

## Design Criteria

During the past few years signal digitalization found its way into the Pro Audio & Entertainment business, revolutionizing equipment and applications.

Nowadays one fiber optic cable can transmit hundreds of channels, is light and easy to pass, and avoids grounding problems or noises.

The weak spot has been again the connector. Fragile fiber optic network connectors like the ST, SC, LC etc. are optimized for a one time permanent connection but can not meet the rough requirements of the entertainment industry. Military extended beam lens coupling connectors are very expensive and have the disadvantage of an extensive attenuation increase.

Neutrik®, as Pro Audio & Video technology leader when it comes to connectors, kept up with the time and developed a suitable fiber optic connection system - the OpticalCon®.

The system is based on a standardized optical LC-Duplex connection but eliminates its weakness and guarantees a safe and rugged connection.

Because of the compatibility with conventional LC connectors it offers the choice of using a cost effective LC connector as a permanent connection (e.g. patch cable) or our rugged OpticalCon® cable connector for mobile applications. The system enables a run of up to 4 copper wires for power supply or any data signal, a special SMPTE-version has been optimized for broadcast applications and offers an additional ground-shell contact. The chassis connector acts as "feed through" and guarantees a simple installation by simply connecting a conventional LC-Duplex connector (e.g. with a permanent installation cable) on the rear.

The cable connector comes pre-assembled onto a choice of mobile field cables, currently 5 types and their variations (Multimode, Singlemode, APC) can be offered in any length.



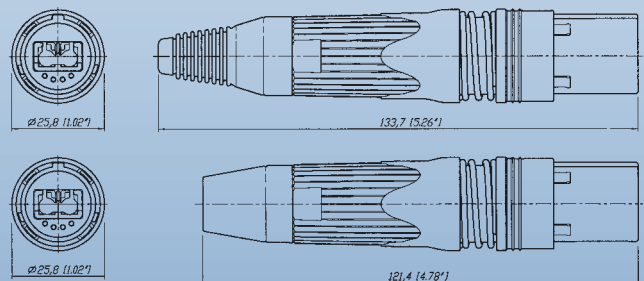
## Cable Connector Assembly



NK02M-4S75

- Ruggedized and dirt protected fiber optic connection system
- Cable connector comes pre-assembled with a choice of five mobile field cables
- Range of cables include rugged hybrid (fiber + 4 copper wires), robust and lightweight mobile field cable with 2 multi- or singlemode fibers, a 4 pole Y-split and a SMPTE type cable
- Accommodates standard optical LC-Duplex connectors
- Cable connector features rugged all metal housing and heavy duty cable retention
- Excellent dust and dirt protection due to automatic sealing shutter with silicone gasket
- Reliable Push-Pull locking mechanism
- Easy to clean, no tools required
- Cable packed in case, on drum or air spool
- Field repairable

NK02M-4S75\*





## Chassis Connector

## Coupler



NO2-4FD-R



NO2-4FD

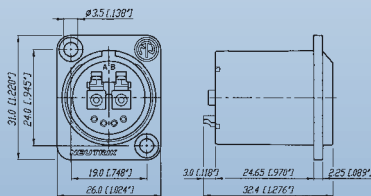


NAO2M-4S75

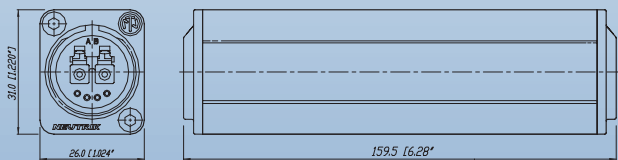
- Designed as feedthrough with automatic sealing shutter
- Shutter with silicone gasket protects optical connection from dust and dirt
- Accommodates standard LC connectors on the rear for simple installation
- Connection on the front side either by rugged OpticalCon® or standard LC connector
- Colour coding to identify fiber mode
  - Multimode – black
  - Singlemode PC – blue
  - Singlemode APC – green

