

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

with type designation(s)

AVENGER T1A, DIEHARD T1D, SLIDER T1S, T1F, BIOTRANS BT1, AVENGER T3KA, DIEHARD T3KD, SLIDER T3KS, SURVIVOR RQP1, DF1E, DINFLEX DF2A

Issued to

RYCO Hydraulics Pty. Ltd.
Melbourne, 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:
AVENGER T1A, DIEHARD T1D, SLIDER T1S	-40°C to +100°C (see certificate)	40 bar to 250 bar (see certificate)	DN 5, 6, 8, 10, 12, 16, 20, 25, 31, 38 & 51 (see certificate)
T1F	-40°C to +100°C (see certificate)	160 bar to 250 bar (see certificate)	DN 5, 6, 10 & 12
BIOTRANS BT1	40 bar to 250 bar (see certificate)	50 bar (for all sizes)	DN 6, 8, 10, 12, 16, 20 & 25
AVENGER T3KA, DIEHARD T3KD, SLIDER T3KS	40 bar to 250 bar (see certificate)	210 bar (for all sizes)	DN 6, 8, 10, 12, 16 & 20
SURVIVOR RQP1	40 bar to 250 bar (see certificate)	90 bar to 225 bar (see certificate)	DN 6, 8, 10, 12, 16, 19 & 25
DF1E	40 bar to 250 bar (see certificate)	160 bar to 225 bar (see certificate)	DN 6, 8, 10 & 12
DINFLEX DF2A	40 bar to 250 bar (see certificate)	167 bar to 420 bar (see certificate)	DN 6, 8, 10, 12, 16, 19 & 25

This Certificate is valid until **2018-12-31**.Issued at **Høvik** on **2018-08-06**DNV GL local station: **Melbourne**for **DNV GL**Approval Engineer: **Maheshraja Venkatesan**

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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

Flexible rubber hoses with permanently attached couplings:-

- AVENGER T1A (as per EN 853 Type 1SN/ SAE J517 Type SAE 100R1)
 - Tube: black, oil resistant synthetic rubber
 - Reinforcement: one braid of high tensile steel wire
 - Cover: AVENGER™ black, oil & abrasion resistant synthetic rubber
 - DIEHARD T1D (as per EN 853 Type 1SN/ SAE J517 Type SAE 100R1)
 - Tube: black, oil resistant synthetic rubber
 - Reinforcement: one braid of high tensile steel wire
 - Cover: DIEHARD™ black, oil & extra abrasion resistant synthetic rubber
 - SLIDER T1S (as per EN 853 Type 1SN/ SAE J517 Type SAE 100R1)
 - Tube: black, oil resistant synthetic rubber
 - Reinforcement: one braid of high tensile steel wire
 - Cover: SLIDER™ black, oil & abrasion resistant synthetic rubber sheathed with a layer of abrasion resistant polyethylene
 - T1F (as per EN 853 Type 1SN/ SAE J517 Type SAE 100R1)
 - Tube: black, oil resistant synthetic rubber
 - Reinforcement: one braid of high tensile steel wire
 - Cover: Red, heat resistant, abrasion & oil resistant synthetic rubber
 - DF2A (as per EN 857 Type 2SC/ SAE J517 Type 100R2)
 - Tube: black, oil resistant synthetic rubber
 - Reinforcement: two braids of high tensile steel wire
 - Cover: black, oil & abrasion resistant synthetic rubber
 - BIOTRANS BT1 (as per SAE J1527 Type Class I)
 - Tube: black, oil resistant synthetic rubber
 - Reinforcement: one braid of high tensile steel wire
 - Cover: blue, oil & abrasion resistant synthetic rubber
 - RQP1 (as per EN 853 Type 1SN/ SAE J517 Type SAE 100R1)
 - Tube: Black, synthetic rubber, specifically compounded for temperature resistance and multi fluid resistance.
 - Reinforcement: one braid of high tensile steel wire
 - Cover: blue, oil & abrasion resistant synthetic rubber
 - AVENGER T3KA (as per SAE J517 SAE 100R17)
 - Tube: oil resistant synthetic rubber
 - Reinforcement: one or two braids of high tensile steel wire
 - Cover: AVENGER™ black, oil & abrasion resistant synthetic rubber
 - DIEHARD T3KD (as per SAE J517 SAE 100R17)
 - Tube: oil resistant synthetic rubber
 - Reinforcement: one or two braids of high tensile steel wire
 - Cover: DIEHARD™ black, oil & extra abrasion resistant synthetic rubber
- Note: T3K10D, T3K12D, T3K10A & T3K12A have 2 wire braids of reinforcement.
- SLIDER T3KS (as per SAE J517 SAE 100R17)
 - Tube: oil resistant synthetic rubber
 - Reinforcement: one or two braids of high tensile steel wire
 - Cover: SLIDER™ black, oil & abrasion resistant synthetic rubber sheathed with a layer of abrasion resistant polyethylene

