ABV Actuators and Control Systems

Overview page 3
ABV Actuators Production Range page 4
Modular Assembly page 5
Dual Valve Mounting Interface page 6
Scotch-Yoke vs. Rack and Pinion Mechanism page 7
Codes for Scotch-Yoke Actuators page 8
Actuators - Name Plate page 10
   Scotch-Yoke Actuators page 11
   Compact Pneumatic Actuators Series CD, CS page 11
   Series CD, CS Coupling Dimensions page 14
   Single Acting Pneumatic Actuators Series PS page 15
   Double Acting Pneumatic Actuators Series PD page 16
   Double Acting Hydraulic Actuators Series HD page 17
   Spring Return Hydraulic Actuators Series HS page 18
   Series PS, PD, HS, HD Coupling Dimensions page 19
Rack and Pinion Actuators page 20
   Subsea Hydraulic Actuators Series SA-HSA page 20
   Subsea Hydraulic Actuators Series SA-HDA page 21
Main Control Systems page 22
   Control System for Series HD Actuators page 22
   Control System for Series HS Actuators page 23
   Control System for Series PD Actuators page 24
   Control System for Series PS Actuators page 25
   Control System for Gas-over-Oil Actuators page 26
Manual Gear Operators page 28
   Worm Gear Operators Series TMG page 28
   Subsea Worm Gear Operators Series SMG page 29
How to contact us page 30

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.

© ABV. No part of this document can be reproduced without ABV written authorization. -Rev. 2.0-
With a production typology including hydraulic, pneumatic, gas-over-oil and sub-sea actuators, together with the capability of developing and assembling the relevant control systems, ABV S.r.l. proposes itself as a modern, versatile and competitive company in the valve automation market.

ABV S.r.l. has a Quality System implemented according to ISO 9001 Standards, and it has obtained Lloyd’s Register Certification for the design and the production of sub-sea actuators, making use of a proper testing procedure in hyperbaric chamber.

In order to satisfy specific customer’s needs, ABV S.r.l. is also able to guarantee the full accordance to the 97/23/EC Directive (Pressure Equipment Directive). The design of all ABV products is carried out by technicians and engineers experienced in operating with the most actual and sophisticated 3D computer programs (CAD-CAM).

The structural verifications, executed with proper programs of structural calculation based on the finite elements analysis (FEA), allows high levels of safety and structural integrity, hence improving the quality of the products. Thanks to the flexibility that has always characterized the Company, ABV S.r.l. is able to satisfy the broadest customer’s needs, elaborating special solutions for particular services.
All ABV actuators are specifically designed and manufactured to operate quarter-turn valves (i.e. ball, butterfly, plug valves). However, depending on specific customer’s needs, ABV S.r.l. may develop actuator typologies different from those listed above. Please contact our Commercial Dept. for more details and information.

ABV actuators production range may be divided into the following main typologies:

### PNEUMATIC AND HYDRAULIC ACTUATORS

<table>
<thead>
<tr>
<th>Mechanism Type</th>
<th>Operating Fluid</th>
<th>Actuator Type</th>
<th>Actuators Series</th>
<th>Torque Range</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scotch Yoke</td>
<td>Pneumatic</td>
<td>Double Acting</td>
<td>CD</td>
<td>From 40 Nm up to 2500 Nm (350 lb in ϖ 22100 lb in)</td>
<td>-ON/OFF (1) -MODULATING (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Acting</td>
<td>CS</td>
<td>From 40 Nm up to 2500 Nm (350 lb in ϖ 22100 lb in)</td>
<td>-ON/OFF (1) -MODULATING (1)</td>
</tr>
<tr>
<td></td>
<td>Pneumatic</td>
<td>Double Acting</td>
<td>PD</td>
<td>From 700 Nm up to 250000 Nm (6200 lb in ϖ 2212000 lb in)</td>
<td>-ON/OFF (1) -MODULATING (1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Acting</td>
<td>PS</td>
<td>From 700 Nm up to 240000 Nm (6200 lb in ϖ 2124000 lb in)</td>
<td>-ON/OFF (1) -MODULATING (1)</td>
</tr>
<tr>
<td></td>
<td>Hydraulic</td>
<td>Double Acting</td>
<td>HD</td>
<td>From 700 Nm up to 240000 Nm (6200 lb in ϖ 2124000 lb in)</td>
<td>-ON/OFF -MODULATING</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Acting</td>
<td>HS</td>
<td>From 700 Nm up to 250000 Nm (6200 lb in ϖ 2212000 lb in)</td>
<td>-ON/OFF -MODULATING</td>
</tr>
<tr>
<td>Rack and Pinion</td>
<td>Hydraulic</td>
<td>Double Acting</td>
<td>SA-HDA</td>
<td>From 100 Nm up to 3000 Nm (880 lb in ϖ 26500 lb in)</td>
<td>-SUBSEA ON/OFF ACTUATOR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Single Acting</td>
<td>SA-HSA</td>
<td>From 100 Nm up to 3000 Nm (880 lb in ϖ 26500 lb in)</td>
<td>-SUBSEA ON/OFF ACTUATOR</td>
</tr>
</tbody>
</table>

### MANUAL GEAR OPERATORS

<table>
<thead>
<tr>
<th>Mechanism Type</th>
<th>Actuators Series</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Worm Gear</td>
<td>TMG</td>
<td>-STANDARD SERVICE</td>
</tr>
<tr>
<td></td>
<td>SMG</td>
<td>-OFF-SHORE SERVICE (2) (3)</td>
</tr>
<tr>
<td>Straight-toothed Spur-gears</td>
<td>SD</td>
<td>-OFF-SHORE SERVICE (3)</td>
</tr>
</tbody>
</table>

