Fiber Optic Solutions for Geophysical Applications

Amphenol

Fiber Systems International

Contents

Amphenol Fiber Systems International (AFSI) designs, manufactures, markets, and supports reliable and innovative fiber optic interconnect solutions optimized to withstand the harsh environments of oil & gas, mining and other geophysical applications. After more than a decade in business, AFSI continues to maintain its position as a global leader in fiber optic interconnect components and systems. Wherever there is a need for superior cost-effective fiber optic systems and products able to withstand demanding environments, you can rely on AFSI for engineering know-how, top-quality products and expert technical support.

Industries Served

AFSI is a global leader in rugged fiber optic interconnect and optical system technologies. Markets or industries utilizing AFSI's products include:

- Oil & gas
- Mining
- Network disaster recovery
- Deployable seismic systems
- Optical sensing
- Marine and land-based geoseismic
- Broadcast
- Aeronautical and airframe
- Tactical deployed communications
- Shipboard communication and navigation
- Ship-to-Shore (Pierside) communications

Products

AFSI provides a wide range of products including:

- Fiber optic connectors and assemblies
- Fiber optic termini
- Optical switching systems
- Electrical-to-Optical-to-Electrical (E-O-E) solutions
- System design services
- Ancillary products such as training, termination kits, test equipment and assembly tools


CERTIFICATE OF REGISTRATION

MOODY INTERNATIONAL CERTIFICATION

This is to certify that the Quality Management Systems of:

Fiber Systems International

1300 Central Expressway North, Suite 100
Allen, TX 75013
USA

ISO 9001:2000

Scope: Design, development, and manufacture of fiber optic products

Reg. Number: 0405006 Date of Issue: 03-Feb-05
Date of Expiration: 18-Jan-08

ANAB

Cable Assemblies

AFSI is one of the world's leading manufacturers of harsh environment fiber optic connectors and cable assemblies for geophysical applications. AFSI's products are found in the leading seismic, mining and offshore equipment manufacturers and service providers.

AFSI cable assemblies are manufactured by expert technicians in our state-of-the-art, ISO 9001:2000 certified facility. (See below.) This ensures that our processes and practices are optimized for the uniquerequirements of fiber optic cable assemblies rather than one-size-fits-all electrical assemblies.

AFSI technicians, skilled in procedures critical to manufacturing harsh environment fiber optic cable assemblies, can assist in designing and building custom assemblies or building to a customer print. An optical test report is included with every completed cable assembly. If required, AFSI will conduct environmental testing. With every cable assembly, our goal is to exceed customer requirements.

TFOCA-II®

The TFOCA-II® fiber optic connectors are ideally suited for harsh operating environment applications in the oil & gas industry requiring high-density optical interconnect solutions.

The TFOCA-II® sealed free-floating termini form the heart of the TFOCA-II® family of deployable fiber optic connectors. The unique termini design enables TFOCA-II® connectors to seal against high humidity and moisture conditions while allowing full axial and orbital movement of the mated termini, providing low insertion loss and minimal back reflection.

AFSI has further refined this successful design to address the unique needs of the oil & gas industries. Accordingly, the TFOCA-II® is offered in anodized aluminum, stainless steel and brass with a variety of cable options such as tactical, armor sheathed, rodent proof and fire proof, meeting IEC 331 enhanced requirements.

Applications

- FPSO
- Wellhead connections for permanent gauges
- Drilling rig control lines
- BOP control lines
- Drill ships (Marine)
- Underground mine communications
- Miner tracking systems
- CCTV networks
- SCR house control lines
- Tender rig bridles
- Continuous miner controls

Features & Benefits

- Hermaphroditic design for versatility
- Removable insert cap facilitates cleaning
- 4 & 12-channel connector designs
- Improved cable retention strength
- Commercial ceramic ferrule technology
- Hermaphroditic dust cap
- Optional key configurations
- Field repairable using existing parts
- Multiple materials & finishes available

TFOCA-II® 4-Ch Specifications

Parameter	Typical	Maximum
Insertion Loss (multimode) Per Mated Pair/Connection	0.30dB	0.75dB
Insertion Loss (single mode) Per Mated Pair/Connection	0.40dB	0.75dB
Back Reflection/Return Loss (SM-UPC Polish)	-50dB	-40dB

Specification	Measurement/Detail
Operating Temperature	-46°C to +71°C
Storage Temperature	-55°C to +85°C
Mud	5 minute immersion, clean with water (per MIL-PRF-83526 requirements)
Water Immersion	EIA/TIA-455-40, Water, 1m, 48hr
Ice Crush	DOD-STD-1678, Method 4050
Humidity	EIA/TIA-455-5
Flammability	MIL-STD-1344, Method 1012
Vibration (operational)	EIA/TIA-455-11
Shock	EIA/TIA-455-14, Condition A
Mating Durability	2,000 cycles per EIA/TIA-455-21
Cable Seal Flexing	100 cycles per EIA/TIA-455-1
Twist	1,000 cycles per EIA/TIA-455-36
Cable Retention	400 pounds minimum per EIA/TIA-455-6, 1hr (applies to plug and strain relief receptacles); 800 pounds typical
Impact	EIA/TIA-455-2, Method B
Crush Resistance	450 pounds minimum per EIA/TIA-455-26
EMI Shielding Effectiveness (receptacle only)	>60dB per IEEE-299, 15KHz to 10GHz
Corrosion Resistance	EIA/TIA-455-16

TFOCA-II® 4-Ch Ordering (Plugs)

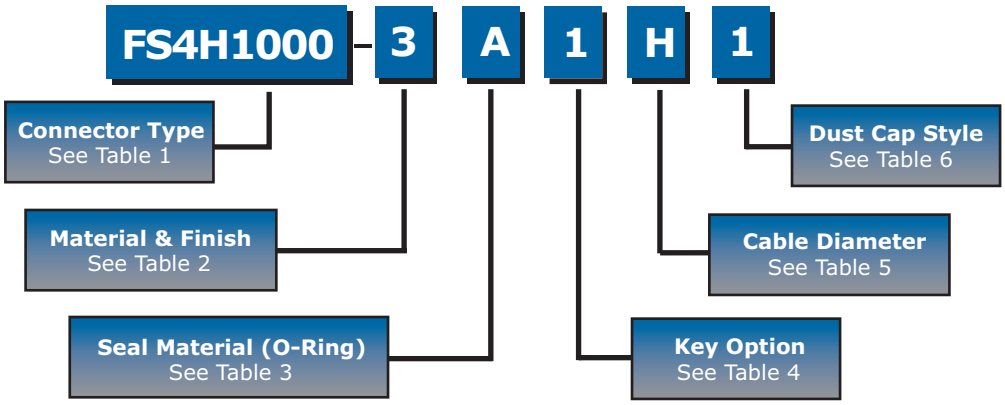


Table 1

Connector Type	Part Number
TFOCA-II® Plug	FS4H1000
TFOCA-II® 90° Plug	FS4H1090

Table 2

Material & Finish	Dash Number
6061-T6 (Al) Black Hard Anodize	3
C63000 Bronze	A
C36000 Brass 360	B
303 Stainless Steel	C
304 Stainless Steel	E
316 Stainless Steel	F

Table 3

Seal Material (O-Ring)	Dash Number
Nitrile	A

Table 4

Key Option	Dash Number
Key 1	1
Key 2	2
Key 3	3
Key U	4

Table 5

Cable Diameter Inch (mm)	Dash Number
0.150-0.190 (3.81-4.83)	P
0.190-0.239 (4.83-6.07)	H
0.240-0.279 (6.10-7.09)	F
0.270-0.290 (6.86-7.37)	N
0.280-0.315 (7.11-8.00)	A
0.316-0.346 (8.03-8.79)	B
0.347-0.379 (8.81-9.63)	G
0.380-0.423 (9.65-10.74)	C
0.424-0.465 (10.77-11.81)	D

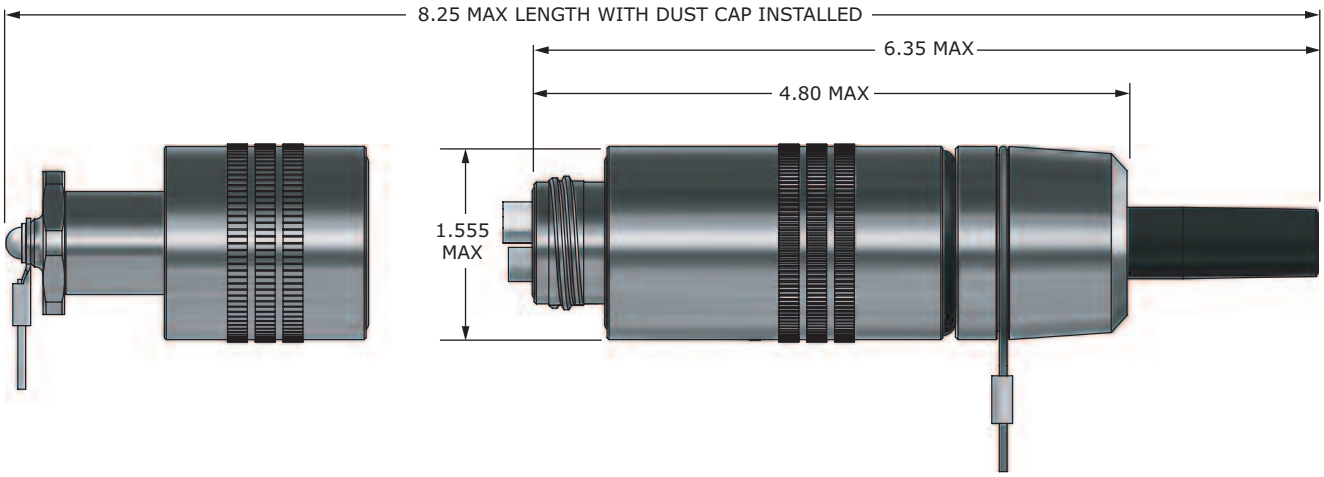
Table 6

Dust Cap Style	Dash Number
Hermaphroditic, 4-Ch	1
Male, 4-Ch	2
Female, 4-Ch	3
Hermaphroditic, 4-Ch Black Plastic	A
Male, 4-Ch Black Plastic	C
Female, 4-Ch Black Plastic	E

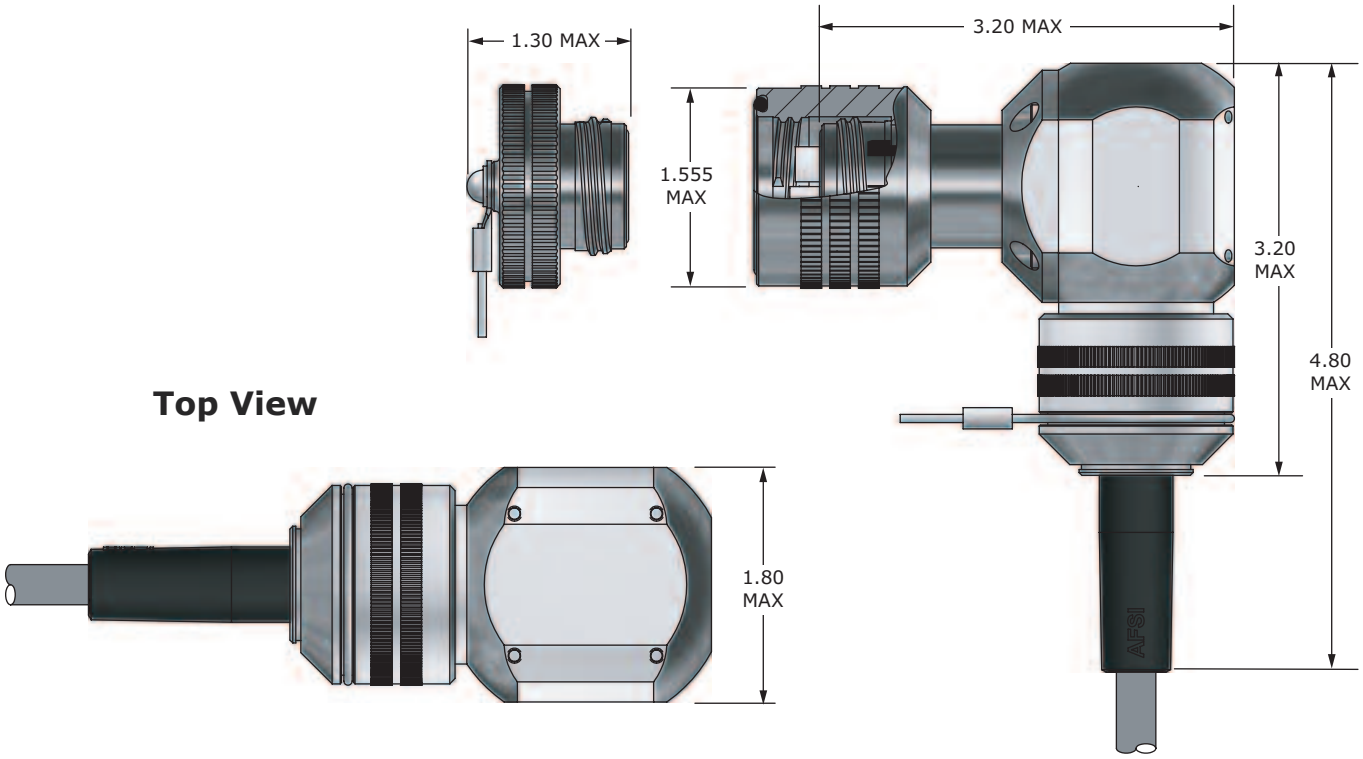
Example Part Number - FS4H1000-3A1H1

FS4H1000 - TFOCA-II® Plug
3 - 6061-T6 (Al) Black Hard Anodize
A - Nitrile
1 - Key 1
H - 0.190-0.239 (4.83-6.07)
1 - Dust Cap Assy, Hermaphroditic

FS4H1000
TFOCA-II® Plug



FS4H1090
TFOCA-II® 90° Plug



Dimensions are for reference only. Dimensions are in inches.

