Marine and underwater cable solutions
“A range of customized cables for the marine and underwater environment”

This catalogue contains a sample range of the 60000 LAPP MULLER special cables designed and manufactured over the last 10 years.

LAPP MULLER has successfully worked with many Coastal and Deep-sea engineering companies as well as Oceanographical Research Institutes and O.E.M. providers of equipment to the offshore gas and oil industry.

Providing both composite electrical and optical cables for many applications such as ROVs (Remote Operated Vehicles), seabed vehicle umbilicals to ship and submarine borne types for the French Navy, with their relevant specifications. These cables can be supplied as complete systems terminated with any preferred style of connector from galvanised, stainless steel to titanium types as either rigid or flexible assemblies dependent on customer specifications.
LAPP MULLER provides different types of cables such as: power, control, signal, fibre optics, strength member, etc. Those cables are watertight and super flexible cables with floating capabilities or with neutral buoyancy to control ROV, trenching and burying machine, plough, submarine working machine (welding, cutting, ...). They can be fitted with customized terminations, connectors and other equipments.
• UNDERWATER MACHINE CABLES

- ROV Theters and Main ROV Cables............................................................p.6-7
- Offshore Umbilicals....................................................................................p.8-9
- Seabed Vehicle Cables................................................................................p.10
- Underwater Vehicle Static Cables...............................................................p.11
HEAVY ROV THETERS
Extra flexible and watertight cable, with strengthening member, including power, control, signal and video.

REF 32629 ROV CABLE WITH COAXIAL AND FIBRE CORE STRENGTH MEMBER
Applications: Linking ship and ROV

Cable make up
Aramid fibre central strength member
2 conductors 0.25 mm², in extra flexible tinned copper, insulated in polyester elastomer
6 conductors 1.5 mm², in extra flexible plain copper, insulated in polyester elastomer
1 pair of conductors 0.15 mm², in flexible tinned copper, insulated in polyester elastomer
pair shielded by a tinned copper spinning
1 coaxial cable 75 Ω
Polyurethane outer sheath

General characteristics
Conductors operating voltage: 250 Volts
Linear resistance:
Conductors 1.5 mm² ≤ 14 Ω/km
Conductors 0.25 mm² ≤ 84.5 Ω/km
Conductors 0.15 mm² ≤ 148.1 Ω/km
Coaxial cable
Characteristic impedance: 75 ± 7 Ω
Capacitance ≤ 0.05 dB/m
Attenuation at 10MHz ≤ 0.05 dB/m
Operating temperature: -30 to +80°C
Strength member breaking load: 200 daN
Static bending radius ≥ 55 mm
Dynamic bending radius ≥ 110 mm
Weight: 0.22 kg/m

REF 37256 ROV CABLE WITH COAXIAL AND OVERALL SHIELDED
Applications: Linking ship and ROV

Cable make up
2 pairs of conductors 0.75 mm², in extra flexible tinned copper, insulated in polyester elastomer,
pairs shielded by a tinned copper spinning
2 quads of conductors 0.25 mm², in extra flexible tinned copper, insulated in polyester elastomer,
quad shielded by a tinned copper spinning
3 coaxial cables 75 Ω
Stranding with watertightness compound
Overall shielding by a tinned copper spinning
Polyurethane outer sheath

General characteristics
Conductors operating voltage: 250 Volts
Linear resistance:
Conductors 0.25 mm² ≤ 85.3 Ω/km
Conductors 0.75 mm² ≤ 29.4 Ω/km
Coaxial cable
Characteristic impedance: 75Ω
Capacitance: 81 pF/m
Attenuation at 200 Mhz: 0.22 dB/m
Operating temperature: -30 to +80°C
Static bending radius ≥ 70 mm
Dynamic bending radius ≥ 140 mm
Weight: 0.2 kg/m

Other constructions and dimensions, please contact us.
Tel +33(0) 4 94 56 65 00
Fax +33(0) 4 94 43 38 16
e-mail: contact@mullercables.com

metric: «LAPP MULLER» - SHIELDED ROV CABLE - REF 37256 - OF
FLOATING ROV THETERS
Extra flexible floating cable, including power, control, signal and fibre optic.

REF 50899 ROV CABLE WITH FIBRE OPTIC AND FIBRE BRAIDED STRENGTH MEMBER
Applications: Linking ship and bomb disposal ROV

Cable make up
1 conductor 0.22 mm², in flexible plain copper, insulated in special polyolefine
3 conductors 0.93 mm², in flexible tinned copper, insulated in special polyolefine
3 singlemode 9/125 optical fibres, tight-buffered
Special polyolefine inner sheath
Special fibre strength member
Special polyolefine outer sheath

Outer diameter: 15 mm maximum

General characteristics
Operating voltage:
- 0.93 mm² conductors: 2400 Volts
- 0.22 mm² conductors: 100 Volts
Linear resistance:
- Conductors 0.93 mm² ≤ 22.7 Ω/km
- Conductors 0.22 mm² ≤ 91.7 Ω/km

Singlemode optical fibres:
- Attenuation at 1310 nm: 0.40 dB/km
- Attenuation at 1550 nm: 0.25 dB/km

Strength member breaking load: 2300 daN
Operating temperature: -10 to +70 °C
Dynamic bending radius: ≥ 250 mm
Linear weight in seawater (d: 1.026): 4g/m
Density: 0.98

