Data sheet

Managed Ethernet switch 500NMD20
EDS500 series - Ethernet & DSL switches

- Integrated managed layer-2-switch
- 24...60 V DC supply voltage
- 4x 10/100 BaseT (RJ45, auto-negotiating)
- 2x SFP slot
- Provides redundant topologies by the Spanning Tree Protocol (STP/ RSTP/ MSTP)
- 1x RS-232/ RS-485 and 1x RS-232 interface suitable for tunneling of serial protocols

Application
The DIN rail mountable 500NMD20 is a managed plug and play layer-2-switch, providing:
- 4 fast Ethernet auto-negotiating RJ45 ports with auto MDI/X (Automatic Crossover Detection and Correction)
- two SFP (small form-factor pluggable) module slots for use with fiber optic transceivers
- 1x RS-232/ RS-485 and 1x RS-232 interface suitable for tunneling of serial protocols

The switch is able to provide redundant topologies by the Spanning Tree Protocol (STP/ RSTP/ MSTP). It supports VLAN frames and tunneling of serial data. Ethernet may be distributed within a station through the 4 RJ45 ports of the switch.

Depending on the SFP module equipped, the unit is able to span distances by fiber optic cable up to 80 km (or even more with special SFP modules).

Figure 1: Block diagram of 500NMD20

Characteristics
For documentation purposes, the Ethernet ports are labeled from 1 to 4. There is no specific uplink port. All ports are equal in function. Link and speed status of each Ethernet are displayed by status indicators (refer
to Connectors and Indicators). SFP related indicators are positioned on the left side.

The switch learns Ethernet addresses by analyzing received frames and stores them in a lookup-table (max. 2048 entries), which is used to forward frames only to the correct port. If it is broadcast or multicast or if the target address is not found in the lookup-table, a received frame is forwarded to all ports except the receiving one. If an entry in the lookup-table is not refreshed by an incoming frame with the specific source address, it is aged out within a maximum of 304 seconds (by default, value is configurable).

Regarding IEEE 802.1Q VLAN frames, the switch can be configured to VLAN or transparent mode. In transparent mode the switch will never change any frame or TAG of a frame; in VLAN mode it can be configured to support several applications like trunk or access ports.

Quality-of-Service is supported by the switch if an IEEE 802.1p compliant frame format is used. The switch can separate frames into up to four queues, which can be configured to priority based or weighted-fair queuing.

The 500NMD20 uses a wide range power supply and works with a voltage from 24 to 60 V.

The component itself, the Ethernet ports as well as the RS-232 interface, the SFP transducers and the extension bus interface (Ext) are hot-plug capable.

Topology
The 500NMD20 provides a total of ports for use with end devices, switches, bridges, hubs and routers. Star, ring or line topologies can easily be built by this family of switches.

Redundant topologies are automatically detected and handled by the Rapid Spanning Tree Protocol (RSTP) or the Multiple Spanning Tree Protocol (MSTP). This is fully backward compatible with the wide-spread Spanning Tree Protocol (STP).

Management and Configuration
Management and configuration of the 500NMD20 can be done by Telnet, Secure Shell (SSH), SNMP, RS-232 or Web-interface. All methods can be used to either read or write parameters of the device.

Additionally the interface and alarm state of the device can be monitored by IEC 60870-5-101 or -104.

An existing configuration can be saved as well as restored. The configuration can also be stored to an external configuration stick (500NMA01), which supports the simple exchange of a device without trained personnel.

By default, the IP address for the configuration of a 500NMD20 switch is 10.0.0.2 with a subnet mask of 255.0.0.0 and a gateway of 10.0.0.1. Connections for configuration purposes may be accepted through any interface. All Ethernet ports are administratively up in default state.

The preconfiguration for the RS-232 interface is baudrate 57600, 8 databits, no parity, 1 stopbit (57600, 8N1). The command-line interpreter for configuration via this interface can be accessed by any terminal software (e.g. Hyperterminal).

