FISCHER Elektromotoren

TA Torque Motor – Outer Rotor

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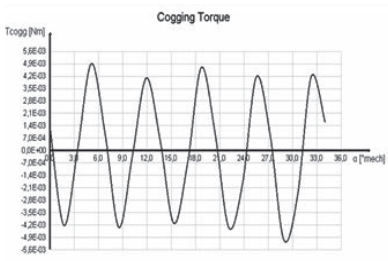
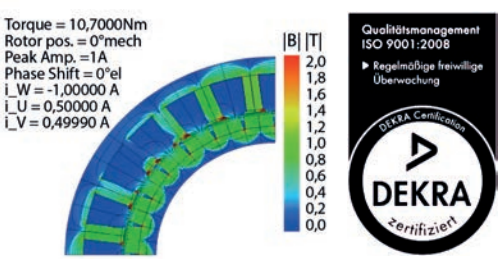
Development & construction of outer rotors are calculated and issued with special programs. Mechanical and thermal simulations are possible and can be incorporated into further constructions.





Qualitätsmanagement ISO 9001:2008
▶ Regelmäßige freiwillige Überwachung
DEKRA Certification
DEKRA zertifiziert

Foreword

The specialist for direct drives

With innovative drive solutions for all industries and any application in the automobile, wood and food industries and all other industrial sectors.

Solutions, products and systems from the company Fischer Elektromotoren are used everywhere - worldwide.

Always the right solution

Due to the number of drive variations, we offer our customers the best conditions for the right drive and therefore the most efficient solutions to requirements.

With our own developments, production and assembly, as well as commissioning (or other services) if required, the maximum flexibility at the highest quality is achieved.

The following is available for the production of prototypes for instance:

- Our own tool-making
- State-of-the-art CNC milling and processing machines
- State-of-the-art 3D measurement machine
- Numerous wire eroding machines
- Laser cutting system
- Laser welding centre
- Our own test bay

With our bundled expertise we are able to calculate, construct and manufacture prototypes for our customers within the shortest possible time.

We are certified in accordance with ISO9001:2008, as well as according to the UL insulation system.

The right partner

Our flexible product range and our services make the company Fischer Elektromotoren GmbH your partner for solutions to demanding tasks in the area of "direct" drive technology.

5

Design, Setup, Functions Electrical connections

Design

The company Fischer Elektromotoren is a specialist for linear and rotating direct drives. **Series products** and **customised** drive solutions are developed and produced. Our own development works with the latest computer-assisted systems such as FEM calculation and 3D CAD programs. This means the motor geometrics and motor parameters can be optimally adapted to your applications. The latest manufacturing and test methods according to the status of technology ensure that Fischer Elektromotoren GmbH can also meet unusual customer requests. We manufacture in individual, small and large series. All motors are measured, tested and data records produced on the test bay.

Layout

It is not only possible to create a rotation movement with the torque motor, but it is also possible to position or run defined step cycles. A gear unit is not required. The design of the winding can be customised to the user.

Functions

If a conductor loop is moved in a magnetic field, a voltage is induced in the conductor loop. A coil with a current flowing through produces a time-variable electrical field, which has a reciprocal effect with the constant magnetic field of the secondary part. The resulting force is used to generate the linear movement. A linear motor consists of two components: the primary part with coils and the secondary part with permanent magnets. A differentiation is made between grooved, grooveless and ironless direct drives. The linear motor allows a high force at a defined speed range. The distance between the primary part and the secondary part (air gap) decides on the force level. A steady bearing system guarantees a constant air gap. A measurement system is used to be able to detect the motor position at all times.

Electrical connections

The type of electrical connection option is versatile and can be customised.

- Cable with plug - variable cable lengths
- Open cable outlet with strand end sleeves - variable cable lengths
- Plug on motor housing

A second cable outlet is necessary depending on the complexity of additional components such as the measurement system and temperature sensors.

6 Winding-related parameters, Thermal motor protection

Winding-related parameters

The nominal speed of the torque motor can be adjusted by the DC-Bus voltage and the winding data. A voltage is induced in the coils as soon as the rotor is moved. This voltage (BEMF) works against the DC-Bus voltage of a field-orientated servo-converter and is proportional to the speed. The BEMF must initially be overcome to be able to store the current necessary for the force in the coils. The result is: the lower the BEMF is, the higher speeds are possible. The working point of the torque motor is determined by the correlation between the winding speed, torque and rotation speed.

