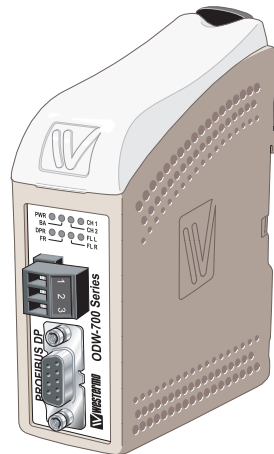




ODW-710-F1

Fibre Optic Modem

Industrial Converter
PROFIBUS DP to Fibre Optic Link-
Point to Point applications



Legal information

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More information about Westermo can be found at the following Internet address:

<http://www.westermo.com>

Safety



Before installation:

Read this manual completely and gather all information on the unit. Make sure that you understand it fully. Check that your application does not exceed the safe operating specifications for this unit.

This unit should only be installed by qualified personnel. This unit should be built-in to an apparatus cabinet, or similar, where access is restricted to service personnel only. The power supply wiring must be sufficiently fused, and if necessary it must be possible to disconnect manually from the power supply. Ensure compliance to national installation regulations. Branch circuit protection (fuse) is required for this unit with rating not exceeding 20 A.

Product should be connected to UL Listed power supplies rated 12 – 48 VDC, min 500 mA or 24 VAC, min 500 mA or reliably grounded DC SELV source.

Connect the unit using at least 18 AWG wiring. This unit uses convection cooling. To avoid obstructing the airflow around the unit, follow the spacing recommendations (see Cooling section).



Before mounting, using or removing this unit:

Prevent access to hazardous voltages by disconnecting the unit from the power supply.

Warning! Do not open a connected unit. Hazardous voltages may occur within this unit when connected to a power supply.



Class 1 Laser Product

This unit is designed to meet the Class 1 Laser regulations. However, the user is warned not to look directly into fibre optical fibre port or any connected fibre.

Care recommendations

Follow the care recommendations below to maintain full operation of the unit and to fulfil the warranty obligations.

This unit must not be operated with covers or lids removed.

Do not attempt to disassemble the unit. There are no user serviceable parts inside.

Do not drop, knock or shake the unit. Rough handling beyond the specification may cause damage to internal circuit boards.

Do not use harsh chemicals, cleaning solvents or strong detergents to clean the unit.

Do not paint the unit. Paint can clog the unit and prevent proper operation.

Do not expose the unit to any kind of liquids (rain, beverages, etc).

The unit is not waterproof. Keep the unit within the specified humidity levels.

Do not use or store the unit in dusty, dirty areas. Connectors as well as other mechanical parts may be damaged.

If the unit is not working properly, contact the place of purchase, nearest Westermo distributor office, or Westermo Tech support.

Fibre connectors are supplied with plugs to avoid contamination inside the optical port.

The plug should be fitted when no optical fibre is inserted in the connector, e.g. during storage, service or transportation.

Note. Fibre Optic Handling

Fibre optic equipment requires careful handling as the fibre components are very sensitive to dust and dirt. If the fibre is disconnected from the modem, the protective plug on the transmitter/receiver must be replaced. The protective plug must be kept on during transportation. The fibre optic cable must also be protected in the same way. If this recommendation is not followed, it can jeopardise the warranty.

Cleaning of the optical connectors

In the event of contamination, the optical connectors should be cleaned by using forced nitrogen and some kind of cleaning stick.

Recommended cleaning fluids:

- Methyl-, ethyl-, isopropyl- or isobutyl-alcohol
- Hexane
- Naphtha

Maintenance

No maintenance is required, as long as the unit is used as intended within the specified conditions.

Product disposal



This symbol means that the product shall not be treated as unsorted municipal waste when disposing of it. It needs to be handed over to an applicable collection point for recycling electrical and electronic equipment.

By ensuring this product is disposed of correctly, you will help to reduce hazardous substances and prevent potential negative consequences to both environment and human health, which could be caused by inappropriate disposal.

Simplified EU declaration of conformity

Hereby, Westermo declares that the equipment is in compliance with EU directives. The full EU declaration of conformity and other detailed information are available at the respective product page at www.westermo.com.

