Linear drive DFPI-...-ND2P-C1V-...-A

2 Design
The DFPI-...-ND2P-C1V-...-A is an electro-pneumatic linear drive consisting of:
- a double-acting pneumatic cylinder with
  - an integrated displacement encoder (potentiometer) for determining the actual position
  - an integrated manifold with directional control valves for controlling the piston rod
  - an integrated positioner for position control.

If necessary, proximity sensors can be installed in the available slots in order to provide binary interrogation of positions.

A pressure compensation element prevents the formation of condensate inside the housing in the event of temperature fluctuations, thus protecting the internal electronics.

For DFPI-...-ND2P-C1V-...-A the pneumatic connections are freely accessible (pneumatic connection G ¼). The electrical connections are protected by a flange receptacle. For DFPI-...-ND2P-C1V-P-...-A the electrical and pneumatic connections are protected against external mechanical influences by a rugged flange receptacle. The flange receptacle provides push-in connectors for the pneumatic system and a G ¼ exhaust port for venting on site.

Fig. 2 Type code (e.g. DFPI-100-200-ND2P-C1V-P-A)

The following characteristics of the linear drive are dependent on the piston diameter, and may differ from the representation in Fig. 1:
- Position of the earth terminal (identification on product)
- Shape of the cylinder barrel
- Shape of the flange receptacle.

In addition, for linear drives with a piston diameter ≥ 200 mm the compressed air supplied from one side is fed via an unprotected line parallel to the cylinder barrel. Tie rod screws are used to mount the cylinder end cap. For linear drives with a piston diameter ≤ 200 mm the compressed air is fed internally. The cylinder end caps are screwed to the housing.

3 Function
The compressed air applied at connection P is directed by the integrated valve manifold alternately to the two piston chambers of the cylinder — depending on the setpoint position that is specified. This causes the piston rod connected to the piston to move backwards and forwards.

The maximum possible venting of the two cylinder chambers can be set independently of each other using flow control screws D2 and D4. D2 controls the venting flow when the piston rod advances. D4 controls the venting flow when the piston rod retracts. This can be used to influence the maximum travel speed of the linear drive in the range from 0 ... 100 %. In the factory setting, the flow control screws are completely open. In the DFPI-...-ND2P-C1V-A they are protected against contamination by rubber plugs, and in the DFPI-...-ND2P-C1V-P-A by the flange receptacle.

Positions are specified via an analogue setpoint signal (4 ... 20 mA). Positioning of the piston rod/slide gate is by means of closed-loop control. The integrated positioner performs position control of the piston rod within the available stroke range. The integrated displacement encoder transmits the current position to the internal positioner as an analogue signal. The positioner cyclically compares the setpoint and actual positions and transmits appropriate positioning signals to the integrated valve manifold for positioning control.
The valve manifold controls the desired direction of movement by pressurising the one cylinder chamber and simultaneously venting the other cylinder chamber with or without flow control.

The current position is provided as an analogue current signal (4 ... 20 mA) via the actual value output and can be evaluated by a higher-order controller if needed.

The drive has a safety position set at the factory. It responds as follows if the operating voltage supply or the analogue setpoint is outside the permitted range (e.g. in the event of a wire break):

For DFPI-....C1V-A and ....C1V-P-A:
- Piston rod is advanced (close process valve).

4 Application
The designated use of the DFPI linear drive is to drive linearly actuated, guided process valves in process automation systems – for example guided gate valve actuators and penstock valves. It is suitable for use in the process industry in the area of:
- water, sewage, industrial process water,
- silage and bulk goods technology.

The stroke length of the drive is generally at least equal to the nominal diameter of the process valves so that the gate valve actuator can be opened and closed completely using the DFPI.

The product is tailored to the requirements of process industries. ([Catalogue www.festo.com/catalogue].)

5 Transport and storage

**Warning**
Danger of crushing! Danger of shearing!
The DFPI can weigh up to about 86 kg, depending on the product version. Body parts can be crushed or cut off if the product fails.

- For product versions weighing more than 12 kg, always use suitable load-carrying equipment.

Ensure storage conditions as follows:
- Short storage times, storage locations should be cool, dry and shady to prevent corrosion.

6 Requirements for product use
Installation and commissioning are to be carried out only by qualified personnel in accordance with the operating instructions.

**Note**
Lateral forces on the piston rod can damage the piston rod bearing of the DFPI.
- Make sure that there are no lateral forces acting on the piston rods, e.g. through external guiding of the useful load (only guided process valves are permissible).

