DNV·GL

Certificate No:
TAD00000CK

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Accumulators

with type designation(s)
1 Quart 3000psi Accumulator, MBA01-03--N-O-1-A**
1 Gallon 3000psi Accumulator, MBA04-03--N-O-1-A**
2.5-15 Gallon 3000psi Bottom Repairable Accumulator, MBAXX-03--N-O-1-A**
2.5-15 Gallon 3000psi Top Repairable Accumulator, MBTXX-03--N-O-1-A**
2.5-15 Gallon 5000psi Bottom Repairable Accumulator, MBAXX-05--N-O-1-A**
2.5-15 Gallon 5000psi Top Repairable Accumulator, MBTXX-05--N-O-1-A**
2.5-15 Gallon 6000psi Bottom Repairable Accumulator, MBAXX-60--N-O-1-A**
2.5-15 Gallon 6000psi Top Repairable Accumulator, MBTXX-60--N-O-1-A**
2.5-15 Gallon 6500psi Bottom Repairable Accumulator, MBAXX-06--N-O-1-A**
2.5-15 Gallon 6500psi Top Repairable Accumulator, MBTXX-06--N-O-1-A**

Issued to
Servi Fluid Power Inc.
Katy TX, United States

is found to comply with
DNVGL-OS-E101 – Drilling plant, Edition July 2015
DNVGL-SI-0166 – Verification for compliance with Norwegian shelf regulations, Edition July 2015

Application :

See Page 2

This Type Approval Certificate is 6 pages long and replaces D-5931, issued 2014-11-21.

This Certificate is valid until **2018-12-31**.

Issued at **Houston** on **2016-05-06**

for **DNV GL**

DNV GL local station: **Approval CMC – Houston**

Approval Engineer: **M. Kevin Mandeville Jr.**

Christian Nilsen
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.

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Job Id:
Certificate No: **TAD00000CK**

The following design codes and standards were used as reference:

ASME *Boiler and Pressure Vessel Code*, Section VIII, Division1, 2013 Edition

Product description

3000 PSI BLADDER TYPE ACCUMULATOR

1 Quart Capacity
1 Gallon Capacity
2.5-15 Gallon Capacity, Top Repairable
2.5-15 Gallon Capacity, Bottom Repairable

5000 PSI BLADDER TYPE ACCUMULATOR

2.5-15 Gallon Capacity, Top Repairable
2.5-15 Gallon Capacity, Bottom Repairable

6000 PSI BLADDER TYPE ACCUMULATOR

2.5-15 Gallon Capacity, Top Repairable
2.5-15 Gallon Capacity, Bottom Repairable

6500 PSI BLADDER TYPE ACCUMULATOR

2.5-15 Gallon Capacity, Top Repairable
2.5-15 Gallon Capacity, Bottom Repairable

Application/Limitation

For Model Nos. MBA01-03-**-N-O-1-A

Design Parameter	Value	Equivalent
Max Internal Working Pressure	3,000 psi	206.8 bar
Max Internal Test Pressure	4,500 psi	310.3 bar
Min Design Temperature	-40 °F	- 40 °C
Max Design Temperature	200 °F	93 °C
Corrosion Allowance (Interior and exterior)	0 in	0 mm
Service	Standard	

For Model Nos. MBA04-03-**-N-O-1-A, MBAXX-03-**-N-O-1-A, and MBTXX-03-**-N-O-1-A,

Design Parameter	Value	Equivalent
Max Internal Working Pressure	3,000 psi	206.8 bar
Max Internal Test Pressure	4,500 psi	310.3 bar
Min Design Temperature	-50 °F	- 46 °C
Max Design Temperature	200 °F	93 °C
Corrosion Allowance (Interior and exterior)	0 in	0 mm
Service	Standard	

