

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Sandwich Core Materials**

with type designation(s)

Divinycell® H; H45, H60, H80, H100, H130, H160, H200, H250

Issued to

**DIAB International AB
Laholm, Sweden**

is found to comply with

Det Norske Veritas' Rules for Classification of High Speed, Light Craft and Naval Surface Craft**Det Norske Veritas' Type Approval Programme 1-501.10, 2009, Sandwich Core Materials****Det Norske Veritas Standards' for Certification No. 2.21, Craft, 2010****Det Norske Veritas' Standards for Certification No. 2.20, Lifeboats and Rescue Boats, 2007****Application :****Core material for sandwich construction. The core material (H100 to H250) is approved for use in areas exposed to slamming and slamming fatigue.****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.**This Certificate is valid until **2019-08-30**.Issued at **Høvik** on **2015-08-31**DNV GL local station: **Gothenburg**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.



Job Id: **262.1-020221-1**
Certificate No: **TAK000002B**

The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Product description

Divinycell® H: H45, H60, H80, H100, H130, H160, H200 and H250.

Core material for sandwich construction. A resilient, closed cell, foam sheet consisting of a polymeric alloy of a cross-linked aromatic polyurea and a linear vinyl polymer.

The following manufacturer's specified values are confirmed by type testing:

Properties	Test Method	H45	H60	H80	H100		
Tensile Strength ¹⁾	ASTM D1623	1,4	1,8	2,5	3,5	MPa	msv
Tensile Strength ¹⁾	ASTM D1623	1,1	1,5	2,2	2,5	MPa	msmv
Tensile Modulus ¹⁾	ASTM D1623	55	75	95	130	MPa	msv
Tensile Modulus ¹⁾	ASTM D1623	45	57	85	105	MPa	msmv
Compressive Strength ¹⁾	ASTM D1621	0,6	0,9	1,4	2,0	MPa	msv
Compressive Strength ¹⁾	ASTM D1621	0,5	0,7	1,15	1,65	MPa	msmv
Compressive Modulus ¹⁾	ASTM D1621-B-73	50	70	90	135	MPa	msv
Compressive Modulus ¹⁾	ASTM D1621-B-73	45	60	80	115	MPa	msmv
Shear Strength	ASTM C273	0,56	0,76	1,15	1,6	MPa	msv
Shear Strength	ASTM C273	0,46	0,63	0,95	1,4	MPa	msmv
Shear Modulus	ASTM C273	15	20	27	35	MPa	msv
Shear Modulus	ASTM C273	12	16	23	28	MPa	msmv
Shear Strain	ASTM C273	12	20	30	40	%	msv
Density	ISO 845	48	60	80	100	kg/m ³	msv
Density	ISO 845	43	54	72	90	kg/m ³	msmv
Slamming Grade Testing, Shear Strength	ASTM C393	2)	2)	2)	>1,4 (msmv) >1,6 (msv)	MPa	

Properties	Test Method	H130	H160	H200	H250		
Tensile Strength ¹⁾	ASTM D1623	4,8	5,4	7,1	9,2	MPa	msv
Tensile Strength ¹⁾	ASTM D1623	3,5	4,0	6,3	8,0	MPa	msmv
Tensile Modulus ¹⁾	ASTM D1623	175	205	250	320	MPa	msv
Tensile Modulus ¹⁾	ASTM D1623	135	160	210	260	MPa	msmv
Compressive Strength ¹⁾	ASTM D1621	3,0	3,4	5,4	7,2	MPa	msv
Compressive Strength ¹⁾	ASTM D1621	2,4	2,8	4,5	6,1	MPa	msmv
Compressive Modulus ¹⁾	ASTM D1621-B-73	170	200	310	400	MPa	msv
Compressive Modulus ¹⁾	ASTM D1621-B-73	145	175	265	350	MPa	msmv
Shear Strength	ASTM C273	2,2	2,6	3,5	4,5	MPa	msv
Shear Strength	ASTM C273	1,9	2,2	3,2	3,9	MPa	msmv
Shear Modulus	ASTM C273	50	60	73	97	MPa	msv
Shear Modulus	ASTM C273	40	50	65	81	MPa	msmv
Shear Strain	ASTM C273	40	40	40	45	%	msv
Density	ASTM D1622	130	160	200	250	kg/m ³	msv
Density	ASTM D1622	117	145	180	230	kg/m ³	msmv
Slamming Grade Testing, Shear Strength	ASTM C393	3)	3)	3)	6.0	MPa	

¹⁾ Perpendicular to the plane. All values measured at 23°C.

²⁾ Not approved for use in areas exposed to slamming and slamming fatigue.

³⁾ Not tested to slamming and slamming fatigue requirements, however, please refer to DNV's Rules for Classification of High Speed, Light Craft and Naval Surface Craft (2013), Pt.3 Ch.4, Sec.5, A105.

Remarks:

Standards used for Type Testing are others than required in the Standards/Rules.

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Legends:

mismv = Manufacturer's Specified Minimum Value

mismv = Manufacturer's Specified Value (average values)

Slamming grade testing - test panel lay-up for H250:

- skins comprising 1 layer 200 g/m² and 5 layers 800/100 g/m², with total thickness of approx. 6 mm
- resin used for both lay-up and joints: Reichhold's PolyLite 505
- core material used was H250 with thickness 45 mm

Slamming grade testing - test panel lay-up for H100:

The adhesive system used in the slamming tests is POLYLITE® 506-647 (a polyester resin)

Manufactured by

DIAB AB, Norra Sofieroleden 8, 312 32 Laholm, Sweden

DNV GL local station: Gothenburg

DIAB S.p.A., Via Alemagna, 29, 32013 Faè di Longarone BL, Italy

DNV GL local station: Venice

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

The core materials (H100 to H250) are approved for use in areas exposed to slamming and slamming fatigue.

DIAB AB, Laholm, Sweden – Manufacturer of **Divinycell® H45, H60, H80, H100, H130, H160, H200, H250**

DIAB S.p.A., Longarone, Italy – Manufacturer of **Divinycell® H45, H60, H80, H100**

Type Approval documentation

Tests carried out

Type Testing carried out in accordance with **Type Approval documentation**, according to:

- DNV GL's Standard for Certification No. 2.9, Type Approval Programme no. 1-501.10, including the tests in accordance with DNV GL's Slamming and Slamming Fatigue Grade Requirements.

Marking of product

Product shall be marked with *manufacturer's name, 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 two (2) years (Certificate Retention) and at renewal after four (4) 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 the DNV GL Type Approval Certificate.

END OF CERTIFICATE