

9.0L 31A/31C3
Part No.: Composite
Cylinder
Rev.: 0.0/0.1
Report Date: 06/25/21

ARROWHEAD INDUSTRIAL SERVICES USA, INC.
Compressed Gas Container Specialists
3537 S. NC 119, PO Box 1000
Graham, NC 27253-1000

Report: 14821030
Sheet No.: 1 of 18

**REPORT OF MANUFACTURE OF CARBON-FIBER REINFORCED FULL WRAPPED SEAMLESS ALUMINUM-LINED
COMPOSITE GAS CONTAINERS**

Manufactured for Location BeiJing TianHai Industry Co.,Ltd
NO 2 South 3rd HuoXian Street,HuoXian Town,TongZhou District
BeiJing,China

Manufactured by Location Shanghai Tianhai Composite Cylinders Co.,Ltd
Jiuting,Songjiang Hi-Tech Park
Shanghai 201615, China

Consigned to: Location N/A

Part Number: 9.0L 31A/31C3 Composite Cylinder

Quantity: 200 **Size:** 6.86 inch/ 174.2 mm. outside diameter by 22.50 inch/ 571.5 mm. long.
550 cuin./ 9.0 Liter

MARKS PLACED ON IMBEDDED LABELS ARE:

TC-3CCM-310 BAR
DOT-SP14621-4500 PSI

Serial Number: C285001 to C285201 inclusive except as noted on hydrostatic test sheet

Identifying Symbol (registered) M0807

Inspector's Mark: 

Test Date: 04  21 **REE:** 166 cc

Other Marks: Label details see Attachment A

Each composite cylinder was made by completely overwrapping a seamless aluminum liner with resin impregnated filament reinforcement. Liners were made by forming a shoulder and neck on the open end of an aluminum seamless shell. Composite overwrap was made by winding resin impregnated Toray T700 carbon continuous filament over the liner in both longitudinal and circumferential directions, followed by curing of the resin at controlled temperature.

The aluminum liner was identified by heat number(s) and verified as to chemical analysis; record thereof is attached hereto. Liners fabricated from the aluminum were solution treated and artificially aged to T-6 temper. Physical tests were made in the presence of the inspector and report of results is attached hereto.

Each liner was inspected both before and after closing in the ends. All that were inspected were found to be free from seam, cracks, laminations and other defects that might prove injurious to the strength of the cylinder.

Certifying Inspector: Joe Cassidy
Director of Quality Assurance
ARROWHEAD INDUSTRIAL SERVICES USA, INC.

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**REPORT OF MANUFACTURE OF CARBON-FIBER REINFORCED FULL WRAPPED SEAMLESS ALUMINUM-LINED
COMPOSITE GAS CONTAINERS**

Liner walls were measured and the minimum was found to be at least equal to the minimum design thickness of 0.055 inch/ 1.4 mm. The outside diameter was found by a close approximation to be 6.26 inch/ 159 mm.

Filament and resin components were certified by the manufactures, and identified by package/lot number. Filament was verified as to strand strength. Composite was verified as to shear strength. After wrapping composite was cured per manufacturer's specification as follows:

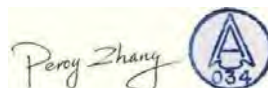
First raise temperature up to 176 °F, hold temperature for 2 hours,
Then raise temperature up to 257 °F, hold temperature for 3 hours

Prescribed autofrettage and hydrostatic tests were made in the presence of the Inspector. All cylinders accepted conform to the specification requirements. Results of autofrettage and hydrostatic tests are attached hereto.

Tensile stress on the aluminum liner in the hoop direction is calculated to be
4406 psi/ 30 N/mm² and 5822 psi/ 40 N/mm² in longitudinal direction at service pressure.

Carbon fiber stress is calculated to be 154309 psi/ 1064 N/mm² in the hoop direction and
83856 psi/ 578 N/mm² in the longitudinal direction at service pressure.

I hereby certify that all of these cylinders proved satisfactory in every way and conform with the requirements of DOT-CFFC, DOT-SP14621 and TC-3CCM.



Certifying Inspector: Percy Zhang
ARROWHEAD INDUSTRIAL SERVICES USA, INC.

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ARROWHEAD INDUSTRIAL SERVICES USA, INC.
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REPORT OF MANUFACTURE OF CARBON-FIBER REINFORCED FULL WRAPPED SEAMLESS ALUMINUM-LINED COMPOSITE GAS CONTAINERS


RECORD OF CHEMICAL ANALYSIS FOR CYLINDER LINERS

MANUFACTURED BY: Shanghai Tianhai Composite Cylinders Co.,Ltd
 FOR: BeiJing TianHai Industry Co.,Ltd
 PLATE SIZE:
 SERIAL NUMBER: C285001 to C285201 inclusive ALUMINUM ALLOY: 6061

Mill Heat Code	Cast Code	Check Analysis Date	Si	Fe	Cu	Mn	Mg	Cr	Zn	Ti	Pb	Bi	Other Each	Other Total
03-0722	6K	17-Mar-21	0.63	0.56	0.23	0.07	0.95	0.17	0.00	0.02	0.001	0.001	/	/
			0.66	0.54	0.24	0.07	0.95	0.17	0.00	0.04	0.001	0.001	0.01	0.02
03-0721	6H	5-Mar-21	0.64	0.57	0.25	0.07	0.97	0.16	0.00	0.02	0.001	0.001	/	/
			0.61	0.54	0.23	0.07	0.94	0.17	0.00	0.03	0.001	0.001	0.01	0.02

The material were manufactured and mill analysis were made by: MEYER ALUMINIUM LIMITED.HONG KONG

The check analysis were made by: Beijing Tianhai Industry Co.,Ltd. Beijing, P.R.China

Percy Zhang 

Certifying Inspector: Percy Zhang
 ARROWHEAD INDUSTRIAL SERVICES USA, INC.

