

# D512

## Ethernet Repeater



LEADING THE EMBEDDED FUTURE

- Fully transparent to all Ethernet protocols
- Full- or half-duplex communication
- Support for 10BASE-T/100BASE-TX Ethernet
- Support for customer-specific Ethernet port configurations (optional)
- Directly powered from the vehicle battery (24 V up to 110 V)



### Compact Ethernet Solution for Railway Applications

The D512 is a compact 2-port Ethernet repeater for railway applications that is completely transparent to all Ethernet protocols and offers full 10/100 Mbit bandwidth in full or half duplex mode. It allows the integration of any remote device or sub-network into an Ethernet network, and with its low latency, it is ideal to bridge long distances in redundant ring topologies.

Optionally it is available with bypass relays. In the case of bypass relays, there is a digital status output pin available.

### High-Speed, Robust Connectivity for Long Distances

The D512 is intended to enable 10BASE-TX or 100BASE-TX connections of more than 100 meters (for connections with a high number of connectors and/or long patch cables the limit is even less than 100 meters).

The two Ethernet ports support 10BASE-TX or 100BASE-TX, auto-crossover and auto-negotiation. They are equipped with M12 connectors to guarantee a reliable connection.

As an option, the repeater can be ordered with a customer defined configuration for the Ethernet ports, with auto-negotiation and auto-crossing on by default.

### For Rolling Stock Environments

The D512 is designed for harsh rolling stock environment and fully compliant to EN 50155, IEC 61375 and IEEE 802.3. It withstands -40 °C to +70 °C ambient temperature, is coated against humidity and provides enhanced EMI and vibration robustness.

D512 is powered directly by the train battery (24 V to 110 V) or by PoE (IEEE 802.3af).

## Data Sheet

## Technical Data

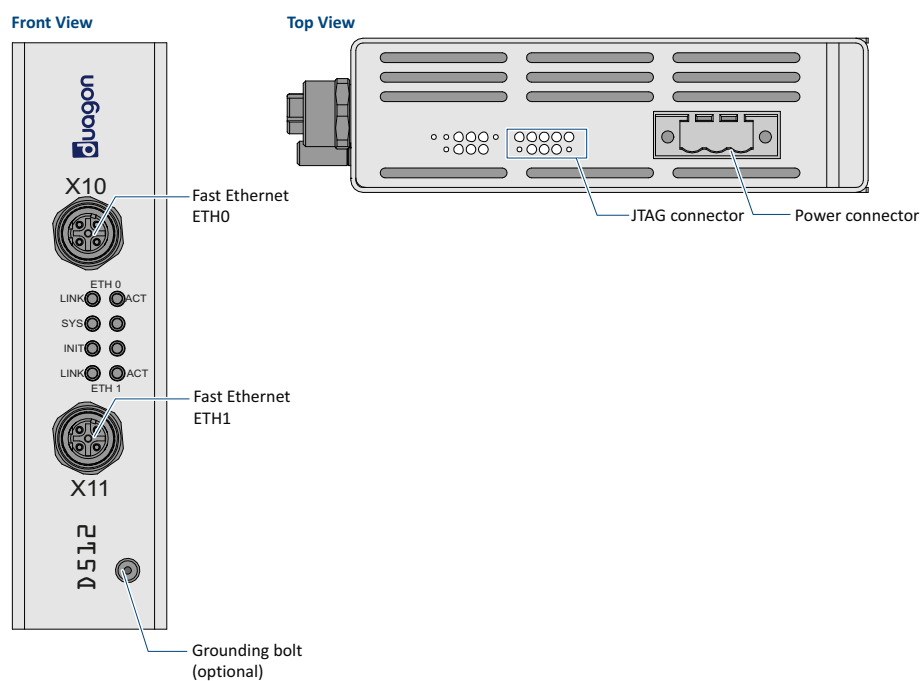
|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Ethernet Interface Functionality</b>         | <ul style="list-style-type: none"> <li>Interface topology/architecture: Ring</li> <li>Bypass relays: supported</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Interfaces</b>                               | <ul style="list-style-type: none"> <li>Ethernet: 2 × 10BASE-T/100BASE-TX, M12, D-coded, receptacle</li> <li>LED <ul style="list-style-type: none"> <li>Status: initialization, system status</li> <li>Ethernet: activity, link</li> </ul> </li> <li>Power <ul style="list-style-type: none"> <li>1 × power in, Phoenix Contact MSTB, 3-pin, plug</li> <li>Option: 1 × power in, Phoenix Contact MSTB, 5-pin, plug (with bypass relays, additional status output on connector)</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Electrical Specifications</b>                | <ul style="list-style-type: none"> <li>Supply voltage <ul style="list-style-type: none"> <li>24 V DC to 36 V DC nom. (EN 50155)</li> <li>48 V DC to 110 V DC nom. (EN 50155)</li> <li>Power over Ethernet (PoE)</li> </ul> </li> <li>Power consumption: 3 W max.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Mechanical Specifications</b>                | <ul style="list-style-type: none"> <li>Dimensions: (W) 31.6 mm, (D) 106 mm, (H) 120 mm</li> <li>Weight: 415 g max. (precise weight may vary according to selected ordering options)</li> <li>Mounting: DIN rail, Wall/flat surface</li> <li>Cooling: Air cooling, natural convection</li> <li>Protection rating: EN 60529, IP30</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Product Compliance: Functions</b>            | <ul style="list-style-type: none"> <li>Ethernet: Fast Ethernet (FE): IEEE 802.3u</li> <li>Train Communication Network (TCN) <ul style="list-style-type: none"> <li>Part 1: General architecture: IEC 61375-1:2012</li> <li>Part 2-3: TCN communication profile, Annex A: Train Real-Time Data Protocol (TRDP): IEC 61375-2-3:2015</li> <li>Part 2-5: Ethernet Train Backbone (ETC): IEC 61375-2-5:2014</li> <li>Part 3-4: Ethernet Consist Network (ECN): IEC 61375-3-4:2014</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Product Compliance: Rail - Rolling Stock</b> | <ul style="list-style-type: none"> <li>Operating temperature: -40 °C to +70 °C, +85 °C for 10 min (EN 50155:2021, class OT4, ST1)</li> <li>Rapid temperature variations: EN 50155:2021, class H1, no requirements</li> <li>Storage temperature: -40 °C (EN 50155:2021) to +85 °C (EN 60068-2-2, Bb)</li> <li>Altitude: +1800 m max. (EN 50125-1:2014, class AX)</li> <li>Humidity: +55 °C and +25 °C, 100 % RH max. (EN 50155:2021)</li> <li>Shock: 30 ms @ 50 m/s<sup>2</sup> (EN 61373:2010/AC:2017-09, vehicle body, cat. 1, class B)</li> <li>Vibration: 10 min @ 1.01 m/s<sup>2</sup> (functional) and 5 h @ 5.72 m/s<sup>2</sup> (long-life) (EN 61373:2010/AC:2017-09, vehicle body, cat. 1, class B)</li> <li>Power supply <ul style="list-style-type: none"> <li>Supply change-over: 100 ms @ 0.6 × Un (EN 50155:2021, class C1)</li> <li>Interruption of voltage supply: 10 ms (EN 50155:2021, class S2)</li> </ul> </li> <li>Pollution degree: EN 50124-1:2017, class PD2</li> <li>Overvoltage category: EN 50124-1:2017, class OV2</li> <li>Fire protection: EN 45545-2:2020, HL3</li> <li>EMC emission: EN 50121-3-2:2016 + A1:2019</li> </ul> |

