Steering Columns
Type OTP

Technical Information
A Wide Range of Steering Components

A wide range of steering components

Technical Literature Survey

Technical literature survey

Fixed Steering Columns, OTPB and OTPM

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Flanges
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Specification table for non-catalogue numbers of OTP fixed steering columns
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OTP Steering Columns
Technical Information
Fixed Steering Columns, OTP

Fixed Steering Columns, OTPB

The OTPB steering columns fit OSPB, OSPC, OSPD, OSPF, OSPL, OSPQ steering units and TAD torque amplifiers.

Fixed Steering Columns, OTPM

The OTPM steering columns fit OSPM steering units.

Versions

Steering wheel connections: SWC

The OTPB steering columns are available with six different standard steering wheel connections:

1. A: 5 x 6.5 DIN 6888
   \[ d_{\text{min}} = 23.16 \text{ mm} \ [0.912 \text{ in}] \]
   K: Taper 1:20

2. B: 5 x 7.5 DIN 6888
   \[ d_{\text{min}} = 20.50 \text{ mm} \ [0.807 \text{ in}] \]
   K: Taper 1:20

3. D: \( \frac{1}{16} \times 3/8 \) SAE J502
   \[ d_{\text{min}} = 20.00 \text{ mm} \ [0.787 \text{ in}] \]
   L: Taper 1:16
4. With \( \frac{3}{16} \) in-36 serration
\( d_{\text{min}} = 20.97 \text{ mm [0.826 in]} \)
L: Taper 1:16
N: 36 teeth

5. With 7/8 in-36 serration
\( d_{\text{min}} = 21.55 \text{ mm [0.848 in]} \)
M: Taper 1:19.26
N: 36 teeth

6. With 7/8 in-36 serration
\( d_{\text{min}} = 21.80 \text{ mm [0.858 in]} \)
M: Taper 1:19.26
N: 36 teeth
The OTPM steering columns are available with three different standard steering wheel connections.

**M1**

A: 5 • 6.5 DIN 6888  
\( d_{\text{min}} = 16.47 \text{ mm} [0.648 \text{ in}] \)  
K: Taper 1:20

**M2**

(same as “5” page 8)  
With \( \frac{3}{8} \) in-36 serration  
\( d_{\text{min}} = 21.55 \text{ mm} [0.848 \text{ in}] \)  
K: Taper 1:19,26

**M3**

With \( \frac{11}{16} \) in-40 serration  
\( d_{\text{min}} = 17.89 \text{ mm} [0.704 \text{ in}] \)  
K: Taper 1:12
Body tubes

The OTPB steering columns are available with three different body tube dimensions:

1. Standard: ∅38 • 1.5 mm [1.50 • 0.06 in]

2. ∅38 • 2.5 mm [1.50 • 0.1in]

3. ∅45 • 2.5 mm [1.77 • 0.1 in]

If the steering column is longer than 150 mm [5.91 in] and support is not possible, the recommended body tube is ∅38 x 2.5mm [1.50 • 0.1in] or ∅45 x 2.5mm [1.77 • 0.1 in].
Body tubes
The OTPM steering columns are available with one body tube dimensions:

1. Standard: ∅ 38 • 1.5 mm [1.50 • 0.06 in]
Flanges

Our OTPB steering columns are available with three different flanges:

**Flange A**

**Flange B**
Flanges

Flange for bottom tilting

The tilting flange makes it possible to tilt steering column and steering unit.

For other versions, please contact the Sauer-Danfoss Sales Organization.
Versions (continued)

**Flanges**

The OTPM steering columns are available with one flange:

---

**Flange M**

![Flange M Diagram]
Axle journals

OTP are available with three different axle journals for connection to the steering unit:

1. Standard axle journal with straight splines. In case of inadequate parallelism between the steering column’s mounting plane (flange) and the steering unit’s steering column plane, use a spherical axle journal. For standard splines, the required parallelism is better than 0.5 mm in relation to the steering unit’s steering column plane.

2. Axle journal with straight splines and O-ring for noise reduction.

3. Spherical axle journal. This axle journal enables angular movements up to 10° between steering unit and steering column.

4. OTP are available with one type of axle journal type “M”
Surface protection
OTP steering columns are available with two different kinds of surface protection:
- Standard: yellow chromate
- Black chromate

Horn buttons
Our steering columns can be delivered with single or double horn button (ref. below).
(description of horn buttons)

1. **Standard single horn button**
   For Ø38 mm [1.5 in] body tube, spare parts bag code number 150-5215

2. **Standard single horn button**
   For Ø45 mm [1.77 in] body tube, spare parts bag code number 150-4032
3. **Flat horn button**
   For ∅38 mm [1.5 in] and ∅45 mm [1.77 in] body tubes, spare parts bag code number 150-6762.
   Height: 10 mm [0.39 in] from surface of body tube.
   Due to the shape of the connecting hole in the steering column, the flat horn button cannot be directly interchanged with a standard horn button.