**Note**
Continuous operation at the limits of the specified ambient temperature and work frequency can reduce the service life of the drive.
- Use lubricated compressed air for continuous operation under extreme conditions. The oil must be chemically inert (chemically resistant) and must not carbonize.

- Compare the maximum values specified in these operating instructions with your actual application (e.g. pressures, forces, torques, masses, speeds, temperatures). The product can only be used in accordance with the relevant safety guidelines if the maximum load limits are observed.
- Ensure that all applicable national and local safety laws are adhered to.
- Take into consideration the ambient conditions at the location of use. Corrosive environments reduce the service life of the product.
- Remove the packaging except for the adhesive labels on the compressed air supply ports (danger of contamination). The material used in the packaging has been specifically chosen for its recyclability (exception: oil paper = residual waste).
- Use the product in its original status, without any unauthorised product modifications.
- Do not loosen or remove the pressure compensation element. This can damage the product.
- Protect the device from fluctuations in pressure and excess operating temperature. Use excess pressure and pressure regulating valves.
- Make sure there is a supply of correctly prepared compressed air – ([Technical data chapter 13].)
- Use only non-lubricated compressed air under normal conditions. The product has an initial lubrication which suffices for the complete service life. Using lubricated compressed air flushes out the initial lubrication. The product may then only be operated with lubricated compressed air.

- Make sure that cut-off tube ends are cut off square and are free of burrs. This way you prevent damage to internal O-rings of the DFPI when the compressed air tubes are inserted.
- Please select the corresponding accessories, e.g. connecting cables and proximity sensors, from our catalogue (www.festo.com/catalogue).
- Use only proximity sensors approved for the product from our catalogue (www.festo.com/catalogue).

7 Installation

**Note**
When proximity sensors are used: Ferrous materials (e.g. steel parts and metal sheets) in the immediate vicinity of proximity sensors can result in undesired switching signals. When linear drives are installed too close to each other, a cylinder magnet can trigger switching of the proximity sensor on the adjacent linear drive.
- During assembly, maintain the required minimum distances from ferrous materials. The required distances must be determined during assembly for each specific case!
- When installing more than one linear drive, make sure that the effective area of each cylinder magnet does not impact any proximity sensors of adjacent linear drives.

If there are high medium temperatures in the tubing and the process valve:
- Use a heat-insulated coupling extension.

7.1 Mechanical installation
For attachment, the linear drive has a mounting hole pattern in accordance with DIN 3358. The mounting orientation is any desired.
- If necessary, use the corresponding adapters for attachment ([Catalogue www.festo.com/catalogue].)
- Attach the DFPI with 4 screws.
- Tighten the mounting screws evenly. Tightening torques: with M8 thread 25 Nm ± 5 %; with M10 thread 46 Nm ± 5 %.
- The piston rod has a male thread for mounting the slide gate.
- The spanner flat at the piston rod is used as a counter holder to avoid impermissible torques at the piston rod – width across flats technical data in chapter 13.
- If necessary, use the corresponding adapters for attachment ([Catalogue www.festo.com/catalogue].)

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Fig. 4
Adapter for attachment of the slide gate – examples
End cap

Fig. 5
Bearing cap with mounting thread (4) for installation – hole pattern in accordance with DIN 3358

The adjacent illustration shows an example of the mechanical connection of a DFPI ([Fig. 5](#)) to a process valve ([Fig. 5](#)). Observe the following during installation:
- Mount the DFPI in such a way that there are no lateral forces acting on the piston rod bearings.
- Mount the DFPI in such a way that the required mode of operation for opening and closing the process valve or penstock valve is implemented.
7.2 Electrical installation

**Warning**
- Use only power sources which guarantee reliable electrical isolation of the operating voltage in accordance with IEC/DIN EN 60204-1. Observe also the general requirements for PELV power circuits in accordance with IEC/DIN EN 60204-1.
- Use only power sources which guarantee reliable electrical isolation of the operating voltage in accordance with IEC/DIN EN 60204-1.

**Note**
- Installation errors can damage the electronics or cause malfunctions.
- Make sure that the length of the signal line does not exceed the maximum permissible length of 15 m.
- Connect the earth terminal (Fig. 1) to the earth potential with low impedance (short cable with large cross-section) – tightening torque 5 Nm ± 10 %.
- Dimension pneumatic lines and electric cables sufficiently.
- Use an electric connecting cable, with at least 5 wires, with an outside diameter of Fig. 7 – conductor cross-section [mm²]: 0.75 ... 1.5.

