TYPE APPROVAL CERTIFICATE

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the DNV GL Type Approval System.

Certificate No.	**61 935 - 14 HH**
Company	**igus GmbH** **Spicher Str. 1a** **51447 Köln, Germany**
Product Description	**TPE insulated and PUR or TPE sheathed, flame retardant chainflex control cables (unshielded or shielded) for shipboard and offshore applications, especially for e-chain use**
Type	**CF9.UL; CF10.UL** **CF77.UL.D; CF78.UL;**
Environmental Category	**None**
Technical Data / Range of Application	**Rated voltage: 300 / 500 V** **Max. operating conductor temperature: 90 °C (20.000h)** **Conductor: Fine- wired, bare copper strand** **Insulation: TPE** **Inner jacket: TPE for CF10.UL** **PUR for CF78.UL** **Shield: Tinned copper wires for CF10.UL and CF78.UL** **Outer sheath: CF9.UL and CF10.UL: TPE** **CF77.UL.D and CF78.UL: PUR** **Number of cores, cross-sectional area and properties according to specification no.:** **chainflex CF9.UL; CF10.UL; CF77.UL.D; CF78.UL;** **special properties mentioned on page 2 and 3**
Test Standard	**UL 758:2013; UL 1581:2011; IEC 60332-1-2:2004** **UL Style: 10479, 21529, 10258, 21387, 10493, 20233,11323, 21223;**
Documents	**Test report : No.: F1150056640 dated 13.02.2014 + 14.02.2014**
Remarks	**This certificate is issued on the basis of GL Guidelines for the Performance of Type Approvals, Chapter 1 - Procedure (VI-7-1), Edition 2007 and the GL Type Approval Procedure for Shipboard Cables.**

Valid until **2019-05-02**

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File No. **I.N.01**

Hamburg, 2014-11-27

Type Approval Symbol

DNV GL

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The cables listed in this certificate are developed, tested and produced especially for continuously moving e-chain applications.
Apart from the qualities listed on page 1, the cables also fulfil the following special characteristics:

Explanation energy chain:
An energy chain (also e-chain, cable carrier or drag chain) is a component that guides and protects special flexible cables, pneumatic or hydraulic hoses.
You can find energy chains wherever moving machine parts need to be supplied with energy, data, liquids or gases.

Special characteristics cables
Due to the permanent bending and moving load of the cables in an energy chain, especially developed, tested and produced cables must have the following special properties:

- highly bending-resistant wires
- insulation materials with low mechanical aging due to bending load
- optimized pitch lengths stranding designs
- for shielded cables, highly bending-resistant braided shields with min. 80% optical coverage
- highly abrasion-resistant outer jacket materials
- highly bending-resistant outer jacket materials
- highly media, UV and ozone resistant outer jacket materials
- compact design for sufficient inherent rigidity (Not highly flexible!)
- have to withstand permanent bending tests in energy chains of min. 2-4 million double strokes (back and forth movement) without damage.
- undergo a minimum 15-20% batch production control through energy chain moving tests of at least 200.000 double strokes

Important note:
During the installation of cables in moving energy chains, special assembly and strain relief instructions have to be taken into account.

For further details check: www.igus.de

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Type Approval Symbol GL

DNV GL

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TYPE APPROVAL CERTIFICATE

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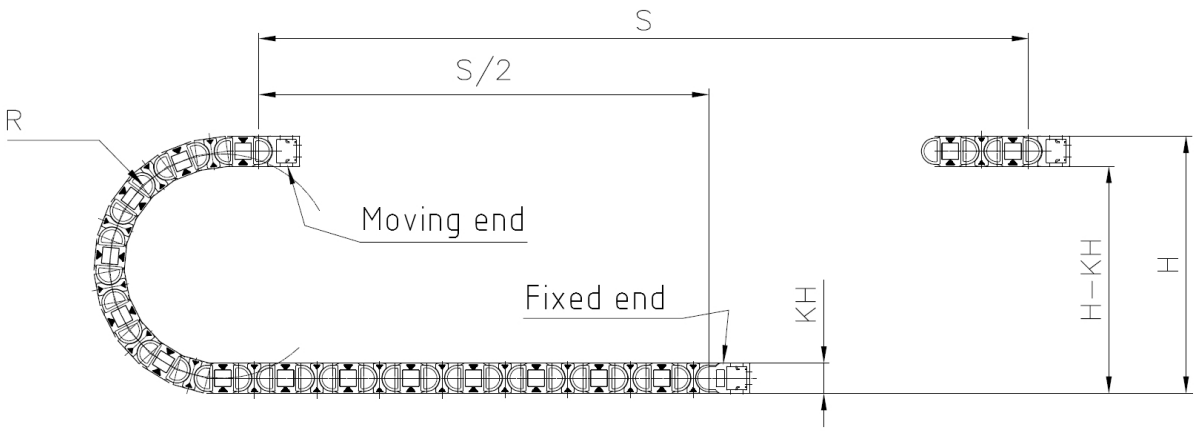
Certificate No. **61 935 - 14 HH**



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Hamburg, 2014-11-27

Type Approval Symbol

DNV GL

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