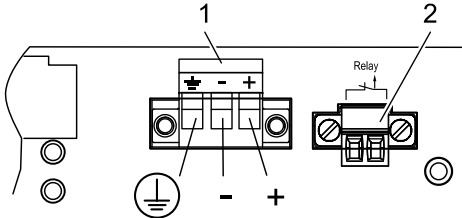


Figure 6: Device with power unit “L”, DC voltage (18...60 VDC)

- 1 - Supply voltage  
2 - Signal contact

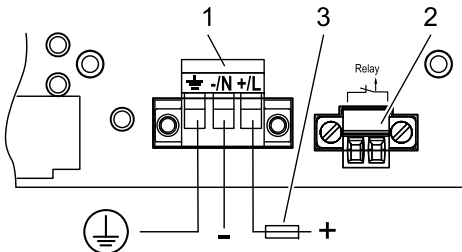


Figure 7a: Devices with power unit “H”, DC voltage 77-300 VDC

- 1 - Supply voltage  
2 - Signal contact  
3 - External fuse for supply voltages > 125 VDC

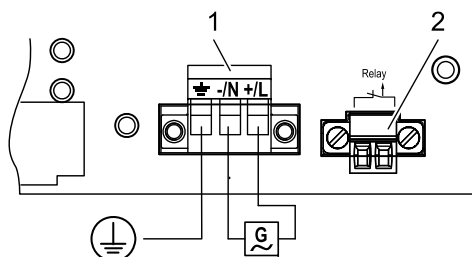


Figure 7b: Devices with power unit “H”, AC voltage

1 - Supply voltage

2 - Signal contact

Connection	Type “L”	Type “H” VDC	Type “H” VAC
⊥, pin 1	Protective conductor	Protective conductor	Protective conductor
-N, pin 2	Minus terminal of the supply voltage	Minus terminal of the supply voltage	Neutral conductor
+L, pin 3	Plus terminal of the supply voltage	Plus terminal of the supply voltage	“Phase” supply voltage

Table 1: Pin assignment of spring-loaded terminal for voltage supply.

For type “H” power units, you can choose between connecting DC or AC voltage.

- For supply voltages > 125 VDC:  
Install a suitable external fuse in the supply voltage input line of the plus terminal (see fig. 7a).

**Note:** The terminal blocks for devices with power unit type “H” (type “L”) are coded to prevent them from being accidentally connected to devices with power unit type “L” (type “H”).

#### ■ Connecting the PoE supply voltage (optional)

The devices connected are supplied with PoE voltage (48 V DC safety low voltage) via an internal power supply unit. The twisted-pair cables at Gigabit ETHERNET ports 1 to 4 of the device are supplied with PoE voltage via the wire pairs transmitting the signal (phantom voltage).

#### ■ **“Relay” signal contact**

Depending on the Magnum 12KX model (equipped with one or two power units), you have either one or two signal contacts.

- The signal contact monitors proper functioning of the device, thus enabling remote diagnostics. You can specify the type of function monitoring in the Management. Pin assignment: see fig. 6 and fig. 7.
- Also, use the Management to switch the signal contact manually and thus control external devices.

A break in contact is used to report the following conditions via the potential-free signal contact (relay contact, closed circuit):

- The failure of associated supply voltage.
- A continuous malfunction in the device.
- The loss of connection at at least one port. The report of the link status can be masked by the Management for each port. In the delivery state, link status monitoring is deactivated.
- A detected error during the self-test.
- Permitted temperature range exceeded/not reached.

**Note:** You can use the signal contact functions when the voltage supply is connected. If there is redundant voltage supply, but this is turned off, there is a contact interruption at the corresponding signal contact.

### **2.1.4 Installing the device and grounding**

**Note:** The shielding ground of the connectable industrial twisted pair lines is connected to the front panel as a conductor.

#### ■ **Mounting in a 19" rack**

The devices are designed to be mounted in a 19" rack.

- Make sure there is sufficient ventilation. If necessary, provide a fan for the 19" rack. This will prevent the basic devices from overheating.
- Measure the depth of the 19" rack so as to allow the main cable, and any power supply cables, to be fitted from the back, and the data cables to be fitted from the front.

