Low Maintenance Filter

Series FN1

A unique element design with back-flush feature generates no industrial waste, thus requires no element replacement.
No more element replacement!

Our unique element construction with back-flushing capability

The element of the filter is constructed of a series of grooved filter plates and wave washers places one above the other and compressed by the compact cylinder on the top filter.

**Element construction**

- **When compressed**
  - Filter plate
  - Groove 5µm, 20µm
  - Wave washer

- **When decompressed**
  - Decompressing the element widens the gap between filter plates and wave washers. While the gap is widened, dust and foreign particles caught between plates can be washed away by back flushing the element. This restores the element and enables repeated use of the element. The gaps between filter plates are equally maintained by the wave washers to allow stable back-flush operation.

**Options**

- **Reservoir tank**: Series FNR
  - To store the fluid required to back-flush the clogged element.
- **Dust removal filter**: Series FND
  - To remove dust and foreign particles from the fluid after back-flushing the element.

**2 types of elements are available according to the type of dust.**

- Cylindrical type (5µm, 20µm)
- Step type (5µm)

**Maximum flow rate**: 40ℓ/min, 80ℓ/min.

Features 1
Operating principle

**Filtering**

The element compressed by the cylinder filters the fluid.

**Back-flushing**

As the cylinder extends downward, the element is decompressed. Air pressure forces the fluid in the reservoir out to the filter and back-flushes the element.

**Automatic back-flushing.**

System circuit allows the automatic back-flushing when the element is clogged. (Refer to page 5 for details.)

**Setting up filters in a line and flushing the fluid alternately allow continuous operation during back-flushing.**

Features 2

IN OUT

Tank for dust removal filter

Filtering

Back-flushing

Fluid direction when filtering

Fluid direction when back-flushing

Fluid

Air

Filtering

Back-flushing

Fluid

Features 2

Approved
# Low Maintenance Filter

## Series FN1

### How to Order

<table>
<thead>
<tr>
<th>Housing material</th>
<th>1</th>
<th>Stainless steel SUS304</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element type</td>
<td>0</td>
<td>Cylindrical type</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Step type</td>
</tr>
<tr>
<td>Element length</td>
<td>1</td>
<td>250mm</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>500mm</td>
</tr>
<tr>
<td>Element material</td>
<td>005</td>
<td>5µm (Cylindrical type, Step type)</td>
</tr>
<tr>
<td></td>
<td>020</td>
<td>20µm (Cylindrical type)</td>
</tr>
<tr>
<td>Port size</td>
<td>10</td>
<td>Rc 1</td>
</tr>
</tbody>
</table>

### Specification

#### Filter

<table>
<thead>
<tr>
<th>Model</th>
<th>FN1111</th>
<th>FN1101</th>
<th>FN1102</th>
<th>FN1112</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element dimension</td>
<td>ø65 x 250mm</td>
<td>ø65 x 500mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluid</td>
<td>Cleaning solvent, coolant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating pressure</td>
<td>MAX. 1.0MPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating fluid temperature</td>
<td>MAX. 80°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow rate (Note 2)</td>
<td>40l/min</td>
<td>80l/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bore size</td>
<td>Rc 1 (IN, OUT, DRAIN)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Case and cover: Stainless steel SUS304, O-ring: NBR/FPM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Element length</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>Cylinder type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step type</td>
<td>Cylinder type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filtration</td>
<td>5µm, 20µm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differential pressure proof</td>
<td>0.6 MPa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>13kg</td>
<td>12.5kg</td>
<td>15kg</td>
<td>14.5kg</td>
</tr>
</tbody>
</table>

Note 1) Refer to the fluid compatibility table on page 2 for details.
Note 2) Values under the following conditions:
Fluid: Water; Filtration: 20µm; Pressure drop: 0.02MPa or less.

