Rexroth Cylinder for
Hydraulic Mold Oscillation (HMO)

Technical Information

Contents

Field of Application 2
Three different Types of HMO Cylinders 2
System Set-up 2
Technical Data of HMO Cylinders by Rexroth 2
Cylinder Program for the Mold Oscillation 3
Performance Range 4
Type Code 5
Some References 6
Example: High Performance Cylinder with protective air-cooled Cover 6
Additional Products and Services 7
System Overview – Mold Oscillation with Hydraulic Linear Drive 7
Predictive Analytics with ODiN 8
Field of Application

Position-controlled hydraulic linear drives allow the complete control of all oscillation variables during casting. Due to this control flexibility, different curve profiles may be applied to optimize the oscillation process. In addition, the amplitude and the oscillation frequency, can be varied together with the casting speed during casting.

Three different Types of HMO Cylinders

Depending on the application, Rexroth offers three types of tailor made HMO Cylinders:

- Basic Cylinders
- High Performance Cylinders (HPC)
- Servo Cylinders

For lower frequencies and velocities the Basic Cylinder is a cost-effective solution based on a Rexroth standard cylinder but with a special sealing kit for low friction and high dynamics. Additional guide rings support the cylinder rod in order to absorb moderate side loads.

For higher frequencies and velocities the High Performance Cylinder is a special cylinder with a pressure free sealing system for a very low and pressure independent friction. Due to its design the HPC is also able to absorb moderate side loads.

For very demanding mold systems with high side loads on the cylinder the Servo Cylinder with its pocket bearing is the perfect solution. With the pocket bearing this cylinder is almost friction free, generates minimum oil temperature and uses the hydraulic pressure to compensate highest side loads. Due to this special design the life time of this cylinder is extremely high.

System Set-up

The HMO Cylinders from Rexroth have a modular design and come as a plug and play solution. The hydraulic manifold is directly mounted on the cylinder including:

- Required proportional/servo valve
- Sensors (pressure, temperature)
- SAE flanges for pressure and return line with measuring points and standardized mounting pattern for the control valve
- Optional water-cooling
- Optional protection cover for the control valve and sensors
- Optional integrated hydraulic functions/components (accumulators, pressure relieve valves ...)

The cylinder design includes:

- Position transducer
- Different mounting styles available (Base Mount, Front or Rear Flange Mount, Front or Rear Trunnion Mount MF3, MF4 preferred, MT4 and MP5 optional)
- Optional air labyrinth sealing for harsh environments

Technical Data of HMO Cylinders by Rexroth

- Nominal pressure: up to 280 bar
- Working stroke: 20 up to 200 mm
- Maximum frequency: up to 50 Hz
- Velocity: up to 5 m/s
- Position measuring system with SSI output and up to 0,5 μm resolution

Depending on customer requirements, other technical specifications are possible.

The Technical Information shows example configurations. The product supplied may therefore differ from the figure shown.
Cylinder Program for the Mold Oscillation

<table>
<thead>
<tr>
<th>Hydraulic mold cylinders</th>
<th>Basic Cylinder</th>
<th>High Performance Cylinder</th>
<th>Servo Cylinder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sealing concept Rod</td>
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<td></td>
<td></td>
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<tr>
<td>Pressure profile</td>
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<tr>
<td>Sealing concept Piston</td>
<td></td>
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<tr>
<td>Bearing concept</td>
<td>Guide rings</td>
<td>Guide rings</td>
<td>Hydrostatic pocket bearing</td>
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<tr>
<td>Lateral force ability</td>
<td>moderate</td>
<td>moderate</td>
<td>high</td>
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<tr>
<td>Nominal pressure</td>
<td>250/350 bar depending on model range</td>
<td>280 bar</td>
<td>280 bar</td>
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<td>Seals</td>
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<td>pressure-compensated</td>
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<tr>
<td>Friction</td>
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<td>pressure independent, lateral force dependent</td>
<td>pressure independent, lateral force independent</td>
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<tr>
<td>Typical frequency</td>
<td>10 Hz</td>
<td>50 Hz</td>
<td>Servo valve limits over 200 Hz</td>
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<tr>
<td>Max. speed</td>
<td>1 m/s</td>
<td>2 m/s</td>
<td>5 m/s</td>
</tr>
</tbody>
</table>

Whether Basic Cylinders, High Performance Cylinders with pressure compensated seals or Servo Cylinders for very demanding applications – Hydraulic Mold Oscillation (HMO) Cylinders by Rexroth meet the most stringent requirements at all performance levels:

- High or extremely low piston velocities
- High frequencies
- Highest repeatability with integrated contactless position measuring systems
- Low-friction and virtually stick-slip free operation
- Absorption of lateral forces on the piston rod
- High dynamics and system stiffness due to the direct mounting of the control valves
- Suitable for harsh/casting environment
Performance Range

The HMO cylinder together with the servo valve is a crucial part in the closed loop system of the mold oscillation application.

