

## FO converters - FL MC EF WDM-B SC - 2902659

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FO converter (replacement device B), for full duplex transmission from 10/100Base-T(X) to individual simplex fiberglass with WDM (wavelength division multiplex) technology, SC simplex fiber optic connection (1550/1310 nm). Device set (type A and type B) required for operation.

### Product Description

Optical transmission with FO technology provides superior immunity to interference at maximum transmission ranges without restricting the transmission bandwidth.

### Your advantages

- ✓ Full duplex communication with only one fiber
- ✓ Transmission ranges up to 38 km
- ✓ Auto negotiation
- ✓ Auto MDI/MDI-X switch-over
- ✓ Link fault pass through (LFPT) and far end fault (FEF) functions for easy connection monitoring
- ✓ Data rates 10/100 Mbps
- ✓ Shipbuilding approval in accordance with DNV GL



### Key Commercial Data

|              |               |
|--------------|---------------|
| Packing unit | 1 pc          |
| GTIN         |               |
| GTIN         | 4046356669696 |

### Technical data

#### Note

|                         |   |
|-------------------------|---|
| Utilization restriction | EMC: class A product, see manufacturer's declaration in the download area |
|-------------------------|---|

#### Dimensions

|         |             |
|---------|-------------|
| Caption | Slim design |
| Width   | 22.5 mm     |
| Height  | 99 mm       |
| Depth   | 114.5 mm    |

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## Technical data

### Ambient conditions

|  |  |
|--|--|
| Ambient temperature (operation)          | -40 °C ... 65 °C   |
| Ambient temperature (storage/transport)  | -40 °C ... 85 °C   |
| Permissible humidity (operation)         | 30 % ... 95 % (non-condensing)   |
| Permissible humidity (storage/transport) | 30 % ... 95 % (non-condensing)   |
| Altitude                                 | ≤ 5000 m (For restrictions, see the manufacturer's declaration for altitude operation) |
|  | ≤ 2000 m (With UL approval)  |
| Degree of protection                     | IP20   |

### General

|  |  |
|--|--|
| Electrical isolation                     | according to IEEE 802.3  |
|  | VCC // FE // Ethernet  |
| Latency                                  | ± 1.3 µs (Store&Forward mode, 10/100 Mbps, depending on the frame size)                                  |
| Test voltage data interface/power supply | 1.5 kV <sub>rms</sub> (50 Hz, 1 min.)  |
| Electromagnetic compatibility            | Conformance with EMC Directive 2014/30/EU  |
| Net weight                               | 120 g  |
| Housing material                         | PA 6.6-FR  |
| Color                                    | green  |
| MTBF                                     | 492 Years (Telcordia standard, 25°C temperature, 21% operating cycle (5 days a week, 8 hours a day))     |
|  | 133 Years (Telcordia standard, 40°C temperature, 34.25% operating cycle (5 days a week, 12 hours a day)) |
| MTTF                                     | 1400 Years (SN 29500 standard, temperature 25°C, operating cycle 21%)                                    |
|  | 599 Years (SN 29500 standard, temperature 40°C, operating cycle 34.25%)                                  |
|  | 101 Years (SN 29500 standard, temperature 40°C, operating cycle 100%)                                    |

### Power supply

|  |   |
|--|---|
| Supply voltage range                       | 18 V DC ... 30 V DC (Screw connection)  |
|  | 18 V DC ... 30 V DC (as an alternative or redundant, via backplane bus contact and system current supply) |
| Typical current consumption                | < 110 mA (24 V DC)  |
| Protective circuit                         | Reverse polarity protection   |
| Connection method                          | Plug-in screw terminal block (COMBICON), redundancy possible  |
| Conductor cross section flexible max.      | 2.50 mm <sup>2</sup>  |
| Conductor cross section flexible min.      | 0.20 mm <sup>2</sup>  |
| Conductor cross section solid max.         | 2.50 mm <sup>2</sup>  |
| Conductor cross section solid min.         | 0.20 mm <sup>2</sup>  |
| Max. AWG conductor cross section, flexible | 14  |
| Min. AWG conductor cross section, flexible | 24  |
| Conductor cross section AWG max.           | 14  |

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## Technical data

### Power supply

|                                  |    |
|----------------------------------|----|
| Conductor cross section AWG min. | 24 |
|----------------------------------|----|

### Interfaces

|                        |   |
|------------------------|---|
| Interface 1            | Ethernet interface, 10/100Base-T(X) in accordance with IEEE 802.3 |
| No. of ports           | 1   |
| Connection method      | RJ45 jack, shielded   |
| Transmission medium    | Copper  |
| Transmission length    | 100 m (shielded twisted pair)                                     |
| Auto-negotiation modes | Auto  |
| Link through           | Link fault pass through   |
| Basic functions        | Store-and-forward media converter                                 |
| MDI-/MDI-X switchover  | Auto-MDI(X)   |
| Signal LEDs            | Activity, link status, 10/100 Mbps                                |

