

# SMPTE & ARIB HDTV CONNECTION SYSTEM CONNECTORS, CABLES AND MEDIA CONVERTERS



 **LEMO**®

## Precision modular connectors to suit your application

Since its creation in Switzerland in 1946 the LEMO Group has been recognized as a global leader of circular Push-Pull connectors and connector solutions. Today LEMO and its affiliated companies, REDEL and COELVER, are active in more than 80 countries with the help of over 40 subsidiaries and distributors.

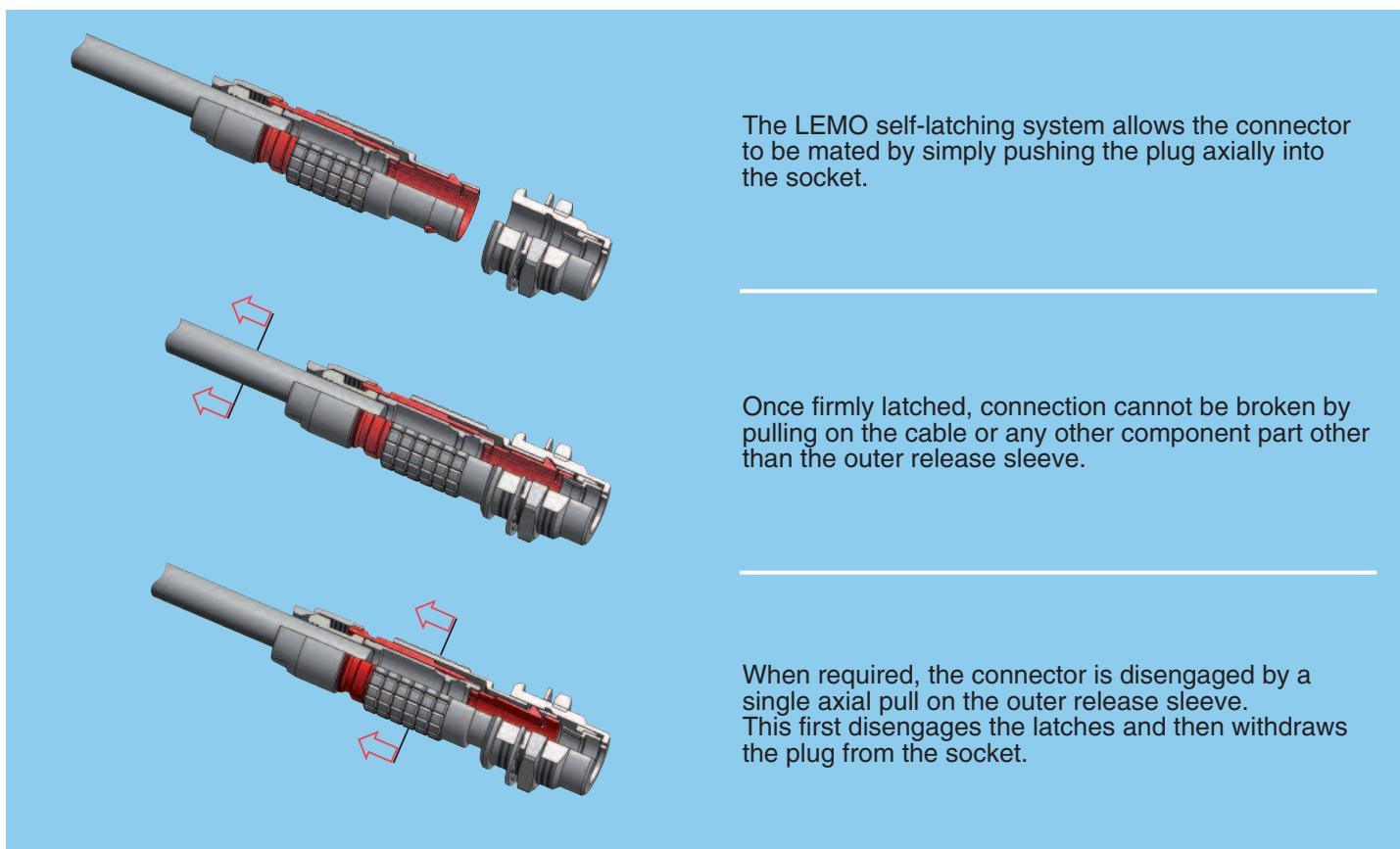
### Over 75'000 connectors

The modular design of the LEMO range provides over 75'000 connectors from miniature  $\varnothing$  3 mm to  $\varnothing$  50 mm, capable of handling cable diameters up to 30 mm and for up to 114 contacts.

This vast portfolio enables you to select the ideal connector configuration to suit almost any specific requirement in most markets, including medical devices, test and measurement instruments, machinery, audio video broadcast, telecommunications and military.

### LEMO's Push-Pull Self-Latching Connection System

This self-latching system is renowned worldwide for its easy and quick mating and unmating features. It provides absolute security against vibration, shock or pull on the cable, and facilitates operation in a very limited space.



### UL Recognition

LEMO connectors are recognized by the Underwriters Laboratories (UL). The approval of the complete system (LEMO connector, cable and your equipment) will be easier because LEMO connectors are recognized.

### CE marking

CE marking means that the appliance or equipment bearing it complies with the protection requirements of one or several European safety directives. CE marking  applies to complete products or equipment, **but not to electromechanical components, such as connectors.**

### RoHS

LEMO connector specifications conforms the requirements of the RoHS directive (2011/65/EU) of the European Parliament and the latest amendments. This directive specifies the restrictions of the use of hazardous substances in electrical and electronic equipment marketed in Europe.

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## Table of Contents

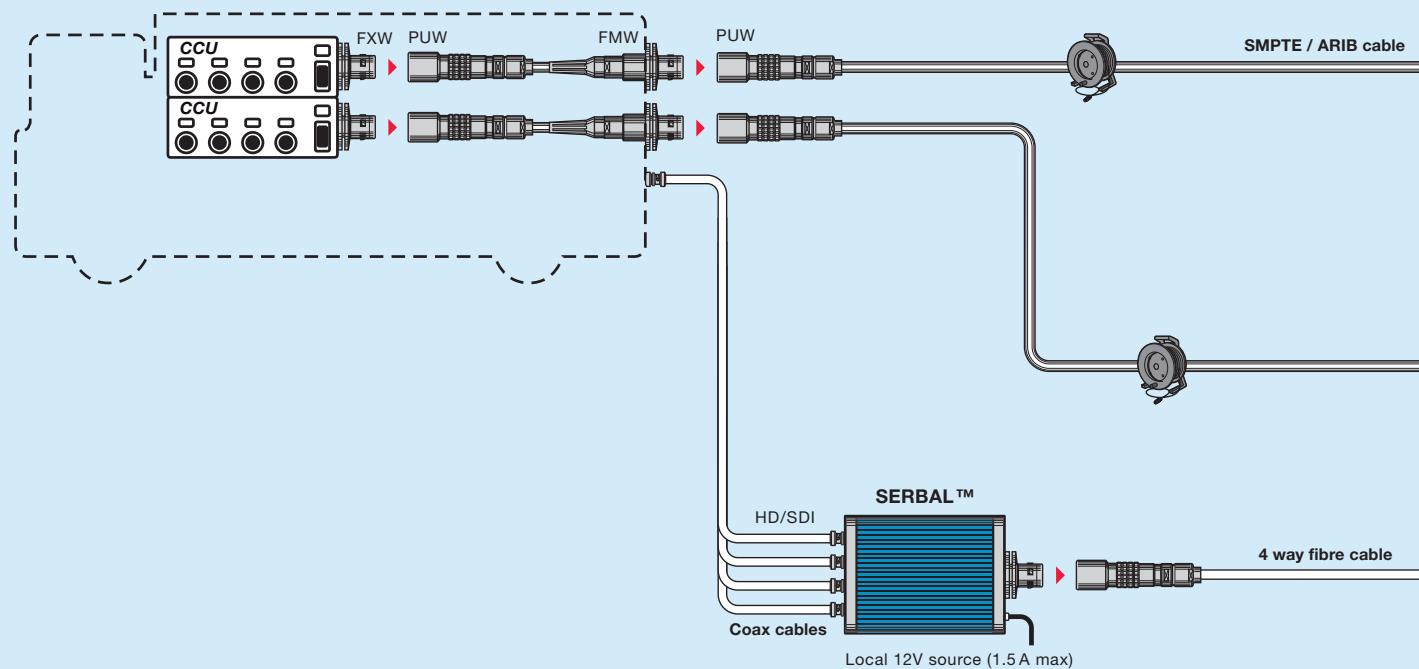
<b>HDTV System Overview</b> .....	4
<b>LEMO pioneered and set the standard for HDTV</b> .....	6
<b>3K.93C series</b>	
Interconnections .....	7
Part section showing internal components .....	8
Technical characteristics .....	8
Part number example .....	9
Models .....	10
Insert configurations .....	12
Fibre optic contact .....	12
Accessories .....	13
Patch panel .....	15
Tooling .....	16
<b>NORTHWIRE™ HDTV cables</b>	
NORTHWIRE hybrid camera cable according to SMPTE 311 and ARIB standards .....	17
Hybrid HDTV fibre optic cable part number .....	18
Cable assembly .....	19
SMPTE 311M standard cable assemblies .....	22
ARIB cable standard cable assemblies .....	22
<b>MEERKAT™ HD converter</b>	
A compact solution for Sony® SD, Grass Valley™ (Thomson®) SD/HD camera based systems .....	23
Technical characteristics .....	24
List of SD or HD compatible cameras .....	24
Local camera power .....	25
Accessories .....	26
<b>SERBAL™ converter</b>	
SERBAL™ - SMPTE Electrical Reconfigurable Bidirectional Alternative Link .....	27
Technical characteristics .....	28
<b>SHACK™ converter</b>	
SHACK™ - SMPTE conversion device for singlemode fibre (SC, ST, FC or LC) .....	29
Technical characteristics .....	30
Models .....	30
<b>MULTISHACK 3X™ or 6X™ converter</b>	
Introduction .....	31
MULTISHACK 3X™ - conversion system .....	32
Technical characteristics .....	32
MULTISHACK 6X™ - conversion system .....	33
Technical characteristics .....	33
<b>HD Z-LINK™ fibre optic link system</b>	
HD Z-LINK™ .....	34

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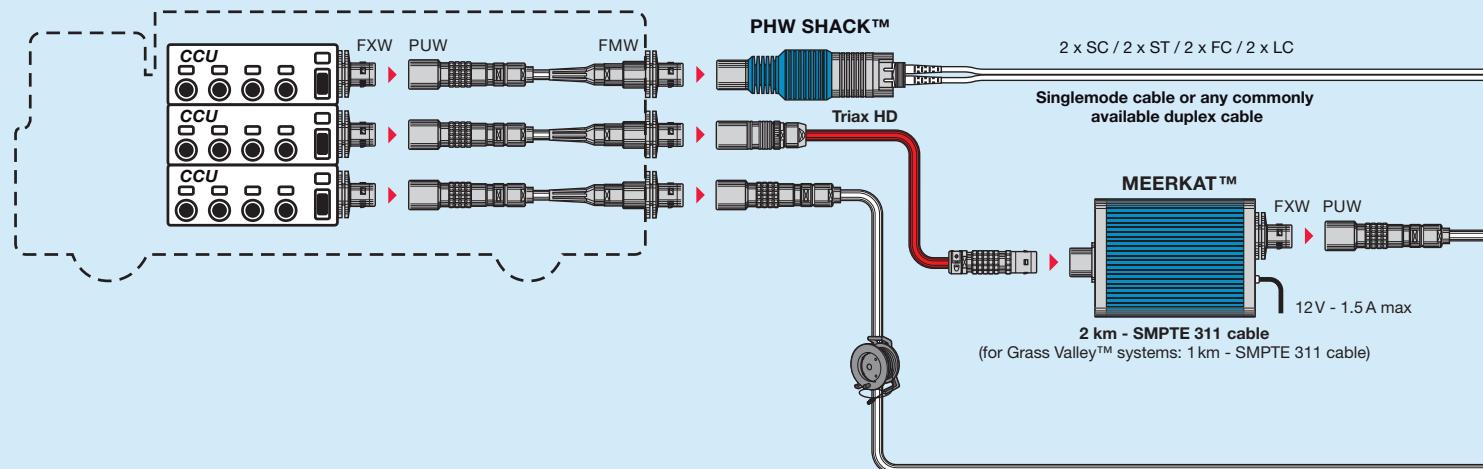
## HDTV System Overview

### CCU SIDE

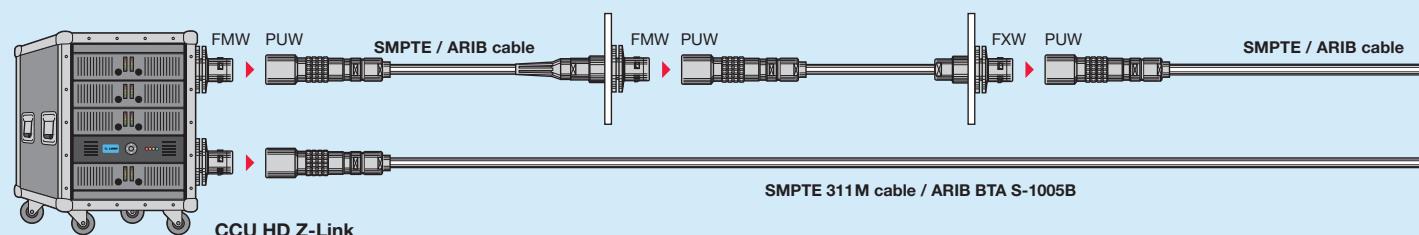
#### Outside Broadcast Van Configuration

