series
500-2
2-Stage Servovalve
Rated flows up to 60 l/m

Features
Standard & high response versions
Maximum operating pressure 400 bar
ISO 10372-04-04-0-92 mounting pattern
Internal pilot supply (4 port)
Suitable for 3-way or 4-way applications
Low hysteresis & zero point drift
High spool drive forces
Spool in bushing design
Dry torque motor with mechanical feedback
Long life Sapphire Technology

Star Hydraulics Limited
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GL20 8SF
England (UK)

www.star-hydraulics.co.uk

ST-500-2-2016.1-En
**Benefits and Features**

**Sapphire ball in slot design**
- Incorporated into Star designs since 1988
- Many billions of cycles per service life
- Increased spool life due to spool rotation
- Ultra low coefficient of friction sapphire to steel
- Feedback mechanism unhindered by spool rotation
- Extended warranties available

**Safety**
- Flame proof
- Intrinsic safety
- Class, Div & Zone coverage
- Mechanical failsafe
- Double & triple coil redundancy

**Quality**
- Independant audit process is our commitment on quality
- Focus on customer needs and expectations
- Delivery schedules on time
- Continual improvements on products and services
- Maintaining design and manufacturing integrity

**Custom spool lap & bushing port geometries**
- Zero overlap
- Overlap (closed center)
- Underlap (open center)
- Dual gain
- Asymmetric gain

**Sapphire flow**
- Ensuring first stage stability
- Precisely matched flow properties
- Long life in extreme environments

**Special connectors**
- MIL-C-5015
- MIL-DTL-38999
- Conduit style male/female
- Hermetic

**Special projects**
- Compact servo designs
- Special interfaces
- Modular components

**Sealing materials**
- Nitrile
- Fluorocarbon (Viton)
- Ethylene-Propylene
- Fluorosilicone

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**Safety**

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**Sealing materials**

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**Special connectors**

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**Custom spool lap & bushing port geometries**

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**Safety**

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**Sealing materials**

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**Special connectors**

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**Custom spool lap & bushing port geometries**

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**Safety**

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**Sealing materials**

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**Special connectors**
## Technical data

### Hydraulic

<table>
<thead>
<tr>
<th>Nominal flow ratings [%10] at 70 bar Δp</th>
<th>standard response</th>
<th>high response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2, 4, 10, 20, 40, 60 l/m</td>
<td>4, 10, 20, 40 l/m</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operating pressure (max) Ports</th>
<th>P, C1, C2</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seal material</td>
<td>NBR, FPM</td>
<td>400 bar</td>
</tr>
<tr>
<td></td>
<td>EPDM</td>
<td>350 bar</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fluid viscosity range (recommended)</th>
<th>10 to 100 mm²/s (cSt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid type</td>
<td>Mineral oil to ISO 11158, DIN 51524 or equivalent MIL-H-5606 Skydrol Kerosene Water glycols others on request</td>
</tr>
<tr>
<td>Filter rating (recommended) Pressure line</td>
<td>Beta 10 = 200 (10 µm abs), non by-pass &amp; indicator</td>
</tr>
<tr>
<td></td>
<td>Beta 2 = 1000 (2 µm abs)</td>
</tr>
<tr>
<td>Fluid cleanliness ISO 4406: 1999</td>
<td>minimum 16/ 14/ 11</td>
</tr>
<tr>
<td></td>
<td>recommended 15/ 13/ 10</td>
</tr>
</tbody>
</table>

### Operational parameters

<table>
<thead>
<tr>
<th>Hysteresis</th>
<th>≤ 3.0% without dither</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold</td>
<td>≤ 0.5% without dither</td>
</tr>
<tr>
<td>Null shift</td>
<td>ΔT 40°C ≤ 2.0%</td>
</tr>
</tbody>
</table>

| Internal leakage 140 bar supply (0.5% overlap) | ≤ 1.2 l/min |
| 2, 4, 10 l/m                                      | ≤ 1.6 l/min |

<table>
<thead>
<tr>
<th>Load pressure difference 1% input</th>
<th>≥ 30% of supply pressure can be as high as 100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response time 0-100% rated spool stroke</td>
<td>standard response 2, 4, 10, 20, 40 l/m 8 ms</td>
</tr>
<tr>
<td></td>
<td>60 l/m 13 ms</td>
</tr>
<tr>
<td></td>
<td>75 l/m 15 ms</td>
</tr>
<tr>
<td></td>
<td>high response 4, 10, 20 l/m 4.5 ms</td>
</tr>
<tr>
<td></td>
<td>40 l/m 6 ms</td>
</tr>
</tbody>
</table>

| Mounting pattern ISO 10372-04-0-92 without X port |
| Mounting position Any, fixed or movable |
| Weight std unit 2.3 kg |
| Design protection EN 60529 IP 65 |
| Shipping protection Sealed base plate |
| Vibration 30 g all axis, 5 Hz to 2,000 Hz |
| Shock 30 g all axis |
| Seal material options NBR, FPM, EPDM |
| Temperature range -30 to 135 °C |
# Technical data