TFOCA-II® 4-Ch Ordering (Receptacles)

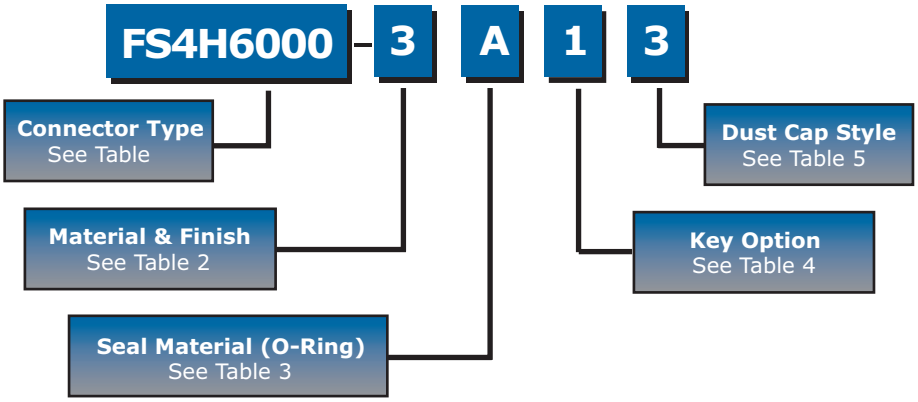


Table 1

Connector Type	Part Number
TFOCA-II® Flange Mount Receptacle, External Mount	FS4H6000
TFOCA-II® Flange Mount Receptacle, Internal Mount	FS4H6080
TFOCA-II® Jam Nut Receptacle, External Mount	FS4H8000
TFOCA-II® Jam Nut Receptacle, Internal Mount	FS4H8080

Table 2

Material & Finish	Dash Number
6061-T6 (Al) Black Hard Anodize	3
C63000 Bronze	A
C36000 Brass 360	B
303 Stainless Steel	C
304 Stainless Steel	E
316 Stainless Steel	F

Table 3

Seal Material (O-Ring)	Dash Number
Nitrile	A

Table 4

Key Option	Dash Number
Key 1	1
Key 2	2
Key 3	3
Key U	4

Table 5

Dust Cap Style	Dash Number
Female, 4-Ch	3
Female, 4-Ch Black Plastic	E

Example Part Number - FS4H6000-3A13

FS4H6000 - TFOCA-II® External Flange Mount Receptacle
3 - 6061-T6 (Al) Black Hard Anodize
A - Nitrile
1 - Key 1
3 - Dust Cap Assy, Female

TFOCA-II® 4-Ch Ordering (SRR Receptacles*)

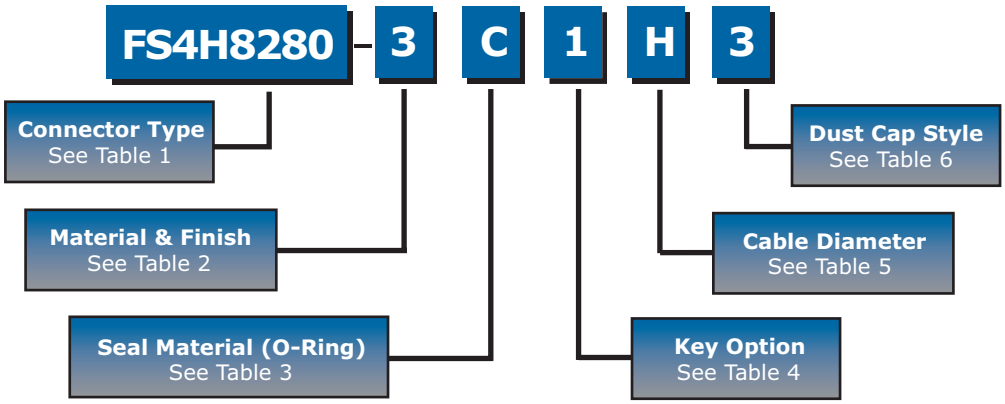


Table 1

Connector Type	Part Number
TFOCA-II® Flange Mount Strain Relief Receptacle, External Mount	FS4H6200
TFOCA-II® Jam Nut Strain Relief Receptacle, Internal Mount	FS4H8280

Table 2

Material & Finish	Dash Number
6061-T6 (Al) Black Hard Anodize	3
C63000 Bronze	A
C36000 Brass 360	B
303 Stainless Steel	C
304 Stainless Steel	E
316 Stainless Steel	F

Table 3

Seal Material (O-Ring)	Dash Number
Nitrile	A

Table 4

Key Option	Dash Number
Key 1	1
Key 2	2
Key 3	3
Key U	4

Table 5

Cable Diameter Inch (mm)	Dash Number
0.150-0.190 (3.81-4.83)	P
0.190-0.239 (4.83-6.07)	H
0.240-0.279 (6.10-7.09)	F
0.270-0.290 (6.86-7.37)	N
0.280-0.315 (7.11-8.00)	A
0.316-0.346 (8.03-8.79)	B
0.347-0.379 (8.81-9.63)	G
0.380-0.423 (9.65-10.74)	C
0.424-0.465 (10.77-11.81)	D

Table 6

Dust Cap Style	Dash Number
Female, 4-Ch	3
Female, 4-Ch Black Plastic	E

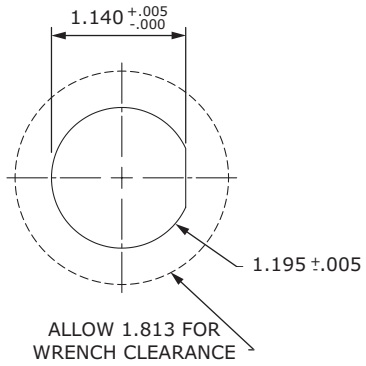
*** Receptacle w/ Integrated Strain Relief**

Example Part Number - FS4H8280-3A1H3

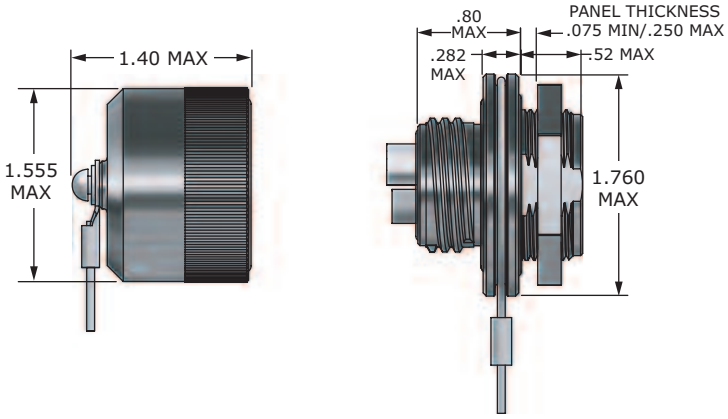
FS4H8280 - TFOCA-II® Jam Nut Strain Relief Receptacle (SRR)
3 - 6061-T6 (Al) Black Hard Anodize
A - Nitrile
1 - Key 1
H - 0.190-0.239 (4.83-6.07)
3 - Dust Cap Assy, Female

TFOCA-II® 4-Ch Jam Nut Receptacles

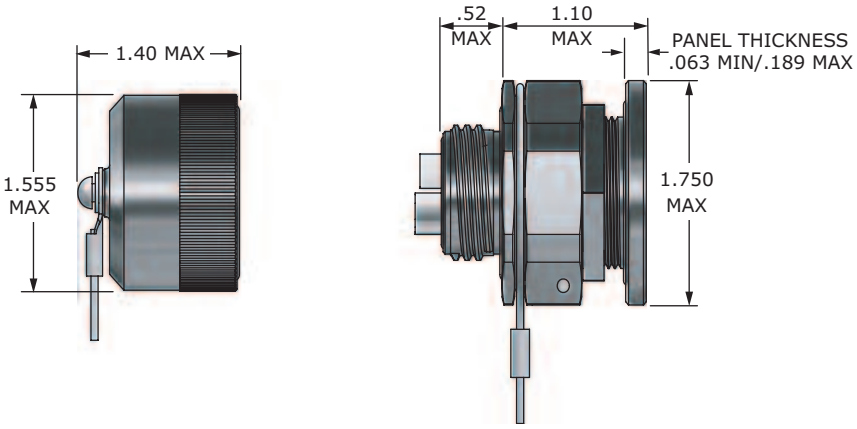
Panel Cut-Out
(Dimensions are the same for FS4H8000, FS4H8080 & FS4H8280)



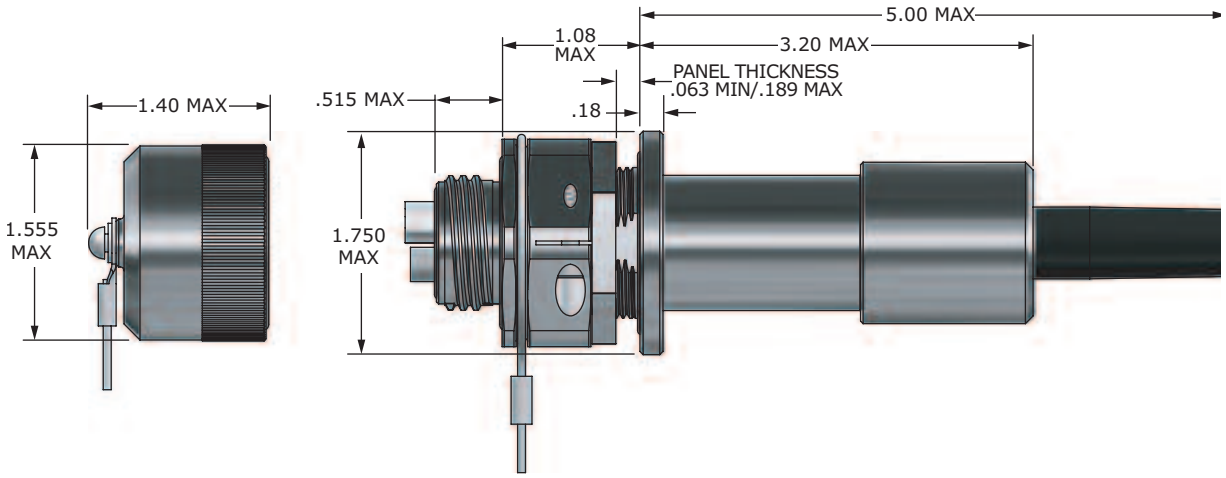
FS4H8000
TFOCA-II® Jam Nut Receptacle
(External Mount)



FS4H8080
TFOCA-II® Jam Nut Receptacle
(Internal Mount)



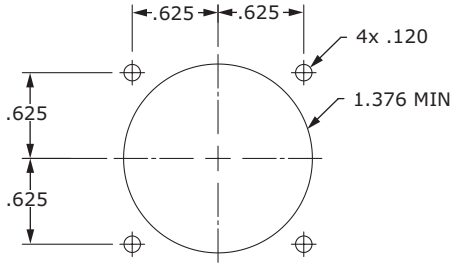
FS4H8280
TFOCA-II® Jam Nut Strain Relief Receptacle (SRR)
(Internal Mount)



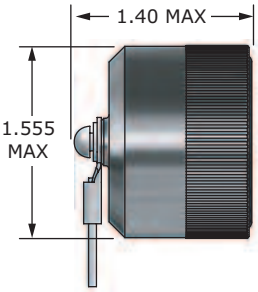
Dimensions are for reference only. Dimensions are in inches.

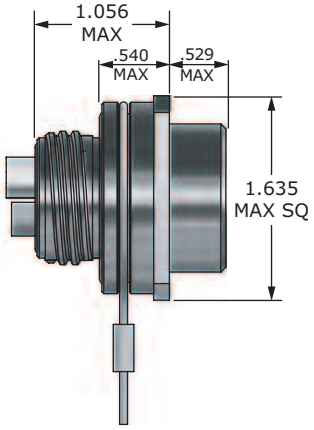
TFOCA-II® 4-Ch Flange Receptacles

FS4H6000
TFOCA-II® Flange Mount Receptacle
(External Mount)

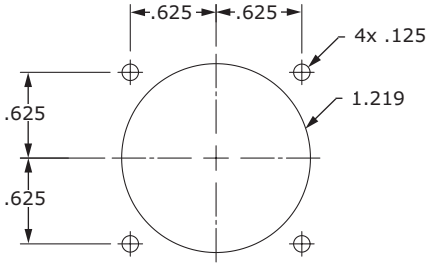


Panel Cut-Out





FS4H6080
TFOCA-II® Flange Mount Receptacle
(Internal Mount)



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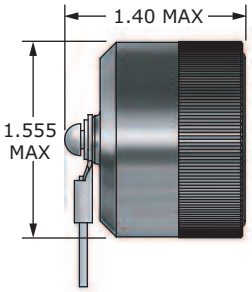
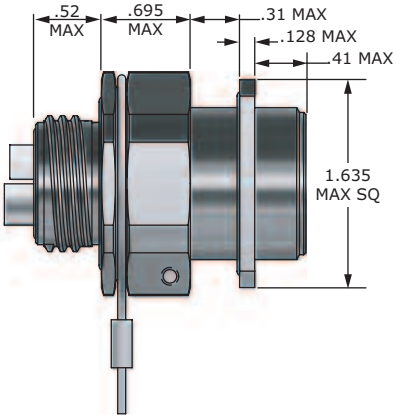
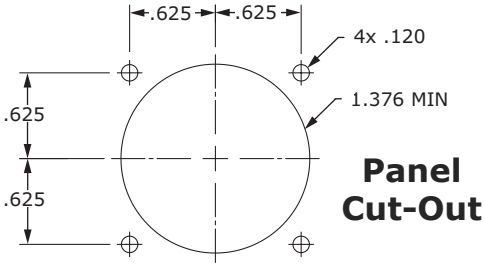
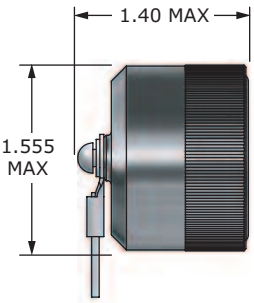


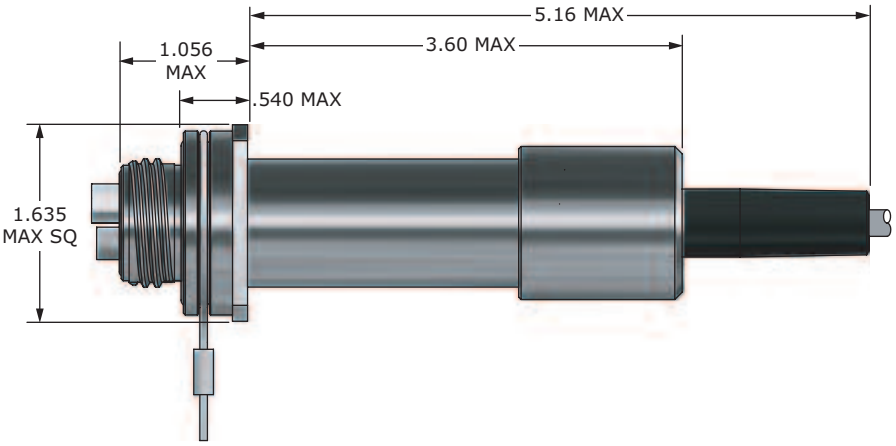




Panel Cut-Out



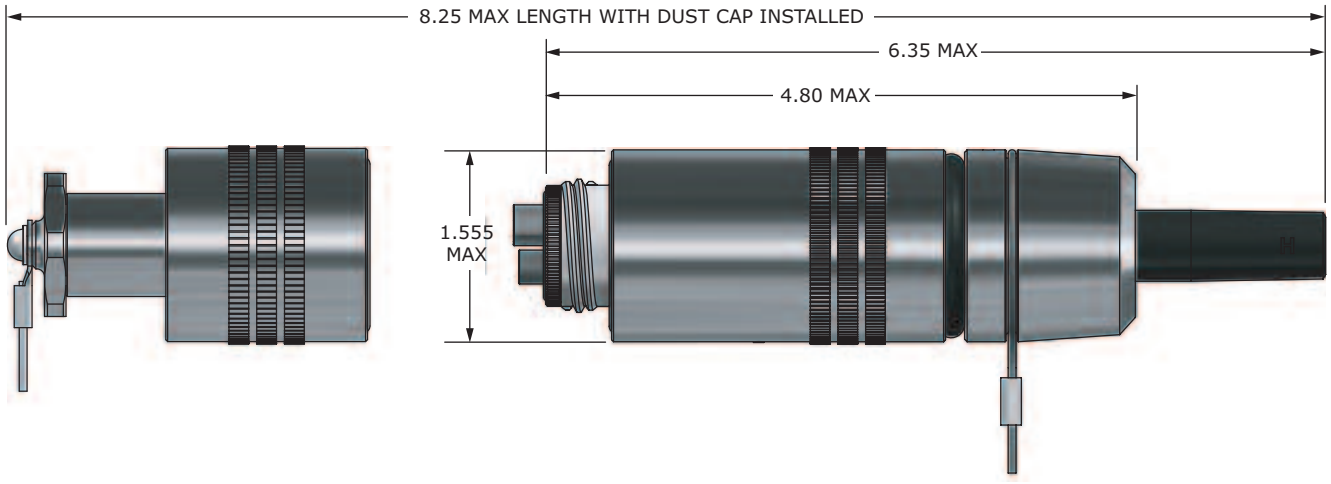
FS4H6200
TFOCA-II® Flange Mount Strain Relief Receptacle (SRR)
(External Mount)



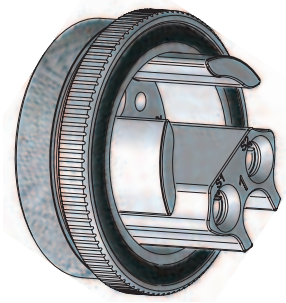
Dimensions are for reference only. Dimensions are in inches.