#### Operating part

<table>
<thead>
<tr>
<th>Model</th>
<th>CDLQB63-□D-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto switch</td>
<td>Without auto switch (built-in magnet) (Note 1)</td>
</tr>
<tr>
<td>Fluid</td>
<td>Air</td>
</tr>
<tr>
<td>Operating pressure</td>
<td>0.2 to 1.0MPa (Note 2)</td>
</tr>
<tr>
<td>Ambient and fluid temperature</td>
<td>–10 to 70°C (with no freezing) (Note 3)</td>
</tr>
<tr>
<td>Lock</td>
<td></td>
</tr>
<tr>
<td>Unlocking pressure</td>
<td>0.2MPa or more</td>
</tr>
<tr>
<td>Locking pressure</td>
<td>0.05MPa or more</td>
</tr>
<tr>
<td>Locking direction</td>
<td>Extension locking</td>
</tr>
</tbody>
</table>

Note 1) Auto switch must be ordered separately. Refer to Series CLQ (Compact Cylinder with Lock) catalog (CAT.ES20-155) for details.
Note 2) The minimum operating pressure for the cylinder is 0.1MPa when the cylinder port and the lock port are separately piped.
Note 3) The temperature will be 0°C to 60°C when the auto switch is mounted on the cylinder.
Low Maintenance Filter  

**Series FN1**

**Option**

### Reservoir

<table>
<thead>
<tr>
<th>Model</th>
<th>FNR100N-10</th>
<th>FNR100V-10</th>
<th>FNR101N-10</th>
<th>FNR101V-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank capacity</td>
<td>1.1r</td>
<td>1.8r</td>
<td>1.8r</td>
<td>1.8r</td>
</tr>
<tr>
<td>Port size</td>
<td>Rc 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Bowl &amp; Cover</td>
<td>Stainless steel SUS304</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>O-ring</td>
<td>NBR</td>
<td>FPM</td>
<td>NBR</td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td>1.5kg</td>
<td></td>
<td>1.9kg</td>
</tr>
<tr>
<td>Applicable filter</td>
<td>FN11[1][1](Element 250mm)</td>
<td>FN11[2][2](Element 500mm)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Dust recovery filter

<table>
<thead>
<tr>
<th>Model</th>
<th>FND100N-10-M149X0</th>
<th>FND100V-10-M149X0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port size</td>
<td>R1</td>
<td></td>
</tr>
<tr>
<td>Material</td>
<td>Bowl &amp; Cover</td>
<td>Stainless steel SUS304</td>
</tr>
<tr>
<td></td>
<td>O-ring</td>
<td>NBR</td>
</tr>
<tr>
<td>Element</td>
<td>Stainless steel SUS304</td>
<td></td>
</tr>
<tr>
<td>Element filtration</td>
<td>149µm</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td></td>
<td>7.5kg</td>
</tr>
</tbody>
</table>

**Fluid Compatibility (Guide)**

<table>
<thead>
<tr>
<th>Fluid</th>
<th>Potable water</th>
<th>Industrial water</th>
<th>Distilled water</th>
<th>Water soluble</th>
<th>Oil-based</th>
<th>Gas oil</th>
<th>Xylene</th>
<th>Ammonium hydroxide</th>
<th>Sodium hydroxide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrile rubber</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>X</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Fluoro rubber</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

- ○○○ Most compatible
- ○○ Compatible
- ×× Not compatible

Note 1) Contact SMC when PTFE is required for seal material.
Note 2) Contact SMC regarding the compatibility of the seal and pressure gauge.

### Cylindrical Type and Step Type Elements

1. **Cylinder type element (5µm, 20µm)**
   - The cylindrical type construction has a smooth peripheral surface since the dimension of the filter plate and wave washer is the same. The use of the entire peripheral surface of the element to collect dust allows larger filtration area and easy dust separation. For this reason, this type of element is ideal for filtering the fluids that contain dust with the same particle size. If the cylindrical type element is used for fluids containing dust particles with a great variance in sizes, large-size dust particles can cover the element’s peripheral surface. This can clog the element prematurely and thus you may no longer use it. (Especially for soft and sticky foreign matter)

2. **Step type element (5µm)**
   - The step type construction has an uneven (stepped) surface since the dimension of the filter plate is smaller than that of the wave washer. When filtering uneven dust particles, larger particles are caught on the peripheral surface of the wave washers, and smaller particles are filtered out with filter plates. This construction can extend the element life and make the effective filtering possible when filtering fluids containing dust particles with a great variance in sizes. Select the appropriate element type (cylindrical or step type) depending on the dust size variance in the fluid.
Series FN1

