Fluid level gauge
FSA

Installation Instructions

English (translation of the original instructions)

Keep for future reference.

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The content of this manual is subject to change without notice.
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Preface

These installation instructions were prepared to the best of our knowledge. Nevertheless and despite the greatest care, it cannot be excluded that mistakes could have crept in. Therefore please understand that in the absence of any provisions to the contrary hereinafter, our warranty and liability – for any legal reasons whatsoever – are excluded in respect of the information in these installation instructions. In particular, we shall not be liable for lost profit or other financial loss. This exclusion of liability does not apply in cases of intent and gross negligence. Moreover, it does not apply to defects which have been deceitfully concealed or whose absence has been guaranteed, nor in cases of culpable harm to life, physical injury and damage to health. If we negligently breach any material contractual obligation, our liability shall be limited to foreseeable damage. Claims due to Product Liability shall remain unaffected.

1.1 GENERAL

For correct use of this fluid level gauge it is vital to observe the following installation instructions.

- The fluid level gauges described in these installation instructions were designed and fabricated in accordance with the latest technological developments. All components are governed by strict quality and environmental criteria during the production process. Our management systems are certified to ISO 9001.
- These installation instructions provide information about handling the device. A prerequisite for safe work is the observance of all stated safety precautions and instructions.
- The local accident prevention specifications and general safety regulations that apply for the device must be observed.
- These installation instructions are a product component and must be accessible to specialist personnel at all times in the immediate vicinity of the device. They must be forwarded to the following users or owners of the device as applicable.
- The specialist personnel must have carefully read through and understood the installation instructions before commencing any work.

1.2 TECHNICAL SUPPORT

Contact our technical sales department if you have any questions on our product. When contacting us, please always include the model code and part no. of the product:

Fax: +49 6897 509 1595
E-mail: accessories@hydac.com

1.3 MODIFICATIONS TO THE PRODUCT

We would like to point out that changes to the product (e.g. purchasing options) may result in the information in the installation instructions no longer being completely accurate or sufficient.

When making modifications or performing repair work to components affecting the safety of the product, the product may not be put back into operation until it has been examined and released by a HYDAC representative.

Please notify us immediately of any modifications made to the product whether by you or a third party.

1.4 WARRANTY

For the warranty provided by us, please refer to the General Conditions of Sale and Delivery of HYDAC ACCESSORIES GmbH. You will find these under www.hydac.com -> General Terms and Conditions.
1.5 USING THE DOCUMENTATION

Please note that the method described above of locating specific information does not release you from your responsibility for carefully reading the entire manual prior to starting the device up/installing the device for the first time and carefully rereading the manual at regular intervals in the future.

What do I want to know?
I determine which topic I am looking for.

Where can I find the information I'm looking for?
The document has a table of contents at the beginning. There, I select the chapter I'm looking for and the corresponding page number.

The documentation number is for identifying and ordering additional copies of the instructions. The index is incremented every time the manual is revised or changed.
2 Safety information

The device was built according to the statutory provisions valid at the time of delivery and satisfies current safety requirements.

Any residual hazards are indicated by safety information and are described in the installation instructions.

Observe all safety and warning instructions attached to the device. They must always be complete and legible.

2.1 SIGNAL WORDS AND THEIR MEANING IN THE SAFETY INFORMATION

In these instructions you will find the following signal words:

![WARNING]

WARNING – The signal word indicates a hazardous situation with a medium level of risk, which, if not avoided, can result lethal or serious injury.

![CAUTION]

CAUTION – The signal word indicates a hazardous situation with a low level of risk, which, if not avoided, can result in minor or moderate injury.

![NOTICE]

NOTICE – The signal word indicates a hazardous situation with a high level of risk, which, if not avoided, will result in damage to property.

2.2 STRUCTURE OF THE SAFETY INFORMATION

All warning instructions in this manual are highlighted with pictograms and signal words. The pictogram and the signal word indicate the severity of the danger.