In order to choose the right cylinder type and valve configuration the specialists from Rexroth apply sophisticated simulation programs to guarantee the smooth functioning of the oscillation process.
# Rexroth Cylinder for Hydraulic Mold Oscillation (HMO) | Technical Information

## Type Code

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</tbody>
</table>

### Mode of operation

1. **CG** Double rod cylinder
2. **CD** Single rod cylinder

### Industry solution

2. **H** Heavy Industry

### Type

2.1
- **L** Basic
- **H** High
- **S** Servo

### Types of mounting *

3. **MF3** Head flange
   - **MF4** Bottom flange
   - **MT4** Trunnion
   - **MP5** Swivel bearing

### Piston diameter

4. --- Piston diameter 50 up to 180 mm

### Piston rod diameter

5. --- Piston rod diameter 40 up to 125 mm

### Working stroke length (Working stroke = Total stroke − head-side and cap-side end position cushioning)

6. --- Working stroke length in mm

### Series

7. **2X** Head and base screwed in (in the tube)

### Mounting pattern for control valves according to ISO 4401

8. **W** Without (only with adapter plate)
   - **P** Size 6
   - **T** Size 10
   - **U** Size 16
   - **V** Size 25

### Pilot oil

9. **A** Intern
   - **B** Extern

### Mounting plate

10. **W** Without
    - **A** Sandwich plate with accumulator

### Piston rod version

11. **C** Hard chromium plated
    - **G** Hardened without chromium

### Piston rod end

12. **A** Male thread
    - **E** Female thread

### Seal system

13. **M** NBR – Seal system suitable for mineral oil HL, HLP and water glycol fluids HFC
    - **V** FKM – Seal system suitable for synthetic water free fluids HFDU

### Option – Position measuring system

14. **T** Magnetostrictive

### Option – Pressure sensor

15. **D** Pressure sensor

### Option – Temperature sensor

16. **T** Temperature sensor

### Option – Others

17. **W** Without
    - **A** Protection cover
    - **P** Labyrinth sealing for air
    - **B** Both ("A" and "P")

* If required additional non-standard mounting types can be offered as well
Technical Information | Rexroth Cylinder for Hydraulic Mold Oscillation (HMO)

Some References

<table>
<thead>
<tr>
<th>Year</th>
<th>Country</th>
<th>Type of caster</th>
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<td>Slab</td>
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</tbody>
</table>

Example: High Performance Cylinder with protective air-cooled Cover
Additional Products and Services

In addition to the HMO Cylinders, Rexroth is also able to offer:

- The soft- and hardware for the control of the cylinders in order to guarantee an optimized process control of the mold oscillation
- Standardized hydraulic power units for the delivery of pressure and flow
- Predictive maintenance systems with AI Technology to reduce unexpected down-time (ODIN)

System Overview – Mold Oscillation with Hydraulic Linear Drive

Systematic partnership: You define the requirements, we supply the suitable components and our expertise.
Predictive Analytics with ODiN (Online Diagnostics Network) – leave nothing to Chance

- **Data collection** – Intelligent combination of sensor technology and machine learning methods.
  In the event of a machine upgrade with our predictive maintenance tool ODiN, we recommend pre-defined sensor packages for all components in the hydraulic system. Measured values from sensors already present can be read out from an existing machine control system. The hardware is installed by Bosch Rexroth specialists.

- **Data transfer** – A direct connection secures your data.
  Data are transferred with a mobile communications router, a pre-configured direct connection and restricted access to the ODiN cloud. The mobile communication router that we provide ensures a secure one-to-one connection.

- **Data analysis** – Systematic analysis. Precise and universal.
  ODiN analyzes your machine data using complex evaluation algorithms. After an initial learning phase (machine learning), the data analytics system is able to recognize changes in good time on the basis of a data-based model.

- **Status report** – Detailed. Clear.
  At regular intervals, you will receive timely recommendations from our experts in the form of detailed status reports.

### The Benefits for You

- Higher machine availability with permanent, automated monitoring of your machine data
- Lower costs thanks to reduced downtimes
- Up to 50% faster maintenance
- Increased productivity
- Reduced storage costs for spare parts
- Data-based analysis and maintenance strategy by our specialists
- Additional Rexroth services