### Optical interface FO

|   |   |
|---|---|
| Transmit capacity, minimum                    | ≥ -14 dBm ((9/125 μm) dynamic in link mode (average))   |
| Transmit capacity, maximum                    | ≤ -8 dBm ((9/125 μm) dynamic in link mode (average))  |
| Minimum receiver sensitivity                  | min. -31 dBm (dynamic in link mode (average))   |
| Overrange receiver                            | -3 dBm (dynamic in link mode (average))   |
| Wavelength                                    | 1310 nm (Send)<br>1550 nm (Receiving)   |
| Transmission length incl. 3 dB system reserve | 38 km (With F-E 9/125 0.36 dB/km)<br>34 km (With F-E 9/125 0.4 dB/km)<br>28 km (With F-E 9/125 0.5 dB/km)<br>21 km (with F-G 62,5/125 0,7 dB/km F 1000)<br>5.5 km (with F-G 62.5/125 2.6 dB/km F 600)<br>21 km (with F-G 50/125 0,7 dB/km F 1200)<br>9 km (with F-G 50/125 1,6 dB/km F 800) |
| Transmission medium                           | Multi-mode fiberglass<br>Single-mode fiberglass   |
| Connection method                             | SC simplex  |

### Conformance/approvals

|                 |   |
|-----------------|---|
| Designation     | CE  |
| Identification  | CE-compliant  |
| Designation     | ATEX  |
| Identification  | # II 3 G Ex nA IIC T4 Gc X  |
| Additional text | Please follow the special installation instructions in the documentation! |
| Designation     | UL, USA/Canada  |
| Identification  | 508 Listed  |
|                 | Class I, Zone 2, AEx nA IIC T4  |
|                 | Class I, Zone 2, Ex nA IIC T4 Gc X  |

# FO converters - FL MC EF WDM-B SC - 2902659

## Technical data

### Conformance/approvals

|                |   |
|----------------|---|
|                | Class I, Div. 2, Groups A, B, C, D  |
| Designation    | Corrosive gas test  |
| Identification | ISA-S71.04-1985 G3 Harsh Group A  |
| Designation    | Shipbuilding  |
| Identification | DNV GL  |
| Temperature    | B   |
| Humidity       | A   |
| Vibration      | A   |
| EMC            | B   |
| Enclosure      | Required protection according to the Rules shall be provided upon installation on board |

### Standards and Regulations

|   |  |
|---|--|
| Electromagnetic compatibility                                     | Conformance with EMC Directive 2014/30/EU                      |
| Type of test  | Free fall in acc. with IEC 60068-2-32                          |
| Test result   | 1 m  |
| Type of test  | Vibration resistance in acc. with EN 60068-2-6/IEC 60068-2-6   |
| Test result   | 5g, 10...150 Hz, 2.5 h, in XYZ direction                       |
| Type of test  | Shock in acc. with EN 60068-2-27/IEC 60068-2-27                |
| Test result   | 25g, 11 ms period, half-sine shock pulse                       |
| Free from substances that could impair the application of coating | according to P-VW 3.10.7 57 65 0 VW-AUDI-Seat central standard |
| Standards/regulations   | EN 61000-4-2   |
| Contact discharge   | ± 6 kV (Test Level 3)  |
| Indirect discharge  | ± 6 kV   |
| Standards/regulations   | EN 61000-4-3   |
| Frequency range   | 80 MHz ... 3 GHz (Test Level 3)                                |
| Standards/regulations   | EN 61000-4-4   |
| Comments  | Criterion B  |
| Standards/regulations   | EN 61000-4-5   |
| Signal  | ± 1 kV (Data line, asymmetrical)                               |
| Standards/regulations   | EN 55032   |
|   | EN 61000-4-6   |
| Frequency range   | 0.15 MHz ... 80 MHz  |
| Designation   | Air clearances and creepage distances                          |
| Standards/regulations   | EN 60950-1   |
| Electrical isolation  | according to IEEE 802.3  |

