

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Electric Power Cable

with type designation(s)

BETAflam 145 C-flex 0,6/1 kV, BETAflam 145 C-flex VFD 0,6/1 kV

Issued to

LEONI Studer AG
Däniken SO, Switzerland

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.

Voltage class (kV) 0,6/1

Temp. class (°C) 90

Issued at **Hamburg** on **2017-01-30**

This Certificate is valid until **2021-06-30**.

DNV GL local station: **Augsburg**

for **DNV GL**

Approval Engineer: **Carsten Hunsalz**

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Duy Nam Le
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.



Product description

Type: BETAflam 145 C-flex 0,6/1 kV

Construction:

Conductors: Tinned or plain stranded copper class 2 or class 5
Core insulation: HF90
Inner covering: Tape
Screen: Tinned fine copper wire braid (Cu foil optional)
Outer sheath: SHF2

Number of cores x conductor cross-section	Overall diameter
mm ²	mm
1 x 1,5	4,8 ±0,4
2 x 1,5	8,2 ±0,4
3 x 1,5	8,7 ±0,4
4 x 1,5	9,4 ±0,4
5 x 1,5	10,4 ±0,6
6 x 1,5	11,5 ±0,6
7 x 1,5	12,6 ±0,6
8 x 1,5	13,7 ±0,6
9 x 1,5	14,6 ±0,6
10 x 1,5	15,0 ±0,6
12 x 1,5	15,0 ±0,6
14 x 1,5	16,0 ±0,6
16 x 1,5	16,9 ±0,6
19 x 1,5	19,3 ±0,6
21 x 1,5	20,3 ±0,6
24 G 1,5	21,7 ±0,6
25 G 1,5	21,7 ±0,6
27 G 1,5	21,7 ±0,6
30 G 1,5	22,4 ±0,6
33 G 1,5	23,4 ±0,6
37 G 1,5	25,6 ±0,6
1 x 2,5	5,6 ±0,4
2 x 2,5	9,8 ±0,4
3 x 2,5	10,4 ±0,6
4 x 2,5	11,5 ±0,6
5 x 2,5	12,6 ±0,6
6 x 2,5	13,8 ±0,6
7 x 2,5	15,3 ±0,6
8 x 2,5	16,5 ±0,6
9 x 2,5	17,6 ±0,6
10 x 2,5	18,3 ±0,6
12 x 2,5	18,3 ±0,6
14 x 2,5	19,7 ±0,6
16 x 2,5	20,7 ±0,6
19 x 2,5	23,5 ±0,6
21 x 2,5	24,3 ±0,6

Number of cores x conductor cross-section	Overall diameter
mm ²	mm
24 x 2,5	26,4 ±0,6
25 x 2,5	26,4 ±0,6
27 x 2,5	26,4 ±0,6
30 x 2,5	27,6 ±0,6
33 x 2,5	28,8 ±0,6
37 x 2,5	31,4 ±0,6
1 x 4	6,3 ±0,4
2 x 4	10,9 ±0,6
3 x 4	11,5 ±0,6
4 x 4	12,8 ±0,6
5 x 4	14,2 ±0,6
6 x 4	15,6 ±0,6
7 x 4	17,0 ±0,6
8 x 4	18,2 ±0,6
9 x 4	20,0 ±0,6
10 x 4	20,7 ±0,6
12 x 4	20,7 ±0,6
14 x 4	22,1 ±0,6
16 x 4	23,5 ±0,6
19 x 4	26,1 ±0,6
21 x 4	27,3 ±0,6
24 x 4	30,0 ±0,6
27 x 4	30,0 ±0,6
1 x 6	6,9 ±0,4
2 x 6	12,1 ±0,6
3 x 6	12,8 ±0,6
4 x 6	14,3 ±0,6
5 x 6	16,0 ±0,6
6 x 6	17,4 ±0,6
7 x 6	19,3 ±0,6
8 x 6	20,6 ±0,6
10 x 6	23,4 ±0,6
12 x 6	23,4 ±0,6
14 x 6	24,7 ±0,6
16 x 6	26,3 ±0,6

Number of cores x conductor cross-section	Overall diameter
mm ²	mm
19 x 6	29,5 ±0,6
21 x 6	31,0 ±0,6
1 x 10	8,4 ±0,4
2 x 10	15,1 ±0,4
3 x 10	16,4 ±0,6
4 x 10	18,1 ±0,6
5 x 10	20,2 ±0,6
6 x 10	22,3 ±0,6
7 x 10	24,3 ±0,6
8 x 10	26,5 ±0,6
10 x 10	30,0 ±0,6
12 x 10	30,0 ±0,6
1 x 16	10,0 ±0,4
2 x 16	18,3 ±0,6
3 x 16	19,9 ±0,6
4 x 16	22,1 ±0,6
5 x 16	24,5 ±0,6
6 x 16	26,8 ±0,6
7 x 16	29,8 ±0,6
8 x 16	32,1 ±0,6
10 x 16	36,5 ±0,6
12 x 16	36,5 ±0,6
1 x 25	11,6 ±0,6
2 x 25	21,9 ±0,6
3 x 25	23,5 ±0,6
4 x 25	26,0 ±0,6
5 x 25	28,8 ±0,6
6 x 25	32,1 ±0,8
7 x 25	35,3 ±0,8