   A: **Spade connector DIN 46244-A6,3-0,8 BZ**

4. **Double horn button.**
   Only for ∅38 mm [1.5 in] body tube, spare parts bag code number 150-6288

   A: **Covered male blade terminals**
   AMP 3-520107-2
Wire ends for steering wheel horn button
Steering columns with horn buttons are available with various wire ends in the steering wheel end of the column:

1. Standard: 100 mm wire with tin-plated end
2. 100 mm wire without tin-plated end
3. 100 mm wire with round AMP male connection, AMP no.160214
4. 100 mm wire with flat AMP female connection, fully insulated, AMP no. 735160-0
5. Customer defined

Flasher activator
OTP steering columns with body tube ∅45 mm are available with flasher activator. The activator returns the flasher switch into neutral after completion of steering rotation.

It is not possible to equip one and the same OTP steering column with both flasher activator and steering wheel sensor.
OTA Steering Columns
Technical Information
Fixed Steering Columns, OTPB

Versions (continued)

Steering wheel sensors

Our OTP steering columns are available in versions prepared for the installation of a steering wheel sensor for pump control. We can offer two different sensors:

1. ON/OFF sensor

Data:
- Principle: Hall-effect, contactless, free of service.
- Power supply: 24 or 48 V DC ± 25%, Failure polarity protected.
- Output: ON/OFF, open collector, NPN outputs. Short circuit-protected.
- Max load on signal: 50 mA
- Response time: < 100 ms
- Enclosure: IP 54
- Wires: White = 24 or 48 V, Green = ON/OFF signal, Brown= 0 V
- LED: For service, light is on when signal is active.

2. Proportional sensor

Data:
- Principle: Hall-effect, contactless, free of service.
- Power supply: 18-80 V DC ± 10%, Failure polarity protected.
- Output: Analogue output (short circuit protected),
  - Min load on proportional signal: 1 mA
  - Max load on proportional signal: 10 mA
- Response time: < 100 ms
- Enclosure: IP 54
- Wires: White = 18-80 V, Green= proportional signal, Brown= 0 V
- LED: For service, light is on when signal is active.

Steering wheel sensors are only available for body tube dimension Ø38 mm. Sensors can only be mounted near to the top of the column, see dimensions. ON/OFF and proportional sensors have same dimensions, see below.

Steering column sensor, dimensions

Height: Max. 12 mm [0.47 in] from surface of body tube.

A: Max tightening torque: 0,5 N•m
B: Wire length: As required
Connector on wire end:
- Standard:
  - contact pins: AMP no.: 926887-1
  - housing for contact pins: AMP no.: 350779-1
- Other connectors: contact Sauer-Danfoss Sales Organisation.
Fixed Steering Columns, OTP

**Code Numbers and Weights, OTPB**

The following steering columns have \( \varnothing 38 \cdot 1.5 \text{ mm} [1.5 \cdot 1.06 \text{ in}] \) body tube, B-flange, and yellow chromate coating.

### Fixed steering columns without horn button

<table>
<thead>
<tr>
<th>Code number</th>
<th>Type</th>
<th>OTPB 75</th>
<th>OTPB 100</th>
<th>OTPB 150</th>
<th>OTPB 200</th>
<th>OTPB 250</th>
<th>OTPB 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>1* With woodruff key 5 • 6.5 mm [0.197 • 0.256 in]</td>
<td></td>
<td>150-5031</td>
<td>150-5032</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( D_{min} = 23.16 \text{ mm} [0.912 \text{ in}], \text{ taper } 1 : 20 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2* With woodruff key 5 • 7.5 mm [0.197 • 0.295 in]</td>
<td></td>
<td>150-5034</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( D_{min} = 20.50 \text{ mm} [0.807 \text{ in}], \text{ taper } 1 : 20 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3* With woodruff key 3( \frac{3}{16} ) • 3( \frac{3}{8} )</td>
<td>**150-5065</td>
<td>**150-5066</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( D_{min} = 20.00 \text{ mm} [0.787 \text{ in}], \text{ taper } 1 : 16 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4* With serration 13( \frac{1}{16} ) - 36</td>
<td></td>
<td>150-5037</td>
<td>150-5038</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( D_{min} = 20.97 \text{ mm} [0.826 \text{ in}], \text{ taper } 1 : 16 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5* With serration 7( \frac{7}{8} ) - 36</td>
<td>150-5040</td>
<td>150-5041</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( D_{min} = 21.55 \text{ mm} [0.848 \text{ in}], \text{ taper } 1 : 19.26 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6* With serration 7( \frac{7}{8} ) - 36</td>
<td>150-5044</td>
<td>150Z1002</td>
<td>150Z1003</td>
<td>150Z1004</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( D_{min} = 21.80 \text{ mm} [0.858 \text{ in}], \text{ taper } 1 : 19.26 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The numbers refer to the dimensional sketch, page 7 - 8
** These code numbers have black chromate as surface protection.

