Elsewedy Cables was established in 1984 and is considered as one of the oldest and most successful industrial and trading business groups across the Middle East and Africa in the fields of energy, plastics and contracting. Elsewedy Cables is specialized mainly in Wires, Cables, Telecom Solutions, Electrical Products, Turnkey Projects and recently Energy Generation. The group’s turnover has been rapidly rising during the past few years to reach $ 1.5 billion in 2007, also, the production capacity is the second highest one in the region, with 125,000 tons/annum, expecting 212,000 tons/annum in 2008.

Although the company began as an Egyptian local manufacturer, it has branched out regionally and internationally to include 23 production facilities for cables and electrical products that are located in 12 countries (Egypt, Sudan, Algeria, Zambia, Ghana, Syria, Saudi Arabia, Qatar, Libya, Slovenia, India and Malaysia), and it currently export its wide range of high quality and safe products to more than 110 countries worldwide. Additionally, the group’s outstanding human potential, which is more than 5,000 employees, and its solid financial position, along with the strong geographical presence, have heavily contributed to the group’s success and prosperity.

To strengthen its position worldwide, and following the corporate strategy, on the one hand, Elsewedy Cables fully acquired by the end of 2007 ISKRAEMECO, a leader manufacturer of electrometers and currently the third largest player in the European market and the seventh largest globally; on the other hand, Elsewedy Cables is involved with 74% ownership jointly with Glencore International in a $500 million project for the construction of a copper smelter to be located in Egypt.

Further more, Elsewedy Cables provides a complete portfolio of solutions and advanced technologies for sectors as diverse as the automotive and aerospace industries, railways, buildings, telecommunication and energy networks, oil and gas, submarine power systems, etc. Accordingly, Elsewedy Cables is divided in three segments in order to cover all those sectors: Wires & cables, electrical products, and turn-key projects. The group has obtained quality certificates from the most reputable laboratories, among them: ISO 9001-2000, ISO 14001, QS 9000, KEMA.
Quality and safety are so much considered. Elsewedy Cables adopted a policy that assures maximum effectiveness and efficiency through processes and systems ensuring that every aspect of each company’s activity is aligned to satisfy customer needs and all other objectives without wasting effort and with the use of the full potential of every person. Our organizational philosophy believes that customer satisfaction, health, safety, environmental considerations, and business objectives are mutually dependent.

In the industrial sector, we currently supply approximately 56% of Egypt’s global market share of power cables, telecommunication cables, and lighting industries. In the export sector, as part of a worldwide marketing plan, Elsewedy Cables has branches throughout Africa, Middle East, Gulf Area, Europe, and Asia. Consistently showing dramatic increases: Egypt enjoys an important number of trade agreements with most of those countries (EU Agreement, Arab Free Trade Agreement, COMESA Agreement). Nowadays, Elsewedy Cables is exporting approximately 60% of its total turnover (export value of $500 million in 2006, 1 $US billion in 2007). For that reason, the group is concentrating efforts and making investments to target market segments and countries world wide with strong growth potential, such as Europe, Asia, or Latin America, although strengthen its leadership in Africa and Middle East.

Elsewedy Cables’ mission is to become world expert in cables, with a strong financial basis and technical advanced product portfolio, making it an attractive partner for all its stakeholders: Shareholders, customers, suppliers, and employees.
1938 ELSEWEDY family started its business as a trader in electrical equipment.

1960 The business was developed further by turning into a distributor for the only cables manufacturer at that time.

1984 Based on their experience in that field, the Family decided to build Egypt’s first private sector cables factory “ARAB CABLES”.

1986 Arab cables started production, as Egypt’s and the Middle East’s first private sector cables supplier.

1986-96 Arab cables’ capacity quadruples from around 6,000 tons of copper cables in 1986 to 30,000 tons in 1996.

1996 ELSEWEDY family established their second cables factory, “EGYTECH CABLES”, which is the most advanced cables production facility in the Middle East with an annual production capacity of 30,000 tons of copper cables and 15,000 tons of aluminum cables.

1996 ELSEWEDY family established their first plant for producing PVC compounds and master batch for cables insulation “SEDPLAST” considered as major component for the production of cables.

1996 ELSEWEDY family established “UNITED INDUSTRIES”, the company consists of three different factories specialized in the production of special cables (first factory in Egypt), Winding Wires & Fiber Glass Poles.

1998 ELSEWEDY family established “ELASTIMOLD EGYPT”, as a joint venture with Elastimold, a unit of Thomas & Betts, one of the leading companies worldwide in the field of cable accessories, to produce power cable joints and Modular Terminators.

1998 ELSEWEDY family Established “UNITED METALS CO.” Egypt’s first factory to produce High Grade Copper Rods, the main component in the production of cables conductors. The factory is considered as the largest copper rod factory in the Middle East region.

