

THE TECHNICAL CONTENT OF THIS DOCUMENT IS APPROVED UNDER THE AUTHORITY OF EASA.21J.140 (C547)

## SUPPLEMENT 7.52 : PERIODIC INSPECTION OF FUEL CYLINDERS

**WARNING:** With cylinders used for the storage of LPG there is a great danger that residual gas mixed with air will cause a fire or explosion hazard. The cylinder must be emptied and depressurised in a safe manner, then purged with nitrogen (N<sub>2</sub>) or other non-oxidising gas prior to any internal inspection or maintenance.

### 7.52.1 GENERAL

Issue 2 of this supplement has 10 pages.

This supplement calls for the use of substances and procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

It has been assumed in the drafting of this supplement that the execution of its provisions is entrusted to appropriately qualified and experienced people. Where judgements are called for, it has been assumed that they are made by competent persons who have been trained specifically for the task. In cases of doubt contact Cameron Balloons Limited. This supplement has been drafted to address both terrestrial transportation and airworthiness criteria.

The periodic inspection is required 10 years from the initial test date of the cylinder and every 10 years subsequent. The procedures for periodic inspection consist of:-

- External Visual Inspection
- Internal Visual inspection
- Hydraulic Proof Pressure test
- Pneumatic leak test

The decision to render the cylinder unserviceable may be taken at any stage in the inspection procedure. With the agreement of the owner the cylinder shall be rendered unserviceable, refer to Section 7.52.9.

**Note:** If any unacceptable defects are found during the external or internal inspections the cylinder must be rejected. A satisfactory proof pressure test does not allow other defects to be ignored.

### 7.52.1.1 Scope

This supplement is applicable to the following cylinders:-

Cylinder Material	Part Number
Aluminium	CB250: Worthington DOT-4E-240 Cylinder, CB2990: Alugas 50l Cylinder
Austenitic Stainless Steel	Cameron: CB426, CB497, CB599, CB959, CB2088. Colt (including Thunder & Colt): V20 (V20-1000), V30 (830922-1, CB8430), V40(V40-100, CB8440), H30 (SC2-106, AS82-310, 830201, CB8424, CB9413), H40 (AS82-410, SC2-106, CB8414, CB9412), H55 (880507-1, H55-300), SKY: V20, V30, V40
Titanium	CB2380, CB2383, CB2385, CB2387
Duplex Stainless Steel	CB2900, CB2901, CB2902, CB2903

### 7.52.1.2 Pressure Relief Valves

Pressure relief valves (PRVs) should be replaced as part of the periodic inspection. PRVs have a permitted shelf life of five years and a projected service life (subject to inspection) of ten years. Valves should not be fitted if the date of manufacture stamped on the valve is more than the sum of the shelf life plus the date of next intended periodic inspection. This ensures it is safe to replace the valve at the time of the subsequent periodic inspection and not to regard PRV replacement as a separate maintenance action.

### 7.52.2 EXTERNAL VISUAL INSPECTION

Remove the cylinder jacket and protective foam.

If required, the cylinder shall be cleaned to remove corrosion products or other foreign matter from its surface.

**Warning: Stainless Steel Cylinders should only be cleaned with products designed for cleaning Austenitic Stainless Steels. Abrasive Pads, wire brushes etc. used for cleaning must be stored and labelled to only be used on a single material. e.g. pads used for cleaning stainless steel cylinders shall not be used for cleaning Titanium cylinders and vice versa.**

The entire external surface of the cylinder shall be inspected for:-

- a) Dents, cuts, gouges, bulges, cracks and punctures applying the criteria for rejection in the Maintenance Manual (Section 6).
- b) Corrosion giving special attention to areas where water can be trapped, to the base of the cylinder, to the joints between the pressure vessel and the upper and lower guard plates and to the longitudinal and circumferential welds.
- c) Integrity of permanent attachments, including the cylinder data plate.
- d) Any other defects.

### 7.52.3 INTERNAL VISUAL INSPECTION

#### 7.52.3.1 Preparation

Cylinders shall be depressurised in a safe and controlled manner before proceeding. Cylinder valves and fitting shall be removed for inspection, maintenance, refurbishment or scrapping in accordance with EN 14912 or national requirements.

