CURVETECH COMPENSATOR

2.75 Litre – EV 4003-22

TECHNICAL MANUAL

SMD Reference: EV 4003-22- 2.75 litre

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1. INTRODUCTION

This document is the technical manual for SMD's Curvetech 2.75 litre compensator.

This document describes the specification, installation, operation and maintenance of this compensator.

All 2.75 litre compensators are fitted with linear transducers to regulate the voltage. The linear transducers regulate the voltage by keeping it proportional to the amount of oil that is in the compensators.

2. SAFETY

2.1 SMD Statement on Product Safety

SMD view system safety as a critical property of all equipment that they manufacture.

SMD strive to:

- Remove or minimise hazards inherent in a system to the greatest practical extent.
- Provide control measures for residual hazards.
- Provide the users with the required information and warnings to avoid, or take precautions against, residual hazards.

Client Responsibilities

- Ensure that all personnel have read the required documentation to ensure they are operating safely.
- Equipment supplied by SMD is as safe as practicality permits regarding standard operation, maintenance and direct access to equipment, however due to the variations in installation SMD cannot foresee all hazards once installed on the clients vessel, therefore SMD shall not be liable for safety in the area where the equipment is installed, or for any deviations from standard operations or installation.
- During standard operations, it is unnecessary for personnel to be in close proximity to the machinery apart from when routine operational maintenance is carried out.
- It is the client's responsibility to provide adequate safety measures and procedures for the protection of personnel, including guards or other means to prevent unauthorised access to equipment.
- As the equipment is normally operated in a marine environment, safety measures pertaining to this must be taken into account and incorporated in the client's safety procedures.
- Training on the equipment and compliance with safety procedures are the responsibility of the client.
- All personnel must observe established safety procedures

2.2 Recommended Safety Precautions

Safety guidelines for handling, installing, operating and maintaining SMD equipment are given below. Specific precautions for protection of personnel and equipment are also provided.

The client is urged to incorporate these safety guidelines into their own safety procedures and make sure that all personnel are fully aware of these.

2.3 General Precautions

Safety devices provided by SMD are primarily intended for the protection of personnel and secondarily for the protection of the equipment.

Only suitably qualified and competent personnel should install, operate or maintain this equipment.

Personnel must fully understand and follow safe operating procedures at all times during the operation and maintenance of the equipment covered by these manuals.

The person in charge of operations must always have a clear view of the deck equipment.

When operations are conducted at night or in poor visibility, ensure that the equipment and immediate area around it are adequately illuminated.

Ensure that the work area is easily accessible without obstruction.

Route cables and hoses through separate protection channels or conduits wherever possible.

Ensure that all guard, guardrails and other protective devices are in position before commencing any operation.

Never wear loose clothing when working with moving machinery.

When there is uncertainty that a circuit is de-energised, it must be considered “live” at all times. This may be taken to mean electric or hydraulic circuits.

Isolate, lock-off and tag all electrical power sources before making any connections or disconnections or working on circuits.

Many critical components of the equipment may be subject to wear or damage and other deterioration, which reduces their normal useful life.

The equipment design provides safety margins taking into account normal wear and tear, however, in the case of extreme wear duty or known overload; the appropriate steps should be taken to rectify any problem and return the system to within its original specification.

If replacement is neglected, components can reach a point where they constitute a safety hazard; similarly, failure to maintain mechanisms necessary to assure correct and proper operation may also constitute a safety hazard.

Safety guidance may also be found in the relevant proprietary information manuals.

2.4 Specific Precautions

The equipment is manufactured from various grades of steel and aluminium.

On no account should welding be undertaken on any of the equipment without implementing approved weld procedures appropriate to the materials involved; failure to do this could endanger life and invalidate the certification of manufacture.

Hydraulic relief valves are one of the most important safety features and must never exceed manufacturer's recommended settings.

Only suitably qualified and competent personnel may perform any testing and re-adjustment of pressure relief devices.

Under no circumstances must anyone undo the main tie bar fixings without restraining the end plate as the unit contains stored energy in a large spring. Failure to take necessary precautions could result in a high risk accident due to the consequences of the uncontrolled energy.