Agency approvals and standards compliance

Type	Approval / Compliance
EMC	EN 61000-6-1, Immunity residential environments
	EN 61000-6-2, Immunity industrial environments
	EN 61000-6-3, Emission residential environments
	EN 61000-6-4, Emission industrial environments
	EN 50121-4, Railway signalling and telecommunications apparatus
	IEC 62236-4, Railway signalling and telecommunications apparatus
	DNV Standard for Certification no. 2.4
Safety	UL/CSA/IEC/EN 60950-1, IT equipment

FCC Part 15.105 Notice:

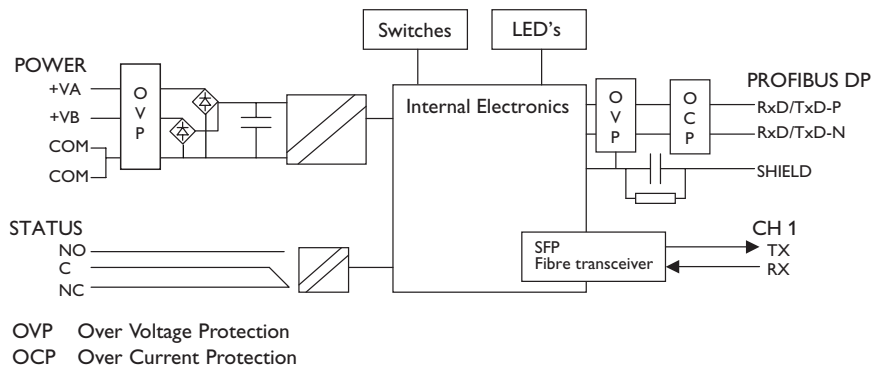
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Type tests and environmental conditions

Electromagnetic Compatibility			
Phenomena	Test	Description	Level
ESD	EN 61000-4-2	Enclosure contact	± 6 kV
		Enclosure air	± 8 kV
RF field AM modulated	IEC 61000-4-3	Enclosure	10 V/m 80% AM (1 kHz), 80 – 800 MHz 20 V/m 80% AM (1 kHz), 800 – 1000 MHz 20 V/m 80% AM (1 kHz), 1400 – 2700 MHz
RF field 900 MHz	ENV 50204	Enclosure	20 V/m pulse modulated 200 Hz, 900 ± 5 MHz
Fast transient	EN 61000-4-4	Signal ports	± 2 kV
		Power ports	± 2 kV
Surge	EN 61000-4-5	Signal ports unbalanced	± 2 kV line to earth, ± 2 kV line to line
		Signal ports balanced	± 2 kV line to earth, ± 1 kV line to line
		Power ports	± 2 kV line to earth, ± 2 kV line to line
RF conducted	EN 61000-4-6	Signal ports	10 V 80% AM (1 kHz), 0.15 – 80 MHz
		Power ports	10 V 80% AM (1 kHz), 0.15 – 80 MHz
Pulse Magnetic field	EN 61000-4-9	Enclosure	300 A/m, 6.4 / 16 µs pulse
Voltage dips and interruption	EN 61000-4-11	AC power ports	10 & 5 000 ms, interruption 200 ms, 40% residual voltage 500 ms, 70% residual voltage
Mains freq. 50 Hz	EN 61000-4-16	Signal ports	100 V 50 Hz line to earth
Mains freq. 50 Hz	SS 436 15 03	Signal ports	250 V 50 Hz line to line
Radiated emission	CISPR 16-2-3	Enclosure	EN 61000-6-3
	ANSI C63.4		FCC part 15
Conducted emission	CISPR 16-2-1	AC power ports	EN 61000-6-3
	ANSI C63.4	AC power ports	FCC part 15
	CISPR 16-2-1	DC power ports	EN 61000-6-4
Dielectric strength	EN 60950	Signal port to all other isolated ports	2 kVrms 50 Hz 1min
		Power port to other isolated ports	3 kVrms 50 Hz 1min 2 kVrms 50 Hz 1min (@ rated power < 60V)
Environmental			
Temperature	EN 60068-2-1	Operating	–40 to +70°C
	EN 60068-2-2	Storage & Transport	–40 to +70°C
		Maximum surface temperature	135°C (temperature class T4)
Humidity	EN 60068-2-30	Operating	5 to 95% relative humidity
		Storage & Transport	5 to 95% relative humidity
Altitude		Operating	2 000 m / 70 kPa
Service life		Operating	10 year
Vibration	IEC 60068-2-6	Operating	7.5 mm, 5 – 8 Hz 2 g, 8 – 500 Hz
Shock	IEC 60068-2-27	Operating	15 g, 11 ms
Packaging			
Enclosure	UL 94	PC / ABS	Flammability class V-1
Dimension W x H x D			35 x 121 x 119 mm
Weight			0.26 kg
Degree of protection			IP21
Cooling	IEC 529	Enclosure	Convection
Mounting			Horizontal on 35 mm DIN-rail

Functional description



Converter PROFIBUS DP – optical fibre

ODW-710-F1 is a fibre optic modem that converts between electrical PROFIBUS DP and a fibre optical link.

