CAMUNA CAVI
Instrumentation, control, power and data cables for the Oil & Gas and process industries
LAPP GROUP: FROM SMALL START-UP TO GLOBAL PLAYER

Family business and global player
LAPP is both. The history of our company has been one of success and expansion ever since it was founded in 1959 by Ursula Ida and Oskar Lapp. It remains resolutely family owned to this day. We safeguard our success by staying close to our customers and markets, maintaining our innovative strength and brand quality, and being a reliable partner. We provide continuity, always guided in our thoughts and actions by our values.

Success built on family values
At LAPP, we maintain values that promote cooperation and enable relationships with employees, suppliers and customers based on partnership and trust. Good relations and mutual respect are key elements of our company culture and a central plank of company policy. We know that our successful business development of the last decades is down in particular to our 3,770 skilled and dedicated staff around the world, as well as the reliable partnership with our customers.

With 17 production facilities, over 40 sales companies and hundreds of dedicated consultants, we are always close to the individual needs and challenges of our customers all over the globe. We are constantly developing our products and system solutions, setting standards in safety, quality and functionality. This is why we are one of the world’s leading manufacturers of integrated solutions and branded products in cable and connection technology. As our success story enters its third generation, we are aware of our duty to the future.

CAMUNA CAVI

With 45 years experience in cable business, Camuna Cavi become part of Lapp in 2001. Camuna Cavi is listed on the vendor lists of the major EPCs, Operators and End-Users. The Industrial Project Business Unit supplies products in full compliance with our customer’s technical specifications to meet applications whenever durability, quality and reliability are mandatory.

Most of Camuna Cavi cables are designed and manufactured according to customer’s needs; they fulfill the technical specs of plants and applications. Camuna Cavi cables are devoted to measurement and control, to connect sensors and actuators and to be installed in dangerous areas such as intrinsically safe or explosion proof zones.
TOTAL QUALITY COMMITMENT

Camuna Cavi is committed to grow as a special and standard cable manufacturer with mutually and continually contributing in the growth of society. Camuna Cavi recognizes that successful Quality, Health, Safety, Environment and Energy management are fundamental to its business and is committed to improve it continually ensuring all legal requirements are met. We firmly believe and stick to the ethical code of practice of Lapp Group implemented under Lapp group values that are:

Camuna Cavi also considers that the development of its activities should be sustainable and compatible with the environment that hosts. Camuna Cavi has decided to adopt a system of integrated management for quality environment and energy management; Camuna Cavi undertakes to make available the necessary resources to ensure the respect of quality standards and environmental concerns and to operate in reference to UNI-EN ISO 9001:2015, UNI EN ISO 14001:2015, UNI EN ISO 50001:2011.

Camuna Cavi is encouraging all necessary initiatives to ensure continual improvement by involving our employees, suppliers, contractors and society to make an Environment and Energy efficient, business system. Top Management of Camuna Cavi also recognizes the necessity of training and employee development in order to achieve best results on above commitments.

LAPP GROUP’S GUIDING PRINCIPLE VALUES

- CUSTOMER ORIENTED
- INNOVATIVE
- SUCCESS ORIENTED
- FAMILY ORIENTED
Camuna Cavi can offer you versatile and wide range of products for the Oil&Gas and process industries applications

Our products have been designed to deliver results where reliability and durability are a key factor.

Connect with Camuna Cavi for custom designed cables manufactured according to your specific needs. Our team is ready to understand your operating challenges and design the right cable solution for your applications in the oil and gas and in all process industries.

Together we will develop unique cable designs that can be installed in the most rigorous environments, where EMC protection or explosion-proof products are required.

1. Oil & Gas Refinery
2. Chemical & Petrochemical
3. Offshore Exploration
4. Marine Shipbuilding & Dockyard
5. Submarine & Underwater Surveillance
6. Water Treatment
7. Power & Energy
8. Mining & Tunnel
9. Iron & Steel
<table>
<thead>
<tr>
<th>No.</th>
<th>Product Description</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>ÖLFLEX® INSTRUM Instrumentation cables</td>
<td>FLAME/FIRE RETARDANT, FIRE RESISTANT</td>
</tr>
<tr>
<td>6</td>
<td>ÖLFLEX® CONTROL Control cables</td>
<td>OIL RESISTANT, HYDROCARBON AND CHEMICAL</td>
</tr>
<tr>
<td>8</td>
<td>THERMOCOUPLE CABLES Extension and Compensating</td>
<td>SUNLIGHT RESISTANT</td>
</tr>
<tr>
<td>10</td>
<td>ÖLFLEX® POWER Power and earthing cables</td>
<td>HALOGEN FREE, LOW SMOKE, DNV, EAC, BV, IMQ</td>
</tr>
<tr>
<td>12</td>
<td>DATA &amp; BUS Copper and fiber optic</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Extreme Series Cables</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>The Construction Products Regulation &quot;CPR&quot;</td>
<td></td>
</tr>
</tbody>
</table>
Benefits

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Oil resistant
- Halogen free
- Low smoke
- Fire behaviour

Product features

Instrumentation Cable are single or multi-pair/triple cables designed to carry signals. They are used for connecting instruments and electrical equipment especially in plants where process control is required, where transducer-generated signals are transmitted through to panels, controllers and other devices. Twisting of the pairs reduces the amount of electromagnetic interference (EMI) from external sources or cross talk between neighboring pairs. The construction with individually shielded pairs is preferred for analog signals; the construction with total shield only is mainly used for digital signals. Instrumentation cables are designed and manufactured following well known international standards like EN-50288-7, NF M 87-202, IEC 60092-376. Special constructions available with DNV-GL approval.

