

CYLINDER TYPE: 618/1/Q

TECHNICAL CHARACTERISTICS

1.1 Dimensions:

Water Capacity (min.)-	1.0	litres
Minimum Wall Thickness-	6.80	mm
Diameter (external)-	102	mm
Test Pressure -	300	bar
Length (approx.)-	240	mm
Weight (Approx. Empty) -	1.62	kg

1.2 Minimum Mechanical Properties:

0.2% Proof	280 N/mm ²
UTS	330 N/mm ²
Elongation	12%

1.3 Material:

Aluminium alloy AA6061 is an alloy containing magnesium and silicon in proportion to form magnesium silicide, thus making the alloy heat treatable. The alloy combines medium strength, good formability and machinability with excellent corrosion resistance.

Setting the Standard Worldwide[®]

Luxfer Gas Cylinders Ltd, Registered in England No. 3376625 Reg. Office: 5 Anchorage Quay, Salford, M50 3XE

1.4 <u>Composition:</u>

		WT/%	
	Min		Max
Silicon	0.40	-	0.8
Iron			0.7
Copper	0.15	-	0.40
Manganese			0.15
Magnesium	0.8	-	1.2
Chromium	0.04	-	0.35
Zinc			0.25
Titanium			0.15
Lead			0.0030*
Bismuth			0.0030*
Others {Each			0.05
{Total			0.15

* Limit set by Luxfer on Suppliers

1.5 <u>Properties (Typical):</u>

Temper	0.2% Proof	UTS	Elongation % (On $5.65\sqrt{S_{\circ}}$)
Condition	N/mm ²	N/mm ²	
Т6	315	356	14.2

1.6 Physical Constants:

Specific gravity	2.7
Electrical conductivity	43.1% IACS
Modulus of elasticity	69 Gpa

1.7 <u>Manufacturing Process:</u>

Luxfer manufacture seamless aluminium alloy cylinders by cold impact extrusion. The open end of the shell formed by extrusion is subsequently closed by heading (hot formed in a die) to give the characteristic cylinder profile. Solution heat treatment, quenching into cold water and artificial ageing is carried out to develop the mechanical properties. This is followed by machining of the threads, stamping of marks and inscriptions, pressure testing, internal cleaning, full inspection, painting as required and packing.

SECTION TWO STRENGTH CALCULATIONS

2.1 Calculation of Minimum Wall Thickness:

Based on wall thickness equation from the EC Directive 84/526/EC :

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Use,

$$a = \frac{P_{h} \cdot D}{\frac{20 \cdot R}{\frac{4}{3}} + P_{h}}$$

Where,

=	Minimum Wall Thickness - (mm)
=	Hydraulic Test Pressure - (bar)
=	Nominal External Diameter of Cylinder - (mm)
=	Lesser of R _e or 0.85 R _m
=	0.2% proof stress of material - (N/mm ²)
=	Tensile strength of material - (N/mm ²)
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For 618/1/Q

P_{h}	=	300	bar
D	=	102	mm
R _e	=	280	N/mm ²
R_{m}	=	330	N/mm ²
R	=	Lesser	$r \text{ of } 280 \text{ or } 0.85 \text{ x } 330 = 280.5 \text{ N/mm}^2$
	a = -2		<u>02</u> + 300

∴ a = 6.80 mm

This is the value of 6.80 mm shown on the cylinder drawing.

The minimum wall thickness of 6.80 mm is greater than $\left(\frac{D}{100} + 1.5 \text{mm}\right)$

Where D = External diameter.

i.e. min. wall of 618/1/Q is 6.80 mm
$$\left(\frac{D}{100} + 1.5 = 2.52 \text{ mm}\right)$$

2.2 **Hydraulic Burst Test**

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The measured burst pressure (P_r) shall be not less than:

$$P_{rt} = \frac{20a \cdot R_m}{D-a}$$

Where;	P_{r}	= Actual burst pressure measured during testing - k	bar
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P_{rt} = Calculated minimum theoretical burst pressure - bar
 a = Calculated minimum wall thickness - mm
 D = The nominal external diameter of the cylinder - mm

Rm = The minimum guaranteed tensile strength - N/mm²

Applying to the 618/1/Q:

Where;	а	= 6.80 mm
	D	= 102 mm
	Rm	$= 330 \text{ N/mm}^2$

Then,

$$P_{rt} = \frac{20 \cdot 6.80 \cdot 330}{102 - 6.80}$$

 $P_{rt} = 472 \text{ bar}$...

Simon Nicholson Senior Design Engineer











NOTIFIED BODY TYPE APPROVAL CERTIFICATE

Issued in accordance with Pt. 1.8.7.2.4 (Renewal) of ADR 2021 agreement and following: Directive 2010/35/EU (TPED) Directives 2008/68/EC (Annex 1) & 2020/1833/EU

Certificate N°:

01/GB/231

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Manufacturer: LUXFER GAS Cylinders Ltd. Colwick, Nottingham, NG4 2BH **ENGLAND**

17020

Concerned Equipment: Seamless aluminium alloy refillable Gas Cylinders. Drawing n° 424/1/Q Issue 1

Test pressure: 300 bar Diameter (out): 102 mm Water Capacity: 1.0 L

Wall thickness min (Cylindrical part): 6.8 mm Bottom thickness min (Central part): 7.5 mm

Concerned EC Directives & Standards used for this type approval (renewal): TPED (2010/35/EU), ADR 2021 and Annex I, Parts 1 to 3 to 84/526/EEC

The conformity assessment of the concerned equipment will be performed in accordance with:

- Pt. 1.8.7.3 of ADR (Supervision of the manufacture)
 Pt. 1.8.7.4 of ADR (Initial inspection and tests)

This will be performed by a relevant body which can be either:

- A TPED ADR notified / inspection body (Xa), See Pt 6.2. of ADR, or
- The in-house Inspection Service of the manufacturer (IS), See Pt 6.2. of ADR. 0

The manufacturer will be allowed to affix the Π mark followed by the appropriate notified body identification number to approved equipment under the conditions described in the chapter 3 of the TPED Directive (2010/35/EU).

The Certificate is valid until 12th October 2031

Approval Date: 29/10/2021 Notified body identification n°: Notified body (Xa):

Name: B. Nève ir 0029 APRAGAZ VZW/ASBL

Position: General Manager Signature:

Notified body reference / Technical file: 0110/F.1391