#### 7.52.3.2 Cleaning

The cylinder may be cleaned internally by adding a small quantity of kerosene and swilling it around the cylinder, or with a commercially available water-based degreasing agent. The cleaning process can be assisted by a high pressure water or steam jet. Repeat the process as necessary. Care should be taken not to damage the cylinder walls.

**Warning: Alcohol or commercial alcohol based cleaners must never be used to clean or dry titanium cylinders.**

#### 7.52.3.3 Inspection

After removing the residual liquid, where necessary, any other foreign matter from the interior, cylinders shall be inspected internally for any sign of corrosion or other defects that may affect their integrity, using a safe inspection lighting system with appropriate internal illumination (e.g. an endoscope).

Cylinders showing signs of internal corrosion, except those having only a thin layer of surface rust (stainless steel and Duplex stainless steel only) shall be removed for further detailed examination.

If further cleaning is required care shall be taken to avoid damaging the cylinder walls. Cylinders shall be re-inspected after cleaning.

#### 7.52.3.4 Inspection of Cylinder Threads

The internal threads of the cylinder shall be visually examined to ensure that they are full form and clean. They shall be examined for burrs, cracks and other thread damage.

### 7.52.4 HYDRAULIC PROOF PRESSURE TEST

#### 7.52.4.1 General

**Warning: Liquids that have been used for testing carbon steel cylinders should not be used for testing cylinders of this type to prevent ferritic contamination.**

A liquid shall be used as the test medium, e.g. water or kerosene. Water for testing the cylinders shall be potable quality with a chloride ion content of less than 50 ppm.

The test pressure ( $P_h$  or  $P_t$ ) for all cylinders is 3.0 Mpa (30 Bar).

**Note:** Older cylinders have a test pressure of 3.3 Mpa engraved on the data plate. These cylinders should be tested to 3.0 Mpa and the data plate amended (if required).

#### **7.52.4.2 Preparation**

In addition to the requirements of 7.52.3.1, the external surface of the cylinder shall be in such condition that any leak can be detected. If the cleaning method involves wetting the outside surface, the outside surface shall be completely dried before commencing the test procedure.

All cylinder ports other than those required for filling or pressure measurement during the test procedure shall be sealed using suitable blanks.

#### **7.52.4.3 Test Equipment**

The design and installation of the equipment and the cylinders connected to it shall ensure that no air is trapped in the system. All joints in the system shall be leak tight.

A device shall be fitted to the test equipment to ensure that no cylinder is subjected to pressure in excess of its test pressure by 0.2 Mpa (2 Bar).

Pressure gauges that are used to read the cylinder test pressure shall be in accordance with EN837-1 and EN837-3 accuracy class 1,6 or better (or equivalent national standard). They shall be checked for accuracy against a master gauge at regular intervals and in any case not less frequently than once a month or, when the gauges are not used for more than one month, before the next use. The master gauge shall be calibrated in accordance with national requirements.

The test equipment shall not restrict the expansion of the cylinder.

#### **7.52.4.4 Procedure**

The cylinder shall be positioned so that the welds are visible during the test. The pressure shall be increased gradually until the test pressure is reached. Then the cylinder should be isolated from the pumping system.

More than one cylinder may be tested at a time provided they all have a test pressure within the tolerance specified.

The test pressure shall be held for the time necessary to inspect the cylinder and check it out for any leak and or other defects, but not less than 5 minutes.

If there is leakage in the pressure test system, it shall be corrected and the cylinders retested.

Cylinders that do not leak or show any visible permanent distortion after the pressure test shall be deemed to have passed this test.

After testing the cylinder should be drained and thoroughly dried and precautions taken to prevent internal corrosion. Standing water should not be allowed to evaporate to dryness, unless de-ionized water is used as a final rinse.

### 7.52.5 VALVING

#### 7.52.5.1 General

New, inspected or refurbished valves approved by the manufacturer shall be fitted (Section 7.52.10). It is recommended that the liquid valve sealing rings (REGO style liquid valves), contents gauge seal and retaining screws are replaced.