For Rapid Field Maintenance Without The Need For Tools

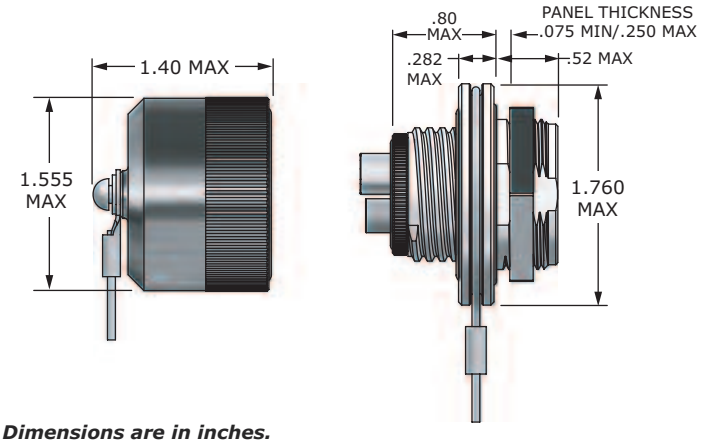
ProCLEAN 4-Ch Hermaphroditic Plug



ProCLEAN Removable Insert Cap With Integral Alignment Sleeves



ProCLEAN 4-Ch Jam Nut Receptacle

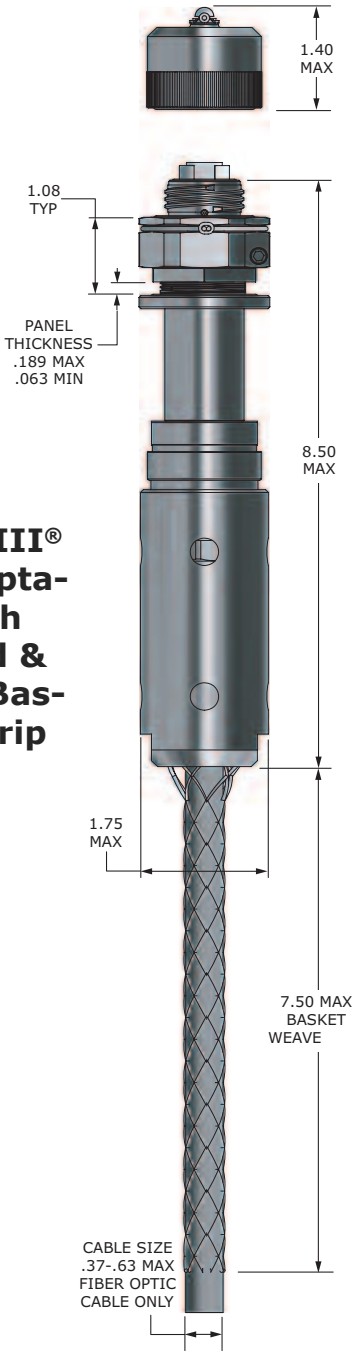


Dimensions are for reference only. Dimensions are in inches.

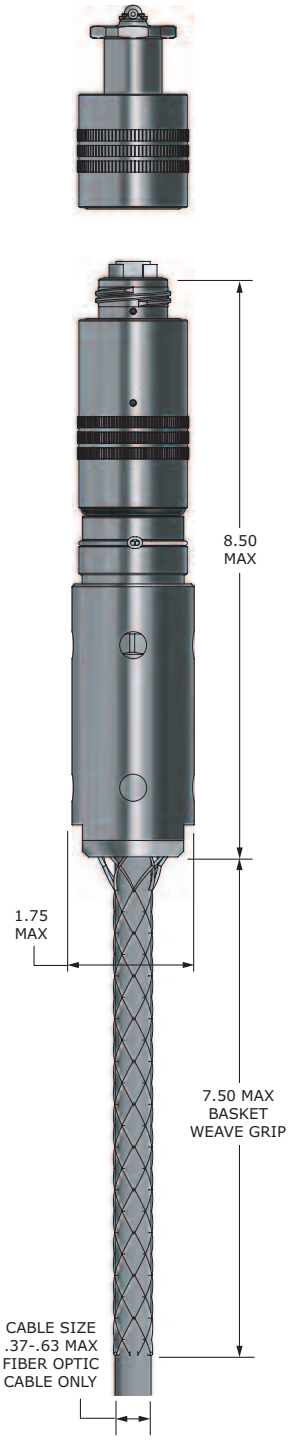
Severe Duty Cable Connectors

TFOCA-II® & III® for Armored and Sheathed Cable Applications
Available in 4, 6, 12 & 24-Channels

TFOCA-II® & III® Jam Nut Receptacle SRR with Hawke Gland & Strain Relief Basket Weave Grip

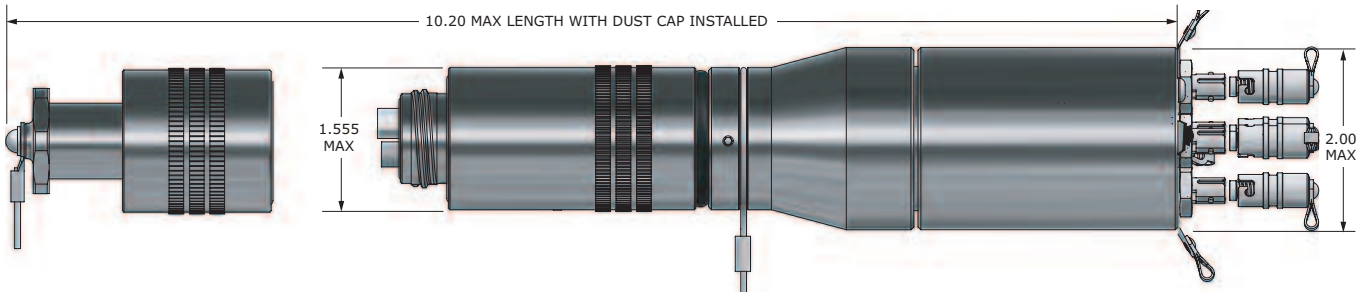


TFOCA-II® & III® Plug with Hawke Gland & Basket Weave Grip

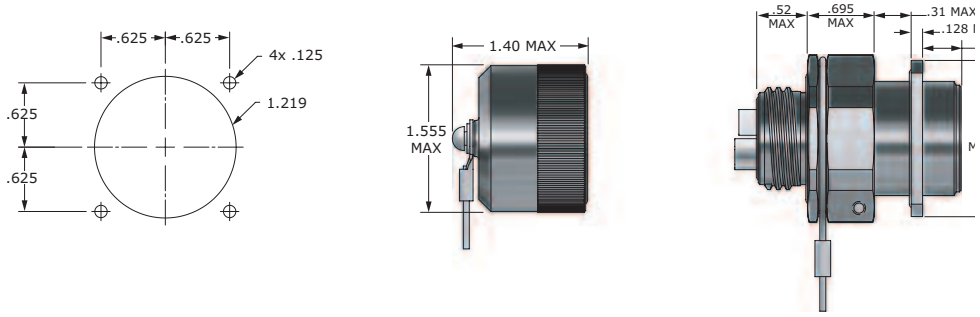


Dimensions are for reference only. Dimensions are in inches.

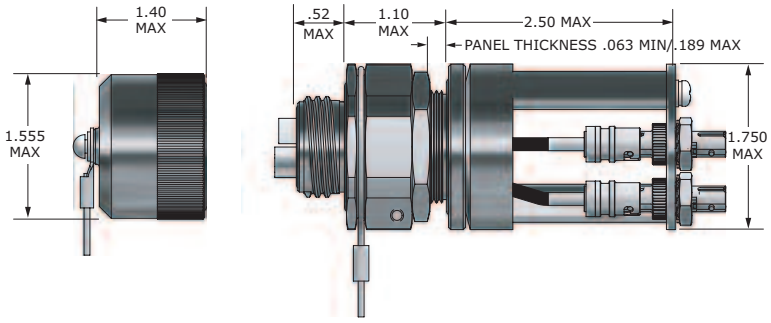
TFOCA-II® 4-Ch Plug with Integrated Patch Panel



TFOCA-II® 4-Ch Flange Mount Receptacle with Integrated Patch Panel



TFOCA-II® 4-Ch Jam Nut Receptacle with Integrated Patch Panel



Dimensions are for reference only. Dimensions are in inches.

GoldRush® Connectors (MSHA Certified)

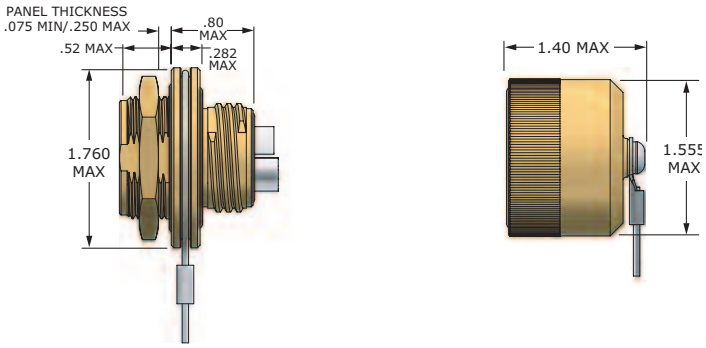
GoldRush®

AFSI anticipated the need for a next generation fiber optic connector capable of withstanding the rigors and hazards of underground mining. The GoldRush® series of connectors builds on the proven legacy of the TFOCA-II® and addresses the unique needs of the mining industry. These innovative interconnect solutions have become an enabling technology for "digital mining." AFSI's GoldRush® connectors address specific mining requirements for the future of intelligent mining.

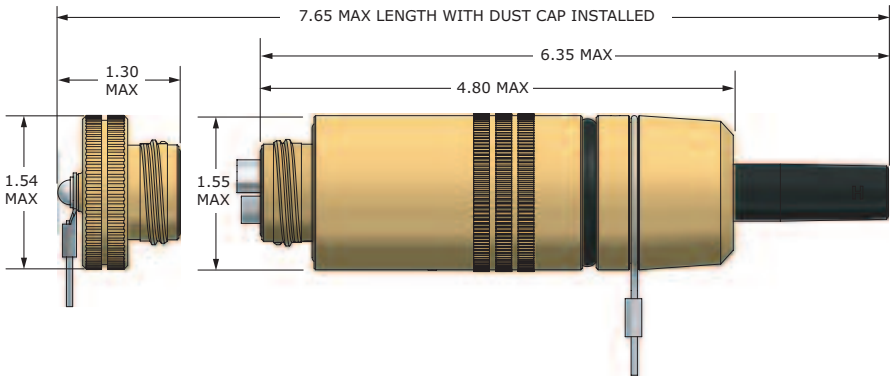
The GoldRush® connectors are the only Mining Safety and Health Administration (MSHA) certified fiber optic connectors for use in underground mines under Title 30 CFR, Part 18.

The heart of the GoldRush® family of deployable fiber optic connectors features the TFOCA-II® "sealed" free-floating termini. This revolutionary design enables GoldRush® connectors to seal against high humidity and moisture conditions while allowing full axial and orbital movement of the mated termini, providing the lowest possible insertion loss.

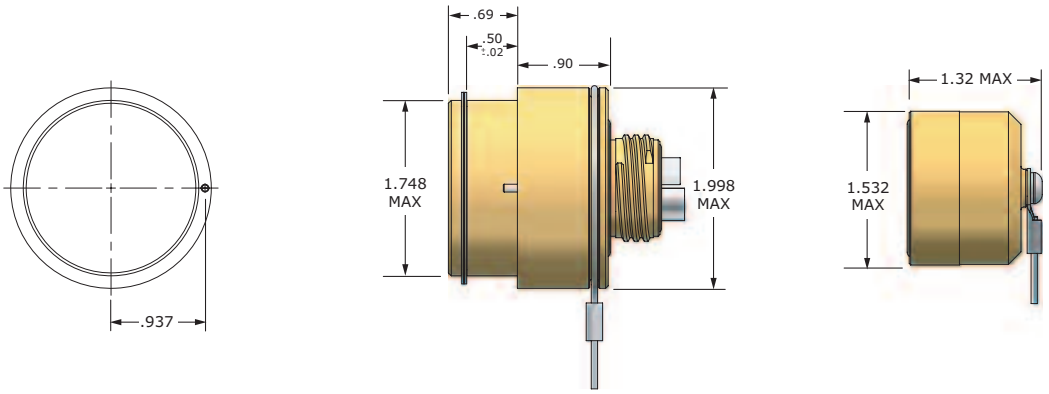
GoldRush® FS4H5001
4-Ch Jam Nut Receptacle



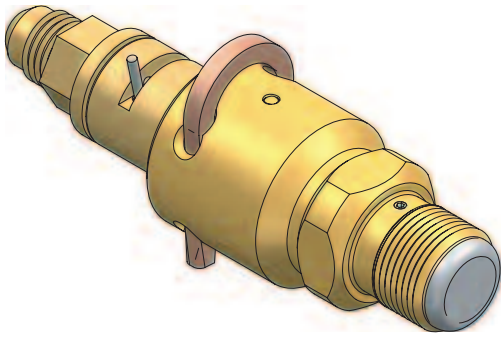
GoldRush® FS4H5000 4-Ch Hermaphroditic Plug



GoldRush® FS4H5002
4-Ch Receptacle with 2" Packing Gland



Dimensions are for reference only. Dimensions are in inches.



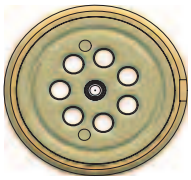
StapleMate®

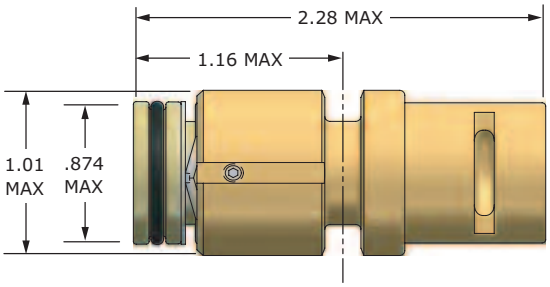
StapleMate®

AFSI has developed the next generation "longwall shield communications" deployable fiber optic connector. The StapleMate® connector was designed for use with standard industry hose conduit. It can be configured to use fiber contacts, electrical contacts or a combination of both. The StapleMate® connectors were developed to withstand the harsh environments of underground mining.

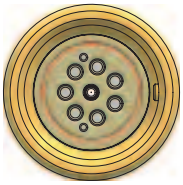
This revolutionary connector provides mining engineers with real-time data on the longwall shield, allowing better control and faster emergency response time. To provide a safer work environment, StapleMate® connectors allow placement of the remote control unit far from the longwall shields, or above ground.

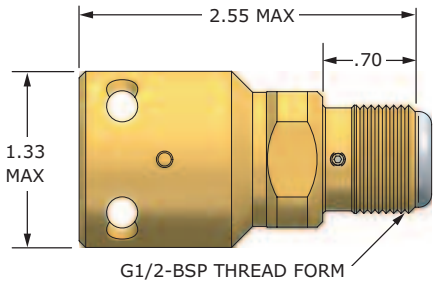
StapleMate® FS335000 - Plug



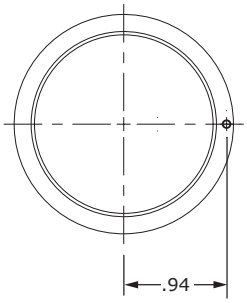


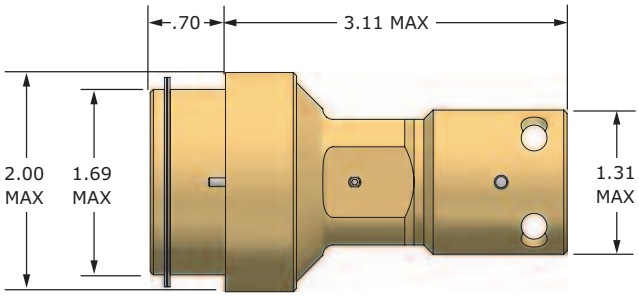
StapleMate® FS335001 - Receptacle

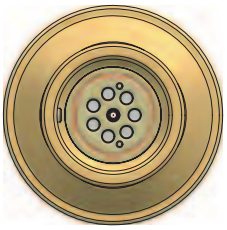




StapleMate® FS335002 - 2.00" Packing Gland







Dimensions are for reference only. Dimensions are in inches.