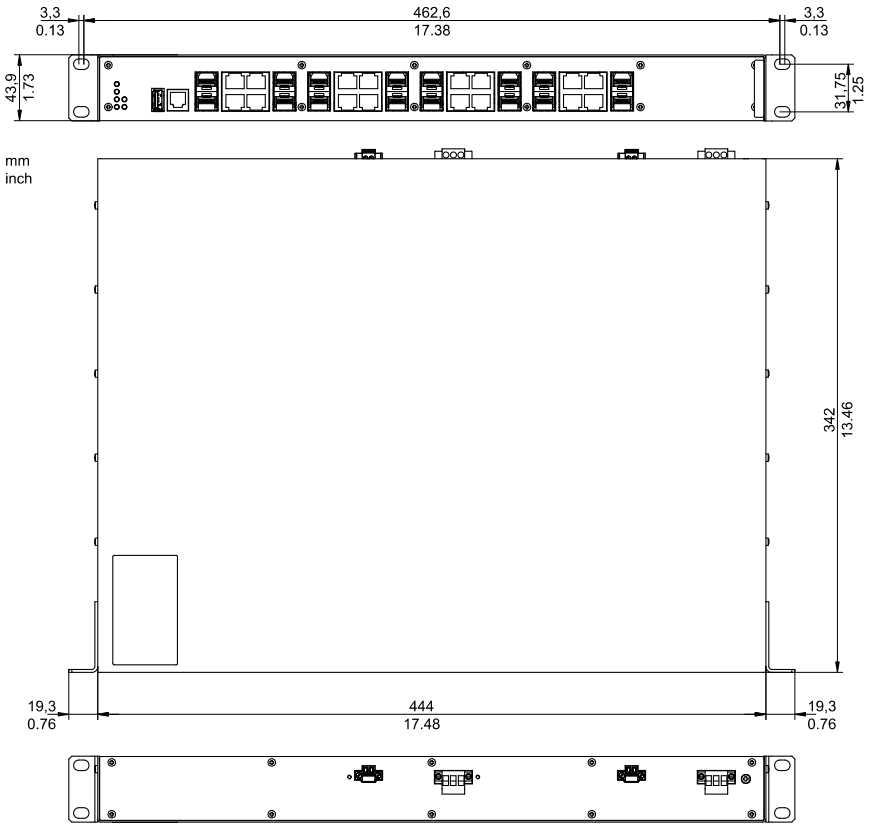


Figure 8: Dimensions (mm / inch)

If you are operating the device in a 19" switch cabinet, mounting brackets are used (included in the delivery) to hold the weight of the device.

**Warning!** If the device is installed in a 19" switch cabinet without mounting brackets, increased vibration can cause damage to the device and/or its modules.



Install the mounting brackets to the 19" switch as instructed. On delivery, two brackets are attached to the sides of the device (see figure below).

- Fasten the device by screwing the brackets to the switch.



Figure 9: Mounting in the switch cabinet



**Warning!**

When installing the device, make sure the ventilation slots remain unobstructed, as otherwise the device can overheat and be damaged.

**Note:** Fasten the device with two additional brackets at the back of the switch cabinet when operating it in environments with strong vibrations.

■ **Vertical mounting on the wall**

- Use the pre-mounted brackets included in the delivery as shown in the following figure (see fig. 11).
- Attach two additional brackets to the device (not included in the delivery) as shown in the following figure (consult the factory).
- Fasten the device by screwing the brackets to the wall.



**Warning!**

When installing the device, make sure the ventilation slots remain unobstructed, as otherwise the device can overheat and be damaged.



**Warning!**

**FIRE HAZARD**

Install the device in a fire protected shell if you are mounting it vertically. Failure to follow these instructions can result in death, serious injury, or equipment damage.

**Note:** The shielding ground of the connectable industrial twisted pair lines is connected to the front panel as a conductor.

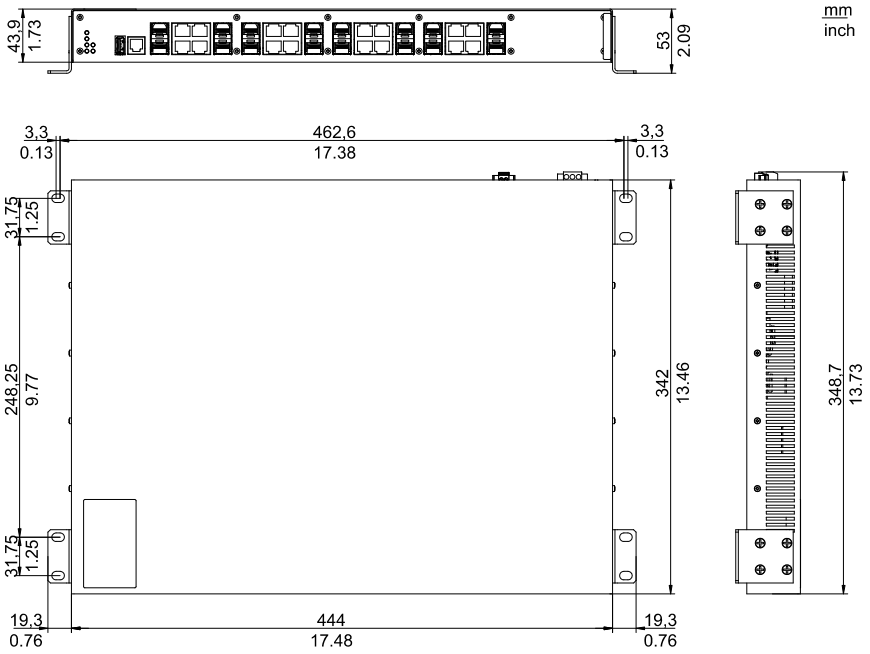


Figure 10: Dimensions (mm / inch)

