

TYPE APPROVAL CERTIFICATE

This is to certify:

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

with type designation(s)

T3000D/S, T3600D/S/C, T4000D/S, T5000D/S, T6000D/S, SR/SRF/SRX, D2B

Issued to

RYCO Hydraulics Pty. Ltd.
Derrimut, VIC, Australia

is found to comply with

DNVGL-OS-D101 – Marine and machinery systems and equipment, Edition January 2018
DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems
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:
T3000D/S	-40°C to +100°C (see page 5)	215 to 245 bar (see page 3)	DN6, 8, 10, 12, 16, 19 & 25
T3600D/S/C	-40°C to +100°C (see page 5)	215 to 250 bar (see page 4)	DN6, 8, 10, 12, 16, 19 & 25
T4000D/S	-40°C to +100°C (see page 5)	280 bar (for all sizes)	DN6, 8, 10, 12, 16, 19 & 25
T5000D/S	-40°C to +100°C (see page 5)	350 bar (for all sizes)	DN6, 8, 10 & 12
T6000D/S	-40°C to +100°C (see page 5)	420 bar (for all sizes)	DN6, 8 & 10
SR/SRF/SRX	-40°C to +100°C (see page 5)	4 to 21 bar (see page 4)	DN19, 25, 31, 38, 51, 63 & 76
D2B	-40°C to +100°C (see page 5)	90 to 100 bar (see page 5)	DN38 & DN51

Issued at **Høvik** on **2020-07-31**

for **DNV GL**

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

DNV GL local station: **Melbourne**

Approval Engineer: **Maheshraja Venkatesan**

.....
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

7 types of flexible rubber hoses with permanently fitted couplings:

1. **T3000D/S** constructed according to ISO 18752 type BC
 - Hose inner tube : Black, oil resistant synthetic rubber
 - Reinforcement : Two braids of high tensile steel wire
 - Hose cover : T3000D: DIEHARD™ Black, oil and extra-abrasion resistant synthetic rubber
T3000S: SLIDER™ Black, oil and extremely abrasion resistant synthetic rubber sheathed with a layer of extremely abrasion resistant Polyethylene
 - 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
2. **T3600D/S/C** constructed according to ISO 18752 type BC
 - Hose inner tube : Black, oil resistant synthetic rubber
 - Reinforcement : One braid (-04 to -06 size) or two braids (-08 to -16 size) of high tensile wire
 - Hose cover : T3600D: DIEHARD™ Black, oil and extra-abrasion resistant synthetic rubber
T3600S: SLIDER™ Black, oil and extremely abrasion resistant synthetic rubber sheathed with a layer of extremely abrasion resistant Polyethylene
T3600C: Black, oil and abrasion resistant synthetic rubber
 - End fittings : BITELOK NON-SKIVE ONE PIECE CRIMP T2000 series for all sizes except T3612 for which T1000 series is used
 - Material for end fittings : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045
Stainless steel - ASTM A276 type 316
3. **T4000D/S** constructed according to SAEJ517 type SAE100R19
 - Hose inner tube : Black, oil resistant synthetic rubber
 - Reinforcement : One braid (-04) or two braids (-05 to -12) of high tensile steel wire
 - Hose cover : T4000A: AVENGER™ Black, abrasion and oil resistant synthetic rubber
T4000D: DIEHARD™ Black, oil and extra abrasion resistant resistant synthetic rubber
T4000S: SLIDER™ Black, oil and extremely abrasion resistant synthetic rubber sheathed with a layer of extremely abrasion resistant Polyethylene
 - 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. **T5000D/S** constructed according to ISO 18752-AC
 - Hose inner tube : Black, oil resistant synthetic rubber
 - Reinforcement : Two braids of high tensile steel wire
 - Hose cover : T5000D: DIEHARD™ Black, oil and extra abrasion resistant resistant synthetic rubber
T5000S: SLIDER™ Black, oil and extremely abrasion resistant synthetic rubber sheathed with a layer of extremely abrasion resistant Polyethylene
 - 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
5. **T6000D/S** constructed according to ISO 18752-AC
 - Hose inner tube : Black, oil resistant synthetic rubber
 - Reinforcement : Two braids of high tensile steel wire
 - Hose cover : T6000D: DIEHARD™ Black, oil and extra abrasion resistant resistant synthetic rubber

