

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Plate Heat Exchanger**

with type designation(s)

5AS, 5T, 8TH, 10T-Ni, 12, 12-Ni, 35T-S, 65, 120T HP, 200T, 250AS-H, 400T-S, 427-L, 427-S, 649HT-S, 649-S

Issued to

**SWEP International AB
LANDSKRONA, Sweden**

is found to comply with

DNV GL rules for classification – Ships Pt.4 Ch.7 Pressure equipment**DNV GL rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers****DNVGL-OS-D101 – Marine and machinery systems and equipment, Edition January 2018****Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.****Temperature range: -196 to 225 °C (dep. on matr. in end conn., see cert.)****Design pressure: See Certificate****Operating media: See Certificate**Issued at **Høvik** on **2019-03-27**This Certificate is valid until **2022-06-30**.for **DNV GL**DNV GL local station: **Gothenburg**Approval Engineer: **Mehdi Rowshan**

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Marianne Spæren Marveng
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

Standard brazed type heat exchangers with two circuits and D-type with flow 3 circuits with threaded, soldered or flanged end connections.
Design according to EN13445-3:2009 Annex T (experimental method)

List of manufacturers:

- SWEP International AB, Bavergatan 9, 261 44 LANDSKRONA, Sweden
- SWEP Technology (Suzhou), No. 7 Chun Hui Road, Weiting Town, SIP, Suzhou, Suzhou, China
- SWEP Slovakia s.r.o., Industrial Park Kechnec 288, Sena 04458, Slovak Republic

Application/Limitation

Brazed plate heat exchangers are approved for the medium according to limitations referred in DNV GL ship rules Pt.4 Ch.7 Sec.1 Table 2 to specify the class for the heat exchanger.

Brazed plate heat exchangers in this type approval shall withstand and meet the requirements of the operating media and temperature.

Stainless steel plates grades SUS304, 316 and 316L shall not be used in seawater systems.

Plate heat exchangers with threaded joints connections shall not be used for piping systems conveying toxic or flammable media or services where fatigue, severe erosion or crevice corrosion is expected to occur.

Otherwise:

- Plate heat exchangers with threaded joints connections in CO₂ systems shall be allowed only inside protected spaces and in CO₂ cylinder rooms.
- Plate heat exchangers with tapered threaded joints connections are only allowed for:
 - Class I, outside diameter not more than 33.7 mm
 - Class II and class III, outside diameter not more than 60.3 mm.
- Plate heat exchangers with parallel threaded joints connections are only allowed for class III, outside diameter not more than 60.3 mm.

Maximum working pressure and temperature and materials references shall be as per following tables:

BPHE Type	5AS		5T		8TH		10T	
Material according to	CR050014		CR050013		CR080011		CR101100	
	Max Pressure (bar) @circuit		Max Pressure (bar) @circuit		Max Pressure (bar) @circuit		Max Pressure (bar) @circuit	
T (°C)	1	2	1	2	1	2	1	2
-196	48	31	48	48	48	48	35	35
20	48	31	48	48	48	48	35	35
135	45	29	45	45	45	45	32	32
225	36	25	36	36	36	36	27	27

BPHE Type	10T-Ni		12		65		400T-S	
Material according to	CR101001		CR121000		CR651000		CR400110	
	Max Pressure (bar) @circuit		Max Pressure (bar) @circuit		Max Pressure (bar) @circuit		Max Pressure (bar) @circuit	
T (°C)	1	2	1	2	1	2	1	2

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-196	13	13	39	35	39	39	39	39
20	13	13	39	35	39	39	39	39
135	11	11	32	29	32	32	32	32
225	9	9	28	25	28	28	28	28

BPHE Type	649-S		250AS-H		35T-S		120T HP	
Material according to.	CR649001		00030207		00020084		CR120101	
	Max Pressure (bar) @circuit		Max Pressure (bar) @circuit		Max Pressure (bar) @circuit		Max Pressure (bar) @circuit	
T (°C)	1	2	1	2	1	2	1	2
-196	30	30	61	37	28	28	53	39
20	30	30	61	37	28	28	53	39
135	27	27	50	31	26	26	44	32
225	20	20	44	27	22	22	36	26

