Camera

Video-vision engineering/bus technology
## Camera Cable Selection

<table>
<thead>
<tr>
<th>Chamflex® cable</th>
<th>Jacket</th>
<th>Shield</th>
<th>Cable type</th>
<th>Approvals and standards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Video-, vision engineering/bus technology</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FireWire</td>
<td>TPE</td>
<td>✓</td>
<td>Ready-made cable</td>
<td>✓</td>
</tr>
<tr>
<td>USB</td>
<td>TPE</td>
<td>✓</td>
<td>Ready-made cable</td>
<td>✓</td>
</tr>
<tr>
<td>GigE</td>
<td>TPE</td>
<td>✓</td>
<td>Ready-made cable</td>
<td>✓</td>
</tr>
<tr>
<td>FOC</td>
<td>PUR</td>
<td>✓</td>
<td>Ready-made cable</td>
<td>✓</td>
</tr>
<tr>
<td>FOC</td>
<td>TPE</td>
<td>✓</td>
<td>Ready-made cable (Robotics)</td>
<td>✓</td>
</tr>
<tr>
<td>Koax</td>
<td>TPE</td>
<td>✓</td>
<td>Ready-made cable</td>
<td>✓</td>
</tr>
</tbody>
</table>
Chainflex® FireWire
TPE outer jacket, oil-resistant, flame-retardant
For the toughest of demands in digital camera technology.

Construction
Conductors: Fine-wire stranded conductor bare copper wires, according to EN 60228
Conductor insulation: Mechanically high-quality PE mixture.
Cable core: Components twisted together with an especially short pitch length.
Element shield: Extremely flexible, tinned copper shield over foil taping.
Coverage approx. 90% optical.
Core identification: 26 AWG: orange/blue, green/red. 22 AWG: black, white.
Outer jacket: Low-adhesion TPE, especially abrasion-resistant and highly flexible, adapted to suit the requirements in Energy Chains®, Silicon-free in compliance with PV 3.10.7 - status 1992. Color: violet (similar to RAL 4001)

Technical Data
Minimum bending radius, moving: 12.5 x outer cable diameter
Minimum bending radius, fixed: 5 x outer cable diameter
Permissible temperature, moving: -31°F to +158°F (-35°C to +70°C)
Permissible temperature, fixed: -40°F to +158°F (-40°C to +70°C)
Nominal voltage: 30 V
Testing voltage: 500 V
Oil resistance: High
Regulations: cRUS UL AWM style for USA & Canada 21371 80°C 30V, Flame resistance: FT1, CE, DESINA

Typical Applications
- FireWire cable for use in Energy Chains® in industrial environments
- Transmission lengths of up to 32.8 ft. (10 m)

Choose from the following preassembled harnessed units.

Part No. | Number of pairs/conductors nominal cross section (mm²) | Overall diameter in. (mm) | Copper index lbs/ft. (kg/km) | Weight lbs/ft. (kg/km)
--- | --- | --- | --- | ---
CFBUS-055 | 2 STP x 0.15 + 2 C x 0.34 | .30 (7.5) | 28.2 (42) | 54.4 (81)

No Minimum Order • No Cut Charges on up to 10 cuts of the same part number
TPE Bus Cable

Chainflex® FireWire
TPE outer jacket, oil-resistant, flame-retardant
For the toughest of demands in digital camera technology.

Choose from the following preassembled harnessed units.

<table>
<thead>
<tr>
<th>Connector body with clip</th>
<th>Part No.: MAT9048625</th>
<th>Moulded connector pin without clip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moulded connector pin without clip</td>
<td>MAT9048627</td>
<td>Moulded connector pin without clip</td>
</tr>
<tr>
<td>Pin body without clip</td>
<td>MAT9048620</td>
<td>Pin body without clip</td>
</tr>
<tr>
<td>Pin body without clip</td>
<td>MAT9048622</td>
<td>Moulded connector socket without clip</td>
</tr>
<tr>
<td>Pin body without clip</td>
<td>MAT9048624</td>
<td>Moulded connector pin without clip</td>
</tr>
<tr>
<td>Moulded connector socket without clip</td>
<td>MAT9048626</td>
<td>Moulded connector socket without clip</td>
</tr>
<tr>
<td>Moulded connector socket without clip</td>
<td>MAT9048628</td>
<td>Moulded connector pin without clip</td>
</tr>
</tbody>
</table>

We have successfully tested CFBUS-055 for more than 6 million cycles at 32.8 ft and 3.3 ft travel distance
See Design Section for test details.