Number of cores x conductor cross-section	Overall diameter
mm ²	mm
1 x 35	12,8 ±0,6
2 x 35	24,3 ±0,6
3 x 35	26,1 ±0,6
4 x 35	29,2 ±0,6
5 x 35	32,3 ±0,8
6 x 35	35,5 ±0,8
7 x 35	38,7 ±0,8
1 x 50	15,7 ±0,6
2 x 50	30,3 ±0,8
3 x 50	32,5 ±0,8
4 x 50	36,1 ±0,8
5 x 50	39,9 ±0,8

Number of cores x conductor cross-section	Overall diameter
mm ²	mm
1 x 70	18,0 ±0,6
2 x 70	34,7 ±0,8
3 x 70	37,2 ±0,8
4 x 70	41,5 ±0,8
5 x 70	45,7 ±0,8
1 x 95	20,1 ±0,6
2 x 95	38,3 ±0,8
3 x 95	41,2 ±0,8
4 x 95	46,1 ±0,8
5 x 95	51,5 ±0,8

Number of cores x conductor cross-section	Overall diameter
mm ²	mm
1 x 120	21,5 ±1,0
2 x 120	41,3 ±2,0
3 x 120	44,1 ±2,0
4 x 120	49,2 ±2,5
1 x 150	23,9 ±1,5
2 x 150	46,1 ±2,5
3 x 150	49,2 ±2,5
1 x 185	26,0 ±1,5
1 x 240	29,3 ±2,0
1 x 300	32,9 ±2,0

Type: BETAflam 145 C-flex VFD 0,6/1 kV:

Construction:

Conductors: Tinned or plain stranded copper class 2 or class 5
Core insulation: HF90
Earth conductors: 3x distributed earth conductors in interstices
Inner covering: Tape
Screen: Cu foil (optional)
Screen: Tinned fine copper wire braid
Outer sheath: SHF2

Number of cores x conductor cross-section	Overall diameter
mm ²	mm
3 x 6 + 3 x 1	13,3 ±0,6
3 x 10 + 3 x 2,5	18,2 ±0,6
3 x 16 + 3 x 2,5	20,0 ±0,6
3 x 25 + 3 x 4	23,6 ±0,6

Number of cores x conductor cross-section	Overall diameter
mm ²	mm
3 x 35 + 3 x 6	26,2 ±0,6
3 x 50 + 3 x 10	32,6 ±0,6
3 x 70 + 3 x 16	38,2 ±0,8
3x95 + 3x16	41,3 ±0,8

Number of cores x conductor cross-section	Overall diameter
mm ²	mm
3x120 + 3x25	46,1 ±0,8
3x150 + 3x25	51,8 ±0,8
3x185 + 3x35	56,5 ±1,0
3x240 + 3x50	64,4 ±1,0

Application/Limitation

The requirements of SOLAS Amendments Chapter II-1, Part D, Reg. 45, 5.2 (provision to be taken to limit Fire Propagation along Bundles of Cables or Wires) are fulfilled without any additional measures.

Power cable or VFD applications. Halogen free. Low smoke. Low temperature.

Type Approval documentation

Tests carried out

Standard	Release	General description	Limitation
IEC 60092-353	2011-08	Electrical installations in ships - Part 353:	

Job Id: **262.1-013803-2**
Certificate No: **TAE00001RM**

Standard	Release	General description	Limitation
		Power cables for rated voltages 1 kV and 3kV	
IEC 60332-1-2	2004-7	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	
IEC 60332-3-22 IEC 60332-3-24	2009-02	Tests on electric cables under fire conditions - Part 3-22/24: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category A/C	Bunch test Category A/C
IEC 60754-1	2011-11	Test on gases evolved during combustion of materials from cables - Part 1: Determination of the halogen acid gas content	Low Halogen: <0,5% Halogen
IEC 60754-2	2011-11	Test on gases evolved during combustion of materials from cables - Part 2: Determination of acidity (by pH measurement) and conductivity	Halogen free: pH > 4,3 Conductivity < 10µS/mm
IEC 61034-1/2	2013-07 2013-09	Measurement of smoke density of cables burning under defined conditions – Test apparatus, procedure and requirements	Low smoke Light transmittance >60%
IEC 60811-1-4	2001	Insulating and sheathing materials of electric and optical cables - Common test methods – Part 1-4: General application; Tests at low temperature	rated -40 °C
EN 50264-1	2008-06	Railway applications - Railway rolling stock power and control cables having special fire performance - Part 1: General requirements	Mineral oil resistance 72h/100°C Oil IRM 902 Fuel resistance 168h/70°C Liquid IRM 903 apply to insulation and sheath material

Marking of product

STUDERCABLES.COM SWITZERLAND BETAFLAM 145 C-FLEX or BETAFLAM 145 C VFD - size -0,6/1 kV – IEC 60332-3 – Lot No..

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.



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END OF CERTIFICATE