#### 7.52.5.2 Fixed Liquid Level Gauge

If the Fixed Liquid Level Gauge (FLLG) is to be refitted , the length shall be checked in accordance with the dimensions given in Figure 7.52.1.

Check that the bleed screw 'A' is captive and that the length 'B' is correct for the cylinder. If not, the FLLG must be replaced.

These lengths give an approximate 80% fill when filling by volume.

**Note:** If a cylinder type is not listed, contact Cameron Balloons Limited.

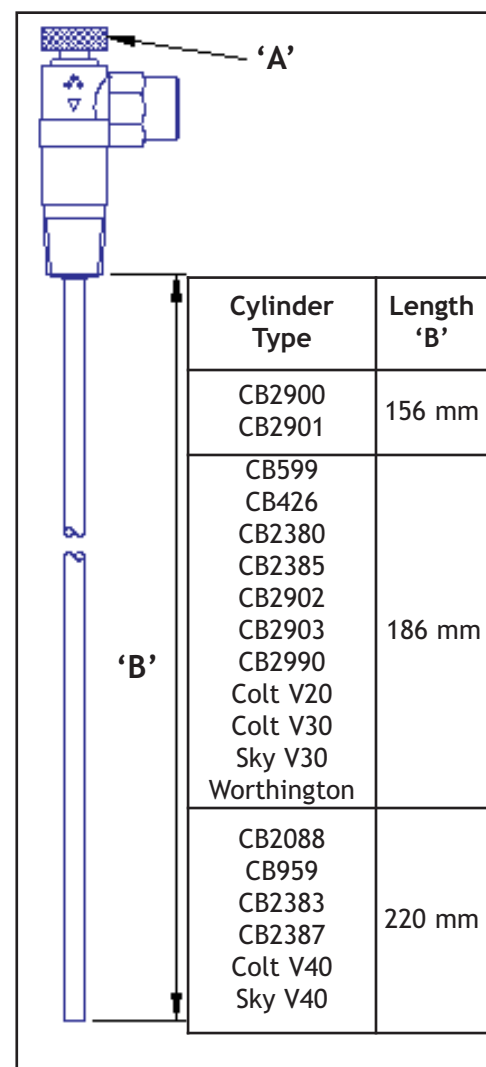


Fig 7.52.1 FLLG Details

### 7.52.5.3 Assembly

Contents gauge screws shall be assembled with a low to medium strength thread locking compound e.g. Loctite 222 or 243.

Valves should be assembled with two to three layers of PTFE tape and PTFE paste in accordance with Section 4 of the Maintenance Manual.

**Note:** Where valves are supplied with a pre-applied sealant, e.g. Everseal 183, no additional, sealant is required.

Torque tightening values are given in Table 7.52.2 but for tapered threads (NPT or NGT) the following alternative method is recommended due to the variations involved such as dissimilar materials of male and female threads, type of sealants used etc. If torque wrenches are used, the thread engagement must be checked in accordance with Table 7.52.1.

### 7.52.5.4 Assembly - Taper Threads

The threads in the valve bosses of the cylinder are 1/4"NPT and 3/4"NPT (National Pipe Thread) which are tapered threads. Because of the taper, an NPT thread can only screw into a fitting a certain distance before it jams.

Tapered threads shall be assembled with PTFE Tape and paste. Refer to Maintenance Manual Section 4.2.2.

The NPT standard specifies the length of hand tight engagement (the distance the pipe thread can be screwed in by hand) and the effective thread (the length of the thread which makes the seal). In practical terms these distances can be translated into how many turns to make by hand and how many with a spanner.

A simple method of installing these valves is to screw the valve into the boss until it is hand tight and then tighten with a spanner for an additional 1-2 turns.

Table 7.52.1 shows the distances and number of turns called for in the standard. A tolerance of plus or minus one turn is allowed.