No Minimum Order • No Cut Charges on up to 10 cuts of the same part number
### TPE Bus Cable

**Chainflex® USB**

TPE Energy Chain® Cable, USB cable 2.0, shielded, oil resistant, flame retardant

#### Construction

**Conductors**: Extremely flexible, very finely stranded bare copper conductor. According to EN 60228.

**Conductor insulation**: According to Bus specifications

**Conductor twisting**: Two conductors each, twisted in a short pitch, conductor pairs also twisted in a short pitch.

**Conductor colors**: 20 AWG: red, black, 28 AWG: white, green (CFBUS.065), 24 AWG: white, green (CFBUS.066)

**Shield**: Extremely bend resistant, tinned copper braid. Coverage, 90% optical

**Outer jacket**: Low-adhesion TPE, especially abrasion-resistant and highly flexible, adapted to suit the requirements in Energy Chains®. Silicon-free in compliance with PV 3.10.7 - status 1992. **Color**: violet (similar to RAL 4001)

#### Technical Data

- **Minimum bending radius, moving**: 12.5 x outer cable diameter
- **Minimum bending radius, fixed**: 5 x outer cable diameter
- **Permissible temperature, moving**: -31°F to +158°F (-35°C to +70°C)
- **Permissible temperature, fixed**: -40°F to +158°F (-40°C to +70°C)
- **UV resistance**: Medium
- **Oil resistance**: High
- **Nominal voltage**: 30V
- **Test voltage**: 500V

**Regulations**: cRUs: UL AWM style for US & Canada: 21371 80°C 30V Flame Resistance: FT1, CE, DESINA, RoHS: 2002/95/EC; Please reference the Design Section (Chapter 1) for more information.

**Cleanroom**: According to ISO Class 1, material/cable tested by IPA according to ISO standard 14644-1. Test cable CF34-25-04

#### Typical Applications

- USB 2.0 cable for use in E-Chains® in industrial environments
- Transmission lengths of up to 19.6 ft. (6 m) (CFBUS.065)
- Transmission lengths of up to 32.8 ft. (10 m) (CFBUS.066)

#### Part No.

<table>
<thead>
<tr>
<th>Part No.</th>
<th>AWG</th>
<th>No. of Conductors and Rated Cross-Section in mm²</th>
<th>Outer Diameter (approx) in. (mm)</th>
<th>Copper Index lbs/mft (kg/km)</th>
<th>Weight lbs/mft (kg/km)</th>
<th>Characteristic Impedance ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFBUS-065</td>
<td>20</td>
<td>2 C x 0.5</td>
<td>.20 (5.0)</td>
<td>17.5</td>
<td>30.2</td>
<td>90</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>1 PR x 0.08</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Choose from the following preassembled harnessed units.

<table>
<thead>
<tr>
<th>USB Type A</th>
<th>Part No.</th>
<th>open end of cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB Type A</td>
<td>USB9040001</td>
<td></td>
</tr>
<tr>
<td>USB Type B</td>
<td>USB9040020</td>
<td></td>
</tr>
</tbody>
</table>

---

*Note: Images of the cables and connectors are included in the document.*
**TPE Bus Cable**

**Chainflex® USB**

TPE Energy Chain® Cable, shielded, oil resistant, flame retardant

---

<table>
<thead>
<tr>
<th>USB Type B</th>
<th>Part No.</th>
<th>USB Type B</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB Type A</td>
<td>USB9040030</td>
<td>USB Type B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USB Type A</th>
<th>Part No.</th>
<th>USB Type B</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB Type A</td>
<td>USB9040040</td>
<td>USB Type B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>USB Type A</th>
<th>Part No.</th>
<th>USB Type A (Socket)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB Type A</td>
<td>USB9040060</td>
<td>USB Type A (Socket)</td>
</tr>
</tbody>
</table>