### Fixed steering columns without horn button, continued

<table>
<thead>
<tr>
<th>Code number</th>
<th>Type</th>
<th>OTPB 350</th>
<th>OTPB 400</th>
<th>OTPB 450</th>
<th>OTPB 550</th>
<th>OTPB 650</th>
<th>OTPB 750</th>
</tr>
</thead>
<tbody>
<tr>
<td>1* With woodruff key 5 • 6.5 mm [0.197 • 0.256 in]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>150-5033</td>
</tr>
<tr>
<td>( D_{min} = 23.16 \text{ mm} [0.912 \text{ in}], \text{ taper } 1 : 20 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2* With woodruff key 5 • 7.5 mm [0.197 • 0.295 in]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>150-5036</td>
</tr>
<tr>
<td>( D_{min} = 20.50 \text{ mm} [0.807 \text{ in}], \text{ taper } 1 : 20 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3* With woodruff key 3( \frac{3}{16} ) • 3( \frac{3}{8} )</td>
<td>**150-5089</td>
<td>**150-5089</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( D_{min} = 20.00 \text{ mm} [0.787 \text{ in}], \text{ taper } 1 : 16 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4* With serration 13( \frac{1}{16} ) - 36</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>150-5039</td>
</tr>
<tr>
<td>( D_{min} = 20.97 \text{ mm} [0.826 \text{ in}], \text{ taper } 1 : 16 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5* With serration 7( \frac{7}{8} ) - 36</td>
<td>150-5039</td>
<td>150-5042</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( D_{min} = 21.55 \text{ mm} [0.848 \text{ in}], \text{ taper } 1 : 19.26 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6* With serration 7( \frac{7}{8} ) - 36</td>
<td>150Z1005</td>
<td>150Z1006</td>
<td>150Z1007</td>
<td>150Z1008</td>
<td>150Z1009</td>
<td>150Z1004</td>
<td></td>
</tr>
<tr>
<td>( D_{min} = 21.80 \text{ mm} [0.858 \text{ in}], \text{ taper } 1 : 19.26 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The numbers refer to the dimensional sketch, page 7 - 8
** These code numbers have black chromate as surface protection.

If you need other lengths, body tube dimensions, surface protection, flasher activator, flanges, noise damping or steering wheel sensor, please fill in the form on page 23 and contact the Sauer-Danfoss Sales Organization.
Following steering columns are with ∅38 x 1.5 mm body tube, B-Flange, yellow chromate, with single standard horn button, and with standard tin-plated wire end.

### Fixed steering columns with single horn button

<table>
<thead>
<tr>
<th>Code number</th>
<th>OTPB 75</th>
<th>OTPB 100</th>
<th>OTPB 150</th>
<th>OTPB 200</th>
<th>OTPB 250</th>
<th>OTPB 300</th>
</tr>
</thead>
<tbody>
<tr>
<td>1* With woodruff key 5 • 6.5 mm [.197 • .256 in]</td>
<td>150-5046</td>
<td>150-5047</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2* With woodruff key 5 • 7.5 mm [.197 • .295 in]</td>
<td>150-5049</td>
<td>150-5050</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4* With serration 7/16 - 36</td>
<td>150-5052</td>
<td>150-5053</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5* With serration 7/8 - 36</td>
<td>150-5055</td>
<td>150-5056</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6* With serration 7/8 - 36</td>
<td>150-5058</td>
<td>150Z1010</td>
<td>150-5059</td>
<td>150Z1011</td>
<td>150Z1012</td>
<td>150Z1013</td>
</tr>
</tbody>
</table>