Flow Characteristics (Initial Value)
- Test fluid: Potable water
- Liquid temperature: 17 to 20°C (room temperature)
- Test method: Per SMC test method (sanitary test stand)

Filtration Efficiency (Initial Value)
- Fluid: Potable water
- Flow rate: 20 l/min
- Liquid temperature: Room temperature
- Test dust: AC course
- Amount of dust: 0.2mg/min
- Test method: Per SMC test method (sanitary test stand, HIAC particle counter)
Blocking Characteristics (Repeatability Characteristics)

- Fluid: Potable water
- Supply pressure: 0.2 MPa
- Flow rate: 20 l/min
- Test dust: AC course test dust
- Test method: Per SMC test method

Filter part no.: FN1101N-10-020
Element: END100-020 (cylindrical type with 20 μm filtration)

Introduce a certain concentration of dust and back-flush the filter when the pressure loss reaches 0.2 MPa. Repeat filtering and back-flushing process (up to five times shown in the graphs). The graphs above show that the initial pressure loss (ΔP=0.015 MPa) and time it takes to reach the pressure loss of ΔP=0.2 MPa return to the rough initial value even after repeated back-flushing.

Measurement Circuit
Series FN1

Piping Example

Series FN1 Low Maintenance Filter cannot be used alone. Please follow the component configuration and operation steps illustrated below.

Example of connection device

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Device</th>
<th>No.</th>
<th>Description</th>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cylinder driving</td>
<td>5-port solenoid valve (Series SY)</td>
<td>4</td>
<td>OUT side valve</td>
<td>Coolant valve (Series VNC)</td>
</tr>
<tr>
<td>2</td>
<td>Air supply valve</td>
<td>Process valve (Series VNB)</td>
<td>5</td>
<td>Drain valve</td>
<td>Coolant valve (Ball type)</td>
</tr>
<tr>
<td>3</td>
<td>IN side valve</td>
<td>Coolant valve (Ball type)</td>
<td>6</td>
<td>Speed controller</td>
<td>Speed controller (Series AS)</td>
</tr>
</tbody>
</table>

Series inside ( ) indicate SMC products. Contact SMC regarding the valves 3 to 5.

Actuation example

<table>
<thead>
<tr>
<th>Step</th>
<th>Operation description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IN side valve: Close</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>4</td>
<td>OUT side valve: Close</td>
</tr>
<tr>
<td>5</td>
<td>Drain valve: Open</td>
</tr>
</tbody>
</table>

*The M/C stop signal and a signal for element clogging (differential signal switch, differential signal switch) are used to start back flushing. Numbers in the chart indicate the operation order for each operation.
1. Cylinder for element decompression and compression
   • Do not overthrottle the speed controller when adjusting the cylinder retraction speed (element decompression). If the element is decompressed too slowly, the back flushing may become ineffective.
   • Refer to page 12 for “Cylinder for element decompression and compression” regarding the detailed pneumatic circuit of the cylinder and lock.

2. Reservoir installation
   • Installation of a reservoir (optional) is recommended to store fluid for back flushing. If a reservoir is not going to be installed, make sure to allow piping capacity equivalent to a size of reservoir between the low maintenance filter and air supply valve.

3. Air pressure
   • Set the pressure of the air supply valve to 0.25 to 0.3 MPa. Increasing the pressure will not improve the back flushing effect.
   • Use the same set pressure for the supply pressure of the lock cylinder. Exceeding this pressure range may increase the load applied to the filtering plate when the element is compressed, causing malfunction.

4. Air pressure
   • Devise the by-pass circuit on the upstream side of IN side valve to prevent the line pressure during back flushing from rising and to protect the pump.