REF 51332 ROV CABLE WITH FIBRE OPTIC, OVERALL SHIELDED AND FIBRE BRAIDED STRENGTH MEMBER
Applications: Linking ship and mine clearance ROV

Cable make up
3 conductors 0.6 mm², in flexible special alloy, insulated in special polyolefine
2 pairs of conductors 0.34 mm², in flexible special alloy, insulated in special polyolefine, pairs sheathed with special polyolefine
2 multimode 62.5/125 optical fibres in loose tube
Stranding with watertightness compound
Overall shielding by aluminum/polyester tape and drain wire
Special fibre strength member
Special polyolefine outer sheath

Outer diameter: 14 ± 0.5 mm

General characteristics
0.6 mm² conductors operating voltage: 1500 Volts
Linear resistance:
- Conductors 0.6 mm² ≤ 48 Ω/km
- Conductors 0.34 mm² ≤ 84 Ω/km

Multimode optical fibres:
- Attenuation at 1300 nm: 1.1 dB/km

Strength member breaking load: 1000 daN
Operating temperature: -30 to +80 °C
Dynamic bending radius: ≥ 170 mm
Density in seawater (d: 1.026): 0.92

Other constructions and dimensions, please contact us.
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e-mail: contact@mullercables.com
**UMBILICALS**

Umbilical cables for fixed installations and mobile underwater machines.

**REF 58361 UMBILICAL** WITH HYDRAULIC HOSES, VIDEO, AND FIBRE BRAIDED STRENGTH MEMBER

Applications: Underwater welding machine

**metric : « LAPP MULLER » - UMBILICAL - REF 58361 - OF**

**Cable make up**

- 2 hoses 1/2" SAE100R8
- 4 quads of conductors 2.5 mm², insulated in polyester elastomer, quads shielded by a tinned copper braid, under a polyurethane sheath
- Polyurethane inner sheath
- Aramid fibre braid
- Polyurethane outer sheath

**General characteristics**

- Conductor operating voltage: 0.6/1 kVolts
- Conductors linear resistance ≤ 9.6 Ω/km
- Hoses operating pressure: 240 bars
- Theoretical breaking strength: 18000 daN
- Operating temperature: -15 to +40 °C
- Static bending radius ≥ 550 mm
- Dynamic bending radius ≥ 1000 mm
- Weight: 3.22 kg/m

**REF 45981 UMBILICAL** WITH HYDRAULIC HOSES AND FIBRE BRAIDED STRENGTH MEMBER

Applications: Valves controlled by high pressure fluid

**metric : « LAPP MULLER » - UMBILICAL - REF 45981 - OF**

**Cable make up**

- 2 hoses 1/2" KX4 50 Ω
- 1 coaxial cable type KX4 50 Ω
- 1 coaxial cable type KX8 75 Ω
- 2 conductors 16 mm², insulated in polyester elastomer
- 14 pairs of conductors 1.5 mm², insulated in polyester elastomer, pairs shielded by a tinned copper spinning, under a polyester elastomer sheath
- 28 conductors 1.5 mm², insulated in polyester elastomer, conductors stranded in layers, under a polyurethane sheath
- Polyurethane inner sheath
- Aramid fibre braid
- Polyurethane outer sheath

**General characteristics**

- Conductors operating voltage:
  - 1.5 mm²: 250 Volts
  - 16 mm²: 1000 Volts
- Linear resistance:
  - Conductors 1.5 mm² ≤ 15 Ω/km
  - Conductors 16 mm² ≤ 1.35 Ω/km
- Coaxial cable type KX4:
  - Characteristic impedance: 50 ± 2 Ω
  - Capacitance ≤ 100 pF/m
- Coaxial cable type KX8:
  - Characteristic impedance: 75 ± 3 Ω
  - Capacitance ≤ 67 pF/m
- Theoretical breaking strength: 18000 daN
- Hoses operating pressure: 190 Bars
- Operating temperature: 0 to +80 °C
- Static bending radius ≥ 560 mm
- Dynamic bending radius ≥ 900 mm
- Weight: 5.15 kg/m

Other constructions and dimensions, please contact us.
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UMBILICALS

Umbilical cables for the control of underwater valves

REF 56769 UMBILICAL WITH HYDRAULIC HOSES, SIGNAL, POWER AND FIBRE BRAIDED STRENGTH MEMBER
Applications: Oil or gas control valves

Cable make up
- 12 hoses 3/8"
- 12 pairs of conductors 1 mm², in extra flexible plain copper, insulated in polyester elastomer, pairs strand shielded by a tinned copper braid, under a polyurethane sheath
- 4 conductors 1.5 mm², in extra flexible plain copper, insulated in polyester elastomer, 10 pairs of conductors 1 mm², in extra flexible plain copper, insulated in polyester elastomer, pairs shielded by aluminium/polyester tape and drain wire, conductors 1.5 mm² and shielded pairs 1 mm² stranded under a polyurethane sheath
- Polyurethane inner sheath
- Aramid fibre braid
- Polyurethane outer sheath

General characteristics
- Conductors operating voltage: 600 Volts
- Linear resistance:
  - Conductors 1 mm² ≤ 21.5 Ω/km
  - Conductors 1.5 mm² ≤ 14.6 Ω/km
- Theoretical breaking strength: 9000 daN
- Operating temperature: -10°C to +70°C
- Bending radius ≥ 830 mm
- Weight: 5.36 kg/m

REF 57330 UMBILICAL HYDRAULIC HOSES AND FIBRE BRAIDED STRENGTH MEMBER
Applications: Oil or gas control valves

Cable make up
- 8 hoses 1/2” SAE100R8
- Copper fillers ballast
- Polyurethane inner sheath
- Aramid fibre braid
- Polyurethane outer sheath

General characteristics
- Theoretical breaking strength: 9000 daN
- Operating temperature: -10°C to +70°C
- Static bending radius ≥ 675 mm
- Dynamic bending radius ≥ 1250 mm
- Operating pressure: 240 bars

Outer diameter: 83.5 ± 2 mm

Other constructions and dimensions, please contact us.
Tel +33(0) 4 94 56 65 00
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Flexible and tight cables with strength member for various underwater tasks.

