

## Introduction Managed switches

The decentralised structure of industrial networks means that many applications require a central switch in the switching cabinet. A Weidmüller IE-SWxx-M high-performance Industrial Ethernet managed switch is ideal for such applications.

The AdvancedLine managed switches are enclosed in a strong aluminium housing. Connections are available for power supply, relay contact and signalling contacts. The device also features optionally 8, 16, or 24 Ethernet ports. Up to two of these are fibre-optic ports for single-mode or multi-mode cable.

The WaveLine managed switches feature up to eight ports in a very small space enclosed in a compact plastic housing. They are available with or without I/Os.

LEDs on the front provide the necessary optical indications. The port LEDs remain permanently on to indicate a connection and flash during data transmissions. Furthermore, they change colour to indicate the data rate: green indicates 100 Mbps and yellow 10 Mbps. The green "Power" LED remains on permanently to indicate a constant power supply. The green "Status" LED is normally permanently green, but switches to red to signal a fault, provided the "Link monitoring" function is active.

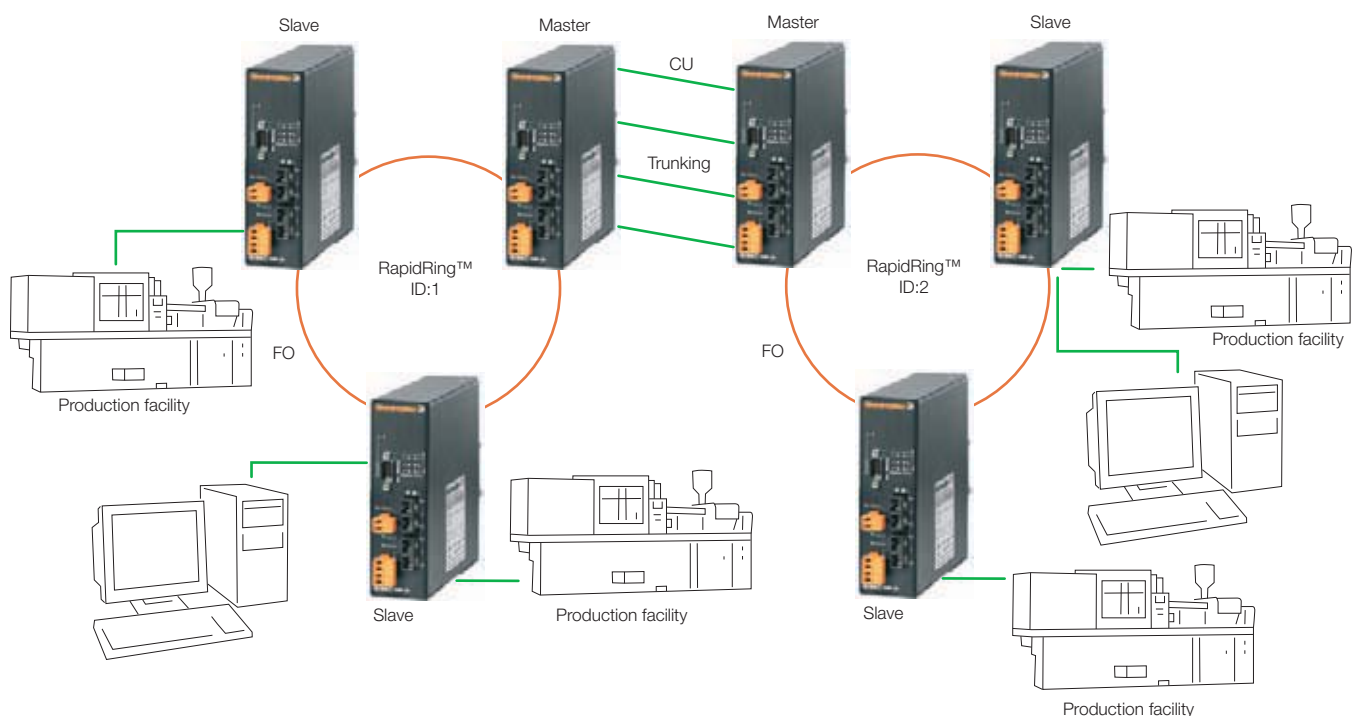
Weidmüller's managed switches enable industry networks to be optimally structured for handling transport routes and network traffic throughput. The individual network components are interconnected in a hierarchical, physical star-type network. The main distributor, in this case a high-performance Industrial Ethernet switch, represents the central switching point in this network.