- OpticalCon® coupler (adapter) in „D“ size housing for cable extensions
- Available in three versions - LC-Duplex multi and single mode (PC and APC) all with 4 copper wires

NO2-4FD



NAO2M-4S75



Look for the Logo



## Features and Benefits

### Technical Data OpticalCon® Connectors

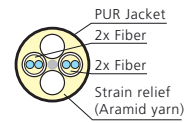
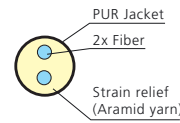
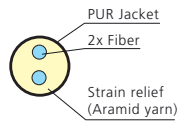
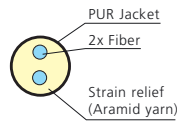
| Optical                                 |                         |  | Cable Connector | Chassis Connector     |
|---|-------------------------|--|-----------------|-----------------------|
| Optical connector                       |                         |  | LC-Duplex       | LC-Duplex Feedthrough |
| Fiber                                   |                         | Multimode, Singlemode PC, Singlemode APC | ●               | ●                     |
| Insertion loss                          |                         | < 0.5 dB / connection                    | ●               | ●                     |
| Mechanical                              |                         |  |                 |                       |
| Insertion / withdrawal force            |                         | < 45 N                                   | ●               | ●                     |
| Lifetime                                |                         | > 1'000 cycles                           | ●               | ●                     |
| Cable retention force                   | 2M-4S75                 | 500 N                                    | ●               | -                     |
|   | 2S/2M                   | 500 N                                    | ●               | -                     |
|   | SMPTE                   | 350 N                                    | ●               | -                     |
|   | 4 MY                    | 300 N                                    | ●               | -                     |
| Electrical                              |                         |  |                 |                       |
| Number of electrical contacts           |                         |  | 4               | 4 (5)                 |
| Rated current                           |                         | 6 A                                      | NKO2M-4S75*     | ●                     |
|   |                         | 10 A (contact 1+4)                       | NKO2S(A)-SMPTE* | ●                     |
| Contact resistance                      |                         | < 7 mΩ                                   | ●               | ●                     |
| Insulation resistance                   | - initial:              | > 10 GΩ                                  | ●               | ●                     |
|   | - after damp heat test: | > 1 GΩ                                   | ●               | ●                     |
| Dielectric strength                     |                         | 1500 V dc                                | ●               | ●                     |
| Rated voltage                           |                         | 50 V ac                                  | ● <sup>1</sup>  | ● <sup>1</sup>        |
| Material                                |                         |  |                 |                       |
| Shell                                   | Zinc diecast (ZnAl4Cu1) | (hard Nickel or Ruthenium plating)       | ●               | ●                     |
| Insert / Insulation                     |                         | Polyamid PA 6, PBT 30% GR, PBT 50% GR    | ●               | ●                     |
| Contacts                                | - male:                 | Brass (CuZn39Pb3)                        | ●               | -                     |
|   | - female:               | Bronze (CuSn6)                           | -               | ●                     |
| Contact surface                         |                         | Gold (gal 0.2 μm Au over 2 μm Ni)        | ●               | ●                     |
| Strain relief                           |                         | POM (brass)                              | ●               | -                     |
| Bushing                                 |                         | ZnAl4Cu1                                 | ●               | -                     |
| Boot                                    |                         | EPDM, rubber boot                        | ●               | -                     |
| Slit sleeve                             |                         | ceramics                                 | -               | ●                     |
| Environmental                           |                         |  |                 |                       |
| Operating temperature                   | -25°C to +75°C          | flammability UL94 HB                     | ●               | ●                     |
| Solderability complies with IEC 68-2-20 |                         |  | ●               | ●                     |

<sup>1</sup> ... Not compatible to the SMPTE standard, suitable for indoor studio applications acc. IEC 60664-1 (pollution degree 1, over voltage category 1)