Norm references / Approvals

- Hydrocarbon & Oil resistance: CEI 20-34/0
- Halogen acid gas: IEC 60754-1 (max 20%) for PVC cables, IEC 60754-1 and 2 for LSZH cables
- Fire behaviour: IEC 60332-1-2 (flame retardant), IEC 60332-3-22 (Cat. A) (fire retardant), IEC 60331-21 (fire resistant), IEC 60331-23 (90 min./750°C fire resistant)
- Smoke: IEC 61034-1 and 2
<table>
<thead>
<tr>
<th>CABLES</th>
<th>NOMENCLATURE</th>
<th>CORE INSULATION</th>
<th>SCREEN</th>
<th>CHEMICAL BARRIER</th>
<th>ARMOUR</th>
<th>REFERENCE NORMS</th>
</tr>
</thead>
<tbody>
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</table>
**Benefits**
- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Oil resistant
- Halogen free
- Low smoke
- Fire behaviour

**Product features**
A control cable is a multi-conductor cable made for operation in control circuit, like for example controlling of valves or engines. It is generally used to carry out on/off controlling signals like for example start/stop command. The nature of the type of the signal (on/off) do not require special precaution in terms of shielding and twisting of pairs, in fact the assembling of cores have a simple multi-core structure.

Control Cables are designed and manufactured following well known international standards like EN-50288-7, NF C 32-322, IEC 60502-1, IEC 60092-353. Special constructions available with DNV-GL and UL approval.

**Norm references / Approvals**
- Hydrocarbon & Oil resistance: CEI 20-34/0
- Halogen acid gas: IEC 60754-1 (max 20%) for PVC cables, IEC 60754-1 and 2 for LSZH cables
- Fire behaviour: IEC 60332-1-2 (flame retardant), IEC 60332-3-22 (Cat. A) (fire retardant), IEC 60331-21 (fire resistant), IEC 60331-23 (90 min./750°C fire resistant)
- Smoke: IEC 61034-1 and 2
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<tr>
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<th>NOMENCLATURE</th>
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<th>CHEMICAL BARRIER</th>
<th>ARMOUR</th>
<th>REFERENCE NORMS</th>
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</thead>
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<td>RR0HR 500 V, EN 50288-7</td>
<td>PVC</td>
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<td>ÖLFLEX® CONTROL SWA 135</td>
<td>RR0HBF R 500 V, EN 50288-7</td>
<td>PVC</td>
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<td>Galvanized steel wires</td>
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<td>ÖLFLEX® CONTROL SWA LEAD 185</td>
<td>RE40HRBF R 500 V, EN 50288-7</td>
<td>XLPE</td>
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<td>RE40HSEAR4FR 500 V, EN 50288-7</td>
<td>XLPE</td>
<td>&quot;OS Aluminum longitudinal tape (AL) + TC Drain wire&quot;</td>
<td>AL/HOPE/PA</td>
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<td>FG70M1 0,6/1 kV, IEC 60502-1</td>
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<td>RE40HM1FM1 500 V, EN 50288-7</td>
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<td>ÖLFLEX® CONTROL F90 339 H</td>
<td>RTE40HM1 500 V EN 50288-7, IEC 60331-23</td>
<td>XLPE, over MICA-tape wrapped conductor</td>
<td>OS Aluminum/PET + TC Drain wire</td>
<td>-</td>
<td>Galvanized steel wire braid</td>
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<td>ÖLFLEX® CONTROL SWA F90 341 H</td>
<td>RTE40HM1FM1 500 V EN 50288-7, IEC 60331-23</td>
<td>XLPE, over MICA-tape wrapped conductor</td>
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</tr>
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<td>U/RE40HM1R, 0,6/1 kV, NF C 32-322</td>
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<td>Galvanized steel wire braid</td>
<td>1, 3, 4, 5, NF C 32-322</td>
</tr>
</tbody>
</table>

**SERIES 602**

<table>
<thead>
<tr>
<th>CABLES</th>
<th>NOMENCLATURE</th>
<th>CORE INSULATION</th>
<th>SCREEN</th>
<th>CHEMICAL BARRIER</th>
<th>ARMOUR</th>
<th>REFERENCE NORMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ÖLFLEX® CONTROL NAVAL SWB 713 H</td>
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</table>

1. CEI 20-34/0  
2. IEC 60331-21  
3. IEC 60332-1-2  
4. IEC 60332-3-22 (Cat. A)  
5. IEC 60754-1 (max 20%)  
6. IEC 60754-1 and 2  
7. IEC 61034-1 and 2  
8. IEC 60331-23 (90 min./750°C)  
9. NF M 87-202
EXTENSION AND COMPENSATING THERMOCOUPLE CABLES

Benefits
- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Oil resistant
- Temperature resistant
- Halogen free
- Low smoke
- Fire behaviour

Product features
Thermocouple cable is required to make the connection between the thermocouple and the measuring instrument. The construction is very similar to the Instrument cables apart the material of the conductors. Thermocouple Extension cables use the same alloys as the thermocouple. Compensating cables use different alloys that have a matched EMF output over the appropriate temperature range. The Extension cables are more accurate but more expensive than Compensating.

