DNV·GL

Certificate No:
TAE00003X7

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Flexible cable

with type designation(s)
CFBUS Ethernet

Issued to
igus GmbH
Köln, Nordrhein-Westfalen, Germany

is found to comply with
DNV GL rules for classification – Ships, offshore units, and high speed and light craft

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

Issued at **Hamburg** on **2020-04-24**
This Certificate is valid until **2025-04-23**.
DNV GL local station: **Essen**

Approval Engineer: **Carsten Hunsalz**

for **DNV GL**

Arne Schaarmann
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

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Product description

TPE sheathed, flame retardant chainflex Ethernet cables for shipboard and offshore applications, especially for e-chain use

Type CFBUS Ethernet

Rated voltage:	50 V
Conductor:	Fine- wired, bare copper strand
Core design (Insulation / inner jacket / element shield):	According to bus specification
Overall shield:	Tinned copper wires
Outer sheath:	TPE

Bus Type	Standard	Impedance (Ω)
Ethernet CAT 5e	IEC 61158-2 IEC 61156-6	100
Ethernet CAT 6A	IEC 61158-2 IEC 61156-6	100
Ethernet CAT 7	IEC 61158-2 IEC 61156-6	100

Number of cores, cross-sectional area according to:

EU_igus_chainflex_catalogue_05.2020

Application/Limitation

The cables listed in this certificate are developed, tested and produced especially for continuously moving e-chain applications.
Apart from the qualities listed above, 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.

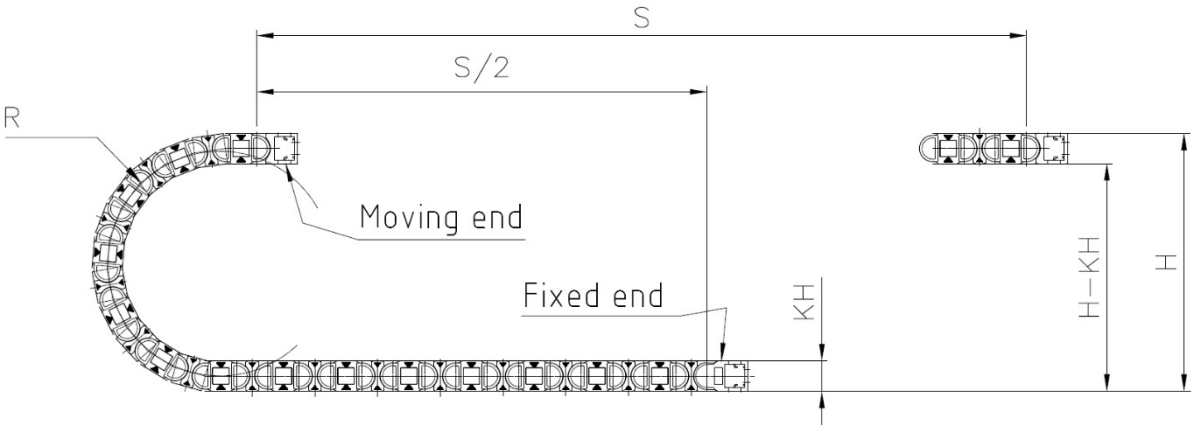
Special characteristics cables
Due to the permanent bending and moving load of the cables in an energy chain, especially developed, tested and produced cables must have the following special properties:

- 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

Job Id: **262.1-031962-1**
Certificate No: **TAE00003X7**

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



CFBUS .040-.049

Temperature range	-50 ° C <	-45°C <	-35°C <	-25°C / 60°C	> +70°C
Min. bending radius for e-chain use	-	-	12,5 x d	10 x d	12,5 x d
Min. bending radius for flexible movement, following EN 60811-504	-	8 x d		8 x d	8 x d
Min. bending radius for fixed installation, following DIN EN 50305	5 x d			5 x d	5 x d

CFBUS .050-.052

Temperature range	-50 ° C <	-45°C <	-35°C <	-25°C / 60°C	> +70°C
Min. bending radius for e-chain use	-	-	15 x d	12,5 x d	15 x d
Min. bending radius for flexible movement, following EN 60811-504	-	8 x d		8 x d	8 x d
Min. bending radius for fixed installation, following DIN EN 50305	5 x d			5 x d	5 x d

Type Approval documentation

Test Report: No.: 78772939 dated 06.03.2014
78772939 / 78774222 dated 06.02.2014
Specification: igus GmbH chainflex CFBUS

Tests carried out

Standard	Issued	General description	Limitation
DNVGL-CP-0417	2015-12	DNV GL Type approval program for Flexible electrical cables	
UL Style		11632, 21218	
UL 758	2019-04	Appliance Wiring Material	
UL 1581	2020-02	Reference Standard for Electrical Wires, Cables, and Flexible Cords	

Standard	Issued	General description	Limitation
IEC 60332-1-2	2015-07	Tests on electric and optical fibre cables under fire conditions – Part 1-2: Test for vertical flame propagation for a single insulated wire or cable –Procedure for 1 kW pre-mixed flame	
EN 50289-1-11	2016-12	Communication cables Specifications for test methods Part 1-11: Electrical test methods Characteristic impedance, input impedance, return loss	

Marking of product

Example:

"00000 m" igus chainflex CFBUS size 50V
E310776 N c*RU*us AWM Style xxx VW-1 AWM I/II A/B 80°C 600V
FT1 CE N RoHS-II conform www.igus.de

Place of Production

DNV GL id: 10384447

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the Type approval are complied with and that no alterations are made to the product design or choice of materials.

The main elements of the assessment are:

- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Routine Tests (RT) checked (if not available tests according to RT to be carried out)
- Review of type approval documentation
- Review of possible change in design, materials and performance
- Ensuring traceability between manufacturer's product type marking and Type Approval Certificate.

Periodical assessment is to be performed after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate.

END OF CERTIFICATE