### Technical Data Fiber Cables

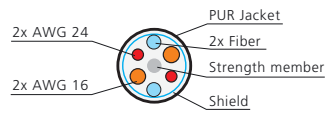
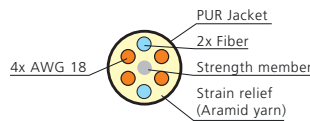
|                   |           | 2M         | 2S        | 2SA       | 4MY        | 2M-4S75    | 2S-S1      | 2SA-S1     |
|-------------------|-----------|------------|-----------|-----------|------------|------------|------------|------------|
| Attenuation:      | @ 850 nm  | 3 dB/km    |           |           | 3.5 dB/km  | 2.5 dB/km  |            |            |
|                   | @ 1300 nm | 1 dB/km    |           |           | 1.5 dB/km  | 0.7 dB/km  |            |            |
|                   | @ 1310 nm |            | 0.5 dB/km | 0.5 dB/km |            |            | 0.45 dB/km | 0.45 dB/km |
|                   | @ 1550 nm |            | 0.5 dB/km | 0.5 dB/km |            |            | 0.5 dB/km  | 0.5 dB/km  |
| Bandwidth:        | @ 850 nm  | 500 MHz-km |           |           | 500 MHz-km | 500 MHz-km |            |            |
|                   | @ 1300 nm | 500 MHz-km |           |           | 500 MHz-km | 500 MHz-km |            |            |
|                   | @ 1310 nm |            |           |           |            |            |            |            |
|                   | @ 1550 nm |            |           |           |            |            |            |            |
| Refraction index: | @ 850 nm  | 1.468      |           |           | 1.468      | 1.482      |            |            |
|                   | @ 1300 nm | 1.468      |           |           | 1.468      | 1.477      |            |            |
|                   | @ 1310 nm |            | 1.458     | 1.458     |            |            | 1.468      | 1.468      |
|                   | @ 1550 nm |            | 1.458     | 1.458     |            |            | 1.468      | 1.468      |

## Technical Data Mobile Fiber Cables



|                     | 2M           | 2S            | 2SA            | 4MY           |
|---------------------|--------------|---------------|----------------|---------------|
| Number of Fibers    | 2            | 2             | 2              | 4             |
| Fiber type          | Multimode    | Singlemode    | Singlemode     | Multimode     |
| Core diameter       | 50 µm        | 9 µm          | 9 µm           | 50 µm         |
| Cladding diameter   | 125 µm       | 125 µm        | 125 µm         | 125 µm        |
| Copper wires        | -            | -             | -              | -             |
| Outer shield        | -            | -             | -              | -             |
| Strength member     | -            | -             | -              | -             |
| Cable retention     | Aramid yarn  | Aramid yarn   | Aramid yarn    | Aramid yarn   |
| Overall diameter    | 5 mm         | 5 mm          | 5 mm           | 9.5 mm        |
| Jacket              | PUR          | PUR           | PUR            | PUR           |
| Optical connector   | LC-Duplex    | LC-Duplex     | LC-Duplex      | 2 x LC-Duplex |
| Type                | Multimode    | Singlemode PC | Singlemode APC | Multimode     |
| Colour              | black, matte | black, matte  | black, matte   | black, matte  |
| Min. bending radius | 4 cm         | 4 cm          | 4 cm           | 10 cm         |
| Weight              | 23 kg/km     | 23 kg/km      | 23 kg/km       | 103 kg/km     |
| Wiring              |              |               |                |               |