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ARROWHEAD INDUSTRIAL SERVICES USA, INC.
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REPORT OF MANUFACTURE OF CARBON-FIBER REINFORCED FULL WRAPPED SEAMLESS ALUMINUM-LINED COMPOSITE GAS CONTAINERS

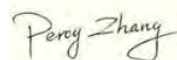

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDER LINERS

MANUFACTURED BY: Shanghai Tianhai Composite Cylinders Co.,Ltd
 FOR: BeiJing TianHai Industry Co.,Ltd

SERIAL NUMBER: C285001 to C285201 inclusive ALUMINUM ALLOY: 6061

Test Specimen: 6T width by 24T gauge length

LOT NUMBER	CYLINDERS REPRESENTED BY TEST (SERIAL NUMBER)		YIELD STRENGTH AT 0.2 PERCENT OFFSET (Psi/Mpa)	TENSILE STRENGTH (Psi/Mpa)	ELONGATION (PERCENT)
6K2M	C285001	to	42786 (295)	48153 (332)	12.8
	C285201		44236 (305)	48298 (333)	12.5
6H0M	C285001	to	44817 (309)	50038 (345)	12.3
	C285201		44236 (305)	49313 (340)	12.0

Percy Zhang  

 Certifying Inspector: Percy Zhang
 ARROWHEAD INDUSTRIAL SERVICES USA, INC.

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REPORT OF MANUFACTURE OF CARBON-FIBER REINFORCED FULL WRAPPED SEAMLESS ALUMINUM-LINED COMPOSITE GAS CONTAINERS

RECORD OF COMPOSITE ANALYSIS

MANUFACTURED BY: Shanghai Tianhai Composite Cylinders Co.,Ltd
 FOR: BeiJing TianHai Industry Co.,Ltd

SERIAL NUMBER: C285001 to C285201 inclusive

Filament designation and specification: * T700SC-12000-50C
 ** E-Glass
 Filament manufactured by: * TORAY, JAPAN
 ** Chongqing International Composite Co.,Ltd


MANUFACTURING LOT NUMBER	NUMBER TENSILE STRENGTH (Psi/Mpa)	INTERLAMINAR SHEAR (Psi/Mpa)	RESULT
*J7120A4	608433 (4195)	N/A	OK
**BE20122800301	248014 (1710)	N/A	OK
***PH0G1123	N/A	5716 (39.41)	OK

RESIN SYSTEMS COMPONENTS AND MANUFACTURING LOT NUMBERS

Resin Type: EPIKOTE / RESIN 828
 Resin designation: Momentive
 Resin manufactured by: Hexion B.V, Seattleweg 17 3195 ND, Pernis, Rotterdam, Netherlands.

RESIN		CURING AGENT		AIR RELEASE	
TYPE	LOT NUMBER	TYPE	LOT NUMBER	TYPE	LOT NUMBER
EPIKOTE / RESIN 828	PH0G1123	T-403	SC20M23S02	BYK-A-500	620B051

* Carbon Fiber
 ** Fiber Glass
 ***Resin

Percy Zhang 

 Certifying Inspector: Percy Zhang
 ARROWHEAD INDUSTRIAL SERVICES USA, INC.

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**REPORT OF MANUFACTURE OF CARBON-FIBER REINFORCED FULL WRAPPED SEAMLESS ALUMINUM-LINED
 COMPOSITE GAS CONTAINERS**

RECORD OF LOT QUALIFICATION TEST

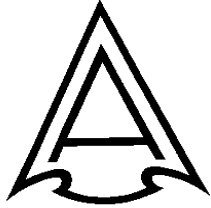
MANUFACTURED BY: Shanghai Tianhai Composite Cylinders Co.,Ltd LOT No. C285
 FOR: BeiJing TianHai Industry Co.,Ltd
 SERIAL NUMBER: C285001 to C285201 inclusive

LOT TEST CYLINDER S/N	TEST CYLINDER WEIGHT lbs/kgs	PRESSURIZATION	PRESSURIZATION	ACHIEVED BURST PRESSURE	BURST INITIATE LOCATION
		RANGE AND CYCLE NUMBERS	RANGE AND CYCLE NUMBERS		
		>= 4500 psi (31Mpa)	>= 7500 psi (51.7Mpa)	>= 15300 psi (105.5Mpa)	
C285070	10.9 (4.96)	10010	35	16096 (110.98)	CSW
C285070	10.9 (4.96)	NA	NA	16096 (110.98)	CSW

Percy Zhang 

 Certifying Inspector: Percy Zhang
 ARROWHEAD INDUSTRIAL SERVICES USA, INC.

