



ENGINEERING TECHNICAL WHITE PAPER

Selecting a MIL-PRF-29504 Fiber Optic Terminus

Interface selection, optical media, cable retention and configuration control

Prepared for design engineers, connector applications engineers, manufacturing engineers and program technical authorities.

Document ID	Revision	Issue date	Classification
XI-TP-29504-005	Rev D	31 October 2026	Engineering application guidance

Scope: Selection of XiOptics /4, /5, /6 and /7 product families. The applicable drawing, contractual specification revision, approved termination procedure and program requirements govern the final selection. This paper does not authorize component substitution or establish qualification status for an individual configuration.

Executive technical summary

Select the terminus by working from the connector and cable assembly requirements toward the part number. The mating interface, optical media, ferrule bore, cable construction, retention style and procurement requirements form one configuration. A match on a single attribute, such as contact size or nominal fiber type, is not enough to release a part for use.

For an existing assembly, begin with its approved drawing and change-control requirements. For a new design, identify the connector cavity and mating terminus, then review optical and mechanical requirements together. Use the XiOptics configurator to identify a candidate and retain the complete resulting part number for engineering review and quotation.

1 Establish the selection basis

Collect the connector manufacturer and part number, insert or cavity identification, mating-half details, cable datasheet, and applicable assembly drawing. Record the required optical performance and operating environment from the program specification. Identify whether procurement calls for a qualified military item, a commercial configuration, or a customer-controlled part.

An incomplete selection basis should produce an engineering question, not a guessed configuration. In particular, do not infer cable retention from outer diameter alone or qualification from a product-family description.

2 Select the connector interface and terminus function

The current XiOptics product family separates the four interfaces below. Use these descriptions to enter the correct product family, then verify the exact connector drawing and approved component requirements. The slash number identifies an interface; it does not by itself define the fiber, ferrule bore or retention construction.

Interface	Function	XiOptics product-family context
/4	Pin terminus	MIL-DTL-38999 size 16 connector applications
/5	Socket terminus	MIL-DTL-38999 size 16 connector applications
/6	Pin terminus	ARINC 600 / ARINC 404 connector applications
/7	Socket terminus	ARINC 600 / ARINC 404 connector applications

Check the pin/socket relationship at the optical mating interface rather than assuming it from the connector shell description. Confirm contact seating, rear clearance, insertion and extraction access, and any socket alignment components against the released drawings. A shared interface designation is not blanket approval for every connector or cable assembly.

3 Match the optical media and ferrule bore

Identify whether the application uses single-mode glass fiber, multimode glass fiber or plastic optical fiber. Supply the fiber manufacturer and designation, nominal dimensions and tolerances, coating or buffer details, and complete cable construction. Core diameter alone is insufficient to select a ferrule bore. The design selection must consider tolerances of the fiber core/cladding OD and then include an allocation for adhesive to secure the cladding to the ferrule bore.

Select the bore using the applicable fiber and terminus drawings and the approved termination process. Do not apply a generic clearance allowance from this paper: dimensional tolerances, fiber preparation and the required termination process must be reviewed together. Where the requested bore or cable construction is not represented in the standard choices, send the datasheets to XiOptics engineering.

Plastic optical fiber requires its own product and process review. Do not assume that a glass-fiber ferrule option, adhesive selection, or polishing procedure is transferable to POF because the connector interface is similar.

Be aware that single-mode fiber with its small optical waveguide requires a more precise ferrule fitment than multi-mode fiber. XiOptics helps the design and production engineers by holding single mode thru hole tolerances to -0/+0.5 micron where-as multi-mode termini will have ferrules with typically a -0/+1.0 to +1.5 micron tolerance. For single mode applications a ferrule thru hole ID should be likely sized to the nearest 0.5 micron of the maximum core/cladding diameter of the optical media selected.

4 Define the optical acceptance requirements

Record the specified insertion-loss and return-loss requirements where applicable, operating wavelength, test method, endface requirements, and mating conditions. These requirements belong to the program or assembly specification; this selection guide does not introduce new limits. Confirm how the selected terminus, fiber and termination process will be evaluated before release.