Thermal motor protection

Direct drives are mainly operated at their thermal limit and the temperature must be constantly monitored. Temperature-related resistances are installed in torque motors to protect against thermal overload. The following temperature sensors are available:

- PTC (thermistor)
- KTY
- Triplet switch (Klixon)

In order to protect the motor against thermal overload, three PTCs can be switched in sequence. Each PTC measures the temperature of one phase. This means that temperature monitoring is even guaranteed when the motor has to maintain its position at a standstill and an asymmetrical current supply occurs. The resistance value of the PTC increases heavily once the nominal temperature is overcome. This means that the overall resistance of row switching also changes rapidly. If a resistance changes, safe shutdown of the motor by the motor protection trigger device (FIMO TA 03) is guaranteed before thermal destruction. The motor protection trigger device also identifies if resistance is too low, signalling a possible defect in the monitoring circuit. The PTC temperature sensor is not suitable for accurate temperature measurement. A KTY temperature sensor is used to measure a temperature sequence exactly. This semiconductor resistance reacts linear to the temperature. This is why a shutdown limit is defined to protect the motor against thermal overload. Because the KTY only monitors the temperature of one phase, the motor can overheat if heating is asymmetrical.

Figure 1: Temperature sensors circuit diagram

FIMO TA 03

7 Water cooling, Measurement technology

Water cooling

Not only losses of copper cause the motor temperature to increase. More re-magnetising losses and eddy current losses occur at a higher frequency. Water cooling is used in order to be able to channel the produced heat away as well as possible. When using water cooling, the nominal torque can almost be doubled in comparison to an air cooled motor. An increase of the peak torque is not possible with water cooling. Water cooling is necessary if:

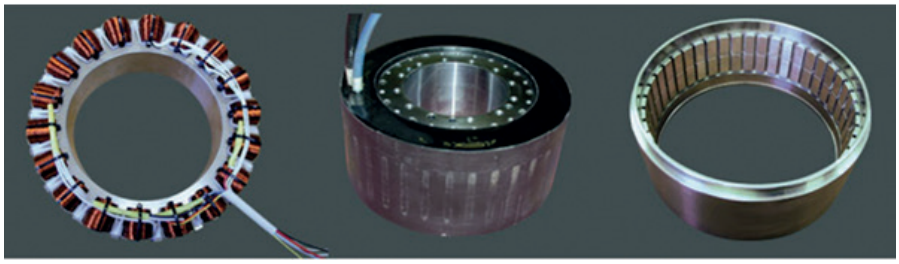
- The drive is only used in the load and brake cycle.
- No rest periods are available
- No temperature should be lost in the machine system.
- There are high outputs.

Measurement technology

Motors from Firma Fischer Elektromotoren GmbH are tested in accordance with the EC guideline 73/23/EEC and the norms EN 50178 and EN 60204. The motors go through these various test procedures before they are delivered.

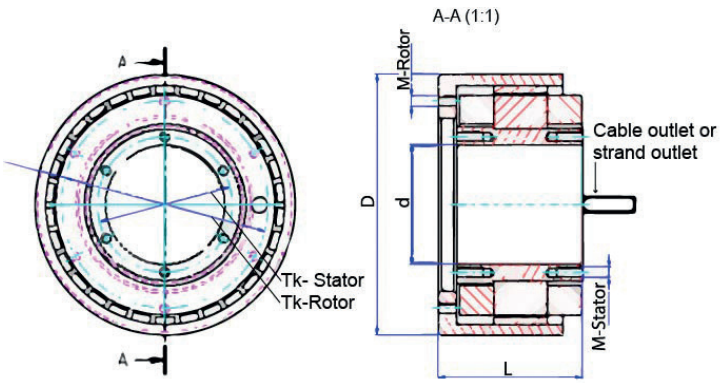
- High-voltage test
- Partial discharge test
- Insulation test (VDE measurement)
- Pole test
- Resistance measurement for faces and temperature sensors
- Inductivity measurement
- EMF measurement

Furthermore, the motor is measured on the test bench with state-of-the-art measurement technology. The parameter records for commissioning and the peak and nominal values of the motor are established here. All mechanically installed components are measured with the latest measurement technologies such as 3D and a height measurement machine. This allows housings and parts with complex constructions to be measured.



