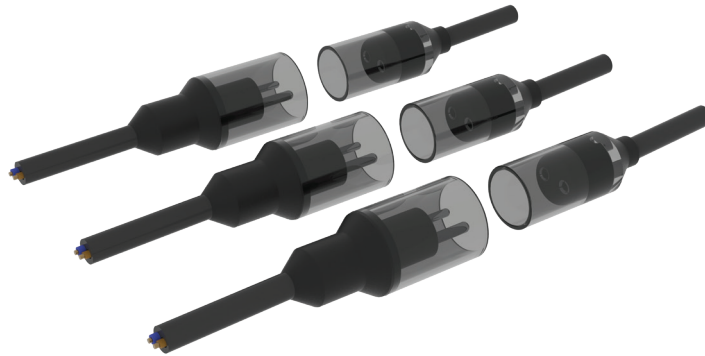


# SELECTION GUIDE AND INSTALLATION MANUAL FRANGIBLE MAST EXTENSION CORDS KDCE6 series



## 1 Requirements of ICAO

According to the requirements of ICAO (International Civil Aviation Organisation) frangible safety approach light masts shall be used in all installations.

Annex 14 — Aerodromes, Volume I — Aerodrome Design and Operations, Chapter 5, specifies that elevated approach lights and their supporting structures should be frangible except that, in that portion of the approach lighting system beyond 300 m from the threshold:

- a) where the height of the supporting structure exceeds 12 m, the frangibility requirements should apply to the top of 12 m only; and
- b) where a supporting structure is surrounded by non-frangible objects, only that part of the structure that extends above the surrounding objects shall be frangible.

Aerodrome Design Manual Part 6 specifies that electronic equipments, components and supports should be designed to be frangible, while ensuring that the operational functions are not degraded. The strength of electrical conductors incorporated in the design of frangible structures as well as the fire hazard presented by the arcing of disrupted conductors will have to be considered. It is recommended that conductors be designed such that they do not rupture but break at predetermined points within the limits for frangibility of the structure (Chapter 4.8.1 and 4.8.2.)

### Other criteria for determining frangibility

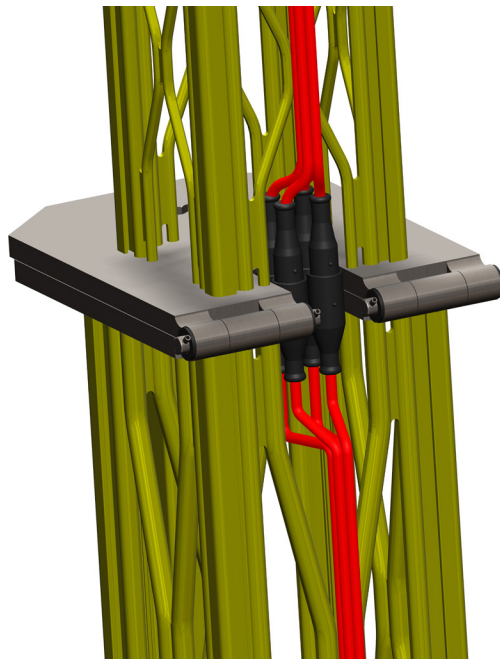
Upon impact, the tower may be fragmented into several components. The mass of these components and their manner of release should not cause a secondary hazard to the aircraft (e.g. To enter through the windscreen, fuselage, tail surfaces).” Frangibility of the design should be proven either by means of full-scale tests, computer evaluations or by calculations based on comparison with similar already approved structures possibly supported by additional component tests.



## 2 Frangible mast extension cords of EFLA Oy

Efla Oy, the leading manufacturer of series isolation transformers, L-823 connector kits, and prefabricated cable leads, has accepted the challenge of ICAO requirements by designing extension cords to frangible, approach light mast based on TPE material. **The EFLA extension cords functionality is tested with a frangible mast full-scale impact test as proof of meeting ICAO requirements.** EFLA extension cords are suitable for all manufacturers of frangible masts as long as their frangibility results with the same method as ICAO states. **In EFLA extension cords, frangibility is designed with break-away points at regular intervals. In case of a collision, the extension cords will break at a predetermined point, without the cable rupture and possible secondary hazard of arcing.** Also, break-away points are arc protected with an additional TPE sleeve.