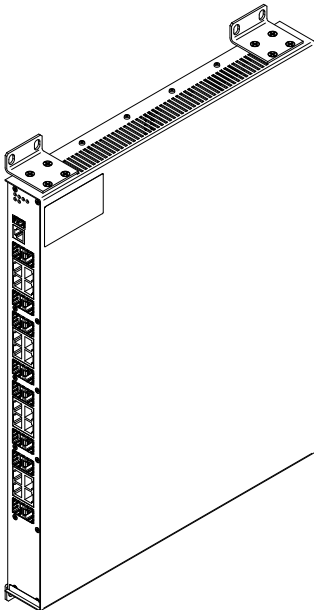


Figure 11: Vertical mounting on the wall

### ■ **Grounding the device**

The device is grounded via a ground connection on the front panel of the device.

- Connect the protective conductor before you set up the other connections. When removing the connections, you remove the protective conductor last.
- Connect both protective conductors if your device is equipped with two power supply units.

### **2.1.5 Startup procedure**

When you connect the supply voltage, you start up the device.

### **2.1.6 Connecting the data lines**

You can connect terminal devices and other segments at the ports of the device via twisted pair cables or F/O cables.

- Install the data lines according to your requirements.

### ■ **10/100/1000 Mbit/s twisted pair connection**

These connections are via RJ45 sockets.

10/100/1000 Mbit/s TP ports enable the connection of terminal devices or independent network segments according to the IEEE 802.3 10BASE-T/ 100BASE-TX/1000BASE-T standard.

The Magnum 12KX PoE and reverse mount 12KXR PoE also allow: IEEE 802.3af (Power over ETHERNET on data lines).

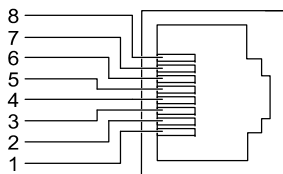
These ports support:

- Auto-negotiation
- Auto-polarity
- Auto-crossing (if auto-negotiation is activated)
- 1000 Mbit/s full duplex
- 100 Mbit/s half-duplex mode, 100 Mbit/s full duplex mode
- 10 Mbit/s half-duplex mode, 10 Mbit/s full duplex mode
- Also for Magnum 12KX PoE and reverse mount 12KXR PoE: Power over ETHERNET (PoE, at the first four ports of the device)  
The PoE voltage is input via the wire pairs transmitting the signal (phantom voltage).

Default setting: auto-negotiation activated.

The socket housing is electrically connected to the front panel.

The pin assignment corresponds to MDI-X.



*Table 2: Pin assignment of a 1000 MBit/s TP interface in MDI-X mode, RJ45 socket - for PoE with the power supplied via the wire pairs transmitting the signal*

Pin	Function	PoE
1	DB+	V-
2	DB-	V-
3	DA+	V+
4	DD+	
5	DD-	
6	DA-	V+
7	DC+	
8	DC-	

**Note:** In substation applications, the RJ45 ports are used to connect to additional communication devices such as routers or telecommunication multiplexers that are installed in close proximity to the device (i.e. less than 3 meters away). It is not recommended to use these ports for connection to field devices across longer distances which could cause a significant increase in the ground potential (Ground Potential Rise GPR, i.e. more than 2500 V). Alternately use F/O cables.

**Note:** In general, you should adhere to the following recommendations for data cable connections using copper in environments with high electrical interference levels:

- Keep the length of the data cables as short as possible - ideally max. 3m long. You should not use any copper data cables for the data transmission between buildings.
- Power supply and data cables should not run parallel over longer distances, and ideally they should be installed in separate cable channels. If the inductive coupling has to be reduced, the power supply and data cables should cross at a 90° angle.
- You may also choose to use shielded cables. Ground the cable shielding at one point in order to avoid causing a ground loop.

#### ■ 100 Mbit/s fiber optic connection

These ports are SFP slots.

100 MBit/s F/O ports enable the connection of terminal devices or independent network segments in compliance with the IEEE 802.3 100BASE-FX standard.

