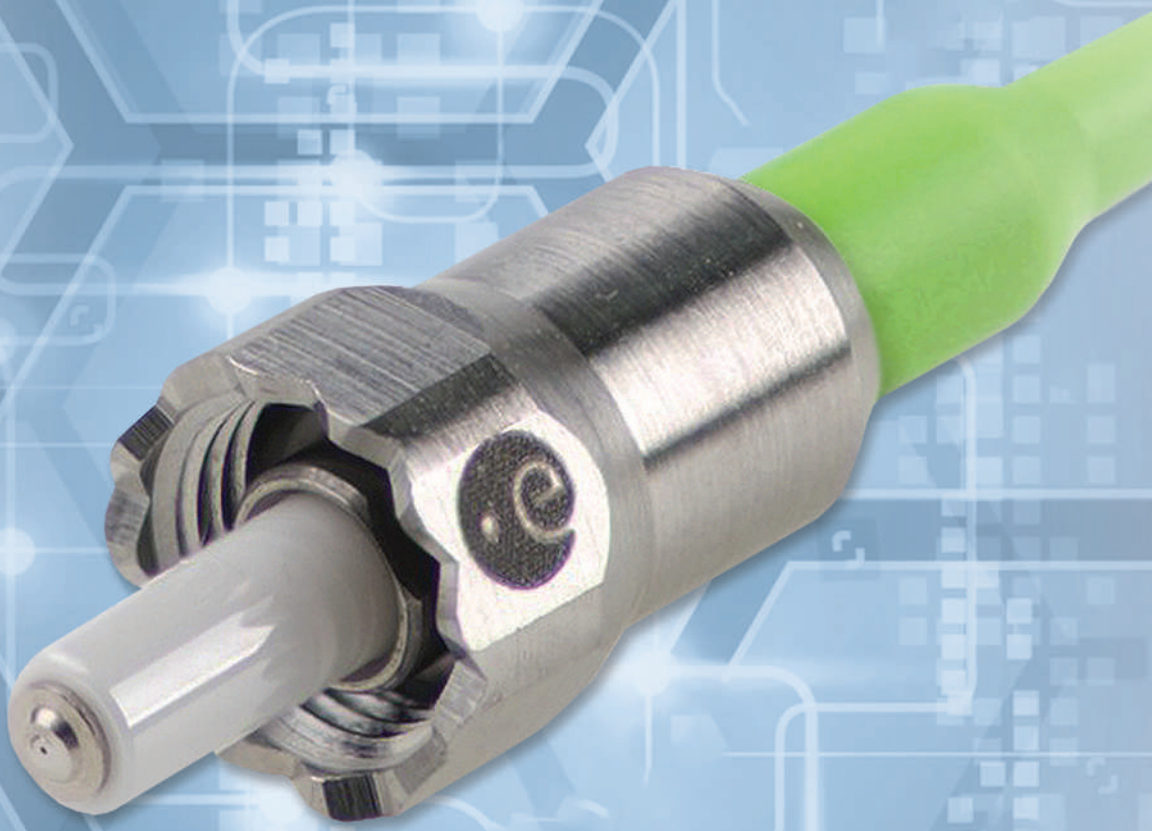
# AVIM® FAMILY



DIAMOND
the fiber meeting

## CONTENT

# DIAMOND
# Fiber Optic Components

## CABLE ASSEMBLIES, ADAPTERS, IMODs AND TOOLS

The AVIM® connector is born in mid 1990's as a vibration resistant connector for avionics and space application. Since then, the evolution of these connectors has been driven by harsh environment applications, especially for Aerospace and Naval applications.

In a first step, AVIM® has been adapted to Naval applications, then by 2009, a lighter and rugged version was commissioned for a Mars rover, the Mini AVIM®. This connector has been used in various application due to its exceptional environmental resistance characteristics, and to its high end optical performance benefitting from Diamond unique ferrule designs and technologies.
An intermediate version, the Midi AVIM® is coming to complete this family of shock and vibration resistant small single channel fiber optic connectors.

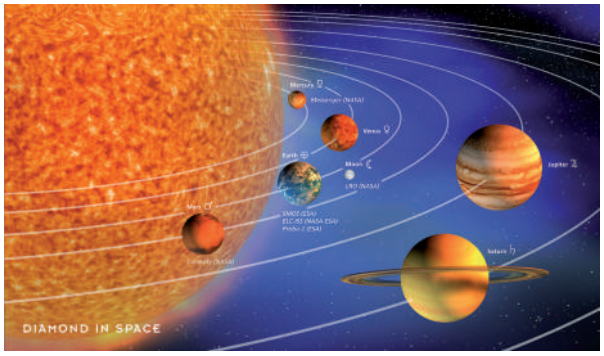
In the next pages, you will discover the different applications where these products are deployed, a description of Diamonds Space Grade process for Flight models that must follow the European Space Agency standards and the various products themselves, as well as tools and services provided by Diamond.

## APPLICATIONS

### SPACE

Active since mid-1990's in the space market, Diamond products have a long heritage in space, mainly used by NASA GSFC and more recently standardized by the ESCC, the European Space Components Coordination. The Mini AVIM® is Diamond's only ESCC standardized component, but Diamond produce other flight models for custom configurations. The historically mostly used space connector, the AVIM®, due to commercial reasons, has not been standardized under ESCC but is still available, using the same Space Grade or Commercial Grade process as the Mini AVIM®.
You can find connectors from Diamond from Mercury, on Mars, around the moon, mostly around the earth and soon toward Jupiter.

The Space applications have been divided in three groups:
1. Sensing
2. Inter-satellite communication
3. Intra-satellite communication

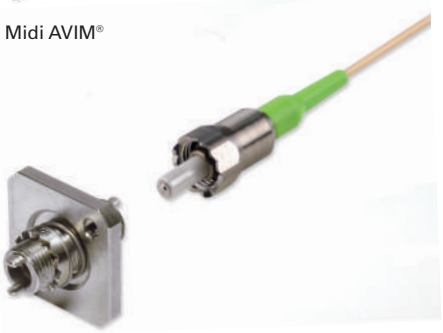



## AVIM® Family

AVIM®
Midi AVIM®
Mini AVIM® (ESCC 3420/001)
Micro AVIM®
CLEANING KIT

AVIM®

Midi AVIM®



Mini AVIM®

Micro AVIM®

Cleaning Kit

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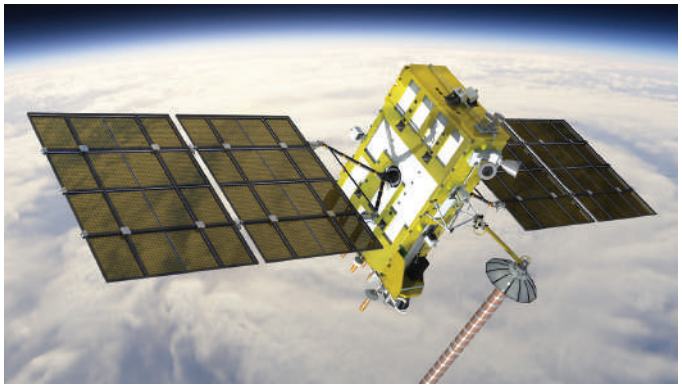
*Specifications subject to change without notice*

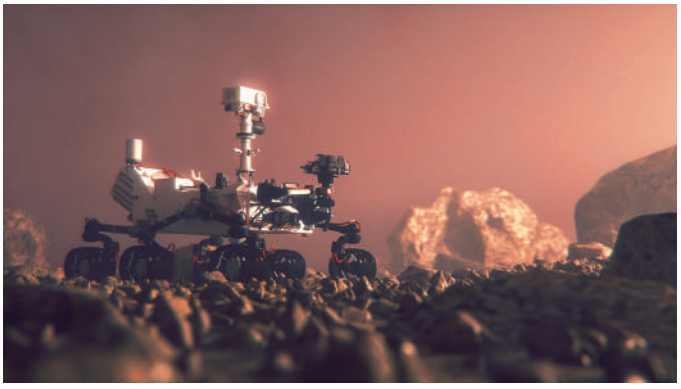
BDD 1951881 *03_24*

**Sensing**

The sensing application are numerous, probably driven by Lidar or Laser Altimeter, but numerous other application have been seen, using optical fiber from low wavelength, small core single mode polarization maintaining to large core multimode.

It is almost impossible to standardize those applications and these are the most demanding, as the pass/fail criteria can be quite different than the standard digital communication application because other properties from the light are used, such as wavelength, intensity, phase, polarization,...





