

AMS



COMPOSITE CYLINDER USER MANUAL



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1. Cylinder Specifications

The products are

1. Carbon fully wrapped composite cylinders, which can be categorized as a Type III cylinder;
2. Carbon hoop wrapped composite cylinders, which can be categorized as a Type II cylinders.

The products are designed for use as a pressure cylinder for compressed gases. The main specifications and standards of composite cylinders are shown in Table 1-3.

WARNING!!

- Do not overfill the cylinder. Overfilled cylinders must be retested before return for service.
- Never remove valve from the cylinder before it is fully discharged. Refitting the valve should only be operated by trained personnel.



Table 1. The main specifications of ISO 11119-2 Type III composite cylinders.

Product	Thread Type	Service Pressure (psi / bar)	Diameter (in. / mm)	Length (in. / mm)	Water Capacity (ci / L)	Empty Weight (lbs / kg)
2-C-100 / PF-011-01	0.625-18 UNF	4500 / 310	3.9 / 99.0	9.8 / 250.0	67 / 1.10	2.1 / 0.95
2-C-101 / PF-011-01a	0.625-18 UNF	4350 / 300	3.9 / 99.0	9.8 / 250.0	67 / 1.10	2.1 / 0.95
2-C-102 / PF-008-01	0.625-18 UNF	4500 / 310	3.9 / 99.0	7.7 / 195.5	48 / 0.79	1.8 / 0.80
2-C-103 / PF-008-01a	0.625-18 UNF	4350 / 300	3.9 / 99.0	7.7 / 195.5	48 / 0.70	1.8 / 0.80
2-C-104 / PF-009-01	0.625-18 UNF	4500 / 310	3.9 / 99.0	8.3 / 212.0	54 / 0.89	1.9 / 0.83
2-C-105 / PF-009-01a	0.625-18 UNF	4350 / 300	3.9 / 99.0	8.3 / 212.0	54 / 0.89	1.9 / 0.83
2-C-106	M18x1.5-6H	4350 / 300	3.9 / 99.0	9.3 / 235.0	61 / 1.00	1.9 / 0.84
2-C-107	17E	4350 / 300	3.9 / 99.0	9.3 / 235.0	61 / 1.00	1.9 / 0.84
2-C-108	17E	4350 / 300	3.9 / 99.0	12.8 / 325.0	92 / 1.50	2.7 / 1.20
2-C-109	M18x1.5-6H	4350 / 300	3.9 / 99.0	12.8 / 325.0	92 / 1.50	2.7 / 1.20
2-C-10A	M18x1.5-6H	4350 / 300	3.9 / 99.0	9.8 / 250.0	67 / 1.10	2.1 / 0.95
2-C-10B	17E	4350 / 300	3.9 / 99.0	9.8 / 250.0	67 / 1.10	2.1 / 0.95
2-C-10C	M18x1.5-6H	4350 / 300	3.9 / 99.0	7.7 / 195.5	48 / 0.79	1.8 / 0.80
2-C-10D	17E	4350 / 300	3.9 / 99.0	7.7 / 195.5	48 / 0.79	1.8 / 0.80
2-C-10E	M18x1.5-6H	4350 / 300	3.9 / 99.0	8.3 / 212.0	54 / 0.89	1.9 / 0.83
2-C-10F	17E	4350 / 300	3.9 / 99.0	8.3 / 212.0	54 / 0.89	1.9 / 0.83
2-C-10G	0.625-18 UNF	4350 / 300	3.9 / 99.0	9.3 / 235.0	61 / 1.00	1.9 / 0.86
2-C-10H	0.625-18 UNF	4350 / 300	3.9 / 99.0	12.8 / 325.0	92 / 1.50	2.7 / 1.20
2-C-10J	M18x1.5-6H	4500 / 310	3.9 / 99.0	9.8 / 250.0	67 / 1.10	2.1 / 0.95
2-C-10K	17E	4500 / 310	3.9 / 99.0	9.8 / 250.0	67 / 1.10	2.1 / 0.95
2-C-10L	M18x1.5-6H	4500 / 310	3.9 / 99.0	7.7 / 195.5	48 / 0.79	1.8 / 0.80
2-C-10M	17E	4500 / 310	3.9 / 99.0	7.7 / 195.5	48 / 0.79	1.8 / 0.80
2-C-10N	M18x1.5-6H	4500 / 310	3.9 / 99.0	8.3 / 212.0	54 / 0.89	1.9 / 0.83
2-C-10P	17E	4500 / 310	3.9 / 99.0	8.3 / 212.0	54 / 0.89	1.9 / 0.83
2-C-200 / PF-011-11	0.625-18 UNF	4500 / 310	4.3 / 109.0	8.9 / 225.0	67 / 1.10	2.1 / 0.95
2-C-201 / PF-011-11a	0.625-18 UNF	4350 / 300	4.3 / 109.0	8.9 / 225.0	67 / 1.10	2.1 / 0.95
2-C-202 / PF-008-11	0.625-18 UNF	4500 / 310	4.3 / 109.0	7.3 / 185.0	48 / 0.79	1.8 / 0.80
2-C-203 / PF-008-11a	0.625-18 UNF	4350 / 300	4.3 / 109.0	7.3 / 185.0	48 / 0.70	1.8 / 0.80
2-C-204 / PF-014-11	0.625-18 UNF	4500 / 310	4.3 / 109.0	10.8 / 275.0	88 / 1.44	3.0 / 1.32
2-C-205 / PF-014-11a	0.625-18 UNF	4350 / 300	4.3 / 109.0	10.8 / 275.0	88 / 1.44	3.0 / 1.32
2-C-206 / PF-016-11	0.625-18 UNF	4500 / 310	4.3 / 109.0	11.8 / 300.0	98 / 1.60	3.3 / 1.47
2-C-207 / PF-016-11a	0.625-18 UNF	4350 / 300	4.3 / 109.0	11.8 / 300.0	98 / 1.60	3.3 / 1.47
2-C-208	17E	4350 / 300	4.3 / 109.0	14.4 / 365.0	122 / 2.00	3.7 / 1.65
2-C-209	M18x1.5-6H	4350 / 300	4.3 / 109.0	14.4 / 365.0	122 / 2.00	3.7 / 1.65