**REF 37640 CABLE** WITH POWER, SIGNAL, CONTROL WITH FIBRE OPTIC AND FIBRE BRAIDED STRENGTH MEMBER

**Applications**: Trenching and burying tracted machine

**Cable make up**

- 12 multimode 62.5/125 optical fibres, in 6 loose tubes stranded under a polyurethane sheath
- 4 pairs of conductors 0.22 mm², in flexible tinned copper, insulated in XLPE, pairs shielded by aluminum/polyester tape and drain wire, under a XLPE sheath
- 6 triplets of conductors 1 mm², in extra flexible plain copper, insulated in polyester elastomer
- 17 conductors 25 mm², in flexible plain copper, insulated in XLPE
- Stranding with watertightness compound
- Aramid fibre contra-helical double layer strength member
- Polyurethane outer sheath

**Outer diameter**: 76 ± 1 mm

**General characteristics**

- **Operating voltage**: Conductors 0.22 mm²: 250 Volts
  Conductors 1 mm²: 1 kVolts
  Conductors 25 mm²: 3 kVolts
- **Linear resistance**: Conductors 0.22 mm² ≤ 93.3 Ω/km
  Conductors 1 mm² ≤ 23.4 Ω/km
  Conductors 25 mm² ≤ 0.819 Ω/km
- **Theoretical breaking strength**: 60 000 daN
- **Operating temperature**: -10°C to +70°C
- **Bending radius**: ≥ 1000 mm
- **Weight in air**: 8.5 kg/m
  **Weight in seawater**: 3.6 kg/m

**REF 43330 FLOATING CABLE** WITH POWER, SIGNAL, CONTROL, FIBRE OPTIC AND FIBRE BRAIDED STRENGTH MEMBER

**Applications**: Burying tracted Plough

**Cable make up**

- 8 singlemode 9/125 optical fibres in loose tubes, tubes stranded under a polyolefine sheath
- 11 conductors 1.2 mm², in flexible plain copper, insulated in special polyolefine
- 3 conductors 1.2 mm² in flexible plain copper
- Aluminum tape armoring
- Polyolefine inner sheath
- Fibre braid strength member
- Polyolefine outer sheath

**Outer diameter**: 42 ± 0.5 mm

**General characteristics**

- **Conductors operating voltage**: 3000 Volts
- **Singlemode optical fibres**: Attenuation at 1285-1330 nm: 0.36 to 0.40 dB/km
  Attenuation at 1550 nm: 0.22 to 0.30 dB/km
- **Theoretical breaking strength**: 15 000 daN
- **Operating temperature**: -10 to 70 °C
- **Dynamic bending radius**: ≥ 600 mm
- **Weight in air**: 1306 g/m
  **Weight in seawater (cable’s interstices filled with oil-density: 0.887)**: -30 g/m

Other constructions and dimensions, please contact us.
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Static cables for equipment of machines and underwater robots for captor, sensor, video, equipped arm, etc...

**REF 59986 UNDERWATER SHIELDED POWER CABLE**

Applications: Cable for underwater projectors

Cable make up

3 conductors 1 mm², in flexible tinned copper, insulated in XLPE
Overall shield by aluminum/polyester tape and drain wire
Polyurethane outer sheath

Outer diameter: 8.5 ± 0.4 mm

General characteristics

Conductors operating voltage: 1000 Volts
Conductors linear resistance ≤ 20 Ω/km
Operating temperature: -20 to +70°C
Static bending radius ≥ 65 mm
Flame retardant according to IEC 332-1
Weight: 0.11 kg/m

**REF 55753 WATERTIGHT, POWER, SIGNAL, VIDEO CABLE**

Applications: Cable for sensor, video and projectors

Cable make up

1 coaxial cable 75 Ω
2 pairs of conductors 0.34 mm², in extra flexible tinned copper, insulated in polyester elastomer, pairs shielded by aluminum/polyester tape and drain wire
2 conductors 1 mm², in extra flexible plain copper, insulated in polyester elastomer
Polyurethane outer sheath

Outer diameter: 9 mm Maxi

General characteristics

Operating voltage:
- Conductors 1 mm²: 600 Volts
- Conductors 0.34 mm²: 250 Volts
Linear resistance:
- Conductors 1 mm² ≤ 21 Ω/km
- Conductors 0.34 mm² ≤ 63 Ω/km
Coaxial cable:
- Characteristic impedance: 75 ± 7 Ω
- Capacitance: 80 pF/m
Operating temperature:
- -20 to +80 °C
- Static bending radius ≥ 45 mm
- Dynamic bending radius ≥ 90 mm
Weight in air: 0.11 kg/m
Weight in seawater: 0.045 kg/m

Other constructions and dimensions, please contact us.
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e-mail: contact@mullercables.com
“A complete range of cables for measurement systems”

These cables are intended for detection, instrumentation, sonar, acoustic, security, oceanography, environment analysis. They are multifunction (power, signal, control, fibre optic) great depth watertight (6000m or 20000 ft), reinforced, high tensile strength, armoured, according to the request.
DETECTION AND INSTRUMENTATION CABLES

Submarine Detection Cables ................................................................. p.14

Inboard Sonar Cables ........................................................................ p.15

Oceanographic and Seismic Cables .................................................. p.16

Instrumentation and Sonar Buoy Cables .......................................... p.17
DETECTION SYSTEM

Special cables, watertight, manufactured with long lifespan materials for security and monitoring systems with magnetic or acoustic detection.

