Tratos reeling cables

Cables for a moving world

TRATOS FLEX®
Introduction

**TratosFlex: Reeling cables for moving applications**

**Typical Applications**
- Monospiral, multi-spiral and spreader reeling; festoons and basket
- Specifically designed for mobile installations with high torsional and tensile stresses for applications in harsh working environments
- For supply power, control and signalling functions, including fibre-optic cables

**Main characteristics**
- High speed applications up to 300 mt/min
- Operating temperatures from -40°C up to +80°C

**TratosFlex ESDB**
- Phenomenal strength and flexibility
- Unique cable design focusing on tightening the internal structure to accommodate high speed applications.
- Prevents twisting and breakage which allows higher duration under constant severe conditions

TratosFlex ESDB is used extensively for numerous applications worldwide, without any corkscrew effect at high speed up to 300 mt/min.
Key Customers
Quality Approvals

Facilities

CESI
British Approval Service for Cables

CSI
Certified Quality System

AENOR
Empresa Registrada

Products

DVE
Verband Der Elektrotechnik

IMQ
Instituto Marchio di Qualità

UL
Underwriters Laboratories Inc.

GOST
Russian Certificate of Conformity

Lloyd’s Register

Registro Italiano Navale
Case studies

**London Gateway - UK**
*Type: Tratosflex ESDB*
Tratos has received an order to provide Tratosflex ESDB reeling cables for London Gateway, the UK’s first major deep-sea container port. Situated 25 miles east of central London and due to open in Q4 2013, the port is one of the most extensive developments in the UK and will provide entry into London for the world’s largest container ships.

**Khalifa Port - United Arab Emirates**
*Company: ADPC - Abu Dhabi Ports Company*
*Cranes Maker: Konecranes*
*Reeling Manufacturer: Cavotec SPECIMAS*
*Cable: TratosFlex ES-DB 3X50+2X25/2+12FO(9/125) 6/10kV*
The order includes 30 automated stacking cranes (ASC) and a container terminal operating system (TOS). The value of the order is over EUR 80 million. The cranes will be taken into operation in the new Khalifa Port in two phases: 14 cranes by the end of March 2012 and 16 by the end of June 2012.

**Jebel Ali Free Zone - Dubai**
*Owner: Dubai Port Authority*
*Company: Cavotec Middle East FZE*
*Cable: TratosFlex ESDB*
*Date installation: 2011*
Case studies

EuroMax (Holland)
Company: ZPMC
Type: End-feed point, reeling
Speed: 270 m/min
Situated at the mouth of Holland’s busiest port the Euromax harbour presented very tough working conditions for crane cables. Working with the port we were able to design a special cable which has been working continuously without problems since installation.

Thamesport (United Kingdom)
Company: Fantuzzi Reggiane
Type: Central-feed reeling
Speed: 240 m/min
Thamesport presented an innovative and challenging setup combining a high speed application with a central feed point. Over the course of several years we developed our special TRATOSFLEX ESDB to meet the needs of our customer.

Damietta (Egypt)
Company: Doosan
Type: Central-feed reeling
Speed: 140 m/min
The hot and dry conditions present in Egypt led to our developing TRATOSFLEX ES3
Case studies

**Rizhao (China)**

**Rizhao Port**, the largest and busiest iron-ore terminal in Asia, has chosen Tratosflex-ES for a total of fourteen machines since its opening in the year 2004. Tratosflex, now, are running well on 4 truck-loaders, 6 stacker & reclaimers and 4 ship-unloaders made by three of the biggest port machine manufacturers in China: ZPMC, Wuxi Gongli Engineering Machinery Ltd.,Co. and ChangchunPower Generation Equipment Ltd.,Co. 'We trust and rely on the cables made by the Italian Tratos Company very much because all of my 14 jumbo’s are equipped with Tratos cable. Fortunately, of cable performance does not disappoint us even in the hectic operation".

**Memphis (USA)**

**Company: Konecranes**

**Type: Central-feed reeling**

**Speed: 150 m/min**

Working with our customer we provided cables which have been use in on railway cranes since 2008.
Virginia (USA)  
Company: APM Terminals  
Type: End-feed reeling  
Speed: 300 m/min  
Working with our customer we provided cables which have been use in on railway cranes since 2010.

Tercat (Spain)  
Company: Konecranes  
Type: End-feed reeling  
Speed: 270 m/min  
We will supply the cables for this installation which will start its operation in the year 2012.

