

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Flexible Hoses of Non-Metallic Material with Permanently Fitted Couplings

with type designation(s)

Flexor 1SN/1AT-HF (Dunlop Hiflex: Greenline plus 122), Flexor 2SN/2AT-HF (Dunlop Hiflex: Greenline plus 222), 1SN MINETUFF (Dunlop Hiflex: 1SN H1-TUFF), 2SN MINETUFF (Dunlop Hiflex: 2SN H1-TUFF)

Issued to

**ALFAGOMMA HYDRAULIC SPA
CASTELNUOVO VOMANO TE, Italy**

is found to comply with

**Det Norske Veritas' Rules for Classification of Ships Pt.4, Ch.6 "Piping Systems"
Det Norske Veritas' Standards for Certification 2.9 No. 5-791.70**

Application :

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

Type:	Temperature range:	Max. working press.:	Sizes:
Flexor 1SN/1AT-HF (Dunlop Hiflex: Greenline plus 122)	Dependent on the medium (see certificate)	40 bar to 225 bar (see certificate)	DN6 to DN51
Flexor 2SN/2AT-HF (Dunlop Hiflex: Greenline plus 222)	Dependent on the medium (see certificate)	80 bar to 400 bar (See certificate)	DN6 to DN51
1SN MINETUFF (Dunlop Hiflex: 1SN H1-TUFF)	Dependent on the medium (see certificate)	40 bar to 225 bar (see certificate)	DN6 to DN51
2SN MINETUFF (Dunlop Hiflex: 2SN H1-TUFF)	Dependent on the medium (see certificate)	80 bar to 400 bar (See certificate)	DN6 to DN51

This Certificate is valid until **2019-06-30**.

Issued at **Høvik** on **2015-11-10**

for **DNV GL**

DNV GL local station: **Milan**

Approval Engineer: **Adel Samiei**

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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

- Four types of hose assemblies. Hoses and fittings are manufactured by ALFAGOMMA Hydraulic SPA.
- Hoses:
 - Flexor 1SN/1AT-HF (Dunlop Hiflex: Greenline Plus 122) & 1SN MINETUFF (Dunlop Hiflex: 1SN H1-TUFF)
 Designed according to EN853 / 1SN
 - Tube: Oil Resistant synthetic rubber
 - Reinforcement: One high tensile steel braid (1B)
 - Cover: Abrasion, Ozone and hydrocarbon resistant synthetic rubber
 - Flexor 2SN/2AT-HF (Dunlop Hiflex: Greenline Plus 222) & 2SN MINETUFF (Dunlop Hiflex: 2SN H1-TUFF)
 Designed according to EN853 / 2SN
 - Tube: Oil Resistant synthetic rubber
 - Reinforcement: Two high tensile steel braids (2B)
 - Cover: Abrasion, Ozone and hydrocarbon resistant synthetic rubber
- Couplings:
 - Flexor 1SN/1AT-HF & 1SN MINETUFF (Dunlop Hiflex: Greenline Plus 122 & 1SN H1-TUFF)

Nominal size (DN / inch)		Carbon Steel 95MnPb28 acc. UNI4838 Stainless Steel XCrNi 18 10 acc. UNI 6901				
		Skive fittings 1SN/1AT-HF		No Skive fittings 1SN/1AT-HF		AG Branding*
		AG Branding	DH Branding	AG Branding	DH Branding	
6	¼	H1100204-04	D330000-04/0	H1200102-04	D110000-04/0	H1200AD01-04
8	5/16	H1100204-05	D330000-05/0	H1200202-05	D110000-05/0	H1200AD01-05
10	3/8	H1100204-06	D330000-06/0	H1200212-06	D110000-06/0	H1200AD01-06
12	½	H1100204-08	D330000-08/0	H1200212-08	D110000-08/0	H1200AD01-08
16	5/8	H1100204-10	D330000-10/0	H1200202-10	D110000-10/0	H1200AD01-10
19	¾	H1100204-12	D330000-12/0	H1200202-12	D110000-12/0	H1200AD01-12
25	1	H1100204-16	D330000-16/0	H1200202-16	D110000-16/0	H1200AD01-16
31	1 ¼	H1100104-20	H1100104-20	H1200102-20	D110000-20/0	H1200AD01-20
38	1 ½	H1100104-24	H1100104-24	H1200202-24	D110000-24/0	H1200AD01-24
51	2	H1100104-32	H1100104-32	H1200202-32	D110000-32/0	H1200AD01-32

- Flexor 2SN/2AT-HF & 2SN MINETUFF (Dunlop Hiflex: Greenline Plus 222 & 2SN H1-TUFF)