Warning instructions listed before an activity are laid out as follows:

<table>
<thead>
<tr>
<th>SIGNAL WORD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type and source of danger</td>
</tr>
<tr>
<td>Consequence of danger</td>
</tr>
<tr>
<td>► Measures to avert danger</td>
</tr>
</tbody>
</table>
2.3 USED SYMBOLS

These signs are listed for all general safety information and instructions in these installation instructions which indicate particular dangers to persons, property or the environment.

Warning sign

![Warning sign]

Danger point warning

GHS sign

![GHS sign]

Health hazard

Other signs

The following signs are used in these installation instructions:

![Tip for handling the product]

Tip for handling the product

![Required tools]

Required tools

![Risk of breakage]

Risk of breakage

I, II, III, IV, V

Sequence of the working steps

![Signs for the required specialist personnel]

Signs for the required specialist personnel

2.4 OBSERVE REGULATORY INFORMATION

Observe the following regulatory information and directives:

- Legal and local regulations for accident prevention
- Legal and local regulations for environmental protection
- Country-specific regulations, organisation-specific regulations
2.5 TARGET GROUP / QUALIFICATIONS OF PERSONNEL

**CAUTION**

Insufficient qualifications mean a risk of injuries
Incorrect handling may lead to severe injuries and damage to property.
► Deployment of authorised specialist personnel.

**Specialist personnel**

Specialist personnel authorised by the owner are those who can perform the work described and identify possible hazards independently due to their specialist training, knowledge of fluid power and experience with and awareness of the national regulations, applicable standards and directives.

The following requirements that apply for the specialist personnel for installation, initial start-up, maintenance and repair of the FSA must be met:

- Safe handling/use of tools
- Reliable knowledge of fitting and connection of hydraulic lines and connections
- Product-specific knowledge
- Knowledge about how to handle operating media.
- Trained in device safety.
- Familiar with the device’s particular operating conditions.
- For Ex-certified FSA: also trained in explosion protection.

2.6 OBSERVE REGULATORY INFORMATION

Observe the following regulatory information and directives:

- Legal and local regulations for accident prevention
- Legal and local regulations for environmental protection
- Country-specific regulations, organisation-specific regulations

2.7 TRANSPORT, PACKAGING AND STORAGE

**Transport**

**NOTICE**

Risk of breakage
The FSA will be destroyed.
► Do not throw.

When receiving and unpacking the FSA, check it for damage in transit. Report any damage to the respective forwarding agent immediately.

**Packaging**

Do not remove the packing until you are ready for installation/initial start-up of the device.

**Storage**

Make sure to store the FSA in a clean, dry place, in the original packing, if possible. Do not remove the packing until you are ready to install the device.

2.8 CHECKING THE SCOPE OF DELIVERY

The fluid level gauge comes packed and factory-assembled. Before installation, check the contents of the package to make sure it is complete and has not been damaged during transport.
3

Product description

3.1 INTENDED USE

HYDAC FSA fluid level gauges are used to continuously display the fluid level in a hydraulic container. Connecting the FSA directly to a pressure operating fluid container enables the fluid level to be easily read from the outside of the container. With the optional use of a thermometer, the current temperature of the fluid will also be shown.

Any use extending beyond or deviating therefrom shall not be considered intended use. HYDAC Accessories GmbH will assume no liability for any loss or damage as the result thereof. This risk is borne solely by the owner.

Intended use of the product extends to the following:

- Maintaining adherence to all notices contained in the installation instructions
- Complying with the installation instructions

| NOTICE |
| Non-permitted operating fluid |
| The FSA will no longer be leaktight and/or will be destroyed. |
| ► Only use the specified fluids. In the standard design, not suitable for use with glycol or fluids containing glycol. |

| NOTICE |
| Exceeding the operating pressure |
| The FSA will no longer be leaktight and/or will be destroyed. |
| ► Compliance with the stipulated operating pressure. |

| NOTICE |
| Operating temperatures above or below permitted levels |
| The FSA will no longer be leaktight and/or will be destroyed. |
| ► Compliance with the stipulated operating temperature. |