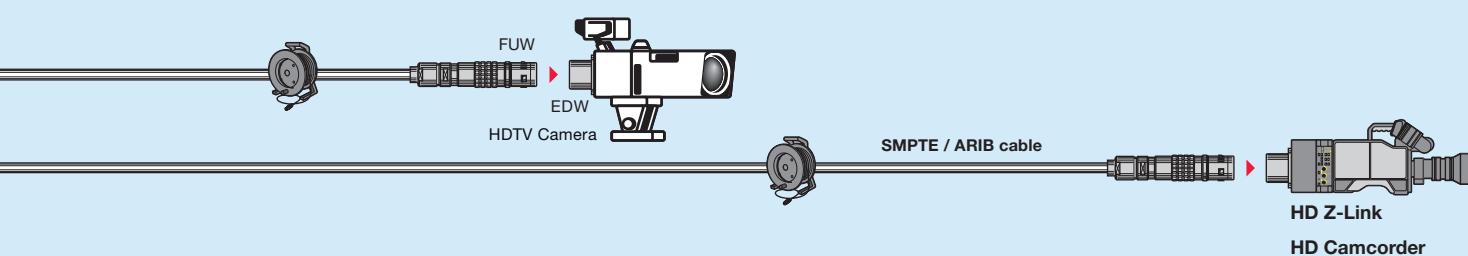
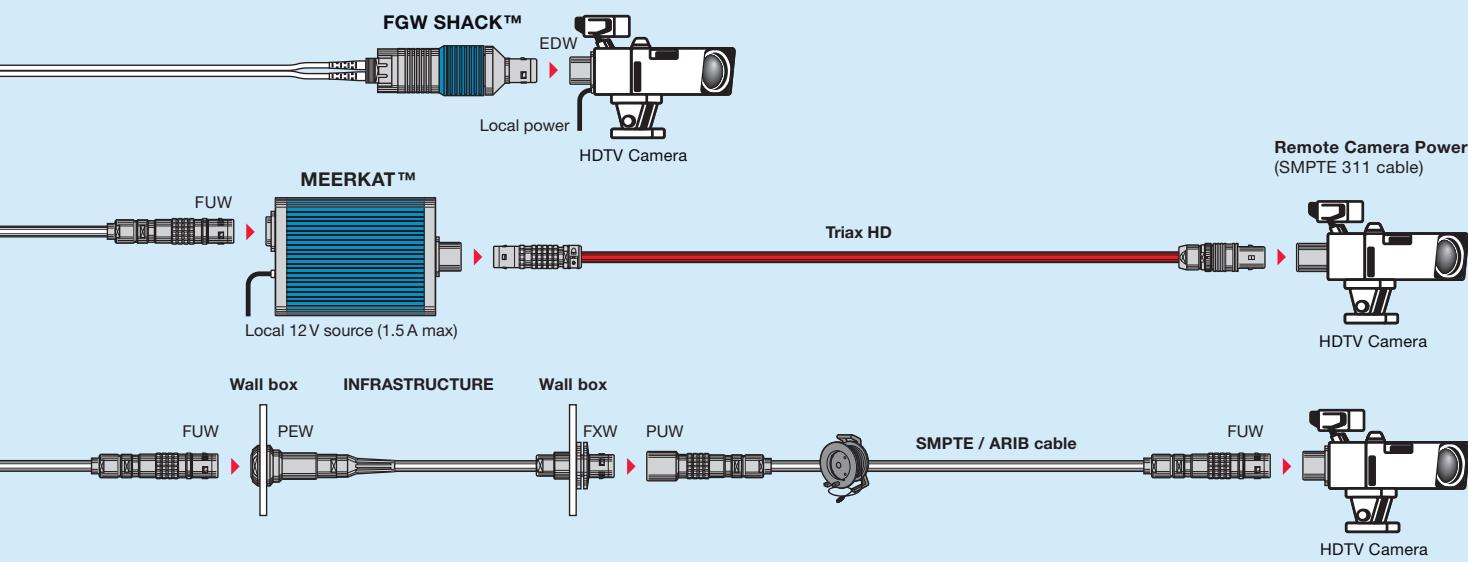
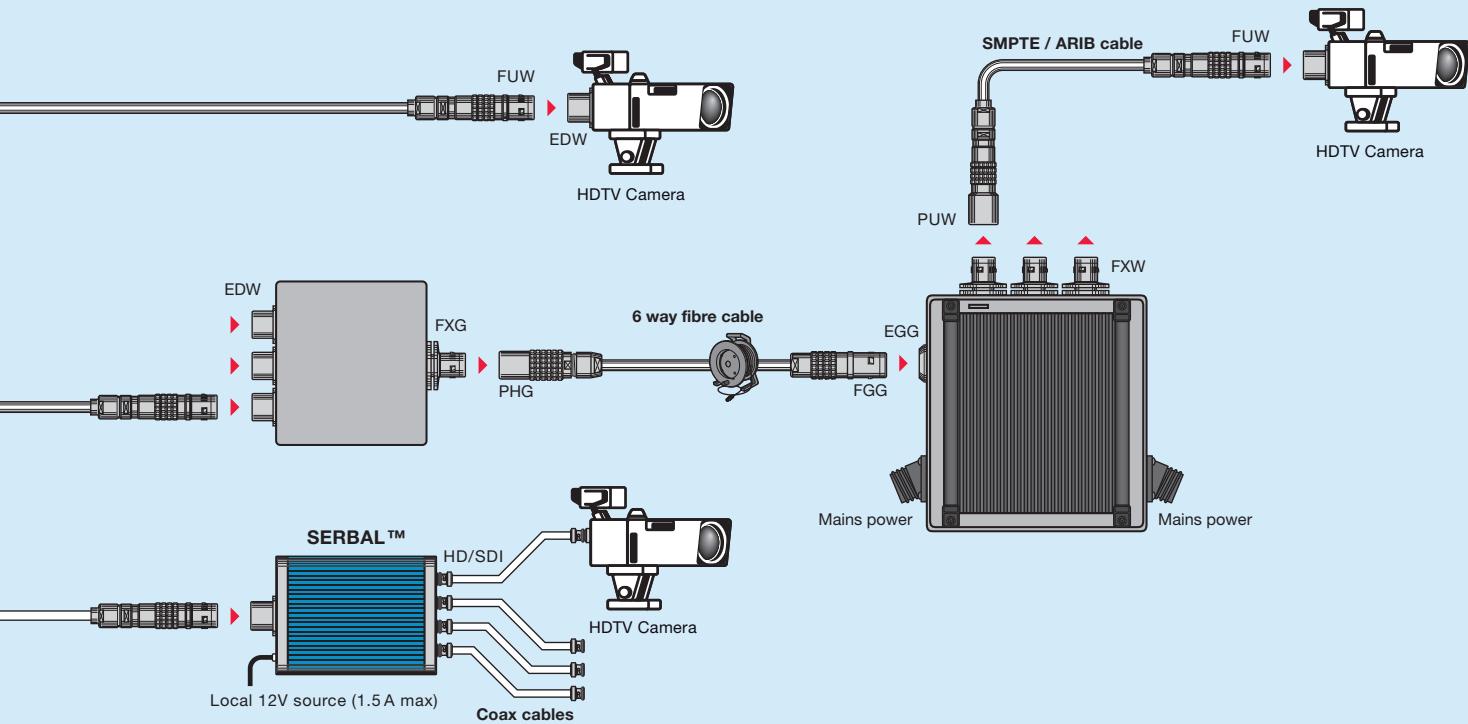


#### Stadium/building application



#### Studio application



**CAMERA SIDE**


## LEMO pioneered and set the standard for HDTV

### The global standard for HDTV fibre connector

LEMO developed the 3K.93C Series connectors in the early stages of the introduction of HDTV, becoming the standard for high-definition TV.

It is one of the only connectors being used worldwide that complies fully with SMPTE, ARIB and EBU standards for both signal and cable. LEMO's 3K.93C connectors are the standard in national and international broadcast companies.

### Fast transition to HDTV

Transition to HDTV is easier than ever with LEMO. The wide range of shell styles and termination procedures, for even non-fibre experts, makes it possible for everyone to be successful in HDTV.

The LEMO 3K.93C connector uses two single-mode fibre contacts, two high voltage contacts, and two signal contacts. Cable drums and cable assemblies with standard lengths are available off the shelf.

### Over 20'000 stainless steel shells mating cycles offered

The rugged stainless steel outer shell of the LEMO 3K.93C connectors ensures a very long product life, when properly cleaned. The fibre optic contact can last many years.

### Simple maintenance

The optical contacts are accessible for fast cleaning; an optional simple, lightweight and portable fibre inspection unit helps the user view the condition of the fibre optic contact to ensure reliable operation.

### Highest performance with LEMO standard F2 fibre contact

The advantage of using epoxy and polish contacts is the reliability of the termination and longevity of the connector to assure a quality signal transmission.

These contacts are very robust and can withstand wide outdoor temperature variations.

### Extend the quality of your connection

LEMO offers quality assembly service for HDTV connection systems. The connector assembly is done in-house by qualified personnel.

### F2 fibre optic contacts in various dimensions

LEMO now offers 3 choices of F2 ferrule size to fit your fibre dimensions. Fibres are manufactured to about 125 microns, but in some occasion the fibres might be larger.

LEMO's choice of inner ferrule diameter are fit for 125 µm, 125.5 µm and 126 µm fibres. Designed for use with the LEMO 3K.93C, these contacts can be used directly into any LEMO connector where the F2 contact is used.

### Benefits

- Quick disconnect Push-Pull self latching system
- Over 11 shells to meet various application needs
- Stainless steel shell for rugged and harsh environment
- Optional pre-terminated F2 contacts for simple and rapid field assembly
- UL certified connectors
- ARIB (BTA S-1005B), ANSI/SMPTE (304 and 311) and EBU (R100-1999) compatible

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# 3K.93C Series

The LEMO 3K.93C connectors with keys (W) were developed to meet the critical requirements of the new generation of digital HDTV cameras.

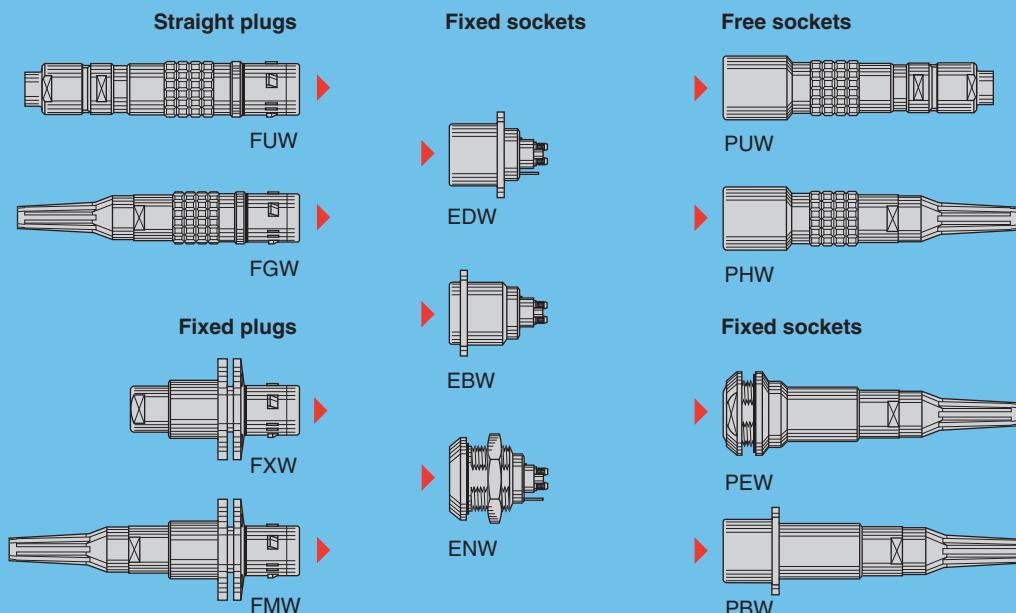
The main features of this series are as follows:

- Security of the LEMO Push-Pull self-latching system
- Fitted with the standard LEMO **F2** fibre optic contacts.
- Conforms to the Japanese ARIB technical report BTA S-1005B, to the ANSI/SMPTE 304 M-1998 and 311M-1998 standards and to the European EBU Technical Recommendation R100-1999.
- Qualified for use in UL approved equipment such as those specified in UL 1419 «Professional Video and Audio Equipment».
- Cabled connectors have obtained the EC Attestation of conformity No: N8 00 03 39058 001 from the German TÜV Product Service.

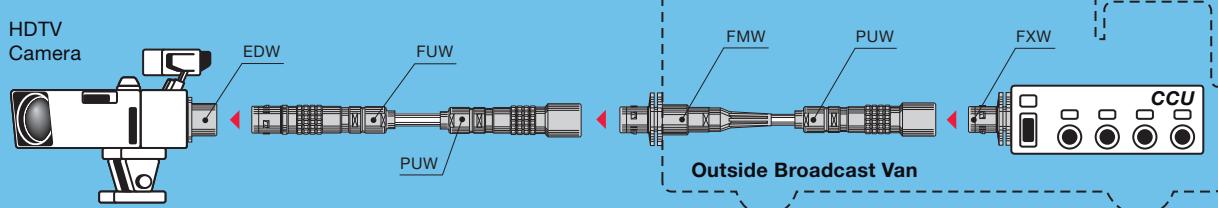
The 3K.93C series consists of eleven models which will accept cables specific to this application.

It includes the HEAVY DUTY line with stainless steel shells that is guaranteed to at least 20,000 mating cycles and offer more resistance to heavy wear conditions.

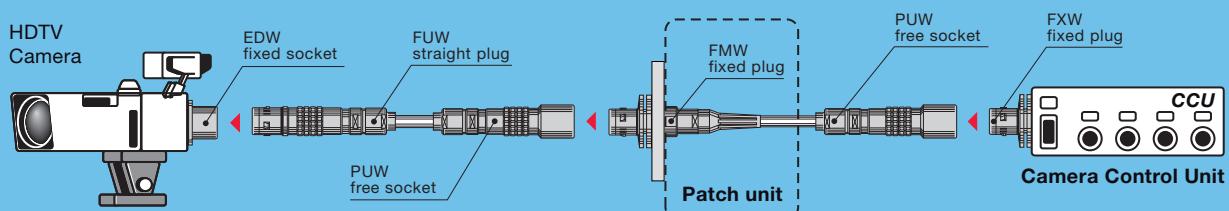
## Models (page 10)



## Outside Broadcast Van Configuration

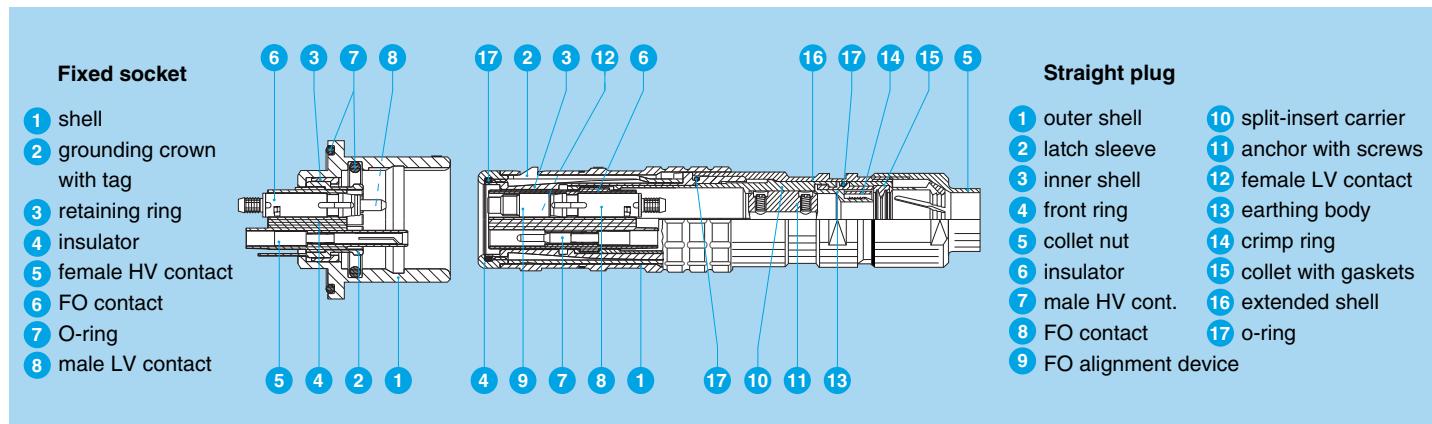


## Studio Configuration



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## Part section showing internal components



## Technical characteristics

### Materials and treatments

Component	Material (Standard)	Surface treatment ( $\mu\text{m}$ )					
		chrome Cu	Ni	Cr	nickel Cu	Ni	gold Cu
Outer shell, collet nut and oversized collet	Brass (UNS C 38500)	0.5	3	0.3			
	Stainless steel (AISI 303)				without treatment		
Grounding crown	Special brass				0.5	3	
	Stainless steel (AISI 416)				without treatment		
Latch sleeve	Special brass	0.5	3	0.3			
	Stainless steel (AISI 416)				without treatment		
Locking washer	Bronze (UNS C 52100)				0.5	3	
Hexagonal nut or round nut	Brass (UNS C 38500)				0.5	3	
Male crimp contact	Brass (UNS C 34500)					0.5	3
Female crimp contact	Bronze (UNS C 54400)					0.5	3
Clips	Cu-Be (FS-QQ-C-530)				without treatment		
Insulator	PEEK						
Crimping tube	Copper (UNS C 18700)				0.5	3	
Other metallic components	Brass (UNS C 38500)				0.5	3	
	Stainless steel (AISI 303)				without treatment		
O-ring and gaskets	Silicone MQ/MVQ, FPM/FKM (Viton®) or Nitril NBR						

### Electrical

Characteristics	Value	Standard
Insulation resistance	$> 10^{12} \Omega$	IEC 60512-2 test 3a
Shell electrical continuity	$< 1.6 \text{ m}\Omega$	IEC 60512-2 test 2f
Contact resistance (signal)	$< 4.8 \text{ m}\Omega$	IEC 60512-2 test 2a
Contact resistance (power)	$< 3.6 \text{ m}\Omega$	IEC 60512-2 test 2a
Radiated emission	freq. 30-220 MHz: $< 30 \text{ dBpV/m}$ freq. 220-1000 MHz: $< 37 \text{ dBpV/m}$	EN 55022 class B EN 55022 class B

### Optical

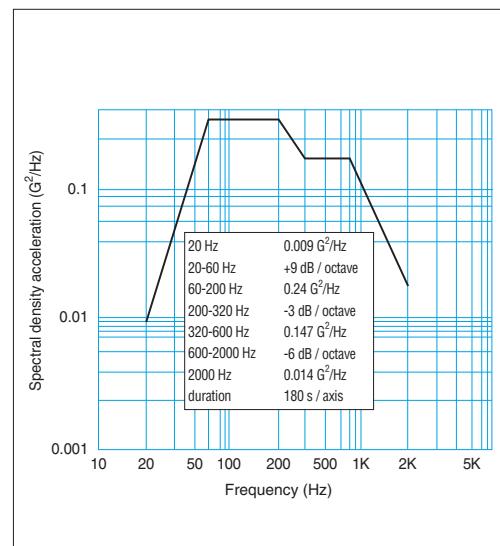
Characteristics	Value	Standard	Method
Average insertion loss fibre 9/125 $\mu\text{m}$	0.10 dB	IEC 61300-03-04	Insertion Method B
Return loss fibre 9/125 $\mu\text{m}$ (UPC)	$\geq 45 \text{ dB}$	IEC 61300-03-06	Branching Device Met.
Return loss fibre 9/125 $\mu\text{m}$ (Hand polish)	$\sim 30 \text{ dB}$	IEC 61300-03-06	Branching Device Met.

