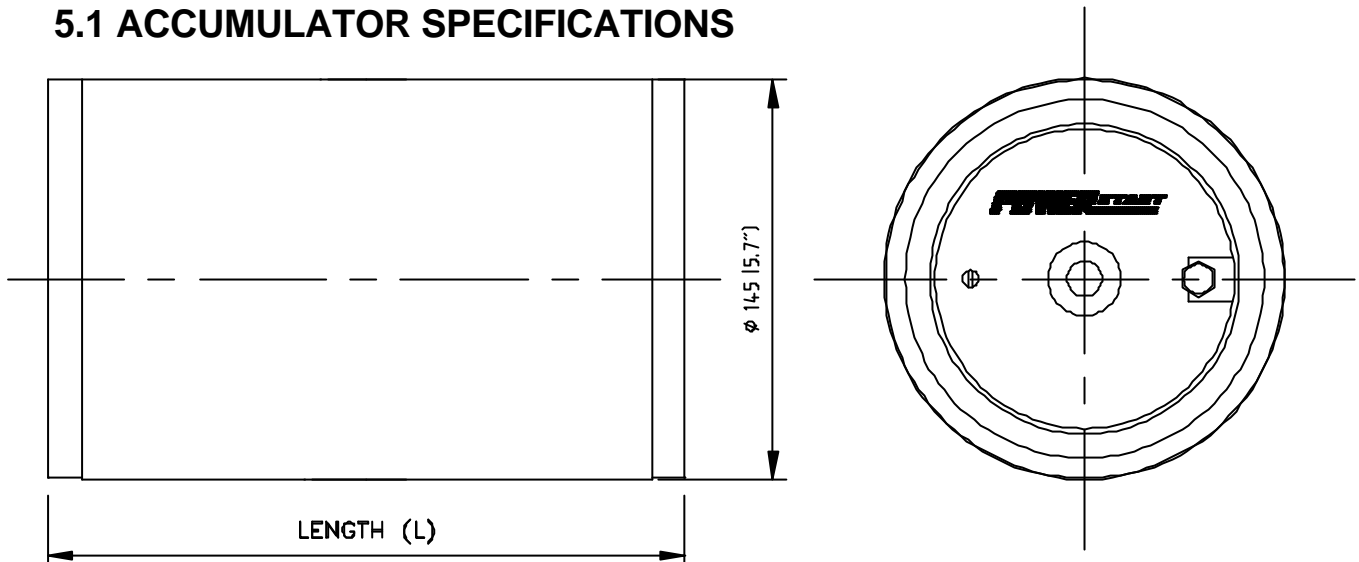


5. ACCUMULATORS

5.1 ACCUMULATOR SPECIFICATIONS



Features:

- ? During severe over pressurisation seals extrude to vent gas pressure prior to structural failure.
- ? End cap retention design prevents disassembly if accumulator is pressurised.
- ? Protector plug quick exhaust slot safeguards operator during disassembly in the unlikely event of the valve core failing.
- ? Pre-charge valve is protected from damage.
- ? Unique piston T-seal cannot roll.
- ? Accumulators conform to PD5500:2003 and are certified by Lloyd's Register of Shipping as standard
- ? Powerstart accumulator design is approved by the American Bureau of Shipping and accumulators may be ABS type approved as an option.

Specifications:

Construction	Certified steel tube - seamless to DIN 2391 (part 2)
Working pressure / Test pressure	21 MPa (3000 psi) / 35 MPa (5000 psi)
Average burst pressure	120 MPa (20000 psi)
Safety ratio	In excess of 4:1
Fluid media	Mineral oil
Viscosity range	ISO 32 to 46 (SUS 140 to 230)
Temperature range	-30°C to +100°C (-22°F to +212°F)
Seals	Nitrile (std.), Viton (optional)
Gas valve assembly	Stainless steel tamper resistant
Gas seal	Twin - bubble tight

Model	Capacity		Length "L"		Mass	
	ltr.	USG	mm	in.	kg	lbs.
A010SC	1.0	0.25	230	9.0	15.5	34
A025SC	2.5	0.66	350	13.8	19.5	43
A040SC	4.0	1.06	475	18.7	24.0	53
A055SC	5.5	1.50	600	24.0	28.0	62

Model	Capacity		Length "L"		Mass	
	ltr.	USG	mm	in.	kg	lbs.
A075SC	7.5	1.95	740	29.0	34.5	76
A100SC	10.0	2.60	965	38.0	40.5	89
A120SC	12.0	3.20	1125	44.0	46.0	101
A160SC	16.0	4.20	1450	57.0	57.0	125

Specifications are subject to change without prior notice due to product improvements.

