

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Carbon Fibre Products**

with type designation(s)

**Bi-axial; X-C (200-2000 g/m²) and B-C (200-2000 g/m²) with or without S (3-1000 g/m²),
Bi-axial; X-C (200-2000 g/m²) and B-C (200-2000 g/m²) with or without V (3-1000 g/m²),
- with or without stabilization (1-500 g/m²)**

Issued to

**Devold AMT AS
LANGEVÅG, Norway**

is found to comply with

**DNV GL class programme DNVGL-CP-0434 – Type approval – Uni- and multi-axial multi-ply
fabrics made of carbon fibres****DNV GL rules for classification – High speed and light craft****DNV GL standard DNVGL-ST-0342 – Craft****Det Norske Veritas' Standards for Certification No. 2.20, Lifeboats and Rescue Boats, 2007****Application :****For use in marine vessels in accordance with stated Rules/Standards.****Product(s) approved by this certificate is/are accepted for installation on all vessels classed
by DNV GL.**This Certificate is valid until **2021-12-18**.Issued at **Høvik** on **2016-12-19**DNV GL local station: **Ålesund**Approval Engineer: **Gisle Hersvik**for **DNV GL**

**Martin Strande
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

Bi-axial; X-C (200-2000 g/m²) and B-C (200-2000 g/m²) with or without S (3-1000 g/m²)
 Bi-axial; X-C (200-2000 g/m²) and B-C (200-2000 g/m²) with or without V (3-1000 g/m²)
 - with or without stabilization (1-500 g/m²)

Bi-axial Carbon Fiber products, of +45°/-45° orientation:

X-C and CSM/CFM reinforced X-S-C (S3 to S1000) or X-C and V reinforced X-V-C (V3 to V1000)

Bi-axial Carbon Fiber products, of 0° /90° orientation:

B-C and CSM/CFM reinforced B-S-C (S3 to S1000) or B-C and V reinforced B-V-C (V3 to V1000)

Legends:

CSM Chopped strand mat
 CFM Chopped fiber mat
 C Carbon
 V Fleece
 S CSM/CFM
 X Biax +/-
 B Biax 0°/90°

The following indicative properties have been verified by Type Testing of laminates:

Property	Test Method	DB420C05 / X-C-413g/m ²	LT450C10 / B-C-422g/m ²		
Tensile Strength – 0°	ISO 527 – 4	813	877	MPa	mean*
Tensile Modulus – 0°	ISO 527 – 4	64	63	GPa	mean*
Tensile Elongation – 0°	ISO 527 – 4	-	-	%	mean/msmv
Compressive Strength – 0°	EN 2850	403	334	MPa	mean*
Compressive Modulus – 0°	EN 2850	58	67	GPa	mean*
Compressive Elongation – 0°	EN 2850	-	-	%	mean/msmv
Fibre content (by volume)	EN 2564	60	60	%	mean*
Resin	DION® 9500-501 Vinylester Resin (Reichhold)				
Curing Procedure for Type Testing	See below table				

Legend:

msmv = Manufacturer's Specified Minimum Value (verified to be below mean - 2 standard deviation of Type Test results)

mean = Mean of Type Test results

mean* = Mean of Type Test results, normalised to 60% fibre volume

Curing procedure for Type Testing:

Temperature [°C]	Time [hh.mm.ss]
23	00:00:00
23	00:15:00
70	00:25:00
70	12:00:00
23	00:16:00

* Further details on curing procedure must be discussed with Devold AMT AS, if needed.

Job Id: **262.1-018263-4**
Certificate No: **TAK00000KW**

Manufactured by

Devold AMT UAB, Pramonės g. 20D, 81123 Kursenai, Lithuania

DNV GL local office: Klaipėda

Responsibility

The Company (stated on the front page of this Certificate) takes the responsibility that both design and production are in compliance with Rules, Standards and/or Regulations listed on page 1 of this certificate.

Application/Limitation

Area of application will be evaluated during approval of classified objects.

Type Approval documentation

1. Previous Type Approval Certificate No. K-6122.
2. Email from DNV GL Klaipėda of 2016-12-09, incl. Assessment Report of 2016-12-09.
3. Email from DNV GL Ålesund of 2016-12-09, incl. Assessment Report of 2016-12-09.
4. Email from Devold AMT AS of 2016-12-01, incl. changes to product naming and Application for Type Approval of 2016-12-01.
5. Email from DNV GL Klaipėda of 2014-09-18, incl. Periodical Assessment Report from DNV GL Klaipėda of 2014-05-07 and letter from Devold AMT UAB re. Change of company name.
6. Various correspondences between DNV GL and Devold AMT AS, December 2013-September 2014.
7. Survey Report from DNV Klaipėda of 2012-10-11.
8. Survey Report from DNV Ålesund of 2012-09-19.
9. Application for Type Approval of 2012-08-24.
10. Letter from Devold AMT AS of 2012-06-08.
11. Previous Type Approval Certificate for Devold AMT AS, Norway.
12. Test Report No. Q2009/004 from Toho Tenax Europe GmbH of 2010-01-21.
13. Email from DNV Essen of 2009-11-05.
14. Emails from Devold AMT AS of 2009-04-30 and 2009-06-04.
15. Letter from DNV Ålesund of 2009-04-03, incl. Survey Report of 2009-03-13, Application for Type Approval of 2009-03-13 and Product Specifications.

Tests carried out

Type Testing carried out in accordance with **Type Approval documentation**, ref. Test Report No. Q2009/004 from Toho Tenax Europe GmbH of 2010-01-21.

Marking of product

Product shall be marked with *manufacturer's name*; **Devold AMT AS**, *place of production* and *type designation*.

The marking is to be carried out in such a way that it is visible, legible and indelible. The marking of product is to enable traceability to the DNV GL Type Approval Certificate.

Periodical assessment

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



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Periodical Assessment to be performed after 2 and 3.5 years (Certificate Retention) and at renewal after 5 years (Certificate Renewal).

The main elements of the Periodical Assessment are to:

- Ensure that **Type Approval documentation** is available.
- Review design, materials, production process, and performance with respect to possible changes, in order to ensure compliance with **Type Approval documentation** and/or referenced material specifications.
- Ensure traceability between manufacturer's product marking and DNV GL Type Approval Certificate.

END OF CERTIFICATE