## Electrical

<table>
<thead>
<tr>
<th>Rated input ± (mA)</th>
<th>single (differential)</th>
<th>8</th>
<th>15</th>
<th>30</th>
<th>40</th>
<th>100</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other coil rates available</td>
<td>single</td>
<td>4</td>
<td>7.5</td>
<td>15</td>
<td>20</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>series</td>
<td>8</td>
<td>15</td>
<td>30</td>
<td>40</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>parallel</td>
<td>8</td>
<td>15</td>
<td>30</td>
<td>40</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Coil resistance (Ω)</td>
<td>per coil</td>
<td>1000</td>
<td>200</td>
<td>300</td>
<td>80</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td>Power (W)</td>
<td>single</td>
<td>0.064</td>
<td>0.045</td>
<td>0.27</td>
<td>0.128</td>
<td>0.280</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>series</td>
<td>0.032</td>
<td>0.023</td>
<td>0.135</td>
<td>0.064</td>
<td>0.140</td>
<td>0.440</td>
</tr>
<tr>
<td></td>
<td>parallel</td>
<td>0.032</td>
<td>0.023</td>
<td>0.135</td>
<td>0.064</td>
<td>0.140</td>
<td>0.440</td>
</tr>
</tbody>
</table>

## Connector pin out identification

- A
- B
- C
- D

## Polarity P×C2, C1×R

- single: A +, B - or C +, D -
- series: A +, D -, B & C linked
- parallel: A & C linked +, B & D linked -

## Valve connector type

- MIL-C-5015
- MS3102E-14S-2P
- MS3106F-14S-2S

## Consult factory for more options

## Standard connector orientation

- P port
- also available over C1, C2 or R port; please advise when ordering
The flow tolerance for standard servovalves is ±10% of the rated flow at 100% rated input signal.

Rated Signal [In] is the specified input voltage or current of either polarity to produce rated flow. Rated input does not include null bias values.

Rated flow corresponds to the flow at rated input at 10 bar or 70 bar, with no load, therefore in 4-way valves there will be a pressure drop of 5 bar or 35 bar respectively across each land.

Load pressure difference versus input signal indicates typical differential pressure gain between ports C1 (A) and C2 (B) for standard lap spools. Negative and positive overlap change this characteristic significantly.

Internal leakage comprises of tare first stage and laminar leakage between spool and sleeve. With critical lap conditions in 4-way designs the leakage peaks through the null region.
Technical data

Std response Qn 2, 4, 10, 20, 40 l/m at 25% In, 210 bar

Std response Qn 2, 4, 10, 20, 40 l/m at 100% In, 210 bar

Std response Qn 60 l/m at 25% In, 210 bar

Std response Qn 60 l/m at 100% In, 210 bar
Technical data

- High response Qn 4, 10, 20 l/m at 25% In, 210 bar

- High response Qn 4, 10, 20 l/m at 100% In, 210 bar

- High response Qn 40 l/m at 25% In, 210 bar

- High response Qn 40 l/m at 100% In, 210 bar
### INSTALLATION DETAILS

**Mounting screws**
Skt head cap screws M8 x 50 - 10.9 ISO 4762

**Null adjust (Mechanical)**
- 2.5 hex skt & 10 A/F lock nut
- slacken lock nut (ccw) half-turn with 10 A/F ring spanner
- insert 2.5 hex key into socket and rotate to obtain required null / offset value
- hold hexagon key in desired position then tighten lock nut to 2 Nm

**Porting details**
P, C1, C2, R ports Ø9.0, Ø14.25 Ø1.40 on 23.8 P.C.D.

**Interface seals**
Ports P, C1, C2, R - ID 10.82 x Ø1.78 O-Ring

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**Mounting interface conforms to ISO 10372-04-0-0-92 (X port must not be used)**

<table>
<thead>
<tr>
<th></th>
<th>P</th>
<th>C1</th>
<th>C2</th>
<th>R</th>
<th>X</th>
<th>F1</th>
<th>F2</th>
<th>F3</th>
<th>F4</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>size</td>
<td>Ø9</td>
<td>Ø9</td>
<td>Ø9</td>
<td>Ø9</td>
<td>-</td>
<td>M8</td>
<td>M8</td>
<td>M8</td>
<td>M8</td>
<td>Ø3 5</td>
</tr>
<tr>
<td>x</td>
<td>22.25</td>
<td>11.14</td>
<td>33.35</td>
<td>22.25</td>
<td>-</td>
<td>0</td>
<td>44.50</td>
<td>44.50</td>
<td>0</td>
<td>12.35</td>
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<tr>
<td>y</td>
<td>21.39</td>
<td>32.50</td>
<td>32.50</td>
<td>43.61</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>65</td>
<td>65</td>
<td>19.80</td>
</tr>
</tbody>
</table>

Surface flat within 0.01 / 100 : finish better than 0.8 μm