

UTF 4000 SM CWDM Series

Optical video transmitter and receivers, single mode, CWDM

User Manual



T<H
GROUP

**SECURITY
SOLUTIONS**

Note: To ensure proper operation, please read this manual thoroughly before using the product and retain the information for future reference.

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UTF CWDM
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How to contact us

If you have any comments or queries concerning any aspect related to the product, do not hesitate to contact:

Siqua B.V.
Zuidelijk Halfroond 4
2801 DD Gouda
The Netherlands

General : +31 182 592 333
Fax : +31 182 592 123
E-mail : sales.nl@tkhsecurity.com
WWW : <http://www.tkhsecurity.com>

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1 About this manual

What this manual covers

This manual is valid for the UTF CWDM series units. It explains:

- How to install the units
- How to establish connections
- How to configure device settings

Who should read this manual

This manual is intended for installers and users of UTF CWDM units.

What you should already know

To be able to install and use UTF CWDM units properly, you should have adequate knowledge and skills in the fields of:

- Installing electronic devices
- Installing optical equipment
- Signal transmissions over fiber

Before you start

We advise you to read and observe all instructions and warnings in this manual before you continue. Keep this manual with the original bill of sale for future reference and warranty service. When you unpack your product, check for missing or damaged items. If any item is missing, or if damage is evident, do not install or operate this product. Contact your supplier for assistance.

Why specifications may change

We are committed to delivering high-quality products and services. The information given in this manual was current when published. As we continuously seek to improve our products and user experience, all features and specifications are subject to change without notice.

We like to hear from you!

Customer satisfaction is our first priority. We welcome and value your opinion about our products and services. Should you detect errors or inaccuracies in this manual, we would be grateful if you would inform us. We invite you to offer your suggestions and comments via t.writing@tkhsecurity.com. Your feedback helps us to further improve our documentation.

2 Safety and compliance

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2.1 Safety information

The safety information contained in this section, and on other pages of this manual, must be observed whenever this unit is operated, serviced, or repaired. Failure to comply with any precaution, warning, or instruction noted in the manual is in violation of the standards of design, manufacture, and intended use of the module. Sigura assumes no liability for the customer's failure to comply with any of these safety requirements.

Trained personnel

Installation, adjustment, maintenance, and repair of this equipment are to be performed by trained personnel aware of the hazards involved. For correct and safe use of the equipment and in order to keep the equipment in a safe condition, it is essential that both operating and servicing personnel follow standard safety procedures in addition to the safety precautions and warnings specified in this manual, and that this unit be installed in locations accessible to trained service personnel only.

Safety requirements

The equipment described in this manual has been designed and tested according to the **UL/IEC/EN 60950-1** safety requirements. For compliance information, see the EU Declaration of Conformity, which is available for download at www.tkhsecurity.com/support-files.

Warning: If there is any doubt regarding the safety of the equipment, do not put it into operation.

This might be the case when the equipment shows physical damage or is stressed beyond tolerable limits (for example, during storage and transportation).

Important: Before opening the equipment, disconnect it from all power sources.

The equipment must be powered by a SELV¹ power supply. This is equivalent to a Limited Power source (LPS, see UL/IEC/EN 60950-1 clause 2.5) or a "NEC Class 2" power supply. When this module is operated in extremely elevated temperature conditions, it is possible for internal and external metal surfaces to become extremely hot.

Optical safety

This optical equipment contains Class 1M lasers or LEDs and has been designed and tested to meet **IEC 60825-1:1993+A1+A2** and **IEC 60825-2:2004 safety class 1M** requirements.

Warning: Optical equipment presents potential hazards to testing and servicing personnel, owing to high levels of optical radiation.

1. SELV: conforming to IEC 60950-1, <60 Vdc output, output voltage galvanically isolated from mains. All power supplies or power supply cabinets available from TKH Security comply with these SELV requirements.

When using magnifying optical instruments, avoid looking directly into the output of an operating transmitter or into the end of a fiber connected to an operating transmitter, or there will be a risk of permanent eye damage. Precautions should be taken to prevent exposure to optical radiation when the unit is removed from its enclosure or when the fiber is disconnected from the unit. The optical radiation is invisible to the eye.

Use of controls or adjustments or procedures other than those specified herein may result in hazardous radiation exposure.

The installer is responsible for ensuring that the label depicted below (background: yellow; border and text: black) is present in the restricted locations where this equipment is installed.