All switches from Weidmüller are protocol-transparent. Every port forms its own network segment, its own collision domain. The entire network bandwidth is available to each one of these segments. This increases not only the network performance across the entire network, but also in every individual segment. The switch examines every incoming packet for the MAC address of the destination segment and can then forward it directly to its destination.

The great advantage of Weidmüller switches is their ability to interconnect their ports directly.

### Port-Trunking

Port-Trunking enables users to combine two or more ports on two Ethernet devices to form a group. This group then behaves like a "single logical link", but with a correspondingly higher data rate. Furthermore, port trunking provides redundancies with a very fast



recovery time. If a link in the trunk group fails, the remaining links take over immediately in order to maintain the data exchange between the two switches.

### Port-Mirroring

Port mirroring enables users to mirror – in other words copy – at one port all the data transmitted or received at one or more, other ports of the Managed Switches. The messages sent to the mirrored port can be filtered, e.g. by way of MAC addresses.

### VLAN

The abbreviation VLAN stands for “Virtual Local Area Network”. This is a network structure with all the properties of a conventional LAN, but without any physical connections. VLANs are generally switched networks that can link more remote nodes to form a virtual local network. The VLAN function enables a network to be split into various segments. It is possible to combine servers and workstations into dynamic workgroups according to their function. VLANs can be set up transparently and without any physical changes to the network and can be configured like multiple virtual local networks.

VLANs are broadcast domains that can also extend over several switches. The broadcast traffic is then only visible in the respective VLAN. This possibility of completely isolating VLANs from one

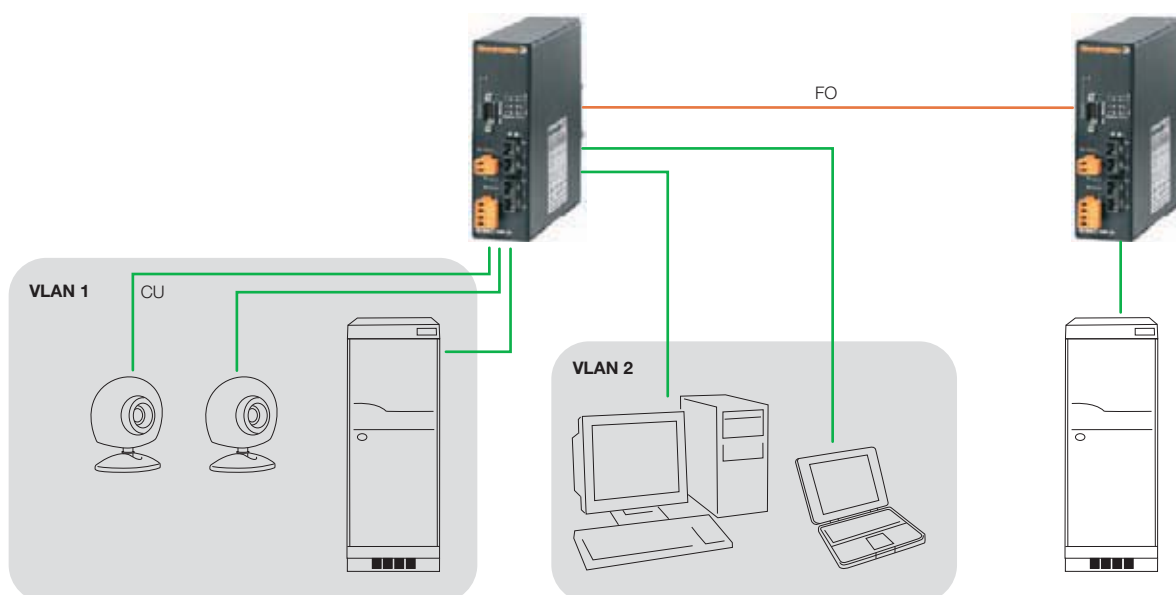
another helps to increase the security of data transmissions. Consequently, the data is sent only to the Ethernet devices within one VLAN group. Once the VLAN function has been activated, a VLAN frame can be sent only to one port belonging to this VLAN within the VLAN. If the destination port belongs to a different VLAN, the frame is deleted. It is also possible to assign a port to several VLANs simultaneously. This type of structure enables networks to share one router or server.