**Notes:**
- (1) : on request, pneumatic cylinders materials according to NACE MR 0175 (for Sour Gas service).
- (2) : provided with hand-wheel, for divers operations.
- (3) : for divers and/or R.O.V. operations (R.O.V. interface according to API 17D).
ABV
Series PD, PS, HD, DS
Standard Scotch Yoke Actuators
Modular Assembly

**ABV** scotch-yoke actuators share a modular design and assembly, with considerable advantages with regard to the economic and productive aspects. The scotch-yoke mechanism (symmetric or canted) is fully contained in a housing, which is available in different standard sizes. According to specific needs, a hydraulic or pneumatic cylinder, and if necessary a spring cartridge for emergency operations (on spring-return actuators), can be connected to the left or to the right side of the housing.

On customer’s request, all **ABV** actuators may be provided with a suitable manual control, consisting handwheel or a hydraulic handpump.

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.
ABV Compact Type actuators Series C are economical, lightweight and low maintenance pneumatic actuators, particularly designed to operate quarter-turn valves characterized by medium-low torque values. ABV Compact Type actuators are available with double-acting cylinders (Series CD) or with single-acting cylinders (Series CS), and they may be provided with jackscrew manual override (as an optional), to satisfy any customer’s requirement. In order to achieve a high level of flexibility, Series C actuators are provided with a dual valve mounting interface that allows to change the failure mode simply upsetting the whole actuator (see figure above), with no need to disassembly. At last, as for the other ABV standard actuators, Compact Type actuators Series C can be installed parallel or perpendicular with regard to the flow line, and in a vertical or horizontal plane.
Scotch-Yoke vs. Rack and Pinion Mechanism

In the diagram plotted beside, the output torque curves for different types of quarter-turn valve actuators are shown. For explanation purposes, all the graphs refer to the opening conditions of ball valve and double-acting actuators.

The curve 1 is relevant to a rack and pinion actuator: the output torque remains constant independently from the angular position of the valve stem connection. Furthermore, the curve 2 is typical of a symmetric scotch-yoke actuator, while the curve 3 is relevant to a canted scotch-yoke actuator.

Considering the typical trend of a ball valve opening torque (curve 4), it should be clear that scotch-yoke actuators are particularly suitable for automatic control of this type of valves. In particular, a symmetric scotch-yoke is convenient for small size valves, characterized by low break-to-open/running torque ratios. For large size valves, with high break-to-open/running torque ratios, the use of a canted scotch-yoke is preferable.
ABV Codes for Scotch-Yoke Actuators
Series CD and CS

<table>
<thead>
<tr>
<th>Operating Fluid</th>
<th>Acting Type</th>
<th>Body Size (Torque Arm)</th>
<th>Yoke Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Code</td>
<td>Code</td>
<td>Code</td>
<td>Code</td>
</tr>
<tr>
<td>C = Pneumatic</td>
<td>S = Single Acting</td>
<td>1, 2, 3</td>
<td>N = Symmetric Yoke</td>
</tr>
<tr>
<td>D = Double acting</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code Description</th>
<th>Code Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A = low pressure (up to 12 barg), NBR</td>
<td>D1 = double acting actuator</td>
</tr>
<tr>
<td>B = low pressure (up to 12 barg), Viton®</td>
<td>M1, ..., M4 = single acting actuator</td>
</tr>
<tr>
<td>C = low pressure (up to 12 barg), Fluorosilicon</td>
<td></td>
</tr>
</tbody>
</table>

Manual Override

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>no manual override</td>
</tr>
<tr>
<td>J1</td>
<td>manual override with screw</td>
</tr>
<tr>
<td>J2</td>
<td>manual override with screw and handwheel</td>
</tr>
</tbody>
</table>

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.
ABV Codes for Scotch-Yoke Actuators
Series PD/PS and HD/HS

<table>
<thead>
<tr>
<th>Operating Fluid</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>P</td>
<td>Pneumatic</td>
</tr>
<tr>
<td>H</td>
<td>H</td>
<td>Hydraulic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Acting Type</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>S</td>
<td>Single Acting</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
<td>Double acting</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Body Size</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, ..., 7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yoke Design</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>S</td>
<td>Simmetric Yoke</td>
</tr>
<tr>
<td>A</td>
<td>A</td>
<td>Canted Yoke</td>
</tr>
</tbody>
</table>