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## Mechanical and environmental

Characteristics	Value	Standard
Mating durability (Brass+Brass)	10000 cycles	IEC 61300-02-02
Mating durability (Brass+Stainless steel)	8000 cycles	IEC 61300-02-02
Mating durability (Stainless steel+St. steel)	20000 cycles	IEC 61300-02-02
Damp heat steady state	up to 95% at 60°C	IEC 61300-02-19
High temperature	+80°C	IEC 61300-02-18
Low temperature	-40°C	IEC 61300-02-17
Temperature cycling	-55°C + 90°C	
Cable retention	1000 N	IEC 61300-02-04
Impact (Method A)	2 m onto concrete floor	IEC 61300-02-12
Shock (3 cycles in 2 directions)	100 g, 10-50 ms; 20 g 6-9 ms	IEC 61300-02-09
Water resistance (Depth of 1.8 for 48 h)	IP 68	IEC 60529
Salt spray corrosion test	> 144 h	IEC 60512-6 test 11f

## Vibration



## Part number example

### Straight plug and free socket

F U W . 3 K . 9 3 C . T L E C 9 6 Z

Model  
Series: 3K  
Type: 93C  
Housing:  
T = stainless steel

#### Variant

Cable ø:  
74 = 6.2 to 7.4 mm  
96 = 8.9 to 9.5 mm  
12 = 11.6 to 12.5 mm

Cable fixing type:  
C = collet adapter  
T = cable adapter

Fibre contact:  
(page 12)

Insulator: L = PEEK

**FUW.3K.93C.TLEC96Z** = Straight plug with keys (W), 3K series, mixed type to accept 2 F2 type fibre optic contacts, 2 power and 2 signal electrical contacts, stainless steel housing, PEEK insulator, female crimp signal contacts, cable fixing type T for 9.2 mm diameter cable, and nut for fitting a bend relief.

### Fixed socket

E D W . 3 K . 9 3 C . T L E

Model  
Series: 3K  
Type: 93C

Fibre contact:  
(page 12)

Insulator: L = PEEK

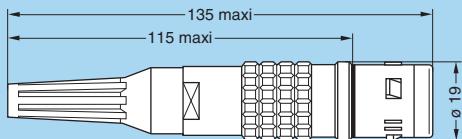
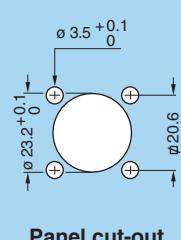
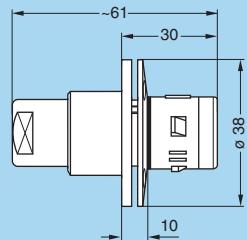
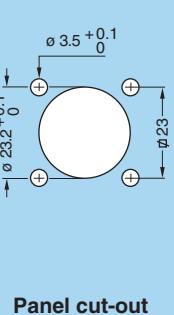
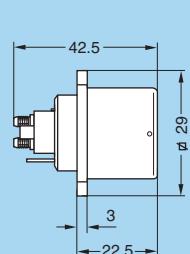
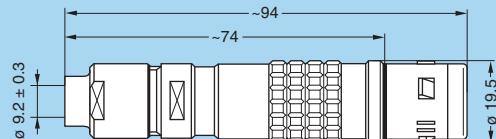
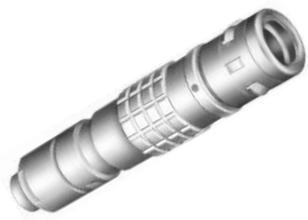
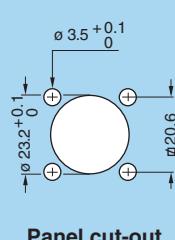
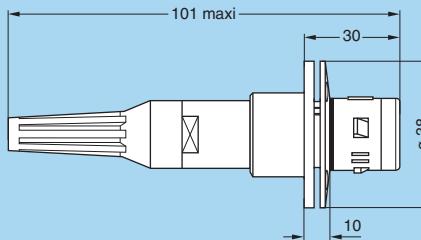
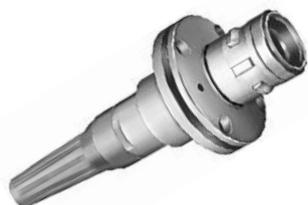
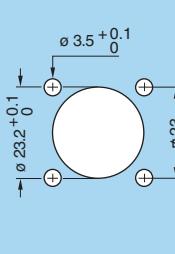
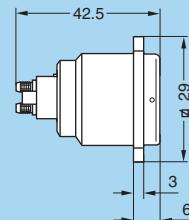
Housing:  
T = stainless steel

**EDW.3K.93C.TLE** = Fixed socket with rear square flange, keys (W), 3K series, mixed type to accept 2 F2 type fibre optic contacts, 2 power and 2 signal electrical contacts, stainless steel housing, PEEK insulator, male crimp signal contacts.

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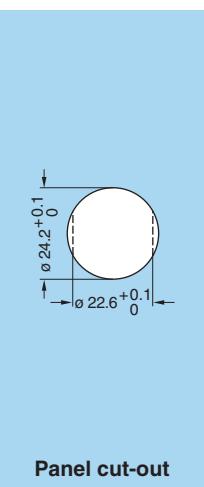
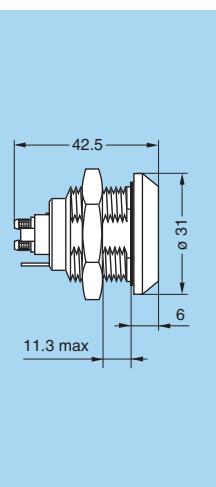


3 K 9 3 C

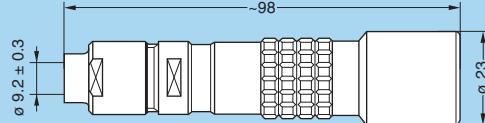
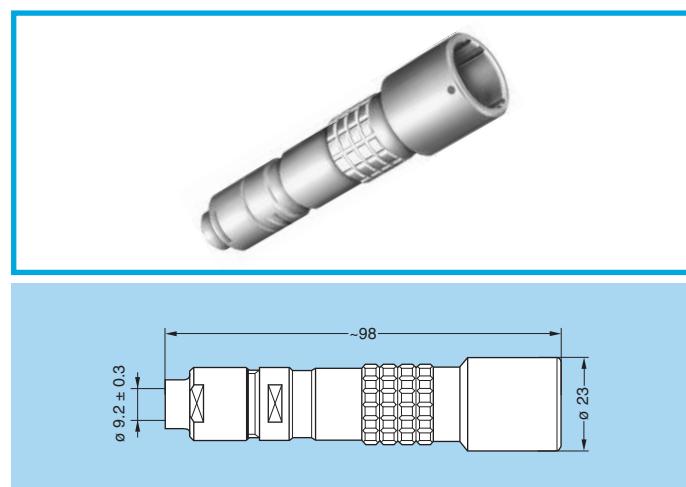
**FGW** Straight plug, cable adapter, with bend relief

**FXW** Fixed plug, round flange (4 holes mounting), without collet

**EDW** Fixed socket with rear square flange, (4 holes mounting), and earthing tag

**FUW** Straight plug, cable collet adapter, long shell, nut for fitting a bend relief with cap

**FMW** Fixed plug, round flange (4 holes mounting), cable adapter, with bend relief

**EBW** Fixed socket with front square flange, (4 holes mounting)


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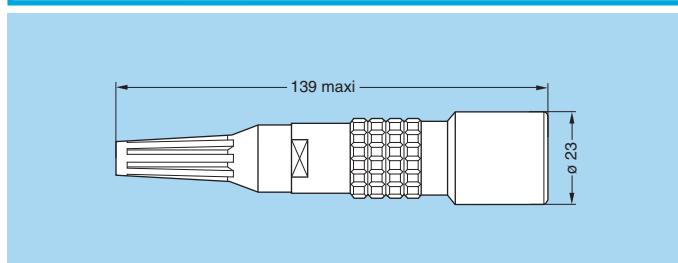
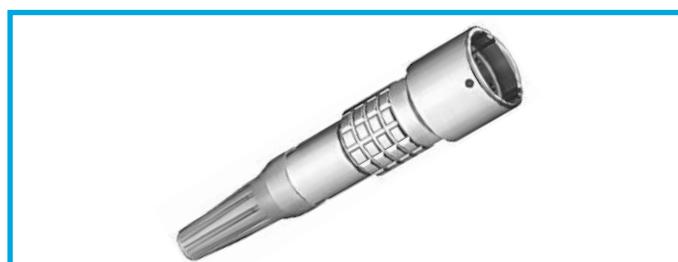
**ENW** Fixed socket, nut fixing and earthing tag



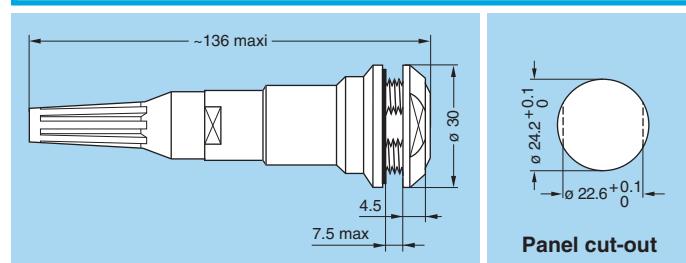
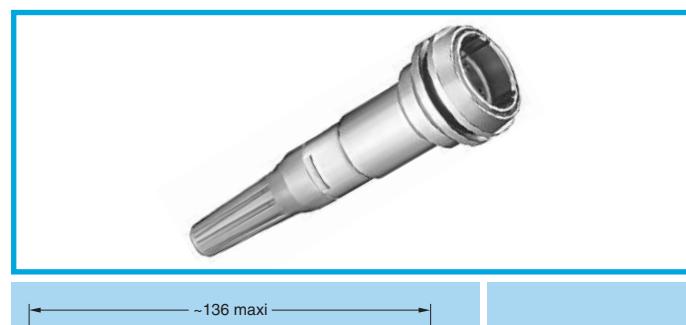
**PUW** Free socket, cable collet adapter, long shell, nut for fitting a bend relief with cap



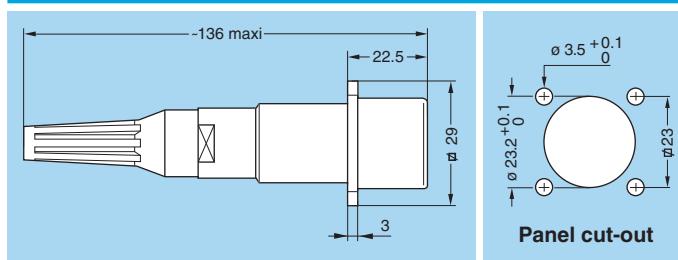
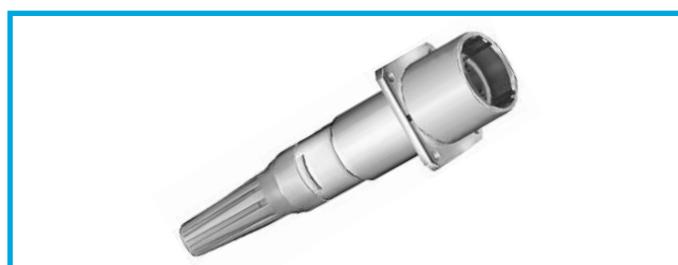
**PHW** Free socket, cable adapter with bend relief



**PEW** Fixed socket, nut fixing, cable adapter, with bend relief (back panel mounting)



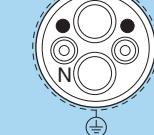
**PBW** Fixed socket with rear square flange, (4 holes mounting, cable adapter, with bend relief

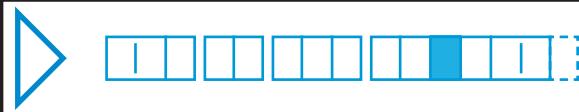


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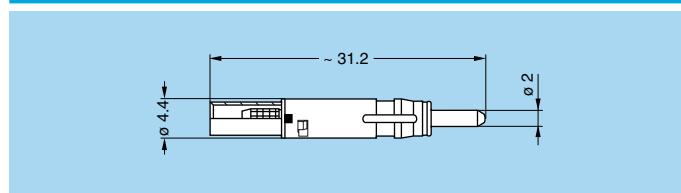
## Insert configurations

Number of fibre optic contacts	Plug insulator	Socket insulator	Reference	Fibre optic contact			Electrical crimp contacts								
				Contact type for plug	Fibre core/cladding (µm)	Ferrule bore inside ø (µm)	Number of contacts	Contact function	Contact type for plug	Contact ø (mm)	AWG range	Creepage distance and air clearance (mm)	Working voltage (V rms)	Test voltage (V rms)	Rated current (A)
2			93C	fem.	9/125	125	2	signal	LV male	0.9	20-24		≤ 42	1000	3
							2	power	HV male	1.3	14-18	> 6.5	≤ 600	2250	10



## Fibre optic contact

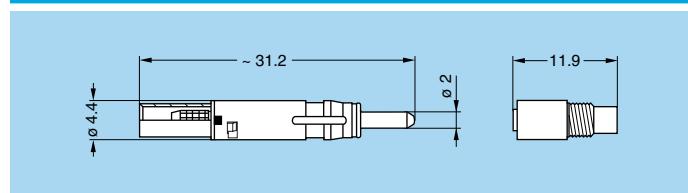
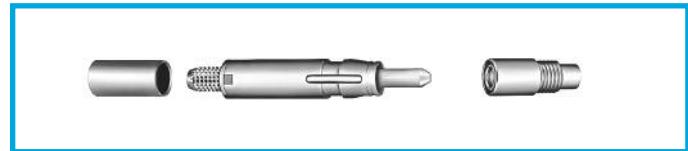
### FFS.F2 Male F2 Fibre Optic Contact



Ref.	Contact	Ferrule hole	Type	Gender	Note
E	FFS.F2.BA2.LCE30	125 µm	Crimp	Male	●
K	FFS.F2.BA2.LCT10	125 µm	Epoxy	Male	●
X	FFS.F2.BX2.LCE30	125.5 µm	Crimp	Male	○
V	FFS.F2.BX2.LCT10	125.5 µm	Epoxy	Male	○
F	FFS.F2.BB2.LCE30	126 µm	Crimp	Male	○
N	FFS.F2.BB2.LCT10	126 µm	Epoxy	Male	○

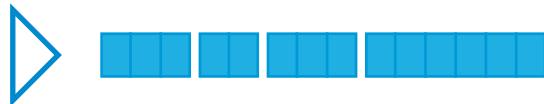
● First choice alternative  
○ Special order alternative

### PSS.F2 Female F2 Fibre Optic Contact



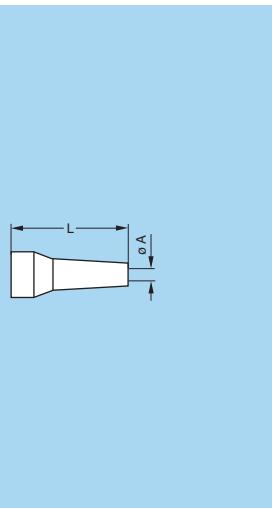
Ref.	Contact	Ferrule hole	Type	Gender	Note
E	PSS.F2.BA2.LCE30	125 µm	Crimp	Female	●
K	PSS.F2.BA2.LCT10	125 µm	Epoxy	Female	●
X	PSS.F2.BX2.LCE30	125.5 µm	Crimp	Female	○
V	PSS.F2.BX2.LCT10	125.5 µm	Epoxy	Female	○
F	PSS.F2.BB2.LCE30	126 µm	Crimp	Female	○
N	PSS.F2.BB2.LCT10	126 µm	Epoxy	Female	○

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## Accessories

### GMA Bend relief



Part number	Dim. (mm)	
	A	L
GMA.3B.090.DN	9	42
GMA.4B.011.DN	11	60

**Note:** The last letter «N» of the part number indicates the colour black of the bend relief. For others colour, refer to the table below and replace letter «N» by the letter of the colour required.