**Inter-satellite Communication**

With optical signal, a line of sight is necessary to bring the data on the ground and it is not always possible from any satellite position. For this reason, communication between satellite, even planes, unmanned vehicle or balloons is required. Constellation of hundreds of satellites are discussed, each would require a communication terminals, which are already commercially available or in development.

**Intra-Satellite communication**

Telecom satellite are using up and down-link using radio waves and use electric cable internally (several tons). The challenge to change these payloads in fiber optic, improving dramatically weight, power dissipation and power consumption can change dramatically the face of communication via satellite. A typical telecom satellite would have a thousand connection to be replaced by optical fibers.

## PRODUCT GRADES

The AVIM® family products comes in four quality grades varying in the procurement and production process, but sharing the same components.

- Commercial Grade CG
- Space Grade SG
- Enhanced Grade EG
- Customized Grade CUST

### Commercial Grade, CG

- Standard procurement process
- Performance according to datasheet
- Qualification Test Report according to IEC standards mostly
- Standard Packaging
- 3-4 weeks typical lead time

### Space Grade, SG

- Space procurement process
  - Customer specification acceptable, fee based Compliance Matrix
  - Traceability according to prescription from RFQ, standard traceability covered by ESCC certificate 355
  - All travel cards archived 10 years
  - Specific Quality management process, inspired by ESCC
  - Offer containing Diamond performance specification document, PSD
  - 100% Screening
  - Clean room packaging included
- Production according to confidential, ESA deposited, Product Identification Document (PID)
  - Material Deviation list (MDL) declared in PSD
  - Process Deviation List (PDL) declared in PSD
- Performance according to ESCC standards certified by ESCC certificate 355 or according to PSD/Compliance Matrix.
- Qualification Test Report according to ESCC 3420 available
- Superior reliability due to 100% screening
- Lot Verification Test, LVT, also called Lot Acceptance Test, based on a full or partial Chart F4 of ESCC 3420, available on demand and described in a Product Test Sequence (PTS).
- 9-10 weeks typical lead time

### Enhanced Grade, EG

- Space procurement process with restriction
  - Traceability and Quality management according to Diamond SG standards
  - All travel cards archived 10 years
  - Offer containing Diamond performance specification document, PSD
  - No Screening
  - Clean room packaging included
- Not applicable to Mating adapter or IMOD (SG or CG)
- Production according to Diamond assembly process identical to SG
- Performance according to PSD documents
- Not recommended for flight model, use SG for better reliability
- Qualification Test Report available
- 6 weeks typical lead time

### Customized, CUST

- Product, assembly process, procurement process customized
- Will follow either standard or space procurement process
- No systematic process qualification by similarity
- Require a Setup Fee for each case

| | AVIM® | Midi AVIM® NEW | Mini AVIM® | Micro AVIM® NEW |
|---|---|---|---|---|
| **Connector interface standards (compatible and exceeding)** | IEC 61754-3<br>100% compatible DIN LSA | Diamond Midi AVIM®<br>Mini AVIM™ mating adapter<br>Partial ESCC 3420/001 | Diamond Mini AVIM®<br>ESCC 3420/001 | Diamond Micro AVIM®<br>Partial ESCC 3420/001 |
| **Materials (see datasheet for details)** | Nickel-Silver, Stainless steel for springs and keyed nose, Hytrel® 8068 vacuum baked for boot | Titanium, Stainless steel for springs, Hytrel® 8068 vacuum baked for boot | Titanium, Stainless steel for springs, Hytrel® 8068 vacuum baked for boot | Titanium, CuBe clip |
| **Optical interface standards** | IEC 61755-3-7 (PC)<br>IEC 61755-3-8 (APC)<br>Diamond PM<br>Diamond MM | IEC 61755-3-7 (PC)<br>IEC 61755-3-8 (APC)<br>Diamond PM<br>Diamond MM | IEC 61755-3-7 (PC)<br>IEC 61755-3-8 (APC)<br>Diamond PM<br>Diamond PS, PM-PS<br>Diamond PSf, PM-PSf | IEC 61755-3-7 (PC)<br>IEC 61755-3-8 (APC)<br>Diamond PM<br>Diamond PS, PM-PS<br>Diamond PSf, PM-PSf |
| **Active Core Alignment (ACA)**<br>**Active Polarization Orientation (APO)**<br>**Power Solution collimation (PS)**<br>**High Temperature (HAT)**<br>**Product Quality Grades** | ✔<br>✔ limited<br><br>✔<br>CG, SG, EG, CUST | ✔<br>✔<br><br>✔<br>CG, SG, CUST | ✔<br>✔<br>✔<br>✔<br>CG, SG, EG, CUST | ✔<br>✔<br>✔<br>✔<br>CG, SG, EG, CUST |
| **Cable compatibility** | Fiber and loose tube or TB<br>Cable up to 3.5mm<br>Stainless steel reinforced cable | Fiber and loose tube or TB<br>Cable up to 2.1mm<br>Stainless steel reinforced cable | Fiber and loose tube or TB<br>Max 1.2mm | Fiber and loose tube or TB<br>Max 1.2mm |
| **Target Application** | Avionics | Avionics / Space<br>Vibration environment | Space rover<br>Small ultracompact instrument | Space rover<br>Small ultracompact instrument |
| **Performance Qualification IEC 61753-2-1 cat. U uncontrolled** | ✔ TR-005 (SM) | ✔ QTR-114 | ✔ QTR-040 (SM)<br>✔ QTR-111 (PM)<br>✔ QTR-117 (PSm) | ✔ QTR-091 (SM)<br>✔ QTR-099 (PM)<br>✔ QTR-069 (PS) |
| **Reliability Qualification IEC 62005-9-1 an additional Telcordia GR-326 extended humidity' test** | | | | ✔ TR-037 (DMI PM)<br>✔ TR-034 (DMI PS) |
| **Harsh Environment qualification** | ✔ QTR-064 (AVIM ESCC) | ✔ QTR-114 | ✔ QTR-065 | |
| **ESA ESCC 3420 Qualification** | | Compatibility with mating adapter | ✔ ESCC certificate 355 | |
| **IL, Insertion Loss**<br>**RL, Return loss**<br>**ER, Extinction Ratio** | ++<br>++<br>++ | +++<br>+++<br>+++ | +++<br>+++<br>+++ | +++<br>+++<br>+++ |
| **Handling** | Tools required | Easy, no tools required | Delicate, require tools | Delicate, require tools |
| **Connector mass** | 7 | 2.8 | 1.2 | 0.4 |
| **Mating adapter mass Square(hexagonal)** | 9.7 (7.5) | 2.7 | 2.7 | 0.6g (TBC) |
| **Connector parts** | 13 | 11 | 6 | 2 |

# DIAMOND
# Fiber Optic Components

## CABLE ASSEMBLIES AND ADAPTERS

Developed in the 1990's for aerospace application and compatible with the DIN LSA connector, the AVIM® is a multipurpose Commercial-Off-The-Shelf, COTS, fiber optic connector offering high optical performance and capable in dynamic environments of mobile platforms, including avionics and especially space flight.
These connectors are compatible with the widest range of optical fibers, including single mode (SM), multimode (MM), polarization maintaining (PM) and other fibers of different core/cladding sizes, multi-fiber ferrule and multi-core fibers.
High performance in the form of lowest insertion loss provided by Diamond's unique Active Core Alignment termination process as well as high return loss for the most demanding, high bandwidth transmission systems.

