DNV·GL

Certificate No:
TAE000036H

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Low Voltage Cable

with type designation(s)
BETAtrans 3 GKW-ENX FE 180 C-flex 150/250 V MM S
BETAtrans 3 GKW-ENX FE 180 CC-flex 150/250 V MM S

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.
Rated voltage (V) 150/250
Temp. class (°C) 90

Issued at **Hamburg** on **2019-04-26**
This Certificate is valid until **2024-04-25**.
DNV GL local station: **Augsburg**

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

Type: BETAtrans 3 GKW-ENX FE 180 C-flex 150/250 V MM S and
BETAtrans 3 GKW-ENX FE 180 CC-flex 150/250 V MM S

Construction:

Conductors:	Tinned or plain stranded copper class 2 or class 5
Core insulation:	Mica tape + HF90
Inner covering:	Tape
Screen:	Tinned fine copper wire braid or Pairs individually screened with aluminium foil, overall screen with tinned fine copper wire braid (CC-flex)
Outer sheath:	SHF2 (C752)

BETAtrans 3 GKW-ENX FE 180 C-flex 150/250 V MM S

Number of cores x conductor cross-section	Overall diameter
mm^2	mm
1 X 0,5	4,3 ±0,8
2 X 0,5	7,0 ±0,8
3 X 0,5	7,4 ±0,8
4 X 0,5	8,1 ±0,8
5 X 0,5	8,9 ±0,8
6 X 0,5	9,8 ±0,8
7 X 0,5	10,6 ±1,0
8 X 0,5	11,3 ±1,0
9 X 0,5	12,0 ±1,0
10 X 0,5	12,0 ±1,0
12 X 0,5	12,6 ±1,0
14 X 0,5	13,3 ±1,0
16 X 0,5	14,2 ±1,0
18 X 0,5	15,0 ±1,0
20 X 0,5	15,9 ±1,0
24 X 0,5	17,2 ±1,0
25 X 0,5	17,8 ±1,0
36 X 0,5	20,3 ±1,2
37 X 0,5	21,2 ±1,2
1 X 0,75	4,6 ±0,8
2 X 0,75	7,6 ±0,8
3 X 0,75	8,0 ±0,8
4 X 0,75	9,1 ±0,8
5 X 0,75	10,5 ±1,0
6 X 0,75	10,7 ±1,0
7 X 0,75	11,6 ±1,0
8 X 0,75	12,6 ±1,0
9 X 0,75	13,3 ±1,0
10 X 0,75	13,3 ±1,0
12 X 0,75	13,9 ±1,0
14 X 0,75	14,8 ±1,0
16 X 0,75	15,8 ±1,0
18 X 0,75	16,6 ±1,0
20 X 0,75	17,7 ±1,0

Number of cores x conductor cross-section	Overall diameter
mm^2	mm
24 X 0,75	19,2 ±1,0
25 X 0,75	20,0 ±1,0
36 X 0,75	21,5 ±1,2
37 X 0,75	23,6 ±1,2
1 X 1	4,8 ±0,8
2 X 1	8,2 ±0,8
3 X 1	8,6 ±0,8
4 X 1	9,5 ±0,8
5 X 1	10,5 ±1,0
6 X 1	11,3 ±1,0
7 X 1	12,4 ±1,0
8 X 1	13,5 ±1,0
9 X 1	14,2 ±1,0
10 X 1	14,2 ±1,0
12 X 1	14,9 ±1,0
14 X 1	15,8 ±1,0
16 X 1	16,8 ±1,0
18 X 1	17,6 ±1,0
20 X 1	18,8 ±1,0
24 X 1	20,7 ±1,2
25 X 1	21,4 ±1,2
36 X 1	24,1 ±1,2
37 X 1	25,3 ±1,2
1 X 1,5	5,1 ±0,8
2 X 1,5	8,7 ±0,8
3 X 1,5	9,3 ±0,8
4 X 1,5	10,2 ±1,0
5 X 1,5	11,3 ±1,0
6 X 1,5	12,3 ±1,0
7 X 1,5	12,3 ±1,0
8 X 1,5	14,6 ±1,0
9 X 1,5	15,6 ±1,0
10 X 1,5	15,8 ±1,0