Table 1. The main specifications of ISO 11119-2 Type III composite cylinders. (cont.)

Product	Thread Type	Service Pressure (psi / bar)	Diameter (in. / mm)	Length (in. / mm)	Water Capacity (ci / L)	Empty Weight (lbs / kg)
2-C-20A	M18x1.5-6H	4350 / 300	4.3 / 109.0	8.9 / 225.0	67 / 1.10	2.1 / 0.95
2-C-20B	17E	4350 / 300	4.3 / 109.0	8.9 / 225.0	67 / 1.10	2.1 / 0.95
2-C-20C	M18x1.5-6H	4350 / 300	4.3 / 109.0	7.3 / 185.0	48 / 0.79	1.8 / 0.80
2-C-20D	17E	4350 / 300	4.3 / 109.0	7.3 / 185.0	48 / 0.79	1.8 / 0.80
2-C-20E	M18x1.5-6H	4350 / 300	4.3 / 109.0	10.8 / 275.0	88 / 1.44	3.0 / 1.32
2-C-20F	17E	4350 / 300	4.3 / 109.0	10.8 / 275.0	88 / 1.44	3.0 / 1.32
2-C-20G	M18x1.5-6H	4350 / 300	4.3 / 109.0	11.8 / 300.0	98 / 1.60	3.3 / 1.47
2-C-20H	17E	4350 / 300	4.3 / 109.0	11.8 / 300.0	98 / 1.60	3.3 / 1.47
2-C-20J	0.625-18 UNF	4350 / 300	4.3 / 109.0	14.2 / 360.0	122 / 2.00	3.7 / 1.65
2-C-20K	M18x1.5-6H	4500 / 310	4.3 / 109.0	8.9 / 225.0	67 / 1.10	2.1 / 0.95
2-C-20L	17E	4500 / 310	4.3 / 109.0	8.9 / 225.0	67 / 1.10	2.1 / 0.95
2-C-20M	M18x1.5-6H	4500 / 310	4.3 / 109.0	7.3 / 185.0	48 / 0.79	1.8 / 0.80
2-C-20N	17E	4500 / 310	4.3 / 109.0	7.3 / 185.0	48 / 0.79	1.8 / 0.80
2-C-20P	M18x1.5-6H	4500 / 310	4.3 / 109.0	10.8 / 275.0	88 / 1.44	3.0 / 1.32
2-C-20Q	17E	4500 / 310	4.3 / 109.0	10.8 / 275.0	88 / 1.44	3.0 / 1.32
2-C-20R	M18x1.5-6H	4500 / 310	4.3 / 109.0	11.8 / 300.0	98 / 1.60	3.3 / 1.47
2-C-20S	17E	4500 / 310	4.3 / 109.0	11.8 / 300.0	98 / 1.60	3.3 / 1.47
2-C-400	M18x1.5-6H	4500 / 310 4350 / 300	6.3 / 160.0	20.6 / 524.0	415 / 6.80	9.1 / 4.1
2-C-401	M18x1.5-6H	4500 / 310 4350 / 300	6.3 / 160.0	20.6 / 524.0	415 / 6.80	9.1 / 4.1
2-C-410	M18x1.5-6H	4500 / 310 4350 / 300	6.9 / 176.0	22.2 / 563	549 / 9.00	11.0 / 5.00
2-C-411	M18x1.5-6H	4500 / 310 4350 / 300	6.9 / 176.0	22.2 / 563	549 / 9.00	11.0 / 5.00
2-C-412	M18x1.5-6H	4500 / 310 4350 / 300	6.9 / 176.0	24.4 / 620	610 / 10.0	11.3 / 5.1
2-C-413	M18x1.5-6H	4500 / 310 4350 / 300	6.9 / 176.0	24.4 / 620	610 / 10.0	11.3 / 5.1
2-C-500	M18x1.5-6H	4500 / 310 4350 / 300	4.0/101	15.2/386	122/2.00	2.9/1.30
2-C-501	0.625-18 UNF	4500/310 4350/300	4.0/101	15.2/386	122/2.00	2.9/1.30
2-C-502	17E	4500/310 4350/300	4.0/101	15.2/386	122/2.00	2.9/1.30
2-C-510	0.625-18 UNF	4500 / 310	4.4/112	8.2/208	67.1/1.10	1.8/0.80
2-C-513	0.625-18 UNF	4500 / 310	4.4/112	6.6/167	48.2/0.79	1.5/0.67



