

DOT/TC6831A
Part No.: Composite
Cylinder
Rev.: 0.1/0.0
Report Date: 05/20/21

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

Report: 14821014
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: DOT/TC6831A Composite Cylinder

Quantity: 200 **Size:** 6.18 inch/ 157.0 mm. outside diameter by 20.40 inch/ 518.0 mm. long.
416 cuin./ 6.8 Liter


MARKS PLACED ON IMBEDDED LABELS ARE:

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

Serial Number: Y161001 to Y161201 inclusive except as noted on hydrostatic test sheet

Identifying Symbol (registered) M0807

Inspector's Mark: 

Test Date: 04  21 **REE:** 118 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: 14821014
Sheet No.: 2 of 18

**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 0.079 inch/ 2.0 mm. The outside diameter was found by a close approximation to be 5.70 inch/ 145 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:

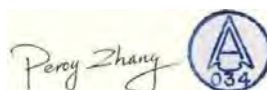
First raise temperature up to 176 °F, hold temperature for 2 hours,
Then raise temperature up to 257 °F, hold temperature for 3 hours

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
4641 psi/ 32 N/mm² and 5947 psi/ 41 N/mm² in longitudinal direction at service pressure.

Carbon fiber stress is calculated to be 149244 psi/ 1029 N/mm² in the hoop direction and
89271 psi/ 616 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.

DOT/TC6831A
 Part No.: Composite Cylinder
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ARROWHEAD INDUSTRIAL SERVICES USA, INC.
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Report: 14821014
 Sheet No.: 3 of 18

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: Y161001 to Y161201 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
03-0228			0.64	0.47	0.23	0.03	0.99	0.18	0.00	0.02	0.001	0.001	/	/
	6F	27-Nov-20	0.60	0.44	0.22	0.03	0.99	0.18	0.00	0.02	0.001	0.001	0.01	0.02
93-0720			0.65	0.58	0.25	0.07	0.95	0.17	0.00	0.02	0.001	0.001	/	/
	4T	16-Apr-20	0.62	0.53	0.23	0.08	0.96	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



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

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Report: 14821014
 Sheet No.: 4 of 18

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

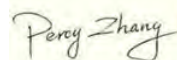

RECORD OF PHYSICAL TESTS OF MATERIAL FOR CYLINDER LINERS

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

SERIAL NUMBER: Y161001 to Y161201 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)
6FN8	Y161001	to	44527 (307)	50328 (347)	12.6
	Y161201		45107 (311)	50183 (346)	13.0
4T2C	Y161001	to	45107 (311)	50473 (348)	12.3
	Y161201		45542 (314)	51488 (355)	12.5

Percy Zhang  

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

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 Sheet No.: 5 of 18

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: Y161001 to Y161201 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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 Sheet No.: 6 of 18

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

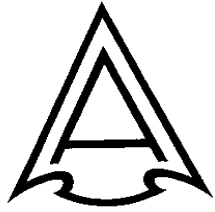
RECORD OF LOT QUALIFICATION TEST

MANUFACTURED BY: Shanghai Tianhai Composite Cylinders Co.,Ltd
 FOR: BeiJing TianHai Industry Co.,Ltd
 LOT No. Y161
 SERIAL NUMBER: Y161001 to Y161201 inclusive

LOT TEST CYLINDER S/N	TEST CYLINDER WEIGHT lbs/kgs	PRESSURIZATION RANGE AND CYCLE NUMBERS >= 4500 psi (31Mpa)	PRESSURIZATION RANGE AND CYCLE NUMBERS >= 7500 psi (51.7Mpa)	ACHIEVED BURST PRESSURE >= 15300 psi (105.5Mpa)	BURST INITIATE LOCATION
Y161090	8.8 (3.99)	10010	35	16537 (114.02)	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: 7905 psi 54.5 Mpa

Hold for: 60 Seconds

Part Number: DOT/TC6831A Composite Cylinder Test Date: 22-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: Y161001 to Y161017 inclusive.