REF 56427 UNDERWATER CABLE WATERTIGHT AND SHIELDED
Application: Magnetic detection system

Cable make up

4 triplets type KU 06-16
triplets of conductors 1.34 mm², in flexible tinned copper, insulated in ETFE
triplets shielded by tinned copper braid, sheathed in ETFE
Polyethylene inner sheath
Stainless steel braid armoring with watertightness compound
Polyethylene outer sheath

General characteristics

Conductors operating voltage: 600 Volts
Conductors linear resistance ≤ 15 Ω/km
Cable with good crushing resistance
Theoretical breaking strength: 1500 daN
Operating temperature: -20 to +70 °C
Static bending radius ≥ 300 mm
Weight: 0.83 kg/m

REF 50108 UNDERWATER CABLE REINFORCED AND STEEL-ARMOURED
Application: Acoustic detection system

Cable make up

3 conductors 0.6 mm², in flexible plain copper, insulated in polyethylene
2 conductors 1 mm², in flexible plain copper, insulated in polyethylene
1 conductor 4 mm², in flexible plain copper, insulated in polypropylene
Stranding with watertightness compound
Overall shield by copper braid
HDPE inner sheath
Galvanized steel wires armoring
Polyurethane outer sheath

General characteristics

Operating voltage:
Conductors 0.6 mm²: 1000 Volts
Conductors 1 mm²: 500 Volts
Conductors 4 mm²: 500 Volts
Linear resistance:
Conductors 0.6 mm² ≤ 36 Ω/km
Conductors 1 mm² ≤ 21 Ω/km
Conductors 4 mm² ≤ 5.5 Ω/km
Theoretical breaking strength: 8900 daN
Operating temperature: -20 to +80 °C
Static bending radius ≥ 280 mm
Dynamic bending radius ≥ 560 mm
Weight in air: 1.28 kg/m
Weight in seawater: 0.65 kg/m

Other constructions and dimensions, please contact us.
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E-mail: contact@mullercables.com
Inboard ship sonar system cables, shielded and manufactured with high insulation resistance.

**REF 6050 PLATED COPPER COAXIAL**
Application: Inboard ship sonar connection

**Cable make up**
- Tinned copper conductor
- Insulated in FEP
- Tinned copper braid
- Rubberized tape
- Neoprene outer sheath

**General characteristics**
- Coaxial cable type DSM 40-01
- Operating voltage: 4.5 kV (peak)
- Insulation resistance / 500 V > 1000 MΩ.km
- Capacitance < 125 pF/m
- Impedance at 20 to 50 MHz: 40 Ω
- Attenuation at 20 MHz: 6.05 dB/100m
- Attenuation at 30 MHz: 7.45 dB/100m
- Attenuation at 50 MHz: 9.95 dB/100m
- Weight: 0.15 kg/m

**REF 57942 SHIELDED MULTIPAIRS DYNAMIC CABLE**
Application: Inboard ship sonar connection

**Cable make up**
- 28 pairs of conductors 0.34 mm²,
- in extra flexible tinned copper,
- insulated in polyester elastomer,
- pairs shielded by tinned copper spinning,
- sheathed in polyester elastomer
- Overall shield by tinned copper braid
- Polyurethane outer sheath

**General characteristics**
- Conductors operating voltage: 600 Volts
- Conductors linear resistance ≤ 62.8 Ω/km
- Characteristic impedance between 2 conductors: 40 ± 5 Ω
- Capacitance between 2 conductors ≤ 180 pF/m
- Operating temperature: -30 to +70 °C
- Static bending diameter ≥ 100 mm
- Dynamic bending diameter ≥ 160 mm
- Weight: 740 g/m

Other constructions and dimensions,
Please contact us.
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e-mail: contact@mullercables.com
Electrical and fibre optic cables with strength member reinforced for electromagnetic and optic detection instruments (radio-telescope, seismograph...).

REF 50580 ELECTRO OPTIC CABLE REINFORCED, WATERTIGHT AND FIBRE BRAIDED STRENGTH MEMBER

Application: Connection for optical amplifiers of underwater radiotelescope (-2500m)

Cable make up

- 21 singlemode 9/125 optical fibres in stainless steel loose tube (7 fibres per tube)
- 9 conductors 1 mm², in flexible plain copper, insulated in XLPE
- Stranding with silicone compound
- Polyethylene inner sheath
- Aramid fibre braid
- Polyurethane outer sheath

Outer diameter: 30 ± 0.5 mm

General characteristics

- Conductors operating voltage: 600 Volts
- Conductors linear resistance ≤ 22 Ω/km
- Optical fibres:
  - Attenuation between 1285 and 1330 nm ≤ 0.6 dB/km
  - Attenuation at 1550 nm ≤ 0.4 dB/km
- Fibres proof test: 200 kpsi
- Theoretical breaking load ≥ 18 000 daN
- Pressure rating: 260 bars
- Operating temperature: -10 to +60 °C
- Static bending radius ≥ 300 mm
- Weight in air: 0.83 kg/m
- Weight in seawater: 0.104 kg/m

