DNV·GL

Certificate No:
TAP0000089

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Heat Exchanger

with type designation(s)
MD15/MD20/MD25/MD30

Issued to
Alfa Laval Aalborg A/S
Aalborg, Denmark

is found to comply with
DNV GL rules for classification – Ships Pt.4 Ch.7 Pressure equipment

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

Temperature range:	**Shell side: 204°C Tube side: 100°C**
Design pressure:	**16 bar on shell/tube side**
Operating media:	**Shell side:Steam/Condensate Tube side:Sea/Fresh water**

This Certificate is valid until **2020-06-30**.

Issued at **Høvik** on **2016-02-04**

for **DNV GL**

DNV GL local station: **Aalborg**

Approval Engineer: **Zeinab Sharifi**

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.

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Product description

Shell and tube heat exchanger with different fixed/floating tube sheets and water boxes. Types of heat exchangers covered by this certificate are listed bellow:

- MD15 T16
- MD20 T16
- MD25 T16
- MD30 T16

Materials for the main parts:
(Optional materials acc. to detailed material list for MD heaters doc. No. 11G4001, dated 2015-22-06)

Part/component	Material grade/standard.
Shell and nozzles	P235 GH/EN 10217-2
Shell flanges	P265GH/10028-2
Tube sheets	P265GH/10028-2, CuAl10NiFe4/EN1653
Water boxes	CuAl10Fe5Ni5-C, CC33G/ EN1982
Tubes	CuNi10Fe1Mn/ EN 12451, CuNi30Mn1Fe/ EN 12451, 1.4404/EN10217-7.

Manufactured by
Alfa Laval Aalborg A/S
Gasværksvej 24
DK-9100 Aalborg
Denmark

Alfa Laval Qingdao Ltd.
No. 86, Guangzhou Road North, Jiaozhou
266300 Qingdao, Shandong Province
China

Responsibility
Alfa Laval Aalborg A/S takes the sole responsibility for the product's compliance to the DNV Rules (design and manufacturing). Accordingly, Alfa Laval Aalborg A/S has to take necessary actions if for example, changes to the design and production of the product are required.

Application/Limitation

All the heat exchanger types are designed for same design data:

Design data	Shell side	Tube side
Design pressure	16 barg	16 barg
Design temperature range	0 to 204°C	0 to 100°C
Test pressure	24 barg	24 barg
Operating medium	Steam/condensate	Sea/fresh water
DNV GL pressure class	II	III

Corrosion allowance: 1 mm (carbon steel), 0.3 mm (copper&copper alloy).

Stainless steel (1.4404) shall not be used in seawater applications.

Design verification has been limited to the pressure envelope and does not include review of non-pressure retaining parts, internals, electrical instrumentation & components, evaluation of safety devices, lifting during transportation & installation etc. Nozzle- and foundation loads are also excluded form scope of design evaluation.

Certification of materials shall be in accordance with DNV GL Ship Rules Pt.4 Ch.7 Sec.2 Table 1. Material certificates shall be issued by an approved material manufacturer of DNV GL for the type, grade and thickness of product being supplied.

Extent of Non-destructive testing shall be in accordance with DNV GL Ship Rules Pt.4 Ch.7 Sec.7, 4.1.

Each heat exchanger is to be:
- Hydraulic pressure tested to at least 1.5 times the design pressure.
- Certified by DNV GL and delivered with a product cerificate when required by DNV GL Rules or by the purchaser.