Thermocouple Cables are designed and manufactured following well known international standards like EN-50288-7, IEC 60584-3, ISA MC 96.1.

Norm references / Approvals
- Hydrocarbon & Oil resistance: CEI 20-34/0
- Halogen acid gas: IEC 60754-1 (max 20%) for PVC cables, IEC 60754-1 and 2 for LSZH cables
- Fire behaviour: IEC 60332-1-2 (flame retardant), IEC 60332-3-22 (Cat. A) (fire retardant)
- Smoke: IEC 61034-1 and 2

Design
- Conductor: Solid or stranded alloys according to IEC 60584-3, ISA MC 96.1
- Core insulation: XLPE/ PVC/LSZH/XLPO
- Screen: IS/OS Aluminum/PET + TC Drain wire, Copper Braid, Copper Tape
- Armour: Galvanized Steel Wire, Galvanized Steel Wire Braid, Galvanized Steel Tape
- Chemical Barrier: Lead sheath, AL/HDPE/PA
- Outer sheath: LSZH/PVC/XLPO color in accordance with IEC 60584-3, or ISA MC 96.1

Core identification code: In accordance with IEC 60584-3, or ISA MC 96.1
Insulation resistance:
- PVC 100 MOhm x km
- XLPO 1000 MOhm x km
- PE/XLPE 5000 MOhm x km

Conductor stranding:
- Solid or stranded alloys
- Size 0.5 - 0.8 - 1.3 mm²; 16 - 18 - 20 AWG

Nominal Voltage Uo/U:
- 300/300 V

Test voltage:
- C/C 1500 V x 1 minute

Temperature range:
- during operation: -30° to +70°C or -40 to +125°C depending on construction
- during installation: -5° to +50°C

Minimum Bending Radius:
- 8 x Outer Diameter not armoured cables
- 10 x Outer Diameter armoured cables
- 15 x Outer Diameter lead or AL/HDPE/PA & armoured cables

Low Smoke
<table>
<thead>
<tr>
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<th>NOMENCLATURE</th>
<th>CORE INSULATION</th>
<th>SCREEN</th>
<th>CHEMICAL BARRIER</th>
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<td>1), 3, 4, 5)</td>
</tr>
<tr>
<td>TT PVC-oST-PVC</td>
<td>TT URXOHR 300 V, EN 50288-7 IEC 60584-3, ISA MC 96.1</td>
<td>PVC</td>
<td>IS/OS Aluminum/PET + TC Drain wire</td>
<td>-</td>
<td>Galvanized Steel Wire</td>
<td>1), 3, 4, 5)</td>
</tr>
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<td>TT PVC-oST-PVC</td>
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<td>Galvanized Steel Wire</td>
<td>1), 3, 4, 5)</td>
</tr>
</tbody>
</table>

1. CEI 20-34/0
2. IEC 60331-21
3. IEC 60332-1-2
4. IEC 60332-3-22 (Cat. A)
5. IEC 60754-1 (max 20%)
6. IEC 60754-1 and 2
7. IEC 61034-1 and 2
8. IEC 60331-23 (90 min./750°C)
9. NF M 87-202
Design

- **Conductor:** Stranded Annealed Copper, Tinned Copper
- **Core insulation:** PE/XLPE/HEPR/PVC/LSZH/XLPO
- **Armour:** Galvanized Steel Wire, Galvanized Steel Wire Braid, Galvanized Steel Tape
- **Chemical Barrier:** Lead sheath, AL/HDPE/PA
- **Outer sheath:** LSZH/PVC

**ÖLFLEX® POWER**

**Benefits**

- Sunlight resistant
- Hydrocarbon and Chemical resistant
- Oil resistant
- Temperature resistant
- Halogen free
- Low smoke
- Fire behaviour

**Product features**

A power cable is used for transmission of electrical power. They are typically composed up to five conductors for the following purposes:

- 3 cores for each phase (R, S, T)
- 1 core for neutral (N)
- 1 core for protection earth (PE)

Power Cables are designed and manufactured following well known international standards like EN 50288-7, IEC 60502-1, IEC 60092-353, CEI 20-20/3.

**Norm references / Approvals**

- **Hydrocarbon & Oil resistance:** CEI 20-34/0
- **Halogen acid gas:** IEC 60754-1 (max 20%) for PVC cables, IEC 60754-1 and 2 for LSZH cables
- **Fire behaviour:** IEC 60332-1-2 (flame retardant), IEC 60332-3-22 (Cat. A) (fire retardant), IEC 60331-21 (fire resistant)
- **Smoke:** IEC 61034-1 and 2

**Core identification code:**

**WITH PROTECTIVE CONDUCTOR:** according to HD 308 - 1 core green/yellow; 3 cores green/yellow, blue, brown; 4 cores green/yellow, brown, black, grey; 5 cores green/yellow, blue, brown, black, grey.

