



Assembly Instructions

Rotary tables TMB, TMS, TMN

Contents

1. General information	4	5. Assembly and connection	16
1.1 About these assembly instructions	4	5.1 Assembling the rotary table	16
1.2 Depictions used in these assembly instructions	4	5.2 Assembly of the moved load	16
1.3 Warranty and liability	6	5.3 Electrical connection	17
1.4 Manufacturer's details	6		
1.5 Copyright	6	6. Commissioning	23
1.6 Product monitoring	6	6.1 Switching on the rotary table	23
		6.2 Programming	23
2. Basic safety notices	7	7. Maintenance and cleaning	24
2.1 Intended use	7	7.1 Maintenance	24
2.2 Reasonably foreseeable misuse	7	7.2 Cleaning	25
2.3 Conversions and modifications	7		
2.4 Residual risks	7	8. Faults	26
2.5 Personnel requirements	7	8.1 Faults with the motor	26
2.6 Protective equipment	8	8.2 Faults during operation with drive amplifier	26
2.7 Labels on rotary tables	8		
3. Description of the rotary table	9	9. Disposal	27
3.1 Field of application	9		
3.2 Design of the rotary table (example: TMS3x)	9	10. Appendix 1: Order codes	28
3.3 Functional description	10	10.1 Order code TMB	28
3.4 Types	10	10.2 Order code TMS	28
3.5 Protective plate (optional)	11	10.3 Order code TMN	29
3.6 Parking brake (optional)	12		
4. Transport and installation	14	11. Appendix 2: Dimensional drawings and technical data	30
4.1 Delivery of TMB, TMS, TMN	14	11.1 TMB series	30
4.2 Transport to the installation site	14	11.2 TMS series	32
4.3 Requirements at the installation site	14	11.3 TMN series	40
4.4 Storage	14		
4.5 Unpacking and installing	15	12. Appendix 3: Declaration of Incorporation	46

1. General information

1.1 About these assembly instructions

1.1.1 Version management

Table 1.1 Version management

Version	Date	Notes
02-1	July 2018	Adjustment of the product line
02-0	April 2017	Update of technical data
01-9	October 2016	Update of "Declaration of Incorporation"
01-7	June 2016	Updating
01-6	January 2016	Update of "Declaration of Incorporation"
01-5	November 2015	Various corrections
01-4	July 2015	Various corrections
01-3	May 2015	Adjustment of technical data
01-2	January 2015	Various corrections
01-1	August 2014	Initial creation of common assembly instructions for rotary tables

1.1.2 Requirements

We assume that

- operating personnel are trained in the safe operation practices for rotary tables, and have read and understood these assembly instructions in full;
- maintenance personnel maintain and repair the rotary tables in such a way that they pose no danger to people, property or the environment.

1.1.3 Availability

These assembly instructions must remain constantly available to all persons who work with or on the rotary tables.

1.2 Depictions used in these assembly instructions

1.2.1 Instructions

Instructions are indicated by triangular bullet points in the order in which they are to be carried out.

Results of the actions carried out are indicated by ticks.

Example:

- ▶ Position the rotary table over the mounting holes.
- ▶ Place the mounting bolts into the mounting holes and tighten in a spiral pattern to a torque of 10 Nm.

✓ Rotary table is mounted.

1.2.2 Lists

Lists are indicated by bullet points.

Example:

Rotary tables must not be operated:

- Outdoors
- In potentially explosive atmospheres
- ...

1.2.3 Depiction of safety notices

Safety notices are always indicated using a signal word and sometimes also a symbol for the specific risk (see Section 1.2.4 "Symbols used").

The following signal words and risk levels are used:

 DANGER!
Imminent danger! Noncompliance with the safety notices will result in serious injury or death!
 WARNING!
Potentially dangerous situation! Noncompliance with the safety notices runs the risk of serious injury or death!
 CAUTION!
Potentially dangerous situation! Noncompliance with the safety notices runs the risk of slight to moderate injury!
ATTENTION!
Potentially dangerous situation! Noncompliance with the safety notices runs the risk of damage to property or environmental pollution!

1.2.4 Symbols used

The following symbols are used in these assembly instructions and on the rotary tables:

Table 1.2 **Warning signs**

	Warning of dangerous electrical voltage!
	Warning of hot surfaces!
	Substance hazardous to the environment!

Table 1.3 **Mandatory signs**

	Wear protective gloves!
	Isolate before work!

1.2.5 Information

NOTE Describes general information and recommendations.

General information

1.3 Warranty and liability

The manufacturer's "General conditions of sale and delivery" apply.

1.4 Manufacturer's details

Table 1.4 **Manufacturer's details**

Address	HIWIN GmbH Brücklesbünd 2, D-77654 Offenburg
Phone	+49 (0) 781 932 78-0
Technical customer service	+49 (0) 781 932 78-77
Fax	+49 (0) 781 932 78-90
Technical customer service fax	+49 (0) 781 932 78-97
E-mail	info@hiwin.de
Website	www.hiwin.de

1.5 Copyright

These assembly instructions are protected by copyright. Any reproduction, publication in whole or in part, modification or abridgement requires the written approval of HIWIN GmbH.

1.6 Product monitoring

Please inform the manufacturer of:

- Accidents
- Potential sources of danger in the rotary tables
- Anything in these assembly instructions which is difficult to understand

2. Basic safety notices

There are no magnetic fields around complete rotary tables

NOTE

For IP65 version according to DIN 40050/IEC 529/VDE 0470/EN 60529

Note the chemical resistance of the used materials to the surrounding atmosphere/liquid:

Housing:	Anodised aluminium, partially carbon for TMS3 and TMS7
Plug connector material:	Brass, nickel plated
Screws:	Stainless steel
Seals:	NBR (sealing lip)
Protective plate:	Stainless steel

NOTE

2.1 Intended use

The rotary table is a rotary drive system for the precise positioning in terms of time and location of fixed mounted loads, e.g. system components, within an automated system.

Rotary tables are designed for installation and operation in any position. These, however, are not fitted with a parking brake.

The loads being moved must be solidly mounted to the rotor.

Rotary tables must not be used outdoors or in potentially explosive atmospheres.

Rotary tables may only be used for the intended purpose as described.

- Rotary tables must be operated within their specified performance limits (see Chapter 11).
- Proper use of the rotary tables includes observing the assembly instructions and following the maintenance and repair specifications.
- Use of the rotary tables for any other purpose shall be considered improper use.
- Use only genuine spare parts from HIWIN GmbH.

2.2 Reasonably foreseeable misuse

Rotary tables must not be operated:

- Outdoors
- In potentially explosive atmospheres

2.3 Conversions and modifications

Conversions or modifications to the rotary tables are not permitted.

2.4 Residual risks

During normal operation, there are no residual risks associated with the rotary tables. Warnings about risks that may arise during maintenance and repair work are provided in the relevant sections.

2.5 Personnel requirements

Only authorised and competent persons may carry out work on the rotary tables. They must be familiar with the safety equipment and regulations before starting work (see Table 2.1).

Table 2.1 **Personnel requirements**

Activity	Qualification
Normal operation	Trained personnel
Cleaning	Trained personnel
Maintenance	Trained specialist personnel of the operator or manufacturer
Repairs	Trained specialist personnel of the operator or manufacturer

Basic safety notices

2.6 Protective equipment

Table 2.2 **Personal protective equipment**

Operating phase	Personal protective equipment
Normal operation	When in the vicinity of the rotary tables, the following personal protective equipment is required: ○ Safety shoes
Cleaning	When cleaning the rotary tables, the following personal protective equipment is required: ○ Safety shoes
Maintenance and repairs	When carrying out maintenance and repairs, the following personal protective equipment is required: ○ Safety shoes

2.7 Labels on rotary tables

2.7.1 Type plate

 HIWIN GmbH Brücklesbünd 2 77654 Offenburg www.hiwin.de	Type: TMS34-A00	
	S/N: HSN0000001999	
	Art. No: 7.R2250	Year built: 2017
	Rated current I_C : 3.4 A	Mass of table: 7 kg
	Rated torque T_C : 20.0 Nm	Max. DC bus: 600 VDC
	Max. current I_p : 10.2 A	Temp.sensor: PTC120
Max. torque T_p : 60.0 Nm	Protection class: IP40	

Fig. 2.1 **Type plate (example only)**

3. Description of the rotary table

3.1 Field of application

The rotary table is a rotary drive system for the precise positioning in terms of time and location of fixed mounted loads, e.g. system components, within an automated system.

Rotary tables are designed for installation and operation in any position. These, however, are not fitted with a parking brake. The loads being moved must be solidly mounted to the rotor.

3.2 Design of the rotary table (example: TMS3x)

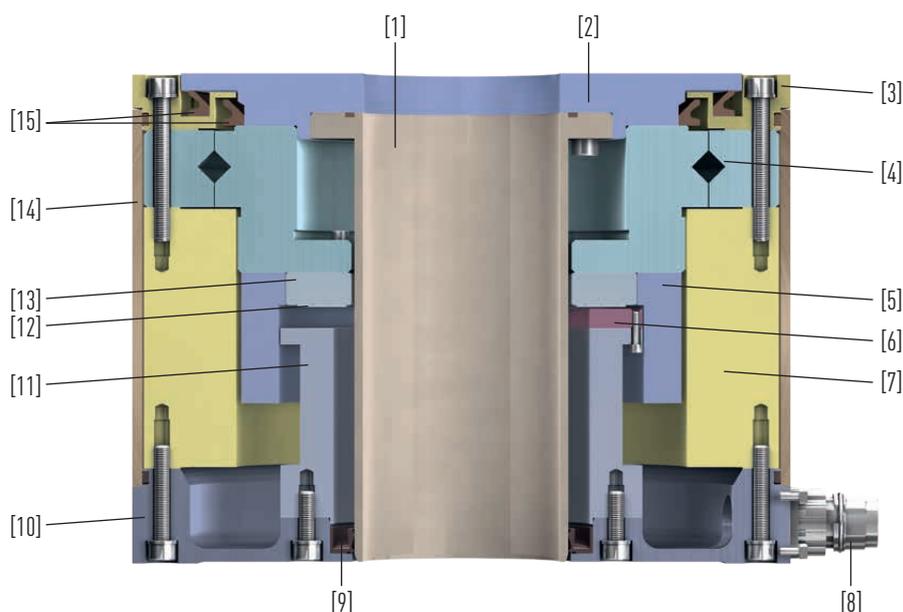


Fig. 3.1 Main components of a rotary table

Table 3.1 Main components of a rotary table

Number	Description
1	Hollow shaft
2	Top housing cover (rotor)
3	Top housing ring (stator)
4	Crossed roller bearing
5	Rotor
6	Encoder
7	Stator
8	Installation box
9	Sealing
10	Bottom housing cover
11	Carrier for encoder
12	Scanning disc
13	Receiver for scanning disc
14	Motor housing
15	Sealing

Description of the rotary table

3.3 Functional description

The rotary table is driven by a three-phase permanent magnet torque motor. The integrated bearing absorbs loads and torques and directs these into the machine bed. The integrated positioning measuring system generates a standardised $\sin/\cos 1 V_{PP}$ output signal. The rotary table is operated with a suitable drive.

3.4 Types

3.4.1 TMB

Key features:

- Backlash-free and extremely dynamic
- Compact design
- Hollow shaft, 12 mm in diameter
- 65 mm outer diameter
- Integrated optical rotary encoder
- Very low running noise

Typical applications:

- Automation technology
- Pick-and-place machines

3.4.2 TMS

Key features:

- Backlash-free and extremely dynamic
- Brush-less and high-torque
- Integrated optical rotary encoder

Typical applications:

- Automation technology
- Pick-and-place machines

3.4.3 TMN

Key features:

- Backlash-free and extremely dynamic
- Extremely flat design
- Integrated rotary encoder

Typical applications:

- LED manufacture and testing
- Production of solar cells
- Manufacture of semiconductor components

Details of torque motors suitable for HIWIN rotary tables can be taken from the assembly instructions "Torque motors TMR, TMRW". These can be downloaded from www.hiwin.de.

3.5 Protective plate (optional)

The torque rotary table is sealed with a labyrinth containing sealing lips or so called V seals.