Hold for: 60 Seconds

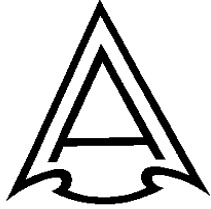
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
Y161001	4T2C001	4.0	4.9	8.9	23.9	416	147.0	34.5	107.5	1.5	106.0	1.4	22-Apr
Y161002	4T2C002	4.0	4.9	8.9	24.0	418	148.1	35.2	107.5	1.5	106.0	1.4	22-Apr
Y161003	4T2C003	4.0	4.9	8.9	23.9	417	143.6	32.0	106.7	1.5	105.2	1.4	22-Apr
Y161004	4T2C004	4.0	4.9	8.8	23.9	416	139.5	28.0	106.4	1.4	105.0	1.3	22-Apr
Y161005	4T2C005	4.0	5.1	9.0	24.1	416	145.9	34.2	106.7	1.6	105.1	1.5	22-Apr
Y161006	4T2C006	4.0	5.0	8.9	24.0	416	146.0	33.1	107.7	1.3	106.4	1.2	22-Apr
Y161007	4T2C007	4.0	5.0	9.0	24.1	417	144.5	32.3	106.5	1.2	105.3	1.1	22-Apr
Y161008	4T2C008	4.0	4.9	8.9	23.9	417	143.0	31.5	107.7	2.9	104.8	2.7	22-Apr
Y161009	4T2C009	4.0	4.9	8.8	23.9	416	141.0	29.8	106.1	1.6	104.5	1.5	22-Apr
Y161010	4T2C010	4.0	4.9	8.8	23.9	417	141.5	30.8	106.3	1.7	104.6	1.6	22-Apr
Y161011	4T2C011	4.0	4.9	8.9	24.0	417	141.0	29.4	107.7	3.2	104.5	3.0	22-Apr
Y161012	4T2C012	4.0	5.0	9.0	24.0	417	145.1	32.4	106.9	1.4	105.5	1.3	22-Apr
Y161013	4T2C013	4.0	4.9	8.8	23.9	417	143.4	32.7	107.3	1.3	106.0	1.2	22-Apr
Y161014	4T2C014	4.0	5.0	9.0	24.0	417	138.7	27.9	106.9	1.0	105.9	0.9	22-Apr
Y161015	4T2C015	4.0	4.9	8.8	23.9	416	141.6	30.4	107.1	0.7	106.4	0.7	22-Apr
Y161016	4T2C016	4.0	5.0	8.9	24.0	417	145.3	33.8	107.6	0.4	107.2	0.4	22-Apr
Y161017	4T2C017	4.0	4.9	8.9	23.9	417	145.4	33.6	106.2	1.2	105.0	1.1	22-Apr

Yin. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 20-May-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 7905 psi 54.5 Mpa

Hold for: 60 Seconds

Part Number: DOT/TC6831A Composite Cylinder Test Date: 22-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: Y161018 to Y161034 inclusive.