### FEATURES

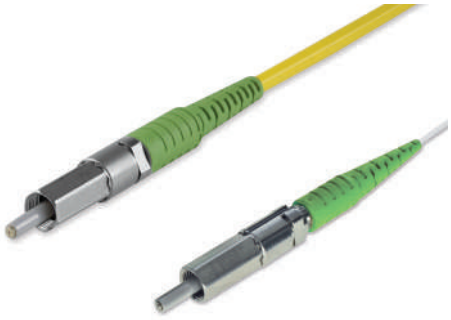
- Low IL due to Active Core Alignment (A.C.A.)
- High return loss due to Diamond ultra-polishing process and A.C.A
- High vibration/shock resistance due to Miniaturized MIL-style ratchet system
- AVIM® 2-piece cleanable adapter for front panel easy cleaning and maintenance access.
- IEC 61754-3 100% compatible with LSA (DIN) standard
- Tooling for installation mandatory

### AVAILABLE AS

- Terminated connectors and assemblies with following optical interface
  - SM, MM, MM large core
  - PM or PZ
  - Multi-fiber Ferrule
- Components:
  - Connector Set (require Diamond production line)
  - Mating adapters
  - Interface Module IMOD
- Product grades:
  - Commercial Grade, CG
  - Enhanced Grade, EG
  - Space Grade, SG
  - Customized CUST

## AVIM®

| | |
|---|---|
| SINGLE MODE | PC/APC |
| MULTIMODE | PC |
| PM | PC/APC |
| HIGH TEMP, HT | PC/APC |



## SPECIFICATIONS

The products are available in different grade, changing the operating range and performance. Two tables are provided: Optical performance at room temperature and list of test performed on each product grade.

| COMMERCIAL GRADE, CG | SINGLE MODE | MULTIMODE | PM APC 8° | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|
| Insertion loss, IL max | typ. 0.2, max 0.4 | typ. 0.2, max 0.4 | typ. 0.2, max 0.4 | dB | IEC 61300-3-4 method B, λ=1550nm |
| Return loss, RL min | 50 (PC), 75 (APC) | 40 (PC) | 50 (PC), 75 (APC) | dB | IEC 61300-3-6, λ=1550nm |
| Polarization extinction ratio, ER min | - | - | typ 27, min 23 | dB | Diamond validated cross polarizers, low coherence method, λ λ=1550nm |
| Polarization angular error, α | - | - | ± 2 | ° | |
| Repeatability of IL | <= 0.2 | | | dB | IEC 61300-2-2 method B, λ=1550nm |
| Service life | 500 mate/demate cycles | | | dB | |
| Operating temperature | -40 to +85 | | | C° | |

| ENHANCED AND SPACE GRADE, EG AND SG | SINGLE MODE | MULTIMODE | PM APC 8° | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|
| Insertion loss, IL | typ. 0.25, max 0.5 | typ. 0.2, max 0.4 | typ. 0.2, max 0.5 | dB | IEC 61300-3-4 method B, λ =1550nm |
| Return loss, RL | 50 (PC), 75 (APC) | 40 (PC) | 50 (PC), 75 (APC) | dB | IEC 61300-3-4 method B, λ=1550nm |
| Polarization extinction ratio, ER | - | - | typ 25, min 21 | dB | Similar to IEC 61300-3-40, low coherence, λ =1550nm |
| Polarization angular error, α | - | - | ± 2 | ° | |
| Repeatability of IL | <= 0.4 | | | dB | IEC 61300-2-2 method B, λ=1550nm |
| Service live | 100 mate/demate cycles | | | dB | |
| Operating temperature | -55 to +85 | | | C° | |

NOTES
- Those values are at BOL, room temperature.
- For specific fibers and wavelength, please inquire on the optical specification
- Cable can further limit those values

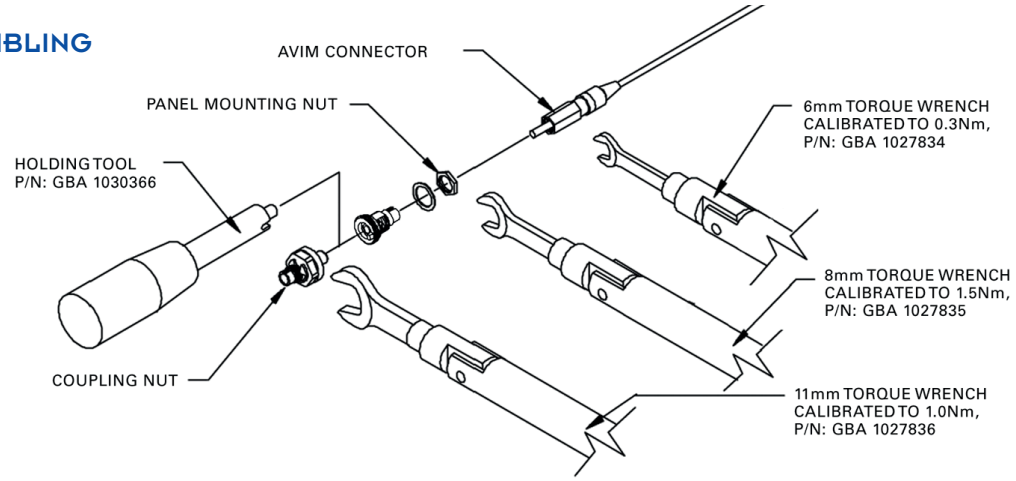
## ENVIRONMENTAL TESTS

| | CG | |
|---|---|---|
| | LEVEL | METHOD |
| Thermal cycles | -40°C to +85°C, 20 cycles | IEC 61300-2-22 |
| Humidity | +40°C, 168h | IEC 61300-2-19 |
| Vibration | Sinus, 20g, 15cycles | IEC 61300-2-19 |
| Shock | 5 drops, 1.5m | IEC 61300-2-12 |
| Torsion | 2N, 25 cycles 180° | IEC 61300-2-5 |
| Static side load | 0.2N, 90°, 5min | IEC 61300-2-42 |
| Fiber/cable retention | 5N, 1min | IEC 61300-2-4 |
| High temperature storage | +85°C, 168h | IEC 61300-2-18 |
| Mating durability | 500 | IEC 61300-2-22 |

Qualification test reports describe in details tests and results.

| | SG and EG | |
|---|---|---|
| | LEVEL | METHOD |
| Thermal cycles | -55°C to +85°C, 100 cycles | IEC 61300-2-22 |
| Humidity | +25°C to +55°C, 6 cycles, 144h | IEC 61300-2-46 |
| Vibration | Random, 35gRMS | IEC 60068-2-64 |
| Shock | 500g, 2ms | IEC 60068-2-27 |
| Torsion | 2N, 25 cycles 180° | IEC 61300-2-5 |
| Static side load | 0.2N, 90°, 60min | IEC 61300-2-42 |
| Fiber/cable retention | 5N, 2min | IEC 61300-2-4 |
| High temperature storage | +85°C, 1000h | IEC 61300-2-18 |
| Mating durability | 100 | IEC 61300-2-2 |
| Low pressure | 4*10-8 Torr, 8h | IEC 60068-2-13 |
| Dust | 30°C to 60°C, 2h | IEC 61300-2-27 |
| Salt mist | +35°C, 85% r.h, 5% salt, 96h | IEC 60068-2-11 |
| Rapid depressurisation | atm to 50mbar in 5s, 5 cycles | MIL-STD.810G |

## TOOLING FOR ASSEMBLING

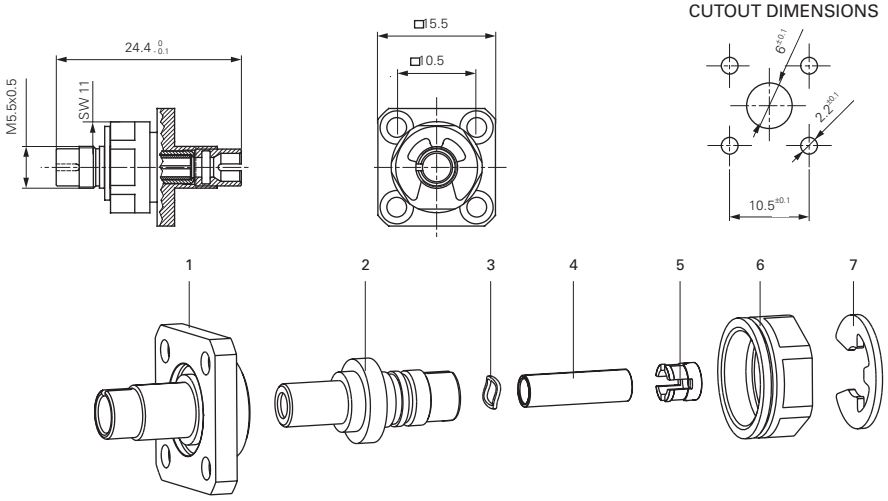


## AVIM® ADAPTER AND DIMENSIONS

Available types: Hexagonal and square flange adapter for wall mount
Material: According to part list