ICAO states, with regard to cabling, the designer should ensure that there are points of disconnection so that segmentation is not hindered. To utilize this, it is recommended to install cabling to back side of frangible mast and minimize the cabling influence to frangible mast breaking mechanism. Due their ultimate UV protection features, Efla extension cords(TPE) combined with Panduit cable ties (Acetal) are maintenance free solution. Acetal (strap material) provides twenty plus years weatherability life for tough outdoor applications; high impact resistance, and strength (compared to weather resistant nylon 7-9 years). C/w double stainless steel locking barbs



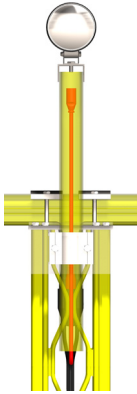
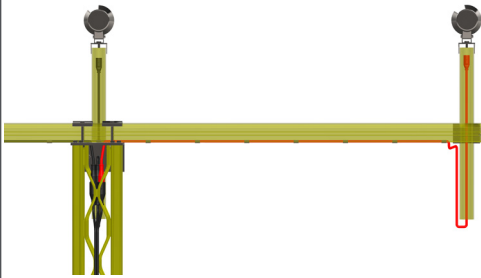
### Illustrations from Lattix®

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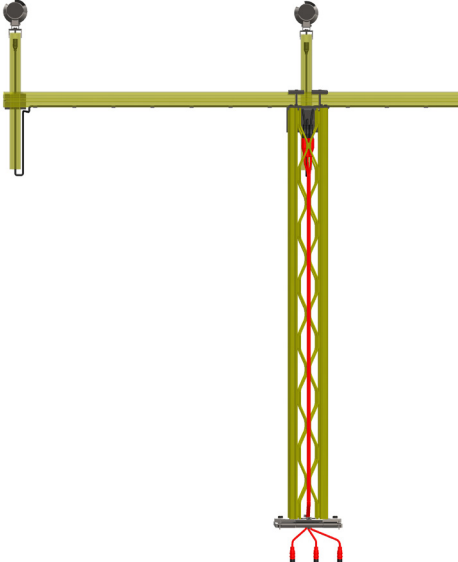
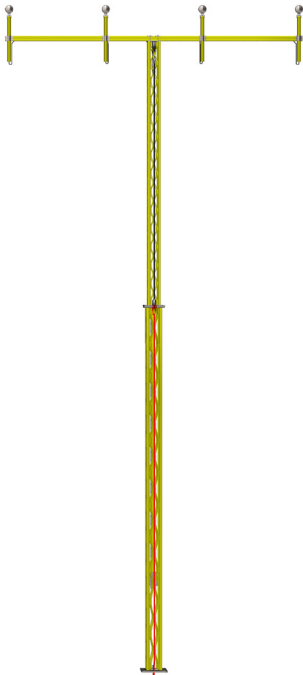


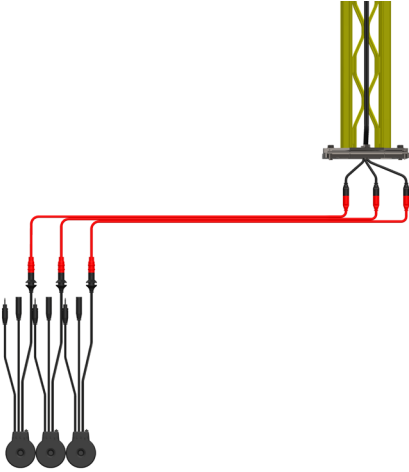



## 2.1 Selection of electrical wires

Equipment needed for installation of frangible extension cords.

	Function	Description	Item
1A	<p>Extension cord for light adjustment tube to ONE light mast and/or to Center light in crossbar masts</p> 	<p>Required length is comparable with light adjustment tube length (add +10cm for easy maintenance) For example:</p> <p>Light adjustment tube length 70cm</p> <p>Required cable length = 70cm+10cm = 80 cm</p> <p><b>EFLA code: KDCE6.2.80</b></p>	<b>KDCE6.2.XX</b>
1B	<p>Extension cord for light adjustment tube in Crossbars</p> 	<p>Required length is comparable with light adjustment tube length(A) x 1.5, and length (B) along the crossbar to mast/crossbar center point.</p> <p>For example:</p> <ul style="list-style-type: none"> <li>- Height (A) 70cm</li> <li>- Distance (B) 150cm</li> </ul> <p>Required Cable length: 70cm x 1.5 +150cm = 255cm</p> <p><b>EFLA Code: KDCE6.2.255</b></p>	<b>KDCE6.2.XX</b>