Ports
All ports of the device can be disabled or enabled by configuration. Furthermore, the speed and duplex of any port can be set according to its capabilities. This is 10 or 100 Mbps, Full or Half duplex for the Ethernet ports. It is also possible to use an auto-detect setting.

The switch supports multiple additional features, like port mirroring, bandwidth control, or quality of service.

Alerts, Notifications and Logging
The 500NMD20 provides Syslog and SNMP capabilities to send alerts and notifications to one or more predefined destinations. There is also a relay for configurable out-of-band alerts.

For each Syslog server entry a severity can be entered to filter outgoing messages.

A system log stores critical messages. The log includes a timestamp either by system uptime, or date and time if a time server is configured.

For Syslog and local logging, a SNTP time server can be used to synchronize clocks and to enable the generation of date and time timestamps instead of uptime referencing messages.

Redundancy Support
The redundancy protocols Spanning Tree Protocol (STP), Rapid Spanning Tree Protocol (RSTP) and Multiple Spanning Tree Protocol (MSTP) are fully supported. Without configuration RSTP is enabled for all ports. Switching from RSTP to STP is done automatically to ensure the compatibility to existing STP installations.

For every port, the parameters can be adjusted separately. This includes port priority for root bridge control as well as point-to-point and edge connection settings. A global bridge priority is also settable.

The protocol Ethernet Ring Protection Switching (ERPS) is supported as well.
Security

Access to the configuration interfaces of the 500NMD20 is controlled by a two-level password protection. The first level enables the user to access parameters in read-only mode and has to be entered as soon as a connection is established. To read and write parameters, the device has to be put in a configuration mode that requires an additional password. Any password can be disabled. Some security sensitive information, such as the configuration file, are not available in read-only mode.

Besides the two-level password protection, users may be authenticated by a standard RADIUS server.

Devices can be authenticated via optional IEEE 802.1X support using a central authentication server (RADIUS).

Access control lists provide packet filtering and class-of-service rewriting on a per port basis.
**Technical data**

In addition to the EDS500 series general technical data, the following applies:

### General standards

- Safety tested according to IEC 60950-1
- Environmental conditions tested according to:
  - ETSI EN 300 019-1-3 class 3.4
  - ETSI EN 300 019-2-8 test condition T8.1
  - IEC 61850-3
  - IEC 60255-21-1 class 2
  - IEC 60255-21-2 class 1
  - IEC 60721-3-3 class 3M5
  - EN 50125-3 class T1 and T2

### Electromagnetic compatibility (EMC) tested according to:

- IEC 61000-6-2
- IEC 61000-6-4
- ETSI EN 300 386
- EN 50121-4
- IEC 61850-3

### Environmental conditions - climatic

- Nominal operating temperature range:
  - EN 60068-2-1, EN 60068-2-2, EN 60068-2-14
  - -40 °C... 80 °C
- Relative humidity:
  - EN 60068-2-30
  - 5... 95 % (non condensing)
- Railway applications:
  - EN 50125-3

### Environmental conditions - mechanical

- Vibration sinusoidal, Test Fc, IEC 60068-2-6:
  - 1.2 mm (5... 9 Hz)
  - 4 m/s² (9... 200 Hz)
  - 1 octave/ min, 5 cycles per axis
  - EN 300 019-2-8 class T8.1
  - 0.075 mm (10... 60 Hz)
  - 9.8 m/s² (60... 150 Hz)
  - 1 octave/ min, 1 cycle per axis
  - IEC 60255-21-1 class 2
- Shock and Bump, Test Ea, IEC 60068-2-27:
  - 300 m/s², 18 ms
  - 3 shocks per direction
  - IEC 60721-3-3 class 3M5
  - 50 m/s², 11 ms
  - 100 shocks per direction
  - EN 300 019-2-8 class T8.1
  - 100 m/s², 16 ms
  - 1000 shocks per direction
  - IEC 60255-21-2 class 1
- Vibration broad-band random, Test Fh, IEC 60068-2-64:
  - 1.5 m/s² (5... 100 Hz)
  - 30 min per axes
  - EN 300 019-2-8 class T8.1
- Hammer test, Test Eh, IEC 60068-2-75:
  - Energy: 0.2 J