**PS2/S-A/060/C1-W1**

<table>
<thead>
<tr>
<th>Service and Seals Material</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A</td>
<td>low pressure (up to 12 barg), NBR</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
<td>low pressure (up to 12 barg), Viton®</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
<td>low pressure (up to 12 barg), Fluorosilicon</td>
</tr>
<tr>
<td>M</td>
<td>M</td>
<td>medium pressure (from 13 up to 103 barg), NBR</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
<td>medium pressure (from 13 up to 103 barg), Viton®</td>
</tr>
<tr>
<td>P</td>
<td>P</td>
<td>medium pressure (from 13 up to 103 barg), Fluorosilicon</td>
</tr>
<tr>
<td>Q</td>
<td>Q</td>
<td>medium-high pressure (from 104 up to 207 barg), NBR</td>
</tr>
<tr>
<td>R</td>
<td>R</td>
<td>medium-high pressure (from 104 up to 207 barg), Viton®</td>
</tr>
<tr>
<td>T</td>
<td>T</td>
<td>medium-high pressure (from 104 up to 207 barg), Fluorosilicon</td>
</tr>
<tr>
<td>U</td>
<td>U</td>
<td>high pressure (from 208 up to 345 barg), NBR</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>high pressure (from 208 up to 345 barg), Viton®</td>
</tr>
<tr>
<td>Y</td>
<td>Y</td>
<td>high pressure (from 208 up to 345 barg), Fluorosilicon</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cylinder Size</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring Container Size</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>D1</td>
<td>Double Acting Actuator</td>
</tr>
<tr>
<td>O1, O2, ...</td>
<td>O1</td>
<td>Fail Open Actuator</td>
</tr>
<tr>
<td>C1, C2, ...</td>
<td>C1</td>
<td>Fail Close Actuator</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manual Override</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>00</td>
<td>no manual override</td>
</tr>
<tr>
<td>J1</td>
<td>J1</td>
<td>manual override with screw</td>
</tr>
<tr>
<td>J2</td>
<td>J2</td>
<td>manual override with screw and handwheel</td>
</tr>
<tr>
<td>W1</td>
<td>W1</td>
<td>manual override by handwheel</td>
</tr>
<tr>
<td>W2</td>
<td>W2</td>
<td>manual override by declutchable handwheel</td>
</tr>
<tr>
<td>H1</td>
<td>H1</td>
<td>manual override by hydraulic pump (single acting actuators)</td>
</tr>
<tr>
<td>H2</td>
<td>H2</td>
<td>manual override by hydraulic pump (double acting actuators)</td>
</tr>
</tbody>
</table>

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.
ABV Actuators - Name Plate

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.

© ABV. No part of this document can be reproduced without ABV written authorization. -Rev. 2.0-
ABV
Series CS and CD
Compact Type
Pneumatic Actuators

MAIN FEATURES

• Output torque up to 2500 Nm (22100 lb in)
• Operating pressure up to 12 bar (174 psi)
• Suitable to operate quarter turn valves (i.e. ball, butterfly type)
• Nodular cast iron housing, weatherproof type
• Die cast aluminium piston, for weight limitation
• Centre Chromium plated guide bar, to guide the piston throughout its stroke, for alignment, transversal thrust support purposes and tightening of the cylinder
• Electroless nickel plated cylinder tube to assure perfect dynamic seal, corrosion resistance and low friction
• Floating type piston seal to guarantee minimum wear and minimum friction avoiding stick slip effect
• On request, possibility to have mechanical manual override (by handwheel)
• Dual valve mounting interface, so to change the failure mode simply upsetting the whole actuator
## ABV Actuators Series CS
### Part List and Typical Materials

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Material</th>
<th>Part No.</th>
<th>Description</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Housing</td>
<td>Nodular Cast Iron</td>
<td>14</td>
<td>Cap Screw</td>
<td>Alloy Steel</td>
</tr>
<tr>
<td>2</td>
<td>Yoke</td>
<td>Nodular Cast Iron</td>
<td>15</td>
<td>Cap Nut</td>
<td>Alloy Steel</td>
</tr>
<tr>
<td>3</td>
<td>Piston</td>
<td>Die Cast Aluminium</td>
<td>16</td>
<td>Nut</td>
<td>Steel</td>
</tr>
<tr>
<td>4</td>
<td>Guide Bar</td>
<td>Alloy Steel (1)</td>
<td>17</td>
<td>Seal</td>
<td>Steel + NBR</td>
</tr>
<tr>
<td>5</td>
<td>Cylinder</td>
<td>Carbon Steel (2)</td>
<td>18</td>
<td>Seal</td>
<td>Steel + NBR</td>
</tr>
<tr>
<td>6</td>
<td>End Flange</td>
<td>Carbon Steel</td>
<td>19</td>
<td>Seal</td>
<td>Steel + NBR</td>
</tr>
<tr>
<td>7</td>
<td>Torque Shaft</td>
<td>Alloy Steel</td>
<td>20</td>
<td>O-Ring</td>
<td>NBR</td>
</tr>
<tr>
<td>8</td>
<td>Stop Setting Screw</td>
<td>Alloy Steel</td>
<td>21</td>
<td>Sliding Ring</td>
<td>PTFE</td>
</tr>
<tr>
<td>9</td>
<td>Nut</td>
<td>Steel</td>
<td>22</td>
<td>O-Ring</td>
<td>NBR</td>
</tr>
<tr>
<td>10</td>
<td>Cap Nut</td>
<td>Steel</td>
<td>23</td>
<td>O-Ring</td>
<td>NBR</td>
</tr>
<tr>
<td>11</td>
<td>Spring</td>
<td>Chrome Alloy</td>
<td>24</td>
<td>O-Ring</td>
<td>NBR</td>
</tr>
<tr>
<td>12</td>
<td>Guide Pin</td>
<td>Alloy Steel</td>
<td>25</td>
<td>O-Ring</td>
<td>NBR</td>
</tr>
<tr>
<td>13</td>
<td>Thrust Plug</td>
<td>Bronze</td>
<td>26</td>
<td>Bug Screen</td>
<td>Brass</td>
</tr>
</tbody>
</table>

*Notes:*

(1) : Chromium plated.
(2) : ENP 25 microns thickness.

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.