- **Recommendation:** For the DFPI-...-C1V-A, use the pre-assembled connecting cable NHSB with protective conduit according to accessories (www.festo.com/catalogue).

<table>
<thead>
<tr>
<th>Type</th>
<th>Outside diameter [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>DFPI-...-C1V-A</td>
<td>Fig. 8</td>
</tr>
<tr>
<td>DFPI-...-C1V-P-A</td>
<td>Fig. 9</td>
</tr>
</tbody>
</table>

The electrical connection is concealed by the flange receptacle (Fig. 1). To perform electrical installation you will have to dismantle the flange receptacle.

**For DFPI-...-ND2P-C1V-A**
1. Mounting screws – tightening torque 1.4 Nm ± 10 %
2. Seal
3. Tightening torque 0.3 Nm ± 10 %
4. Tightening torque 1.5 Nm ± 10 %
5. Tightening torque 3.5 Nm ± 10 %

**For DFPI-...-ND2P-C1V-P-A (protected pneumatic connections)**
1. Mounting screws – tightening torque 2.7 Nm ± 10 %
2. With guided air vent: plug screw with sealing ring (mounted at factory); With on-site air vent: filter nipple or silencer (accessories)
3. Seals (O-rings)
4. Mounting thread (M32 x 1.5) for connection line (accessories) – tightening torque 7 Nm ± 10 %.

The integrated positioner is supplied with operating voltage and the setpoint signal via the 5-pin plug connector.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Allocation</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power supply 24 V DC</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Input analogue setpoint value 4 ... 20 mA(1)</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>GND Power supply/Input/Output</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Output analogue actual value 4 ... 20 mA(2)</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Input initialisation 24 V DC</td>
<td>2</td>
</tr>
</tbody>
</table>

1) Permissible operating voltage range ➔ Technical data in section 13
2) Reference between position and analogue value is dependent on the initialization (Fig. 13)

6. Carefully plug the wired-up socket strip onto the plug connector.
7. Fasten the socket strip with the two screws – tightening torque 0.5 Nm ± 10 %.
8. Mount the flange receptacle. When doing so, make sure that the seals are correctly seated – tightening torque ➔ Fig. 8 or Fig. 9.
9. For DFPI-...-ND2P-C1V-A: Retighten the cable conduit fitting – tightening torque ➔ Fig. 8.
For DFPI-...-ND2P-C1V-P-A before tightening the cable conduit fitting (accessories) you first have to perform the pneumatic installation (section 7.3).

7.3 Pneumatic installation
- Check the necessity of an emergency compressed air supply and of non-return valves. You will then avoid sudden compensating movements of the piston rod if there is a drop in pressure and a sudden sliding down of the moving load in a vertical or inclined mounting position.

**For DFPI-...-ND2P-C1V-A**
1. If necessary, remove the adhesive labels from the supply ports.
2. Use only suitable threaded connectors – pneumatic connection G¼.
3. Connect the tubing of the DFPI to the compressed air connections (Fig. 1).
   - Connection P: compressed air supply port for operating pressure
   - Connection R: exhaust port

**For DFPI-...-ND2P-C1V-P-A (protected pneumatic connections)**
- Use the pre-assembled connecting cable NHSB with protective conduit according to accessories or externally calibrated pneumatic connection lines with the following outside diameter:
  - Connection P: 8 mm; connection R: 10 mm
- The flange receptacle has two threaded holes (Fig. 11). Push-in fittings are pre-assembled in the factory (included in scope of delivery).
1. If necessary, loosen the cable conduit fitting (assembly instructions of the accessories).
2. Remove the blanking plugs from the push-in fittings, if necessary.

**Pneumatic connection P**
- Pneumatic connection R, (guided exhaust)
- From the plant: plug screw G¼ Optional – for on-site air vent: filter nipple G¼ or silencer G¼ (accessories)
- Passage for electric cables

3. Decide whether the air vent should be made on site or guided.

**For guided air vent:**
At the factory, the plug screw (Fig. 11) is already mounted and the DFPI-...-C1V-P-A is thus prepared for guided air venting.
- If the plug screw has been displaced: Reseat the connection for air vent on site with sealing ring and plug screw – tightening torque 13.5 Nm.
- Connect the tubing of the DFPI to the connections P and R (Fig. 11). Insert the compressed air tubing into the push-in fitting up to the stop.

