

TYPE APPROVAL CERTIFICATE

This is to certify:

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

with type designation(s)
T2C/T2D/T2S, TXA2D, RQP2, DF2D, DK2D

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:
T2C/T2D/T2S	-40°C to 100°C (see page 4)	70 bar to 420 bar (size dependant, see page 3)	DN 06 to DN 63 (see page 3)
TXA2D	-40°C to 100°C (see page 4)	175 bar to 375 bar (size dependant, see page 3)	DN 19 to DN 51 (see page 3)
RQP2	-40°C to 100°C (see page 4)	90 bar to 400 bar (size dependant, see page 3)	DN 06 to DN 51 (see page 3)
DF2D	-40°C to 100°C (see page 4)	170 bar to 420 bar (size dependant, see page 3)	DN 06 to DN 25 (see page 3)
DK2D	-40°C to 100°C (see page 4)	175 bar to 450 bar (size dependant, see page 4)	DN 06 to DN 31 (see page 4)

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**

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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 fitted couplings:

1. **T2C/T2D/T2S** constructed according to SAEJ517 type SAE100R2/ EN853 type 2SN
 - Hose inner tube : Black, oil resistant synthetic rubber
 - Reinforcement : Two braids of high tensile steel wire
 - Hose cover : T2C: Black, oil and abrasion resistant synthetic rubber
T2D: DIEHARD™ Black, abrasion and oil resistant synthetic rubber
T2S: SLIDER™ Black, 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
2. **TXA2D** constructed according to SAEJ517 type SAE100R2/ EN853 type 2SN
 - Hose inner tube : Black, oil resistant synthetic rubber
 - Reinforcement : Two braids of high tensile steel wire
 - Hose cover : DIEHARD™ Black, oil and extra abrasion resistant synthetic rubber
 - End fittings : BITELOK NON-SKIVE T2000 series
 - Material for end fittings : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045
Stainless steel - ASTM A276 type 316
3. **DF2D** constructed according to SAEJ517 type SAE100R16/ EN857 type 2SC
 - Hose inner tube : Black, oil resistant synthetic rubber
 - Reinforcement : Two braids of high tensile steel wire
 - Hose cover : DIEHARD™ Black, oil and extra abrasion resistant synthetic rubber
 - End fittings : BITELOK NON-SKIVE T2000 series
 - Material for end fittings : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045
Stainless steel - ASTM A276 type 316
4. **RQP2** constructed according to SAEJ517 type SAE100R13/ EN856 type R13
 - Hose inner tube : Black, oil resistant synthetic rubber
 - Reinforcement : Two braids of high tensile steel wire
 - Hose cover : Blue, abrasion and oil resistant synthetic rubber
 - End fittings : T2000 series (up to size -20);
T7000 series (for sizes -24 & -32)
 - Material for end fittings : Carbon steel - AS1443 grades 12L14, 1010, 1020, 1040 & 1045
Stainless steel - ASTM A276 type 316
5. **DK2D** constructed according to EN 857 Type 2SC
 - Hose inner tube : Black, oil resistant synthetic rubber
 - Reinforcement : Two braids of high tensile steel wire
 - Hose cover : DIEHARD™ Black, oil, ozone and extra abrasion 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

Hose manufacturing location

- RYCO Hydraulics Sdn. Bhd., Malaysia

End fittings manufacturing locations:

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

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Hose assembling locations

- RYCO Hydraulics, Victoria, Australia
- RYCO Hydraulics (Dalian) Ltd.,
Dalian City, Liaoning Province, China