Written records of inspection and maintenance activities should be maintained and regularly updated.

2.5 Warnings and Cautions

⚠ WARNING - Statements outline minimum safety requirements to be observed when operating the equipment and during maintenance procedures.

Ignoring these warnings could result in serious injury or death of personnel.

⚠ CAUTION - Statements call particular attention to a step in a procedure that, if not followed, could result in damage to, or destruction of, equipment.

3. SPECIFICATIONS

Type	
Rolling Diaphragm with internal springs.	
Pressure at Min. Volume	
Calculated pressure is 7 psi.	
Pressure at Max. Volume	
Calculated pressure is 14 psi.	
Total Volume	
2.82 litres (5 imp. Pints)	
Hydraulic connections	
2 x ½" BSPP female	
Materials	
Body	Polycarbonate, Acetal (300MSW) (Aluminium for 6000m depth)
Spring	Aluminium alloy BS1470.
Diaphragm	Fabric reinforced nitrile rubber.
Mounting method	
Half clamp	
Dimensions	
Diameter	181mm
Length (Empty)	430mm
Weight	
In air (Empty)	11.5kg
In air (Oil filled)	41kg
In seawater (Oil filled)	3.5kg

See figure 2 for linear transducer option

4. 2.75L COMPENSATOR EV 4003-22 ASSEMBLY PROCEDURE

- Glue the 5 magnets in position in the piston (Item 13) ensuring the set of 4 are all aligned in the same polarity.
- Grease (Molykote 111) and fit an O-ring (Item 15) to the top plate (Item 1).
- Push the pressure housing (Item 2) fully into the recess in the top plate (Item 1).
- Grease (Molykote 111) and fit an O-ring (Item 15) to the coupling flange (Item 3).
- Push the coupling flange (Item 3) fully on to the pressure housing (Item 2).
- Apply a light coat of Molykote 111 to the fabric side of the diaphragm (Item 14).
- Place the diaphragm (Item 14) inside the pressure housing (Item 2) so that the sealing lip faces upwards.
- Place the coupling flange (Item 3) on top of the diaphragm (Item 14) to seal the lip.
- Clamp the two coupling flanges (Items 3 & 4) using the M6 cap screws, nuts and washers (Items 10, 8 & 7).
- Place the piston (Item 12) inside the diaphragm (Item 14) so that the magnets are arranged symmetrically about the inner sensor, locating hole on the coupling flange (Item 3).
- Dress both ends of the spring (Item 11) so that both ends are rounded and there are no sharp edges.
- Place the spring (Item 11) into the piston (Item 12).
- Insert the four tie bars (Item 9) in position and tighten the nuts and washers (Items 8 & 7) against the face of the top plate (Item 1).
- Place the piston housing (Item 5) in the groove in the coupling flange (Item 3) so that the end of the piston housing (Item 5) with the four holes is furthest away from the coupling flange (Item 3).
- Place the bottom plate (Item 6) on top of the spring (Item 11) so that the raised boss fits inside the top of the spring.
- Using a press or an assistant push the bottom plate (Item 6) down so that the four tie bars (Item 9) project from the four locating holes**.**
- Fit the flat washers and nuts (Items 7 & 8) and tighten up against the bottom plate (Item 6). **Take care -** When dismantling, the spring will release stored energy (item 11).
- **It should be noted that to dismantle the compensator, the above steps could be taken in the reverse order.**

5. PARTS LISTS

5.1 Parts list EV 4003-22 – 2.75 litre compensator 7 – 14 psi

See general arrangement (Page 13)

6. SERVICE AND SPARE PARTS

6.1 Service Returns Procedure

- The compensator should be suitably packaged and returned to SMD freight paid after advising SMD of the required service work.
- A maintenance/failure report by the customer is required.
- A quotation for service/repair will be provided by SMD.
- An order to service/repair the unit is required before work can commence.

6.2 Spare Parts

Refer to the attached parts list and general assembly drawing. Ordering by SMD part number reduces the risk of wrong parts being provided.

