

## C10 & Cepac Cylinders

### Operating Parameters

#### Standard cylinders

<b>Working pressure</b>	250 bar
<b>External sea pressure - Cepac subsea cylinders</b>	350 bar depth : 3500 metres
<b>Temperature range</b>	-10°C to +80°C
<b>Hydraulic fluid</b>	All good quality mineral oils, water in oil emulsions, water glycols and 95/5 HWB fluids
<b>Rod speed</b>	500mm/sec maximum with mineral oil at working pressure
<b>Rec filtration</b>	NAS 1638 class 10 (ISO 19/16) or 25 micron absolute

#### Materials of construction

<b>Tubes</b>	Dom 1026 or ST52 steel, honed to 0.4µm Ra. minimum UTS 580 N/mm <sup>2</sup>
<b>Rods - C10</b>	BS 970: 080M40 steel hard chrome plated to depth of 0.025mm and polished to 0.15µm Ra. minimum UTS 550N/mm <sup>2</sup>
<b>Rods - Cepac</b>	BS 970: 43I S29T hardened and tempered, stress relieved stainless steel hard chrome plated to depth of 0.025mm and polished to 0.15µm Ra. minimum UTS 850N/mm <sup>2</sup>

#### Note

The above parameters apply to cylinders within the standard range of C10 and Cepac cylinders manufactured by the company. Custom built cylinders are supplied to meet other specifications including higher operating pressures, temperatures and fire resistant fluids.

#### Application

Check that the cylinder application is the same as when the cylinder was ordered. Special attention should be given to the load-carrying capacity. Long cylinders, particularly with rear mountings have limited load-carrying capacity due to their 'strut' strength. Consequently, cylinders are selected in accordance with the APH buckling charts on pages B6 and B7, thereby ensuring the correct size of rod necessary to transmit the required thrust at full stroke.

Attention should also be paid to support tubes which are necessary to avoid high mechanical load on piston seals and gland bushings.



Subsea and industrial hydraulic manufacturers

Hillington Estate Glasgow G52 4PQ Scotland Tel: 0141 810 4511 Fax: 0141 883 3825  
 Email: hydraulics@aph.co.uk Internet: www.aph.co.uk  
 Lakewood New Jersey 08701 USA Tel: 732 370 3906 Fax: 732 370 3967



FM1442

## C10 & Cepac Cylinders

### Installation

#### Mounting the cylinders

- 1 Where cylinders are supplied for rigid mounting, ensure that the direction of travel of the load connected to the piston rod exactly aligns with the piston rod travel. If not, provision must be made for axial misalignment.
- 2 Flange mounted cylinders should be solidly mounted to a rigid section of the machine using high-tensile bolts (socket head type recommended). Where a spigot diameter cannot be used to locate the cylinder, it must be accurately aligned to the work, tightened in place, and the flange drilled for a dowel pin to prevent axial movement.
- 3 Standard clevis and trunnion mounted cylinders are designed for pivoting in one plane only. It is therefore essential that these cylinders are accurately aligned throughout their operating arc thereby avoiding excessive side loading. Where accurate alignment is not possible, the cylinder must be equipped with two-directional pivoting at both ends eg swivel eye mountings.
- 4 When fitting trunnion mounted cylinders, pillow-blocks of adequate dimensions should be rigidly mounted as close as possible to the trunnion faces. Bearings must be provided over the full length of the trunnion pins and lubrication provided to the bearing interface.

#### Storage

If it is necessary to store cylinders prior to installation, the following provisions should be made for their protection:

- 1 Cylinders should be stored indoors in a clean, dry environment with the rod retracted. Where this is not possible, and they are likely to be exposed to dampness or other corrosive atmospheres, all unpainted external parts, including the piston rod, must be coated with a corrosion inhibiting material. In addition, both ends of the cylinder should be filled with a corrosion resistant fluid which is compatible with the operating fluid.
- 2 Where possible, the cylinders should be stored in a vertical position with the piston rod upwards.
- 3 Dirt-protection plugs must be left in the ports during storage.