Hose types covered

- : All types as covered by this certificate
- : T2D/T2S/T2C

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 fittings designation
				T2C		T2D		T2S		
	DN	Inch	Dash	Bar	PSI	Bar	PSI	Bar	PSI	
T24	6	¼	-04	420	6100	420	6100	420	6100	T2000
T25	8	5/16	-05	350	5100	350	5100	350	5100	T2000
T26	10	3/8	-06	350	5100	350	5100	350	5100	T2000
T28	12	½	-08	350	5100	345	5000	345	5000	T2000
T210	16	5/8	-10	250	3600	250	3600	250	3600	T2000
T212	20	¾	-12	215	3100	215	3100	215	3100	T2000
T216	25	1	-16	175	2500	167	2400	167	2400	T2000
T220	32	1-¼	-20	140	2000	125	1800	125	1800	T2000
T224	40	1-½	-24	100	1300	90	1300	90	1300	T2000
T232	50	2"	-32	90	1150	80	1150	80	1150	T2000
T240 ⁽¹⁾	63	2-½	-40	-	-	70 ⁽¹⁾	1000	-	-	T2000

Part No.	TXA2D						End fitting designation (Non-skive)
	Hose size			MAWP			
	DN	Inch	Dash	Bar	PSI		
TXA28D	12	½	-12	375	5440	T2000	
TXA210D	16	5/8"	-16	345	5000	T2000	
TXA212D	20	¾	-20	313	4530	T2000	
TXA216D	25	1"	-24	225	3250	T2000	

Part No.	RQP2						End fitting designation
	Hose size			MAWP			
	DN	Inch	Dash	Bar	PSI		
RQP24	6	¼	-04	400	5800	T2000	
RQP25	8	5/16	-05	350	5100	T2000	
RQP26	10	3/8	-06	350	5100	T2000	
RQP28	12	½	-08	300	4350	T2000	
RQP210	16	5/8	-10	250	3600	T2000	
RQP212	19	¾	-12	215	3100	T2000	
RPQ216	25	1	-16	167	2400	T2000	
RPQ220	31	1.¼	-20	150	2175	T2000	
RPQ224	38	1.½	-24	100	1450	T7000	
RPQ232	51	2	-32	90	1300	T7000	

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Part No.	Hose size			DF2D		End fitting designation
	DN	Inch	Dash	Bar	PSI	
DF24D	6	¼	-04	420	6100	T2000
DF25D	8	5/16	-05	350	5100	T2000
DF26D	10	3/8	-06	350	5100	T2000
DF28D	12	½	-08	295	4250	T2000
DF210D	16	5/8	-10	250	3625	T2000
DF212D	19	¾	-12	215	3100	T2000
DF216D	25	1	-16	170	2400	T2000

Part No.	DK2D					End fitting designation (Non-skive)
	Hose size			MAWP		
	DN	Inch	Dash	Bar	PSI	
DK24D ⁽¹⁾	6	¼	-04	450	6525	T2000
DK25D	8	5/16	-05	420	6100	T2000
DK26D	10	3/8	-06	385	5590	T2000
DK28D	12	½	-08	345	5000	T2000
DK210D	16	5/8	-10	290	4210	T2000
DK212D	19	¾	-12	280	4100	T2000
DK216D	25	1	-16	200	2900	T2000
DK220D	31	1.¼	-20	175	2540	T2000

(1) Hoses T240D and DK24D are not allowed to be used in piping systems for flammable media or 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.

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

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.

