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MACH4000 Series Gigabit Backbone Layer 2/3 Rack-Mount Switches

MACH4000 Series

Fast Ethernet Ports, Gigabit Ethernet Uplink Ports, and 10Gigabit Uplink Ports

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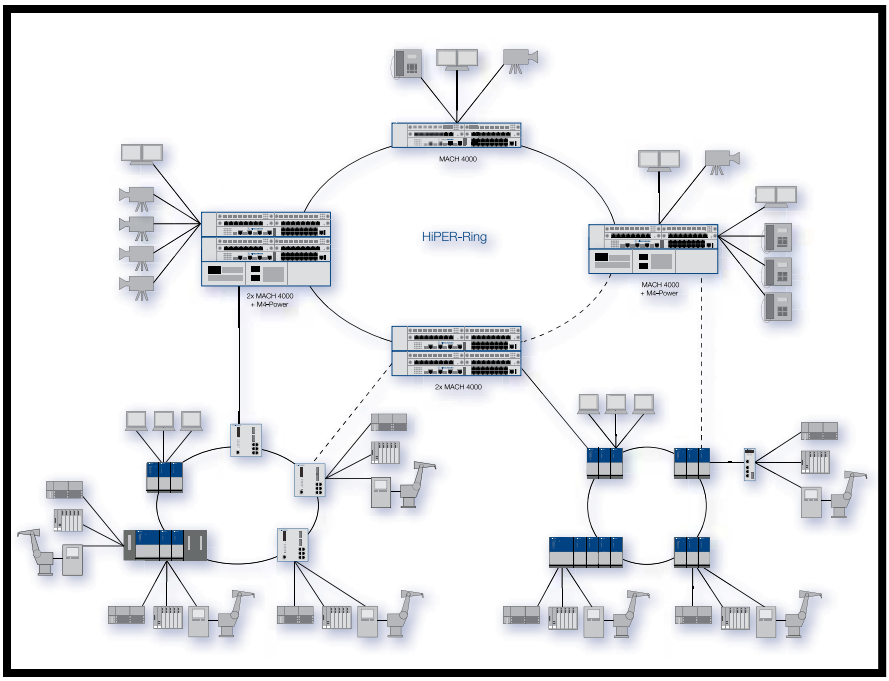
MACH4000 Series Gigabit Backbone Layer 2/3 Rack-Mount Switches

The MACH4000 series of gigabit backbone switches and routers offers maximum transmission rates while providing connection and management functionality between multiple networks. With its modular, stackable system, the MACH4000 provides highly available Ethernet communication management, serving as the backbone for industrial networks. The MACH4000 supports between 24 GE to 48 GE ports and up to 3x10GE ports to assure fast switching in industrial Ethernet applications. The compact chassis offers high port density and modularity with minimum space requirements. Additional functions for industry include HIPER-Ring, redundant coupling, or shock and vibration resistance with GL approval.

Applications

Industrial ETHERNET has become increasingly important in factory and process automation, where optimum interaction among production areas via the HIPER-Ring protocol and redundant coupling is essential. Other applications include transportation automation, such as on ships, in locks and waterways, in tunnels or for video monitoring. In short: in all transportation applications where extremely fast switching is required for convergent networks, i.e. combinations of voice, data and video via HIPER-Ring.

As robust backbone switches and routers, the MACH4000 family assures maximum performance, optimum reliability, and cost effective port prices in industrial networks. Perfectly packaged in a compact, industrial-grade chassis, the MACH4000 provides expansion capability with a variety of media modules for specific requirements.



Typical gigabit backbone industrial Ethernet network featuring a series of MACH4000 Gigabit Ethernet switches with HIPER-Ring redundancy.

Features

The MACH Gigabit switches and routers are available in various versions: either as a Layer 2 Switch (L2P), additionally with static routing (L3E), or in a dynamic routing version with multicast routing (L3P). Each has a choice of power supply and can be individually populated with various media modules that include RJ45 copper ports, Fast-Ethernet SFP ports, power over Ethernet (PoE) ports, and Gigabit SFP ports.

- The combination of pre-installed and modular ports offers an excellent price/ performance ratio.
- Each hot-swappable media module supports up to 8 ports
- Expandable by up to 4 media modules
- Extended operating temperature range of 0 to + 60°C
- Plug and Play functionality
- Supports power sources with 100 up to 240 V AC, 120 up to 350 V DC, 24 V DC and 48 V DC
- Redundancy tools include HIPER-Ring protocol, redundant coupling, MRP-Ring protocol, link aggregation, and RSTP
- Power supply redundancy through use of M4-POWER chassis

