Overview Hybrid Copper/OF Cables
MMS Forum March 2009
Areas

- Indoor Cat.-OF Cables
- CATV-OF Cables (Trunk)
- OF-Power cables
- Copper Telecom – OF Cables
- Studio Broadcast
- Shipboard and Special applications
- Blown Cables solutions
Indoor Cat.-OF Cables

- Cat.5/6 Indoor/Outdoor with FO elements
- Outdoor with swellable materials
- Often figure eight design
- Stranded versions include FO element as “fifth” pair or center element
Cat.5-OF Cables

TDC Hybrid Outdoor-Cable Cat.5e

J-2Y(St)H 4x2x0,51 + J-D(ZN)H 4G 50/125 HiCap
100-Datenkabel ISO/IEC 11801 CAT-5e + LWL-Innenkabel, halogenfrei
Indoor Cat.-OF Cables

Hybrid Cable U/UTP Cat 6 + 4xSM G657 9/125 BBXS
Indoor Cat.-OF Cables

J-02YSCH 4x2x0,56 PiMF + J-DH 4..8G50/125
Datenkabel ISO/IEC 11801 CAT-7 + OM2/OM3
Indoor Cat.-OF Cables

J-02YS(St)Y 4x2x0.56 (AWG 23)
100W Data Cable ISO/IEC 11801 CAT-6
+ J-V(ZN)H 2G50/125 2G/125
FO Mini-Breakout Cable

UC400 HS23 Cat.6 + OM2
Indoor Cat.-OF Cables

2 x UC400 HS23 4 P Cat.6 + FO Cable UT 2G 50/125 OM3 LSHF-FR

UC400 HS23 Cat.6 + FO Cable UT 2G 50/125 OM3 LSHF-FR
### Indoor Cat.-OF Cables

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Type</th>
</tr>
</thead>
</table>
| UC400 25 POF | LI-2YY 4x2x0.54L POF (AWG 25)  
100Ω Data Cable ISO/IEC 11801 CAT-6 | UTP   |
| UC600 SS27 POF | LI-02YSCH 4x2x0.42L PIMF + POF  
100Ω Data Cable ISO/IEC 11801 CAT-7 | S/STP |
Remote powering of Telecom equipment in combination with Loose tube construction

Access cables for powering of NIU for Fttx
Examples

- Central Strength Member (CSM): glass fibre reinforced plastic rod (FRP), with or without over-sheathing.
- Loose Tube: thermoplastic material, containing up to 14 fibres and filled with a suitable water tightness compound.
- Power conductor: insulated annealed copper wire, section 2.5 mm².
- Stranding: loose tubes, copper conductors, SZ stranded around the CSM.
- Longitudinal Water Tightness: dry core with water swellable elements.
- Outer Sheath: LLDPE. Two ripcords beneath the sheath.
Examples 2

- **Central Strength Member (CSM):** glass fiber reinforced plastic rod (FRP), with plastic oversheathing when needed.
- **Core:** copper insulated conductor: 6 mm², insulation XLPE 0.6/1 kV
- **Uni-tube:** reinforced non-metallic uni-tube
- **Stranding:** 4 or 6 cores plus 1 or 2 uni-tube, SZ stranded around the CSM.
- **Longitudinal Water Tightness:** dry core with water swellable elements
- **Inner Sheath:** PE
- **Screen:** bare copper wire plus copper tape which also acts as earth continuity
- **Outer Sheath:** LDPE, 2 rip cords beneath.

This cable fulfills the requirements of IEC 60502
Examples

- Fibres: For fibre characteristics see attached datasheet C03e
- Central Strength Member (CSM): glass fiber reinforced plastic rod (FRP)
- Loose Tube: thermoplastic material, containing up to 12 fibers and filled with a suitable water tightness compound.
- Conductor: Each conductor consists of a solid wire of commercially pure annealed copper. Nominal conductor diameter 1.38 mm (1.8 mm²)
- Insulation conductors: The power conductors consist of PVC or flame-retardant LSZH insulation.
- Stranding: loose tube and conductors are SZ stranded around the CSM.
- Water tightness: in the interstices of the cable core swelable yarns are applied.
- Cable core: swelable tape is applied over the stranding.
- Strength members: Reinforcement layer with Aramid yarns.
- Outer sheath: The cable sheath consists of Polyethylene compound.