© ABV. No part of this document can be reproduced without ABV written authorization. -Rev. 2.0-
ABV
Series CD
Compact Type
Double Acting
Pneumatic Actuators

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Material</th>
<th>Part No.</th>
<th>Description</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Housing</td>
<td>Nodular Cast Iron</td>
<td>13</td>
<td>Cap Screw</td>
<td>Alloy Steel</td>
</tr>
<tr>
<td>2</td>
<td>Yoke</td>
<td>Nodular Cast Iron</td>
<td>14</td>
<td>Cap Nut</td>
<td>Alloy Steel</td>
</tr>
<tr>
<td>3</td>
<td>Piston</td>
<td>Die Cast Aluminium</td>
<td>15</td>
<td>Nut</td>
<td>Steel</td>
</tr>
<tr>
<td>4</td>
<td>Guide Bar</td>
<td>Alloy Steel (1)</td>
<td>16</td>
<td>Seal</td>
<td>Steel + NBR</td>
</tr>
<tr>
<td>5</td>
<td>Cylinder</td>
<td>Carbon Steel (2)</td>
<td>17</td>
<td>Seal</td>
<td>Steel + NBR</td>
</tr>
<tr>
<td>6</td>
<td>End Flange</td>
<td>Carbon Steel</td>
<td>18</td>
<td>Seal</td>
<td>Steel + NBR</td>
</tr>
<tr>
<td>7</td>
<td>Torque Shaft</td>
<td>Alloy Steel</td>
<td>19</td>
<td>O-Ring</td>
<td>NBR</td>
</tr>
<tr>
<td>8</td>
<td>Stop Setting Screw</td>
<td>Alloy Steel</td>
<td>20</td>
<td>Sliding Ring</td>
<td>PTFE</td>
</tr>
<tr>
<td>9</td>
<td>Nut</td>
<td>Steel</td>
<td>21</td>
<td>O-Ring</td>
<td>NBR</td>
</tr>
<tr>
<td>10</td>
<td>Cap Nut</td>
<td>Steel</td>
<td>22</td>
<td>O-Ring</td>
<td>NBR</td>
</tr>
<tr>
<td>11</td>
<td>Guide Pin</td>
<td>Alloy Steel</td>
<td>23</td>
<td>O-Ring</td>
<td>NBR</td>
</tr>
<tr>
<td>12</td>
<td>Thrust Plug</td>
<td>Bronze</td>
<td>24</td>
<td>O-Ring</td>
<td>NBR</td>
</tr>
</tbody>
</table>

Notes:
(1): Chromium plated.
(2): ENP 25 microns thickness.

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.

© ABV. No part of this document can be reproduced without ABV written authorization. -Rev. 2.0-
ABV
Series CD and CS
Compact Type
Pneumatic Actuators
Coupling Dimensions

Scotch Yoke shown in position labelled "0°".

<table>
<thead>
<tr>
<th>Actuator</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>D (mm)</th>
<th>C (mm)</th>
<th>Q (mm)</th>
<th>SC</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1 – CD1</td>
<td>57.2</td>
<td>25</td>
<td>19</td>
<td>22</td>
<td>16 (square)</td>
<td>No.4 threaded holes 5/16&quot;-18UNC x9.7mm deep</td>
</tr>
<tr>
<td>CS2 – CD2</td>
<td>76.2</td>
<td>25</td>
<td>19</td>
<td>28</td>
<td>22 (square)</td>
<td>No.4 threaded holes 3/8&quot;-16UNC x12.7mm deep</td>
</tr>
<tr>
<td>CS3 – CD3</td>
<td>88.9</td>
<td>38</td>
<td>28</td>
<td>38</td>
<td>28 (square)</td>
<td>No.4 threaded holes 1/2&quot;-13UNC x12.7mm deep</td>
</tr>
</tbody>
</table>

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.

© ABV. No part of this document can be reproduced without ABV written authorization. -Rev. 2.0-
ABV Series PS
Scotch-Yoke Spring Return Pneumatic Actuators

DESCRIPTION
1. Yoke
2. Yoke Bushing
3. Piston Rod
4. Housing
5. Thrust Bar
6. Sliding Block
7. Bushing
8. Seal
9. Tie-Rod
10. Cylinder Tube
11. Piston
12. O-Ring
13. Sliding Ring
14. End Flange
15. Stop Setting Screw
16. Bushing
17. Spring
18. Spring Cartridge
19. Bushing
20. Stop Setting Screw
21. O-Ring

MAIN FEATURES
- Output torque up to 250000 Nm (1)
- Operating pressure up to 12 bar (1)
- Suitable to operate quarter turn valves (i.e. ball, butterfly type) where an emergency action (by spring) in case of supply failure is required
- Fabricated carbon steel housing weatherproof type
- Chromium plated guide bar for alignment and transversal thrust support purposes
- Bronze bushings and slidings to guarantee high efficiency and self lubricating
- Chromium plated piston rod to assure perfect dynamic seal, corrosion resistance and low friction
- Electroless nickel plated cylinder tube to assure perfect dynamic seal, corrosion resistance and low friction
- Floating type piston seal to guarantee minimum wear and minimum friction avoiding stick slip effect
- Totally welded spring container for maximum safety and long life spring design
- On request, possibility to have mechanical (by handweel) or hydraulic manual override (by pump)

(1) : Special actuators are available on request.

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.
ABV
Series PD
Scotch-Yoke
Double Acting
Pneumatic Actuators

DESCRIPTION
1. Yoke
2. Yoke Bushing
3. Piston Rod
4. Housing
5. Thrust Bar
6. Sliding Block
7. Bushing
8. Seal
9. Tie-Rod
10. Cylinder Tube
11. Piston
12. O-Ring
13. Sliding Ring
14. Head Flange
15. End Flange
16. Stop Setting Screw
17. Stop Setting Screw
18. O-Ring

