

ERFS.. Series cable sets are mixed signal cable sets that can be used to transmit Fiber, Coaxial and electrical signals using 1 SINGLE CABLE SET. They use small form factor push-pull connectors which are much smaller than traditional MIL38999 connectors. 1 single cable set can have fiber, coaxial and electrical signal transmission thereby reducing the need for separate cables for fiber or coax. These have been designed for military applications where size and weight are a premium, for example man-portable systems.



APPLICATIONS

- Handheld communication, ECM
- Headup-display, Missiles
- FLIR's, Gimbals, Thermal Imagers
- Various Man-Portable Military Equipments

MIL STANDARDS CONFORMANCE

- MIL-W-22759/18 conformant electrical cable, imported from reputed suppliers like Habia, Sweden
- Fiber Optic cable conforms to MIL-85045 and RF Cable conforms to MIL-C-17
- Connectors conform to MIL-STD-810(enironmental), MIL-STD-202 (sealing)

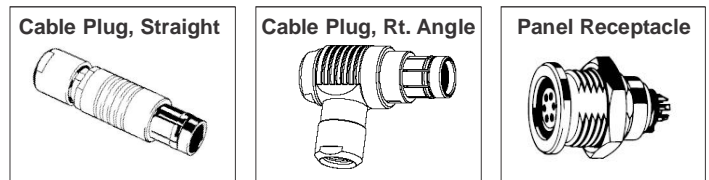
FEATURES OF ELECTRICAL CABLE

- Cable conforms to MIL-W-22759/18
- ETFE polymer cable
- -90°C ~ +155°C operating temperatures
- Highly chemical resistant to fuels, oils, acids
- Highly flame retardent, low smoke

FEATURES OF CONNECTORS USED

- Smaller form factor connector as compared to MIL38999 yet meets all the MIL standards as of MIL38999.
- Far lighter in weight as compared to MIL38999, ideal for man-portable military equipments or applications where weight is a premium.
- High density contact packing upto 55 pins
- Rated to IP68
- High functional life of upto 5000 mating cycles
- -50°C ~ +150°C operating temperatures
- EMC Shielding: 360°
- Convenient push-pull locking mechanism

Small Form Factor MIL-Confirmant Connectors



Connector Technical Specifications

Sealing Performance	IP68: 2m submersion for 24 hours	IEC 60529
Operating Temperature	-65°C to +130°C	IEC 60512-6-11 i+j
Corrosion Resistance	Salt mist, 96 hours, 5% salt solution, 35°C	MIL-STD-202, Method 101 Condition A
Endurance	5000 mating cycles	IEC 60512-5-9a
Vibration	10 to 2000 Hz, 1.5 mm or 15 g, 12 sweep cycles per axis, 20 minutes per 10-2000-10 Hz sweep cycle, no discontinuity > 1 us	MIL-STD-202 Method 204 Condition B
Radiation Resistance	10° Gy (=100M Rads)	

Insulation Resistance	> 10 ¹⁰ Ω, IEC 60512-2-3a Method C
Shell Resistance	45 mΩ, IEC 60512-2-2f
Contact Resistance over 5000 Mating Cycles	5 mΩ, IEC 60512-2-2a/b
Shielding Effectiveness	> 60 dB to 1GHz, IEC 60512-23-3

Body Shell	Brass, Chrome over Nickel
Cable Clamp, Nuts and other inner parts	Brass, Nickel
Contacts (Male)	Brass, Gold Plated
Contacts (Female)	Bronze, Gold Plated