Number of cores x conductor cross-section	Overall diameter
mm^2	mm
12 X 1,5	16,3 ±1,0
14 X 1,5	17,2 ±1,0
16 X 1,5	18,4 ±1,0
18 X 1,5	19,4 ±1,0
20 X 1,5	20,4 ±1,2
24 X 1,5	21,5 ±1,2
25 X 1,5	23,4 ±1,2
36 X 1,5	26,5 ±1,2
37 X 1,5	27,6 ±1,2
1 X 2,5	5,7 ±0,8
2 X 2,5	10,0 ±0,8
3 X 2,5	10,7 ±1,0
4 X 2,5	12,0 ±1,0
5 X 2,5	13,1 ±1,0
6 X 2,5	14,4 ±1,0
7 X 2,5	15,7 ±1,0
8 X 2,5	16,9 ±1,0
9 X 2,5	18,0 ±1,0
10 X 2,5	18,0 ±1,0
12 X 2,5	19,0 ±1,0
14 X 2,5	20,0 ±1,0
16 X 2,5	21,5 ±1,0
18 X 2,5	22,9 ±1,0
20 X 2,5	24,0 ±1,2
24 X 2,5	26,5 ±1,2
25 X 2,5	27,5 ±1,2
36 X 2,5	31,2 ±1,2
37 X 2,5	32,5 ±1,2

Number of cores x conductor cross-section	Overall diameter
mm²	mm
1 X 2 x 0,5	7,2 ±1,0
2 X 2 x 0,5	11,1 ±1,5
3 X 2 x 0,5	11,7 ±1,5
4 X 2 x 0,5	12,8 ±1,5
5 X 2 x 0,5	14,1 ±1,5
6 X 2 x 0,5	15,6 ±1,5
7 X 2 x 0,5	17,1 ±1,5
8 X 2 x 0,5	18,8 ±1,5
10 X 2 x 0,5	20,1 ±1,5
12 X 2 x 0,5	21,2 ±1,5
14 X 2 x 0,5	22,3 ±2,0
16 X 2 x 0,5	23,6 ±2,0
19 X 2 x 0,5	24,9 ±2,0
20 X 2 x 0,5	26,5 ±2,0
24 X 2 x 0,5	29,3 ±2,0
30 X 2 x 0,5	31,5 ±2,0
1 X 2 x 0,75	7,9 ±1,0
2 X 2 x 0,75	11,4 ±1,5
3 X 2 x 0,75	13,4 ±1,5
4 X 2 x 0,75	14,7 ±1,5
5 X 2 x 0,75	16,1 ±1,5
6 X 2 x 0,75	18,0 ±1,5
7 X 2 x 0,75	19,6 ±1,5
8 X 2 x 0,75	21,4 ±1,5
10 X 2 x 0,75	23,4 ±2,0
12 X 2 x 0,75	24,2 ±2,0
14 X 2 x 0,75	25,6 ±2,0
16 X 2 x 0,75	26,9 ±2,0
19 X 2 x 0,75	28,7 ±2,0
20 X 2 x 0,75	30,4 ±2,0
24 X 2 x 0,75	33,9 ±2,5
30 X 2 x 0,75	36,1 ±2,5

