

# TYPE APPROVAL CERTIFICATE

**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  
**RYCO Hydraulics Pty. Ltd.**  
**Derrimut, VIC, Australia**

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-0183 – Type approval – Flexible hoses**

**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:
<b>T1D/S/F</b>	<b>-60°C to +100°C</b> (see page 3)	<b>40 bar to 250 bar</b> (see page 3)	<b>DN 5, 6, 8, 10, 12, 16, 19, 25, 31, 38 &amp; 51</b>
<b>BT1</b>	<b>-40°C to +100°C</b> (see page 3)	<b>50 bar (for all sizes)</b>	<b>DN 6, 8, 10, 12, 16, 20 &amp; 25</b>
<b>RQP1</b>	<b>-40°C to +150°C</b> (see page 3)	<b>90 bar to 225 bar</b> (see page 4)	<b>DN 6, 8, 10, 12, 16, 19 &amp; 25</b>
<b>DF1D</b>	<b>-40°C to +100°C</b> (see page 3)	<b>90 bar to 225 bar</b> (see page 4)	<b>DN 6, 8, 10, 12, 16, 19 &amp; 25</b>
<b>DK1D</b>	<b>-40°C to +100°C</b> (see page 3)	<b>100 bar to 295 bar</b> (see page 4)	<b>DN 6, 8, 10, 12, 16, 19, 25 &amp; 31</b>

This Certificate is valid until **2023-12-31**.

Issued at **Høvik** on **2020-07-31**

for **DNV GL**

DNV GL local station: **Melbourne**

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.

## 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 : **T1D**: DIEHARD™ Black, abrasion and oil resistant synthetic rubber  
**T1S**: SLIDER™ Black, abrasion and oil resistant rubber sheathed with a layer of polyethylene  
**T1F**: 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

### Hoses manufacturing location

- RYCO Hydraulics Sdn. Bhd., Malaysia

### End fittings manufacturing location:

- RYCO Hydraulics Pty. Ltd., Victoria, Australia
- RYCO Hydraulics (DALIAN), P.R.China

Job Id: **262.1-015853-12**  
 Certificate No: **TAP00000ET**  
 Revision No: **2**

- Hose assembling locations : Hose types covered
- RYCO Hydraulics, Victoria, Australia : All types as covered by this certificate
  - RYCO Hydraulics (Dalian) Ltd., : T1D/T1S, DF1D, BT1  
 Dalian City, Liaoning Province, China

## 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.

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 <sub>2</sub> applications	-	-60°C to +100°C	-

(1) Sizes up to 1" covered under type designations T1S/D/F are allowed to be used for CO<sub>2</sub> applications within temperature range between -60°C and 100°C.

Maximum allowable working pressures (MAWP):

Part No.	Hose size			MAWP						End fitting designation (Bitelok)
				T1S		T1D		T1F		
	DN	Inches	DASH	bar	psi	bar	psi	bar	psi	
T13 <sup>(2)</sup>	5	3/16	-03	250	3600	-	-	250	3600	T2000
T14	6	¼	-04	225	3250	225	3250	225	3250	T2000
T15	8	5/16	-05	215	3100	-	-	-	-	T2000
T16	10	3/8	-06	180	2600	180	2600	180	2600	T2000
T18	12	½	-08	160	2300	160	2300	160	2300	T2000
T110	16	5/8	-10	130	1900	130	1900	-	-	T2000
T112	19	¾	-12	105	1500	105	1500	-	-	T2000
T116	25	1	-16	90	1300	90	1300	-	-	T2000
T120	31	1-¼	-20	65	945	65	945	-	-	T2000
T124	38	1-½	-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.