	Function	Description	Item
2	<p>Extension cord of Lattice or tubular mast section(s)</p> 	<p>Required length is comparable with each mast section length (add +10cm for easy maintenance)</p> <p>For example:</p> <p>Mast section length 600cm</p> <p>Cable length = 600cm+10cm= 610 cm</p> <p><b>EFLA Code: KDCE6.2.610</b></p>	<b>KDCE6.2.XX</b>
2	<p>Extension cord of second lattice section, if two size mast</p> 	<p>Required length is comparable with each mast section length (add +10cm for easy maintenance)</p> <p>For example:</p> <p>Mast section length 500cm</p> <p>Cable length = 500cm+10cm= 510 cm</p> <p><b>EFLA Code: KDCE6.2.510</b></p>	<b>KDCE6.2.XX</b>

	Function	Description	Item
3	<p>Prefabricated lead from foundation to transformer pit /deep base</p> 	<p>Prefabricated lead with arc protection Receptable sleeve. Free end in transformer side allows cut-to length in Transformer pit and installation of KD502 connector kit. Add minimum one meter for easy installation</p> <p>For example:</p> <p>Length from mast base to Pit 500cm</p> <p>Cable length =500cm+100cm= 600cm</p> <p><b>EFLA Code: KDCE6.2.600</b></p>	<b>KDCE6.2.XX</b>
4	<p>Secondary kit for for transformer connection in Pit (Optional)</p> 	<p>Secondary connector kit 2,5mm<sup>2</sup></p>	<b>KD501</b>
5	<p>Fastening of extension cords</p> 	<p>Panduit UV-protected Ashetal cable ties. (3pcs per meter)</p> <p>For example: Mast height 900cm= 9m</p> <p>3 ties x 9m = 27 ties</p>	<b>DT4-EH-L0</b>
6	<p>Hand tool for cable tie installation</p> 	<p>Panduit recommended tool for fast and easy installation</p> <p>For example: One per assembly site</p>	<b>GS4EH-E</b>



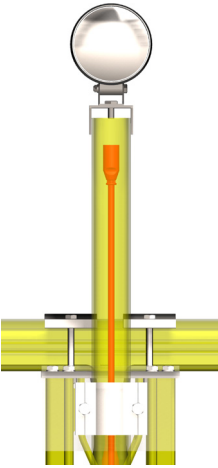
## 2.2 Work instruction for wiring

ICAO's recommendation for wiring of an approach mast encourages the designer to provide points of disconnection for the wires to ensure that segmentation is not hindered in case of a collision. In addition, the connection points should be protected by a break-away boot to prevent any arcing at disconnection. The wiring method presented in this document satisfies the recommendation, reduce workload at site and has been found practical in maintenance free solution.

Wiring installation to Frangible mast to be carried out at the mast assembly site. It is recommended to cable the mast to the greatest possible extent at the mast assembly site. Only the connection of the extension cords in the mast to the extension cords drawn from the transformer housing will be carried out at the erection site.

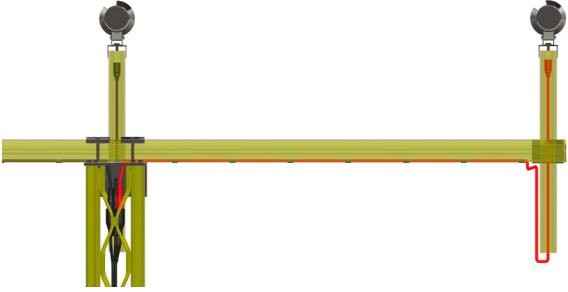
### 2.2.1 Wiring of the mast light adjustment tube

#### CENTER LIGHT (One light masts and cross arm masts)

	<ol style="list-style-type: none"> <li>1. Connect the extension cord Receptacle to light fixture Plug, and guide the cable through the mast light adjustment tube</li> <li>2. Install light and position adjustment tube correctly</li> <li>3. Guide extension cord Plug inside of the mast for the next connection</li> <li>4. Hide cable leftovers inside of light adjustment tube and close the cap according to mast manufacturer instructions. IF cap is not in use, use cable ties to secure the leftover cable to inside of adjustment tube</li> </ol>
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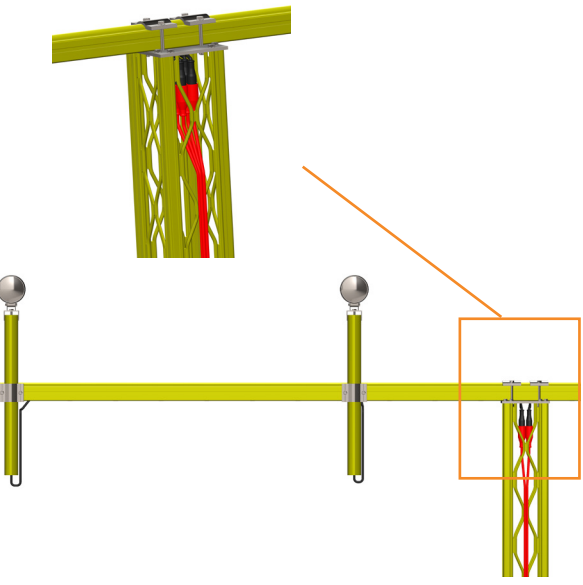
## CROSS ARM LIGHTS (2-5 light cross arm masts)

