

SICOM1005R-M12

Industrial Ethernet Switch

User's Manual

KYLAND Technology Co., Ltd.

**SICOM1005R-M12 Industrial Ethernet Switch
User's Manual**

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Preface

SICOM1005R-M12 is a high-performance 5 M12 ports unmanaged industrial Ethernet switch specially designed by KYLAND Technology CO., LTD. for industrial applications. Its high-performance switch engine, IP67 protection class, solid and sealed case design, low-power fanless design, overcurrent, overvoltage and EMC protection at power input interface, and excellent EMC protection of M12 port make SICOM1005R-M12 applicable in harsh and dangerous industrial environments, providing multiplex guarantee for reliable operation of the system.

The user's Manual for SICOM1005R-M12 Industrial Ethernet Switch mainly introduces the technical principles, performance indexes, installation and commissioning, etc. It is a reference for users in system startup, expansion and routine maintenance. It is also a practical teaching material for user training and technician study.

This manual mainly includes the following contents:

Chapter 1 Overview and system features of SICOM1005R-M12;

Chapter 2 Performance and service functions of SIOCM1005R-M12;

Chapter 3 Hardware structure of SICOM1005R-M12;

Chapter 4 Field test methods for SICOM1005R-M12;

Appendix A Introduces twisted pair and pin distribution rules of SICOM1005R-M12;

Appendix B Introduces cable types and specifications of SICOM1005R-M12;

Appendix C Introduces abbreviations used in this manual.

Statement: As product and technology upgrades and improves constantly, the contents of this document may not completely accord with the actual product. For product upgrading information, please visit our company's website or directly contact with our business representative.

Notice for Safety Operation

This product performs reliably as long as it is used according to the guidance. Artificial damage or destruction of the equipment should be avoided.

- Read this manual and put it away for future reference;
- Do not place the equipments near water sources or humid places;
- Do not place anything on power cable and put the cable in unreachable places;
- Do not tie or wrap the cable to prevent fire.
- Power connectors and connectors for other equipments should be firmly interconnected and frequently checked.

In the following cases, please immediately cut off the power supply and contact our company:

1. Water gets into the equipments;
 2. Equipment damage or shell breakage;
 3. Abnormal operation conditions of equipment or the demonstrated performances have changed;
 4. The equipment emits odor, smoke or makes noise.
- Please keep optical fiber plugs and sockets clean. During the operation of equipments, do not look directly at the cross section of optical fiber;
 - Please keep the equipment clean; if necessary, wipe the equipment with soft cotton cloth;
 - Do not repair the equipment by yourself, unless it is clearly specified in the manual.

Explanation of Warning Marks:

This manual uses two kinds of noticeable warning signs to arouse special

attention of users during operation. The implications of these signs are as follows:



Warning: pay special attention to the notes behind the mark, improper operation will lead to serious damage of the switch or injury of the operating personnel.



Caution, attention, danger: remind the operators places that need to pay attention to.

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Chapter 1: System Overview

1.1 Product Overview

SICOM1005R-M12 is a 5 M12 ports unmanaged industrial Ethernet switch specially designed by KYLAND Technology CO., LTD. Product features: IP67 protection class, solid and sealed aluminum case, low-power fanless design, overcurrent, overvoltage and EMC protection at power input interface and excellent EMC protection of M12 ports. These features make SICOM1005R-M12 applicable in harsh and dangerous industrial environments and provide multiplex guarantee for reliable operation of the system.

SICOM1005R-M12-5T has 5 10/100Base-TX M12 ports. Each port has self-adaptive function, making it automatically configured to 10Base-T/100Base-TX, full/half duplex mode and MDI/MDI-X auto-connection.

Power input interface with M12 connector supports plug-and-play, saving the time of startup. It supports single power input, allowing 24VDC, 48VDC, 110VDC, 220VAC/DC, improving the reliability of power supply.