5.2 LLOYD'S APPROVAL CERTIFICATE



LR Type Approval Certificate Extension

This is to certify that Certificate No. 93/00020(E1) for the undernoted products is extended and renumbered as shown.

This certificate is issued to:

PRODUCER	Powerstart (Pty) Ltd
PLACE OF PRODUCTION	PO Box 77 Rivonia 2128 South Africa
DESCRIPTION	Hydraulic accumulators of fabricated Carbon Steel.
TYPE	SC, SR, SS.
APPLICATION	Marine, offshore, industrial and mining use in hydraulic systems, and steering gears.
SPECIFIED STANDARDS	PD 5500: 2003


"This Certificate is not valid for equipment, the design, ratings or operating parameters of which have been varied from the specimen tested. The manufacturer should notify LR of any modification or changes to the equipment in order to obtain a valid certificate."

The attached Design Appraisal Document No. 93/00020(E2) and its supplementary Type Approval Terms and Conditions form part of this Certificate.

All other details remain as the previous Certificate No. 93/00020(E1) to which this extension should be attached.

Certificate No.	93/00020(E2)
Issue Date	11 June 2003
Expiry Date	1 February 2008
Sheet	1 of 1

*Lloyd's Register of Shipping
71 Fenchurch Street, London EC3M 4BS*


P.F. Moysey
Marine Support Group
London

INCORPORATE PAPER (01/02/03)

Specifications are subject to change without prior notice due to product improvements.

5.3 ABS APPROVAL CERTIFICATE



CERTIFICATE NUMBER

04-HS407816-PDA

DATE

10 February 2004

ABS TECHNICAL OFFICE

Houston SED - Ship Equipment

CERTIFICATE OF Design Assessment

This is to Certify that a representative of this Bureau did, at the request of
Powerstart (Pty) Ltd.

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate. It will remain valid for five years from the date of issue or until the Rules or specifications used in the assessment are revised (whichever occurs first).

PRODUCT: Hydraulic Piston Accumulators
MODEL: Type SC
ABS RULE: 2004 Steel Vessel Rules 1-1-4/3.7, 4-4-1, 4-4-1A1, and 4-6-7/3.5.4
OTHER STANDARD: None;

AMERICAN BUREAU OF SHIPPING

Hans P. Haendler

Engineering Type Approval Co-ordinator

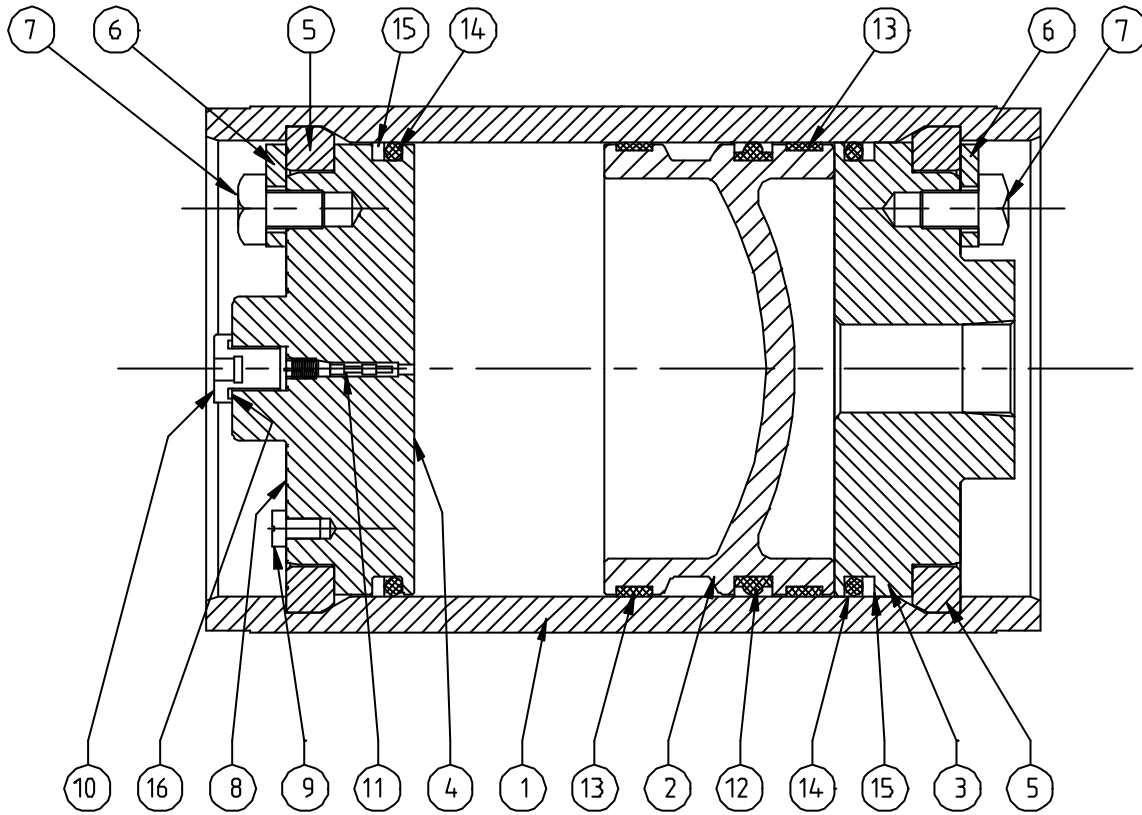
AB258(07/03)

