

Optical Gable and Accessory for TV Camera

Standardizing a new optical fiber with maximized bendability allowing a 15mm minimum bending radius



Furukawa Optical Cable and Accessory for TV Camera Supporting "Digital Broadcasting" and "High-Definition TV Broadcasting"

Optical composite cable has made remarkable progress. Optical fiber with maximized bendability has been and ardized realizing a minimum bending radius of 15 mm. Furukawa's TV Camera Optical Cable and Accessory has advanced ahead of the times.

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Optical Composite Cable for TV Camera (Page 5~Page 7, Page 9)

High-quality, high-durability products are achieved from our expertise in designing and manufacturing world-class quality optical fibers and mobile equipment cables such as robot cables. The wide array of cable products in compliance with ARIB* and SMPTE standards as well as Furukawa standard strongly support the customers.

Technical Information (Page 8)

Technical information on the basic characteristics of optical fiber and optical composite cable for TV camera is provided in this Section together with brief description of technical terms which may be heard frequently.

Optical Cable for Information Transmission (Page 10)

Based on the expertise of Furukawa Electric in both optical transmission and mobile equipment, various multi-fiber optical cables and multi-core cables have been developed. These high-reliability optical cables for information transmission with excellent flexibility are based on our expertise in TV camera cables.

Connector Assembly (Page 11~Page 16)

High reliability is always pursued in connector assemblies as much as for cables. Development of those for mobile equipment is also aimed at high durability.

Installation Part (Page 17~Page 20)

A variety of junction boxes with superior workability and compactness are being developed based on our extensive experience in cable installation. Panel-integrated optical joint box is one example of the products resulting from Furukawa's proprietary technology.

Technical Reference (Page 21~Page 22)

Brief description is given for work flow from cable laying to finish jointing. In addition, the methods for testing and confirming the completed cable system are presented.

Optical Cable and Accessory for TV Camera



Base Stati

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Connector Assembly

Installation Part

Optical Composite Cable for TV Can (Page 5~Page 9)

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An installation example of a TV camera cable and accessory in a studio is shown here. Camera positions around the studio are connected with the sub control room using optical composite cables for TV camera. When patch panel is provided, all kinds of video images on different channels become available. Employment of an optical cable and accessory for TV camera enables real-time transmission of high-quality information.

NEWS

C4

Connector-Terminated Cable

C2

Optical Composite Cable for TV Camera

Connection Configuration of Optical Composite Cable for TV Camera

Pattern 1

Design of the cable with panel mounting connectors.



	Pattern1	Pattern2	Pattern3	Remarks
Initial Install cost	0	\bigtriangleup	×	
Initial Install time	0	0	\bigtriangleup	
Cabling by cable ladder	0	0	0	
Cabling by Free-access floor	0	0	0	
Cabling by cable pipe	×	×	0	
Cabling for short length	0	0	0	It is up to around 30m
Cabling for long length	×	×	0	
Maintainance cost after install	×	0	0	Easy to change the connector

 $[\]bigcirc$ Good \bigtriangleup Fair \times Poor

Optical Composite Cable for TV Camera (Japan Standard: ARIB)



Description

This composite cable integrates power line for TV camera, control line, and optical fiber for video and audio transmission. The cable is standardized by ARIB as a cable for TV camera.

- * The cable diameter can be changed as requested by using a double sheath.
- * The cable is available in two kinds: mobile cable for use in studios or relay fields; and static cable for use in fixed installation.

Specifications





Optical fiber

	Itom	Condition	Characteristics	Conver	sion
	nem	Condition	Gilaracteristics	Condition (km)	Formula
Transmission lass	1-1 2um	0.EdP/km>	L≥0.4	0.5xLdB≥	
	1121151115510111055	ν=1.3μm	0.50D/KIII2	L<0.4	0.5x0.4dB≥

Item	Description	
Type of fiber	Single-mode silica fiber	
Mode field diameter	9.5±1µm	
Clad diameter	125±3µm	
Amount of eccentricity	1µm or less	
Cutoff wavelength	1.10~1.35µm	
Coated outside diameter	0.9±0.1mm	

Power line

Item	Characteristics
Conductor resistance	37.5Ω/km
Insulation resistance	10,000MΩ·km
Withstand voltage	AC1,000V/1min.

Control line

Item	Characteristics
Conductor resistance	113Ω/km
Insulation resistance	10,000MΩ·km
Withstand voltage	AC1,000V/1min.

*ARIB stands for Association of Radio Industries and Businesses.



Applications

Multipurpose cable: 2SM-9.2-37.5

This cable is suitable for wide applications such as fixed installation in facilities, relay cable, handy camera cable and patch cable.

Large-camera cable in studio: 2SM-16-37.5

This is a cable for large-sized TV cameras in studios. The cable has a larger outside diameter due to the additional sheath on a multipurpose cable in order not to be jammed between the camera pedestal dolly and the floor in studios.