Subsea and industrial hydraulic manufacturers

Hillington Estate Glasgow G52 4PQ Scotland Tel: 0141 810 4511 Fax: 0141 883 3825  
Email: hydraulics@aph.co.uk Internet: www.aph.co.uk  
Lakewood New Jersey 08701 USA Tel: 732 370 3906 Fax: 732 370 3967



FM1442

## Pencyl Cylinders

### Operating Parameters

#### Standard cylinders

<b>Working pressure</b>	350 bar
<b>Temperature range</b>	-40°C to +80°C
<b>Hydraulic fluid</b>	All good quality mineral oils, water in oil emulsions, water glycols, 95/5 HWB fluids and fresh water
<b>Seal material</b>	Medium nitrile rubber (Buna N) and polyurethane or PTFE depending on fluid
<b>Rod speed</b>	500mm/sec maximum with mineral oil at working pressure
<b>Rec filtration</b>	NAS 1638 class 10 (ISO 19/16) or 25 micron absolute

#### Materials of construction - Pencyl

<b>External parts</b>	BS 970 316S11 stainless steel
<b>Internal parts</b>	NES 833 aluminium bronze or equivalent
<b>Rod</b>	BS 970 431S29T hardened and tempered, stress relieved stainless steel hard chrome plated to depth of 0.025mm and polished to 0.15µm Ra. minimum UTS 850N/mm <sup>2</sup>

#### Materials of construction - Pencyl Lite

<b>External parts</b>	6082 T6 hard anodised aluminium alloy
<b>Internal parts</b>	NES 833 aluminium bronze or equivalent
<b>Rod</b>	BS 970 431S29T hardened and tempered, stress relieved stainless steel hard chrome plated to depth of 0.025mm and polished to 0.15µm Ra. minimum UTS 850N/mm <sup>2</sup>

#### Note

The above parameters apply to cylinders within the standard range of Pencyl and Pencyl Lite cylinders manufactured by the company. Custom built cylinders are supplied to meet other specifications including higher operating pressures, temperatures and special fluids.



Subsea and industrial hydraulic manufacturers

Hillington Estate Glasgow G52 4PQ Scotland Tel: 0141 810 4511 Fax: 0141 883 3825  
 Email: hydraulics@aph.co.uk Internet: www.aph.co.uk  
 Lakewood New Jersey 08701 USA Tel: 732 370 3906 Fax: 732 370 3967