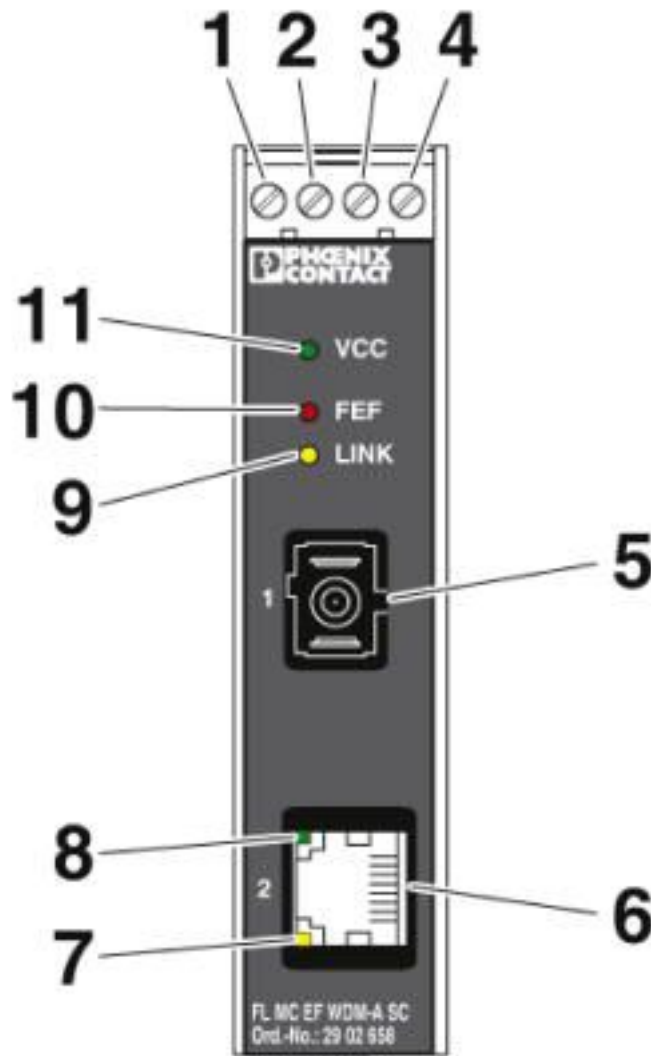
### Environmental Product Compliance

|            |   |
|------------|---|
| REACH SVHC | Lead 7439-92-1  |
| China RoHS | Environmentally Friendly Use Period = 50 years  |
|            | For details about hazardous substances go to tab "Downloads", Category "Manufacturer's declaration" |

# FO converters - FL MC EF WDM-B SC - 2902659

## Drawings

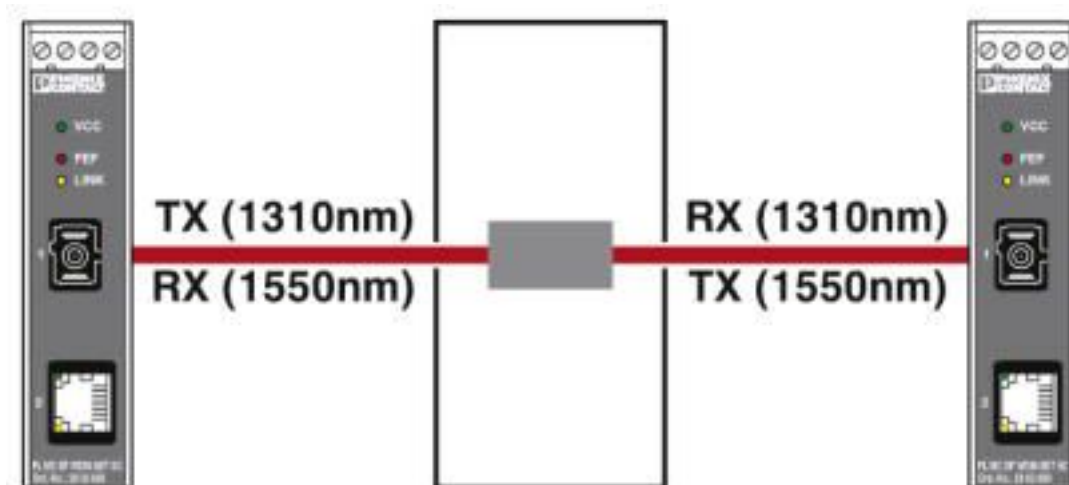
Schematic diagram



Front view

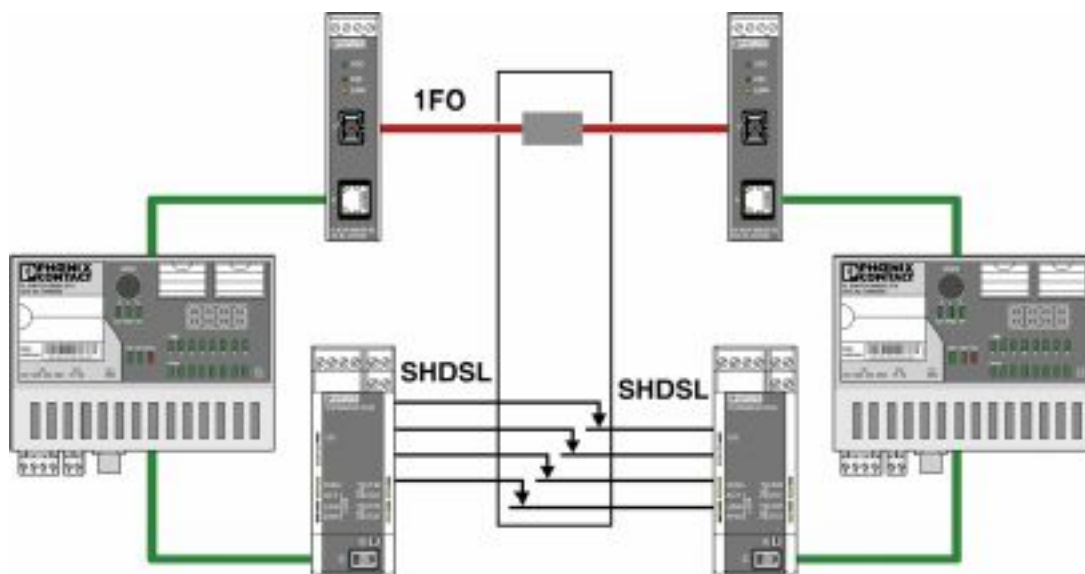
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Application drawing