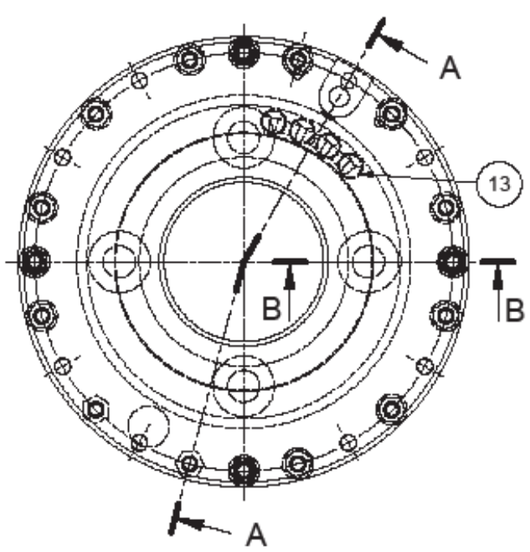
7. DISTRIBUTORS

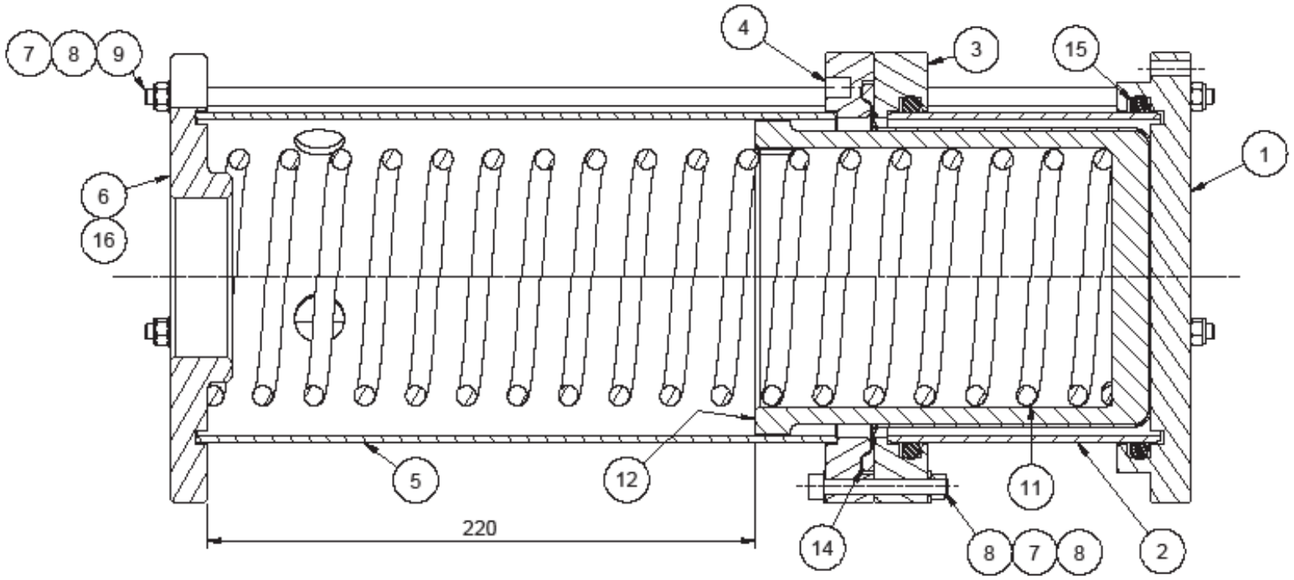
Contact SMD Limited, for a current list of distributors:-

- Telephone :- ++44 (0) 191 234 2222.
- Fax :- ++44 (0) 191 234 8599.
- E-mail :- info@smd.co.uk
- Web Site :- http://www.smd.co.uk
- Address :- Soil Machine Dynamics Limited.
  Turbinia Works
  Davy Bank
  Wallsend,
  Tyne and Wear,
  United Kingdom.
  NE28 6UZ.

