

TYPE APPROVAL CERTIFICATE

This is to certify:

That the **Termination and Joint for Cable**

with type designation(s)

KLAUKE Alu/Cu bimetallic compression cable lugs for class 5*) aluminum conductor sizes 35, 50, 70, 95, 120, 150, 185 mm²

Issued to

Gustav Klauke GmbH
Remscheid, Germany

is found to comply with

DNV rules for classification – Ships, offshore units, and high speed and light craft

Application :

Special terminations for Aluminum power cables.

Products approved by this certificate are accepted for installation on all vessels classed by DNV.

Issued at **Høvik** on **2021-11-25**

This Certificate is valid until **2026-11-24**.

DNV local station: **Essen**

Approval Engineer: **Ivar Bull**

for **DNV**

Trond Sjøvåg
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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Product description

Bimetallic Alu/Cu compression cable lugs designed for class 5*) fine stranded aluminum conductors.
 Made of an E-aluminum tube friction welded to a copper lug with stud hole.
 Stud holes for bolt sizes in the range of M6 - M20.

Lugs are delivered with pre-installed contact grease contained under a plastic end cap. To ensure clean contact surfaces before installation, lugs are delivered hermetically sealed in plastic wrapping.

Approval covers terminations for cables with class 5*) fine stranded aluminum conductors with cross sections 35, 50, 70, 95, 120, 150 and 185 mm².

Helkama conductor size Alu Cl 5*)	Klauke Art.-Nr.	Marking on lug:		Stud holes Ø [mm]	Length of termination [mm] (rear end to centre of stud hole)
		rm/sm fine strand	re/se solid cond		
35 mm ²	366R ^x	50	70	6 - 20	77
50 mm ²	367R ^x	70	95	6 - 20	84,5
70 mm ²	368R ^x	95	120	6 - 20	90,5
95 mm ²	369R ^x	120	150	6 - 20	95
120 mm ²	370R ^x	150	185	6 - 20	104,0
150 mm ²	371R ^x	185	240	6 - 20	105,5
185 mm ²	372R ^x	240	300	6 - 20	118,5

In Klauke Article number please replace x with a stud hole size from 6-20 mm.

For class 5*) fine stranded aluminum conductors, always choose lug size rm/sm one size bigger than Helkama cable cross section. Example: For Helkama 120mm² cable choose Klauke lug marked with rm/sm 150.

*) IEC 60228(2004) specifies only class 5 conductors made of copper. Lugs in this certificate are qualified with Helkama fine stranded aluminum class 5 similar to IEC 60228 class 5 Cu conductors.
 Resistance according to IEC 60228 class 2 aluminium.

Application/Limitation

Cable lugs in this certificate are approved for Helkama DNV type approved cables with fine stranded Cl 5*) aluminum conductors 35-185mm².

DNV Type Approval certificate	Cable types
Helkama TAE000047D	LKM-ALU, LKM-ALU-SHF2
Helkama TAE000047F	LKSM-ALU LKSM-EMC-ALU LKSM-VFD-ALU LKSM-ALU-SHF2 LKSM-EMC-ALU-SHF2 LKSM-VFD-ALU-SHF2

Terminations shall be installed by skilled personnel according to Klauke installation instruction by use of Klauke press tool EKM60ID.

To prevent ingress of moisture, DNV Type Approved Heat shrink tubing with melt glue shall cover cable sheath and all aluminum parts of termination.

DNV Rules Part 4 Chapter 8 Section 9 1.1.3 states that "The design of all electrical cables installed shall comply with the requirements of applicable IEC Publications.". Further, Section 1 Service Description 1.1.4 states "The Society will consider the use of alternative standards if they are found to represent an overall safety concept equivalent to that of the rules."

Based on successful tests in DNV Class program CP-0409, DNV considers the aluminum cables and terminations listed in this certificate to represent an equivalent safety level as traditional copper cables.

At termination points, clear marking shall inform that service and repair work on cable terminations require special equipment and tools to maintain safety level of aluminum cable system.

Type Approval documentation

Tests carried out

	Release	General description	Limitation
DNVGL-CP-0409	2021-09	Terminal lugs for LV power cables with aluminum conductors	Resistance test before/ after vibration test. Resistance test before/after salt mist test. Water tightness test.
IEC 61238-1	2003-05	Compression and mechanical connectors for power cables for rated voltages up to 30kV (Um=36kV). Part 1: Test methods and requirements	Short circuit test Class A.
DNVGL-CG-0339	2021-08	Environmental test specification for electrical, electronic and programmable equipment and systems	Vibration test Salt mist test

Marking of product

Manufacturer letters **K** or **KL** - Cross sectional areas **rm/sm** and **re/se**.

After crimp the die identification **K60** shall be embossed on opposite side of deep indent press.

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 shall 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