If the rotary table is used in abrasive liquids, e.g. in grinding machines, this liquid then comes into contact with the sealing lips and can damage them and their running surfaces.

A protective plate of stainless steel is placed on the labyrinth gap to preserve the service life of the seal in abrasive liquids as well. This protective plate offers reliable protection against the ingress of liquids when the rotary table is installed horizontally.

The protective plate should not be used on overhead or wall installations: it would then collect additional liquid and dirt particles.

When fitted with the protective plate, the outer diameter of the rotary table increases by 5 mm.

NOTE



Fig. 3.2 TMSX – version with optional protective plate

For overhead or wall installations with abrasive liquids, HIWIN rotary tables are delivered with a barrier air facility.

For the additional barrier air, five of the radial M4 threads (see Fig. 3.3) are sealed with the provided threaded pins and the barrier air connected to the sixth threaded bore. The matching push-in fitting is provided.

Hose diameter: 4 mm

Air pressure: 0.2 to 0.5 bar

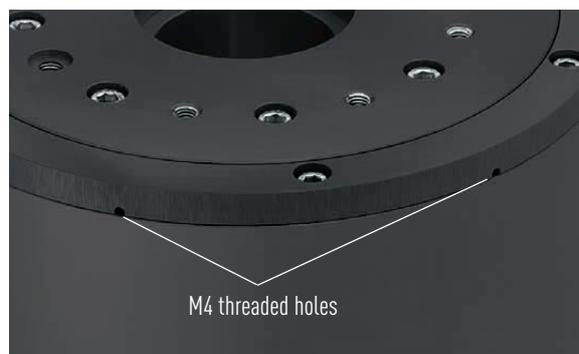


Fig. 3.3 TMS3X – M4 threaded holes

Description of the rotary table

3.6 Parking brake (optional)

NOTE

In continuous duty, the parking brake (clamping element) serves only to clamp the stationary shaft.

NOTE

The parking brakes are installed as standard under the housing cover. The rotary table dimensions change as a result.

Some rotary table types are fitted with a pneumatic parking brake. The used brakes are suitable for emergency stops, i.e. they engage when unpressurised. At present there are parking brakes available for the TMS3 and TMS7 series.

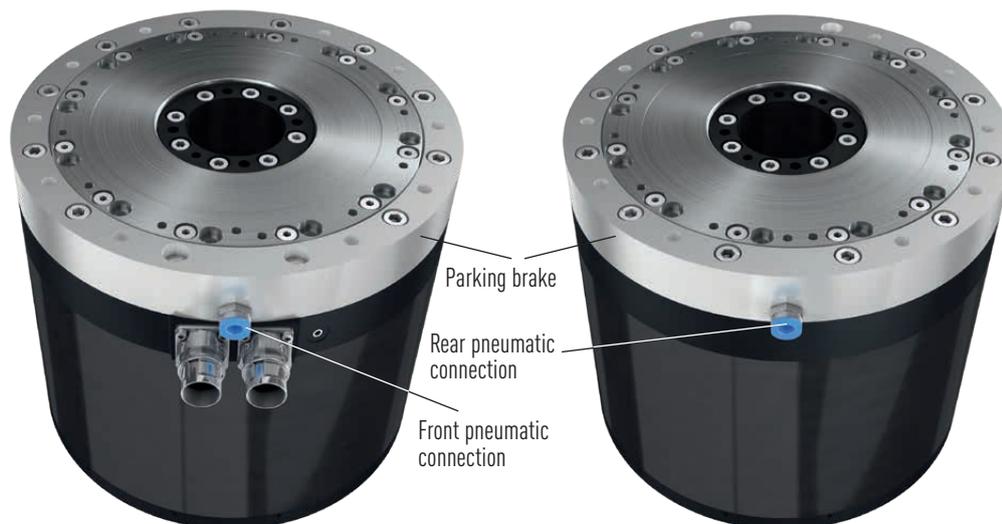


Fig. 3.4 TMS3, view of clamping from below – view from front (left) and from rear (right)

3.6.1 Braking torques

If there is no additional air connected, the rear valve ("Close") must remain open.

The braking torques are listed in Table 3.2. Unpressurised with air, the parking brakes are engaged. The braking torque can be increased with additional air at the rear valve ("Close") (see Fig. 3.5).

Table 3.2 Braking torques on the pneumatic parking brake

Rotary table	TMS3x		TMS7x	
Open under rated pressure	6 bar	4 bar	6 bar	4 bar
Braking torque without additional air	114 Nm	114 Nm	336 Nm	336 Nm
Braking torque with additional air	210 Nm	140 Nm	600 Nm	400 Nm

3.6.2 Connection

The response times are minimised when the valves are positioned as close as possible to the parking brake. Also quick ventilation valves can shorten the response time.

NOTE

As shown in Fig. 3.5, the parking brake must be actuated with a 3/2- or 5/2-way valve. The valves' nominal sizes must not be less than G 1/8. The diameter of the connecting hose may not be less than 6 mm.

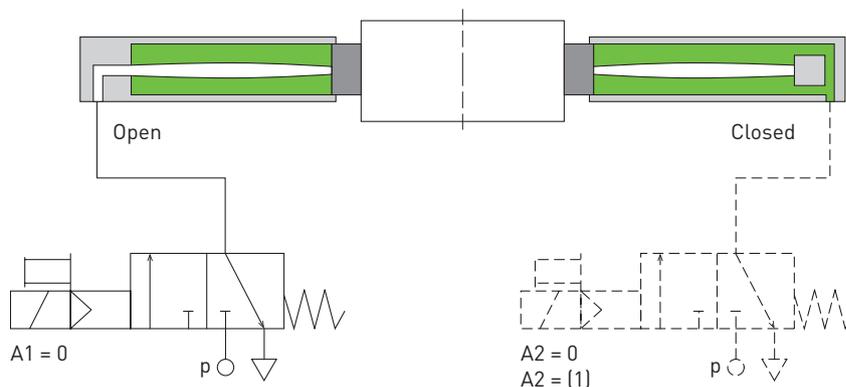


Fig. 3.5 Pneumatic connection of the parking brake

3.6.3 Commissioning

HIWIN tests the parking brake functions before delivery. Before the rotary table is started up, however, a check must ensure that

- The parking brake is open (this check involves rotating the shaft manually).
- There is no contamination (oil, grease, solid particles) between the clamping surfaces.

4. Transport and installation

4.1 Delivery of TMB, TMS, TMN

4.1.1 Delivery state

The rotary table is supplied fully assembled, function tested and ready for connection.

4.1.2 Scope of delivery

For the scope of delivery, please see the contractual documentation.

4.2 Transport to the installation site

ATTENTION!

Damage to rotary table!

Rotary tables may be damaged by mechanical loads.

- ▶ During transport, do not transport any additional loads on the rotary table!
- ▶ Secure rotary table against tilting!

- ▶ Transport rotary table to the installation site using a suitable hoist (pay attention to weights – see appendix from [Page 30](#)).
- ▶ Ensure even load distribution while lifting.

4.3 Requirements at the installation site

4.3.1 Ambient conditions

Ambient temperature	+5 °C to +40 °C
Installation site	flat, dry, vibration-free
Atmosphere	not corrosive, not explosive

4.3.2 Safety equipment to be provided by the operator

Possible safety equipment/measures:

- Personal protective equipment in accordance with UVV (German accident prevention regulations)
- Zero-contact protective equipment
- Mechanical protective equipment

4.4 Storage

- ▶ Store the rotary tables in their transport packaging.
- ▶ Do not store the rotary table in explosive atmospheres or in environments exposed to chemicals.
- ▶ Only store the rotary tables in dry, frost-free areas with a corrosion-free atmosphere.
- ▶ Make sure that the rotary tables are not subjected to vibrations or impacts while in storage.
- ▶ Clean and protect used rotary tables before storage.
- ▶ The ambient temperature for storing the motors should be between +5 and +70 °C.

4.5 Unpacking and installing

ATTENTION!

Damage to rotary table!

Rotary tables may be damaged by mechanical loads.

- ▶ During transport, do not transport any additional loads on the rotary table!
- ▶ Secure rotary table against tilting!

The rotary table may only be installed and operated indoors.

NOTE

- ▶ Remove protective film.
- ▶ Carefully transport rotary table to the designated installation site.
- ▶ Ensure that the maintenance points are easily accessible.
- ▶ Dispose of packaging in an environmentally friendly way.

5. Assembly and connection

DANGER!



Danger from electrical voltage!

Before and during assembly, disassembly and repair work, dangerous currents may flow.

- ▶ Work may only be carried out by a qualified electrician and with the power supply disconnected!
- ▶ Before carrying out work on the rotary table, disconnect the power supply and protect it from being switched back on!

DANGER!



Danger from electrical voltage!

Electrical constructions are not safely earthed through the rotary table.

- ▶ Use separate earth to secure electrical constructions!

WARNING!

Danger from heavy loads!

Lifting heavy loads may damage your health.

- ▶ Use a hoist of an appropriate size when positioning heavy loads!
- ▶ Observe applicable occupational health and safety regulations when handling suspended loads!

ATTENTION!

Damage to rotary table!

Rotary tables with protection class IP40 can be damaged by liquids.

- ▶ Clean rotary tables with a moist damp only!

NOTE

The rotary tables may only be assembled by specialist personnel.

5.1 Assembling the rotary table

NOTE

The rotary table is secured as standard from below.

- ▶ Drill mounting holes in the mounting surface in accordance with dimensional drawing (see Chapter 11).
- ▶ Clean mounting surface.
- ▶ Position the rotary table on the mounting holes.
- ▶ Insert the mounting bolts in the mounting holes, and tighten them in a crosswise fashion, noting the maximum torque.

✓ The rotary table has now been installed.

5.2 Assembly of the moved load

- ▶ Clean the mounting surface for the load on the rotary table.
- ▶ Clean the mounting surface on the load.
- ▶ Position the load on the rotary table.
- ▶ Tighten the mounting bolts in a crosswise fashion, noting the maximum torque.
- ▶ Check manually that the load moves freely over the whole travel angle.

✓ The moved load has now been installed.

5.3 Electrical connection

⚠ DANGER!



Danger from electrical voltage!

If rotary table motors are incorrectly earthed, there is a danger of electric shock.

- ▶ Before connecting the electrical power supply, ensure that the rotary table is correctly earthed via the PE rail in the switch cabinet!

⚠ DANGER!



Danger from electrical voltage!

Electrical currents may flow even if the motor is not moving.

- ▶ Ensure that the rotary table is disconnected from the power supply before the electrical connections are detached from the motors.
- ▶ After disconnecting the drive amplifier from the power supply, wait at least 5 minutes before touching live parts or breaking connections.
- ▶ For safety reasons, measure the voltage in the intermediate circuit and wait until it has fallen below 40 V.

Observe the separate assembly instructions of the drive!

NOTE

5.3.1 Connection of motor

Maximum length of the supply cable 10 m.

For longer cables, suitable filters must be fitted to prevent voltage peaks.

NOTE



Fig. 5.1 Motor connection TMS, TMN



Fig. 5.2 Motor connection TMB

Assembly and connection

- Brushless three-phase synchronous motors
- Connection via motor connector (M17 7-pin round connector)
- Motor connector up to max. 630 VAC
- Motors are designed for intermediate circuit voltages up to 600 VDC (TMB up to 325 VDC)
- Suitable for drives up to 3 × 400 VAC (TMB up to 1 × 230 VAC)

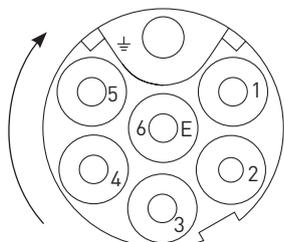


Fig. 5.3 PIN assignment for round connector to rotary table

Table 5.1 Connector assignment for rotary table

PIN no.	Signal	Function	Colour of motor extension cable
1	U	Motor phase	Black-1
4	V	Motor phase	Black-2
3	W	Motor phase	Black-3
5	T+	Thermal protection contact	Red
6	T-	Thermal protection contact	Yellow
2		Not assigned	
Protective earth/ground		GND	Green/Yellow

NOTE

The rotary tables TMB02H and TMB06H must be fitted with additional earthing to their housings as shown in Fig. 5.4.

