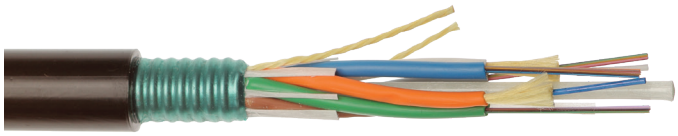
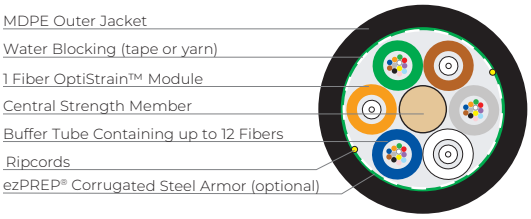
DFS™ Cable with OptiStrain™ Module

Temperature, Acoustic, & Strain Sensing





OVERVIEW

Prysmian's DFS™ cables can be used for many Distributed Fiber Optic Sensing applications. They can be placed along pipelines, powerlines, roadways, railroad tracks, property perimeters, etc. and provide distributed temperature (DTS), distributed acoustic (DAS) and distributed strain sensing (DSS) capabilities. Prymian's OptiStrain™ modules are used for strain and acoustic sensing, and loose tube fibers are used for temperature sensing. Asset monitoring with multiple sensing functions significantly reduces false positive occurrences, thus enhancing sensing system performance and benefits. Additional loose tube optical fibers can be added for telecommunications and data applications.

FEATURES AND BENEFITS

Sensing Cable

- Temperature sensing provides leak detection for pipelines, power cable transmission monitoring, etc.
- Strain sensing detects and locates ground movement, monitors asset health, etc.
- Acoustic sensing detects property intrusion, digging or excavating, pipeline leaks, faulty railroad rails/wheels, etc.
- Extra fibers available for telecom or datacom

Flexible Polypropylene Buffer Tubes

- Ideal for temperature sensing and communications fibers
- Isolates optical fibers from mechanical influences in the environment
- Gel-filled for optimal acoustic sensing
- Enables rapid temperature sensing
- Zero fiber strain up to the residual load provides optimum SBS sensing
- High flexibility and superior kink resistance
- Facilitates easy route management in closures and eliminates any need for closure fiber transportation tubes

OptiStrain™ modules

- Provides high sensitivity and accuracy without high attenuation
- Optical fibers highly sensitive to environmental influences
- Optimal for Strain sensing
- Ideal for Acoustic sensing
- Contains Prysmian BendBright™ XS SMF for superior Brillouin sensing

Dry Core Water Blocking Technology

- Dry core design permits rapid cable preparation and termination
- Dry core water blocking materials are easily removed

ezPREP® Corrugated Steel Armor

- Provides rodent and mechanical protection needed for direct buried environments
- Special armor coating reduces time and effort to remove the outer jacket

SPECIFICATIONS / RATINGS

Applications	Pipeline leak, ground-movement, and intrusion detection Powerline temperature and ground-movement monitoring Facility and Perimeter security Railway track and train monitoring Roadway traffic monitoring Border Security
Constructions	Dielectric, armored, double armored, dual jacket
Fiber Count	2 to 4 tight buffer acoustic and strain sensing fibers, and up to 120 loose buffered fibers in 12 fiber per buffer tube configuration for temperature sensing and communications.(maximum size: single layer, 12 position cable)
Fiber Types	**Distributed Temperature Sensing (DTS)** **Raman Backscatter**: BendBright™ XS ITU G.657.A2 Single-Mode ESMF ITU G.652.D Single-Mode 50/125 OM3/OM4 multimode **Distributed Acoustic Sensing (DAS)** **Raleigh Backscatter**: BendBright™ XS ITU G.657.A2 Single-Mode ESMF ITU G.652.D single-mode **Distributed Strain Sensing (DSS)** **Brillouin Backscatter:** BendBright™ XS ITU G.657.A2 Single-Mode
Options	*Gel-filled loose buffer tubes (LT) Optistrain™ Tight Buffer Breakout (BO) simplex modules Single armor/single jacket or all-dielectric sheath configurations
Standards	Loose tube units per GR 20 & ICEA 640, simplex units per GR-409 & ICEA 596
Registered Supplier	ISO 9001, ISO 14001, TL 9000, and OHSAS 18001

*Gel-free is available on request, but Gel-filled buffer tubes are highly recommended for sensing applications

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TLS-DS-D-701-1124

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Dimensions

		6 Core Elements			7 Core Elements			8 Core Elements			12 Core Elements		
Number of Loose Tube Fibers		≤ 48	≤ 36	≤ 24	≤ 60	≤ 48	≤ 36	≤ 72	≤ 60	≤ 48	≤ 120	≤ 108	≤ 96
Number of Strain Sensing Fibers		2	3	4	2	3	4	2	3	4	2	3	4
Armored	Outer Diameter	0.48 inches (12.3 mm)			0.52 inches (13.3 mm)			0.56 inches (14.3 mm)			0.69 inches (17.6 mm)		
	Weight	101 lb/kft (151 kg/km)			120 lb/kft (180 kg/km)			130 lb/kft (194 kg/km)			188 lb/kft (280 kg/km)		
All-Dialectric	Outer Diameter	0.41 inches (10.3 mm)			0.44 inches (11.1 mm)			0.47 inches (11.9 mm)			0.57 inches (15.4 mm)		
	Weight	55 lb/kft (81 kg/km)			61 lb/kft (91 kg/km)			70.6 lb/kft (105 kg/km)			117 lb/kft (174 kg/km)		

Main mechanical and environmental properties

Cable is tested per Telcordia GR-20 and ICEA 640 per the below tables. Loose tube units are tested to the acceptance criterial for GR-20 and simplex units are tested to the GR-409 acceptance criteria.

