Compact, dynamic and rugged

Direct drives for harsh operation conditions

SIMOTICS T Heavy Duty Torque Motors
SIMOTICS T – Heavy Duty Torque Motors

Overview

In many machining processes in the industrial environment, the tools and machining equipment are subject to extreme mechanical stress. This is certainly the case in metal forming for example, but also in machining processes in which extremely high forces must be applied.

At the same time, the trend towards greater productivity and more sophisticated products requiring the use of more complex machining techniques demands the use of state-of-the-art but also extremely rugged drive and automation technology.

With the SIMOTICS T-1FW3 Heavy Duty and 1FW4 Heavy Duty torque motors, Siemens offers direct drives that comply with both aspects.

The powerful, permanent-magnet-excited synchronous motors set themselves apart with their high dynamic response and precision. In addition, the motors have a mechanical design that is especially rugged, enabling them to resist shocks of the order of 10 g without any difficulty.

As a consequence, SIMOTICS T-1FW3/1FW4 Heavy Duty torque motors are ideally suited to follow the dynamically demanding motion profiles of higher-level motion controllers even under harsh operating conditions.

In contrast to motor/gearbox combinations, SIMOTICS T-1FWx Heavy Duty torque motors not only set themselves apart as a result of their increased ruggedness, but also thanks to their compactness. As a result of these properties, they are especially suitable as main drives in servo presses, where they have been successfully used since 2008.

Our portfolio with shaft heights 200, 280 and 400 with rated speeds up to 1200 rpm and rated torques up to 15000 Nm can be used in a wide range of motion control applications.

Designed as a complete motor in the IM B5 type of construction with a flanged shaft, the torque motor is easy to integrate in the machine.

Highlights

- Especially rugged direct drive for use in harsh environments, e.g. in servo presses
- Highly accurate concentricity
- Excellent dynamic performance
- Rated speed up to 1200 rpm, maximum speed up to 1800 rpm
- Rated torque up to 15000 Nm, maximum torque up to 29500 Nm
- Up to 200% overload capability
- Easy to integrate
  - in the mechanical system
  - in the SINAMICS S120 drive system
- Worldwide applicability thanks to UL-listing
- Water cooling/plug-on shaft or flanged shaft
- Possible applications/application areas:
  - Shredders
  - Ring rolling mills
  - Servo presses
SIMOTICS T-1FW3 Heavy Duty Torque Motors
Shaft heights 200 and 280

SIMOTICS T-1FW3 Heavy Duty torque motors can be used in many motion control applications.

Designed as a complete motor in the IM B5 type of construction with a flanged shaft, these torque motors are easy to integrate in the machine.

With the optional DRIVE-CLiQ interface and the electronic rating plate, the motors are not only optimized to the SINAMICS S120 drive system, but they can also be easily and reliably commissioned.

In past years, these versatile Heavy Duty torque motors have especially proven themselves as main drives for servo presses.

Heavy Duty torque motors represent the basis of the successful servo press solutions from Siemens, in addition to SIMOTION, SINAMICS and intelligent energy management which increase efficiency.

Configuration example, SIMOTION motion control system, SINAMICS S120 drive system and SIMOTICS T-1FW3 Heavy Duty torque motors with energy buffering via the DC link
**SIMOTICS T-1FW3 Heavy Duty Torque Motors**

Shaft height 200

Technical specifications of SIMOTICS T-1FW3 Heavy Duty

<table>
<thead>
<tr>
<th>Motor type</th>
<th>Main Order No.</th>
<th>1FW3 202-3 (Length 2)</th>
<th>1FW3 203-3 (Length 3)</th>
<th>1FW3 204-3 (Length 4)</th>
<th>1FW3 206-3 (Length 6)</th>
<th>1FW3 208-3 (Length 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>P winding</td>
<td>S winding</td>
<td>P winding</td>
<td>S winding</td>
<td>P winding</td>
</tr>
<tr>
<td>Rated speed (n_n) (\text{rpm})</td>
<td>800</td>
<td>1200</td>
<td>800</td>
<td>1200</td>
<td>800</td>
<td>1200</td>
</tr>
<tr>
<td>Rated torque (M_n) (\text{Nm})</td>
<td>470</td>
<td>440</td>
<td>680</td>
<td>630</td>
<td>930</td>
<td>860</td>
</tr>
<tr>
<td>Rated current (I_n) (\text{A})</td>
<td>69</td>
<td>92</td>
<td>96</td>
<td>131</td>
<td>137</td>
<td>191</td>
</tr>
<tr>
<td>Maximum torque (M_{max}) (\text{Nm})</td>
<td>860</td>
<td>860</td>
<td>1210</td>
<td>1210</td>
<td>1700</td>
<td>1700</td>
</tr>
<tr>
<td>Frame length (L) (\text{mm})</td>
<td>338</td>
<td>338</td>
<td>384.5</td>
<td>384.5</td>
<td>453.5</td>
<td>453.5</td>
</tr>
<tr>
<td>Rotor moment of inertia (J) (\text{kgm}^2)</td>
<td>0.4</td>
<td>0.4</td>
<td>0.52</td>
<td>0.52</td>
<td>0.69</td>
<td>0.69</td>
</tr>
<tr>
<td>Motor weight (\text{kg})</td>
<td>214</td>
<td>214</td>
<td>246</td>
<td>246</td>
<td>287</td>
<td>287</td>
</tr>
</tbody>
</table>