VLANs combine the advantages of bridges and routers. Consequently, it is easy to add, delete or modify a station. Furthermore, the network can have any structure. For example, it is possible to set up virtual user groups. It is no longer necessary to assign users to various subnetworks just because of the great physical distances between them. Servers housed in central locations can be assigned to distant workgroups.

IE-SWxx-M switches support two types of VLAN:

- Port-VLAN
- 802.1q VLAN

Managed switches also permit static entries in addition to the “learning” of addresses in the forwarding table or the address table. These entries remain in the table permanently and are not subject to the aging process.



## Switches with management functions

### Quality of Service

The Quality of Service (QoS) function permits a QoS priority to be used in every Ethernet frame. The priority depends on the port from which the frame originates.

### Differential relay

The AdvancedLine managed switches also feature a relay connection. This can be used to monitor individual events on the network. The relay can signal an outage or the presence of a link on one or multiple ports.

### Browse Address Table

The “browse address table” function enables the display of the entire address table or the localisation of a MAC address. Select the type of search (sequence or MAC address) and afterwards the “find” function. This function is useful for obtaining an overview of all MAC addresses. The ports belonging to the MAC addresses are also displayed.

### SNMP-Management

The SNMP protocol enables the monitoring, controlling and administration of networks. According to the model of SNMP architecture, the network is divided into network management stations and network components. The network management

stations host applications for the monitor and control of network components.

### IGMP-Snooping

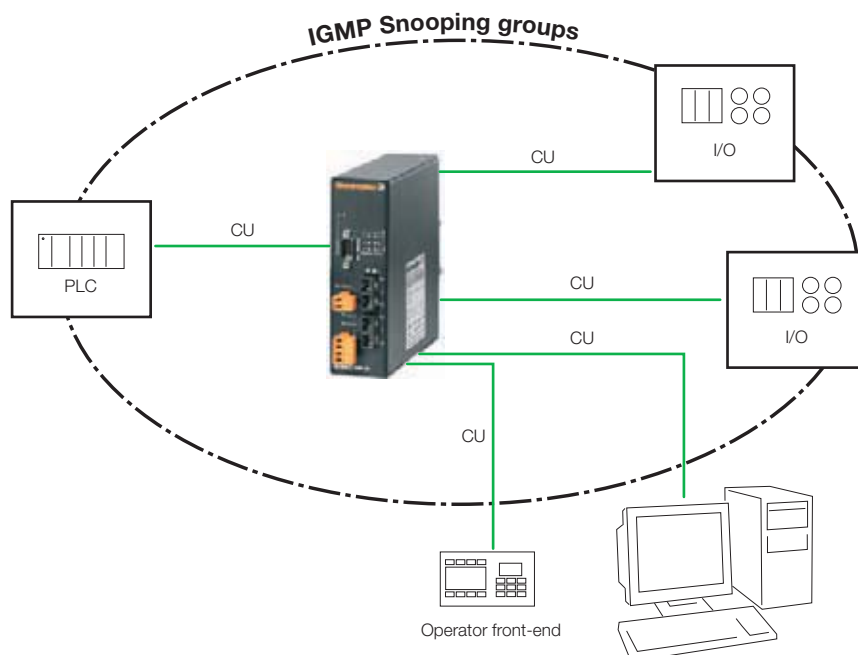
IGMP snooping controls the switch when join requests appear on the port for a multicast group. When this happens, the particular port is incorporated into the forward table for this group. This reduces the net load, since the switch does not flood all ports with multicast traffic.