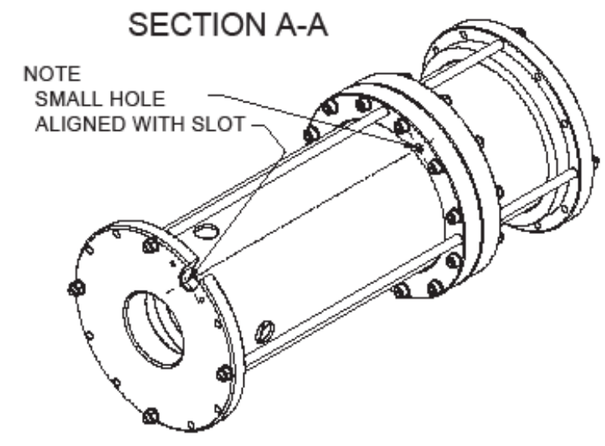
SMD have a network of distributors that are in-field support for Curvetech Products in their relative areas.

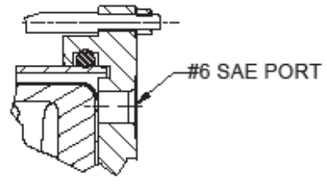
8. GENERAL ARRANGEMENT DRAWINGS





PARTS LIST			
ITEM	PART No	DESCRIPTION	QTY
1	AA0244	PLATE, 2.75L COMPENSATOR TOP	1
2	DE2086	PRESSURE HOUSING 2.75L COMPENSATOR	1
3	DE 2088	COUPLING FLANGE, 2.75L COMPENSATOR	1
4	DE2089	DIAPHRAGM COUPLING FLANGE 2.75L COMP	1
5	DE2085	PISTON HOUSING (258 LONG) 2.75L COMPENSATOR	1
6	AB0674	BASEPLATE 2.75 L COMP	1
7	PA0546	WASHER M6 FLAT SS	32
8	PA0078	NUT, M6, NYLOC, SS	20
9	DE3736	TIE BAR 429L COMPENSATOR	4
10	PA4815	BOLT M6 x 50 SHCS	12
11	OV4638	SPRING TYPE 'B' 2.75 COMPENSATOR	1
12	DE2098	PISTON 2.75L COMPENSATOR	1
13	OV4690-4	BAR MAGNET NEODYMIUM 9DIA x 9L	4
14	DV3008	DIAPHRAGM 2.75L COMPENSATOR	1
15	OR152431	O' RING 132 x 7.0 NITRILE	2
16	PD5650	INSERT - HELICOIL M4 x 2D SS	2