Job Id: **262.1-015853-12**
 Certificate No: **TAP00001SJ**
 Revision No: **1**

T6000S: SLIDER™ Black, oil and extremely abrasion resistant synthetic rubber sheathed with a layer of extremely abrasion resistant Polyethylene
 End fittings : BITELOK NON-SKIVE ONE PIECE CRIMP T2000 series
 Material for end fittings : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045
 fittings : Stainless steel - ASTM A276 type 316

6. **DEFIANT SR/SRF/SRX** constructed according to SAEJ517 type SAE100R4
 Hose inner tube : Black, oil resistant synthetic rubber
 Reinforcement : Textile reinforcement with spiral wire
 Hose cover : Black, oil resistant and abrasion resistant synthetic rubber
 End fittings : BITELOK NON-SKIVE ONE PIECE CRIMP T4000 series
 Material for end fittings : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045
 fittings : Stainless steel - ASTM A276 type 316
 Fire protection : Fire sleeve FS1072
 All the three types SR, SRF and SRX have identical design/ construction except with the minimum bending radius (MBR), refer page 4.

7. **DRILLER D2B** constructed according to SAEJ517 type SAE100R16
 Hose inner tube : Black, oil resistant synthetic rubber
 Reinforcement : Two braids of high tensile steel wire
 Hose cover : Perforated blue, oil and abrasion resistant synthetic rubber
 End fittings : BITELOK NON-SKIVE ONE PIECE CRIMP T7000 series
 Material for end fittings : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045
 fittings : Stainless steel - ASTM A276 type 316

Hose manufacturing locations

- Hose types T3000, T3600, T4000, T5000, T6000 and D2B: RYCO Hydraulics Sdn. Bhd., Malaysia
- Hose types SR/SRF/SRX: Wellcall Hose (M) Sdn. Bhd., Malaysia

End fittings manufacturing locations

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

Hose assembling locations

- RYCO Hydraulics, Victoria, Australia : All types as covered by this certificate
- RYCO Hydraulics (Dalian) Ltd., Dalian City, Liaoning Province, China : T3000D, T3000S, T4000D, T4000S, T5000D, T5000S, T6000D, T6000S, SR/SRF

Hose types covered

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.

Maximum Allowable Working Pressures (MAWP):

Part No.	Hose size			MAWP				End fitting designation (Bitelok)
				T3000D		T3000S		
	DN	Inch	DASH	Bar	PSI	Bar	PSI	
T3004	6	¼	-04	245	3500	245	3500	T2000
T3005	8	5/16	-05	245	3500	245	3500	T2000
T3006	10	3/8	-06	215	3100	215	3100	T2000
T3008	12	½	-08	215	3100	215	3100	T2000
T3010	16	5/8	-10	215	3100	215	3100	T2000
T3012	19	¾	-12	215	3100	215	3100	T2000
T3016 ⁽¹⁾	25	1	-16	215	3100	215	3100	T2000

Job Id: **262.1-015853-12**
 Certificate No: **TAP00001SJ**
 Revision No: **1**

Part No.	Hose size			MAWP						End fitting designation (Bitelok)
				T3600D		T3600S		T3600C		
	DN	Inch	DASH	Bar	PSI	Bar	PSI	Bar	PSI	
T3604 ⁽¹⁾	6	¼	-04	250	3625	250	3625	250	3625	T2000
T3605 ⁽¹⁾	8	5/16	-05	245	3500	245	3500	245	3500	T2000
T3606 ⁽¹⁾	10	3/8	-06	215	3100	215	3100	215	3100	T2000
T3608 ⁽¹⁾	12	½	-08	250	3625	250	3625	250	3625	T2000
T3610 ⁽¹⁾	16	5/8	-10	250	3625	250	3625	250	3625	T2000
T3612	19	¾	-12	250	3625	250	3625	250	3625	T2000
T3616 ⁽¹⁾	25	1	-16	250	3625	250	3625	250	3625	T2000

Part No.	Hose size			MAWP				End fitting designation (Bitelok)
				T4000D		T4000S		
	DN	Inch	DASH	Bar	PSI	Bar	PSI	
T4004	6	¼	-04	280	4100	280	4100	T2000
T4005	8	5/16	-05	280	4100	280	4100	T2000
T4006	10	3/8	-06	280	4100	280	4100	T2000
T4008	12	½	-08	280	4100	280	4100	T2000
T4010	16	5/8	-10	280	4100	280	4100	T2000
T4012	19	¾	-12	280	4100	280	4100	T2000