TFOCA-II® 12-Ch Specifications

Parameter	Typical	Maximum
Insertion Loss (multimode) Per Mated Pair/Connection	0.30dB	0.75dB
Insertion Loss (single mode) Per Mated Pair/Connection	0.40dB	0.75dB
Back Reflection/Return Loss (SM-UPC Polish)	-50dB	-40dB

Specification	Measurement/Detail
Operating Temperature	-46°C to +71°C
Storage Temperature	-55°C to +85°C
Mud	5 minute immersion, clean with water (per MIL-PRF-83526 requirements)
Water Immersion	EIA/TIA-455-40, Water, 1m, 48hr
Ice Crush	DOD-STD-1678, Method 4050
Humidity	EIA/TIA-455-5
Flammability	MIL-STD-1344, Method 1012
Vibration (operational)	EIA/TIA-455-11
Shock	EIA/TIA-455-14, Condition A
Mating Durability	2,000 cycles per EIA/TIA-455-21
Cable Seal Flexing	100 cycles per EIA/TIA-455-1
Twist	1,000 cycles per EIA/TIA-455-36
Cable Retention	400 pounds minimum per EIA/TIA-455-6, 1hr (applies to plug and strain relief receptacles); 800 pounds typical
Impact	EIA/TIA-455-2, Method B
Crush Resistance	450 pounds minimum per EIA/TIA-455-26
EMI Shielding Effectiveness (receptacle only)	>60dB per IEEE-299, 15KHz to 10GHz

TFOCA-II® 12-Ch Ordering (Plug)

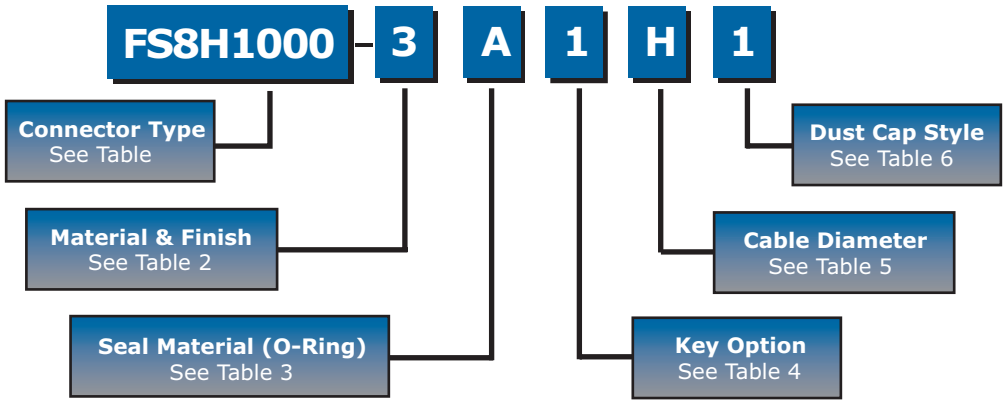


Table 1	
Connector Type	**Part Number**
TFOCA-II® Plug	FS8H1000

Table 2	
Material & Finish	**Dash Number**
6061-T6 (Al) Black Hard Anodize	3
C63000 Bronze	A
C36000 Brass 360	B
303 Stainless Steel	C
304 Stainless Steel	E
316 Stainless Steel	F

Table 3	
Seal Material (O-Ring)	**Dash Number**
Nitrile	A

Table 4	
Key Option	**Dash Number**
Key 1	1
Key 2	2
Key 3	3
Key U	4

Table 5	
Cable Diameter Inch (mm)	**Dash Number**
.240-.279 (6.1-7.1)	F
.280-.315 (7.1-8.0)	A
.316-.346 (8.0-8.8)	B
.347-.379 (8.8-9.6)	G
.380-.423 (9.7-10.7)	C
.424-.465 (10.8-11.8)	D
.466-.515 (11.8-13.0)	E
.516-.555 (13.1-14.1)	R
.600-.635 (15.2-16.1)	K
.635-.665 (16.1-16.9)	H
.669-.701 (17.0-17.8)	N
.705-.736 (17.9-18.7)	P
.750-.775 (19.0-19.8)	J
.776-.805 (19.7-20.4)	M

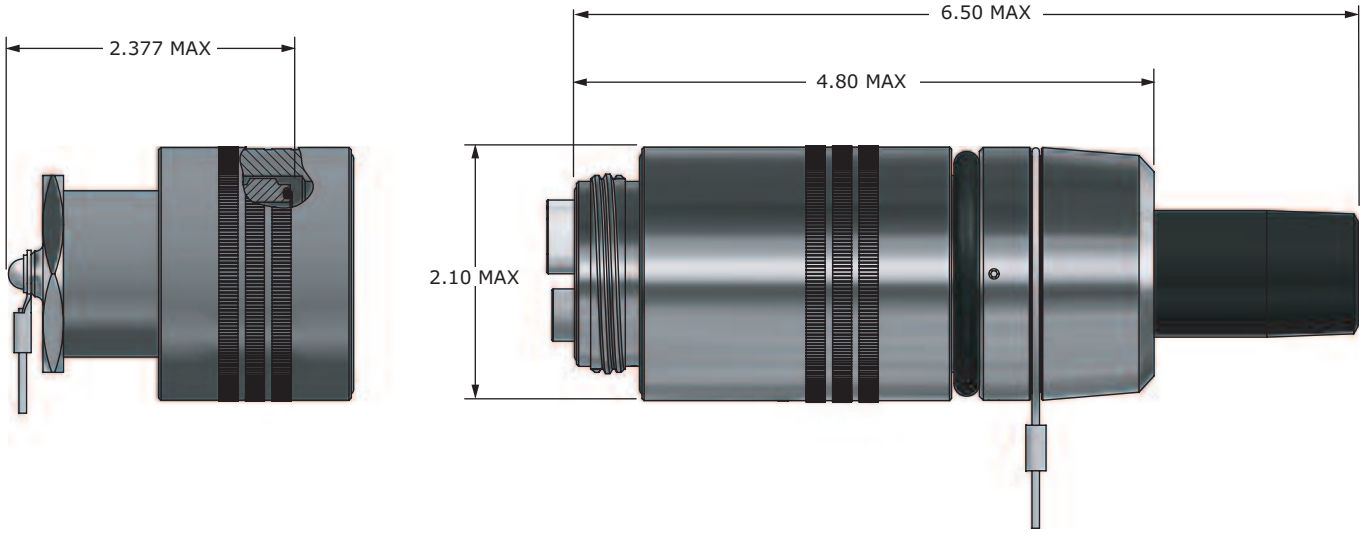
Example Part Number - FS8H1000-3A1H1

FS8H1000 - TFOCA-II® Plug
3 - 6061-T6 (Al) Black Hard Anodize
A - Nitrile
1 - Key 1
H - .635-.665 (16.1-16.9)
1 - Dust Cap Assy, Hermaphroditic

Table 6	
Dust Cap Style	**Dash Number**
Hermaphroditic, 12-Ch	1
Male, 12-Ch	2
Female, 12-Ch	3

TFOCA-II® 12-Ch Plug

FS8H1000
TFOCA-II® Plug



Dimensions are for reference only. Dimensions are in inches.

TFOCA-II® 12-Ch Ordering (Receptacles)

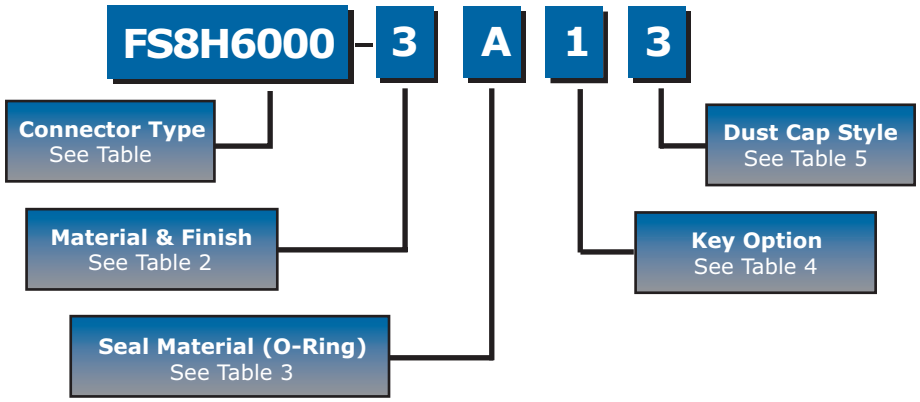


Table 1

Connector Type	Part Number
TFOCA-II® Flange Mount Receptacle, External Mount	FS8H6000
TFOCA-II® Jam Nut Receptacle, External Mount	FS8H8000
TFOCA-II® Jam Nut Receptacle, Internal Mount	FS8H8080

Table 2

Material & Finish	Dash Number
6061-T6 (Al) Black Hard Anodize	3
C63000 Bronze	A
C36000 Brass 360	B
303 Stainless Steel	C
304 Stainless Steel	E
316 Stainless Steel	F

Table 3

Seal Material (O-Ring)	Dash Number
Nitrile	A

Table 4

Key Option	Dash Number
Key 1	1
Key 2	2
Key 3	3
Key U	4

Table 5

Dust Cap Style	Dash Number
Female, 12-Ch	3

Example Part Number - FS8H6000-3A13

FS8H6000 - TFOCA-II® External Flange Mount Receptacle
3 - 6061-T6 (Al) Black Hard Anodize
A - Nitrile
1 - Key 1
3 - Dust Cap Assy, Female

TFOCA-II® 12-Ch Ordering (SRR Receptacles*)

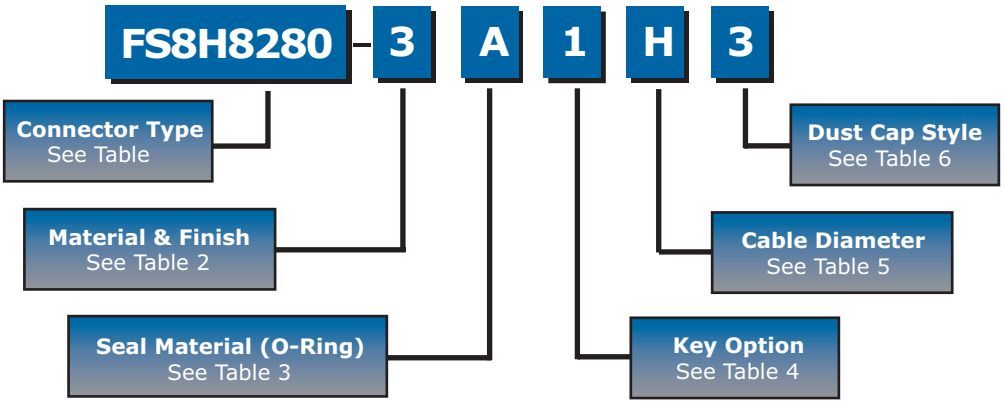


Table 1

Connector Type	Part Number
TFOCA-II® Flange Mount Strain Relief Receptacle, External Mount	FS8H6200
TFOCA-II® Jam Nut Strain Relief Receptacle, Internal Mount	FS8H8280

Table 2

Material & Finish	Dash Number
6061-T6 (Al) Black Hard Anodize	3
C63000 Bronze	A
C36000 Brass 360	B
303 Stainless Steel	C
304 Stainless Steel	E
316 Stainless Steel	F

Table 3

Seal Material (O-Ring)	Dash Number
Nitrile	A

Table 4

Key Option	Dash Number
Key 1	1
Key 2	2
Key 3	3
Key U	4

Table 5

Cable Diameter Inch (mm)	Dash Number
.240-.279 (6.1-7.1)	F
.280-.315 (7.1-8.0)	A
.316-.346 (8.0-8.8)	B
.347-.379 (8.8-9.6)	G
.380-.423 (9.7-10.7)	C
.424-.465 (10.8-11.8)	D
.466-.515 (11.8-13.0)	E
.516-.555 (13.1-14.1)	R
.600-.635 (15.2-16.1)	K
.635-.665 (16.1-16.9)	H
.669-.701 (17.0-17.8)	N
.705-.736 (17.9-18.7)	P
.750-.775 (19.0-19.8)	J
.776-.805 (19.7-20.4)	M

Example Part Number - FS8H8280-3A1H3

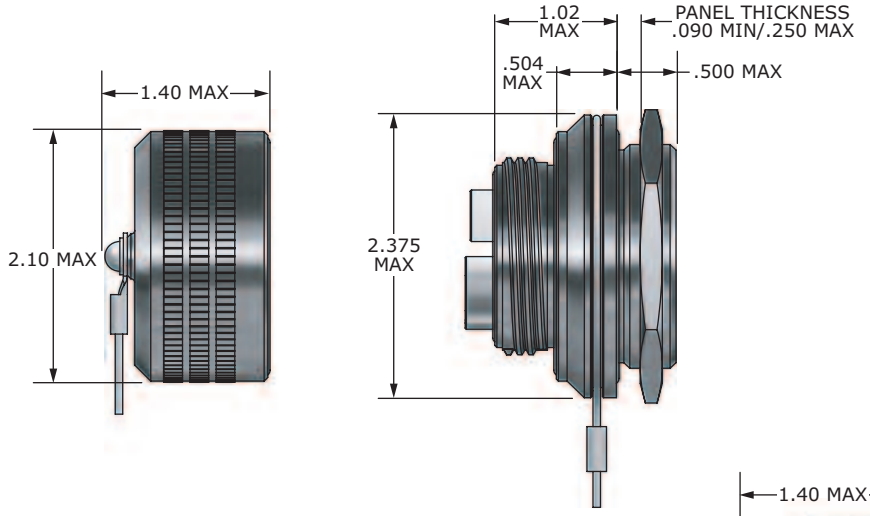
FS8H8280 - TFOCA-II® Jam Nut Strain Relief Receptacle (SRR)
3 - 6061-T6 (Al) Black Hard Anodize
A - Nitrile
1 - Key 1
H - .635-.665 (16.1-16.9)
3 - Dust Cap Assy, Female

Table 6

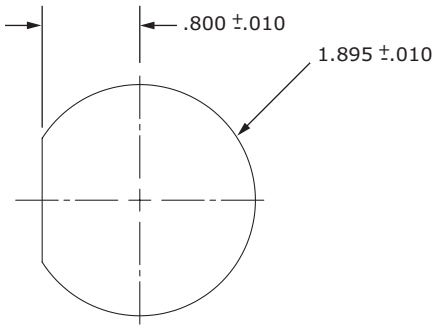
Dust Cap Style	Dash Number
Female, 12-Ch	3