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 8410 psi 58.0 Mpa

Hold for: 60 Seconds

Part Number: 9.0L 31A/31C3 Composite Cylinder Test Date: 20-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: C285018 to C285034 inclusive.

Hold for: 60 Seconds

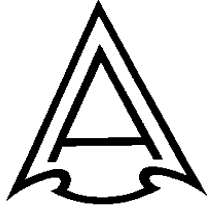
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
C285018	6H0M018	4.1	6.4	10.6	30.6	553	225.2	50.7	152.6	0.7	151.9	0.5	20-Apr
C285019	6H0M019	4.1	6.7	10.8	30.8	553	219.4	48.3	149.7	0.8	148.9	0.5	20-Apr
C285020	6H0M020	4.1	6.6	10.7	30.7	553	202.2	30.5	150.0	0.9	149.1	0.6	20-Apr
C285021	6H0M021	4.1	6.6	10.7	30.7	553	217.7	45.6	150.6	1.7	148.9	1.1	20-Apr
C285022	6H0M022	4.1	6.7	10.9	30.8	553	213.2	43.3	149.4	1.9	147.5	1.3	20-Apr
C285023	6H0M023	4.1	7.0	11.1	31.1	553	212.7	41.0	151.4	3.2	148.2	2.1	20-Apr
C285024	6H0M024	4.1	7.0	11.1	31.1	553	212.1	40.2	150.0	0.7	149.3	0.5	20-Apr
C285025	6H0M025	4.1	6.9	11.0	31.0	553	205.5	35.3	150.6	2.5	148.1	1.7	20-Apr
C285026	6H0M026	4.1	6.8	10.9	30.9	553	213.4	43.5	151.5	2.7	148.8	1.8	20-Apr
C285027	6H0M027	4.1	6.7	10.8	30.8	553	218.8	47.7	151.0	1.9	149.1	1.3	20-Apr
C285028	6H0M028	4.1	6.8	11.0	31.0	553	212.1	39.7	152.2	2.2	150.0	1.4	20-Apr
C285029	6H0M029	4.1	6.7	10.9	30.8	553	211.8	40.3	152.0	2.1	149.9	1.4	20-Apr
C285030	6H0M030	4.1	6.6	10.7	30.7	553	211.5	39.7	151.2	1.2	150.0	0.8	20-Apr
C285031	6H0M031	4.1	6.6	10.7	30.7	553	213.0	40.3	153.3	2.1	151.2	1.4	20-Apr
C285032	6H0M032	4.1	6.8	10.9	30.8	552	210.5	39.2	151.7	2.3	149.4	1.5	20-Apr
C285033	6H0M033	4.1	7.1	11.2	31.2	553	220.6	50.6	152.5	1.9	150.6	1.2	20-Apr
C285034	6H0M034	4.1	6.9	11.0	31.1	554	216.4	46.0	151.8	1.6	150.2	1.1	20-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 25-Jun-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 8410 psi 58.0 Mpa

Hold for: 60 Seconds

Part Number: 9.0L 31A/31C3 Composite Cylinder Test Date: 20-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: C285035 to C285051 inclusive.

Hold for: 60 Seconds

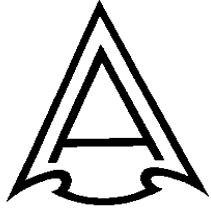
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
C285035	6H0M035	4.1	6.9	11.0	31.0	553	211.4	40.2	151.2	1.4	149.8	0.9	20-Apr
C285036	6H0M036	4.1	6.7	10.8	30.8	553	214.9	41.9	152.9	1.7	151.2	1.1	20-Apr
C285037	6H0M037	4.1	6.8	10.9	30.9	553	211.3	40.2	152.9	3.6	149.3	2.4	20-Apr
C285038	6H0M038	4.1	6.9	11.0	31.0	554	211.6	40.0	153.0	3.3	149.7	2.2	20-Apr
C285039	6H0M039	4.1	6.8	10.9	30.9	553	211.7	40.1	151.8	2.6	149.2	1.7	20-Apr
C285040	6H0M040	4.1	6.7	10.8	30.8	553	210.8	39.0	151.8	2.2	149.6	1.4	20-Apr
C285041	6H0M041	4.1	6.6	10.8	30.8	553	216.2	43.8	153.7	2.6	151.1	1.7	20-Apr
C285042	6H0M042	4.1	6.8	11.0	30.9	553	208.9	38.7	151.2	2.5	148.7	1.7	20-Apr
C285043	6H0M043	4.1	6.7	10.9	30.9	553	209.0	37.0	152.6	2.3	150.3	1.5	20-Apr
C285044	6H0M044	4.1	6.9	11.0	31.1	554	210.8	38.6	152.2	1.9	150.3	1.2	20-Apr
C285045	6H0M045	4.1	6.9	11.0	31.0	553	211.7	42.3	151.4	1.8	149.6	1.2	20-Apr
C285046	6H0M046	4.1	7.1	11.3	31.3	553	211.6	41.0	154.0	3.7	150.3	2.4	20-Apr
C285047	6H0M047	4.1	6.7	10.8	30.8	553	216.3	45.9	151.8	1.1	150.7	0.7	20-Apr
C285048	6H0M048	4.1	6.9	11.0	31.0	553	219.3	49.7	152.3	1.8	150.5	1.2	20-Apr
C285049	6H0M049	4.1	6.8	10.9	30.9	553	210.5	38.0	151.6	1.5	150.1	1.0	20-Apr
C285050	6H0M050	4.1	6.7	10.8	30.8	553	206.8	34.3	152.9	3.2	149.7	2.1	20-Apr
C285051	6H0M200	4.1	6.6	10.7	30.7	553	211.8	37.4	153.6	2.1	151.5	1.4	20-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 25-Jun-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 8410 psi 58.0 Mpa

Hold for: 60 Seconds

Part Number: 9.0L 31A/31C3 Composite Cylinder Test Date: 20-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: C285052 to C285068 inclusive.