Part No.	Hose size			MAWP				End fitting designation (Bitelok)
				T5000D		T5000S		
	DN	Inch	DASH	Bar	PSI	Bar	PSI	
T5004 ⁽¹⁾	6	¼	-04	350	5100	350	5100	T2000
T5005 ⁽¹⁾	8	5/16	-05	350	5100	350	5100	T2000
T5006	10	3/8	-06	350	5100	350	5100	T2000
T5008	12	½	-08	350	5100	350	5100	T2000

Part No.	Hose size			MAWP				End fitting designation (Bitelok)
				T6000D		T6000S		
	DN	Inch	DASH	Bar	PSI	Bar	PSI	
T6004 ⁽¹⁾	6	¼	-04	420	6100	420	6100	T2000
T6005 ⁽¹⁾	8	5/16	-05	420	6100	420	6100	T2000
T6006	10	3/8	-06	420	6100	420	6100	T2000

DEFIANT					SR ⁽²⁾		SRF ⁽²⁾		SRX ⁽²⁾		End fitting designation (Bitelok)
					MBR (mm)	Part No.	MBR (mm)	Part No.	MBR (mm)	Part No.	
Hose size			MAWP								
DN	Inch	Dash	Bar	PSI							
19	¾	-12	21	300	125	SR12	63	SRF12	40	SRX12	T4000
25	1	-16	17	250	150	SR16	75	SRF16	45	SRX16	T4000
31	1-¼	-20	14	200	-	-	100	SRF20	60	SRX20	T4000
38	1-½	-24	11	150	-	-	125	SRF24	65	SRX24	T4000
51	2	-32	7	100	-	-	150	SRF32	100	SRX32	T4000
63 ⁽¹⁾	2-½	-40	4	62	350	SR40	-	-	140	SRX40	T4000
76 ⁽¹⁾	3	-48	4	56	450	SR48	-	-	180	SRX48	T4000

Job Id: **262.1-015853-12**
 Certificate No: **TAP00001SJ**
 Revision No: **1**

Part No.	DRILLER D2B ⁽²⁾					End fitting designation (Bitelok)
	Hose size			MAWP		
	DN	Inch	Dash	Bar	PSI	
D224B	38	1-½	-24	100	1450	T7000
D232B ⁽¹⁾	51	2	-32	90	1300	T7000

- ⁽¹⁾ The following hose assemblies are not allowed to be used in in piping systems for flammable media and sea water systems where failure may result in flooding, are to be of fire-resistant type 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:
- T3016
 - T3604, T3605, T3606, T3608, T3610 & T3616
 - T5004 & T5005
 - T6004 & T6005
 - SR40, SRX40, SR48 & SRX48
 - D232B
- ⁽²⁾ Hose types SR/SRF/SRX and D2B shall not be installed in piping systems where pressure pulses and/or high levels of vibration are expected to occur in service.

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

<i>Operating media</i>	<i>Temperature range (for all types)</i>
Petroleum based hydraulic fluids	-40°C to +100°C
Water based Hydraulic fluids	-40°C to +70°C
Water and air	0°C to +70°C

Hose assemblies for fire safe applications under type DEFIANT SR/SRF/SRX shall always be installed with fire sleeve as specified in this certificate.

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 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.