Core number	Core name	Core color
1	Optical fibor	Yellow
2	Optical fiber	Blue
3	Control line	Red
4		Green
5	Power line	Black
6		White

Cable (integrated)

Item Type		2SM-9.2-37.5	2SM-16-37.5	
Opti	cal fiber core	See Table on the left	See Table on the left	
Power line Conductor		Tin-plated soft copper wire strand (21 wire/0.18mm)		
	Insulation thickness	0.4mm	nominal	
Control line	Conductor	Tin-plated soft co (7 wire /	Tin-plated soft copper wire strand (7 wire /0.18mm)	
	Insulation thickness	0.3mm nominal		
Tens	sion member	nber Sheathed steel wire, 1.8mm nominal in outside diamete		
Core stranding		Two cores of optical fiber, four cores of power line and two cores of control line are stranded around a tension member		
Shield		Tin-plated soft copper wire braid		
Sheath (Pb-free)		Abrasion-resistant sheath	Abrasion-resistant sheath (double)	
Finished outside diameter		9.2 ± 0.3mm nominal	16.0 ± 0.5mm nominal	
Approximate mass		120kg/km nominal	270kg/km nominal	

Note: ECO specification cables (type EM-) are also available exclusively for fixed installation.

Mechanical characteristics

Item	Characteristics
Allowable tension	70kgf
Allowable bending radius	Six times the cable outside diameter or larger

Optical Composite Cable for TV Camera (U.S. Standard: SMPTE)



Description

This composite cable integrates power line for TV camera, control line, and optical fiber for video and audio transmission. The cable is standardized by SMPTE as a cable for TV camera.

* The cable diameter can be changed as requested by using a double sheath.

Specifications



Optical fiber

Itom	Condition	Condition Characteristics	Conversion	
item	Condition		Condition (km)	Formula
Transmission loss	λ_1 3µm	0.5dB/km>	L≥0.4	0.5xLdB≥
1141151115510111055	<i>λ</i> =1.5μΠ	0.50D/KIII2	L<0.4	0.5x0.4dB≥
Item		Description		
Type of fiber		Single-mode silica fiber		
Mode field diameter		9.5±1µm		
Clad diameter		125±3µm		
Amount of eccentricity		1µm or less		
Cutoff wavelength		1.10~1.35µm		
Costed outside diameter		0.9+0.1mm		

Power line

Item	Characteristics
Conductor resistance	37.5Ω/km
Insulation resistance	10,000MΩ·km
Withstand voltage	AC2,000V/1min.

Control line

Item	Characteristics	
Conductor resistance	113Ω/km	
Insulation resistance	10,000MΩ·km	
Withstand voltage	AC2,000V/1min.	

*SMPTE stands for The Society of Motion Picture and Television Engineers.



Applications

Multipurpose cable: TV-OM-AMS

This cable is suitable for wide applications such as fixed installation in facilities, relay cable, handy camera cable and patch cable.

Multipurpose cable: TV-OM-HAMS, TV-OM-SAMS

This is a cable for large-sized TV cameras in studios. The cable has a larger outside diameter due to the additional sheath on a multipurpose cable in order not to be jammed between the camera pedestal dolly and the floor in studios.

Core number	Core name	Core color
1	Optional fibor	Blue
2	Optical liber	Yellow
3	Control line	Red
4	Control line	Gray
5	Power line	Black
6	Fowerline	White

Cable (integrated)

Item	Туре	TV-OM-AMS TV-OM-HAMS TV-OM-S					
Optic	al fiber core	See Table on the left					
Power line	Conductor	Tin-plated soft copper wire strand (21wire/0.18mm)					
	Insulation thickness		0.4mm nominal				
Control line	Conductor	Tin-plate	ed soft copper wi 7 wire /0.203mm	re strand)			
	Insulation thickness	0.33mm nominal					
Tensi	ion member	Sheathed steel wire, 1.8mm nominal in outside diameter					
Core	e stranding	Two cores of optical fiber, four cores of power line and two cores of control line are stranded around a tension member					
	Shield	Tin-plated soft copper wire braid					
Shea	th (Pb-free)	Abrasion-resistant Abrasion-resistant sheath (double)					
Finished	outside diameter	9.2 ± 0.3mm nominal	12 ± 0.5mm nominal	16 ± 0.5mm nominal			
Appro	ximate mass	120kg/km nominal	20kg/km nominal 150kg/km nominal 270kg/				

Mechanical characteristics

Item	Characteristics			
Allowable tension	700N			
Allowable bending radius	Six times the cable outside diameter or larger			

*Thease cables meet SMPTE311M. (TV-OM-AMS : AWM21480)



Optical Composite Cable for TV Camera (For Fixed Cabling)

Type: TV-OM-CMR



Description

This composite cable integrates power line for TV camera, control line, and optical fiber for video and audio transmission. For fixed cabling applications, two grades of cables are available: highly fire-resistant riser grade (CMR-OF) and low-smoke emission, halogen-free, fire-resistant grade.

