FKHS Series 3 Jaw Parallel Motion Pneumatic Grippers

- Mounting Hole
  Can be mounted from the gripper side

- Bottom tapped holes
  Can be mounted from the bottom

- Mounting slot for easy sensor installation
  Sensor Capable

- Easy alignment when mounting.

Catalog No. FKHS-16
3-17-16
PNEUMATIC PARALLEL GRIPPER

Features

Three (3) jaw gripping.
Top & bottom mounting.
Dowel pin hole and mounting slot registration.
Reduced weight.
Magnetic piston is standard feature.
Adding optional sensors enables "open" and "close" position sensing.
Compact design make grippers ideal for handling small parts in confined areas.

How to Order

```
FKHS - 50 D
```

Series | Bore | Action type
--- | --- | ---
Ø25 | Ø32 | Ø40 | Ø50 | Ø63 | Ø80 D Double acting

Sensors

See specifications and pricing on pages 6 and 7.

9C49 Sensors

9G49 Sensors

All 9C49 sensors feature surge protection, polarity protection, LED indicator, and extremely fast switching speeds.

Quick Disconnect Sensors

Female Cord Sets

<table>
<thead>
<tr>
<th>Length</th>
<th>Part No.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Meter</td>
<td>CFC-1M</td>
<td>-</td>
</tr>
<tr>
<td>2 Meters</td>
<td>CFC-2M</td>
<td>-</td>
</tr>
<tr>
<td>5 Meters</td>
<td>CFC-5M</td>
<td>-</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th>Series</th>
<th>FKHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FKHS - 50 D Double acting</td>
<td></td>
</tr>
<tr>
<td>Bore</td>
<td>Ø25</td>
</tr>
<tr>
<td>Operating fluid</td>
<td>Compressed air</td>
</tr>
<tr>
<td>Operating pressure</td>
<td>0.2<del>0.6MPa(2.0</del>6.1kgf/cm²)</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-10°C (14°F) to 60°C (140°F)</td>
</tr>
<tr>
<td>Lubrication</td>
<td>None required or use ISO VG32</td>
</tr>
<tr>
<td>Repeatability</td>
<td>±0.01mm</td>
</tr>
<tr>
<td>Effective grip force(N) at 0.5 MPa</td>
<td>42</td>
</tr>
<tr>
<td>External grip</td>
<td>47</td>
</tr>
<tr>
<td>Internal grip</td>
<td>120 C.P.M</td>
</tr>
<tr>
<td>Max. operating frequency</td>
<td>6</td>
</tr>
<tr>
<td>Opening / Closing stroke (Diameter change)</td>
<td>6</td>
</tr>
<tr>
<td>Weight (g)</td>
<td>140</td>
</tr>
</tbody>
</table>

(Note 1) Values for ø25 are with gripping point L = 20 mm. • For ø32 to ø63 with gripping point L = 30 mm.
• For ø80 mm with gripping point L = 50 mm. Refer to grip force charts on page 3.

Specifications and prices subject to change without notice or incurring obligation.
External Grip Forces

FKHS-25D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

FKHS-32D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

FKHS-40D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

FKHS-50D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

FKHS-63D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

FKHS-80D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

Internal Grip Forces

FKHS-25D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

FKHS-32D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

FKHS-40D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

FKHS-50D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

FKHS-63D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

FKHS-80D

Gripping force (N) vs. Gripping point L (mm)

Pressure 0.6 MPa

Gripping force (N)

Gripping point L (mm)

0.5 MPa

0.4 MPa

0.3 MPa

0.2 MPa

10 20 30 40 50

0 10 20 30 40 50

60 50 40 30 20 10

Conversions

Grip force lbf = N x 0.224

Grip force in psi:

0.1 MPa = 15 psi

0.2 MPa = 29 psi

0.3 MPa = 43 psi

0.4 MPa = 58 psi

0.5 MPa = 72 psi

0.6 MPa = 87 psi

Specifications and prices subject to change without notice or incurring obligation.
Model Selection

Known Conditions:
(a) Workpiece mass  (b) External or internal grip  (c) Gripping point  (d) Operating pressure

Gripping point

The workpiece gripping point distance should be within the ranges given for each pressure in the effective gripping force graphs. See page 3.