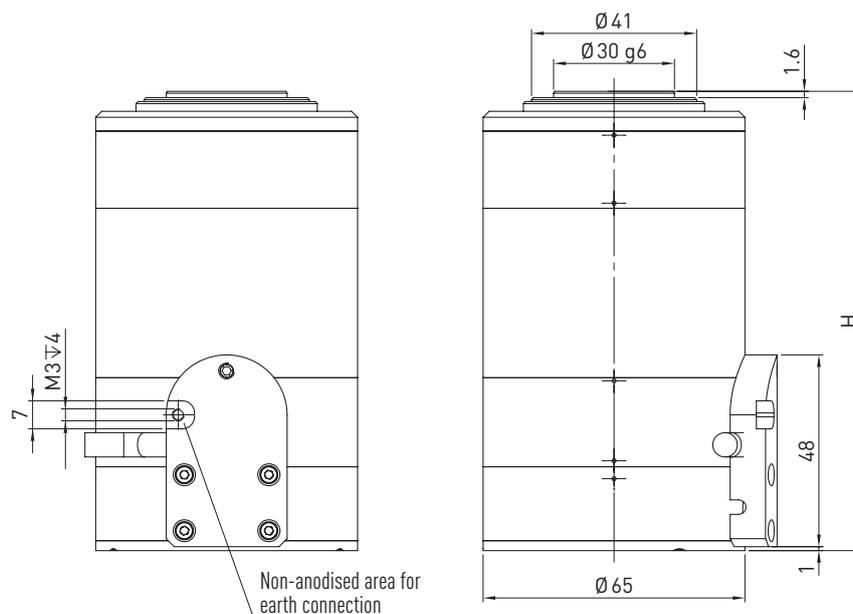


Fig. 5.4 Earth connection on TMB0XH

5.3.2 Positioning measurement

All rotary tables are fitted as standard with a position encoder that outputs a sin/cos $1V_{PP}$ signal with an index. The index position is marked on the housing (see. Fig. 5.5).



H1 = Marking for the 0° position $\pm 15^\circ$

Fig. 5.5 Index marking for position encoder

5.3.3 Connection for the incremental rotary encoder



Fig. 5.6 Encoder connection TMS, TMN



Fig. 5.7 Encoder connection TMB

- Rotary encoder installed and ready to operate
- Connection via M17 17-pin round connector
- The rotary encoder is an optical incremental measurement system with sin/cos $1V_{PP}$ output signal

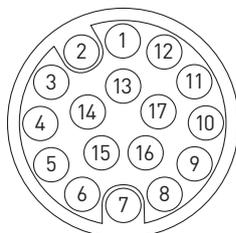


Fig. 5.8 PIN assignment for round connector to positioning measuring system

Table 5.2 **PIN assignment for positioning measuring system**

Round connector PIN no.	Output signals from the positioning measuring system	Colour of encoder cables
1	V 1-	Green
9	V 1+	Yellow
4	Voltage supply 5 VDC	Red (0,5 mm ²)
2	V 2-	Black
12	GND	Black (0,5 mm ²)
11	V 0-/Ref-	Red
3	V 0+/Ref+	Orange
10	V 2+	Brown
15	Internal shield	Internal shield
Connector housing	External shield	External shield

5.3.4 Connection for the absolute rotary encoder

- Rotary encoder installed and ready to operate
- Connection via M17 17-pin round connector
- The rotary encoder is an optical absolute measurement system with sin/cos 1 V_{PP} output signal and EnDat 2.1 interface
- For rotary tables TMS3x-Axxx and TMS7x-Axxx, the rotary encoder has 2048 divisions and 13 bit data width (= 8192 increments, corresponding to 156 arcsec resolution).

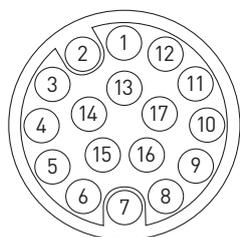


Fig. 5.9 **PIN assignment for round connector to positioning measuring system**

Table 5.3 **PIN assignment for positioning measuring system**

Round connector PIN no.	Output signals from the positioning measuring system	Colour of encoder cables
1	A-	Green
9	A+	Yellow
4	5 V Up voltage supply	Brown/Red (0,5 mm ²)
2	B-	Black
12	GND (0 V Un)	Brown/Blue (0,5 mm ²)
11	Data	Red
3	Data /	Orange
10	B+	Brown
7	CLK	White/Black
6	CKL /	White/Yellow
5	5 V sensor	Grey
13	0 V sensor	Blue
Connector housing	External shield	External shield
15	Internal shield	Internal shield

5.3.5 Motor and encoder cables

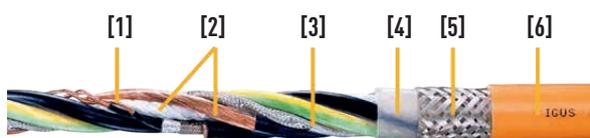
ATTENTION!

Danger with use of unapproved extension cables!

The use of cables that have not been approved by HIWIN may cause damage and malfunctions on the rotary tables for which HIWIN accepts no liability.

- ▶ Use only cables that have been approved by HIWIN!

Motor cables



- [1] Extremely flexurally resistant special conductor
- [2] Power cores with control elements stranded around core element with high tensile strength
- [3] Extremely flexurally resistant pair-braided copper shield
- [4] Gusset-filled extruded
- [5] Extremely flexurally resistant braided copper shield
- [6] Pressure extruded PUR compound

- For extremely heavy-duty use
- PUR outer jacket
- Overall shield
- Resistant to oils and coolants
- Cut-resistant
- Flame-retardant
- Hydrolysis and microbe resistant
- PVC- and halogen-free

Source: igus

Igus Chainflex CF27.15.05.04.D with one open cable end, preassembled on motor side with coupling suitable for M17, 7-pin round encoder connector for the motor series TMS, TMB, and TMN.

Table 5.4 Article numbers for motor cables

Article number	Cable length [m]
8-10-0109	3
8-10-0110	5
8-10-0111	8
8-10-0112	10
8-10-0114	15

Encoder cables (incremental positioning measuring systems)



- [1] Tensile stress resistant centre element
- [2] Fine-stranded special conductor
- [3] Cores in accordance with the measurement system specifications
- [4] Extremely flexurally resistant braided copper shield
- [5] PVC-based oil resistant compound

- For heavy-duty use
- PVC outer jacket
- Overall shield
- Oil-resistant
- Flame-retardant

Source: igus

Igus Chainflex CF211.002 with one open cable end, preassembled on motor side with coupling suitable for M17, 17-pin round encoder connector for the motor series TMS, TMB, and TMN.

Table 5.5 **Article numbers for encoder cables (incremental positioning measuring systems)**

Article number	Cable length [m]
8-10-0115	3
8-10-0116	5
8-10-0117	8
8-10-0118	10
8-10-0120	15

Encoder cables (absolute positioning measuring systems)



- [1] Tensile stress resistant centre element
- [2] Fine-stranded special conductor
- [3] Cores in accordance with the measuring system specifications
- [4] Extremely flexurally resistant braided copper shield
- [5] PVC-based oil resistant compound

- For heavy-duty use
- PVC outer jacket
- Overall Shield
- Oil-resistant
- Flame-retardant

Source: igus

Igus Chainflex CF211.001 with one open cable end, preassembled on motor side with coupling suitable for M17, 17-pin round encoder connector for the motor series TMS, TMB, and TMN.

Table 5.6 **Article numbers for encoder cables (incremental positioning measuring systems)**

Article number	Cable length [m]
8-10-0315	3
8-10-0316	5
8-10-0317	8
8-10-0318	10
8-10-0320	15

5.3.6 Drive amplifier power supply – typical values

NOTE

Follow the installation instructions for the drive amplifier that is being used.

- The minimum cross-section of the mains connection cable depends on local requirements (see VDE 0100 Part 523, VDE 0298 Part 4), the ambient temperature and the drive amplifier's required rated current.

Table 5.7 **Typical values for the power supply**

Amplifier rated current [A]	Connected load [kVA]	Max. cable cross-section of the clamps [mm ²]	Recommended fuse (gL) [A]
4.0	1.7	2.5	1 × 10
5.5	2.3	2.5	1 × 16
5.7	4.2	2.5	3 × 10
10.0	7.3	2.5	3 × 16
17.0	12.4	4.0	3 × 25

6. Commissioning

6.1 Switching on the rotary table

WARNING!



Risk of burns!

The motor heats up during operation and thus touching the motor can lead to burns!

- ▶ Provide protective devices and warning notices at the motor!

ATTENTION!

Danger of material damage!

Danger of material damage through uncontrolled movements of the rotor in the case of a power cut!

- ▶ Make sure that suitable end stops are fitted at the end positions or that the parking brake (optional) is engaged!

The operator should provide a controller pursuant to DIN EN ISO 12100 that prevents the machine from being started up unintentionally after power is restored, troubleshooting or the machine is stopped.

NOTE

- ▶ Switch off the controller.
 - ▶ Detach the motor cable.
 - ▶ If applicable, connect the cable for the positioning measuring system (see Section [5.3.3](#) or [5.3.4](#))
 - ▶ Switch on the controller.
 - ▶ If applicable, check the positioning measuring system (see separate assembly instructions for the drive amplifier and positioning measuring system).
 - ▶ Switch off the controller.
 - ▶ Connect motor cable (see Section [5.3.1](#)).
 - ▶ Switch on the controller.
 - ▶ Perform test run at slow speed.
 - ▶ Perform test under usage conditions.
- ✓ Rotary table is ready for operation.

6.2 Programming

The programming of the rotary table depends on the controller and drive amplifier used. Observe the assembly instructions for the controller and drive amplifier!

NOTE

7. Maintenance and cleaning

WARNING!

Unauthorised repairs on the system

Unauthorised work on the system creates the risk of injuries and may invalidate the warranty.

- ▶ The system must only be serviced by specialist personnel!

NOTE

Use only suitable, non-hazardous agents. Please observe the manufacturer's safety data sheets.

During maintenance:

- ▶ Secure the rotary table against being switched back on without authorisation.
- ▶ Disconnect the power supply of the rotary table.
- ▶ Secure the rotary table against being switched back on without authorisation.



7.1 Maintenance

NOTE

Relubrication may become necessary when running noise increases after several hundred operating hours. Please consult HIWIN GmbH.

Like every rolling bearing, the ball or cross roller bearings installed in the rotary tables require an adequate supply of lubricant. The lubricants reduce wear, protect against dirt, prevent corrosion, and extend the service life.

The cross roller bearings used in the rotary tables are fitted with seals that prevent the lubricant from exiting the bearing. After installation, the rolling bearings receive their first lubrication at the plant before delivery.

If the rotary table is not heated or rotated excessively during operations (higher than 50 °C or 500 rpm), relubrication is normally not necessary.

7.2 Cleaning

WARNING!

Aggressive media

Using aggressive media for cleaning creates the risk of injury and of damaging the rotary tables.

- ▶ Use only suitable, non-hazardous agents.
- ▶ Check the safety data sheets!

ATTENTION!

Damage to rotary table!

Rotary tables with protection class IP40 can be damaged by liquids.

- ▶ Clean rotary tables with a moist damp only!

Dirt can settle and accumulate over time on the rotary tables. The rotary tables must therefore be regularly checked for dirt and cleaned if necessary, e.g. using a 70 % alcohol solution.