Busan (Korea)  
Company: Busan Port terminal  
Type: Central-feed reeling  
Speed: 270 m/min  
We will supply the cables for this installation which will start its operation in the year 2011.
Reeling Cables

TRATOS FLEX®
Control Cables 0,6/1 kV according to standards VDE 0250 p.814 (as applicable)
Reduced dimension cable laid on ground for reeling one way application.

**Main application:**
- monospiral one way reel up to 200 m/min
- multi-spiral spreader reels up to 200 m/min

**Additional application:**
- festoons up to 240 m/min
- tender system up to 60m/min

**TRATOSFESTOON®**

Low voltage power and control cable.
Reduced dimension cable for festoon application.

**Main application:**
- festoons up to 240 m/min.
TRATOSLIGHT-VRDB® - Vertical Reels
TRATOSLIGHT-VRDB-FO® - Vertical Reels + Fibre optic

Low voltage control cables for vertical application.

Main application:
- multi-spiral vertical reels up to 300 m/min.

Additional application:
- tender system up to 180 m/min.
- multi-spiral spreader reels up to 300 m/min.

TRATOSCOILFLEX® - 300/500 V – Lead free
TRATOSCOILFLEX-K® - 300/500 V – Lead free
TRATOSCOILFLEX-FO® - 300/500 V – Lead free+Fibre optic

Control cables for gravity-fed collector in basket suitable for spreader connection.
Heavy duty cable for basket applications.

Main application:
- vertical basket up to 160 m/min.
Reeling Cables

**TRATOSMART-DB® - (N)SHTÖU-J** - High speed, high pull & torsion resistance

**TRATOSGREEN-DB® - (N)SHTÖU-J** - Reduced halogens and reduced toxicity

Low voltage power cables - (N)SHTÖU-J VDE 0250 p.814.

- High speed, high pull & torsion resistance.
- Main application: Electrified rubber tyred gantry cranes (E-RTG) and reel two ways.

**Main application:**
- monospiral reel two ways up to 200 m/min.
- multi-spiral spreader reel up to 200 m/min.

**Additional application:**
- monospiral reel one way up to 300 m/min.
- festoons up to 240 m/min.

**TRATOSMART® - (N)SHTÖU-J**

**TRATOSMART® - (N)SHTÖU-JK**

**TRATOSGREEN® - (N)SHTÖU-J** - Reduced halogens and reduced toxicity

Low voltage power cables - (N)SHTÖU-J VDE 0250 p.814.

- Reduced dimension cable laid on ground for reeling one way application.

**Main application:**
- monospiral reel one way up to 200 m/min.
- multi-spiral spreader reel up to 200 m/min.

**Additional application:**
- festoons up to 240 m/min.
- tender system up to 60 m/min.
Reeling Cables

**TRATOSFLEX-ESDB®** - High speed, high pull & torsion resistance

Medium voltage power cables - (N) TSCGEWÖU VDE 0250 p.813 (as applicable) & HD 620 s1 p.9.
High speed, high pull & torsion resistance for reeling one and two ways application.

**Main application:**
- monospiral reel one way up to 300 m/min.
- monospiral two ways up to 200 m/min.
- random up to 60 m/min.
- multisprial spreader reel up to 200 m/min.

**Additional application:**
- tender system up to 60 m/min.

**TRATOSFLEX-ES3®** - (Extruded Screen) - Reduced weight and dimension

**TRATOSGREEN-ES3** - Reduced halogens and reduced toxicity

Medium voltage power cables - (N) TSCGEWÖU VDE 0250 p.813 (as applicable) & HD 620 s1 p.9
Extruded screen. Reduced weight and dimension for reeling one way application.

**Main application:**
- monospiral reel one way up to 200 m/min.
- multi-spiral reel (tender system) up to 60 m/min.
Reeling Cables

**TRATOSFLEX-ESDB-FO®** - High speed, high pull & torsion resistance

Medium voltage power cables - (N) TSCGEWÖU VDE 0250 p.813 (as applicable) & HD 620 S1 p.9.
High speed, high pull & torsion resistance for reeling one and two ways application with optical fibre.

**Main application:**
- monospiral reel one way up to 300 m/min.
- monospiral reel two ways up to 200 m/min.
- random up to 60 m/min.
- multisprial reel (spreader) up to 200 m/min.
- tender system up to 60 m/min.

