DNV·GL

Certificate No:
TAP000004B

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Preheaters, Steam, Water or Oil Heated

with type designation(s)
MX T12, MX T16, MC T13, MX T32

Issued to
Alfa Laval Aalborg A/S
Aalborg Nordjylland, 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.

Type:	Temperature range:	Design pressure:
MX T12	**See certificate**	**See certificate**
MX T16	**See certificate**	**See certificate**
MC T13	**See certificate**	**See certificate**
MX T32	**See certificate**	**See certificate**

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

Issued at **Høvik** on **2015-11-23**

for **DNV GL**

DNV GL local station: **Aalborg**

Approval Engineer: **Adel Samiei**

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

The heaters are a type of shell and tube heat exchangers.
The heat exchangers may be provided with dished head or flat end plates.

Corrosion allowance: 1 mm (for carbon steel parts)
0.3 mm (for copper and copper alloy tubes)

Material: According to material list 15G4023 rev.3 dated 2015-10-06

Manufactured by: Alfa Laval Aalborg A/S, Denmark. / Alfa Laval Qingdao Ltd. , China.
Responsibility: Alfa Laval Aalborg A/S, Denmark.

Application/Limitation

Type: MX T12

Design pressure (Shell side/ Tube side): 12 bar/ 12 bar
Design Temperature (Shell side/ Tube side): 300^{0}C / 300^{0}C
DNV GL Pressure Class (Shell side/ Tube side): II / II

Type designation	Accepted nozzle diameter at shell side	Accepted nozzle diameter at tube side
MX10 T12	DN 15, 20, 25, 32, 40, 50, 65, 80	DN 15,20,25,32, 40
MX15 T12	DN 20, 25, 32, 40, 50, 65, 80, 100	DN 15,20,25,32, 40, 50
MX20 T12	DN 20, 25, 32, 40, 50, 65, 80, 100, 125	DN 15,20,25,32, 40, 50, 65, 80
MX25 T12	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150	DN 15,20,25,32, 40, 50, 65, 80, 100
MX30 T12	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150
MX40 T12	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150

Type: MX T16

Design pressure (Shell side/ Tube side): 16 bar/ 16 bar
Design Temperature (Shell side/ Tube side): 160^{0}C / 204^{0}C
DNV GL Pressure Class (Shell side/ Tube side): II / II

Type designation	Accepted nozzle diameter at shell side	Accepted nozzle diameter at tube side
MX10 T16	DN 15, 20, 25, 32, 40, 50, 65, 80	DN 15,20,25,32, 40
MX15 T16	DN 20, 25, 32, 40, 50, 65, 80, 100	DN 15,20,25,32, 40, 50
MX20 T16	DN 20, 25, 32, 40, 50, 65, 80, 100, 125	DN 15,20,25,32, 40, 50, 65, 80
MX25 T16	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150	DN 15,20,25,32, 40, 50, 65, 80, 100
MX30 T16	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150
MX40 T16	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150

Type: MC T13

Design pressure (Shell side/ Tube side): 13 bar/ 13 bar
Design Temperature (Shell side/ Tube side): 300^{0}C / 100^{0}C
DNV GL Pressure Class (Shell side/ Tube side): II / III

Type designation	Accepted nozzle diameter at shell side	Accepted nozzle diameter at tube side
MC10 T13	DN 15, 20, 25, 32, 40, 50, 65, 80	DN 25, 32, 40
MC15 T13	DN 20, 25, 32, 40, 50, 65, 80, 100	DN 25, 32, 40, 50
MC20 T13	DN 20, 25, 32, 40, 50, 65, 80, 100, 125	DN 25, 32, 40, 50, 65, 80
MC25 T13	DN 20, 25, 32, 40, 50, 65, 80, 100, 125,	DN 25, 32, 40, 50, 65, 80, 100

	150	
MC30 T13	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200	DN 25, 32, 40, 50, 65, 80, 100, 125, 150
MC40 T13	DN 20, 25, 32, 40, 50, 65, 80, 100, 150, 200, 250	DN 25, 32, 40, 50, 65, 80, 100, 125, 150

Type: MX T32
Design pressure (Shell side/ Tube side): 32 bar/ 19 bar
Design Temperature (Shell side/ Tube side): 195^{0}C / 212^{0}C
DNV GL Pressure Class (Shell side/ Tube side): II / II

Type designation	Accepted nozzle diameter at shell side	Accepted nozzle diameter at tube side
MX15 T32	DN 20, 25, 32, 40, 65, 80	DN 15, 20, 25, 32, 40, 50
MX20 T32	DN 20, 25, 32, 40, 50, 65, 80	DN 15, 20, 25, 32, 40, 50, 65, 80
MX25 T32	DN 20, 25, 32, 40, 50, 65, 80, 100	DN 15,20,25,32, 40, 50, 65, 80, 100
MX30 T32	DN 20, 25, 32, 40, 50, 65, 80, 100	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150
MX40 T32	DN 20, 25, 32, 40, 50, 65, 80, 100	DN 20, 25, 32, 40, 50, 65, 80, 100, 125, 150

Operating medium:
- Shell side: Oil, thermal oil, steam or fresh water
- Tube side: Steam, fresh water or thermal oil

Extent of non-destructive testing shall be in accordance with DNV GL ship rules pt.4 Ch.7 Sec.7 4.1.2.

Each heat exchanger shall be hydraulic pressure tested to minimum 1.5 times the calculating pressure. (as defined in DNV GL ship rules Pt.4 Ch.7 Sec.4 - 2.2)

Each heat exchanger shall be certified by DNV GL and delivered with a product certificate when intended for DNV GL classed vessels or required by the purchaser. In this case hydraulic test shall be done in presence of a DNV GL surveyor.

All used material shall be delivered with material certificate according to DNV GL ship rules Pt.4 Ch.7 Sec.2 Table 1. All materials delivered with VL or works (W) certificate shall be made at works approved by the Society for the type, grade and dimensions of steel being supplied and for the relevant steelmaking and processing route, e.g. delivery condition.

Type Approval documentation

Marking of product

The marking is to show the following particulars:
- the name and domicile of the manufacturer
- the manufacturer's type designation and serial number
- the year of manufacture
- the design pressure
- the design temperatures in °C
- the hydraulic test pressure
- DNV's identifying mark.

Periodical assessment

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