- Central Strength Member (CSM): glass fiber reinforced plastic rod (FRP)
- Loose Tube: thermoplastic material containing, 2 fibers and filled with a suitable water tightness compound.
- Core: 4 PE insulated copper conductors
- Stranding: loose tube + core, SZ stranded around the CSM.
- Cable core: over the cable core a bare copper tape is applied longitudinally with an overlap + separation tape.
- Outer sheath: low smoke, flame retardant, halogen free material (Green)
### JN-SM-SRE +1x2x0.5

#### Cable Design

<table>
<thead>
<tr>
<th>Hybrid Fiber Optic Cable</th>
<th>Copper pair</th>
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</table>

- **Fibres:** Two SM-G657B BendBright XG fibres (see attached characteristics)
- **Fibre coating:** dry semi-tight 0.9 mm. Coating consists of thermoplastic material.
- **Copper pair:** 1 copper pair 1x2x0.5 with PE.
- **Stranding:** The fibres and copper pair are helically stranded.
- **Strengthening Yarns:** Under the outer sheath, aramid yarns are applied, serving as rip cords and as strengthening yarns.
- **Outer sheath:** HDPE blue RAL 5015.
In combination with Copper Telecom constructions used instead of a pair, quad or bundle
Copper Telecom – OF Cables

Data sheet 82/2004

Application
- used in local networks, suitable for laying in ground or in ducts

Construction
- Conductor diameter 0.8 mm, annealed solid copper
- Conductor insulation: foam-skin-PE
- in center optical element with strain relief and PE-sheath; diameter 8.3 mm
- Cable contains quads in concentric layers
- Cable core interstices filled with petrol jelly with temperature 70°C
- Cable core wrapping with plastic water swell tape
- Moisture barrier by PE-Al-tape (Al nominal 0.2 mm thick and coated on both sides with copolymer), bonded with black PE-sheath
- Screen in form of aluminium wires 0.15 mm; depending on required reduction factor
- Outer sheath polyethylene, black

Thermal properties
- operating temperature: -30 °C to 70 °C
- humidification: -40 °C to 70 °C

TCEPKFLE 5 x 4 x 0.8 + 1 x 12 E9/125
Telephone cable with optical elements – hybrid cable
According to customer specification

Application
Used in local networks, suitable for laying in ground or in ducts.

Construction
- Conductor: copper, bare, solid 0.8 mm,
- Insulation: foam-skin-PE
- Twisting: five quads and one optical element (loose tube) in unit stranding (SZ-stranding)
- Filling: interstices filled with waterblocking compound
- Cable core wrapping with plastic water swell tape
- Laminated sheath (moisture barrier) formed by an aluminium tape; coated on both sides with copolymer (Al-thickness at least 0.15 mm) and bonded with
- Outer sheath: PE, black
Copper Telecom – OF Cables

SM-LFMRM (12SM+25x4x0,6) Xz-XzOTkTd12J

Cable Design

Loose Tube Fiber Optic Cable – Copper quads – double APL sheathed – PE inner and outer sheath

- Fibres: For fibre characteristics see attached datasheet COx
- Loose Tube: thermoplastic material, containing up to 12 fibers and filled with a suitable water tightness compound.
- Copper quad: The copper quad consists of four massive polyethylene insulated copper conductors.
- Basic Unit: two copper quads are stranded together into one sub-unit.
- Stranding: The loose tube and the sub-units are stranded together.
- Filling compound: The interstices of the cable are completely filled with a nontoxic and dermatologically safe compound. The compound is especially designed for a twofold influence on the capacitance of the cable.
- Cable core: rewritable tape is applied over the stranding.
- Moisture barrier: The cable is completely covered with an aluminium foil applied longitudinally with an overlap. The aluminium foil is bonded to the sheath.
- Inner sheath: The inner sheath consists of Polyethylene (Black).
- Watertightness: A layer of rewritable tape is applied over the inner sheath.
- Straight members: A layer of aramid yarns is applied around the inner sheath.
- Moisture barrier: The cable is completely covered with an aluminium foil applied longitudinally with an overlap. The aluminium foil is bonded to the sheath.
- Outer sheath: The outer sheath consists of Polyethylene (Black).
Copper Telecom – OF Cables

- Zentrales Stützelement: Glasfaserverstärkter Kunststoff (GFK).
- Bündelader: thermoplastisches Material, enthält bis zu 12 Fasern, gefüllt.
- Kupferpaar: Grundbündel 1x2x0.6 mit Voll-PE-Isolierung.
- Verseilung: Bündeladern, (Blindelemente) und Kupferpaar um den GFK verseilt.
- Längswasserdichtigkeit: die Hohlräume der Seele sind mit Füllmasse gefüllt.
- Bewicklung: Folie aus Kunststoff, darunter Kennfaden und Meßband.
- Zugentlastungselemente: Aramidgarne.
- Schirm: kunststoffbeschichtetes Aluminiumband, längslaufend mit Überlappung, Nennwanddicke: 0.2 mm, 2 Reißfäden unterhalb des Bandes.
- Außenmantel: PE.