*** Receptacle w/ Integrated Strain Relief**

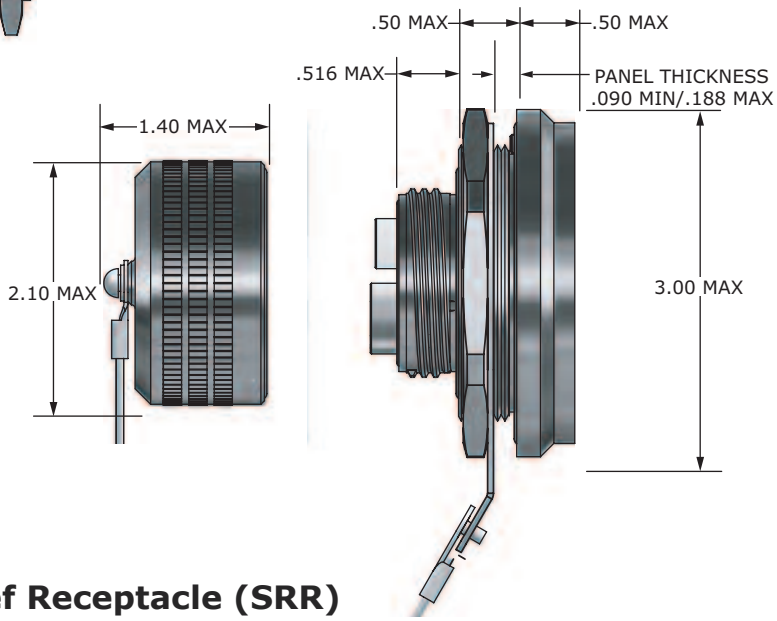
FS8H8000
TFOCA-II® Jam Nut Receptacle
(External Mount)



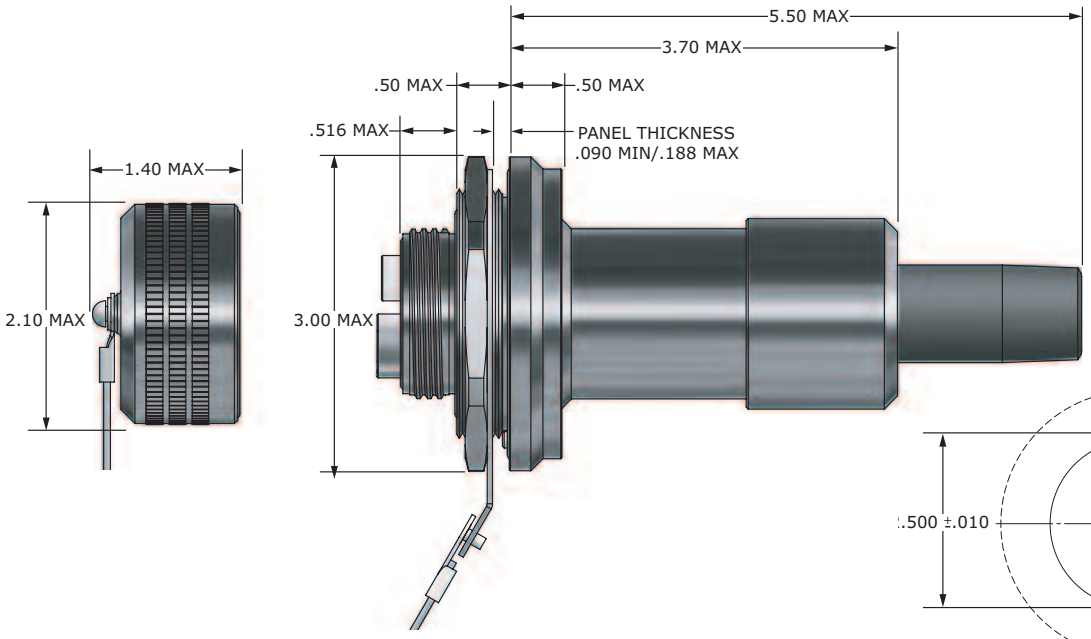
Panel Cut-Out



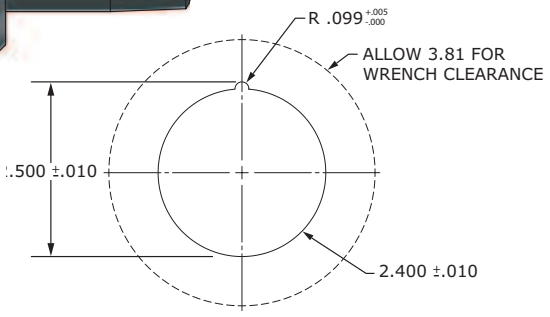
FS8H8080
TFOCA-II® Jam Nut Receptacle
(Internal Mount)



FS8H8280
TFOCA-II® Jam Nut Strain Relief Receptacle (SRR)
(Internal Mount)



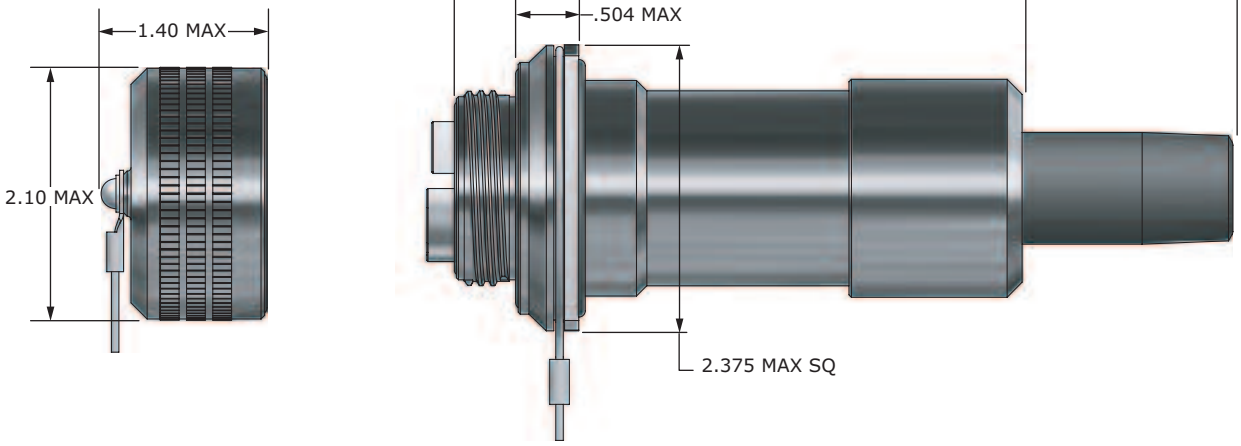
Panel Cut-Out
(Dimensions are the same for FS8H8080 & FS8H8280)



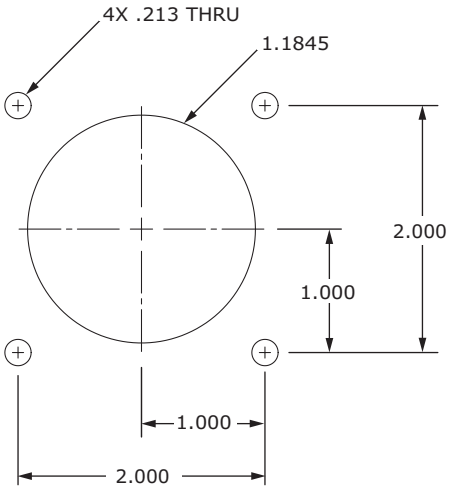
Dimensions are for reference only. Dimensions are in inches.

TFOCA-II® 12-Ch Flange Receptacles

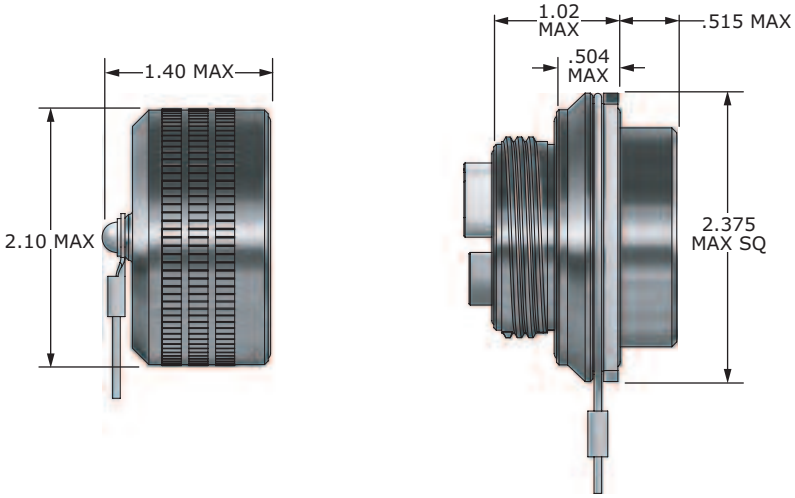
FS8H6200
TFOCA-II® Flange Mount Strain Relief Receptacle (SRR)
(External Mount)



Panel Cut-Out
(Dimensions are the same for FS8H6200 & FS8H6000)

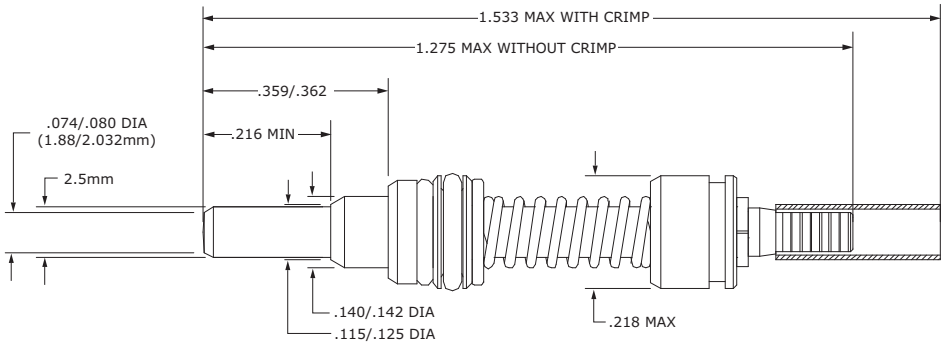


FS8H6000
TFOCA-II® Flange Mount Receptacle
(External Mount)



Dimensions are for reference only. Dimensions are in inches.

MTFP Termini (For TFOCA-II® Connectors)



The AFSI MTFP termini feature an innovative double-floating seal design that allows max/min terminus travel with minimum side forces transferred to the terminus. This AFSI design ensures maximum optical isolation and terminus sealing under the harshest condi-

Parameter	Typical	Maximum
Insertion Loss (multimode) Per mated pair/Connection	0.30dB	0.75dB
Insertion Loss (single mode) per mated pair/Connection	0.40dB	0.75dB
Back Reflection/Return Loss (sm-UPC Polish)	-50dB	-40dB

Specification	Measurement/Detail
Operating Temperature	-46°C to +71°C
Storage Temperature	-55°C to +85°C
Mud	5 minute immersion, clean with water (per MIL-PRF-83526 requirements)
Water Immersion	EIA-455-40, Water, 1m, 48hr
Vibration (operational)	EIA/TIA-455-11
Shock	EIA/TIA-455-14, Condition A
Mating Durability	2,000 cycles per EIA/TIA-455-21

Dimensions are for reference only. Dimensions are in inches. Except where indicated.

TFOCA-III® 6 & 24-Ch Specifications

TFOCA-III®

The TFOCA-III® series of 6 & 24-channel fiber optic connectors are ideal for environmentally harsh conditions.

The TFOCA-III® design utilizes the latest technology in fiber optic connectivity by incorporating industry standard physical contact ceramic ferrules and alignment sleeves.

Features & Benefits

- Hermaphroditic design for versatility
- Removable insert cap facilitates cleaning
- 6 & 24-channel connector designs
- Improved cable retention strength
- Commercial ceramic ferrule technology
- Hermaphroditic dust cap
- Optional key positions
- Field repairable using existing parts
- Available in aluminum, stainless steel and brass

Parameter	Typical	Maximum
Insertion Loss (multimode) Per Mated Pair/Connection	0.30dB	0.75dB
Insertion Loss (single mode) Per Mated Pair/Connection	0.40dB	0.75dB
Back Reflection/Return Loss (SM-UPC Polish)	-50dB	-40dB

Specification	Measurement/Detail
Operating Temperature	-46°C to +71°C
Shock	EIA/TIA-455-14, Condition A
Vibration (operational)	MIL-STD-1344, Method 2500.1
Cable Retention	400 pounds minimum per EIA/TIA-455-6, 1hr (applies to plug and strain relief receptacles); 800 pounds typical
Twist	1,000 cycles per EIA/TIA-455-36
Cable Seal Flexing	100 cycles per EIA/TIA-455-1
Mating Durability	2,000 cycles per EIA/TIA-455-21
Crush Resistance	450 pounds minimum per EIA/TIA-455-26
EMI Shielding Effectiveness (receptacle only)	>60dB per IEEE-299, 15KHz to 10GHz

TFOCA-III® 6-Ch Ordering (Plug)

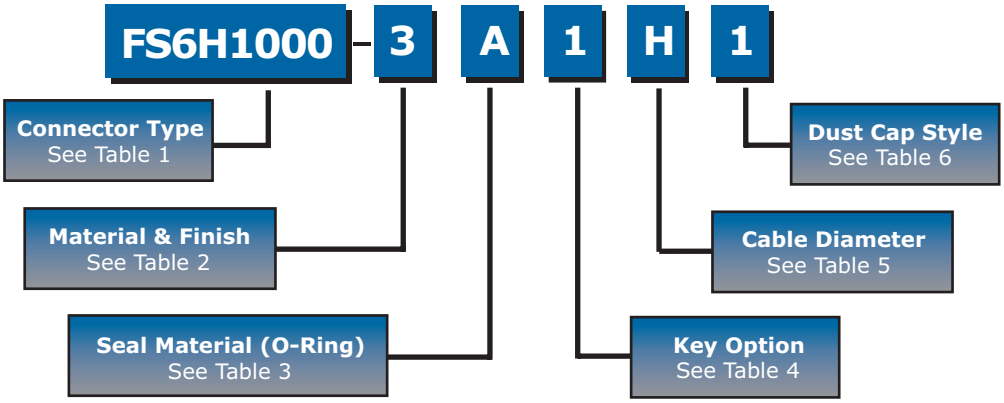


Table 1	
Connector Type	**Part Number**
TFOCA-III® Plug	FS6H1000

Table 2	
Material & Finish	**Dash Number**
6061-T6 (Al) Black Hard Anodize	3
C63000 Bronze	A
C36000 Brass 360	B
303 Stainless Steel	C
304 Stainless Steel	E
316 Stainless Steel	F

Table 3	
Seal Material (O-Ring)	**Dash Number**
Nitrile	A

Table 4	
Key Option	**Dash Number**
Key 1	1
Key 2	2
Key 3	3
Key U	4

Table 5	
Cable Diameter Inch (mm)	**Dash Number**
0.150-0.190 (3.81-4.83)	P
0.190-0.239 (4.83-6.07)	H
0.240-0.279 (6.10-7.09)	F
0.270-0.290 (6.86-7.37)	N
0.280-0.315 (7.11-8.00)	A
0.316-0.346 (8.03-8.79)	B
0.347-0.379 (8.81-9.63)	G
0.380-0.423 (9.65-10.74)	C
0.424-0.465 (10.77-11.81)	D

Table 6	
Dust Cap Style	**Dash Number**
Hermaphroditic, 6-Ch	1
Male, 6-Ch	2
Female, 6-Ch	3
Hermaphroditic, 6-Ch Black Plastic	A
Male, 6-Ch Black Plastic	C
Female, 6-Ch Black Plastic	E

Example Part Number - FS6H1000-3A1H1

FS6H1000 - TFOCA-III® Plug
3 - 6061-T6 (Al) Black Hard Anodize
A - Nitrile
1 - Key 1
H - 0.190-0.239 (4.83-6.07)
1 - Dust Cap Assy, Hermaphroditic

TFOCA-III® 6-Ch Ordering (Receptacles)