1.2 Product Features

1. High performance industrial Ethernet switch

10/100Base-TX self-adaptive Ethernet ports (full/half duplex), MDI/MDI-X auto-connection

2. Industrial Power Design

Support industrial power input: 24VDC, 48VDC, 110VDC, 220VAC/DC

Power input with over-current, over-voltage protection

EMC protection reaching Industrial Level 4

3. Rugged design

High efficient heat dissipation design (no fans); reliable operation at -40°C to +75°C

Solid and sealed aluminum case with IP67 protection class, and is able to work in harsh and dangerous industrial environments

Wall-mounting installation

1.3 Packing list and unpacking check

1. Packing list

Please refer to the packing list

2. Unpacking check

Before opening the case, place it stably, pay attention to the direction of the packing case and ensure its right side is facing upward, so as to prevent SICOM1005R-M12 falling from the case after opening it. If using a hard object to open the case, do not over extend the hard object into the case to avoid damage of the equipments inside it.

After opening the case, please check the amount of SICOM1005R-M12 equipments according to the packing list and check the appearance quality of SICOM1005R-M12.



Warning:

For the built-in precise parts of the equipment, please handle with care and avoid strenuous vibration to avoid affecting the performances of equipments.

Chapter 2: Performance Specifications

2.1 System Specifications

The system performance specifications of SICOM1005R-M12 industrial Ethernet switch are shown in Table 2-1.

Table 2-1 System Specifications

Specifications	SICOM1005R-M12-5T
Quantity of 10/100Base-TX	5 ×10 /100Base-TX, M12 connectors
System performance	Standards: IEEE802.3, IEEE 802.3x, IEEE 802.3u Store-and-Forward speed: 148810pps; Max. filtering speed: 148810pps Switching mode: Store-and-Forward System switching bandwidth: 1.0G Electromagnetic compatibility interference: EN55022 Electromagnetic compatibility immunity: EN50082-2 (industrial level 4)
TP port parameters	Physical port: shielded M12 M12 port: 10/100Base-TX, supporting auto-negotiation Port standard: in line with IEEE802.3 standard Transmission distance: <100m
Power supply	Input voltage: 24VDC (18-36VDC), 48VDC (36-72VDC), 110VDC(88-165VDC), 220VAC/DC Input power consumption: <2.5W Over-current Protection: built-in
Mechanical parameters	Physical dimensions (width×height×depth): 62 mm×56 mm×120 mm Mounting mode: Wall mounting Heat removal method: Aluminum case without fans. Outlet type: top outlet Shell protection: IP67 Weight: 0.5kg
Ambient conditions	Operating temperature: -40℃～75℃ Storage temperature: -40℃～85℃

	Humidity: 0~95% (non-condensing)
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2.2 Service Interface

1. 5 10/100Base-TX M12 ports. Each M12 port has self-adaptive function, capable of automatically configuring between 10Base-T and 100Base-TX, between full duplex and half duplex operation mode, supporting MDI/MDI-X auto-connection. The max transmission distance is 100m.
2. Meanings of M12 ports' indicators: LINK/ACT indicators– showing connection status. on: effective network connection; blink: network activities; off: no connection.

2.3 Service Function

The service functions of SICOM1005R-M12 mainly include:

LED Indicator

The LEDs in top panel of SICOM1005R-M12 indicate the port status including link status and system status.

Layer-2 Switching

The two commonly used switching technologies: Cut-Through and Store-and-Forward. In Cut-Through, as soon as the switch receive a frame header, it is immediately forwarded without any error checking and processing; in Store-and-Forward, after receiving and storing the complete frame, error checking is conducted before forwarding. Store-and-forward is most widely used switching technology and it is also adopted by SICOM1005R-M12.

Chapter 3: Hardware Structure

3.1 System Structure

The hardware structure of SICOM1005R-M12 is as Figure 3-1:

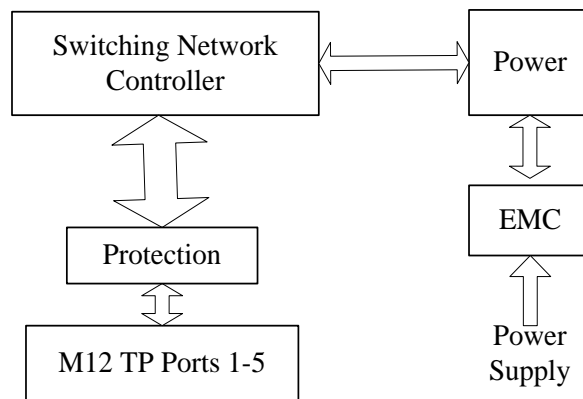


Figure 3-1 Hardware Structure

The system hardware includes:

- 1 . High performance ASIC chip technology is applied in the switching network controlling system, providing layer two wire-speed forwarding of data packets
- 2 . Industrial power supply with over-current, over-voltage and EMC protection
- 3 . All TP ports with EMC protection
- 4 . Anti-reverse protection

3.2 Device Structure

3.2.1 Case

SICOM1005R-M12 case is wall mounting type structure. The entire unit is a six-side-enclosed aluminum case with protection class up to IP67. The figuration of SICOM1005R-M12 case is shown in Figure 3-2 and 3-3.