### DHCP Client

Specially-configured servers, such as Weidmüller’s Router Series, can assign dynamic IP addresses and other network parameters to network components. This is done with the DHCP protocol (Dynamic Host Configuration Protocol). Our managed switches can either receive a fixed, static IP address, or a DHCP server can assign them an IP address.

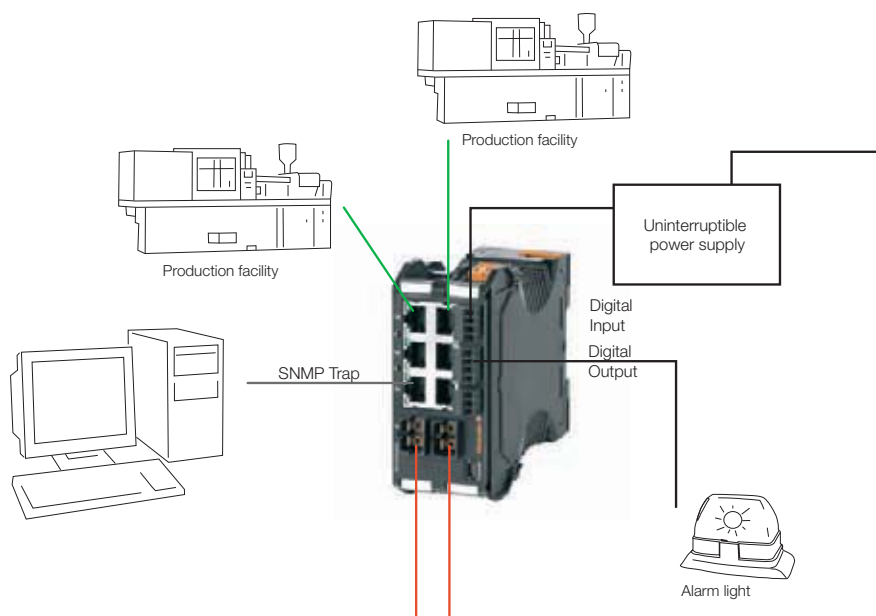
### Diffserv

When using Diffserv (Differentiated Services), every IP packet is tested to determine its priority. In contrast to the Quality of Service, the priority is already determined here by the sender. Thus the path to the receiver is optimized and forwarded with preference.



# WaveLine managed switches with IOs

Our WaveLine switches come optionally with two digital IOs (input and output). After the IOs are configured, network parameters can be monitored with the managed switch. An uninterruptible power supply (UPS) can also be connected to the IOs. If the supply voltage fails, the switch changes over to the battery on the UPS. The signal output wired to the WaveLine managed switch can issue an SNMP trap to a Scada system running on a network server. In addition, the IO output activates an alarm light on the outside of the electrical cabinet so that the power outage can be easily seen. No PLC is required.



# Redundancy in the Industrial Ethernet

Two schemes have become established for achieving network redundancy in Industrial Ethernet applications.

## B

Ring topology is the simplest and quickest way of achieving network redundancy. The lack of a standard led to the development of RapidRing™ technology. This provides industrial automation engineers with a simple and effective way of achieving redundancy. RapidRing™ provides redundancy against a single fault. The devices combined to form a ring are wired like a real logical ring. As the ring structure would lead to a loop in the network, one link is logically deactivated (backup link).

The IEEE standard “Rapid Spanning Tree Protocol” (RSTP, IEEE 802.3w) is the other option for achieving redundancy in a network. RSTP renders possible a net-like structure which enables multiple redundancy to be achieved. RSTP is not as easy to use as RapidRing™, but RSTP does offer many interesting options.