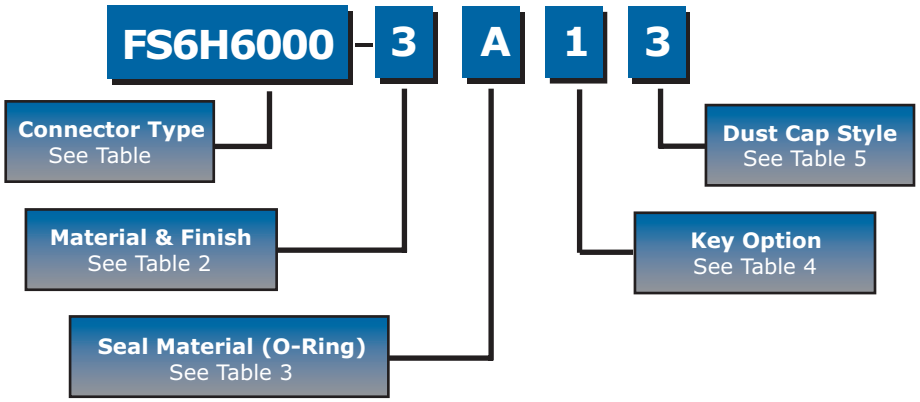


Table 1

Connector Type	Part Number
TFOCA-III® Flange Mount Receptacle, External Mount	FS6H6000
TFOCA-III® Jam Nut Receptacle, External Mount	FS6H8000

Table 2

Material & Finish	Dash Number
6061-T6 (Al) Black Hard Anodize	3
C63000 Bronze	A
C36000 Brass 360	B
303 Stainless Steel	C
304 Stainless Steel	E
316 Stainless Steel	F

Table 3

Seal Material (O-Ring)	Dash Number
Nitrile	A

Table 4

Key Option	Dash Number
Key 1	1
Key 2	2
Key 3	3
Key U	4

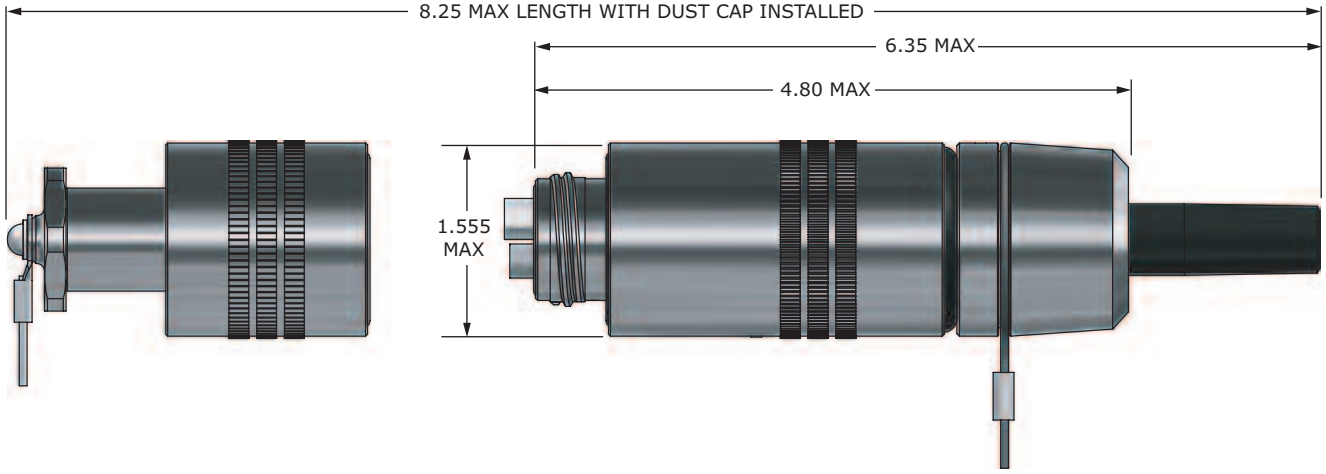
Table 5

Dust Cap Style	Dash Number
Female, 6-Ch	3
Female, 6-Ch Black Plastic	E

Example Part Number - FS6H6000-3A13

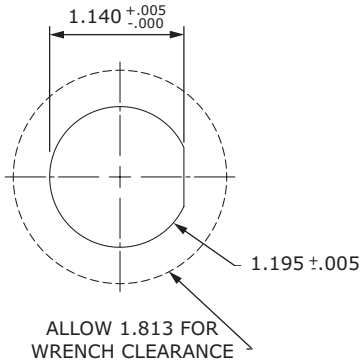
FS6H6000 - TFOCA-III® External Flange Mount Receptacle
3 - 6061-T6 (Al) Black Hard Anodize
A - Nitrile
1 - Key 1
3 - Dust Cap Assy, Female

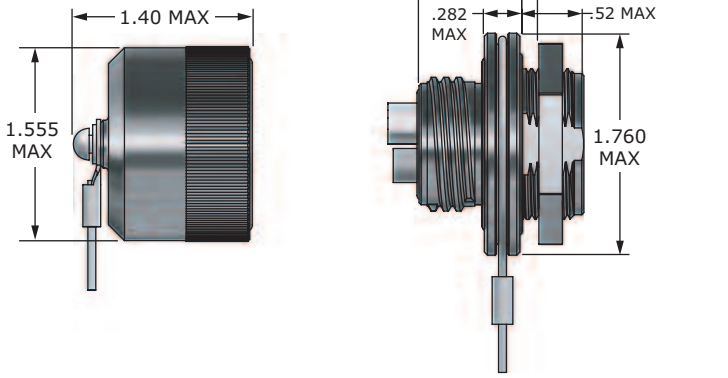
FS6H1000
TFOCA-III® Plug



FS6H8000
TFOCA-III® Jam Nut Receptacle
(External Mount)

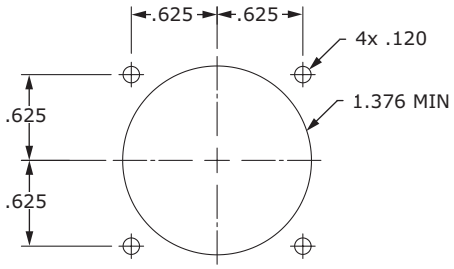
Panel Cut-Out

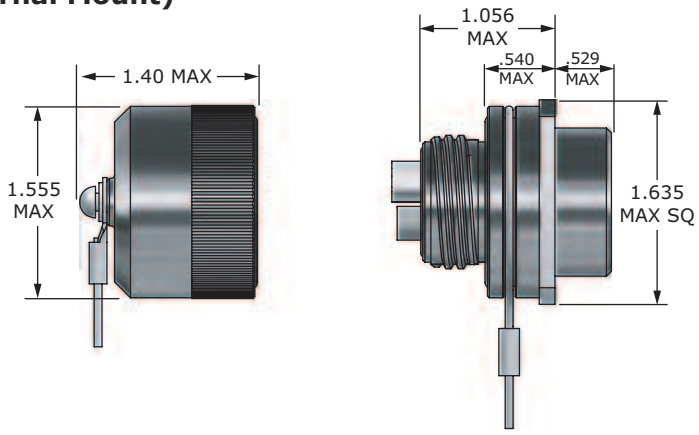




FS6H6000
TFOCA-III® Flange Mount Receptacle
(External Mount)

Panel Cut-Out





Dimensions are for reference only. Dimensions are in inches.

TFOCA-III® 24-Ch Ordering (Plug)

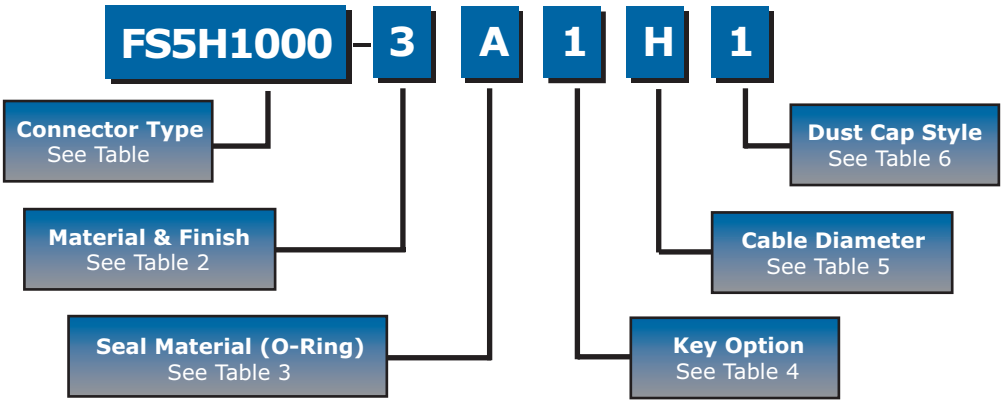


Table 1	
Connector Type	**Part Number**
TFOCA-III® Plug	FS5H1000

Table 2	
Material & Finish	**Dash Number**
6061-T6 (Al) Black Hard Anodize	3
C63000 Bronze	A
C36000 Brass 360	B
303 Stainless Steel	C
304 Stainless Steel	E
316 Stainless Steel	F

Table 3	
Seal Material (O-Ring)	**Dash Number**
Nitrile	A

Table 4	
Key Option	**Dash Number**
Key 1	1
Key 2	2
Key 3	3
Key U	4

Table 5	
Cable Diameter Inch (mm)	**Dash Number**
.240-.279 (6.1-7.1)	F
.280-.315 (7.1-8.0)	A
.316-.346 (8.0-8.8)	B
.347-.379 (8.8-9.6)	G
.380-.423 (9.7-10.7)	C
.424-.465 (10.8-11.8)	D
.466-.515 (11.8-13.0)	E
.516-.555 (13.1-14.1)	R
.600-.635 (15.2-16.1)	K
.635-.665 (16.1-16.9)	H
.669-.701 (17.0-17.8)	N
.705-.736 (17.9-18.7)	P
.750-.775 (19.0-19.8)	J
.776-.805 (19.7-20.4)	M

Example Part Number - FS5H1000-3A1H1

FS5H1000 - TFOCA-III® Plug
3 - 6061-T6 (Al) Black Hard Anodize
A - Nitrile
1 - Key 1
H - .635-.665 (16.1-16.9)
1 - Dust Cap Assy, Hermaphroditic

Table 6	
Dust Cap Style	**Dash Number**
Hermaphroditic, 24-Ch	1
Male, 24-Ch	2
Female, 24-Ch	3

TFOCA-III® 24-Ch Ordering (Receptacles)

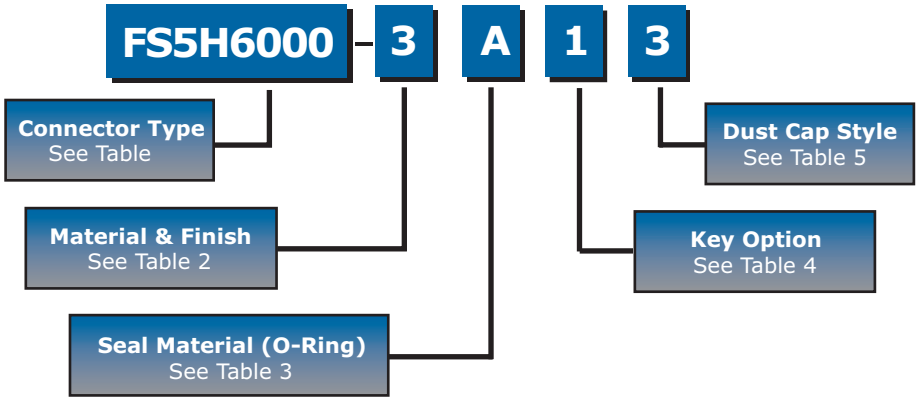


Table 1

Connector Type	Part Number
TFOCA-III® Flange Mount Receptacle, External Mount	FS5H6000
TFOCA-III® Jam Nut Receptacle, External Mount	FS5H8000
TFOCA-III® Jam Nut Receptacle, Internal Mount	FS5H8080

Table 2

Material & Finish	Dash Number
6061-T6 (Al) Black Hard Anodize	3
C63000 Bronze	A
C36000 Brass 360	B
303 Stainless Steel	C
304 Stainless Steel	E
316 Stainless Steel	F

Table 3

Seal Material (O-Ring)	Dash Number
Nitrile	A

Table 4

Key Option	Dash Number
Key 1	1
Key 2	2
Key 3	3
Key U	4

Table 5

Dust Cap Style	Dash Number
Female, 24-Ch	3

Example Part Number - FS5H6000-3A13

FS5H6000 - TFOCA-III® External Flange Mount Receptacle
3 - 6061-T6 (Al) Black Hard Anodize
A - Nitrile
1 - Key 1
3 - Dust Cap Assy, Female

TFOCA-III® 24-Ch Ordering (SRR Receptacles*)

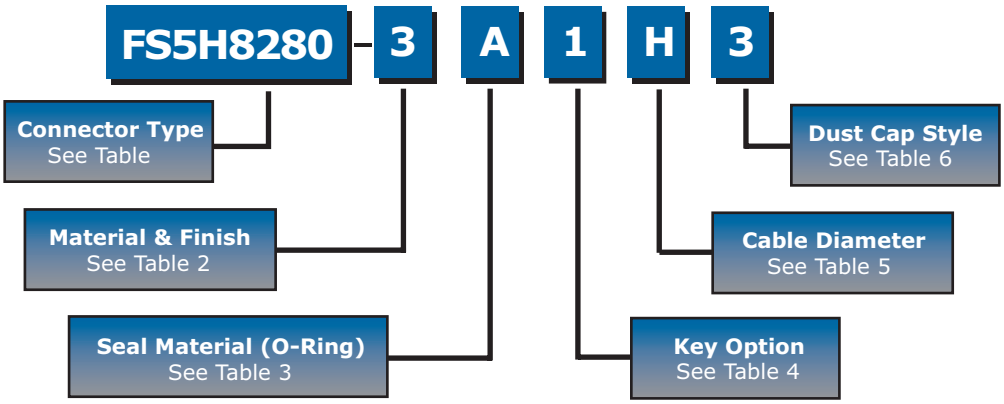


Table 1

Connector Type	Part Number
TFOCA-III® Flange Mount Strain Relief Receptacle, External Mount	FS5H6200
TFOCA-III® Jam Nut Strain Relief Receptacle, Internal Mount	FS5H8280

Table 2

Material & Finish	Dash Number
6061-T6 (Al) Black Hard Anodize	3
C63000 Bronze	A
C36000 Brass 360	B
303 Stainless Steel	C
304 Stainless Steel	E
316 Stainless Steel	F

Table 3

Seal Material (O-Ring)	Dash Number
Nitrile	A

Table 4

Key Option	Dash Number
Key 1	1
Key 2	2
Key 3	3
Key U	4

Table 5

Cable Diameter Inch (mm)	Dash Number
.240-.279 (6.1-7.1)	F
.280-.315 (7.1-8.0)	A
.316-.346 (8.0-8.8)	B
.347-.379 (8.8-9.6)	G
.380-.423 (9.7-10.7)	C
.424-.465 (10.8-11.8)	D
.466-.515 (11.8-13.0)	E
.516-.555 (13.1-14.1)	R
.600-.635 (15.2-16.1)	K
.635-.665 (16.1-16.9)	H
.669-.701 (17.0-17.8)	N
.705-.736 (17.9-18.7)	P
.750-.775 (19.0-19.8)	J
.776-.805 (19.7-20.4)	M

Example Part Number - FS5H8280-3A1H3

FS5H8280 - TFOCA-III® Jam Nut Strain Relief Receptacle
3 - 6061-T6 (Al) Black Hard Anodize
A - Nitrile
1 - Key 1
H - .635-.665 (16.1-16.9)
3 - Dust Cap Assy, Female