**WITHOUT PROTECTIVE CONDUCTOR:** according to HD 308 - 1 core black; 2 cores blue, brown - 3 cores brown, black, grey; 4 cores blue, brown, black, grey; 5 cores blue, brown, black, grey, black.

**Conductor stranding:**

Class 2 or Class 5 IEC 60228

Size up to 240 mm² multicore and 630 mm² single core

**Nominal Voltage Uo/U:**

600/1000 V

**Test voltage:**

C/C 3500 V x 5 minutes

**Temperature range:**

during operation: -30° to +70°C or -40 to +125°C depending on construction

during installation: -5° to +50°C available upon request constructions from -60 °C

**Minimum Bending Radius:**

8 x Outer Diameter not armoured cables
10 x Outer Diameter armoured cables
3 x Outer Diameter lead or AL/HDPE/PA & armoured cables
<table>
<thead>
<tr>
<th>CABLES</th>
<th>NOMENCLATURE</th>
<th>CORE INSULATION</th>
<th>CHEMICAL BARRIER</th>
<th>ARMOUR</th>
<th>REFERENCE NORMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>N07V-K</td>
<td>FR 450/750 V CEI 20-20 CEI UNEL 357513, CEI 20-22 II</td>
<td>PVC, Type R2</td>
<td>-</td>
<td>-</td>
<td>3), CEI 20-22 II</td>
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<tr>
<td>HD7V-K</td>
<td>FR 450/750 V CEI 20-20/3</td>
<td>PVC</td>
<td>-</td>
<td>-</td>
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<tr>
<td>H07V-R</td>
<td>RR 450/750 V CEI 20-20/3</td>
<td>PVC</td>
<td>-</td>
<td>-</td>
<td>3)</td>
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<tr>
<td>ÖLFLEX® POWER 106</td>
<td>RE40R 0,6/1 kV IEC 60502-1</td>
<td>XLPE</td>
<td>-</td>
<td>-</td>
<td>1), 3), 4), 5)</td>
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<tr>
<td>ÖLFLEX® POWER SWA 108</td>
<td>RE40FR 0,6/1 kV IEC 60502-1</td>
<td>XLPE</td>
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<td>Galvanized Steel Wire</td>
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<tr>
<td>ÖLFLEX® POWER 110</td>
<td>RROR 0,6/1 kV IEC 60502-1</td>
<td>PVC</td>
<td>-</td>
<td>-</td>
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<tr>
<td>ÖLFLEX® POWER SWA 111</td>
<td>RR0FR 0,6/1 kV IEC 60502-1</td>
<td>PVC</td>
<td>-</td>
<td>Galvanized Steel Wire</td>
<td>1), 3), 4), 5)</td>
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<tr>
<td>ÖLFLEX® POWER SWA LEAD 187</td>
<td>RE40RLFR 0,6/1 kV IEC 60502-1</td>
<td>XLPE</td>
<td>Lead sheath</td>
<td>Galvanized Steel Wire</td>
<td>1), 3), 4), 5)</td>
</tr>
<tr>
<td>ÖLFLEX® POWER SWA AL/HDPE/PA 188</td>
<td>RE40H5ER4FR 0,6/1 kV Gen. to IEC 60502-1, EN 50288-7</td>
<td>XLPE</td>
<td>AL/HDPE/PA</td>
<td>Galvanized Steel Wire</td>
<td>1), 3), 5)</td>
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<tr>
<td>ÖLFLEX® POWER 190 H</td>
<td>RG100M2 0,6/1 kV IEC 60092-353</td>
<td>XLPO</td>
<td>-</td>
<td>-</td>
<td>1), 3), 4), 7), 6)</td>
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<tr>
<td>ÖLFLEX® POWER SWB 191 H</td>
<td>RG100M2M2 0,6/1 kV IEC 60092-353</td>
<td>XLPO</td>
<td>-</td>
<td>Galvanized steel wire braid</td>
<td>1), 3), 4), 7), 6)</td>
</tr>
<tr>
<td>ÖLFLEX® POWER F90 192 H</td>
<td>RTG100M2 0,6/1 kV IEC 60092-353, 2)</td>
<td>XLPO, over MICA-tape wrapped conductor</td>
<td>-</td>
<td>-</td>
<td>1), 3), 4), 2), 7), 4)</td>
</tr>
<tr>
<td>ÖLFLEX® POWER SWB F90 193 H</td>
<td>RTG100MM2M2 0,6/1 kV IEC 60092-353, 2)</td>
<td>XLPO, over MICA-tape wrapped conductor</td>
<td>-</td>
<td>Galvanized steel wire braid</td>
<td>1), 3), 4), 2), 7), 4)</td>
</tr>
<tr>
<td>ÖLFLEX® POWER 204 H</td>
<td>RE40M1 0,6/1 kV IEC 60502-1</td>
<td>XLPE</td>
<td>-</td>
<td>Galvanized Steel Wire</td>
<td>1), 3), 4), 7), 6)</td>
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<tr>
<td>ÖLFLEX® POWER SWA 205 H</td>
<td>RE40FM1 0,6/1 kV IEC 60502-1</td>
<td>XLPE</td>
<td>-</td>
<td>Galvanized Steel Wire</td>
<td>1), 3), 4), 7), 6)</td>
</tr>
<tr>
<td>ÖLFLEX® POWER F90 304 H</td>
<td>RTE40M1 0,6/1 kV IEC 60502-1, 2)</td>
<td>XLPE, over MICA-tape wrapped conductor</td>
<td>-</td>
<td>-</td>
<td>1), 3), 4), 2), 7), 4)</td>
</tr>
<tr>
<td>ÖLFLEX® POWER SWA F90 306 H</td>
<td>RTE40FM1 0,6/1 kV IEC 60502-1, 2)</td>
<td>XLPE, over MICA-tape wrapped conductor</td>
<td>-</td>
<td>Galvanized Steel Wire</td>
<td>1), 3), 4), 2), 7), 4)</td>
</tr>
</tbody>
</table>