The locations of all optical connections are listed in the *Indicators and connectors* section of this manual. Optical outputs and wavelengths are listed in the Technical Specifications section of this manual.

EMC

Warning: Operation of this equipment in a residential environment could cause radio interference.

This device has been tested and found to meet the CE regulations relating to EMC and complies with the limits for a Class A device, pursuant to Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation. These limits are designed to provide reasonable protection against interference to radio communications in any installation. The equipment generates, uses, and can radiate radio frequency energy; improper use or special circumstances may cause interference to other equipment or a performance decrease due to interference radiated by other equipment. In such cases, the user will have to take appropriate measures to reduce such interactions between this and other equipment.

Note that the warning above does not apply to TKH Security products which comply with the limits for a Class B device. For product-specific details, refer to the EU Declaration of Conformity.

Any interruption of the shielding inside or outside the equipment could make the equipment more prone to fail EMC requirements.

To ensure EMC compliance of the equipment, use shielded cables for all signal cables including Ethernet, such as CAT5E SF/UTP or better, as defined in ISO IEC 11801. For power cables, unshielded three wire cable (2p + PE) is acceptable. Ensure that *all* electrically connected components are carefully earthed and protected against surges (high voltage transients caused by switching or lightning).

ESD

Electrostatic discharge (ESD) can damage or destroy electronic components. *Proper precautions should be taken against ESD when opening the equipment.*

Care and maintenance

The unit will normally need no maintenance. To keep it operating reliably:

- Prevent dust from collecting on the unit.
- Do not expose the equipment to moisture.

RoHS statement

Global concerns over the health and environmental risks associated with the use of certain environmentally-sensitive materials in electronic products have led the European Union (EU) to enact the Directive on the Restriction of the use of certain Hazardous Substances (RoHS) (2002/95/EC). TKH Security offers products that comply with the EU's RoHS Directive.



Product disposal

The unit contains valuable materials which qualify for recycling. In the interest of protecting the natural environment, properly recycling the unit at the end of its service life is imperative.



2.2 Declaration of Conformity

The EU Declaration of Conformity for this product is available for download at www.tkhsecurity.com/support-files.

3 Product description

This chapter describes the features of the individual UTF CWDM units. It also explains the bus system setup of the CWDM system.

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3.1 General

Models

The UTF CWDM series includes the following models.

UTF 4240 TX-MSA CWDMxxxx	Digital video transmitter with CC and two-way data, CWDM, $\lambda = \text{xxxx}^*$
UTF 4240 RX CWDM	Digital video receiver with CC and two-way data
UTF 4040 RX CWDM	Digital video receiver with CC

* $\lambda = \text{xxxx} = 1470, 1490, \dots, 1610 \text{ nm}$

Signal transmissions

A UTF 4240 (Up the Fiber™) transmitter (TX) converts a composite video signal into a high-quality 9-bits digitised optical equivalent and transmits this over optical fiber. Additionally, it optically receives and transmits data signals and converts these signals into electrical equivalents. Finally, the transmitter provides a contact closure input for door contacts and anti-tamper contacts, for example.

Complementary UTF 4240 receivers (RX) receive and convert the optical signal to video/data/contact closure. Like the TX, the RX is a bidirectional optical data transceiver. The UTF 4040 receiver (RX) has no bidirectional data transceiver.

The bidirectional RS-485/422 data interface handles PTZ communication for all types of camera interfaces, such as RS-485, TTY, Manchester, biphase, Sensornet, for example. The data interface configuration (four-wire or two-wire) only needs to be set at the receiver side.

Operating temperature

A wide range of operating temperatures makes the stand-alone transmitter suitable for use within outdoor camera housings and camera connection boxes (see *Technical specifications*).

Powering

The transmitter can be powered by the camera power supply (12 Vdc or 24 Vac) or by a PSA/PSU 12 DC. For operation under extreme environmental conditions, the PSR 12 DC is recommended.

Note: If 24 Vac is used, please read section *Configuration and installation* first.

Location

The UTF TX-MSA miniature stand-alone transmitter can be installed almost anywhere. Its small size makes it possible to mount it inside the camera housing. The UTF receivers (RX) are designed for use in TKH Security MC10 or MC11 power supply racks.

EasyC-s™

The UTF 4240 receiver supports EasyC-s™. With this feature, a group of receivers only needs one external data connection. The data is put on the internal data bus (D-bus) of the rack and is available to all connected receivers in that rack.