NOTE: This certificate evidences compliance with one or more of the Rules, Guides, standards or other criteria of American Bureau of Shipping or a statutory, industrial or manufacturer's standard and is issued solely for the use of the Bureau, its committees, its clients or other authorized entities. Any significant changes to the aforementioned product without ABS approval will result in this certificate becoming null and void. This certificate is governed by the terms and conditions on the reverse side hereof.

TX 06/03 3120A
LTR 2000

Specifications are subject to change without prior notice due to product improvements.

5.4 ACCUMULATOR PARTS LIST



Item	Description	Qty	Part no.
1	Barrel	1	AC-01-□
2	Piston	1	AC-02
3	Oil end cap	1	AC-03-□
4	Gas end cap	1	AC-04
5	Retaining ring (set)	2	AC-05
6	Retaining washer	2	AC-06
7	Retaining bolt	2	AC-07
8	Nameplate	1	AC-08
9	Screw	1	AC-09
10	Gas plug	1	AC-10
11	Valve core	1	AC-11
12	Piston seal (including backup)	1	AC-12
13	Wear strip	2	AC-13
14	O-ring (endcap)	2	AC-14
15	Backup ring (endcap)	2	AC-15
16	Plug seal	1	AC-16

Nominal volume

010	-	1.0 ltr. (0.25 gal.)
025	-	2.5 ltr. (0.66 gal.)
040	-	4.0 ltr. (1.06 gal.)
055	-	5.5 ltr. (1.50 gal.)
075	-	7.5 ltr. (1.95 gal.)
100	-	10.0 ltr. (1.95 gal.)
120	-	12.0 ltr. (2.60 gal.)
160	-	16.0 ltr. (4.20 gal.)