1998 ELSEWEDY family established “ELSEWEDY SEDCO”, as the first and only factory in Africa and the Middle East producing cable accessories.

2002 ELSEWEDY CABLES their first cable factory outside Egypt “GIAD ELSEWEDY CABLES” in partnership with the Sudanese company Giad for the production of power cables, over head conductors and telephone cables.

2003 ELSEWEDY CABLES further enhances their facilities outside Egypt by establishing the “SUDANESE EGYPTIAN ELECTRICAL INDUSTRIES CO” in partnership with Sudanese electricity authority, SUDATRAF (specialized in manufacturing transformers, electrical panels & cables joint and terminators).

2004 Together ELSEWEDY CABLES Group & Italmea company (Italy) established a joint venture for the manufacture of explosion proof electrical equipment, “Italmea ELSEWEDY co”.

2005 ELSEWEDY established the Syria’s latest cables factory “ELSEWEDY CABLES SYRIA” specialized in power cables manufacturing up to 400 kv, relying on the growth in the area of: Syria, Lebanon, Jordan, Iraq, Iran, Palestine and all Arab countries near by.

2006 ELSEWEDY CABLES penetrated Ghana, by establishing “ELSEWEDY ELECTRIC-GHANA” the factory is specialized in Fiber Glass Road Lighting Poles manufacturing.

2007 ELSEWEDY CABLES established two new factories:
1. “ELSEWEDY CABLES SAUDI ARABIA” specialized in wires and cables.
2. “ELSEWEDY ELECTRIC SYRIA” specialized in transformers. In addition to acquisition of ISKRAEMECO Specialized in energy measurement & management systems.

2008 ELSEWEDY CABLES established two new factories:
1. “ELSEWEDY CABLES QATAR” specialized in power cables “Low & Medium”,
2. “ELSEWEDY CABLES ALGERIA” specialized in power cables “Low & Medium” in addition to instrumentation cables.
APPLICATION

These cables are suitable for installation as optical ground wire in powerline installations. The cable acts as an normal ground wire protecting phase wires from lightning strikes and carries earth fault currents. The cable provides also an optic path in powerline installations for telecommunication needs.

FEATURES

- Installation in the same way as normal ground wire with conventional machinery.
- Most reliable optic solution for fibre optic utilities.
- Best solution in old ground wire replacement and in new line constructions.
- Low cost

CROSS SECTIONAL DIAGRAM

Stainless tube of 2.7/3.1 mm; 24 fibres/tube
Inner layer 6 ACS wires
Grease

CONSTRUCTION

Optical fibre : For fibre specification see optical characteristics.
Secondary coating tube, colour and for fibre counts with a coloured fibre bundle yarn.
Central element : 1 stainless steel tube : 3.1 mm
First layer : 6 ACS wires (20SA) : 3.1 mm
Direction layer : "Right"
Grease : The interstices of the cable core are filled with grease according to BS EN 50182 ANNEX B figure B.1-d

All values in this product data sheet are nominal unless otherwise stated.

TECHNICAL CHARACTERISTICS

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of tubes</td>
<td>1</td>
</tr>
<tr>
<td>Number of fibres / tube</td>
<td>24</td>
</tr>
<tr>
<td>Cable ø</td>
<td>9.3</td>
</tr>
<tr>
<td>Cable weight</td>
<td>326</td>
</tr>
<tr>
<td>Supporting cross-section</td>
<td>45.29</td>
</tr>
<tr>
<td>ACS cross-section</td>
<td>45.29</td>
</tr>
<tr>
<td>Calculated breaking load (UIS)</td>
<td>54.61</td>
</tr>
<tr>
<td>Modulus of elasticity</td>
<td>161.99</td>
</tr>
</tbody>
</table>

Other types can be provided upon specified request.
| Coefficient of thermal expansion, $10^{-6}$ | 13 | 1/K |
| Permissible tensile stress acc. | | |
| Everyday stress | 192.9 | N/mm² |
| Maximum tensile stress | 506.4 | N/mm² |
| Endurance tensile stress | 868.2 | N/mm² |
| Nominal short-time current IEC 724 at | | |
| Initial/Final temperature 200 °C [Initial 50 °C] | 3.26 | kA, 1 s. |
| D.C. resistance at 20 °C | 1.67 | Ω/km |
| Transport, storage, operation | -40 to + 80 | °C |
| Installation | -10 to + 50 | °C |