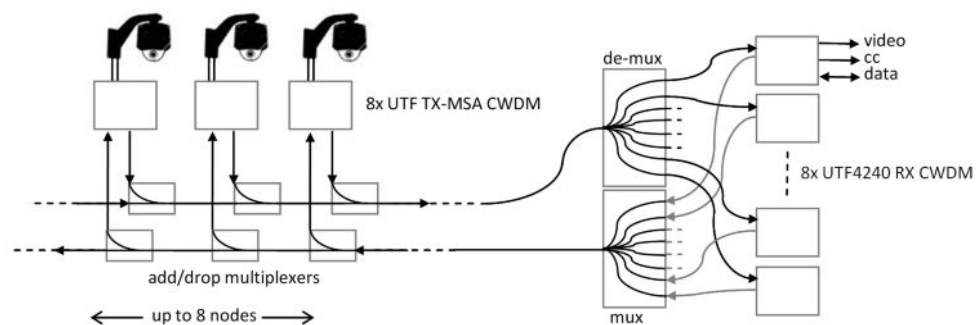
3.2 CWDM System description

The CWDM version of the UTF family offers an optical add/drop video bus system with one-way video and contact closure, and bidirectional data. The maximum number of camera nodes on the bus is eight. The UTF CWDM operates over two single-mode fibers. Components for multiplexing optical signal are project dependent and must be designed according the project requirements.

3.2.1 Bus system setup using fully independent UTF TX-RX pairs

This section describes the bus system setup for eight fully independent UTF TX-RX pairs with their full video, contact closure, and bidirectional data transmission functionality over one fiber pair.

At each camera node an UTF4240 TX-MSA CWDMxxxx emits an optical signal with a certain wavelength. This optical signal carries the video, contact closure, and the downstream data signal. The optical signal is coupled into the central downstream fiber using an add/drop multiplexer which adds that specific wavelength. At the receiver side, a 1 to 8 demultiplexer is applied to split the optical signal into the eight different wavelengths which are connected to eight different receivers. The receivers are not wavelength selective; channel separation depends on the demultiplexer.

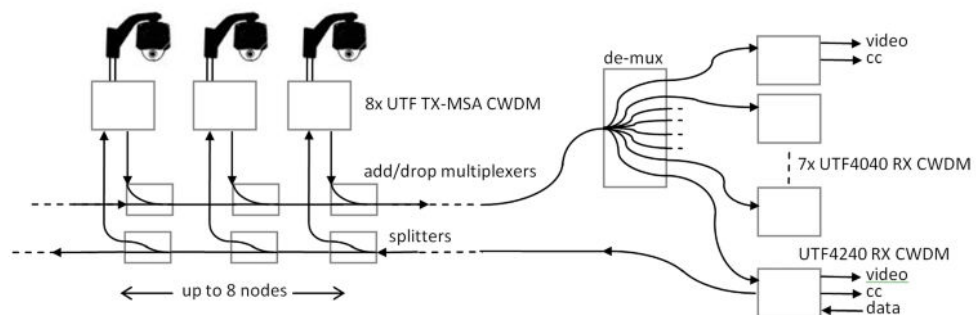


In the reverse direction (upstream), only a data signal is transported. Every UTF4240 RX CWDM emits an optical signal with a certain wavelength carrying the reverse direction data signal. These optical signals are combined into one fiber with a 1 to 8 multiplexer. At each camera node, an add/drop multiplexer is used to drop the optical signal with the appropriate wavelength. This signal is connected to the UTF4240 TX-MSA CWDMxxxx receiver input. Again, selectivity does not depend on the UTF receiver but on the add/drop multiplexer.

3.2.2 Bus system setup using shared upstream data transmission

This section describes the bus system setup for eight UTF TX-RX pairs with their full video and contact closure downstream transmission but shared upstream (PTZ) data transmission functionality over one fiber pair.

In this setup, only one data signal travels upstream. This application addresses the practical situation of PTZ cameras with only one, upstream, identical PTZ control signal. Selectivity of PTZ control is provided by camera ID. Downstream setup is the same as described in Bus system setup using fully independent UTF TX-RX pairs (on page 9). At every camera node, a UTF4240 TX-MSA CDWMxxxx emits an optical signal with a certain wavelength. This optical signal carries the video and contact closure signal. The downstream data signal is not used. The optical signal is coupled into the central downstream fiber using an add/drop multiplexer which adds that specific wavelength. At the receiver side, a 1 to 8 demultiplexer is applied to split the optical signal into the eight different wavelengths which are connected to eight different receivers.