Hold for: 60 Seconds

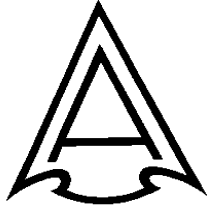
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
Y161018	4T2C018	4.0	4.9	8.9	24.0	417	147.7	34.7	107.0	1.2	105.8	1.1	22-Apr
Y161019	4T2C019	4.0	5.0	8.9	24.0	417	145.8	34.4	106.3	1.3	105.0	1.2	22-Apr
Y161020	4T2C020	4.0	4.9	8.8	23.9	417	143.2	30.4	106.9	1.5	105.4	1.4	22-Apr
Y161021	4T2C200	4.0	4.9	8.9	24.0	417	144.1	33.1	107.7	2.1	105.6	1.9	23-Apr
Y161022	4T2C022	4.0	4.8	8.8	23.9	417	145.4	33.3	107.7	0.9	106.8	0.8	23-Apr
Y161023	4T2C023	4.0	4.9	8.9	23.9	417	142.8	31.7	108.8	2.3	106.5	2.1	23-Apr
Y161024	4T2C024	4.0	4.9	8.8	23.9	417	145.6	33.2	107.2	0.4	106.8	0.4	23-Apr
Y161025	4T2C025	4.0	5.0	9.0	24.0	417	145.8	34.6	107.4	2.0	105.4	1.9	23-Apr
Y161026	4T2C026	4.0	5.2	9.1	24.2	417	147.3	35.1	106.6	1.0	105.6	0.9	23-Apr
Y161027	4T2C027	4.0	5.0	8.9	24.0	417	148.3	36.7	107.2	1.4	105.8	1.3	23-Apr
Y161028	4T2C028	4.0	4.9	8.8	23.9	417	142.0	32.0	105.3	0.7	104.6	0.7	23-Apr
Y161029	4T2C029	4.0	4.8	8.8	23.8	417	141.5	29.9	107.1	1.3	105.8	1.2	23-Apr
Y161030	4T2C030	4.0	4.9	8.8	23.9	417	141.8	30.4	106.7	1.2	105.5	1.1	23-Apr
Y161031	4T2C031	4.0	5.2	9.2	24.3	417	143.3	31.3	107.9	1.9	106.0	1.8	23-Apr
Y161032	4T2C032	4.0	4.9	8.8	23.9	417	142.6	31.4	106.8	1.8	105	1.7	23-Apr
Y161033	4T2C033	4.0	4.8	8.8	23.8	417	141.8	28.8	108.5	2.1	106.4	1.9	23-Apr
Y161034	4T2C034	4.0	4.8	8.8	23.9	417	144.5	31.5	107.8	1.5	106.3	1.4	23-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 20-May-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 7905 psi 54.5 Mpa

Hold for: 60 Seconds

Part Number: DOT/TC6831A Composite Cylinder Test Date: 23-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: Y161035 to Y161051 inclusive.

Hold for: 60 Seconds

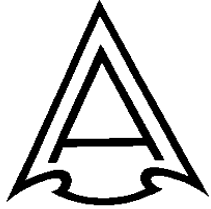
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
Y161035	4T2C035	4.0	4.8	8.8	23.8	417	140.3	27.1	105.4	0.4	105.0	0.4	23-Apr
Y161036	4T2C036	4.0	4.9	8.9	23.9	417	140.8	27.7	105.6	0.9	104.7	0.9	23-Apr
Y161037	4T2C037	4.0	5.0	9.0	24.1	417	143.1	31.4	104.6	0.3	104.3	0.3	23-Apr
Y161038	4T2C038	4.0	5.0	9.0	24.1	417	144.2	32.9	106.5	0.9	105.6	0.8	23-Apr
Y161039	4T2C039	4.0	4.9	8.9	23.9	417	139.3	28.5	106.1	0.9	105.2	0.8	23-Apr
Y161040	4T2C040	4.0	4.9	8.9	23.9	416	144.5	32.9	106.9	1.2	105.7	1.1	23-Apr
Y161041	4T2C041	4.0	5.1	9.0	24.1	417	140.4	30.6	106.3	1.2	105.1	1.1	23-Apr
Y161042	4T2C042	4.0	4.9	8.9	23.9	417	141.7	30.9	106.3	1.2	105.1	1.1	23-Apr
Y161043	4T2C043	4.0	4.9	8.9	23.9	417	143.3	31.8	106.5	0.5	106.0	0.5	23-Apr
Y161044	4T2C044	4.0	4.8	8.8	23.9	417	143.1	31.0	107.4	1.1	106.3	1.0	23-Apr
Y161045	4T2C045	4.0	4.9	8.9	23.9	416	140.3	29.2	107.1	1.6	105.5	1.5	23-Apr
Y161046	4T2C046	4.0	5.0	9.0	24.0	416	139.6	28.7	106.5	1.2	105.3	1.1	23-Apr
Y161047	4T2C047	4.0	4.8	8.8	23.8	417	142.0	31.9	105.3	0.7	104.6	0.7	23-Apr
Y161048	4T2C048	4.0	4.8	8.8	23.8	417	139.3	28.3	106.4	1.1	105.3	1.0	23-Apr
Y161049	4T2C049	4.0	4.8	8.8	23.8	417	146.8	35.6	105.4	1.2	104.2	1.1	23-Apr
Y161050	4T2C050	4.0	4.9	8.9	23.9	417	142.8	32.5	105.1	1.5	103.6	1.4	23-Apr
Y161051	4T2C051	4.0	4.9	8.8	23.9	417	143.6	32.8	105.3	1.6	103.7	1.5	23-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 20-May-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 7905 psi 54.5 Mpa