**OPTICAL CHARACTERISTICS (CABLED MAX. VALUES)**

<table>
<thead>
<tr>
<th>Fibre type</th>
<th>Single mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable specification</td>
<td>IEC 60793-2-101</td>
</tr>
<tr>
<td>Mode field diameter</td>
<td>9.2 ± 0.5</td>
</tr>
<tr>
<td>Cladding diameter</td>
<td>125 ± 1</td>
</tr>
<tr>
<td>Coating diameter</td>
<td>245 ± 10</td>
</tr>
<tr>
<td>Wavelength</td>
<td>1310, 1285, 1330, 1550</td>
</tr>
<tr>
<td>Attenuation coefficient</td>
<td>0.38, 0.40, 0.25</td>
</tr>
<tr>
<td>Extension</td>
<td>3.3, 18.0</td>
</tr>
<tr>
<td>PMD</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**FIBRE COLOURING**

<table>
<thead>
<tr>
<th>Fibre No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Blue</td>
<td>Orange</td>
<td>Green</td>
<td>Brown</td>
<td>Grey</td>
<td>White</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fibre No.</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Red</td>
<td>Black</td>
<td>Yellow</td>
<td>Violet</td>
<td>Rose</td>
<td>Turquoise</td>
</tr>
</tbody>
</table>

Customised colouring upon request.

**BINDER YARN COLOURING**

<table>
<thead>
<tr>
<th>Binder No.</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Blue</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Binder No.</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Orange</td>
</tr>
</tbody>
</table>

**TESTING AND INSPECTION**

Testing will comprise the following:

<table>
<thead>
<tr>
<th>Optical characteristics (each cable length)</th>
<th>Attenuation (Single mode at 1310 / 1550nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical characteristics</td>
<td>Diameter of cable</td>
</tr>
<tr>
<td>Electrical characteristics</td>
<td>DC resistance</td>
</tr>
<tr>
<td>Visual inspection of cable</td>
<td>Colouring / markings of fibres / tubes</td>
</tr>
</tbody>
</table>

The mechanical characteristics and visual inspection shall be carried out with a frequency of 1 out of 10 drums, starting with the first drum. The first drum shall always be checked when the quantity is less than 10 drums.

Certified test results are provided upon request.

If testing and inspection to be carried out by third parties is required, such parties will be nominated and paid by the Purchaser.

**PACKING**

<table>
<thead>
<tr>
<th>Standard length</th>
<th>≥ 3000</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length tolerance</td>
<td>+/- 100, we reserve the right to deliver up to a maximum of 10% of the ordered quantity in shorter lengths with a minimum of 2000 m / drum.</td>
<td></td>
</tr>
<tr>
<td>Sealing of cable ends</td>
<td>To prevent ingress of moisture the cable ends are sealed with heat shrinkable end caps.</td>
<td></td>
</tr>
<tr>
<td>Protection / Packaging</td>
<td>The reel shall be lagged with strong wooden battens so as to prevent the DPGW from damage in ordinary handling and shipping.</td>
<td></td>
</tr>
</tbody>
</table>

Other types can be provided upon specified request.
DOUBLE STRANDING LAYERS, CENTRAL SST OPGW

SM-MFOA 117-58-16-1S AA-ACS-24SMF

APPLICATION

These cables are suitable for installation as optical ground wire in powertline installations. The cable acts as an normal ground wire protecting phase wires from lighting strikes and carries earth fault currents. The cable provides also an optic path in powertline installations for telecommunication needs.

FEATURES

- Installation in the same way as normal ground wire with conventional machinery.
- Most reliable optic solution for fibre optic utilities.
- Best solution in old ground wire replacement and in new line constructions.
- Low cost

CROSS SECTIONAL DIAGRAM

CONSTRUCTION

Optical fibre
Secondary coating tube.
and for fibre counts fibre bundle yarn.

Central element : For fibre specification see optical characteristics.
The secondary coating consists of one laser welded stainless steel. Every fibre is uniquely identified by a fibre colour above 12 fibres with a coloured
First layer
Second layer
Grease : The interstices of the cable core are filled with grease according to IEC 1089 ANNEX C figure C.2
The tube is filled with a water-repellent filling compound.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of tubes</td>
<td>1</td>
</tr>
<tr>
<td>Number of fibres / tube</td>
<td>24</td>
</tr>
<tr>
<td>Cable ø</td>
<td>17.58</td>
</tr>
<tr>
<td>Cable weight</td>
<td>749 kg/km</td>
</tr>
<tr>
<td>Supporting cross-section</td>
<td>172017 mm²</td>
</tr>
<tr>
<td>AA cross-section</td>
<td>116.78 mm²</td>
</tr>
<tr>
<td>ACS cross-section</td>
<td>58.83 mm²</td>
</tr>
<tr>
<td>Calculated breaking load</td>
<td>104.4 kN</td>
</tr>
<tr>
<td>Modulus of elasticity</td>
<td>92.0 kN/mm²</td>
</tr>
<tr>
<td>Coefficient of thermal expansion</td>
<td>17.13 1/K</td>
</tr>
<tr>
<td>Permissible tensile stress</td>
<td>95.3 N/mm²</td>
</tr>
<tr>
<td>Endurance tensile stress</td>
<td>415.4 N/mm²</td>
</tr>
</tbody>
</table>