Seven of these receivers are UTF4040 RX CWDM, receiving the video and contact closure signal. The eighth (UTF4240 RX CWDM) receiver receives video and contact closure, and additionally sends a (PTZ) data signal upstream. This signal is transported through the upstream fiber to every UTF TX on the bus using just optical splitters. By using the right split ratios at each node the optical power is evenly distributed over the TX-MSA CWDMxxxx receiver inputs.

Important: The optical signal in a bus system travels through a large number of optical components (add/drop multiplexers and (de)multiplexers). Each component adds at least two connectors to the optical path. To preserve optical stability in the system (depending on attenuation and reflections) high-quality APC (Angled Physical Contact) optical connectors must be used in all components of the optical bus. To keep the number of connectors as low as possible, no additional patch panels are allowed in the optical path; breakout cables must be welded directly to the main fiber.

4 Indicators and connectors

This chapter describes the indicators and connectors found on the front panels of the UTF CWDM units.

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4.1 UTF 4240 TX-MSA CWDM



The miniature stand-alone UTF transmitter has the following indicators and connectors.

- 1 TX: optical fiber connection
RX: optical fiber connection
- 2 7-Pin data and CC connector
- 3 2-Pin power supply connector
- 4 BNC 75Ω connector composite video input
- 5 SYNC: this indicator can show:
 - Green: operational link
 - Red: local synchronisation error
 - Yellow: remote synchronisation error

4.2 UTF 4040 RX CWDM



The UTF RX 4040 CWDM has the following indicators and connectors:

- 1 RX: connection for optical fiber
- 2 2-Pin connector for potential-free alarm contacts
- 3 BNC 75Ω connector: composite video output
- 4 SYNC: this LED can show:
 - Green: operational link
 - Red: local synchronisation error
 - Yellow: remote synchronisation error
- 5 NV: this LED can show:
 - Red: no video on in- or output
 - Off: video signal present

4.3 UTF 4240 RX CWDM



The UTF RX 4240 CWDM has the following indicators and connectors:

- 1 TX: connection for optical fiber
RX: connection for optical fiber
- 2 6-Pin data connector
- 3 2-Pin connector for potential-free alarm contacts
- 4 BNC 75Ω connector: composite video output
- 5 SYNC: this LED can show:
Green: operational link
Red: local synchronisation error
Yellow: remote synchronisation error
- 6 NV: this LED can show:
Red: no video on in- or output
Off: video signal present
- 7 Dual toggle switches for 4-/2-wire RS-485 data and D-Bus operation (EasyC-s)

5 Installation and configuration

This chapter describes how to install and power UTF CWDM units. It also explains how to configure RS-485/422 data connections and Easy C-s™.

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5.1 Powering a UTF 4240 TX with 24 Vac from the camera



Warning: The following precautions must be taken if the camera and UTF share the same Vac power supply.

- Never use the UTF in combination with a camera with single-side rectifier circuit. The miniature stand-alone UTF transmitter converts 24 Vac power through an internal full rectifier bridge; the "-" of its internal DC voltage is connected to the metal housing. A camera with a single-sided rectifier circuit will have one of the AC power leads connected to the camera housing. The cable between UTF and camera will connect their housings through the coax cable shielding. In case of a shared AC power supply, one of the UTF rectifier diodes shorts the power supply during each positive or negative period of the AC voltage!
- In case of a camera with a full rectifier bridge, the coax cable connection between the housings will put one of the rectifier diodes of the UTF and camera in parallel during each positive and negative period of the AC voltage. Depending on diode characteristics the supply current may run through only one of the rectifier diodes in parallel which may lead to overstressing these components.

To prevent the occurrence of such problems, proper measures must be taken to separate the two loads of the 24 Vac supply. This might be preferable in any case, as a precaution.

If in doubt, please contact your distributor.