**Additional application:**

**TRATOSFLEX-ES3-FO®** - (Extruded Screen) - Reduced weight & dimension

**TRATOSGREEN-ES3-FO®** - Reduced halogens and reduced toxicity

Medium voltage power cables (N)TSCGEWÖU+LWL VDE 0250 p.813 (as applicable) & HD 620 S1 p.9
Extruded screen. Reduced weight and dimension for reeling one way application with optical fibre.

**Main application:**
- monospiral reel one way up to 200 m/min.
- multisprial reel (tender system) up to 60 m/min.
**Reeling Cables**

**TRATOSFLAT® TRATOSFLAT-FO®**

Medium voltage flat cable for reeling application.

**Main application:** • monospiral reel one way up to 200 m/min.

**TRATOSFIBRE-DB® - (Extruded Screen) - Reduced weight and dimension**

Fibre optic cable.

**Main application:** • monospiral reel one way up to 300 m/min.
  • festoons up to 240 m/min.
SPECIAL ATEX TRATOSGREEN version according to atex recommendations is also available upon special request.

For standard reeling applications the same performance as Tratosmart cable but with reduced halogen, toxicity and improved fire resistance. Operational temperature in ambient conditions of -40°C to +80°C

ATEX (explosive atmosphere): Directive 94/9/CE.
Technical Information
Cables tailored to requirements

Tratos is able to offer custom designed and built solutions to the most demanding of circumstances. Tratos can offer you:

1) Reduced toxicity and flame retardant (e.g. for tunnels, buildings...): Halogen Free

2) Fire retardance (bunched low voltage cables) IEC 332-3

3) Improved resistance to chemical attack

4) Improved resistance to low temperatures (down to -50°C only for black outer sheath)

5) Composite Cables (e.g. power and control screened or unscreened cores) L.V. and M.V.

6) Special water resistant outer sheaths
## Crane Cables

<table>
<thead>
<tr>
<th>LONG LIFE BENEFITS</th>
<th>NEEDS</th>
<th>OUR PRODUCT FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGAINST DAMAGE FROM</td>
<td>High tensile load&lt;br&gt;High torsion resistance*</td>
<td>Extra flexible conductors&lt;br&gt;Very small pitch core assembly&lt;br&gt;Kevlar central support&lt;br&gt;Antitorsional protection</td>
</tr>
<tr>
<td>AGAINST DAMAGE FROM</td>
<td>High quality sheaths</td>
<td>Special sheaths</td>
</tr>
<tr>
<td>AGAINST HARSH ENVIRONMENTS</td>
<td>High quality sheaths</td>
<td>Special sheaths</td>
</tr>
<tr>
<td></td>
<td>UV&lt;br&gt;Extreme temperature&lt;br&gt;Fire&lt;br&gt;Water&lt;br&gt;Chemical Agents</td>
<td></td>
</tr>
</tbody>
</table>

**EQUIPEMENT COST BENEFITS DUE TO**

| Cable weight<br>Cable size | Minimum weight<br>Minimum OD | IMPROVED electrical properties<br>of insulation compounds<br>Special design |

* TratosFLEX-ESDB suggested also for pull and store reel
TRATOS FLEX - ES
TRATOS FLEX - ESDB

REDUCED WEIGHT AND DIMENSIONS

MEDIUM VOLTAGE
Special copper conductor design with: Very Fine Diameter of Single Wire

<table>
<thead>
<tr>
<th>Cables</th>
<th>Conductor</th>
<th>Nominal diameter of single wires</th>
<th>VDE 0250</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm&lt;sup&gt;2&lt;/sup&gt;</td>
<td>mm</td>
<td>mm</td>
</tr>
<tr>
<td>3x25+3x10</td>
<td>25 phase</td>
<td>0.24</td>
<td>0.3</td>
</tr>
<tr>
<td>3x25+3x10</td>
<td>10 earth</td>
<td>0.24</td>
<td>0.25</td>
</tr>
<tr>
<td>3x35+3x10</td>
<td>35 phase</td>
<td>0.24</td>
<td>0.3</td>
</tr>
<tr>
<td>3x35+3x10</td>
<td>10 earth</td>
<td>0.24</td>
<td>0.25</td>
</tr>
<tr>
<td>3x50+3x10</td>
<td>50 phase</td>
<td>0.24</td>
<td>0.35</td>
</tr>
<tr>
<td>3x50+3x10</td>
<td>10 earth</td>
<td>0.24</td>
<td>0.25</td>
</tr>
<tr>
<td>Products</td>
<td>TRATOSFLEX-ES</td>
<td>Competitor 1</td>
<td>Competitor 2</td>
</tr>
</tbody>
</table>
**Flexibility**