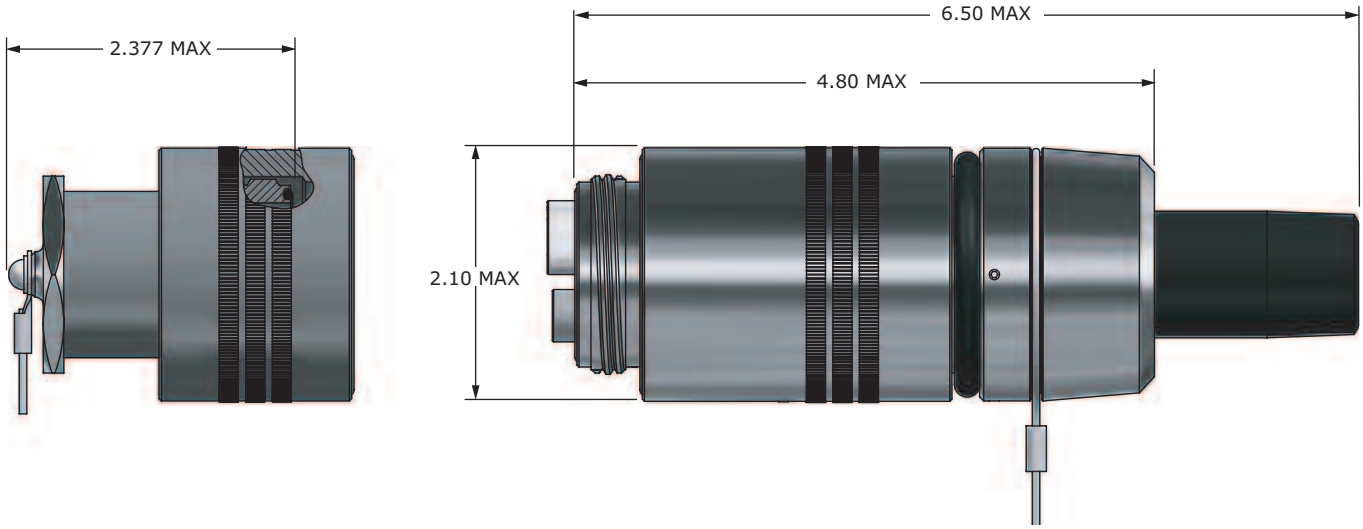
Table 6

Dust Cap Style	Dash Number
Female, 24-Ch	3

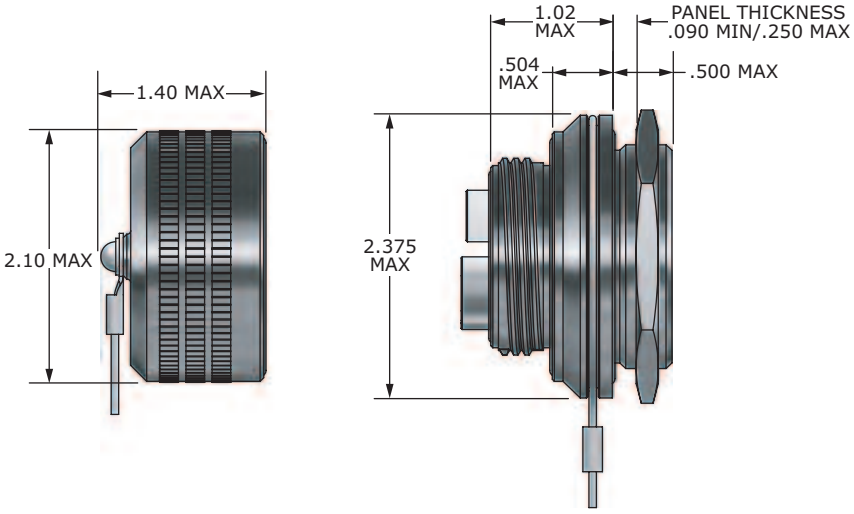
*** Receptacle w/ Integrated Strain Relief**

TFOCA-III® 24-Ch Plug & Jam Nut Receptacle

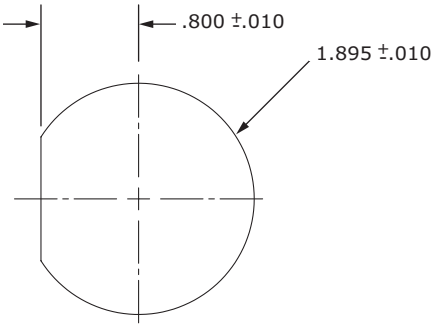
FS5H1000
TFOCA-III® Plug



FS5H8000
TFOCA-III® Jam Nut Receptacle
(External Mount)



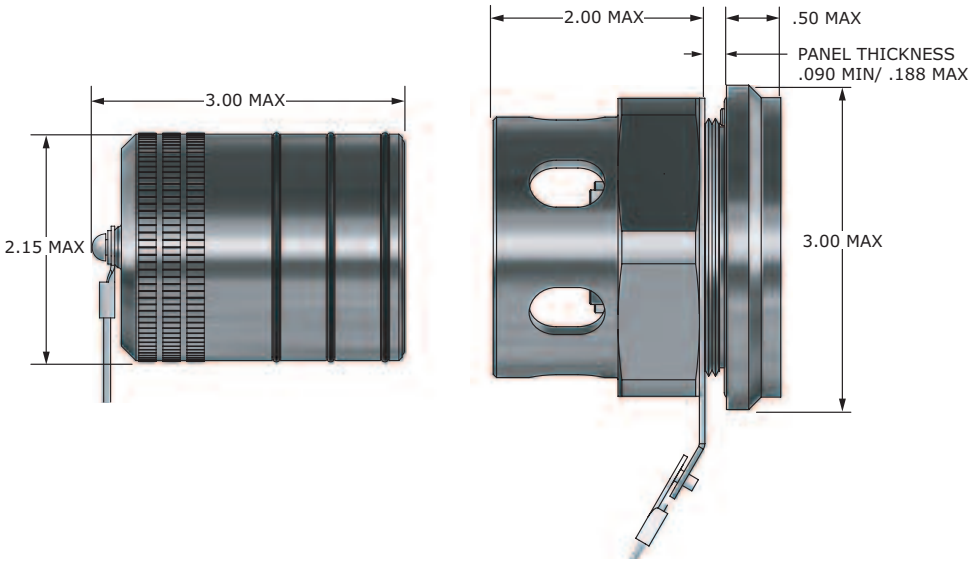
Panel Cut-Out

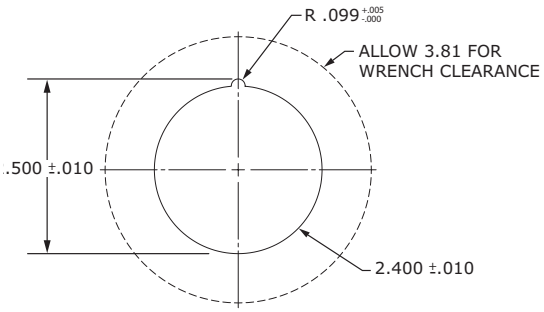


Dimensions are for reference only. Dimensions are in inches.

TFOCA-III® 24-Ch Jam Nut Receptacles

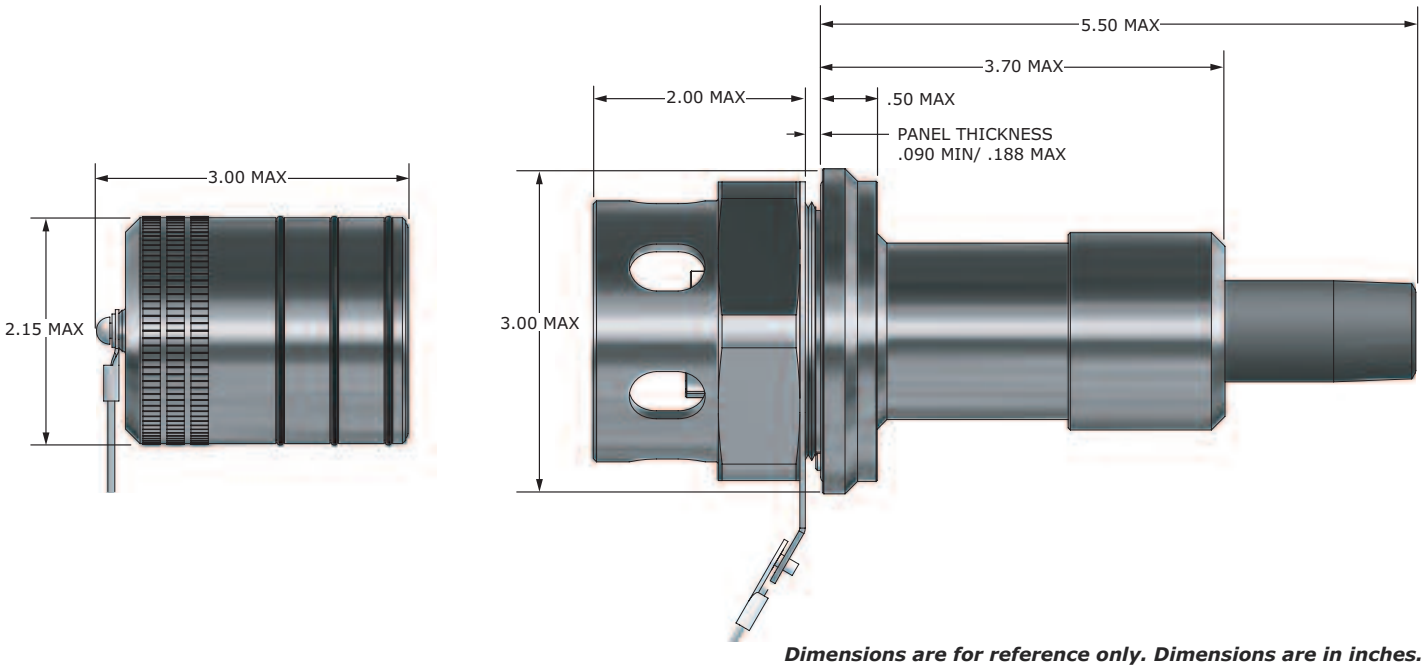
FS5H8080 TFOCA-III® Jam Nut Receptacle with Alignment Shroud Jam Nut
(Internal Mount)





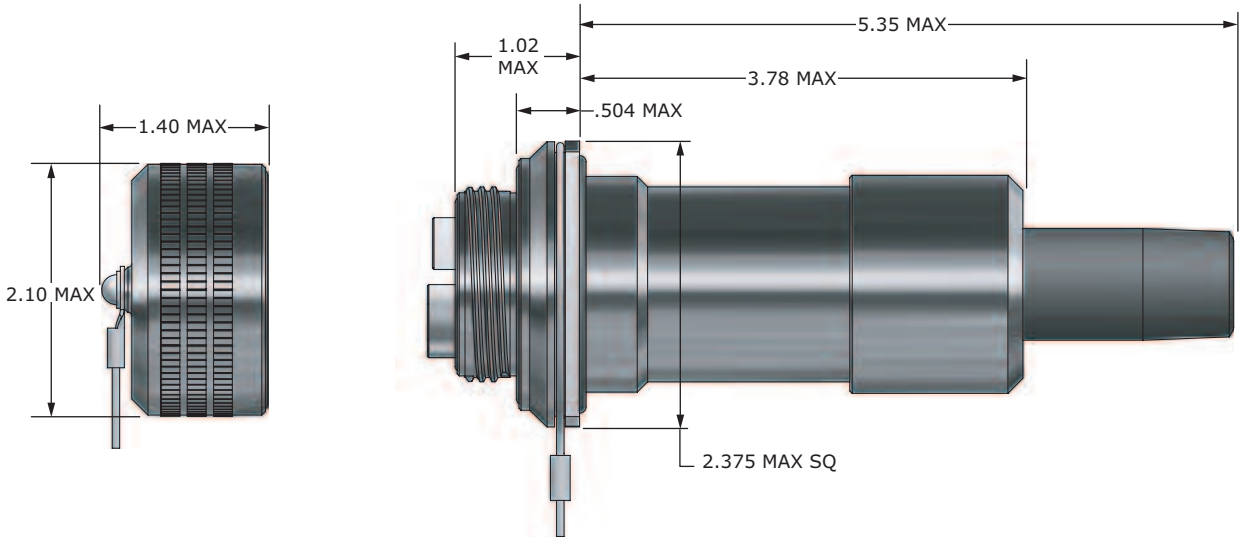
Panel Cut-Out
(Dimensions are the same for FS5H8080 & FS5H8280)

FS5H8280
TFOCA-III® Jam Nut Strain Relief Receptacle (SRR) with Alignment Shroud Jam Nut
(Internal Mount)

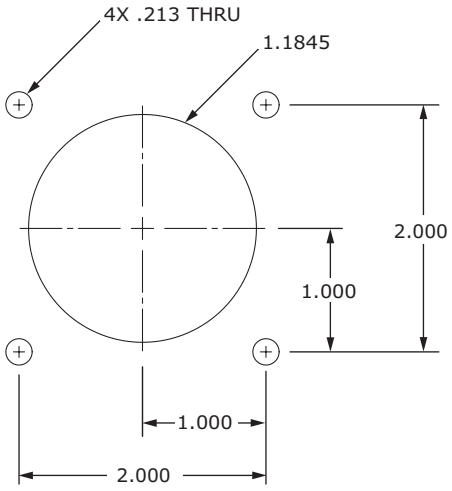


Dimensions are for reference only. Dimensions are in inches.

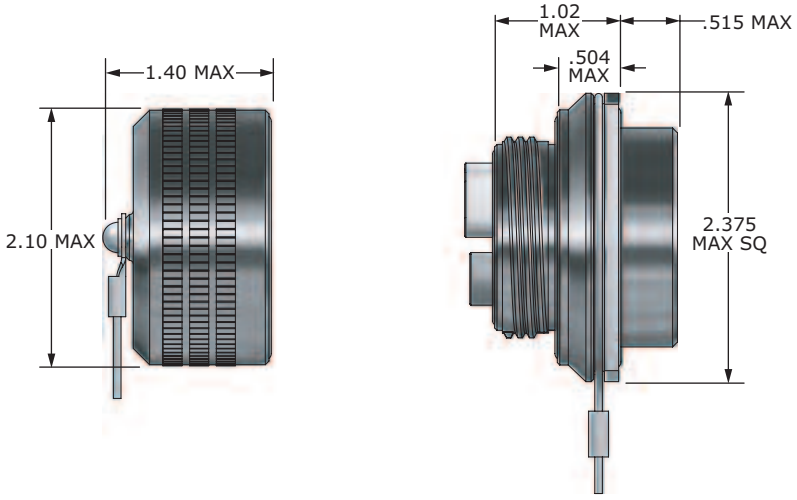
FS5H6200
TFOCA-III® Flange Mount Strain Relief Receptacle (SRR)
(External Mount)



Panel Cut-Out
(Dimensions are the same for FS5H6200 & FS5H6000)

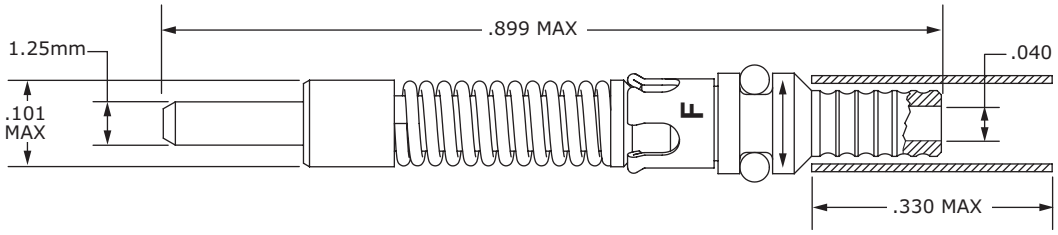


FS5H6000
TFOCA-III® Flange Mount Receptacle
(External Mount)



Dimensions are for reference only. Dimensions are in inches.

FSAF Termini (For TFOCA-III® Connectors)



Parameter	Typical	Maximum
Insertion Loss (multimode) Per Mated Pair/Connection	0.30dB	0.75dB
Insertion Loss (single mode) Per Mated Pair/Connection	0.40dB	0.75dB
Back Reflection/Return Loss (SM-UPC Polish)	-50dB	-40dB

Specification	Measurement/Detail
Operating Temperature	-46°C to +71°C
Storage Temperature	-55°C to +85°C
Mud	5 minute immersion, clean with water (per MIL-PRF-83526 requirements)
Water Immersion	EIA/TIA-455-40, Water, 1m, 48hr
Vibration (operational)	EIA/TIA-455-11
Shock	EIA/TIA-455-14, Condition A
Mating Durability	2,000 cycles per EIA/TIA-455-21

Dimensions are for reference only. Dimensions are in inches. Except where indicated.