8. Faults

8.1 Faults with the motor

Table 8.1 **Fault table**

Fault	Possible cause	Remedy
Motor does not start	Supply lines disconnected	Check connections, plug contacts may be compressed, repair if necessary. The connectors have seals, which means that a certain screw connection resistance must be overcome.
	Fuse has tripped via motor protection	Check motor protection for the right settings, remedy defects if necessary
Motor turns in the wrong direction	Encoder setting wrong	Check settings
	Input phase fault	Change over two phases on the motor
Smell of burning	Controller setup parameters are incorrect	1. Check controller settings
	Cooling system not working properly	2. Check cooling system
	Controller setting does not match the motor parameters	
Communication fault	Motor phase connected incorrectly	Check drive amplifier, check nominal value
Motor hums and has a high current consumption	Rotor is jammed	Check motor for smooth operation
	Brake jammed	Check air pressure and power supply
	Fault in encoder cable	Check encoder cable
	Problem with motor insulation	Check resistance values > 50 MΩ (phase/earth and phase/sensor)
Motor heats up too much (measure temperature)	Controller setting incorrect	Check controller settings
	Overload	Carry out power measurement, if necessary use a larger motor or reduce load
	Cooling insufficient	Rectify cooling air supply or open cooling air passages, retrofit external fan if necessary
	Ambient temperature too high	Observe permissible temperature range
	Rated duty cycle exceeded, e.g. duty cycle too long	Adjust motor's rated duty cycle to the necessary operating conditions
	Damaged bearings	Check bearings
Abnormal friction noise or friction torque too high	Motor alignment problem	Check installation
	Dirt in air gap	Remove dirt

8.2 Faults during operation with drive amplifier

The faults described in Section 8.1 "Faults with the motor" can also occur while operating the motor with a drive amplifier. For interpretation of faults and information on how to remedy them, see the drive amplifier manufacturer's installation instructions.

9. Disposal

ATTENTION!



Danger caused by environmentally hazardous substances!

The danger to the environment depends on the type of substance used.

- ▶ Clean contaminated parts thoroughly before disposal!
- ▶ Clarify the requirements for safe disposal with disposal companies and, where appropriate, with the competent authorities!

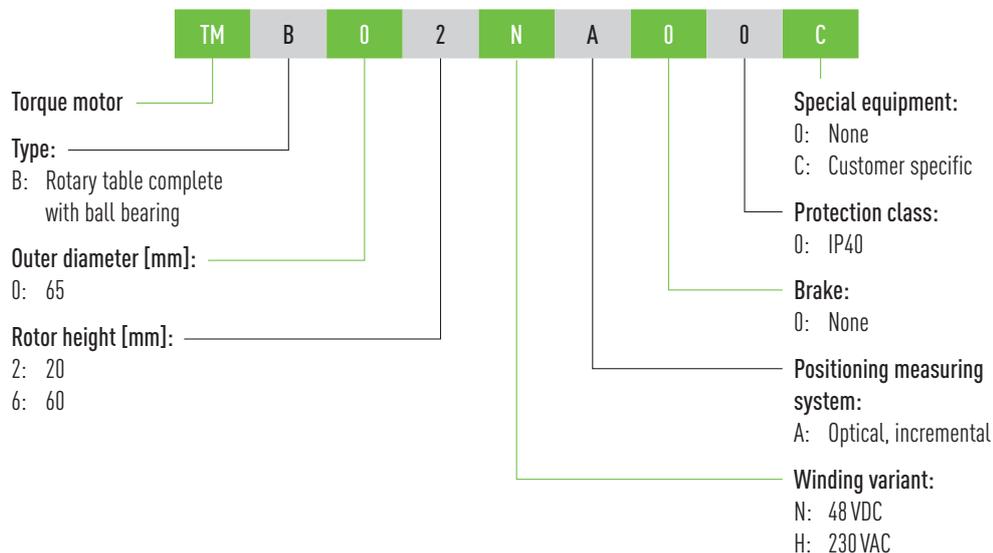
Table 9.1 **Disposal**

Fluids	
Lubricants	Dispose of as hazardous waste in an environmentally friendly way
Soiled cleaning cloths	Dispose of as hazardous waste in an environmentally friendly way
Rotary table	
Cabling, electrical components	Dispose of as electrical waste
Polypropylene (PP) components	Dispose of separately
Aluminium components (housing)	Dispose of separately
Iron components	Dispose of separately
Copper components	Dispose of separately
Brass, nickel-plated components (plug connector materials)	Dispose of separately
Nitrile butadiene rubber (NBR) components (seals)	Dispose of separately
Stainless steel components (bolts)	Dispose of separately

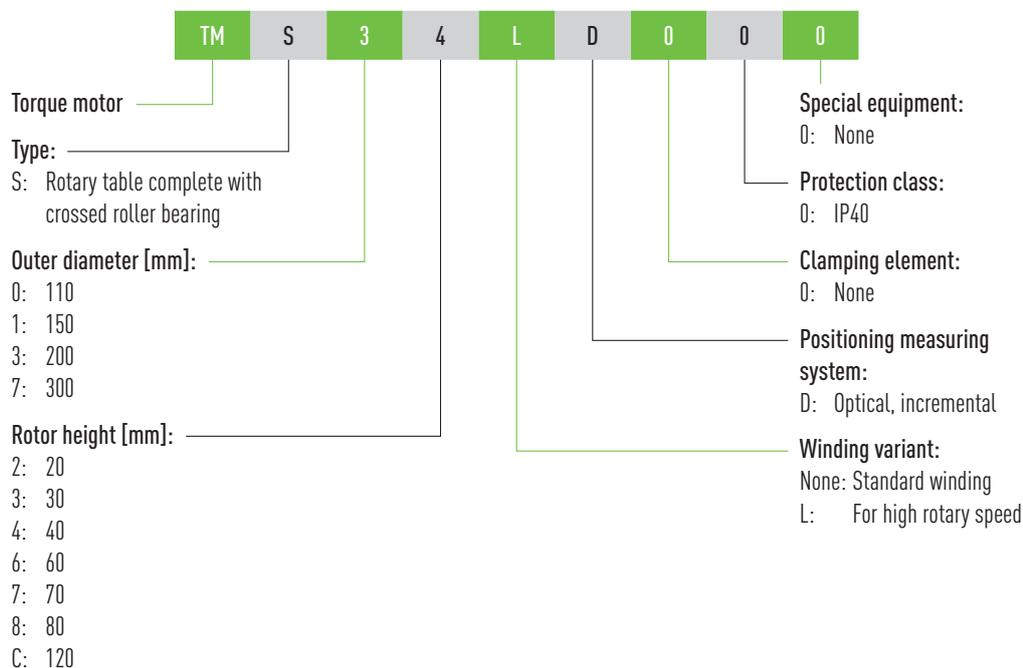
Appendix 1: Order codes

10. Appendix 1: Order codes

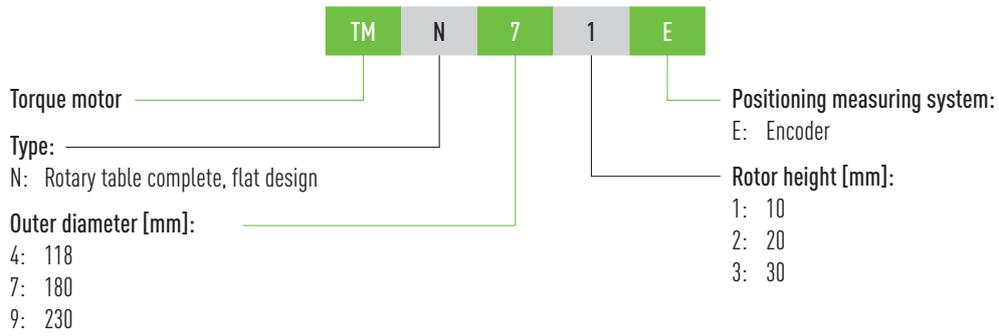
10.1 Order code TMB



10.2 Order code TMS



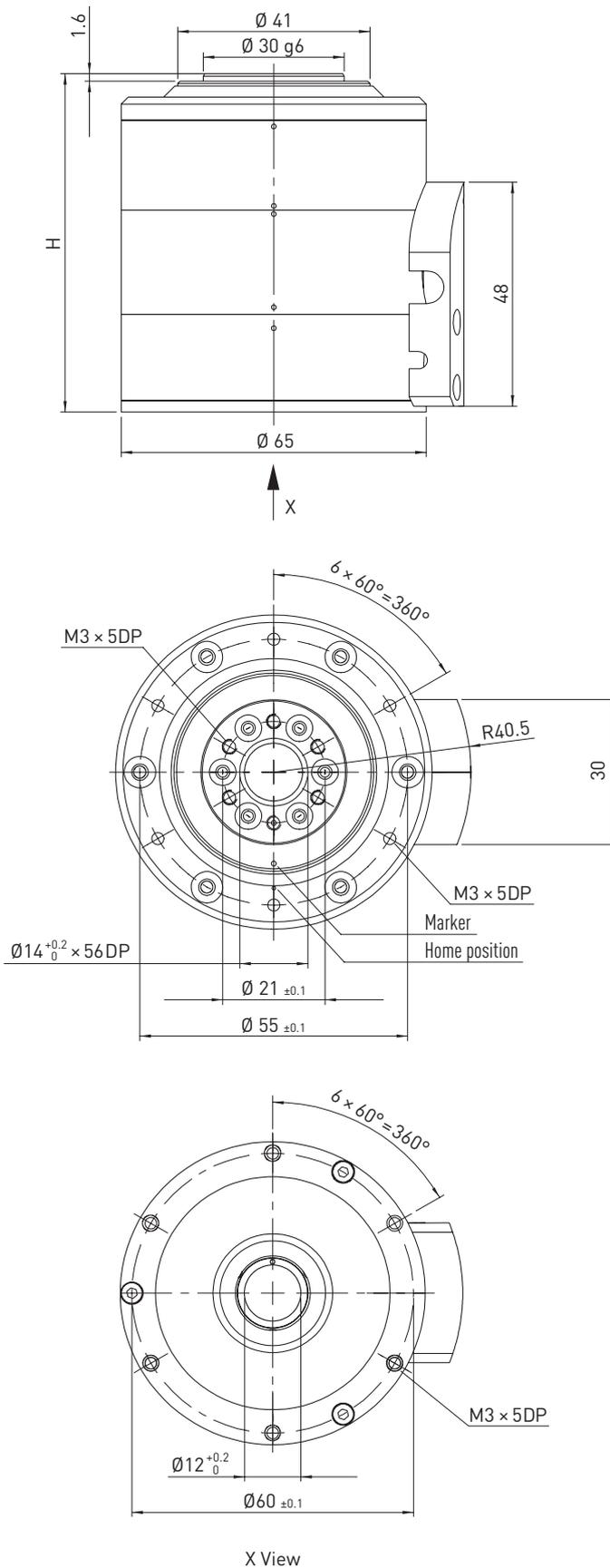
10.3 Order code TMN



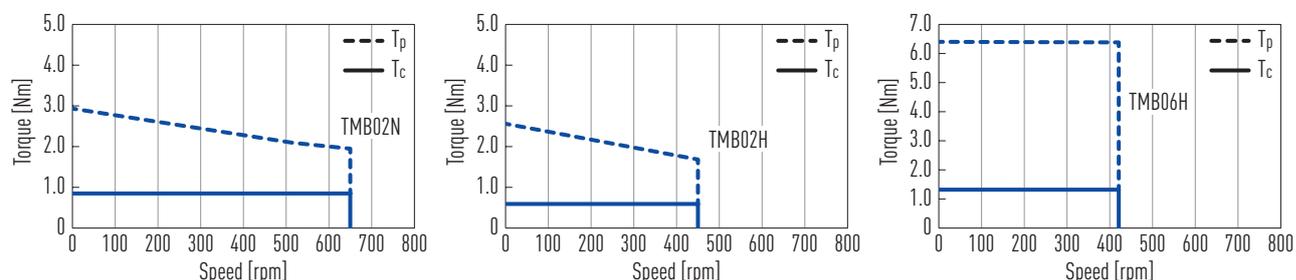
Appendix 2: Dimensional drawings and technical data

11. Appendix 2: Dimensional drawings and technical data

11.1 TMB series



Torque-speed curves (DC bus voltage: TMB02N: 48 VDC; TMB02H: 320 VDC; TMB06H: 320 VDC)



Encoder specifications (optical, incremental)