- Zentrales Stützelement: Glasfaserverstärkter Kunststoff (GFK), mit oder ohne Kunststoffaufdickung.
- Bündelader: thermoplastisches Material, enthält bis zu 12 Fasern, gefüllt.
- Kupferpaar: 1x2x0.6 mit Voll-PE-Isolierung
- Verseilung: Bündeladern, Kupferpaar (und Blindelemente) SŽ-förmig um den GFK verseilt.
- Bewicklung: Quellband, längslaufend, darunter Kennfaden und Meßband.
- Zugentlastungselemente: Aramidgarne.
- Schirm: kunststoffbeschichtetes Aluminiumband, längslaufend mit Überlappung, Aluminum-Nennwanddicke: 0.2 mm, darunter 2 Reißfäden.
- Außenmantel: PE.
Studio Broadcast
LWL-Hybridkabel 4G 62.5/125 + Power

SMPTE 311M-HD-Hybrid-Camera Cable

SMPTE 311M- HD-Hybrid-Kamerakabel
2E 9/125 + 4 x AWG20 + 2 x AWG24 sw

SMPTE 311M Zero-Loss HD Cable
with BendBright XS at core
LWL-Hybridkabel 3x4 G 62.5/125
UC2000 B 3x4 G 62.5/125
+ 0.6/2.8 AF + 3 x 1.5 mm² FRNC-C

LWL-Hybridkabel 12G 62.5/125
+ 0.6/2.8 AF + 3 x 1.5 mm² FRNC-C
LWL-Hybridkabel 12 G 62.5/125
+ 0.6/2.8 AF + 3 x 2.5 mm² FRNC
LWL-Hybrid-Kabel FOVN12-1-3 FRNC

Aufzug VAN LWL/CU-Hybrid-Kabel
Element 1, Stromversorgungsleitung 2 x 1,5 mm² (1x)
Element 2, geschirmte Audioleitung 1 x 2 x 0,22 mm² (2x)
Element 3, ungeschirmte Steuerleitung 4 x 0.14 mm²
Element 4, LWL-Kabel J-V(ZN)11Y 4 x G 62.5/125
Shipboard and Special applications
Shipboard and Special applications

Ship – Hybrid - Cable VDL 621
(1xCoax10 AD 10 S + 5xCoax 0.48Lz/1.98AF +
2xUC900 SS23 4P + 1x4G50/125 PUR)

Ship - Hybrid - Cable VDL 221
(2xCoax10 AD 10 S + 2xUC900 SS23
4P+1x4G50/125 PUR)
Shipboard and Special applications

Hybrid Cable
(coax 9 + 2 x UTP Cat. 5e + 1x4x0.5 + 2SM in central tube)
Blown Cables solutions

CATV-Kabel mit PE- Leerröhrchen
1.65/7.5 CF PE grün + 3,5/5,0

CATV-Kabel mit PE- Leerröhrchen
1.65/7.5 CF PE grün + 8,0/10,0
### Total Construction

<table>
<thead>
<tr>
<th>Field</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable lay up</td>
<td>Screened coaxial element according to A + FO element according to B surrounded by a common sheath as figure eight construction</td>
</tr>
<tr>
<td>Sheath</td>
<td>LSHF-FR, diameter 6.8 mm ± 0.2 mm × 9.8 ± 0.2 mm</td>
</tr>
<tr>
<td>Colour</td>
<td>White or black</td>
</tr>
<tr>
<td>Printing</td>
<td>DRAKA Communications – COAX10 AD 10 A + FO Drop Cable 1S 9/125 BBXS + meter marking + batch number</td>
</tr>
</tbody>
</table>

**CATV - Cable NK-22 C + Steel Tube “STARFOC”**

**CATV/LWL-Hybrid Cable NK**

22 C + 6 x 9/125 SM

NK 22 CN+6xfo

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