Hold for: 60 Seconds

Part Number: DOT/TC6831A Composite Cylinder Test Date: 23-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: Y161052 to Y161068 inclusive.

Hold for: 60 Seconds

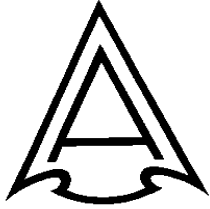
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner lbs	Composite lbs	Tare lbs	Full lbs		Total	Perm	Total	Perm	Elastic	Ratio	
							Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
Y161052	4T2C052	4.0	4.9	8.9	24.0	417	145.1	34.3	105.8	1.8	104.0	1.7	23-Apr
Y161053	4T2C053	4.0	4.9	8.8	23.9	417	141.0	29.7	107.1	1.5	105.6	1.4	23-Apr
Y161054	4T2C054	4.0	4.9	8.9	24.0	417	143.0	32.5	106.4	1.2	105.2	1.1	23-Apr
Y161055	4T2C055	4.0	4.9	8.8	23.9	417	140.8	30.7	106.1	1.2	104.9	1.1	23-Apr
Y161056	4T2C056	4.0	4.8	8.8	23.8	417	144.8	33.8	106.1	1.1	105.0	1.0	23-Apr
Y161057	4T2C057	4.0	4.9	8.9	23.9	417	143.4	32.8	107.1	2.8	104.3	2.6	23-Apr
Y161058	4T2C058	4.0	4.8	8.8	23.9	417	140.8	29.7	106.9	2.5	104.4	2.3	23-Apr
Y161059	4T2C059	4.0	4.9	8.8	23.9	417	146.2	35.2	106.2	1.1	105.1	1.0	23-Apr
Y161060	4T2C060	4.0	4.9	8.8	23.9	417	142.6	32.1	107.1	2.4	104.7	2.2	23-Apr
Y161061	4T2C061	4.0	4.9	8.9	23.9	417	142.0	31.3	106.1	1.2	104.9	1.1	23-Apr
Y161062	4T2C062	4.0	5.0	9.0	24.0	417	142.0	30.7	106.6	1.4	105.2	1.3	23-Apr
Y161063	4T2C063	4.0	4.9	8.9	23.9	417	139.5	29.6	105.7	1.6	104.1	1.5	23-Apr
Y161064	4T2C064	4.0	4.9	8.9	24.0	417	140.4	30.6	106.8	1.4	105.4	1.3	23-Apr
Y161065	4T2C065	4.0	4.9	8.9	23.9	417	140.0	29.4	106.9	2.0	104.9	1.9	23-Apr
Y161066	4T2C066	4.0	5.0	9.0	24.1	417	140.5	29.8	106.2	1.1	105.1	1.0	23-Apr
Y161067	4T2C067	4.0	4.9	8.8	23.9	417	139.4	29.0	106.0	1.2	104.8	1.1	23-Apr
Y161068	4T2C068	4.0	4.9	8.8	23.9	417	143.2	32.3	106.0	1.1	104.9	1.0	23-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 20-May-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 7905 psi 54.5 Mpa

Hold for: 60 Seconds

Part Number: DOT/TC6831A Composite Cylinder Test Date: 23-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: Y161069 to Y161085 inclusive.