MAIN FEATURES
- Output torque up to 250000 Nm (1)
- Operating pressure up to 12 bar (1)
- Suitable to operate quarter turn valves (i.e. ball, butterfly type)
- Fabricated carbon steel housing weatherproof type
- Chromium plated guide bar for alignment and transversal thrust support purposes
- Bronze bushings and slidings to guarantee high efficiency and self-lubricating
- Chromium plated piston rod to assure perfect dynamic seal, corrosion resistance and low friction
- Electroless nickel plated cylinder tube to assure perfect dynamic seal, corrosion resistance and low friction
- Floating type piston seal to guarantee minimum wear and minimum friction avoiding stick slip effect
- On request, possibility to have mechanical (by handwheel) or hydraulic manual override (by pump)

(1) : Special actuators are available on request.
ABV
Series HD
Scotch-Yoke
Double Acting
Hydraulic Actuators

DESCRIPTION

1. Yoke
2. Yoke Bushing
3. Piston Rod
4. Housing
5. Thrust Bar
6. Sliding Block
7. Bushing
8. Seal
9. Tie-Rod
10. Cylinder
11. Piston
12. Seal
13. Sliding Ring
14. Head Flange
15. End Flange
16. Stop Setting Screw
17. Stop Setting Screw
18. O-Ring

MAIN FEATURES

- Output torque up to 250,000 Nm (1)
- Operating pressure up to 210 bar (1)
- Suitable to operate quarter turn valves (i.e. ball, butterfly type)
- Fabricated carbon steel housing weatherproof type
- Chromium plated guide bar for alignment and transversal thrust support purposes
- Bronze bushings and slidings to guarantee high efficiency and self lubricating
- Chromium plated piston rod to assure perfect dynamic seal, corrosion resistance and low friction
- Electroless nickel plated cylinder tube to assure perfect dynamic seal, corrosion resistance and low friction
- PTFE/rubber piston seal type to guarantee minimum wear and minimum friction avoiding stick slip effect
- On request, possibility to have hydraulic manual override (by pump)

(1) : Special actuators are available on request.
ABV
Series HS
Scotch-Yoke
Spring Return
Hydraulic Actuators

**DESCRIPTION**

1. Yoke
2. Yoke Bushing
3. Piston Rod
4. Housing
5. Thrust Bar
6. Sliding Block
7. Bushing
8. Seal
9. Tie-Rod
10. Cylinder
11. Piston
12. Seal
13. Sliding Ring
14. Head Flange
15. End Flange
16. Stop Setting Screw
17. O-Ring
18. Bushing
19. Spring
20. Spring Cartridge
21. Bushing
22. Stop Setting Screw

**MAIN FEATURES**

- Output torque up to 250000 Nm (1)
- Operating pressure up to 210 bar (1)
- Suitable to operate quarter turn valves (i.e. ball, butterfly type) where an emergency action (by spring) in case of supply failure is required
- Fabricated carbon steel housing weatherproof type
- Chromium plated guide bar for alignment and transversal thrust support purposes
- Bronze bushings and slidings to guarantee high efficiency and self lubricating
- Chromium plated piston rod to assure perfect dynamic seal, corrosion resistance and low friction
- Electroless nickel plated cylinder tube to assure perfect dynamic seal, corrosion resistance and low friction
- PTFE/rubber piston seal type to guarantee minimum wear and minimum friction avoiding stick slip effect
- Totally welded spring container for maximum safety and long life spring design
- On request, possibility to have hydraulic manual override (by pump)

(1) : Special actuators are available on request.

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.
ABV
Series PD, PS, HD, DS
Standard Scotch Yoke Actuators
Coupling Dimensions

P = Maximum Stem Insertion

<table>
<thead>
<tr>
<th>Actuator</th>
<th>FL (mm)</th>
<th>SD (mm)</th>
<th>U (mm)</th>
<th>T (mm)</th>
<th>P (mm)</th>
<th>SC</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS1 – PD1</td>
<td>254</td>
<td>50</td>
<td>14</td>
<td>53.8</td>
<td>120</td>
<td>No.8 threaded holes M16</td>
</tr>
<tr>
<td>PS2 – PD2</td>
<td>254</td>
<td>65</td>
<td>18</td>
<td>69.4</td>
<td>120</td>
<td>No.8 threaded holes M16</td>
</tr>
<tr>
<td>PS3 – PD3</td>
<td>350</td>
<td>110</td>
<td>32</td>
<td>116.4</td>
<td>155</td>
<td>No.8 threaded holes M20</td>
</tr>
<tr>
<td>PS5 – PD5</td>
<td>356</td>
<td>130</td>
<td>32</td>
<td>137.4</td>
<td>195</td>
<td>No.8 threaded holes M30</td>
</tr>
<tr>
<td>PS6 – PD6</td>
<td>406</td>
<td>150</td>
<td>36</td>
<td>169.4</td>
<td>250</td>
<td>No.8 threaded holes M36</td>
</tr>
<tr>
<td>PS7 – PD7</td>
<td>483</td>
<td>170</td>
<td>40</td>
<td>179.4</td>
<td>285</td>
<td>No.12 threaded holes M36</td>
</tr>
<tr>
<td>HS1 – HD1</td>
<td>254</td>
<td>50</td>
<td>14</td>
<td>53.8</td>
<td>120</td>
<td>No.8 threaded holes M16</td>
</tr>
<tr>
<td>HS2 – HD2</td>
<td>254</td>
<td>65</td>
<td>18</td>
<td>69.4</td>
<td>120</td>
<td>No.8 threaded holes M16</td>
</tr>
<tr>
<td>HS3 – HD3</td>
<td>350</td>
<td>110</td>
<td>32</td>
<td>116.4</td>
<td>155</td>
<td>No.8 threaded holes M20</td>
</tr>
<tr>
<td>HS5 – HD5</td>
<td>356</td>
<td>130</td>
<td>32</td>
<td>137.4</td>
<td>195</td>
<td>No.8 threaded holes M30</td>
</tr>
<tr>
<td>HS6 – HD6</td>
<td>406</td>
<td>150</td>
<td>36</td>
<td>169.4</td>
<td>250</td>
<td>No.8 threaded holes M36</td>
</tr>
<tr>
<td>HS7 – HD7</td>
<td>483</td>
<td>170</td>
<td>40</td>
<td>179.4</td>
<td>285</td>
<td>No.12 threaded holes M36</td>
</tr>
</tbody>
</table>

- Other dimensions are available on demand.