1. CEI 20-34/0  4. IEC 60332-3-22 (Cat. A)  7. IEC 61034-1 and 2
2. IEC 60331-21  5. IEC 60754-1 (max 20%)  8. IEC 60331-23 (90 min./750°C)
Benefits
- High mechanical protection against accidental impacts
- Excellent rodent protection
- Suitable for direct burial
- UV and water-resistant
- Protection against hydrocarbons and other chemicals (Lead or AL/HDPE/PA sheathed versions)

Application range
- Heavy industrial areas
- For indoor or outdoor use
- Methods of deployment: empty plastic pipes, ducts and trays

And for the LEAD or AL/HDPE/PA sheathed versions
- Harsh oil and chemical environments
- For direct burial, especially in the presence of oil and aggressive chemical substances

COPPER AND FIBER OPTIC

ETHERLINE® ARMOUR SWA CAT. 7
Lan cables with steel wire armouring (SWA)

UNITRONIC® ARMOUR SWA LEAD BUS PA
Cables for bus systems PROFIBUS® PA with extruded lead armouring for chemical protection

UNITRONIC® ARMOUR SWA AL/HDPE/PA BUS LD
Cable for bus systems RS485/RS422 with aluminum tape and additional HDPE and PA sheaths for water and chemical protection

HITRONIC® FIRE
Safety cable with central loose tube, LSZH inner and outer sheath, corrugated steel tape; halogen-free
<table>
<thead>
<tr>
<th>CABLES</th>
<th>NOMENCLATURE</th>
<th>CORE INSULATION</th>
<th>SCREEN</th>
<th>CHEMICAL BARRIER</th>
<th>ARMOUR</th>
<th>REFERENCE NORMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNITRONIC® BUS PA</td>
<td>PA = Process Automation Variant with UL/CSA CMG</td>
<td>foam - skin PE</td>
<td>TCWB</td>
<td>UPON REQUEST</td>
<td>UPON REQUEST</td>
<td>IEC 60332-1-2, IEC 61158-2</td>
</tr>
<tr>
<td>UNITRONIC® BUS LD</td>
<td>LD is a LAPP abbreviation for long distance</td>
<td>special PE</td>
<td>TCWB</td>
<td>UPON REQUEST</td>
<td>UPON REQUEST</td>
<td>IEC 60332-1-2</td>
</tr>
<tr>
<td>UNITRONIC® BUS PB</td>
<td>Lapp Kabel is a member of the PROFIBUS User Organisation (PNO) A for Advanced here: UL and CSA approvals</td>
<td>foam - skin PE</td>
<td>Aluminum/PET + TCWB</td>
<td>UPON REQUEST</td>
<td>UPON REQUEST</td>
<td>IEC 60332-1-2, DIN 19245, EN 50170</td>
</tr>
<tr>
<td>ETHERLINE® CAT.6A + CAT.7</td>
<td>Industrial Ethernet cable For PROFINET applications with 4 pairs Cat.6a and Cat.7 qualified for 10Gbit/s</td>
<td>foam - skin PE</td>
<td>Aluminum/PET + TCWB</td>
<td>UPON REQUEST</td>
<td>UPON REQUEST</td>
<td>IEC 60332-2-3-25, IEC 60754, EN 50173-3</td>
</tr>
<tr>
<td>HITRONIC® HUN UNIVERSAL CABLE</td>
<td>A/J-DQ(ZN)BH or U-DQ(ZN)BH Universal cable with central loose tube and non-metallic strain relief</td>
<td>LSZH outer sheath</td>
<td>-</td>
<td>UPON REQUEST</td>
<td></td>
<td>IEC 60754-1, Environmental and mechanical tests comply to EN 187000 and IEC 60794</td>
</tr>
<tr>
<td>HITRONIC® HQN OUTDOOR CABLE</td>
<td>A-DQ(ZN)B2Y Outdoor cable with central loose tube and non-metallic strain relief</td>
<td>PE outer sheath</td>
<td>-</td>
<td>UPON REQUEST</td>
<td>UPON REQUEST</td>
<td>IEC 60754-1, IEC 60332-1-1</td>
</tr>
<tr>
<td>HITRONIC® FIRE</td>
<td>A/J-DQ(ZN)BH(SR)H or U-DQ(ZN)BH(SR)H Fire-resistant cable designed according to IEC 60331-25 System integrity for at least 90 minutes in the event of fire</td>
<td>LSZH inner and outer sheaths</td>
<td>-</td>
<td>UPON REQUEST</td>
<td></td>
<td>IEC 60754-1, IEC 60332-2, EC 60331-25, IEC 60332-1-1</td>
</tr>
</tbody>
</table>