- 2,048 lines/cycle
- Index mark
- Signal output sin/cos 1 V_{pp}

Table 11.1 **Technical data for HIWIN TMB0 rotary tables**

	Symbol	Unit	TMB02N-A00	TMB02H-A00	TMB06H-A00
Technical data of rotary table					
Peak torque (for 1 sec.)	T _p	Nm	3.0	2.56	6.4
Continuous torque	T _c	Nm	0.9	0.59	1.4
Stall torque	T _s	Nm	0.5	0.42	1
Inertia of rotating parts	J	kgm ²	3.5 × 10 ⁻⁵		9.5 × 10 ⁻⁵
Weight	M _m	G	650	960	1,270
Max. axial load	F _a	N	150		
Max. radial load	F _r	N	150		
Max. moment of tilt	M _k	Nm	4		
Nominal speed (30 % duty cycle)	n	1/min	650	450	420
Position accuracy		arcsec	150		
Repeatability		arcsec	6		
Radial run-out		mm	0.05		
Axial run-out		mm	0.05		
Height	H	mm	72.6		115
Protection class			IP40		
Technical data of motor					
Peak current (for 1 sec.)	I _p	A _{eff}	23.1	5.5	9.7
Continuous current	I _c	A _{eff}	6.9	1.26	2.0
Motor constant	K _m	Nm/√W	0.11	0.10	0.2
Resistance ¹⁾	R ₂₅	Ω	1.4	20.1	10.6
Inductance ¹⁾	L	mH	0.88	11.3	9.9
Electrical time constant	T _e	ms	0.63	0.56	0.93
Torque constant	K _t	Nm/A _{eff}	0.13	0.46	0.66
Back emf constant	K _u	V _{eff} /(rad/s)	0.13	0.46	0.66
Number of poles	2p		12		
Thermal resistance	R _{th}	°C/W	3.3		2.5
Thermal sensor			PTC SNM 125		
Max. DC Bus		VDC	48	340	

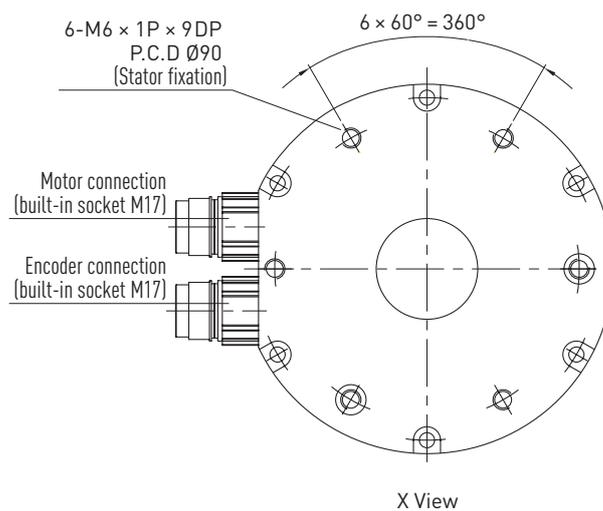
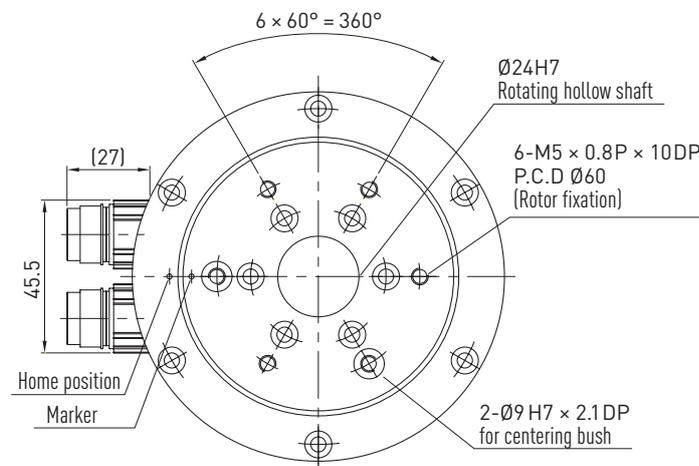
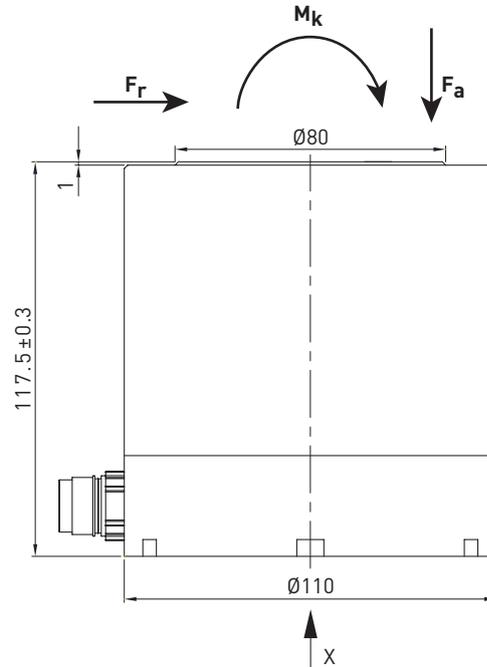
All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature

¹⁾ Line-to-line

Appendix 2: Dimensional drawings and technical data

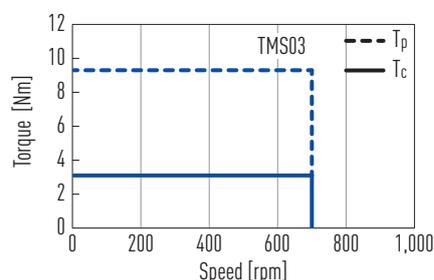
11.2 TMS series

11.2.1 TMS0



X View

Torque-speed curve (DC bus voltage: 560 VDC)



Encoder type D specifications (optical, incremental)

- 5,026 lines/cycle
- Index mark
- Signal output sin/cos 1 V_{pp}

Table 11.2 Technical data for HIWIN TMS0 rotary tables

	Symbol	Unit	TMS03
Technical data of rotary table			
Peak torque (for 1 sec.)	T_p	Nm	9.3
Continuous torque	T_c	Nm	3.1
Stall torque	T_s	Nm	2.17
Inertia of rotating parts	J	kgm ²	0.003
Weight	M_m	kg	4
Max. axial load	F_a	N	3,700
Max. radial load	F_r	N	820
Max. moment of tilt	M_k	Nm	40
Nominal speed (at 400 VAC, 30 % duty cycle)	n	1/min	700
Position accuracy		arcsec	$\pm 45/\pm 10^{2)}$
Repeatability		arcsec	± 3
Radial run-out		mm	0.03
Axial run-out		mm	0.03
Protection class			IP40
Technical data of motor			
Peak current (for 1 sec.)	I_p	A _{eff}	6.0
Continuous current	I_c	A _{eff}	2.0
Motor constant	K_m	Nm/ \sqrt{W}	0.5
Resistance ¹⁾	R_{25}	Ω	7.1
Inductance ¹⁾	L	mH	15.2
Electrical time constant	T_e	ms	2.1
Torque constant	K_t	Nm/A _{eff}	1.55
Back emf constant	K_u	V _{eff} /(rad/s)	0.82
Number of poles	$2p$		10
Thermal resistance	R_{th}	°C/W	1.76
Thermal time constant	T_{th}	s	1,930
Thermal sensor			PTC SMN 100
Max. DC Bus		V	600

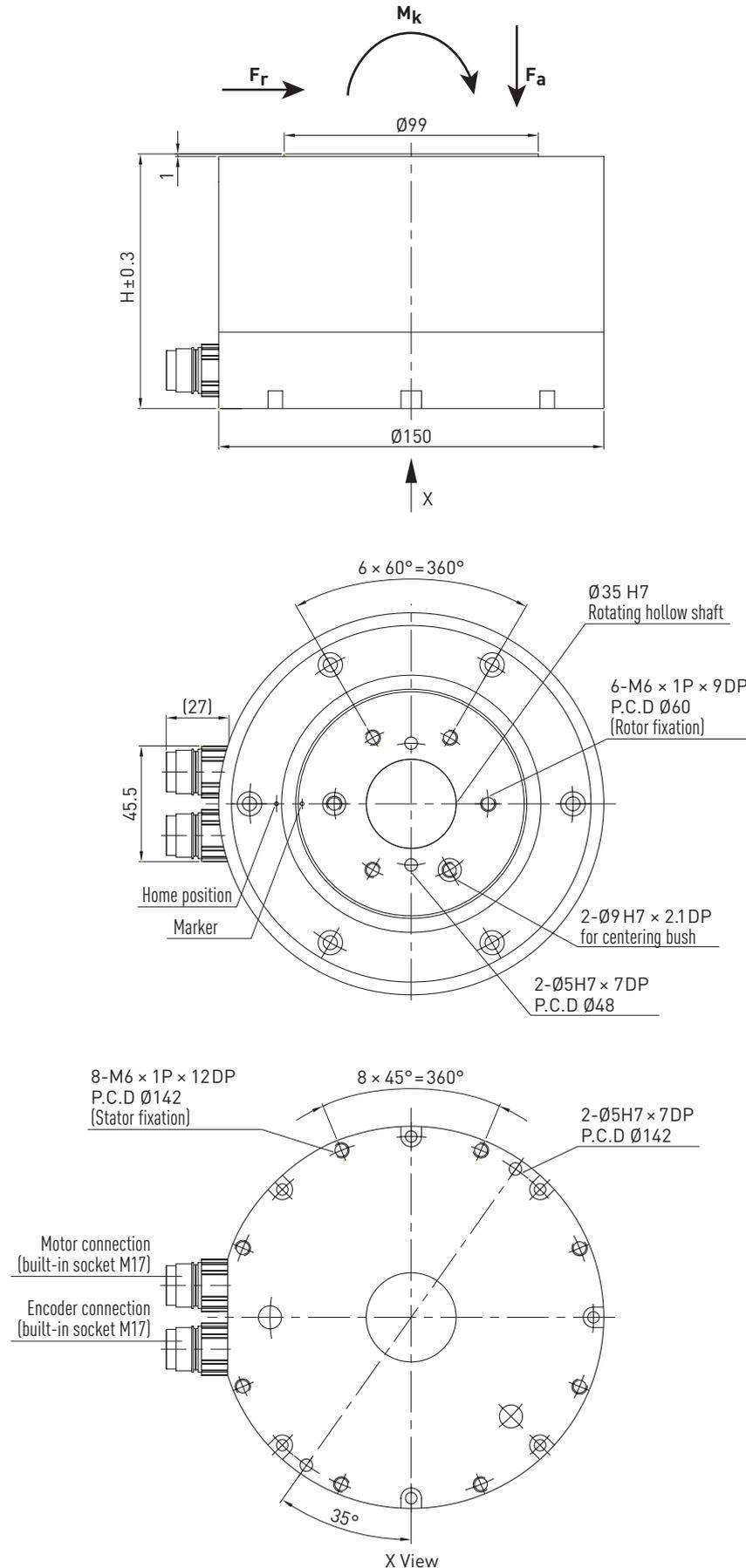
All the specifications in the table (except dimensions) are in $\pm 10\%$ of tolerance at 25 °C ambient temperature

¹⁾ Line-to-line

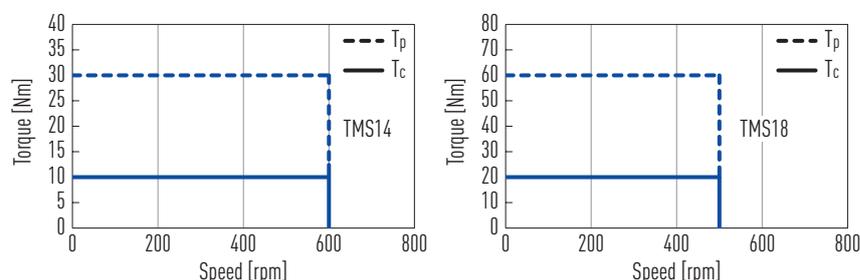
²⁾ With error mapping

Appendix 2: Dimensional drawings and technical data

11.2.2 TMS1



Torque-speed curves (DC bus voltage: 560 VDC)



Encoder type D specifications (optical, incremental)