MiniTAC

AFSI is pleased to offer its new series of high performance dual channel hermaphroditic fiber optic connectors, ideally suited for use in geophysical environments and outdoor applications. The Mini-TAC 2-channel hermaphroditic connector is rugged yet compact. It is designed for use in tight spaces, yet durable enough for applications requiring multiple mating cycles found in harsh environments. The quarter turn bayonet coupling mechanism permits quick, single-handed mating and features audible tactile mating.

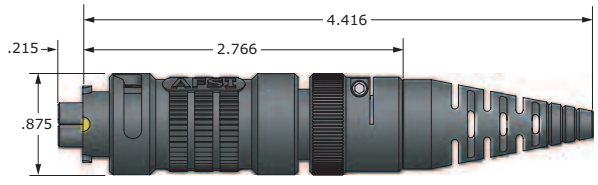
The connector design utilizes a quick and simple termination procedure, allowing users to terminate the connector on-site. AFSI offers simple tools required for assembly and maintenance. Test equipment is also available. AFSI offers training on the termination procedure at our facility in Allen, TX or at the customer's location.

Features & Benefits

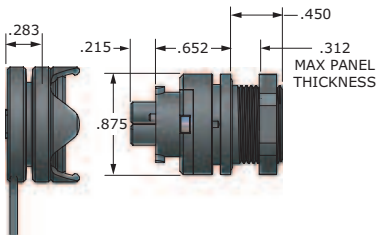
- Easy concatenation
- Single mode and multimode versions
- Quarter turn bayonet coupling
- Audible/tactile click during mating
- Compact size
- Jam nut receptacles support a panel thickness of between .063" & .312" (1.5mm to 8.0mm)
- Two dust cap options: 1 piece rubber cap or a 3 piece severe duty cap for harsh environments
- 2-6mm cable diameter range
- Multiple finishes available
- RoHS compliant
- Environmentally sealed
- 2000 mating cycles durability
- Easy one hand quick connect/disconnect
- Removable insert cap with captive alignment sleeve for easy cleaning & maintenance
- Reusable cable retention components
- 2mm termini

Specifications	Measurement/Detail
Insertion Loss SM Per Mated Pair/Connection	1.0dB Max
Return Loss Per Mated Pair/Connection	50dB Max
Insertion Loss MM Per Mated Pair/Connection	1.0dB Max

MiniTAC Plug



MiniTAC Receptacle



Dimensions are for reference only. Dimensions are in inches.

DeepSight Connectors (for Downhole Applications)

DeepSight

In response to the growing need for fiber optic monitoring systems in oil wells, AFSI has developed the DeepSight series of fiber optic connectors for use in downhole applications. The DeepSight connector has the ability to withstand the high pressure, temperatures and corrosive fluids found in downhole environments. These connectors are precision machined to stringent tolerances and designed to provide superior optical performance in extreme conditions. Custom versions are available.

Features & Benefits

- High pressure: 25,000 PSI
- High temperature: 175°C
- Low loss: 0.3 dB typical
- C-seal pressure barrier
- O-ring sealed termini
- Single mode or multimode
- Downhole compatible materials
- Easy field installation
- Rotating inserts for easy installation
- Pressure test port to verify pressure seal before insertion
- APC or UPC termini: Low back reflection
- Captivated alignment sleeves
- Inconel 718 body
- BeCu or Inconel 718 coupling nut
- Stainless steel 316/316L

Single Channel APC

Single Channel UPC

4-Channel APC

4-Channel UPC

Optron Hybrid Connectors

Optron

AFSI manufactures a complete line of circular hybrid connectors. The Optron connectors were designed to meet the need for a connector that could carry both optical fiber and electrical contacts at the same time. The Optron connectors are precision machined to stringent tolerances and designed to provide superior optical performance in extreme environmental conditions.

The backshells feature the Quickloc captivation system developed by AFSI. Simple to install, it is also easy to remove the captivated aramid yarn of the cable and recapture without cutting back the cable. The Quickloc backshell also allows easy access to maintain or reconfigure termini and electrical contacts without altering the cable components.

Features & Benefits

- Available in 3 shell sizes
- Inserts are interchangeable from plug to receptacle. Either can be operated with pins or socket termini
- Complete line of straight, 45 degree and 90 degree backshells
- Backshell design allows simplified, removable aramid yarn captivation with no mechanical crimp rings
- Angled backshells use the same tools as the straight backshell
- Quickloc aramid yarn retention design enables faster maintenance or repair without complete disassembly of connector backshell assembly

Stainless Steel
Optron Plug & Receptacle without Backshell

Stainless Steel Optron Plug with Straight Backshell

APC & Wiper Seal Termini

AFSI offers optical termini and electrical contacts for customers wanting to design their own interconnect systems. The optical termini range from ferrule sizes of 2.5 mm, 2.0 mm, 1.6mm, and 1.25 mm for both PC and APC applications. Electrical contacts range from 10 AWG to 20 AWG. All termini and contacts utilize elastomer seals. Customers may specify seal material.

APC termini:
These termini are utilized in harsh environment applications, requiring minimal optical return loss.

Electrical and optical termini with "wiper" seals:
The wiper seals provide higher unidirectional sealing pressure than standard O-rings while allowing for maximum articulation of the termini in the cavity.

Severe Duty ST Connectors

ST Connectors

AFSI offers rugged fiber optic ST connectors for deployable and fixed communication systems. AFSI's ST connectors are designed to provide the best possible optical performance in applications with severe environmental conditions.

The stainless steel construction provides excellent mechanical strength and superior corrosion resistance. The boot is attached by a compression ring or a threaded adapter.

Features & Benefits

- RoHS compliant
- Superior optical performance in extreme environmental conditions
- Super and Ultra PC polish capabilities
- Robust construction:
  - High grade stainless steel body (17-4 SS)
  - Zirconia ceramic ferrules and sleeves
  - Fungus-resistant, self-extinguishing boot

Specification	Measurement/Detail
Insertion Loss	Single Mode (-0.2 dB) Multimode (-0.3 dB)
Return Loss	Single Mode (-50 dB) Multimode (-30dB)
Tensile Loading	>230 N
Mating Durability	>500 Cycles
Impact	8 Times, 1.5 Meters
Dust	MIL-STD-202, Method 110
Thermal Shock	MIL-STD-1678, Method 4020
Temperature Humidity	DOD-STD-1678, Method 4030
Salt Spray	MIL-STD-1344, Method 1011
Flammability	MIL-STD-1344, Method 1012
Temperature Cycling	-55°C to +125°C Op, -65°C to +200°C Non-Op
Fungus Resistant	MIL-STD-810, Method 508

Expanded Beam Connectors

CTOS Expanded Beam Connector

Amphenol's CTOS connector is a small, rugged, lightweight expanded beam connector. The flat protective window, mounted on shock absorbers, provides a surface that is easy to clean in the field, improving performance and protection.

This product offers a robust optical connection in a small size design (O.D. 38 mm) and allows for rapid deployment of high-speed transmission links in harsh environments.

The specific design of the lenses guarantees a large beam diameter and a low loss connection resistant to dust and dirt. The CTOS harnesses are easy to repair in the field with the CTOS and FTOS splice kits.

HMA*two* Expanded Beam Connector

The HMA*two* hermaphroditic fiber optic lens connector facilitates the inter-connection of multiple identical fiber optic cable assemblies known as daisy chaining, eliminating the need for polarizing the assemblies and the use of in-line adapters.

The aluminum connector components are protected with a long-life anodize finish while the coupling ring and strain relief feature low temperature, protective "rubber" overmolds. This connector was designed for easy termination directly onto standard tactical cable without the use of special lens terminating tools.

AXOS Expanded Beam Connector

Amphenol's AXOS fiber optic expanded beam is a miniature hermaphroditic connector.

This product offers a robust, protected optical connection in a small size design (O.D. 27 mm) for quick establishment of a variable length daisy-chain link for indoor and outdoor use.

The beam diameter makes the connection resistant to environmental contamination, temperature variations or humidity. The special design ensures easy cleaning of the mechanical and optical connector parts.

FiberPass - Fiber Optic Feed Through

FiberPass

AFSI offers the FiberPass series of fiber optic pressure and vacuum feed-throughs to meet the most demanding geophysical applications. FiberPass provides sealing for one or more single or multimode fiber(s) or cable(s) of various types (e.g. polyimide-coated, large core). FiberPass maintains its sealing integrity for temperatures up to 200C and 20,000 PSI with an insertion loss less than 0.5dB at 1310nm for the pigtailed version. In addition to pigtails, FiberPass can be connected to a variety of terminations including ST, SMA, FC, LC and SC.

Each FiberPass application is typically custom designed to fit the customer's unique interface. AFSI will work with the customer to ensure all application requirements are met.

Other Products

E-O-E System

Features & Benefits

- E/O conversion integrated into the connector body or receptacle
- Efficient E-O-E conversion
- AFSI aramid fiber captivation system
- Multiple electrical formats
- Extended temperature ranges
- Tactical fiber optic cable (other cable options available upon request)
- Standard ranges: 2,000 meters for multimode and 40,000 meters for single mode
- Ruggedized for outdoor use
- Multiple channels
- Customized interfaces
- Low power consumption

Applications

- Seismic exploration
- Oil, gas and geoscience industries
- Industrial
- Remote system operation
- Outdoor networks
- Communication shelters
- Broadcast
- U.S. Army, Navy, Air Force & Marine Corps tactical and strategic deployments

38999 Cable Assemblies

Features & Benefits

- Provides hybrid capabilities
- Epoxy/polish termination
- Termini designed and manufactured to MIL-PRF-29504/4 and /5 specifications

Applications

- Oil & gas
- Mining
- Telecommunications
- Industrial

Materials

- Available in aluminum, stainless steel or composite shell materials

Fiber Optic Test Sets

Features & Benefits

- TFOCA, TFOCA-II®, MIL-PRF-28876 and standard hermaphroditic connector input
- Two modes: dBm and dB with relative store
- Input range: +5 to -70 dBm (InGaAs detector)
- Two 1300 nm LED Sources: -23 dBm into 62.5 micron multimode fiber
- Includes carrying case

Applications

- Oil & gas
- Mining
- Marine and land-based geoseismic
- Broadcast systems
- Tactical deployed communications systems
- Shipboard communication and navigation systems
- Ship-to-Shore (Pierside) communications
- Network disaster recovery
- Deployable seismic systems
- Aeronautical and airframe

Termination Kits, Tools & Training

Termination Kits & Tools

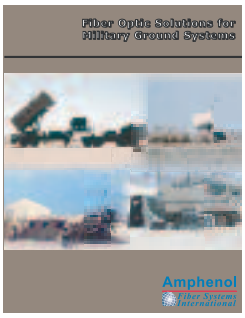
AFSI offers kits for terminating most optical connectors in multiple markets. Available termination kits include: TFOCA-II®; TFOCA-III®; TFOCA; M28876; MIL-ST and M28876/MIL-ST combination. AFSI also offers customized kits. We also sell cleaning and consumable kits and replacements for broken or misplaced tools.

Fiber Optic Training

AFSI's training is designed for personnel involved in the installation, testing, trouble shooting or maintenance of fiber optic systems. AFSI training focuses on both military and civilian field personnel training. Training completion qualifies the student to receive not only AFSI certifications, but also the Fiber Optics Installer (FOI) and the Fiber Optics Technician (FOT) certifications from Electronics Technicians Associations (ETA).

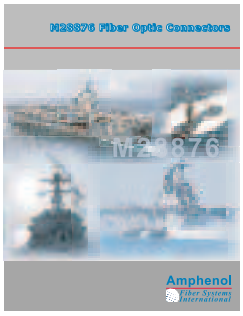
Additional Catalogs Available

Military Ground Systems



Fiber Optic Solutions

M28876



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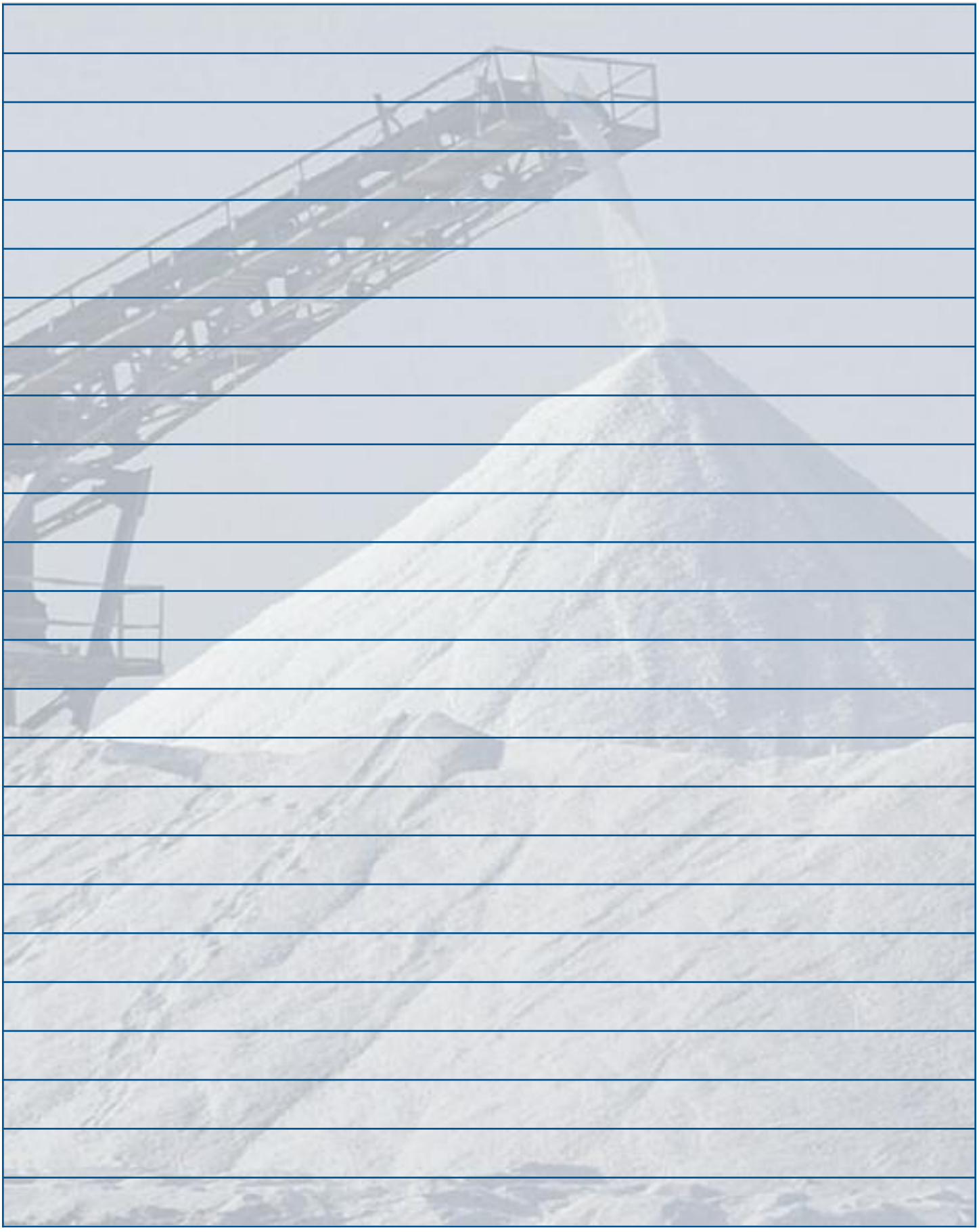

Notes

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