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- DF1E (as per EN 853 Type 1SN/ SAE J517 Type SAE 100R1)
 - Tube: Black, synthetic rubber, specifically compounded for temperature resistance and multi fluid resistance.
 - Reinforcement: one braid of high tensile steel wire
 - Cover: oil & abrasion resistant synthetic rubber

End couplings for all types:

Bitelok non-skive one-piece crimp coupling type T2000

Material of construction for end couplings:

Carbon steel AISI/SAE 12L14, 1010, 1020, 1040, 1065,
electroplated Fe/Zn12c acc. to AS1789;
Stainless steel 316 ASTM A276

Hose manufacturers:

- Rubber hoses for SURVIVOR series: Diesse Rubber S.p.A., Italy
- Rubber hoses for AVENGER and DIEHARD series: RYCO Hydraulics SDN BHD., Malaysia

Coupling Manufacturers:

- RYCO Hydraulics, Footscray, Vic., Australia;
- RYCO Hydraulics (DALIAN) Ltd, P.R. China

Application/Limitation

The hose assemblies covered by this certificate may be used for: Water based hydraulics , pneumatic systems, fresh water, sanitary, hydraulic oil, fuel & lube oil systems.

The various sizes covered under type designations T1A, T1D, T1F & T1S may be used for CO₂ applications within temperature range between -60°C & 100°C.

The hoses may be used with the following max. allowable working pressures:

- T1A/S/D/F :

Part No.	Hose size			Maximum working pressure							
				T1A		T1S		T1D		T1F	
	DN	Inches	Dash size	bar	psi	bar	psi	bar	psi	bar	psi
T13	5	3/16	-03	250	3600	250	3600	-	-	250	3600
T14	6	1/4	-04	225	3250	225	3250	225	3250	225	3250
T15	8	5/16	-05	215	3100	215	3100	-	-	-	-
T16	10	3/8	-06	180	2600	180	2600	180	2600	180	2600
T18	12	1/2	-08	160	2300	160	2300	160	2300	160	2300
T110	16	5/8	-10	130	1900	130	1900	130	1900	-	-
T112	20	3/4	-12	105	1500	105	1500	105	1500	-	-
T116	25	1	-16	90	1300	90	1300	90	1300	-	-
T120	31	1 1/4	-20	65	945	65	945	65	945	-	-
T124	38	1 1/2	-24	50	725	50	725	50	725	-	-
T132	51	2	-32	40	580	40	580	40	580	-	-

- AVENGER T3KA

Part No.	Hose size ID			Max. working pressure	
	DN	inches	Dash size	bar	PSI
T3K4A	6	1/4	-04	210	3050
T3K5A	8	5/16	-05	210	3050
T3K6A	10	3/8	-06	210	3050
T3K8A	12	1/2	-08	210	3050
T3K10A	16	5/8	-10	210	3050
T3K12A	20	3/4	-12	210	3050