3.2 IMPROPER USE OR USE DEVIATING FROM INTENDED USE

Improper use or use deviating from intended use may result in hazards and/or will damage the device. Examples of improper use:

- Operation in potentially explosive atmospheres.
- Operation under non-permitted operational conditions.
- Operation with a non-permitted operating fluid.
- Device modifications without authorisation.
- Inadequate monitoring of parts that are subject to wear and tear.
- Improperly performed repair work.
- Cleaning with non-permitted fluids.
- Use as stepladder, shelf, wall hook or the like
3.3 FUNCTION

The FSA works on the principle of communicating vessels. The fluid enters the device via the lower connection bore and is clearly visible in the tube.

3.4 DESIGN

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Connector (2x)</td>
</tr>
<tr>
<td>(2)</td>
<td>Frame</td>
</tr>
<tr>
<td>(3)</td>
<td>Tube</td>
</tr>
<tr>
<td>(4)</td>
<td>Nut for through-bore (2x)</td>
</tr>
<tr>
<td>(5)</td>
<td>Sealing disc (2x)</td>
</tr>
<tr>
<td>(6)</td>
<td>Banjo bolt (2x)</td>
</tr>
</tbody>
</table>

3.5 DECODING THE NAME PLATE

Details for identifying the fluid level gauge are given on the name plate on the packaging.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Part number</td>
</tr>
<tr>
<td>(2)</td>
<td>Model code, for details see page 18</td>
</tr>
<tr>
<td>(3)</td>
<td>Week/year of manufacture</td>
</tr>
<tr>
<td>(4)</td>
<td>Packaging unit</td>
</tr>
</tbody>
</table>
4 Assembly

4.1 INSTALLATION REQUIREMENTS

For proper functioning of the FSA, correct installation is vital, in compliance with the regulations that apply for the planning, construction and operation of the overall system.

Required tools

- Open-jaw spanner \(\Theta = 17\) mm \(\rightarrow\) Bolt M12 / M10
- Open-jaw spanner \(\Theta = 18\) mm \(\rightarrow\) Nuts M12
- Open-jaw spanner \(\Theta = 15\) mm \(\rightarrow\) Nuts M10
- Torque spanner

4.2 PREPARATORY WORK

**WARNING**

Hydraulic systems are under pressure

Bodily injury

- The hydraulic system must be depressurised before performing any work on the hydraulic system.

**CAUTION**

Danger of slipping due to leaking oil

Bodily injury

- Empty the container before the installation work.

I. Remove the packaging.

II. Check the delivered item for completeness and lack of damage.

III. Ensure that the bores on the container are arranged in accordance with the interface pattern (see following page) and that they are suitable for the FSA that is to be applied.
**Interface for FSA with threaded hole** (dimensions given in mm)

Thread length
M10 - min. 5 mm
M12 - min. 6 mm

**Interface for FSA with through-bore** (dimensions given in mm)

In sealing surface Ø 21.6 Ra 3.2.
Sealing surface free from contamination,
welding beads, scale, varnish etc.

**Centre distance of bolts L2**

<table>
<thead>
<tr>
<th>Nominal size FSA</th>
<th>L2 - M10, M12 [mm]</th>
<th>L2 - ø11, ø13 [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>76</td>
<td>76 ± 0.2</td>
<td>76 ± 0.3</td>
</tr>
<tr>
<td>127</td>
<td>127 ± 0.3</td>
<td>127 ± 0.5</td>
</tr>
<tr>
<td>176</td>
<td>176 ± 0.3</td>
<td>176 ± 0.5</td>
</tr>
<tr>
<td>254</td>
<td>254 ± 0.3</td>
<td>254 ± 0.5</td>
</tr>
<tr>
<td>381</td>
<td>381 ± 0.3</td>
<td>381 ± 0.5</td>
</tr>
<tr>
<td>500</td>
<td>500 ± 0.5</td>
<td>500 ± 0.8</td>
</tr>
<tr>
<td>600</td>
<td>600 ± 0.5</td>
<td>600 ± 0.8</td>
</tr>
<tr>
<td>700</td>
<td>700 ± 0.5</td>
<td>700 ± 0.8</td>
</tr>
<tr>
<td>800</td>
<td>800 ± 0.5</td>
<td>800 ± 0.8</td>
</tr>
<tr>
<td>900</td>
<td>900 ± 0.5</td>
<td>900 ± 0.8</td>
</tr>
<tr>
<td>1000</td>
<td>1000 ± 0.5</td>
<td>1000 ± 0.8</td>
</tr>
</tbody>
</table>
4.3 MOUNTING THE FSA TO THE CONTAINER