Other types can be provided upon specified request.
Nominal short-time current IEC 724 at

<table>
<thead>
<tr>
<th>Physical temperature 30 / 500 °C</th>
<th>16.1</th>
<th>16.1 kA</th>
<th>45.7 kA</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.C. resistance at 20 °C</td>
<td>0.24</td>
<td>Ω/km</td>
<td></td>
</tr>
<tr>
<td>Transport, storage, operation</td>
<td>-40 to +80</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Installation</td>
<td>-10 to +50</td>
<td>°C</td>
<td></td>
</tr>
</tbody>
</table>

**OPTICAL CHARACTERISTICS (CABLED MAX. VALUES)**

<table>
<thead>
<tr>
<th>Fibre type</th>
<th>Single mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>AWC, to specification</td>
<td>ITU-T G.652.B</td>
</tr>
<tr>
<td>Mode field diameter</td>
<td>9.9 ± 0.5 µm</td>
</tr>
<tr>
<td>Cladding diameter</td>
<td>125 ± 1 µm</td>
</tr>
<tr>
<td>Coating diameter</td>
<td>245 ± 10 µm</td>
</tr>
<tr>
<td>Wavelength</td>
<td>1310 nm</td>
</tr>
<tr>
<td>Attenuation coefficient</td>
<td>0.34 dB/km, 0.40 / 0.21 dB/km</td>
</tr>
<tr>
<td>Dispersion</td>
<td>- 3.5 17.5 ps/µm km</td>
</tr>
<tr>
<td>PMD</td>
<td>0.2 ps/µm km</td>
</tr>
</tbody>
</table>

**FIBRE COLOURING**

<table>
<thead>
<tr>
<th>Fibre No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre colour</td>
<td>Blue</td>
<td>Orange</td>
<td>Green</td>
<td>Brown</td>
<td>Grey</td>
<td>White</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fibre No.</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre colour</td>
<td>Red</td>
<td>Black</td>
<td>Yellow</td>
<td>Violet</td>
<td>Rose</td>
<td>Turquoise</td>
</tr>
</tbody>
</table>

Customised colouring upon request

**BINDER YARN COLOURING**

<table>
<thead>
<tr>
<th>Fibre bundle</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yarn colour</td>
<td>Blue</td>
<td>Orange</td>
</tr>
</tbody>
</table>

**TESTING AND INSPECTION**

Testing will comprise the following:

- Optical characteristics (each cable length) Attenuation (single mode at 1310 / 1550 nm)
- Mechanical characteristics Diameter of cable
- Electrical characteristics DC resistance
- Visual inspection of cable Colouring / markings of fibres / tubes

The mechanical characteristics and visual inspection shall be carried out with a frequency of 1 out of 10 drums, starting with the first drum. The first drum shall always be checked when the quantity is less than 10 drums.

Certified test results are provided upon request.

If testing and inspection to be carried out by third parties is required, such parties will be nominated and paid by the Purchaser.

**PACKING**

<table>
<thead>
<tr>
<th>Standard length</th>
<th>≥ 3000 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length tolerance</td>
<td>+/− 100, we reserve the right to deliver up to a maximum of 10% of the</td>
</tr>
<tr>
<td>Sealing of cable ends</td>
<td>To prevent ingress of moisture the cable ends are sealed with heat shrinkable end caps.</td>
</tr>
<tr>
<td>Protection / Packing</td>
<td>The reel shall be lagged with strong wooden battens so as to prevent the OPGW from damage in ordinary handling and shipping.</td>
</tr>
</tbody>
</table>

Other types can be provided upon specified request.
APPLICATION

These cables are suitable for installation as optical ground wire in powerline installations. The cable acts as an normal ground wire protecting phase wires from lightning strikes and carries earth fault currents. The cable provides also an optic path in powerline installations for telecommunication needs.

FEATURES

- Installation in the same way as normal ground wire with conventional machinery.
- Most reliable optic solution for fibre optic utilities.
- Best solution in old ground wire replacement and in new line constructions.
- Low cost

CROSS SECTIONAL DIAGRAM

CONSTRUCTION

Optical fibre
Secondary coating tube...
and for fibre counts fibre bundle yarn.

Central element
First layer
Second layer

: For fibre specification see optical characteristics.
: The secondary coating consists of one laser welded stainless steel
Every fibre is uniquely identified by a fibre colour
above 12 fibres with a coloured

: 1 Aluminium Coated stainless steel tube
: 5 ACS wires (20SA)
: 2 aluminium alloy (AA) wires
: Direction layer
: 10 aluminium alloy (AA) wires
: Direction layer

: 3.6 mm
: 2.75 mm
: 2.75 mm
: “Left”
: 3.9 mm
: “Right”

All values in this product data sheet are nominal unless otherwise stated.

TECHNICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of tubes</td>
<td>1</td>
</tr>
<tr>
<td>Number of fibres / tube</td>
<td>24</td>
</tr>
<tr>
<td>Cables</td>
<td>16.9 mm</td>
</tr>
<tr>
<td>Cable weight</td>
<td>589 kg/km</td>
</tr>
<tr>
<td>Supporting cross-section</td>
<td>161.04 mm²</td>
</tr>
<tr>
<td>AA cross-section</td>
<td>131.34 mm²</td>
</tr>
<tr>
<td>ACS cross-section</td>
<td>25.70 mm²</td>
</tr>
<tr>
<td>Calculated breaking load (UTS)</td>
<td>74.43 kN</td>
</tr>
<tr>
<td>Modulus of elasticity</td>
<td>76.58 kN/mm²</td>
</tr>
<tr>
<td>Coefficient of thermal expansion $\times 10^4$</td>
<td>19.10 1/K</td>
</tr>
<tr>
<td>Permissible tensile stress acc.</td>
<td></td>
</tr>
<tr>
<td>Everyday stress (1.6%)</td>
<td>73.90 N/mm²</td>
</tr>
<tr>
<td>Maximum tensile stress</td>
<td>194.10 N/mm²</td>
</tr>
<tr>
<td>Endurance tensile stress</td>
<td>332.80 N/mm²</td>
</tr>
</tbody>
</table>

Other types can be provided upon specified request.
Nominal short-time current IEC 724 at

<table>
<thead>
<tr>
<th>Temperature</th>
<th>14.23</th>
<th>kA/1 s</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.C. resistance at 20°C</td>
<td>0.23</td>
<td>Ω/km</td>
</tr>
</tbody>
</table>

Transport, storage, operation: -40 to +80 °C
Installation: -10 to +50 °C

**OPTICAL CHARACTERISTICS (CABLED MAX. VALUES)**

<table>
<thead>
<tr>
<th>Fibre type</th>
<th>Single mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acc. to specification</td>
<td>ITU-T G.652.B</td>
</tr>
<tr>
<td>Mode field diameter</td>
<td>9.2 ± 0.5 μm</td>
</tr>
<tr>
<td>Cladding diameter</td>
<td>125 ± 1 μm</td>
</tr>
<tr>
<td>Coating diameter</td>
<td>255 ± 10 μm</td>
</tr>
<tr>
<td>Wavelength</td>
<td>1310, 1285-1330, 1550 nm</td>
</tr>
<tr>
<td>Attenuation coefficient</td>
<td>0.34, 0.40, 0.21 dB/km</td>
</tr>
<tr>
<td>Dispersion</td>
<td>-3.5, 17.5 ps/μm.km</td>
</tr>
<tr>
<td>PMD</td>
<td>0.2 ps/km nm</td>
</tr>
</tbody>
</table>

**FIBRE COLOURING**

<table>
<thead>
<tr>
<th>Fibre No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre colour</td>
<td>Blue</td>
<td>Orange</td>
<td>Green</td>
<td>Brown</td>
<td>Grey</td>
<td>White</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fibre No.</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre colour</td>
<td>Red</td>
<td>Black</td>
<td>Yellow</td>
<td>Violet</td>
<td>Rose</td>
<td>Turquoise</td>
</tr>
</tbody>
</table>

Customised colouring upon request

**BINDER YARN COLOURING**

<table>
<thead>
<tr>
<th>Fibre bundle</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yarn colour</td>
<td>Blue</td>
<td>Orange</td>
</tr>
</tbody>
</table>

**TESTING AND INSPECTION**

Testing will comprise the following:

- Optical characteristics (each cable length) and Attenuation (Single mode at 1310 / 1550nm)
- Mechanical characteristics: Diameter of cable
- Electrical characteristics: DC resistance
- Visual inspection of cable: Colouring / markings of fibres / tubes

The mechanical characteristics and visual inspection shall be carried out with a frequency of 1 out of 10 drums, starting with the first drum. The first drum shall always be checked when the quantity is less than 10 drums.

Certified test results are provided upon request.

If testing and inspection to be carried out by third parties is required, such parties will be nominated and paid by the Purchaser.

**PACKING**

<table>
<thead>
<tr>
<th>Standard length</th>
<th>2-3000</th>
<th>m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length tolerance</td>
<td>+/-100</td>
<td>%</td>
</tr>
</tbody>
</table>

Ordered quantity in shorter lengths with a minimum of 2000 m / drum.

Sealing of cable ends: To prevent ingress of moisture the cable ends are sealed with heat shrinkable end caps.