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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'
Page 85	-	DF2D hose technical data sheet
Page 89	-	DK2D hose technical data sheet
Page 103	-	T2C hose technical data 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
5185	-	Burst test certificate witnessed by DNV GL surveyor dated 2012-11-15
1564	-	DF2 Burst test report witnessed by DNV Surveyor dated 11.04.03
4745i & 4747i	-	DF2 Impulse test certificates dated 2012-11-20
1563	-	RQP2 Burst test report witnessed by DNV Surveyor dated 11.04.03
2775i/ 2646i/ 5046i/ 5045i	-	RQP2 impulse test certificates
1070	-	RQP2 burst test report witnessed by DNV Surveyor dated 15/9/99:
1061/1062/	-	RQP2 impulse test certificates
1063/1066	-	
EB001/KK	-	Report on Burst pressure test witnessed by DNV Surveyor dated 23.09.2010
1429i/1430/1431i	-	T2 Impulse test certificates
847, 849 & 1065	-	T2 Impulse test certificates
KP2 061/11, 4718i & KP2 029/11	-	T2 Impulse test certificates
1559, 1560 & 1561	-	T2 Burst test report witnessed by DNV Surveyor dated 11.04.03
1067	-	T2A burst test report witnessed by DNV surveyor
1073 & 1074	-	T2D burst test reports witnessed by DNV Surveyor
1022/1024/1026/1038	-	T2 Impulse test certificates
1069	-	TXA2D burst test report witnessed by DNV Surveyor dated 15/9/99
-	-	Burst test report witnessed by DNV Surveyor dated 2009-07-03
RH-FT-5/8/9	-	Fire test report for T2D hoses witnessed by DNV Surveyor
RH-FT-79, 80, 81, 172	-	Fire test report for T2A hoses witnessed by DNV Surveyor
RH-FT-25/35/40	-	Fire test report for RQP2 hoses witnessed by DNV Surveyor
RH-FT-12/13/14	-	Fire test report for TXA2D hoses witnessed by DNV Surveyor
RH-FT-42/43/44	-	Fire test report for T2S hoses witnessed by DNV Surveyor
RH-FT-25/35/40	-	Fire test report for RQP2 hoses witnessed by DNV Surveyor
6543-030	-	Impulse test certificate for TXA28D dated 12/06/2019
6545-030	-	Impulse test certificate for TXA212D dated 12/06/2019
5813-030	-	Impulse test certificate for TXA216D dated 1/11/2018
RH-FT-173/174/175	-	Fire test report for DK2D hose types witnessed by DNV GL Surveyor
RH-FT-179/180/181	-	Fire test report for DF2D hose types witnessed by DNV GL Surveyor

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RH-BT-003/18	-	Report on Burst pressure test witnessed by DNV GL surveyor dated 2018-10-18
RHAU-DF-DF216D	-	DF2D Test summary sheet dated 14-07-2014
4079-030/ 4081-030	-	DF2D Test summary sheets dated 13/07/2017
ADH19-004/005/006	-	DF2 adhesion test certificates dated 13/12/2019
CB 19-003/004	-	DF2D cold bend test certificates dated 15/05/2019
CB 19-019	-	DF2D cold bend test certificate dated 16/12/2019
6287-030/6288-030/ 6289-030/ 6290-030/ 6291-030	-	DK2D Test summary sheets dated 29/04/2019
6458-030	-	DK25D Test summary sheet dated 16/05/2019
2499-030/ 2502-030/ 2505-030/ 2508-030	-	RQP2 Braided hose test summary sheets dated 27-01-2016
6641-030/ 6640-030/ 6639-030/		T2C hose test summary sheets dated 31/07/2019
6634-030/ 6635-030/ 6636-030/ 6637-030		T2S hose test summary sheets dated 31/07/2019
2442-030	-	T28C hose test summary sheet dated 16-12-2015
4356-030/ 4357-030/	-	T2D hose test summary sheets dated 26-09-2017
6638-030/6649-030	-	T2D hose test summary sheets dated 31/07/2019
ADH19-007/008/009	-	T2C adhesion test certificates dated 13/12/2019
CB 19-020/021/022	-	T2C cold bend test certificates dated 16/12/2019
5919-030	-	Impulse test certificate for T24D dated 05/12/2018
2446-030	-	TXA28D hose test summary sheets dated 16-12-2015
2445-030	-	TXA212D hose test summary sheets dated 16-12-2015
C30-1135	-	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
RYCO RHCN Hose Assembler Approval Letter-2020-02-13 v1-0	-	Authorization letter dated 13th February 2020 for RYCO Dalian location as hose assembling location

Tests carried out

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

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.