Fluid connection

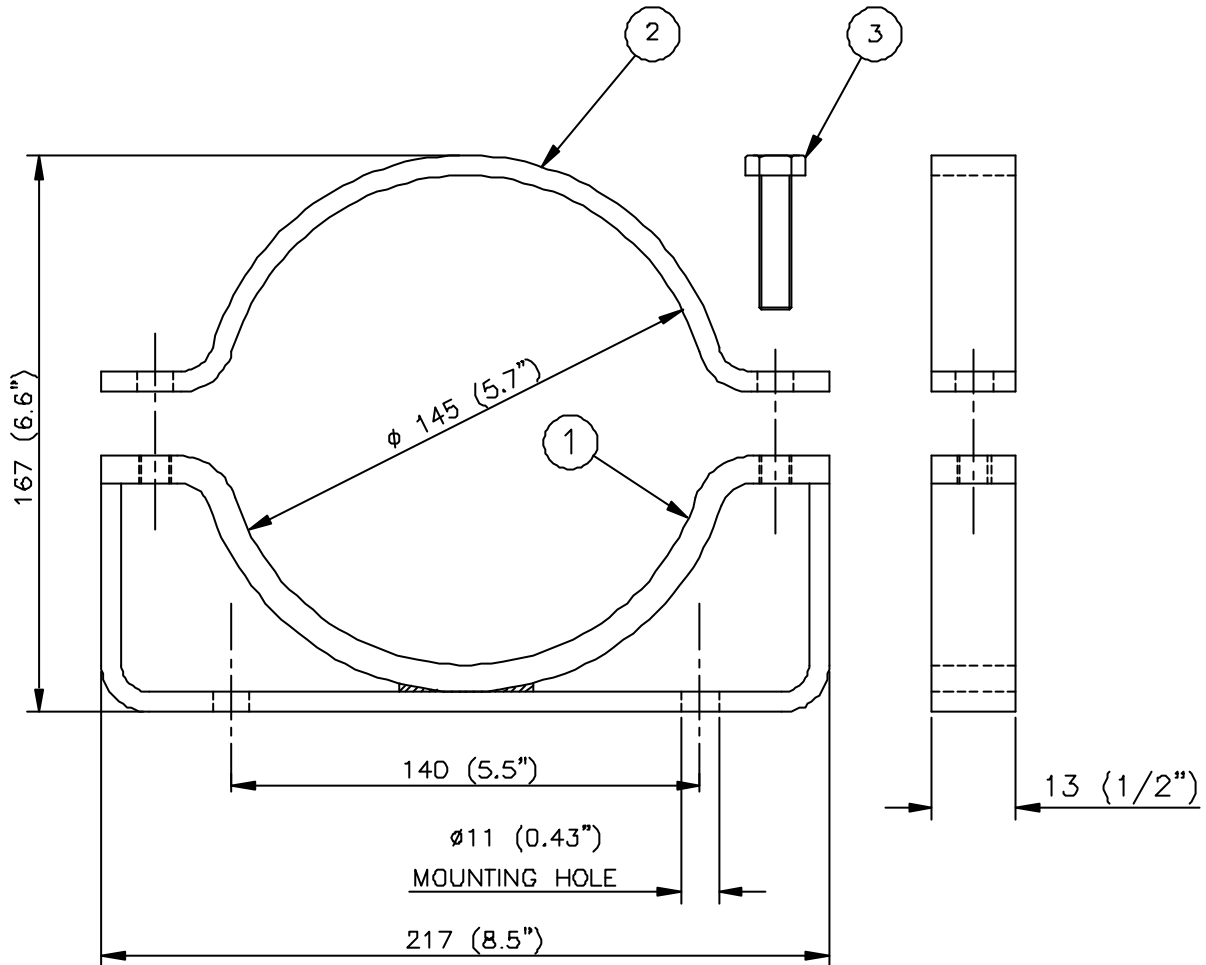
1	-	3/4" NPT (std.)
2	-	1" NPT
3	-	1 1/4" NPT
4	-	3/4" BSPF
5	-	1" BSPF
6	-	1 3/4" BSPF

Repair kit includes items 11-16 AC-RK

Please note: Fluid connections other than 3/4" NPT are not ex-stock and will therefore take longer to manufacture and will affect pricing.

Specifications are subject to change without prior notice due to product improvements.

5.5 ACCUMULATOR BRACKET



Part number:

AC-17

Specifications:

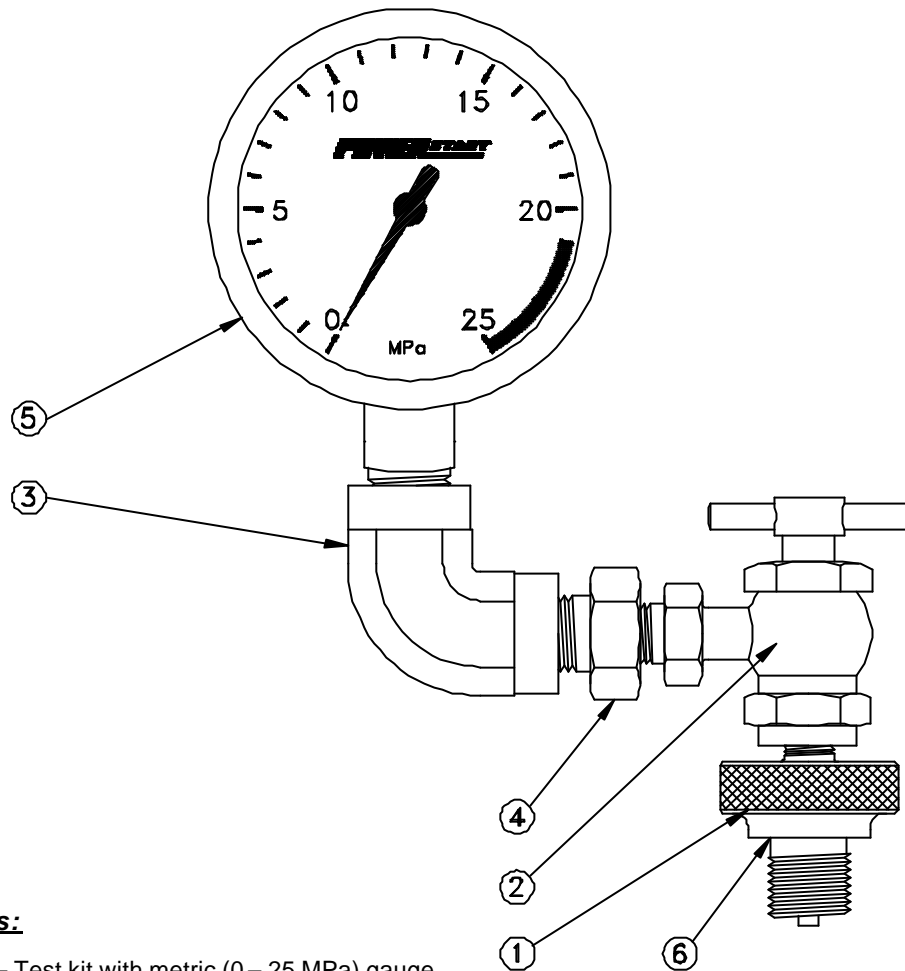
Mass	1.1 kg (2.4 lbs)
Construction	Mild steel
Finish	Zinc plated and yellow passivated
Clamp size	145mm (5.7") Diameter tube

Item	Description	Qty	Part no.
1	Base	1	AC-17-1
2	Clamp	1	AC-17-2
3	Bolt	2	AC-17-3

Note: The part number AC-17 refers to one bracket (i.e. one bracket top, one bracket bottom and two bolts). For most installations, two brackets will be required.

Specifications are subject to change without prior notice due to product improvements.

5.6 ACCUMULATOR TEST KIT



Part numbers:

ACTK – Test kit with metric (0– 25 MPa) gauge

ACTK-U – Test kit with imperial (0– 3000 psi) gauge

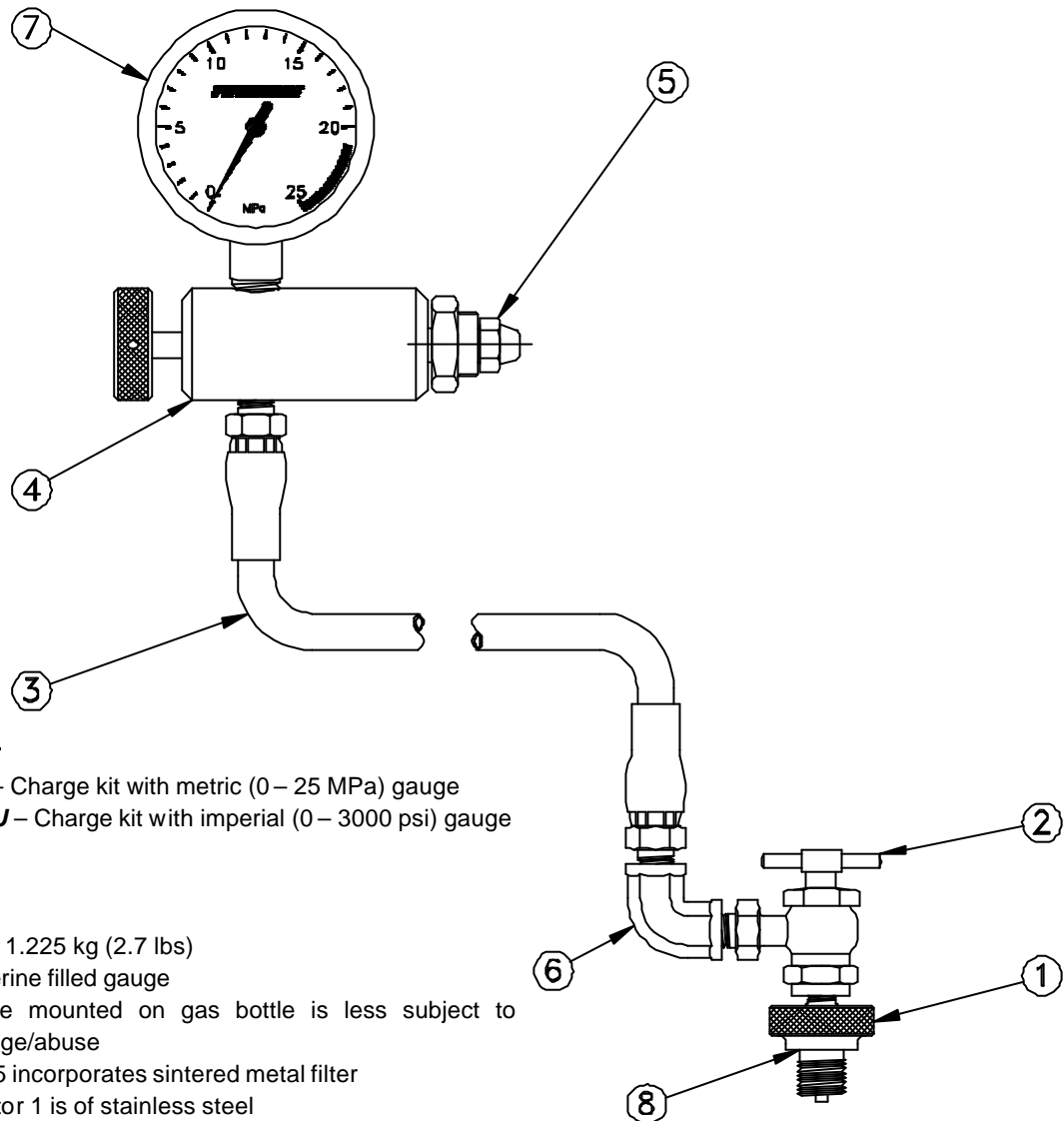
Features:

- ? Mass 545 grams (1.2 lbs)
- ? Compact light weight glycerine filled gauge
- ? Adaptor 1 is of stainless steel
- ? Design minimises gas loss when checking pre-charge pressure
- ? One piece forged brass gauge and stem

Item	Description	Qty	Part no.
1	Adaptor	1	ACGS-01
2	Actuator	1	ACGS-02
3	Elbow	1	ACTK-01
4	Reducer	1	ACTK-02
5	Pressure gauge (metric MPa markings)	1	PG63-25
5	Pressure gauge (imperial psi markings)	1	PG63-25-U
6	Seal	1	AC-16

Specifications are subject to change without prior notice due to product improvements.

5.7 ACCUMULATOR CHARGE KIT



Part number:

ACCK – Charge kit with metric (0 – 25 MPa) gauge

ACCK-U – Charge kit with imperial (0 – 3000 psi) gauge

Features:

- ? Mass 1.225 kg (2.7 lbs)
- ? Glycerine filled gauge
- ? Gauge mounted on gas bottle is less subject to damage/abuse
- ? Item 5 incorporates sintered metal filter
- ? Adaptor 1 is of stainless steel
- ? One piece forged brass gauge case and stem
- ? 3/4" BSPF thread to fit standard nitrogen bottles

Item	Description	Qty	Part no.
1	Adaptor	1	ACGS-01
2	Actuator	1	ACGS-02
3	Hose	1	ACCK-01
4	Pre-charge valve	1	ACCK-02
5	Bottle adapter	1	ACCK-04
6	Elbow	1	ACCK-05
7	Pressure gauge (metric MPa markings)	1	PG63-25
7	Pressure gauge (imperial psi markings)	1	PG63-25-U
8	Seal	1	AC-16

Specifications are subject to change without prior notice due to product improvements.