These ports support:

- Full or half duplex mode State on delivery: full duplex FDX

**Note:** Make sure that the LH ports are only connected with LH ports, SM ports are only connected with SM ports, and MM ports only with MM ports.

**Note 2:** When the SFP port is used, the RJ45 copper port is disabled.



## ■ 1 Gbit/s fiber optic connection

1 GBit/s fiber optic ports (SFP slot) enable the connection of terminal devices or independent network segments in compliance with the IEEE 802.3-2000 (ISO/IEC 8802-3:2000) 1000BASE-SX or 1000BASE-LX standards. When the SFP port is used, the RJ45 copper port is disabled. These ports support:

- Auto-negotiation
- Full duplex mode

Default settings: auto-negotiation

**Note:** Make sure that the LH ports are only connected with LH ports, SX ports are only connected with SX ports, and LX ports only with LX ports.

## 2.2 Display elements

After the operating voltage is set up, the software starts and initializes itself. Afterwards, the device performs a self-test. During this process, various LEDs light up. The process takes around 15 seconds.

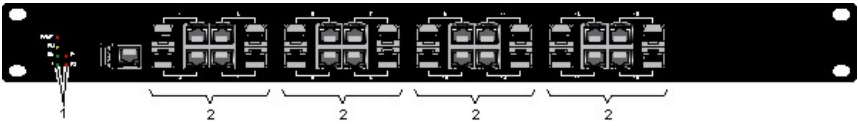


Figure 12: Display elements for 12KX and 12KX PoE (front mount)

- 1 - Device status display elements
- 2 - Port status display elements

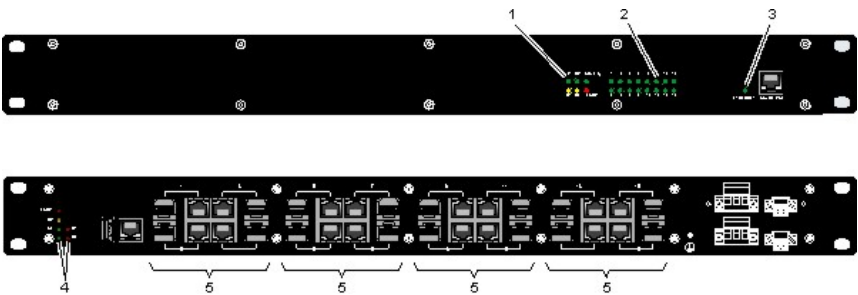


Figure 13: Display elements for 12KXR and 12KXR PoE (reverse mount)

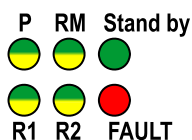
Front of device:

- 1 - Device status display elements
- 2 - Port status display elements for 16 Gigabit ETHERNET ports
- 3 - Diagnosis port with display element

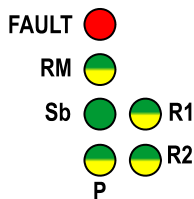
Back of device:

- 4 - Device status display elements
- 5 - Port status display elements

## ■ Device state



*12KXR, 12KXR PoE*  
(reverse mount)



*12KX, 12KX PoE (front mount)*  
*12KXR, 12KXR PoE (reverse mount)*

These LEDs provide information about conditions which affect the operation of the whole device.

### **P – Power (green/yellow LED)**

Glowing green	Models with 2 power supply units: Both supply voltages are ON Models with 1 power supply unit: Supply voltage is ON
Glowing yellow	Models with dual power supply units: There is only one supply voltage (P1 or P2) ON
Not glowing	Supply voltage is too low or not connected

### **Sb Stand By - stand-by mode (green LED)**

Glowing green	Stand-by mode enabled
Not glowing	No stand-by mode

### **RM and Stand-by - display saving processes of the Auto-Configuration Adapter (ACA)**

Flashing alternately	Error during saving process
LEDs flash synchronously, two times a second	Loading configuration from the ACA
LEDs flash synchronously, once a second	Saving the configuration in the ACA

Applies to software releases previous to 06.0.00:

LED	Display	Color	Activity	Meaning
FAULT	Signal contact 1	Red	Lights up	The signal contact is open, it is reporting an error.
			None	Signal contact is closed, it is not reporting an error.

Applies to software release 06.0.00 and higher:

LED	Display	Color	Activity	Meaning
FAULT	Signal contact 1	Red	Lights up	The signal contact is open, it is reporting an error.
			None	Signal contact is closed, it is not reporting an error.
	Duplicate IP detection	Red	Flashing 4 times a period	Reports an IP conflict.