1. CEI 20-34/0  
2. IEC 60331-21  
3. IEC 60332-1-2  
4. IEC 60332-3-22 (Cat. A)  
5. IEC 60754-1 (max 20%)  
6. IEC 60754-1 and 2  
7. IEC 61034-1 and 2  
8. IEC 60331-23 (90 min./750°C)  
9. NF M 87-202
Extreme Series Cables
Camuna Cavi solutions for extreme environments

MUD
NEK TS 606:2016
Mud resistance

Instrumentation, Control & LV Power cables jacketed with LSZH Compound Type SHF2 IEC 60092-360, it is particularly suggested for applications in harsh environments, where superior performances as for contact with organic fluids are required:

- Resistance to Oils IRM 902 and 903 for 7 days @ 100°C
- Resistance to Calcium Bromide for 56 days @ 70°C

Additional requirement NEK TS 606 2016 version
- Resistance to Oil EDC 95-11 for 56 days @ 70°C

GAS TIGHT
IEC 60079-14 ANNEX E
Restricted breathing cables

The new Gas Tight Instrumentation, Control & LV Power cables designed for and installed in explosive atmospheres and hazardous locations. It prevents gas and vapor migration through the interstices between individual cable cores. Camuna Cavi can provide in-house testing solution and test report Certificate of our “gas tight” multi-conductors, multi-pairs and multi-triads cables according to IEC standard Annex E.
**DESER T**
ISO 4892-2
Weathering resistance

**Cable Features & Applications**
Instrumentation, Control & LV Power cables are in compliance with the Weathering test mentioned in ISO 4892-2 (720 h @ method A)
Strong jacket suitable for installation in desert locations having good performance of Tear resistance as per BS 6469 section 99.1.
Reproduction of the weathering effects (temperature, humidity and/or wetting) that occur when materials are exposed in actual end-use environments to daylight.
Severe field test performance simulation with SWA armored cables bended below the typical bending radius carried out in desert locations.

**POLAR**
IEC 60811 Cold bend, impact and elongation down to –60 °C

**Cable Features & Applications**
The new Polar grade Instrumentation, Control & LV Power cables meet the requirements to operate in extremely cold climate conditions like Arctic regions.
Cold bending test as per IEC 60811-504@-60°C
Cold elongation test as per IEC 60811-505@-60°C
Cold impact test as per IEC 60811-506@-60°C
The Construction Products Regulation “CPR”

With effect from 1st July 2017 it is obligatory for cables, having an intended use for permanent installation in buildings and construction works into the EU, to be accompanied by a Declaration of Performance (DoP) and to have CE marking under the CPR. This requirement relates only to the Reaction to Fire performance of the cables. All types of cable (copper and fibre, shielded and unshielded) are covered except to cables having Resistance to Fire, meaning retention of functionality during a fire, that are not covered by the requirement now being introduced (today covered by IEC60331). They are scheduled to be covered at an, as yet, unknown date in the future. The classification splits cables into 7 classes in respect of their reaction to fire. They range from Class Aca, being essentially non-combustible, through to class Fca, which is for cables having no measurable resistance to the spread of flames. National regulations prescribe specific classes based on environment and installation rules and they can differ from country to country.

Low-smoke, zero-halogen (LSZH) cables were built to meet three IEC standards: IEC60332 for flame spread, IEC60754 for smoke acidity and IEC61034 for Smoke emission. CPR applies new criteria and testing procedures to promote a more harmonized standard describing cable fire performance.

### The 7 CPR EuroClasses are:

<table>
<thead>
<tr>
<th>Class</th>
<th>Test method</th>
<th>Classification criteria</th>
<th>Additional Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aca</td>
<td>EN ISO 1716</td>
<td>PCS ≤ 2.0 MJ/kg</td>
<td></td>
</tr>
<tr>
<td>B1ca</td>
<td>EN 50399 30 kW Burner Special assembly, EN 60332-1-2</td>
<td>FS ≤ 1.75 m; HR1200s ≤ 10 MJ; HRR max. ≤ 20 kW; FIGRA ≤ 120 W/s; H ≤ 425 mm</td>
<td>Smoke production (s) Flaming droplets (d) Acidity (a)</td>
</tr>
<tr>
<td>B2ca</td>
<td>EN 50399 20.5 kW Burner, EN 60332-1-2</td>
<td>FS ≤ 1.5 m; THR1200s ≤ 15 MJ; HRR max. ≤ 30 kW; FIGRA ≤ 150 W/s</td>
<td>Smoke production (s) Flaming droplets (d) Acidity (a)</td>
</tr>
<tr>
<td>Cca</td>
<td>EN 50399 20.5 kW Burner, EN 60332-1-2</td>
<td>FS ≤ 2.0 m; THR1200s ≤ 30 MJ; HRR max. ≤ 60 kW; FIGRA ≤ 300 W/s; H ≤ 425 mm</td>
<td>Smoke production (s) Flaming droplets (d) Acidity (a)</td>
</tr>
<tr>
<td>Dca</td>
<td>EN 50399 20.5 kW Burner, EN 60332-1-2</td>
<td>THR1200s ≤ 70 MJ; HRR max. ≤ 400 kW; FIGRA ≤ 1300 W/s</td>
<td>Smoke production (s) Flaming droplets (d) Acidity (a)</td>
</tr>
<tr>
<td>Eca</td>
<td>EN 60332-1-2</td>
<td>H ≤ 425 mm</td>
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<td></td>
<td></td>
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</tbody>
</table>

