



Design Appraisal Document

Lloyd's Register Canada Ltd
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Date
16 November 2022

Please quote this reference number on all future communications
LR22487165TA

Kobelt Manufacturing Co.Ltd
Models 7085, 7147 & 7065 Steering Hydraulic Servo Cylinders

Valid until 15th Nov 2027

This Design Appraisal Document supersedes, and cancels ATS/3565426/TA/001 Issue No.0 dated 11/Jul/2014.

1. The Document(s) listed in paragraph 1 of the appendix have been examined for compliance with Part 5, Chapter 19 of the Rules and Regulations for the Classification of Ships, July 2022 and will be assigned an appraisal status, as indicated, subject to the following conditions and comments.
2. **7085-cylinder details**

Hydraulic Cylinder Maker's Designation	7085 (Balanced & Unbalanced)
Hydraulic Cylinder Stroke, inches	10,12,16,20
Servo Valves Maker's Designation	7085-SA
Maximum Working Pressure, bar	69
<i>Relief Valve</i> Design Pressure, bar	86.3
Hydrostatic Test Pressure, bar	129.4
Temperature range, deg Celsius	0-50

3. **7065-cylinder details:**

Hydraulic Cylinder Maker's Designation	7065 (Balanced)
Hydraulic Cylinder Stroke, inches	10,12, & 16
Servo Valve Type	7247-SAC
Maximum Working Pressure, bar	83
<i>Relief Valve</i> Design Pressure, bar	103
Hydrostatic Test Pressure, bar	154.5
Temperature range, deg Celsius	0-50

FINAL ACCEPTANCE OF ACTUAL ITEM(S) DEPEND(S) ON SATISFACTORY SURVEY AND TESTING

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4. 7147-cylinder details:

Hydraulic Cylinder Maker's Designation	7147 (Balanced)
Hydraulic Cylinder Stroke, inches	7.5,10, 12
Servo Valve Maker's Designation	7247-SAC
Maximum Working Pressure, bar	69
<i>Relief Valve</i> Design Pressure, bar	86.3
Hydrostatic Test Pressure, bar	129.4
Temperature range, deg Celsius	0-50

5. General Comments:

5.1 The hydraulic cylinder servo models 7085-S & 7147 have been Type Approved under LR Type Approval Certificate #14/60018 dated 22 Aug 2014. --

5.2 The hydraulic cylinder model 7065 has been Type Approved as per LR Type Approval Certificate #01/60132(E4) Issue#1 dated 08 Feb 2019. --

5.3 The scope of this design appraisal is limited to servo valves 7247-SAC & 7085-SA identifying the change of material from Aluminum to Steel. The proposed material of construction is to be in accordance with LR Rules for Materials. Supporting documents are to be to satisfaction of the Attending Surveyor. AQS Manufacturer

5.4 Seals and gaskets shall be qualified and capable of functioning at the specified design parameters and retained fluid. Supporting documents are to be to satisfaction of the Attending Surveyor. AQS Manufacturer

5.5 Fittings, flexible hoses, soft seated valves/cartridges, measuring devices, solenoids are outside the scope of this design appraisal. They are to be certified for marine applications and document evidence are shown to the satisfaction of the Attending Surveyor. AQS Manufacturer

5.6 Servo valves are to be hydraulically pressure tested to 1.5 times the Design Pressure (relief valve pressure) AQS Manufacturer

5.7 The application and suitability of the steering cylinders as part of a steering gear system will be reviewed on a case-by-case basis subject to compliance with applicable LR Rules. --

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5.8 The review of steering gear arrangement and hydraulic system aspects will be considered as part of a separate appraisal. The system arrangement plans and specifications are to be submitted for design appraisal for each application.

