# 2. General information

#### 2.1 Properties

There are many benefits associated with HIWIN ballscrews including high efficiency, freedom from axial play, high rigidity and high lead accuracy. The characteristic properties and benefits of HIWIN ballscrews are described in detail below.

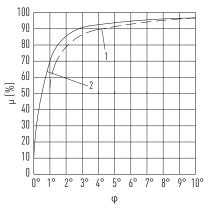
# 2.1.1 High efficiency in both directions

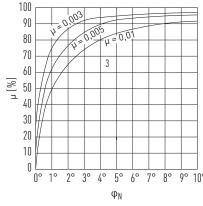
Thanks to the rolling contact between the shaft and nut, ballscrews can achieve an efficiency of up to  $90\,\%$ .

The special surface treatment used on the ball tracks in HIWIN ballscrews reduces the frictional resistance between the ball and track.

The rolling motion of the balls only requires a low drive torque thanks to the high level of efficiency. Operating costs are therefore cut since less drive output is needed.

- 1 Linear to rotary motion
- 2 Ballscrews Rotary to linear motion
- 3 Ballscrews
- μ Efficiency [%]
- φ Lead angle [°]
- φ<sub>N</sub> Lead angle for common transmission [°]
- $\phi_{\text{U}}$  Lead angle for reverse transmission [°]





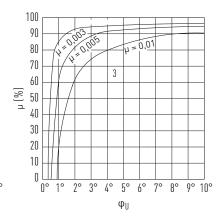
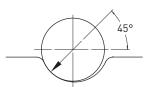
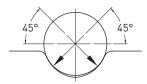


Fig. 2.1 Mechanical efficiency of threaded shafts

### 2.1.2 Zero play and high rigidity

The pointed profile HIWIN uses for ballscrew shafts and nuts allows the ballscrew nuts to be assembled without any axial play. A preload is usually used to achieve the good overall rigidity and repeatability.





Semi circular profile

Pointed profile (Gothic type)

Fig. 2.2 Typical types of contact in ballscrews (semi circular type, Gothic type)

### 2.1.3 High lead accuracy

For applications requiring very high levels of accuracy, our production meets the requirements of ISO and JIS standards; but we manufacture to customer specifications too.

Accuracy is guaranteed by testing with our laser measurement systems and documented for the customer.



#### 2.1.4 Reliable service life

Whereas the life of standard screw drives is determined by wear on the contact surfaces, HIWIN ballscrews can be used virtually up until the end of the metal's fatigue life. Great care is exercised in development, choice of material, heat treatment and manufacturing, as is demonstrated by the reliability and resilience of HIWIN ballscrews over their nominal service life. With every kind of ballscrew, the service

life depends on several influencing factors including design aspects, material quality, maintenance and most importantly the dynamic load rating  $(C_{dyn})$ .

Profile accuracy, material properties and surface hardness are the fundamental factors affecting the dynamic load rating.

### 2.1.5 Low starting torque with smooth operation

The rolling friction of the balls in ballscrews only requires a very low starting torque. To achieve precise ball tracks, HIWIN uses a special design (adaptation factor) and special production procedures. This guarantees that the motor's drive torque remains in the range required.

In one particular step of manufacturing, HIWIN can check the profile of every single ball track. A sample report of this test is shown in Fig. 2.3.

Using computer-based measuring systems, the friction torque of every ballscrew is recorded and documented with great accuracy at HIWIN. Fig. 2.4 shows typical torque progress over travel.

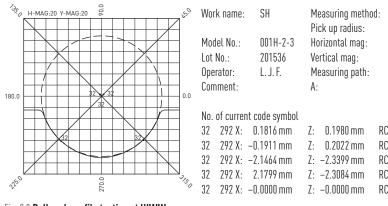


Fig. 2.3 Ball arch profile testing at HIWIN

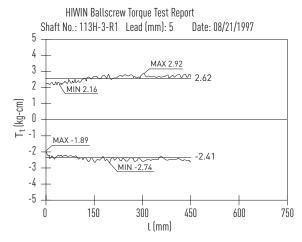


Fig. 2.4 Preload testing at HIWIN

# 2.1.6 Special solutions

HIWIN manufactures ballscrews in line with customer drawings or with HIWIN standard end machining. For the ballscrew definition the requirements on the project planning sheet must be documented and checked. This ensures that the ballscrew is ideally adapted to the requirements in place.

3.4438 mm 3.4532 mm RC:

X lead 0.0256 mm

20.0000

20.0000

7.0000 mm

0.0030 mm

- RC: -42.5259 mm RC: 43.3615 mm RC: 3.1750 mm
  - Distance [mm]
  - T<sub>C</sub> Torque [kg-cm]

9 BS-08-10-EN-2206-K