5. Maintenance
   • The filter should be back flushed until the differential pressure reaches 0.1 MPa to avoid a drop in the flow rate due to the element clogging and to maintain back flushing efficiency.
   • Time it takes to clog the element varies depending on the dust condition. Monitor the clogging condition of the element using a detection switch for differential pressure. The detection switch for differential pressure is sold separately. Contact SMC for more information.
   • Since the element of this low maintenance filter provides rough filtration efficiency (with conventional notch wire level), it can be used as a pre-filter to extend the life of the check filter depending on the fluid condition in use. Installing these low maintenance filters side by side to use them alternately enables continuous operation during back flushing. Use an element with 500 mm in length for highly contaminated fluid. A sufficient flow rate can be ensured by installing two to three low maintenance filters in a row in case of the insufficient flow capacity.
### Series FN1

#### Construction

![Diagram of FN1 construction](image)

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cover</td>
<td>SCS13</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Bowl</td>
<td>SCS13</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Element</td>
<td>SUS304</td>
<td>ø65 x 250mm, ø65 x 500mm</td>
</tr>
<tr>
<td>4</td>
<td>Compact cylinder with lock</td>
<td>FN1□1, FN1□2</td>
<td>CDLQB63-30D-F, CDLQB63-50D-F</td>
</tr>
</tbody>
</table>

**Note:** Items 5 through 9 from the above chart.

**Replacement parts:**

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Seal</td>
<td>FPM</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Scraper</td>
<td>NBR</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>O-ring</td>
<td>NBR</td>
<td></td>
</tr>
</tbody>
</table>

**Replacement parts: Seal kit**

<table>
<thead>
<tr>
<th>Model</th>
<th>Order no.</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>FN1□N</td>
<td>KT-FN11N</td>
<td>NBR</td>
<td>Items 5 through 9 from the above chart.</td>
</tr>
<tr>
<td>FN1□V</td>
<td>KT-FN11V</td>
<td>FPM</td>
<td></td>
</tr>
</tbody>
</table>

Approved
Note) Use the Rc 1/4 port marked with an asterisk when designing an air release circuit.
Series FN1

Options

Reservoir

Dust removal filter

Dimensions (mm)

<table>
<thead>
<tr>
<th>Model</th>
<th>Bore size (Nominal size B)</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>FNR1001-10</td>
<td>Rc 1</td>
<td>194</td>
<td>257</td>
</tr>
<tr>
<td>FNR1011-10</td>
<td></td>
<td>332</td>
<td>385</td>
</tr>
</tbody>
</table>

Parts list

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cover</td>
<td>Stainless steel SUS304</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Bowl</td>
<td>Stainless steel SUS304</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>V-band</td>
<td>Stainless steel SUS304</td>
<td></td>
</tr>
</tbody>
</table>

Replacement parts

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Material</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>O-ring</td>
<td>NBR</td>
<td>JIS B 2401-1A-P85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FPM</td>
<td>JIS B 2401-4D-P85</td>
</tr>
</tbody>
</table>
Series FN1
Safety Instructions

These safety instructions are intended to prevent a hazardous situation and/or equipment damage. These instructions indicate the level of potential hazard by a label of "Caution", "Warning", or "Danger". To ensure safety, be sure to observe these and other safety practices.

⚠️ Caution : Operator error could result in injury or equipment damage.
⚠️ Warning : Operator error could result in serious injury or loss of life.
⚠️ Danger : In extreme conditions, there is a possible result of serious injury or loss of life.

⚠️ Warning

1. Determining the compatibility of the products featured in this catalog is the responsibility of the person who designs the system or decides its specifications.
   Since the products specified here are used in various operating conditions, their compatibility with the specific system must be based on specifications or after analysis and/or tests to meet your specific requirements. Particularly, give due consideration when determining a fluid.

2. Only trained personnel should operate machinery and equipment.
   Fluids can be dangerous if an operators unfamiliar with them. Assembly, handling or repair of systems should be performed by trained and experienced operators.

3. Do not service machinery/equipment or attempt to remove components until safety is confirmed.
   1. Inspection and maintenance of machinery/equipment should only be performed after confirmation of safety measures against danger caused by fluids.
   2. When equipment is to be removed, confirm the safety process, the fluid flow, and that there is no danger from residual fluid in the system.
   3. Before machinery/equipment is restarted, make sure to confirm safety.