Hold for: 60 Seconds

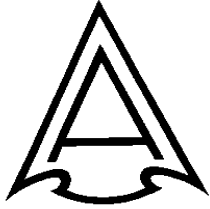
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
C285052	6H0M052	4.1	6.7	10.8	30.9	555	213.8	41.1	152.5	2.0	150.5	1.3	20-Apr
C285053	6H0M053	4.1	7.1	11.2	31.3	555	218.5	46.6	153.2	3.0	150.2	2.0	20-Apr
C285054	6H0M054	4.1	6.9	11.0	31.0	553	213.5	40.8	152.1	2.0	150.1	1.3	20-Apr
C285055	6H0M055	4.1	6.9	11.0	30.9	552	208.9	36.6	151.9	1.8	150.1	1.2	20-Apr
C285056	6H0M056	4.1	6.7	10.8	30.8	553	216.3	42.5	153.6	2.7	150.9	1.8	20-Apr
C285057	6H0M057	4.1	6.7	10.8	30.8	552	219.9	47.5	154.6	3.7	150.9	2.4	20-Apr
C285058	6H0M058	4.1	6.9	11.0	31.0	553	217.0	44.4	153.3	2.5	150.8	1.6	20-Apr
C285059	6H0M059	4.1	6.8	10.9	30.9	553	226.4	53.8	152.9	2.1	150.8	1.4	20-Apr
C285060	6H0M060	4.1	6.7	10.8	30.8	552	214.3	42.6	152.1	2.2	149.9	1.4	20-Apr
C285061	6H0M061	4.1	6.7	10.8	30.8	553	212.7	41.4	151.9	2.7	149.2	1.8	21-Apr
C285062	6H0M062	4.1	6.7	10.8	30.8	553	215.3	45.4	151.5	2.6	148.9	1.7	21-Apr
C285063	6H0M063	4.1	6.6	10.7	30.7	553	221.3	48.1	152.1	1.7	150.4	1.1	21-Apr
C285064	6H0M064	4.1	6.8	11.0	31.0	554	224.3	51.6	151.7	2.1	149.6	1.4	21-Apr
C285065	6H0M065	4.1	6.7	10.8	30.8	553	210.3	39.2	152.1	2.7	149.4	1.8	21-Apr
C285066	6H0M066	4.1	6.7	10.8	30.8	553	212.1	39.9	152.2	2.0	150.2	1.3	21-Apr
C285067	6H0M067	4.1	6.9	11.0	31.0	553	211.5	40.7	151.4	2.1	149.3	1.4	21-Apr
C285068	6H0M068	4.1	6.6	10.8	30.7	553	219.5	47.6	151.6	1.2	150.4	0.8	21-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 25-Jun-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 8410 psi 58.0 Mpa

Hold for: 60 Seconds

Part Number: 9.0L 31A/31C3 Composite Cylinder Test Date: 21-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: C285069 to C285085 inclusive.

Hold for: 60 Seconds

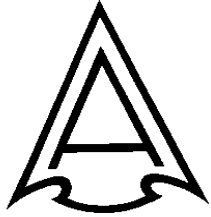
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
C285069	6H0M069	4.1	6.7	10.8	30.8	553	220.2	47.9	151.0	0.6	150.4	0.4	21-Apr
C285070	TP 6H0M070	4.1	6.8	10.9	30.9	553	210.6	39.4	151.1	1.4	149.7	0.9	21-Apr
C285071	6H0M071	4.1	6.8	10.9	30.9	553	213.9	43.2	151.3	1.0	150.3	0.7	21-Apr
C285072	6H0M072	4.1	7.0	11.2	31.2	553	214.5	42.3	150.6	0.0	150.6	0.0	21-Apr
C285073	6H0M073	4.1	6.7	10.8	30.8	553	225.1	52.4	153.2	2.3	150.9	1.5	21-Apr
C285074	6H0M074	4.1	6.9	11.0	31.0	554	222.5	50.3	152.2	1.8	150.4	1.2	21-Apr
C285075	6H0M075	4.1	6.7	10.8	30.8	553	207.2	35.4	152.6	2.7	149.9	1.8	21-Apr
C285076	6H0M076	4.1	6.8	11.0	31.0	553	209.6	37.2	152.7	2.4	150.3	1.6	21-Apr
C285077	6H0M077	4.1	6.9	11.0	31.1	554	214.4	44.2	150.3	1.2	149.1	0.8	21-Apr
C285078	6H0M078	4.1	6.9	11.0	31.0	553	211.3	41.5	149.4	1.0	148.4	0.7	21-Apr
C285079	6H0M079	4.1	6.7	10.8	30.8	553	203.2	32.6	150.8	1.5	149.3	1.0	21-Apr
C285080	6H0M080	4.1	6.9	11.0	31.0	553	210.0	38.5	151.0	0.9	150.1	0.6	21-Apr
C285081	6H0M081	4.1	7.2	11.4	31.3	553	213.5	42.4	149.2	1.1	148.1	0.7	21-Apr
C285082	6H0M082	4.1	6.9	11.0	31.0	553	207.7	35.2	152.7	3.4	149.3	2.2	21-Apr
C285083	6H0M083	4.1	6.9	11.1	31.1	553	211.8	41.3	150.3	1.7	148.6	1.1	21-Apr
C285084	6H0M084	4.1	6.9	11.0	31.0	553	221.6	48.9	149.9	0.5	149.4	0.3	21-Apr
C285085	6H0M085	4.1	6.7	10.9	30.9	553	208.9	38.1	151.6	1.6	150.0	1.1	21-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 25-Jun-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 8410 psi 58.0 Mpa