Both systems have their advantages in particular applications. In industrial automation it is often very simple to wire ring structures. Operating RSTP in a ring of 15 or more switches will lead to unsatisfactory data rates. But the use of RapidRing™ in such an installation results in switching times < 300 ms, and larger rings are also possible.

RapidRing™ is easy to use. Firstly, one switch is selected to be the master and is configured as such. The other switches in the network are configured as slaves. Ports 1 and 2 are always used to connect the ring. Port 1 of one switch is connected to port 2 of the next switch in the redundant ring. This connection scheme leads to a logical ring. After switching on the network, the network is ready for operation.

The backup link is always connected to port 2 of the master switch, which allows the backup links to be predefined. The master can therefore be chosen to optimise the network throughput. If a connection in the ring is interrupted, the backup link takes over its function and so communications are not subjected to long interruptions. Once the defective link has been restored, the backup link is automatically deactivated.

The status of the ring can be interrogated via the Web server of every switch involved. MIB data is made available via the SNMP for remote interrogation and automatic processing in a dedicated section.

The RSTP standard is a further development of the Spanning Tree Protocol (STP, IEEE 802.1D). The RSTP configures the network in such a way that there are no loops. Various redundant connections (backup links) offer multiple redundancy. The switches connected to the RSTP exchange information via the network in Bridge Protocol Data Units (BPDU). An interrupted link is therefore quickly replaced. Modifications within the network are detected automatically.

RSTP is ideal for complex networks with more than one connection. As several possible paths exist in the network, RSTP must always analyse the network fully. That leads to switchover times > 300 ms. Indeed, in large and complex networks the switchover time can run into several seconds.

A network with RSTP should be very carefully planned and conceived, otherwise unexpected behaviour could be the result.



## Configuration

IE-SWxx-M managed switches can be configured with a terminal program but also via a Web interface at the integral, interactive Web server. Every Internet-compatible PC in the local network can have access to this Web server. The Web server is compatible with the latest versions of Internet Explorer (7.0 or higher) and Firefox (3 or higher). This method of configuration enables remote switches to be configured.

The following settings are possible:

- port status: enabled or disabled
- data rate and duplex transmission: fixed or auto-negotiation
- specification of transmission medium (Auto-MDI/X): enabled or disabled
- the IE-SWxx-M can also be managed via the SNMP function  
SNMP traps are messages that are transmitted when a “trap event” occurs. Up to four trap receivers can be specified. The IE-SWxx-M switches support traps for the link-up, link-down, confirmation error, cold restart and warm restart functions.

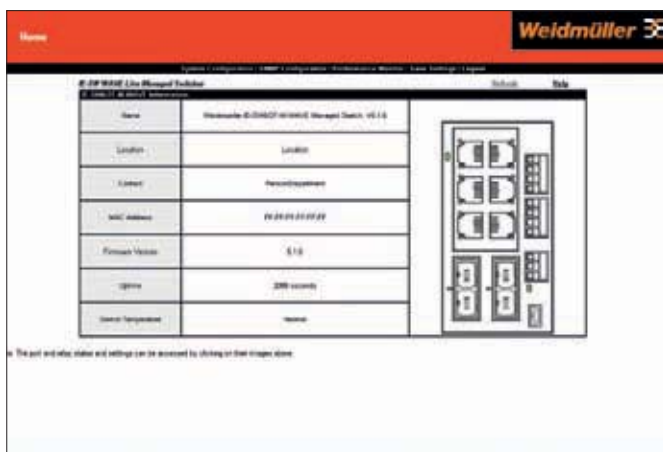
The IE-SWxx-M managed switches can be monitored via SNMP and console menus. The following are just some of the functions available:

- display port traffic
- search address table
- display switching history
- display switch temperature

Port error packets statistics can be generated for every port.