Specifications



Optical fiber

Itom	Condition	Charactoristics	Conversion			
nem	Contaition	onaracteristics	Condition (km)	Formula		
Transmission loss	3 – 1 Gum	0.5 -10 (1	L≥0.4	0.5xLdB≥		
1121151115510111055	λ=1.5μΠ	0.50D/KIII2	L<0.4	0.5x0.4dB≥		
Item		Description				
Type of fit	ber	Single-mode silica fiber				
Mode field dia	ameter	9.5±1µm				
Clad diame	eter	125±3µm				
Amount of ecc	entricity	1µm or less				
Cutoff wavel	ength	1.10~1.35µm				
Coated outside	diameter	0.9±0.1mm				

Power line

Item	Characteristics			
Conductor resistance	37.5Ω/km			
Insulation resistance	10,000MΩ·km			
Withstand voltage	AC2,000V/1min.			

Type: TV-OM-LSZH

Control line

Item	Characteristics
Conductor resistance	113Ω/km
Insulation resistance	10,000MΩ∙km
Withstand voltage	AC2,000V/1min.

Care number	Coro nomo	Core color			
Core number	Core name	TM-OM-CMR	TM-OM-LSZH		
1	Optical fiber	Blue			
2	Optical liber	Yellow			
3	Control line	Red			
4	Control line	Gray			
5	Dewerline	Black,Orange	Black		
6	Powerline	White,Purple	White		

Cable (integrated)

Item	Туре	TV-OM-CMR	TV-OM-LSZH			
Optical fiber core		See Table on the left	See Table on the left			
Power line	Conductor	Tin-plated soft co (21wire/	opper wire strand 0.18mm)			
	Insulation thickness	0.4mm	nominal			
Control line	Conductor	Tin-plated soft co (7 wire /0	opper wire strand 0.203mm)			
	Insulation thickness	0.33mm nominal				
Tens	sion member	Sheathed steel wire, 1.8mm nominal in outside diameter				
Cor	re stranding	Two cores of optical fiber, four cores of power line and two cores of control line are stranded around a tension member				
	Shield	Tin-plated soft copper wire braid				
She	ath (Pb-free)	Highly flame-resistant	Low smoke-emission, halogen-free, flame-resistant			
Finished outside diameter		9.2 ± 0.3mm nominal				
Appro	oximate mass	120kg/km nominal				

Mechanical characteristics

Item	Characteristics			
Allowable tension	700N			
Allowable bending radius	Six times the cable outside diameter or larger			



Technical Information

What is the optical fiber with maximized bendability ?

This is a novel optical fiber developed by Furukawa Electric which permits flexible optical wiring.

- The allowable bending radius for the fiber is 15mm, one half the conventional values.
- The fiber can be jointed with conventional single-mode fibers.
- The fiber is in compliance with ITU-T G.652B standard.
- The fiber can be used at a wavelength band of 1280~1625nm.

2 What is single mode fiber (SM) or multimode (GI) fiber?

Graded-index fiber, GI fiber

In graded-index fiber, the refraction index in the core is graded to gradually increase farther to the center. Thus, the refractive index at the axis is higher slowing the speed of light rays, while that near the cladding is lower increasing the light speed. Because light speed is inversely proportional to refractive index, this reduces the arrival time disparity to have all modes (light rays (1), (2) and (3) in the Figure) arrive at about the same time, resulting in improved transmission characteristics or transmission bandwidth. Fibers with a core diameter of 50µm or 62.5µm are widely used at a transmission wavelength of 0.85µm.



Single-mode fiber, SM fiber

Whereas multi-mode fiber supports many modes within its core, fiber with a much reduced core diameter of, say 10µm, can support only the fundamental mode of propagation as shown in the Figure. There is no waveform distortion due to arrival time disparity because only one mode propagates along the fiber. This type of fiber is called single-mode fiber, and its refractive index distribution is generally step-like. Single-mode fiber is suited for high-speed, high-capacity transmission systems because of its superior transmission characteristics, and is used at a wavelength of $1.31\mu m$ or $1.55\mu m$, at the former of which ordinary silica fibers have zero chromatic dispersion.



3 What is transmission bandwidth?

In designing optical fiber communication systems, amplitude response in the baseband is used. Transmission bandwidth refers to a modulation frequency fb, at which the baseband amplitude response expressed as log[H(fb)] equals -6 (dB). Thus, it gives a rough estimate of up to which frequency the signals are transmitted without being distorted.



4 What is transmission loss?

Taking two points Z1 and Z2 along an optical fiber (Z2 > Z1) and letting the magnitudes of optical intensity at these points be P1(Z1) and P2(Z2), respectively, the transmission loss in this section can be expressed as α = -log (P2/P1) (dB). Thus, it corresponds to the ratio of optical energy being transmitted at these points. The transmission loss of an optical fiber comprises absorption loss that turns into heat and scattering loss or radiation loss that leaks out of fiber, and therefore, it depends on the wavelength and spectrum of light source, incident mode distribution and so forth.

5 What is cutoff wavelength?

Cutoff wavelength of a single-mode fiber is the wavelength above which the fiber supports and propagates only one mode of light. The cutoff wavelength is dependent on the fiber structure such as refractive index distribution within the core, core dimension and the like.

6 What if a heavy load falls onto the optical cable?

The results will depend on what structure the cable you stepped on has. As for the cables of the Company, increase in transmission loss generally appears at approximately 1,000kgf as illustrated in the Figure. But loss increase can appear at around 500kgf depending on the structural design or material selection.