### Classification parameters:
- **PCS**: Gross Heat of Combustion
- **FS**: Flame Spread (test EN 50399)
- **THR1200S**: Total Heat Release
- **Peak HRR**: Peak of Heat Release Rate
- **FIGRA**: Fire Growth Rate Index
- **H**: Flame Spread (test EN 60332-1-2)

**Smoke opacity classification**: this classification provides information about the opacity of the emitted smoke (s: smoke).
- s1: TSP1200s ≤ 50 m² and peak SPR ≤ 0.25 m²/s;
- s1a: s1 and transmittance according to EN 61034-2 ≥ 80% ;
- s2: TSP1200s ≤ 400 m² and peak SPR ≤ 1.5 m²/s;
- s3: neither s1 nor s2.

**Flaming droplets classification**: this classification provides information about the dripping of burning material during the fire (d: droplet).
- d0: no burning droplets or particles;
- d1: No burning droplets or particles that last more than 10 seconds;
- d2: neither d0 nor d1.

**Acidity classification**: this classification provides information about the emission of acid gases during the fire (a: acidity).
- a1: Conductivity < 2.5 µS/mm, pH > 4.3;
- a2: Conductivity < 10 µS/mm, pH > 4.3;
- a3: neither a1 nor a2.
Cables manufactured by Camuna Cavi can be certified on request under one of the classes from Fca to B2ca.
Camuna Cavi has already been approved after FPC (Factory Production Control) as required by CPR EU 35/2011 procedures.

As a general information we have seen that trend for future regulation (or de-facto practices) seems to be (with varying levels for smoke, acidity and droplets):
- **Euroclass B2ca - s1a, d1, a1**: for areas with high fire risks, typically underground railways, tunnels, airports, etc.
- **Euroclass Cca - s1b, d1, a1**: for areas with medium fire risks, such as public buildings, hotels, schools, escape routes
- **Euroclass Eca**: for areas with medium or low fire risks, such as residential or standard industrial premises

Instrumentation and control cables by Camuna Cavi Srl will be in general covered by Euroclass Cca - s1b, d1, a1 (to be read as: Cca for areas with high fire risks, s1b smoke opacity transmittance >60% and <80%, d1 No burning droplets or particles that last more than 10 seconds, a1 smoke acidity conductivity < 2.5 µS/mm pH > 4.3). Other Euroclasses will be available on request.
The primary purpose of armor is to protect the cable against mechanical damage during installation and operation. The most common armor designs with their most important features are the following:

**Armor of galvanized round steel wires**
Armor with good mechanical protection, suitable for tensile loads. It allows a good cable flexibility; the coverage degree is up to 90%. It is possible to add a counterspiral in galvanized steel tape for a better mechanical protection.

**Armour of galvanized steel tapes**
Dual helicoid armor with overlap. Excellent protection against shocks, compression and rodents, but not suitable for tensile loads. It imparts the best protection from electromagnetic fields with compared to other armors.

**lead sheath**
The safest, though most expensive protection against aggressive chemicals. It increase weight and bending radius of the cable. Normally and additional armoring is required to protect it from crushing.

**Armour of galvanized steel wire braid**
Lightweight armor to withstand tensile loads; permits the smallest bending radius of all armor designs. A coverage of at least 80% and a wire diameter of 0.3 mm are recommended to achieve sufficient mechanical protection.

**Multilayer AL/HDPE/PA sheath**
Same as lead protection against aromatic hydrocarbons and aggressive chemicals. This design combining aluminum tape and high-density polyethylene HDPE sheath with a covering of polyamide PA (Nylon), represents an excellent barrier against penetrating chemicals, corrosion and humidity. It can be used as an alternative to lead sheath. Advantage: lighter, smaller diameter, environment protection.
# Common Test Methods for Cables under Fire Conditions

