Managed Ethernet switch 500NMD11
EDS500 series - Ethernet & DSL switches

- Integrated managed layer-2-switch
- 24... 60 V DC supply voltage
- 4x 10/100 BaseT (RJ45, auto-negotiating)
- 1x SFP slot
- 1x SHDSL-port for copper wire
- 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 500NMD11 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)
- one 2-wire SHDSL-port for use with private copper cables
- one SFP (small form-factor pluggable) module slot 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.

The SHDSL port can be used for interconnecting stations with a maximum distance of 25 km (copper cable with diameter of 0.8 mm). The SHDSL interface can be connected to any EDS500 SHDSL compatible device including 560NMS24 and 560NMS34 and any EFM based SHDSL device.

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).

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. The SHDSL port is connected through a pluggable screw connector. Link and speed status of each Ethernet and the SHDSL port 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 broad- or multicast or if the target address is not found in the lookup-

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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 500NMD11 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 SHDSL connection, the RS-232 interface, the SFP transducers and the extension bus interface (Ext) are hot-plug capable.

Topology

The 500NMD11 provides a total of five 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 500NMD11 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 500NMD11 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, or quality of service.

Alerts, Notifications and Logging

The 500NMD11 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 500NMD11 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
• EN 300 019-2-8 class T8.1
• IEC 61850-3

**Environmental conditions - climatic**
Nominal operating temperature range
-40 °C... 80 °C
EN 60068-2-1, EN 60068-2-2, EN 60068-2-14
Relative humidity
5... 95 % (non condensing)
EN 60068-2-30
Railway applications climbers class T1 and T2
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
330 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
IEC 61000-6-4
### Ethernet interfaces (Port1 - Port4)

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification/Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrical specification</strong></td>
<td>IEEE 802.3</td>
</tr>
<tr>
<td><strong>Protocol</strong></td>
<td>Fast Ethernet, Auto negotiation, Auto sense</td>
</tr>
<tr>
<td><strong>Data rate</strong></td>
<td>100 Mbps, 10 Mbps or auto</td>
</tr>
<tr>
<td><strong>Duplex</strong></td>
<td>full duplex, half duplex or auto</td>
</tr>
<tr>
<td><strong>Transmission / Network termination</strong></td>
<td>MDI, MDI-X or auto</td>
</tr>
<tr>
<td><strong>Cable</strong></td>
<td>shielded CAT5e cable (or better), maximum length: 100m</td>
</tr>
<tr>
<td><strong>Plug type</strong></td>
<td>RJ-45 (8P8C)</td>
</tr>
<tr>
<td><strong>Circuit classification</strong></td>
<td>TNV-1 (acc. IEC 60950-1)</td>
</tr>
<tr>
<td><strong>Galvanic isolation</strong></td>
<td>1.5 kV isolation voltage</td>
</tr>
<tr>
<td><strong>Overvoltage protection</strong></td>
<td>Shield to earth ±4 kV</td>
</tr>
<tr>
<td><strong>Electrical fast transient / Burst</strong></td>
<td>4 kV (level 4), criterion A</td>
</tr>
<tr>
<td><strong>Surge 1.2/50 μs, IEC 61000-4-5</strong></td>
<td>4 kV (level 4), criterion A</td>
</tr>
<tr>
<td><strong>Conducted disturbances, induced by radio-frequency fields, IEC 61000-4-6</strong></td>
<td>10 V (level 3), criterion A</td>
</tr>
<tr>
<td><strong>Conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz, IEC 61000-4-16</strong></td>
<td>30 V continuous disturbance/ 300 V short duration disturbance (level 4), criterion A</td>
</tr>
<tr>
<td><strong>Conducted emissions - symmetrical network ports (0.15 MHz to 30 MHz)</strong></td>
<td>EN 55032/ CISPR 32 class B</td>
</tr>
</tbody>
</table>

### Serial interfaces (Con0 - Con1)

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<th>Component</th>
<th>Specification/Details</th>
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<tbody>
<tr>
<td><strong>Electrical specification</strong></td>
<td>Con0: ITU-T V.24, EIA RS-232 or EIA RS-422/485, Con1: ITU-T V.24, EIA RS-232</td>
</tr>
<tr>
<td><strong>Data rate</strong></td>
<td>50 bps... 230.4 kbps</td>
</tr>
<tr>
<td><strong>Plug type</strong></td>
<td>RJ-12 (6P6C)</td>
</tr>
<tr>
<td><strong>Cable</strong></td>
<td>shielded RS-232 cable, up to 3 m</td>
</tr>
<tr>
<td><strong>Adapter cable</strong></td>
<td>500CAB06 1KGT038912R0001: RS-232 cable, RJ12 to SubD9F (DTE-PC)</td>
</tr>
<tr>
<td><strong>Circuit classification</strong></td>
<td>SELV (acc. IEC 60950-1)</td>
</tr>
<tr>
<td><strong>Galvanic isolation</strong></td>
<td>no</td>
</tr>
<tr>
<td><strong>Overvoltage protection</strong></td>
<td>Shield to earth ±4 kV</td>
</tr>
<tr>
<td><strong>Electrical fast transient / Burst</strong></td>
<td>4 kV (level 4), criterion A</td>
</tr>
<tr>
<td><strong>Surge 1.2/50 μs, IEC 61000-4-5</strong></td>
<td>4 kV (level 4), criterion A</td>
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<td><strong>Conducted disturbances, induced by radio-frequency fields, IEC 61000-4-6</strong></td>
<td>10 V (level 3), criterion A</td>
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<td><strong>Conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz, IEC 61000-4-16</strong></td>
<td>30 V continuous disturbance/ 300 V short duration disturbance (level 4), criterion A</td>
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### SFP interface (Po1)