Ref.	Colour
A	blue
B	white
G	grey

Ref.	Colour
J	yellow
M	brown
N	black

Ref.	Colour
R	red
S	orange
V	green

### GMF Bend relief with cap for FUW plug



Part number
GMF.3K.085.EANZ

● Material: black ALCRYN®

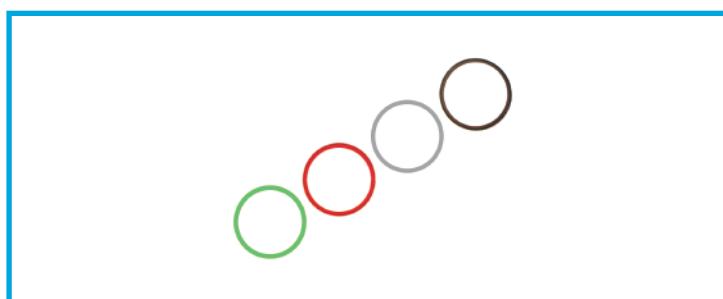
### GMP Bend relief with cap for PUW free socket



Part number
GMP.3K.085.EANZ

● Material: black ALCRYN®

### GMF Coloured ring for bend relief with cap



Part number	Colour
GMF.3K.265.RG	grey
GMF.3K.265.RN	black
GMF.3K.265.RR	red
GMF.3K.265.RV	green

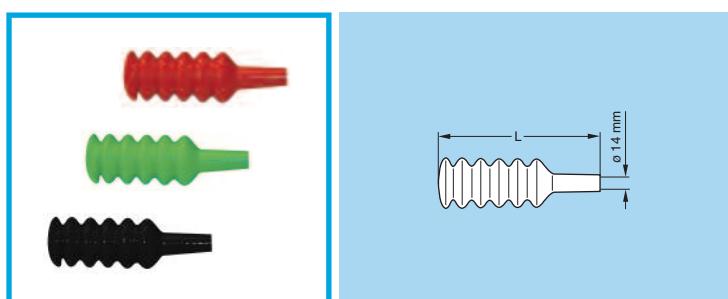
● Material: Silicone

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**Bee** Blanking caps

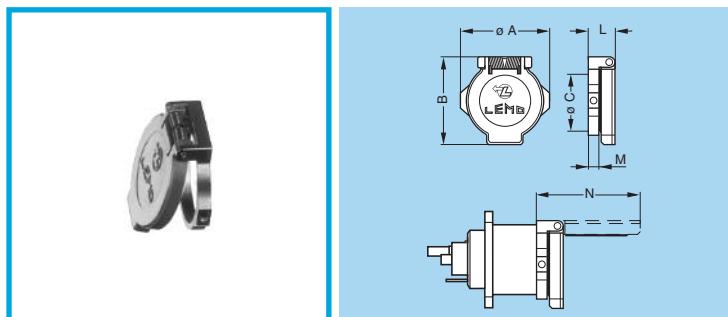

Part number	For connector model
<b>BHA.3K.100.EAN</b>	FMW, FXW
<b>BRA.3K.200.EAN</b>	EDW, PEW
<b>BFG.3K.100.EAN</b>	FMW, FXW
<b>BRF.3K.200.EAN</b>	PUW
<b>BHA.3K.100.715EN</b>	FMW, FXW
<b>BRA.3K.100.715EN</b>	EBW, EDW, ENW, PBW, PEW

● Material: black ALCRYN®

**GM● Gaiters**


Part number	Colour	Dimension L (mm)	For connector model
<b>GMP.3K.140.165PER</b>	red	165	PUW
<b>GMP.3K.140.165PEN</b>	black	165	PUW
<b>GMF.3K.140.156PEV</b>	green	156	FUW
<b>GMF.3K.140.156PEN</b>	black	156	FUW

● Material: PVC

**BRR** Spring loaded dust cap for EDW and EBW


Part number	Dimensions (mm)					
	A	B	C	L	M	N
<b>BRR.3K.200.PZSG</b>	29	29	23	8.1	3	33.2

**Note:** On request, this cap is available in black. If so replace the last letter «G» of the part number by «N».

● Material: Polyoxymethylene (POM) grey (or black)



## Patch panels

### PB • Patch panel



2U panel with one row of 6 or 10 plugs or sockets of the 3K.93C Series.

P B G . 3 K . 9 3 C . M W 9 6 0 6

Ref.	Colour
C	beige
G	grey
N	black
T	nat. anod.

Ref.	Front side connection
MW	Plug FMW
EW	Socket PEW
BW	Socket PBW

Ref.	Cable ø (mm)	Nb of connectors
9606	8.9 to 9.5	6
1206	11.6 to 12.4	6
9610	8.9 to 9.5	10
1210	11.6 to 12.4	10

### Integrated 3U panel with splice tray and connector junctions



An integrated panel with built in splice tray and connector junctions for use where space is limited, either at a wallbox or a patching unit. Up to 3 can be mounted side-by-side to fit in 3U rack dimensions.

**Note:** Available on request.

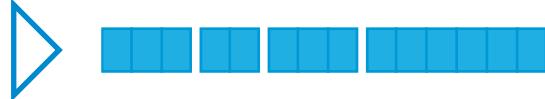
### 2U Rack mounted splice tray with connector junctions



Rack mounted splice tray of 2U height with connector junctions for patch unit. Can accommodate up to 10 LEMO connectors. The modular design of the unit along with blanking plates provides opportunity for increasing numbers of channels up to 10.

**Note:** Available on request.

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## Tooling

### DCS.F2.N02.PA Fibre Optic one-click cleaner



Insert the one-click cleaner into the insulator and push until an audible “click” is heard. The cleaner uses a mechanical push action to advance an optical grade cleaning tape. More than 500 cleaning per cleaner. Product includes special LEMO F2 ferrule adaptor.

### DCS.F2.035.PN Alignment device tool



Simple tool with two threaded end for installation/extraction of the F2 contact alignment device. For use with WST.KI.125.34 kit above.

### WST.FB.CI1.10US2 Video inspection viewer



A portable fibre optic viewer for F2 contact consisting of handset probe, LCD display, ferrule tips for LEMO contacts & software & United States - AC power supply all in a rugged case. European power supply version (WST.FB.CI1.10EU2). An optional USB capture device is also available (part number: WST.FB.CI1.00USB2).

### DRV.FO.MOB.LAB3KC Mobile Lab for 3K.93C with F2 fibre optic contact



### DCT.F2.125.PA Fibre Optic ferrule cleaner



This cleaning tool comes with a bush for different cleaning configurations. More than 500 cleaning per cleaner. This cleaner is for on-site purposes only and should not replace regular maintenance cleaning with cotton buds and alcohol.

### WST.KI.125.34 Cleaning kit F2 contact



Fibre optic cleaning kit of 2 cotton buds, 1 dry and 1 being soaked in IPA (Isopropyl Alcohol) used for cleaning the fibre optic contacts.

### DCS.3K.175.72LN Cable puller



The LEMO cable puller, is a pull through tool that allows passing the cable through narrow sections and protects the optical fibre during installation.

### HD cable tester



This cable tester provides a quick and easy means of checking the functionality of HD hybrid fibre cables and cable systems. A laser source checks the fibres giving an indication of the attenuation through the whole cable or cable system, and electrical tests check for continuity of both the power and control conductors.

**Note:** Available on request.

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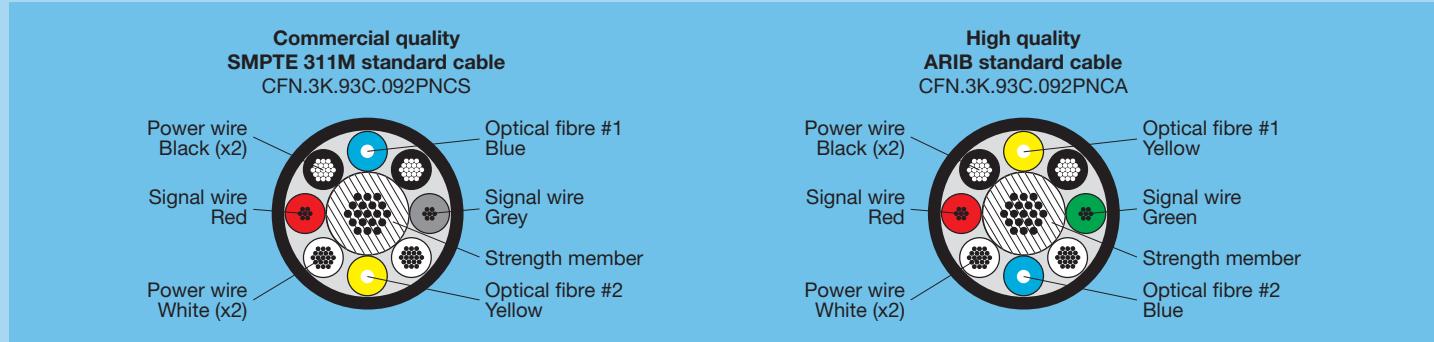
# NORTHWIRE™ HDTV cables

## NORTHWIRE hybrid camera cable according to SMPTE 311 and ARIB standards

This composite cable combines power conductors for TV camera, control wires, and optical fibres for video and audio transmission in a single cable. Specially designed to cope with the heavy demands of outside broadcast. The cable fully meets the requirements of the SMPTE 311M standard for camera cables.

Primary features and benefits of this cable are:

- High durability construction.
- Excellent flexing and twist capability coping with rough handling by rigging crews.
- Superior load bearing capabilities – can be driven over by trucks whilst in operation.
- High tensile strength.



## Cable specification

Core type	Power (Aux)	Control (Signal)	Optic fibre	Strength member
Nb of cores	4	2	2	1
Conductor sizes - AWG	20	24	—	—
Conductor construction - Nb/mm	19/0.185	7/0.193	—	19/0.330
Mode field diameter - $\mu\text{m}$	—	—	$8.9 \pm 0.8 \text{ at } 1310$	—
Cladding diameter - $\mu\text{m}$	—	—	$125 \pm 1 \mu\text{m}$	—
Approx. diameter of conductor - mm	0.88	0.58	—	1.75
Nominal insulation thickness - mm	0.41	0.30	—	0.38
Approx. core diameter - mm	1.72	1.22	0.9	2.51
Approx. thickness of tin-coated annealed copper braid - mm			0.127	
Nominal thickness of jacket - mm			1.14	
Approx. overall diameter - mm			9.2	
Approx. net weight - g/m <sup>2</sup>			137	
Max. conductor resistance - (20°C) $\Omega/\text{km}$	43	184 (SMPTE)	—	—
AC withstanding voltage - Vrms at 60 Hz, 1 min	1750	1750 (SMPTE)	—	—
Min. insulation resistance - (20°) M $\Omega$ km	10'000	10'000	—	—
UL Listing			AWM STYLE 21971	
Allowable tension			700N	

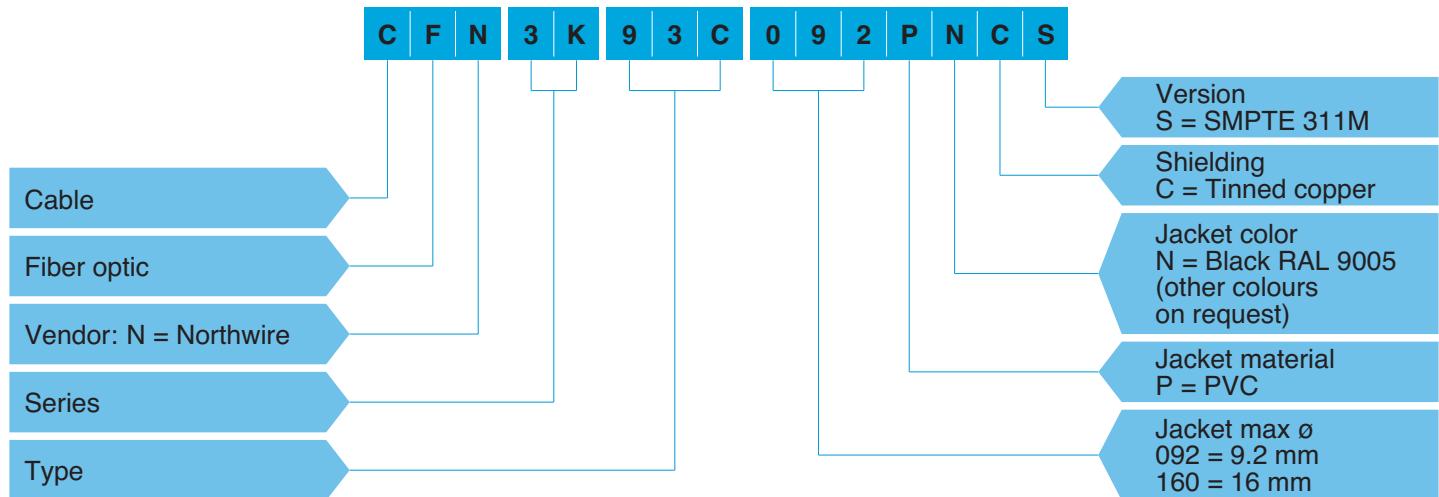
## Optical fibre

Item	Wavelength	Characteristics	Conversion condition (km)	Conversion formula
Transmission loss	$\lambda = 1.31 \mu\text{m}$	Less than .8 dB/km	up to $\geq 0.4$	$0.5 \times L \text{dB} \geq$
	$\lambda = 1.31 \mu\text{m}$	Less than .8 dB/km	$L < 0.4$	$0.5 \times 0.4 \text{dB} \geq$