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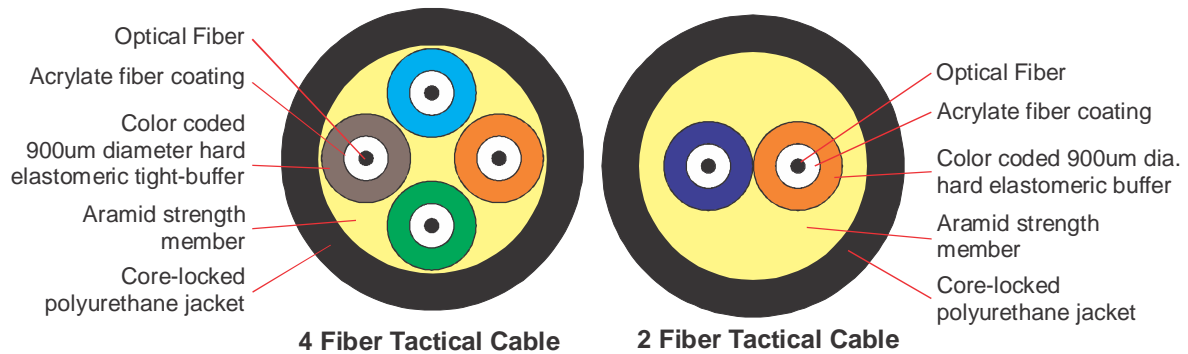
Fiber Optic Contacts Data

	Singlemode	Multimode
Fiber diameter (µm)	9/125	50&62.5/125
Insertion loss (dB)	0.5	<1
Mating cycles	> 500	
Oper. Temperature (°C)	- 40 to +80	

Coaxial Contacts Data

Oper. Voltage	500 V
Impedance	50 or 75 Ohms
Frequency	DC - 6 GHz
Mating cycles	> 500
VSWR	<1.08 @1 GHz ; < 1.12 @1-3 GHz <1.35 @3-6 GHz

Fiber Optic Cables - Technical Data



Cable Code	No of Fiber	Mode	Core/Cladding (um)	Cable Dia. mm	Weight kg/km	Tensile Load Max (N)		Bend Radius Min (cm)		Attenuation Min (dB/Km)		
						Install.	Oper.	Install	Oper.	850nm	1300nm	1550nm
D02	2	Single	9/125	5	23	1800	600	8	4	-	0.5	0.5
D04	4	Single	9/125	5.5	28	1800	600	8.8	4.4	-	0.5	0.5
D02	2	Multi	62.5/125	5	23	1800	600	8	4	3.5	1.5	-
D04	4	Multi	62.5/125	5.5	28	1800	600	8.8	4.4	3.5	1.5	-



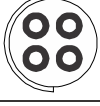


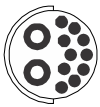
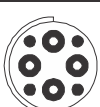
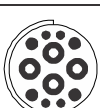
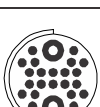
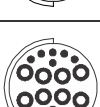
Choice of RF Cable Types

Parameter	RG316	RG 174	MF05
Diameter Outer	0.098 inch (2.48mm)	0.114 inch (2.9mm)	0.106 inch (2.7mm)
Dielectric	PTFE	PE	PTFE
Outer Shield	Silver-plated copper	Tinned copper	Silver-plated copper
Jacket	FEP	PVC	FEP
Min. Bend Radius	0.5 inch (12.5mm)	0.4 inch (10.2mm)	0.78 inch (20mm)
Weight	0.0122 (lb/ft)	0.0008 (lbs/ft)	0.015 (lbs/ft)
Temp. Range	-55°C to +125°C	-40°C to +85°C	-55°C to +125°C
Impedance	50Ω	50Ω	50Ω
Capacitance	29.4 (pF/ft)	29.9 (pF/ft)	30 (pF/ft)

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Connector Choices and Contact Arrangement

CONTACT ARRANGEMENT	CONNECTOR CODE	Number of Fiber or Coax contacts	Dimension			Electrical Contacts					Compatible Wires
			A (mm)	B (mm)	C (m)	Number of contacts	Contact Diameter [mm]	Maximum Wire AWG	Max. Current [A] with 20°C Temp rise	Max. Current [A] with 40°C Temp rise	
	4A109-1	1	50	12	15	6	0.9	22	5	7	AW22~30
	P1924	1				10	0.5	30	1.5	2	AW28~30
	5A105-1	4	60	15	18						
	5A117-1	2	60	15	18	4	0.7	26	2.5	3.8	AW26~30
	5A121-1	3	60	15	18	5	0.7	26	2.5	3.8	AW26~30
	P1912	2				10	0.7	26	2.5	3.8	AW26~30
	51A024-1	4	60	15	18	4	0.9	22	5	7	AW22~30
	51A025-1	4	60	15	18	4 4	0.9 1.3	22 20	5 8.5	7 12	AW22~30 AW20~30
	P1882	2				22	0.7	26	2.5	3.8	AW26~30
	6A037-1	8	78	27	32	12	0.9	22	5	7	AW22~30