Hold for: 60 Seconds


Part Number: 9.0L 31A/31C3 Composite Cylinder Test Date: 21-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: C285086 to C285102 inclusive.

Hold for: 60 Seconds

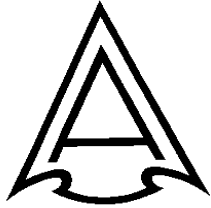
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
C285086	6H0M086	4.1	6.9	11.0	31.0	553	208.7	37.4	151.8	1.6	150.2	1.1	21-Apr
C285087	6H0M087	4.1	6.7	10.9	30.8	553	212.7	42.2	151.8	1.5	150.3	1.0	21-Apr
C285088	6H0M088	4.1	6.9	11.0	31.0	553	213.7	42.4	152.4	1.5	150.9	1.0	21-Apr
C285089	6H0M089	4.1	6.8	10.9	30.9	553	215.1	43.1	151.4	1.7	149.7	1.1	21-Apr
C285090	6H0M090	4.1	6.7	10.8	30.8	553	205.9	33.8	151.4	1.5	149.9	1.0	21-Apr
C285091	6H0M091	4.1	6.9	11.0	31.0	552	209.4	38.6	151.4	1.4	150.0	0.9	21-Apr
C285092	6H0M092	4.1	6.9	11.0	31.0	553	208.6	37.8	150.4	1.3	149.1	0.9	21-Apr
C285093	6H0M093	4.1	6.8	10.9	30.9	553	212.5	40.1	153.1	2.2	150.9	1.4	21-Apr
C285094	6H0M094	4.1	7.1	11.2	31.2	554	212.4	41.1	152.3	2.3	150.0	1.5	21-Apr
C285095	6H0M095	4.1	6.9	11.0	31.0	553	210.4	41.0	151.7	1.9	149.8	1.3	21-Apr
C285096	6H0M096	4.1	6.9	11.0	31.0	553	210.2	38.9	152.8	2.2	150.6	1.4	21-Apr
C285097	6H0M097	4.1	6.9	11.0	31.0	553	209.2	38.6	152.6	3.5	149.1	2.3	21-Apr
C285098	6H0M098	4.1	6.8	10.9	30.9	553	212.6	41.2	151.9	1.9	150.0	1.3	21-Apr
C285099	6H0M099	4.1	7.2	11.3	31.3	553	214.8	44.1	150.4	0.9	149.5	0.6	21-Apr
C285100	6H0M100	4.1	6.9	11.0	31.0	553	211.8	41.6	151.7	2.0	149.7	1.3	21-Apr
C285101	6H0M101	4.1	6.9	11.0	31.0	553	212.5	41.6	152.1	3.1	149.0	2.0	21-Apr
C285102	6H0M102	4.1	6.8	11.0	31.0	553	208.7	36.9	151.0	1.8	149.2	1.2	21-Apr

Yim. Zhang 

Accepted by: _____ on behalf of Arrowhead

Date 25-Jun-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 8410 psi 58.0 Mpa

Hold for: 60 Seconds

Part Number: 9.0L 31A/31C3 Composite Cylinder Test Date: 21-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: C285103 to C285119 inclusive.