Torque motor - outer rotor dimensions

Dimensions - technical data



Legend (example)

Type classification:

TA 050-024-XXX

- Iron length (mm)
- Air gap diameter (mm)
- Outer diameter of stator (mm)
- Motor type: A = outer rotor

- An adjustment of the speed can be made on request.
- Other DC-Bus voltages are also possible.
- Special lengths are possible on request.

Size	Air cooling		Rotor		Stator	
	d	D	TK-Rotor	M-Rotor	TK-Stator	M-Stator
TA 050-024-XXX	14	67	43	M 3	19	M 3
TA 083-057-XXX	45	98	78	M 4	51	M 4
TA 110-074-XXX	62	130	105	M 4	68	M 4
TA 124-085-XXX	68	150	120	M 5	76	M 5
TA 134-084-XXX	68	157	128	M 5	75	M 5
TA 175-115-XXX	96	200	160	M 5	106	M 5
TA 204-135-XXX	111	234	188	M 5	125	M 5
TA 256-192-XXX	172	284	238	M 6	182	M 6
TA 298-220-XXX	180	340	275	M 8	200	M 8
TA 330-250-XXX	225	370	310	M 8	238	M 8
TA 360-280-XXX	252	400	373	M 8	266	M 8
TA 410-325-XXX	295	450	386	M 8	310	M 8