5 Choose a retention architecture for the cable

Cable retention must transfer the prescribed mechanical loads through the intended reinforcement and body interfaces without compromising the optical termination. Review the jacket, buffer, strength members, strip dimensions and rear-seal interface as one assembly. The selected retention construction must be supported by an approved procedure for that cable.

Consideration	Style 1	Style 2
Representative rear retention	External reinforcement capture using an adhesive-lined recovered sleeve	Prepared reinforcement bonded within an integral rear cup
Distinct process controls	Yarn placement, sleeve position and controlled thermal recovery	Bond-area preparation, adhesive placement, reinforcement engagement and cure
Selection implication	Review established drawings, tooling and approved assembly procedures	Evaluate cable-specific bonding and connector rear-interface compatibility
Controls shared by both	Optical termination and prescribed mechanical/environmental acceptance	Optical termination and prescribed mechanical/environmental acceptance

These are representative architectures for the /4 and /5 comparison in XiOptics white paper XI-TP-29504-001 Rev B. Availability and detailed construction for an exact part, including /6 and /7, must be checked against that part's drawing. The table does not imply every style is available in every family.

Style 2 eliminates the separate external sleeve-recovery operation in the representative comparison. It still requires adhesive and workmanship controls and final verification. For a legacy assembly, retaining the approved Style 1 configuration may be necessary until an engineering change is authorized. Neither geometry nor reduced step count establishes universal reliability or environmental superiority.

6 Confirm procurement and qualification requirements

Keep the optical-interface decision separate from procurement status. A commercial configuration and a qualified military item may be offered within the same product family, but their descriptions are not interchangeable. Confirm the exact part number, suffix, required source approval and applicable qualification evidence before ordering or releasing a bill of materials.

For a substitution, the design authority should review mating, optical characteristics, cable retention, tooling, rear-seal geometry and environmental requirements. Record the required verification and obtain the applicable drawing or change approval. XiOptics configurator identifies a candidate; it is not an approval of a program-specific substitution.

7 Use the configurator as a documented selection aid

Open the MIL-PRF-29504 product page and choose the required /4, /5, /6 or /7 interface. Work through the applicable fiber, bore and construction choices. Compare those choices with the assembly requirements rather than choosing an available option solely because it produces a part number.

Retain the complete configured part number, the selected options, and the drawing revision used for review. Send this information with the cable datasheet, quantity and required date when requesting a quotation. Resolve any mismatch or unavailable option with XiOptics before placing it on a controlled drawing.

8 Engineering release checklist

Review item	Evidence to retain
Connector and mating interface	Connector/cavity drawing; mating-half and pin/socket identification
Fiber and cable	Manufacturer datasheets; dimensions/tolerances; buffer, jacket and reinforcement
Terminus construction	Complete part number; bore and retention choice; released drawing
Assembly process	Approved instructions, tooling, adhesive and cure requirements where applicable
Acceptance and procurement	Program test requirements; required source and qualification evidence
Release decision	Engineering disposition of exceptions and required configuration approval

9 Conclusion

A defensible selection is a documented match between the connector interface, optical media, cable construction and program requirements. Start from controlled assembly information, use the configurator to identify the candidate, and close the remaining engineering questions before release. This sequence makes the selection review traceable and avoids treating interface compatibility as a substitute for full assembly approval.

References and application support

1. XiOptics, Style 1 vs. Style 2 Cable Strength-Member and Jacket Retention, XI-TP-29504-001, Rev B, 31 October 2026.
2. XiOptics, MIL-PRF-29504 product family, configurator and FAQ; website content reviewed 31 October 2026. www.xioptics.com/m29504-termini.html and www.xioptics.com/faq.html.
3. Governing documents for the application: MIL-PRF-29504 and the applicable /4, /5, /6 or /7 detail sheet at the contractual revision; released connector, cable and terminus drawings; approved termination instructions. Verify revision applicability before engineering release.

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