

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Flexible Hoses of Metallic Material with permanently fitted couplings

with type designation(s)
FMH, FFFF

Issued to

Hacı Ayvaz Endüstriyel Mamuller Sanayi ve Tic. A.S.
Istanbul, Turkey

is found to comply with

DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems
DNVGL-OS-D101 – Marine and machinery systems and equipment, Edition January 2018
DNV GL class programme DNVGL-CP-0184 – Type approval – Flexible hoses with permanently fitted couplings

Application :

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

Type:	Temperature range:	Max. working press.:	Sizes:
FMH	-20°C to 550°C	27 bar to 140 bar (size dependant, see page 2)	DN 8 to DN 50 (see page 2)
FFFF	-20°C to 550°C	10 bar to 17 bar (size dependant, see page 2)	DN 65, 80 and 100

Issued at **Høvik** on **2020-08-24**

for **DNV GL**

This Certificate is valid until **2025-08-23**.

DNV GL local station: **Istanbul**

Approval Engineer: **Maheshraja Venkatesan**

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Zeinab Sharifi
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 GL AS, its parent companies and subsidiaries as well as their officers, directors and employees ("DNV GL") 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

Flexible hose assemblies of metallic materials designed in accordance with Type 1-50 of ISO 10380 with the following construction:

Hose type	No. of braids	Material designation		
		Corrugated metal hose	Braid/ band (ferrule)	End fittings
FMH	1 ^{a)}	1.4404 or AISI 316L	1.4301	1.0038 or 1.4301
FFFF	1	1.4404	1.4301	1.0038 or 1.4301

a) Except for size DN 8 which is constructed with two braids of reinforcement

End fittings designation:

- Type FMH: threaded end couplings (as per submitted drawing AYV-STD-FMH)
- Type FFFF: standard flanges (as per submitted drawing AYV-STD-FFFF)

Hose & fittings manufacturer: Haci Ayvaz Endüstriyel Mamuller Sanayi ve Tic. A.S., Istanbul, Turkey

Application/Limitation

This certificate is valid for the specific assembly of hose and coupling type as specified, assembled and delivered by the holder (named as manufacturer) of this certificate.

The flexible hoses covered by this certificate may be used in freshwater cooling systems, sprinkler systems (fresh water), lubrication oil, fuel oil, compressed air, steam (class III) and condensate applications.

Pressure rating at 20°C:

Size (DN)	Maximum working pressure (bar)
<i>Type FMH</i>	
8	140
10	60
12	55
16	50
20	45
25	40
32	35
40	30
50	27
<i>Type FFFF</i>	
65	17
80	12
100	10

At elevated temperatures, maximum allowable pressure is to be reduced according to ISO10380 Table A4, as below:

Temperature °C	≤20	50	100	150	200	250	300	350	400	450	500	550
AISI304 (1.4301)	1	0.88	0.73	0.66	0.60	0.56	0.52	0.50	0.48	0.47	0.46	0.42
AISI316L (1.4404)	1	0.88	0.74	0.67	0.62	0.58	0.54	0.52	0.50	0.48	0.47	0.47
1.0038	1	1	1	0.89	0.81	0.72	0.65	0.59	0.54	0.50	-	-

Flexible hoses are only to be used where it is necessary due to vibrations or flexible mounting of the machinery. The hoses shall not replace/be used where permanent piping is possible/required. The hoses must only be fitted on places where they are always accessible for inspection.

Hose assemblies covered by this certificate shall not to be used in systems where pressure pulsations may occur.

Material of the fittings shall meet relevant requirements of DNV GL Pt.2 Ch.2. For all couplings where the temperature is below 0°C, the material is to be delivered with charpy v-notch impact testing values as per DNV GL Rules (at 5 °C below the minimum temperature, applicable where the governing thickness is 6 mm or greater.)

Hose assemblies covered by this certificate shall not be used in LNG/LPG systems.

It must be possible to shut off from the system all hoses used in the fuel oil, lubricating oil and compressed air systems.

The hoses are to be mounted according to the manufacturer's instructions.

Welding shall fulfill requirements in DNV GL Rules Pt.2 Ch.4.