Technical data

Name	L	Torque						Idling speed	DC-Bus voltage
		Air cooling		Watercooling		Peak			
		M [Nm]	I [Aeff]	M [Nm]	I [Aeff]	M [Nm]	I [Aeff]	n [rpm]	U [VDC]
TA050-024-020-08S5O-06N01AU2	55	0,4	0,7	0,9	1,3	2,2	3,3	800	48
TA050-024-040-08S5O-06N02AU2	75	0,9	1,3	1,7	2,7	4,3	6,6	800	
TA050-024-060-08S5O-06N02AX2	90	1,3	1,9	2,6	3,8	6,4	9,5	780	
TA050-024-080-08S5O-06N02BB2	115	1,8	2,6	3,5	5,3	8,7	13,2	790	
TA083-057-020-15S5O-08N01AW2	57	1,1	0,9	2,2	1,7	5,6	4,3	400	48
TA083-057-040-15S5O-08N03AS2	77	2,3	1,6	4,6	3,2	11,6	7,9	360	
TA083-057-060-15S5O-08N03AW2	97	3,5	2,6	7	5,1	17,5	12,8	380	
TA083-057-080-15S5O-08N03AZ2	117	4,6	3,5	9,3	7,1	23,3	17,7	400	
TA110-074-020-15S5O-08N01AR2	57	3,7	0,5	7,3	0,9	17,9	2,3	450	320
TA110-074-040-15S5O-08N01AX2	77	7,3	1	14,6	1,9	35,8	4,8	460	
TA110-074-060-15S5O-08N01BA2	97	11,1	1,3	22,1	2,6	54	6,6	420	
TA110-074-080-15S5O-08N01BD2	117	14,7	1,9	29,3	3,7	72	9,4	450	
TA124-085-025-14S3O-08N01AU2	63	5,8	0,7	11,6	1,3	28,6	3,3	410	320
TA124-085-050-14S3O-08N02AU2	88	11,6	1,3	23,2	2,7	57	6,6	410	
TA124-085-075-14S3O-08N04AS2	113	18,3	2,1	36,5	4,2	90	10,6	410	
TA124-085-100-14S3O-08N04AU2	138	23,2	2,7	46,3	5,3	114	13,3	410	
TA134-084-025-16S3O-08N01AS1	63	8,1	0,5	16,1	1,1	35,8	2,6	400	560
TA134-084-050-16S3O-08N02AS1	88	16,3	1,1	32,2	2,1	72	5,3	400	
TA134-084-075-16S3O-08N02AV1	113	24,6	1,5	48,7	3	108	7,5	370	
TA134-084-100-16S3O-08N02AY1	138	32,7	2,1	65	4,3	144	10,6	400	
TA175-115-025-21S2O-08N01AX1	65	18,9	1	37,4	1,9	66	3,8	310	560
TA175-115-050-21S2O-08N02AX1	90	37,8	1,9	75	3,8	132	7,6	310	
TA175-115-075-21S2O-08N02BA1	115	55	2,6	109	5,3	193	10,6	290	
TA175-115-100-21S2O-08N02BD1	140	76	3,7	150	7,5	264	15	300	
TA204-135-025-21S2O-08N01BC2	79	34,1	1,7	66	3,4	113	6,8	300	560
TA204-135-050-21S2O-08N01BJ2	104	69	3,4	133	6,8	227	13,6	300	
TA204-135-075-21S2O-08N02BG2	129	102	4,8	198	9,5	339	19	280	
TA204-135-100-21S2O-08N02BJ2	154	138	6,8	267	13,6	455	27,2	300	
TA256-192-025-28S2O-08N01BB2	70	42,4	1,5	85	3	194	7,4	210	560
TA256-192-050-28S2O-08N02BB2	95	85	3	169	5,9	387	14,8	210	
TA256-192-075-28S2O-08N04AY2	120	122	4,3	244	8,5	564	21,3	210	
TA256-192-100-28S2O-08N04BB2	145	169	5,9	339	11,8	775	29,6	210	
TA298-220-025-25S3O-08N01BI2	87	81	3	155	6	264	12,1	220	560
TA298-220-050-25S3O-08N05BA2	112	166	6,6	317	13,2	536	26,5	240	
TA298-220-075-25S3O-08N05BD2	137	250	9,4	478	18,7	805	37,4	230	
TA298-220-100-25S3O-08N05BH2	162	332	13,3	636	26,5	1074	53	240	
TA298-220-125-25S3O-08N05BI2	187	412	15,1	789	30,2	1334	60	220	
TA298-220-150-25S3O-08N05BK2	212	486	19,1	933	38,2	1585	76	240	
TA330-250-025-28S3O-10N02BB2	90	93	3	184	5,9	321	11,8	190	560
TA330-250-050-28S3O-10N04BC2	115	190	6,8	373	13,6	648	27,1	220	
TA330-250-075-28S3O-10N04BG2	140	279	9,5	549	19	960	38	210	
TA330-250-100-28S3O-10N08BC2	165	379	13,6	746	27,1	1296	54	220	
TA330-250-125-28S3O-10N08BG2	190	464	15,9	915	31,9	1599	64	210	
TA330-250-150-28S3O-10N08BE2	215	557	19	1099	38	1917	76	210	
TA360-280-025-35S3O-10N02BC2	90	110	3,4	218	6,8	387	13,6	190	560
TA360-280-050-35S3O-10N05BA2	115	217	6,6	430	13,2	766	26,5	180	
TA360-280-075-35S3O-10N05BF2	140	325	10,6	645	21,2	1148	42,3	200	
TA360-280-100-35S3O-10N10BA2	165	434	13,2	860	26,5	1530	53	180	
TA360-280-125-35S3O-10N10BC2	190	551	17	1091	33,9	1934	68	190	
TA360-280-150-35S3O-10N10BF2	215	650	21,2	1290	42,3	2295	85	200	
TA410-325-025-35S4O-10N02BF2	90	142	4,2	284	8,5	623	21,2	180	560
TA410-325-050-35S4O-10N05BC2	115	277	8,5	552	17	1221	42,2	190	
TA410-325-075-35S4O-10N05BH2	140	428	13,3	854	26,5	1866	66	190	
TA410-325-100-35S4O-10N10BC2	165	554	17	1105	33,9	2440	85	190	
TA410-325-125-35S4O-10N10BF2	190	691	21,2	1379	42,3	3045	106	190	
TA410-325-150-35S4O-10N10BH2	215	856	26,5	1708	53	3742	133	190	

Specification book for motor design

Please send response to
info@fischer-elektromotoren.de
or fax: 0049-6265-9222-22

Your contact details:	
Company:	
Name:	
Tel. no.:	
Email:	
Project name:	

Specification book for motor design

Tasks of the motor			
Application			
Positioning-accuracy [°]			
Rotation - speed [rpm]			
Required torques			
Nominal torque [Nm]			
Acceleration torque [Nm]			
Connected load			
Intermediate circuit voltageg [VDC]			
max. current [Aeff]			
Motor size			
Diameter x length [mm]			
Weight [kg]			
Construction type			
Housing	○ Air cooled	○ Water cooled	○ None, (installation kit)
Environmental conditions			
Environmental conditions [°C]			
Protection type (only with housing)			
Cable version			
Version	○ Cable	○ Single strands	○ Industrial plug
Winding protection			
Sensors	○ KTY84-130	○ PTC (thermistor)	○ Klixon (switch)
Other/comments			

Note

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