Hold for: 60 Seconds

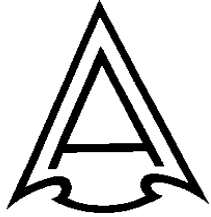
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
Y161069	4T2C069	4.0	4.9	8.8	23.9	417	141.3	29.0	108.7	2.2	106.5	2.0	23-Apr
Y161070	4T2C070	4.0	4.9	8.9	23.9	417	139.8	29.6	107.5	1.7	105.8	1.6	23-Apr
Y161071	4T2C071	4.0	5.0	9.0	24.1	417	144.8	33.8	107.7	1.5	106.2	1.4	23-Apr
Y161072	4T2C072	4.0	4.9	8.9	24.0	417	142.1	29.8	108.0	2.0	106.0	1.9	23-Apr
Y161073	4T2C073	4.0	4.9	8.9	23.9	417	141.6	30.6	106.2	1.0	105.2	0.9	23-Apr
Y161074	4T2C074	4.0	4.9	8.8	23.9	417	147.9	36.1	106.8	0.8	106.0	0.7	23-Apr
Y161075	4T2C075	4.0	4.9	8.8	23.9	417	140.9	30.2	106.1	0.6	105.5	0.6	23-Apr
Y161076	4T2C076	4.0	5.0	9.0	24.1	417	143.0	31.6	106.7	0.9	105.8	0.8	23-Apr
Y161077	4T2C077	4.0	4.9	8.9	24.0	418	136.2	26.3	109.4	3.9	105.5	3.6	23-Apr
Y161078	4T2C078	4.0	4.9	8.8	23.9	418	137.4	26.9	109.3	3.2	106.1	2.9	23-Apr
Y161079	4T2C079	4.0	4.9	8.9	23.9	417	136.7	26.7	108.0	2.0	106.0	1.9	23-Apr
Y161080	4T2C080	4.0	4.9	8.8	23.9	417	136.7	26.1	107.8	1.8	106.0	1.7	23-Apr
Y161081	4T2C081	4.0	5.0	9.0	24.0	417	148.1	37.6	107.3	2.1	105.2	2.0	23-Apr
Y161082	4T2C082	4.0	4.9	8.9	24.0	417	141.2	30.1	108.0	3.0	105.0	2.8	23-Apr
Y161083	4T2C083	4.0	4.9	8.9	24.0	417	143.3	32.6	106.0	0.9	105.1	0.8	23-Apr
Y161084	4T2C084	4.0	4.9	8.9	24.0	418	145.0	33.4	106.5	0.8	105.7	0.8	23-Apr
Y161085	4T2C085	4.0	4.9	8.9	23.9	417	140.1	29.5	106.1	1.5	104.6	1.4	23-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 20-May-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 7905 psi 54.5 Mpa

Hold for: 60 Seconds

Part Number: DOT/TC6831A Composite Cylinder Test Date: 23-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: Y161086 to Y161102 inclusive.

Hold for: 60 Seconds

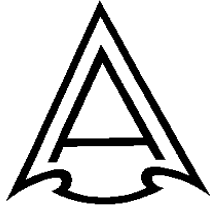
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
Y161086	4T2C086	4.0	5.0	8.9	24.0	418	142.2	30.8	106.9	1.6	105.3	1.5	23-Apr
Y161087	4T2C087	4.0	4.9	8.9	24.0	417	143.0	31.7	106.2	1.2	105.0	1.1	23-Apr
Y161088	4T2C088	4.0	4.9	8.9	24.0	417	139.4	28.3	106.5	1.6	104.9	1.5	23-Apr
Y161089	4T2C089	4.0	4.9	8.9	24.0	418	144.9	34.5	105.8	1.7	104.1	1.6	23-Apr
Y161090	TP 4T2C090	4.0	4.8	8.8	23.9	417	141.6	29.9	106.2	1.7	104.5	1.6	23-Apr
Y161091	4T2C091	4.0	4.9	8.9	24.0	417	144.1	34.6	107.0	3.0	104.0	2.8	23-Apr
Y161092	4T2C092	4.0	4.9	8.9	24.0	417	141.1	30.9	107.1	3.5	103.6	3.3	23-Apr
Y161093	4T2C093	4.0	4.9	8.9	24.0	417	141.3	29.9	107.6	2.7	104.9	2.5	23-Apr
Y161094	4T2C094	4.0	5.0	8.9	24.0	417	149.4	37.2	106.8	1.2	105.6	1.1	23-Apr
Y161095	4T2C095	4.0	4.9	8.8	23.9	417	148.2	36.2	107.0	1.4	105.6	1.3	23-Apr
Y161096	4T2C096	4.0	4.9	8.8	23.9	417	148.6	36.5	107.2	1.8	105.4	1.7	23-Apr
Y161097	4T2C097	4.0	4.9	8.9	23.9	417	143.7	32.7	108.1	2.4	105.7	2.2	23-Apr
Y161098	4T2C098	4.0	4.9	8.9	23.9	417	137.6	26.7	107.0	1.5	105.5	1.4	23-Apr
Y161099	4T2C099	4.0	5.0	9.0	24.0	417	142.2	32.7	108.3	2.5	105.8	2.3	23-Apr
Y161100	4T2C100	4.0	4.9	8.8	23.9	417	143.6	31.8	107.9	1.2	106.7	1.1	23-Apr
Y161101	4T2C101	4.0	4.9	8.9	24.0	417	145.7	34.3	106.7	1.6	105.1	1.5	23-Apr
Y161102	4T2C102	4.0	4.9	8.9	24.0	417	143.7	31.8	107.3	2.0	105.3	1.9	23-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 20-May-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 7905 psi 54.5 Mpa