Vibration resistance: 10 \(g\) radial and 5 \(g\) axial acceleration as a result of shock for a frequency range from 0 to 2 kHz.

Type of construction: IM B5

Degree of protection: IP54

Shaft design: Flanged shaft

Cooling method: Water cooling

Encoders: 22-bit absolute encoder with DRIVE-CLiQ interface

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Dimension drawing, SIMOTICS T-1FW3 Heavy Duty

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SIMOTICS T-1FW3 Heavy Duty Torque Motors

Shaft height 280

Technical specifications of SIMOTICS T-1FW3 Heavy Duty

<table>
<thead>
<tr>
<th>Motor type</th>
<th>1FW3 281-3 (Length 1)</th>
<th>1FW3 283-3 (Length 3)</th>
<th>1FW3 285-3 (Length 5)</th>
<th>1FW3 287-3 (Length 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winding design</td>
<td>J winding</td>
<td>M winding</td>
<td>J winding</td>
<td>M winding</td>
</tr>
<tr>
<td>Rated speed $n_r$ (rpm)</td>
<td>400</td>
<td>600</td>
<td>400</td>
<td>600</td>
</tr>
<tr>
<td>Rated torque $M_n$ (Nm)</td>
<td>2350</td>
<td>2200</td>
<td>3300</td>
<td>3100</td>
</tr>
<tr>
<td>Rated current $I_n$ (A)</td>
<td>188</td>
<td>255</td>
<td>275</td>
<td>355</td>
</tr>
<tr>
<td>Maximum torque $M_{max}$ (Nm)</td>
<td>4050</td>
<td>4050</td>
<td>5.700</td>
<td>5.700</td>
</tr>
<tr>
<td>Frame length L (mm)</td>
<td>629</td>
<td>629</td>
<td>713</td>
<td>713</td>
</tr>
<tr>
<td>Rotor moment of inertia $J$ (kgm²)</td>
<td>3.60</td>
<td>3.60</td>
<td>4.50</td>
<td>4.50</td>
</tr>
<tr>
<td>Motor weight (kg)</td>
<td>755</td>
<td>755</td>
<td>854</td>
<td>854</td>
</tr>
</tbody>
</table>

Vibration resistance: 10 g radial and 5 g axial acceleration as a result of shock for a frequency range from 0 to 2 kHz.

Type of construction: IM B5
Degree of protection: IP54
Shaft design: Flanged shaft
Cooling method: Water cooling
Encoders: 22-bit absolute encoder with DRIVE-CLiQ interface

Dimension drawing, SIMOTICS T-1FW3 Heavy Duty
SIMOTICS T-1FW4 Heavy Duty Torque Motors

Shaft height 400

Different from the concept of the SIMOTICS T-1FW3 Heavy Duty torque motor, the 1FW4 Heavy Duty is fed from two SINAMICS motor modules.

For applications, which up until now, required the use of several SIMOTICS T-1FW3 motors, the SIMOTICS T-1FW4 Heavy Duty has been developed to supplement the Heavy Duty motor family.

As a result of its high power density and its high peak torque, the SIMOTICS T-1FW4 Heavy Duty is the ideal motor for large machines.

Energy management:
The energy management system, mentioned several times in this flyer, is an innovation that provides the possibility of maintaining energy in the system for machines with a cyclic load profile. As a consequence, this allows the infeed power of the complete system to be optimized or minimized. In practice, this means that the infeed to the machine ideally only has to supply the process power and losses for a system equipped with energy management. Energy differences as result of different speeds, resulting from the machine motion profile, are stored in the system and are not mapped to the line side. Siemens offers this technology with capacitive (capacitor bank) or kinetic (rotating moment of inertia) energy storage devices.
SIMOTICS T-1FW4 Heavy Duty Torque Motors