AQS
Manufacturer

Praveen Dwarakanath
Specialist – Engineering Systems
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Appendix

1. The documents listed below have been examined

Document No.	Rev.	Title	Status	Date
7085 Cylinder				
7085-SB10	A	7085 Servo Cyl. 10" Stroke (Balanced)	SI	16-Nov-2022
7085-SB12	A	7085 Servo Cyl. 12" Stroke (Balanced)	SI	16-Nov-2022
7085-SB-16	A	7085 Servo Cyl. 16" Stroke (Balanced)	SI	16-Nov-2022
7085-SB20	A	7085 Servo Cyl. 20" Stroke (Balanced)	SI	16-Nov-2022
7085-SU10	A	7085 Servo Cyl. 10" Stroke (Unbalanced)	SI	16-Nov-2022
7085-SU12	A	7085 Servo Cyl. 12" Stroke (Unbalanced)	SI	16-Nov-2022
7085-SU16	A	7085 Servo Cyl. 16" Stroke (Unbalanced)	SI	16-Nov-2022
7085-SU20	A	7085 Servo Cyl. 20" Stroke (Unbalanced)	SI	16-Nov-2022
7085-SBXX-GA	A	7085-SBXX General Arrangement	SI	16-Nov-2022
7085-SUXX-GA	A	7085-SUXX General Arrangement	SI	16-Nov-2022
7085-0001	B	Foot	SI	16-Nov-2022
7085-0002	B	Swivel	SI	16-Nov-2022
7085-0003	A	End Cap Swivel End	SI	16-Nov-2022
7085-0004	A	Rod end sub assembly	SI	16-Nov-2022
7085-0004H	A	Rod end housing	SI	16-Nov-2022
7085-0006	A	End Cap	SI	16-Nov-2022
7085-0012	A	7085 Servo End Cap	SI	16-Nov-2022
7085-0015	B	Main Shaft Guide	SI	16-Nov-2022
7085-0020	C	Servo Piston	SI	16-Nov-2022
7085-0021	D	7085 Main Piston Balanced	SI	16-Nov-2022
7085-1018	B	7085 Main Tube-10" Stroke	AQ	16-Nov-2022
7085-1019	B	Servo Tube-10" Stroke	AQ	16-Nov-2022
7085-1022	E	Main Piston Rod-10" Stroke Balanced	AQ	16-Nov-2022
7085-1022-U	D	Main Piston Rod-10" Stroke Unbalanced	AQ	16-Nov-2022
7085-1032	B	7085 Main Tie Rod – Long 10" Stroke	AQ	16-Nov-2022
7085-1033	C	7085 Main Tie Rod – Short 10" Stroke	AQ	16-Nov-2022
7085-1034	B	Servo Tie Rod-10 " Stroke	AQ	16-Nov-2022
7085-1035	B	Servo Tie Rod 10" Stroke	AQ	16-Nov-2022
7085-1218	B	7085 Main Tube – 12" Stroke	AQ	16-Nov-2022
7085-1219	B	Servo Tube 12" Stroke	AQ	16-Nov-2022