- 7,226 lines/cycle
- Index mark
- Signal output sin/cos 1 V_{pp}

Table 11.3 Technical data for HIWIN TMS1 rotary tables

	Symbol	Unit	TMS14	TMS18
Technical data of rotary table				
Peak torque (for 1 sec.)	T_p	Nm	30	60
Continuous torque	T_c	Nm	10	20
Stall torque	T_s	Nm	7	14
Inertia of rotating parts	J	kgm ²	0.0065	0.0075
Weight	M_m	kg	7.0	9.5
Max. axial load	F_a	N	3,700	
Max. radial load	F_r	N	1,700	
Max. moment of tilt	M_k	Nm	60	
Nominal speed (at 400 VAC, 30 % duty cycle)	n	1/min	600	500
Position accuracy		arcsec	$\pm 45/\pm 10^{2)}$	
Repeatability		arcsec	± 3	
Radial run-out		mm	0.03	
Axial run-out		mm	0.03	
Height	H	mm	120	160
Protection class			IP40	
Technical data of motor				
Peak current (for 1 sec.)	I_p	A _{eff}	12	
Continuous current	I_c	A _{eff}	4	
Motor constant	K_m	Nm/ \sqrt{W}	1.0	1.6
Resistance ¹⁾	R_{25}	Ω	3.9	6.5
Inductance ¹⁾	L	mH	14.0	26.0
Electrical time constant	T_e	ms	3.6	4.0
Torque constant	K_t	Nm/A _{eff}	2.50	5.00
Back emf constant	K_u	V _{eff} /(rad/s)	1.2	2.4
Number of poles	2p		22	
Thermal resistance	R_{th}	$^{\circ}C/W$	0.80	0.48
Thermal time constant	T_{th}	s	2,290	2,520
Thermal sensor			PTC SNM 100	
Max. DC Bus		V	600	

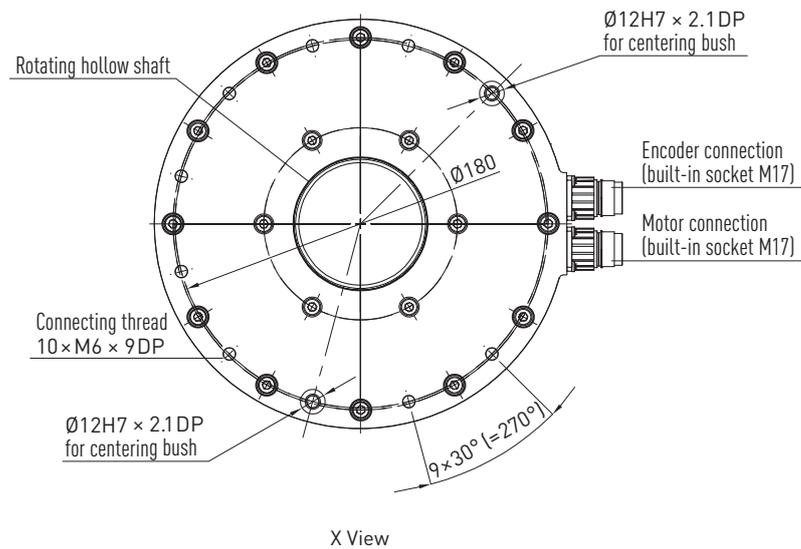
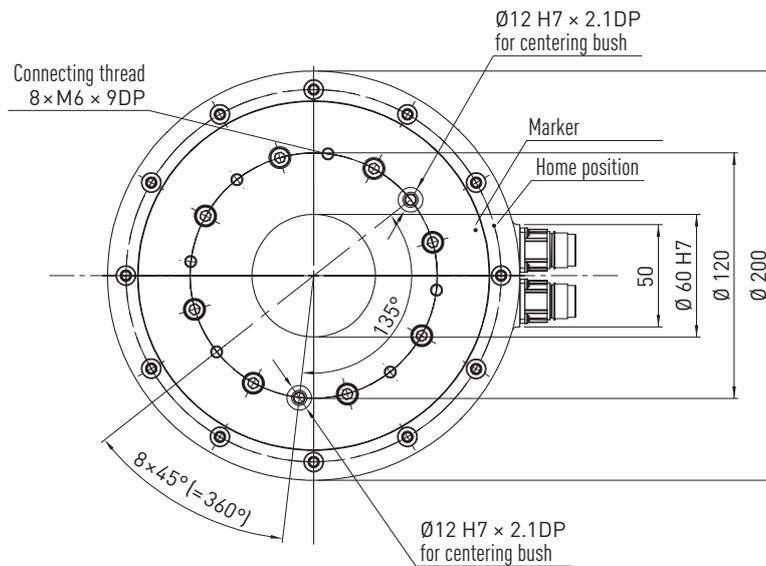
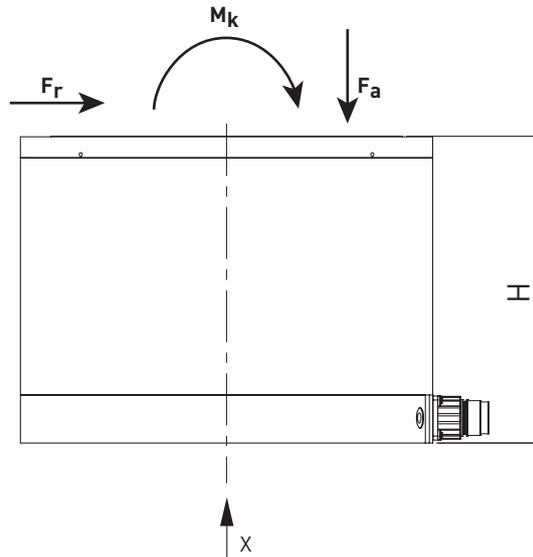
All the specifications in the table (except dimensions) are in $\pm 10\%$ of tolerance at 25 °C ambient temperature

¹⁾ Line-to-line

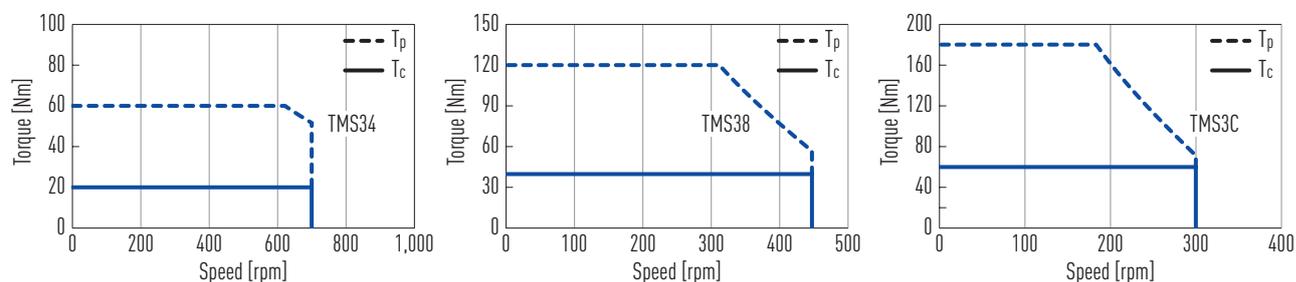
²⁾ With error mapping

Appendix 2: Dimensional drawings and technical data

11.2.3 TMS3



Torque-speed curves (DC bus voltage: 560 VDC)



Encoder specifications type D (optical, incremental)

- 7,226 lines/cycle
- Index mark
- Signal output sin/cos 1 V_{pp}

Table 11.4 Technical data for HIWIN TMS3 rotary tables

	Symbol	Unit	TMS34	TMS38	TMS3C
Technical data of rotary table					
Peak torque (for 1 sec.)	T_p	Nm	60	120	180
Continuous torque	T_c	Nm	20	40	60
Stall torque	T_s	Nm	14	28	42
Inertia of rotating parts	J	kgm ²	0.020	0.026	0.035
Weight	M_m	kg	21	26	32
Max. axial load	F_a	N	8,000		
Max. radial load	F_r	N	6,500		
Max. moment of tilt	M_k	Nm	240		
Nominal speed (at 400 VAC, 30 % duty cycle)	n	1/min	700	450	300
Position accuracy		arcsec	$\pm 25/\pm 10^{2)}$		
Repeatability		arcsec	± 2.5		
Radial run-out		mm	0.05		
Axial run-out		mm	0.05		
Height	H	mm	150	190	230
Protection class			IP40		
Technical data of motor					
Peak current (for 1 sec.)	I_p	A _{eff}	10.2		
Continuous current	I_c	A _{eff}	3.4		
Motor constant	K_m	Nm/ \sqrt{W}	1.8	2.8	3.6
Resistance ¹⁾	R_{25}	Ω	7.5	12.0	17.1
Inductance ¹⁾	L	mH	34.6	53.6	84.4
Electrical time constant	T_e	ms	4.6	4.5	4.9
Torque constant	K_t	Nm/A _{eff}	6	12	18
Back emf constant	K_u	V _{eff} /(rad/s)	3	6	9
Number of poles	2p		22		
Thermal resistance	R_{th}	$^{\circ}C/W$	0.73	0.46	0.32
Thermal time constant	T_{th}	s	2,020	2,130	2,170
Thermal sensor			PTC SNM 120		
Max. DC Bus		V	600		

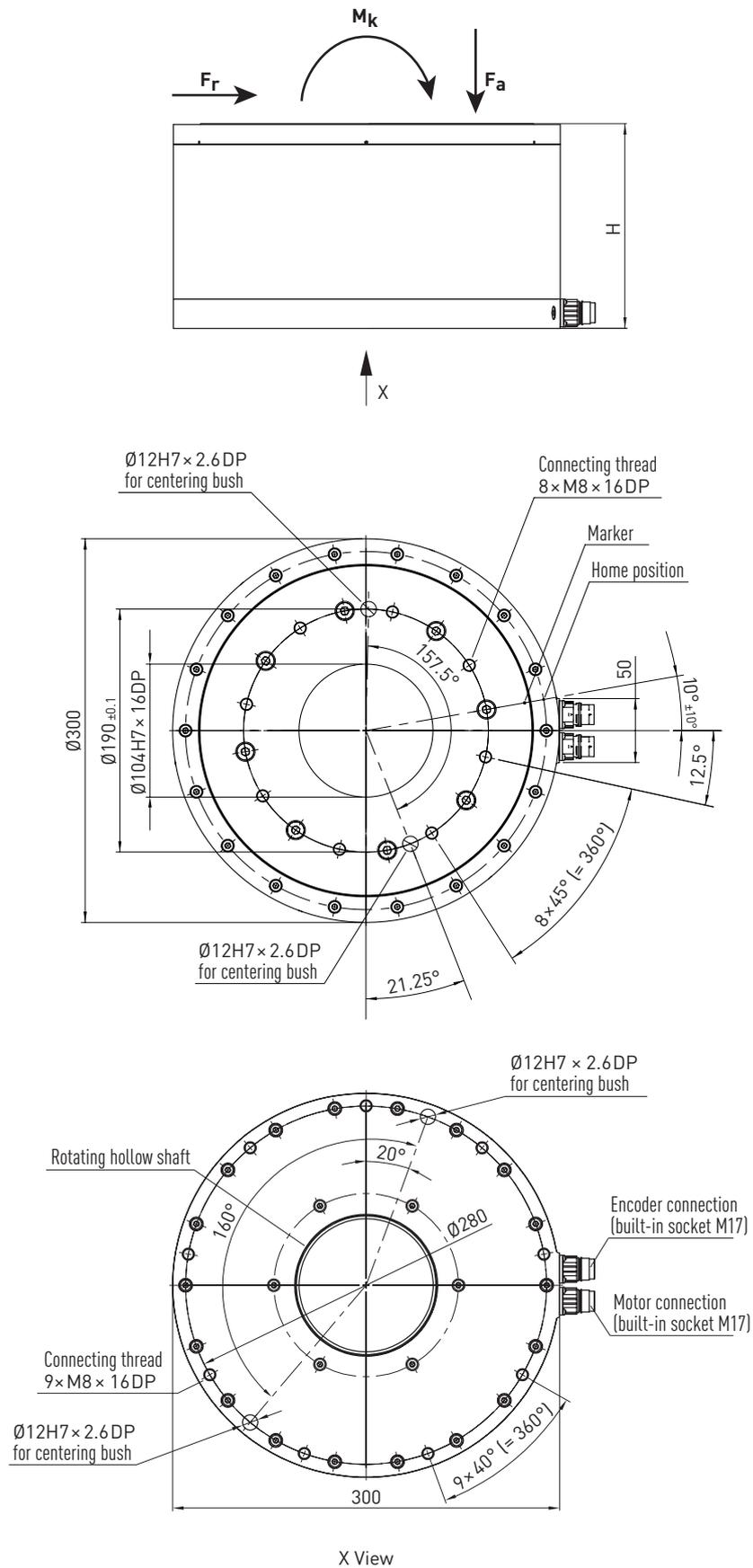
All the specifications in the table (except dimensions) are in $\pm 10\%$ of tolerance at 25 $^{\circ}C$ ambient temperature