Slip ring communication

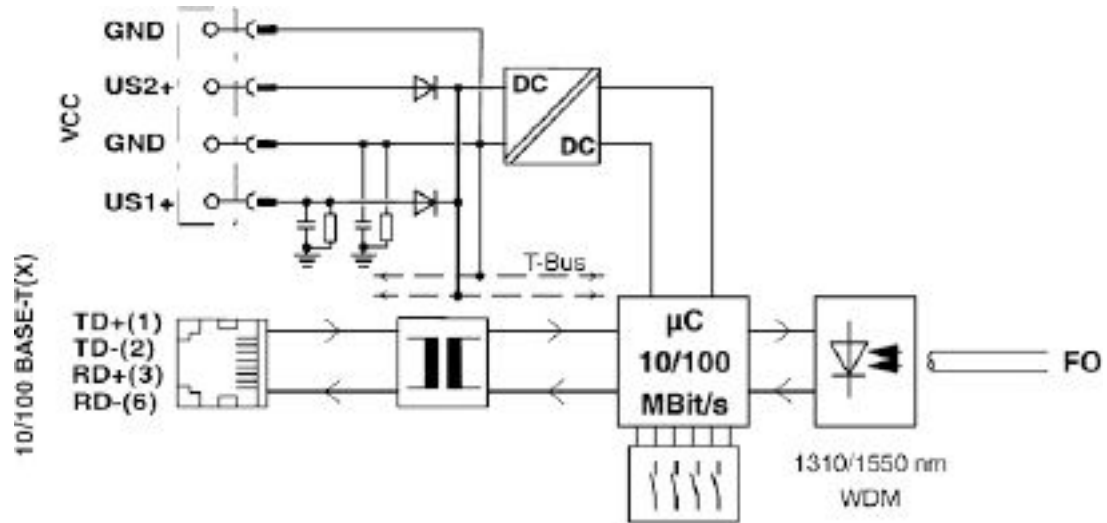
Application drawing



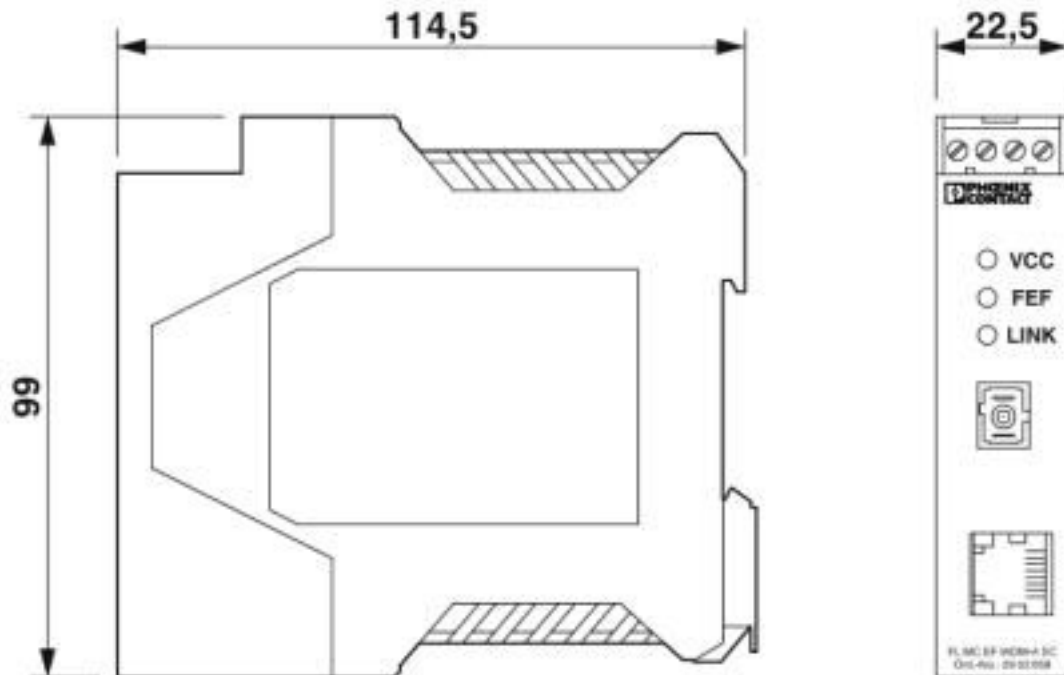
Redundant slip ring communication

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Block diagram



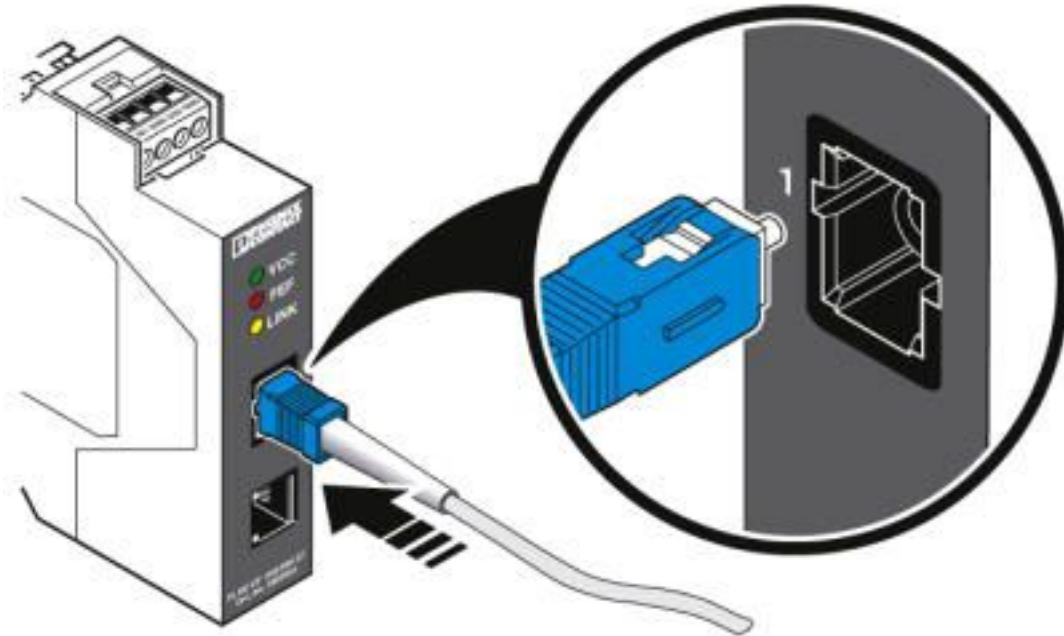
Dimensional drawing



Slim design

## FO converters - FL MC EF WDM-B SC - 2902659

Schematic diagram

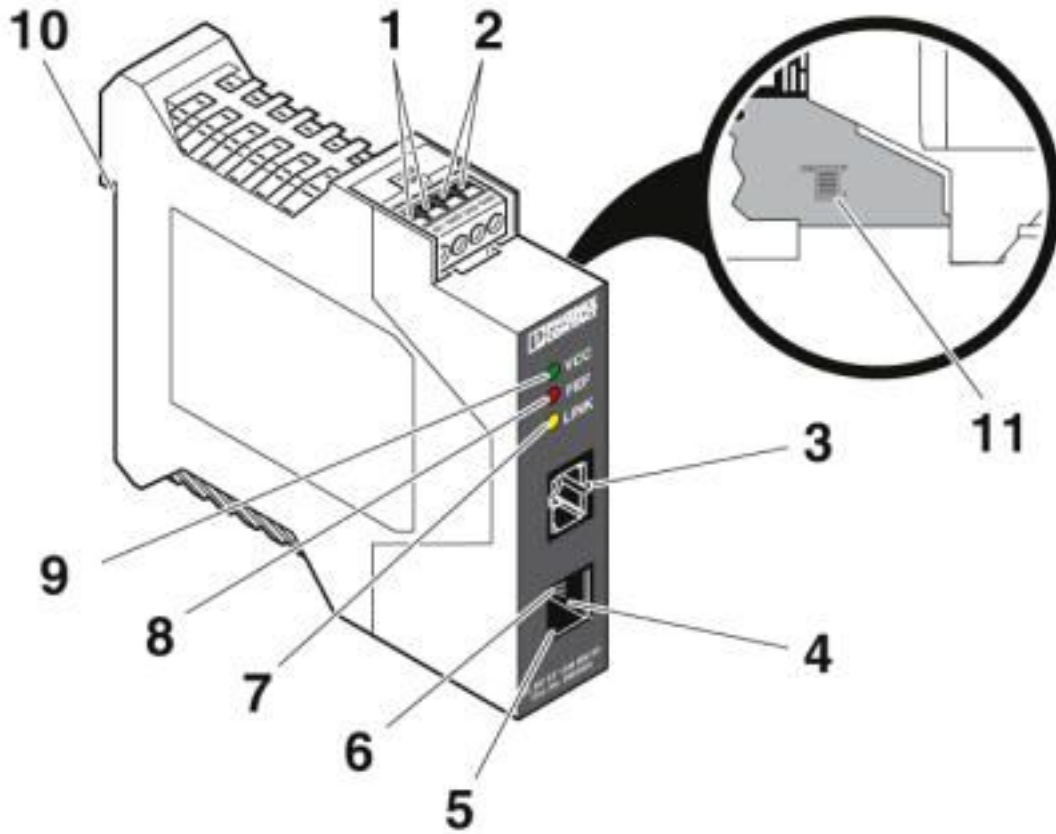


Connect SC simplex plug



# FO converters - FL MC EF WDM-B SC - 2902659

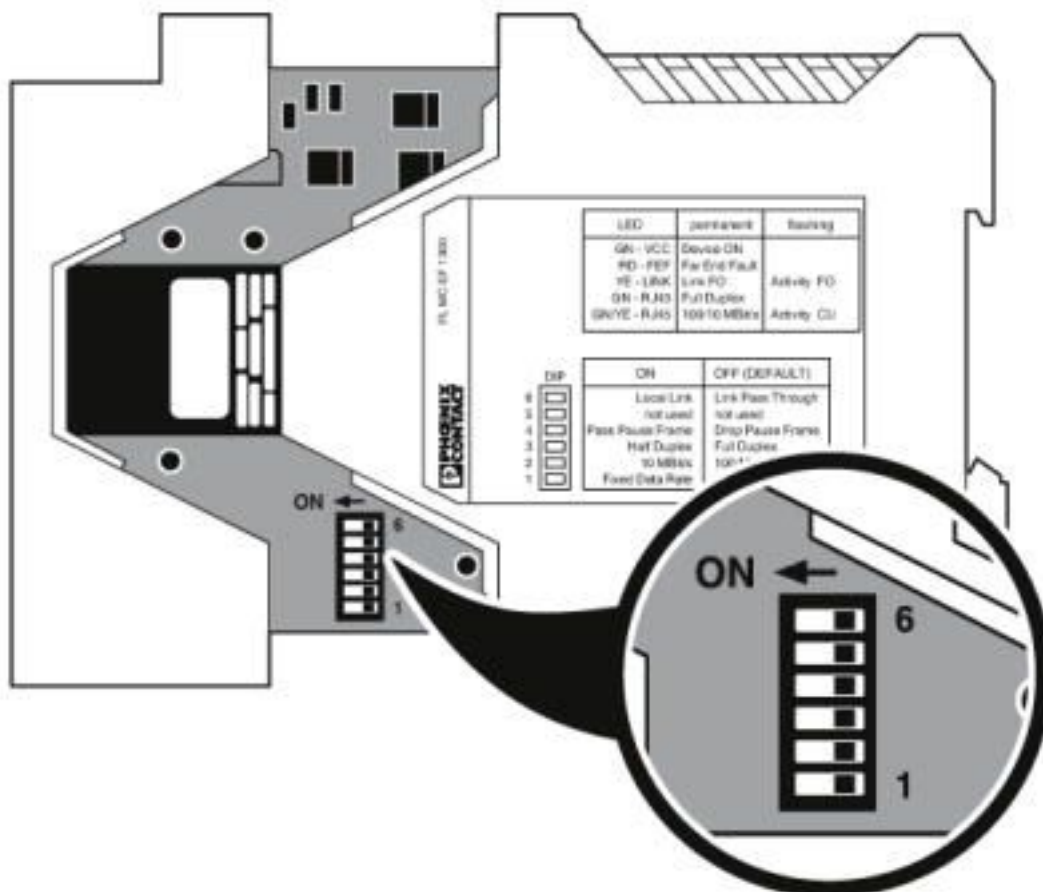
Schematic diagram



Function elements

# FO converters - FL MC EF WDM-B SC - 2902659

Schematic diagram



DIP switches

## Classifications

eCl@ss

|               |          |
|---------------|----------|
| eCl@ss 10.0.1 | 19170132 |
| eCl@ss 4.0    | 27230200 |
| eCl@ss 4.1    | 27230200 |
| eCl@ss 5.0    | 27230200 |