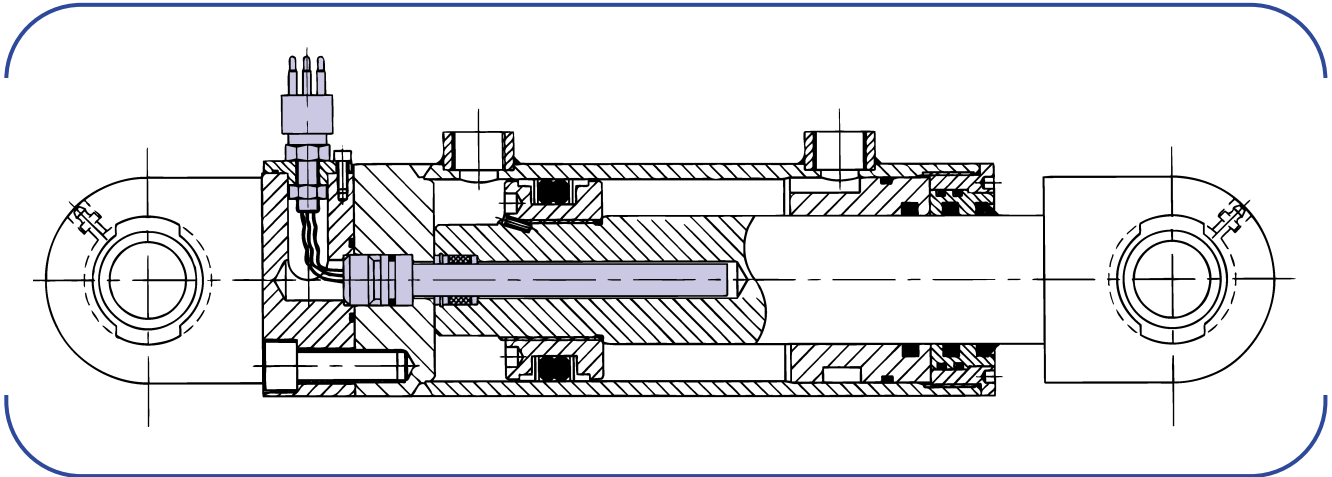


FM1442



## C10 & Cepac Cylinders

### Electronic Rod Position Indication



#### Introduction

Air Power & Hydraulics first introduced Internal Electronic Rod Position Indication in 1990. Since then the range of transducers has increased making it possible now to offer our 18 series cylinder - 32mm bore x 18mm rod - incorporating a VRVT type transducer with up to 300mm of stroke.

The sectional drawing above is typical of the whole range of our cylinders with Electronic Rod Position Indication and shows a 48 series Cepac subsea cylinder with transducer and straight subsea connector.

#### Transducer models available

- Penny & Giles VRVT type transducer with loose electronic modules to handle all standard input and output signals.

**Accuracy:**  $\pm 0.2\%$  of electrical stroke. **Maximum stroke:** 1000mm.

- Rota multiple reed switch transducer giving variable output voltage signal of 0.5v to 5.0v DC (4 to 20 mA optional) with input of 12v to 24vDC.

**Signal resolution:** 3, 5 or 10mm. **Maximum stroke :** 4000mm.

- Temposonics III and Balluff robust design magnetostrictive transducers with on board digital or analog electronics for high accuracy and long stroke applications.

**Analog resolution:** Infinite.

**Digital resolution:** 0.1 mm, 0.01 mm or 0.0025mm max.

**Maximum stroke:** 1500mm.

#### Features

- Available with C10 heavy duty and Cepac marine & subsea cylinders.
- Stroke indication to client specification.
- Available currently with all cylinders from 32mm to 250mm bore.
- Suitable for system pressures up to 350 bar.
- Water-tight connectors for subsea applications.
- Suitable for use with all standard mineral oils, water glycols and HWB (95/5) fluids and [inhibited] water.

#### Options

- Output connector can be 90° type and positioned at an angle to the rear port.
- Ported rod cylinders available with all types of transducer.
- Electronic packages available for computer control including interconnecting cabling and plugs.
- Cartridge valves such as dual overcentre, pilot-operated check and flow controls can be incorporated in the cylinder end cap with a fully welded transfer tube to the annular port for operation in extremely arduous conditions.