## BILL OF MATERIAL - AVIM® MATING ADAPTER - SQUARE FLANGE

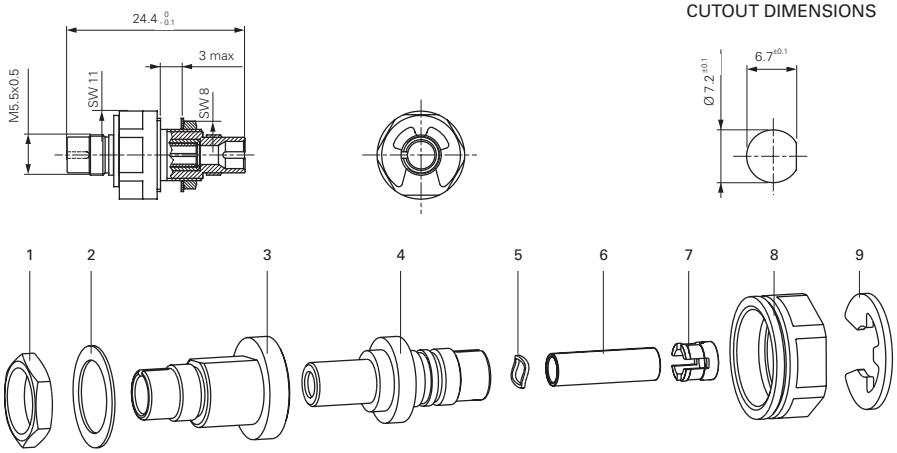
CUTOUT DIMENSIONS




| POS. | DESCRIPTION | MATERIAL | UNIT MASS (g) |
|---|---|---|---|
| 1 | Square flange | X10 Cr Ni S 18 9 (Inox) | 4.93 |
| 2 | Body | X10 Cr Ni S 18 9 (Inox) | 1.77 |
| 3 | Elastic washer | X12CrNi177 | 0.01 |
| 4 | Elastic sleeve | ZrO2 | 0.20 |
| 5 | Elastic ring | X10 Cr Ni S 18 9 (Inox) | 0.08 |
| 6 | Nut | X10 Cr Ni S 18 9 (Inox) | 1.86 |
| 7 | Serclip | X35CrMo17 | 0.24 |
| | | **Total** | **9.09** |

## BILL OF MATERIAL - AVIM® MATING ADAPTER - HEXAGONAL FLANGE

CUTOUT DIMENSIONS




| POS. | DESCRIPTION | MATERIAL | UNIT MASS (g) |
|---|---|---|---|
| 1 | Nut | X5 Cr Ni 18 10 (Inox) | 0.31 |
| 2 | Washer | CuSn6 | 0.09 |
| 3 | D-shape body | X5 Cr Ni 18 10 (Inox) | 2.60 |
| 4 | Body | X10 Cr Ni S 18 9 (Inox) | 1.77 |
| 5 | Elastic washer | X12CrNi177 | 0.01 |
| 6 | Elastic sleeve | ZrO2 | 0.20 |
| 7 | Elastic ring | X10 Cr Ni S 18 9 (Inox) | 0.08 |
| 8 | Nut | X10 Cr Ni S 18 9 (Inox) | 1.86 |
| 9 | Serclip | X35CrMo17 | 0.24 |
| | | **Total** | **7.16** |

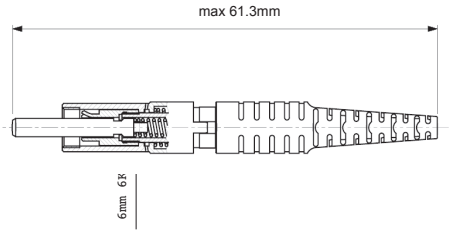
NOTE Other adapters are available, with square flange or not un-mountable. Please inquire for more information.

## AVIM® CONNECTOR AND DIMENSIONS

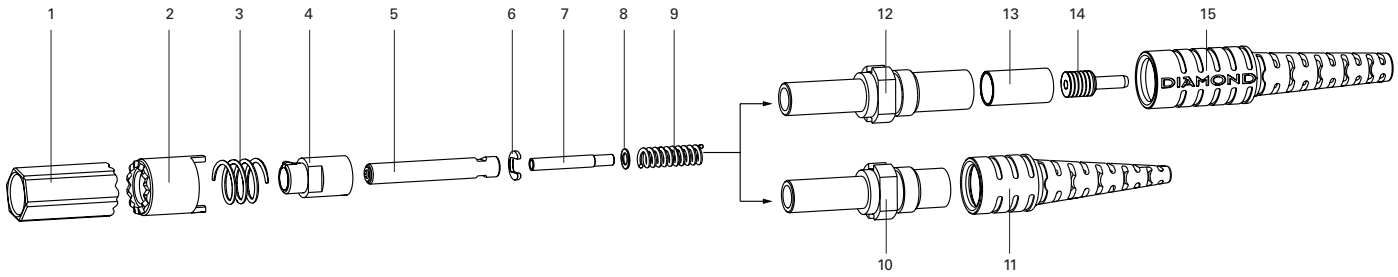
Connectors for 900µm - 3mm, straight boot style

Available types: **AVIM® (PC, APC, PM, PS)**

Ferrule material: Zirconia/metal insert, custom upon request




## BILL OF MATERIAL - BOM




| POS. | DESCRIPTION | MATERIAL | UNIT MASS (g) |
|---|---|---|---|
| 1 | Hexagonal ring | X5 Cr Ni 18 10 (Inox) | 1.08 |
| 2 | Antirotation ring | X5 Cr Ni 18 10 (Inox) | 0.78 |
| 3 | Anti-rotation spring | 1.4310 | 0.13 |
| 4 | Body Keyed nose | X10CrNiS189 | 0.48 |
| 5 | Ferrule | ZrO2, titanium | 0.27 |
| 6 | Ferrule anti-rotation std | 1.4301 | 0.01 |
| 7 | Ferrule back tube | CuZn37 | 0.06 |
| 8 | Ferrule ring for PM | CuZn37 | 0.01 |
| 9 | Ferrule spring | X12CrNi177 | 0.10 |
| 10 | Short Main body | X5 Cr Ni 18 10 (Inox) | 2.02 |
| 11 | Boot | Hytrel 8068[1] | 0.34 |
| 12 | Long main body | X5 Cr Ni 18 10 (Inox) | 1.40 |
| 13 | Crimp ring (only with long main body) | Cu-5um Ni | 0.77 |
| 14 | Reductiononly (with long main body) | CuZn39Pb3 | 0.16 |
| 15 | Long boot | Hytrel 8068[1] | 0.55 |
| 16 | Protection cap (not displayed) | DIN 1.4310 or PPO Noryl V150 | |
| | | **Total** | **8.25** |

[1] Vacuum bake is 24h at 10-2 Torr and between 110°C to 125°C.

## ORDER INFORMATION

Please refer to the part numbers provided in the separate P/N list.
For assemblies or other configurations, please contact your nearest local Diamond representative or fill in the contact form available on the **www.diamond-fo.com** website.

# DIAMOND
# Fiber Optic Components

## CABLE ASSEMBLIES AND ADAPTERS

## Midi AVIM®

| | |
|---|---|
| SINGLE MODE | PC/APC |
| MULTIMODE | PC |
| PM | PC/APC |
| HIGH TEMP, HT | PC/APC |

Following market feedback for a lighter version of the AVIM® connectors and the performance of the mini AVIM® connector, but with improved ease of use than the latter, the Midi AVIM® connector has been developed with the same optical high performance. In addition, the midi AVIM® has been made compatible with chosen aramid reinforced cables.

This connector performance is shared with the family, using identical ferrule technologies and has been made compatible with a large choice of fiber types.

### FEATURES

The optical interface follows the standards as well as most of the connector types.

- Low IL due to Active Core Alignment (A.C.A.)
- High return loss due to Diamond ultra-polishing process and A.C.A
- High vibration/shock resistance due to Miniaturized MIL-style ratchet system
- Lightweight due to the use of titanium
- Compatible with Mini AVIM® mating adapters and IMOD
- ESCC 3420/001 configurable
- Tooling for installation mandatory

### AVAILABLE AS

- Terminated connectors and assemblies with following optical interface
  - SM, MM, MM large core
  - PM or PZ
  - Multi-fiber Ferrule
- Components:
  - Connector Set (require Diamond production line)
  - Mating adapters (Mini AVIM®)
  - Interface Module IMOD (Mini AVIM®)
  - Custom assemblies
- Product grades:
  - Commercial Grade, CG
  - Customized CUST

## SPECIFICATIONS

The products are available in commercial grade. Two tables are provided: Optical performance at room temperature and list of test performed.

| COMMERCIAL GRADE, CG | SINGLE MODE | MULTIMODE | PM APC 8° | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|
| Insertion loss, IL max | typ. 0.2, max 0.4 | typ. 0.2, max 0.4 | typ. 0.2, max 0.4 | dB | IEC 61300-3-4 method B, λ=1550nm |
| Return loss, RL min | 50 (PC), 75 (APC) | 40 (PC) | 50 (PC), 75 (APC) | dB | IEC 61300-3-6, λ =1550nm |
| Polarization extinction ratio, ER min | - | - | typ 27, min 23 | dB | Diamond validated cross polarizers, low coherence method, λ=1550nm |
| Polarization angular error, α | - | - | ± 2 | ° | |
| Repeatability of IL | <= 0.2 | | | dB | IEC 61300-2-2 method B, λ=1550nm |
| Service life | 500 mate/demate cycles | | | dB | |
| Operating temperature | -40 to +85 | | | C° | |