7 To what degree of bending can an optical cable resist for light transmission?

The Figure shows the performance of our cable using the new optical fiber with maximized bendability in comparison with that of conventional ones.





Optical Composite Cable for TV Camera (Furukawa Standard)

Optical Composite Cable for TV Camera

Description

These are reduced-diameter cables and twist-resistant cables for high definition (HD) video signal transmission. A variety of cables are available including multi-core cables based on Furukawa's original design.

Product number	Outside diameter (mm)	Mass (kg/km)	Tensile strength (kgf)	Power line resistance (Ω/km)	Control line resistance (Ω/km)	Remarks
TV-OM-CF	8.6	110	60	39.4	98.3	Only OPS- and OPC-series connectors are compatible
TV-OM-CH	12.0	235	60	39.4	98.3	Only OPS- and OPC-series connectors are compatible
TV-OM-CS	16.0	310	60	39.4	98.3	Only OPS- and OPC-series connectors are compatible
TV-OM-CFS	9.2	122	60	39.4	98.3	
TV-OM-CSS	16.0	310	60	39.4	98.3	
2SM-9.2-37.5 (PE) (PE double sheathed)	12.2	150	70	37.5	113.0	For fixed installation, lightly water-resistant
EM-2SM-9.2-37.5 (Fire-resistant ECO cable)	9.2	120	70	37.5	113.0	For fixed installation, lightly water-resistant
2SM-6.8-98.3	6.8	65	60	113.0	113.0	Reduced-diameter type
2SM-9.2-37.5 (H)	9.2	120	70	37.5	113.0	Cold latitudes use (-40°C)

• Composite Cable with Power Line for Crane

Product number	Outside diameter (mm)	Mass (kg/km)	Tensile strength (kgf)	Power line resistance (Ω/km)	Control line resistance (Ω/km)	Remarks
2SM-9.2-37.5 (with power line for crane)	15.5	320	70	37.5	113.0	Power line for crane: 0.52mm ² x 20wire
TV-OM-CF (with power line for crane)	14.9	280	60	39.4	98.3	Power line for crane: 0.52 mm ² x 18wire
TV-OM-CFS (with power line for crane)	15.5	322	60	39.4	98.3	Power line for crane: 0.52 mm ² x 20wire

Outer sheath







2SM-9.2-37.5

2SM-16-37.5

Composite cable with power line for crane

Multi-Core Cable



Product number	Outside diameter (mm)	Mass (kg/km)
3×2SM-9.2-37.5	23.0	450
3×TV-OM-CF	21.0	430
3×2SM-6.8-98.3	16.8	270
5×2SM-9.2-37.5	28.0	730
5×TV-OM-CF	26.5	700
5×2SM-6.8-98.3	20.5	430

Optical Cable for Information Transmission

Description

These are optical multi-core cables intended for transmission of digital signals including high definition (HD) video signals. They are flexible optical cables provided with both high reliability and ease of handling.

Product number	Outside diameter (mm)	Mass (kg/km)	Tensile strength (kgf)	Power line resistance (Ω/km)	Control line resistance (Ω/km)	Remarks
4SM-8.6S	8.6	87	60			
6SM-8.6S	8.6	92	60		_	
6SM-8.6-75	8.6	100	60		113	0.18 mm ² x 6wire
6SM-10S	10.0	130	70	_		
8SM-9.2S	9.2	92	60		_	
8SM-9.2-49.15	9.2	110	60		113	0.18mm ² x 8wire



List of Optical Fiber for Selection

	Type number	Transmission loss (dB/km)	Transmission bandwidth (MHz·km)	Wavelength (µm)	Nominal NA	Core dia. (µm)	Clad dia. (µm)	Allowable bending radius (mm)
	G·3002	3.0	200	0.85	0.2	50	125	30
	G·3004	3.0	400	0.85	0.2	50	125	30
	G·1002	1.0	200	1.3	0.2	50	125	30
	G·1004	1.0	400	1.3	0.2	50	125	30
	G·1006	1.0	600	1.3	0.2	50	125	30
	C.3002.1002	3.0	200	0.85	0.2	50	105	20
	G-3002-1002	1.0	200	1.3	0.2	50	125	30
	G-3004-1004	3.0	400	0.85	0.2	50	125	20
Silica fiber, multimode (GI)	4.2004 1004	1.0	400	1.3	0.2	50	125	50
	G·3004·1006	3.0	400	0.85	0.2	50	105	20
		1.0	600	1.3	0.2	50	125	50
	0 2005 1006	3.0	500	0.85	0.2	50	125	30
	G-3005-1006	1.0	600	1.3	0.2	50	125	50
	G62·1505	1.5	500	1.3	0.275	62.5	125	30
	G62·3516	3.5	160	0.85	0.275	62.5	125	30
	060 0516 1505	3.5	160	0.85	0.275	62.5	125	30
	G02-3316-1505	1.5	500	1.3	0.275	02.5	125	30
Silion fiber single mode (SM)	S-05	0.5		1.31	-	9.5	125	30
Silica liber, single-mode (SM)	FW-05	0.5		1.31	-	9.5 [*]	125	15

Note: * Core diameter (mode field diameter) of FW-05 is 8.5~9.1µm.