Its contour dimension is 62 mm× 56 mm×120 mm, (width ×height× depth)



Figure 3-2: Product appearance

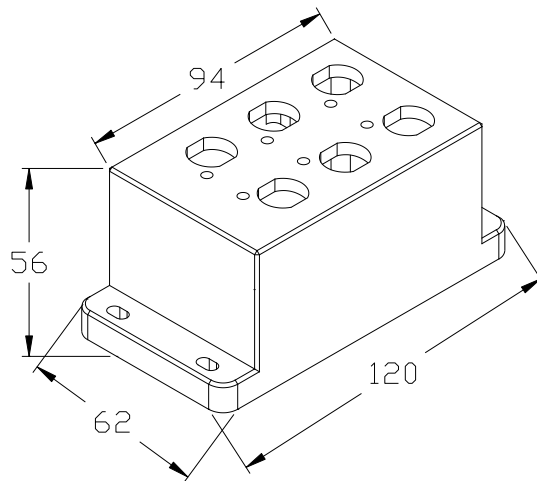


Figure 3-3 Case dimensions of SICOM1005R-M12

3.2.2 Top Panel

SICOM1005R-M12-5T Industrial Ethernet switch's top panel has 5 10/100Base-TX M12 ports, one M12 power input interface, 5 Ethernet ports' LINK indicators and one power input indicator. The top panel structure is shown as Figure 3-4:

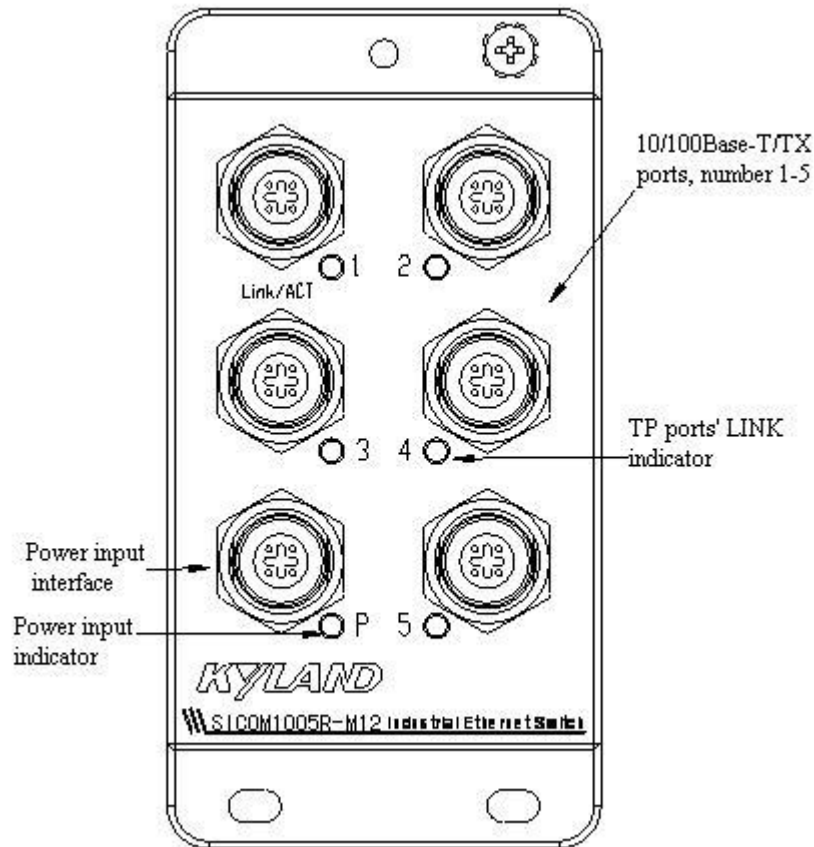


Figure 3-4 SICOM1005R-M12-5T's top panel

Ethernet M12 Ports

SICOM1005R-M12-5T offers five 10/100Base-TX Ethernet M12 ports. Each M12 port has self-adaptive function, support MDI/MDI-X auto-connection and can be connected to terminal equipments, servers, hubs or other switches in straight-through or cross-over way. Each port supports IEEE802.3x self-adaptation, so the most suitable transmission mode (half duplex or full duplex) and data rate (10 Mbps or 100Mbps) can be automatically selected (the connected equipment should also support this characteristic). If the equipment connected to these ports does not support self-adaptation, the ports will be able to send at proper speed but transmission mode is default as half duplex. M12D-coding 4-pin socket is adopted in these ports.