NOTES
- Those values are at BOL, room temperature.
- For specific fibers and wavelength, please inquire on the optical specification
- Cable can further limit those values

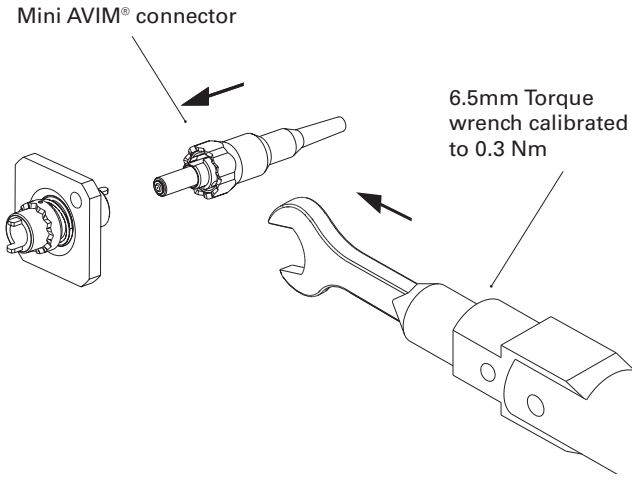
## ENVIRONMENTAL TESTS

| | CG | |
|---|---|---|
| | LEVEL | METHOD |
| Thermal cycles | -40°C to +85°C, 12 cycles | IEC 61300-2-22 |
| Humidity | +25°C to +55°C, 6 cycles, 144h | IEC 61300-2-46 |
| Vibration | Random, 35gRMS | IEC 60068-2-64 |
| Shock | 100g, 2ms | IEC 60068-2-27 |
| Torsion | 15N, 25 cycles 180° | IEC 61300-2-5 |
| Static side load | 1N, 90°, 60min | IEC 61300-2-42 |
| Fiber/cable retention | 70N, 2min | IEC 61300-2-4 |
| High temperature storage | +85°C, 96h | IEC 61300-2-18 |
| Mating durability | 500 | IEC 61300-2-22 |

Qualification test reports describe in detail test and results.

## TOOLING FOR ASSEMBLING

The same tool as for the mini AVIM® is to be used.

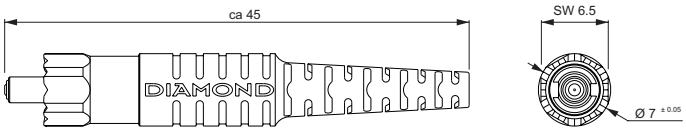


## Midi AVIM® CONNECTOR TYPES AND DIMENSIONS

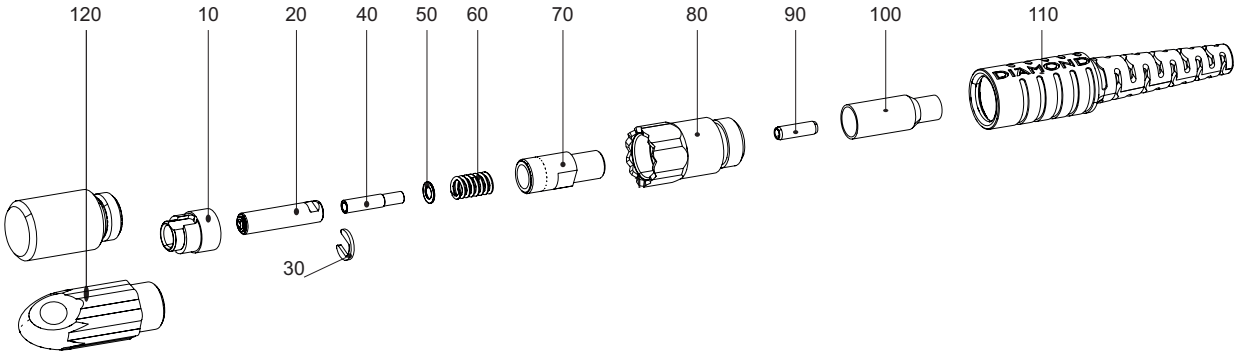
Connectors for 900um buffer coatings (or loose tube) with vacuum baked anti-flexion

Available types: **Midi AVIM® (PC, APC, PM)**

Material: According to part list




## BILL OF MATERIAL - BOM




| POS. | DESCRIPTION | MATERIAL | UNIT MASS (g) |
|---|---|---|---|
| 10 | Orientation ring | Ti6Al4V or DIN 3.7165 | 0.17 |
| 20 | Ferrule | ZrO2 . -Ti gr 1 | 0.23 |
| 30 | Orientation washer | AISI304 - DIN 1.4301 | 0.02 |
| 40 | Ferrule tube | CuZn37 | 0.09 |
| 50 | Washer | CuZn37 | 0.01 |
| 60 | Ferrule spring | AISI301 - DIN 1.4310 | 0.05 |
| 70 | Body | Ti6Al4V or DIN 3.7165 | 0.25 |
| 80 | Locking nut | Ti6Al4V or DIN 3.7165 | 0.70 |
| 90 | Crimping tube | CuZn213138 | 0.02 |
| 100 | Crimp ring | Cu-5um Ni | 0.28 |
| 110 | Antiflexion boot | Hytrel® 8068 vacuum baked | 0.83 |
| 120 | Protection cap | PPO black Noryl V0150B | n.a. |
| | Protection cap metal | X10CrNiS189 | n.a. |
| | | **Total** | **2.65** |

[1] Vacuum baked is 24h at 110°C to 125°C to 125°C and $10^{-3}$ Torr

**NOTE** Diamond's standard boot colors are as follows: Black for MM and SM PC, and green for SM APC.

## ORDER INFORMATION

When ordering pigtails or cable assemblies, please refer to the **connector type description** in the Available types section.

# DIAMOND
# Fiber Optic Components

## CABLE ASSEMBLIES AND ADAPTERS

## Mini AVIM®

| | |
|---|---|
| SINGLE MODE | PC/APC |
| MULTIMODE | PC |
| PM | PC/APC |
| PS, PM-PS, PSF | PC/APC 4° |
| PSM | PC |
| HIGH TEMP, HT | PC/APC |

The Mini AVIM® is originally a Diamond development for Exomars rover and has been standardized under ESCC 3420/001 Detail specification.

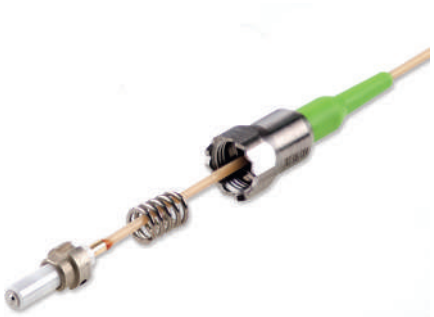
Born for space application with variants qualified for ESA and covered by ESCC certificate 355, the Mini AVIM® is born as a small connector for very harsh environment.

The Mini AVIM® combines two leading edge technologies: the AVIM® MIL-style ratchet system and the base construction of Diamond Micro Interface (DMI) connector.

The Mini AVIM® is a Commercial-Off-The-Shelf (COTS) connector that can be precisely aligned in rotation and therefore can be used for both standard SM and MM fibers, as well as for PM technologies and multi-fiber ferrules or multi-core fibers.

Our Power Solution (PS) technology can also be applied to this connector. The use of a 100% aligned GRIN lens spliced to the SM fiber allows to lower the power density at the output interface, and improve resistance to power failure due to particles.

Harsh environment applications will range from Space to underwater, applying to mobile, avionics, shipboard, oil downhole, etc.