This contains information regarding:

- dropped packets
- oversized packets
- undersize packets
- fragments
- jabbers
- collisions
- deferred transmission

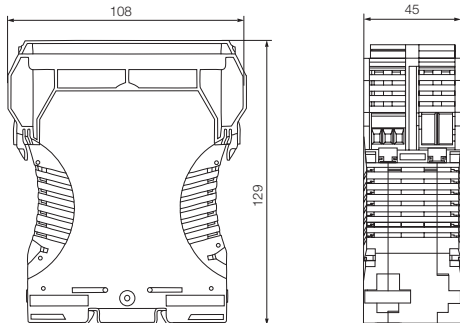


Refer to Chapter W for a description of the connection possibilities for redundant power supplies.

## Switches with management functions

## WaveLine Managed Switches

- Compact plastic housing in IP20
- For mounting on TS 35
- IEEE 802.3x / 802.3 / 802.4 standard



## WaveLine Managed Switches

## Note

Our product line of managed switches has now also been extended to our WaveLine. With its six copper and two optional FO ports, our WaveLine is the perfect introduction for industrial applications. The optional FO ports - with SC, LC or ST connectors - offer disturbance-free transmissions of up to 2km. Our managed switches support many features:

- Auto-negotiation
- Redundant power supply
- Programmable error relay for PLC support
- SNMP V1
- Rapid Ring™
- RSTP 802.3w
- IGMP snooping
- Querier
- Port mirroring
- Port filtering
- Port setup functionality
- VLAN
- QoS
- TOS
- Diffserv
- MAC-based trunking
- Auto-crossover / Auto-polarity
- Auto-polarity
- Filtering and forwarding table
- Operational earthing
- Configuration via console (USB) or integrated web server



## Ordering data

Number of ports
6 x RJ45, 1 x USB, 2 x SC multi-mode
6 x RJ45, 1 x USB, 2 x SC single-mode
6 x RJ45, 1 x USB, 2 x ST multi-mode
6 x RJ45, 1 x USB, 2 x LC multi-mode
6 x RJ45, 1 x USB, 2 x SCRJ multi-mode
8 x RJ45, 1 x USB

## Note

Type	Order No.
IE-SW6/2SC-1300-M-WAVE	8943790000
IE-SW6/2SCS-1300-M-WAVE	1067880000
IE-SW6/2ST-1300-M-WAVE	8943800000
IE-SW6/2LC-1300-M-WAVE	8943820000
IE-SW6/2SCRJ-650-M-WAVE	8943810000
IE-SW8-M-WAVE	8943780000

## Accessories

Type	Order No.
RJ45 dust-protection plug	8813490000
markers	1609880000

Cables and connection elements are found starting at Chapter C.

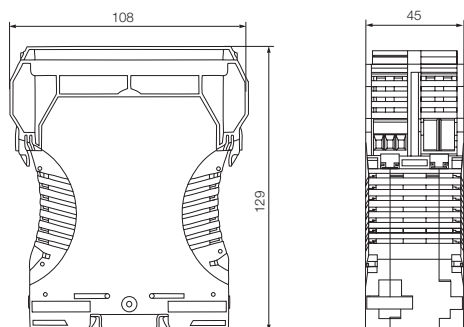
## Technical data

Housing	Plastic
Length / Width / Height	108 mm / 45 mm / 127.8 mm
AC input voltage, min.-max.	10-24 V AC
DC input voltage, min.-max.	10-35 V DC
AC input power / DC	5 VA AC / 5 W DC
Input frequency	47 - 63 Hz
Operating temperature, min.-max.	-40 °C-70 °C
Storage temperature, min.-max.	-40 °C-85 °C
Installation	TS 35
Protection class	IP 20
Standard	IEEE 802.3; 802.3u; 802.3x; Class I, Division 2
Data rate	10 Base-T/100 Base-TX (copper) 100 Base-FX (fibre)
Segment length	Copper 100 m; fibre (multimode) 2 km; fibre (single mode) 20 km
Functionality	Auto-negotiation; programmable error relay; redundant power supply
Flow control	HD (backpressure) / FD (pause)
Status indication	Data rate, Power, Temperature monitoring, Connection/Activity
Buffer memory	2 x 256 Kbyte per 8 ports
Address memory	4 K MAC addresses per 8 ports
Approvals	cULus, CE, EN55024, EN 55022, Gost R, GL
Aging	300 s
Optical budget	8 dB for 62.5/125 µm multi-mode 4 dB for 50/125 µm multi-mode 13 dB for 9/125 µm single-mode cable
Supported protocols	Profinet RT, Modbus TCP, TCP/IP, EthernetIP
Fault relay	max. 24 V / 30mA