Data rate up to 12 Mbit/s

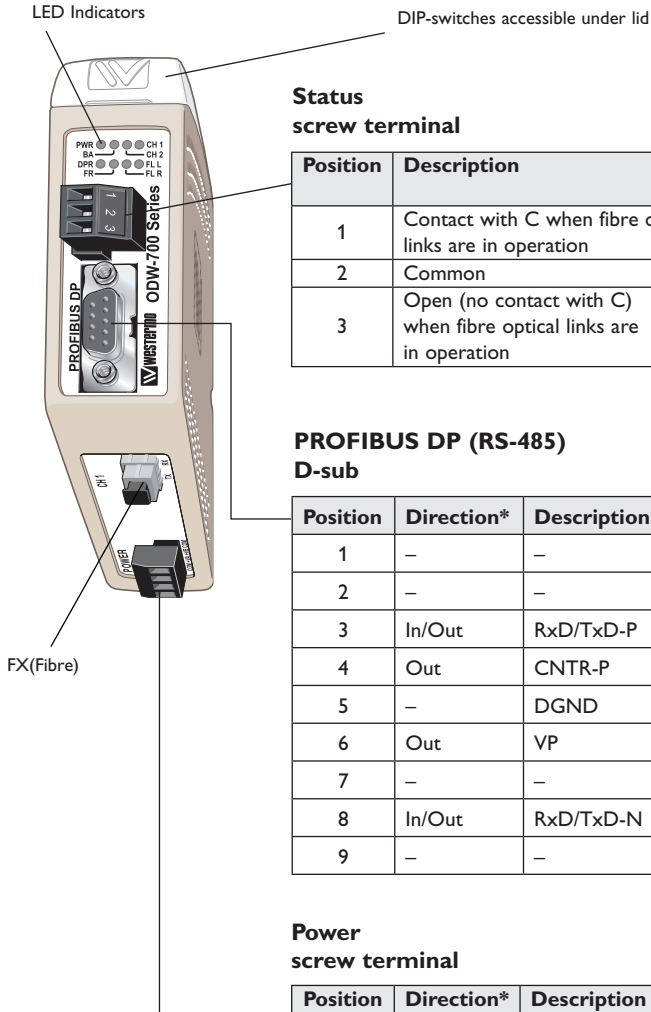
ODW-710-F1 converts PROFIBUS DP data using data rates from 9 600 bit/s up to 12 Mbit/s. Retiming of the PROFIBUS DP data ensures that the correct signal form is transmitted from the ODW-710-F1 converter.

Automatic data rate detection

The PROFIBUS data rate is set automatically as soon as the ODW-710-F1 receives a correct data frame, whether data is received from PROFIBUS DP or the fibre optical link. The detected data rate remains until a number of consecutive faulty received frames have been detected or no further frames are detected within the timeout period. The timeout period is set by switches, with the default setting of 31 faulty frames or 5 seconds without any received frames.

Location of Interface ports, LED's and DIP-switches

ODW-710-F1



Status screw terminal

Position	Description	Product marking
1	Contact with C when fibre optical links are in operation	NO
2	Common	C
3	Open (no contact with C) when fibre optical links are in operation	NC

PROFIBUS DP (RS-485) D-sub

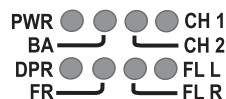
Position	Direction*	Description
1	-	-
2	-	-
3	In/Out	RxD/TxD-P
4	Out	CNTR-P
5	-	DGND
6	Out	VP
7	-	-
8	In/Out	RxD/TxD-N
9	-	-

Power screw terminal

Position	Direction*	Description	Product marking
1	In	Common voltage	COM
2	In	Voltage A	+VA
3	In	Voltage B	+VB
4	In	Common voltage	COM