Connector Assembly

Receptacle

Description

These connectors are to be placed on the camera head side of the cable seen from the base station. It should be noted that every series of connectors are not compatible with each other. Pigtail cords are generally provided with SC connectors and the like for maintenance consideration i.e exchanging components.



Connector dimensions and Mounting dimensions

TV camera connector

Product number	Optical pin count	Electric pin count	A (mm)	B (mm)	C (mm)	D (ø)	E (ø)	F	G (mm)	Remarks
EDW-SUS	2	4	29.0	36.5	16.5	23.0	18.2	M3	23.0	3K series, stainless steel
EDW	2	4	29.0	36.5	16.5	23.0	18.2	M3	23.0	3K series, brass
OPS-R	2	4	29.0	42.4	26.5	21.3	21.7	M3	23.0	OPS2402-R
OPC-R	2	4	36.0	45.4	27.0	27.2	26.4	M3	29.0	OPC112-R

Multi-pin connector

Product number	Optical pin count	Electric pin count	A (mm)	B (mm)	C (mm)	D (ø)	E (ø)	E2 (mm)	G (mm)		Remarks		
OPS6-R	6	0	29.0	42.4	26.5	21.3	21.7	-	М3	23.0	OPS series		
OPC6-R	6	0	36.0	45.4	27.0	27.2	26.4	-	M3	29.0	OPC6004-R		
OPC62-R	6	2	36.0	45.4	27.0	27.2	26.4	-	M3	29.0	OPC6206-R		
EGG8	8	0	55.0	47.5	19.0	55.0	45.2	42.6	—	-	5K series		
OPC8-R	8	0	36.0	45.4	27.0	27.2	26.4	-	M3	29.0	OPC8002-R		
EGG82	8	2	55.0	47.5	19.0	55.0	45.2	42.6	_	_	5K series		

Note: When ordering, specify the following in the type number.

##: Type of connector for optical pigtail fiber or cord, such as FC, SC or NN (for cord only).



*3K and 5K series are products of LEMO S.A. in Switzerland; and OPS and OPC series are products of TAJIMI ELECTRONICS CO., LTD. in Japan.

Plug Receptacle

Description

These connectors are to be placed on the base station side of the cable seen from the camera head. It should be noted that every series of connectors are not compatible with each other. Receptacle and plug connectors mate with each other as a pair.



Connector dimensions and Mounting dimensions

TV camera connector

Product number	Optical pin count	Electric pin count	A (mm)	B (mm)	C (mm)	D (ø)	E (ø)	F	G (mm)	Remarks
FXW-SUS	2	4	38.0	60.0	30.0	38.0	23.0	M3	20.6	3K series, stainless steel
FXW	2	4	38.0	60.0	30.0	38.0	23.0	M3	20.6	3K series, brass
OPS-PR	2	4	29.0	43.9	21.0	24.0	26.4	M3	23.0	OPS2404-PR
OPC-PR	2	4	36.0	47.1	20.8	-	34.8	M3	29.0	OPC114-PR

Multi-pin connector

Product number	Optical pin count	Electric pin count	A (mm)	B (mm)	C (mm)	D (ø)	E (ø)	F	G (mm)	Remarks
OPS6-PR	6	0	29.0	43.9	21.0	24.0	26.4	M3	23.0	OPS series
OPC6-PR	6	0	36.0	47.1	20.8	31.6	34.8	M3	29.0	OPC6006-R
OPC62-PR	6	2	36.0	47.1	20.8	31.6	34.8	M3	29.0	OPC6208-R
FXG8	8	0	65.0	100.0	38.5	65.0	42.6	M4	38.0	5K series
OPC8-PR	8	0	36.0	47.1	20.8	31.6	34.8	M3	29.0	OPC8004-PR
FXG82	8	2	65.0	100.0	38.5	65.0	42.6	M4	38.0	5K series

Connector Assembly

Connector-Terminated Cable

Description This cable assembly connects power lines, control lines, and optical fibers. It should be noted that they are not compatible with each other. Refer to "Selection Table of Connector and Cable" on the next page, since each connector has its own attachable cables.

3K series (ARIB and SMPTE standards)

Multipurpose cable

<Type:FUW-SUS#/F****/PUW-SUS>







Cable for large-sized studio camera <Type:FUW-SUS#()/S****/PUW-SUS⁽⁾>



Stair-like removal of outer sheath is needed for 3K type connector of large-sized studio camera. Please order with the indication of length for removal sheath more than 400mm.