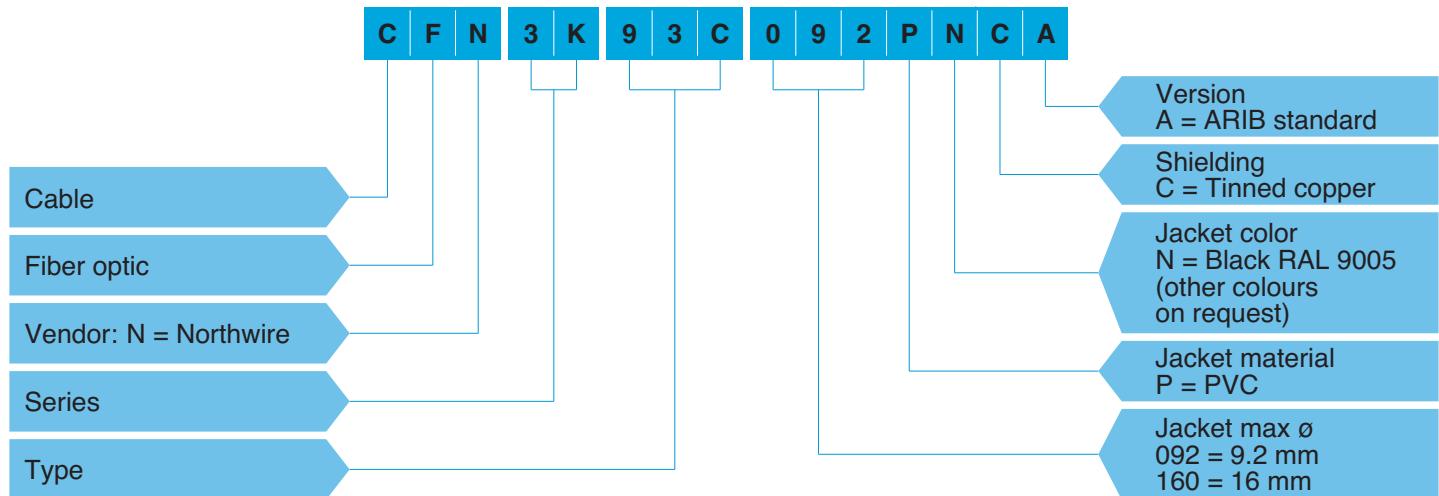
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## Hybrid HDTV fibre optic cable part number

### SMPTC standard



### ARIB standard



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## Cable assembly

### Part Number Example

#### Cable

M | F | P | 3 | K | 9 | 3 | C | A | M | 0 | 2 | 5 | N | S

Model 1 (table 1)

Model 2 (table 1)

Cable ø (table 2)

S = SMPTE 311M  
A = ARIB

Jacket color  
N = Black RAL 9005  
(other colours  
on request)

Cable length

M = Meters  
C = Centimeters  
K = Kilometers  
G = Gaiters<sup>1)</sup>  
J = Gaiters<sup>2)</sup>

**MFP.3K.93C.AM025NS** = 1 FUW plug and 1 PUW socket (key W), 3K.93C series, on a SMPTE 311M screened cable, 25 m length, sheath ø 9.2 mm, black RAL 9005 jacket color, with GMF/GMP bend relief with cap.

#### Note:

- 1) «G» stands for cable length in meters with red garter for free socket and green garter for plug.
- 2) «J» stands for cable length in meters with yellow garter for free socket and yellow garter for plug.

**Table 1**  
Model

Model 1 & 2	Code
FUW	F
FMW	M
PUW	P
PEW	E
PBW	B

**Table 2**  
Cable ø

Code	Sheath ø (mm)
A	9.2
B	2.5
C	2.8
D	12.0
E	16.0

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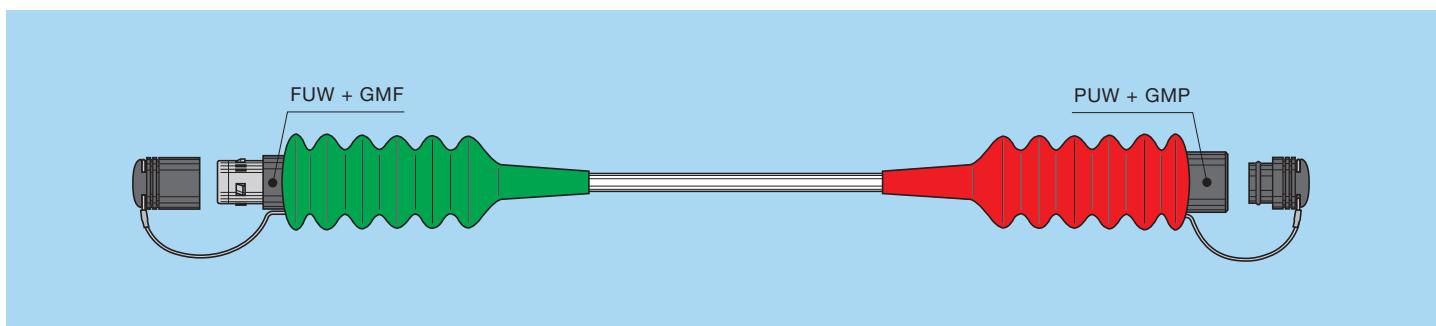
### MFP Outside broadcast cable assembly

Assembly cable with one straight plug (FUW) and one straight socket (receptacle) (PUW), both complete with GMF/GMP bend relief with cap.



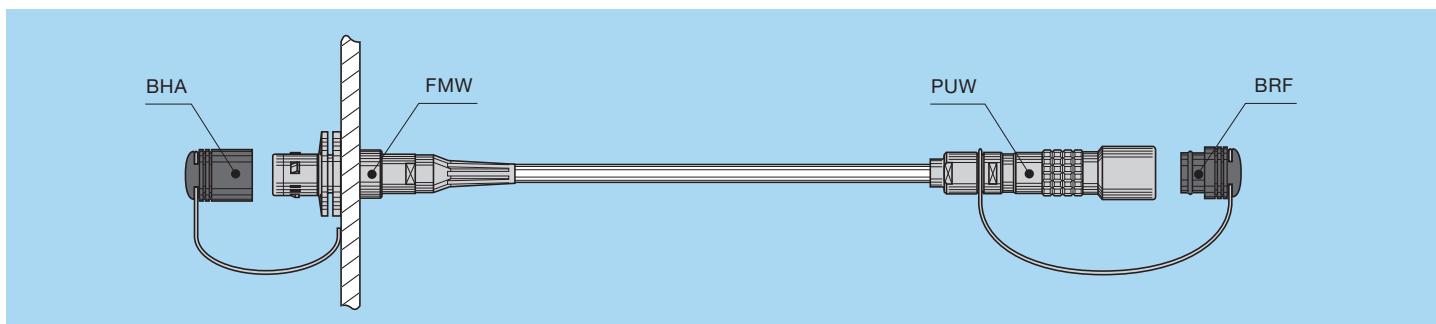
### MFP Outside broadcast cable assembly

Assembly cable with one straight plug (FUW) and one straight socket (receptacle) (PUW), both complete with GMF/GMP bend relief with cap and gaiters.



### MMP Internal OB van cable assembly

Assembly cable with one fixed plug (FMW) and one straight socket (receptacle) (PUW), both complete with BHA/BRF caps.



### MME Studio/Infrastructure cable assembly

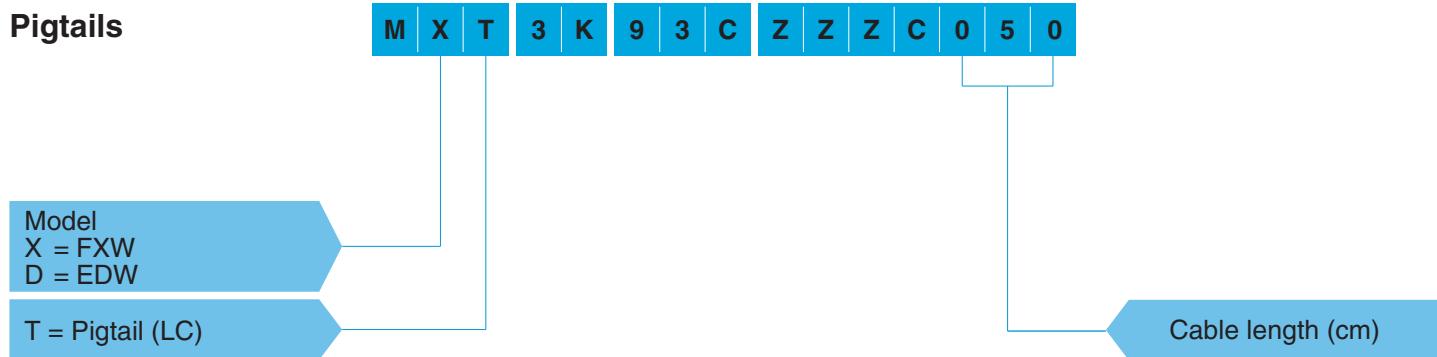
Assembly cable with one fixed plug (FMW) and one straight socket (receptacle) (PEW), complete with BHA cap.



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## Part Number Example

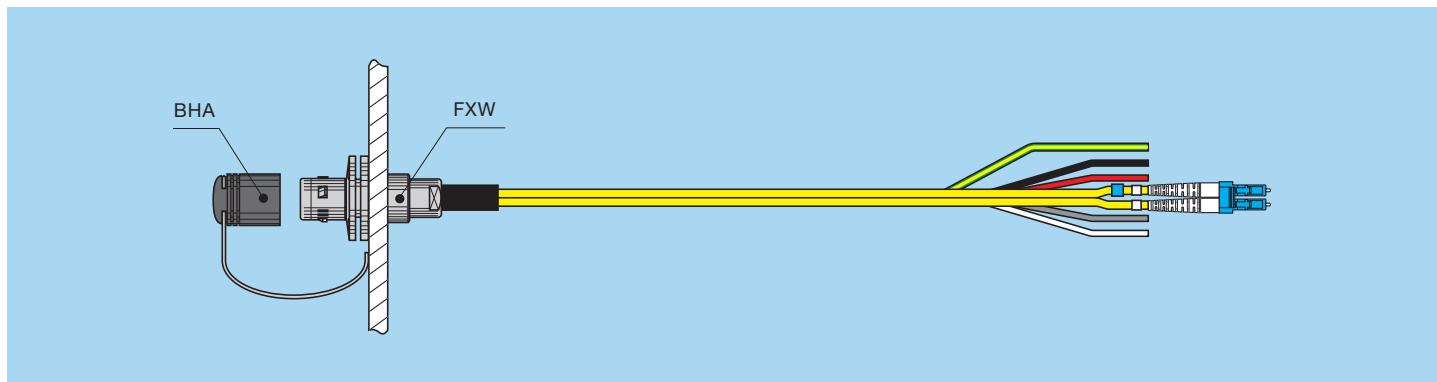
### Pigtails



**MXT.3K.93C.ZZZC050** = 1 FXW plug (key W), 3K.93C series and one pigtail (LC) on the other side, 50 cm length.

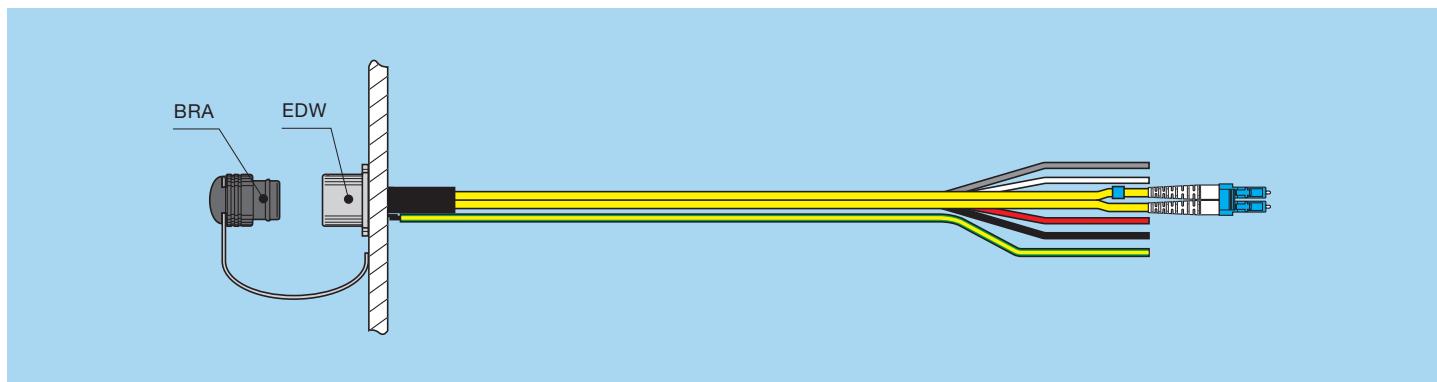
### MXT ECU side pigtails

Assembly cable with one fixed plug (FXW) and one pigtail (LC) complete with BHA cap.



### MDT Camera side pigtails

Assembly cable with one fixed socket (EDW) and one pigtail (LC) complete with BRA cap.



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## SMPTE 311M standard cable assemblies

### Outside Broadcast FUW-PUW

Part number	Description
MFP.3K.93C.AM025NS	25 meter length
MFP.3K.93C.AM050NS	50 meter length
MFP.3K.93C.AM100NS	100 meter length
MFP.3K.93C.AM200NS	200 meter length
MFP.3K.93C.AM300NS	300 meter length
MFP.3K.93C.AM400NS	400 meter length
MFP.3K.93C.AM500NS	500 meter length

### Internal OB van

Part number	Description
MMP.3K.93C.AM003NS	3 meter length
MMP.3K.93C.AM005NS	5 meter length
MMP.3K.93C.AM010NS	10 meter length
MMP.3K.93C.AM015NS	15 meter length
MMP.3K.93C.AM020NS	20 meter length

### Studio/Infrastructure

Part number	Description
MME.3K.93C.AM020NS	20 meter length
MME.3K.93C.AM050NS	50 meter length

## ARIB standard cable assemblies

### Outside Broadcast FUW-PUW

Part number	Description
MFP.3K.93C.AM025NA	25 meter length
MFP.3K.93C.AM050NA	50 meter length
MFP.3K.93C.AM100NA	100 meter length
MFP.3K.93C.AM200NA	200 meter length
MFP.3K.93C.AM300NA	300 meter length
MFP.3K.93C.AM400NA	400 meter length
MFP.3K.93C.AM500NA	500 meter length

### Internal OB van

Part number	Description
MMP.3K.93C.AM003NA	3 meter length
MMP.3K.93C.AM005NA	5 meter length
MMP.3K.93C.AM010NA	10 meter length
MMP.3K.93C.AM015NA	15 meter length
MMP.3K.93C.AM020NA	20 meter length

### Studio/Infrastructure

Part number	Description
MME.3K.93C.AM020NA	20 meter length
MME.3K.93C.AM050NA	50 meter length

Other cable assemblies, patch cords and pig tails available on request.

# MEERKAT™ HD converter

## A compact solution for Sony® SD, Grass Valley™ (Thomson®) SD/HD camera based systems

The LEMO MEERKAT™ Triax media converter system provides the solution the broadcast industry has been waiting for. This compact «plug and play» transmission system provides a fibre link between Triax cameras and OB vans. The LEMO Media Converter offers mobile facility providers, production centres and broadcast studios an appropriate and professional solution for long distance signal transmission.

### Get more from your cables

The camera is powered via a hybrid cable from the CCU with both the camera signals and the return monitor signals being digitally encoded and transmitted over fibre.

The SMPTE 311 hybrid cable uses the well proven technology of the LEMO 3K.93C series. If power from the CCU/OB van is not required, i. e. local power is available, a two fibre cable using 2 x FC-PC or 2 x SC may be used for signal transmission.