BPHE Type	427-S		427-L		649HT-S	
Material according to.	CR427100		CR427101		00032231	
	Max Pressure (bar) @circuit		Max Pressure (bar) @circuit		Max Pressure (bar) @circuit	
T (°C)	1	2	1	2	1	2
-196	31	31	11	11	30	30
20	31	31	11	11	30	30
135	29	29	9	9	25	25
225	25	25	8	8	22	22

BPHE Type	200T		
Material according to	CR200310		
	Max Pressure (bar) @circuit		
T (°C)	1	2	3
-196	48	48	48
20	48	48	48
135	45	45	45
225	36	36	36

Allowable temperature range is depending upon the material in the end connections:

Material in end conn.	Temp. range
C22.8 DIN17243	-20 to 225 °C
EN10273, EN10222-2, EN10222-4	0 to 225 °C
Stainl. Steel EN10028-7	-196 to 225 °C

The material C22.8 DIN17243 shall meet the tensile and toughness (impact) test requirements of Part 5 Chapter 7 Section 6, Table 1.

The heat Exchanger item numbers: 8 TH, 427-S, 649-S and 10T-Ni shall not be exposed to the pressure life cycles of more than 550 (cycles).

Production testing

Each heat exchanger shall be subjected to hydrostatic pressure test upon completion to at least 1.5 times the design pressure in the presence of a DNV GL Surveyor.

Certification

Materials used shall have certificates according to DNV GL Rules Pt.4 Ch.7 Sec.1 [3.2.2].

Materials for heat exchangers contain LPG/ LNG shall comply with Part 5 Chapter 7 Section 6 Table 3.

Each heat exchanger shall be certified by a DNV GL surveyor and to be delivered with a DNV GL product certificate

Approval of manufacturer is required for VL and W material certificates.

For class I and class II pressure vessels: Manufacturer of pressure vessels of class I and II shall be approved manufacturer.

Type Approval documentation

Document Number	Document Name	Rev	status
CR050014	5AS PED Test Report dated 21.03.2013	-	FI
	B5AS-M, CALCULATION DRAWING	02	AP
CR050013	B5T PED test Report dated 21.03.2013	-	FI
	B5T-M CALCULATION DRAWING	02	AP
CR080011	8TH Burst test Lloyds_2012-09-10	-	FI
	B8TH CALCULATION DRAWING, dated 2009.07.02	-	AP
CR101101	Burst Test Repot 10T-Ni, dated 2005.07.22	-	FI
	10T-Ni CALCULATION DRAWING	02	AP
CR121000	B12MT-S PED test Report dated 10.12.2014	-	FI
	12-S CALCULATION DRAWING	06	AP
CR121003	PED test report B12H-SN dated 16.12.2016	-	FI
	12-Ni CALCULATION DRAWING	03	AP
00020084	35T-S PED Int Test Report dated 19.11.2014	-	FI
	35T-S CALCULATION DRAWING	0	AP
CR651000	65-S PED Test Report dated 05.04.2017	-	FI
	65-S CALCULATION DRAWING	11	AP
CR120101	B120T PED test report dated 09.12.2016	-	FI
	120T HP CALCULATION DRAWING	04	AP
CR200310	B200T-M PED test Report dated 03.02.2015	-	FI
	200T CALCULATION DRAWING	07	AP
00030207	250AS-H PED Test Report dated 25.05.2016	-	FI
	250AS-H CALCULATION DRAWING	0	AP
CR400110	400T-S PED test report dated 05.04.2017	-	FI
	400T CALCULATION DRAWING	04	AP

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CR427101	427-L PED test report dated 28.02.2017	-	FI
	427-L CALCULATION DRAWING	04	AP
	427-S Witnessed Proof test report dated 15.10.2013	-	FI
CR427100	427-S CALCULATION DRAWING	12	AP
00032231	649HT-S PED Test report	-	FI
	649 HT-S CALCULATION DRAWING	0	AP

Tests carried out

Cyclic load/burst test according to EN13445 Annex T

Marking of product

Each heat exchanger shall be permanently and legibly marked on the pressure part or on a nameplate permanently attached to a principal pressure part to show its identity and origin.

The marking of the heat exchanger shall show at least the following particulars:

- manufacturer's name and address
- type designation and serial number
- year of manufacture
- maximum allowable working pressure
- hydrostatic test pressure
- design temperature range.

Periodical assessment

For retention of the Type Approval, a DNV GL Surveyor shall perform periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the approval are complied with. Reference is made to DNVGL-CP-0338.