SURVIVOR RQP1						End fitting designation (Bitelok)
Part No.	Hose size			Max. working pressure		
	DN	inches	Dash size	bar	PSI	
RQP14	6	1/4	-04	225	3250	T2000
RPQ15	8	5/16"	-05	215	3120	T2000
RQP16	10	3/8"	-06	180	2600	T2000
RQP18	12	½"	-08	160	2300	T2000
RQP110	16	5/8"	-10	130	1890	T2000
RQP112	20	¾"	-12	120	1740	T2000
RQP116	25	1"	-16	90	1300	T2000

Job Id: **262.1-015853-12**  
 Certificate No: **TAP00000ET**  
 Revision No: **2**

<b>BIOTRANS BT1<sup>(3)</sup></b>						End fittings designation (BITELOK)
Part No.	Hose size			MAWP		
	DN	Inches	Dash size	bar	PSI	
BT14	6	¼	-04	50	725	T2000
BT15	8	5/16	-05	50	725	T2000
BT16	10	3/8	-06	50	725	T2000
BT18	12	½	-08	50	725	T2000
BT110	16	5/8	-10	50	725	T2000
BT112	20	¾	-12	50	725	T2000
BT116	25	1	-16	50	725	T2000

<sup>(3)</sup> 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.

<b>DIEHARD DF1D</b>						End fitting designation (Non-skive)
Part No.	Hose size			Max. working pressure		
	DN	inches	Dash size	bar	PSI	
DF14D	6	¼	-04	225	3250	T2000
DF15D	8	5/16	-05	215	3100	T2000
DF16D	10	3/8	-06	180	2600	T2000
DF18D	12	½	-08	160	2300	T2000
DF110D	16	5/8	-10	130	1900	T2000
DF112D	19	¾	-12	105	1500	T2000
DF116D	25	1	-16	88	1280	T2000

<b>DIEHARD DK1D</b>						End fitting designation (Non-skive)
Part No.	Hose size			Max. working pressure		
	DN	inches	Dash size	bar	PSI	
DK14D	6	¼	-04	295	4280	T2000
DK15D	8	5/16	-05	250	3625	T2000
DK16D	10	3/8	-06	230	3340	T2000
DK18D	12	½	-08	200	2900	T2000
DK110D	16	5/8	-10	150	2175	T2000
DK112D	19	¾	-12	125	1815	T2000
DK116D	25	1	-16	110	1600	T2000
DK120D	31	1-¼	-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

Job Id: **262.1-015853-12**  
Certificate No: **TAP00000ET**  
Revision No: **2**

- 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 DNVGL-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 DNVGL-RU-SHIP-Pt.4 Ch.6 Sec.9, then they shall be separately type approved.

## Production testing

All hose assemblies delivered under the DNV GL 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

<u>Document No.</u>	<u>Rev.</u>	<u>Title</u>
-	-	'RYCO Product Technical Manual'
-	-	Datasheet DF1D
-	-	Datasheet DK1D
28913076	-	DNV Inspection and Testing Report dated 2009-04-17
3089	-	Burst test report witnessed by DNV Surveyor
RH-WI-83	8	Hose and coupling Assembly instructions dated 29/11/2017
RH-WI-61	09	RYCO – Metric Crimp Chart and Rapid Numbers dated 2017-12-21
5378	-	Report on burst pressure test witnessed by GL Surveyor dated 2013-02-20
20181024	-	Renewal burst test report witnessed by DNV GL Surveyor dated 2018-11-02
5185	-	T1 Burst test certificate witnessed by DNV GL surveyor dated 2012-11-15
EB001_KK	-	T1 Burst pressure test certificate dated 23-09-2010 witnessed by DNV Surveyor
1556, 1557 & 1558	-	T1 Burst pressure test certificates dated 11.04.03 witnessed by DNV Surveyor
KP3 010/11	-	T1 impulse test certificate dated 21.02.11
4763i	-	T1 impulse test certificate dated 20.11.2012
4083i & 4796i	-	T1 impulse test certificates dated 15.08.2012
2244-030	-	T116D impulse test certificate dated 11/09/2015
3714-030	-	T124D impulse test certificate dated 27/03/2017
5793i	-	T132A impulse test certificate dated 20.08.2013
5952-030	-	T14D impulse test certificate dated 10/12/2018
702, 874 & 877	-	T1 Impulse test certificates
1072 & 1076	-	Burst test certificates witnessed by DNV Surveyor
6647-030, 6648-030, 2441-030, 3709-030, 4849-030, 4850-030, RHAU-TD-T16D, RHAU-TD-T110D, RHAU-TD-T112D, RHAU-TD-T120D, E2400260, E2200053, E2200064, E2100389	-	T1 RYCO hose test reports