Applies to software releases previous to 06.0.00:

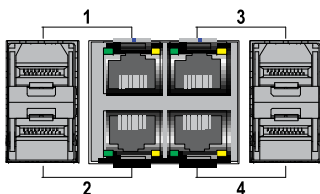
LED	Display	Color	Activity	Meaning
R1	Signal contact 1	Yellow	Lights up	The signal contact is closed in manual operation.
			None	The signal contact is open in manual operation.
R2	Signal contact 2	Yellow	Lights up	The signal contact is closed in manual operation.
			None	The signal contact is open in manual operation.

Applies to software release 06.0.00 and higher:

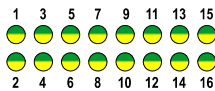
LED	Display	Activity	Color	Meaning
R1	Signal contact 1	Lights up	Green	The signal contact is open in non manual operation.
			Yellow	The signal contact is open in manual operation.
		None	The signal contact is closed.	
R2	Signal contact 2	Yellow	Green	The signal contact is open in non manual operation.
			Yellow	The signal contact is open in manual operation.
		None	The signal contact is closed.	

If the manual adjustment is active on the “relay” signal contact, then the error display is independent of the setting of the signal contact.

## ■ Port state



12KX, 12KX PoE,  
12KXR, 12KXR PoE



12KXR, 12KXR PoE



ETHERNET Service Port

The green and yellow LEDs at the individual port display port-related information. During the boot phase, these LEDs are used to display the status of the boot procedure.

### LS, DA - link status, data

(one green/yellow LED or one green and one yellow LED per port)

Not glowing	No valid connection.
Glowing green	Valid connection.
Flashing green (1 time a period)	Port is switched to stand-by.
Flashing green (3 times a period)	Port is switched off.
Flashing yellow	Receive data / send data.

## 2.3 Basic set-up

The IP parameters must be entered when the device is installed for the first time. The device provides 6 options for configuring IP addresses:

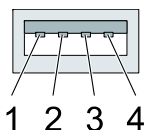
- Entry via V.24 connection
- Configuration via BOOTP
- Configuration via DHCP
- Configuration via DHCP Option 82
- Auto Configuration Adapter

## ■ Default settings

- IP address: The device looks for the IP address using DHCP
- Password for management:  
Login: user; password: public (read only)  
Login: manager; password: manager (read and write)
- Parameters that can be set via the management are set to pre-defined values in accordance with the MIB
- V.24 data rate: 9,600 Baud (see next page for additional V.24 settings)
- Ethernet ports: link status is not evaluated (signal contact)
- Optical 100 Mbit/s ports: 100 Mbit/s, full duplex  
All other ports: auto-negotiation

### ■ USB interface

The USB socket has an interface for the local connection of an Auto Configuration Adapter (part number ACA21-USB-12KX see on page 11). It is used for saving/loading the configuration and for loading the software.



Pin	Function
1	VCC (VBus)
2	- Data
3	+ Data
4	Ground (GND)

Table 3: Pin assignment of the USB interface

### ■ V.24 interface (external management)

The V.24 interface is an RJ11 socket. At the V.24 connection, a serial interface is provided for the local connection of an external management station (VT100 terminal or PC with corresponding terminal emulation). This enables you to set up a connection to the Command Line Interface (CLI) and to the system monitor.

VT 100 terminal settings	
Speed	9,600 Baud
Data	8 bit
Stopbit	1 bit
Handshake	Off
Parity	none

The socket housing is electrically connected to the front panel of the device. The V.24 interface is not electrically isolated from the supply voltage.

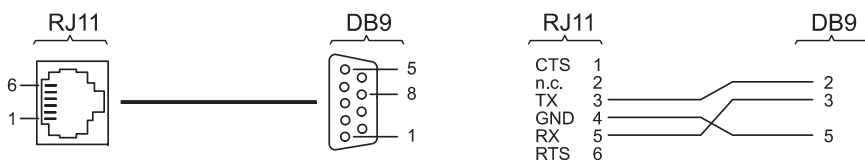


Figure 14: Pin assignment of the V.24 interface and the DB9 connector

**Note:** You will find the order number for the terminal cable, which is ordered separately, in the Ordering information section (pn: CONSOLE-CBL-12KX, see page 11).