5.2 Mounting

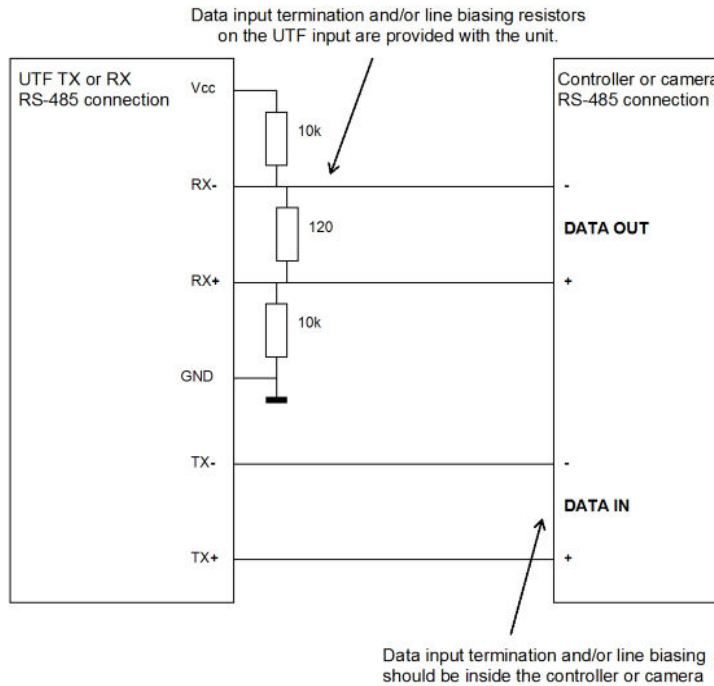
Before mounting the miniature transmitter, the mounting bracket has to be installed in a suitable place. After securing the bracket, the transmitter can be clicked into it. Make sure the transmitter is positioned and fixed correctly.

5.3 RS-485/422 connection

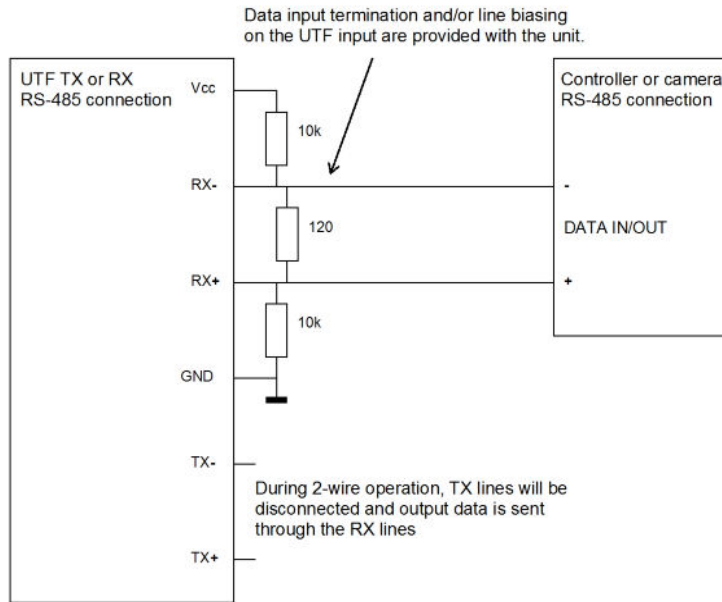
Before connecting the system, the RS-485 connection needs to be configured for 2-wire or 4-wire mode. This can be done with the upper switch (2W - 4W) on the front panel of the UTF 4240 RX receiver. For the exact position of this switch, see UTF 4240 RX CWDM (on page 13) (position 4 in the front panel picture).

The connections between the transmitter ↔ camera, and receiver ↔ controller in 4-wire and in 2-wire mode are indicated in the following figures.

4-wire mode:

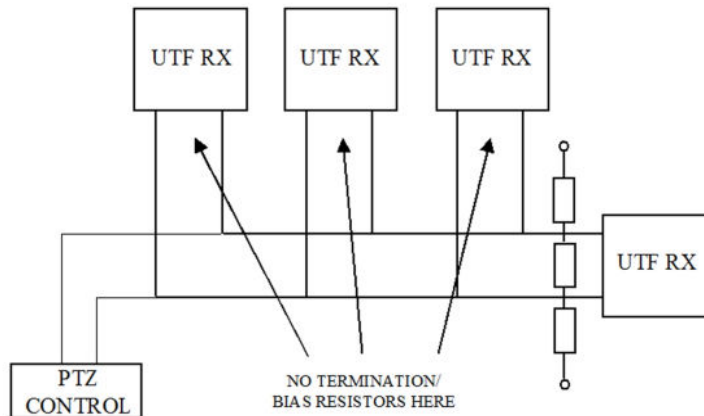


2-wire mode:



5.4 Termination and bias resistors

When connecting more than one UTF in a bus structure, only one data input on the UTF modules needs to be terminated and/or biased. The resistors can be attached to the external connectors. Whether they are needed depends on the termination and bias resistors in the camera, etc.