Cable is also available in bulk reels

<table>
<thead>
<tr>
<th>Part No.</th>
<th>AWG</th>
<th>No. of Conductors and Rated Cross-Section in mm²</th>
<th>Outer Diameter (approx) in. (mm)</th>
<th>Copper Index</th>
<th>Weight lbs/mft (kg/km)</th>
<th>Characteristic Impedance ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFBUS-066</td>
<td>20</td>
<td>2 C x 0.5</td>
<td>.24</td>
<td>21.5</td>
<td>37.6 (56)</td>
<td>90</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part No.</th>
<th>AWG</th>
<th>No. of Conductors and Rated Cross-Section in mm²</th>
<th>Outer Diameter (approx) in. (mm)</th>
<th>Copper Index</th>
<th>Weight lbs/mft (kg/km)</th>
<th>Characteristic Impedance ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB Type A</td>
<td>USB9040201</td>
<td>open end of cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USB Type A</td>
<td>USB9040210</td>
<td>open end of cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USB Type B</td>
<td>USB9040220</td>
<td>open end of cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USB Type B</td>
<td>USB9040230</td>
<td>open end of cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USB Type A</td>
<td>USB9040240</td>
<td>open end of cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USB Type A</td>
<td>USB9040260</td>
<td>open end of cable</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Choose from the following preassembled harnessed units.
TPE Bus Cable

Chainflex® GigE

TPE Energy Chain® Cable, Ethernet cable for industrial use, shielded, oil resistant, flame retardant

Construction
Conductors: Extremely flexible, very finely stranded bare copper conductor. According to EN 60228.
Conductor insulation: According to Bus specifications
Conductor twisting: Two conductors each, twisted in a short pitch, conductor pairs also twisted in a short pitch.
Conductor colors: Color Code in accordance with DIN 47100
Shield: Tinned copper braid. Coverage, 90% optical
Outer jacket: Low-adhesion TPE, especially abrasion-resistant and highly flexible, adapted to suit the requirements in Energy Chains®. Silicon-free in compliance with PV 3.10.7 - status 1992. Color: violet (similar to RAL 4001)

Technical Data
Minimum bending radius, moving: 12.5 x outer cable diameter
Minimum bending radius, fixed: 5 x outer cable diameter
Permissible temperature, moving: -31°F to +158°F (-35°C to +70°C)
Permissible temperature, fixed: -40°F to +158°F (-40°C to +70°C)
UV resistance: Medium
Oil resistance: High
Nominal voltage: 30V
Test voltage: 500V
Regulations: cRUus: UL AWM style for US & Canada: 21371 80°C 30V Flame Resistance: FT1, CE, DESINA, RoHS: 2002/95/EC; Please reference the Design Section (Chapter 1) for more information.
Cleanroom: According to ISO Class 1, material/cable tested by IPA according to ISO standard 14644-1. Test cable CF34-25-04

Typical Applications
- Ethernet cable for use in E-Chains® in industrial environments
- Transmission lengths of up to 50 m (CFBUS.065)
TPE Bus Cable

Chainflex® GigE

TPE Energy Chain® Cable, Ethernet cable for industrial use, shielded, oil resistant, flame retardant

Cable is also available in bulk reels

| Part No.      | AWG   | No. of Conductors and Rated Cross-Section in mm² | Outer Diameter (approx) | Copper Index |Weight
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Prizes</td>
<td>in. (mm)</td>
<td>lbs/ft (kg/m)</td>
<td>lbs/ft (kg/m)</td>
</tr>
<tr>
<td>CFBUS-044</td>
<td>26</td>
<td>4 PR x 0.14</td>
<td>.32 (8.0)</td>
<td>24.0 (35)</td>
<td>53.7 (79)</td>
</tr>
<tr>
<td>CFROBOT8-045</td>
<td>26</td>
<td>(4x2x0.14)C</td>
<td>.33 (8.5)</td>
<td>23.5 (35)</td>
<td>43.6 (65)</td>
</tr>
</tbody>
</table>

Note: The mentioned external diameters are maximum values

Choose from the following preassembled harnessed units.

- Connector RJ45 Metal, 8 poles Part No.: GIG9040001

- Connector RJ45 Metal, 8 poles Part No.: GIG9040002

Plug made of RJ45 plastic with knurled screws

No Minimum Order • No Cut Charges on up to 10 cuts of the same part number
PUR Fiber Optic Cable

Chainflex® Glass Fiber

PUR Energy Chain® gradient glass fiber optic cable, UV-resistant, halogen-free, oil-resistant, metal-free

**Construction**

- **Fiber:** 50/125 µm; 62.5/125 µm fibers in gel filled hollow tubes
- **Core stranding:** Tubes with one fiber in each are twisted with strain relief elements
- **Color code:** Black fiber jackets with white printed numbers
- **Outer jacket:** Low adhesion PUR  Color: Black

**Technical Data**

- **Minimum bending radius, moving:** 12.5 outer cable diameter
- **Minimum bending radius, fixed:** 7.5 x outer cable diameter
- **Permissible temperature, moving:** -4°F to +140°F (-20°C to +60°C)
- **Permissible temperature, fixed:** -13°F to +140°F (-25°C to +60°C)
- **UV Resistance:** High
- **Oil Resistance:** High
- **Silicone free:**