Hold for: 60 Seconds

Part Number: DOT/TC6831A Composite Cylinder Test Date: 23-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: Y161103 to Y161119 inclusive.

Hold for: 60 Seconds

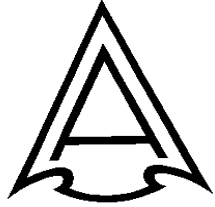
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
Y161103	4T2C103	4.0	4.9	8.9	23.9	417	138.7	27.2	106.1	1.5	104.6	1.4	23-Apr
Y161104	4T2C104	4.0	5.0	9.0	24.0	417	145.1	33.6	106.5	1.1	105.4	1.0	23-Apr
Y161105	4T2C105	4.0	4.8	8.8	23.9	417	143.2	31.7	107.7	2.3	105.4	2.1	23-Apr
Y161106	4T2C106	4.0	4.9	8.8	23.9	417	146.6	35.0	108.6	3.1	105.5	2.9	23-Apr
Y161107	4T2C107	4.0	5.0	8.9	24.0	417	150.6	38.7	106.5	0.9	105.6	0.8	23-Apr
Y161108	4T2C108	4.0	4.9	8.9	24.0	417	139.8	28.8	105.8	0.6	105.2	0.6	23-Apr
Y161109	4T2C109	4.0	5.0	8.9	24.0	417	149.1	38.0	106.7	1.3	105.4	1.2	23-Apr
Y161110	4T2C110	4.0	4.9	8.9	23.9	417	145.8	34.1	107.0	0.9	106.1	0.8	23-Apr
Y161111	4T2C111	4.0	4.9	8.9	24.0	417	145.7	35.0	106.4	0.7	105.7	0.7	23-Apr
Y161112	4T2C112	4.0	4.9	8.9	24.0	417	144.4	33.3	107.6	1.7	105.9	1.6	23-Apr
Y161113	4T2C113	4.0	4.9	8.8	23.9	417	142.7	31.6	107.4	1.4	106.0	1.3	23-Apr
Y161114	4T2C114	4.0	5.0	9.0	24.0	417	145.2	34.3	107.4	1.5	105.9	1.4	23-Apr
Y161115	4T2C115	4.0	4.9	8.9	23.9	417	144.9	33.9	108.1	1.7	106.4	1.6	23-Apr
Y161116	4T2C116	4.0	4.8	8.8	23.9	417	140.6	28.9	110.3	3.9	106.4	3.5	23-Apr
Y161117	4T2C117	4.0	4.9	8.8	23.9	417	144.8	32.5	108.3	1.8	106.5	1.7	23-Apr
Y161118	4T2C118	4.0	4.9	8.8	23.9	419	145.8	33.1	108.8	2.0	106.8	1.8	23-Apr
Y161119	4T2C119	4.0	4.9	8.9	24.0	417	143.5	31.2	108.0	1.3	106.7	1.2	23-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 20-May-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 7905 psi 54.5 Mpa

Hold for: 60 Seconds


Part Number: DOT/TC6831A Composite Cylinder Test Date: 23-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: Y161154 to Y161170 inclusive.