### Emission test

- Radiated emissions - enclosure ports (30 Mhz to 1 GHz), CISPR 16-2-3/ EN 55016-2-3: EN 55022/ CISPR 22 class A
- Radiated emissions - enclosure ports (1 to 3 GHz), CISPR 16-2-3/ EN 55016-2-3: EN 55022/ CISPR 22 class A

### Immunity test

- Electrostatic discharge, IEC 61000-4-2: 8 kV air / 6 kV contact (level 3), criterion A
- Radiated radio-frequency electromagnetic field, IEC 61000-4-3:
  - 20 V/m (level x), criterion A
- Impulse magnetic field, IEC 61000-4-9: 100 A/m (level 3), criterion A

### Mean time between failure (MTBF)

- Calculation according to MIL-Handbook-217F: 125 years @ 40 °C

### Mechanical layout

- Dimensions: 99 x 68 x 115 mm (H x W x D)
- Mounting: 35 mm DIN-rail
- Cooling: thermal convection (no moving parts)
- Weight: 325 g

### Power supply input (X1)

- Operating voltage: 24... 60 V DC -20%... +20%
- Power consumption (typical): 6 W (all ports active)
- Current demand (peak):
  - 540 mA @ 24 V
  - 220 mA @ 60 V
- Plug type: Phoenix Contact MSTBT 2.5/4-ST
- Reverse polarity protection: yes
- Circuit classification: SELV (acc. IEC 60950-1)
- Galvanic isolation: 1.5 kV isolation voltage
- Overvoltage protection:
  - line to earth ±4 kV, line to line ±2 kV
- Electrical fast transient / Burst, IEC 61000-4-4:
  - 4 kV line to earth, 2 kV line to line (level 4), criterion A
- Surge 1.2/50 µs, IEC 61000-4-5:
  - 4 kV line to earth, 2 kV line to line (level 4), criterion A
- Conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz, IEC 61000-4-16:
  - 30 V continuous disturbance/ 300 V short duration disturbance (level 4), criterion A
- Conducted emissions - asymmetrical DC ports, common mode (0.15 MHz to 30 MHz): EN 55032/ CISPR 32 class A
  - EN 55032/ CISPR 32 class A
  - IEC 61000-6-4
### SFP interface (Fo1 - Fo2)

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical specification</td>
<td>IEEE 802.3</td>
</tr>
<tr>
<td>Protocol</td>
<td>Fast Ethernet</td>
</tr>
<tr>
<td>Data rate</td>
<td>100 Mbps</td>
</tr>
<tr>
<td>Duplex</td>
<td>Full duplex or half duplex (manual)</td>
</tr>
<tr>
<td>Plug type</td>
<td>SFP (INF-8074i)</td>
</tr>
</tbody>
</table>

### Optical SFPs

<table>
<thead>
<tr>
<th>Distance</th>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 km</td>
<td></td>
<td>(62.5/125 and 50/125 μm multi mode)</td>
</tr>
<tr>
<td>15 km</td>
<td></td>
<td>(9/125 μm single mode)</td>
</tr>
<tr>
<td>40 km</td>
<td></td>
<td>(9/125 μm single mode)</td>
</tr>
<tr>
<td>80 km</td>
<td></td>
<td>(9/125 μm single mode)</td>
</tr>
</tbody>
</table>

### Serial interfaces (Con0 - Con1)

<table>
<thead>
<tr>
<th>Surge</th>
<th>4 kV (level 4), criterion A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducted...</td>
<td>10 V (level 3), criterion A</td>
</tr>
<tr>
<td>400 V short duration disturbance, IEC 61000-4-6</td>
<td></td>
</tr>
</tbody>
</table>

### Serial interfaces (Con0 - Con1)

<table>
<thead>
<tr>
<th>Surge</th>
<th>4 kV (level 4), criterion A</th>
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<td></td>
</tr>
</tbody>
</table>

### Ext Connector

<table>
<thead>
<tr>
<th>Connector</th>
<th>Proprietary</th>
</tr>
</thead>
</table>

For usage of the configuration stick 500NMA01 to save the configuration to an external media.