### Applications

- Golf, skiing, auto racing, olympic games
- Pre-fibred venues
- Stadiums, racing tracks

### Advantages

- Plug & play solution
- Lightweight and portable, compact
- No need for bulky / heavy triax cables
- High quality signal transmitted over fibre
- LED functionality display

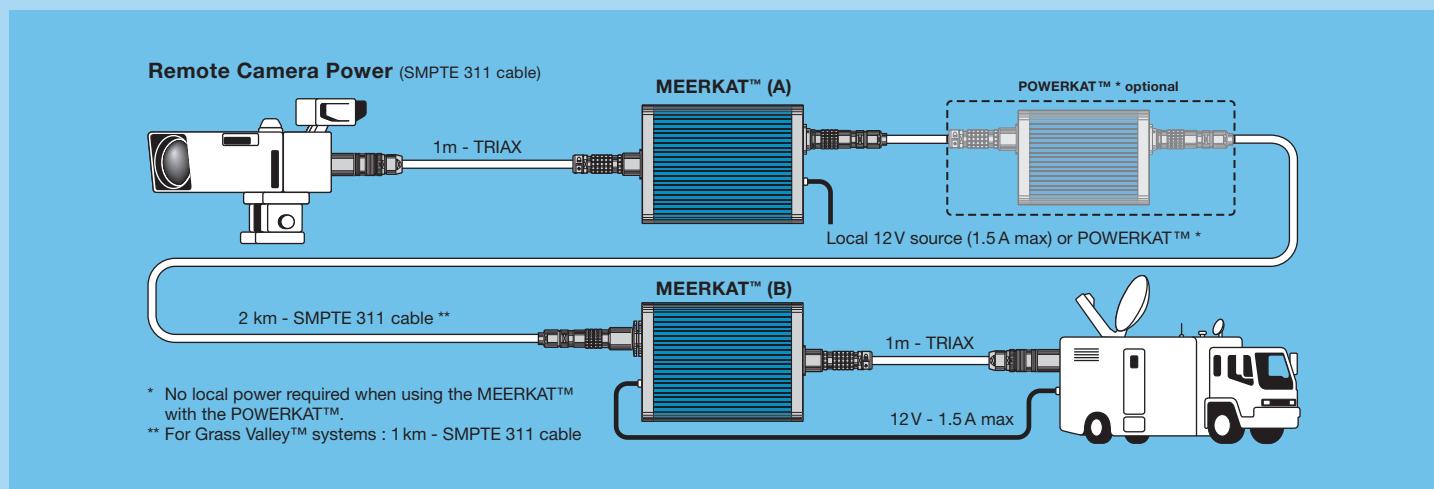
### Features

- CE and FCC class B certified
- Immune to EMI
- NTSC & PAL
- Digital encoding and transmission
- Portable device
- No repeaters needed

### Accessories

- Tripod clamps (WST.MT.286.DZZ)
- MEERKAT™ carry belt (WST.MT.170.TZZ)
- 3K.93C assembled cable
- 3K.93C – SC or FC/PC adapter cable
- Option in-line power supply

Every triax-to-fibre Media Converter comes with power supply (110V/220V) adapter and its specific dongle (either Grassvalley™ or Sony®).



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## Technical characteristics

Input/outputs	Connectors
I/O ports	Triaxial connector 75 Ω <sup>1)</sup>
DC in	LEMO 0K series, 2 pin in-line transformer
General	Values
Dimensions	125W x 270L x 50H mm
Mass (approx.)	2 kg
Power requirements <sup>2)</sup>	100 to 120 Vac, 50/60 Hz
Power requirements <sup>3)</sup>	220 to 240 Vac, 50/60 Hz
Power consumption	16 W
Operating voltage	12 Vdc / 1.5 A max
Operating temperature	-20°C to +55°C
Humidity	up to +95%
Index protection	IP66 (when mated)

Note: 1) LEMO 3K.93C series (HDTV). 2) In North America, Japan and areas of South America. 3) In Europe, Africa, Australia, Scandinavia, China.

### List of HD compatible cameras

Manufacturer	Camera		Triax camera adaptor Part Nr	Base station	
	Part Nr	Type		Part Nr	Type
Grass Valley™	LDK 3000	HD	LDK5630	LDK4580	HD
Grass Valley™	LDK 4000	HD	LDK5460	LDK4502	HD
Grass Valley™	LDK 4000	HD	LDK5860	LDK4506	HD
Grass Valley™	LDK 6000	HD	LDK5460	LDK4502	HD
Grass Valley™	LDK 6200	HD	LDK5462	LDK4506	HD
Grass Valley™	LDK 8000	HD	LDK5860	LDK4502	HD
Grass Valley™	LDK 8000 (S)	HD	LDK5860	LDK4506	HD



Each MEERKAT™ is delivered in a black watertight flightcase.

Signals	Values
Optical RX sensitivity	-3 dB to -21 dB
Data rate	2x2.5 GB/s
Optical Tx output	200 µW (250 µW max)
Transmission wavelength	1310 nm / 1550 nm

Supplied accessories	Quantity
Fuse	4 x 4 Amp Wickmann TR5
AC/DC power supply	2 with UK, USA, Europe adaptors
User's guide	1

### List of SD compatible cameras

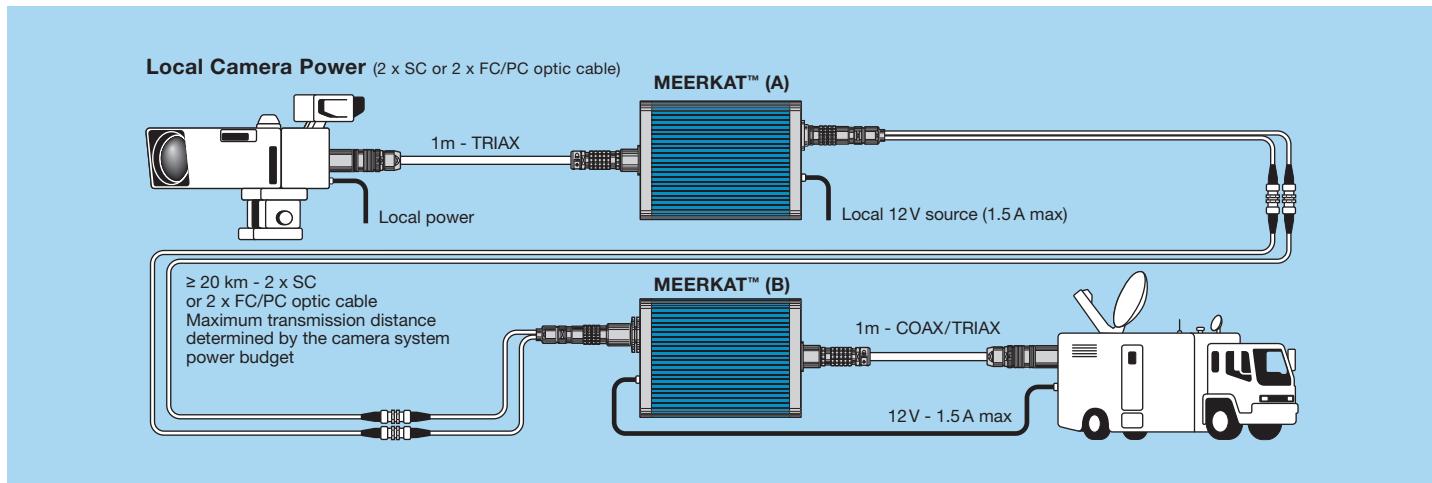
Manufacturer	Camera		Triax camera adaptor Part Nr	Base station	
	Part Nr	Type		Part Nr	Type
SONY®	BVP-E30	SD	CA590	CCU-790	SD
SONY®	BVP550	SD	CA550	CU-550	SD
SONY®	BVP950	SD	CA570	CCU-700	SD
SONY®	BVP700	SD		CCU-700	
SONY®	BVP750	SD		CCU-700	
SONY®				CCU-750	
SONY®				CCU-500	
Grass Valley™	LDK20s	SD	LDK5400	LDK4053	SD
Grass Valley™	LDK20s	SD	LDK5430	LDK4501	SD
Grass Valley™	LDK100	SD	LDK5400	LDK4053	SD
Grass Valley™	LDK200	SD	LDK5430	LDK4501	SD
Grass Valley™	LDK300	SD	LDK5400		SD
Grass Valley™	LDK300	SD	LDK5430	LDK4501SL	SD
Grass Valley™	LDK400	SD	LDK5400		SD
Grass Valley™	LDK400	SD	LDK5430	LDK4501SL	SD
Grass Valley™	LDK500	SD	LDK5400		SD
Grass Valley™	LDK500	SD	LDK5430	LDK4501SL	SD

Notes: Do not connect any camera other than those on the list above without contacting the LEMO Technical Support Group.

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## Option 2 - Local Camera Power

With the Local Camera Power setup, the camera is powered with its AC or DC voltage from a local source of power either - a generator or a power pack.



LEMO triax connector on the camera	Part number of the <b>MEERKATTM (A)</b> on the camera side	Electrical triax connector on cable	LEMO triax connector on the CCU	Part number of the <b>MEERKATTM (B)</b> on the CCU side	Electrical triax connector on cable
Socket 4M.650	<b>PHW.MT.300.TFRP10</b>	FGG.4M.650.CTLC90	Plug 4M.650	<b>FGW.MT.300.TPRP10</b>	PHG.4M.650.CTAC90
Plug 4M.650	<b>PHW.MT.300.TPRP10</b>	PHG.4M.650.CTAC90	Socket 4M.650	<b>FGW.MT.300.TFRP10</b>	FGG.4M.650.CTLC90
Socket 4E.675	<b>PHW.MT.300.TFUP10</b>	FFA.4E.675.CTAC90	Plug 4E.675	<b>FGW.MT.300.TPUP10</b>	PCA.4E.675.CTLC90
Plug 4E.675	<b>PHW.MT.300.TPUP10</b>	PCA.4E.675.CTLC90	Socket 4E.675	<b>FGW.MT.300.TFUP10</b>	FFA.4E.675.CTAC90
Socket 4A.675	<b>PHW.MT.300.TFVP10</b>	FXB.4A.675.CTCC85	Plug 4A.675	<b>FGW.MT.300.TPVP10</b>	PXA.4A.675.CTRC85
Plug 4A.675	<b>PHW.MT.300.TPVP10</b>	PXA.4A.675.CTRC85	Socket 4A.675	<b>FGW.MT.300.TFVP10</b>	FXB.4A.675.CTCC85
Socket REDEL F	<b>PHW.MT.300.TFWP10</b>	FAZ.T7.675.CTA02C	Plug REDEL F	<b>FGW.MT.300.TPWP10</b>	PCZ.T7.675.CTL02C
Socket 3T.675	<b>PHW.MT.300.TFTP10</b>	FFA.3T.675.CTAY92S	Plug 3T.675	<b>FGW.MT.300.TPTP10</b>	PCA.3T.675.CTLY92S

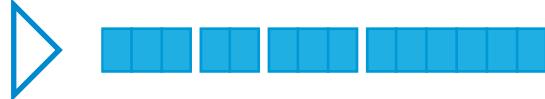
..	Camera system
<b>KC</b>	SONY® SD / Grass Valley™ SD
<b>TH</b>	Grass Valley™ HD / Grass Valley™ SD / SONY® SD

Cable camera to <b>MEERKATTM (A)</b>	Type	Cable CCU to <b>MEERKATTM (B)</b>
<b>MAP.MC.TAA.MM012G</b>	4A series	<b>MAM.MC.TAA.CM012G</b>
<b>MAF.MC.TRA.AM012G</b>	REDEL T7	<b>MAR.MC.TRA.AM012G</b>
<b>MAC.MC.TMA.AM012G</b>	4M series	<b>MAG.MC.TMA.LM012G</b>
<b>MAL.MC.TEA.LM012G</b>	4E series	<b>MAA.MC.TEA.AM012G</b>
<b>MAA.MC.TTA.AM012G</b>	3T series	<b>MAC.MC.TTA.LM012G</b>



Additional triax cables can be ordered for specific cameras. One set of cable comes with fully working MEERKAT™ System.

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## Accessories

### EDW POWERKAT™



#### EDW.MT.126.TE3K

It retrieves the power directly from the CCU and allows powering both the camera and HD MEERKAT™ directly from the SMPTE cable. Delivered with 1 meter cable to HD MEERKAT™ (PUW-FUW).

### WST Hang up strap kit



#### WST.MT.170.TZZ

The hang up strap kit allows the camera operator to easily hang up the HD MEERKAT™ while shooting. (Strap length: 0.25 m).

### MGY Cable lead for battery



#### MGY.0K.302.YAM020N

Cable lead for professional battery belt, it allows powering the HD MEERKAT™. Cable (length 2 meters) with 2 pin LEMO connector (FGG.0K) to a 4-Pin XLR male Neutrik connector.

To be used with commercially available battery belts (12V)

### GSF Tripod clamp



#### GSF.MT.283.DZZ

The tripod clamp allows the camera operator to fix the HD MEERKAT™ to the camera tripod.

### WSK Belt carrier



#### Belt: WSK.MT.285.PN

#### Buckles: WSK.MT.284.RT

The belt carrier allows the cameraman to carry the MEERKAT™ or the POWERKAT™ on the hip. Simply slide the belt through two buckles.

**Note:** Two buckles are necessary to carry the MEERKAT™.

### FGG Programming dongle



The HD MEERKAT™ is delivered with its original dongle.

An additional dongle is available (Grass Valley® / Sony®). The second dongle allows switching from one system to another.

Grass Valley® SD: **FGG.0K.309.CB70TS**

Sony® SD: **FGG.0K.309.CD70SS**

Grass Valley® HD: **FGG.0K.309.CA00TH**

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# SERBAL™ converter

## SERBAL™ - SMPTE Electrical Reconfigurable Bidirectional Alternative Link

The LEMO SERBAL™ is a 4 channel multiplexer that makes HD/SDI to fibre conversion possible. The SERBAL™ provides a compact conversion unit which allows output from up to 4 cameras to be transmitted over a single standard LEMO 3K.93C SMPTE cable.

The optical multiplexers of the SERBAL™ use Wavelength Division Multiplexing (WDM). Each signal within a fibre has a different optical wave length, enabling interference free transmission over longer distance.

The system is available in three versions: it can send 4x HD/SDI signals from the cameras to the OB van using one SMPTE cable. The second version can send 2x HD/SDI signals from the cameras to the OB van, while using the remaining 2 signals for monitor feedback. If only one monitor feedback is required, the third version can send up to 3 camera signals to the OB van.

### Applications

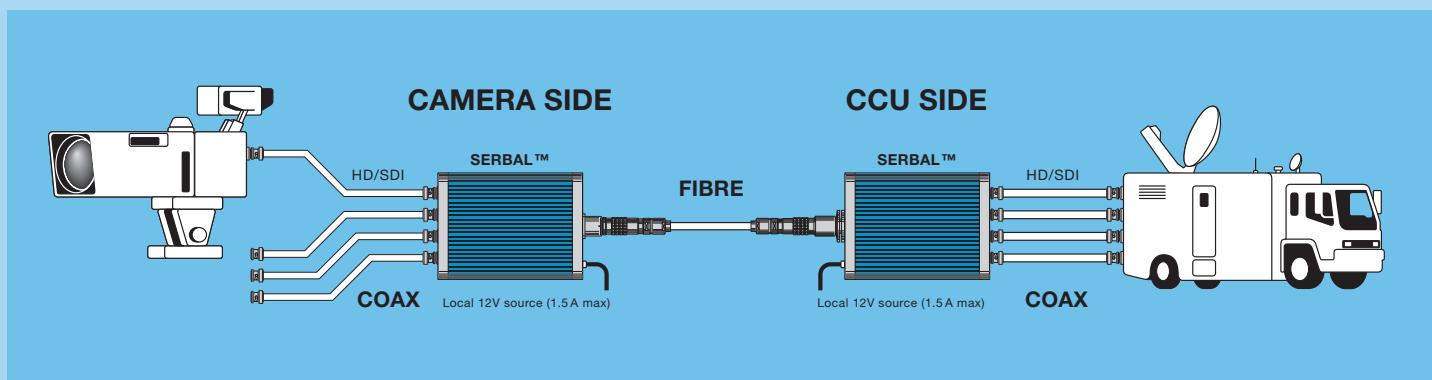
- Golf, skiing, auto racing, olympic games
- Pre-fibred venues
- Stadiums, racing tracks

### Advantages

- Plug & play solution
- High quality signal transmitted over fibre
- Compact

### Features

- Converts from Coaxial BNC input to transmission over standard 3K.93C cable assemblies
- Multiple transmission options available
  - 4 x Tx
  - 2 x Tx + 2 x Rx
  - 3 x Tx + 1 x Rx
- Audio/Data:
  - passes pre-embedded Audio
- Supports all NRZI data formats from 10 Mb/s to 1.5 Gb/s
- Signal format:
  - HD/SDI SMPTE 292M, SDI, DVB-ASI, 19.4 Mb/s SMPTE 310, 142-540 Mb/s SMPTE 259M, SDTI.