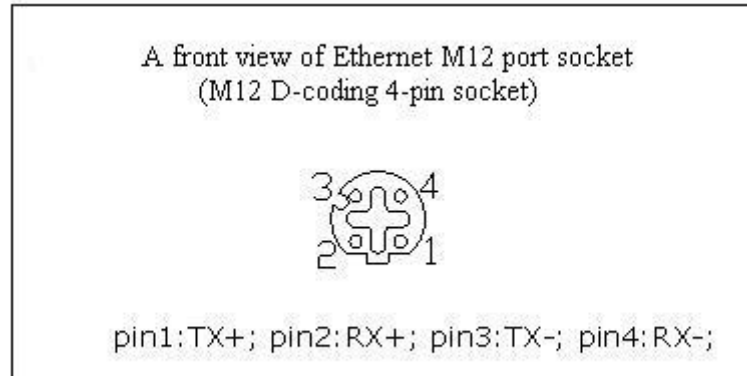


Figure 3-5 Wiring sequence of Ethernet M12 port

LED indicators

The indicators on the top panel of SICOM1005R-M12 can show system operation and port status, helping detect and eliminate faults. Table 3-1 describes the meanings of all indication lights on the top panel.

Table 3-1 LED indicators

LED	State	Description
System state LED		
P	ON	Power is connected and supplied normally.
	OFF	Power is not connected or supplied normally.
Ethernet M12 port state LED		
Each M12 Ethernet port has a LINK/ACT indicator to indicate the port connection state.		
LINK/ACT	On	Effective network connection has been established for the port
	Blinking	Network activities are available at the port
	Off	No effective network connection for the port.

Power input terminal

SICOM1005R-M12 has a power input terminal, M12 A-coding 4-pin socket is adopted in the terminal. The diameter of power lines is less than 1.5 mm. The wiring sequence of M12 power input terminal is shown as Figure 3-6.



Figure 3-6 Wiring sequence of M12 power input terminal

3.2.3 Bottom mounting panel

The mounting panel of SICOM1005R-M12 Industrial Ethernet Switch has 3 screw holes for wall mounting and one grounding screw hole.

Grounding

The mounting panel of SICOM1005R-M12 has a grounding screw hole. After connecting one terminal of grounding wire with the cold-pressing terminal, fix it to the grounding hole with grounding screws. The other terminal of grounding wire reliably connects to the ground. The section of grounding wire should not be less than 2.5 mm^2 .

Chapter 4: Test Methods

4.1 Self inspection

When the equipment is powered on, all service indicators in the top panel will flash one time, showing that all ports are working smoothly . Then the indicator marking with "P" will keep on.

4.2 TP Port Test

Showing as Figure 4-1, after SICOM1005R-M12 is powered on, respectively connect two TP ports in the switch with two test computers by the straight-through cables, and send the "ping" command to each other. If both of them receive complete command without packet loss and the corresponding LINK/ACT indicators blink, it means that these two TP ports are in good conditions. The PING command example is as follows.

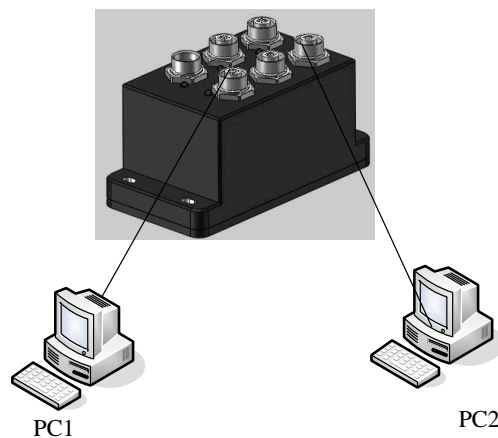


Figure 4-1 TP port test

PING command example:

Suppose the IP address of test computer 1 is 192.168.100.10 and the test computer 2 is 192.168.100.11. Click the "Begin" menu on the test computer 1, select the "Operation" item, input "cmd" (WIN2000) or "command" (WIN98/95), and send ping 192.168.100.11 -l 1000 -t; (-l means the number of bytes of sending packets, -t means keep sending the data);

Operate the "Begin" menu on the test computer 2, select the "Operation" item. input "cmd"

(WIN2000) or "command" (WIN98/95), and send ping 192.168.100.10 -l 1000 -t.