• SURVIVOR RQP1

Part No.	Hose size ID			Max. working pressure	
	DN	inches	Dash size	bar	PSI
RQP14	6	1/4	-04	225	3250
RPQ15	8	5/16"	-05	215	3120
RQP16	10	3/8"	-06	180	2600
RQP18	12	1/2"	-08	160	2300
RQP110	16	5/8"	-10	130	1890
RQP112	20	3/4"	-12	120	1740
RQP116	25	1"	-16	90	1300

• DIEHARD T3KD

Part No.	Hose size ID			Max. working pressure	
	DN	inches	Dash size	bar	PSI
T3K4D	6	1/4"	-04	210	3050
T3K5D	8	5/16	-05	210	3050
T3K6D	10	3/8	-06	210	3050
T3K8D	12	1/2	-08	210	3050
T3K10D	16	5/8	-10	210	3050
T3K12D	20	3/4	-12	210	3050

• DF1E

Part No.	Hose size ID			Max. working pressure	
	DN	inches	Dash size	bar	PSI
DF14E	6	1/4	-04	225	3250
DF15E*	8	5/16	-05	215	3100
DF16E*	10	3/8	-06	180	2600
DF18E	12	1/2	-08	160	2300

• DINFLEX DF2A

Part No.	Hose size			Max. working pressure	
	DN	Inches	Dash Size	bar	PSI
DF24A	6	1/4	-04	420	6100
DF25A	8	5/16	-05	350	5100
DF26A	10	3/8	-06	350	5100
DF28A	12	1/2	-08	295	4250
DF210A	16	5/8	-10	250	3600
DF212A	19	3/4	-12	215	3100
DF216A*	25	1	-16	167	2400

- * The variants DF15E, DF16E & DF216A are 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.

• SLIDER T3KS

Part No.	Hose size			Max. working pressure	
	DN	Inches	Dash Size	bar	PSI
T3K4S	6	1/4	-04	210	3050
T3K5S	8	5/16	-05	210	3050
T3K6S	10	3/8	-06	210	3050
T3K8S	12	1/2	-08	210	3050
T3K10S	16	5/8	-10	210	3050
T3K12S	19	3/4	-12	210	3050

- BIOTRANS BT1

Part No.	Hose size			Max. working pressure	
	DN	Inches	Dash size	bar	PSI
BT14	6	¼	-04	50	725
BT15	8	5/16	-05	50	725
BT16	10	3/8	-06	50	725
BT18	12	½	-08	50	725
BT110	16	5/8	-10	50	725
BT112	20	¾	-12	50	725
BT116	25	1	-16	50	725

Temperature range for all types:-

Petroleum based hydraulic fluids	: -40°C to +100°C
Water based hydraulic fluids	: -40°C to +70°C
Water & compressed air	: 0°C to +70°C

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 delivered under the DNV GL type approval scheme shall be subjected 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.

Hoses used for continuous operation at temperatures higher than 100°C 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.

Flexible hoses of these types are not to be used on boiler fronts.

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.

Hose assemblies with couplings made of carbon steel are not to be used at temperatures below -10°C unless the material is normalized.

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

For use with compressed air or gases, the cover of the hose has to be pin pricked.

Type Approval documentation

Tests carried out

Dimensional check, Burst, Change in length, Impulse, Cold flexibility, Oil resistance, Ozone resistance, Adhesion, Fire resistance test, Burst (at -60°C for CO₂ applications)

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Marking of product

For traceability to this type approval the hose assembly is to be marked atleast with:

- Manufacturers name or trade mark
- Type designation

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. In addition, Surveyor shall witness burst tests on every 3rd size from each type. The tests are to be performed with the type of couplings that are type approved with the hoses.

Also during renewal, Pin prick procedure & Endurance test with liquid carbon dioxide as per DNV GL-CP-0183 Sec.2 [3.4] shall be performed for minimum three test specimens of different sizes (the smallest, the middle and the largest nominal diameter) from each type T1A, T1S, T1D & T1F.