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.

© ABV. No part of this document can be reproduced without ABV written authorization.
ABV
Series SA-HDA - Double Acting
Series SA-HSA - Single Acting

Sub-sea Rack and Pinion Hydraulic Actuators

**MAIN FEATURES**

- Output torque up to 10000 N·m (1)
- Operating pressure up to 210 bar (1)
- Suitable to operate quarter turn valves (i.e. ball, butterfly type)
- Design life 30 years
- Operable by R.O.V. (R.O.V. interface according to API 17D)
- Manual override on request
- Mechanical/Tactile valve position indicator (remote on request)
- Separate flushing ports
- Fully pressure equalization to assure complete internal corrosion protection, and to obtain the required performances at every operating depth
- Possibility of installing the actuator on the valve by means of diver or R.O.V. assistance
- Pressure containing parts according to ASME VIII
- Power hydraulic oil cleanness according to NAS 6

(1) : Special actuators are available on request.
ABV
Series SA-HDA
Double Acting
Sub-sea Hydraulic Actuators

**DESCRIPTION**

1. R.O.V. Interface
2. Seal
3. R.O.V. Shaft
4. Screw
5. Flange
6. Bushing
7. Pin
8. Gear Housing
9. Bushing
10. O-Ring
11. Gear Shaft
12. Actuator Housing
13. Bushing
14. O-Ring
15. Pinion
16. Bushing
17. O-Ring
18. O-Ring
19. Screw
20. Gear
21. Bushing
22. O-Ring
23. Gear Cover
24. Position Indicator
25. Seal
26. Shaft
27. Cylinder Plug
28. Cylinder
29. Piston
30. Screw
31. O-Ring
32. Bushing
33. Rack
34. Sleeding Ring
35. Screw
36. Seal
37. O-Ring
38. Stopper
Scheme H-D00-001-00-Q-0
Control System for Hydraulic Double Acting Actuator Series HD

DESCRIPTION
1. Mechanism
2. Limit Switches Enclosure
3. Hydraulic Cylinder
4. Unidirectional Flow Regulator
5. 4/2 Solenoid Valve
6. Pressure Gauge
7. Filter
8. Stop Valve
9. Check Valve
10. Control Panel

CONNECTIONS

X = Oil Supply Line
J = Oil Return Line
Y = Electric Connection to Limit Switches Enclosure
Z = Electric Connection to Coil of Solenoid Valve

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.
**Scheme H-SC0-001-00-C-0**

Control System for
Hydraulic Single Acting Actuator Series HS

**DESCRIPTION**

1. Mechanism
2. Limit Switches Enclosure
3. Filter Regulator with Gauge
4. Silencer
5. 3/2 Manual Valve
6. 5/2 Spring Return Pneumatic Solenoid Valve
7. Unidirectional Flow regulator
8. Control Panel

**CONNECTIONS**

- **X1** = Oil Supply Line
- **X2** = Oil Return Line
- **J** = Oil Supply Line to Actuator
- **Y** = Electric Connection to Limit Switches Enclosure
- **Z** = Electric Connection to Coil of Solenoid Valve

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.

© ABV. No part of this document can be reproduced without ABV written authorization. -Rev. 2.0-
Scheme P-D00-001-00-C-0
Control System for
Pneumatic Double Acting Actuator Series PD

DESCRIPTION
1. Mechanism
2. Limit Switches Enclosure
3. Filter Regulator with Gauge
4. Silencer
5. 3/2 Manual Valve
6. 5/2 Spring Return Pneumatic Solenoid Valve
7. Unidirectional Flow Regulator
8. Control Panel

CONNECTIONS
X = Pneumatic Supply
Y = Electric Connection to Limit Switches Enclosure
Z = Electric Connection to Coil of Solenoid Valve

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.
Scheme P-SC0-004-00-C-0
Control System for Pneumatic Single Acting Actuator Series PS

DESCRIPTION

1. Mechanism
2. Pneumatic Cylinder
3. Spring Enclosure
4. Limit Switches Enclosure
5. Filter Regulator with Gauge
6. Silencer
7. 3/2 Solenoid Valve
8. Unidirectional Flow Regulator
9. 3/2 Manual Valve
10. Quick Exhaust Valve
11. Flow Regulator
12. Control Panel

CONNECTIONS

X = Pneumatic Supply
Y = Electric Connection to Limit Switches Enclosure
Z = Electric Connection to Coil of Solenoid Valve
Scheme K-D00-002-00-Q-0
Control System for Gas-over-Oil Actuator
Local/Remote Control and Storage Tank

DESCRIPTION
1. Hydraulic Actuator
3. Gas/Hydraulic Tank
4. 3-Way Valve, with Manual Override
5. 3-Way Valve, with Manual Override
6. Selector Valve for manual Pump
7. Speed Control Valve
9. Handpump

10. Filter Dehydrator
15. End of Stroke Valve
21. Check Valve
22. Volume Tank
23. Relief Valve
24. Pressure Reducer
65. Relief Valve
70. Junction Box

© ABV. No part of this document can be reproduced without ABV written authorization. -Rev. 2.0-