For Model No MBAXX-05-**-N-O-1-A, MBTXX-05-**-N-O-1-A,

Design Parameter	Value	Equivalent
Max Internal Working Pressure	5,000 psi	344.7 bar
Max Internal Test Pressure	7,500 psi	517.1 bar
Min Design Temperature	-40 °F	- 40 °C
Max Design Temperature	200 °F	93 °C
Corrosion Allowance (Interior and exterior)	0 in	0 mm
Service	Standard	

For Model No MBAXX-60-**-N-O-1-A, MBTXX-60-**-N-O-1-A,

Design Parameter	Value	Equivalent
Max Internal Working Pressure	6,000 psi	413.7 bar
Max Internal Test Pressure	9,750 psi	672.2 bar
Min Design Temperature	-40 °F	- 40 °C
Max Design Temperature	200 °F	93 °C
Corrosion Allowance (Interior and exterior)	0 in	0 mm
Service	Standard	

Job Id:
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For Model No MBAXX-06-**-N-O-1-A, MBTXX-06-**-N-O-1-A,

Design Parameter	Value	Equivalent
Max Internal Working Pressure	6,500 psi	448.2 bar
Max Internal Test Pressure	9,750 psi	672.2 bar
Min Design Temperature	-40 °F	- 40 °C
Max Design Temperature	200 °F	93 °C
Corrosion Allowance (Interior and exterior)	0 in	0 mm
Service	Standard	

Note: Bladder Accumulators are not approved for external gauge pressure.

Model Number Explanation:
For MB(Y)(XX)-(PP)-(**)-N-O-1-A, the following table applies

Variable	Value	Meaning
Y, Top/ Bottom repairable	A	Bottom Repairable
	T	Top Repairable
XX, Size	01	1 Quart
	04	1 Gallon
	10	2.5 Gallon
	20	5.0 Gallon
	37	10.0 Gallon
	42	11.0 Gallon
	57	15.0 Gallon
PP, Pressure	03	3000 PSI working pressure
	05	5000 PSI working pressure
	60	6000 PSI working pressure
	06	6500 PSI working pressure
**, Fluid Port Options	FP10-NE1H	1-1/4” NPT, in AISI 4140
	FP10-NG1H	2” NPT, in AISI 4140
	FP10-SL1H	1-7/8” SAE, in AISI 4140
	FP10-FA1H	2” Code 61 SAE Flange
	FP10-FB1H	1-1/2”Code 62 SAE Flange, in AISI 4140
	FP10-FE1H	1” Code 61 SAE Flange
	FP10-NE2H	1-1/4” NPT, in 316/316L SST
	FP10-NG2H	2” NPT, in 316/316L SST
	FP10-SL2H	1-7/8” SAE, in 316/316L SST
	FP10-FA2H	2” Code 61 SAE Flange, in 316/316L SST
	FP10-FB2H	1-1/2”Code 62 SAE Flange, in 316/316L SST
	FP10-FE2H	1” Code 61 SAE Flange, in 316/316L SST
	FP10-NE3H	1-1/4” NPT, in 17-4PH SST
	FP10-NG3H	2” NPT, in 17-4PH SST
	FP10-SL3H	1-7/8” SAE, in 17-4PH SST
	FP10-FA3H	2” Code 61 SAE Flange, in 17-4PH SST
	FP10-FB3H	1-1/2”Code 62 SAE Flange, in 17-4PH SST
	FP10-FD3H	1-1/2 Code 62 SAE W/Subseal in 17-4PH SST
	FP10-FE3H	1” Code 61 SAE Flange, in 17-4PH SST
	FP01-NC1H	1 Quart Fluid Port, 3000psi, 1” NPT
	FP01-ND1H	1 Quart Fluid Port, 3000psi, 3/4" NPT
	FP01-SJ1H	1 Quart Fluid Port, 3000psi, 1-5/16”-12UN SAE
	FP04-FC1H	1 Gal. Fluid Port, 3000psi, 1-1/4” Code 61 SAE Flange
	FP04-NE1H	1 Gallon Fluid Port, 3000psi, 1-1/4” NPT
	FP04-SK1H	1 Gallon Fluid Port, 3000psi, 1-5/8”-12UN SAE
	FP01-NC2H	1 Quart Fluid Port, 3000psi, 1” NPT, in 316/316L SST
	FP01-ND2H	1 Quart Fluid Port, 3000psi, 3/4" NPT, in

