

TYPE APPROVAL CERTIFICATE**This is to certify:****That the Flexible Hoses of Non-Metallic Material with Permanently Fitted Couplings**

with type designation(s)

Equator/1, Equator/2, Rockmaster/2 Plus, Tractor/1SN

Issued to

**Manuli Hydraulics (Suzhou) Co., Ltd.
Suzhou Jiangsu, China**

is found to comply with

DNV GL rules for classification – Ships**DNVGL-OS-D101 – Marine and machinery systems and equipment, Edition July 2015****DNV GL class programme DNVGL-CP-0183 – Type approval – Flexible hoses****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:
Equator/1	-55 to 135 °C	35 to 225 bar (see Table 1b)	DN06 to DN63 (see Table 1b)
Equator/2	-55 to 135 °C	90 to 400 bar (see Table 1a)	DN06 to DN51 (see Table 1a)
Rockmaster/2 Plus	-40 to 100 °C	70 to 450 bar (see Table 1a)	DN06 to DN76 (see Table 1a)
Tractor/1SN	-40 to 100 °C	50 to 250 bar (see Table 1b)	DN05 to DN60 (see Table 1b)

This Certificate is valid until **2021-06-28**.Issued at **Høvik** on **2016-06-29**for **DNV GL**DNV GL local station: **Shanghai CMC**Approval Engineer: **Maheshraja Venkatesan**

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 flexible hose assemblies Equator/1, Equator/2, Tractor/1SN & Rockmaster/2 Plus

Design:

Equator/1:

- Tube: Oil resistant synthetic rubber
- Reinforcement: One high tensile steel braid
- Cover: Synthetic rubber with high ozone, weather and heat resistance.

Equator/2:

- Tube: Oil resistant synthetic rubber
- Reinforcement: Two high tensile steel braids
- Cover: Synthetic rubber with high ozone, weather and heat resistance

Tractor/1SN:

- Tube: Oil resistant synthetic rubber
- Reinforcement: One high tensile steel braid
- Cover: Environment resistant synthetic rubber

Rockmaster/2 Plus:

- Tube: Oil resistant synthetic rubber
- Reinforcement: Two high tensile steel braids
- Cover: Synthetic rubber with high ozone, weather and heat resistance

Couplings are made of electroplated normalized carbon steel & stainless steel as described in Fittings catalogue – 'Multifit type' ver. 0001.

Rubber Hose manufacturer:

Hose type	Hose Production Manufacturers	
	Manuli Hydraulics(Suzhou) Co., Ltd Suzhou, Jiangsu, China	Manuli Hydraulics Italia S.r.l. a Socio Unico, Italy
Equator/ 1	DN6,8,10,12,16,19,25,31,38,51,63	DN31,38,51,63
Equator/ 2	DN6, 8, 10,12,16,19,25,31,38,51	DN31,38,51
Tractor/1SN	DN5,6,8,10,12,16,19,25,31,38,51,60	DN31,38,51,60
Rockmaster/ 2 Plus	DN6,10,12,16,19,25,31,38,51,76	DN31,38,51,76

Coupling manufacturer:

Manuli Hydraulics Polska S.A.

Applications/Limitations

Table 1a: Maximum working pressure:

Sizes		Equator/ 2		Rockmaster/ 2 Plus	
DN	Inches	bar	psi	bar	psi
6	¼	400	5800	450	6520
8	5/16	350	5070	-	-
10	3/8	330	4780	400	5800
12	½	275	3980	362	5250
16	5/8	250	3620	340	4930
19	¾	215	3110	310	4490
25	1	175	2530	240	3480
31	1. ¼	150	2170	175	2530
38	1. ½	100	1450	146	2110
51	2	90	1300	130	1880
76	3	-	-	70	1010

- Not Applicable

Table 1b: Maximum working pressure:

Sizes		Equator/ 1		Tractor/1SN	
DN	Inches	bar	psi	bar	psi
5	3/16	-	-	250	3620
6	¼	225	3260	225	3260
8	5/16	215	3110	215	3110
10	3/8	180	2610	180	2610
12	½	160	2320	160	2320
16	5/8	130	1880	130	1880
19	¾	105	1520	105	1520
25	1	88	1270	88	1270
31	1. ¼	65	940	63	910
38	1. ½	50	720	50	720
51	2	40	580	40	580
60	2. 3/8	-	-	50	720
63	2. ½	35	500	-	-

- Not Applicable

Hose assemblies covered by this certificate are suitable for petroleum base and water base fluids within a temperature range as stated in the front page. Operating temperatures in excess of maximum working temperature may materially reduce the life of the hose.

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.