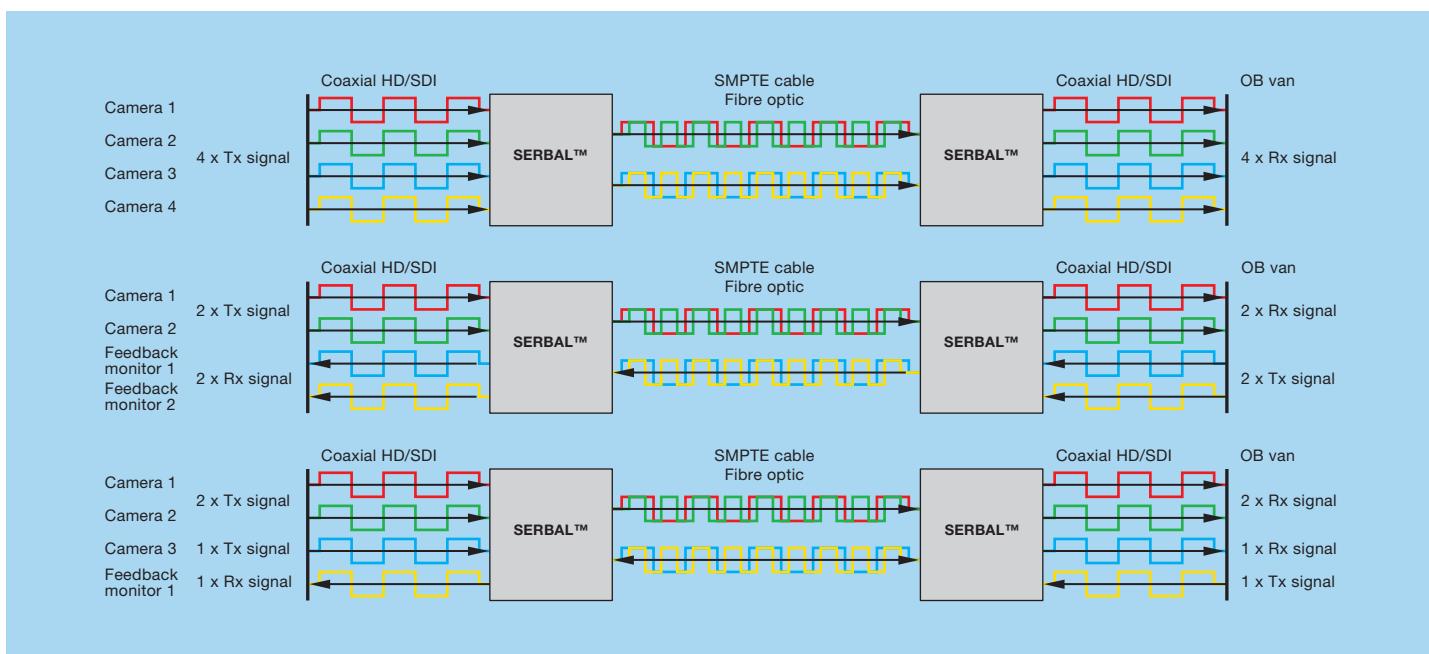
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Broadcast setup Camera side	<b>SERBAL™</b> Part number	Broadcast setup CCU side	<b>SERBAL™</b> Part number
4 cameras	<b>PHW.MS.3C4.TPBCC</b>	4 Rx signals	<b>FGW.MS.3C4.TPBCM</b>
2 cameras / 2 monitors	<b>PHW.MS.3C2.TPBCC</b>	4 Rx signals + 2 Tx signals	<b>FGW.MS.3C2.TPBCM</b>
3 cameras / 1 monitor	<b>PHW.MS.3C3.TPBCC</b>	3 Rx signals + 1 Tx signals	<b>FGW.MS.3C3.TPBCM</b>

**Note:** Every coax-to-fibre Media Converter comes with power supply (110V/220V) adapter.

## Technical characteristics

Characteristics	Values	Characteristics	Values
Weight / dimension	2 kg / 172 x 125 x 50 mm	Optical launch power	- 4.5 dB @ 1550 nm
Transmission wavelength	1310 nm / 1550 nm	Optical receive sensitivity	- 30 dB @ 1310 nm
Cable (hybrid)	SMPTE 311	Optical receive sensitivity	- 30 dB @ 1550 nm
Cable (2 fibre 9/125)	2 fibre single mode cable	Equalisation (camera side)	up to 300 m @ 270 Mb/s
Fibre type	Single mode	Equalisation (camera side)	up to 100 m @ 1.485 Gb/s
Optical connector	LEMO 3K.93C series	Temperature range	-30°C to +55°C
Electrical coax connector	BNC 75Ω	Humidity range	Up to 95%
Optical launch power	- 6 dB @ 1310 nm	Input voltage	12 Vdc @ 1.5 A maximum



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## SHACK™ converter

### SHACK™ - SMPTE conversion device for singlemode fibre (SC, ST, FC or LC)

The SHACK™ is a conversion system from SMPTE connectors/cable to standard singlemode connectors. The system provides a transition from optical communication over hybrid (copper and fibre) cables to optical communication over commonly available singlemode fibre optic cables. The SHACK™ permits the camera to be locally powered while allowing the optical signals to be transmitted.

It is a lightweight and very compact solution for stadiums, sports arenas or outside broadcast applications.

#### Applications

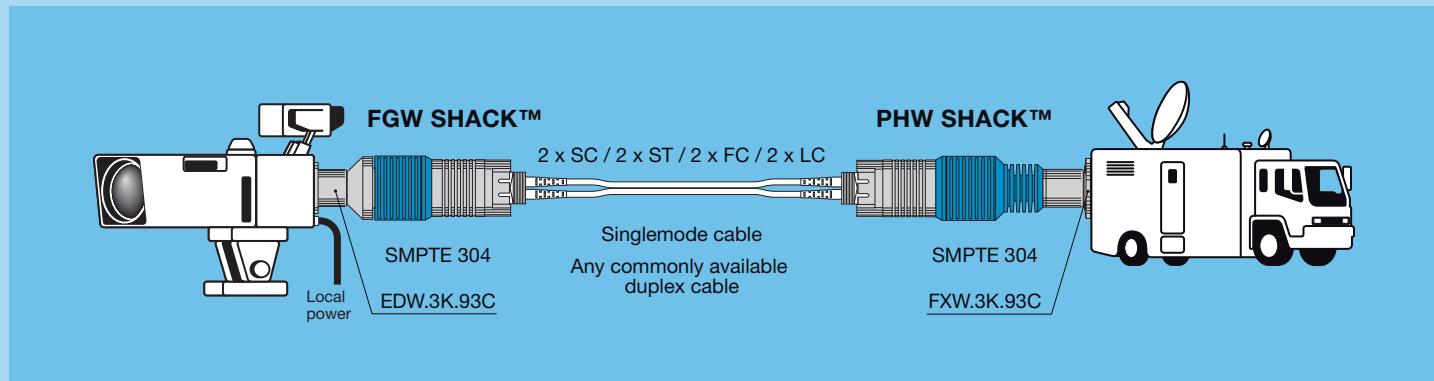
- Golf, skiing, auto racing, olympic games
- Pre-fibred venues
- Stadiums, racing tracks

#### Advantages

- Plug & play solution
- High quality signal transmitted over fibre
- Compact
- Uses inexpensive SC, ST, FC or LC connectors
- Camera brand independant

#### Features

- Converts from SMPTE 304 connectors to standard duplex fibre optic cable assemblies
- Plugs directly into camera/base station



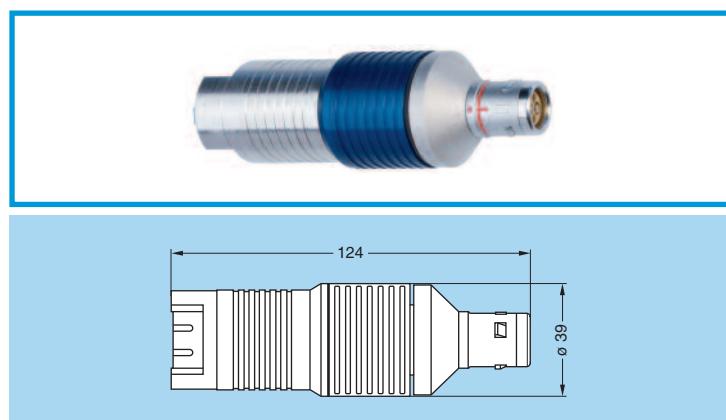
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## Technical characteristics

Characteristics	Values	Characteristics	Values
Fibre type	Singlemode	Electrical	1)
Hybrid connector	LEMO 3K.93C series	Laser safety	2)
Singlemode fibre connector	SC, ST, FC, LC	Humidity range	Up to 95%
Temperature range	-20°C to +60°C	Warranty	5 years
CCU supply voltage range	15 V to 360 V	Return loss	≤ 45 dB per unit
EMI/RFI	Complies with 89/336/EEC	Average insertion loss	0.4 dB per unit

Note: 1) Complies with EN 61000-6-1, EN61000-6-2. 2) Complies with Class 1 laser product 24 CFR 1040.10 & 1040.11.

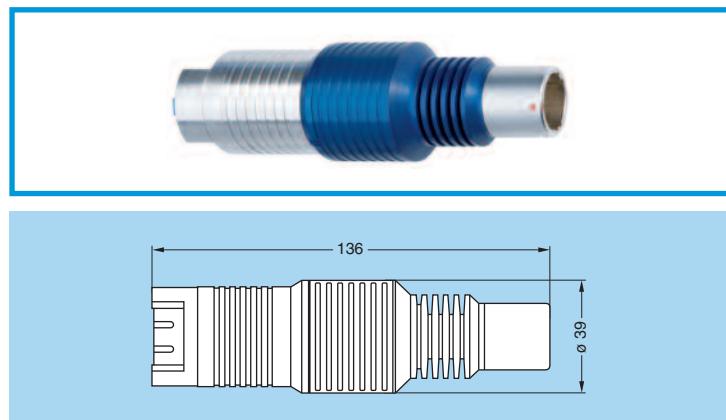
### FGW Straight plug 3K.93C - singlemode



Part number	Singlemode fibre connector	Note
<b>FGW.3K.93C.CLMSC</b>	SC	●
<b>FGW.3K.93C.CLMSST</b>	ST	●
<b>FGW.3K.93C.CLMF</b>	FC	○
<b>FGW.3K.93C.CLMLC</b>	LC	○

● Standard  
○ Upon request

### PHW Free socket 3K.93C - singlemode



Part number	Singlemode fibre connector	Note
<b>PHW.3K.93C.CLCSC</b>	SC	●
<b>PHW.3K.93C.CLCSST</b>	ST	●
<b>PHW.3K.93C.CLCF</b>	FC	○
<b>PHW.3K.93C.CLCLC</b>	LC	○

● Standard  
○ Upon request

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## MULTISHACK 3X™ or 6X™ converter

The MULTISHACK™ is a conversion system from multiple SMPTE connectors/cable to a single multiway fibre cable. The system provides a transition from HD over hybrid (copper and fibre) cables to HD over a single multiway fibre optic cable.

The MULTISHACK™ enables up to 3 or 6 cameras to be individually powered from one remote source (i.e. a local generator) through the 3K.93C connectors and cables. The optical signals will continue to be transmitted through individual pairs of fibres within a multiway fibre optic cable.

The power is inserted at the Camera end MULTISHACK™ via a waterproof mains / power connector and is distributed to the hybrid cables through individual circuits. The CCU / OB MULTISHACK™ is powered by the output voltage from the CCU.

The MULTISHACK™ uses the technology proven in the SHACK™ and has individual transmission circuits ensuring a manufacturer protection handshake for each channel.

### Applications

- Golf, skiing, auto racing, olympic games
- Stadiums, racing tracks
- Wherever multiple cameras are needed in a remote location

### Advantages

- Plug & play solution
- One multiway cable is cheaper than multiple SMPTE 311 hybrid cables
- The 6 cameras can be powered without additional mains / DC leads to every camera

### Features

- Converts from SMPTE 304 connectors to a single multiway fibre optic cable
- Plugs directly into camera/base station via cable
- Allows connection of up to 6 cameras
- Redundant power supply



MULTISHACK 3X™



MULTISHACK 6X™

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## MULTISHACK 3X™ conversion system

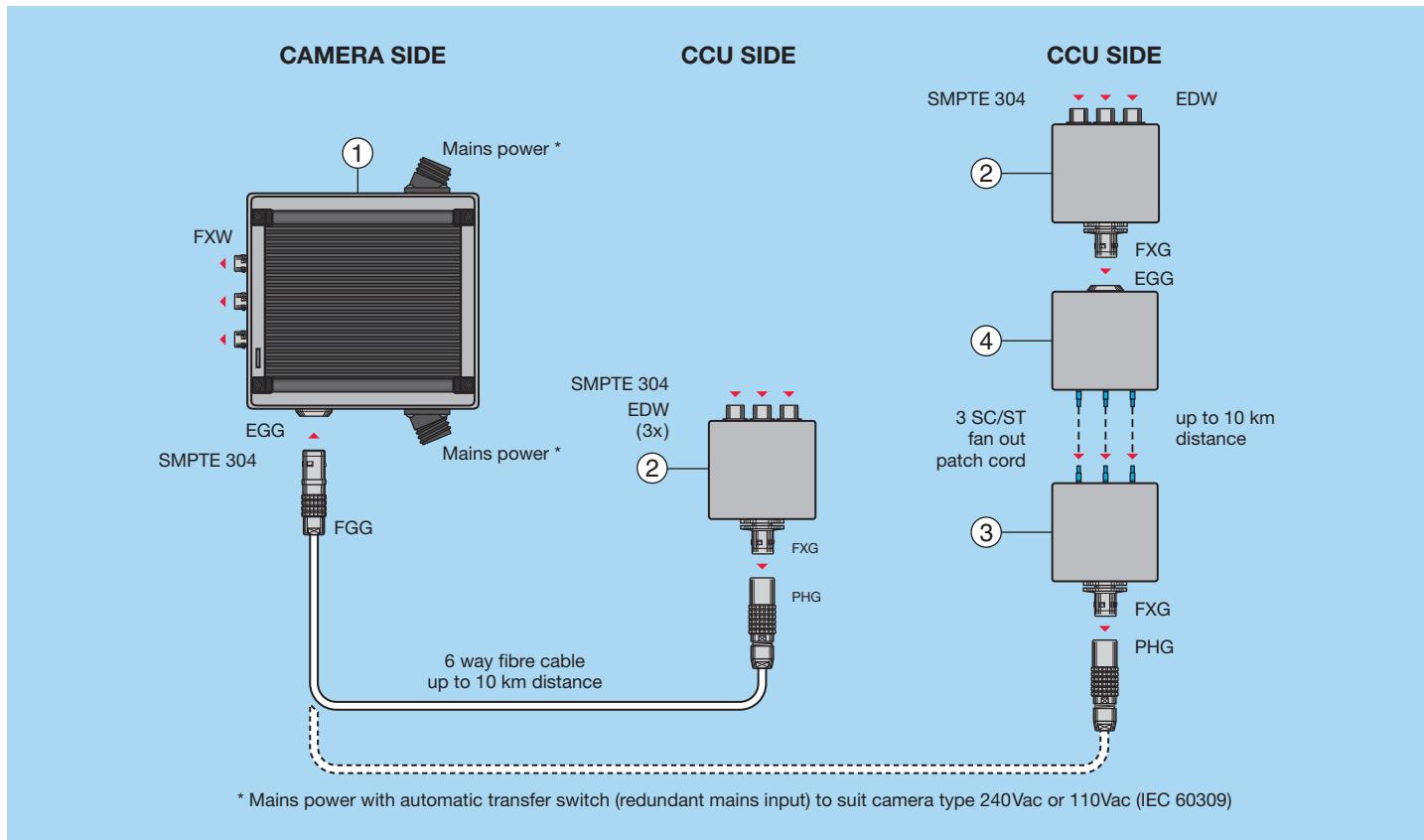
### Technical characteristics

Characteristics	Values	Characteristics	Values
Fibre type	Singlemode	Electrical	1)
Hybrid connector	LEMO 3K.93C series	Laser safety	2)
Multifibre connector	LEMO 4K series	Humidity range	Up to 95%
Temperature range	-20°C to +60°C	Warranty	5 years
CCU supply voltage range	15 V to 360 V	Return loss	Better than 45 dB per channel
EMI/RFI	Complies with 89/336/EEC	Average insertion loss	0.4 dB per channel

Note: 1) Complies with EN 61000-6-1, EN61000-6-2. 2) Complies with Class 1 laser product 24 CFR 1040.10 & 1040.11.