Termination and bias example, front panel bus configuration

5.5 Easy C-s™

With the lower switch (D-bus, see UTF 4240 RX CWDM (on page 13), position 4 on the front panel picture) in the "ON" position, the external data going into the data input (see UTF 4240 RX CWDM (on page 13), position 6 on the front panel picture) is put onto the internal data bus, while a UTF receiver is then also enabled to such get data from this internal data bus. To minimise external wiring, the UTF models are fitted with EasyC-s™.

To be able to control a group of receivers with one external data connection, the D-bus switch has to be in the "ON" position for each receiver belonging to that group and the external data has to be connected to only one receiver of that group.

The single RS-485/422 data link in the lowest UTF RX needs no termination resistors.

5.6 Powering up a system

When powering up a system, the "SYNC" indicator on the transmitter should show green and the "SYNC" indicator on the receiver should also light up green. When no video signal is present, the "NV" indicators show red.

6 Technical specifications

This chapter provides the technical specifications of the UTF CWDM units.

Video	
Number of channels	1
Video format	NTSC, PAL, SECAM
Input/output level	1 Vpp (± 3 dB)
Bandwidth (-3 dB)	6 MHz
Sampling resolution	9-bit effective
Group delay	<20 ns
Differential phase	<1.0°
Differential gain	<2.0%
Signal-to-noise ratio	>63 dBw
Connector type	75 Ω BNC (gold-plated centre pin)

Data	
Number of channels	1 (full duplex)
Data interfaces	RS-422/485 (2- or 4-wire)
Interface support	Current loop, TTL, TTY, Manchester, Bi-phaseBi-phase
Data format	Asynchronous, serial
Data rate	DC to 230 kb/s
Connector type	6-pin screw screw terminal
EasyC-s™	Backplane data bus wiring and single-point configuring (RX)

Contact closures	
Number of channels	1
Input (TX)	+3.3 V pull-up, 2.2 k Ω
Threshold	1.4 V
Output (RX)	Fail-safe, isolated, 100 mA / 50 V

Management	
LED status indicators	
TX models	Power on (green), local synchronisation error (red), remote synchronisation error (yellow)
RX models	NV: no video on output (red); Sync: operational link (green), local synchronisation error (red), remote synchronisation error (yellow)

Powering	
Power consumption	<3 W
Rack-mount units	MC 10 and MC 11 power supply cabinets
Stand-alone units (/SA)	12 Vdc (PSA-UN12DC with ferrules or PSR-12DC)
Miniature stand-alone transmitters	11 to 40 Vdc (PSA-UN12DC with ferrules or PSR-12DC or 20 to 30 Vac)

Environmental	
Operating temperature	-40 °C to +74 °C (-40 °F to +165 °F)
Storage temperature	-55 °C to +85 °C (-67 °F to +185 °F)
Relative humidity	<95% with no condensation
MTBF (Mean Time Between Failures)	>250,000 hours
Safety and EMC	IEC/EN 60950-1, IEC/EN 60825, IEC/EN 61000, EN 50130-4, EN 50081-1, EN 55022, FCC part 15, UL pending

Mechanical	
Stand-alone	
Dimensions (h x w x d)	45 x 45 x 25 mm (1.8 x 1.8 x 1.0 in)
Weight	250 g (8.8 oz)
Rack-mount units	
Dimensions (h x w x d)	128 x 35 x 190 mm (5 x 1.4 x 7.5 in)
Weight	450 g (15.9 oz)

Optical		
	UTF 4240 TX-MSA CWDM to UTF 4240 RX CWDM	UTF 4240 TX-MSA CWDM to UTF 4040 RX CWDM
Fiber type	2x SM (9/125 μm)	1x SM (9/125 μm)
System link budget	21 dB / 28 dB	21 dB
Minimum link loss	0 dB	0 dB
Output power	-15 dBm / -8 dBm	-15 dBm
Input sensitivity	-36 dBm / -36 dBm	-36 dBm
Output wavelength	1470 - 1610 nm (in 20 nm steps) / 1310 nm	1470 - 1610 nm (in 20 nm steps)
Input wavelength	1260 - 1620 nm	1260 - 1620 nm
Connector type	dual SC	single SC