1* The numbers refer to the dimensional sketch, page 7 - 8

### Fixed steering columns with single horn button, continued

<table>
<thead>
<tr>
<th>Code number</th>
<th>OTPB 350</th>
<th>OTPB 400</th>
<th>OTPB 450</th>
<th>OTPB 550</th>
<th>OTPB 650</th>
<th>OTPB 750</th>
</tr>
</thead>
<tbody>
<tr>
<td>1* With woodruff key 5 • 6.5 mm [.197 • .256 in]</td>
<td>150-5048</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2* With woodruff key 5 • 7.5 mm [.197 • .295 in]</td>
<td>150-5051</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4* With serration 7/16 - 36</td>
<td>150-5054</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5* With serration 7/8 - 36</td>
<td>150-5057</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6* With serration 7/8 - 36</td>
<td>150Z1014</td>
<td>150Z1015</td>
<td>150Z1016</td>
<td>150Z1017</td>
<td>150Z1018</td>
<td>150-5060</td>
</tr>
</tbody>
</table>

* The numbers refer to the dimensional sketch, page 7 - 8

If you need other lengths, body tube dimensions, surface protection, flasher activator, flanges, noise damping, types of horn button, or steering wheel sensor, please fill in the form on page 23 and contact the Sauer-Danfoss Sales Organization.
OTP Steering Columns
Technical Information
Fixed Steering Columns, OTP

**Code Numbers and Weights, OTPM**

Following steering columns are with Ø38 x 1.5 mm [1.496 • 0.059] body tube, M-Flange, and black chromate coating.

<table>
<thead>
<tr>
<th>Type</th>
<th>Code number</th>
<th>OTPM 163</th>
<th>OTPM 350</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight kg [lb]</td>
<td>1.3 [2.90]</td>
<td>1.8 [4.00]</td>
<td></td>
</tr>
<tr>
<td>M 1*) With woodruff key 5 • 6.5 mm [.197 • .256 in] (D_{min}= 16.47 \text{ mm} [0.648 \text{ in}], \text{ taper } 1 : 20)</td>
<td>150L1024</td>
<td>150L1025</td>
<td></td>
</tr>
<tr>
<td>M2*) With serration (7/8 - 36) (D_{min}= 21.55 \text{ mm} [0.848 \text{ in}], \text{ taper } 1 : 19.26)</td>
<td>150L1026</td>
<td>150L1027</td>
<td></td>
</tr>
<tr>
<td>M6*) With serration (11/16 - 40) (D_{min}= 17.89 \text{ mm} [0.704 \text{ in}], \text{ taper } 1 : 19.26)</td>
<td>150L1028</td>
<td>150L1029</td>
<td></td>
</tr>
</tbody>
</table>

*The numbers refer to the dimensional sketch, page 9*
### Specification Table for Non-Catalogue Numbers of Sauer-Danfoss OTPB

Fixed Steering Columns

Fill in your company data. Tick off and give in values in the table where appropriate, and send to your local Sauer-Danfoss Sales Organization.

<table>
<thead>
<tr>
<th>Your company</th>
<th>Name</th>
<th>Vehicle</th>
<th>Potential, pcs/year</th>
<th>Completed by</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OTPB for: OSPB, OSPC, OSPD, OSPF, OSPL, OSPQ and TAD</td>
<td>OTPM for: OSPM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For steering unit type

<table>
<thead>
<tr>
<th>Steering wheel connection see page 7 - 9</th>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
<th>Type 4</th>
<th>Type 5</th>
<th>Type 6</th>
<th>Type M1</th>
<th>Type M2</th>
<th>Type M3</th>
<th>Customer defined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body tube</td>
<td>∅38 • 1.5 mm, standard</td>
<td>∅38 • 2.5 mm</td>
<td>∅45 • 2.5 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flange type</td>
<td>Type A</td>
<td>Type B</td>
<td>Tilting</td>
<td>Type M</td>
<td>Customer defined</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-dimension</td>
<td>Min. 45 mm, state length</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-dimension</td>
<td>Type A standard 10.5 mm</td>
<td>Type B standard 6.5 mm</td>
<td>Type M: standard -14 mm</td>
<td>Other: State length</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axle journal</td>
<td>Standard, straight splines</td>
<td>With O-ring</td>
<td>Spherical</td>
<td>Standard M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface protection</td>
<td>Yellow chromate (not for OTPM)</td>
<td>Black chromat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horn button</td>
<td>None</td>
<td>Standard for ∅38 mm body tube</td>
<td>Standard for ∅45 mm body tube</td>
<td>Flat version</td>
<td>Double for ∅38 mm body tube only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horn button: Wire length at steering wheel</td>
<td>Standard 100 mm</td>
<td>Customer defined, state length</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horn button: Wire connection steering wheel</td>
<td>Standard, tin-plated wire end</td>
<td>Wire end without tin-plating</td>
<td>Round male AMP</td>
<td>Flat female AMP insulated</td>
<td>Customer defined</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flasher activator</td>
<td>No</td>
<td>Yes (for ∅45 mm body tube only)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prepared for steering wheel sensor</td>
<td>No</td>
<td>Yes (for ∅38 mm body tube only)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steering wheel sensor</td>
<td>None</td>
<td>ON/OFF</td>
<td>Proportional</td>
<td>Power supply, state voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wire length</td>
<td>T</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T is linked to steering wheel connection type

Alternativ specify by stating code number of basic steering column: __________________________

Requested modifications: __________________________
### OTP Steering Columns

#### Technical Information

### Fixed Steering Columns, OTP

**Dimensions**

OTP standard steering column referring to code numbers page 20 - 21.