Hold for: 60 Seconds

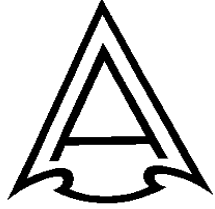
Cylinder Serial Number	Liner Cast Code/Lot No.	Weight				Volume cu. in	Autofrettage		Hydrostatic Test			Perm	Testing date
		Liner	Composite	Tare	Full		Total	Perm	Total	Perm	Elastic	Ratio	
		lbs	lbs	lbs	lbs		Expansion	Expansion	Expansion	Expansion	Expansion	to Ttl.	
Y161154	4T2C154	4.0	4.9	8.8	23.9	417	137.2	26.7	106.7	1.3	105.4	1.2	23-Apr
Y161155	4T2C155	4.0	4.8	8.7	23.8	417	136.3	25.2	107.0	0.9	106.1	0.8	23-Apr
Y161156	4T2C156	4.0	5.1	9.1	24.1	417	136.3	26.1	106.5	0.9	105.6	0.8	23-Apr
Y161157	4T2C157	4.0	4.8	8.8	23.9	417	144.0	33.1	106.4	0.9	105.5	0.8	23-Apr
Y161158	4T2C158	4.0	4.8	8.8	23.8	417	141.5	30.7	106.5	1.1	105.4	1.0	23-Apr
Y161159	4T2C159	4.0	4.8	8.8	23.8	417	141.5	30.5	105.7	0.3	105.4	0.3	23-Apr
Y161160	4T2C160	4.0	4.8	8.8	23.9	417	140.5	29.3	106.2	0.6	105.6	0.6	23-Apr
Y161161	4T2C161	4.0	4.9	8.8	23.9	417	138.9	28.3	107.2	1.3	105.9	1.2	23-Apr
Y161162	4T2C162	4.0	5.0	9.0	24.0	417	142.1	30.4	107.7	0.9	106.8	0.8	23-Apr
Y161163	4T2C163	4.0	4.8	8.7	23.8	417	139.0	28.0	107.5	1.1	106.4	1.0	23-Apr
Y161164	4T2C164	4.0	4.7	8.7	23.8	417	135.9	24.4	106.8	0.0	106.8	0.0	23-Apr
Y161165	4T2C165	4.0	4.8	8.8	23.8	417	136.7	25.2	105.3	0.3	105.0	0.3	23-Apr
Y161166	4T2C166	4.0	4.8	8.8	23.8	417	138.0	26.1	105.8	0.3	105.5	0.3	23-Apr
Y161167	4T2C167	4.0	4.9	8.8	23.9	417	140.1	29.1	105.9	0.8	105.1	0.8	23-Apr
Y161168	4T2C168	4.0	4.8	8.8	23.8	417	141.7	29.6	106.0	0.2	105.8	0.2	23-Apr
Y161169	4T2C169	4.0	5.0	9.0	24.0	417	141.1	30.4	106.5	1.1	105.4	1.0	23-Apr
Y161170	4T2C170	4.0	4.9	8.8	23.9	417	141.5	29.3	107.1	1.2	105.9	1.1	23-Apr

Yim. Zhang 

Accepted by: _____ on behalf of Arrowhead

Date 20-May-21

Arrowhead Industrial Services USA Inc.