**Caution:** Only use flat jaw spanners. Stilsons/pipe wrenches must not be used.

**Table 7.52.1 Taper Thread dimensions**

Nominal Size	Actual OD in (mm)	Threads per Inch	Length of engagement (tighten by hand) in (mm)	Length of effective thread in (mm)
1/4"	0.546 (13.87)	18	0.172 (4.37)=3.1turns	0.401(10.19)
3/4"	0.681 (17.3)	14	0.267(6.78)=3.7 turns	0.546 (13.87)

Table 7.52.2 Torque Tightening Values

Fitting	Thread Form	Torque (Nm)
Fixed Liquid Level Gauge (FLLG)	1/4"NPT	28-50
Liquid Offtake	3/4"NPT	110-200
Vapour Offtake	3/4"NPT	110-200
Blanking Plug	3/4"NPT	110-200
Contents Gauge Screws	M5	3-5
Contents Gauge Screws	7/16"UNF	3-5
QSO retaining Bolts	M6	3-5
QSO Outlet	7/8"UNF	5-8
QSO Outlet	3/8"BSP	5-8
Vapour Regulator	3/4"NPT	5-8
Vapour Regulator Quick Coupling	1/4" BSPT	4-6

Note: 1 Nm = 0.737 lb ft = 8.85 lb in.

#### 7.52.5.5 Padded Cover

The main body of Stainless Steel, Duplex Stainless Steel and Titanium cylinders shall be covered by an outer, water-resistant protective layer at least 25 mm thick made from structural cellular foam or similar material.

#### 7.52.5.6 PRV Adaptor: CB8426

Sky & T&C Cylinders were originally fitted with a Sherwood PV435L PRV. This valve may be replaced with the Omeca 660248 valve (CB-8412-1000) by fitting an adaptor, CB8426, into the cylinder boss before fitting the valve.

#### 7.52.6 PNEUMATIC LEAK TEST

1. Close all valves.
2. Charge the cylinder, through the liquid valve, with the pneumatic test medium (e.g. dried compressed air, nitrogen). The minimum pressure in the cylinder should be 0.6 Mpa (6 bar).
3. Isolate the cylinder from the supply.
4. Perform a leak check as detailed in the annual inspection procedure.
5. Vent cylinder to atmospheric pressure.

Cylinders that do not leak shall be deemed to have passed this test.

**WARNING: Always vent the cylinder after testing.**

### 7.52.7 TARE WEIGHT

The tare weight or indication of the tare weight shall be re-established if any modification or re-valving has been made which affects the tare weight of the cylinder.

If the new tare indication is different from the old tare indication, it shall be marked on the cylinder and the former tare shall be made unreadable.

### 7.52.8 MARKING

After successful completion of the periodic inspection, each cylinder shall be legibly and durably marked in accordance with EN14894 or national regulations.

As a minimum the cylinder shall be marked with:

- a) the symbol of the re-qualification test station or the symbol of an inspection body.
- b) the year and month of the re-qualification.
- c) the date of the next re-qualification.

The markings shall be not less than 4 mm in height.

**Warning:** The cylinder must only be marked on either the guard ring or foot ring. The cylinder must not be marked on the pressure vessel.

### 7.52.8 PURGING

Air shall be removed from the cylinder, e.g. by evacuation or by displacement with LPG.

**Note:** This may be done at the test station or during filling.

### 7.52.9 FAILED CYLINDERS

**Note:** If a cylinder has been deemed unsuitable for further service, it is deemed unsuitable for use in aircraft AND unsuitable for the safe storage liquefied gases.

The rejected cylinder must be rendered unserviceable in accordance with EN 12816 or applicable national regulations.

The serial number of a failed cylinder should be entered in the aircraft logbook.



### 7.52.10 REPLACEMENT PARTS

In addition to the items listed in the Maintenance Manual Section 8.4.3 the following replacement parts are available.

Where replacement parts are not listed, please contact Cameron Balloons Limited for further information.