*T-dimension is linked to SWC, Steering Wheel Connection, see page 7 - 8*

<table>
<thead>
<tr>
<th>Type</th>
<th>C [mm]</th>
<th>C [in]</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTPB 75</td>
<td>62.7</td>
<td>2.47</td>
</tr>
<tr>
<td>OTPB 100</td>
<td>100</td>
<td>3.94</td>
</tr>
<tr>
<td>OTPB 150</td>
<td>153.9</td>
<td>6.06</td>
</tr>
<tr>
<td>OTPB 200</td>
<td>200</td>
<td>7.87</td>
</tr>
<tr>
<td>OTPB 250</td>
<td>250</td>
<td>9.84</td>
</tr>
<tr>
<td>OTPB 300</td>
<td>300</td>
<td>11.81</td>
</tr>
<tr>
<td>OTPB 350</td>
<td>350</td>
<td>13.78</td>
</tr>
<tr>
<td>OTPB 400</td>
<td>400</td>
<td>15.75</td>
</tr>
<tr>
<td>OTPB 450</td>
<td>450</td>
<td>17.72</td>
</tr>
<tr>
<td>OTPB 550</td>
<td>550</td>
<td>21.65</td>
</tr>
<tr>
<td>OTPB 650</td>
<td>650</td>
<td>25.59</td>
</tr>
<tr>
<td>OTPB 750</td>
<td>762.5</td>
<td>30.02</td>
</tr>
</tbody>
</table>
Dimensions

OTPM standard steering column referring to code numbers page 22.

T-dimension is linked to SWC, Steering Wheel Connection, see page 9.

<table>
<thead>
<tr>
<th>Type</th>
<th>C</th>
<th>[in]</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTPM 163</td>
<td>163</td>
<td>6.42</td>
</tr>
<tr>
<td>OTPM 350</td>
<td>350</td>
<td>13.78</td>
</tr>
</tbody>
</table>
Installation

Installation of steering column with A-flange
Sauer-Danfoss steering column with A-flange can be mounted on the cabin floor, and the Sauer-Danfoss steering unit can be mounted under the cabin floor. The S-dimension has to be equal to the thickness of the cabin floor + 6.5 mm [0.26 in]. Example: If the cabin floor is 4 mm [0.16 in], then S = 4 + 6.5 = 10.5 mm [0.16 + 0.26 = 0.41 in]

⚠️ Caution

The steering column must be coaxial with the splined connection of the steering unit:
It must be guaranteed that the shaft of the steering column generates no radial and/or axial forces in the splined connection of the steering unit.

Max tightening torque for fixing screws is 30 N•m [265.5 lbf•in]. Recommended tightening torque for the steering wheel connection is 40 ± 5 N•m [354 ± 44 lbf•in].

![Diagram of steering column installation](image)
Installation of steering column with B-flange

Sauer-Danfoss steering column with B-flange and Sauer-Danfoss steering unit must be assembled directly with one another. Max tightening torque for fixing screws is 30 N•m [265.5 lbf•in]. Recommended tightening torque for the steering wheel connection is 40 ±5 N•m [354 ±44 lbf•in].

A good alternative installation method is using a bracket, which is slotted so that steering column and steering unit can be mounted radically. Max. tightening torque for fixing screws is 30 N•m [265.5 lbf•in].
Installation (continued)  

Installation of steering column with tilting flange

Sauer-Danfoss steering column with tilting flange and Sauer-Danfoss steering unit must be assembled directly with one another. Max tightening torque for fixing screws is 30 N•m [354 ±44 lbf•in].

The holes in the tilt-point (A) are ∅13.6 +0.3/-0 mm [0.54 +0.11/-0 in]

Sauer-Danfoss recommends bushings to be mounted in the tilt point. Brackets (B) to fix the steering column in position are not included in the steering column delivery but must be customer made. To mount a fix point for the bracket on the steering column, please see the below installation drawing as an example.
Installation of steering column OTPM
The OTM column has to be mounted directly on the OSPM steering unit. Max. tightening torque for M6 fixing screws is 11 N•m [97 lbf•in].
The OSPM steering unit with OTPM steering column, has to be mounted on the cabin floor / instrument board. Max tightening torque for M8 fixing screws is 20 N•m [177 lbf•in].