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Document No.	Rev.	Title	Status	Date
7085-1222	E	Main Piston Rod 12" Stroke Balanced	AQ	16-Nov-2022
7085-1222-U	D	Main Piston Rod 12" Stroke Unbalanced	AQ	16-Nov-2022
7085-1232	B	7085 Main Tie Rod – Long 12" Stroke	AQ	16-Nov-2022
7085-1233	C	7085 Main Tie Rod – Short 12" Stroke	AQ	16-Nov-2022
7085-1234	B	Servo Tie Rod 12" Stroke	AQ	16-Nov-2022
7085-1235-	B	Servo Tie Rod 12" Stroke	AQ	16-Nov-2022
7085-1618	B	7085 Main Tube 16" Stroke	AQ	16-Nov-2022
7085-1619	B	Servo Tube 16" Stroke	AQ	16-Nov-2022
7085-1622	E	Main Piston Rod 16" Stroke Balanced	AQ	16-Nov-2022
7085-1622-U	D	Main Piston Rod 16" Stroke Unbalanced	AQ	16-Nov-2022
7085-1632	B	7085 Main Tie Rod-Long 16" Stroke	AQ	16-Nov-2022
7085-1633	C	7085 Main Tie Rod-Short 16" Stroke	AQ	16-Nov-2022
7085-1634	B	Servo Tie Rod 16 Stroke	AQ	16-Nov-2022
7085-1635	B	Servo Tie Rod 16" Stroke	AQ	16-Nov-2022
7085-2018	B	7085 Main Tube – 20" Stroke	AQ	16-Nov-2022
7085-2019	B	Servo Tube 20" Stroke	AQ	16-Nov-2022
7085-2022	E	Main Piston Rod 20" Stroke Balanced	AQ	16-Nov-2022
7085-2022-U	D	Main Piston Rod 20" Stroke Unbalanced	AQ	16-Nov-2022
7085-2032	B	7085 Main Tie Rod – Long 20" Stroke	AQ	16-Nov-2022
7085-2033	C	7085 Main Tie Rod – Short 20" Stroke	AQ	16-Nov-2022
7085-2034	B	Servo Tie Rod – 20" Stroke	AQ	16-Nov-2022
7085-2035	B	Servo Tie Rod- 20" Stroke	AQ	16-Nov-2022
7085-XX23	H	Servo Piston Rod	AQ	16-Nov-2022
7147 Cylinder				
7147-H7.5C	A	7147 Servo Cylinder 7.5" Stroke	SI	16-Nov-2022
7147-H7.5C-GA	A	7147 Servo Cylinder 7.5" Stroke	SI	16-Nov-2022
7147-H10C	A	7147 Servo Cylinder 10" Stroke	SI	16-Nov-2022
7147-H10C-GA	A	7147 Servo Cylinder 10" Stroke	SI	16-Nov-2022
7147-H12C	A	7147 Servo Cylinder 12" Stroke	SI	16-Nov-2022
7147-H12C-GA	A	7147 Servo Cylinder 12" Stroke	SI	16-Nov-2022
7147-0001	B	Foot	SI	16-Nov-2022

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Document No.	Rev.	Title	Status	Date
7147-0002	B	Swivel	SI	16-Nov-2022
7147-0003	A	End cap Swivel end	SI	16-Nov-2022
7147-0004	A	End cap	SI	16-Nov-2022
7147-0006	C	Servo End cap	SI	16-Nov-2022
7147-0008	A	7147 Spring cover	SI	16-Nov-2022
7147-0009	--	Servo Mounting Bracket	SI	16-Nov-2022
7147-0012	A	Spool housing cover	SI	16-Nov-2022
7147-0012H	A	Rod Ball End Housing	SI	16-Nov-2022
7147-0015	B	7147 Main Piston	SI	16-Nov-2022
7147-0016	C	Servo Piston	SI	16-Nov-2022
7147-0013	-	Main Piston rod	AQ	16-Nov-2022
7147-0014	-	Servo Piston rod	AQ	16-Nov-2022
7147-1013	A	Main Piston Rod 10" Stroke	AQ	16-Nov-2022
7147-1017	A	7147 Main Tube 10" Stroke	AQ	16-Nov-2022
7147-1018	A	7147 Servo Tube 10" Stroke	AQ	16-Nov-2022
7147-1020	A	7147 Main Tie Rod 10" Stroke	AQ	16-Nov-2022
7147-1021	B	Servo Tie Rod 10" Stroke	AQ	16-Nov-2022
7147-1030	A	7147 Spacer Tie Rod 10" Stroke	SI	16-Nov-2022
7147-1213	A	Main Piston Rod 12" Stroke	AQ	16-Nov-2022
7147-1217	A	7147 Main Tube 12" Stroke	AQ	16-Nov-2022
7147-1218	A	7147 Servo Tube 12" Stroke	AQ	16-Nov-2022
7147-1220	A	7147 Main Tie Rod 12" Stroke	SI	16-Nov-2022
7147-1221	B	Servo Tie Rod 12" Stroke	AQ	16-Nov-2022
7147-1230	A	7147 Spacer Tie Rod 12" Stroke	SI	16-Nov-2022
7147-7513	A	Main Piston Rod 7.5" Stroke	AQ	16-Nov-2022
7147-7517	A	7147 Main Tube 7.5" Stroke	AQ	16-Nov-2022
7147-7518	A	7147 Servo Tube 7.5" Stroke	AQ	16-Nov-2022
7147-7520	A	7147 Main Tie Rod 7.5" Stroke	AQ	16-Nov-2022
7147-7521	B	Servo Tie Rod 7.5" Stroke	AQ	16-Nov-2022
7147-7530	A	7147 Spacer Tie Rod 7.5" Stroke	SI	16-Nov-2022

