

## T2 DTL Series

### TFOCA Media Converters



#### Ethernet Connectivity in Rugged Environments

The Cinch Stratos T2 series media converter is a 2-channel optical transceiver and media converter. Each channel interfaces with up to 1000 MBPS Ethernet electrical signals and converts to/from up to 1000 MBPS optical signals.

The optical interface uses a TFOCA-II (four fiber) connector to support a variety of wavelengths and fiber modes. The circular electrical connector provides copper Ethernet and power to the unit.

#### Features & Benefits

- Supports Up to 2 GBPS Ethernet Link (2 Channels @ 1 GBPS Each) Over Fiber Between Linked Devices
- Rugged MIL Circular Connector for Electrical Interface
- Units are 100% Tested at Both Temperature Extremes Prior to Shipment
- MIL-STD-810 Qualified for Temperature, Thermal Shock, Vibration, Mechanical Shock, Humidity & Altitude
- FCC Class A Compliant with Internal & External EMI Sealing
- Built & Tested in the USA
- Internal Construction Includes Use of Tin-lead Solder & Conformal Coating
- Rugged PTFE Anodized Finish & All Stainless-steel Hardware

#### Applications

- Oil & Gas
- Fire & Rescue
- Security
- Shipboard
- Tactical Communications
- Military Communications

**Ordering Information**

Part Number	Ethernet Rates	Optical Rate	Optical Signal	Distance	Link Fault	Cross Channel
T2F-DTL002-24VM	10/100 BT	FE (125 Mbps)	1310 nm Multimode	2 km		
T2F-DTL002-24VM-01	10/100 BT	FE (125 Mbps)	1310 nm Multimode	2 km	X	
T2F-DTL002-24VM-03	10/100 BT	FE (125 Mbps)	1310 nm Multimode	2 km	X	X
T2F-DTL002-24VM-03A	10/100 BT	FE (125 Mbps)	1310 nm Multimode	2 km	X	X
T2K-DTL002-24VM	10/100/1000 BT	GE (1.25 Gbps)	850 nm Multimode	1 km		
T2K-DTL002-24VM-01	10/100/1000 BT	GE (1.25 Gbps)	850 nm Multimode	1 km	X	
T2K-DTL002-24VM-03	10/100/1000 BT	GE (1.25 Gbps)	850 nm Multimode	1 km	X	X
T2K-DTL202-24VM	10/100/1000 BT	GE (1.25 Gbps)	1310 nm Multimode	1 km		
T2K-DTL202-24VM-01	10/100/1000 BT	GE (1.25 Gbps)	1310 nm Multimode	1 km	X	
T2K-DTL202-24VM-03	10/100/1000 BT	GE (1.25 Gbps)	1310 nm Multimode	1 km	X	X
T2K-DTL602-24VM	10/100/1000 BT	GE (1.25 Gbps)	1310 nm Singlemode	10 km		
T2K-DTL602-24VM-01	10/100/1000 BT	GE (1.25 Gbps)	1310 nm Singlemode	10 km	X	
T2K-DTL602-24VM-03	10/100/1000 BT	GE (1.25 Gbps)	1310 nm Singlemode	10 km	X	X

**Notes:**

1. Ethernet rates are auto-negotiated on the copper port side to 10 BT, 100 BT, or (in the case of the GigE converter) 1000 BT. The optical link rate is always fixed and does not change regardless if the copper side is auto-negotiated down to a lower rate. The Near End and Far End Optical Converters must match the optical rate, wavelength, and fiber type (singlemode or multimode) for proper operation.
2. Link distances may be improved by using higher bandwidth rated fiber. For example, using OM4 rated multimode fiber could extend GE optical link distance to 2 km.

**Absolute Maximum Ratings**

Parameter	Symbol	Min	Typical	Max	Unit
Storage Temperature	Ts	-55		+100	°C
Supply Voltage - DTL	Vcc	0		+35	V

**Recommended Operating Condition**

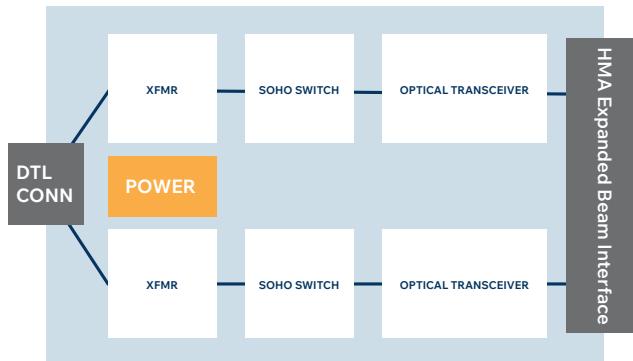
Parameter	Symbol	Min	Typical	Max	Unit
Case Operating Temperature	Ts	-40		+71	°C
Supply Voltage - DTL	Vs	0	+24	+35	V
Power Draw	Ps		5.0	6.0	W

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## TFOCA Media Converters

# Stratos Optical Technologies

### Block Diagram, T2 Series DTL Media Converter



### TFOCA Cross Channel Option, -03(A) versions

Cross Option	Electrical RJ45	Optical TFOCA
No (BLANK, -01)	Chan 1	P2/S2
	Chan 2	P1/S1
Yes (-03 or -03A)	Chan 1	P1/S1
	Chan 2	P2/S2

#### Note:

Historic versions of the Stratos Media Converters use TFOCA P2/S2 pin and socket for Channel 1. This nomenclature has been preserved in order to provide backwards compatibility to those older systems.

### Block Diagram Description

The electrical signals are transformer coupled into a Physical Layer Device (PHY), buffered, and then regenerated into up to an optical data stream. The optical data stream is then routed to an internal optical transceiver to create the optical signal. The optical signal is routed to the TFOCA-II compatible connector interface for direct connection to a tactical optical cable.

The media conversion process is compliant to the IEEE 802.3 specifications for Fast Ethernet 100 BT and 100 BFX, as well as the IEEE 802.3Z specifications for Gigabit Ethernet 100/1000 BT and 1000 BLX. The Ethernet connection supports auto-negotiation for 10/100/1000 BT interfaces. In the case of auto-negotiation to a lower ethernet rate on the copper link, the optical link is always at the fixed rate of either 125 Mbps (T2F series) or 1.25 Gbps (T2K series). The Ethernet connection also supports auto-cross to automatically support both crossed and un-crossed ethernet cables.

DC Power is supplied to the entire converter (to both channels) through the circular DTL connector.

### Optical Performance, T2F Series (Fast Ethernet), High Optical Power

Applicable part numbers: T2F-DTL002-24VM, T2F-DTL002-24VM-01, T2F-DTL002-24VM-03

Parameter	Symbol	Min	Typical	Max	Unit
Transmit Output Power	P <sub>o</sub>	-12.0	-	-3.0	dBm
Transmit Output Center Wavelength	λ <sub>OUT</sub>	1290	1310	1330	nm
Transmit Output Spectral Width	Δλ <sub>RMS</sub>	-	-	4	nm
Transmit Extinction Ratio	ER	8	10	-	dB
Transmit Rise/Fall Time (10 ~ 90%)	t <sub>R</sub>	-	-	3000	ps
Receive Sensitivity	P <sub>i</sub>	-32.0	-	-3.0	dBm
Receive Center Wavelength	λ <sub>IN</sub>	1260	-	1380	nm
Fiber Core Diameter	Ø <sub>CORE</sub>	-	63	-	um

#### Notes:

1. Transmit Output Power measured @ 125 Mbps, PRBS 2<sup>7</sup>-1, NRZ
2. Receive Sensitivity is -32.0 dBm with TX FP Laser source (this device) at BER=1E-10 @ 125 Mbps, PRBS 2<sup>7</sup>-1, NRZ, ER = 8.0 dB or better.
3. Derate Receiver Sensitivity to -31.5 dBm when interfacing to TX LED source equipment, BER=1E-10 @ 125 Mbps, PRBS 2<sup>7</sup>-1, NRZ, ER = 8.0 dB or better.

**Optical Performance, T2F Series (Fast Ethernet), Standard (IEEE 802.3) Optical Power**

Applicable part numbers: T2F-DTL002-24VM-03A

Parameter	Symbol	Min	Typical	Max	Unit
Transmit Output Power	P <sub>o</sub>	-14.0	-	-8.0	dBm
Transmit Output Center Wavelength	λ <sub>OUT</sub>	1290	1310	1330	nm
Transmit Output Spectral Width	Δλ <sub>RMS</sub>	-	-	4	nm
Transmit Extinction Ratio	ER	8	10	-	dB
Transmit Rise/Fall Time (10 ~ 90%)	t <sub>R</sub>	-	-	3000	ps
Receive Sensitivity	P <sub>I</sub>	-32.0	-	-3.0	dBm
Receive Center Wavelength	λ <sub>IN</sub>	1260	-	1380	nm
Fiber Core Diameter	Ø <sub>CORE</sub>	-	63	-	um

**Notes:**

1. Transmit Output Power measured @ 125 Mbps, PRBS 2<sup>7</sup>-1, NRZ
2. Receive Sensitivity is -32.0 dBm with TX FP Laser source (this device) at BER=1E-10 @ 125 Mbps, PRBS 2<sup>7</sup>-1, NRZ, ER = 8.0 dB or better.
3. Derate Receiver Sensitivity to -31.5 dBm when interfacing to TX LED source equipment, BER=1E-10 @ 125 Mbps, PRBS 2<sup>7</sup>-1, NRZ, ER = 8.0 dB or better.

**Optical Performance, T2K Series (Gigabit Ethernet), 850 nm Multimode**

Applicable part numbers: T2K-DTL002-24VM, T2K-DTL002-24VM-01, T2K-DTL002-24VM-03

Parameter	Symbol	Min	Typical	Max	Unit
Transmit Output Power <sup>1</sup>	P <sub>o</sub>	-9.5	-	-4.0	dBm
Transmit Output Center Wavelength	λ <sub>OUT</sub>	830	850	860	nm
Transmit Output Spectral Width	Δλ <sub>RMS</sub>	-	-	0.85	nm
Transmit Extinction Ratio	ER	9	10	-	dB
Transmit Rise/Fall Time (10 ~ 90%)	t <sub>R</sub>	-	-	260	ps
Receive Sensitivity <sup>1</sup>	P <sub>I</sub>	-20.0	-	0	dBm
Receive Center Wavelength	λ <sub>IN</sub>	770	-	860	nm
Fiber Core Diameter	Ø <sub>CORE</sub>	-	63	-	um

**Note:**

<sup>1</sup> BER=1E-12 @ 1.25 Gbps, PRBS7, NRZ, ER = 9 dB or greater

**Optical Performance, T2K Series (Gigabit Ethernet), 1310 nm Multimode**

Applicable part numbers: T2K-DTL202-24VM, T2K-DTL202-24VM-01, T2K-DTL202-24VM-03

Parameter	Symbol	Min	Typical	Max	Unit
Transmit Output Power <sup>1</sup>	P <sub>O</sub>	-10.0	-	-4.0	dBm
Transmit Output Center Wavelength	λ <sub>OUT</sub>	1285	1310	1343	nm
Transmit Output Spectral Width	Δλ <sub>RMS</sub>	-	-	4	nm
Transmit Extinction Ratio	ER	9	10	-	dB
Transmit Rise/Fall Time (10 ~ 90%)	t <sub>R</sub>	-	-	260	ps
Receive Sensitivity <sup>1</sup>	P <sub>I</sub>	-20.0	-	-3.0	dBm
Receive Center Wavelength	λ <sub>IN</sub>	1270	-	1355	nm
Fiber Core Diameter	Ø <sub>CORE</sub>	-	63	-	um

**Note:**

<sup>1</sup> BER=1E-12 @ 1.25 Gbps, PRBS7, NRZ, ER = 9 dB or greater

**Optical Performance, T2K Series (Gigabit Ethernet), 1310 nm Singlemode**

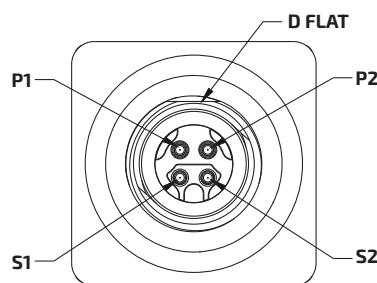
Applicable part numbers: T2K-DTL602-24VM, T2K-DTL602-24VM-01, T2K-DTL602-24VM-03

Parameter	Symbol	Min	Typical	Max	Unit
Transmit Output Power <sup>1</sup>	P <sub>O</sub>	-8	-	-3	dBm
Transmit Output Center Wavelength	λ <sub>OUT</sub>	1285	1310	1343	nm
Transmit Output Spectral Width	Δλ <sub>RMS</sub>	-	-	4	nm
Transmit Extinction Ratio	ER	9	10	-	dB
Transmit Rise/Fall Time (10 ~ 90%)	t <sub>R</sub>	-	-	260	ps
Receive Sensitivity <sup>1</sup>	P <sub>I</sub>	-20	-	0	dBm
Receive Center Wavelength	λ <sub>IN</sub>	1270	-	1355	nm
Fiber Core Diameter	Ø <sub>CORE</sub>	-	9	-	um

**Note:**

<sup>1</sup> BER=1E-12 @ 1.25 Gbps, PRBS7, NRZ, ER = 9 dB or greater

**Optical Pinout and Cross Options**



Pin/Socket	Cross = NO (blank or -01)	Cross = YES (-03 suffix)
P1	<b>RX2</b> - Channel 2 Optical Input	<b>RX1</b> - Channel 1 Optical Input
S1	<b>TX2</b> - Channel 2 Optical Output	<b>TX1</b> - Channel 1 Optical Output
P2	<b>RX1</b> - Channel 1 Optical Input	<b>RX2</b> - Channel 2 Optical Input
S2	<b>TX1</b> - Channel 1 Optical Output	<b>TX2</b> - Channel 2 Optical Output

**Note:**

**Cross option = YES** applies to part numbers that end in “-03” only.  
For example, T2F-DTL002-24VM-03 or T2K-DTL002-24VM-03..

### Link Control Options

Link control options (-01 or -03 suffix) will force the copper Ethernet link to a disconnect state when the optical link goes down. When the optical link is re-established, the Ethernet is reconnected. In this fashion, the host system is able to detect no connectivity unless both the copper and optical link are up.

Media Converters without link control (blank suffix) leave the copper Ethernet link always connected, regardless of the state of the optical link.

### Electrical Connector and Signal Definitions

T2F-DTL002-24VM, -01, -03, -03A



Glenair 800-012-07NF8-13PN  
Mil Circular Connector

### T2F-DTL

Pin	Symbol	Description
1	CH1_RX+	Channel 1, Receive Positive
2	CH1_RX-	Channel 1, Receive Negative
3	CH1_TX+	Channel 1, Transmit Positive
4	CH1_TX-	Channel 1, Transmit Negative
5	CH2_RX+	Channel 2, Receive Positive
6	CH2_RX-	Channel 2, Receive Negative
7	CH2_TX+	Channel 2, Transmit Positive
8	CH2_TX-	Channel 2, Transmit Negative
9	VCC	+9 ~ +32 VDC Input Power
10	GND	Ground
11, 12, 13	NC	No Connect

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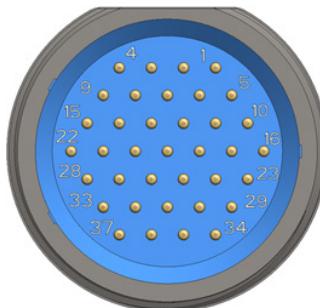
Stratos Optical Technologies

### Electrical Connector and Signal Definitions

T2K-DTL002-24VM, -01, -03

T2K-DTL202-24VM, -01, -03

T2K-DTL602-24VM, -01, -03



Glenair 800-012-07MT12-37PN  
Mil Circular Connector

### T2K-DTL

Pin	Symbol	Description
5	CH1_TP0+	Channel 1, Twisted Pair, 0 Positive
1	CH1_TP0-	Channel 1, Twisted Pair, 0 Negative
2	CH1_TP1+	Channel 1, Twisted Pair, 1 Positive
3	CH1_TP1-	Channel 1, Twisted Pair, 1 Negative
4	CH1_TP2+	Channel 1, Twisted Pair, 2 Positive
9	CH1_TP2-	Channel 1, Twisted Pair, 2 Negative
15	CH1_TP3+	Channel 1, Twisted Pair, 3 Positive
22	CH1_TP3-	Channel 1, Twisted Pair, 3 Negative
29	CH2_TP0+	Channel 2, Twisted Pair, 0 Positive
23	CH2_TP0-	Channel 2, Twisted Pair, 0 Negative
35	CH2_TP1+	Channel 2, Twisted Pair, 1 Positive
34	CH2_TP1-	Channel 2, Twisted Pair, 1 Negative
37	CH2_TP2+	Channel 2, Twisted Pair, 2 Positive
36	CH2_TP2-	Channel 2, Twisted Pair, 2 Negative
28	CH2_TP3+	Channel 2, Twisted Pair, 3 Positive
33	CH2_TP3-	Channel 2, Twisted Pair, 3 Negative
10, 11, 16, 17, 18	VCC	+9 ~ +32 VDC Input Power
6, 12, 13, 19, 20, 25, 26	GND	Ground
7, 8, 14, 21, 24, 27, 30, 31, 32	NC	No Connect

**Mechanical Properties**

**Plating Specification**

**EMI conductive seal area:**

Chem film per MIL-DTL-5541 Type 1, Class 111

Color: Clear

**All other areas:**

Hard Coat Anodize IAW MIL-A-8625

Type III, Class 2, Polytetrafluoroethylene (PTFE) Impregnated, 0.0012 in-0.0018 in THK

Color: Black



**External O-Ring**

**Standard EMI O-Ring**

Silicone Elastomer

Binder with silver aluminum conductive

Filler IAW MIL-DTL-83528G

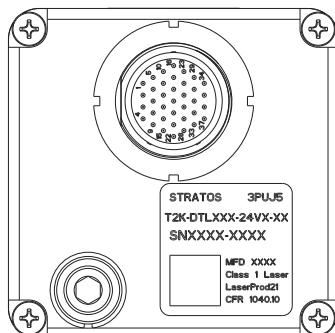
Color: Light beige or blue (Color depending on supplier)

Other external O-rings (non-conductive/non-EMI available by request)

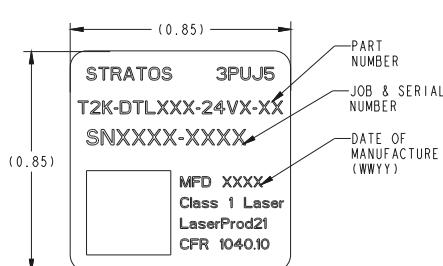
**Label**

**T2K-DTL**

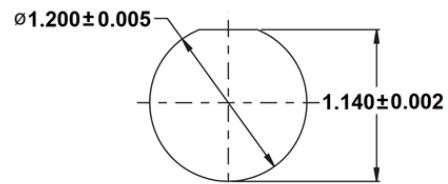
**Label Position**



**Label Detail**



**Bulkhead Cutout Dimension**



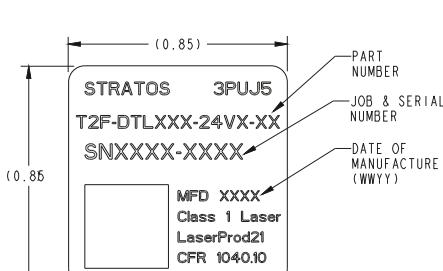
\*All dimensions in inches

**T2F-DTL**

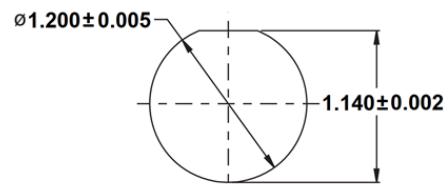
**Label Position**



**Label Detail**



**Bulkhead Cutout Dimension**



\*All dimensions in inches

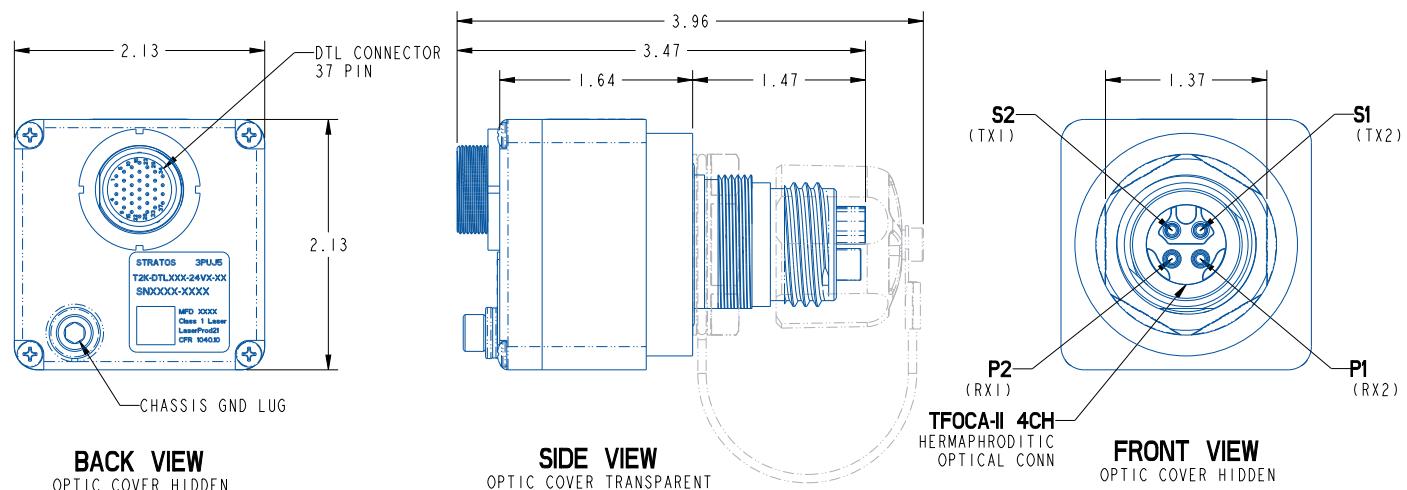
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TFOCA Media Converters

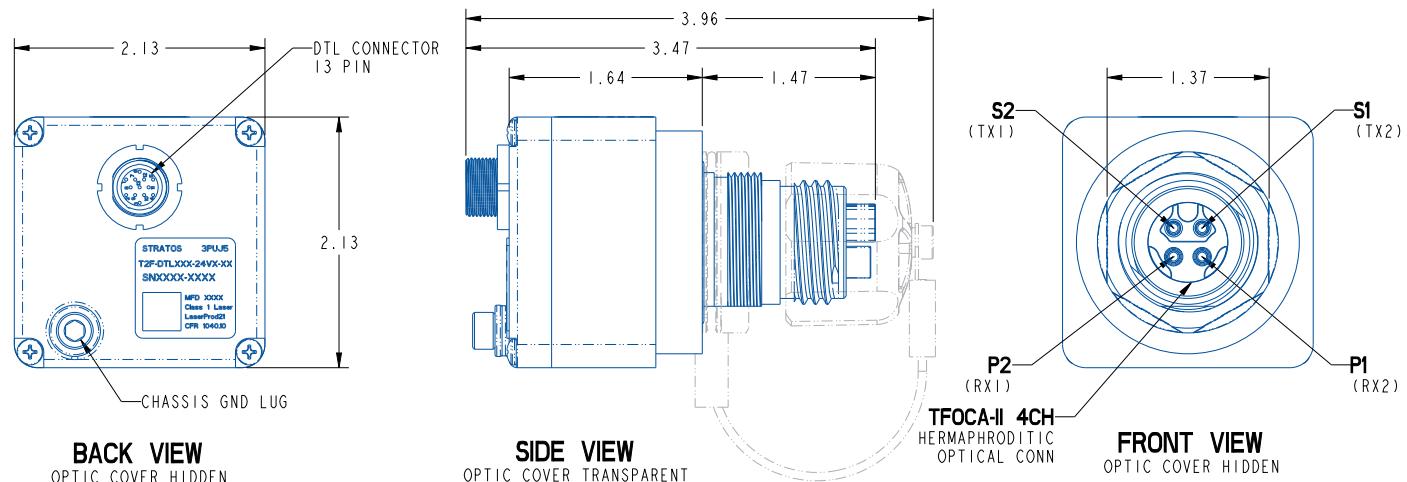
Stratos Optical Technologies

## Mechanical Dimensions (inches)

T2K-DTL



T2F-DTL

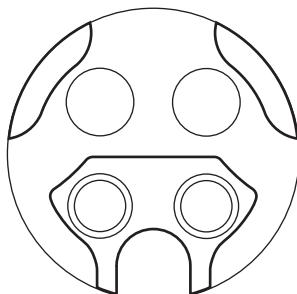


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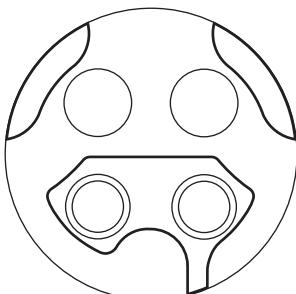
## TFOCA Media Converters

# Stratos Optical Technologies

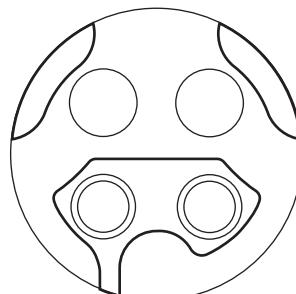
### TFOCA Connector Key Options



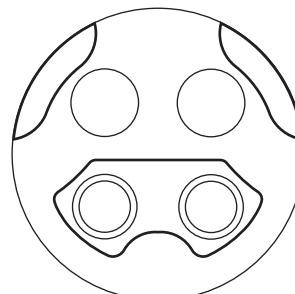
Default  
(Standard Key)



Key Option K2



Key Option K3



Key Option K4  
(Universal)

The T2 Series Media Converters are normally offered with the Default (Standard) Key on the TFOCA optical connector. Other Key options are available, consult the factory for alternate Key part numbers.

### Environmental Compliance

Category	Standard	Conditions
Operating Temperature	MIL-STD-810, Method 501 & 502	-40°C ~ +71°C
Thermal Shock	MIL-STD-810, Method 503	-40°C ~ +71°C
High Temp Operating Life	MIL-STD-202G, Section 108A	1000 hrs @ +71°C
Vibration	MIL-STD-810, Method 514.6	16.9 GRMS, 3 Axes, 1 hr Per Axis
Mechanical Shock	MIL-STD-810, Method 516.6	20G Peak, 18 ms
Humidity	MIL-STD-810, Method 507.5	85% RH, -32°C ~ +27°C
Altitude	MIL-STD-810, Method 500	40,000 ft Transport
MTBF	MIL-HDBK-217FN2	100,000 hrs, 30°C GB Environment

### Regulatory Compliance

Requirement	Feature	Condition	Notes
MIL-STD-883-3015.7	ESD	Class II	2200 V
IEC-801-2	ESD	Human Body Model	25 kV
IEC-801-3	EMI	Immunity	10 V/M
FCC	EMI	Class A	>20 dB
IEC-825 ISSUE 1993-11	Eye safety	Class 1	
FDA CDRH 21-CFR 1040	Eye safety	Class 1	



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