The MACH4000 Order Information

Product description			
Description	MACH4000, modular, managed Industrial Backbone-switch, Layer 2 Switch with Software Professional.	MACH4000, modular, managed Industrial Backbone-router, Layer 3 Switch with Software Enhanced.	MACH4000, modular, managed Industrial Backbone-router, Layer 3 Switch with Software Professional.
Type	**MACH4002-24G-L2P**	**MACH4002-24G-L3E**	**MACH4002-24G-L3P**
Order number	943 916-101	943 916-201	943 916-301
Port type and quantity 	Up to 24 Gigabit-Ethernet ports, thereof up to 16 Gigabit-Ethernet ports via media modules practicable, 8 Gigabit combo ports SFP(100/1000MBit/s) or TP (10/100/1000Mbit/s) are integral installed.		
Type	**MACH4002-24G+3X-L2P**	**MACH4002-24G+3X-L3E**	**MACH4002-24G+3X-L3P**
Order number	943 915-101	943 915-201	943 915-301
Port type and quantity 	Up to 24 Gigabit-Ethernet and 3x 10Gigabit-Ethernet ports, thereof up to 16 Gigabit-Ethernet ports via media modules practicable, 3x 10Gigabit XFP sockets and 8 Gigabit TP (10/100/1000Mbit/s) ports are integral installed.		
Type	**MACH4002-48G-L2P**	**MACH4002-48G-L3E**	**MACH4002-48G-L3P**
Order number	943 911-101	943 911-201	943 911-301
Port type and quantity 	Up to 48 Gigabit-Ethernet ports, thereof up to 32 Gigabit-Ethernet ports via media modules practicable, 16 Gigabit TP (10/100/1000Mbit/s) therof 8 as combo SFP(100/1000MBit/s)/TP ports are integral installed.		
Type	**MACH4002-48G+3X-L2P**	**MACH4002-48G+3X-L3E**	**MACH4002-48G+3X-L3P**
Order number	943 878-101	943 878-201	943 878-301
Port type and quantity 	Up to 48 Gigabit-Ethernet and 3x 10Gigabit-Ethernet ports, thereof up to 16 Gigabit-Ethernet ports via media modules practicable, 3x 10Gigabit XFP sockets and 16 Gigabit TP (10/100/1000Mbit/s) ports are integral installed.		

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The MACH4000 Technical Information

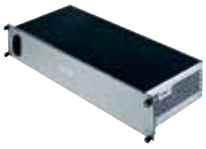
Technical data	
Interfaces	
Signaling contact	1 plug-in terminal block, 4-pin, 2x egresses manual or automatic switchable (1A at 24 VDC)
V.24 interface	1 x RJ11 socket, serial interface to the configuration of devices
USB interface	1 USB interface to connect auto-configuration adapter (ACA21-USB)
Network size – cascadibility	
Line-/star topology	any
Ring structure (HIPER-Ring)	Ring-recovery time < typ. 80 ms at LWL (120ms with Fast-Ethernet link)
Power requirements	
Operating voltage	24V DC or 48V DC or 110-240V AC (variant applicable)
PoE (802.3af) ports supported	Yes (variant applicable)
PoE Plus (802.3at) ports supported	n/a
Power consumption	70W (without media modules)
Redundancy	Redundant 24 V power supply by M4-Power basic device
Ambient conditions	
Operating temperature	0°C - 60°C I Power supply unit M4-S-xx or M4-Power chassis with power supply unit, please order separately.
Storage/transport temperature	-20° - +85°C
Relative humidity (non-condensing)	10% to 95%
Mechanical construction	
Dimensions (WxHxD)	480mmx88mmx435mm
Mounting	19” control cabinet
Protection class	IP 20
Approvals	
Safety of Industrial Control Equipment	cUL 508
Hazardous Locations	n/a
Germanischer Lloyd	Germanischer Lloyd
Transportation	n/a
Railway (norm)	n/a
Substation	n/a
Scope of delivery and accessories	
Scope of delivery	Device, terminal block, operating manual, fan M4-AIR installed
Accessories to order separately	Power supply unit, auto-configuration adapter ACA21-USB, Industrial HiVision network management
Reliability	
MTBF Range (Years)	11.1 to 18.9
Warranty	5 years standard