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Cable Insulation (ETFE) Technical Data

Physical & Mechanical	Test method	Conditions	Value
Operating temperature	IEC 60216	20000 hrs	155°C
Elongation at break	ASTM D638		300%
Flexural modulus	ASTM D790		1380 MPa
Hardness	ASTM D2240		67 D
Radiation resistance	IEC 60544		10 E5 Gy
Temperature range			-100 to 155°C
Tensile strength at break	ASTM D638		45 Mpa
Water absorption	ASTM D570	25°C	< 0.01%
Dielectric constant	ASTM D150	0.1 kHz / 10 MHz	2.6 / 2.6
Dissipation factor	ASTM D150	1.2 kHz / 10 MHz	0.001 / 0.004
Volume resistivity	ASTM D257		10 E16 ohms-cm
Combustion corrosivity	DIN 57472-813		pH 2.6 / 2700uS/cm
Flammability	UL 94	1.6mm	V-0
Oxygen index	ASTM D2863		31%
Smoke index	Def Stan 61-12 Pt 18/2	per m wire	1
Temperature index	NES 715		290°C
Toxicity index	Def Stan 61-12 Pt 18/2	per m wire	5
Acid Resistance			Excellent
Fuels Resistance			Excellent
Oils Resistance			Excellent

Cable Electrical and Mechanical Specifications - Single Wire, no Shield

Construction:

Conductor : Tin Plated Copper (TPC)
 Insulation : ETFE
 Temperature rating : -65 / +150°C
 Voltage : 600VAC
 Test voltage : 3400VAC

Colour code:

● Black : 00 ● Green : 55
 ● Brown : 11 ● Blue : 66
 ● Red : 22 ● Violet : 77
 ● Orange : 33 ● Grey : 88
 ● Yellow : 44 ○ White : 99

Type	Code	Size		Conductor			Finished Wire			
		AWG	mm ²	Stranding	Wire Ø	DC Res @ 20°C (Ohms / km)	Core Ø	Tolerance	Weight (kg/km)	Amps (@ 40°C)
M-ZL 3007	AW30	30	0.057	7 x 0.10	0.30	355	0.61	+ 0.04 - 0.03	0.9	3
M-ZL 2807	Aw28	28	0.089	7 x 0.13	0.38	225	0.68	+ 0.05 - 0.04	1.2	4
M-ZL 2619	AW26	26	0.155	19 x 0.10	0.48	135	0.81	± 0.05	1.9	6
M-ZL 2419	AW24	24	0.241	19 x 0.13	0.60	86.0	0.91	+ 0.06 - 0.05	2.8	9
M-ZL 2219	AW22	22	0.382	19 x 0.16	0.76	53.1	1.09	+ 0.06 - 0.05	4.2	12
M-ZL 2019	AW20	20	0.597	19 x 0.20	0.96	32.4	1.30	+ 0.06 - 0.05	6.4	16
M-ZL 1819	AW18	18	0.963	19 x 0.25	1.21	20.4	1.55	± 0.05	9.7	22
M-ZL 1619	AW16	16	1.229	19 x 0.29	1.36	15.8	1.70	± 0.05	12	27
M-ZL 1419	AW14	14	1.870	19 x 0.36	1.70	10.0	2.06	± 0.05	19	37
M-ZL 1237	AW12	12	2.976	37 x 0.32	2.20	6.63	2.62	± 0.05	31	50
M-ZL 1037	AW10	10	4.650	37 x 0.40	2.77	4.13	3.20	± 0.05	48	69