We recommend a vertical installation position, so that the FSA can fulfil its function completely.

### CAUTION

**Risk of injury if unsuitable tools are used**

Using the wrong tools may lead to severe injuries and damage to property.

- Use the necessary tools.

### NOTICE

**Incorrect tightening torque**

The FSA will no longer be leaktight and/or will be destroyed.

- The specified one-off tightening torque for the banjo bolts of 8.0 ±0.5 Nm (dry) or 6.5 ±0.5 Nm (lubricated) must be observed.

The FSA is connected to the container with 2x M10 or M12 banjo bolts:

- The two threaded holes in the container
- The two through-bores in the container

### NOTICE

**Uneven tightening of the bolts**

The FSA will no longer be leaktight and/or will be destroyed.

- Even tightening of the bolt with the specified tightening torque.

Bolt the FSA to the container wall in accordance with specifications (See installation information on following page).

**Ⓐ Installation steps for FSA with threaded hole**

I. Remove the nuts (4).
II. Place the FSA on the threaded holes. Ensure that all individual parts remain in their intended positions.
III. Tighten the bolts (6) evenly with the specified tightening torque.

**Ⓑ Installation steps for FSA with through-bore**

I. Loosen the nuts (4).
II. Insert the FSA into the through-bores. Ensure that all individual parts remain in their intended positions.
III. Place the nuts (4) on the banjo bolts (6) and tighten them finger-tight. Ensure that the lock nut is not placed on the thread with a tilt. This would damage the thread.
IV. Tighten the bolts (6) while simultaneously tightening the nuts (4) evenly with the specified tightening torque.

Once installation is complete, check that the connection between FSA and container is leaktight.
**A Installation information for FSA with threaded hole**

- **Correct**
  - Tank
  - FSA
  - Tighten both bolts evenly
  - Tightening torque:
    - Dry: 8 Nm
    - Lubricated: 6.5 Nm

- **Wrong**
  - Bolt and frame in wrong position
  - O-ring in wrong position
  - O-ring will be damaged

**B Installation information for FSA with through-bore**

- **Correct**
  - Tank
  - FSA
  - Tighten both bolts evenly
  - Tightening torque:
    - Dry: 8 Nm
    - Lubricated: 6.5 Nm
### Servicing/maintenance

**NOTICE**

**Unsuitable cleaning agent**

The FSA will no longer be leaktight and/or will be destroyed.

- Only light surfactant cleaning agents may be used.
- Cleaning the FSA with a high-pressure cleaner is not permitted.

---

### De-commissioning/disassembly

To de-commission the FSA, proceed as follows:

**CAUTION**

**Risk of injury if unsuitable tools are used**

Using the wrong tools may lead to severe injuries and damage to property.

- Use the necessary tools.

**SIGNAL WORD**

**Danger of slipping due to leaking oil**

Bodily injury

- Empty the container before the installation work.