## Technical Data Mobile Hybrid Cables



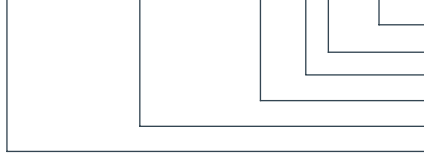
|                     | 2M-4S75                           | 2S-S1               | 2SA-S1              |
|---------------------|-----------------------------------|---------------------|---------------------|
| Number of Fibers    | 2                                 | 2                   | 2                   |
| Fiber type          | Multimode                         | Singlemode          | Singlemode          |
| Core diameter       | 50 µm                             | 9 µm                | 9 µm                |
| Cladding diameter   | 125 µm                            | 125 µm              | 125 µm              |
| Copper wires        | 4 x AWG 18 (0.75mm <sup>2</sup> ) | 2 x AWG 24 + AWG 16 | 2 x AWG 24 + AWG 16 |
| Outer shield        | -                                 | Copperbraid-Tinned  | Copperbraid-Tinned  |
| Strength member     | GFK                               | Stainless Steel     | Stainless Steel     |
| Cable retention     | Aramid yarn                       | Crimp type          | Crimp type          |
| Overall diameter    | 8.9 mm                            | 9.2 mm              | 9.2 mm              |
| Jacket              | PUR                               | PVC                 | PVC                 |
| Optical connector   | LC-Duplex                         | LC-Duplex           | LC-Duplex           |
| Type                | Multimode                         | Singlemode PC       | Singlemode APC      |
| Colour              | black, matte                      | black, matte        | black, matte        |
| Min. bending radius | 10 cm                             | 10 cm               | 10 cm               |
| Weight              | 78 kg/km                          | 118 kg/km           | 118 kg/km           |
| Wiring              |                                   |                     |                     |

## Ordering Information

### Coding of Mobile Cables

Find a convenient OpticalCon® part number generator on [www.neutrik.com](http://www.neutrik.com)

**N K O | 2 M - 4 S 7 5 - | R - | 1 F - | 1 5 0** (Example)



Length [m]

Gender: No suffix ... Male-Male; F ... Male-Female

Packaging 0 to 4

Plating: No suffix ... hard Nickel; R ... Ruthenium

Cable (Assembled)

Neutrik® Optical Cable

### Gender

Male-Male



Standard product (two cable ends)

Male-Female



wired chassis connector for cable extension (one cable end)

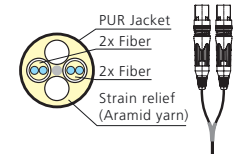
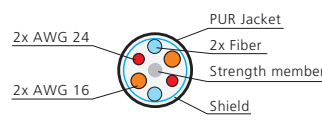
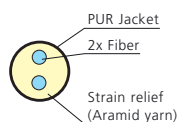
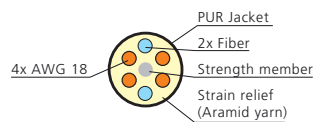
### Cable

Field cable + copper

2 pole field cable

SMPTE cable

4 pole Y-split cable



Multimode PC (black)

2M-4S75<sup>2)</sup>

2M

-

4MY<sup>1) 2)</sup>

Singlemode PC (blue)

-

2S

2S-S1<sup>2)</sup>

-

Singlemode APC (green)

-

2SA

2SA-S1<sup>2)</sup>

-

<sup>1)</sup> ...Gender: Male-male only (no suffix)

### Packaging

0 ... Airspool



1 ... OpticalCon Case



2 ... Drum Schill GT310



3 ... Drum Schill GT380



4 ... Drum Schill HT582



<sup>2)</sup> ...Packaging "2" not possible

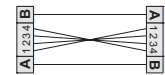
### Chassis Connectors

| Colour      | Plating | Fiber       | Solder contacts | Shell ground contact |     |
|-------------|---------|-------------|-----------------|----------------------|-----|
| NO2-4FD     | *       | hard Nickel | 2 x             | 4 x                  | -   |
| NO2-4FD-R   | *       | Ruthenium   | 2 x             | 4 x                  | -   |
| NO2-4FD-1   | *       | hard Nickel | 2 x             | 4 x                  | 1 x |
| NO2-4FD-1-R | *       | Ruthenium   | 2 x             | 4 x                  | 1 x |

\* ... Coloured labeling plates to indicate the fiber mode included.