### Wiring of light adjustment tube

	<ol style="list-style-type: none"> <li>1. Connect the extension cord Receptacle to light fixture Plug, and guide the cable through the mast light adjustment tube</li> <li>2. Install light and position adjustment tube correctly</li> <li>3. Guide extension cord along the cross arm to the the top center of the mast mast for the next connection</li> <li>4. Hide cable leftovers inside of light adjustment tube and close the cap according to mast manufacturer instructions. IF cap is not in use, use cable ties to secure the leftover cable to inside of adjustment tube</li> </ol>
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### 2.2.2. Wiring of Lattice or tubular mast section

#### ONE PART MAST (Mast with one section 1-5 lights)

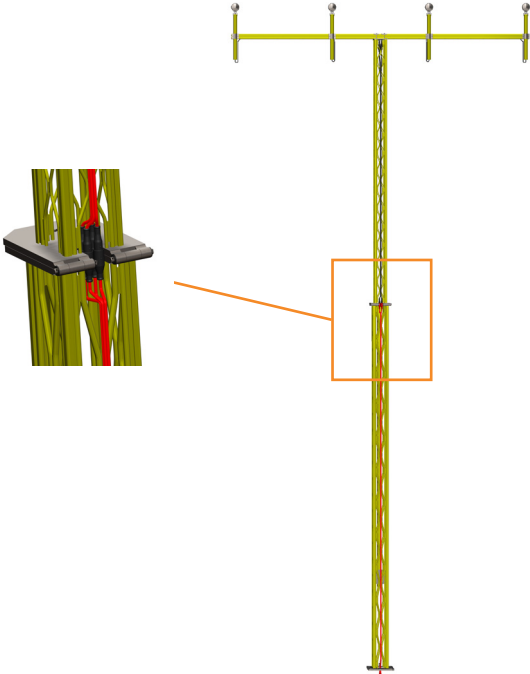
	<ol style="list-style-type: none"> <li>1. Connect the extension cord Plug(s) from light adjustment tube(s) to Receptacle(s).</li> <li>2. Leave connection(s) inside of the mast module and <b>guide the cable(s) through to the backside of the lattice mast structure (view from threshold).</b></li> <li>3. Run the cables down and install the cable to middle of mast structure with cable ties to 30-50cm incrementals.</li> </ol> <p><b>NOTE: Do not use additional cable channels to secure frangibility</b></p>
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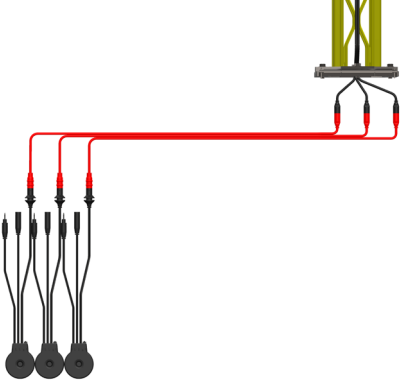
### 2.2.3. Wiring of second Lattice or tubular mast sections

#### TWO OR THREE PART MASTS, AND CENTER-HINGE MODELS

For two section masts and center-hinged models requires natural break-away point also for the cabling

	<ol style="list-style-type: none"> <li>1. Connect the upper section Receptacle to lower section Plug</li> <li>2. Run the cables down and install the cable to middle of mast structure with cable ties to 30-50cm incrementals.</li> <li>3. Use cable ties to coil additional length for easy maintenance and tilting the mast.</li> <li>4. With three mast sections models repeat the same until to reach foundation</li> </ol>
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### 2.2.5. Wiring at the foundation site

	<ol style="list-style-type: none"> <li>1. Pass the free end of KDC506 prefabricated lead from the foundation to the transformer pit / deep can</li> <li>2. Cut to length and install KD502 connector kit plug to pit / deep can end</li> <li>3. Connect with transformer</li> </ol>
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