#### 7.52.10.1 Contents Gauge

Part No.	Description	Applicability
CB-2561-0000	Gasket, Contents Gauge	All cylinders except CB2990
CB-2990-5000	Gasket, Contents Gauge	CB2990
CB-2551-0000	Contents Gauge	Worthington (CB250), Sky and T&C V20
CB-2552-0000	Contents Gauge	CB426, CB599, CB2380, CB2385, CB2900, CB2901
CB-2553-0000	Contents Gauge	CB959, CB2088, CB2383, CB2387, CB2903
CY-5000-0014	Screw, 7/16"UNF Phillister Head	CB426, CB599, CB959, CB2088, Worthington.
CY-0006-3020	Socket Head Cap Screw, M6	Alugas 50l, CB2990
CY-0006-3025	Socket Head Cap Screw, M6	Sky and T&C V20, V30 and V40
CY-5000-0013	Socket Head Cap Screw, 7/16"UNF	CB2380, CB2383, CB2385, CB2387

#### 7.52.10.2 Fixed Liquid Level Gauge (FLLG)

Part No.	Description	Applicability
CB-2480-0021	FLLG -186 mm Dip Tube	CB426, CB599, CB2380, CB2385, CB2902, CB2903, CB2990, Worthington, Sky and T&C V20 and V30
CB-2480-0022	FLLG -220 mm Dip Tube	CB959, CB2088, CB2383, CB2387, Sky and T&C V40
CB-2480-0023	FLLG -156 mm Dip Tube	CB2900, CB2901
CB-2483-0000	Blanking Plug	All of the above

#### 7.52.10.3 Pressure Relief Valve

Part No.	Description	Applicability
CB-8412-1000	Omeca 660248	CB250 (Worthington), CB426, CB599, CB959, CB2088, CB2380, CB2383, CB2385, CB2900, CB2901, CB2902, CB2903, CB2990, Sky and T&C V20*, V30* and V40*
CA-0001-0171	Sherwood PV435L	Sky and T&C V20, V30 and V40
CB-8412-2000	REGO8545AK	CB250 (Worthington), CB426, CB599, CB959, CB2088, CB2380, CB2383, CB2385, CB2900, CB2901, CB2902, CB2903, CB2990
CB-8412-3000	Ceodeux 071131	
CB-8412-4000	Sherwood PV435A	
CB-8426-0000	PRV Adaptor	Sky and T&C V20, V30 and V40

\* can only be fitted using adaptor CB-8426-0000

**7.52.10.4 Liquid Valve**
**7.52.10.4.1 Handwheel (REGO) Valve**

Part No.	Description	Applicability
CB-2992-0000	Liquid valve with itegral dip tube	CB2990
CB-0824-0001	Liquid Valve, Handwheel (BMV344)	All Cylinders except CB2990
CT-8180-9000	Dust Cap	
CB-2628-0000	Self Seal Repair Kit (BMV344)	
CB-2629-0000	Main Seal Repair Kit	

**7.52.10.4.2 Quick Shut Off (QSO) Valve**

Part No.	Description	Applicability
CB-0671-1000	Liquid Valve, QSO, 1¼"ACME Outlet	All Cylinders except CB2990
CB-0671-2000	Liquid Valve, QSO, TEMA 3800 Outlet	
CB-0392-0018	Seal Kit, QSO, (Worcester Type 44 Ball Valve)	
CB-0671-0007	TEMA 3800 Outlet	
CH-3800-0003	Bonded Seal (3/8"BSP)	
CH-3800-0006	Dust Cap (TEMA 3825)	
CB-8407-0000	Outlet Adapter, 1¼"ACME	

**7.52.10.5 Vapour Valve**

Part No.	Description	Applicability
CB-2884-0000	Vapour Valve, No PRV or dip tube	CB426, CB599, CB959, CB2088, CB2900, CB2901, CB2902, CB2903
CB-2883-0000	Vapour Valve, PRV, POL Outlet	T&C V20, V30 and V40
CB-2886-0000	Vapour Valve, PRV, 3/8"NPT Outlet	CB2380, CB2383, CB2385, CB2387
CB-2895-0000	Vapour Valve with withdrawal tube	CB2380, CB2383, CB2385, CB2387, CB2387, CB2900, CB2901, CB2902, CB2903
CB-2595-0000	Vapour Regulator	All Cylinders
CT-1300-0007	TEMA Quick Connector	All Cylinders
CT-0341-0001	Dynaquip Quick Connector	All Cylinders
CT-0250-0013	Blanking Plug, 3/4" NPT	All Cylinders

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