### FEATURES

- Low IL due to Active Core Alignment (A.C.A.)
- High return loss due to Diamond ultra-polishing process and A.C.A
- High vibration/shock resistance due to Miniaturized MIL-style ratche system
- Lightweight due to the use of titanium and simple design
- ESCC 3420/001 configurable
- ESA qualification certificate 355 for defined variants
- Tooling for installation mandatory

### AVAILABLE AS

- Terminated connectors and assemblies with following optical interface
  - SM, MM, MM large core
  - PM or PZ
  - PS, PM-PS, PSf, PSm
  - Multi-fiber Ferrule
- Components:
  - Connector Set (require Diamond production line)
  - Mating adapters
  - Interface Module IMOD
- Product grades:
  - Commercial Grade, CG
  - Enhanced Grade, EG
  - Space Grade, SG
  - Customized CUST

## SPECIFICATIONS

The products are available in different grade, changing the operating range and performance. Two tables are provided: Optical performance at room temperature and list of test performed on each product grade. Some Space Grade variants are covered by ESCC qualification certificate 355 for space application.

| COMMERCIAL GRADE, CG | SINGLE MODE | MULTIMODE | PM APC 8° | PS APC 4° | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Insertion loss, IL max | typ. 0.2, max 0.4 | typ. 0.2, max 0.4 | typ. 0.2, max 0.4 | typ. 0.2, max 0.4 | dB | IEC 61300-3-4 method B, λ=1550nm |
| Return loss, RL min | 50 (PC), 75 (APC) | 40 (PC) | 50 (PC), 75 (APC) | 50 (PC), 75 (APC) | dB | IEC 61300-3-6, λ=1550nm |
| Polarization extinction ratio, ER min | - | - | typ 27, min 23 | - | dB | Diamond validated cross polarizers, low coherence method, λ=1550nm |
| Polarization angular error, α | - | - | ± 2 | - | ° | |
| Repeatability of IL | <= 0.4 | | | | dB | IEC 61300-2-2 method B, λ=1550nm |
| Service life | 500 mate/demate cycles | | | | dB | |
| Operating temperature | -40 to +85 | | | | C° | |

| ENHANCED AND SPACE GRADE, EG AND SG | SINGLE MODE | MULTIMODE | PM APC 8° | PS APC 4° | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Insertion loss, IL | typ. 0.25, max 0.5 | typ. 0.2, max 0.4 | typ. 0.25, max 0.5 | TBD | dB | IEC 61300-3-4 method B, λ=1550nm |
| Return loss, RL | 50 (PC), 75 (APC) | 40 (PC) | 50 (PC), 75 (APC) | TBD | dB | IEC 61300-3-4 method B, λ=1550nm |
| Polarization extinction ratio, ER | - | - | typ 25, min 21 | | dB | Similar to IEC 61300-3-40, low coherence, λ=1550nm |
| Polarization angular error, α | - | - | ± 2 | | ° | |
| Repeatability of IL | <= 0.4 | | | | dB | IEC 61300-2-2 method B, λ=1550nm |
| Service live | 100 mate/demate cycles | | | | dB | |
| Operating temperature | -55 to +85 | | | | C° | |

NOTES
- Those values are at BOL, room temperature.
- For specific fibers and wavelength, please inquire on the optical specification
- Cable can further limit those values

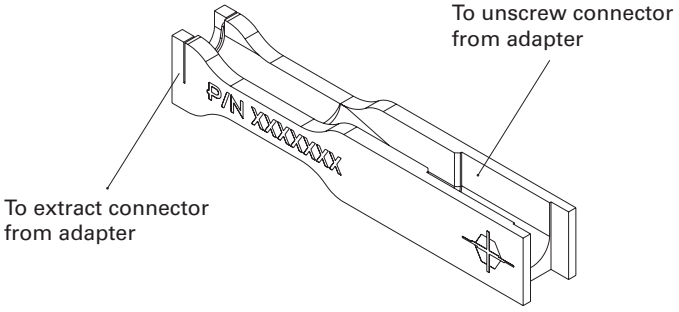
## ENVIRONMENTAL TESTS

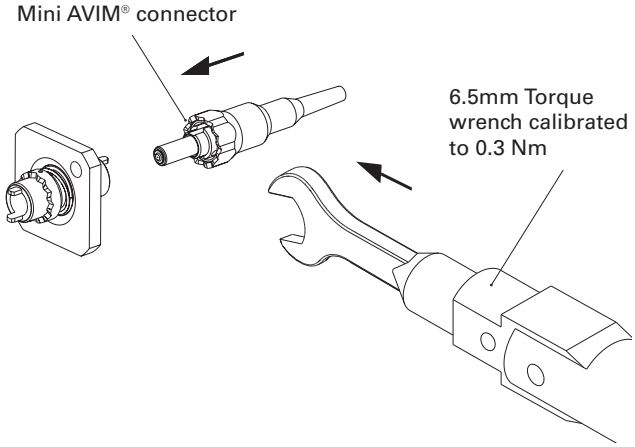
| | CG | |
|---|---|---|
| | LEVEL | METHOD |
| Thermal cycles | -40°C to +85°C, 20 cycles | IEC 61300-2-22 |
| Humidity | +40°C, 168h | IEC 61300-2-19 |
| Vibration | Sinus, 20g, 15cycles | IEC 61300-2-19 |
| Shock | 5 drops, 1.5m | IEC 61300-2-12 |
| Torsion | 2N, 25 cycles 180° | IEC 61300-2-5 |
| Static side load | 0.2N, 90°, 5min | IEC 61300-2-42 |
| Fiber/cable retention | 5N, 1min | IEC 61300-2-4 |
| High temperature storage | +85°C, 168h | IEC 61300-2-18 |
| Mating durability | 500 | IEC 61300-2-22 |
| Low pressure | - | - |
| Dust | - | - |
| Salt mist | - | - |
| Rapid depressurisation | - | - |

| | SG and EG | |
|---|---|---|
| | LEVEL | METHOD |
| Thermal cycles | -55°C to +85°C, 100 cycles | IEC 61300-2-22 |
| Humidity | +25°C to +55°C, 6 cycles, 144h | IEC 61300-2-46 |
| Vibration | Random, 35gRMS | IEC 60068-2-64 |
| Shock | 500g, 2ms | IEC 60068-2-27 |
| Torsion | 2N, 25cycles 180° | IEC 61300-2-5 |
| Static side load | 0.2N, 90°, 60min | IEC 61300-2-42 |
| Fiber/cable retention | 5N, 2min | IEC 61300-2-4 |
| High temperature storage | +85°C, 1000h | IEC 61300-2-18 |
| Mating durability | 100 | IEC 61300-2-2 |
| Low pressure | 4*10-8 Torr, 8h | IEC 60068-2-13 |
| Dust | 30°C to 60°C, 2h | IEC 61300-2-27 |
| Salt mist | +35°C, 85% r.h, 5% salt, 96h | IEC 60068-2-11 |
| Rapid depressurisation | atm to 50mbar in 5s, 5 cycles | MIL-STD.810G |

Qualification test reports describe in detail test and results.