Table 1. The main specifications of ISO 11119-2 Type III composite cylinders. (cont.)

Product	Thread Type	Service Pressure (psi / bar)	Diameter (in. / mm)	Length (in. / mm)	Water Capacity (ci / L)	Empty Weight (lbs / kg)
2-C-516	0.625-18 UNF	4500 / 310	4.4/112	9.0/228	76.8/1.26	1.9/0.86
2-C-519	0.625-18 UNF	4500 / 310	4.4/112	10.0/252	87.8/1.44	2.1/0.94
2-C-51C	0.625-18 UNF	4500 / 310	4.4/112	10.7/273	97.6/1.6	2.3/1.00
2-C-51F	0.625-18 UNF	4500 / 310	4.4/112	8.2/208	67.1/1.10	1.8/0.80
2-C-51L	0.625-18 UNF	4500 / 310	4.4/112	9.0/228	76.8/1.26	1.9/0.86
2-C-51P	0.625-18 UNF	4500 / 310	4.4/112	10.0/252	87.8/1.44	2.1/0.94
2-C-51S	0.625-18 UNF	4500 / 310	4.4/112	10.7/273	97.6/1.6	2.3/1.00
2-C-520	M18x1.5-6H	4500/310 4350/300	4.5/115.3	16.7/425	183/3.00	3.8/1.70
2-C-521	0.625-18 UNF	4500/310 4350/300	4.5/115.3	16.7/425	183/3.00	3.8/1.70
2-C-522	17E	4500/310 4350/300	4.5/115.3	16.7/425	183/3.00	3.8/1.70
2-C-700	M18x1.5-6H	1850/127.5	3.6/90.35	9.2/232.5	58.0/0.95	1.28/0.58
2-C-701	M18x1.5-6H	1850/127.5	3.6/90.35	13.5/341	94.6/1.55	1.78/0.81
2-C-702	M18x1.5-6H	1850/127.5	3.6/90.35	19.0/481	140.4/2.30	2.38/1.1
2-C-800	0.625-18 UNF	4500 / 310	2.7/68.0	6.6/166.0	19.5/0.32	0.78/0.35
2-C-801	0.625-18 UNF	4500 / 310	2.7/68.0	9.3/234.0	30.5/0.50	1.11/0.50
2-C-802	0.625-18 UNF	4500 / 310	2.7/68.0	5.7/144.0	15.3/0.25	0.64/0.29
2-C-803	0.625-18 UNF	4500 / 310	2.7/68.0	13.0/331.0	45.8/0.75	1.31/0.60

Table 2. The main specifications of EN 12245 Type III composite cylinders.

Product	Thread Type	Service Pressure (psi / bar)	Diameter (in. / mm)	Length (in. / mm)	Water Capacity (ci / L)	Empty Weight (lbs / kg)
4-C-300 / SF-068-01	M18x1.5 6H	4350 / 300	6.2 / 158.0	20.5 / 521.0	415 / 6.80	8.6 / 3.90
4-C-500	M18x1.5 6H	4500 / 310	4.0 / 101.0	15.2 / 386.0	122 / 2.00	2.9 / 1.30
4-C-503	25E	4500 / 310	4.0 / 101.0	15.2 / 386.0	122 / 2.00	2.9 / 1.30



Table 3. The main specifications of PED Type III composite cylinders.