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<u>7065 Cylinder</u>				
7065-SB10	A	7065 Servo Cylinder 10" Stroke	SI	16-Nov-2022
7065-SB10-H	A	7065 Servo Cylinder 10" Stroke	SI	16-Nov-2022
7065-SB10-H-GA	C	Servo Cylinder 10" Stroke	SI	16-Nov-2022
7065-SB12	A	7065 Servo Cylinder 12" Stroke	SI	16-Nov-2022
7065-SB16	A	7065 Servo Cylinder 16" Stroke	SI	16-Nov-2022
7065-SBXX-GA	A	7065- SBXX General Arrangement	SI	16-Nov-2022
7065-0004	A	Rod End Assembly,7/8 Diameter	SI	16-Nov-2022
7065-0004-H	A	Rod End,7/8 Diameter	SI	16-Nov-2022
7065-0007	A	Rod Guide	SI	16-Nov-2022
7065-0014	--	Piston Balanced Cylinder	SI	16-Nov-2022
7065-0016	A	Pin	SI	16-Nov-2022
7065-0017	B	Foot	SI	16-Nov-2022
7065-0018	B	Swivel	SI	16-Nov-2022
7065-0019	B	End Cap – Swivel End	SI	16-Nov-2022
7065-0020M	--	End Cap	SI	16-Nov-2022
7065-0022	--	Servo Link	SI	16-Nov-2022
7065-0026	B	Hex Shoulder Bolt- Short	SI	16-Nov-2022
7065-0027	B	Hex Shoulder Bolt- Long	SI	16-Nov-2022
7065-1021	A	Link Arm	SI	16-Nov-2022
7065-XX06	B	Cylinder Tube	AQ	16-Nov-2022
7065-XX12	B	Tie Rod	AQ	16-Nov-2022
7065-XX23	B	Main Piston Rod Balanced Servo Cylinder	AQ	16-Nov-2022
7065-XX25	A	Spacer Tube	AQ	16-Nov-2022
7065-XX29	A	Spacer Tie Rod	AQ	16-Nov-2022
<u>Servo valve 7085</u>				
7085-SA	A	7085 Servo Valve Assembly	SI	16-Nov-2022
7185-0010	D	Spool Housing Outlet Port – 7185 Servo	AQ	16-Nov-2022
7185-0011	F	Spool Housing 7185 Servo	AQ	16-Nov-2022
<u>Servo Valve 7247</u>				

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Document No.	Rev.	Title	Status	Date
7247-SAC	D	7247 Servo Spool Assembly	SI	16-Nov-2022
7247-0010	E	Spool Housing Outlet Port	AQ	16-Nov-2022
7247-0011	F	Spool Housing	AQ	16-Nov-2022

2. The documents listed below have been considered together with the submitted documents in the appraisal

Document No.	Rev.	Title
01/60132(E4)	E4	LR Type Approval certificate – Steering Hydraulic Cylinders
01/60132(E4)	1	Design Appraisal Document
--	--	Servo Tube calculation
--	--	Servo Valve calculation
ATS/3565426/TA/001	0	Machinery General Design Appraisal- 7085-S & 7147 Steering Cylinders(for TAC#14/60018)
14/60018	0	Type Approval 7085-S & 7147 Steering Cylinders
--	April 2021	7065-SBXX Power Assist Cylinder- Manual

Appraisal Status Key

SI	Retained as supporting documentation for information only
AQ	Approved subject to the matters raised that require resolution - and provided the arrangements are to the surveyor's satisfaction
AQS	Comments to be resolved at the manufacturing site
Manufacturer	

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