If operated with the workpiece gripping point beyond the indicated ranges, an excessive offset load will be applied to the sliding section of the fingers, which can have an adverse effect on the service life of the product.

Effective gripping force

The effective gripping force shown in the graphs on page 3 is expressed as F, which is the thrust of one finger when all 3 of the fingers and attachments are in full contact with the workpiece as shown in the figures on the left.
Model Selection (continued)

Given
- Workpiece mass = 0.6 kg
- External grip method
- Gripping point = 40mm from face of gripper
- Operating pressure = 0.4MPa

Calculation
For a safety factor of 4 and setting the gripping force to be at least 13 times the workpiece weight;

Required gripping force \( F = 13 \times mg \)
\[ = 13 \times 0.6 \times 9.8 \text{ m/s}^2 \]
\[ = 76.4 \text{N minimum} \]

Using the External Grip Force graph for FKHS-40D from page 3, a gripping force of 87N is obtained from the intersection of the gripping point distance \( L = 40\text{mm} \) and a pressure of 0.4MPa.

Select model #FKHS-40D because the graph value is greater than grip force required. The graph value for the smaller FKHS-32D is approximately 56N, less than required, therefore inadequate.

Guidelines for selection of the gripper with respect to workpiece weight.

Review the following calculations to consider acceleration and slight impacts which occur during normal transfer, etc., using a safety margin of \( a = 4 \).

<table>
<thead>
<tr>
<th>7 x workpiece weight</th>
<th>13 x workpiece weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>When ( \mu = 0.2 )</td>
<td>When ( \mu = 0.1 )</td>
</tr>
</tbody>
</table>

\[ F = \frac{mg}{3 \times 0.2} \times 4 \]
\[ = 6.67 \times mg \]
\[ \approx 7 \times mg \]

\[ F = \frac{mg}{3 \times 0.1} \times 4 \]
\[ = 13.3 \times mg \]
\[ \approx 13 \times mg \]

- Even in cases where the coefficient of friction is greater than \( \mu = 0.2 \), for safety reasons, it is recommended to select a gripping force which is at least 7 to 13 times the workpiece weight.
- If high acceleration, deceleration or impact forces are encountered during motion, a greater margin of safety should be considered.
Sensor Specifications & Prices for FKHS-25D

Using 9C49 Sensors on Ø32 or larger requires use of an adapter #TD11046 (included with 9C49-300-xxx sensors) which allows fitting these 4mm round sensors into any of the sensor slots. The adapter is also available separately at no charge. See page 7.

Ø25 Dimensions (mm)

<table>
<thead>
<tr>
<th>9C49 Sensor Selection Guide</th>
<th>Prewired 9 ft. Leadwire</th>
<th>Quick Disconnect*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Type</td>
<td>Electrical Characteristics</td>
<td>Part No.</td>
</tr>
<tr>
<td>Reed (LED)</td>
<td>5-120 VDC/VAC, 0.04 Amp Max current, 4 Watt Max., 2.5 voltage drop</td>
<td>9C49-000-002</td>
</tr>
<tr>
<td>Electronic (LED)</td>
<td>Sourcing PNP 6-30 VDC, 0.2 Amp Max current, 6 Watt max, 1.5 voltage drop</td>
<td>9C49-000-031</td>
</tr>
<tr>
<td>Electronic (LED)</td>
<td>Sinking NPN 5-28 VDC, 0.2 Amp Max current, 6 Watt max, 1.5 voltage drop</td>
<td>9C49-000-032</td>
</tr>
</tbody>
</table>

Electrical Characteristics:
- 5-120 VDC/VAC, 0.04 Amp Max current, 4 Watt Max., 2.5 voltage drop
- 6-30 VDC, 0.2 Amp Max current, 6 Watt max, 1.5 voltage drop
- 5-28 VDC, 0.2 Amp Max current, 6 Watt max, 1.5 voltage drop

Sourcing PNP 5-28 VDC, 0.2 Amp Max current, 6 Watt max, 1.5 voltage drop
- 5-28 VDC, 0.2 Amp Max current, 6 Watt max, 1.5 voltage drop

Sensor mounting slot dimensions for 9C49-000-xxx sensors

Using 9C49 Sensors on Ø32 or larger requires use of an adapter #TD11046 (included with 9C49-300-xxx sensors) which allows fitting these 4mm round sensors into any of the sensor slots. The adapter is also available separately at no charge. See page 7.