Product	Thread Type	Service Pressure (psi / bar)	Diameter (in. / mm)	Length (in. / mm)	Water Capacity (ci / L)	Empty Weight (lbs / kg)
P-C-400	M18x1.5-6H	4500 / 310 4350 / 300	6.3 / 160.0	20.6 / 524.0	415 / 6.80	9.1 / 4.1
P-C-401	M18x1.5-6H	4500 / 310 4350 / 300	6.3 / 160.0	20.6 / 524.0	415 / 6.80	9.1 / 4.1
P-C-410	M18x1.5-6H	4500 / 310 4350 / 300	6.9 / 176.0	22.2 / 563	549 / 9.00	11.0 / 5.00
P-C-411	M18x1.5-6H	4500 / 310 4350 / 300	6.9 / 176.0	22.2 / 563	549 / 9.00	11.0 / 5.00
P-C-412	M18x1.5-6H	4500 / 310 4350 / 300	6.9 / 176.0	24.4 / 620	610 / 10.0	11.3 / 5.1
P-C-413	M18x1.5-6H	4500 / 310 4350 / 300	6.9 / 176.0	24.4 / 620	610 / 10.0	11.3 / 5.1
P-C-700	M18x1.5-6H	1850/127.5	3.6/90.35	9.2/232.5	58.0/0.95	1.28/0.58
P-C-701	M18x1.5-6H	1850/127.5	3.6/90.35	13.5/341	94.6/1.55	1.78/0.81
P-C-702	M18x1.5-6H	1850/127.5	3.6/90.35	19.0/481	140.4/2.30	2.38/1.1
P-C-800	0.625-18 UNF	4500 / 310	2.7/68.0	6.6/166.0	19.5/0.32	0.78/0.35
P-C-801	0.625-18 UNF	4500 / 310	2.7/68.0	9.3/234.0	30.5/0.50	1.11/0.50
P-C-802	0.625-18 UNF	4500 / 310	2.7/68.0	5.7/144.0	15.3/0.25	0.64/0.29
P-C-803	0.625-18 UNF	4500 / 310	2.7/68.0	13.0/331.0	45.8/0.75	1.31/0.60

Table 4. The main specifications of EN12257 Type II composite cylinders.

Product	Thread Type	Service Pressure (psi / bar)	Diameter (in. / mm)	Length (in. / mm)	Water Capacity (ci / L)	Empty Weight (lbs / kg)
9-H-900	M18x1.5-6H	4350 / 300	3.9 / 100.0	15.6 / 395.0	122 / 2.00	4.6 / 2.1
9-H-901	25E	4350 / 300	3.9 / 100.0	15.7 / 400.0	122 / 2.00	4.6 / 2.1
9-H-902	25E	4350 / 300	4.0 / 100.7	15.4 / 390.0	122 / 2.00	4.6 / 2.1



Additionally, TPED cylinders are designed and verified according to regulations shown as below:

- ADR 2017
- ADR 2019
- ADR 2021
- Directive 2010/35/EU(TPED)
- Directive 2008/68/EC(Annex 1), 2016/2309/EU, 2018/1846/EU and 2020/1833/EU.

PED cylinders are designed and verified according to the regulation shown as below:

- Directive 2014/68/EU (PED)

DOT & TC cylinders are designed and verified according to regulations and standards shown as below:

- 49 CFR§178.71
- CSA B342-18



1.1. Marking

Each finished Type III cylinder has a marking on the lateral surface of the cylinder. For Type II cylinder, each finished has a marking on the shoulder same as the aluminum cylinder. Marking damage or illegibility can be cause for rejection of the cylinder. If the serial number is no longer legible, the cylinder must be rejected or AMS contacted for advice. A composite cylinder that is known to be a AMS cylinder, which still has a legible serial number, can be returned to service only after all the other product information is made legible. For instance, an illegible part of a composite cylinder marking which has the part identification on it can be corrected by putting that information back on the cylinder, only if the serial number is still legible on the marking. **CONTACT AMS for further advice, if needed.** The marking contains the following information:



1.1.1. TPED UN Cylinder

17E TW AMS BU##### SERVICE OOOO/OO

PW300 PH450BAR 0.86KG 1L

Ⓔ ISO11119-2 B Ⓑ YYYY/MM 0029

Row 1

- Thread specification: e.g. 17E
- Country of manufacture: TW
- Cylinder manufacturer: AMS
- Cylinder serial number: e.g. BU#####
- SERVICE Life Date: SERVICE OOOO/OO

Row 2

- Working pressure: e.g. PW300
- Test pressure: e.g. PH450BAR
- Empty weight of cylinder only : e.g. 0.86KG
- Minimum water capacity of cylinder : e.g. 1L

Row 3

- UN symbol: Ⓔ
- Design specification: e.g. ISO 11119-2
- Country of approval and mark of notified body: B Ⓑ (Belgium APRAGAZ)
- Year/month of initial hydrostatic test: YYYY/MM
- TPED notified body ID: 0029

1.1.2. TPED Non-UN Cylinder

M18x1.5	TW	AMS	#####
PW300	PH450BAR	3.90KG	6.80L
0029	EN12245	B	AMS YYYY/MM

Row 1

- Thread specification: e.g. M18x1.5
- Country of manufacture: TW
- Cylinder manufacturer: AMS
- Cylinder serial number: e.g. #####

Row 2

- Working pressure: e.g. PW300
- Test pressure: e.g. PH450BAR
- Empty weight of cylinder only : e.g. 3.90KG
- Minimum water capacity of cylinder : e.g. 6.80L

Row 3

- TPED notified body ID: 0029
- Design specification: e.g. EN12245(Type III), EN12257(Type/II)
- Country of approval
- Mark of In-House inspection: AMS (AMS)
- Year/month of initial hydrostatic test: YYYY/MM