Number of cores x conductor cross-section	Overall diameter
mm²	mm
1 X 2 x 1,0	8,4 ±1,0
2 X 2 x 1,0	13,4 ±1,5
3 X 2 x 1,0	14,1 ±1,5
4 X 2 x 1,0	15,8 ±1,5
5 X 2 x 1,0	17,7 ±1,5
6 X 2 x 1,0	19,5 ±1,5
7 X 2 x 1,0	21,3 ±1,5
8 X 2 x 1,0	22,7 ±1,5
10 X 2 x 1,0	24,9 ±2,0
12 X 2 x 1,0	25,9 ±2,0
14 X 2 x 1,0	27,3 ±2,0
16 X 2 x 1,0	29,1 ±2,0
19 X 2 x 1,0	30,9 ±2,0
20 X 2 x 1,0	32,8 ±2,0
24 X 2 x 1,0	36,5 ±2,5
30 X 2 x 1,0	38,4 ±2,5
1 X 2 x 1,5	9,6 ±1,0
2 X 2 x 1,5	15,7 ±1,5
3 X 2 x 1,5	16,8 ±1,5
4 X 2 x 1,5	18,8 ±1,5
5 X 2 x 1,5	21,0 ±1,5
6 X 2 x 1,5	23,2 ±2,0
7 X 2 x 1,5	25,0 ±2,0
8 X 2 x 1,5	26,9 ±2,0
10 X 2 x 1,5	29,6 ±2,0
12 X 2 x 1,5	30,8 ±2,0
14 X 2 x 1,5	32,8 ±2,0
16 X 2 x 1,5	34,6 ±2,5
19 X 2 x 1,5	36,8 ±2,5
20 X 2 x 1,5	38,9 ±2,5
24 X 2 x 1,5	43,2 ±2,5
30 X 2 x 1,5	46,2 ±2,5

Number of cores x conductor cross-section	Overall diameter
mm²	mm
1 X 2 x 2,5	11,4 ±1,5
2 X 2 x 2,5	18,9 ±1,5
3 X 2 x 2,5	20,1 ±1,5
4 X 2 x 2,5	22,6 ±2,0
5 X 2 x 2,5	25,0 ±2,0
6 X 2 x 2,5	27,5 ±2,0
7 X 2 x 2,5	29,9 ±2,0
8 X 2 x 2,5	32,7 ±2,0
10 X 2 x 2,5	35,9 ±2,5
12 X 2 x 2,5	37,1 ±2,5
14 X 2 x 2,5	39,4 ±2,5
16 X 2 x 2,5	41,9 ±2,5
19 X 2 x 2,5	44,1 ±2,5
20 X 2 x 2,5	46,7 ±2,5
24 X 2 x 2,5	52,3 ±2,5
30 X 2 x 2,5	56,1 ±2,5

BETAtrans 3 GKW-ENX FE 180 CC-flex 150/250 V MM S (pairflex)

Number of cores x conductor cross-section	Overall diameter
mm²	mm
1 X 2 x 0,5	7,3 ±1,0
2 X 2 x 0,5	11,6 ±1,5
3 X 2 x 0,5	12,3 ±1,5
4 X 2 x 0,5	13,6 ±1,5
5 X 2 x 0,5	14,9 ±1,5
6 X 2 x 0,5	16,4 ±1,5
7 X 2 x 0,5	18,3 ±1,5
8 X 2 x 0,5	19,8 ±1,5

Number of cores x conductor cross-section	Overall diameter
mm²	mm
1 X 2 x 1,0	8,5 ±1,0
2 X 2 x 1,0	14,0 ±1,5
3 X 2 x 1,0	14,9 ±1,5
4 X 2 x 1,0	16,7 ±1,5
5 X 2 x 1,0	18,7 ±1,5
6 X 2 x 1,0	20,5 ±1,5
7 X 2 x 1,0	22,3 ±1,5
8 X 2 x 1,0	24,0 ±1,5

Number of cores x conductor cross-section	Overall diameter
mm²	mm
1 X 2 x 2,5	11,5 ±1,5
2 X 2 x 2,5	19,7 ±1,5
3 X 2 x 2,5	22,0 ±1,5
4 X 2 x 2,5	23,6 ±2,0
5 X 2 x 2,5	26,4 ±2,0
6 X 2 x 2,5	29,0 ±2,0
7 X 2 x 2,5	31,1 ±2,0
8 X 2 x 2,5	34,5 ±2,0

