

# TYPE APPROVAL CERTIFICATE

Certificate No:  
**TAK000002B**  
Revision No:  
**2**

## 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

**DNV rules for classification – Ships**

**DNV rules for classification – High speed and light craft**

**DNV class programme DNV-CP-0084 – Type approval – Sandwich core materials**

## 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.**

Issued at **Hamburg** on **2022-01-04**

for **DNV**

This Certificate is valid until **2027-01-03**.

DNV local station: **Sweden FiS**

Approval Engineer: **Gabi Dau**

**Thorsten Lohmann**  
**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

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:

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

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

<sup>1)</sup> Perpendicular to the plane. All values measured at 23°C.

<sup>2)</sup> Not approved for use in areas exposed to slamming and slamming fatigue.

<sup>3)</sup> 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.

### Legends:

mmsv = Manufacturer's Specified Minimum Value

msv = Manufacturer's Specified Value (average values)

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

- skins comprising 1 layer 200 g/m<sup>2</sup> and 5 layers 800/100 g/m<sup>2</sup>, with total thickness of approx. 6 mm
- resin used for both lay-up and joints: Reichhold's Polylyte 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)

### 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® H60, H80, H100**

DIAB New Materials (Zhanjiagang) Co., Ltd., Zhangjiagang, China – Manufacturer of **Divinycell® H60, H80**

### Assessed production site

Diab AB  
Norra Sofieroledden 8  
312 32 Laholm  
Sweden

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

DIAB New Materials (Zhanjiagang) Co., Ltd.  
No. 56 Nanhai Road, Yangtze River industrial Park  
215634 Zhangjiagang, Jiangsu Province  
China

### Type Approval documentation

1. Previous Type Approval Certificate Nos. K-5009 & K-5126.
2. Assessment Report from DNV GL Gothenburg of 2015-01-27.
3. Assessment Report from DNV GL Venice of 2014-12-01.
4. Application for Type Approval of 2015-08-14.
5. Description of changes to certificate, dated 2014-03-17.
6. DNV GL Report No. 2015-3081, Rev. 0 "Testing of Divinycell IPN100" of 2015-04-14.
7. Various correspondences between DIAB AB and DNV GL during 2014 and 2015.
8. Survey Report from DNV Malmø of 2012-05-03.
9. Letter from DIAB AB of 2010-08-17, plus Technical Data Sheet for Divinycell® H, October 2010.
10. Letters from DNV Malmø of 2006-05-17 and 2006-11-17, incl. test results for H45 and H60 to H250 and Technical Specification for Divinycell® H Grades - H45 - H250 (2006).
11. Assessment reports TA401, dated 2019-09-24 Longarone, 2019-09-12 Laholm, 2020-06-03 Zhangjiagang
12. Technical report No. 21-114, dated 2021-12-14
13. TDS rev.18 dated 2018-06 and SDS rev.4 dated 2019-02-10

### Tests carried out

Type Testing carried out in accordance with **Type Approval documentation**.

### 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 Type Approval Certificate.

### Periodical assessment

Periodical assessments will be required after 2 years and after 3.5 years (retention surveys) and for renewal after 5 years (renewal survey).

A production site with a valid Approval of Manufacturer (AoM) certificate for material in question is



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exempted from the obligation concerning retention and renewal assessments.  
This certificate is only valid if required periodical assessments are carried out with satisfactory results. To check the validity of this certificate, please look it up in <https://approvalfinder.dnvgl.com>

END OF CERTIFICATE