### Coupler

| Colour (fiber mode) | Plating | Fiber | Copper wire                                       |
|---------------------|---------|-------|---|
| NAO2M-4S75          | black   | black | LC-Duplex Multimode PC 4 x 0.75 mm <sup>2</sup>   |
| NAO2S-4S75          | blue    | black | LC-Duplex Singlemode PC 4 x 0.75 mm <sup>2</sup>  |
| NAO2SA-4S75         | green   | black | LC-Duplex Singlemode APC 4 x 0.75 mm <sup>2</sup> |



## Accessories



DSS-\*



SCDR



SCDX

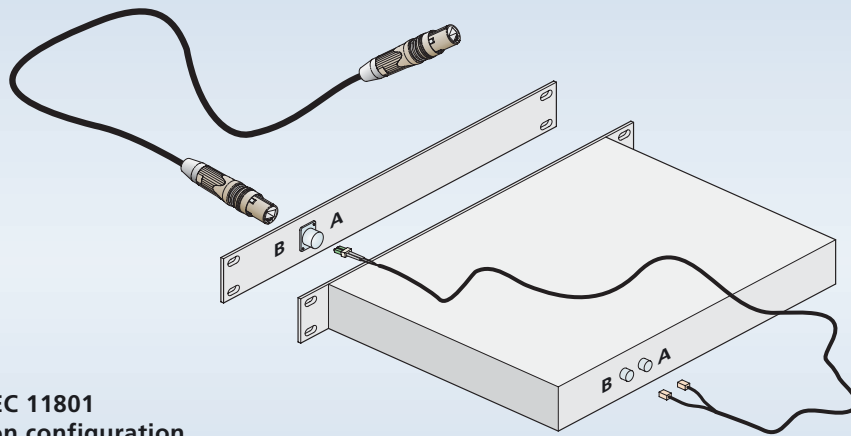


Field repair toolkit

|  |   |
|--|---|
| DSS-*  | Lettering plate for D series, coloured plastic                            |
| SCDR   | Rear end protection cover for D-size chassis connectors                   |
| SCDX   | Hinged cover seals D-size chassis connectors, IP54 rated                  |
| Field repair toolkit   | find more details on <a href="http://www.neutrik.com">www.neutrik.com</a> |
| *: 0 - Black, 1 - Brown, 2 - Red, 3 - Orange, 4 - Yellow, 5 - Green, 6 - Blue, 7 - Violet, 8 - Grey, 9 - White |   |

## OpticalCon® Wiring and hook up suggestion

In order to achieve uniform and compatible systems we recommend to follow the hook up suggestions of the ISO / IEC 11801 which defines channel A (right) as input and B (left) as output.



### Extract of the ISO / IEC 11801 Patch cord termination configuration

It is recommended that connection of patch cords and equipment cords to the duplex adapter be made by means of a duplex connector assembly.

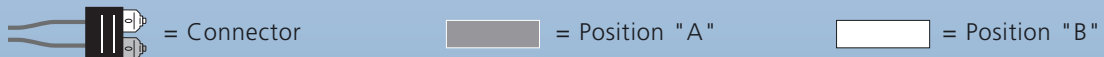
Optical fibre patch cords, whether they are used for cross-connection or interconnection to equipment, shall be of a cross-over orientation such that Position A goes to Position B on one optical fibre, and Position B goes to Position A on the other optical fibre of the optical fibre pair (Figure 17). Each end of the optical fibre patch cord shall be identified to indicate Position A and Position B if the connector can be separated into its simplex components. For alternate connector designs utilising latches, the latch defines the positioning in the same manner as the keys.

For simplex connectors, the connector that plugs into the receiver shall be considered Position A, and the connector that plugs into the transmitter shall be considered Position B.



Figure 17 - Optical

Legend:



Note: Shading for clarification only