| eCl@ss 5.1    | 27230200 |
| eCl@ss 6.0    | 19179200 |
| eCl@ss 7.0    | 19179290 |
| eCl@ss 8.0    | 19179290 |
| eCl@ss 9.0    | 19170114 |

ETIM

|          |          |
|----------|----------|
| ETIM 3.0 | EC000310 |
| ETIM 4.0 | EC000310 |

# FO converters - FL MC EF WDM-B SC - 2902659

## Classifications

### ETIM

|          |          |
|----------|----------|
| ETIM 5.0 | EC001467 |
| ETIM 6.0 | EC001467 |
| ETIM 7.0 | EC001467 |

### UNSPSC

|               |          |
|---------------|----------|
| UNSPSC 6.01   | 30211506 |
| UNSPSC 7.0901 | 39121008 |
| UNSPSC 11     | 39121008 |
| UNSPSC 12.01  | 39121008 |
| UNSPSC 13.2   | 43222604 |
| UNSPSC 18.0   | 43223323 |
| UNSPSC 19.0   | 43223323 |
| UNSPSC 20.0   | 43223323 |
| UNSPSC 21.0   | 43223323 |

## Approvals

### Approvals

#### Approvals

DNV GL / UL Listed / cUL Listed / cULus Listed

#### Ex Approvals

ATEX / UL Listed / cUL Listed / cULus Listed

### Approval details

|        |  |   |            |
|--------|--|---|------------|
| DNV GL |  | <a href="https://approvalfinder.dnvgl.com/">https://approvalfinder.dnvgl.com/</a> | TAA00001KR |
|--------|--|---|------------|

|           |  |   |               |
|-----------|--|---|---------------|
| UL Listed |  | <a href="http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm">http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm</a> | FILE E 238705 |
|-----------|--|---|---------------|

|            |  |   |               |
|------------|--|---|---------------|
| cUL Listed |  | <a href="http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm">http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm</a> | FILE E 238705 |
|------------|--|---|---------------|