Shaft height 400

Technical specifications of SIMOTICS T-1FW4 Heavy Duty

<table>
<thead>
<tr>
<th>Motor type</th>
<th>SIMOTICS T-1FW4 Heavy Duty 1FW4 407-1KM81-1BC0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated speed $n_r$</td>
<td>rpm 520</td>
</tr>
<tr>
<td>Rated torque $M_r$</td>
<td>Nm 15000</td>
</tr>
<tr>
<td>Rated current $I_n$</td>
<td>A 1300</td>
</tr>
<tr>
<td>Maximum torque $M_{max}$</td>
<td>29500</td>
</tr>
<tr>
<td>Frame length $L$</td>
<td>mm 1293</td>
</tr>
<tr>
<td>Rotor moment of inertia $J$</td>
<td>kg/m² 37</td>
</tr>
<tr>
<td>Motor weight</td>
<td>kg 3200</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>10 g radial and 5 g axial acceleration as a result of shock for a frequency range from 0 to 1 kHz.</td>
</tr>
<tr>
<td>Type of construction</td>
<td>IM B5</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP54</td>
</tr>
<tr>
<td>Shaft design</td>
<td>Plug-on shaft</td>
</tr>
<tr>
<td>Cooling method</td>
<td>Water cooling</td>
</tr>
<tr>
<td>Encoders</td>
<td>22-bit absolute encoder</td>
</tr>
</tbody>
</table>

Motor data

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque $M$ / Nm</td>
<td>15300</td>
<td>15000</td>
<td>29500</td>
<td>7500</td>
</tr>
<tr>
<td>Speed $n$ / rpm</td>
<td>0</td>
<td>520</td>
<td>480</td>
<td>700</td>
</tr>
<tr>
<td>Power $P$ / kW</td>
<td>0</td>
<td>817</td>
<td>1483</td>
<td>550</td>
</tr>
<tr>
<td>Voltage $U$ / V</td>
<td>7</td>
<td>405</td>
<td>420</td>
<td>420</td>
</tr>
<tr>
<td>Current $I$ / A</td>
<td>1305</td>
<td>1300</td>
<td>2600</td>
<td>845</td>
</tr>
<tr>
<td>Efficiency $\eta$ / %</td>
<td>–</td>
<td>– 96.4</td>
<td>–</td>
<td>– 96.4</td>
</tr>
<tr>
<td>Power factor $\cos \varphi$ / –</td>
<td>–</td>
<td>0.93</td>
<td>–</td>
<td>– 0.93</td>
</tr>
</tbody>
</table>

Valid for pulse frequency = 2.5 kHz.

Dimension drawing, SIMOTICS T-1FW4 Heavy Duty
Ordering data
SIMOTICS T-1FW3/1FW4 Heavy Duty

Note when ordering SIMOTICS T-1FW3 Heavy Duty

The SIMOTICS T-1FW3 Heavy Duty torque motor is a special version of the standard SIMOTICS T-1FW3 torque motor. See Catalog PM 21, direct drives.

The available variants of SIMOTICS T-1FW3 Heavy Duty can be ordered as follows:

- **AH 200:**
  - 1FW3 20-3C 65-AP0-Z Z=L03
  - Position of terminal box and cable outlet:
    - 5 – Terminal box top, radial right
    - 6 – Terminal box top, axial NDE
    - 8 – Terminal box top, axial DE
  - Winding design:
    - P: Winding rated speed 800
    - S: Winding rated speed 1200
  - Shaft height: 200
  - Lenghts: 2, 3, 4, 6 or 8
  - See table Technical Specifications
  - Necessary additional entry for motor type:
    - SIMOTICS T-1FW3 Heavy Duty

- **AH 280:**
  - 1FW3 28-3C 65-AP0-Z Z=L03
  - Position of terminal box and cable outlet:
    - 5 – Terminal box top, radial right
    - 6 – Terminal box top, radial left
    - 7 – Terminal box top, axial NDE
    - 8 – Terminal box top, axial DE
  - Winding design:
    - J: Winding rated speed 400
    - M: Winding rated speed 600
  - Shaft height: 280
  - Lenghts: 1, 3, 5 or 7
  - See table Technical Specifications
  - Necessary additional entry for motor type:
    - SIMOTICS T-1FW3 Heavy Duty

Other windings on request.

Other options, for example motor protection, paint finish: see Catalog PM 21 or on the internet directly at [www.siemen.com/industrymall](http://www.siemen.com/industrymall)

Note when ordering SIMOTICS T-1FW4 Heavy Duty

The available version of the SIMOTICS T-1FW4 Heavy Duty can be ordered as follows:

- **1FW4 407-1KM81-1BC0**
  - Other options, for example motor protection, paint finish:
    - on the internet directly at [www.siemen.com/industrymall](http://www.siemen.com/industrymall)

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