1.1.3. PED Cylinder

M18x1.5 EN12245 TW AMS V##### UN1002 BREATHING AIR
 3.90KG V6.80L PS300BAR at 15°C PT450BAR AA6061 TS-50°C TO 70°C
 [B] YYYY/MM FIN YYYY/MM C€0029
 AMS SF-068-01

Row 1

- Thread type: e.g. M18x1.5
- Design specifications: e.g. EN12245
- Country of manufacture: TW
- Manufacturer: AMS
- Cylinder serial number: e.g. V#####
- UN number (Gas content): e.g. UN1002
- Gas content: BREATHING AIR

Row 2

- Empty weight: e.g. 3.90KG
- Minimum water capacity: e.g. V6.80L
- Filling pressure in bar: e.g. PS300BAR at 15°C
- Test pressure in bar: e.g. PS450BAR
- Liner material: AA6061
- Service temperature range: TS -50°C TO 70°C

Row 3

- Notified body (APRAGAZ): [B]
- First hydrostatic test date (Year and month): YYYY/MM
- End of life date: FIN YYYY/MM
- Mark of directive and notified Body ID: C€0029

Row 4

- AMS part number: SF-068-01



M18x1.5 EN12245 TW AMS V##### GROUP2 BREATHING GASES

3.90KG V6.80L PS300BAR at 15°C PT450BAR AA6061 TS-50°C TO 70°C

⌈B⌋ YYYY/MM FIN YYYY/MM C€0029

AMS SF-068-01

Row 1

- Thread type: e.g. M18x1.5
- Design specifications: e.g. EN12245
- Country of manufacture: TW
- Manufacturer: AMS
- Cylinder serial number: e.g. V#####
- Gas content: GROUP2 BREATHING GASES

Row 2

- Empty weight: e.g. 3.90KG
- Minimum water capacity: e.g. V6.80L
- Filling pressure in bar: e.g. PS300BAR at 15°C
- Test pressure in bar: e.g. PS450BAR
- Liner material: AA6061
- Service temperature range: TS -50°C TO 70°C

Row 3

- Notified body (APRAGAZ): ⌈B⌋
- First hydrostatic test date (Year and month): YYYY/MM
- End of life date: FIN YYYY/MM
- Mark of directive and notified Body ID: C€0029

Row 4

- AMS part number: SF-068-01



M18x1.5 EN12245 TW AMS V##### GROUP1 NITROX
 3.90KG V6.80L PS300BAR at 15°C PT450BAR AA6061 TS-50°C TO 70°C
 [B] YYYY/MM FIN YYYY/MM C€0029
 AMS SF-068-01

Row 1

- Thread type: e.g. M18x1.5
- Design specifications: e.g. EN12245
- Country of manufacture: TW
- Manufacturer: AMS
- Cylinder serial number: e.g. V#####
- Gas content: GROUP1 NITROX

Row 2

- Empty weight: e.g. 3.90KG
- Minimum water capacity: e.g. V6.80L
- Filling pressure in bar: e.g. PS300BAR at 15°C
- Test pressure in bar: e.g. PS450BAR
- Liner material: AA6061
- Service temperature range: TS -50°C TO 70°C

Row 3

- Notified body (APRAGAZ): [B]
- First hydrostatic test date (Year and month): YYYY/MM
- End of life date: FIN YYYY/MM
- Mark of directive and notified Body ID: C€0029

Row 4

- AMS part number: SF-068-01

All the PED markings indicated above are marked according to the standard, some contents might be added in the marking per customer's requirement. For example: the "underwater use" is applied in the marking for the scuba cylinder.



1.1.4. DOT & TC UN Cylinder

0.625-18 UNF TW DB##### UW FINAL XXXX/XX SERVICE OOOO/OO
 PW310 PH465BAR 0.95KG 1.1L
 (U) ISO11119-2 USA/M0812 IA18 YYYY/MM

Row 1

- Thread specification: e.g. 0.625-18 UNF
- Country of manufacture: TW
- Cylinder serial number: e.g. DB#####
- UW: For underwater use (if applicable)
- Limited Design Date: FINAL XXXX/XX
- Service Life Date: SERVICE OOOO/OO

Row 2

- Working pressure: e.g. PW310
- Test pressure: e.g. PH465BAR
- Empty weight of cylinder only : e.g. 0.95KG
- Minimum water capacity of cylinder : e.g. 1.1L

Row 3

- UN symbol: (U)
- Design specification: e.g. ISO 11119-2
- Country of approval/Manufacturer approval number: USA/M0812
- Independent inspector: IA18
- Year/month of initial hydrostatic test: YYYY/MM



1.1.5. Global UN Cylinder

0.625-18 UNF	TW	AMS	DB#####	FINAL	XXXX/XX	SERVICE	OOOO/OO
PW310	PH465BAR	0.95KG	1.10L	TPED	0029		
UN	ISO11119-2	USA/M0812	IA18				
		B	BE	YYYY/MM			