**Typical Applications**

- Fiber optic cable for use in E-Chains® in industrial environments
- Transmission lengths of up to 500 m

**Technical Data**

- **Minimum bending radius, moving:** 12.5 outer cable diameter
- **Minimum bending radius, fixed:** 7.5 x outer cable diameter
- **Permissible temperature, moving:** -4°F to +140°F (-20°C to +60°C)
- **Permissible temperature, fixed:** -13°F to +140°F (-25°C to +60°C)
- **UV Resistance:** High
- **Oil Resistance:** High
- **Silicone free:**

**Part No.**

- **Cable Only**
- **Connector ST**
- **Connector LC**

<table>
<thead>
<tr>
<th>Part No.:</th>
<th>Fiber Count</th>
<th>Fiber Diameter (µm)</th>
<th>Outer Diameter (mm)</th>
<th>Weight (lbs/mft) (kg/km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFLG-2HG-MF-50/125</td>
<td>2</td>
<td>50/125</td>
<td>.35 (9)</td>
<td>56 (85)</td>
</tr>
<tr>
<td>CFLG-2HG-MF-62.5/125</td>
<td>2</td>
<td>62.5/125</td>
<td>.35 (9)</td>
<td>56 (85)</td>
</tr>
</tbody>
</table>

*Choose from the following preassembled harnessed units.*

**Connector ST**

- LWL90412393
- LWL90412394
- LWL90412396
- LWL90412397
- LWL90412398

**Connector LC**

- LWL90412395
- LWL90412399

*2 ST coupling pieces needed to be ordered extra, if used as extension cable (MAT0176314).*

**Closed corrugated tube to feed in Fibre optic cables (image shown cut open)**
PUR Fiber Optic Cable

Chainflex® Glass Fiber

PUR Energy Chain® gradient glass fiber optic cable, UV-resistant, halogen-free, oil-resistant, metal-free

FOC patch cables for static installation

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Fiber Count</th>
<th>Fiber Diameter approx (µm)</th>
<th>Outer Diameter in. (mm)</th>
<th>Weight lbs/ft (kg/km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFLG-2G-MF-50/125</td>
<td>2</td>
<td>50/125</td>
<td>.25 (6.5)</td>
<td>18.1 (27)</td>
</tr>
<tr>
<td>FFLG-2G-MF-62.5/125</td>
<td>2</td>
<td>62.5/125</td>
<td>.25 (6.5)</td>
<td>18.1 (27)</td>
</tr>
</tbody>
</table>

Choose from the following preassembled harnessed units.

- **Connector ST**
  - LWL90412399
  - LWL90412400
  - LWL90412401
  - LWL90412402
  - LWL90412403
  - LWL90412404

- **Connector LC**
  - L90412400
  - L90412401
  - L90412402
  - L90412403
  - L90412404

* 2 ST coupling pieces needed to be ordered extra, if used as extension cable (MAT0176314).

Harnessed igus® E6 system on a camera application.
TPE Fiber Optic Cable

Chainflex® CF ROBOT5

TPE outer jacket, oil-resistant, bio-oil-resistant, UV-resistant, low temperature flexible, hydrolysis-resistant and microbe-resistant

Fiber optic cable for robotic applications with torsional movements

Construction

Conductors: 50/125µm, 62.5/125µm special fixed wired elements with aramide strain relief
Conductor stranding: FOC wires stranded with high-tensile aramide dampers around the GRP central element

Technical Data

Minimum bending radius, moving: 12.5 x outer cable diameter
Minimum bending radius, fixed: 7.5 x outer cable diameter
Permissible temperature, moving: -4°F to +140°F (-20°C to +60°C)
Permissible temperature, fixed: -13°F to +140°F (-25°C to +60°C)
Oil resistance: High
UV resistance: High
Flame Resistance: According to IEC 60332-1-2, CEI 20-34, FT1, VW-1
Regulations: CE, RoHS: 2002/95/EC; Please reference the Design Section (Chapter 1) for more information.
Cleanroom: According to ISO Class 1, material/cable tested by IPA according to ISO standard 14644-1. Test cable CF9-15-07

Typical Applications

• for maximum mechanical load requirements with torsion movements
• indoor and outdoor applications, UV-resistant
• especially for robots and movements in the 3D range
• robots, handling

Part No.
Cable Only

<table>
<thead>
<tr>
<th>No. of Fibers</th>
<th>Fiber Diameter approx. µm</th>
<th>Outer Diameter (approx) in. (mm)</th>
<th>Weight lbs/mft (kg/km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFROBOT5-501</td>
<td>2</td>
<td>50/125</td>
<td>.33 (8.5)</td>
</tr>
</tbody>
</table>

Choose from the following preassembled harnessed units.