Job Id: **262.1-015853-12**  
Certificate No: **TAP00000ET**  
Revision No: **2**

1017, 1018 & 1021, DNV001/16	-	T1 Impulse test certificates
	-	T1 burst test report (at -60°C) witnessed by DNV GL Surveyor dated 12/05/2016
WI-WB-015-KK Issue 18 19-024	-	Work Instruction: Terkelsen wrapping unwrapping process
	-	RYCO T1D/T1F/T1S hose – Test report for DNV-GL – CO <sub>2</sub> Endurance test
RH-BT-003/18	-	Report on Burst pressure test witnessed by DNV GL Surveyor dated 18/10/2018
RHAU-BT-1001, RHAU-BT-1002, RHAU-BT-1003 & RHAU-BT-1004, 6642-030, 6643-030	-	BT1 RYCO hose test reports dated 30-08-2012
-	-	DF1D RYCO hose test reports
	-	DF16D RYCO hose test report dated 22-01-2016
6652-030	-	Impulse test certificate for DF14D dated 02/08/2018
IT 18-029	-	Impulse test certificate for DF15D dated 31-10-2018
IT 18-030	-	Impulse test certificate for DF18D dated 31-10-2018
5808-030	-	Impulse test certificate for DF116D dated 31/10/2018
6643-030, 6644-030, 6645-030, 6646-030	-	DK1D RYCO hose test reports dated 31/07/2019
5806-030	-	Impulse test certificate for DK15D dated 30/10/2018
5799-030	-	Impulse test certificate for DK112D dated 30/10/2018
5798-030	-	Impulse test certificate for DK120D dated 30/10/2018
2529-030, 2530-030, 2438-030, 5043i & 5044i	-	RQP1 RYCO hose test reports
2671i	-	RQP1 Impulse test certificates dated 20.11.2012
-	-	RQP1 impulse test certificate dated 05.04.07
	-	Test report for Oil resistance (RYCO RQP and Driller hose tube) dated 7 <sup>th</sup> June 2019
1071	-	RQP1 Burst test certificate dated 17/9/99 witnessed by DNV Surveyor
1059 & 1060	-	RQP1 impulse test certificates dated 14.09.99
1558	-	RQP1 burst pressure test certificate dated 11.04.03 witnessed by DNV Surveyor
RH-FT-77, 78, 82, 144, 145, 146		Fire test reports for T1A (T1E) hose assemblies witnessed by DNV Surveyor
RH-TF-29, 31, 32		Fire test reports for T1F hose assemblies witnessed by DNV Surveyor
RH-FT-22, 23, 24		Fire test reports for RQP1 hose assemblies witnessed by DNV Surveyor
RH-FT-93, 108, 113, 141, 142, 143		Fire test reports for BT1 hose assemblies witnessed by DNV Surveyor
RH-FT-176, 177, 178	-	Fire test reports for DK1 hose assemblies witnessed by DNV GL Surveyor
RH-FT-182, 183, 184	-	Fire test reports for DF1 hose assemblies witnessed by DNV GL Surveyor
C30-1134, C30-1136, C30-1142	-	Burst test certificates witnessed by DNV GL Surveyor dated 2020-06-15
RH-WI-83, Issue no. 8	-	Hose & coupling assembly instructions
RH-WI-61	09	RYCO metric crimp chart and rapid numbers
RH-WI-70, Issue no. 3	-	Hose crimping assembly/ inspection
RH-WI-101, Issue no.3	-	Safe operation of crimping machines

Job Id: **262.1-015853-12**  
Certificate No: **TAP00000ET**  
Revision No: **2**

RYCO RHCN Hose - Authorization letter dated 13th February 2020 for RYCO Dalian  
Assembler Approval location as hose assembling location  
Letter-2020-02-13 v1-  
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## Tests carried out

For all hose types:

- As per DNVGL-CP-0183 Sec.2 Table 1 and 2 (except vacuum testing)

For hose type T1:

- Burst at -60°C, Endurance & Pin pricking for CO<sub>2</sub> 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

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.