Hold for: 60 Seconds

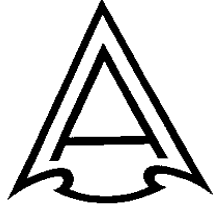
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
C285103	6H0M103	4.1	6.7	10.8	30.8	553	220.8	49.5	151.6	1.8	149.8	1.2	21-Apr
C285104	6H0M104	4.1	7.0	11.1	31.2	554	220.3	49.2	150.7	1.7	149.0	1.1	21-Apr
C285105	6H0M105	4.1	6.8	10.9	30.9	553	215.8	45.4	152.0	0.7	151.3	0.5	21-Apr
C285106	6H0M106	4.1	6.8	10.9	30.9	553	210.2	40.3	153.5	1.8	151.7	1.2	21-Apr
C285107	6H0M107	4.1	7.0	11.1	31.1	553	207.9	38.5	151.9	0.4	151.5	0.3	21-Apr
C285108	6H0M108	4.1	6.8	10.9	30.9	554	224.3	52.2	153.7	0.7	153.0	0.5	21-Apr
C285109	6H0M109	4.1	7.0	11.1	31.1	553	210.4	39.0	153.2	2.3	150.9	1.5	21-Apr
C285110	6H0M110	4.1	6.8	10.9	30.9	553	205.8	33.6	153.6	2.7	150.9	1.8	21-Apr
C285111	6H0M111	4.1	6.8	11.0	31.0	553	211.6	39.2	152.9	1.6	151.3	1.0	21-Apr
C285112	6H0M112	4.1	7.0	11.1	31.1	553	207.8	36.2	152.3	1.5	150.8	1.0	21-Apr
C285113	6H0M113	4.1	6.7	10.9	30.9	553	212.2	40.6	154.8	3.9	150.9	2.5	21-Apr
C285114	6H0M114	4.1	7.1	11.2	31.2	553	208.1	38.0	152.0	1.9	150.1	1.3	21-Apr
C285115	6H0M115	4.1	6.8	10.9	30.9	553	202.9	31.4	152.2	2.0	150.2	1.3	21-Apr
C285116	6H0M116	4.1	6.9	11.0	31.0	553	208.6	37.6	152.6	2.0	150.6	1.3	21-Apr
C285117	6H0M117	4.1	6.9	11.1	31.1	553	212.5	40.5	152.2	2.5	149.7	1.6	21-Apr
C285118	6H0M118	4.1	6.8	10.9	30.9	553	224.3	50.9	152.5	1.7	150.8	1.1	21-Apr
C285119	6H0M119	4.1	7.4	11.5	31.5	553	211.2	40.6	150.3	1.9	148.4	1.3	21-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead


Date 25-Jun-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd Autofrettage pressure: 8410 psi 58.0 Mpa
 Hold for: 60 Seconds
 Part Number: 9.0L 31A/31C3 Composite Cylinder Test Date: 21-Apr-21 Testing pressure: 7500 psi 51.7 Mpa
 Serial Number: C285120 to C285136 inclusive. Hold for: 60 Seconds

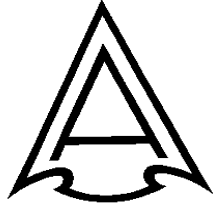
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
C285120	6H0M120	4.1	7.0	11.1	31.1	553	211.7	42.0	151.3	2.0	149.3	1.3	21-Apr
C285121	6H0M121	4.1	6.9	11.0	31.0	553	209.2	39.7	152.6	2.1	150.5	1.4	21-Apr
C285122	6H0M122	4.1	6.9	11.0	31.0	554	205.2	35.2	152.7	2.3	150.4	1.5	21-Apr
C285123	6H0M123	4.1	6.8	10.9	30.9	553	215.8	46.1	152.7	1.8	150.9	1.2	21-Apr
C285124	6H0M124	4.1	7.3	11.4	31.4	554	209.6	41.3	151.2	2.0	149.2	1.3	21-Apr
C285125	6H0M125	4.1	6.9	11.1	31.1	554	214.1	41.8	150.6	1.3	149.3	0.9	21-Apr
C285126	6H0M126	4.1	6.9	11.0	31.0	553	213.0	39.3	151.8	1.5	150.3	1.0	21-Apr
C285127	6H0M127	4.1	6.9	11.0	31.0	553	212.6	41.2	149.9	1.3	148.6	0.9	21-Apr
C285128	6H0M128	4.1	6.9	11.0	31.0	553	219.6	46.6	151.1	1.5	149.6	1.0	21-Apr
C285129	6H0M129	4.1	7.1	11.2	31.2	554	211.7	41.7	149.6	0.7	148.9	0.5	21-Apr
C285130	6H0M130	4.1	6.9	11.0	31.0	553	211.2	42.2	151.0	1.9	149.1	1.3	21-Apr
C285131	6H0M131	4.1	6.9	11.0	31.0	553	210.5	40.5	151.1	1.7	149.4	1.1	21-Apr
C285132	6H0M132	4.1	6.9	11.0	31.0	553	210.8	40.6	149.9	1.2	148.7	0.8	21-Apr
C285133	6H0M133	4.1	6.9	11.0	31.0	554	227.6	55.1	152.1	1.9	150.2	1.2	21-Apr
C285134	6H0M134	4.1	7.1	11.2	31.2	554	213.4	43.9	151.5	2.6	148.9	1.7	21-Apr
C285135	6H0M135	4.1	6.9	11.0	31.0	553	210.0	39.0	152.4	2.7	149.7	1.8	21-Apr
C285136	6H0M136	4.1	6.9	11.0	31.0	553	211.4	39.5	152.8	2.7	150.1	1.8	21-Apr

Yim. Zhang 

Accepted by: _____ on behalf of Arrowhead

Date 25-Jun-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 8410 psi 58.0 Mpa

Hold for: 60 Seconds


Part Number: 9.0L 31A/31C3 Composite Cylinder Test Date: 21-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: C285154 to C285170 inclusive.