---

I. Loosen the banjo bolts (6)

II. Remove the FSA from the hydraulic system

---

### Waste disposal

- Dispose of the packaging material as appropriate for your area.
- When decommissioning and/or disposing of the FSA, observe all local guidelines and regulations pertaining to occupational health and safety and environmental protection. This applies in particular to the oil contained in the device and to components coated in oil.
- After disassembling the device and separating the various materials, recycle them or dispose of them properly in accordance with local regulations.
8 Spare parts
8.1 SEAL KIT

<table>
<thead>
<tr>
<th>Seal kit</th>
<th>Order no. = part no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSA - 76 - 381 - 1.X/-12 NBR</td>
<td>704616</td>
</tr>
<tr>
<td>FSA - 76 - 381 - 1.X/-12 FKM</td>
<td>704627</td>
</tr>
<tr>
<td>FSA - 76 - 381 - 1.X/-10 NBR</td>
<td>3248767</td>
</tr>
<tr>
<td>FSA - 76 - 381 - 2.X/-10 FKM</td>
<td>3395614</td>
</tr>
<tr>
<td>FSA 500 - 1000 FKM or NBR</td>
<td>on request</td>
</tr>
</tbody>
</table>

9 Technical data
9.1 PERFORMANCE DATA

<table>
<thead>
<tr>
<th>Installation</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container-side, threaded hole</td>
<td>FSA 076 0.162 kg</td>
</tr>
<tr>
<td>Alternative through-bore</td>
<td>FSA 127 0.172 kg</td>
</tr>
<tr>
<td>Installation position</td>
<td>FSA 176 0.196 kg</td>
</tr>
<tr>
<td>Vertically on the tank wall</td>
<td>FSA 254 0.217 kg</td>
</tr>
<tr>
<td></td>
<td>FSA 381 0.250 kg</td>
</tr>
<tr>
<td></td>
<td>FSA 500 0.667 kg</td>
</tr>
<tr>
<td></td>
<td>FSA 600 0.750 kg</td>
</tr>
<tr>
<td></td>
<td>FSA 700 0.835 kg</td>
</tr>
<tr>
<td></td>
<td>FSA 800 0.918 kg</td>
</tr>
<tr>
<td></td>
<td>FSA 900 0.994 kg</td>
</tr>
<tr>
<td></td>
<td>FSA 1000 1.126 kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ambient temperature range</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FKM</td>
<td>-20 °C to +80 °C</td>
</tr>
<tr>
<td>NBR</td>
<td>-25 °C to +80 °C</td>
</tr>
<tr>
<td>NBT-TT</td>
<td>-46 °C to +100 °C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Connectors</td>
<td>Plastic or aluminium</td>
</tr>
<tr>
<td>Riser tube</td>
<td>Plastic or glass</td>
</tr>
<tr>
<td>Seals</td>
<td>Viton (FKM), Perbunan (NBR) or low-temperature Perbunan (NBR-TT), EPDM (on request)</td>
</tr>
</tbody>
</table>

9.2 HYDRAULIC SPECIFICATIONS

| Nominal pressure                             | PN 0.5 bar |
| Media                                        | Mineral oil to DIN 51524 part 1 and part 2 Water-oil emulsions and synthetic fluids, such as pressure fluids based on phosphate ester, Other fluids on request |

<table>
<thead>
<tr>
<th>Fluid temperature range</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FKM</td>
<td>-20 °C to +80 °C</td>
</tr>
<tr>
<td>NBR</td>
<td>-25 °C to +80 °C</td>
</tr>
<tr>
<td>NBR-TT</td>
<td>-40 °C to +100 °C</td>
</tr>
</tbody>
</table>

| Viscosity range                              | max. 2000 mm²/s |
Appendix

10.1 CUSTOMER SERVICE/SERVICE

HYDAC SYSTEMS & SERVICES GmbH
Friedrichsthaler Straße 15, Werk 13
66540 Neunkirchen-Heinitz
Germany

Phone: +49 6897 509 9858
Fax: +49 6897 509 9028
E-mail: service@hydac.com
10.2 MODEL CODE

**FSA 076 ... 381**
(Also order example)

- **Designation**
  - FSA = Fluid level gauge

- **Nominal size**
  - (± centre distance of bolts)
  - 076; 127; 176; 254; 381

- **Sealing material**
  - 1 = NBR (Perbunan)
  - 2 = FKM (Viton)

- **Serie**
  - (Specified by manufacturer)

- **Additional thermometer function**
  - - = No additional function (standard)
  - T = Thermometer in display tube