Protection / Packing: The reel shall be lagged with strong wooden batters so as to prevent the OPGW from damage in ordinary handling and shipping.

Other types can be provided upon specified request.
SM-MFOA 83-23-14-0.5S ACS-24SMF

APPLICATION

These cables are suitable for installation as optical ground wire in powerline installations. The cable acts as an normal ground wire protecting phase wires from lighting strikes and carries earth fault currents. The cable provides also an optic path in powerline installations for telecommunication needs.

FEATURES

- Installation in the same way as normal ground wire with conventional machinery.
- Most reliable optic solution for fibre optic utilities.
- Best solution in old ground wire replacement and in new line constructions.
- Low cost

CROSS SECTIONAL DIAGRAM

- Stainless tube of 2.3/2.7 mm: 24 fibres/tube
- Inner layer 3 ACS + 2 AA
- Outer layer consists of 12 AA
- Grease

CONSTRUCTION

Optical fibre: For fibre specification see optical characteristics.
Secondary coating tube: The secondary coating consists of one laser welded stainless steel tube. Every fibre is uniquely identified by a fibre colour above 12 fibres with a coloured fibre bundle yarn.
Central element
- 1 ACS wires (20SA) : 2.75 mm
- 1 stainless steel tube : 2.7 mm
- 3 ACS wires (20SA) : 2.75 mm
- 2 aluminium alloy (AA) wires : 2.75 mm

First layer
- Direction layer : "Left"

Second layer
- 12 aluminium alloy (AA) wires : 2.75 mm
- Direction layer : "Right"

Grease: The interstices of the cable core are filled with grease according to IEC 1089 ANNEX C figure C.2

All values in this product data sheet are nominal unless otherwise stated.

TECHNICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Number of tubes</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of fibres / tube</td>
<td>24</td>
</tr>
<tr>
<td>Cable Ø</td>
<td>13.75 mm</td>
</tr>
<tr>
<td>Cable weight</td>
<td>412 kg/km</td>
</tr>
<tr>
<td>Supporting cross-section</td>
<td>164.9 mm²</td>
</tr>
<tr>
<td>AA cross-section</td>
<td>83.15 mm²</td>
</tr>
<tr>
<td>ACS cross-section</td>
<td>23.67 mm²</td>
</tr>
</tbody>
</table>

Calculated breaking load (UTS) 53.1 kN
Modulus of elasticity 80.67 kN/mm²
Coefficient of thermal expansion, 10⁻⁶ 16.54 per °C
Permissible tensile stress acc. Everyday stress 79.5 N/mm²
Maximum tensile stress 208.6 N/mm²
Endurance tensile stress 357.5 N/mm²

Other types can be provided upon specified request.
Nominal short-time current IEC 724 at

| Temperature 40 / 200 °C | 140 | @ 0.5 s.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D.C. resistance at 20 °C</td>
<td>0.360</td>
<td>Q/km</td>
</tr>
</tbody>
</table>

Transport, storage, operation
- 40 to +80 °C
- 10 to +50 °C

OPTICAL CHARACTERISTICS [CABLED MAX. VALUES]

<table>
<thead>
<tr>
<th>Fibre type</th>
<th>Single mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acc. to specification</td>
<td>ITU-T G.652</td>
</tr>
<tr>
<td>Mode field diameter</td>
<td>9.2 ± 0.5 μm</td>
</tr>
<tr>
<td>Cladding diameter</td>
<td>125 ± 1 μm</td>
</tr>
<tr>
<td>Coating diameter</td>
<td>245 ± 10 μm</td>
</tr>
<tr>
<td>Wavelength</td>
<td>1310 / 1330 / 1550 nm</td>
</tr>
<tr>
<td>Attenuation coefficient</td>
<td>0.38 / 0.40 / 0.25 dB/km</td>
</tr>
<tr>
<td>Dispersion</td>
<td>3.0 ps/nm.km / 18.0 ps/km.km</td>
</tr>
<tr>
<td>PMD</td>
<td>0.5 ps/km.km²</td>
</tr>
</tbody>
</table>

FIBRE COLOURING

<table>
<thead>
<tr>
<th>Fibre No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre colour</td>
<td>Blue</td>
<td>Orange</td>
<td>Green</td>
<td>Brown</td>
<td>Grey</td>
<td>White</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fibre No.</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibre colour</td>
<td>Red</td>
<td>Black</td>
<td>Yellow</td>
<td>Violet</td>
<td>Rose</td>
<td>Turquoise</td>
</tr>
</tbody>
</table>

Customised colouring upon request

BINDER YARN COLOURING

<table>
<thead>
<tr>
<th>Fibre bundle</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yarn colour</td>
<td>Blue</td>
<td>Orange</td>
</tr>
</tbody>
</table>

TESTING AND INSPECTION

Testing will comprise the following:

- Optical characteristics (each cable length)
- Attenuation (Single mode at 1310 / 1550nm)
- Mechanical characteristics
- Diameter of cable
- Electrical characteristics
- DC resistance
- Visual inspection of cable
- Colouring / markings of fibres / tubes

The mechanical characteristics and visual inspection shall be carried out with a frequency of 1 out of 10 drums, starting with the first drum. The first drum shall always be checked when the quantity is less than 10 drums.