**For on-site air venting directly at the DFPI:**
- Seal the unused connection R (Fig. 11) with the plug (accessories).
- Open the connection for on-site air vent by displacing the plug screw (Fig. 11).
- Screw a filter nipple G¼ (for air vent without silencer) or a silencer G¼ (accessories) into the connection for on-site air vent (Fig. 11) – tightening torque 4 Nm ± 10 %.
4. Connect tubing to the DFPI at the connection P by inserting the compressed air tubing into the push-in fitting up to the stop.
In both cases:
5. Only in the unpressurized status: Check the reliable hold of the tubing connection by lightly pulling on the tubing.
6. With use of the connecting cable available as an accessory: Mount the cable connector and protective conduit in accordance with the related assembly instructions.

To loosen a tune
1. Press down on the solution ring (blue) of the push-in fitting and hold it down.
2. Carefully pull the tube out of the push-in fitting.
Cut off the damaged part before further use of the tube.

8 Commissioning

Caution
Uncontrolled movements of the drive can cause damage.
- Please note that when the compressed air supply is switched on and there is no setpoint input or no power supply, the drive moves to the safety position (➔ Chapter 3).
- During initialization, movement takes place to both end positions in succession, independently of the present setpoint value.
- If you want to prevent the drive from moving to the safety position when the energy supplies are switched on, first switch on the operating voltage supply and the setpoint input, and after that the compressed air supply.

- Make sure that the operating conditions lie within the permitted ranges (Technical specifications ➔ Chapter 13).
- Make sure that a slide gate (process valve) mounted on the linear drive can be positioned without hindrance.
- If necessary, adjust the linear drive adapter attached to the piston rod. This setting serves for optimising the opening or closing reaction of the connected process valve or penstock valve.
- At first, select a slow travel speed. To do this, first turn flow control valves D2 and D4 all the way closed. After that, turn flow control valves D2 and D4 open by two or three turns.
- After installation on initial start-up, always perform an initialization of the drive.

Initialization
The linear drive is preinitialized before being shipped from the factory. The internal positioner is then adjusted for travel without a load, without flow control, and for use of the entire stroke length of the drive.

<table>
<thead>
<tr>
<th>Analogue setpoint</th>
<th>Setpoint position upon pre-initialisation from the factory</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5 – 4.2 [mA]</td>
<td>Safety position; advance piston rod (end position)</td>
</tr>
<tr>
<td>4.2 – 19.8 [mA]</td>
<td>Intermediate position regulated 1)</td>
</tr>
<tr>
<td>19.8 – 20.0 [mA]</td>
<td>Retract piston rod (end position) with maximum control force</td>
</tr>
<tr>
<td>&gt; 20.5 [mA]</td>
<td>Safety position; advance piston rod (end position)</td>
</tr>
</tbody>
</table>

1) The setpoint characteristic curve is linear.

In the following cases you have to execute a new initialization:
- On initial start-up after installation of the device
- After adjustment of flow control screws D2 and D4
- After changing the operating pressure
- After changing the process that influence the forces, e.g. at the slide gate, and thus the process parameters
- After changing the stroke length used.

Initialization shifts the setpoint and actual characteristic curve corresponding to the taught end positions. As a result, the relationship is determined between the analogue setpoint value and the setpoint position as well as between the analogue actual value and the actual position.

Example DFPI-...-990-...: Initialization of the stroke length l = 200 … 800 mm

![Characteristic curve shift (example)](image)

During initialization the end positions of the DFPI are moved to automatically. As a result, the positioner learns the available/used stroke length. After successful initialization the linear drive is ready for operation. The integrated positioner now ensures that the slide gate moves to the desired positions under closed-loop control – at the farthest to the end positions taught during the initialization.

Carry out initialization as follows:

1. Switch on the operating voltage supply and setpoint input.
2. Switch on the compressed air supply. The drive moves to the specified setpoint position.
3. Apply a logic 1 (+24 V) at pin 5 for t > 1000 ms (see Fig. 14) – e.g. by briefly bridging PIN 1 and PIN 5. The initialization process will then start (see Fig. 14). During the initialization procedure, a current value of 21.5 mA is output at the analogue output.

4. When the initialization is completed the DFPI is ready for operation (➔ Chapter 13). It then travels to the specified setpoint position.