Note: GL is pending

### WaveLine managed switch IOs

- Compact plastic housing in IP20
- For mounting on TS 35
- IEEE 802.3x / 802.3 / 802.4 standard



### WaveLine managed switch IOs

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- IGMP snooping
- Querier
- Port mirroring
- Port filtering
- Port setup functionality
- VLAN
- QoS
- TOS
- Diffserv
- MAC-based trunking
- Auto-crossover / Auto-polarity
- Auto-polarity
- Filtering and forwarding table
- Functional earth
- Configuration via console (USB) or integrated web server



### Ordering data

Number of ports
6 x RJ45, 1 x USB, 2 x SC multi-mode
6 x RJ45, 1 x USB, 2 x SC single-mode
6 x RJ45, 1 x USB, 2 x ST multi-mode
6 x RJ45, 1 x USB, 2 x SCRJ multi-mode
8 x RJ45, 1 x USB

Type	Order No.
IE-SW6/2SC2DIO-M-WAVE	8972580000
IE-SW6/2SCS2DIO-M-WAVE	1067870000
IE-SW6/2ST2DIO-M-WAVE	8972600000
IE-SW6/2SCRJ2DIO-M-WAVE	8972590000
IE-SW8-2DIO-M-WAVE	8972570000

**Note**

### Accessories

RJ45 dust-protection plug
markers

**Note**

Type	Order No.
IE-DPC	8813490000
WS 15/5 MC NEUTRAL	1609880000

Cables and connection elements are found starting at Chapter C.

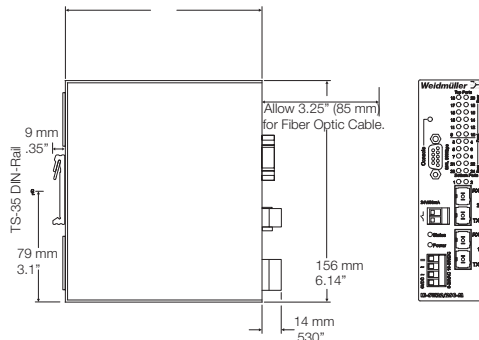
### Technical data

Housing	plastic
Length / Width / Height	108 mm / 45 mm / 127.8 mm
AC input voltage, min.-max.	10-24 V AC
DC input voltage, min.-max.	10-35 V DC
AC input power / DC	5 VA AC / 5 W DC
Input frequency	47 - 63 Hz
Operating temperature, min.-max.	-40 °C-70 °C
Storage temperature, min.-max.	-40 °C-85 °C
Installation	TS35
Protection class	IP 20
Standard	IEEE 802.3; 802.3u; 802.3x; Class I, Division 2
Data rate	10 Base-T/100 Base-TX (copper) 100 Base-FX (fibre)
Segment length	Copper 100 m; fibre (multimode) 2 km; fibre (single mode) 20 km
Functionality	Auto-negotiation; programmable error relay; redundant power supply
Flow control	HD (backpressure) / FD (pause)
Status indication	Data rate, Power, Temperature monitoring, Connection/Activity
Buffer memory	2 x 256 Kbyte per 8 ports
Address memory	4 K MAC addresses per 8 ports
Approvals	cULus, CE, EN55024, EN 55022, Gost R, GL
Aging	300 s
Optical budget	8 dB for 62.5/125 µm multi-mode 4 dB for 50/125 µm multi-mode 13 dB for 9/125 µm single-mode cable
Supported protocols	Profinet RT, Modbus TCP, TCP/IP, Ethernet/IP
Fault relay	max. 24 V / 30mA
Digital input	2 x 24V DC
Digital output	2 x 30mA
<b>Note:</b>	GL is pending