Certified test results are provided upon request.

If testing and inspection to be carried out by third parties is required, such parties will be nominated and paid by the Purchaser.

PACKING

<table>
<thead>
<tr>
<th>Standard length</th>
<th>≥ 3000 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length tolerance</td>
<td>+/-100, we reserve the right to deliver up to a maximum of 10 % of the quantity in shorter lengths with a minimum of 2000 m / drum,</td>
</tr>
</tbody>
</table>

Sealing of cable ends
- To prevent ingress of moisture the cable ends are sealed with heat shrinkable end caps.

Protection / Packing
- The reel shall be lagged with strong wooden battens so as to prevent the OPGW from damage in ordinary handling and shipping.

Other types can be provided upon specified request.
INTRODUCTION

We as Elsewedy Cables one of the most advanced and leading cables manufacturer in the Middle East & Africa has a great history in engineering, implementing and managing major fiber optic networks in Egypt thanks to our well established partnership with our principles all over the world. Our major business partner is DRAKA NKF TELECOM (Netherlands) for producing Optical Ground Wires (OPGW). Due to the necessity of having OPGW, we decide to start to produce, install and maintain the OPGW by doing the relevant service on turn-key bases.

Elsewedy Cables frame, mainly, outlines the OPGW & Optical fiber cables in an evolved, innovated, state-of-the-art and latest technology Modules. The advanced Technology provided reflects wide latitude of matching and conformity with the supper design and luxury planning.

Generally, Elsewedy Cables follows the customer’s specification to meet the stated requirements. We are offering our inhouse produced OPGW cables as, a perfect match solution to the required specifications with much more features to serve the advanced telecommunication application through optical fibers.

Furthermore, we cover the customer’s scope of supply completely with state-of-the art technology of OPGW, optical fiber cables, fittings and accessories to fulfill the projects turn-key activities.

INSTALLATION OF OPGW CABLES

Important factors to be taken into account during stringing
The general method of installation is shown in Figure 2.

As a rule, one drum at a time of OPGW cable is installed. In case of any difficulties, the Egytech Cables Elsewedy supervisors have to be contacted. He will give the correct guidelines to proceed with the OPGW cable installation.

Please refer to figure 3 to 7 to see the installation tools, components and elements.
1. BASIC CONTROLS

Strict controls must be established during installation to ensure that it is performed correctly, without excess tension, twist of the OPGW, unsuitable compression, regulating a correct sagging. Neither the fibers nor the fibers tube (Stainless Steel Tube or Aluminum Tube) will be damaged.

The tensioner and the puller should be placed at a distance from the first tower pulley which is equivalent to at least twice the height of the pulley (see figure 2 and figure 8).

Intermediate control points should be established, with the necessary precautions that are required at critical points during installation (beginning/end of drum, angles, etc.).

During installation, the OPGW cable should not strike nor graze any objects other than the pulleys.

No obstacles must prevent the pulleys from rotating in the correct way.

The minimum bending / twisting radius must be controlled during all installation operations. Please refer to figure 9 for anti - twisting devices.

Ensure that the metal part of the pulleys do not make contact with the cable to prevent it from being damaged.
2 STRINGING SPEED
The maximum permissible stringing speed is 40 meters per minute. It always depends on the stringing conditions and must be reduced to avoid damages to the optical fibers, the aluminum tube and the OPGW cable.

3 PULLING TENSION
The recommended pulling tension shall be lower than 1.5 times the weight (kg) of 1 km OPGW cable length.

4 MINIMUM BENDING RADIUS
The minimum bending radius is in the whole situations as follows:

- on tensioner reels 40 times the cable diameter
- during installation 400 mm
- after installation 20 times the cable diameter

Please refer to figure 10 for puller / tensioner machines and figure 11 to see the Ground connection of the OPGW cable at the tensioner outlet.

5 COMMUNICATIONS DURING STRINGING
The personnel located at the puller, the tensioner, the pulley crossings and the cable ends are in communication at all times by communication system.

6 SAGGING OF THE CABLE
Generally, the methods used to obtain the correct sag values of the OPGW cables are the same used for conventional ground wire cables. The specific recommendations are as follows:

Pulling is performed by a preformed fitting or tension clamp (in intermediate spans) or with the pull jacket at the end.