150-638.10

150-640.10
Installation (continued)  

Load on fixed steering columns

Symbols:
- \( L \) (m [in]): Axial length between mounting surface and steering wheel
- \( P_r \) (N [lbf]): Radial force on steering wheel
- \( P_a \) (N [lbf]): Axial force on steering wheel
- \( M_D \) (N•m [lbf•in]): Turning torque
- \( M_B \) (N•m [lbf•in]): Bending moment on the steering column, \( M_B = P_r \times L \)

When \( L \) exceeds 150 mm [5.91 in], the standard steering column with body tube \( \varnothing 38 \times 1.5 \text{ mm} \) [1.50 • 0.06 in] must be supported, and when using standard body tube \( \varnothing 38 \times 1.5 \text{ mm} \) [1.50 • 0.06 in], the following max permissible values must not be exceeded:
- \( M_D \) max 240 N•m [2124 lbf•in]
- \( M_B \) max 200 N•m [1770 lbf•in]
- \( P_a \) max 1000 N•m [8850 lbf•in]

If \( L > 150 \text{ mm} \) [5.91 in] and no support is possible, Sauer-Danfoss recommends columns with body tube \( \varnothing 38 \times 2.5 \text{ mm} \) [1.50 • 0.10 in] or \( \varnothing 45 \times 2.5 \text{ mm} \) [1.77 • 0.10 in].
Axle journals for customer made columns

Customers, who wish to construct their own steering columns, can purchase axle journals from Sauer-Danfoss.

Standard axle journal, code number 150-0674

Spherical axle journal, code number 150-4036

Standard splined tube section type “M” (for OSP only), code number 150L0387

When constructing your own steering column, please observe the following points:

1. Make sure that length and other dimensions of the axle journal part protruding from the mounting surface are correct to ensure the right engagement with the Sauer-Danfoss steering unit (See page 24 - 25 ).
2. The steering column must only be provided with one bearing (in the top).
3. The welded journal must be coaxial with the steering column.
4a. The steering column must be coaxial with the spigot hole Ø44.6 mm [Ø1.76 in] (see page 24 for OSP except OSPM).
4b. The steering column must be coaxial with the spigot hole Ø35 mm [Ø1.38 in] (see page 25 for OSPM).
5. As the axle journal material is chrome alloy steel, we recommend CO₂ welding.
Installation (continued)

Horn button
The figure below illustrates a proposal of an electrical circuit with single horn button on steering column.

Single horn contact system

The figure below illustrates a proposal of an electrical circuit with double horn button on steering column.

Double horn contact, system

Max. electrical load on horn buttons: 60 W
OTP Steering Columns
Technical Information
Adjustable Steering Columns, OTP

Adjustable Steering Columns
Sauer-Danfoss adjustable steering columns fit OSPB, OSPC, OSPD, OSPF, OSPL, OSPM, OSPQ steering units and TAD torque amplifiers.

Versions
Four different kinds of adjustable steering columns are available:

1. **OTP-ST**, standard OTP tilting steering columns

![Image of OTP-ST]

2. **OTP-MT**, mini tilting steering columns

![Image of OTP-MT]

3. **OTP-STT**, standard tilting and telescopic steering columns, tilt point above telescope section.

![Image of OTP-STT]

4. **OTP-BTT**, bottom tilt and telescope steering columns, tilt point below telescope section.

![Image of OTP-BTT]
Adjustable steering columns always have a black chromate coating. Specifications for wheel connections, horn buttons, flanges and axle journals are identical for fixed and for adjustable columns.

Horn buttons are placed on the upper part of OTP-ST and OTP-STT. All features of wheel connections, horn buttons, flasher activator, flange type A, axle journals and steering wheel sensors are described in the section for fixed steering columns.

Tilting: Maximum tilt angle from lock to lock is 40°. Adjusting principle and area: see the specific types.

Telescope: For OTP-STT and OTP-BTT the adjustable length is 80 mm [3.15 in].

### Versions (continued)

The matrix below shows the features available for the different types of adjustable columns:

<table>
<thead>
<tr>
<th>Feature</th>
<th>OTP-ST Standard tilt</th>
<th>OTP-MT Mini tilt</th>
<th>OTP-STT Standard tilt and telescope</th>
<th>OTP-BTT Bottom tilt and telescope</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 different steering wheel connections</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Horn button</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flasher activator</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flange:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type A</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type M</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer defined</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flange:</td>
<td>Specific</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Axle journal:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straight splines, S= customer defined</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Straight splines, with O-ring, S= customer defined</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Spherical splines, S= customer defined</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Straight spline “M” for OSPM only</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Steering wheel sensor</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
OTP Steering Columns
Technical Information
Adjustable Steering Columns, OTP

OTP-ST standard tilting columns are provided with a mechanical incremental locking system for the tilt function. The tilting angles are adjusted in steps of 5°. The maximum tilt angles can be selected between $DA_{\text{max}} = 25°/WA_{\text{max}} = 15°$ or $DA_{\text{max}} = 15°/WA_{\text{max}} = 25°$.