## 3.0 Technical Specifications

### ■ General technical specifications

Dimensions W x D x H	without brackets	17.6 x 1.7 x 13.6 in (448 x 44 x 345 mm)
Weight	12KX, 12KXR (single power supply)	max. 9.3 lbs (4.2 kg)
	12KX, 12KXR (dual power supply)	max. 9.7 lbs (4.4 kg)
	12KX, 12KXR (single PoE power supply)	max. 10.1 lbs (4.6 kg)
Power Supply unit type "H"	Nominal voltage AC	100 - 240 V, 50 - 60 Hz
	Voltage range AC	90 - 265 V, 47 - 63 Hz
	Nominal voltage DC	110 - 250 V
	Voltage range DC	77 - 300 V
	Connection type	3-pin terminal block
	Power failure bridging Fuse	> 20 ms at 230 V AC Built into the power unit
Power Supply unit type "L"	Nominal voltage DC	24 - 48 V
	Voltage range DC	18 - 60 V
	Connection type	3-pin terminal block
	Power failure bridging Fuse	> 10 ms at 20.4 V DC Built into the power unit
	Signal contact	Nominal value for AC
Nominal value for DC		2 A at 30 V DC
		0.2 A at 125 V DC
		0.1 A at 250 V DC
Connection type		2-pin terminal block
Environment	Storage temperature (ambient air)	Standard: -40 °C to +70 °C Extended: -40 °C to +85 °C
	Humidity	5% to 95% (non-condensing)
	Air pressure	Up to 2000 m (795 hPa)
	Operating temperature	Extended (surrounding air)
Pollution degree		2
Protection classes	Laser protection	Class 1 according to EN 60825-1 (2001)
	Protection class	IP 30

## ■ EMC and immunity

<b>EMC interference immunity IEC/EN 61850- 3:2002 EMI TYPE tests, test in comp. with</b>	<b>Description</b>	<b>Test level</b>
IEC/EN 61000-4-2	Electrostatic discharge	
	Contact discharge	+/- 8 kV
	Air discharge	+/- 15 kV
IEC/EN 61000-4-3	Electromagnetic field 80 - 2,700 MHz	20 V/m
IEC/EN 61000-4-4	Fast transients (burst)	
	DC power line	+/- 4 kV (2.5 kHz)
	AC power line	+/- 4 kV (2.5 kHz)
	Data line	+/- 4 kV (2.5 kHz)
IEC/EN 61000-4-5	Voltage surges	
	DC power line	+/- 2 kV line/earth; +/- 1 kV line/line
	AC power line	+/- 4 kV line/earth; +/- 2 kV line/line
	Data line	+/- 4 kV line/earth
IEC/EN 61000-4-6	Line-conducted interference voltages 150 kHz - 80 MHz	10 V
IEC/EN 61000-4-12	Damped vibration	
	DC power line	+/- 2.5kV line/earth; +/- 1kV line/line
	AC power line	+/- 2.5kV line/earth; +/- 1kV line/line
	Data line	+/- 2.5kV line/earth; +/- 1kV line/line
IEC 60255-5	Dielectric strength	
	DC power line, power unit type L	500 VAC
	AC power line, power unit type H	2000 VAC
	DC power line, power unit type H	2000 VAC
	Signal contact type L and H	2000 VAC

<b>EMC interference immunity IEEEE 1613:2009 EMI TYPE tests, test in comp. with</b>	<b>Description</b>	<b>Test level</b>
IEEE C37.90.3	Electrostatic discharge	
	Contact discharge	+/- 8 kV
	Air discharge	+/- 15 kV
IEEE C37.90.2	Electromagnetic field 80 - 1,000MHz	35 V/m (peak)
IEEE C37.90.1	Fast transients (burst)	
	DC power line	+/- 4 kV (2.5 kHz)
	AC power line	+/- 4 kV (2.5 kHz)
	Data line	+/- 4 kV (2.5 kHz)
IEEE C37.90.1	Damped vibration	
	DC power line	+/- 2.5kV line/earth; +/- 1kV line/line
	AC power line	+/- 2.5kV line/earth; +/- 1kV line/line
	Data line	+/- 2.5kV line/earth; +/- 1kV line/line

EMC interference immunity IEEB 1613:2009 EMI TYPE tests, test in comp. with	Description	Test level
IEEE C37.90	H.V. impulse DC power line AC power line	+/- 5 kV line / earth +/- 5 kV line / earth
IEEE C37.90	Dielectric strength DC power line, power unit type L AC power line, power unit type H DC power line, power unit type H Signal contact type L and H	500 VAC 2000 VAC 2000 VAC 2000 VAC

EMC emitted interference	
EN 55022	Class A
FCC 47 CFR Part 15	Class A
German Lloyd	Classification + Construction Guidelines VI-7-3 Part 1 Ed.2001

Environment type tests, test in comp. with	Description	Test level
IEC 60068-2-1	Cold	-40 °C, 16 hours
IEC 60068-2-2	Dry heat	+85 °C, 16 hours
IEC 60068-2-30	Relative humidity	95 % (non condensing) 55 °C, 4 cycles
IEC 60068-2-6	Vibration, test Fc	2- 9 Hz with 3 mm amplitude 1 g at 9 - 150 Hz 1.5 g at 200 - 500 Hz
IEC 60068-2-27	Shock, test Ea	15 g at 11 ms