**Special copper conductor** design with:

* a very short pitch*

<table>
<thead>
<tr>
<th></th>
<th>Approx index</th>
<th>mm PITCH mm diameter</th>
<th>(K)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Single strand</td>
<td>14</td>
<td>14</td>
<td>15</td>
<td>20 Single strand</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>9</td>
<td>13</td>
<td>13.5 Finished conductor</td>
</tr>
<tr>
<td>TRATOSFLEX-ES</td>
<td>Competitor 1</td>
<td>Competitor 2</td>
<td>Competitor 3</td>
<td></td>
</tr>
</tbody>
</table>
Antitorsion and tensile stress

NEW
TRATOS FLEX ESDB – Medium voltage

In order to avoid damage of cable during working conditions caused by:
- tensile stress
- change of direction

BRAID: REDUCED ANGLE of TORSION

BRAID and CENTRAL SUPPORT: REDUCED ELONGATION of CABLES

Central support
Braid
**Comparison between different cables:**

<table>
<thead>
<tr>
<th>Central support</th>
<th>Material</th>
<th>Braid</th>
<th>Material</th>
<th>Nominal Max. Elongation</th>
<th>Products</th>
<th>Products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aramidic Yarn</td>
<td>Aramidic Yarn</td>
<td>Polyester</td>
<td>2% *</td>
<td>TRATOSFLEX-ESDB</td>
<td>Cable 1</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>Polyester</td>
<td>Rayon</td>
<td>14%</td>
<td>Competitor 1</td>
<td>Cable 2</td>
</tr>
<tr>
<td></td>
<td>Rayon</td>
<td>Rayon</td>
<td></td>
<td>16%</td>
<td>Competitor 2</td>
<td></td>
</tr>
</tbody>
</table>

* When tensile forces are applied, elongations on copper conductors are reduced
**Antitorsion and tensile stress**

**TRATOS FLEX - ESDB**

has **double the strength** of our competitors.

<table>
<thead>
<tr>
<th>Pulling Tension</th>
<th>Dynamic (N)</th>
<th>Static (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRATOS</td>
<td>4125</td>
<td>3000</td>
</tr>
<tr>
<td>Competitor 1</td>
<td>2250</td>
<td>1500</td>
</tr>
<tr>
<td>Competitor 2</td>
<td>2250</td>
<td>1500</td>
</tr>
<tr>
<td>Competitor 3</td>
<td>2250</td>
<td>1500</td>
</tr>
</tbody>
</table>

Blue: TRATOS FLEX-ESDB

Green: High quality cable

Red: Standard quality cable
For several years the cable industry for Medium Voltage cables have been using an HEPR compound. Improved mechanical and electrical characteristics allow us, using the norms HD620-S1 p.9-E-4 July 2001, to employ a reduced thickness compared to the previous edition of June 1996 and the VDE 0250 P813 May 1985. Obtaining a finished cable weight and dimensions smaller than those cables to previous VDE norms.

For incoming orders from April 2004, cables have been produced with insulation thickness according to HD620-S1 p.9-E-4 July 2001.

Dimensions and weights are shown in table 1

Cables for reeling applications (N)TSCGEWöU manufactured according to VDE 0250 p.813 May 1985 should be insulated with EPR material quality of at least 3GI3.

**HD 620 S1: Harmonization document**
Title: Distribution cables with extruded insulation for rated voltages from 3,6/6 kV to 20,8/36 kV
Tratos on demand

Cables Tailor Made

Our “Cables Tailor Made” service can offer custom design and built solutions to the most demanding of circumstances. In conjunction with our clients Tratos can offer you:

- Variety of lengths
- Large overall diameter (above standard products)
- Cable designs
- Bespoke cables
- Environmentally specific cables (mud, chemicals, UV, water, oil, radiation)

Case Study
Tratos has manufactured and supplied Superconducting conductors to ITER (International Thermonuclear Experimental Reactor), an international nuclear fusion research and engineering project, which is currently building the world’s largest experimental tokamak nuclear fusion reactor at the Cadarache facility in the south of France.

www.iter.org