Connector ST
LWL90422491
Connector LC

Connector ST
LWL90422492
Connector ST

Connector LC
LWL90422493
Connector LC

No Minimum Order • No Cut Charges on up to 10 cuts of the same part number
TPE Fiber Optic Cable

Chainflex® CF ROBOT5

TPE outer jacket, oil-resistant, bio-oil-resistant, UV-resistant, low temperature flexible, hydrolysis-resistant and microbe-resistant

Fiber optic cable for robotic applications with torsional movements

<table>
<thead>
<tr>
<th>Part No.</th>
<th>No. of Fibers</th>
<th>Fiber Diameter approx. µm</th>
<th>Outer Diameter (approx) in. (mm)</th>
<th>Weight lbs/mft (kg/km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFROBOT5-500</td>
<td>2</td>
<td>62.5/125</td>
<td>.33 (8.5)</td>
<td>58.4 (87)</td>
</tr>
</tbody>
</table>

Choose from the following preassembled harnessed units.

* 2 ST coupling pieces needed to be ordered extra, if used as extension cable (MAT0176314).

Closed corrugated tube to feed in Fibre optic cables (image shown cut open)

No Minimum Order • No Cut Charges on up to 10 cuts of the same part number
TPE Coax Cable

Chainflex® CFKoax1
TPE Energy Chain® cable, 75Ω coax cable, oil-resistant, bio-oil-resistant, UV-resistant

Construction
Conductors: Tinned copper wires
Conductor insulation: FEP
Coax shield: Tinned copper braid, 90% optical coverage
Coax jacket/color: TPE, red, green, blue, white, black
Cable core for 5 coax cable: coaxes twisted together with a short pitch length
Outer jacket: TPE abrasion-resistant, high-flex blend, oil-resistant, coolant-resistant. Color: dark blue (RAL 5011).

Technical Data
Minimum bending radius, moving: 10 x outer cable diameter
Minimum bending radius, fixed: 7.5 x outer cable diameter
Permissible temperature, moving: -31°F to +212°F (-35°C to +100°C)
Permissible temperature, fixed: -40°F to +212°F (-40°C to +100°C)
UV resistance: High
Oil resistance: High
Nominal voltage: 300V
Test voltage: 1500V
Operating capacitance: approx. 19.5pF/ft
Characteristic impedance: 75Ω
Cleanroom: According to ISO Class 1, material/cable tested by IPA according to ISO standard 14644-1. Test cable CF9-15-07
Coax is compatible with RG179 type connectors

Typical Applications
• for maximum mechanical load requirements
• indoor and outdoor applications, UV resistant
• for unsupported and gliding travel up to 1312 ft (400m)
• storage and retrieval units for high bay warehouses, machine tools, quick handling, cleanroom, semiconductor insertion, outdoor cranes, low temperature applications

Part No.
Cable Only  No. of Coaxes Diameter Copper Index Weight
            in. (mm)   lbs/ft (kg/m) lbs/ft (kg/km)
CF Koax 1-01 1 coaxial element .18 (4.5) 6.0 (9) 16.7 (25)

Choose from the following preassembled harnessed units.
TPE Coax Cable

Chainflex® CFKoax5
TPE Energy Chain® cable, 75Ω coax cable, oil-resistant, bio-oil-resistant, UV-resistant

<table>
<thead>
<tr>
<th>Part No.</th>
<th>No. of Coaxes</th>
<th>Diameter in. (mm)</th>
<th>Copper Index lbs/ft (kg/m)</th>
<th>Weight lbs/ft (kg/km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF Koax 1-05</td>
<td>5 coaxial element</td>
<td>.39 (10)</td>
<td>31.5 (47)</td>
<td>16.7 (25)</td>
</tr>
</tbody>
</table>

Choose from the following preassembled harnessed units.

- **Connector**
  - MAT90423405

- **Socket**
  - MAT90423407

- **Connector**
  - MAT90423406

- **Socket**
  - MAT90423409

- **Connector**
  - MAT90423408

- **Socket**
  - MAT90423409

No Minimum Order • No Cut Charges on up to 10 cuts of the same part number