OPC series

Multipurpose cable

<Type:OPS-P#/F****/OPS-J※>



Cable for large-sized studio camera <Type:OPS-SP#()/S****/OPS-SJ※>





(107.0)

634.0

OPS-SP Plug





Connector-Terminated Cable

OPC series

Multipurpose cable

<Type:OPC-P#/F****/OPC-J >>







Connector series for panel mouting

Cable with 3K flanged jack (PBW-SUS)

<Type:PBW-SUS>



Mounting dimensions (Please refer to P11 EDW)

Cable with 3K flanged plug (FMW-SUS)

<Type:FMW-SUS>



Mounting dimensions (Please refer to P12 FXW) Cable with OPS flanged jack (OPS-PJ) <Type:OPS-PJ>



Cable with OPS flanged plug (OPS-PP) <Type:OPS-PP>



Mounting dimensions (Please refer to P11 OPS-R)

Mounting dimensions (Please refer to P12 OPS-PR)

Connector Assembly

Selection Table of Connector and Cable

Product number	Optical pin count	Electric pin count	Attachable cable
Optical composite connector for TV camera			2SM 0 2 27 5
3K series plug connector, FUW-SUS			25W1-9.2-37.3
3K series plug connector, PUW-SUS	2	4	23W-10-37.5
3K series panel plug connector, FMW-SUS			TV-OM-CFS
3K series panel jack connector, PBW-SUS			TV-0M-055*
			2SM-9.2-37.5
OPS series plug connector OPS P			2SM-16-37.5
OPS series judy connector, OPS-P			TV-OM-CFS
OPS series panel plug connector OPS-PP	2	4	TV-OM-CSS
OPS series panel jack connector, OPS-PI			TV-OM-CF
Ord series parier jack connector, Ord-ru			TV-OM-CS
			TV-OM-CH
OPC series plug connector OPC P			2SM-9.2-37.5
			2SM-16-37.5*
	2	4	TV-OM-CF
OPC series panel plug connector, OPC-PP			TV-OM-CS
Ord series panel jack connector, Ord-ru			TV-OM-CH
Optical multi-connector			6SM-8 6S
OPC series plug connector, OPC-P	6	0	6SM-10S
OPC series jack connector, OPC-J			
OPC series panel plug connector, OPC-PP	6	2	6SM-8.6-75
OPC series panel jack connector, OPC-PJ	8	0	8SM-9.2S
5K series plug connector, FGG.5K	8	2	99M 0 2 40 15
5K series jack connector, PHG.5K	0	2	03111-3.2-43.13

Note: * Stair-like removal of outer sheath is needed.

When ordering, specify the following in the type number. #: Color of ring for the plug side, i.e. G for green or R for red. X: Color of ring for the jack side, i.e. K for black or N for gray.

Conversion Connector Series

Description

Every series of 3K, OPS and OPC connectors are not interchangeable. Conversion connectors are needed where different series connectors are used for the camera head and panel plug receptacles.

Conversion Cable Series

3K 🔶 OPS



FUW-SUS#/F****/OPS-J PUW-SUS%/F****/OPS-P#

3К 🛏	OPC
	FUW-S
Iype	

FUW-SUS#/F****/OPC-J% PUW-SUS%/F****/OPC-P# OPS 🔶 OPC



Conversion Connector Unit

Make selection from the Table below.

	Combination	toble fee		a a min a at a n comit
\cup	Combination	table for	conversion	connector unit.

3K series	OPS series	OPC series	Multipurpose connector
EDW-SUS	OPS-R	OPC-R	dLC
FXW-SUS	OPS-PR	OPC-PR	SC

Please ask for information for other combinations.

*3K and 5K series are products of LEMO S.A. in Switzerland; and OPS and OPC series are products of TAJIMI ELECTRONICS CO., LTD. in Japan. ARIB stands for Association of Radio Industries and Businesses. SMPTE stands for The Society of Motion Picture and Television Engineers.



Cable with other connectors

FC-cord cable



SC-cord cable



SC-connector cord, C363



ST-connector cord, C381







Optical characteristics of polished connectors

		SC connecto	r (JIS C 5973)	FC connecto	or (JIS C 5970)	ST connector	IEC compliant)	LC connector		
	Type of fiber	GI	SM (FW)	GI	SM (FW)	GI	SM (FW)	GI	SM (FW)	
Transmission loss	PC polished	0.3	0.5	0.3	0.5	0.5	0.5	0.5	0.5	
(in dB, not more than)	SPC polished	_	0.5	_	0.5	-	0.5	0.5	0.5	
Reflection loss	PC polished	25	25	25	25	25	25	25	25	
(in dB, not more than)	SPC polished	-	40	—	40	-	40	40	40	

• Type of ferrule polishing

Туре	Name of polishing	Reflection loss (dB)
Flat polishing	Flat	Approx. 14
Sphorical poliching	Physical contact	25 ~ 40
Spherical polishing	Super physical contact	40 ~ 55
Angled polishing	Angled physical contact	60 ~





Installation Material

Joint Unit for TV Camera Cable

Description

<Direct Joint>

In this joint method, the receptacle on optical fiber cord is directly fusion spliced with optical fibers in the optical composite cable, using fusion splicing machine. Whereas the size of the joint box can be made smaller in comparison to the joint method using J/J, it becomes necessary to carry out fusion splicing again when the receptacle has to be



<J/J Joint >

In this joint method, the receptacle on SC optical cord is connected with the optical composite cable. Fusion splicing machine is used to fusion splice the optical fibers in the cable with the SC cords, and then the spliced joints are accommodated in the tray in the joint box to be properly protected. The receptacle is easy to replace since the SC connector of the receptacle and the cord with SC connector that is fusion spliced with the cable can be connected using a J/J adaptor.