9 Operation

Warning
Uncontrolled fast moving parts can cause injury to people in the vicinity of the DFPI.
- Make sure that, in the positioning range:
  - nobody can place his/her hand in the path of moving components (e.g. by providing a protective guard).
  - there are no foreign objects in the path of the moving components.
It should not be possible to touch the DFPI until the mass has come to a complete rest.

After the compressed air supply is switched on, the drive travels as follows:
- The drive moves to the safety position if the operating voltage supply or the analogue setpoint are outside the permissible range.
- The drive moves to the specified analogue setpoint position if the operating voltage supply is in the permissible range, depending on the end positions taught during initialization.
**10 Maintenance and care**

If used as intended in the operating instructions, the device will be free of maintenance.

**11 Disassembly and repair**

**Warning**

Danger of crushing! Uncontrolled advance of piston rod.

When the power supplies are switched off, if the compressed air supply is switched off first and only after that the operating voltage supply, in case of error (e.g. defective valve manifold) there may be continuous excess pressure in a cylinder chamber. During dismantling the linear drive can then advance unexpectedly, thus crushing people’s body parts.

**Warning**

Danger from parts flying through the air!

If there is still excess pressure in a cylinder chamber despite the compressed air supply being switched off, when a cylinder end cap is loosened it can tear off, fly through the air and injure people.

- Do not dismantle cylinder end cap! The product may be overhauled only by our repair service.

**Disassembly**

1. First switch off the operating voltage supply and then the compressed air supply to allow the integrated valve manifold to vent the drive.
2. Remove the slide gate from the piston rod.
3. Remove the screws on the flange of the process valve or penstock valve.
4. Remove the drive (if necessary including mounting adapter and coupling extension).

**Repair**

- Make sure that the product is overhauled only by our repair service.

**12 Troubleshooting**

<table>
<thead>
<tr>
<th>Malfunction</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>The DFPI closes the process valve, even though a different setpoint is specified.</td>
<td>Operating voltage supply or the analogue setpoint is outside of the permitted range (e.g. in the event of a wire break); the DFPI moves to the safety position.</td>
<td>Check operating voltage supply and analogue setpoint.</td>
</tr>
<tr>
<td>Even though the energy supply is switched off, the piston rod cannot be shifted manually.</td>
<td>The drive has not been ventilated because the compressed air supply was switched off first, and then the operating voltage supply.</td>
<td>First switch off the operating voltage supply, and then the compressed air supply.</td>
</tr>
<tr>
<td>Current at the analogue output = 3.5 mA</td>
<td>Device error</td>
<td>Check operating voltage supply, operating pressure and analogue setpoint.</td>
</tr>
<tr>
<td>Current at the analogue output = 21.0 mA</td>
<td>The device must be taught</td>
<td>Initialize device</td>
</tr>
<tr>
<td>Current at the analogue output = 21.5 mA</td>
<td>Device is in teach-in status</td>
<td>Initialize device</td>
</tr>
</tbody>
</table>

**13 Technical data**

<table>
<thead>
<tr>
<th>DFPI-ND2P-CIV-...-A</th>
<th>-100</th>
<th>-125</th>
<th>-160</th>
<th>-200</th>
<th>-250</th>
<th>-320</th>
</tr>
</thead>
<tbody>
<tr>
<td>Based on standard</td>
<td>DIN 3358</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of mounting</td>
<td>On flange in accordance with DIN 3358</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flange hole pattern</td>
<td>F07</td>
<td>F10</td>
<td>F10, F14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Width across flats, spanner flat on the piston rod</td>
<td>22</td>
<td>27</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>Piston rod, cylinder barrel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cushioning</td>
<td>No cushioning</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting position</td>
<td>Any</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Switching the DFPI off**

- Switch the power supplies off in the following sequence to ensure safe venting of the integrated valve manifold:
  1. First switch off the operating voltage supply.
  2. Only after that switch off the compressed air supply.

- Only when the drive is vented can the piston rod be shifted manually, for example to push the piston rod in for safe transport.