Manufactured By: Shanghai Tianhai Composite Cylinders Co.,Ltd

Autofrettage pressure: 7905 psi 54.5 Mpa

Hold for: 60 Seconds

Part Number: DOT/TC6831A Composite Cylinder Test Date: 23-Apr-21

Testing pressure: 7500 psi 51.7 Mpa

Serial Number: Y161171 to Y161187 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.	
Y161171	4T2C171	4.0	4.8	8.8	23.8	417	141.4	28.8	107.3	1.1	106.2	1.0	23-Apr
Y161172	4T2C172	4.0	4.8	8.8	23.9	417	138.3	25.4	106.6	0.3	106.3	0.3	23-Apr
Y161173	4T2C173	4.0	4.8	8.7	23.8	417	140.7	28.7	107.3	2.0	105.3	1.9	23-Apr
Y161174	4T2C174	4.0	4.8	8.8	23.9	417	135.6	24.6	106.1	1.6	104.5	1.5	23-Apr
Y161175	4T2C175	4.0	4.8	8.7	23.8	417	138.5	26.4	107.0	1.6	105.4	1.5	23-Apr
Y161176	4T2C176	4.0	4.9	8.8	23.9	417	138.8	26.5	107.2	1.6	105.6	1.5	23-Apr
Y161177	4T2C177	4.0	4.8	8.8	23.8	417	141.3	29.8	107.4	2.0	105.4	1.9	23-Apr
Y161178	4T2C178	4.0	4.8	8.8	23.9	417	138.0	27.3	106.1	0.9	105.2	0.8	23-Apr
Y161179	4T2C179	4.0	4.9	8.8	23.9	417	135.8	25.2	105.3	0.5	104.8	0.5	23-Apr
Y161180	4T2C180	4.0	4.9	8.9	23.9	416	135.4	24.9	105.2	0.7	104.5	0.7	23-Apr
Y161181	4T2C181	4.0	4.9	8.9	23.9	417	139.6	28.9	105.5	0.6	104.9	0.6	23-Apr
Y161182	4T2C182	4.0	5.2	9.1	24.3	418	139.5	29.5	104.8	0.4	104.4	0.4	23-Apr
Y161183	4T2C183	4.0	4.9	8.8	23.9	417	138.1	27.1	106.2	1.1	105.1	1.0	23-Apr
Y161184	4T2C184	4.0	4.9	8.9	24.0	417	138.7	28.2	106.6	1.5	105.1	1.4	23-Apr
Y161185	4T2C185	4.0	4.9	8.9	23.9	417	141.4	29.8	105.0	1.2	103.8	1.1	23-Apr
Y161186	4T2C186	4.0	4.9	8.8	23.9	417	139.6	28.2	105.3	1.1	104.2	1.0	23-Apr
Y161187	4T2C187	4.0	5.0	9.0	24.1	417	139.1	27.5	105.4	1.5	103.9	1.4	23-Apr

Yim. Zhang

Accepted by: _____ on behalf of Arrowhead

Date 20-May-21

THREAD CODE

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**

XXXXXX

**6831A-XXXXXX M0807
45 MINUTES**

MM YY
MANUFACTURE DATE

**REE:XXX
AIR, COMPRESSED
Respirable D Air**

CONTENTS: AIR, 66 SCF AT 4500 PSIG-310 BAR



**AIR, COMPRESSED
UN 1002**



NOTES:

1. The size of the letters and numbers used those on the right must be at least 0.64cm(1/4inch) high if space permits.
2. The thread code are shown in the table below.

THREAD CODE
ISO M18x1.5-6H
3/4-16 UNF-2B
7/8-14 UNF-2B



Digitally signed by Bing Zhang
DN: cn=Bing Zhang, o=AISL,
ou=UK,
email=bing.zhang@arrowheadis.
com, c=GB
Reason: I have reviewed this
document
Date: 2019.12.16 21:35:25 +08'00'

REV	0.2			6.8L COMPOSITE CYLINDER LABEL DRAWING (FOR DOT-SP14621 AND TC-3CCM)	DOTTC6831A-M		
NO	INDEX	SIGN	DATE		QUANTITY	WEIGHT	SCALE
DESN	Wang.Y.X	REVD	F.W.Shi				
DRAN		APPD					
CHKD	Yue.Z.Z						
		DATE	2019.12.16	TOTAL 1 PAGE			

BEIJING TIANHAI
INDUSTRY CO., LTD.