(All dimensions in mm)

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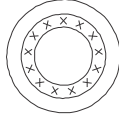



Cable Electrical and Mechanical Specifications - Shielded & Jacketed

Construction:

Conductor : Tin Plated Copper (TPC)
 Insulation : ETFE
 Shield : Tin Plated Copper (TPC)
 Jacket : ETFE
 Temperature rating : -65 / +150°C
 Voltage : 600 V AC
 Test voltage : 1500 V AC

Colours:

Single core : White
 Two cores : White / Red
 Three cores : White / Red / Black
 Four cores : White / Red / Black / Blue
 Jacket : White

	Type	Size		Conductor			Finished Cable			
		AWG	mm ²	Stranding	Wire Ø	DC Res @ 20°C (Ohms/km)	Core Ø	Shield Ø	Jacket Ø	Weight (kg/km)
 Single, Shielded Jacketed	M-ZL 3007 STZ 1	30	0.06	7 x 0.10	0.30	355	0.61	1.1	1.5	5.3
	M-ZL 2807 STZ 1	28	0.09	7 x 0.13	0.38	225	0.68	1.2	1.6	5.9
	M-ZL 2619 STZ 1	26	0.16	19 x 0.10	0.48	135	0.81	1.3	1.7	7.0
	M-ZL 2419 STZ 1	24	0.24	19 x 0.13	0.60	86.0	0.91	1.4	1.8	8.8
	M-ZL 2219 STZ 1	22	0.38	19 x 0.16	0.76	53.1	1.09	1.5	2.0	10
	M-ZL 2019 STZ 1	20	0.61	19 x 0.20	0.96	32.4	1.30	1.8	2.2	14
	M-ZL 1819 STZ 1	18	0.96	19 x 0.25	1.21	20.4	1.55	2.0	2.5	18
	M-ZL 1619 STZ 1	16	1.20	19 x 0.29	1.36	15.8	1.70	2.2	2.7	21
 Pair, Shielded Jacketed	M-ZL 3007 STZ 2	30	0.06	7 x 0.10	0.30	355	0.61	1.7	2.1	7.9
	M-ZL 2807 STZ 2	28	0.09	7 x 0.13	0.38	225	0.68	1.8	2.3	9.1
	M-ZL 2619 STZ 2	26	0.16	19 x 0.10	0.48	135	0.81	2.1	2.6	9.5
	M-ZL 2419 STZ 2	24	0.24	19 x 0.13	0.60	86.0	0.91	2.3	2.8	14
	M-ZL 2219 STZ 2	22	0.38	19 x 0.16	0.76	53.1	1.09	2.7	3.2	18
	M-ZL 2019 STZ 2	20	0.61	19 x 0.20	0.96	32.4	1.30	3.1	3.6	24
	M-ZL 1819 STZ 2	18	0.96	19 x 0.25	1.21	20.4	1.55	3.6	4.1	32
	M-ZL 1619 STZ 2	16	1.20	19 x 0.29	1.36	15.8	1.70	3.9	4.5	40
 Triple, Shielded Jacketed	M-ZL 3007 STZ 3	30	0.06	7 x 0.10	0.30	355	0.61	1.8	2.2	10
	M-ZL 2807 STZ 3	28	0.09	7 x 0.13	0.38	225	0.68	1.9	2.4	12
	M-ZL 2619 STZ 3	26	0.16	19 x 0.10	0.48	135	0.81	2.2	2.7	15
	M-ZL 2419 STZ 3	24	0.24	19 x 0.13	0.60	86.0	0.91	2.4	2.9	19
	M-ZL 2219 STZ 3	22	0.38	19 x 0.16	0.76	53.1	1.09	2.8	3.3	24
	M-ZL 2019 STZ 3	20	0.61	19 x 0.20	0.96	32.4	1.30	3.3	3.8	33
	M-ZL 1819 STZ 3	18	0.96	19 x 0.25	1.21	20.4	1.55	3.8	4.4	45
	M-ZL 1619 STZ 3	16	1.20	19 x 0.29	1.36	15.8	1.70	4.1	4.8	56
 Quad, Shielded Jacketed	M-ZL 3007 STZ 4	30	0.06	7 x 0.10	0.30	355	0.61	1.9	2.4	12
	M-ZL 2807 STZ 4	28	0.09	7 x 0.13	0.38	225	0.68	2.1	2.6	14
	M-ZL 2619 STZ 4	26	0.16	19 x 0.10	0.48	135	0.81	2.4	2.9	18
	M-ZL 2419 STZ 4	24	0.24	19 x 0.13	0.60	86.0	0.91	2.7	3.2	22
	M-ZL 2219 STZ 4	22	0.38	19 x 0.16	0.76	53.1	1.09	3.1	3.6	30
	M-ZL 2019 STZ 4	20	0.61	19 x 0.20	0.96	32.4	1.30	3.6	4.1	41
	M-ZL 1819 STZ 4	18	0.96	19 x 0.25	1.21	20.4	1.55	4.2	4.7	58
	M-ZL 1619 STZ 4	16	1.20	19 x 0.29	1.36	15.8	1.70	4.6	5.3	70