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.
Scheme K-D00-001-00-Q-0
Control System for Gas-over-Oil Actuator
Local Control and Mechanical Line Break System

DESCRIPTION

1. Hydraulic Actuator
2. Gas/Hydraulic Tank
3. 3-Way Valve, with Manual Override
4. 3-Way Valve, Manual/Pilot
5. Selector Valve for manual Pump
6. Speed Control Valve
7. Handpump
8. Filter Dehydrator
9. End of Stroke Valve
10. Check Valve
11. Pre-Filter
12. Relief Valve
13. Pressure Reducer
14. Restrictor
15. Tank Drain Valve
16. Rate Tank
17. Pipeline Isolation Valve
18. Filter Dehydrator
19. Check Valve
20. Restrictor
21. Tank Drain Valve
22. Rate Tank
23. Relief Valve
24. Pressure Reducer
25. Differential Pressure Pilot

A = LINE BREAK GROUP
B = ACTUATOR PNEUMATIC CONTROL GROUP
C = HYDRAULIC PUMP GROUP

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.

© ABV. No part of this document can be reproduced without ABV written authorization.
### ABV Series TMG
Manual Gear Operators
Worm Gear Operators

**DESCRIPTION**

1. Body
2. Coverplate
3. Gear
4. Position Indicator
5. Worm
6. Shaft
7. Set Screw
8. Seal
9. Bushing
10. Needle-Bearing
11. Grease
12. Gasket
13. Gear
14. Seal
15. Gasket
16. Gasket
17. Seal

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.
ABV
Series SMG
Manual Gear Operators
Sub-sea Worm Gear Operators

DESCRIPTION

1. Body
2. Coverplate
3. Quadrant
4. Visual-Tactile Position indicator
5. Worm
6. Shaft
7. Set Screw
8. Seal
9. Bushing
10. Needle-Bearing
11. Protective Oil
12. Gasket
13. Gear
14. Seal
15. Gasket
16. O-Ring
17. O-Ring
18. Seal
19. O-Ring
20. O-Ring
21. Set Screw Cover

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.

© ABV. No part of this document can be reproduced without ABV written authorization. -Rev. 2.0-
How to contact us

ABV S.r.l.
Via di Coselli, 13/15
55060 Coselli
Lucca, ITALY

Phone  ++39 0583 403587
Fax      ++39 0583 949920

E-mail:  info@abvvalves.com
Web site:  www.abvvalves.com

Contacts:
Mr. Luca Marianetti
MANAGING DIRECTOR
**ABV Conversions Tables**

### LENGTH EQUIVALENTS

<table>
<thead>
<tr>
<th>METERS</th>
<th>INCHES</th>
<th>FEET</th>
<th>MILLIMETERS</th>
<th>Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>METERS</td>
<td>1</td>
<td>39.37</td>
<td>3.2808</td>
<td>1000</td>
</tr>
<tr>
<td>INCHES</td>
<td>0.0254</td>
<td>1</td>
<td>0.0833</td>
<td>25.4</td>
</tr>
<tr>
<td>FEET</td>
<td>0.3048</td>
<td>12</td>
<td>1</td>
<td>304.8</td>
</tr>
<tr>
<td>MILLIMETERS</td>
<td>0.0001</td>
<td>0.03937</td>
<td>0.0032808</td>
<td>1</td>
</tr>
<tr>
<td>MILES</td>
<td>1609.35</td>
<td>63360</td>
<td>5280</td>
<td>1609350</td>
</tr>
</tbody>
</table>

### FORCE EQUIVALENTS

<table>
<thead>
<tr>
<th>FORCE-KILOGRAMS, kg</th>
<th>N</th>
<th>lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>9.80665</td>
<td>2.204623</td>
</tr>
<tr>
<td>NEWTONS, N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.101972</td>
<td>1</td>
<td>0.224809</td>
</tr>
<tr>
<td>POUNDS, lb</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.453592</td>
<td>4.44822</td>
<td>1</td>
</tr>
</tbody>
</table>

### PRESSURE EQUIVALENTS

<table>
<thead>
<tr>
<th>kg/cm²</th>
<th>lb/in²</th>
<th>atm</th>
<th>bar</th>
<th>In. of Hg</th>
<th>kPa</th>
<th>In. of H₂O</th>
<th>Ft. of H₂O</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg/cm²</td>
<td>1</td>
<td>0.9678</td>
<td>0.98067</td>
<td>28.96</td>
<td>98.067</td>
<td>394.05</td>
<td>32.84</td>
</tr>
<tr>
<td>lb/in²</td>
<td>0.07031</td>
<td>1</td>
<td>0.06804</td>
<td>0.06895</td>
<td>2.036</td>
<td>6.895</td>
<td>27.7</td>
</tr>
<tr>
<td>atm</td>
<td>1.0332</td>
<td>14.696</td>
<td>1</td>
<td>0.01325</td>
<td>29.92</td>
<td>101.325</td>
<td>407.14</td>
</tr>
<tr>
<td>bar</td>
<td>1.01972</td>
<td>14.5038</td>
<td>0.98692</td>
<td>1</td>
<td>29.53</td>
<td>100</td>
<td>402.156</td>
</tr>
<tr>
<td>In. of Hg</td>
<td>0.03453</td>
<td>0.4912</td>
<td>0.03342</td>
<td>0.033864</td>
<td>1</td>
<td>3.3864</td>
<td>13.61</td>
</tr>
<tr>
<td>kPa</td>
<td>0.0101972</td>
<td>0.145038</td>
<td>0.0098696</td>
<td>0.01</td>
<td>0.2953</td>
<td>1</td>
<td>4.02156</td>
</tr>
<tr>
<td>In. of H₂O</td>
<td>0.002538</td>
<td>0.0361</td>
<td>0.002456</td>
<td>0.00249</td>
<td>0.07349</td>
<td>0.249</td>
<td>1</td>
</tr>
</tbody>
</table>