¹⁾ Line-to-line

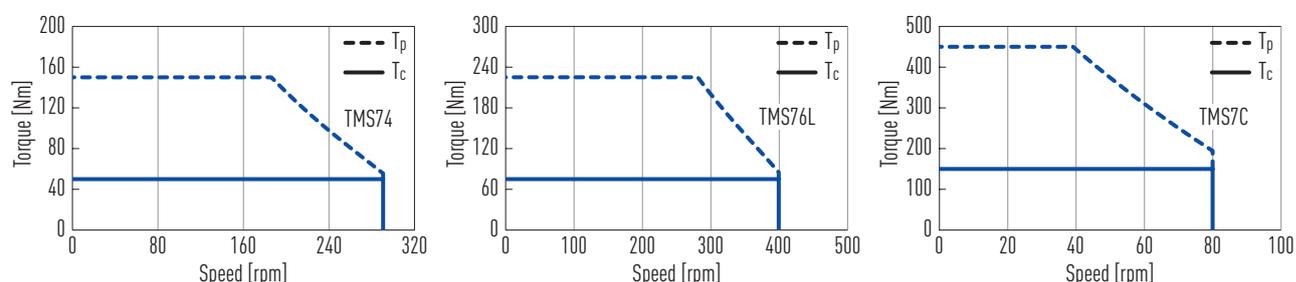
²⁾ With error mapping

Appendix 2: Dimensional drawings and technical data

11.2.4 TMS7



Torque-speed curves (DC bus voltage: 560 VDC)



Encoder specifications type D (optical, incremental)

- 11,152 lines/cycle
- Index mark
- Signal output sin/cos 1 V_{pp}

Table 11.5 Technical data for HIWIN TMS7 rotary tables

	Symbol	Unit	TMS74	TMS76L	TMS7C
Technical data of rotary table					
Peak torque (for 1 sec.)	T _p	Nm	150	225	450
Continuous torque	T _c	Nm	50	75	150
Stall torque	T _s	Nm	35.0	52.5	105.0
Inertia of rotating parts	J	kgm ²	0.152	0.174	0.241
Weight	M _m	kg	39.0	44.5	61.5
Max. axial load	F _a	N	8,000		
Max. radial load	F _r	N	6,500		
Max. moment of tilt	M _k	Nm	360		
Nominal speed (at 400 VAC, 30 % duty cycle)	n	1/min	290	400	80
Position accuracy		arcsec	± 25/± 10 ²⁾		
Repeatability		arcsec	± 2.5		
Radial run-out		mm	0.05		
Axial run-out		mm	0.05		
Height	H	mm	160	180	240
Protection class			IP40		
Technical data of motor					
Peak current (for 1 sec.)	I _p	A _{eff}	10.2	20.4	10.2
Continuous current	I _c	A _{eff}	3.4	6.8	3.4
Motor constant	K _m	Nm/√W	3.9	5.0	7.7
Resistance ¹⁾	R ₂₅	Ω	12.9	4.3	29.0
Inductance ¹⁾	L	mH	55	19	145
Electrical time constant	T _e	ms	4.3	4.4	5.0
Torque constant	K _t	Nm/A _{eff}	17.0	12.8	51.1
Back emf constant	K _v	V _{eff} /(rad/s)	9.8	7.4	29.5
Number of poles	2p		44		
Thermal resistance	R _{th}	°C/W	0.42	0.32	0.19
Thermal time constant	T _{th}	s	2,230	2,330	2,350
Thermal sensor			PTC SNM 120		
Max. DC Bus		V	600		

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature

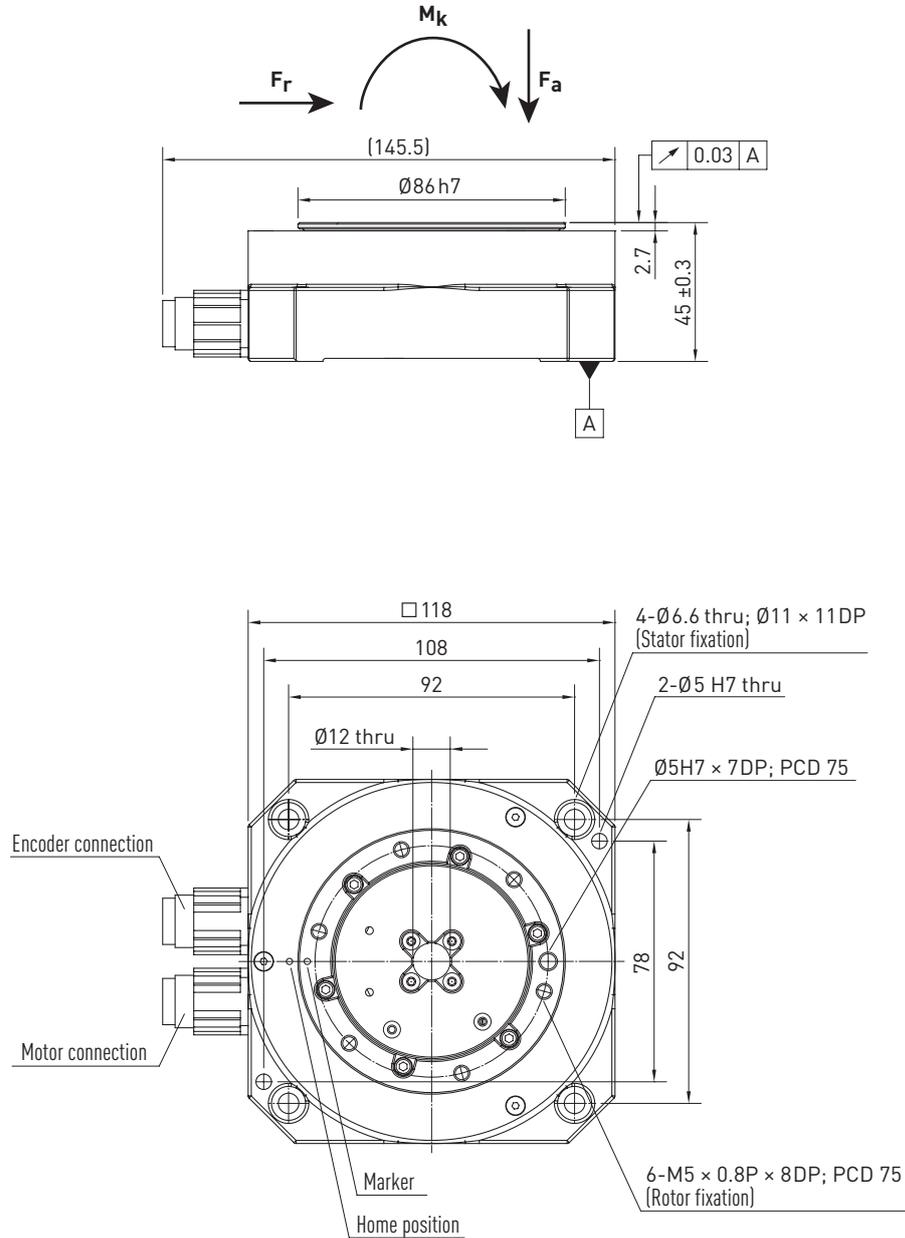
¹⁾ Line-to-line

²⁾ With error mapping

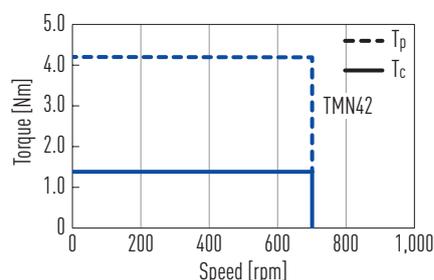
Appendix 2: Dimensional drawings and technical data

11.3 TMN series

11.3.1 TMN42



Torque-speed curve (DC bus voltage: 320/560 VDC)



Encoder specifications (optical, incremental)

- 2,048 lines/cycle
- Index mark
- Signal output sin/cos 1 V_{pp}

Table 11.6 Technical data for HIWIN TMN42 rotary tables

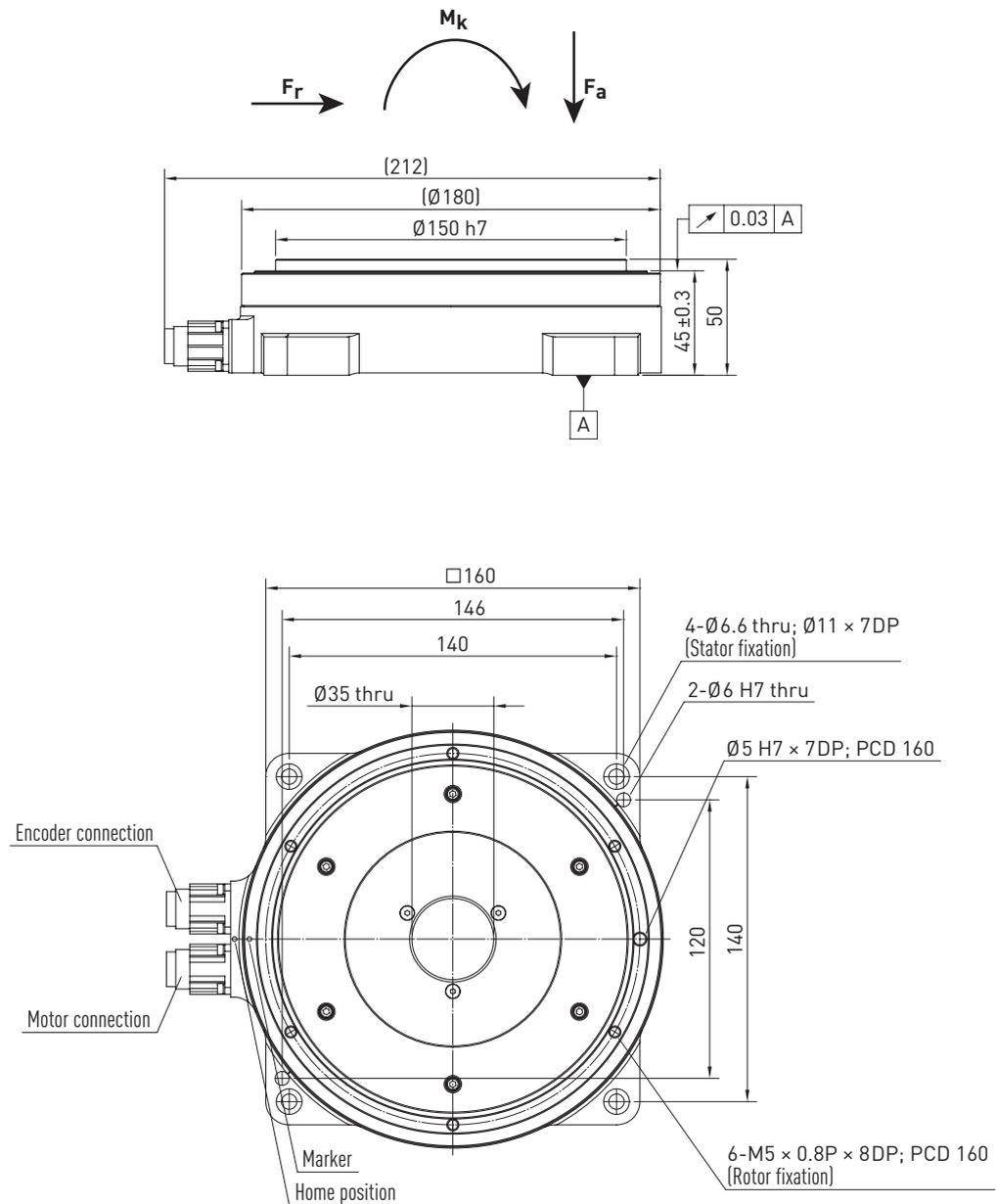
	Symbol	Unit	TMN42
Technical data of rotary table			
Peak torque (for 1 sec.)	T_p	Nm	4.2
Continuous torque	T_c	Nm	1.4
Stall torque	T_s	Nm	0.98
Inertia of rotating parts	J	kgm ²	0.003
Weight	M_m	kg	2
Max. axial load	F_a	N	600
Max. radial load	F_r	N	600
Max. moment of tilt	M_k	Nm	30
Nominal speed (at 400 VAC)	n	1/min	700
Position accuracy		arcsec	± 45
Repeatability		arcsec	± 2.5
Radial run-out		mm	0.03
Axial run-out		mm	0.03
Height	H	mm	45
Protection class			IP40
Technical data of motor			
Peak current (for 1 sec.)	I_p	A _{eff}	4.5
Continuous current	I_c	A _{eff}	1.5
Motor constant	K_m	Nm/√W	0.4
Resistance ¹⁾	R_{25}	Ω	4.59
Inductance ¹⁾	L	mH	8.18
Electrical time constant	T_e	ms	1.78
Torque constant	K_t	Nm/A _{eff}	0.97
Back emf constant	K_u	V _{eff} /(rad/s)	0.56
Number of poles	2p		16
Thermal resistance	R_{th}	°C/W	4.84
Thermal time constant	T_{th}	s	1,170
Thermal sensor			PTC SNM 100
Max. DC Bus		V	600