The MACH4000 Software and Power Supply Chassis

Software			
Versions	**L2P – Layer 2 Professional**	**L3E – Layer 3 Enhanced**	**L3P – Layer 3 Professional**
Management	Serial interface, web-interface, SNMP V1/V2, HiVision file transfer SW HTTP/TFTP, LLDP-MED, Voice VLAN		
Configuration	Comand line interface (CLI), TELNET, BootP, DHCP, DHCP option 82, HIDiscovery, easy device exchange with auto-configuration adapter ACA21-USB (automatic software and/or configuration upload), Automatic script load from ACA21 on boot, integrated DHCP server per port, automatic invalid configuration undo, Offline Configuration, SFP Whitelist.		
Diagnostics	LEDs, log-file, syslog, relay contact, RMON, port mirroring 1:1 and n:1, topology discovery 802.1AB, cable tester (TX), address conflict detection, network error detection, SFP diagnostic (temperature, optical input and output power, power in dBm), Trap for configuration saving and changing, duplex mismatch detection, disable learning, Port Monitor.		
Security	Port Security (IP und MAC) with multiple addresses(50 MACs per port), SNMP V3, SSH, Authentication (IEEE802.1x), 802.1x Multi Client Authentication, Guest VLAN and Unauthenticated VLAN, MAC based Radius VLAN assignment.		
Other services	QoS 8 classes, port priorisation (IEEE 802.1D/p), VLAN (802.1Q), TOS (Type of Service) Diff.-Serv, TOS-Prio-Mapping, traffic shaping, flow control IEEE 802.3x, SNTP (Simple Network Time Protocol), protocol based VLANs (IP, nonIP Traffic), multicast (IGMP snooping/querier, GMRP), broadcast limiter, Fast Aging, Multicast Detection unknown Multicast, Multicast GMRP IEEE 802.1D, DHCP Option 82.		
Redundancy functions	HIPER-Ring (ring structure), MRP (IEC-ring functionality), MSTP, RSTP (rapid spanning tree protocol), redundant network/ring coupling (master/receiver functionality), MRP and RSTP in parallel, link aggregation, redundant 24 V power supply by M4-Power basic device, redundant signal contact, link aggregaion dynamic and static (max. 7 trunks, 8 ports/trunk, LACP).		
Routing		Static routing, layer 3 – ACL	Static routing, layer 3 – ACL
Router redundancy		VRRP, HiVRRP	VRRP, HiVRRP
Dynamic routing		RIP V1/2	RIP V1/2, OSPF
Multicast routing			Multicast routing DVMRP/PIM DM / DVMRP/PIM SM

Power supply chassis	
Description 	M4-POWER chassis for taking up to three power supply plug-in M4-P-xx enables the external and redundant power supply of MACH4002 switch chassis.
Type	**M4-Power**
Order number	943 874-001
Technical data	
Technical data	see Power supply plug-in M4-P-AC/DC 300W, M4-P-24 V DC 300W, M4-P-48 V DC 300W
Mechanical construction	
Dimensions (WxHxD)	480mmx88mmx435mm
Mounting	19” control cabinet
Protection class	IP 20

The MACH4000 Power Supplies and Power Supply Plug-in

Power supplies			
Description 	Power supply plug-in for MACH4002 switch chassis.	Power supply plug-in for MACH4002 switch chassis with two inputs for redundant power supply.	Power supply plug-in for MACH4002 switch chassis with two inputs for redundant power supply.
Type	**M4-S-AC/DC 300W**	**M4-S-24VDC 300W**	**M4-S-48VDC 300W**
Order number	943 870-001	943 871-001	943 872-001
Technical data			
Voltage input	Non-heating appliance socket.	Plug-in terminal block.	Plug-in terminal block.
Operating voltage	100 – 240 V AC, 120 – 350 V DC	24 V DC (19 V– 32 V)	48 V DC (38 V – 60 V)
Input frequency	47– 63 Hz		
Current consumption	max. 1.7 A (240 VAC), max. 4.0 A (100 VAC)	max. 16.0 A (24 VDC), max. 20 A (19.2 - 32 VDC)	max. 8.0 A (48 VDC), max. 10 A (38.4 - 60 VDC)
Activation current	typ. < 40 A at 265 V AC and cold start		
Max power consumption (max power output is 300W)	350W (230 V), 370W (110 V)	380 W	380W
Diagnostics	LEDs (P1) at switch chassis	LEDs (P1 and P2) at switch chassis	LEDs (P1 and P2) at switch chassis
Operating temperature	0° C up to + 60° C	0° C up to + 60° C	0° C up to + 60° C

Plug-in power supplies			
Description	Power supply plug-in for basic device M4-Power 	Power supply plug-in for basic device M4-Power with two inputs for redundant power supply 	Power supply plug-in for basic device M4-Power with two inputs for redundant power supply 
Type	**M4-P-AC/DC 300W**	**M4-P-24VDC 300W**	**M4-P-48VDC 300W**
Order number	943 875-001	943 876-001	943 877-001
Technical data			
Voltage input	Non-heating appliance socket.	Plug-in terminal block.	Plug-in terminal block.
Operating voltage	100 – 240 V AC, 120 – 350 V DC	24 V DC (19 V– 32 V)	48 V DC (38 V – 60 V)
Input frequency	47– 63 Hz		
Current consumption	max. 1.7 A (240 VAC), max. 4.0 A (100 VAC)	max. 16.0 A (24 VDC), max. 20 A (19.2 - 32 VDC)	max. 8.0 A (48 VDC), max. 10 A (38.4 - 60 VDC)
Activation current	typ. < 40 A at 265 V AC and cold start		
Max power consumption (max power output is 300W)	350W (230 V), 370W (110 V)	380 W	380W
Diagnostics	LEDs (P1) at switch chassis	LEDs (P1 and P2) at switch chassis	LEDs (P1 and P2) at switch chassis
Operating temperature	0° C up to + 60° C	0° C up to + 60° C	0° C up to + 60° C