End connections shall fulfil the restrictions in Pt.4 Ch.6 Sec.9 [5] and Pt.6 Ch.2 Sec.5 [11.2] as below:

- Flanges with their pressure-temperature ratings shall be in accordance with a recognised international standard.
- For general machinery systems: threaded joints having pipe threads where pressure-tight joints are made on the threads:
 - 1) with parallel or tapered threads, shall comply with requirements of a recognized national or international standard.
 - 2) Shall not be use for piping systems conveying toxic or flammable media or services where fatigue, severe erosion or crevice corrosion is expected to occur.
 - 3) For cases other than (2), tapered threads are only to be used for outside diameters:
 - not more than 33.7 mm, for class I piping systems
 - not more than 60.3 mm, for class II and III piping systems
 - 4) For cases other than (2), parallel thread are only allowed for class III piping systems where outside diameter is not more than 60.3 mm.
- For general machinery systems: Mechanical joints other than standard bolted flanges are not covered by this certificate and shall be type approved separately in accordance with DNVGL-CP-0185
- Flanges in fuel piping systems shall be of the welding neck, slip-on or socket welding type. For all piping (except open ended lines), the following restrictions apply:
 - 1) For design pressure above 10 bar, only welding neck flanges shall be used.
 - 2) For design temperatures <-10°C slip-on flanges shall not be used in nominal sizes above 100 mm and socket welding flanges shall not be used in nominal sizes above 50 mm.

Production testing

Each hose assembly shall be hydrostatically tested at a hydrostatic pressure of 1.5 times the maximum working pressure and shall be delivered with the pressure test report with reference to the type approval certificate (product certificate is not required).

Type Approval documentation

<u>Document No.</u>	<u>Rev.</u>	<u>Title</u>
AYV-STD-FFFF	5	Flexible metal hose
AYV-STD-FMH	4	Flexible metal hose
-	-	Laboratory test note – U-bend: <ul style="list-style-type: none">- size DN8 dated 28.01.2020- size DN10 dated 28.01.2020- size DN20 dated 31.01.2020- size DN40 dated 03.02.2020- size DN80 dated 06.02.2020

-	-	- size DN100 dated 09.02.2020
-	-	Laboratory test note – Bursting, witnessed by DNV GL Surveyor:
		- size DN8 dated 27.01.2020
		- size DN10 dated 27.01.2020
		- size DN20 dated 27.01.2020
		- size DN40 dated 27.01.2020
		- size DN80 dated 27.01.2020
		- size DN100 dated 27.01.2020
-	-	Laboratory test note – Deformation:
		- size DN8 dated 27.01.2020
		- size DN10 dated 27.01.2020
		- size DN20 dated 27.01.2020
		- size DN40 dated 27.01.2020
		- size DN80 dated 27.01.2020
		- size DN100 dated 27.01.2020
-	-	Laboratory test note – Elongation:
		- size DN8 dated 27.01.2020
		- size DN10 dated 27.01.2020
		- size DN20 dated 27.01.2020
		- size DN40 dated 27.01.2020
		- size DN80 dated 27.01.2020
		- size DN100 dated 27.01.2020
-	-	Laboratory test note – Pliability:
		- size DN8 dated 28.01.2020
		- size DN12 dated 28.01.2020
		- size DN25 dated 28.01.2020
		- size DN40 dated 29.01.2020
		- size DN65 dated 30.01.2020
		- size DN80 dated 30.01.2020
		- size DN100 dated 31.01.2020
-	-	Laboratory test note – Tightness:
		- size DN8 dated 27.01.2020
		- size DN10 dated 27.01.2020
		- size DN12 dated 27.01.2020
		- size DN20 dated 27.01.2020
		- size DN25 dated 27.01.2020
		- size DN40 dated 27.01.2020
		- size DN80 dated 27.01.2020
		- size DN100 dated 27.01.2020
-	-	Laboratory test note – Electrical conductivity:
		- size DN8 dated 28.01.2020
		- size DN65 dated 28.01.2020
		- size DN80 dated 28.01.2020
		- size DN100 dated 28.01.2020
LTAL.015	0	Instruction – type testing sequence – (TS EN ISO 10380)
LTAL.016	0	Instruction – type tests – Pliability (TS EN ISO 10380 clause 5.7.2.1)
LTAL.017	0	Instruction – type tests – U bend (TS EN ISO 10380 clause 5.6)
LTAL.019	0	Instruction – type tests – Explosion test (TS EN ISO 10380 clause 6.4.2)
LTAL.020	0	Instruction – type tests – Elongation (TS EN ISO 10380 clause 5.4)
LTAL.023	0	Instruction – type tests – Electrical conductivity (TS EN ISO 10380 clause 5.8.2)

Tests carried out

Burst test, Elongation, Electrical conductivity, Pliability, Pressure resistance, Leak tightness, Bending Fatigue test



Job Id: **262.1-032547-1**
Certificate No: **TAP000023D**

Marking of product

For traceability to this Type Approval, the products are at least to be marked with:

- hose manufacturer's name or trademark;
- date of manufacture (month/year);
- designation type reference;
- nominal diameter;
- pressure rating;
- temperature rating.

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.