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature

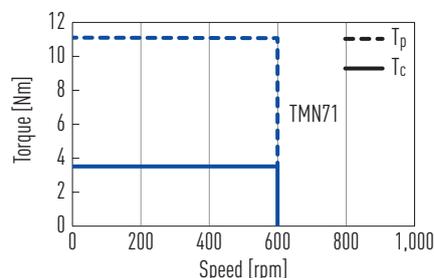
¹⁾ Line-to-line

Appendix 2: Dimensional drawings and technical data

11.3.2 TMN71



Torque-speed curve (DC bus voltage: 320/560 VDC)



Encoder specifications (optical, incremental)

- 2,048 lines/cycle
- Index mark
- Signal output sin/cos 1 V_{pp}

Table 11.7 Technical data for HIWIN TMN71 rotary tables

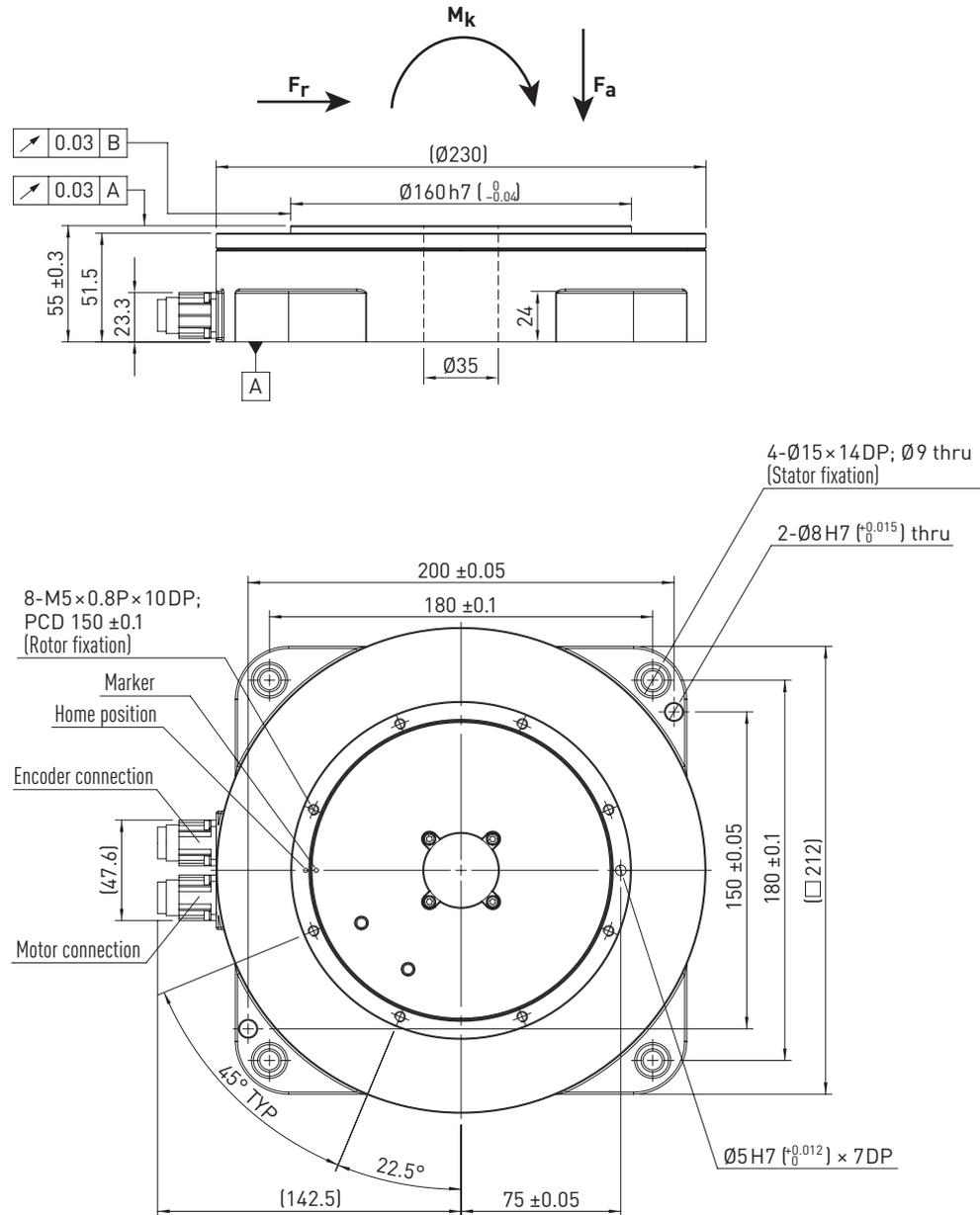
	Symbol	Unit	TMN71
Technical data of rotary table			
Peak torque (for 1 sec.)	T_p	Nm	11.1
Continuous torque	T_c	Nm	3.7
Stall torque	T_s	Nm	2.59
Inertia of rotating parts	J	kgm ²	0.008
Weight	M_m	kg	3.5
Max. axial load	F_a	N	1,000
Max. radial load	F_r	N	1,000
Max. moment of tilt	M_k	Nm	50
Nominal speed (at 400 VAC)	n	1/min	600
Position accuracy		arcsec	± 45
Repeatability		arcsec	± 2.5
Radial run-out		mm	0.03
Axial run-out		mm	0.03
Height	H	mm	50
Protection class			IP40
Technical data of motor			
Peak current (for 1 sec.)	I_p	A _{eff}	10.2
Continuous current	I_c	A _{eff}	3.4
Motor constant	K_m	Nm/√W	0.6
Resistance ¹⁾	R_{25}	Ω	2.22
Inductance ¹⁾	L	mH	9.02
Electrical time constant	T_e	ms	4.1
Torque constant	K_t	Nm/A _{eff}	1.09
Back emf constant	K_u	V _{eff} /(rad/s)	0.63
Number of poles	2p		16
Thermal resistance	R_{th}	°C/W	1.95
Thermal time constant	T_{th}	s	1,420
Thermal sensor			PTC SNM 100
Max. DC Bus		V	600

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature

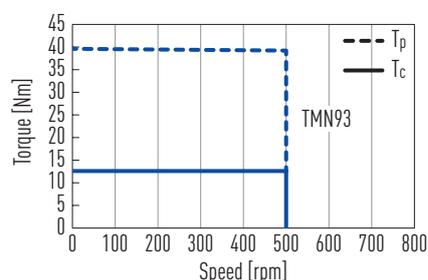
¹⁾ Line-to-line

Appendix 2: Dimensional drawings and technical data

11.3.3 TMN93



Torque-speed curve (DC bus voltage: 320/560 VDC)



Encoder specifications (optical, incremental)

- 3,600 lines/cycle
- Index mark
- Signal output sin/cos 1 V_{pp}

Table 11.8 Technical data for HIWIN TMN93 rotary tables

	Symbol	Unit	TMN93
Technical data of rotary table			
Peak torque (for 1 sec.)	T_p	Nm	39.6
Continuous torque	T_c	Nm	13.2
Stall torque	T_s	Nm	9.24
Inertia of rotating parts	J	kgm ²	0.012
Weight	M_m	kg	7.5
Max. axial load	F_a	N	1,000
Max. radial load	F_r	N	1,000
Max. moment of tilt	M_k	Nm	50
Nominal speed (at 400 VAC)	n	1/min	500
Position accuracy		arcsec	± 45
Repeatability		arcsec	± 2.5
Radial run-out		mm	0.03
Axial run-out		mm	0.03
Height	H	mm	55
Protection class			IP40
Technical data of motor			
Peak current (for 1 sec.)	I_p	A _{eff}	10.2
Continuous current	I_c	A _{eff}	3.4
Motor constant	K_m	Nm/√W	1.5
Resistance ¹⁾	R_{25}	Ω	4.3
Inductance ¹⁾	L	mH	23.2
Electrical time constant	T_e	ms	5.4
Torque constant	K_t	Nm/A _{eff}	3.9
Back emf constant	K_u	V _{eff} /(rad/s)	2.25
Number of poles	2p		22
Thermal resistance	R_{th}	°C/W	1.01
Thermal time constant	T_{th}	s	1,780
Thermal sensor			PTC SNM 100
Max. DC Bus		V	600

All the specifications in the table (except dimensions) are in ± 10 % of tolerance at 25 °C ambient temperature

¹⁾ Line-to-line

12. Appendix 3: Declaration of Incorporation

in the sense of the EC Machinery Directive 2006/42/EC, Annex II 1. B for partly completed machinery

The manufacturer: HIWIN GmbH, Brücklesbünd 2, 77654 Offenburg
Documentation department: HIWIN GmbH, Brücklesbünd 2, 77654 Offenburg

Description and identification of the partly completed machinery:

Product: Rotary table
Model/Type: TMB_, TMS_, TMN_
Year of manufacture: from 2017

It is hereby declared that the following essential requirements of the Machinery Directive 2006/42/EC have been fulfilled.

1.1.3, 1.1.5, 1.1.6, 1.2.1, 1.2.3, 1.3.1, 1.3.3, 1.3.4, 1.3.7, 1.3.9, 1.5.1, 1.5.8, 1.5.9, 1.5.16, 1.6.2, 1.6.3, 1.6.4, 1.5.5

Moreover, it is declared that the relevant technical documentation specified under Annex VII Part B has been compiled.

It is hereby explicitly declared that the partly completed machine complies with all of the pertinent conditions in the following EC Directives.

2006/42/EC	EC Machinery Directive
2014/30/EU	Directive on electromagnetic compatibility
2011/65/EU	RoHS Directive on the restriction of hazardous substances

A reference to the harmonised standards used, as referred to in Article 7(2)

EN ISO 13732-1:2008	EN ISO 13732-1:2008 Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces (ISO 13732-1:2008)
EN ISO 12100:2010-11	Safety of machinery – General principles for design – Risk assessment and risk reduction (ISO 12100:2010)
EN 60204-1:2006/AC:2010	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
EN ISO 13849-1:2016-06	Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
EN ISO 13849-2:2012	Safety of machinery – Safety-related parts of control systems – Part 2: Validation
EN 61000-6-2:2005	Electromagnetic compatibility – Part 6-2: Generic standards – Immunity for industrial environments
EN 61000-6-3:2007+A1:2011	Electromagnetic compatibility – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments

The manufacturer or the authorised person undertakes to transmit, in response to a reasoned request by the national authorities, the relevant documentation on the partly completed machinery.

This is without prejudice to the intellectual property rights of the manufacturer!

Important note! The partly completed machinery may not be commissioned until it has been ascertained that the machinery into which this partly completed machinery is to be incorporated is compliant with the provisions of this Directive.

Offenburg, 01.01.2017



Werner Mäurer,
Managing Director



Linear Guideways



Ballscrews



Linear Motor Systems



Linear Axes



Linear Actuators



Robots



Linear Motor Components



Rotary Tables



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