Certificate no.:
TAP00002Y6

TYPE APPROVAL CERTIFICATE

This is to certify:

that the Flexible hoses of metallic material with permanently fitted couplings

with type designation(s)
FLEX TREC B (single braid), FLEX TREC 2B (double braid)

issued to

Alfagomma Hydraulic S.p.A.

Castelnuovo Vomano – Castellalto, TE, Italy

is found to comply with

DNV rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV-OS-D101 – Marine and machinery systems and equipment, Edition July 2021
DNV rules for classification – Ships Pt.5 Ch.7 Liquefied gas tankers
DNV class programme DNV-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.

Type:	Temperature range:	Max. working press.:	Sizes:
FLEX TREC B (single braid)	-196°C to +550°C (see page 4)	see page 3	DN8 to DN100 (see page 3)
FLEX TREC 2B (double braid)	-196°C to +550°C (see page 4)	see page 3	DN8 to DN100 (see page 3)

Issued at **Høvik** on **2025-05-27**

This Certificate is valid until **2030-05-26**.

for **DNV**

DNV local unit: **Italy/Malta CMC**

Approval Engineer: **Sarah Miller**

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 USD 300 000.

Product description

Two types of flexible hoses of metallic materials with permanently fitted couplings:

1. **FLEX TREC B** (single braided)
2. **FLEX TREC 2B** (Double braided)

Material of construction:

Part Name	Material Type	AISI/ ASTM Materials	EN Materials
Hose	Stainless steel	AISI 321/ ASTM A240 Gr. 321	1.4541 EN 10028-7/ EN10088-2
		AISI 316L/ ASTM A240 Gr. 316L	1.4404 EN 10028-7/ EN10088-2
		AISI 316Ti/ ASTM A240 Gr. 316Ti	1.4571 EN 10028-7/ EN10088-2
		AISI 304 / ASTM A240 Gr. 304	1.4301 EN 10028-7/ EN10088-2
		AISI 304L / ASTM A240 Gr. 304L	1.4306 EN 10028-7/ EN10088-2
Braid	Stainless steel	AISI 304 / ASTM A478 Gr. 304	1.4301/ EN 10088-3
		AISI 321 / ASTM A478 Gr. 321	1.4541/ EN 10088-3
		AISI 316L/ ASTM A478 Gr. 316L	1.4404/ EN 10088-3
		AISI 316Ti / ASTM A478 Gr. 316Ti	1.4571/ EN 10088-3
		AISI 304L / ASTM A240 Gr. 304L	1.4306 EN 10028-7/ EN10088-2
Ferrule (Collar)	Stainless steel	AISI 321/ ASTM A240 Gr. 321	1.4541 EN 10028-7/ EN10088-2
		AISI 316L/ ASTM A240 Gr. 316L	1.4404 EN 10028-7/ EN10088-2
		AISI 316Ti/ ASTM A240 Gr. 316Ti	1.4571 EN 10028-7/ EN10088-2
		AISI 304 / ASTM A240 Gr. 304	1.4301 EN 10028-7/ EN10088-2
		AISI 304L / ASTM A240 Gr. 304L	1.4306 EN 10028-7/ EN10088-2

Hoses and Ferrule manufacturing locations:

- Alfagomma Hydraulic S.p.A.,
  Castelnuovo Vomano – Castellalto, TE, Italy

Hoses assembling locations:

- Alfagomma Hydraulic S.p.A.,
  Castelnuovo Vomano – Castellalto, TE, Italy
- SITEF Service S.r.l.,
  via Attilio Di Sante Sant'Atto 64100 Teramo, Italy
- Dunlop Hiflex OY,
  Pirkkala, Finland
- Alfagomma Benelux BV,
  Z5 Mollem 340 - 1730 Asse, Belgium

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 and assembling locations as listed above.

The hoses are not to be used in systems where pressure pulsations may occur

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.

Hose assemblies covered by this certificate are approved for use in the following systems with maximum working pressures as listed in Table 1 below:

- liquid fuel systems
- lubricating, hydraulic and thermal oil systems,
- fresh water and seawater cooling systems,
- compressed air systems,
- CO_2 systems,
- bilge and ballast systems,
- refrigeration systems
- class III steam systems.

Table 1: Maximum working pressure at ambient temperature for ordinary machinery applications:

Nominal Diameter DN [mm]	Max. Working Pressure (bar)	
	FLEX TREC B (Single Braid)	FLEX TREC 2B (Double braid)
8	110	-
10	90	-
12	70	120
15	65	95
20	43	85
25	49	75
32	35	60
40	35	45
50	26	42
65	21	27
80	16	22
100	10	20

The hose assemblies are approved for use in LNG/LPG (cryogenic) systems with the maximum working pressure as per Table 2 below.

Table 2: Maximum working pressure at ambient temperature for Hose assemblies for LNG Cargo - Cryogenic applications:

Nominal Diameter DN [mm]	Max. Working Pressure (bar)	
	FLEX TREC B (Single Braid)	FLEX TREC 2B (Double braid)
8	88	-
10	72	-
12	56	96
15	52	76
20	34	68
25	39	60
32	28	48
40	28	36
50	21	34
65	17	22
80	13	18
100	8	16

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. Flexible hoses of these types are not to be used on boiler fronts.

End connections shall fulfil the restrictions stated in DNV-RU-SHIP Pt.4 Ch.6 Sec.9 [5] and Pt.5 Ch.7 Sec.5

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 DNV-CP-0185.

Welding shall fulfil requirements in DNV-RU-SHIP Pt.2 Ch.4 and Pt.5 Ch.7 Sec.8, as appropriate.

At elevated temperatures, the maximum allowable pressure shall be reduced with the following factors (According to ISO 10380 Table A.4):

Temperature °C		20	50	100	150	200	250	300	350	400	450	500	550
Material	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
	1.4571	1	0.90	0.81	0.76	0.73	0.69	0.65	0.63	0.61	0.59	0.59	0.58
	1.4541	1	0.92	0.83	0.78	0.74	0.71	0.67	0.64	0.62	0.61	0.60	0.59
	1.4306	1	0.87	0.72	0.65	0.59	0.55	0.51	0.48	0.46	0.45	0.44	0.43
	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

Production testing and Certification

For ordinary machinery systems: All hose assemblies delivered under the DNV type approval scheme shall be subject to a hydrostatic pressure test at 1.5 times the maximum working pressure and shall be delivered with the pressure test report with reference to this Type Approval certificate.

For LNG/LPG systems: Each hose assembly shall be delivered with Product Certificate issued by DNV including witnessing of hydrostatic pressure test at 1.5 times the maximum working pressure.

Type Approval documentation

Tests carried out

Burst pressure, Elongation, Pliability, Fatigue test, cyclic and burst (IGC code) testing as per DNV-RU-SHIP Pt.5 Ch.7 Sec.5 [11.6.3]

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

This certificate is only valid if required periodical assessments are carried out with satisfactory results.

For retention of the Type Approval, a DNV 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 DNV-CP-0338.

To check the validity of this certificate, please look it up in https://approvalfinder.dnv.com.