## FO converters - FL MC EF WDM-B SC - 2902659

### Approvals

cULus Listed



### Accessories

#### Accessories

##### Data cable by the meter

##### Network cable - FL CAT5 HEAVY - 2744814



CAT5-SF/UTP cable (J-02YS(ST)C HP 2 x 2 x 24 AWG), heavy-duty installation cable, 2 x 2 x 0.22 mm<sup>2</sup>, solid conductor, shielded, outer sheath: 7.8 mm diameter, inner sheath: 5.75 mm ± 0.15 mm diameter

##### Installation cable - FL CAT5 FLEX - 2744830



By the meter, Installation cable, Ethernet CAT5 (100 Mbps), shielded, PUR halogen-free, water blue RAL 5021, 4-wire (2x2xAWG26/7; SF/UTP), color single wire: white/orange-orange, white/green-green, cable length: Free entry (1.0 ... 1000.0 m)

##### FO cable - PSM-LWL-GDO- 50/125 - 2799432



Fiberglass cable, duplex 50/125 µm, by the meter, without connector, for outdoor installation

##### FO cable - PSM-LWL-GDM-RUGGED- 50/125 - 2799322



Fiber glass cable, duplex 50 µm/125 µm, by the meter, without male connector, for installation in stationary systems and machines

##### Data cable preassembled

## FO converters - FL MC EF WDM-B SC - 2902659

### Accessories

FO patch cable - FOC-LC:PA-SC:PA-OM2:D01/1 - 1115607



FO patch cable - FOC-LC:PA-SC:PA-OM2:D01/2 - 1115605



FO patch cable - FOC-SC:PA-SC:PA-OM2:D01/1 - 1115536



Multi-mode OM2 duplex jumper, SC-SC, UPC polishing, length 1 m

FO patch cable - FOC-SC:PA-SC:PA-OM2:D01/2 - 1115535



Multi-mode OM2 duplex jumper, SC-SC, UPC polishing, length 2 m

FO patch cable - FOC-ST:PA-SC:PA-OM2:D01/1 - 1115574



Multi-mode OM2 duplex jumper, ST-SC, UPC polishing, length 1 m

## FO converters - FL MC EF WDM-B SC - 2902659

### Accessories

FO patch cable - FOC-ST:PA-SC:PA-OM2:D01/2 - 1115573



Multi-mode OM2 duplex jumper, ST-SC, UPC polishing, length 2 m

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FO patch cable - FOC-LC:PA-SC:PA-OM4:D01/1 - 1115601



Multi-mode OM4 duplex jumper, LC-SC, UPC polishing, length 1 m

---

FO patch cable - FOC-LC:PA-SC:PA-OM4:D01/2 - 1115600



Multi-mode OM4 duplex jumper, LC-SC, UPC polishing, length 2 m

---

FO patch cable - FOC-SC:PA-SC:PA-OM4:D01/1 - 1115424



Multi-mode OM4 duplex jumper, SC-SC, UPC polishing, length 1 m

---

FO patch cable - FOC-SC:PA-SC:PA-OM4:D01/2 - 1115423



Multi-mode OM4 duplex jumper, SC-SC, UPC polishing, length 2 m

---

## FO converters - FL MC EF WDM-B SC - 2902659

### Accessories

FO patch cable - FOC-GDM-RUGGED-1016/IP20/... - 2901558



Robust GOF installation cable for assembly (IP20 heads only) for installation in stationary systems and machines, aramid strain-relief elements, with individual elements made from FRNC material, halogen-free, ozone and UV resistant, with a polyurethane (PUR) outer sheath

---

FO patch cable - FOC-GDM-RUGGED-1016/... - 1402193



rugged GOF installation cable for inner areas with highly tear-proof aramid strain-relief elements. Individual elements consist of highly flexible FRNC material. The cable is halogen-free, ozone and UV resistant and has a rugged polyurethane (PUR) outer sheath.

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FO patch cable - FOC-GDO-1017/IP20/... - 2901559



Highly rugged GOF round cable (IP20 heads only) for assembly and for outdoor installation with integrated moisture barrier as well as rodent-proof scrim. Individual elements made from highly flexible FRNC material. The wire is ozone and UV resistant with a very rugged polyethylene outer sheath.