REF 39465 POWER/SIGNAL CABLE, REINFORCED, WATERTIGHT AND FIBRE BRAIDED STRENGTH MEMBER

Application: Detection line for seismic instrumentation (-2000m)

Cable make up

- 2 pairs of conductors 0.22 mm², in flexible tinned copper, insulated in polypropylene, pairs shielded by aluminum/polyester tape and drain wire, sheathed in PVC
- 1 pair of conductors 1.5 mm², in extra flexible plain copper, insulated in polyester elastomer, pair shielded by aluminum/polyester tape and drain wire
- 3 conductors 1.5 mm² (filling + ballast)
- Stranding with watertightness compound
- HDPE inner sheath
- Aramid fibre braid
- HDPE outer sheath

Outer diameter: 24 ± 1 mm

General characteristics

- Conductors operating voltage: 600 Volts
- Linear resistance:
  - Conductors 0.22 mm² ≤ 96 Ω/km
  - Conductors 1.5 mm² ≤ 15 Ω/km
- Pairs 0.22 mm² theoretical impedance: 120 Ω
- Pairs 0.22 mm² capacitance: 40 pF/m
- Theoretical breaking load: 10 000 daN
- Operating temperature: -30 to 70 °C
- Static bending radius ≥ 150 mm
- Dynamic bending radius ≥ 370 mm
- Weight in air: 507 g/m
- Weight in seawater: 43 g/m
Buoy cables for measurement and oceanographical data acquisition.

**REF 31555 UMBILICAL** POWER, SIGNAL, HOSES WITH FIBRE STRENGTH CORE MEMBER AND REINFORCED SHEATH

Application: Oceanographical measurement buoy

**General characteristics**
- Theoretical breaking load: 5000 daN
- Hoses working pressure: 15 bars
- Hoses maximum pressure: 50 bars
- Static bending radius ≥ 250 mm
- Dynamic bending radius ≥ 620 mm
- Weight in air (hoses filled with water): 3.64 kg/m
- Weight in seawater (hoses filled with water): 0.34 kg/m

**Cable make up**
- Central aramid strength member
- 4 PVC hoses
- Fillers
- PVC sheath
- Polyurethane outer sheath
- Outer diameter: 63 ± 1 mm
- HDPE inner sheath
- Double layer galvanized steel wire armoring
- Armoring diameter: 15 mm maximum
- HDPE sheath diameter: 9.7 ± 0.1 mm

**REF 26896 CABLE** WITH ARMOURED STEEL AND FLEXIBLE CAREENS

Application: Buoy of sonar towed, equipped with terminations and connectors

**General characteristics**
- Coaxial cables:
  - Impedance at 10 MHz: 50 Ω ≤ Z ≤ 60 Ω
  - Impedance at 200 MHz: 50 Ω ≤ Z ≤ 60 Ω
  - Attenuation ≤ 65 dB/km at 10 MHz
  - Capacitance ≤ 100 pF/m
  - Linear resistance:
    - Conductor ≤ 55 Ω/km
    - Braid ≤ 35 Ω/km
  - Armoring breaking load > 9000 daN
  - Operating temperature: -30 to +70 °C
  - Pressure rating: 250 bars
  - Weight in air: 0.75 kg/m
  - Weight in seawater: 0.56 kg/m

**Cable make up**
- 3 Coaxial cables with 0.34 mm² conductor in silver-plated copper, insulated in FEP, shield by silver-plated copper braid, and ETFE sheath
- HDPE inner sheath
- Double layer galvanized steel wire armoring
- Axial resistance:
  - Conductor ≤ 55 Ω/km
  - Braid ≤ 35 Ω/km

Other constructions and dimensions, please contact us.
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These cables can carry (800 daN up to 150 000DaN), non-spinning, out of synthetic fibre with high tenacity for various applications as well as the lines of damping and mooring, the staying of masts.... Equipped with our terminations (marine eye, fork termination, turnbuckle....) as well as electric on board cables for ships and oil and gas platforms complying to international standards and specifications.
BOAT AND SHIP CABLES

Mooring Line Cables .................................................................................................................. p.20

Rig Mast Cables ......................................................................................................................... p.21-22

Ship Power and Instrumentation Cables ...................................................................................... p.23

LAPP MÜLLER
MOORING LINE

High tenacity fibre mooring line, light, insulating, non-magnetic, corrosion resistant.

REF 22399  3 TONS ARAMID FIBRE MOORING LINE WITH ANTIFOULING COPPER BRAID
Application: Mooring line for instrumentation basket

Cable make up
High modulus aramid fibre
Polyurethane sheath
Copper braid, coverage: 50%

General characteristics
Theoretical breaking load: 3000 daN
Theoretical elongation at break: 2.3%
Weight: 0.39 kg/m

Outer diameter: 8.9 ± 0.1 mm

REF 57912  35 TONS ARAMID FIBRE ANTIGIRATORY MOORING LINE
Application: Mooring line buoy

Cable make up
High modulus aramid fibre
High density polyethylene sheath
Anti-torsion aramid fibre braid
High density polyethylene sheath

General characteristics
Theoretical breaking load: 35 000 daN
Theoretical elongation at break: 2.4%
Weight: 0.39 kg/m

Outer diameter: 21.4 ± 0.5 mm
RIG STAY CABLE

High tenacity fibre rig guys, light, insulating, non-magnetic, antigiratory, corrosion resistant.