* Direction relative this unit

LED Indicators



LED	Status	Description
PWR Power	ON	Power is on.
	OFF	Power is off.
BA Bus active	ON	Data rate has been identified and data frames are being received on the electrical or optical interface.
	OFF	Data rate has not been identified.
CH 2	Not used	
CH 1 Channel 1 link status	ON	Fibre link to other unit has been established at CH 1.
	Flashing	Optical power detected but link to other unit has not been established at CH 1.
	OFF	No optical power detected and no link to other unit has been established at CH 1.
DPR Receive PROFIBUS DP	Flash	Data received on the electrical interface and transmitted out on the optical interface.
	OFF	No data received on the electrical interface.
FR Receive fibre link	Flash	Data received on the optical interface and transmitted out on the electrical interface.
	OFF	No data received on the optical interface.
FL R Failure link remote	ON	Remote fibre link failure. A fibre link is out of operation at any other unit than this one.*
	Flashing	Hardware error or invalid configuration.
FL L Failure link local	ON	Local fibre link failure. A fibre link is out of operation.
	Flashing	Hardware error or invalid configuration.

* Only valid if used together with ODW-710-F2 units in a multidrop network.

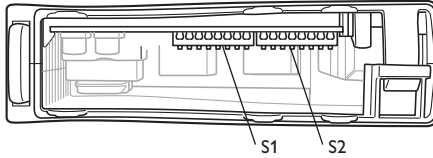
Note: During power up, all LED's will turn on for about 1 second.

DIP-switch settings



Before setting DIP-switches:

Prevent damage to internal electronics from electrostatic discharges (ESD) by discharging your body to a grounding point (e.g. use of wrist strap).



S2 DIP-switch



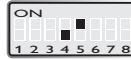
Multidrop mid unit or redundant ring member.
N/A for ODW-710-F1



5 seconds interruption in receiving frames, until inactive BA*.



Multidrop end unit. E.g. the first or last unit in a multidrop network.
Always "ON" for ODW-710-F1



10 seconds interruption in receiving frames, until inactive BA*.



Redundant ring focal point
Only one focal point allowed in a ring. N/A for ODW-710-F1



20 seconds interruption in receiving frames, until inactive BA*.



65535 t_{bit} interruption in receiving frames, until inactive BA.

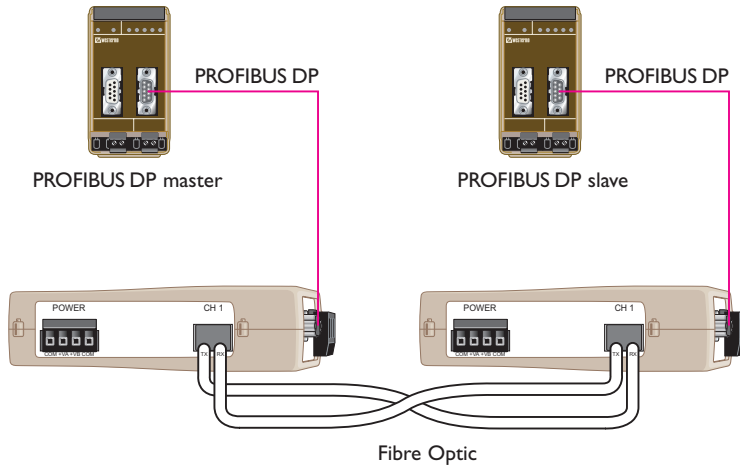
* See section "About the automatic data rate detection" for a more detailed description.

S1 DIP-switch	S2 DIP-switch	Description
		1 faulty frame before data rate seen as unidentified*. S1: No extended retry limit.
		2 faulty frames before data rate seen as unidentified*. S1: No extended retry limit.
		3 faulty frames before data rate seen as unidentified*. S1: No extended retry limit.
		4 faulty frames before data rate seen as unidentified*. S1: No extended retry limit.
		5 faulty frames before data rate seen as unidentified*. S1: No extended retry limit.
		6 faulty frames before data rate seen as unidentified*. S1: No extended retry limit.
		7 faulty frames before data rate seen as unidentified*. S1: No extended retry limit.
		8 faulty frames before data rate seen as unidentified*. S1: No extended retry limit.
		31 faulty frames before data rate seen as unidentified*. S1: Extended retry limit.
		63 faulty frames before data rate seen as unidentified*. S1: Extended retry limit.
		127 faulty frames before data rate seen as unidentified*. S1: Extended retry limit.
		255 faulty frames before data rate seen as unidentified*. S1: Extended retry limit.
		Set status port at local fibre link (FL L) error only. Only applicable if used together with ODW-710-F2 units in a multidrop network.
		Factory default

* See section "About the automatic data rate detection" for a more detailed description.