4. Contact SMC if the product is to be used in any of the following conditions:
   1. Conditions and environments beyond the given specifications.
   2. The use of a fluid whose suitability causes concern due to its type and additives.
   3. Installation on equipment in conjunction with atomic energy, railway, air navigation, vehicles, medical equipment, food and beverages, recreation equipment, emergency shutdown circuits, press applications, brake circuits, or safety equipment.
Design

⚠️ Caution
1. Do not operate exceeding the operating pressure range.
2. Do not operate exceeding the operating temperature range.
3. Fluid
   - Do not operate with gases.
4. Fatigue failure
   - Be sure to implement necessary measures for the following operating conditions:
     1) When surge pressure is applied to the element
     2) Unstable filter causes sliding or vibration.
     3) When the element repeatedly expands and shrinks due to thermal effect.
5. Pressure drop
   - Adjust the initial pressure drop to 0.01MPa to 0.02MPa or less.
6. Corrosion
   - Corrosion may occur depending on the operating condition and environment.
     The wetted part of the pressure gauge is made of brass. Confirm the compatibility with fluid in use.

Selection

⚠️ Warning
1. For model selection, confirm application purpose, required specification, and operating condition (such as fluid, pressure, flow rate, temperature, and environment) so that the selected model is within the specified range.
2. Do not use at temperature that exceeds the boiling point of the fluid.
3. Never use with gases, including air.
4. Do not use in locations where pressure rises over 1MPa due to water hammer or surge pressure.

⚠️ Caution
1. Design circuits to prevent back pressure or backflow. Back pressure can damage the element.

Fluid

⚠️ Warning
1. Use a low maintenance filter for filtration of water, alkali, and cleaning solvent.
   - There may be circumstances where a seal or an O-ring deteriorates, causing leakage.

Piping

⚠️ Caution
1. Ensure sufficient clearance for maintenance when piping.
2. Before piping is connected, it should be thoroughly flushed out with air or water to remove chips, cutting oil, and other debris.
3. Before piping is connected, confirm IN and OUT sides.
4. Connection
   - When screwing together pipes and fittings, be certain that chips from the pipe threads and sealing material do not get inside the piping.
   - Also, when sealant tape is used, leave 1.5 to 2 thread ridges exposed at the end of the male threads.
5. Line flushing
   - Flush the piping lines at the time of initial use and when replacing the element.
6. Connect piping to prevent rise of line pressure on the IN side at the time of back flushing.
7. When starting normal operation after back flushing, release residual pressure in the filter to completely replace the air with the fluid.

Operating Environment

⚠️ Caution
1. Discoloration or material deterioration may occur in an atmosphere where there is a possibility of corrosion. As a corrosion advances, the filter will lose its function.
2. When the filter used in locations where there is a vibration or impact, fatigue failure may occur.
   - Provide proper reinforcement for operation.

Maintenance

⚠️ Caution
1. The pressure drop fluctuates depending on operating conditions. Since the pressure drop is one of the factors indicating filter characteristics, set a control standard for the filter.
2. Be sure to conduct a back-flush to prevent dust adhesion before operation stop (pause).
<Cylinder for element decompression and compression>

### Pneumatic Circuit

#### Warning

1. **Do not use 3-position valves.**
   Unlocking pressure may unlock the lock.
2. **Use a speed controller with meter-out control.**
   Malfunction may occur if meter-in control is used.
3. **Be careful of backflow of pressure exhausted from a common exhaust type valve manifold.**
   A backflow of exhaust pressure may release the lock. Use an individual exhaust type manifold or single type valve.
4. **Split the pneumatic piping for the lock unit between the cylinder and the speed controller.**
   Splitting the piping outside of these 2 components may shorten a service life.
5. **Keep the piping of the lock unit from the branching short.**
   Long piping can cause malfunctioning of unlocking and shorten a service life of the lock.

![Pneumatic Circuit Diagram]

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### Manual Lock Release

#### Warning

1. **Follow the steps shown below for manual release after confirming safety.**
   Make sure that there will be no danger even when the load moves suddenly. Also confirm that no personnel is present in the movement range of the load.

   ![Manual Lock Release Diagram]

   1) Remove the protective cover.
   2) As shown above, insert a flat head screw driver in the clearance of the rod side of the manual lock release lever. Tilt the driver slightly toward the direction indicated by the arrow (to the rod side) to release the lock.

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![Unlocking Lever Diagram]

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