Row 1

- Thread specification: e.g. 0.625-18 UNF
- Country of manufacture: TW
- Cylinder manufacturer: AMS
- Cylinder serial number: e.g. DB#####
- Limited Design Date: FINAL XXXX/XX
- Service Life Date: SERVICE OOOO/OO

Row 2

- Working pressure: e.g. PW310
- Test pressure: e.g. PH465BAR
- Empty weight of cylinder only : e.g. 0.95KG
- Minimum water capacity of cylinder : e.g. 1.10L
- TPED notified body ID: TPED0029

Row 3

- UN symbol: UN
- Design specification: e.g. ISO 11119-2
- Country of approval/Manufacturer approval number: USA/M0812
- Independent Inspector: IA18
- Country of approval and mark of notified body: B BE (Belgium APRAGAZ)
- Year/month of initial hydrostatic test: YYYY/MM



2. Cylinder Use

2.1. General

These cylinders only can be filled with the compatible gases informed in ISO 11114-1 and Packing Instruction P200 of ADR 4.1.4.1. Check the specification packing provision column of Table P200 before filling gases in these cylinders. If it has not been performed by AMS, the marking and labeling (See ADR pt.5.2) must also be taken into consideration by the user before to put the cylinders on the marker.

Maintenance

After each use, check for cylinder damage. Clean the cylinder and components. If water is used to clean, make sure you allow enough time for all components to dry. Don't reassemble until all components are thoroughly dried. Do not apply heat higher than the temperature of steam (212°F/100°C) in order to dry a wet cylinder.

Storage

Tightly close the cylinder valve. Leave some pressure in the cylinder (between 2 and 3 bar). Secure the cylinder and assembly from rolling loose, tipping over or falling. Store cylinder at room temperature, in a dry place, keep away from chemicals, artificial heat sources and corrosive environments.

Handling

Cylinders should never be dragged, or dropped. When transporting cylinders, make sure that the valve is well protected and that the cylinder is well secured.



Painting

Retouch damaged paint areas with air drying paint, but if damage has been done to the cylinder metal or composite materials, have it visually inspected first by an authorized technician. Never use corrosive, caustic, or acid paint strippers, burning techniques, or solvents, in order to remove paints from aluminum or composite surfaces.

Chemical Exposure

Composite materials can be attacked by chemicals or treated water. If the cylinder has been exposed to chemicals or aggressive fluids, the external composite surfaces must be checked for any visible signs of damage.

REJECT composite cylinders known to have been covered, splashed or left standing (soaked) in unknown chemicals.

REJECT composite cylinders if the composite surface is blotchy or the paint and/or resin shows signs of chemical attachment (e.g., paint or resin has softened, smeared, bubbled, etc.).

HOLD composite cylinders if the composite portion has come into contact with a type of chemical that is not listed below and if you are unsure of its effects on the composite material. Contact AMS for advice.

CAUTION!!

Any cylinder composite material coming into prolonged contact with these types of chemicals and materials must be rejected :

Solvents

Paint thinners, kerosene, turpentine, paint solvents, paint cleaners, epoxy solvents, resin removers, organic solvents, etc.



Vehicle Fluids :

Materials that contain benzene, glycol(anti-freeze), battery acids/alkalis, window washer fluids, oils containing solvents, flammable materials, organic volatile materials, gasoline and oil additives, fuels(gasoline, gasohol, methanol, etc.)

Strong Bases

Materials that contain medium to high concentrations of : sodium hydroxide, potassium or hydroxides, materials that contain strong soap solutions, cleaning (soap) solutions, etc.

Acids

Materials that contain any concentration of acids like hydrochloric, sulphuric, nitric, phosphoric, etc.

Corrosives

Materials that contain corrosive components or that are corrosive themselves, such as the chemicals mentioned above and: cleaners, glass cleaners, metal cleaners, resin cleaners/removers, drain openers/cleaners, glues, rubber and other chemical cements, and atmospheres containing corrosive gases.



2.2. Valve Installation

The recommended torque for fitting value of products are shown in Table 3, which are referred to CGA C-6.1 and ISO 13341 :

Table 3. Recommended torque for composite cylinder threads.

Threads size	Recommended torque	
	lbs-ft	N·m
0.625-18 UNF	40-50	54-68
0.875-14 UNF	40-60	54-81
M18x1.5	63-70	85-95
17E	55-63	75-85
25E	70-77	95-105

For the paintball use cylinder, the threadlocker might be applied before the installation.

2.3. Cylinder Filling

The settled pressure of the filled cylinder must not exceed the design filling pressure indicated on the cylinder marking.

Slow Filling

Filling the cylinder(s) slowly will significantly reduce the heat generated in the filling process. A maximum charging rate of 30 bar/min or less is recommended.