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FO patch cable - FOC-SC:PA-SC:PA-OS2:D01/1 - 1115550



Single-mode OS2 duplex jumper, SC-SC, UPC polishing, length 1 m

---

FO patch cable - FOC-SC:PA-SC:PA-OS2:D01/2 - 1115548



Single-mode OS2 duplex jumper, SC-SC, UPC polishing, length 2 m

---

## FO converters - FL MC EF WDM-B SC - 2902659

### Accessories

FO patch cable - FOC-ST:PA-SC:PA-OS2:D01/1 - 1115582



Single-mode OS2 duplex jumper, ST-SC, UPC polishing, length 1 m

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FO patch cable - FOC-ST:PA-SC:PA-OS2:D01/2 - 1115581



Single-mode OS2 duplex jumper, ST-SC, UPC polishing, length 2 m

---

FO patch cable - FOC-LC:PA-SC:PA-OS2:D01/1 - 1115618



Single-mode OS2 duplex jumper, LC-SC, UPC polishing, length 1 m

---

FO patch cable - FOC-LC:PA-SC:PA-OS2:D01/2 - 1115617



Single-mode OS2 duplex jumper, LC-SC, UPC polishing, length 2 m

---

FO patch cable - FL MM PATCH 1,0 SC-SCRJ - 2901812



Assembled FO cable, break out cable, multimode fiberglass 50/125 µm (OM2), connector: SC duplex/SC-RJ, degree of protection: IP20, for installation in cable ducts or control cabinets, length: 1 m

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## FO converters - FL MC EF WDM-B SC - 2902659

### Accessories

FO patch cable - FL MM PATCH 2,0 SC-SCRJ - 2901813



Assembled FO cable, break out cable, multimode fiberglass 50/125 µm (OM2), connector: SC duplex/SC-RJ, degree of protection: IP20, for installation in cable ducts or control cabinets, length: 2 m

FO patch cable - FL MM PATCH 5,0 SC-SCRJ - 2901814



Assembled FO cable, break out cable, multimode fiberglass 50/125 µm (OM2), connector: SC duplex/SC-RJ, degree of protection: IP20, for installation in cable ducts or control cabinets, length: 5 m

Patch cable - NBC-R4AC-R4AC-IE8A/.../... - 1411854



Patch cable, degree of protection: IP20, number of positions: 8, 10 Gbps, CAT6<sub>A</sub>, cable outlet: straight

### Data plug

Assembly tool - FL CRIMPTOOL - 2744869



Crimping pliers, for assembling the RJ45 plugs FL PLUG RJ45..., for assembly on site

RJ45 connector - VS-08-RJ45-5-Q/IP20 - 1656725



RJ45 connector, degree of protection: IP20, number of positions: 8, 1 Gbps, CAT5 (IEC 11801:2002), material: PA, connection method: IDC fast connection, connection cross section: AWG 26- 23, cable outlet: straight, color: traffic grey A RAL 7042

## FO converters - FL MC EF WDM-B SC - 2902659

### Accessories

RJ45 connector - VS-08-RJ45-5-Q/IP20 BK - 1658008



RJ45 connector, degree of protection: IP20, number of positions: 8, 1 Gbps, CAT5 (IEC 11801:2002), material: PA, connection method: IDC fast connection, connection cross section: AWG 26- 23, cable outlet: straight, color: black

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### DIN rail connector

DIN rail bus connectors - ME 22,5 TBUS 1,5/ 5-ST-3,81 GN - 2707437



DIN rail connector, nominal current: 8 A, rated voltage (III/2): 125 V, number of positions: 5, pitch: 3.81 mm, color: green, mounting: DIN rail, Item with gold-plated contacts, bus connectors for connecting with electronics housings, 5 parallel contacts

DIN rail bus connectors - ME 17,5 TBUS 1,5/ 5-ST-3,81 GN - 2709561



DIN rail connector for DIN rail mounting. Universal for TBUS housing. Gold-plated contacts, 5-pos.

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### Media converter

FO converters - FL MC EF WDM-SET SC - 2902660



FO converter set, consisting of type A devices and type B devices, for full duplex transmission from 10/100Base-T(X) to individual simplex fiberglass with WDM (wavelength division multiplex) technology. SC simplex fiber optic connection (1550/1310 nm).

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### Patch cable

Patch cable - FL CAT5 PATCH 0,5 - 2832263



Patch cable, CAT5, assembled, 0.5 m

## FO converters - FL MC EF WDM-B SC - 2902659

### Accessories

Patch cable - FL CAT5 PATCH 1,0 - 2832276



Patch cable, CAT5, assembled, 1 m

---

Patch cable - FL CAT5 PATCH 2,0 - 2832289



Patch cable, CAT5, assembled, 2 m

---

Patch cable - FL CAT5 PATCH 3,0 - 2832292



Patch cable, CAT5, assembled, 3 m

---

### Power supply

Power supply unit - MINI-SYS-PS-100-240AC/24DC/1.5 - 2866983



Primary-switched MINI POWER supply for DIN rail mounting, input: 1-phase, output: 24 V DC/1.5 A

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### Additional products

FO converters - FL MC EF WDM-A SC - 2902658



FO converter (replacement device A), for full duplex transmission from 10/100Base-T(X) to individual simplex fiberglass with WDM (wavelength division multiplex) technology, SC simplex fiber optic connection (1310/1550 nm). Device set (type A and type B) required for operation.

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## FO converters - FL MC EF WDM-B SC - 2902659

### Accessories

FO converters - FL MC EF WDM-SET SC - 2902660



FO converter set, consisting of type A devices and type B devices, for full duplex transmission from 10/100Base-T(X) to individual simplex fiberglass with WDM (wavelength division multiplex) technology. SC simplex fiber optic connection (1550/1310 nm).

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