## ■ Network range

TP port	
Length of a twisted pair segment	max. 100 m / 328 ft (cat5e cable with 1000BASE-T)

Table 4: TP port 10BASE-T / 100BASE-TX / 1000BASE-T

Model (SFP-12KX-...)	Wave length	Fiber	System Attenuation	Distance	Fiber Data
-FXMM2	MM 1310nm	50/125 μm	0-8 dB	0-5 km	1.0 dB/km, 800 MHz*km
-FXMM2	MM 1310nm	62.5/125 μm	0-11 dB	0-4 km	1.0 dB/km, 500 MHz*km
-FXSM25	SM 1310nm	9/125 μm	0-13 dB	0-25 km	0.4 dB/km; 3.5 ps/(nm*km)
-FXSM100	SM 1550nm	9/125 μm	10-29 dB	40-104 km	0.25 dB/km; 19 ps/(nm*km)

Table 5: Fiber port 100BASE-FX (SFP fiber optic Fast ETHERNET Transceiver)



Model (SFP-12KX-...)	Wave length	Fiber	System Attenuation	Distance	Fiber Data
-SX	MM 850nm	50/125 $\mu$ m	0-7.5 dB	0-5 km	3.0 dB/km, 400 MHz*km
-SX	MM 850nm	62.5/125 $\mu$ m	0-7.5 dB	0-4 km	3.2 dB/km, 200 MHz*km
-LX25	SM 1310nm	9/125 $\mu$ m	0-11 dB	0-20 km	0.4 dB/km; 3.5 ps/(nm*km)
-ZX40	SM 1550nm	9/125 $\mu$ m	5-20 dB	14-42 km	0.4 dB/km; 3.5 ps/(nm*km)
-ZX70	SM 1550nm	9/125 $\mu$ m	6-22 dB	24-72 km	0.25 dB/km; 19 ps/(nm*km)

Table 6: Fiber port 1000BASE-FX (SFP fiber optic Gigabit ETHERNET Transceiver)

MM = Multimode, SM = Singlemode

### ■ Power consumption/power output

Models without PoE (12KX, 12KXR)	Maximum power consumption	Maximum power output
Device (without SFP modules, without TP links)	10 W	34 Btu (IT)/h
additionally for each connected SFP module	1 W	3 Btu (IT)/h
additionally for each TP port with link	0.8 W	3 Btu (IT)/h
Device at full capacity (16 links)	26 W	88 Btu (IT)/h

Models with PoE (12KX, 12KXR)	Maximum power consumption	Maximum power output
Device (without SFP modules, without TP links)	10 W	34 Btu (IT)/h
additionally for each connected SFP module	1 W	3 Btu (IT)/h
additionally for each TP port with link	0.8 W	3 Btu (IT)/h
additionally for each TP port with link when one Class0-PD (powered device) is connected	19.5 W	12 Btu (IT)/h
Device at full capacity with 4 x Class0-PD (powered device) connected	100 W	136 Btu (IT)/h

## ■ Underlying norms and standards

Name	
EN 61000-6-2:2005	Generic norm – immunity in industrial environments
EN 55022:2006 + A1:2007	IT equipment – radio interference characteristics
IEC/EN 60950-1:2006	Safety for the installation of IT equipment
EN 61131-2:2007	Programmable logic controllers
EN 50121-4:2006	Railway applications - EMC - emitted interference and interference immunity for signal and telecommunication systems
FCC 47 CFR Part 15:2009	Code of Federal Regulations
Germanischer Lloyd	Ship Applications - Classification and Construction Guidelines VI- 7-3 Part 1 Ed.2003
cUL 508:1998	Safety for Industrial Control Equipment
EN 61850-3	Communications networks and systems in stations
IEEE 1613	Standard Environment and Testing Requirements for Communication Networking Devices in Electric Power Substations

Table 7: List of norms and standards

Name	
IEEE 802.1 D	Switching, GARP, GMRP, Spanning Tree
IEEE 802.1 D-1998	Media access control (MAC) bridges (includes IEEE 802.1p Priority and Dynamic Multicast Filtering, GARP, GMRP)
IEEE 802.1 Q	Tagging
IEEE 802.1 Q-1998	Virtual Bridged Local Area Networks (VLAN Tagging, GVRP)
IEEE 802.1 w.2001	Rapid Reconfiguration
IEEE 802.3-2002	Ethernet

Table 8: List of IEEE standards

The device has a certification based on a specific standard only if the certification indicator appears on the housing.