Variable	Value	Meaning
		316/316L SST
	FP01-SJ2H	1 Quart Fluid Port, 3000psi, 1-5/16”-12UN SAE, in 316/316L SST
	FP04-FC2H	1 Gal. Fluid Port, 3000psi, 1-1/4” Code 61 SAE Flange, in 316/316L SST
	FP04-NE2H	1 Gallon Fluid Port, 3000psi, 1-1/4” NPT, in 316/316L SST
	FP04-SK2H	1 Gallon Fluid Port, 3000psi, 1-5/8”-12UN SAE, in 316/316L SST
	FP01-NC3H	1 Quart Fluid Port, 3000psi, 1” NPT, in 17-4PH SST
	FP01-ND3H	1 Quart Fluid Port, 3000psi, 3/4" NPT, in 17-4PH SST
	FP01-SJ3H	1 Quart Fluid Port, 3000psi, 1-5/16”-12UN SAE, in 17-4PH SST
	FP04-FC3H	1 Gal. Fluid Port, 3000psi, 1-1/4” Code 61 SAE Flange, in 17-4PH SST
	FP04-NE3H	1 Gallon Fluid Port, 3000psi, 1-1/4” NPT, in 17-4PH SST
	FP04-SK3H	1 Gallon Fluid Port, 3000psi, 1-5/8”-12UN SAE, in 17-4PH SST
	FP10-FFXX	2.5-15 Gal Fluid Port, SAE 1” Code 62, 6000 psi
N, Bladder Material	*Not evaluated*	
O, Service	O	Oil
	W	Water
1, Fluid Port, AE Ring, Locknut material, Valve Stem	1	Carbon Steel
	2	Stainless Steel
A, Approval Options	D	ASME & DNV GL
	E	ASME & DNV GL & ABS
	H	ASME & DNV GL & ABS & CE

Type Approval documentation

Tests carried out

The following burst pressure tests were carried out to validate a 5000psi shell:

File Name	Report No.	Date
ZP-OD229-124-20L-34.5MPA-YEAR2009.PDF	HBT2009-140	2009-06-25
ZP-OD168-9.4-4L-34MPA-YEAR2009.pdf	HBT2009-141	2009-11-2
TTHP-OD168-7.8-4L-25MPA-YEAR2007.pdf	HBT2007-113	2007-12-9

In addition, the justification is under the excel file "Burst Pressure Extrapolation Table.xlsx"
This will be combined with hydrostatic testing of each accumulator.

Marking of product

For traceability, the following marking is to be carried out on each product:

1. Serial No.
2. Manufacturer's Name or Trademark
3. Additional marking at the manufacturer's discretion

Certificate Retention Survey

For retention of the Type Approval Certificate, DNV GL's surveyor shall perform a survey every second year in accordance with DNV GL's Type Approval Class Programme, DNVGL-CP-0338.

Other conditions/comments

- Manufacture and Examination of integrally forged cylinder to be in accordance with the requirements of ASME 2015 BPVC Sec. VIII Div. 1, Mandatory Appendix 22
- Data report must include "Constructed in Conformance with Mandatory Appendix 22, Integrally Forged Vessels"
- Hydrostatic test requirements can be waived for the end fittings when these are manufactured under surveillance through an appropriate quality control system and full traceability is imposed on the critical pressure components as per DNV GL Fax, ref. number OFF-0028-97, Dated 1997-10-20. This waiver only applies to the accumulators when they are used per the scope of DNVGL-OS-E101 and will be part of a system with subsequent commissioning and/or operation testing.
- DNV GL Ref. Project No. PP156627.

END OF CERTIFICATE