Higher Filling Pressure

It is possible to compensate for the higher temperatures occurring during the filling process by filling to a higher pressure. A cylinder filled to 300 bar at 15°C will develop a pressure of 324 bar at 30°C or alternatively, if a cylinder were filled under ambient condition of 30°C, it would be necessary to fill the cylinder to 324 bar to achieve a full charge.

AMS carbon cylinders can be filled to a higher pressure up to a maximum of 10% above settled filling pressure(service pressure) as long as the settled pressure is at the correct, marked service pressure.

Fast Filling

AMS composite cylinders can be fast filled and re-used if the cylinder is properly cared for, well maintained and undamaged. However, the filler should ensure that the settled pressure at 15°C does not exceed the rated charging pressure.

Note : During hydrostatic testing cylinders are pressurized to test pressure typically within 15 seconds. AMS fast fill experiments on composite cylinders have shown that the aluminum liner achieves temperatures of about 50°C when the cylinders are filled with air within 30-60 seconds. This temperature is well below any temperature that might degrade the aluminum or the matrix.

2.3.1. Approved Gases

Composite cylinders are approved to the pressure receptacles use in USA, Canada and Europe with air and oxygen. The cylinders are marked on the cylinder label with the gas name and shall only be filled with the indicated gas.

Oxygen

Do not mix gases. This practice can cause catastrophic failure and loss of life or serious injury. Air cylinders, valves and other components are not specifically cleaned for oxygen, or oxygen enriched, use. Also, some lubricants used in the industry are not compatible with pure oxygen, or oxygen enriched air. This could result in a fire or rupture. Breathing air that contains more than 23.5 percent oxygen is generally referred to as “oxygen-enriched air”. The cylinder interior, valve threads, “O” ring of cylinders to be filled with oxygen, and any equipment



coming into contact with the oxygen, must be clean and free of any contaminant which may react with the oxygen.

Compressed Air

When filling aluminum cylinders with compressed air, according to EN 12021, care should be taken to ensure that the compressor is properly maintained so that the air quality complies with the appropriate standard.



3. Periodic Examination and Testing

3.1. General

Cylinders must be subjected to a thorough periodic inspection in accordance with ISO 11623. The period of inspection for this composite cylinder is 5 years for non-toxic gases or 3 years for toxic gases*. Check the specification packing provision column before filling gases in the composite cylinder with aluminum liner.

*: The test period of some TPED cylinders may be extended to 10 years depend on the conditional approval by the notified body with specific gas company / user, intended carriage of gases and equipped with a “Residual Pressure Valve”.

The periodic requalification requires each cylinder to be examined internally and externally for defects, and then subjected to a hydrostatic pressure test to the design test pressure. Only on completing these procedures satisfactorily can the cylinder be returned to service.

The cylinder should be examined for defects externally and internally, and before continuing in service, subjected to a hydrostatic pressure test in accordance with the relevant regulations and the manufacturer’s recommended procedure, by the manufacturer or a station authorized to test composite cylinders on behalf of the manufacturer.

The inspector must follow regulatory authority requirements and criteria in the country the periodic inspection and testing takes place. If the following guidelines are less stringent than the regulatory requirements, apply the regulatory authority criteria.

Cylinders shall be rejected if they do not meet the volumetric expansion criteria or if any flaw has grown following repair and testing. Rejected cylinders shall be rendered unable to hold gas under pressure. In the event of doubt or dispute in connection with re-testing, AMS and, if necessary, the approved Inspection Body shall be consulted.



Before an internal inspection can be carried out, the cylinder must be emptied of its pressurized gas and the valve must be removed. Consult the valve supplier's recommendations before performing this operation.

AMS recommends the valve should be checked at this stage. Contact the manufacturer about the correct valve inspection procedure. The valve and cylinder threads should be inspected for the damage. Clean the O-ring groove, taking care not to remove metal and damage the groove.

IMPORTANT !!

Records of all periodic examinations and testing shall be sent to the manufacturer on completion of the examinations for storage together with materials and test certificates and inspection reports relating to the manufacture of the cylinder, for the lifetime of the cylinder.

The manufacturer recommends that if there is evidence that a cylinder has been exposed to overheating but the temperature of liner is not believed to have reached 350°F (176°C) for any duration of time, the cylinder must still be subjected to hydrostatic testing or condemned. A cylinder that has been exposed to temperatures great enough to change the temper of the liner could show an increase in total or permanent expansion as measured during hydrostatic testing. Cylinders showing unusually high total expansion or exceeding the regulatory limits for the relationship of permanent expansion to total expansion (i.e. 5%) should be condemned.

3.2. Exterior Inspection

Composite cylinders are very resistant to impact damage, and a significant impact is required to cause damage sufficient to warrant condemning a cylinder. Acceptance criteria is demonstrated as below. Except that, **CONTACT AMS for further inspection and service.**



Abrasion and Cut Damage

For Type III cylinder, minor abrasion such as scuffs less than 0.005 in. (0.127mm) deep is acceptable.