## TOOLING FOR ASSEMBLING

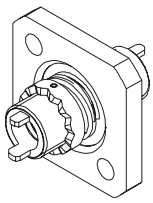


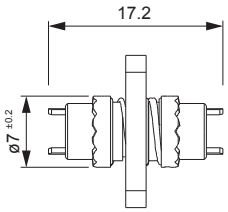



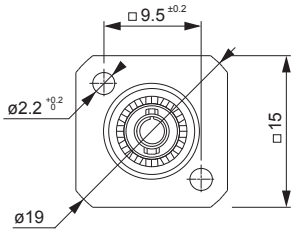
## MINI AVIM® ADAPTER AND DIMENSIONS

Available types: Square flange adapter for wall mount

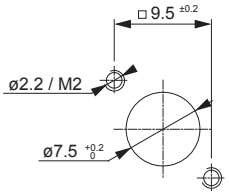
Material: According to part list



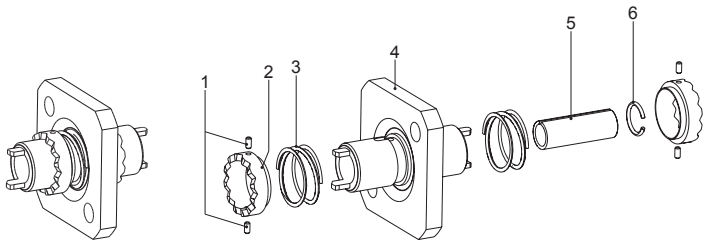



CUTOUT DIMENSIONS




## BILL OF MATERIAL - BOM



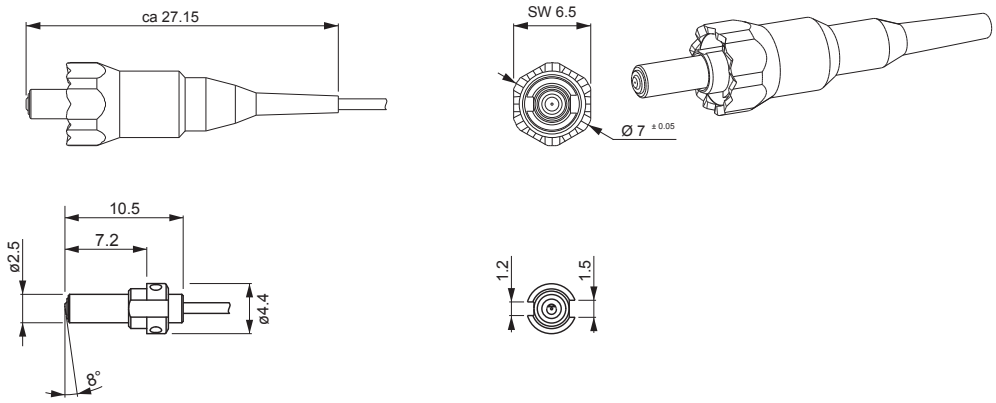

| POS. | DESCRIPTION | MATERIAL | WEIGHT (gr.) |
|---|---|---|---|
| 1 | Pin for Anti-rotation ring (4x) | Ti6AL4V | 0.01 |
| 2 | Anti-rotation ring (2x) | Ti6Al4V | 0.20 |
| 3 | Anti-rotation spring (2x) | AISI 316 or DIN 1.4401 | 0.14 |
| 4 | Main body | Ti6Al4V | 2.12 |
| 5 | Split sleeve | ZrO2 | 0.16 |
| 6 | Clip for split sleeve | AISI 301 or DIN 1.4310 | 0.01 |
| | | **Total** | **2.64** |

## Mini AVIM® CONNECTOR DIMENSIONS

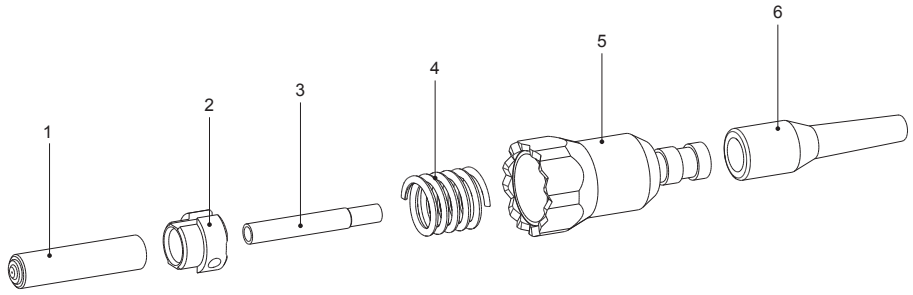
Connectors for 900um buffer coatings (or loose tube) up to 1.2mm cable

Available types: **Mini AVIM® (PC, APC, PM, PS)**

Material: According to part list




## BILL OF MATERIAL - BOM




| POS. | DESCRIPTION | MATERIAL NAME | MATERIAL NORMS | UNIT MASS (g) |
|---|---|---|---|---|
| 1 | Ferrule | Ceramic-Titanium | ZrO2, Ti gr 1 | 0.21 |
| 2 | DMI ring | Titanium | Ti6Al4V | 0.09 |
| 3 | Ferrule back tube | Brass | CuZn37 | 0.03 |
| 4 | Spring | Stainless steel | 1.4310 (AISI 301) | 0.11 |
| 5 | Outside shell | Titanium | Ti6Al4V | 0.52 |
| 6 | Vacuum baked boot | Thermoplastic Elastomer TCP-ET | Hytrel 8068[1] | 0.08 |
| | | | **Total** | **1.06** |

[1] Vacuum baked, 144h at 110°C to 125°C and $10^{-2}$ Torr

NOTE Diamond's standard **boot** colors are as follows: Black for MM and SM PC, and green for SM APC.

## ORDER INFORMATION

Please refer to the part numbers provided in the separate P/N list.
For assemblies or other configurations, please contact your nearest local Diamond representative or fill in the contact form available on the **www.diamond-fo.com** website.

# DIAMOND
# Fiber Optic Components

## CABLE ASSEMBLIES AND ADAPTERS

## Micro AVIM®

| | |
|---|---|
| SINGLE MODE | PC/APC |
| MULTIMODE | PC |
| PM | PC/APC |
| PS, PM-PS, PSF | PC/APC 4° |
| PSM | PC |
| HIGH TEMP, HT | PC/APC |

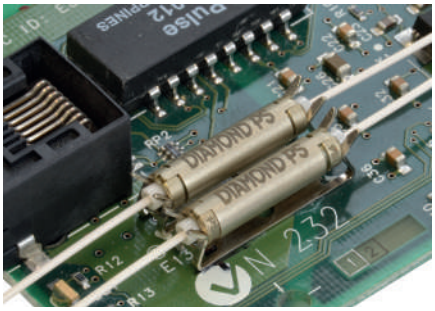
In order to ensure the highest technical performance and to provide an optimum solution for high density packaging, DIAMOND has developed the micro AVIM® based on the DMI connectors, but using only titanium components.

The micro AVIM® is identical to the mini AVIM® in terms of termini, but use different locking mechanism borrowed to the DMI.

Micro AVIM® connectors are based on standard ø2.5 mm ferrules and are designed to operate with multimode and single mode fibers, 0° PC as well as 8° APC polished.

Thanks to its minimal space requirement, this system is an ideal solution for Printed Circuit Board (PCB) applications as well as a high quality interface between active and passive components of fiber optic installations.

As such it has been used to replace splices, in some applications, improving the modularity at a low height budget impact.


### FEATURES

- Low IL due to Active Core Alignment (A.C.A.)
- High return loss due to Diamond ultra-polishing process and A.C.A
- High vibration/shock resistance due to minimal mass and simple design
- Very lightweight due to the use of titanium and simplest design
- ESCC 3420/001 configurable
- Mating adapter clip simple installation (screw and/or solder)
- Tooling for installation mandatory

### AVAILABLE AS

- Terminated connectors and assemblies with following optical interface
  - SM, MM, MM large core
  - PM or PZ
  - PS, PM-PS, PSf, PSm
  - Multi-fiber Ferrule
- Multi-fiber Ferrule
  - Components:
  - Connector Set (require Diamond production line)
  - Mating adapters
  - Custom assemblies
- Product grades:
  - Commercial Grade, CG
  - Enhanced Grade, EG
  - Space Grade, SG
  - Customized CUST

## SPECIFICATIONS

The products are available in different grade, changing the operating range and performance. Two tables are provided: Optical performance at room temperature and list of test performed on each product grade.

| COMMERCIAL GRADE, CG | SINGLE MODE | MULTIMODE | PM APC 8° | PS APC 4° | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Insertion loss, IL max | typ. 0.2, max 0.4 | typ. 0.2, max 0.4 | typ. 0.2, max 0.4 | typ. 0.2, max 0.4 | dB | IEC 61300-3-4 method B, λ=1550nm |
| Return loss, RL min | 50 (PC), 75 (APC) | 40 (PC) | 50 (PC), 75 (APC) | 50 (PC), 75 (APC) | dB | IEC 61300-3-6, λ=1550nm |
| Polarization extinction ratio, ER min | - | - | typ 27, min 23 | - | dB | IEC 61300-3-55 method A |
| Polarization angular error, α | - | - | ± 2 | - | ° | |
| Repeatability of IL | <= 0.5 | | | | dB | IEC 61300-2-2 method B, λ=1550nm |
| Service life | 500 mate/demate cycles | | | | dB | |
| Operating temperature | -40 to +85 | | | | C° | |

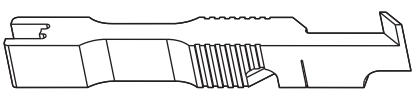
| ENHANCED AND SPACE GRADE, EG AND SG | SINGLE MODE | MULTIMODE | PM APC 8° | PS APC 4° | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Insertion loss, IL | typ. 0.25, max 0.5 | typ. 0.2, max 0.4 | typ. 0.25, max 0.5 | TBD | dB | IEC 61300-3-4 method B, λ=1550nm |
| Return loss, RL | 50 (PC), 75 (APC) | 40 (PC) | 50 (PC), 75 (APC) | TBD | dB | IEC 61300-3-4 method B, λ=1550nm |
| Polarization extinction ratio, ER | - | - | typ 25, min 21 | | dB | IEC 61300-3-55 method A |
| Polarization angular error, α | - | - | ± 2 | | ° | |
| Repeatability of IL | <= 0.5 | | | | dB | IEC 61300-2-2 method B, λ=1550nm |
| Service live | 100 mate/demate cycles | | | | dB | |
| Operating temperature | -55 to +85 | | | | C° | |

NOTES
- Those values are at BOL, room temperature
- For specific fibers and wavelength, please inquire on the optical specification
- Cable can further limit those values