Test computer 1 returns "Reply from 192.168.100.11:bytes=1000 time<10ms TTL=128", Test computer 2 returns "Reply from 192.168.100.10:bytes=1000 time<10ms TTL=128". Ten minutes later, use CTL+C command to get the packet loss rate. If the rate is "0", it shows that the equipment are running well.

Appendix A: Twisted-pair and Pin Distribution

For the connection of 10Base-T/100Base-TX, the twisted-pair must have two pairs of cables. Each pair is distinguished with two different colors. For example, one strand is green, and the other is the alternate of green and white stripes. One end of the cable is equipped with M12 or RJ45 connector and the other end is RJ45 connector.

Fig. A-1 and Figure A-2 show how the connectors of RJ-45 and M12 are numbered and make sure that the inserting direction is correct.

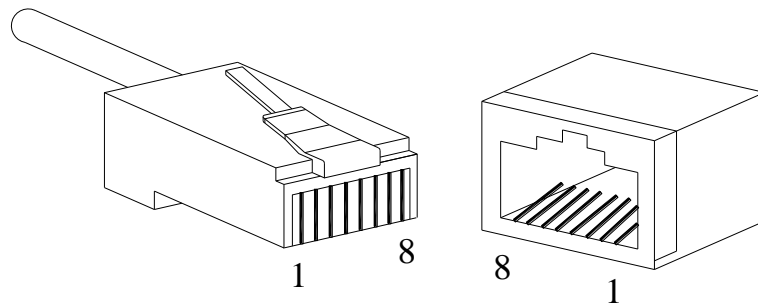


Figure A-1 The connector of RJ-45

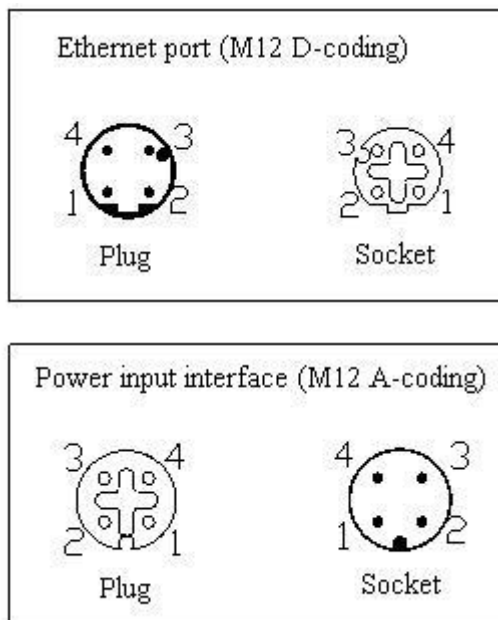


Figure A-2 M12 coding

Pin distribution of 10Base-T/100Base-TX

Unshielded twisted-pair (UTP) or shielded twisted-pair (STP) will be used for the connection of M12: for the connection of 10Mbps, category 3, 4 and 5 of 100 ohm will be used, and cat.5 of 100 ohm will be used for 100Mbps. Additionally, do make sure that the connecting length of any twisted-pair shall not exceed 100 meter.

M12 ports support automatic MDI/MDI-X operation, connected with PC or server by straight-through cable, or connected with other switch or hub. In straight-through cable, pin 1, 2, 3 and 4 of M12 are connected to pin 3, 1, 6 and 2 of RJ45 in turn. In Cross-over cable, pin 2, 1, 4 and 3 of M12 are connected to pin 1, 3, 2 and 6 of RJ45 in turn. The pin distribution of 10Base-T/100Base-TX is listed in the table A-1.