- **Installation conditions (thread of banjo bolt)**
  - 12 = M12 (standard)
  - 10 = M10 (not for T3)

- **Special designs**
  - SO2 = with glass tube, aluminium connecting blocks and round design
  - SO7 = frame, fastening bolts and nuts made from stainless steel
  - SO8 = fastening bolts and nuts made from stainless steel (1.4571)
  - SO14 = with glass tube, plastic connecting blocks (PA)
  - SO19 = with green hollow ball, no contrast washer
  - SO65 = FSA – standard, but without fastening bolts or sealing washers
  - SO67 = FSA – standard, but without sealing washers
  - SO79 = with side viewing window

*only for size M12

**FSA 500 ... 1000**
(Also order example)

- **Designation**
  - FSA = Fluid level gauge

- **Nominal size**
  - (± centre distance of bolts)
  - 500; 600; 700; 800; 900; 1000

- **Sealing material**
  - 1 = NBR (Perbunan)
  - 2 = FKM (Viton)

- **Riser tube design**
  - O = Round

- **Additional thermometer function**
  - - = No additional function (standard)
  - FT = Probe thermometer

- **Installation conditions**
  - 12 = M12 (thread of banjo bolt)

- **Housing seal**
  - ... = Gasket (no entry required)
  - OR = O-ring

- **Diameter of riser tube**
  - ø19 = 19 mm

- **Special designs**
  - SO2 = with glass tube, aluminium connecting blocks and round design
## 10.3 EXPLANATION OF TERMS AND ABBREVIATIONS

An explanation of terms and abbreviations follows below:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ø</td>
<td>Diameter</td>
</tr>
<tr>
<td>⊥</td>
<td>Perpendicularity (positional tolerance)</td>
</tr>
<tr>
<td>−</td>
<td>Straightness (shape tolerance)</td>
</tr>
<tr>
<td>○</td>
<td>Hexagon (shape of bolts/nuts)</td>
</tr>
<tr>
<td>°C</td>
<td>Degrees Celsius</td>
</tr>
<tr>
<td>DIN</td>
<td>Deutsche Industrie Norm [German Industry Standard]</td>
</tr>
<tr>
<td>EPDM</td>
<td>Ethylene propylene diene monomer rubber</td>
</tr>
<tr>
<td>FKM</td>
<td>Fluoroelastomer rubber</td>
</tr>
<tr>
<td>FSA</td>
<td>Fluid level gauge</td>
</tr>
<tr>
<td>Lubricated</td>
<td>Bolt oiled</td>
</tr>
<tr>
<td>Poss.</td>
<td>Possibly</td>
</tr>
<tr>
<td>Finger-tight</td>
<td>Tighten nut finger-tight</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>kg</td>
<td>Kilogram</td>
</tr>
</tbody>
</table>

**Communicating vessels**

Communicating vessels refers to vessels that are open at the top but joined together at the bottom. As conditions (gravity, atmospheric pressure) are the same, a homogeneous fluid rises to an equal height in the vessels.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>M10, M12</td>
<td>Metric thread size 10 or 12</td>
</tr>
<tr>
<td>Max.</td>
<td>Maximum</td>
</tr>
<tr>
<td>mm</td>
<td>Millimetre</td>
</tr>
<tr>
<td>mm²/s</td>
<td>Measurement unit for kinematic viscosity</td>
</tr>
<tr>
<td>NBR</td>
<td>Nitrile rubber</td>
</tr>
<tr>
<td>NBR-TT</td>
<td>Nitrile rubber for low temperatures</td>
</tr>
<tr>
<td>Nm</td>
<td>Newton metres (torque specification)</td>
</tr>
<tr>
<td>No.</td>
<td>Number</td>
</tr>
<tr>
<td>Ra</td>
<td>Average roughness value (in this case roughness of housing surface)</td>
</tr>
<tr>
<td>Dry</td>
<td>Bolt dry</td>
</tr>
<tr>
<td>etc.</td>
<td>And so on</td>
</tr>
<tr>
<td>e.g.</td>
<td>For example</td>
</tr>
</tbody>
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