

TYPE APPROVAL CERTIFICATE

Certificate no.:
TAP00000ET
Revision No:
4

This is to certify:

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

with type designation(s)
T1D/S/F, BT1, RQP1, DF1D, DK1D

issued to

Manuli RYCO Hydraulics Sdn. Bhd.
Kuala Ketil, Kedah, Malaysia

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 class programme DNV-CP-0183 – Type approval – Flexible non-metallic hoses

Application:

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

| Type: | Temperature range: | Max. working press.: | Sizes: |
|---------|---------------------------------|---------------------------------|---|
| T1D/S/F | -60°C to +100°C (see page 3) | 40 bar to 250 bar (see page 3) | DN 5, 6, 8, 10, 12, 16, 19, 25, 31, 38 & 51 |
| BT1 | -40°C to +100°C (see page 3) | 50 bar (for all sizes) | DN 6, 8, 10, 12, 16, 20 & 25 |
| RQP1 | -40°C to +150°C (see page 3) | 90 bar to 225 bar (see page 4) | DN 6, 8, 10, 12, 16, 19 & 25 |
| DF1D | -40°C to +100°C (see page 3) | 90 bar to 225 bar (see page 4) | DN 6, 8, 10, 12, 16, 19 & 25 |
| DK1D | -40°C to +100°C (see page 3) | 100 bar to 295 bar (see page 4) | DN 6, 8, 10, 12, 16, 19, 25 & 31 |

Issued at **Høvik** on **2025-06-18**

This Certificate is valid until **2028-12-30**.

for **DNV**

DNV local unit: **Inspection Malaysia**

Approval Engineer: **Maheshraja Venkatesan**

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 300,000 USD.



Form code: TA 251

Revision: 2023-09

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Product description

5 types of flexible rubber hoses with permanently attached couplings:

1. **T1D/S/F** constructed according to SAEJ517 type SAE100R1/ EN 853 Type 1SN

| | |
|---------------------------|--|
| Hose inner tube | : Black, oil resistant synthetic rubber |
| Reinforcement | : One braid of high tensile steel wire |
| Hose cover | : <u>T1D</u> : DIEHARD™ Black, abrasion and oil resistant synthetic rubber <u>T1S</u> : SLIDER™ Black, abrasion and oil resistant rubber sheathed with a layer of polyethylene <u>T1F</u> : Red, heat resistant, oil and abrasion resistant rubber |
| End fittings | : BITELOK NON-SKIVE ONE-PIECE CRIMP T7000 series |
| Material for end fittings | : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045 Stainless steel - ASTM A276 type 316 |

2. **BIOTRANS BT1** constructed according to SAE J1527 Type Class I

| | |
|---------------------------|---|
| Hose inner tube | : Black, oil resistant synthetic rubber |
| Reinforcement | : One braid of high tensile steel wire |
| Hose cover | : Blue, oil resistant and abrasion resistant synthetic rubber |
| End fittings | : BITELOK NON-SKIVE ONE-PIECE CRIMP T2000 series |
| Material for end fittings | : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045 Stainless steel - ASTM A276 type 316 |

3. **SURVIVOR RQP1** constructed according to SAEJ517 type SAE100R1/ EN 853 Type 1SN

| | |
|---------------------------|--|
| Hose inner tube | : Black, synthetic rubber, specifically compounded for temperature resistance and multi fluid resistance |
| Reinforcement | : One braid of high tensile steel wire |
| Hose cover | : Blue, oil resistant and abrasion resistant synthetic rubber |
| End fittings | : BITELOK NON-SKIVE ONE-PIECE CRIMP T2000 series |
| Material for end fittings | : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045 Stainless steel - ASTM A276 type 316 |

4. **DF1D** constructed according to EN 857 Type 1SC

| | |
|---------------------------|---|
| Hose inner tube | : Black, oil resistant synthetic rubber |
| Reinforcement | : One braid of high tensile steel wire |
| Hose cover | : DIEHARD™ Black, extra abrasion and oil resistant synthetic rubber |
| End fittings | : NON-SKIVE ONE-PIECE CRIMP T2000 series |
| Material for end fittings | : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045 Stainless steel - ASTM A276 type 316 |

5. **DK1D** constructed according to EN 857 Type 1SC

| | |
|---------------------------|---|
| Hose inner tube | : Black, oil resistant synthetic rubber |
| Reinforcement | : One braid of high tensile steel wire |
| Hose cover | : DIEHARD™ Black, ozone, extra abrasion and oil resistant synthetic rubber |
| End fittings | : BITELOK NON-SKIVE ONE-PIECE CRIMP T2000 series |
| Material for end fittings | : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045 Stainless steel - ASTM A276 type 316 |