Table A-1 Pin distribution of 10Base-T/100Base-TX

RJ45 Pin	MDI-X signal name	MDI signal name
1	Receiving data + (RD+)	Output data+ (TD+)
2	Receiving data - (RD-)	Output data - (TD-)
3	Output data + (TD+)	Receiving data+ (RD+)
6	Output data- (TD-)	Receiving data -(RD-)
4, 5, 7, 8	Unused	Unused

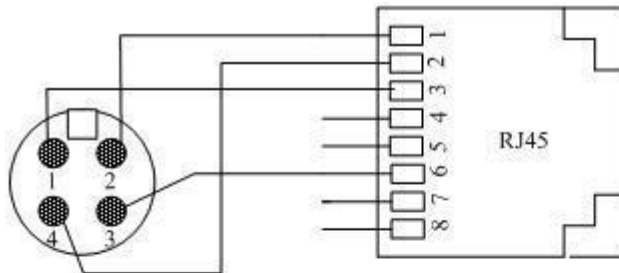
Note: "+" "-" denoting cable polarity.

Definition of straight-through cable from M12-D (4-pin) to RJ45 (8-pin)

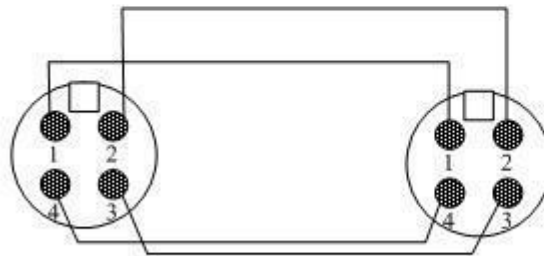
M 12 connector	MDI-X Signal name	RJ45 connector	MDI Signal name
M12-PIN	Meaning of PIN	RJ45-PIN	Meaning of PIN
PIN1	TX+	PIN3	RX+
PIN2	RX+	PIN1	TX+
PIN3	TX-	PIN6	RX-
PIN4	RX-	PIN2	TX-

Definition of M12-A (4-pin) power lines

M12-PIN	Meaning of PIN
PIN1	L/+
PIN2	N/-
PIN3、PIN4	PGND

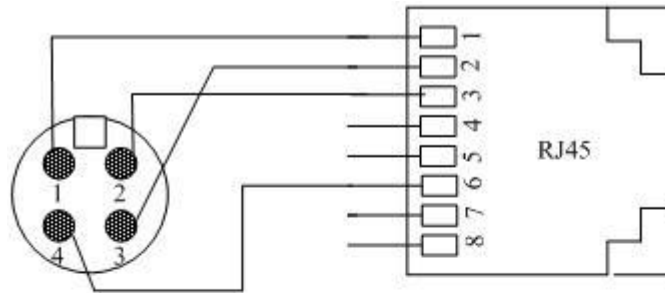


The connecting sequence of PIN 1,2,3,4 of M12 in turn is: Green-white, Orange-white, Green, Orange
 The connecting sequence of PIN 1,2,3,6 of RJ45 in turn is: Orange-white, Orange, Green-white, Green

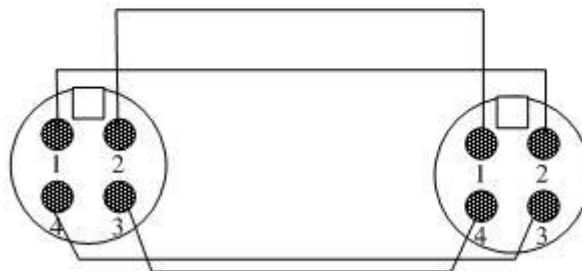


The connecting sequence of M12 from PIN 1 to 4 in turn is: Green-white, Orange-white, Green, Orange
 The connecting sequence of M12 on the other end from PIN 1 to 4 in turn is: Green-white, Orange-white, Green, Orange

Figure A-3 Connecting sequence of straight-through cable

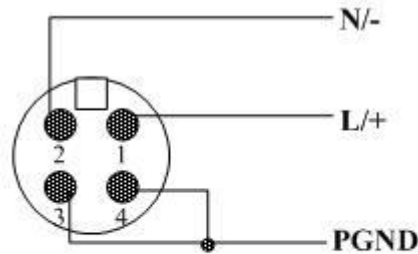


The connecting sequence of PIN 1,2,3,4 of M12 in turn is: Green-white, Orange-white, Green, Orange
 The connecting sequence of PIN 1,2,3,6 of RJ45 in turn is: Green-white, Green, Orange-white, Orange