## ENVIRONMENTAL TESTS

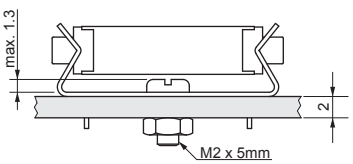
| | CG | |
|---|---|---|
| | LEVEL | METHOD |
| Thermal cycles | -40°C to +85°C, 20 cycles | IEC 61300-2-22 |
| Humidity | +40°C, 168h | IEC 61300-2-19 |
| Vibration | Sinus, 20g, 15cycles | IEC 61300-2-19 |
| Shock | 5 drops, 1.5m | IEC 61300-2-12 |
| Torsion | 2N, 25 cycles 180° | IEC 61300-2-5 |
| Static side load | 0.2N, 90°, 5min | IEC 61300-2-42 |
| Fiber/cable retention | 5N, 1min | IEC 61300-2-4 |
| High temperature storage | +85°C, 168h | IEC 61300-2-18 |
| Mating durability | 500 | IEC 61300-2-22 |
| High power, dry heat | 6W, 85°C, 1h | IEC 61300-2-14 |
| Low pressure | - | - |
| Dust | - | - |
| Salt mist | - | - |
| Rapid depressurisation | - | - |

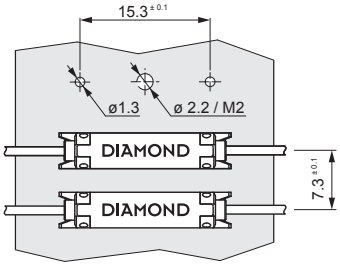
## TOOLING FOR ASSEMBLING



PN: 1032053

DMI and Micro AVIM® mounting tool



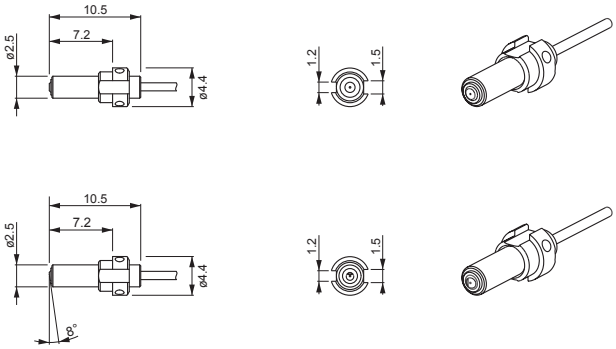

PN: 1009209

DMI and Micro AVIM® Adapter Clip
CuBe Nickel coated (Screw not included)

## CONNECTOR TYPES AND DIMENSIONS

Micro AVIM® connectors on 900 µm fiber, without boot

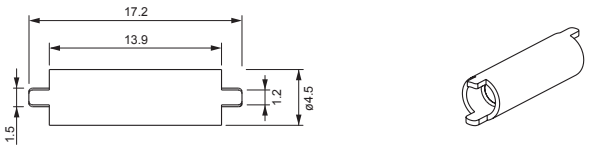
| | |
|---|---|
| Available types: | **Micro AVIM® - PC**<br>**Micro AVIM® - APC** |
| Ferrule material: | Zirconia/Ti gr 1 |
| External parts: | Ti6Al4V |
| Mass: | 0.33 gr |




## ADAPTER TYPES AND DIMENSIONS

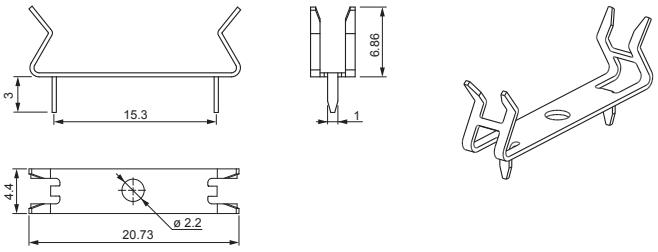
Micro AVIM® mating adapters

| | |
|---|---|
| External parts: | Ti6Al4V |
| Mating sleeve: | Zirconia |
| Mass: | 0.6 gr |




Micro AVIM® mating adapters clip

| | |
|---|---|
| External parts: | Metal (Cu Be2; tinned solderable) |
| Mass: | 0.36 gr |




## ORDER INFORMATION

Please refer to the part numbers provided in the separate P/N list.
For assemblies or other configurations, please contact your nearest local Diamond representative or fill in the contact form available on the **www.diamond-fo.com** website.

## ACCREDITED LABORATORY

For opto-mechanical product tests, quality control and qualifications Diamond relies since 2002 upon an internal, fully independent, test laboratory qualified by the Swiss Accreditation Service SAS. The laboratory has a STS 0333 accreditation for fiber-optic component testing as well as a SCS 0101 accreditation for the calibration of fiber-optic measurement instruments according to ISO/IEC 17025 :2017.

The laboratory is equipped to perform a wide variety of tests both on the optical or mechanical product performance under different environmental conditions according to IEC, ISO, Telcordia, or MIL standard requirements. Additional characterization procedures that have not yet been standardized are also possible, particularly in relation to the use of high-power lasers.

These testing services are also available to customers.

## ISO 6 AND ISO 7 CLEANROOM

For particularly demanding markets such as the medical, the space, life sciences industry sectors, Diamond offers a dedicated controlled environment where to perform part of the product processing. In an ISO 7 cleanroom (class 10'000 according to FED STD 1209E) products can be cleaned, dried, inspected, and packaged before delivery. Specific custom procedures may be implemented upon request.

**Cleanroom ISO 7 characteristics:**

- **Class:** ISO 7 (norm DIN EN ISO 14644-1)
- **Filters:** 3 ULPA U15 filters
- **ESD-compliant:** yes
- **Surface:** 40 m2

**Cleanroom ISO 6 characteristics:**

- **Class:** IOS 6
- **Filters:**
- **ESD-compliant:** yes
- **Surface:** 180 m2

# PRODUCTS PART NUMBER

## Mating-Adapters

| DESCRIPTION | ORDER NUMBER |
|---|---|
| Mini AVIM® mating adapter square Flange CG | 1058232 |
| AVIM® mating adapter hex flange NS CG | 1028003 |
| AVIM® mating adapter square flange NS CG | 1073322 |
| Micro AVIM® mating adapter | 1023245 |
| Micro AVIM® mating adapter clip | 1009209 |

## Hybrid Mating-Adapters

| DESCRIPTION | ORDER NUMBER |
|---|---|
| Mini AVIM® - LSA/AVIM® | 1064074 |
| Micro AVIM® - FC NS | 1082140 |
| Mini AVIM® - Micro AVIM®/DMI | 1065927 |
| LSA/AVIM® - FC wk (key 2.14 mm) | 1018449 |
| LSA/AVIM® - FC nk (key 2.00 mm) | 1024895 |
| LSA/AVIM® - ST | 1018448 |
| LSA/AVIM® - SC SM APC | 1018490 |
| LSA/AVIM® - E-2000® SM APC | 1018934 |
| LSA/AVIM® - F-3000® (LC) SM APC | 1018818 |

## MAS Adapter System

| DESCRIPTION | ORDER NUMBER |
|---|---|
| MAS Mini AVIM® Universal Flange | 1059841 |
| MAS adapter E-2000® | 1023701 |
| MAS adapter SC | 1023681 |
| MAS adapter LSA/AVIM® | 1023676 |
| MAS adapter ST™ | 1018981 |
| MAS adapter F-3000® (LC) | 1023682 |
| MAS adapter FC wk (wide key 2.14 mm) | 1023677 |
| MAS adapter FC nk (narrow key 2.00 mm) | 1023678 |
| MAS FC wk Universal Flange | 1022898 |

## IMOD

| DESCRIPTION | ORDER NUMBER |
|---|---|
| IMOD Mini AVIM® PC, stopper on ceramic CG | 1080135 |
| IMOD Mini AVIM® APC8, stopper on ceramic CG | 1080823 |

## Tools

| DESCRIPTION | ORDER NUMBER |
|---|---|
| AVIM® 6mm torque wrench 0.3Nm for connector | 1027834 |
| AVIM® 8mm torque wrench 1.5Nm for mating adapter | 1027835 |
| AVIM® 11mm torque wrench 1.0Nm for mating adapter coupling nut | 1027836 |
| AVIM® mating adapter holding tool | 1030366 |
| Mini AVIM® torque wrench 0.3Nm | 1060037 |
| Mini AVIM® un-mounting tool | 1060258 |
| Micro AVIM®/DMI mounting tool | 1032053 |
| Video Inspection microscope kit | 1081582 |