Type Approval documentation

MD15:

Title	Drawing number	Status
General assembly drawing	11G3275	Type Approved
Dimension drawing	11K3275	Type Approved
Shell assembly drawing	11A3275	Type Approved
Tube insert drawing	11B3275	Type Approved
Tube Sheet Fixed	11P4001 C	Type Approved
Tube Sheet Floating	11P4002 C	Type Approved
Welded WaterBox Floating End	11C3021	Type Approved
Waterbox Floating end	11C4001	Type Approved
Welded WaterBox Fixed End	11C3020	Type Approved
Waterbox Fixed end	11C4005	Type Approved
Tube Bundle Impingement plate	11B4005 A	Type Approved

MD20:

Title	Drawing number	Status
General assembly drawing	11G3276	Type Approved
Dimension drawing	11K3276	Type Approved
Shell assembly drawing	11A3276	Type Approved
Tube insert drawing	11B3276	Type Approved
Tube Sheet Fixed	11P4003 B	Type Approved
Tube Sheet Floating	11P4004 B	Type Approved
Welded WaterBox Floating End	11C3023	Type Approved
Waterbox Floating end	11C4002 A	Type Approved
Welded WaterBox Fixed End	11C3022	Type Approved
Waterbox Fixed end	11C4006	Type Approved
Tube Bundle Impingement plate	11B4006 A	Type Approved

MD25:

Title	Drawing number	Status
General assembly drawing	11G3277	Type Approved
Dimension drawing	11K3277	Type Approved
Shell assembly drawing	11A3277	Type Approved
Tube insert drawing	11B3277	Type Approved

Tube Sheet Fixed	11P4005 A	Type Approved
Tube Sheet Floating	11P4006 C	Type Approved
Welded WaterBox Floating End	11C3025	Type Approved
Waterbox Floating end	11C4003 A	Type Approved
Welded WaterBox Fixed End	11C3024	Type Approved
Waterbox Fixed end	11C4007	Type Approved
Tube Bundle Impingement plate	11B4007 B	Type Approved

MD30:

Title	Drawing number	Status
General assembly drawing	11G3278	Type Approved
Dimension drawing	11K3278	Type Approved
Shell assembly drawing	11A3278	Type Approved
Tube insert drawing	11B3278	Type Approved
Tube Sheet Fixed	11P4007 B	Type Approved
Tube Sheet Floating	11P4008 C	Type Approved
Welded WaterBox Floating End	11C3027	Type Approved
Waterbox Floating end	11C4004 C	Type Approved
Welded WaterBox Fixed End	11C3026	Type Approved
Waterbox Fixed end	11C4008 C	Type Approved
Tube Bundle Impingement plate	11B4013 A	Type Approved
Tube Bundle Impingement plate	11B4008 C	Type Approved

Type Specific Drawings:

Title	Drawing number	Status
Welding details MD	11G3008 C	Type Approved
Welding details Waterbox	11G3022 A	Type Approved
Flat End Plate	13P4006 P	Type Approved
Socket with flange - shellside	15P3003 J	Type Approved
Socket ½"BSP x 60 mm	15P4001 G	Type Approved
Socket ½"BSP x 35 mm	15P4133 D	Type Approved
Socket 1"BSP x 60 mm	15P4205 B	Type Approved
Plate Flange DIN EN	15P4334 G	Type Approved
Plate Flange JIS 16K	15P4341 C	Type Approved
Plate Flange ANSI 150	15P4452 A	Type Approved
Socket with Flanges	15P4501	Type Approved
Materials list MD dated 2015-22-06	11G4001 E	Type Approved
Strength Welded Water Box Shell	30B1073	Used for information
Strength Welded Water Box Flat Endplate.	30B1074	Used for information

Marking of product

For identification to this Type Approval the products are to be marked with:

- the name and domicile of the manufacturer
- the manufacturer's type designation and serial number
- the year of manufacture
- the design pressure
- the design temperature (s) in °C
- the hydraulic test pressure
- DNV GL 's identifying mark.

Periodical assessment

For retention of the Type Approval, a DNV GL surveyor shall perform periodical assessment every second year and before the expiry date of this certificate. The scope of the periodical assessment survey 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.

The main elements of the certificate retention survey are:

- Review of Type Approval documentation
- Review of possible changes in design, materials and performance
- Ensure traceability between manufacturer’s product type marking and Type Approval Certificate.