REF 59608  28 TONS HIGH MODULUS FIBRE, ANTIGIRATORY CABLE
Application: Race sailing yacht rig guy

Cable make up
- Very high modulus synthetic fibre
- High density polyethylene sheath
- Anti-torsion synthetic fibre braid
- High density polyethylene sheath

General characteristics
- Theoretical breaking load: 28 000 daN
- Theoretical elongation at break: 2.4%
- Weight: 0.33 kg/m

REF 55530  88 TONS HIGH MODULUS FIBRE CABLE
Application: Stay mast antenna

Cable make up
- Very high modulus synthetic fibre
- Polyurethane sheath

General characteristics
- Theoretical breaking load: 88 000 daN
- Theoretical elongation at break: 2.4%
- Weight: 0.780 kg/m

Other constructions and dimensions, please contact us.
Tel +33(0) 4 94 56 65 00
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e-mail: contact@mullercables.com
Cables of staying out of fibres synthetic with high tenacity, insulators, light, non-magnetic and corrosion resistant equipped with terminations and moulds.

**REF 17353 CARRYING CABLE** SYNTHETIC FIBRE 5T EQUIPPED WITH TERMINATIONS IN EYE TITANEART

*Application*: Staying

**Cable make up**
- High modulus aramid fibre
- Polyurethane sheath

**General characteristics**
- Theoretical breaking load: 5000 daN
- Theoretical elongation at break: 3%
- Weight (bare cable): 87 g/m

**Outer diameter**: 9.9 ± 0.1 mm

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**REF 17354 CARRYING CABLE** SYNTHETIC FIBRE 15T EQUIPPED WITH TERMINATIONS IN EYE TITANIUM

*Application*: Staying

**Cable make up**
- High modulus aramid fibre
- Polyurethane sheath

**General characteristics**
- Theoretical breaking load: 15 000 daN
- Theoretical elongation at break: 3%
- Weight (bare cable): 220 g/m

**Outer diameter**: 12.2 ± 0.1 mm

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Other constructions and dimensions, please contact us.
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INBOARD INSTALLATION CABLE

Electric cables of power/signal/instrumentation/without halogen, fire resistant, armoured tanks and not armoured for the electric installation embarked in the boats and submarines.

**REF 57517 STANDARDIZED ELECTRIC CABLE**
OF POWER SHIELDING GENERAL

Application: Food of power circuits of ships

**Cable make up**

- 4 conductors 25 mm², in flexible plain copper, insulated in XLPE
- Shield by double tinned copper braid
- XLPE outer sheath

**Outer diameter:** 27.8 ± 1 mm

**General characteristics**

- Conductors operating voltage: 600/1000 Volts
- Conductors linear resistance ≤ 0.84 Ω/km
- Double shield theoretical linear resistance: 0.56 mΩ/m
- Fire retardant according to IEC 60332-3
- Operating temperature: -25 to +90 °C
- Static bending radius ≥ 115 mm
- Weight: 1.7 kg/m

**REF 57525 STANDARDIZED ELECTRIC CABLE**
OF INSTRUMENTATION ARMOURED PER PAIRS
AND GENERAL SHIELDING

Application: Power supply of the instruments

**Cable make up**

- 2 pairs of conductors 0.75 mm², in flexible tinned copper, insulated in XLPE
- Pairs shielded by tinned copper braid, sheathed with fire-retardant polyolefine
- Overall shield by tinned copper braid
- Outer sheath in fire-retardant polyolefine

**Outer diameter:** 17.1 ± 0.7 mm

**General characteristics**

- Conductors operating voltage: 600/1000 Volts
- Conductors linear resistance ≤ 29 Ω/km
- Overall shield theoretical linear resistance: 2.75 mΩ/m
- Fire retardant according to IEC 60332-3
- Operating temperature: -25 to +90 °C
- Static bending radius ≥ 70 mm
- Weight: 0.36 kg/m

Other constructions and dimensions, please contact us:
Tel +33(0) 4 94 56 65 00
Fax +33(0) 4 94 43 38 16
E-mail: contact@mullercables.com
“A complete range of special cables, studied and manufactured according to your needs.”

The experience of LAPP MULLER has enabled us to anticipate the evolution of marine and underwater technologies and thus be present with new solutions complying with the specific needs of the off-shore industry, ship building, institutes research, defence and security systems. The multi-disciplinary R&D team and modular production tool, are key to reacting properly to the most variable demand in special cables. We are able to tailor your cable design, bearing in mind all the electrical, mechanical and environmental constraints of your application.

We propose turnkey solutions, integrating the cable connections and terminations. LAPP MULLER makes your cords and harnesses from the connectors of your choice and those especially designed by us.

This catalogue contains a sample range of the 60000 LAPP MULLER special cables designed and manufactured over the last 10 years.
- **SPECIAL CABLES**

Diving Bell and Divers Umbilicals ........................................................................................................... p.26

Swimming Pool Robot Cables...................................................................................................................... p.27

Seafarm and Fishing Cables...................................................................................................................... p.28

Special Customized Cables........................................................................................................................ p.29

Connectors, Terminations, Fittings............................................................................................................. p.30
Submarine cables for all types of work and underwater human interventions.