Nominal size (DN / inch)		Carbon Steel 95MnPb28 acc. UNI4838 Stainless Steel XCrNi 18 10 acc. UNI 6901				
		Skive fittings		No Skive fittings		AG Branding*
		AG Branding	DH Branding	AG Branding	DH Branding	
6	¼	H1100204-04	D330000-04/0	H1200202-04	D220000-04/0	H1200AD02-04
8	5/16	H1100204-05	D330000-05/0	H1200202-05	D220000-05/0	H1200AD02-05
10	3/8	H1100204-06	D330000-06/0	H1200212-06	D220000-06/0	H1200AD02-06
12	½	H1100204-08	D330000-08/0	H1200212-08	D220000-08/0	H1200AD02-08
16	5/8	H1100204-10	D330000-10/0	H1200202-10	D220000-10/0	H1200AD02-10
19	¾	H1100204-12	D330000-12/0	H1200202-12	D220000-12/0	H1200AD02-12
25	1	H1100204-16	D330000-16/0	H1200202-16	D220000-16/0	H1200AD02-16
31	1 ¼	H1100204-20	D330000-20/0	H1200202-20	D220000-20/0	H1200AD02-20
38	1 ½	H1100204-24	D330000-24/0	H1200202-24	D220000-24/0	H1200AD02-24
51	2	H1100204-32	D330000-32/0	H1200202-32	D220000-32/0	H1200AD02-32

*) AD1 and AD2 coupling are the Alfangomma branding of D11 and D22 coupling branding Dunlop Hiflex

Application/Limitation

- Hose assemblies are approved to use with:
 - Hydraulic fluids in accordance with ISO 6743-4 with the exception of HFD R, HFD S and HFD T at temperatures ranging from -40 °C + 100 °C;

- Water based fluids at temperatures ranging from -40 °C to +70 °C;
- Water at temperatures ranging from 0 °C to +70 °C.
- CO2 systems at temperatures ranging from -60°C to 100°C - Just hose assemblies 1SN/1AT-HF (Dunlop Hiflex: Greenline Plus 122) with H1100204 fittings (or D33 Dunlop Hiflex branding) and 1SN MINETUFF (Dunlop Hiflex: 1SN H1-TUFF) with AD1 couplings (or D11 Dunlop Hiflex branding) up to size 1" can be used in CO₂ applications

- Maximum working pressure of each hose assemblies shall be as follows:

Nominal size (DN / inch)		1SN/1AT HF 1SN MINETUFF	2SN/2AT HF 2SN MINETUFF
6	¼	225 bar	400 bar
8	5/16	215 bar	350 bar
10	3/8	180 bar	330 bar
12	½	160 bar	275 bar
16	5/8	130 bar	250 bar
19	¾	105 bar	215 bar
25	1	88 bar	165 bar
31	1 ¼	63 bar	125 bar
38	1 ½	50 bar	90 bar
51	2	40 bar	80 bar

- Flexible hoses are only to be used in short lengths 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.
- Hose assemblies with couplings made of carbon steel are not to be used at temperatures below -10°C unless the material is normalized.
- The hose assemblies covered by this type approval may be assembled and delivered by other than the certificate holder under the following conditions:
 - The assembler is authorized by a written authorization from a certificate holder. The certificate holder shall keep record of all assembler authorizations.
 - Hose assemblies are in accordance with an assembly procedure issued by the certificate holder and the assembler has proved their qualifications by burst testing of a selection of hose/coupling combinations.
 - One sample of each hose type is to be burst tested and the testing is to be witnessed by DNV.
- Hose assemblies delivered from an authorized assembler shall in addition to the pressure test report with reference to the type approval certificate be delivered with a copy of the written authorization stamped by DNVGL.
- All hose assemblies delivered under the DNV type approval scheme shall be subject to a pressure test at 1.5 times the maximum working pressure and shall be delivered with the pressure test report with reference to the type approval certificate.
- The hose assemblies must only be fitted in places where they are always accessible.
- The hose assemblies are to be mounted in accordance with the manufacturer's instructions.
- The hoses shall not be installed in systems subject to pressure below atmospheric.
- For CO₂ applications the cover shall be pin pricked.
- Flexible hoses of these types are not to be used in boiler fronts.
- It must be possible to shut off from the system all flexible hoses used in systems for petroleum base hydraulic oil.