Specifications of Joint Unit

 Opcome 			onne										
			Dim	ensions	(mm)	Mounting dim	ensions (mm)	Acces	sories	Metal con	nector	50	Ground
Category	No. of cable	Type number	A (length)	B (width)	C (height)	D	E	SC cord *1, *2	Splicing sleeve	Housing	Socket, Pin	adaptor	wire*2
Fusion	1	OPSS-1	280	125	45	240	100	0	3	6P	-	_	30
splicing	2	OPSS-2	320	160	80	280	138	0	6	10P	-	-	60
	3	OPSS-3	340	200	80	300	178	0	9	10P+6P	-	—	90
	4	OPSS-4	340	200	80	300	178	0	12	10P+10P	-	—	120
	5	OPSS-5	340	280	80	300	258	0	15	10P+6P	-	—	150
	6	OPSS-6	340	280	95	300	258	0	18	10P+10P+10P	-	-	180
SC	1	OPIS-1	290	170	60	180	160	1	3	1 pair	5	2	30
connector	2	OPIS-2	290	170	60	180	160	2	6	2 pair	10	4	60
Jointing	3	OPIS-3	290	220	60	180	210	3	9	3 pair	15	6	90
	4	OPIS-4	290	220	60	180	210	4	12	4 pair	20	8	120
	5	OPIS-5	290	260	70	180	250	5	15	5 pair	25	10	150
	6	OPIS-6	290	260	70	180	250	6	18	6 pair	30	12	180



Note: *1 Applicable to optical fiber with maximized bendability of 15-mm radius. *2 Fire-resistant polyethylene sheath (ECO product). *3 Dimensions exclude screw heads *4 Use M4 or M5 screws for mounting.

Compact Joint Unit for High-Strength Optical Fiber

Description

Downsizing of termination space has been achieved by using a high-strength optical fiber that has halved the allowable bending radius of conventional optical fibers. This compact, user-friendly joint unit allows for ease of termination work. Exchange of receptacles is easy since J/J adaptors are used for connecting SC-connector cords.



Dimensions (Common to one-line and two-line cables)



			Acces	Accessories		nector	90	Ground
Category	No. of cable	Type number	SC cord *1, *2	Splicing sleeve	Housing	Socket, Pin	adaptor	wire*2
SC	1	OPISS-1	1	3	1pair	5	2	30
jointing	2	OPISS-2	2	6	2pair	10	4	60

Note: *1 Applicable to optical fiber with maximized bendability of 15-mm radius. *2 Fire-resistant polyethyl (ECO product). *3 Dimensions exclude screw heads.*4 Use M4 or M5 screws for mounting.

J/J Unit



Description

This compact joint box for SC connector jointing is an excellent application when suitable compact cable layout environments exist.



			Dim	ensions (mm)	Mounting o (m	dimensions m)	Metal con	nector	sc	Ground
Category	No. of cable	Type number	A (length)	B (width)	C (height)	D	E	Housing	Socket, Pin	adaptor	wire *2
SC connector	1	OPJJ-1	180	80	37	130	60	1 pair	5	2	30
jointing	2	OPJJ-2	180	105	37	130	85	2 pair	10	4	60
	3	OPJJ-3	180	130	37	130	110	3 pair	15	6	90
	4	OPJJ-4	180	155	37	130	135	4 pair	20	8	120

Ultra-Compact B Unit

B Unit



Description

Using Furukawa's proprietary technology, this panel-integrated optical joint box utilizes minimum termination space while considering ease of working. Fusion splicing is allowed for in an unprecedentedly small space.



			Dim	ensions (I	mm)	Mounting o (m	dimensions m)	Acce	ssories	Metal cor	nnector	SC	Ground
Category	No. of cable	Type number	A (height)	B (width)	C (depth)	D	E	SC cord *1, *2	Splicing sleeve	Housing	Socket, Pin	adaptor	wire *2
B Unit	1	OPIS-B1	90	190	90	60	160	1	3	1 pair	5	2	30
	2	OPIS-B2	90	190	90	60	160	2	6	2 pair	10	4	60

BH Unit



Description

This is a single-system version of B Unit.



			Dim	Dimensions (mm)		Mounting dimensions (mm)		Accessories		Metal connector		SC	Ground
Category	No. of cable	Type number	A (height)	B (width)	C (depth)	D	E	SC cord *1, *2	Splicing sleeve	Housing	Socket, Pin	adaptor	wire *2
BH Unit	1	OPIS-BH	90	90	130	60	60	1	3	1 pair	5	2	30
Note													

*1 Applicable to optical fiber with maximized bendability of 15-mm radius. *2 Fire-resistant polyethylene sheath (ECO product). *3 Dimensions exclude screw heads. *4 Use M4 screw for mounting.

Installation Material

Panel-Integrated FOP Unit

Description

The connector panel and termination box are integrated to create this compact unit. With all optical cords equal in length, workability is improved and installation methods can be unified without much concern over the terminal board size during design. Moreover, optical cords can be handled without fear of damage when the panel is removed for maintenance.