REF 60480 UMBILICAL MULTIFUNCTION/POWER/CONTROL/OPERATION/SIGNAL/VIDEO/FLUID MONOPiece
Application: Diving Bell

Cable make up
- Central aramid fiber strength member
  - 1 hose 3/4"
  - 3 hoses 1/2"
  - 5 hoses 1/4"
- 3 coaxial cables type KX8
  - 1 shielded power cable 12 x 2.5 mm²
  - 1 communication cable of 7 shielded pairs 0.5 mm²
- Overall assembling tape
- Polypropylene protection braid

General characteristics
- Conductors operating voltage: 250 Volts
- Linear resistance:
  - Conductors 0.5 mm² ≤ 43 Ω/km
  - Conductors 1 mm² ≤ 21.5 Ω/km
  - Conductors 2.5 mm² ≤ 9 Ω/km
- Coaxial cables:
  - Characteristic impedance: 75 Ω
  - Capacitance ≤ 71 pF/m
- Strength member breaking load ≥ 6000 daN
- Operating temperature: -10 to +60 °C
- Static bending radius ≥ 500 mm
- Weight in air (empty hoses): 3990 g/m
- Weight in seawater (empty hoses): 250 g/m

REF 41136 CABLES TIGHT POWER/SIGNAL/VIDEO
Application: Complement for narguile of deep-sea diving

Cable make up
- 1 coaxial cable type KX6
- 1 pair of conductors 0.75 mm², in extra flexible plain copper, insulated in polyester elastomer, pair sheathed in polyurethane
- 1 pair of conductors 0.5 mm², in extra flexible tinned copper, insulated in polyester elastomer, pair shielded by aluminum/polyester tape and drain wire, sheathed with polyurethane
- Polypropylene yarns fillers
- Polyurethane outer sheath

General characteristics
- Conductors operating voltage: 250 Volts
- Linear resistance:
  - Conductors 0.5 mm² ≤ 44.5 Ω/km
  - Conductors 0.75 mm² ≤ 28.6 Ω/km
- Coaxial cable:
  - Characteristic impedance: 75 ± 3 Ω
  - Capacitance: 70 pF/m
- Theoretical breaking load of the polypropylene yarns: 55 daN
- Operating temperature: -10 to +70 °C
- Static bending radius ≥ 75 mm
- Dynamic bending radius ≥ 130 mm
- Weight in air: 0.16 kg / m
- Weight in seawater: 25 g / m
Floating cables for cleaning robots of extra swimming pool flexible.

**REF 50531 CABLES** FLOWTTING/POWER/COMMANDEAR

*Application:* Swimming pool robots

**Cable make up**

4 conductors 0.75 mm², in flexible plain copper, insulated in polyethylene
Low density fillers
Overall assembling tape
Low density polyolefine outer sheath

**General characteristics**

Conductors operating voltage: 500 Volts
Conductors linear resistance ≤ 27.3 Ω/km
Operating temperature: -15°C to +70°C
Static bending radius ≥ 33 mm
Weight in air: 274 g/m
Weight in seawater: -9.2 g/m

**REF 49491 CABLES** NONFLOATING/POWER/ORDER

*Application:* Robots of swimming pool

**Cable make up**

2 conductors 0.75 mm², in flexible plain copper, insulated in PVC
2 conductors 0.34 mm², in flexible plain copper, insulated in PVC
PVC outer sheath

**General characteristics**

Conductors operating voltage: 500 Volts
Conductors linear resistance ≤ 27.3 Ω/km
Operating temperature: -15°C to +75°C
Static bending radius ≥ 85 mm
Weight in air: 274 g/m
Weight in seawater: -9.2 g/m

Other constructions and dimensions, please contact us.
Tel +33(0) 4 94 56 65 00
Fax +33(0) 4 94 43 38 16
e-mail: contact@mullercables.com
Multifunction immergeables, tight composite cables for aquacoles farms and halieutic observation and information system.

**REF 15689 CABLES** POWER/CONTROL/SIGNAL WITH SHEATH REINFORCED

Application: Connection between the coast and the aquacole farm

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**REF 59436 CABLES** VIDEO POWER/CONTROL/OPERATION/SIGNAL/ BY OPTICAL FIBRES

Application: Halieutic observation and information system

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**Cable make up**

**REF 15689 CABLES**

4 conductors 2.5 mm², in flexible tinned copper, insulated in XLPE
20 conductors 0.6 mm², in flexible tinned copper, insulated in XLPE
Polyurethane outer sheath

**General characteristics**

Operating voltage:
- Conductors 2.5 mm²: 1000 Volts
- Conductors 0.6 mm²: 250 Volts

Linear resistance:
- Conductors 2.5 mm²: ≤ 8.21 Ω/km
- Conductors 0.6 mm²: ≤ 34 Ω/km

Operating temperature: -15 to 70 °C
Static bending radius ≥ 240 mm
Weight: 0.39 kg/m

**REF 59436 CABLES**

1 pair 0.75 mm², in extra flexible plain copper, insulated in polyester elastomer, pair shielded by tinned copper spinning
2 BUS pairs type RS 422, pairs of conductors 0.25 mm², in extra flexible tinned copper, insulated in polypropylene
2 singlemode 9/125 tight-buffered optical fibres, sheathed with polyurethane
5 conductors 0.25 mm², in extra flexible tinned copper, insulated in polyester elastomer
Aramid fibre braid
Polyurethane outer sheath