(All dimensions in mm)

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Ordering Codes Description

ERFS - (Connector 1) (Connector 2) (Length) (Elec. Cable) (RF Cable) (Fiber Cable)
 □ (□ / □) - □ (□ / □) - □ □ - □ □ □ C - □ C □ □ □ C - REPEAT
1 2 3 1 2 3 L U 4 5 6 4 7 8 4

1	Connector Series	4A109-1 = 4A109-1; P1294 = P1294 ; see prev. pages for full list
2	Male/Female Designator	M = Male ; F = Female
3	Orientation of Connector	ST = Straight; RT = Right Angle
L L	Length	0.5 = 0.5 ; 1 = 1.0 ; 2 = 2.0
U	Unit of Length	M = Meter ; F = Feet ; I = Inch
4	Cable Code (Electrical) Cable Code (RF) Cable Code (Fiber)	AW30 = AW30; AW28 = AW28 ; see previous pages for full list RG174 = RG174 ; RG316 = RG316; Mf05 = MF05 D02 = D02; D04 = D04
5	Cable type (Electrical)	D = Discrete ; ST1 = Shielded Jacketed Single ; ST2 = Shielded Jacketed Pair; ST3 & 4 = Shielded Jacketed Triple & Quad
6	No. of Cables (Elec. & RF)	Mention total No. of cables in set, Example 5 cables = 5 & so on
7	Mode (only for fiber)	9S = 9/125u single ; 5M = 50/125u multi; 6M = 62.5/125u multi
8	No. of Fibers (only for fiber)	2 Fibers = 2F; 4 Fibers = 4F

Few Examples of Cable Sets Ordering Code - Make your own customization

Ordering Code	Conn 1	Conn 2	Conn 1 Contacts & Code	Conn 2 Contacts & Code	Length	Cable Code	Cable Type	No of Cables or Fibers
ERFS-5A117-1(M/ST)-5A117-1 (M/ST)-1F-AW26-D-4C-9S2FD02	St. Plug	St. Plug	6, 5A117-1	6, 5A117-1	1 meter	AW26 D02	Discrete Singlemode	4 2 Fiber
ERFS-P1912(M/ST)-P1912(M/S) 2M-AW26-D-10C-RG316-2C	St. Plug	St. Plug	12,P1912	12, P1912	2 meter	AW26 RG316	Discrete Discrete	10 2
ERFS-51A025-1(M/ST)-51A025-1 (M/ST) -1M-AW24-D-4C-RG174-2C-5M2FD02	St. Plug	St. Plug	12, P1912	12, P1912	1 meter	AW24 RG316 D02	Discrete Discrete Multimode	4 2 2 Fiber
ERFS-P1882(M/ST)-P1882(M/S) 8F-AW28-D-16C-RG316-2C	St. Plug	St. Plug	24, P1882	24, P1882	8 feet	AW28 RG316	Discrete Discrete	16 2

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