Subsea and industrial hydraulic manufacturers

Hillington Estate Glasgow G52 4PQ Scotland Tel: 0141 810 4511 Fax: 0141 883 3825

Email: hydraulics@aph.co.uk Internet: www.aph.co.uk

Lakewood New Jersey 08701 USA Tel: 732 370 3906 Fax: 732 370 3967

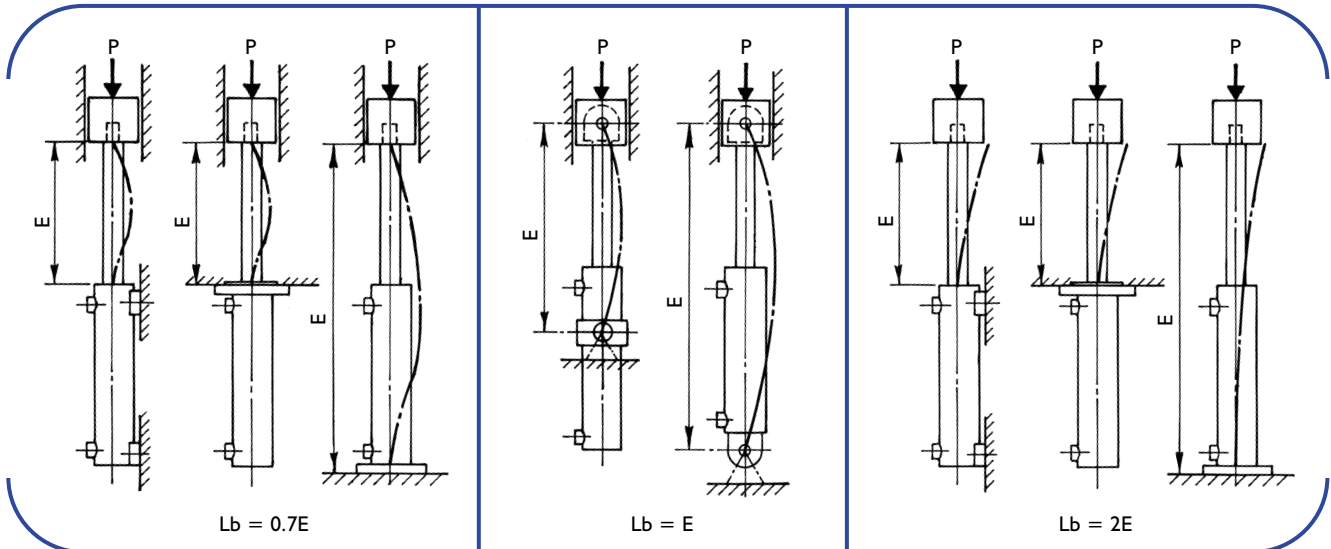


FM1442

## C10, Cepac & K10 Cylinders

### Stroke / Buckling length limits

Chart A



#### Piston rod selection

The standard catalogue cylinder/rod diameter combinations are suitable for most applications but the tendency for "long" rods to buckle under compressive loads should always be considered. In these circumstances, selection of the piston rod diameter should be determined prior to finalising the mounting style.

The optimum rod diameter is established with the following procedure:-

- 1 Calculate the cylinder push force "P" (tonnes) available by multiplying the cylinder full bore area (cm<sup>2</sup>) by the maximum pressure (bar) to be applied to the cylinder (please refer to technical bulletin - areas and performance data on pages C1 & D1).
- 2 Relating the cylinder mounting style to chart A, establish the distance "E" and hence the buckling length "Lb" in metres.
- 3 Using this value of Lb in chart B on page B7, follow its line vertically up till it intersects the horizontal line representing the cylinder push force in tonnes. The correct piston rod diameter can now be read from the curved line immediately above the point of interestion.

#### Internal support (stop) tube

Long stroke cylinders are fitted with an internal stop tube between the piston and gland assembly (or in special circumstances an additional piston); this increases bearing spread hence reducing the bearing load, especially at full stroke.

The stop tube length (if required) can be established with the following procedure:-

- 1 Relate the cylinder mounting style to chart A, establish the distance "E" and hence the buckling length "Lb" in metres.
- 2 If "Lb" is less than 1 metre, no stop tube is required.
- 3 If "Lb" is greater than 1 metre, 25 mm of stop tube is recommended for every 250 mm (or part thereof) beyond 1 metre.

Note carefully: Stop tube length adds to basic cylinder length.