The MACH4000 Fans and Media Modules

Fans				
Description	Plug-in fan for MACH4002 switch chassis, four redundant single fans.			
Type	**M4-AIR**			
Order number	943 869-001			
Technical data				
Operating voltage	Operating voltage via MACH4002 switch chassis			
Diagnostics	LEDs (FAN) at basic device			
Operating temperature	0° C up to + 60° C			

Media Modules				
Description	Media module for MACH4000 10/100/1000BASE-TX	Media module for MACH4000 10/100BASE-TX with power supply for terminals for IEEE802.3af (PoE)	Media module for MACH4000 100BASE-FX with SFP sockets	Media module for MACH4000 100/1000BASE-X with SFP sockets
Type	**M4-8TP-RJ45**	**M4-FAST 8TP-RJ45-PoE**	**M4-FAST 8-SFP**	**M4-GIGA 8-SFP**
Order number	943 863-001	943 873-001	943 864-001	943 879-001
Technical data				
Port type and quantity	8 x10/100/1000BASE-TX RJ 45 sockets for TP cable, auto-crossing, autonegotiation, auto-polarity		8 x100 BASE-FX, with M-FAST SFP transceiver	8 x100/1000 BASE-X, 100MBit/s using M-FAST SFP transceiver, 1000MBits/s using M-SFP transceiver
Diagnostics	LEDs (power, link status, data)			
Operating voltage	Power supply via the backplane of the MACH4000 switch			
Power consumption	2W	2W + max. 123W PoE	15W	15W
Operating voltage	0° C up to + 60° C			

The MACH4000 SFP Fiber Optic Fast-, Gigabit- and 10Gigabit- Ethernet Transceivers

SFP fiber optic Fast-Ethernet transceiver				
Description SFP fiber optic Fast-Ethernet transceiver				
Type	**M-FAST SFP-LH/LC**	**M-FAST SFP-SM+/LC**	**M-FAST SFP-SM/LC**	**M-FAST SFP-MM/LC**
Order number	943 868-001	943 867-001	943 866-001	943 865-001
Network size – length of cable				
Multimode fiber (MM) 50/125 µm (62.5/125 µm)				5km (4 km at 62.5/125 µm)
Single mode fiber (SM) 9/125 µm	40 – 104 km	25 – 65 km	25 km	
Technical data				
Port type and quantity	1x100BASE-FX with LC-Connector			
Diagnostics	Optical input- and output power, transceiver temperature (diagnostic not for M-FAST SFP-MM/LC)			
Operating voltage	Power supply via media module			
Power consumption	1W			
Operating temperature	0° C up to + 60° C			

SFP fiber optic Gigabit-Ethernet transceiver				
Description SFP fiber optic Gigabit-Ethernet transceiver				
Type	**M-SFP-LH+/LC**	**M-SFP-LH/LC**	**M-SFP-LX/LC**	**M-SFP-SX/LC**
Order number	943 049-001	943 042-001	943 015-001	943 014-001
Network size – length of cable				
Multimode fiber (MM) 50/125 µm (62.5/125 µm)				550m (275m at 62.5/125 µm)
Single mode fiber (SM) 9/125 µm	60 –120 km	24 – 72 km	20 km	
Technical data				
Port type and quantity	1x1000BASE-SX with LC-Connector			
Diagnostics	Optical input- and output power, transceiver temperature			
Operating voltage	Power supply via media module			
Power consumption	1W			
Operating temperature	0° C up to + 60° C			

XFP fiber optic 10Gigabit-Ethernet transceiver				
Description XFP fiber optic 10Gigabit-Ethernet transceiver				
Type	**M-XFP-ZR/LC**	**M-XFP-ER/LC**	**M-XFP-LR/LC**	**M-XFP-SR/LC**
Order number	943 921-001	943 920-001	943 919-001	943 917-001
Network size – length of cable				
Multimode fiber (MM) 50/125 µm (62.5/125 µm)				300m (26m at 62.5/125 µm)
Single mode fiber (SM) 9/125 µm	40 –80 km	10 – 40 km	10 km	
Technical data				
Port type and quantity	1x10GBASE-SX with LC-Connector			
Diagnostics	Optical input- and output power, transceiver temperature			
Operating voltage	Power supply via media module			
Power consumption	3W			
Operating temperature	0° C up to + 60° C			