$DA = $ degrees towards the driver, $WA = $ degrees towards the windscreen/away from the driver.

Dimensions

**OTP-ST standard tilting**

T dimension is linked to SWC, Steering Wheel Connection type, see page 7 - 9

Fl: Flange, see page 12

A-flange is standard.
When using mini tilt columns, the steering unit except OSPM must be flanged onto a flange in the cabin by means of special Allen screws with flat heads, M10x16 mm, see page 42. These screws are included in the steering column delivery.

OTP-MT mini tilt columns are provided with a mechanical incremental locking system for the tilting function. The tilt angles are adjusted in steps of 5°. The maximum tilt angles can be selected between \( D_{\text{max}} = 25° / W_{\text{max}} = 15° \) or \( D_{\text{max}} = 15° / W_{\text{max}} = 25° \).

\( D_A = \) degrees towards the driver, \( W_A = \) degrees towards the windscreen/away from the driver.

**Dimensions OTP-MT mini tilt**

T dimension is linked to SWC, Steering Wheel Connection type, see page 7 - 9
When using OTP-MT together with OSPM, the OSPM is mounted directly on the bottom plate of the steering column by means of 4 pieces of standard M6 • 12 mm Allen screws (not included in the steering column delivery), using the 4 • ∅6.5 holes in the bottom of the column.

<table>
<thead>
<tr>
<th>Type</th>
<th>Code number</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTP-MT 140</td>
<td>150L1100</td>
<td>2.7 kg [5.95 lb]</td>
</tr>
</tbody>
</table>

Below drawing is OTP-MT code no 150L1100 for OSPM

With 1/16 in-40 serration
\[d_{\text{min}} = 17.89 \text{ mm [0.704 in]}\]
K: Taper 1:12
OTP Steering Columns
Technical Information
Adjustable Steering Columns, OTP

OTP-STT, standard tilt and telescopic steering columns
The standard version of the tilt and telescope steering columns has the telescope function placed below the tilt point. A plastic cover and a rubber bellows for covering the tilt and telescope functions are optional. The lever of the column activates both functions: Lever upwards activates the telescope function and lever downwards activates the tilt function.

OTP-STT standard columns are provided with a mechanical incremental locking system for the tilting function. The tilt angles are adjusted in steps of 5°. The maximum tilt angles can be selected between DAmax = 25°/WAmax = 15° or DAmax = 15°/WAmax = 25°.

DA = degrees towards the driver, WA = degrees towards the windscreen/away from the driver.

Dimensions

OTP-STT, standard tilt and telescope

T dimension is linked to SWC, Steering Wheel Connection type, see page 7 - 9
Fl: Flange, see page 12
A-flange is standard.
Adjustable Steering Columns (continued)

OTP-BTT, bottom tilt and telescope steering columns
This version of the tilt and telescopic steering columns has its tilt point near the bottom plate and the telescope function is therefore placed above tilt point. The tilt point is covered with a rubber bellow. The column has two levers: one for telescope activation by hand and one for tilt activation by foot.
This column is provided with a step-less locking system for the tilt and telescope function.
The maximum tilt angles can be selected between DA\text{max} = 25°/WA\text{max} = 15°.
Maximum B measurement is 700 mm.
When using bottom tilt columns, the steering unit must be flanged onto a flange in the cabin by means of special Allen screws with flat heads, M10 x 16 mm, see page 50. These screws are included in the steering column delivery.

Dimensions OTP-BTT, bottom tilt and telescope steering columns

T dimension is linked to SWC, Steering Wheel Connection type, see page 7 - 9
### Specification Table for Sauer-Danfoss Adjustable Steering Columns

Fill in your company data. Tick off and give in values in the table where appropriate and send to your local Sauer-Danfoss Sales Organization.