Test	Standard	Specified Value	Acceptance Criteria
Temperature cycling			
Loose tube units	ICEA S-87-640 Telcordia GR-20	-40°C to +70°C	GR-20: R6-69
Simplex units	ICEA S-83-595 Telcordia GR409	-40°C to +70°C	GR-409: R6-78
Mechanical Tests			
Loose tube units	ICEA S-87-640 Telcordia GR-20	Cable tested to GR20 test methods	GR-20
Simplex units	ICEA S-83-595 Telcordia GR409		GR-409
Water Penetration			
	ICEA S-87-640 Telcordia GR-20	Sample=1m, water=1m, 24h	GR-20 : R6-75

Temperature Range

Shipping and Storage:	-40° F to +167° F	(-40° C to +75° C)
Installation:	+14° F to +140° F	(-10° C to +60° C)
Operation:	-40° F to +158° F	(-40° C to +70° C)

Mechanical Properties

· Minimum Bending Radius:	Under Tension	20 x Cable Diameter
	No Tension	10 x Cable Diameter
· Installation Tensile Load:	600lbf (2700 N)	
· Long Term Tensile Load:	180 lbf (800 N)	(-40° C to +70° C)

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Ordering Guide

The Prysmian Group part number incorporates several significant attributes involving cable design and optical performance.
The appropriate part number can be configured using the process described below

Example: Gel-filled, Armored: F-ETS1A1J-MX-nnXXYYLT/nBXE7BO or Gel-filled Non-Armored: F-ETS1JKT-MX-nXXYYLT/nnBXE7BO

	1 LENGTH MARKINGS		2 PRODUCT FAMILY		3 CONSTRUCTION		4 FIBER GROUPING		5 6 LOOSE TUBE & BREAKOUT
Gel-Filled, Armored, Prysmian SM Fiber	F	–	ETS		1A1J	–	MX	–	nnBXE3LT / nBXE7BO
Gel-Filled, Non-Armored, Prysmian SM Fiber	F	–	ETS		1JKT	–	MX	–	nnBXE3LT / nBXE7BO

PART NUMBER CONSTRUCTION

1 LENGTH MARKINGS

F = Feet or M = Meters

2 PRODUCT FAMILY

ETS = Sensing Cable (Gel-Filled)

3 CONSTRUCTION

1JKT = Single Jacket

1A1J = Single Armor, Single Jacket

1A2J = Single Armor, Dual Jacket

2A2J = Double Armor, Dual Jacket

NA2J = Non Armored, Dual Jacket

4 FIBER GROUPING

MX = 12F/Loose Buffer Tube, 1F/Optistrain™ Tight Buffer Breakout Unit

FIBER INFORMATION

5 LOOSE TUBE (LT) FIBER COUNT, TYPE, & ATTENUATION

FIBER COUNT

nn = Number of Loose Buffered Fibers

PRYSMIAN SINGLEMODE

*BXE3 = BendBright™ XS Singlemode (ITU G.657.A2 / ITU G.652.D)
Attenuation = 0.35/0.35/0.25 dB/km @ 1310/1383/1550 nm wavelength attenuation

ESE3 = Enhanced Single Mode (ITU G.652.D)
Attenuation = 0.35/0.35/0.25 dB/km @ 1310/1383/1550 nm wavelength attenuation

PRYSMIAN MULTIMODE

6SM2 = OM1 62.5 µm with 3.5/1.0 dB/km @ 850/1300 nm wavelength attenuation

5EM2 = OM2 50 µm with 3.0/1.0 dB/km @ 850/1300 nm wavelength attenuation

5FM2 = OM3 50 µm with 3.0/1.0 dB/km @ 850/1300 nm wavelength attenuation

5GM2 = OM4 50 µm with 3.0/1.0 dB/km @ 850/1300 nm wavelength attenuation

6 OptiStrain™ COUNT, FIBER TYPE, ATTENUATION

Tight Buffer Breakout Unit Count

n = Number of Optistrain Units

BXE7 = BendBright™ XS Singlemode (ITU G.657.A2 / ITU G.652.D)

Attenuation = 0.4/0.4/0.3 dB/km @ 1310/1383/1550 nm wavelength attenuation

*Recommended for superior bending performance and consistency with Optistrain™ units
Other loose tube fiber types and attenuation grades including hybrid SMF & MMF configurations are available on request

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