- EMC immunity: EN 50121-3-2:2016 + A1:2019
- Protective coatings: EN 50155:2021, class PC2 (Any PCB protected on both sides)
- Sockets and edge connectors: EN 50155:2021, class K2 (Integrated circuit sockets and edge connectors are not allowed)
- Programmable component: EN 50155:2021, class M0
- Useful life: 20 years (EN 50155:2021, class L4)

## Reliability

- See the MTBF document for the MTBF values.

## Diagram



## Ordering Information

### Ordering Options

D512 [1] [2] [3] [4]

D512 -F -HV -G (example)

| Position | Description                 | Options                                      | Code    |
|----------|-----------------------------|----------------------------------------------|---------|
| 1        | Ethernet link configuration | Auto                                         | <empty> |
|          |                             | Auto 10 Mbit                                 | -10     |
|          |                             | Fixed 100 Mbit FD                            | -F      |
|          |                             | Fixed 10 Mbit FD                             | -F10    |
|          |                             | Fixed 10 Mbit HD                             | -F10H   |
|          |                             | Fixed 100 Mbit HD                            | -FH     |
| 2        | Bypass relays               | Without bypass relays                        | <empty> |
|          |                             | With bypass relays                           | -BY     |
| 3        | Power supply                | Nominal battery voltage: 48V, 72V, 96V, 110V | -HV     |
|          |                             | Nominal battery voltage: 24V, 36V            | -LV     |
|          |                             | Power over Ethernet (PD)                     | -PoE    |
| 4        | Case options                | No grounding bolt                            | <empty> |
|          |                             | M5 grounding bolt                            | -G      |

| Group | Option     | Note                                           |
|-------|------------|------------------------------------------------|
| 1     | -FH, -F10H | Contact duagon for availability and lead times |
| 3     | -PoE       | Contact duagon for availability and lead times |

► **Contact duagon** for availability and lead times for product models not listed above.