Hose manufacturing locations:

| <u>Site address</u> | <u>Hose types covered</u> |
|---|---|
| ▪ Manuli RYCO Hydraulics Sdn. Bhd., Malaysia | : All sizes under hose types T1D/S/F, BT1, RQP1, DF1D and DK1D |
| ▪ Manuli Hydraulics (Suzhou) Co., Ltd., China | : T13D, T14D, T15D, T16D, T18D, T110D, T112D, T116D, T120D, T124D and T132D |

End fittings manufacturing locations:

- Manuli RYCO Hydraulics (Dalian) Co., Ltd., China
- Manuli Hydraulics Polska S.A., Poland

Hose assembling locations:

| <u>Site address</u> | <u>Hose types covered</u> |
|--|----------------------------------|
| ▪ Manuli Ryco Hydraulics Sdn. Bhd., Malaysia | : T1D/S/F, BT1, RQP1, DF1D, DK1D |
| ▪ MANULI RYCO Hydraulics (Dalian) Co., Ltd., China | : T1D/S/F, BT1, RQP1 |
| ▪ Manuli Hydraulics (Suzhou) Co., Ltd., China | : T1D/S/F, BT1 |

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) and hose assembling locations as stated in this certificate.

Hose assemblies covered by this certificate are approved to be used in:

| Operating media | Temperature range | | | |
|----------------------------------|------------------------|--|-----------------|-----------------|
| | Types BT1, DF1D & DK1D | | Type T1 | Type RQP1 |
| Petroleum based hydraulic fluids | -40°C to +100°C | | -40°C to +100°C | -40°C to +150°C |
| Water based Hydraulic fluids | -40°C to +70°C | | -40°C to +70°C | -40°C to +70°C |
| Water and air | 0°C to +70°C | | 0°C to +70°C | 0°C to +70°C |
| CO ₂ applications | - | | -60°C to +100°C | - |

(1) Sizes up to 1" covered under type designations T1S/D/F are allowed to be used for CO₂ applications within temperature range between -60°C and 100°C.

Maximum allowable working pressures (MAWP):

| Part No. | Hose size | | | MAWP | | | | End fitting designation (Bitelok) |
|--------------------|-----------|--------|------|------|------|-----|------|-----------------------------------|
| | DN | Inches | DASH | bar | psi | bar | psi | |
| T13 ⁽²⁾ | 5 | 3/16 | -03 | 250 | 3600 | - | - | T2000 |
| T14 | 6 | 1/4 | -04 | 225 | 3250 | 225 | 3250 | T2000 |
| T15 | 8 | 5/16 | -05 | 215 | 3100 | - | - | T2000 |
| T16 | 10 | 3/8 | -06 | 180 | 2600 | 180 | 2600 | T2000 |
| T18 | 12 | 1/2 | -08 | 160 | 2300 | 160 | 2300 | T2000 |
| T110 | 16 | 5/8 | -10 | 130 | 1900 | 130 | 1900 | T2000 |
| T112 | 19 | 3/4 | -12 | 105 | 1500 | 105 | 1500 | T2000 |
| T116 | 25 | 1 | -16 | 90 | 1300 | 90 | 1300 | T2000 |
| T120 | 31 | 1-1/4 | -20 | 65 | 945 | 65 | 945 | T2000 |
| T124 | 38 | 1-1/2 | -24 | 50 | 725 | 50 | 725 | T2000 |
| T132 | 51 | 2 | -32 | 40 | 580 | 40 | 580 | T2000 |

(2) T13 is not fire-resistant and shall not be used for installation in piping systems for flammable media and sea water systems where failure may result in flooding except in cases where such hoses are installed on open decks, as defined in SOLAS II-2/Reg. 9.2.3.3.2.2(10) and not used for fuel oil lines.