The connecting sequence of M12 from PIN 1 to 4 in turn is: Green-white, Orange-white, Green, Orange
 The connecting sequence of M12 on the other end from PIN 1 to 4 in turn is: Orange-white, Green-white, Orange, Green

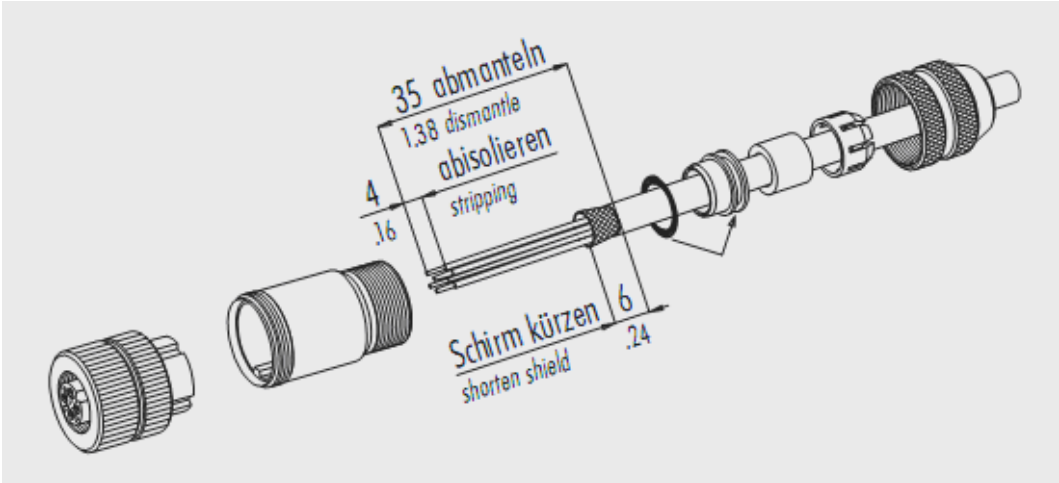
Figure A-4 Connecting sequence of cross-over cable



The connecting sequence of PIN 1, 2, 3(4) of M12 in turn is: Red, Blue, Black
 or: Brown, Blue, Yellow-green

Figure A-5 Connecting sequence of power cable

M12 connector installation



Appendix B: Cable Type and Specifications

The cable type and specifications are shown as table B-1:

Table B-1 Cable type and specification

Cable	Type	Max. length	Connector
10Base-T	Cat 3,4 and 5 100 ohm UTP	100m (328 feet)	M12/RJ-45
100Base-TX	Cat 5 -100ohm UTP	100m (328 feet)	M12/RJ-45

Appendix C: Glossary

Terminology	Explanation
10Base-T	Twisted-pair standard of Cat 3, Cat 4 and Cat 5 in IEEE specification for 10Mbps Ethernet
100Base-TX	Twisted-pair standard of Cat5 or above in IEEE specification for 100Mbps Fast Ethernet
Adaptive	A characteristic that is automatically configured to adaptive mode for the speed, duplex and traffic control port.
Bandwidth	The information capacity that the channel can transmit. For instance, the bandwidth of the Fast Ethernet is 100Mbps (bit per second) .
Baud Rate	It expresses the signaling rate which is defined as the change times of the status for the electric or optical transmission medium within 1 second.
Bridge	One of network equipments which run on the layer2 in the OSI layer7 model, and it can be connected to the LAN or network segment which uses the same protocol. It presents the automatic network address learning and network configuration function.
Traffic Control	It is a congestion control mechanism. The network equipment sends the data to the equipment which has overloaded and causes the port to congest. The traffic control can prevent the data packet from loss and avoid the congestion for the port.
Broadcast	One data packet is sent to all equipments on the network.
Broadcast storm	Restless forward broadcast frame or multicast frame on bridge caused by the bridge ring.
Full Duplex	Use switches to set up the point to point connection among nodes in the LAN and allow them to receive and send data packet at the same time.
Half Duplex	The communication for two nodes can only move toward one direction at the same time, but cannot move toward both directions.
MDI	It is the Medium Dependent Interface, in which, one Ethernet port is taken as the receiving terminal to connect to the port of other equipment.

MDI-X	Medium Dependent Interface Cross-over
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