FOP Unit

			Din	nensions (r	nm)	Accessories		Metal connector		SC	Ground
Category	No. of cable	Type number	A (height)	B (width)	C (depth)	SC cord *1, *2	Splicing sleeve	Housing	Socket, Pin	adaptor	wire *2
2U	1	FOP1/**/*/2U	88	142	170	1	3	1 pair	5	1	15
	2	FOP2/**/*/2U	88	142	170	2	6	2 pair	10	2	35
3U	1	FOP1/**/*	132.6	142	110	1	3	1 pair	5	1	15
	2	FOP2/**/*	132.6	142	110	2	6	2 pair	10	2	35

¹¹ Applicable to optical fiber with maximized bendability of 15-mm radius. *2 Fire-resistant polyethylene sheath (ECO product). *3 Dimensions exclude screw heads

FOP Unit with Circuit Breaker

Features

Note

- •Surge protection circuit has been combined with the panel-integrated optical joint box, i.e. FOP unit, with a size increase of only 15mm in the depth.
- Peak surge voltage is suppressed by about half, and the total energy, i.e. voltage multiplied by time, down to 0.1msec after the outbreak of a surge is reduced by a factor of 7 to 10.
- By manipulating a switch on the panel, the surge ingress circuit is cut off electrically.
- Evaluation method:
- Corresponding to the level 4, i.e. 4kV x 1.2/50µsec by IEC61000-4-5 (Surge immunity test)

Applied waveform



Output waveform





Panel-Integrated FOP Unit, Mounting Frame and Related Materials

• FOP-P



	Main	body (dimens	sions	Mounting dimensions				
Type number	а	b	с	d	Α	В	С	D	Ν
FOP-P1	180	170	166	120	150	156	166	120	M4
FOP-P2	325	170	312	120	296	156	312	120	M4
FOP-P3	468	170	454	120	438	156	454	120	M4
FOP-P1/2U	180	126	166	80	150	110	166	80	M4
FOP-P2/2U	322	126	312	80	296	110	312	80	M4
FOP-P3/2U	468	126	454	80	438	110	454	80	M4

• FOP-RP



	Mair	Mainbody dimensions Mounting dimensions						ions		
Type number	а	b	с	d	Α	В	С	D	Ν	
FOP-RP1	197	132.6							M5	
FOP-RP2	340	132.6		EIA standard size						
FOP-RP3	483	132.6								
FOP-RP1/2U	197	88								
FOP-RP2/2U	340	88								
FOP-RP3/2U	483	88							M5	
FOP-RP1/3H	197	149.0							M5	
FOP-RP2/3H	340	149.0							M5	
FOP-RP3/3H	483	149.0		IIC standard size						
FOP-RP1/2H	197	99	JIS Standard Size							
FOP-RP2/2H	340	99							M5	
FOP-RP3/2H	483	99							M5	

• Guide Bar



	L (mm)	W (mm)	H (mm)	D (ø)	Withstand load (kgf)
2U type	66	16	30	6	40
3U type	86	16	31.5	6	40

Blank Panel



Type number	W (mm)	H (mm)
2U type	142	88
3U type	142	132.6

• FOP Tray



	Accessory,	Splicing	Metal co	onnector	SC	Ground
	SC cord	sleeve	Housing	Socket, Pin	adaptor	wire
FOP1T/C	1	3	1 pair	5	2	15
FOP2T/C	2	6	2 pair	10	4	30

Technical Reference

Flowchart from Cable Installation to Completion of Jointing

■ Cable route confirmation

- Does the route have bending?
- •What about cable installation conditions such as piping, ladder and rack?
- Is the distance to power lines sufficient?
- •Is there no fear of submersion?
- Is there any possible influence of small animals including rat?

Specification of terminal board

•

- •What is the size of terminal board? Where is the termination box to be placed?
- •What would be the entry route of the cable into the terminal board?
- Is there any coexistence of other cables?
- •Does the board have door? What would be the situation when in operation?
- •What is the height of the terminal board from the floor?
- •Is connector guide bar necessary?

Installation

- Is the cable surplus length sufficient for maintenance?
- •Can the cable be accommodated without any twist or tight bending?
- Is the metal cable securely terminated without any loosening or misalignment?
- •Have the optical fiber fusion splicing procedures been securely carried out?

Inspection

Conduction test

 •	OK NG
•	NG

Crossed line test

ST	ОК
	NG
	NG
	Measurement using TDR
	NG
	• ок



Optical transmission loss of the object under test is |P₀-P₁|.



• Optical Time Domain Reflectomer (OTDR) method

1. Principle

When an optical pulse is input at one end of an optical fiber, the pulse propagates along the fiber with its intensity being attenuated due to the radiation and absorption losses. On the other hand, small portions of the light pulse are reflected by such causes as Rayleigh scattering, fiber fracture and the mirror surface at the output end of the fiber, propagating back to the input end in succession. These reflected pulses represent, when accumulated over time and displayed on a screen with respect to fiber length, a waveform from which useful information on the fiber is obtained including splicing loss, transmission loss, line length and fault location.

2. Measurement example

An example of line measurement is shown in the Figure.





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