Hold for: 60 Seconds

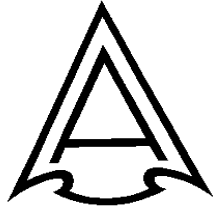
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
C285154	6H0M154	4.1	6.9	11.0	31.0	553	215.8	45.7	151.1	1.9	149.2	1.3	21-Apr
C285155	6H0M155	4.1	6.8	10.9	30.9	553	207.2	34.5	151.8	1.6	150.2	1.1	21-Apr
C285156	6H0M156	4.1	6.6	10.7	30.7	553	205.5	33.2	151.4	1.5	149.9	1.0	21-Apr
C285157	6H0M157	4.1	7.1	11.2	31.2	553	214.5	44.5	150.6	0.7	149.9	0.5	21-Apr
C285158	6H0M158	4.1	6.7	10.8	30.8	555	203.6	33.3	153.8	3.5	150.3	2.3	21-Apr
C285159	6H0M159	4.1	6.8	10.9	30.9	554	216.9	45.9	151.2	0.5	150.7	0.3	21-Apr
C285160	6H0M160	4.1	6.9	11.0	31.0	553	207.6	36.6	150.5	0.6	149.9	0.4	21-Apr
C285161	6H0M161	4.1	6.6	10.7	30.7	553	206.0	36.0	150.9	1.5	149.4	1.0	21-Apr
C285162	6H0M162	4.1	6.7	10.8	30.8	553	205.7	33.8	152.6	2.3	150.3	1.5	21-Apr
C285163	6H0M163	4.1	6.6	10.8	30.8	554	200.9	29.3	151.8	1.9	149.9	1.3	21-Apr
C285164	6H0M164	4.1	6.7	10.8	30.8	553	205.3	32.7	151.8	1.3	150.5	0.9	21-Apr
C285165	6H0M165	4.1	6.8	10.9	30.9	554	214.1	43.2	151.5	1.1	150.4	0.7	21-Apr
C285166	6H0M166	4.1	6.6	10.8	30.8	553	207.5	35.6	151.7	1.3	150.4	0.9	21-Apr
C285167	6H0M167	4.1	6.8	10.9	30.9	553	212.2	39.2	153.1	2.0	151.1	1.3	21-Apr
C285168	6H0M168	4.1	6.8	11.0	31.0	554	214.5	42.6	150.9	0.6	150.3	0.4	21-Apr
C285169	6H0M169	4.1	6.8	10.9	30.9	553	210.3	39.7	152.1	1.7	150.4	1.1	21-Apr
C285170	6H0M170	4.1	6.8	10.9	30.9	553	212.0	40.4	151.9	1.0	150.9	0.7	21-Apr

Yim. Zhang 

Accepted by: _____ on behalf of Arrowhead

Date 25-Jun-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 8410 psi 58.0 Mpa

Hold for: 60 Seconds

Part Number: 9.0L 31A/31C3 Composite Cylinder Test Date: 21-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: C285171 to C285187 inclusive.

Hold for: 60 Seconds

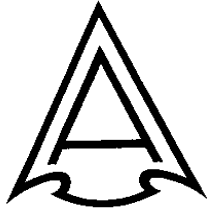
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
C285171	6H0M171	4.1	6.8	10.9	30.9	553	207.4	37.9	150.5	0.6	149.9	0.4	21-Apr
C285172	6H0M172	4.1	6.7	10.8	30.8	553	222.1	50.3	152.2	0.6	151.6	0.4	21-Apr
C285173	6H0M173	4.1	6.8	10.9	30.9	553	208.6	37.3	152.1	2.0	150.1	1.3	21-Apr
C285174	6H0M174	4.1	6.7	10.8	30.8	553	207.0	34.3	151.9	1.2	150.7	0.8	21-Apr
C285175	6H0M175	4.1	6.7	10.8	30.8	553	209.6	37.4	152.5	1.8	150.7	1.2	21-Apr
C285176	6H0M176	4.1	6.8	10.9	30.9	553	206.3	34.0	151.1	0.8	150.3	0.5	21-Apr
C285177	6H0M177	4.1	6.8	10.9	30.9	552	216.6	45.2	150.0	1.6	148.4	1.1	21-Apr
C285178	6H0M178	4.1	6.9	11.0	31.0	553	209.3	37.1	150.6	1.2	149.4	0.8	21-Apr
C285179	6H0M179	4.1	6.8	11.0	31.0	553	206.3	34.0	150.4	1.3	149.1	0.9	21-Apr
C285180	6H0M180	4.1	6.9	11.0	31.0	553	209.7	36.9	151.3	1.6	149.7	1.1	21-Apr
C285181	6H0M181	4.1	6.7	10.8	30.8	553	222.2	50.0	150.8	1.3	149.5	0.9	21-Apr
C285182	6H0M182	4.1	6.7	10.8	30.8	553	215.2	42.4	151.2	1.2	150.0	0.8	21-Apr
C285183	6H0M183	4.1	6.8	10.9	30.9	553	222.0	48.5	151.7	0.9	150.8	0.6	21-Apr
C285184	6H0M184	4.1	6.6	10.8	30.7	553	210.9	37.6	151.1	0.5	150.6	0.3	21-Apr
C285185	6H0M185	4.1	6.6	10.7	30.7	553	205.5	34.7	152.1	1.7	150.4	1.1	21-Apr
C285186	6H0M186	4.1	6.8	11.0	31.0	553	202.6	32.3	152.6	2.7	149.9	1.8	21-Apr
C285187	6H0M187	4.1	6.8	10.9	30.9	553	207.5	37.1	151.6	1.2	150.4	0.8	21-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead


Date 25-Jun-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd Autofrettage pressure: 8410 psi 58.0 Mpa
 Hold for: 60 Seconds
 Part Number: 9.0L 31A/31C3 Composite Cylinder Test Date: 21-Apr-21 Testing pressure: 7500 psi 51.7 Mpa
 Serial Number: C285188 to C285201 inclusive. Hold for: 60 Seconds

Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
C285188	6H0M188	4.1	6.9	11.0	31.0	553	211.4	40.8	152.6	1.5	151.1	1.0	21-Apr
C285189	6H0M189	4.1	6.8	10.9	30.9	553	211.1	40.1	152.7	2.2	150.5	1.4	21-Apr
C285190	6H0M190	4.1	6.7	10.9	30.9	554	206.5	36.0	151.5	1.9	149.6	1.3	21-Apr
C285191	6H0M191	4.1	6.8	10.9	30.9	553	207.9	36.7	152.7	2.4	150.3	1.6	21-Apr
C285192	6H0M192	4.1	6.7	10.9	30.9	553	220.4	48.9	152.2	1.6	150.6	1.1	21-Apr
C285193	6H0M193	4.1	6.9	11.0	31.0	553	211.5	39.9	151.4	2.0	149.4	1.3	21-Apr
C285194	6H0M194	4.1	6.7	10.8	30.8	553	207.6	34.6	152.3	2.1	150.2	1.4	21-Apr
C285195	6H0M195	4.1	6.8	10.9	30.9	553	221.7	48.8	150.8	0.7	150.1	0.5	21-Apr
C285196	6H0M196	4.1	6.6	10.7	30.7	553	206.6	34.0	150.9	1.1	149.8	0.7	21-Apr
C285197	6H0M197	4.1	6.8	10.9	30.9	554	218.6	46.8	152.7	1.2	151.5	0.8	21-Apr
C285198	6H0M198	4.1	6.9	11.1	31.1	554	211.6	38.6	151.7	0.0	151.7	0.0	21-Apr
C285199	6H0M199	4.1	6.8	11.0	31.0	553	210.2	37.7	152.0	0.8	151.2	0.5	21-Apr
C285200	6K2M015	4.1	6.8	10.9	30.8	553	207.4	36.0	153.6	3.6	150.0	2.3	21-Apr
C285201	6K2M017	4.1	6.8	10.8	30.8	552	212.3	36.1	155.6	1.2	154.4	0.8	21-Apr

Yim. Zhang 

Accepted by: _____ on behalf of Arrowhead

Date 25-Jun-21

WARNING:

Training is REQUIRED BEFORE use or maintenance of this equipment. Inspect after each use. Repair only by properly trained personnel. Manufactured in PRC. IMPROPER USE OF THIS EQUIPMENT MAY RESULT IN DEATH OR SERIOUS INJURY. REINSPECT AND RETEST HYDROSTATICALLY EVERY 5 YEARS IN ACCORDANCE WITH DOT-SP 14621 AND TC-3CCM

- DO NOT fill if cylinder has visible damage, strand unraveling or charring of the carbon fibers has occurred.
- DO NOT fill if cylinder retest date is out of prescribed period.
- DO NOT exceed maximum charge pressure.
- DO NOT use unless cylinder is charged to the full pressure.
- DO NOT alter, modify or substitute any components.
- DO NOT carry the cylinder by the valve handwheel.
- DO NOT drop cylinder or bump handwheel. Valve could partially open causing cylinder to become an airborne projectile under its own pressure.

CAUTION:

- HIGH PRESSURE GAS-MAY ACCELERATE COMBUSTION.
- Keep oil and gas away.
- Use equipment rated for cylinder pressure.
- Cylinder temperature should not exceed 125°F or 52°C.
- CLOSE VALVE AFTER EACH USE AND WHEN EMPTY.

DOT-SP 14621-4500 PSI
 TC-3CCM-310 BAR
 9031-XXXXXX M0807
 7/8-14UNF-2B
 60 MINUTES

MM  YY
 MANUFACTURE DATE

REE:XXX
 AIR, COMPRESSED
 Respirable D Air

CONTENTS: AIR, 88 SCF AT 4500 PSIG-310 BAR



XXXXXX



AIR, COMPRESSED
 UN 1002



Note: The size of each marking must be at least 6 mm.

Digitally signed by Allen Woodruff
 DN: cn=Allen Woodruff, o=Arrowhead Industrial Services USA Inc, ou=Arrowhead Corporate Office - Graham, North Carolina, email=AWoodruff@ArrowheadIndustrial.com, c=US
 Date: 2019.06.12 11:53:29 -04'00'

REV	0.0			Label Drawing	TC9031A-M		
					QUANTITY	WEIGHT	SCALE
NO	INDEX	SIGN	DATE				
DESN	Wang.Y.X	REVD	F.W.Shi				
DRAN		APPD					
CHKD	Yue.Z.Z						
		DATE	2019.06.12	TOTAL 1 PAGE	BEIJING TIANHAI INDUSTRY CO., LTD.		