All hose assemblies delivered under this type approval certificate shall be in compliance with an assembly procedure issued by the certificate holder.

Each hose assembly is before delivery to be hydraulic pressure tested to 1.5 times the maximum working pressure, and delivered with the manufacturer's pressure test certificate, with reference to the type approval certificate.

Hoses used for continuous operation at temperatures higher than maximum design temperature will have their lifetime reduced. In such cases more frequent inspections and planned exchange should be a part of the maintenance program.

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 in places where they are always accessible.

The hoses are to be mounted in accordance with the manufacturer's instructions.

It must be possible to shut off from the system all flexible hoses used in systems for compressed air, lube oil, fuel oil and petroleum base hydraulic oil.

Carbon steel used in couplings shall be normalised when the minimum design temperature is -10°C or below.

Type Approval documentation

- Relevant pages of the manufacturer's product catalogue
- Manufacturer's Assembly instructions 2005
- Manufacturer's type approval books for hoses Equator/2, Rockmaster/ 2SN and Rockmaster/ 2 Plus
- Manufacturer's test reports No: QT060633, QT060634, QT060635, QT060636, QT060637, QT060638, QT060671, QT060672, QT060673, QT060674, QT060675
- Manufacturer's test reports included in the type approval book for hose Rockmaster/ 2SN.
- Burst test reports witnessed by DNV.
- LAPI fire test reports No: 010.0IS0110/07, 011.0IS0110/07, 012.0IS0110/07, 014.0IS0110/07, 335.0IS0110/06
- WTD 71 fire test reports No: 72/06, 73/06
- Relevant pages of the manufacturer's product catalogue
- Manufacturer's Assembly instructions 2005
- Manufacturer's type approval books for hoses Equator/1, Rockmaster/ 1SN and Tractor/ 1T dated 2006-06-24 and 26
- Manufacturer's test reports No: QT060612, QT060613, QT060614, QT060615, QT060616, QT060617, QT060655, QT060656, QT060657, QT060658, QT060659, QT060660, QT060573, QT060574
- Burst test reports witnessed by DNV
- LAPI Fire test reports No: 1036.0IS0110/06, 1037.0IS0110/06, 1038.0IS0110/06
- WTD 71 fire test reports No: 69/06, 71/06, 74/06, 79/06
- Tests reports for hose type- and dimensions shown in the table below is received by e-mail.
- Vacuum resistance- and cover adhesion test reports received by e-mail, dated: 2012.01.04
- Ozone resistance- and fire test reports received by email, dated: 2012.01.10
- Hydrostatic – impulse test reports received by e-mail dated: 2012.01.10
- Dimension check and burst test reports received by e-mail, dated: 2012.01.18
- Ozone resistance, fluid resistance and cold flexibility test reports received by e-mail, dated: 2012.01.19
- Retention survey report from DNV Milan, dated 2012-05-09.
- Attachment to Type Approval Survey Report from DNV Milan, dated 2012-05-09.
- Letter for change of type designation from Tractor/1t to Tractor/1SN
- Technical data sheets, release 1 dated 2013.10.21, release 0 for types Rockmaster/2 plus, Equator/2 (Black), Equator/2 (Blue), Equator/2 (Black) & Equator/1 (Black)
- Hose check test report (for renewal 2016) nos. 20160307-001C, 20160307-002C, 20160307-003C, 20160307-004C, 20160307-005C, 20160307-006C, 20160307-007C, 20160307-008C, 20160308-001C, 20160308-002C, 20160308-003C, 20160308-004C, 20160308-005C, 20160309-001C, 20160309-002C, 20160309-003C & 20160309-005C
- Cold flexibility reports for sizes DN6 & DN25 from Equator/1 and Equator/2 dated 2015-06-25
- Impulse test reports for sizes: DN25 & DN63 from Equator/1 dated 2010-08-18, DN25 from Equator/2 dated 2010-08-18 and DN51 from Equator/2 dated 2011-04-04
- Type approval (renewal) assessment report dated 2016.03.17

Tests carried out

Dimensional, burst, adhesion, impulse, oil resistance, ozone resistance, cold bend, vacuum and fire test

Marking of product

For traceability to this type approval the products are marked:

- Manufacturer's name or trademark
- Specification or hose name
- Hose size (inside diameter in inches)
- Date code (quarterly and daily production code)

Job Id: **262.1-002170-5**
Certificate No: **TAP00000BG**

Certificate Retention Survey

For retention of the Type Approval, a DNV GL Surveyor shall perform a survey 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.
- Change in length
- Leakage test
- Burst test

The tests shall be performed in accordance with procedures given in DNVGL-CP-0183.

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