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

### Optical SFPs

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification/Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cable</strong></td>
<td>2 km (62.5/125 and 50/125 μm multi mode)</td>
</tr>
<tr>
<td><strong>Plug type</strong></td>
<td>Duplex LC (IEC 61754-20, TIA604-10-A)</td>
</tr>
</tbody>
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### DSL interface (X3)

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification/Details</th>
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<tbody>
<tr>
<td><strong>Electrical specification</strong></td>
<td>ETSI TS 101 524, ITU-T G.991.2, IEEE 802.3-2008 Cl. 63</td>
</tr>
<tr>
<td><strong>Protocol</strong></td>
<td>ETSI SDSL (ETSI TS 101 524 V 1.2.1)</td>
</tr>
<tr>
<td><strong>Data rate</strong></td>
<td>up to 15 Mbps</td>
</tr>
<tr>
<td><strong>Plug type</strong></td>
<td>Phoenix Contact MSTBT 2,5/3-ST</td>
</tr>
<tr>
<td><strong>Cable</strong></td>
<td>shielded, twisted telecommunications cable, up to 25 km with cable diameter 0.8 mm</td>
</tr>
<tr>
<td><strong>Circuit classification</strong></td>
<td>TNV-1 (acc. IEC 60950-1)</td>
</tr>
<tr>
<td><strong>Auto crossover detection</strong></td>
<td>yes</td>
</tr>
<tr>
<td><strong>Galvanic isolation</strong></td>
<td>3 kV isolation voltage</td>
</tr>
<tr>
<td><strong>Overvoltage protection</strong></td>
<td>Shield to earth ±6 kV, line to earth ±6 kV, line-line ±6 kV</td>
</tr>
<tr>
<td><strong>Electrical fast transient / Burst</strong></td>
<td>4 kV (level 4), criterion A</td>
</tr>
<tr>
<td><strong>Surge 1.2/50 μs, IEC 61000-4-5</strong></td>
<td>6 kV line to earth, 6 kV line to line (level x), criterion B</td>
</tr>
<tr>
<td><strong>Surge 10/700 μs, IEC 61000-4-5</strong></td>
<td>6 kV line to earth, 6 kV line to line (level x), criterion B</td>
</tr>
<tr>
<td><strong>Conducted disturbances, induced by radio-frequency fields, IEC 61000-4-6</strong></td>
<td>10 V (level 3), criterion A</td>
</tr>
</tbody>
</table>
**DSL interface (X3)**

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

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**Ext Connector**

Connector: Proprietary

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

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**Alarm output (X2)**

Type of switch: Toggle (potential free)

Switching voltage: 60 VDC / 25 VAC

Switching current: 500 mA

Plug type: Phoenix Contact MSTBT 2,5/4-ST

Circuit classification: SELV (acc. IEC 60950-1)

Overvoltage protection: line to earth ±4 kV, line to line ±2 kV

Electrical fast transient / Burst, IEC 61000-4-4: 4 kV (level 4), criterion A

Surge 1.2/50 µs, IEC 61000-4-4: 4 kV (level 4), criterion A

Conducted disturbances, induced by radio-frequency fields, IEC 61000-4-6: 10 V (level 3), 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

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**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

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**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

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**Supported Protocols**

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

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**Ordering information**

500NMD11 R0002 1KHWO27869R0002

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**Accessories ordering information**

500NMA01 configuration adapter

500NMA01 R0001 1KHWO27870R0001

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**Accessories ordering information**

500CAB06 RS-232 adapter cable RJ12 to SubD9F (DTE-PC)

500CAB06 R0001 1KT038912R0001

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**Accessories ordering information**

500SSM02 SFP Module multi-mode

500SSM02 R0001 1KT038901R0001

short range up to 2 km

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**Accessories ordering information**

500SSM15 SFP Module single-mode

500SSM15 R0001 1KT038902R0001

intermediate range up to 15 km

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**Accessories ordering information**

500SSM40 SFP Module single-mode

500SSM40 R0001 1KT038914R0001

long range up to 40 km

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**Accessories ordering information**

500SSM80 SFP Module single-mode

500SSM80 R0001 1KT038907R0001

long range up to 80 km
<table>
<thead>
<tr>
<th>Accessories ordering information</th>
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<tbody>
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<tr>
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<tr>
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