e-chain® - control cable for use in rail vehicles (class S.1.3); PVC- and halogen-free, flame-retardant, oil-resistant, low smoke gas density, low smoke gas toxicity as well as low smoke gas corrosivity.

Subject to misprints and errors. Technical modifications are possible at any time. Maybe older batches do not have all or other features. Please refer regarding the availability of the items also the information in the latest chainflex® catalogue.

Core design:
Conductor: Fine-wire strand in especially bending-stable version consisting of tinned copper wires (following DIN EN 60228).
Core insulation: Mechanically high-quality special mixture.
Core identification:
- ≤ 0,34 mm²: Black cores with white numerals.
- ≥ 0,5 mm²: Black cores with white numerals & one core greenyellow.

Jacket design:
Outer jacket: Special mixture (according EN 50264-1 EM 104), adapted to suit the requirements in e-chains® for use in rail vehicles.
- oil-resistant (following DIN EN 60811-2-1)
- flame-retardant (according to DIN EN 60332-1-2, DIN EN 45545-2) [Fire protection class: 3 (fol. EN 45545-2) or 4 (fol. DIN 5510-2)]
- PVC- and halogen-free (following DIN EN 50267-2-1)
- self extinguishing (following DIN EN 60332-1-2)
- low smoke gas density (following DIN EN 60332-1-2)
- low smoke gas toxicity (following DIN EN 50305-9-2)
- low smoke gas corrosivity (following DIN EN 50267-2-2)
- silicon-free (following PV 3.10.7 - status 1992)
- lead-free (following 2011/65/EU (RoHS-II))
- UV-resistant: High

Colour outer jacket: Jet black (similar to RAL 9005)
Cable marking (White):
- 00000 m*: igus chainflex CFSPECIAL.414.--.--.---
- 300/500V CE
- RoHS-II conform www.igus.de ++ chainflex cable works +++

* Length printing: Not calibrated. Only intended as an orientation aid.
Φ / Φ: Cable identification according to part no. (see technical table for details).
Ex.: CFSPECIAL.414.03.06: …x CFSPECIAL.414.03.06 6x0,34 300,

General mechanical values:
(for individual details see technical table)

<table>
<thead>
<tr>
<th>Double strokes *</th>
<th>1 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (from/to) °C</td>
<td>Travel distance (TD)</td>
</tr>
<tr>
<td>-20 / -10</td>
<td>≤ 5 m</td>
</tr>
<tr>
<td>-10 / +70</td>
<td>(unsupported)</td>
</tr>
<tr>
<td>+70 / +80</td>
<td></td>
</tr>
</tbody>
</table>

*: Minimum guarantee lifetime of the cable under the specified conditions.
The installation of the cable is recommended within the middle temperature range.

<table>
<thead>
<tr>
<th>Temperature range</th>
<th>-30 °C</th>
<th>-20 °C</th>
<th>-10 °C → +70 °C</th>
<th>+80 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min. bending radius for fixed installation</td>
<td>10,0 x d</td>
<td>7,5 x d</td>
<td>5,0 x d</td>
<td>7,5 x d</td>
</tr>
<tr>
<td>Torsion (at 1 m cable length)</td>
<td>—</td>
<td>±10 °</td>
<td>±30 °</td>
<td>±10 °</td>
</tr>
</tbody>
</table>

General electrical values:
(for individual details see technical table)
Nominal voltage: 300 / 500 V
Test voltage: 2 kV (following VDE 0281-2)
Guidelines: CE

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e-chain® - control cable for use in rail vehicles (class S.1.3): PVC- and halogen-free, flame-retardant, oil-resistant, low smoke gas density, low smoke gas toxicity as well as low smoke gas corrosivity.

Dynamic values:
Max. speed for e-chain® use:** Unsupported (up to 5 m): v = 10 m / s
Max. acceleration for e-chain® use:** a = 20 m / s²

** These values are based on specific applications or tests. They do not represent the limit of what is technically feasible.

Typical lab test setup for this cable group:
Test bending radius R: approx. 48 mm
Test travel S: approx. 1 - 15 m
Test period: min. 2 million strokes
Test speed: approx. 0,5 - 2 m / s
Test acceleration: approx. 0,5 - 1,5 m / s²

Dynamic values:
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Max. acceleration for e-chain® use:** a = 20 m / s²

** These values are based on specific applications or tests. They do not represent the limit of what is technically feasible.

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Test acceleration: approx. 0,5 - 1,5 m / s²

e-chain® - cable for use in rail vehicles:
- low smoke gas density
- low smoke gas toxicity
- low smoke gas corrosivity
- self extinguishing
- for unsupported travel distances up to 5 m
- suitable for up to 1 million movements (double strokes) in e-chains®
- UV-resistant
- CE, RoHS-II

Typical application areas:
For moving energy supplies in rail vehicles.
Indoor and outdoor applications.
Automatic doors in rail vehicles, busses adjusting equipment.

- Low smoke gas density in case of fire following DIN EN 61034-2
- Low smoke gas toxicity in case of fire following DIN EN 50305-9-2
- Low smoke gas corrosivity in case of fire following DIN EN 50267-2-2.
  pH value ≥ 4,3 & conductivity ≤ 10 µS / mm
### Technical tables:

#### Mechanical values:

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Number of cores &amp; nominal cross section [mm²]***</th>
<th>External diameter (d)**** [max. mm]</th>
<th>Copper index [kg / km]</th>
<th>Weight [kg / km]</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFSPECIAL.414.02.04</td>
<td>4x0,25</td>
<td>5,0</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>CFSPECIAL.414.02.06</td>
<td>6x0,25</td>
<td>5,5</td>
<td>18</td>
<td>40</td>
</tr>
<tr>
<td>CFSPECIAL.414.02.08</td>
<td>8x0,25</td>
<td>6,5</td>
<td>24</td>
<td>53</td>
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<td>CFSPECIAL.414.03.04</td>
<td>4x0,34</td>
<td>5,0</td>
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<td>6,0</td>
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<td>52</td>
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<tr>
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<td>62</td>
</tr>
<tr>
<td>CFSPECIAL.414.15.03</td>
<td>3G1,5</td>
<td>7,5</td>
<td>50</td>
<td>96</td>
</tr>
</tbody>
</table>

*** G → Cable contains a greenyellow core.

**** External diameters are maximum values and may tend toward lower tolerance limits.

#### Electrical values:

<table>
<thead>
<tr>
<th>Nominal cross section [mm²]</th>
<th>Conductor resistance [approx. Ω / km] at 20 °C</th>
<th>Max. current rating [A] at 30 °C*</th>
</tr>
</thead>
<tbody>
<tr>
<td>(following)</td>
<td>DIN EN 50289-1-2</td>
<td>DIN VDE 0298-4</td>
</tr>
<tr>
<td>0,25</td>
<td>78,5</td>
<td>5</td>
</tr>
<tr>
<td>0,34</td>
<td>60,4</td>
<td>7</td>
</tr>
<tr>
<td>1,5</td>
<td>14,1</td>
<td>21</td>
</tr>
</tbody>
</table>

* The max. current rating depends on factors such as the individual environmental conditions and the type of installation.

#### Construction table:

<table>
<thead>
<tr>
<th>Part no.</th>
<th>No. of cores</th>
<th>Core stranding</th>
<th>Part no.</th>
<th>No. of cores</th>
<th>Core stranding</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFSPECIAL.414.XX.03</td>
<td>3</td>
<td></td>
<td>CFSPECIAL.414.XX.04</td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>CFSPECIAL.414.XX.08</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>