Start up guide

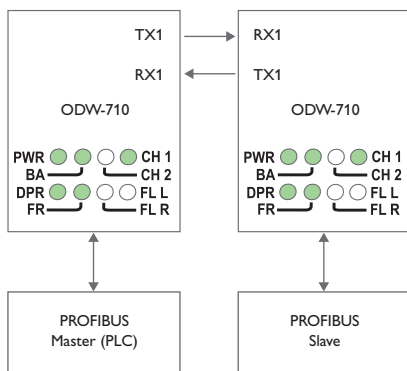
Follow the steps below to get the unit up and running in a simple application.



- ⌘ Use the factory DIP-switch settings.
- ⌘ Connect The fibre link between the both units.
- ⌘ Connect the power supply to both units.
The Fibre link should be in operation as indicated by the CH1 LED.
- ⌘ Connect the PROFIBUS DP connectors between both ODW-710-F1 and PROFIBUS units configured to be units in the PROFIBUS DP network. The PROFIBUS DP will be in operation and the data rate will be automatically detected, as indicated by the BA LED.
- ⌘ The point to point application is up and running.

Note: In an ODW-710-F1 fibre optic link there will be some additional processing delays that do not exist in an electrical bus. It is possible that the PROFIBUS application must be adjusted to accommodate for this delay. See “Calculating system processing delay” for more information on how to determine the overall system delay time.

LED indication under normal operation

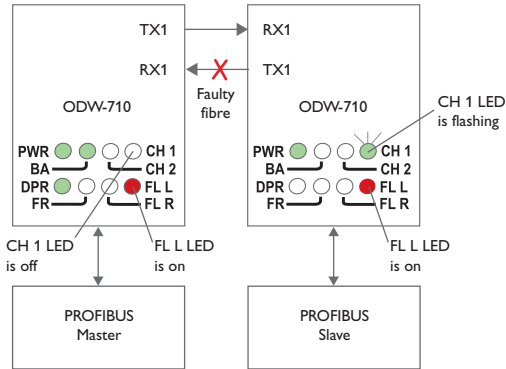


Data from the PROFIBUS master is received at the ODW-710-F1 electrical port (as indicated by the DPR LED), data rate is automatically detected (as indicated by the BA LED), data bits are retimed according to the determined rate and sent out on the optical fibre at CH 1.

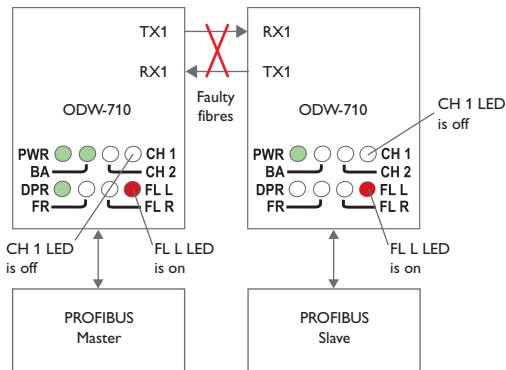
The ODW-710-F1 slave unit receives data at optical fibre CH 1 (as indicated by the FR LED), data rate is automatically detected (as indicated by the BA LED) and data is sent out on the electrical port.

Responses from the PROFIBUS slaves are processed in the same fashion and sent back to the PROFIBUS master in the opposite direction.

LED indication during optical link failure



If one fiber in the optical fibre pair fails, all communication with will be lost and the FL R LED's will turn on. The ODW-710-F1 that is still sensing optical power will indicate this by flashing the CH1 LED.



If both fibers in the optical fibre pair fails, all communication with will be lost, the CH1 LED's will turn off and the FL R LED's will turn on.

Calculating system processing delay

Data exchange between a PROFIBUS DP master and slave via ODW-710-F1 fibre optic link, will be delayed due to the length of the optical fibre and the signal processing within the ODW-710-F1. The signal processing delay is dependent on the data rate, and the fibre delay is dependent on the total length of the optical fibre. The additional time resulting from the optical fibre and ODW-710-F1 is the Overall system delay.

	Delay @ ≤ 1.5 Mbit/s	Delay @ 3 to 12 Mbit/s
Optical fibre length delay (typical)	5 μ s/km	5 μ s/km
Signal processing, electrical to fibre (max)	1 tbit + 1 μ s	9 tbit + 1 μ s
Signal processing, fibre to electrical (max)	0.3 μ s	0.3 μ s
Signal processing, fibre to fibre (max)	1.3 μ s	1.3 μ s

Note! tbit = 1 / Baud rate (Baud rate in bit/s)

Example

One PROFIBUS DP master and slave using a data rate of 12 Mbit/s. and a total fibre length of 40 km. A data frame sent from the master to a slave.