For Type II cylinder, minor abrasion with depths less than or equal to 1% of the hoop thickness is acceptable. If the abrasion with depths between 1% and 3% of hoop thickness, the cylinders should be repaired and perform the pressure test before return to the market.

Any abrasion with depth greater than 3% of the thickness of the hoop, cylinder must be rejected.

Impact damage

Impact damage is a white, frosted area that shows no indication of cutting delaminated peeling of the fibers or indentation. Damage that is relatively slight causes only a frosted appearance in the impact area with no other evidence of damage. A cylinder such a condition may be returned to service.

Heat exposure

Light discoloration of the clear coat or painted surface may be evaluated by using a fine grit scrubbing pad and liquid dish detergent mixed with warm water to clean the surface. An immediate color change back to an off-white color indicates that the cause of discoloration has no significant depth and is acceptable. This also applies to a painted surface that has no evidence of blistering or charring.

Resin expansion and surface cracks

The full-wrapped cylinder (Type III) has fibers running in the longitudinal direction, which stack up and cross over each other in the neck or base area, where there are most to voids or surface cracks. Filler material can be used to fill any surface voids before final process. After subjecting expansion and age effects, cracking may appear in the neck or base area, where no



contribution to the strength of the cylinder. That is no affect the cylinder's performance and no repair is necessary.

Label hairline cracks

Hairline cracks may appear in the area of the label, which is no impact on the integrity of the cylinder and no necessity to repair. If the label is difficult to distinguish, please contact the supplier.



3.3. Repair Instructions

IMPORTANT !!

For Type III cylinder, only minor damage, depth less than 0.005 in. (0.127mm) and length less than 1.0 in. (25.4mm), is repairable. Any repairs to the composite cylinder must be conducted by AMS, approved repair shop or well-trained personnel. A repaired cylinder must be subjected to a hydrostatic test before returning to service.

A typical commercial room temperature cure two-component epoxy shall be used for repair. Recommended procedure for repair is provided for reference.

- Check the damage within the allowable repair limits.
- Remove the fluffy or loose fiber and roughen the repair area with sandpaper (> P150)
- Mix two-component epoxy resin in compliance with the manufacturer instructions.
- Apply the mixed epoxy on the damaged area and even the coated surface by using a soft pad or brush (Make sure the damaged area is filled with resin).



- Attach a glass fiber cloth and apply the resin until the glass fiber cloth become translucent.
- Make sure the resin is fully cured (follow the resin manufacturer instructions)
- Use sandpaper (> P150) polish unsmooth area.

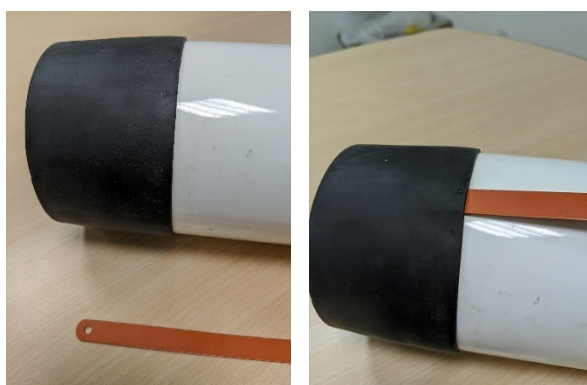


3.4. Boot removal and installation

When removing a boot, make sure that the fibers layer have not been damaged !!

Boot removal procedure:

1. Tool required: Thin and flexible metal strip.
2. Slip the metal strip between the boot and the cylinder to a depth of 25-30mm.
3. Sliding the metal strip in between cylinder and boot circumferentially.



4. Remove the boot by lifting the boot.
5. Remove the remaining adhesive on the cylinder and the boot by using a cloth with organic solvent. (Please wearing the protection gear when using chemicals)

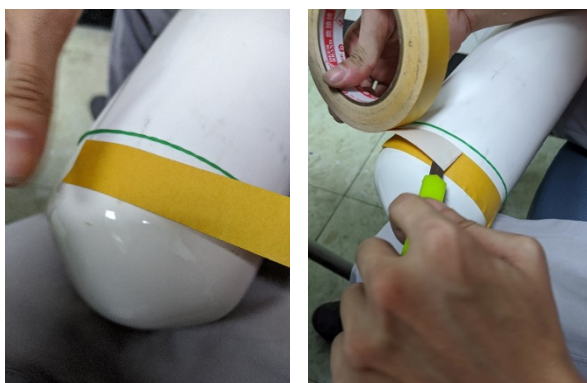


Boot installation procedure:

1. Material required: JC DS-17B double sided tape (<http://www.ictape.com/en/index.htm>) or equivalent tape.
2. Preassembly the cylinder and boot. Mark the boot position.



3. Remove the boot and apply the tap that the tape edge close to the marking position. Make sure that the tap covers whole circumference.



4. Remove the release film and assembly the cylinder and boot. Press the tape region for 30 seconds to have the tape to be fully contact with the boot.



Note that all required materials and tools could be purchased from AMS. Please contact AMS for further information.

4. Contact AMS

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