Subsea and industrial hydraulic manufacturers

Hillington Estate Glasgow G52 4PQ Scotland Tel: 0141 810 4511 Fax: 0141 883 3825

Email: hydraulics@aph.co.uk Internet: www.aph.co.uk

Lakewood New Jersey 08701 USA Tel: 732 370 3906 Fax: 732 370 3967



FM1442



# Cylinders

## C10, Cepac & K10 Cylinders

### Piston rod buckling chart

Chart B

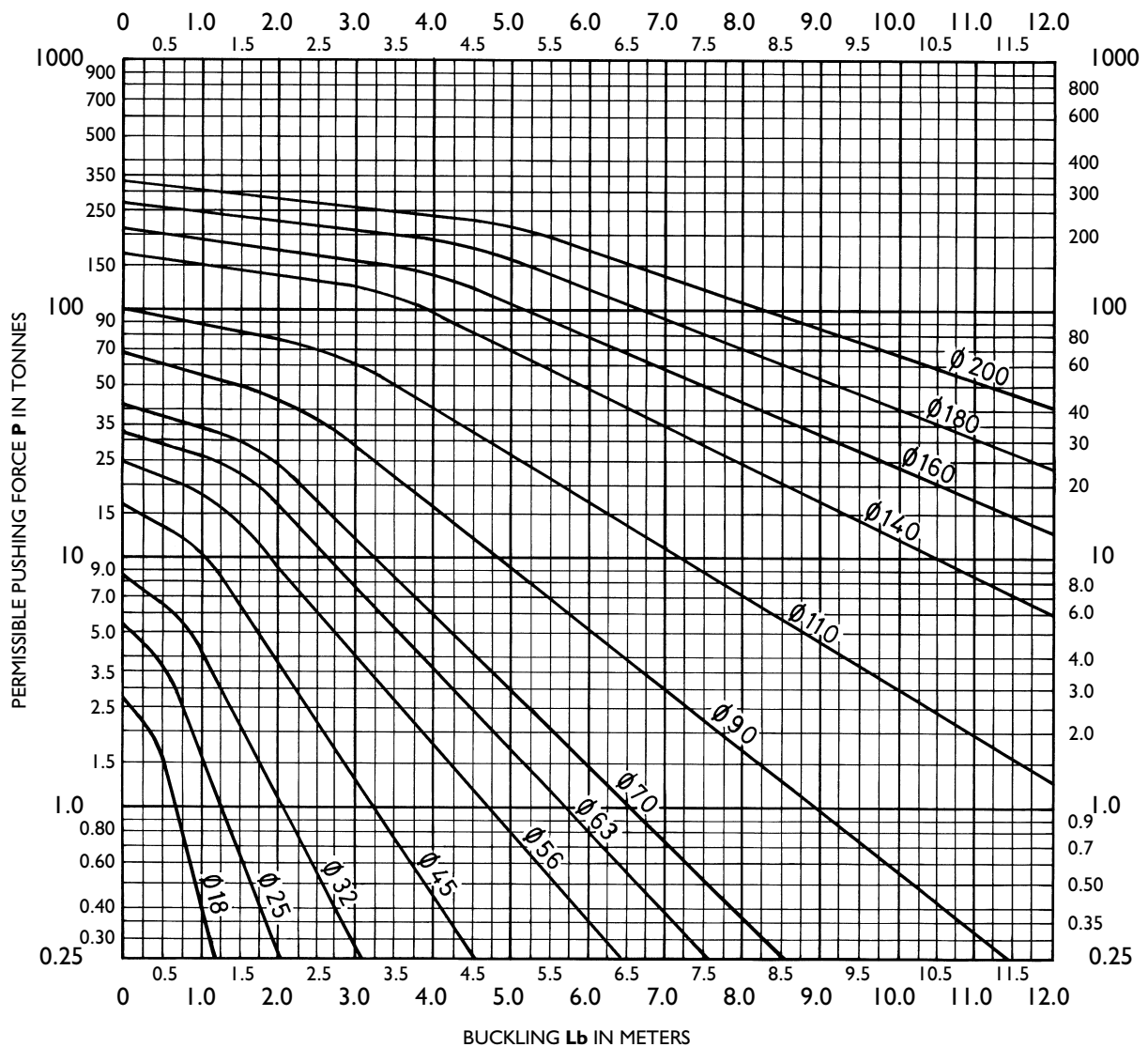


Chart values based on a factor of safety of 3 on buckling



Subsea and industrial hydraulic manufacturers

Hillington Estate Glasgow G52 4PQ Scotland Tel: 0141 810 4511 Fax: 0141 883 3825  
 Email: hydraulics@aph.co.uk Internet: www.aph.co.uk  
 Lakewood New Jersey 08701 USA Tel: 732 370 3906 Fax: 732 370 3967



FM1442