**General characteristics**

Conductors operating voltage: 250 Volts

Linear resistance:
- Conductors 0.25 mm²: ≤ 8.06 Ω/km
- Conductors 0.75 mm²: ≤ 27.3 Ω/km

Pairs type RS 422:
- Characteristic impedance: 100 Ω
- Capacitance ≤ 60 pF/m

Optical fibres:
- Attenuation at 1310 nm < 0.25 dB/km
- Attenuation at 1550 nm < 0.40 dB/km

Strength member breaking load: 140 daN
Operating temperature: -15 to +60 °C
Static bending radius ≥ 80 mm
Dynamic bending radius ≥ 150 mm
Weight: 0.11 kg/m
REF 58400 UMBILICAL FOR GAS EXTRACTION EQUIPPED WITH ANCHORING STAINLESS AND LIMITING DEVICE OF CURVE OUT OF PU

Application: This system makes it possible to extract methane gas found during oil extraction, and then to burn it off.

Cable make up

- Armored stainless steel hose 2"
- Aramid fibre contra-helical double layer strength member
- Galvanized steel wire armor
- Polyurethane outer sheath

General characteristics

- Theoretical breaking strength ≥ 57 000 daN
- Dynamic bending radius ≥ 1700 mm
- Weight: 7 kg/m

Other constructions and dimensions, please contact us.
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e-mail: contact@mullercables.com
In the last ten years, LAPP MULLER has developed specific know-how renowned in the world of equipped electro-optical cables ready to be connected.

Our technical means allow us to propose performing cable-connector-termination solutions perfectly suiting our customers’ specifications. We choose the standard connectors and assemble them with our cable in full observance of standards, in close collaboration with connector manufacturers, in order to guarantee the best solutions.

We also study strength members systems, specific connections, over moulding and/or bending limitations on self-bearing and bearer cables in braids or layers in steel or high tenacity synthetic fibres, to ensure the integrity of the interface.

We can also fit out our cables for towed devices with rigid or flexible fairing intended to improve hydrodynamic behaviour.

Our offer may be completed with adapted products such as:
- Cable glands in plastic or metal
- Obturators
- Fixing flanges and collars
- Protection sheaths and braids
- Cable pullers in steel braid
- Fleximark marking system

We have a standard range of terminations, strength members units and sleeves for our cables in high tenacity synthetic fibres.

These marine eye terminations, fork termination and turn are in different kinds of materials: anodised aluminium (colours), galvanised steel, stainless steel, titanium...

We define on request a file of specifications, including drawings, nomenclatures, recommendations for assembly and use to order, etc...

Our cables may be prescribed and approved to order by control bodies:
Present for more than 30 years in the nuclear field, LAPP MULLER SAS has equipped since 1985 the first fuel assembly handling bridges of the waste processing plant of LA HAGUE in France. LAPP MULLER SAS has built its reputation by designing and manufacturing high performance cables using constructions and materials to meet the requirement of nuclear engineering cables.

LAPP MULLER has more than 25 successful years in robotic and chain carry-cable applications. Working in partnership with many companies supplying original equipment into the industrial sector with applications such as machine tools, robots and gantries integrating power lines, power/control, signal, servomotors and safety control systems. Lapp Muller’s knowledge and expertise have seen the production of both hybrid and dynamic cable designs ideally suited to withstand the severe mechanical demands of continual and repeated bending as well as the harsh working environment where welding, moulding and chemical processes take place.

LAPP MULLER cables have been used in many applications for both exploration as well as production on oil and gas platforms around the world. Found in day to day maintenance equipment to the actual positioning systems used for the location of platforms and pipelines to all important safety equipment. Additionally LAPP MULLER cables can also be seen in valve control and monitoring equipment used for gas transportation.

LAPP MULLER technology can be found in many containerised ports, where the need for mixed umbilical links within the winding cables is required.

LAPP MULLER ultra flexible cables are to be found in many airside applications such as rollers on aerobridges and taxiway power-stations used to energize the aircraft’s electrical systems when on the ground. Both the construction and materials used in these cables make them ideal to withstand both the harsh mechanical and chemical conditions that these applications demand.

LAPP MULLER cables can also be found in many other industrial sectors such as medical, petrochemical, telecommunications, leisure and defence. Cables for applications such as silo control in agriculture, ski and chair lifts control in the leisure industry, safety systems used in large buildings from railway stations to municipal complexes. Due to their lightness and high mechanical specification, technologically advanced products such as Araline cables make them ultra competitive and ideal for these applications. In fact anywhere the need for integrity of the cables is paramount particularly because of safety demands or where severe environmental conditions are to be experienced LAPP MULLER cables are to be found.

Certification ISO 9001 V2000
Founded in 1939 by M. Jean Muller, the Muller et Landais company used to make electric cables for the construction industry. Then the company quickly turned to the manufacture of specially designed electrical cables and more specifically to moving and composite cables. In 1980, the firm became MULLER SA. Muller met a growing demand for special cables and expanded to produce high tech applications cable systems with fitted connectors.

In 2003, Muller became LAPP MULLER integrating into LAPP group, with its 2500 employees, its 15 productions sites, and its 35 sales companies.

Reference of the LAPP group for cables with technology, LAPP MULLER covers a number of speciality including design studies, tests and “turnkey” systems.

Head Office and Manufacturing Plant

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Through thousands of kilometres of cable
LAPP MULLER links man and machine in every field of activity