Job Id: **262.1-015853-12**
 Certificate No: **TAP00001SJ**
 Revision No: **1**

Type Approval documentation

<u>Document No.</u>	<u>Rev.</u>	<u>Title</u>
-	-	'RYCO Product Technical Manual'
Page 64	-	T3600C hose assembly specification sheet
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
20181128	-	Renewal burst test report witnessed by DNV GL Surveyor dated 2018-11-02
5185	-	Burst test certificate witnessed by DNV GL surveyor dated 2012-11-15
RHAU-IB-1001A, RHAU-IB-1001D, RHAU-IB-1001S, RHAU-IB-1007A, RHAU-IB-1007D, RHAU-IB-1007S, RHAU-IB-1008A, RHAU-IB-1008D, RHAU-IB-1008S, RHAU-IB-1009A, RHAU-IB-1009D, RHAU-IB-1009S	-	T3000 Hose manufacturer's test reports dated 27-08-2012
RHAU-IB-T3004D, RHAU-IB-T3006D, RHAU-IB-T3008D, RHAU-IB-T3016D, 2443-030, 2444-030	-	T3000D hose manufacturer's test report dated 18-01-2017
6128i	-	T3600 hose manufacturer's test report dated 16-12-2015
6144	-	T3600 Impulse test certificate dated 03-10-2013
	-	T3600 burst test certificate dated 26/09/2013 reviewed by DNV GL Surveyor dated 2019-07-31
RHAU-IB-1002A, RHAU-IB-1002D, RHAU-IB-1002S, RHAU-IB-1003A, RHAU-IB-1003D, RHAU-IB-1003S, RHAU-IB-1004D, RHAU-IB-1004D, RHAU-IB-1004S	-	T4000 Hose manufacturer's test reports dated 27-08-2012
RHAU-IB-T4004D, RHAU-IB-T4008D, RHAU-IB-T4010D, RHAU-IB-T4012D	-	T4000 Hose manufacturer's test reports dated 07-07-2014
RHAU-IB-1006A, RHAU-IB-1006D, RHAU-IB-1006S	-	T5000 Hose manufacturer's test reports dated 27-08-2012
3546-030, 3547-030, 3548-030	-	T5000 hose manufacturer's test report dated 10-03-2017
2209-030i, 3914-030, KP2012/13	-	T5000 impulse test certificates reviewed by DNVGL Surveyor dated 2019-09-02
4216-030	-	T6004 Hose manufacturer's test reports dated 25-08-2017
RHAU-IB-1005A, RHAU-IB-1005D, RHAU-IB-1005S	-	T6000 Hose manufacturer's test reports
RH-FT-97,98,120	-	Fire test reports for T3000A hose assemblies witnessed by DNV Surveyor
RH-FT-99, 100, 114	-	Fire test reports for T3000D hose assemblies witnessed by DNV Surveyor
RH-FT-101, 115, 121	-	Fire test reports for T3000S hose assemblies witnessed by DNV Surveyor
RH-FT-015/13	-	Fire test reports for T3600 hose assemblies witnessed by

Job Id: **262.1-015853-12**
Certificate No: **TAP00001SJ**
Revision No: **1**

RH-FT-122, 123	-	DNV Surveyor
RH-FT-102, 116, 117, 103	-	Fire test reports for T4000A hose assemblies witnessed by DNV Surveyor
RH-FT-104, 105, 106, 107	-	Fire test reports for T4000D hose assemblies witnessed by DNV Surveyor
RH-FT-140	-	Fire test reports for T5000A/D/S hose assemblies witnessed by DNV Surveyor
127	-	Fire test reports for T6000A/D hose assemblies witnessed by DNV Surveyor
RYAU-111	-	SRX type hose datasheet
WC-2012/ 0810/ 8177	-	SR/SRF Hose test reports from Wellcall Hose (M) SDN.BHD, Malaysia
R076/09	-	SR Dimensional control & physical test report from from Wellcall Hose (M) SDN.BHD, Malaysia
1562	-	SRF Cold flexibility test report dated 19-Sep-09
RHAU-DB-1001	-	SR burst test report witnessed by DNV surveyor dated 11.04.03
3467-030, 3470-030, 3471-030,	-	D2B Hose manufacturer's test report
3468-030, 3472-030, 3473-030,	-	SRX hose manufacturer's test reports
3469-030	-	
RHAU-SRF-SRF20,	-	SRF hose manufacturer's test reports
RHAU-SRF-SRF24,	-	
RHAU-SRF-SRF32,	-	
5988-030, 5987-030	-	
RYCO-TR-19-01, RYCO-TR-19-02,	-	Internal Test report (SR) from Wellcall Hose (M) SDN. BHD.
RYCO-TR-19-03, RYCO-TR-19-04,	-	
RYCO-TR-19-05, RYCO-TR-19-06,	-	
RYCO-TR-19-07,	-	
-	-	Authorization letter from Wellcall(M) SDN. BHD. Dated 14 August 2019
RH-FT-60, 61, 62	-	Fire test reports for SRF hose assemblies witnessed by DNV Surveyor
RH-FT-136	-	Fire test report for D2B hose assemblies witnessed by DNV Surveyor
CB 19-020/021/022	-	Cold bend test certificates with cover 'C' dated 16/12/2019
C30-1133, C30-1137, C30-1138,	-	Burst test certificates witnessed by DNV GL Surveyor dated 2020-06-15
C30-1140, C30-1143	-	
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
RYCO RHCN Hose Assembler	-	Authorization letter dated 13th February 2020 for RYCO
Approval Letter-2020-02-13 v1-0	-	Dalian location as hose assembling location


Tests carried out

Dimensional check, cover adhesion, Ozone resistance, fire, Oil resistance, Cold flexibility, Change in length, Burst, Impulse & abrasion resistance tests

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;



Job Id: **262.1-015853-12**
Certificate No: **TAP00001SJ**
Revision No: **1**

- 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.