## Reaction to Fire - IEC Standards

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 60332</td>
<td>Tests on electric and optical cables under fire conditions</td>
</tr>
<tr>
<td>-1-1</td>
<td>Test on a single vertical insulated wire or cable, Apparatus</td>
</tr>
<tr>
<td>-1-2</td>
<td>Test on a single vertical insulated wire or cable, Procedure</td>
</tr>
<tr>
<td>-1-3</td>
<td>Test on a single vertical insulated wire or cable, Procedure for determination of flaming droplets/particles</td>
</tr>
<tr>
<td>IEC 60332</td>
<td>Tests on electric cables under fire conditions</td>
</tr>
<tr>
<td>-2-1</td>
<td>Test on a single vertical insulated wire or cable - Apparatus</td>
</tr>
<tr>
<td>-2-2</td>
<td>Test on a single vertical insulated wire or cable - Procedure</td>
</tr>
<tr>
<td>IEC 60332-3</td>
<td>Tests on bunched wires or cables</td>
</tr>
<tr>
<td>-10</td>
<td>Apparatus</td>
</tr>
<tr>
<td>-21</td>
<td>Procedures Category A F/R</td>
</tr>
<tr>
<td>-22</td>
<td>Procedures Category A</td>
</tr>
<tr>
<td>-23</td>
<td>Procedures Category B</td>
</tr>
<tr>
<td>-24</td>
<td>Procedures Category C</td>
</tr>
<tr>
<td>-25</td>
<td>Procedures - small cables</td>
</tr>
<tr>
<td>IEC 60754</td>
<td>Tests on gases evolved during combustion of materials from cables</td>
</tr>
<tr>
<td>-1</td>
<td>Determination of amount of halogen acid gas</td>
</tr>
<tr>
<td>-2</td>
<td>Determination of degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and conductivity</td>
</tr>
<tr>
<td>IEC 61034</td>
<td>Measurement of smoke density of cables burning under defined conditions</td>
</tr>
<tr>
<td>-1</td>
<td>Test apparatus</td>
</tr>
<tr>
<td>-2</td>
<td>Test procedure and requirements</td>
</tr>
</tbody>
</table>

## Reaction to Fire - IEC Standards

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 60331</td>
<td>Tests for electric cables under fire conditions, Circuit Integrity</td>
</tr>
<tr>
<td>-11</td>
<td>Apparatus, Fire alone at temperature of at least 750°C</td>
</tr>
<tr>
<td>-21</td>
<td>Procedures and requirements, Cables of rated voltage up to and including 0,6/1 kV Procedures Category A</td>
</tr>
<tr>
<td>-22</td>
<td>Procedures and requirements, Cables of rated voltage greater than 1 kV (under consideration)</td>
</tr>
<tr>
<td>-23</td>
<td>Proc. and requirements, Electric data cables</td>
</tr>
<tr>
<td>-25</td>
<td>Proc. and requirements, Optical fibres cables</td>
</tr>
</tbody>
</table>
**Our global corporate network**

### America
- **Brazil**
  - Cabos Lapp Brasil LTDA.
- **Canada**
  - Lapp Canada Inc.
- **Mexico**
  - Lapp Mexico S de RL de CV
- **Panama**
  - Lapp Cable Works Inc.
  - Lapp Tannenhill Inc.
  - Phoenix Wire & Cable Inc.
- **USA**
  - Lapp Cable Works Inc.
  - Lapp Tannenhill Inc.
  - Phoenix Wire & Cable Inc.

### Europe
- **Austria**
  - Lapp Austria GmbH
- **Benelux**
  - Lapp Benelux B.V.
- **Czech Republic**
  - Lapp Kabel s.r.o.
- **Denmark**
  - Lapp Miltronic AB
  - Lapp Connecto A/S
- **Estonia**
  - Lapp Miltronic SIA
- **Finland**
  - Lapp Automaatio Oy
  - Lapp Connecto Oy
- **France**
  - Lapp France S.A.R.L.
- **Germany**
  - U.I. Lapp GmbH
  - Lapp GmbH Kabelwerke
  - Lapp Systems GmbH
  - Contact GmbH Elektrische Bauelemente
- **Great Britain**
  - Lapp Limited
- **Hungary**
  - Lapp Hungária Kft.
- **Ireland**
  - Lapp Limited Ireland
- **Italy**
  - Lapp Italia s.r.l.
  - Camuna Cavi s.r.l.
  - Ceam Cavi Speciali S.r.l.
  - Lapp Sistemi Italia s.r.l.
- **Latvia**
  - Lapp Miltronic SIA
- **Lithuania**
  - Lapp Miltronic UAB
- **Norway**
  - Miltronic AS
- **Poland**
  - Lapp Kabel Sp. z o.o
  - Lapp Connecto Polska Sp. z o.o.
- **Portugal**
  - Policabos - Soluções Técnicas De Condutores, S.A.

### Asia
- **China**
  - Lapp Kabel Shanghai Co. Ltd.
  - Shanghai Co. Ltd. India
- **India**
  - Lapp Kabel Shanghai Co. Ltd.
- **Indonesia**
  - JJ-Lapp Cable (I) SMI
- **Japan**
  - Lapp Japan K.K.
- **Kazakhstan**
  - Lapp Kazakhstan LLP
- **Malaysia**
  - JJ-Lapp Cable (M) Sdn Bhd
- **Philippines**
  - JJ-Lapp Cable (P) Inc.
- **Russia**
  - Lapp Russia OOO
- **Singapore**
  - JJ-Lapp Cable (S) Pte. Ltd.
  - Lapp Logistics Pte. Ltd.
- **South Korea**
  - Lapp Korea LLC.
- **Thailand**
  - JJ-Lapp Cable (T) Ltd.
- **United Arab Emirates**
  - LAPP Cables Middle East FZE
- **Vietnam**
  - JJ-Lapp Cable (V) Ltd.

### Africa
- **South Africa**
  - Lapp Southern Africa (PTY) Ltd.

### Australia
- **Australia**
  - LAPP Australia Pty Ltd

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