## Switches with management functions

### Managed switch, with 8 to 24 ports

- Robust IP20 aluminium enclosure
- For mounting on TS35 rail or wall
- IEEE 802.3x / 802.3 / 802.4 standard



### Managed switch, with 8 to 24 ports

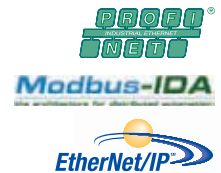
The managed switches in rugged aluminium housing are just 45 mm wide and have between 8 and 24 ports for your industrial network. With their IP 20 class of protection and operating temperature range of -40°C to +75°C, these switches are ideal for industrial applications.

The optional multimode FO ports with SC or ST plugs ensure noise-free transmissions over distances of up to 2 km, or up to 20 km in the single-mode form with SC plugs.

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- Redundant power supply
- Programmable error relay for PLC support
- SNMP V1
- Rapid Ring™
- RSTP 802.3w
- IGMP snooping
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- Port setup functionality
- VLAN
- QoS
- TOS
- Diffserv
- MAC-based trunking
- Auto-crossover / Auto-polarity
- Auto-polarity
- Filtering and forwarding table
- Operational earthing
- Configuration via console (RS-232) or integrated web server

Our managed-line switches are also available as either multimode or singlemode versions.



### Ordering data

Number of ports	Type	Order No.
6 x RJ45, 1 x RS232, 2 x SC multi-mode	IE-SW6/2SC-M	8845840000
6 x RJ45, 1 x RS232, 2 x SC single-mode	IE-SW6/2SCS-M	8851850000
6 x RJ45, 1 x RS232, 2 x ST multi-mode	IE-SW6/2ST-M	8845850000
8 x RJ45, 1 x RS232	IE-SW8-M	8845740000
14 x RJ45, 1 x RS232, 2 x SC multi-mode	IE-SW14/2SC-M	8845780000
14 x RJ45, 1 x RS232, 2 x SC single-mode	IE-SW14/2SCS-M	8851860000
14 x RJ45, 1 x RS232, 2 x ST multi-mode	IE-SW14/2ST-M	8845790000
16x RJ45, 1 x RS232	IE-SW16-M	8845800000
22 x RJ45, 1 x RS232, 2 x SC multi-mode	IE-SW22/2SC-M	8845810000
22 x RJ45, 1 x RS232, 2 x SC single-mode	IE-SW22/2SCS-M	8851870000
22 x RJ45, 1 x RS232, 2 x ST multi-mode	IE-SW22/2ST-M	8845820000
24x RJ45, 1 x RS232	IE-SW24-M	8845830000

Singlemode design up to 120 km on request

### Accessories

Type	Order No.
RJ45 dust-protection plug	IE-DPC 8813490000
Null modem cable	IE-C-NULLMODEM 8866660000

Cables and connection elements are found starting at Chapter C.

### Technical data

Housing	Aluminium
Length / Width / Height	140 mm / 45 mm / 155 mm
AC input voltage, min.-max.	8-24 V AC
DC input voltage, min.-max.	10-36 V DC
AC input power / DC	20 VA AC / 20 W DC
Input frequency	47 - 63 Hz
Operating temperature, min.-max.	-40 °C-75 °C
Storage temperature, min.-max.	-40 °C-85 °C
Installation	TS 35, wall
Standard	IEEE 802.3; 802.3u; 802.3x; Class I, Division 2
Segment length	Copper 100 m; fibre (multimode) 2 km; fibre (singlemode) 20 km
Functionality	Auto-negotiation; programmable error relay; redundant power supply
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Optical budget	8 dB for 62.5/125 µm multimode 4 dB for 50/125 µm multimode 13 dB for 9/125 µm singlemode cable
Supported protocols	Profinet RT, Modbus TCP, TCP/IP, Ethernet/IP
Fault relay	max. 24 V / 30mA

### Note:

