Lightning Series

MIL-DTL-38999 Optical Transceiver, 100Mbps to 3.2Gbps Applications, Multimode, 850nM

Single Port Transceiver Receptacle

One TX and One RX Channel Operating from 100Mbps to 3.2Gbps

FEATURES

- Suitable for ARINC 818, sFPDP and other applications from 100Mbps to 3.2Gbps
- Optical fiber link distances up to 550 Meters (50/125µ 500MHz*Km MMF)
- Maximum optical channel bit error rate less than $1x10^{-12}$
- Operating temperature range from -40°C to +85°C
- Shock, vibration and immersion resistant per MIL-STD-810
- Olive drab cadmium over electroless nickel plating meets stringent corrosion resistance requirements
- Aluminum alloy MIL-DTL-38999 housings are strong, durable, and light weight
- MIL-T-29504 compliant optical fiber connector interface
- MIL-DTL-32139 Compliant

APPLICATIONS

Lightning series bulkhead mounted optical transceivers enable high speed network communications over long distances in harsh environments.

- sFPDP data links
- ARINC 818 Video displays and drivers

The MIL-DIL-38999, Series III shell provides a sealed optical interface that is water-tight to MIL-STD-810 / IP67 / NEMA-4x when mated.

The multimode optical fiber interface supports applications where copper cable link distance, bandwidth, weight or bulk make the use of twisted pair, twinax or quadrax copper conductors unacceptable.

DESCRIPTION

Lightning series optical fiber transmitters consist of optoelectronic transmitter functions integrated into a bulkhead mounted MIL-DTL-38999, Series III receptacle connector. The optical transmitters are 850nm VCSEL lasers. The transmitter input lines are driven with differential CML signals applied to the transmitter (TX+ and TX-) lines. Dual loop, temperature compensated, VCSEL drivers convert the transmitter input signals to suitable VCSEL bias and modulation currents.

The optical receivers consist of PIN and preamplifier assemblies and limiting post-amplifiers. Outputs from the receivers consist of differential CML data signals on the receiver (RX+ and RX-) lines and single ended CMOS indicator functions on the Loss of Signal (LOS) lines. The receiver data lines are squelched upon LOS assertion, preventing errant data generation when an invalid incoming optical signal is presented to the transceiver.

The electrical interface to the Lightning series optical transmitters is a MIL-DTL-32139 compliant Nano-D connector.

Lightning series optical fiber transceiver are vibration isolated, environmentally hardened components designed for use in harsh environment applications.

ORDERING INFORMATION

Application	Part Number
100Mbps to 2.49Gbps	P38x-2S1D-Dx-ND
2.5Gbps to 3.2Gbps	P38x-2S1E-Dx-ND

MOOG

ABSOLUTE MAXIMUM RATINGS

Absolute maximum limits mean that no catastrophic damage will occur if the product is subjected to these ratings for short periods, provided each limiting parameter is in isolation and all other parameters have values within the performance specification. It should not be assumed that limiting values of more than one parameter can be applied to the product at the same time.

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Storage Temperature	T_S	-55		+100	°C
Supply Voltage	V_{CC}	-0.5		+4.5	V
Differential Input Voltage (p-p)	V_D			2.0	
					V

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Operating Temperature	T_A	-40		+85	°C
Supply Voltage	V_{CC}	+3.135		+3.465	V
TX Differential Input Voltage (p-p)	V_D	0.25		2.0	V
Power Supply Noise (p-p)	N_P			200	mV

CONNECTOR INTERFACE SPECIFICATIONS COMPLIANCE

Requirement	Feature	Condition	Notes
MIL-STD-883	ESD	Class II	2200V
MIL-STD-810	Vibration	$3.8g^2/Hz$	43G rms
MIL-STD-810	Shock	40.0g	6-9mS
MIL-STD-810	Immersion	1.0 meter	2 .0Hours
MIL-STD-1344	Flame Resistance	Method 1012	30 Seconds
MIL-STD-1344	Damp Heat	10 Cycles	24 Hours
MIL-STD-38999	Mating Durability	500 Cycles	<0.5dB Change
FDA / CDRH / IEC-825-1	Eye Safety	Class 1	No Safety Interlocks Required

MATERIALS

Item	Detail	Notes
Shell	Aluminum Alloy	
Shell Plating	Olive Drab Cadmium over Nickel	QQ-P-416, QQ-N-290
Insert	Thermoplastic	
Interfacial Seal	Elastomer	
Alignment Sleeves	Composite Polymer	
Printed Circuits	Polyimide / FR-4	Mil-P-31032 Type 4

OPTICAL TRANSMITTERS T_A = Operating Temperature Range, V_{CC} = 3.135V to 3.465V

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Output Power (BER<10^{-12})	P_o	-9.5		-4.0	dBm
Optical Output Wavelength	λ_{OUT}	830	850	860	nM
Spectral Width	$\Delta\lambda_{RMS}$			0.85	nM
Extinction Ratio	ER	6.0	9.0		dB
Optical Rise, Fall Time (20% to 80%)	$t_{R,F}$			150	pS

POWER SUPPLY CURRENT T_A = Operating Temperature Range, V_{CC} = 3.135V to 3.465V

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Current per TX	I_{CCT}		90	120	mA

OPTICAL RECEIVERS T_A = Operating Temperature Range, V_{CC} = 3.135V to 3.465V

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Sensitivity (BER<10^{-12}, ER=9.0) P38x-xxxD-xx @ 125Mbps to 1.25Gbps P38x-xxxD-xx @ 2.125Gbps P38x-xxxE-xx @ 2.5Gbps to 3.2Gbps	P_I	 -17.0 -15.0 -14.0		 0.0	 dBm
Optical Wavelength	λ_{IN}	830		860	nM
RX Data Output - Low	V_{OL} - V_{CC}	-1.810		-1.475	V
RX Data Output - High	V_{OH} - V_{CC}	-1.165		-0.880	V

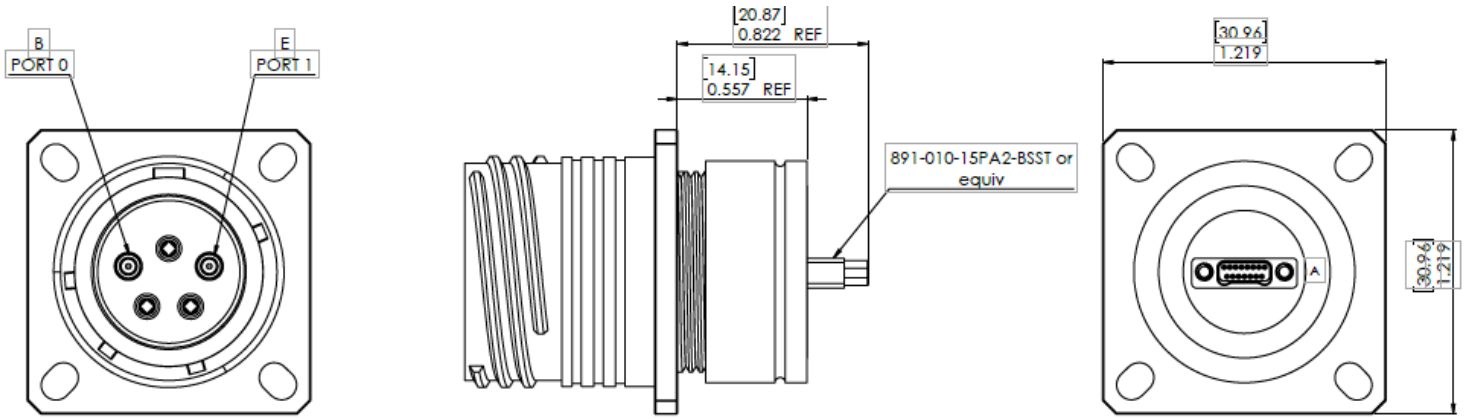
OPTICAL LINK DISTANCES

Protocol	62.5/125µ 200MHz*Km	50/125µ 500MHz*Km
2xFibre Channel - ANSI X3.297 FC-PI	150M	300M
Gigabit Ethernet - IEEE-802.3:2005	275M	550M
1xFibre Channel - ANSI X3.297 FC-PH-2	300M	500M

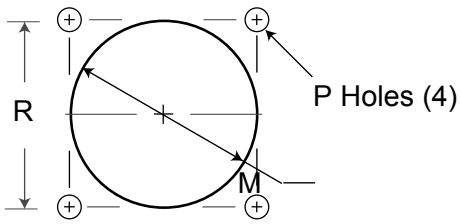
Single Port Lightning Series MIL-DTL-38999 Optical Transceiver, ARINC 818 and sFPDP Applications, Multimode

OUTLINE DRAWING - Flange Option

Dimensions are shown as: inches (mm)



Panel Cutout Dimensions Rear Panel Mounting Only				
Shell Size Code	**Shell Size**	**M Min**	**P Holes**	**R Bsc**
D	15	1.047 (26.59)	0.133 (3.4) 0.123 (3.1)	0.969 (24.6)

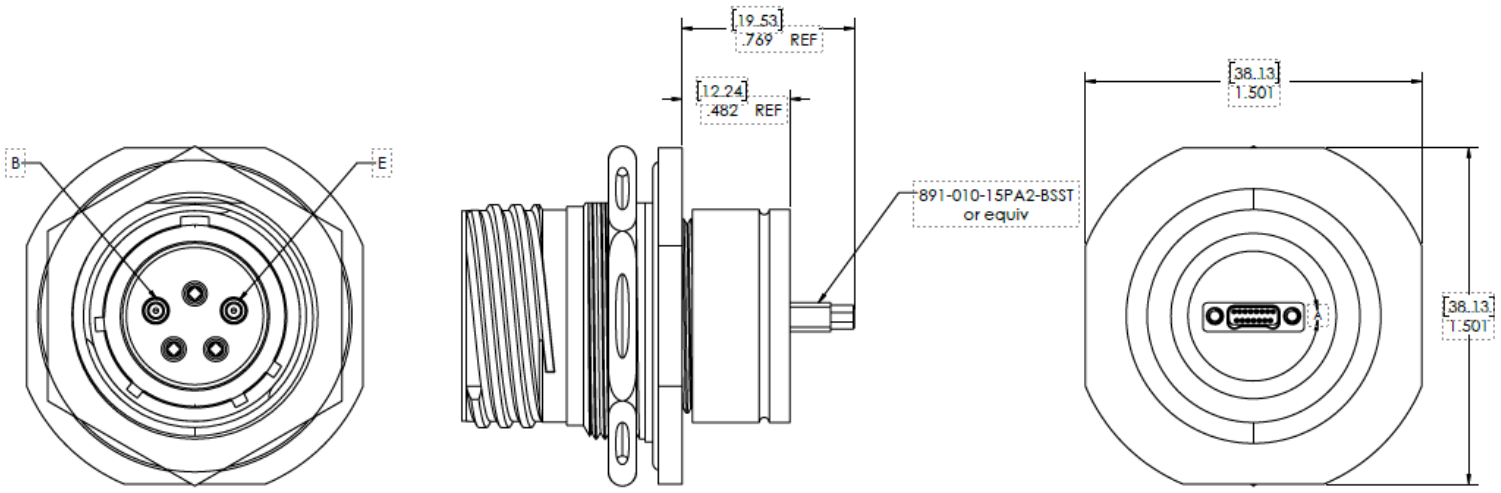


Part Number = *P38F-2xxx-Dx-ND

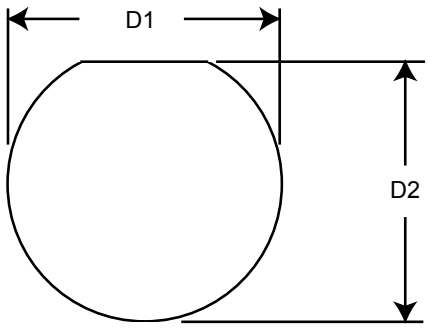
*see page 11 for complete ordering options

OUTLINE DRAWING - Jam Nut Option

Dimensions are shown as: inches [mm]



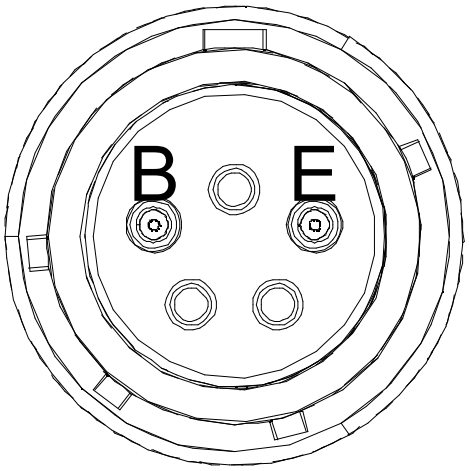
Panel Cutout Dimensions			
Shell Size Code	**Shell Size**	**D1 Min**	**D2 Min**
D	15	1.135 [28.83]	1.085 [27.56]



Part Number = *P38J-2xxx-Dx-ND
*see page 11 for complete ordering options

OPTICAL INSERT ARRANGEMENT

TOP



Front view of the MIL-DTL-38999 optical insert shown, fiber optic cable plug opposite - see Appendix A1 for mating connector details

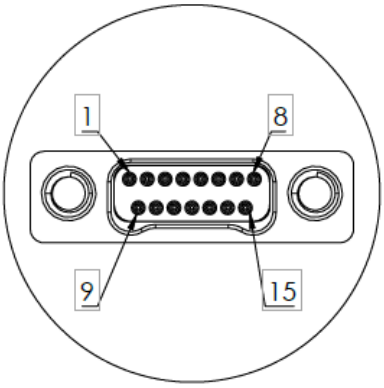
OPTICAL PORT ASSIGNMENTS

MIL-DTL-38999 OPTICAL INTERFACE	
FUNCTION	**PIN #**
TX	B
RX	E

Single Port Lightning Series MIL-DTL-38999 Optical Transceiver, ARINC 818 and sFPDP Applications, Multimode

NANO-D ELECTRICAL PIN ASSIGNMENTS

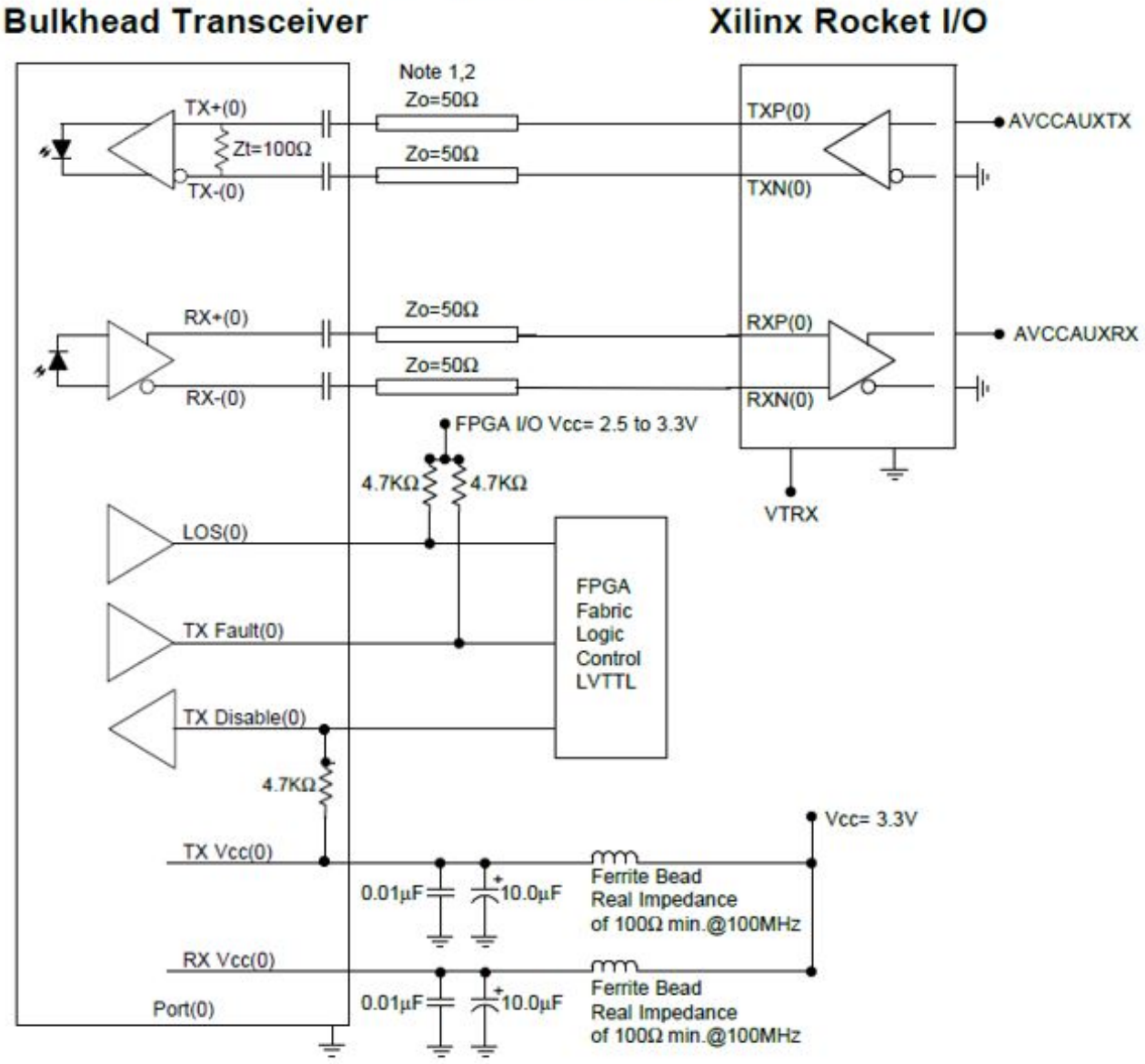
All dimensions shown are for reference only: inches [mm]



PIN NUMBER	SYMBOL	DESCRIPTION	LOGIC FAMILY
1	RX_VCC	POWER SUPPLY	N/A
2	GND	GROUND	N/A
3	LOS	LOSS OF SIGNAL - OUTPUT Logic 1: UNSATISFACTORY OPTICAL INPUT Logic 0: SATISFACTORY OPTICAL INPUT	OPEN DRAIN CMOS
4	NC	FACTORY CONNECT ONLY	N/A
5	TX_DIS	Transmit Disable - Input Logic 1: Disable Optical Output Logic 0: Enable Optical Output	CMOS Internal 4.7KΩ to 10.0KΩ pullup
6	TX_FAULT	INTERNAL TX FAULT INDICATOR - OUTPUT Logic 1: INTERNAL FAULT Logic 0: SATISFACTORY OPERATION	OPEN DRAIN CMOS
7	GND	GROUND	N/A
8	TX_VCC	POWER SUPPLY	N/A
9	GND	GROUND	N/A
10	RX-	RECEIVER DATA OUTPUT	CML (INTERNALLY AC COUPLED) Internal 100Ω differential termination
11	RX+	RECEIVER DATA OUTPUT	CML (INTERNALLY AC COUPLED) Internal 100Ω differential termination
12	GND	GROUND	N/A
13	TX+	TRANSMITTER DATA INPUT	CML (INTERNALLY AC COUPLED) Internal 100Ω differential termination
14	TX-	TRANSMITTER DATA INPUT	CML (INTERNALLY AC COUPLED) Internal 100Ω differential termination
15	GND	GROUND	N/A

APPLICATION SCHEMATIC

For Xilinx Rocket I/O Interfaces



Typical application schematic shown
For alternate applications or termination techniques, please consult the Factory

Note: 1
When using controlled impedance cable (Coaxial cable) and Pre_Emphisis, lengths of 1.0meter are obtainable.

Note: 2
50 Ohm impedance termination shown. For alternate impedance requirements, please consult the Factory.

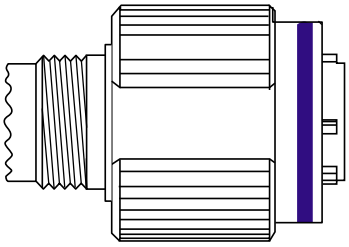
APPENDIX A1

MIL-DTL-38999 FIBER OPTIC CABLE PLUG / MIL-T-29504 PIN TERMINI

*See DSCC or SAE QPL for Approved Suppliers
http://www.dscc.dla.mil/programs/qmlqpl/QPLdetail.asp?QPL=38999

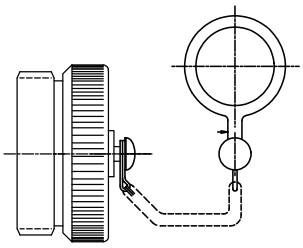
*D38999 PLUG - PIN INSERT

MIL-DTL-38999 CABLE PLUG	
MS PLUG P/N	*D38999/26WD5PN



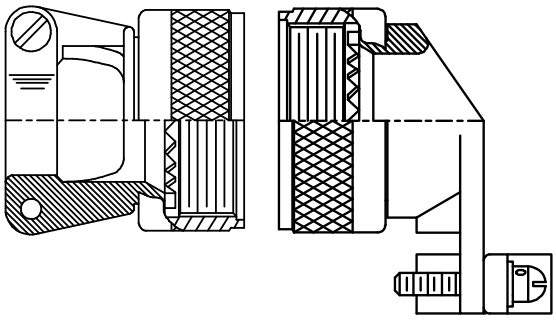
*CABLE PROTECTION CAP

D38999/32 PLUG PROTECTION CAP	
MS PLUG CAP P/N	*D38999/32W15N



*CABLE BACKSHELL

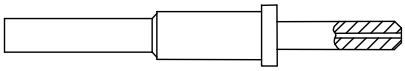
MIL-C-85049 CABLE BACKSHELL	
MS BACKSHELL P/N	*MS85049/xxxxxx**



**Straight or angled backshell - defined by application / mounting configuration

*FIBER OPTIC PIN TERMINUS

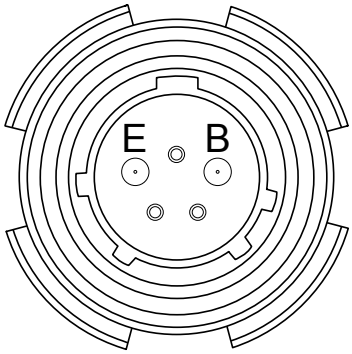
MIL-T-29504 PIN TERMINUS	
MS PIN TERMINUS P/N	*M29504/04-xxxx**



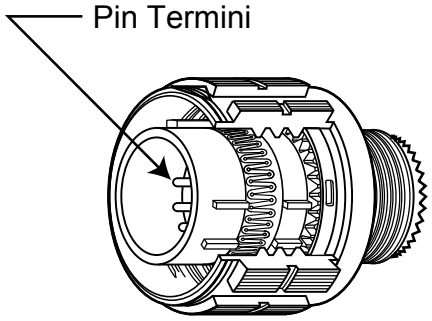
**defined by fiber optic cable configuration

D38999 PLUG PORT FUNCTIONS

FUNCTION	PIN
TX	B
RX	E



Front face of the optical cable plug pin insert shown. Transceiver insert opposite.



APPENDIX A2
PART NUMBER OPTIONS
Dual Port Transmitters

P38 x - 2 S 1 x - D x x - ND

Shell Configuration
P38= 38999 Receptacle

Shell Configuration
F = Square Flange
J = Jam Nut

 # Channels
2= 1TX + 1RX

Functions
S = 850nM

Cable Mode
1= Multimode

Fiber Optic Interface
D = 100Mbps - 2.49Gbps
E = 2.5Gbps-3.2Gbps

Shell Size Code
D = 15-05

Shell Plating
F = NI
W = OD CD / NI
Z = ZN - NI

Polarization
(leave blank) _ = N
A = A
B = B
C = C
D = D

Electrical Interface
ND = MIL-DTL-32139 compliant Nano-D connector

Other wavelength,mounting and port count options are available.
Please consult the Protokraft website for alternate configurations.

MOOG PROTOKRAFT

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