### VOLUME EQUIVALENTS

<table>
<thead>
<tr>
<th>LITER, l</th>
<th>m³</th>
<th>U.S. gal</th>
<th>in³</th>
</tr>
</thead>
<tbody>
<tr>
<td>LITER, l</td>
<td>1</td>
<td>0.001</td>
<td>0.264172</td>
</tr>
<tr>
<td>CUBIC METER, m³</td>
<td>1000</td>
<td>1</td>
<td>264.172</td>
</tr>
<tr>
<td>U.S. galon, gal</td>
<td>3.785</td>
<td>0.0037854</td>
<td>1</td>
</tr>
<tr>
<td>CUBIC INCH, in³</td>
<td>0.016387</td>
<td>0.0000164</td>
<td>0.004329</td>
</tr>
</tbody>
</table>

Design and dimensions may be subject to change without notice, except the dimensions established by international standard specifications.

© ABV. No part of this document can be reproduced without ABV written authorization. -Rev. 3.0-
# ABV Conversions Tables

## TEMPERATURE CONVERSIONS

<table>
<thead>
<tr>
<th>Degrees Celsius (°C)</th>
<th>Degrees Fahrenheit (°F)</th>
<th>Kelvin (K)</th>
<th>Degrees Rankine (°R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-273.15</td>
<td>-459.7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>-250</td>
<td>-418</td>
<td>23.15</td>
<td>41.7</td>
</tr>
<tr>
<td>-200</td>
<td>-328</td>
<td>73.15</td>
<td>131.7</td>
</tr>
<tr>
<td>-150</td>
<td>-238</td>
<td>123.15</td>
<td>221.7</td>
</tr>
<tr>
<td>-100</td>
<td>-148</td>
<td>173.15</td>
<td>311.7</td>
</tr>
<tr>
<td>-90</td>
<td>-130</td>
<td>183.15</td>
<td>329.7</td>
</tr>
<tr>
<td>-80</td>
<td>-112</td>
<td>193.15</td>
<td>347.7</td>
</tr>
<tr>
<td>-70</td>
<td>-94</td>
<td>203.15</td>
<td>365.67</td>
</tr>
<tr>
<td>-60</td>
<td>-76</td>
<td>213.15</td>
<td>383.7</td>
</tr>
<tr>
<td>-50</td>
<td>-58</td>
<td>223.15</td>
<td>401.7</td>
</tr>
<tr>
<td>-40</td>
<td>-40</td>
<td>233.15</td>
<td>419.7</td>
</tr>
<tr>
<td>-30</td>
<td>-22</td>
<td>243.15</td>
<td>437.7</td>
</tr>
<tr>
<td>-20</td>
<td>-4</td>
<td>253.15</td>
<td>455.7</td>
</tr>
<tr>
<td>-17.8</td>
<td>0</td>
<td>255.37</td>
<td>459.67</td>
</tr>
<tr>
<td>-10</td>
<td>14</td>
<td>263.15</td>
<td>473.7</td>
</tr>
<tr>
<td>0</td>
<td>32</td>
<td>273.15</td>
<td>491.7</td>
</tr>
<tr>
<td>10</td>
<td>50</td>
<td>283.15</td>
<td>509.7</td>
</tr>
<tr>
<td>20</td>
<td>68</td>
<td>293.15</td>
<td>527.7</td>
</tr>
<tr>
<td>30</td>
<td>86</td>
<td>303.15</td>
<td>545.7</td>
</tr>
<tr>
<td>40</td>
<td>104</td>
<td>313.15</td>
<td>563.7</td>
</tr>
<tr>
<td>50</td>
<td>122</td>
<td>323.15</td>
<td>581.7</td>
</tr>
<tr>
<td>60</td>
<td>140</td>
<td>333.15</td>
<td>59.7</td>
</tr>
<tr>
<td>70</td>
<td>158</td>
<td>343.15</td>
<td>617.7</td>
</tr>
<tr>
<td>80</td>
<td>176</td>
<td>353.15</td>
<td>635.7</td>
</tr>
<tr>
<td>90</td>
<td>194</td>
<td>363.15</td>
<td>653.7</td>
</tr>
<tr>
<td>100</td>
<td>212</td>
<td>373.15</td>
<td>671.7</td>
</tr>
<tr>
<td>150</td>
<td>302</td>
<td>423.15</td>
<td>761.7</td>
</tr>
<tr>
<td>200</td>
<td>392</td>
<td>473.15</td>
<td>851.7</td>
</tr>
<tr>
<td>250</td>
<td>482</td>
<td>523.15</td>
<td>941.7</td>
</tr>
<tr>
<td>300</td>
<td>572</td>
<td>573.15</td>
<td>1031.7</td>
</tr>
<tr>
<td>350</td>
<td>662</td>
<td>623.15</td>
<td>1121.7</td>
</tr>
</tbody>
</table>

## TEMPERATURE CONVERSION FORMULAS

\[
\begin{align*}
(°\text{Celsius}) & = (\text{Kelvin}) - 273.15 \\
(°\text{Fahrenheit}) & = 1.8 \cdot (\text{Kelvin}) - 459.67 \\
(°\text{Fahrenheit}) & = 1.8 \cdot (°\text{Celsius}) + 32 \\
(°\text{Rankine}) & = 1.8 \cdot (\text{Kelvin})
\end{align*}
\]