<table>
<thead>
<tr>
<th>Your company</th>
<th>Name</th>
<th>Vehicle</th>
<th>Potential, pcs/year</th>
<th>Completed by</th>
<th>Date</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type of adjustable column</th>
<th>OTP-ST</th>
<th>OTP-MT</th>
<th>OTP-STT</th>
<th>OTP-BTT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard tilt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mini tilt</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard tilt with telescope</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom tilt and telescope</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For steering unit type</th>
<th>OSPB, OSPC, OSPD, OSPF, OSPL, OSPQ and TAD</th>
<th>OSPM</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Steering wheel connection</th>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
<th>Type 4</th>
<th>Type 5</th>
<th>Type 6</th>
<th>Type M1</th>
<th>Type M2</th>
<th>Type M3</th>
<th>Customer defined</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tilt angle*</th>
<th>DA: Towards driver, step of 5°, max. 25°</th>
<th>WA: Towards windscreen, step of 5°, max. 25°. For OTP-BTT: max. 15°</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Flange type</th>
<th>Fixed for OTP-MT and OTP-BTT, see drawings</th>
<th>Type A (OTP-ST and OTP-STT only)</th>
<th>Type M (OTP-ST and OTP-STT only)</th>
<th>Customer defined (OTP-ST and OTP-STT only)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>B-dimension**</th>
<th>Min. 85 mm, state length</th>
<th>OTP-ST: min. 90 mm, OTP-STT: min 300 mm, state length</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>E-dimension</th>
<th>Fixed for OTP-MT and OTP-BTT, see drawings</th>
<th>OTP-ST: min. 90 mm, OTP-STT: min 300 mm, state length</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>S-dimension</th>
<th>State length (S= distance from bottom of flange to steering column surface of steering unit + 6.5 mm)</th>
<th>OSPM: -14 mm</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Axle journal</th>
<th>Standard straight splines</th>
<th>With O-ring</th>
<th>Spherical</th>
<th>Standard M</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Horn button</th>
<th>None</th>
<th>Standard (for OTP-ST and OTP-STT only)</th>
<th>Flat version (for OTP-ST and OTP-STT only)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Horn button: Wire length at steering wheel</th>
<th>Standard 100 mm</th>
<th>Customer defined</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Horn button: Wire connection at steering wheel</th>
<th>Standard, tinned wire end</th>
<th>Wire end without tin-plating</th>
<th>Round male AMP</th>
<th>Flat female AMP insulated</th>
<th>Customer defined</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Flasher activator</th>
<th>No</th>
<th>Yes (for OTP-ST and OTP-STT only and for Ø 35 mm body tube only)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Prepared for steering wheel sensor</th>
<th>No</th>
<th>Yes (for OTP-ST and OTP-STT only and for Ø 38 mm body tube only)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Steering wheel sensor</th>
<th>None</th>
<th>ON/OFF</th>
<th>Proportional</th>
<th>Power supply, state voltage</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Rubber bellows</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Plastic cover</th>
<th>No</th>
<th>Yes (F or OTP-STT only)</th>
</tr>
</thead>
</table>
OTP Steering Columns
Technical Information

Adjustable Steering Columns, OTP

Load on Adjustable Steering Columns

Symbols:

A    :  Tilt point
L m [in]  :  Axial length between mounting point and steering wheel.
E m [in]  :  Axial length between mounting point and tilt point.
B m [in]  :  Axial length between tilt point and end of body tube.
Pr N [lbf•in]  :  Radial force on steering wheel
Pa N [lbf•in]  :  Axial force on steering wheel.
MD Nm [lbf•in]  :  Turning torque
MB Nm [lbf•in]  :  Bending moment on the steering column, MB = Pr * L

The following max permissible values must not be exceeded:

M_D :  max 240 Nm [2124 lbf•in]
M_B :  max 200 Nm [1770 lbf•in]
P_a :  max 1000 N [224.8 lbf]

Installation

Installation of adjustable steering columns.

⚠️ Caution

Alignment of steering column and steering unit is very important.
The steering column must be coaxial with the splined connection of the steering unit:
It must be guaranteed that the shaft of the steering column generates no radial and/or axial forces in the splined connection of the steering unit.
Installation of OTP-MT and OTP-BTT

A. Allen screws with flat heads, M10 • 16 mm.
   These screws are included in the steering column delivery.
B. Customer console plate.
   Holes not defined on drawing: ∅11 mm [0.43 in].

The S-dimension must be equal to the thickness of the console plate
(x) + 6.5 mm [(x) + 0.26 in]
Example: If the console plate thickness is 4 mm, then S = 4 + 6.5 = 10.5 mm
[0.16 + 0.26 = 0.42 in].
The screws (A) can be used for console plate thickness 4 – 6 mm [0.16 - 0.24 in].
Sauer-Danfoss is a global manufacturer and supplier of high-quality hydraulic and electronic components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market. Building on our extensive applications expertise, we work closely with our customers to ensure exceptional performance for a broad range of off-highway vehicles.

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