### Alarm output (X2)

<table>
<thead>
<tr>
<th>Type of switch</th>
<th>Toggle (potential free)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching voltage</td>
<td>60 VDC / 25 VAC</td>
</tr>
<tr>
<td>Switching current</td>
<td>500 mA</td>
</tr>
<tr>
<td>Plug type</td>
<td>Phoenix Contact MSTBT 2.5/4-ST</td>
</tr>
<tr>
<td>Circuit classification</td>
<td>SELV (acc. IEC 60950-1)</td>
</tr>
<tr>
<td>Overvoltage protection</td>
<td>line to earth ±4 kV, line to ±2 kV</td>
</tr>
<tr>
<td>Surge</td>
<td>4 kV (level 4), criterion A</td>
</tr>
<tr>
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</tr>
<tr>
<td>400 V short duration disturbance, IEC 61000-4-6</td>
<td></td>
</tr>
</tbody>
</table>
Alarm output (X2)

Conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz, IEC 61000-4-16
30 V continuous disturbance/ 300 V short duration disturbance (level 4), criterion A

Switching

Flow Control
Full duplex flow control according to IEEE 802.32005 An. 31B and IEEE 802.3x-1997
Half duplex back pressure

Max. Frame size
1552 Bytes

Quality of Service
IEEE 802.1p Tag based priority

MAC Lookup Table
Max. 2048 entries
Max. 304 s hold time

Switching Mode
Store and forward

Supported Protocols

Telecontrol Comm. IEC 60870-5-101 IEC 60870-5-104

Link Layer Discovery IEEE 802.1AB-2009

Spanning Tree IEEE 802.1D-2004

Class of Service IEEE 802.1p

VLAN Tagging IEEE 802.1Q-2005

Network Access Ctrl. IEEE 802.1X-2001

UDP RFC-768

IP RFC-791

ICMP RFC-792

TCP RFC-793

ARP RFC-826

Telnet RFC-854

SNMP RFC-1155 to RFC-1157 RFC-1901 to RFC-1908

SNMP MIB-II RFC-1213

TFTP RFC-1350

CIDR RFC-1519

RIP RFC-2453

HTTP RFC-2616

L2TP RFC-2661

RADIUS RFC-2865

Syslog RFC-3164

SSHv2 RFC-4254 and RFC-5251

SNTP RFC-4330

Ordering information
500NMD20 R0002 1KHW025098R0002

Accessories ordering information
500NMA01 configuration adapter
500NMA01 R0001 1KHW027870R0001

500NAB06 RS-232 adapter cable RJ12 to SubD9F (DTE-PC)
500NAB06 R0001 1KGT038912R0001

Accessories ordering information
500SM02 SFP Module multi-mode
500SM02 R0001 1KGT038901R0001

short range up to 2 km

Accessories ordering information
500SM15 SFP Module single-mode
500SM15 R0001 1KGT038902R0001

intermediate range up to 15 km

Accessories ordering information
500SM40 SFP Module single-mode
500SM40 R0001 1KGT038914R0001

long range up to 40 km

Accessories ordering information
500SM80 SFP Module single-mode
500SM80 R0001 1KGT038907R0001

long range up to 80 km

Accessories ordering information
500SDM20 SFP Module single-mode
500SDM20 R0001 1KGT038903R0001

bidirectional transceiver, downstream, long range up to 20 km

Accessories ordering information
500SUM20 SFP Module single-mode
500SUM20 R0001 1KGT038904R0001

bidirectional transceiver, upstream, long range up to 20 km

Accessories ordering information
500SDM40 SFP Module single-mode
500SDM40 R0001 1KGT038905R0001

bidirectional transceiver, downstream, long range up to 40 km
<table>
<thead>
<tr>
<th>Accessories ordering information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>500SUM40 SFP Module single-mode</strong></td>
</tr>
<tr>
<td>500SUM40 R0001 1KGT038906R0001</td>
</tr>
</tbody>
</table>

bidirectional transceiver, upstream, long range up to 40 km

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