Sagging of the cable and fittings installation are always performed after stringing. At this time, the attachment fittings are also installed to prevent damage to the OPGW cable.
The installer is responsible for any damage to the OPGW cable that may occur due
to failure cause by incorrect application of the previous points.

If the tension and sags are different from the expected values, the stringing or
sagging should be halted. The Egytech Cables supervisor and the project leader
will be consulted in order to safely continue the installation operations.

7 INSTALLATION OF FITTINGS AND ACCESSORIES
The fittings: tension clamps, suspensions, earthing clamps, dampers, etc., should be
installed in accordance with the manufacturer’s instructions and using the appropriate
tools.

8 PERSONNEL TRAINING
All personnel who participate in the installation of the OPGW cable should be
informed of handling problems and installation procedures for the OPGW cable.

It is responsibility of the installer to assure the correct instruction to the whole personnel
involved in the installation works.

9 SUPERVISION
The supervisor designated by Egytech Cables El Sewedy will be responsible for
ensuring compliance with all of the points indicated in this document as well as all
required standards applicable to the specific installation.

The supervisor will communicate to Egytech Cables El Sewedy any non-conformity
detected in the cable or cable installation procedures.

If a situation occurs that is not covered in the present installation procedure, whenever
this occurs with an OPGW cable, the Supervisor will determine whether or not the
action is correct.

The supervisor will request the installer to provide a descriptive list of the components
to be used for installation. Moreover, he will verify that these components are
sufficient and adequate.

10 SPLICES
After the stringing of the OPGW and the optical measurements done after installation,
the fibers inside OPGW cable will be spliced.

11 TRANSMISSION TEST DURING THE INSTALLATION PHASES
Prior to as well as during the installation phases, the transmission characteristics of
the fibre optic cables are verified in order to ensure proper installation and be sure
that the final tests are within the specified range of tolerances.

12 MEASUREMENTS BEFORE OPGW CABLE INSTALLATION
Prior to OPGW cable installation, each optical fibres is verified using OTDR.

The attenuation values recorded are registered in “Attenuation test during installation
phase”
document and saved on an electronic diskette. This computer register is kept by
Egytech Cables El Sewedy.

The attenuation values recorded are registered in a document and are also saved
on an electronic diskette. This computer register is kept by EGYTECH CABLES EL
SEWEDY. It is suitably identified and referenced.

13 SPLICES MEASUREMENT
After splicing, each joint is optically verified using OTDR in order to ensure that the
attenuation
values are within the required margins.
The attenuation values recorded are registered in a document, “Splice attenuation test” and are also saved on an electronic diskette. This computer register is kept by EGYTECH CABLES EL SEWEDY. It is suitably identified and referenced.

14 MEASUREMENTS AFTER INSTALLATION
After the cable has been installed, and prior to the splices, each of the cable fibers are verified once again using OTDR.

15 FINAL ACCEPTANCE TEST
After installation, a final measurement of the transmission characteristics is done and the values are duly recorded. A copy of this document is submitted to the customer.

These measurements are also recorded and kept by EGYTECH CABLES EL SEWEDY.

16 HEALTH & SAFETY
The supervisor designated by EGYTECH CABLES EL SEWEDY is responsible for compliance with the general Health and Safety standards for EGYTECH CABLES EL SEWEDY or the requirements stipulated by contract, if any.

17 ENVIRONMENT

17.1 WITHDRAWAL OF SPECIAL WASTE (TOXIC AND DANGEROUS)
If any type of special waste such as oil, grease, solvents, saturation of gloves or rags, etc. are produced during cable installation, proceed as follows:

- Place in heavy-duty carboys or steel drums, indicating what type of waste it is.

17.2 WITHDRAWAL OF NON-SPECIAL OR INERT WASTE
- If there are excess materials or waste such as aluminum, optical fiber, plastic, wood, iron, etc., whenever possible, this should be sent to an authorized recycler or a controlled dumping ground.
- Regardless of the amount, the waste should never be abandoned. Moreover, the area should be cleaned when the work is finished.
Elsawedy Cables Contacts

Elsawedy Cables Head Office
Loc: 14 Baghdad St., El-Korba – Helwan, Cairo, Egypt
Tel: +202 22990430 / Fax: +22991078
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Fax: +966 2 60 67 489
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Email: uae@elsawedy.com

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Fax: +963 1 430865
Email: yemen@elsawedy.com

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Equatorial Park Of Dakar, Dakar, Senegal
Inside Mility Corp, Malabo, Equatorial Guinea
Tel: +245 (0) 99 596 596 / Fax: +245 (0) 99 596 596
Email: gins@elsawedy.com

Nigeria
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Tel: +91 22 66752613 / 66750130 / FAX NO. +91 22 66750131