## 4.0 Troubleshooting

All Magnum products are designed to provide reliability and consistently high performance in all industrial network environments. The installation of a Magnum 12KX Switch is a straight forward procedure. The operation is also straightforward and is discussed in Section 2.0 of this User Guide.

Should problems develop during installation or operation, this section is intended to help locate, identify and correct these types of problems. Please follow the suggestions listed below prior to contacting your supplier. However, if you are unsure of the procedures described in this section or if the Magnum 12KX Switch is not performing as expected, do not attempt to repair the unit; instead contact your supplier for assistance or contact GarrettCom Customer Support.

### 4.1 Before Calling for Assistance

1. If difficulty is encountered when installing or operating the unit, refer back to the Installation and Set up section of the applicable chapter of this manual. Also check to make sure that the various components of the network are interoperable.
2. Check the cables and connectors to ensure that they have been properly connected and the cables/wires have not been crimped or in some way impaired during installation. (About 90% of network downtime can be attributed to wiring and connector problems.)
3. Make sure that power is properly attached to each Magnum 12KX Switch unit. Use the PWR LEDs to verify each unit is receiving power.
4. If the problem is isolated to a network device other than the Magnum 12KX Switch product, it is recommended that the problem device be replaced with a known good device. Verify whether or not the problem is corrected. If not, go to Step 5 below. If the problem is corrected, the Magnum 12KX Switch and its associated cables are functioning properly.
5. If the problem continues after completing Step 4 above, contact your supplier of the Magnum 12KX Switch unit or if unknown, contact GarrettCom, Inc. by fax, phone or email ([support@garrettcom.com](mailto:support@garrettcom.com)) for assistance.

## 4.2 When Calling for Assistance

Please be prepared to provide the following information.

1. A complete description of the problem, including the following points:
  - a. The nature and duration of the problem;
  - b. Situations when the problem occurs;
  - c. The components involved in the problem;
  - d. Any particular application that, when used, appears to create the problem;
2. An accurate list of GarrettCom product model(s) involved, with serial number(s). Include the date(s) that you purchased the products from your supplier.
3. It is useful to include other network equipment models and related hardware, including personal computers, workstations, terminals and printers; plus, the various network media types being used.
4. A record of changes that have been made to your network configuration prior to the occurrence of the problem. Any changes to system administration procedures should all be noted in this record.

## 4.3 Return Material Authorization (RMA) Procedure

All returns for repair must be accompanied by a Return Material Authorization (RMA) number. To obtain an RMA number, please use this URL -

[https://rma.garrettcom.com/rma/rma\\_request\\_noaccount.php](https://rma.garrettcom.com/rma/rma_request_noaccount.php) to fill out the form.

Please have the following information readily available:

Name and phone number of your contact person.

Name of your company / institution

Your shipping address

Product name

Serial Number (or Invoice Number)

Packing List Number (or Sales Order Number)

Date of installation

Failure symptoms, including a full description of the problem.

GarrettCom will carefully test and evaluate all returned products, will repair products that are under warranty at no charge, and will return the warranty-repaired units to the sender with shipping charges prepaid (see Warranty Information, Appendix A, for complete details). However, if the problem or condition causing the return cannot be duplicated by GarrettCom, the unit will be returned as:

### No Problem Found.

GarrettCom reserves the right to charge for the testing of non-defective units under warranty. Testing and repair of product that is not under warranty will result in a customer (user) charge.

## 4.4 Shipping and Packaging Information

Should you need to ship the unit back to GarrettCom, please follow these instructions:

1. Package the unit carefully. It is recommended that you use the original container if available. Units should be wrapped in a "bubble-wrap" plastic sheet or bag for shipping protection. (You may retain all connectors and this Installation Guide.)

**CAUTION: Do not pack the unit in Styrofoam "popcorn" type packing material. This material may cause electro-static shock damage to the unit.**

2. Clearly mark the Return Material Authorization (RMA) number on the outside of the shipping container.
3. GarrettCom is not responsible for your return shipping charges.
4. Ship the package to:

**GarrettCom, Inc.  
47823 Westinghouse Dr.  
Fremont, CA 94539  
Attn.: Customer Service**

## APPENDIX A: WARRANTY INFORMATION

GarrettCom, Inc. warrants its products to be free from defects in materials and workmanship for a period of five (5) years from the date of shipment by GarrettCom.

During this warranty period, GarrettCom will repair or, at its option, replace components in the products that prove to be defective at no charge other than shipping and handling, provided that the product is returned pre-paid to GarrettCom.

This warranty will not be effective if, in the opinion of GarrettCom, the product has been damaged by misuse, misapplication, or as a result of service or modification other than by GarrettCom.

GarrettCom reserves the right to make a charge for handling and inspecting any product returned for warranty repair which turns out not to be faulty.