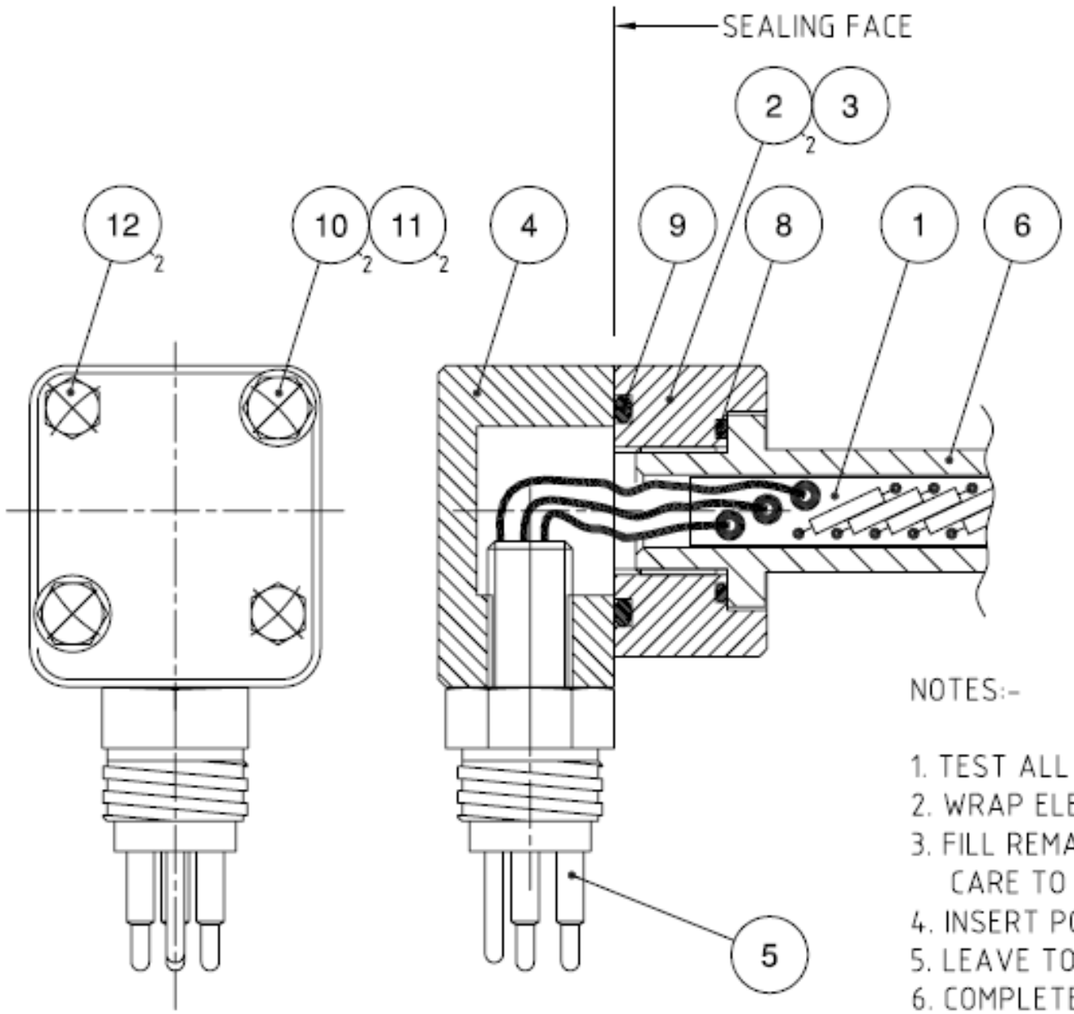




PART SECT B-B

ESTIMATED MASS = 12.5 kg

Figure 1 - 2.75 LITRE COMPENSATOR GENERAL ARRANGEMENT 7 - 14 PSI COMPENSATOR - EV 4003-22



CONNECTION DETAILS

FUNCTION	SUBSEA CONNECTOR	PCB CONNECTION
0V	PIN 1	PAD 2
0-10V SIGNAL	PIN 2	PAD 1
24V SUPPLY	PIN 3	PAD 3

NOTES:-

1. TEST ALL SENSOR FUNCTION WITH MAGNET
2. WRAP ELECTRICAL TAPE AROUND SOLDERED PAD CONNECTIONS TO PROTECT
3. FILL REMAINDER OF SENSOR VESSEL (ITEM 6) WITH COMPOUND, TAKING CARE TO KEEP VESSEL SEALING FACES CLEAR
4. INSERT PCB (ITEM 1) TO REQUIRED DEPTH, AS SHOWN ON DRAWING
5. LEAVE TO SET FOR 24 HOURS
6. COMPLETE ASSEMBLY OF VESSEL ENDCAP & RE-TEST SENSOR FUNCTION.

Figure 2 – EV 4013-11 2.75 LITRE COMPENSATOR LINEAR TRANSDUCER KIT

PARTS LIST

No.	Part	Description	Qty
1	AA0572	LINEAR SENSOR PCB 24V 250 LONG	1
2	PD5649	INSERT HELICOIL M5 x 2D SS	2
3	AB0677	CLAMP BODY	1
4	AB0678	CLAMP COVER	1
5	PJ6580	CONNECTOR IMPULSE MCBH-3-MP	1
6	AB0675	VESSEL PCB 248 LONG	1
8	PC4025	SEAL O-RING BS018 (18.77 X 1.78)	1
9	PC9509	SEAL O-RING BS119 (23.47 x 2.62)	1
10	PE4415	BOLT M5 x 35 SHCS A4 SS	2
11	PA4768	WASHER M5 SPRING SS	2
12	PJ2542	BOLT M4 x 50 SHCS SS	2

Figure 3 – EV 4013-11 2.75 LITRE COMPENSATOR LINEAR TRANSDUCER KIT PARTS LIST