10 X 2 x 0,5	21,4 ±1,5
12 X 2 x 0,5	22,2 ±1,5
14 X 2 x 0,5	23,7 ±2,0
16 X 2 x 0,5	24,8 ±2,0
19 X 2 x 0,5	26,4 ±2,0
20 X 2 x 0,5	28,1 ±2,0
24 X 2 x 0,5	31,0 ±2,0
30 X 2 x 0,5	33,4 ±2,0
1 X 2 x 0,75	8,0 ±1,0
2 X 2 x 0,75	12,0 ±1,5
3 X 2 x 0,75	14,0 ±1,5
4 X 2 x 0,75	15,6 ±1,5
5 X 2 x 0,75	17,4 ±1,5
6 X 2 x 0,75	18,9 ±1,5
7 X 2 x 0,75	21,0 ±1,5
8 X 2 x 0,75	22,5 ±1,5
10 X 2 x 0,75	24,6 ±2,0
12 X 2 x 0,75	25,6 ±2,0
14 X 2 x 0,75	27,0 ±2,0
16 X 2 x 0,75	28,7 ±2,0
19 X 2 x 0,75	30,4 ±2,0
20 X 2 x 0,75	32,2 ±2,0
24 X 2 x 0,75	35,9 ±2,5
30 X 2 x 0,75	38,3 ±2,5

10 X 2 x 1,0	26,5 ±2,0
12 X 2 x 1,0	27,2 ±2,0
14 X 2 x 1,0	28,9 ±2,0
16 X 2 x 1,0	30,8 ±2,0
19 X 2 x 1,0	32,8 ±2,0
20 X 2 x 1,0	34,4 ±2,0
24 X 2 x 1,0	38,5 ±2,5
30 X 2 x 1,0	39,6 ±2,5
1 X 2 x 1,5	9,7 ±1,0
2 X 2 x 1,5	16,5 ±1,5
3 X 2 x 1,5	17,9 ±1,5
4 X 2 x 1,5	19,8 ±1,5
5 X 2 x 1,5	22,1 ±1,5
6 X 2 x 1,5	24,4 ±2,0
7 X 2 x 1,5	26,5 ±2,0
8 X 2 x 1,5	28,9 ±2,0
10 X 2 x 1,5	31,6 ±2,0
12 X 2 x 1,5	32,8 ±2,0
14 X 2 x 1,5	35,0 ±2,0
16 X 2 x 1,5	36,7 ±2,5
19 X 2 x 1,5	38,8 ±2,5
20 X 2 x 1,5	41,2 ±2,5
24 X 2 x 1,5	46,0 ±2,5
30 X 2 x 1,5	48,8 ±2,5

10 X 2 x 2,5	37,7 ±2,5
12 X 2 x 2,5	39,0 ±2,5
14 X 2 x 2,5	41,2 ±2,5
16 X 2 x 2,5	43,9 ±2,5
19 X 2 x 2,5	46,5 ±2,5
20 X 2 x 2,5	49,7 ±2,5
24 X 2 x 2,5	55,1 ±2,5
30 X 2 x 2,5	58,5 ±2,5

Application/Limitation

This type of cable is fire resistant in accordance with IEC Publication 60331.

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

Control and instrumentation. Halogen free. Low smoke. Low temperature.

Type Approval documentation

Tests carried out

Standard	Release	General description	Limitation
IEC 60092-376	2017-05	Cables for control and instrumentation circuits 150/250 V (300 V)	
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	
IEC 60332-3-22 IEC 60332-3-25	2018-03	Tests on electric cables under fire conditions - Part 3-22/25: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category A/D	Bunch test Category A/D
IEC 60331-1	2018-03	Fire resistance / Circuit integrity – Test for method for fire with shock at temperature of at least 830ºC for cables rated up to and including 0,6/1 kV	For cables with an overall diameter exceeding 20 mm

Standard	Release	General description	Limitation
IEC 60331-21	1999-04	Tests for electric cables under fire conditions Circuit integrity Part 21: Procedures and requirements. Cables of rated voltage up to and including 0,6/1,0 kV	For cables with an overall diameter not exceeding 20 mm
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	2013-06	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

Example:

LEONI BETATRANS 3 GKW-ENX FE 180 C-flex (CC-flex) 150/250 V MM S - size – IEC 60332-3-22/25 – IEC 60331-1/21 -

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