Type Approval documentation

- ALFAGOMMA technical datasheets no. 255 (FLEXOR 1SN/1AT-HF) and no. 257 (FLEXOR 2SN/2AT-HF) dated 2010-03-15
- ALFAGOMMA technical datasheets no. 305 (1SN MINETUFF) and no. 307 (2SN MINETUFF) dated 2015-04-15
- Burst test and change in length test reports numbers 33/2010, 34/2010, 15/2010 & 35/2010 dated 2010-12-16 witnessed by DNV surveyor (1SN/1AT HF – DN6, 10, 20 & 38)
- Burst test and change in length test reports numbers 09/2015, 10/2015, 11/2015 & 12/2015 dated 2015-07-20 witnessed by DNV GL surveyor (1SN/1AT HF with AD1 couplings DN6, 12, 25 & 51)
- Burst test and change in length test reports numbers 01/2015, 02/2015, 03/2015 & 04/2015 dated 2015-07-20 witnessed by DNV GL surveyor (1SN MINETUFF with AD1 couplings DN6, 12, 25 & 51)
- Burst test and change in length test reports numbers 13/2015, 14/2015, 15/2015 & 16/2015 dated 2015-07-20 witnessed by DNV GL surveyor (2SN/1AT HF with AD2 couplings DN6, 12, 25 & 51)
- Burst test and change in length test reports numbers 05/2015, 06/2015, 07/2015 & 08/2015 dated 2015-07-20 witnessed by DNV GL surveyor (2SN MINETUFF with AD2 couplings DN6, 12, 25 & 51)
- Burst test reports (@-65°C) numbers 001/2014, 002/2014 & 003/2014 dated 2014-08-01 witnessed by DNV GL surveyor (1SN/1AT HF – DN6, 12 & 20)
- Burst test reports (@-65°C) numbers 17/2015, 18/2015 & 19/2015 dated 2015-07-21 witnessed by DNV GL surveyor (1SN MINETUFF – DN6, 12 & 20)
- Fire test reports (done by LAPI) numbers: 1666.0ISO110/10 (1SN/1AT – DN6), 1667.0ISO110/10 (1SN/1AT – DN16) & 1668.0ISO110/10 (1SN/1AT – DN51) with H1100204 type fittings / dated 2010-11-26
- Impulse test reports numbers: 074/09 (1SN – DN6), 094/10 (1SN-DN12), 090/09 (1SN – DN25), 080/09 (1SN –DN38), 128/10 (2SN – DN5), 120/09 (2SN – DN10), 106/09 (2SN – DN19) & 076/09 (2SN – DN38)
- Burst test and change in length test reports numbers 38/2010, 36/2010, 16/2010 & 37/2010 dated 2010-12-16 witnessed by DNV surveyor (2SN/2AT – DN5, 10, 20 & 38)
- Fire test reports (done by LAPI) numbers: 1669.0ISO110/10 (2SN/2AT – DN6), 1670.0ISO110/10 (2SN/2AT – DN16) & 1671.0ISO110/10 (2SN/2AT – DN51) with H1100204 type fittings / dated 2010-11-26
- Change in length, dimensional check, abrasion resistance, cover adhesion test, oil resistance test, cold flexibility test, ozone resistance test reports numbers: 427-10, 428-10, 429-10, 430-10, 431-10, 432-10, 433-10, 434-10, 435-10, 436-10, 437-10, 438-10, 439-10, 440-10, 441-10, 442-10, 443-10, 444-10, 191-10 & 192-10
- Change in length, dimensional check, abrasion resistance, cover adhesion test, oil resistance test, cold flexibility test, ozone resistance test reports numbers: 01/2015, 02/2015, 03/2015, 04/2015, 05/2015, 06/2015, 07/2015, 08/2015, 09/2015, 10/2015, 11/2015, 12/2015, 13/2015, 14/2015, 15/2015 & 16/2015 dated 2015-07-04
- Impulse test reports number 227/14, 232/14, 221/14 & 003/14 (1SN MINETUFF – DN6, 12, 25 & 51) with AD1 couplings
- Impulse test reports number 228/14, 223/14, 240/14 & 012/14 (2SN MINETUFF – DN6, 12, 25 & 51) with AD2 couplings
- Fire test reports (done by LAPI) numbers: 767.0ISO110/15 (1SN MINETUFF – DN6), 768.0ISO110/15 (1SN MINETUFF – DN16) & 769.0ISO110/15 (1SN MINETUFF – DN51) with AD1 type fittings / dated 2015-06-01
- Fire test reports (done by LAPI) numbers: 770.0ISO110/15 (2SN MINETUFF – DN6), 771.0ISO110/15 (2SN MINETUFF – DN16) & 772.0ISO110/15 (2SN MINETUFF – DN51) with AD2 type fittings / dated 2015-06-01

Tests carried out

Change in length, dimensional check, abrasion resistance, cover adhesion test, oil resistance test, cold flexibility test, ozone resistance, fire test, burst pressure, impulse test.

Marking of product

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

Job Id: **262.1-010925-2**
Certificate No: **TAP000002W**

- Manufacturer's name or trade mark
- Type designation
- Maximum working pressure
- Size
- Additional marking at manufacturer's option

Periodical assessment

For retention of the Type Approval, DNV GL Surveyor shall perform a periodical assessment every second year, to verify that the conditions for the type approval are complied with and to witness the following tests on a selection of sizes:

- Dimensional check
- Leakage test
- Burst test
- Change in length test

The tests are to be performed with the type of couplings fitted that are Type Approved with the hoses.