1. Fibre: The total optical fibre length delay.

$$40 \times 5 \mu\text{s} = 200 \mu\text{s}$$

2. Converter electrical to fibre: Signal processing delay (ODW-710-F1 connected to PROFIBUS DP master).

$$9 \text{ tbit} + 1 \mu\text{s} = 9 \times 0.083 \mu\text{s} + 1 \mu\text{s} \approx 1.1 \mu\text{s}$$

3. Converter fibre to electrical: Signal processing delay (ODW-710-F1 connected to addressed slave).

$$0.3 \mu\text{s}$$

4. The system delay is calculated by summing the delays in item 1 to 3 above:

$$200 \mu\text{s} + 1.1 \mu\text{s} + 0.3 \mu\text{s} = 201.4 \mu\text{s}$$

About the interfaces

Power

The power terminal has two independent inputs, +VA and +VB, allowing redundant power input. The ODW-710-F1 power supply is galvanically isolated from all other interfaces.

Optical fibre interfaces

ODW-710-F1 uses Small Form Factor Pluggable (SFP) transceivers. This means that a wide range of different fibre transceivers and connectors can be used.

PROFIBUS DP interface

The PROFIBUS DP interface is a female 9-position D-sub. Pin assignments are compliance with the PROFIBUS standard EN 50 170.

Status port

The status port connects to an internal relay which may be used to trigger an external alarm if a fault condition occurs. During normal operation pins 1 and 2 are in contact with each other, and pins 2 and 3 are isolated. During an optical link failure, or power failure, pins 1 and 2 are isolated, and pins 2 and 3 are in contact with each other.

Optical link failures can be classified into two categories, local or remote, as indicated by the FL L and FL R LED's. A local link failure is when an optical link is down at this particular unit. A remote link failure is when an optical link is down at some other unit.

From the factory, the status port is set to trigger on both types of link failures. However, by setting DIP-switch S1:1 to the ON position, the status port will only trigger when a local link failure has occurred.

Note: Setting DIP-switch S1:1 ON is only applicable if using the ODW-710-F1 together with ODW-710-F2 in a multidrop network.

About the automatic data rate detection

ODW-710-F1 automatically detects the data rate by monitoring incoming PROFIBUS data frames on both the electrical and optical interfaces. When the data rate has been established the BA LED will go active.

If no data frames are transmitted for a period of time the automatic data rate detection will restart and the BA LED will go inactive.

The idle time before the automatic data rate detection re-starts is set using DIP-switches S2:4 and S2:5. The factory default setting is 5 seconds.

The automatic data rate detection determines the actual data rate by listening for PROFIBUS Start Delimiters (SD1 – SD4) at the beginning of each data frame. If one or more Start Delimiters are lost the automatic data rate detection will re-start.

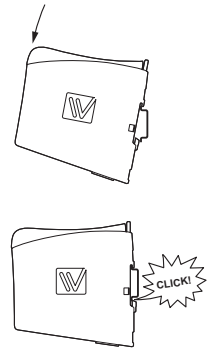
The number of lost Start Delimiters before the automatic data rate detection re-starts is set using DIP-switches S1:2 and S2:6 – S2: 8. The factory default setting is 31 faulty frames (31 lost Start Delimiters).

Note: Start Delimiters can be lost during an electrical or optical disturbance.

For example a PROFIBUS slave unit is connected/disconnected or an optical fibre is disconnected. It is advisable to start of by using the factory default settings and only manipulate them if a problem exists.

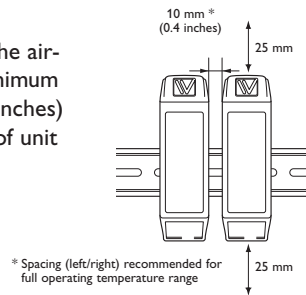
Mounting

This unit should be mounted on 35 mm DIN-rail, which is horizontally mounted inside an apparatus cabinet, or similar. Snap on mounting, see figure.



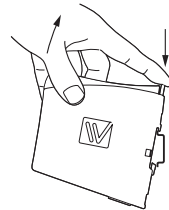
Cooling

This unit uses convection cooling. To avoid obstructing the air-flow around the unit, use the following spacing rules. Minimum spacing 25 mm (1.0 inch) above /below and 10 mm (0.4 inches) left /right the unit. Spacing is recommended for the use of unit in full operating temperature range and service life.



Removal

Press down the black support at the top of the unit. See figure.





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