Explaining AS22759 Wire Families: When to Use /32, /33, /34, /35, and /36

Executive Summary

AS22759 wires are a cornerstone of aerospace and defense electrical systems, offering reliability in high-temperature, high-vibration, and chemically aggressive environments. This white paper provides a comprehensive guide to the /32, /33, /34, /35, and /36 wire families, comparing insulation systems, temperature and voltage ratings, platform suitability, and recommended applications. Understanding these distinctions allows engineers to select the optimal wire for mission-critical systems, balancing flexibility, durability, and safety.

Introduction

Modern aerospace and defense platforms operate in environments that push electrical systems to their limits. Wires must survive extremes of temperature, mechanical stress, vibration, and chemical exposure while maintaining electrical performance over decades.

The AS22759 series of wires addresses these challenges with standardized constructions, conductor stranding, and insulation systems designed for demanding conditions. Choosing the correct wire family is not trivial: factors such as flexibility, thermal tolerance, voltage rating, and platform-specific requirements must all be considered.

AS22759 wire families of /32, /33, /34, /35, and /36 are compared in this paper, with a focus on insulation type, temperature and voltage ratings, and platform suitability to aid design engineers in making informed choices.

AS22759 Wire Families: Common Characteristics

Wire Family	Conductor Type	Stranding	Insulation	Temp. Range	Voltage Rating	Flexibility	Platform Suitability	Typical Applications
/32	Tinned Copper	19	ETFE	-65°C to +200°C	600V	Low	Aircraft (static harnesses), spacecraft	Power distribution, static circuits

Wire Family	Conductor Type	Stranding	Insulation	Temp. Range	Voltage Rating	Flexibility	Platform Suitability	Typical Applications
/33	Tinned Copper	37	ETFE	-65°C to +200°C	600V	Medium	Aircraft, satellites, UAVs	Secondary wiring, medium-flex circuits
/34	Tinned Copper	19	FEP	-65°C to +200°C	600V	Low	Engines, hot avionics zones	High-temp circuits, fuel systems
/35	Tinned Copper	37	FEP	-65°C to +200°C	600V	Medium	Engines, avionics, UAVs	Medium-flex high-temp circuits
/36	Tinned Copper	61	FEP	-65°C to +200°C	600V	High	Dynamic platforms: turrets, robotic arms, moving surfaces	Flexible harnesses, dynamic connections

Observations:

- **Insulation:** ETFE offers excellent abrasion and chemical resistance; FEP is superior for flexibility and chemical/thermal tolerance.
- **Temperature rating:** Uniform across families, suitable for both continuous operation and short-term thermal spikes.
- **Voltage rating:** Standard 600V, sufficient for most aerospace power and signal circuits.
- **Flexibility:** Conductor stranding governs bend radius and fatigue life; higher strands allow dynamic applications.
- **Platform suitability:** Wire selection should consider static vs dynamic installation, environmental exposure, and mechanical stress.

When to Use Each Family

AS22759/32

- **Best For:** Low-flex static circuits.
- **Advantages:** Cost-effective, durable insulation, easy to terminate.
- **Platform Suitability:** Static aircraft harnesses, spacecraft power distribution.

AS22759/33

- **Best For:** Medium-flex circuits that require occasional movement.
- **Advantages:** Balances cost and flexibility; ETFE insulation enhances chemical and abrasion resistance.
- **Platform Suitability:** Aircraft secondary circuits, UAV wiring harnesses.

AS22759/34

- **Best For:** High-temperature environments.
- **Advantages:** FEP insulation tolerates engine heat, chemical exposure, and occasional flexing.
- **Platform Suitability:** Engine compartments, avionics near heat sources, fuel line circuits.

AS22759/35

- **Best For:** Medium-flex circuits in high-temperature zones.
- **Advantages:** Good compromise between flexibility, temperature tolerance, and chemical resistance.
- **Platform Suitability:** Engines, avionics compartments, UAVs requiring moderate flex.

AS22759/36

- **Best For:** Dynamic wiring systems with repeated flexing.
- **Advantages:** Maximum flexibility, highest fatigue life, FEP insulation for thermal and chemical resistance.
- **Platform Suitability:** Turrets, robotic arms, moving control surfaces, dynamic aircraft systems.

Installation and Maintenance Considerations

- **Bend Radius:** Maintain a minimum bend radius of 6× the wire diameter to avoid insulation or conductor damage.
- **Routing:** Separate high-temperature wires from heat sources or shield appropriately.
- **Termination:** Follow AS or MIL standards for crimping or soldering to prevent premature failures.
- **Labeling:** Proper identification reduces maintenance errors and downtime.
- **Voltage and Temperature Compliance:** Confirm that wires are applied within rated voltage and temperature ranges to maintain safety and reliability.

Conclusion

Selecting the correct AS22759 wire family is critical for mission-critical systems in aerospace and defense. By evaluating insulation type, temperature rating, voltage rating, and platform suitability, engineers can optimize harness design for durability, safety, and maintainability.

- **Static applications:** /32, /34
- **Medium-flex applications:** /33, /35
- **Dynamic/high-flex applications:** /36

Proper wire selection assures that electrical systems survive mechanical stress, thermal extremes, and chemical exposure, ultimately supporting platform reliability, operational safety, and long-term performance.