**13.1 Technical data**

<table>
<thead>
<tr>
<th>DFPI-ND2P-CIV-...-A</th>
<th>-100</th>
<th>-125</th>
<th>-160</th>
<th>-200</th>
<th>-250</th>
<th>-320</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode of operation</td>
<td>Double-acting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position sensing</td>
<td>With integrated displacement encoder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring principle</td>
<td>Potentiometer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Principle of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>displacement encoder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positioning accuracy</td>
<td>[% FS]</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repetition accuracy</td>
<td>[% FS]</td>
<td>±1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrospeed</td>
<td>[% FS]</td>
<td>±1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Size of the dead zone</td>
<td>[% FS]</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy of analogue output</td>
<td>[% FS]</td>
<td>±1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analogue output</td>
<td>ms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. load of the analogue output</td>
<td>[N]</td>
<td>Max. 600</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. load of the analogue input</td>
<td>[N]</td>
<td>Max. 500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical connection</td>
<td>5-pin, straight plug, screw terminal</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumatic connection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– DFPI-...-ND2P-CIV</td>
<td>G/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– DFPI-...-ND2P-CIV-P</td>
<td>For tube outside Ø 8 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating pressure</td>
<td>[bar]</td>
<td>3 ... 8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal operating pressure</td>
<td>[bar]</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating medium</td>
<td>Compressed air in accordance with (ISO 8573-1:2010 [7.4.4])</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note on the operating medium</td>
<td>Operation with lubricated medium possible (in which case lubricated operation will always be required)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative air humidity</td>
<td>[%]</td>
<td>0 ... 100 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating voltage range</td>
<td>[V DC]</td>
<td>24 ± 10 %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal operating voltage</td>
<td>[V DC]</td>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. current consumption</td>
<td>[mA]</td>
<td>220 (with 24 V DC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Idile current</td>
<td>[mA]</td>
<td>40 (with 24 V DC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Max. cable length</td>
<td>[m]</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse polarity protection</td>
<td>For operating voltage, setpoint value, initialisation connection</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setpoint input</td>
<td>[mA]</td>
<td>4 ... 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analogue output</td>
<td>[mA]</td>
<td>4 ... 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initialisation input</td>
<td>[V DC]</td>
<td>22.8 ... 26.4; I = 11 mA with 24 V DC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seal closing function</td>
<td>[mA]</td>
<td>4.0 mA ± 4.2 mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leak-proof function</td>
<td>[mA]</td>
<td>19.8 mA ± 20 mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>- in mounted status</td>
<td>IP65, IP67, IP68, IP69K, NEMA 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Stroke</td>
<td>[mm]</td>
<td>40 ... 990</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Stroke reserve</td>
<td>[mm]</td>
<td>3</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature</td>
<td>[°C]</td>
<td>-5 ... +50</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Use in exterior**

C1 – weather-protected areas in accordance with IEC 60654

**Product weight**

- Basic weight with 0 mm stroke
  - DFPI-...-ND2P-CIV | [g] | 4 671 | 7 693 | 9 099 | 18 358 | 29 956 | 45 200 |
  - DFPI-...-ND2P-CIV-P | [g] | 5 237 | 8 259 | 9 665 | 18 924 | 30 552 | 45 766 |
  - Additional weight of moving load per 10 mm stroke | [g] | 27 | 52 | 52 | 87 | 87 | 87 |
  - Moving mass with 0 mm stroke | [g] | 1228 | 1944 | 2250 | 4722 | 7059 | 11 1417 |
  - Additional weight per 10 mm stroke | [g] | 80 | 145 | 159 | 187 | 325 | 399 |
  - Additional weight of displacement encoder per 10 mm stroke | [g] | 2 | 2 | 2 | 2 | 2 | 2 |

**Materials**

- Cylinder barrel | Anodised wrought aluminium alloy | High-alloy stainless steel |
- Cap (end cap) | Anodised wrought aluminium alloy or Anodised and painted wrought aluminium alloy or Cast aluminium painted |
- Bottom cap (bearing cap) | | |
- Piston rod | High-alloy stainless steel |
- Screws | Steel1) |
- Seals | NBR, FPM, NBR |
- Note on materials | RoHS-compliant, contains paint-wetting impairment substances |
- Vibration resistance in accordance with DIN/IEC 68, Part 2-6 | 0.35 mm path at 20 ... 60 Hz; 5 g acceleration at 60 ... 150 Hz |
- Continuous shock resistance in accordance with DIN/IEC 68, Part 2-82 | ≤ 15 g at 6 ms duration, 1000 shocks per direction |
- Certification | RCM |
- CE certification (see declaration of conformity | [www.festo.com] |

1) Steel and high-alloy stainless steel
2) The device is intended for use in an industrial environment. Outside of industrial environments, e.g. in commercial and mixed-residential areas, actions to suppress interference may have to be taken.
3) Certification-specific special documentation must be considered ([www.festo.com/sp]).

**Fig. 15**

**Fig. 16**