Part number	Manufacturer	Description	No
<b>PXG.MX.C31.AT</b>	Grass Valley™ (grey)	Camera end/for Grass Valley™ model/3 way	1
<b>PHD.MX.V13.AT</b>	Grass Valley™ (grey)	CCU end/for Grass Valley™ camera model/3 way	2
<b>PHT.MX.R13.AT</b>	Grass Valley™ (grey)	Break out box for ST fibre Camera end	3
<b>PTG.MX.R31.AT</b>	Grass Valley™ (grey)	Break out box for ST fibre CCU end	4
<b>PHC.MX.R13.AT</b>	Grass Valley™ (grey)	Break out box for SC fibre Camera end	3
<b>PCG.MX.R31.AT</b>	Grass Valley™ (grey)	Break out box for SC fibre CCU end	4

**Notes:** For a Sony® version, replace last digit of the part number «T» by «S». Grass Valley™ version is grey and Sony® version is blue.



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## MULTISHACK 6X™ conversion system

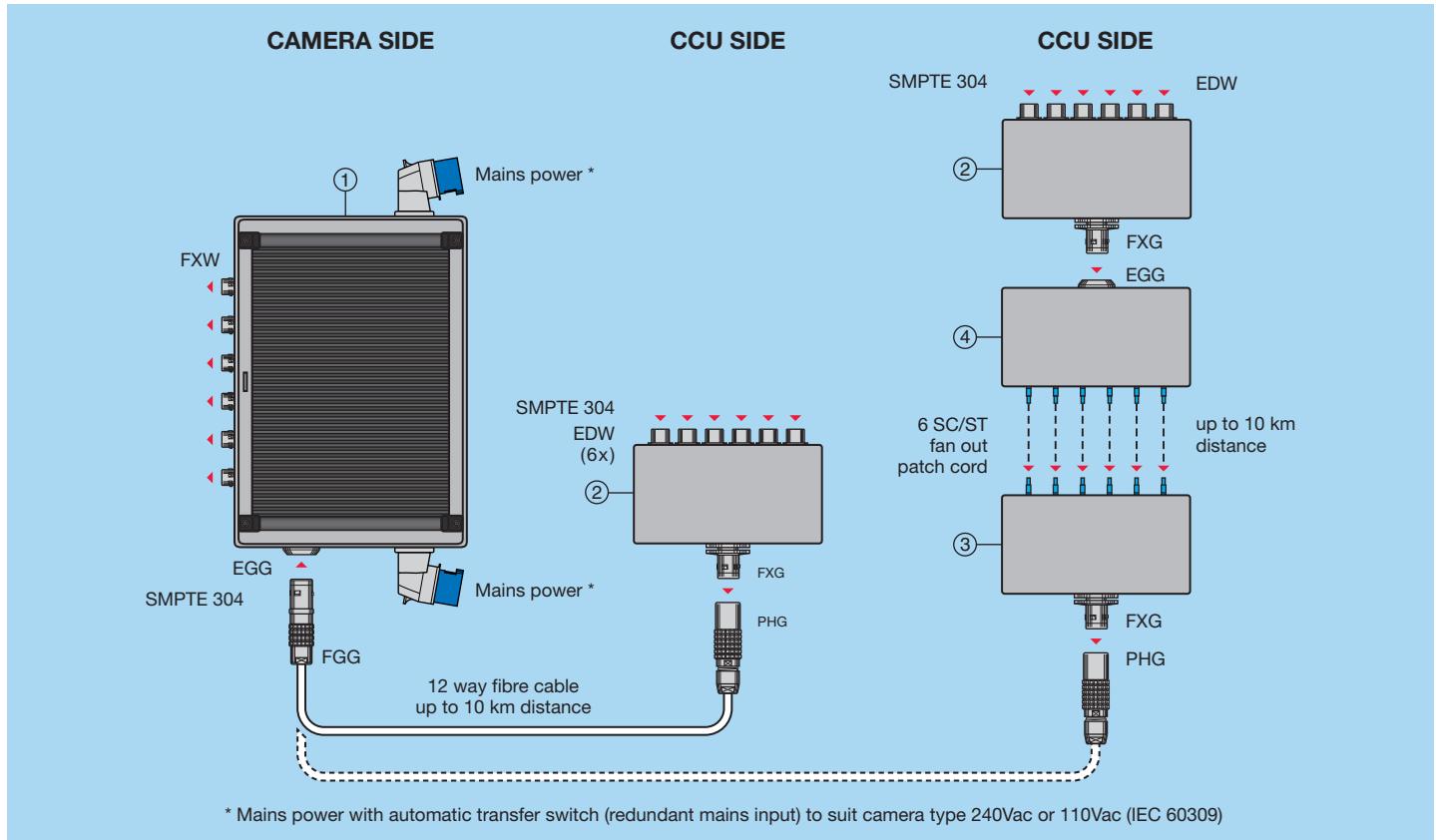
## Technical characteristics

Characteristics	Values	Characteristics	Values
Fibre type	Singlemode	Electrical	1)
Hybrid connector	LEMO 3K.93C series	Laser safety	2)
Multifibre connector	LEMO 5K series	Humidity range	Up to 95%
Temperature range	-20°C to +60°C	Warranty	5 years
CCU supply voltage range	15 V to 360 V	Return loss	Better than 45 dB per channel
EMI/RFI	Complies with 89/336/EEC	Average insertion loss	0.4 dB per channel

**Note:** 1) Complies with EN 61000-6-1, EN61000-6-2. 2) Complies with Class 1 laser product 24 CFR 1040.10 & 1040.11.

Part number	Manufacturer	Description	No
<b>PXE.MX.C61.AS</b>	SONY® (blue)	Camera end/for Sony® model/6 way	1
<b>PFD.MX.V16.AS</b>	SONY® (blue)	CCU end/for Sony® camera model/6 way	2
<b>PFT.MX.R16.AS</b>	SONY® (blue)	Break out box for ST fibre Camera end	3
<b>PTE.MX.R61.AS</b>	SONY® (blue)	Break out box for ST fibre CCU end	4
<b>PFC.MX.R16.AS</b>	SONY® (blue)	Break out box for SC fibre Camera end	5
<b>PCE.MX.R61.AS</b>	SONY® (blue)	Break out box for SC fibre CCU end	6

**Notes:** For a Grass Valley™ version, replace last digit of the part number «S» by «T». Sony® version is blue and Grass Valley™ version is grey.



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## HD Z-LINK™ fibre optic link system

The HD Z-Link fibre optic camera link system from LEMO provides multi-channel system camera-style video and audio connections, and control for studio cameras and camcorders alike over a single hybrid cable using LEMO 3K.93C connectors.

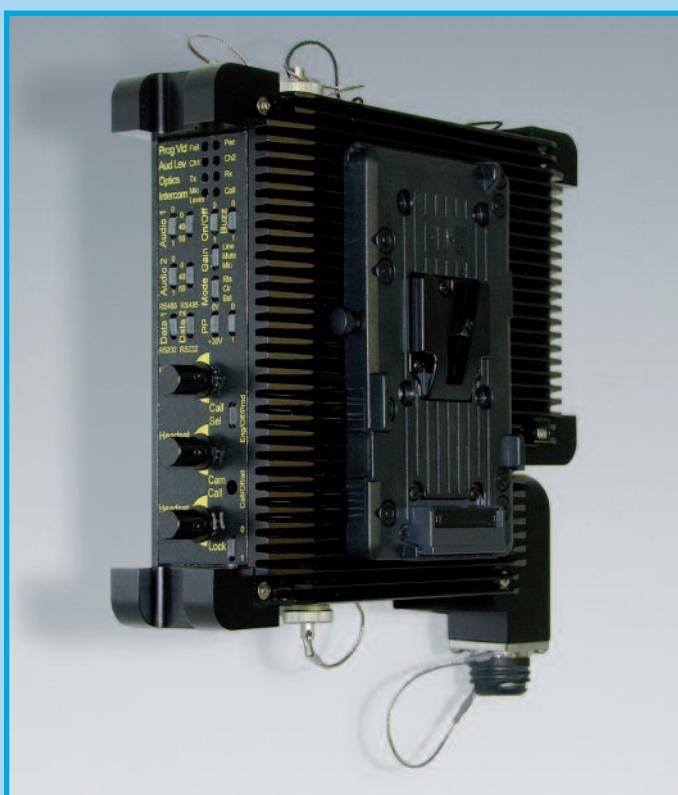
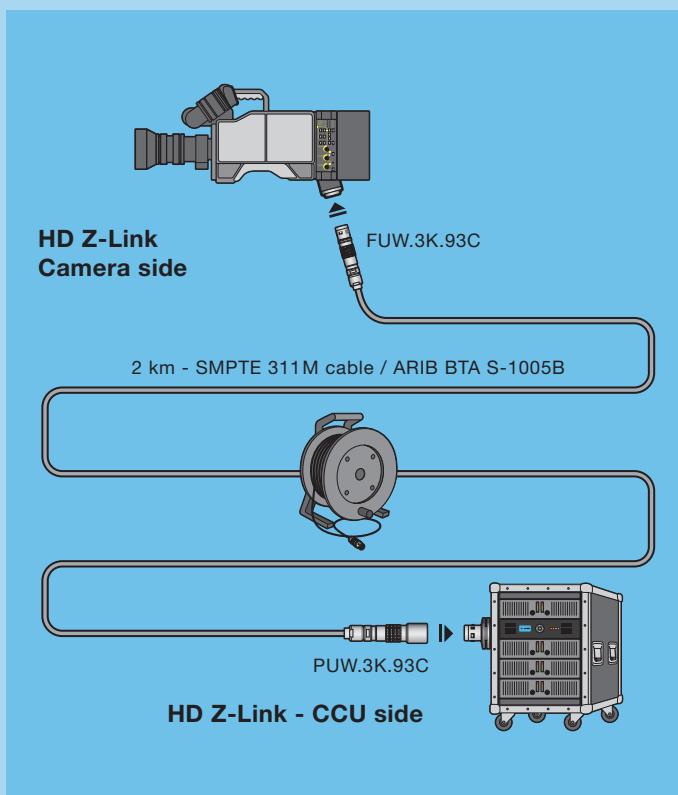
The use of high bandwidth fibre optics and the multiplexing of numerous forward and return video, audio, talkback and data channels provides full communication with any camera position.

The HD Z-Link is compatible with a wide range of cameras from top end digital cinematography cameras, broadcast system cameras and camcorders, professional cameras and camcorders and top end consumer cameras from Sony, Thomson, Hitachi, Ikegami, and Panasonic, to name a few, to low cost handheld camcorders.

The dual 1.5Gb/s HD SDI option allows support of stereoscopic (3D) implementations of the Red One® (and other cameras). The HD Z-Link is able to carry 3Gb/s HD SDI which gives it a competitive advantage over the 2.5Gb/s products that do not support 1080P.

The base unit incorporates a menu-driven front panel control for ease of configuration of your camera system. The system offers automatic Genlock/synchroniser management facilities. Additional features include full audio with 8 digital stereo channels and intercom systems.

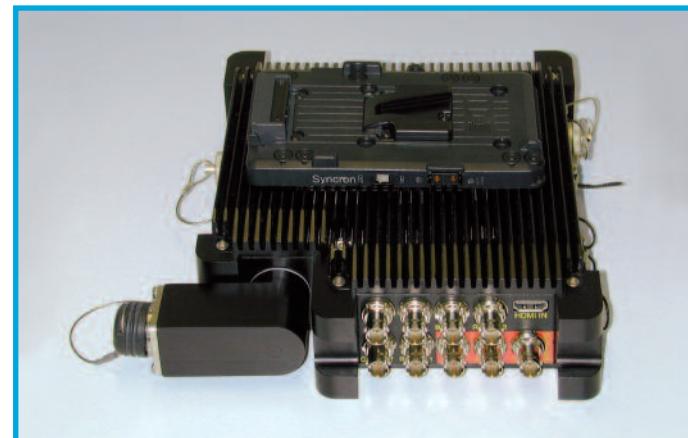
An extensive range of connectors is provided to enable connection of most camera types and ethernet connectivity is also provided. A clip-on in-line power supply option is also available providing up to 120W.



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HD Z-Link CCU side



HD Z-Link camera side

Part number	Description
<b>CHD.MZ.3KC.NVVF</b>	HD Z-LINK FULL FEATURE (Camera side)
<b>RHD.MZ.3KC.NZZF</b>	HD Z-LINK FULL FEATURE (CCU side)
<b>CHD.MZ.3KC.NVVB</b>	HD Z-LINK BASIC (Camera side)

Part number	Description
<b>RHD.MZ.3KC.NZZB</b>	HD Z-LINK BASIC (CCU side)
<b>PHD.MZ.3KC.NVZ</b>	HYBRID POWER (Camera side)
<b>THD.MZ.3KC.NZZZ</b>	HYBRID POWER (CCU side)

HD Z-Link with all options	Basic HD Z-Link	Description
●	●	3G 1080P 50Hz or 59.94Hz programme video
●	●	HD 1.5Gb/s programme video
●	●	Dual HD channel programme video for stereoscopic (3D)
●	●	Dual link HD to 3G conversion (Level B)
●	●	3G 1080P return video
●	●	Analogue video
●	●	Basic camera reference connection
●	●	Gearsync (Automatic Genlock/Synchroniser management)
●	●	8 stereo digital audio channels + 1 stereo analogue audio channel
●	●	Two-channel intercom
●	●	Multisystem intercom
●	●	Front panel menu-driven control unit
●	●	Test pattern generator
●	●	HD to SD monitoring down converter
●	●	Ethernet port
●	●	Compatible with all SD cameras
●	● 1)	Compatible with all HD cameras
●	●	9V supply for Camcorders
●	●	Hybrid power option (120W)

**Note:** 1) not 3G 1080P.

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LEMO:

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[FMW.3K.93C.TLMT96Z](#)

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В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибуторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ Р В 0015-002 и ЭС РД 009

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