ø25 Dimensions (mm)
Using 9C49 Sensors on ø32 or larger requires use of an adapter #TD11046 (included with 9C49-300-xxx sensors) which allows fitting these 4mm round sensors into any of the sensor slots. The adapter is also available separately at no charge.

### 9C49 Sensor Selection Guide

#### 9G49 Sensor Selection Guide for bore sizes ø32 ~ ø80

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Electrical Characteristics</th>
<th>Part No.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reed (LED)</td>
<td>5-120 VDC/VAC, 0.03 Amp max, 0.005 AMP min, 4 Watt max., 2.0 voltage drop</td>
<td>9G49-000-002</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9G49-000-302</td>
<td>...</td>
</tr>
<tr>
<td>Electronic (LED)</td>
<td>Sourcing PNP 5-28 VDC, 0.20 Amp max current, 0.5 voltage drop</td>
<td>9G49-000-031</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9G49-000-331</td>
<td>...</td>
</tr>
<tr>
<td>Electronic (LED)</td>
<td>Sinking NPN 5-28 VDC, 0.20 Amp max current, 0.5 voltage drop</td>
<td>9G49-000-032</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9G49-000-332</td>
<td>...</td>
</tr>
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</table>

#### 9C49 Sensor Selection Guide

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<tr>
<td>Reed (LED)</td>
<td>5-120 VDC/VAC, 0.04 Amp Max current, 4 Watt Max., 2.5 voltage drop</td>
<td>9C49-300-002</td>
<td>...</td>
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<tr>
<td></td>
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<td>Sinking NPN 6-30 VDC, 0.2 Amp Max current, 6 Watt max., 1.5 voltage drop</td>
<td>9C49-300-032</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9C49-300-332</td>
<td>...</td>
</tr>
</tbody>
</table>

### ø32-ø80 Dimensions (mm)

#### Sensor mounting slot dimensions for 9G49 sensors or 9C49 sensors with TD11046 adapter

- ØVA depth VB
- ØWA depth WB
- 3 holes equally spaced on øR B.C. (Mounting hole)

#### Sensor mounting slot dimensions for 9G49 sensors or 9C49 sensors with TD11046 adapter

- 3 holes equally spaced on øR B.C. (Mounting hole)

### Part List

| Model     | AA | AB | AC | B | CA | CB | DC | DO | EC | EO | EX | FY | FZ | G | I | J | K | L | M | NA | NB |
|-----------|----|----|----|---|----|----|----|----|----|----|----|----|----|---|---|---|---|---|----|----|
| FKHS-32D  | 44 | 41 | 3  | 52| 8  | 16 | 28 | 32 | 8  | 12 | 22 | 19.5| 5 | 30.5| 6 | 20 | 9 | 2 | 14 | 8 | 8h9 |
| FKHS-40D  | 47 | 44 | 3  | 62| 9  | 17 | 31 | 35 | 10 | 14 | 26.5| 23.5| 6 | 32 | 7 | 21 | 9 | 3 | 16 | 8h9| |
| FKHS-50D  | 55 | 52 | 3  | 70| 9  | 20 | 35 | 41 | 11 | 17 | 31 | 28 | 6 | 37.5| 9 | 24 | 10 | 4 | 18 | 10h9| |
| FKHS-63D  | 66 | 62 | 4  | 86| 12 | 22 | 43 | 51 | 15 | 23 | 38 | 34.5| 7 | 44 | 11 | 28 | 11 | 6 | 24 | 12h9| |
| FKHS-80D  | 82 | 77 | 5  | 106| 13.5| 27 | 53.5| 63.5| 21.5| 31.5| 47.5| 43.5| 8 | 56 | 12 | 32 | 12 | 8 | 28 | 14h9| |

*Quick Disconnect*