| Part No. | SURVIVOR RQP1 | | | Max. working pressure | | End fitting designation (Bitelok) |
|----------|---------------|--------|-----------|-----------------------|------|-----------------------------------|
| | DN | inches | Dash size | bar | PSI | |
| RQP14 | 6 | 1/4 | -04 | 225 | 3250 | T2000 |
| RQP15 | 8 | 5/16" | -05 | 215 | 3120 | T2000 |
| RQP16 | 10 | 3/8" | -06 | 180 | 2600 | T2000 |
| RQP18 | 12 | 1/2" | -08 | 160 | 2300 | T2000 |
| RQP110 | 16 | 5/8" | -10 | 130 | 1890 | T2000 |
| RQP112 | 20 | 3/4" | -12 | 120 | 1740 | T2000 |
| RQP116 | 25 | 1" | -16 | 90 | 1300 | T2000 |

| Part No. | BIOTRANS BT1 ⁽³⁾ | | | MAWP | | End fittings designation (BITELOK) |
|----------|-----------------------------|--------|-----------|------|-----|------------------------------------|
| | DN | Inches | Dash size | bar | PSI | |
| BT14 | 6 | 1/4 | -04 | 50 | 725 | T2000 |
| BT15 | 8 | 5/16 | -05 | 50 | 725 | T2000 |
| BT16 | 10 | 3/8 | -06 | 50 | 725 | T2000 |
| BT18 | 12 | 1/2 | -08 | 50 | 725 | T2000 |
| BT110 | 16 | 5/8 | -10 | 50 | 725 | T2000 |
| BT112 | 20 | 3/4 | -12 | 50 | 725 | T2000 |
| BT116 | 25 | 1 | -16 | 50 | 725 | T2000 |

(3) Hose type BT1 shall not be installed in piping systems where pressure pulses and/or high levels of vibration are expected to occur in service.

| Part No. | DIEHARD DF1D | | | Max. working pressure | | End fitting designation (Non-skive) |
|----------|--------------|--------|-----------|-----------------------|-----|-------------------------------------|
| | DN | inches | Dash size | bar | PSI | |
| | | | | | | |

| | | | | | | |
|--------|----|------|-----|-----|------|-------|
| DF14D | 6 | 1/4 | -04 | 225 | 3250 | T2000 |
| DF15D | 8 | 5/16 | -05 | 215 | 3100 | T2000 |
| DF16D | 10 | 3/8 | -06 | 180 | 2600 | T2000 |
| DF18D | 12 | 1/2 | -08 | 160 | 2300 | T2000 |
| DF110D | 16 | 5/8 | -10 | 130 | 1900 | T2000 |
| DF112D | 19 | 3/4 | -12 | 105 | 1500 | T2000 |
| DF116D | 25 | 1 | -16 | 88 | 1280 | T2000 |

| DIEHARD DK1D | | | | | End fitting designation (Non-skive) | |
|--------------|-----------|--------|-----------|-----------------------|--|-------|
| Part No. | Hose size | | | Max. working pressure | | |
| | DN | inches | Dash size | bar | PSI | |
| DK14D | 6 | 1/4 | -04 | 295 | 4280 | T2000 |
| DK15D | 8 | 5/16 | -05 | 250 | 3625 | T2000 |
| DK16D | 10 | 3/8 | -06 | 230 | 3340 | T2000 |
| DK18D | 12 | 1/2 | -08 | 200 | 2900 | T2000 |
| DK110D | 16 | 5/8 | -10 | 150 | 2175 | T2000 |
| DK112D | 19 | 3/4 | -12 | 125 | 1815 | T2000 |
| DK116D | 25 | 1 | -16 | 110 | 1600 | T2000 |
| DK120D | 31 | 1-1/4 | -20 | 100 | 1450 | T2000 |

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.

The hose assemblies must only be fitted in places where they are always accessible. Flexible hoses of these types are not to be used on boiler fronts.

Hose assemblies covered by this certificate shall not be used in system subject to pressure below atmospheric or vacuum condition.

The cover of hoses for gaseous applications shall be pin-pricked.

The outer end of the pipe coupling (performing the connection to the fixed piping) is not covered by this certificate and shall follow the below requirements:

- Flanged ends shall be according to a recognized standard
- Slip-on threaded joints having pipe threads where pressure-tight joints are made on the threads with parallel or tapered threads, shall comply with requirements of a recognized standard.
Limitations stated in DNV-RU-SHIP Pt.4 Ch.6 Sec.9 [5.2.6] to be followed.
- If these outer ends are going to be part of a mechanical joint as covered by Table 10 DNV-RU-SHIP-Pt.4 Ch.6 Sec.9, then they shall be separately type approved.

Production testing

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 this type approval certificate.

Type Approval documentation

Tests carried out

For all hose types:

- Dimensional check, Burst, Change in length, Leakage, Cover Adhesion, Cold flexibility, Fluid resistance, Ozone resistance, Fire test.

For hose type T1:

- Burst at -60°C, Endurance & Pin pricking for CO₂ applications

Marking of product

Flexible hoses are to be permanently marked by the manufacturer with the following details:

- 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 at <https://approvalfinder.dnv.com>.