

Precision target wheel

made of ferromagnetic steel

ZAN/Z/ ZFF/M/N/Z

Technical information

Version 21-07-2021

General

- Suitable for contactless, magnetic scanning with magnetoresistive sensor elements for rotational speed and position detection
- Reference mark (tooth, lug or groove) to create a reference signal
- Manufacture of target wheels for rotational speed and position detection with eddy currents is possible
- Complete manufacture with bores, threads and grooves (upon request)

Properties

- Tooth quantity: typically 64 to 1024
- Module: 0.3 to 1.00
- Standard material: 16MnCr5, stainless steel optional
- Individual inside diameters optionally with feather keyway for torsion protection

Advantages

- High level of mounting flexibility (shrink-fit, clamping, screw-on)
- Multifunctional design makes it possible to use the target wheel as a bearing cover
- High design flexibility due to customer-specific manufacture

Field of application

- Motor spindles in machine tool manufacture
- Torque motors
- Vacuum pumps



Description

Measuring systems

For magnetic detection of rotational movements, rotational speed and position sensors form a unit with target wheels. Magnetoresistive elements in the sensor scan the structure of the ferromagnetic target wheel without contact. The sensor generates sin/cos signals from this, for example.

In many applications, for example in machine tool spindle motors, the speed signals are highly interpolated. Precision target wheels are a prerequisite for optimal signals with high quality.

Use with MiniCODER

MiniCODERs deliver rotational speeds of over 100,000 r.p.m. They generate square-wave signals (TTL, HTL) or sin/cos signals ($1 V_{pp}$) optionally with reference signals. The reference pulse detected is used to reference the position. This is required, for example, for automatic tool changing on a milling or grinding spindle.

The position of the reference mark determines the phase position of the reference signal to the track signals. To ensure proper functioning of the sensor, the MiniCODER and the target wheel must match.

Standard target wheels

High-precision standard target wheels (ZA) made of ferromagnetic steel are available from the factory at short notice.

Customer-specific target wheels

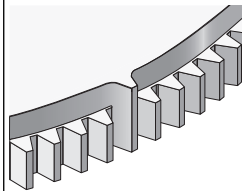
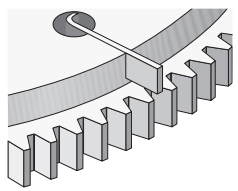
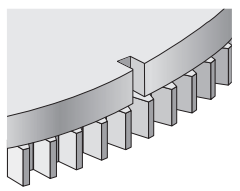
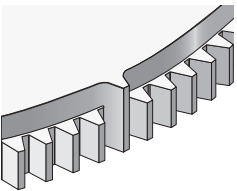
Lenord+Bauer supplies customer-specific target wheels (ZF) upon request. These are manufactured in accordance with drawings and are fitted with bores, threads and grooves, for example. Please attach a design drawing of the target wheel (if possible in PDF format) to your inquiry and forward them to: info@lenord.de.

Reference marks

Selection of the reference mark is determined by the size and rotational speed of the target wheel used, as both affect the forces acting on the reference mark.

The following reference marks can be selected: lug (N), tooth (Z) or groove (M). For new designs, we recommend using a target wheel with tooth (Z) reference marks.

Overview of MiniCODER and target wheel combinations

Example	2444K-x	2444KZx	2444KNx	2444KMx	2449KZx
Target wheel					
Reference mark (RM)	without	Tooth	Lug	Groove	Tooth
Standard	ZA-	ZAZ	ZAN	-	-
Customer-specific	ZF-	ZFZ	ZFN	ZFM	ZFF
Figure					
Width	10 mm	10 mm	10 mm	10 mm	8.6 mm
RM position	-	congruent with one tooth	precisely between two teeth	precisely between two teeth	congruent with one tooth
Module		0.3/0.4/0.5/1.0	0.3/0.5	0.3/0.5	0.4/1.0
		others upon request			
Manufacture	in one piece		in one piece, metal lug ⁽²⁾ glued and cast	assembled from two parts	in one piece

(1) Depending on the size and geometry of the target wheel, see "Maximum rotational speed" section, → [page 3](#)
Please tell us the maximum rotational speed at which the target wheel is to be used; we will check the possible applications for you.

(2) The lug must be made of ferromagnetic material and must not extend beyond the tip circle.

Module and outside diameter

Depending on the application and the sensor used, target wheels with different modules are used.

The module is a toothing dimension for target wheels and describes the relationship between the number of teeth and the pitch diameter of the target wheel.

For most applications, the outside diameter of the target wheel is decisive.

The following applies:

$d_a = m \cdot (z+2)$	d_a = outside diameter m = module z = tooth number
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For the same number of teeth, the smaller the module, the smaller the outer diameter.

Maximum rotational speed

Size, inside diameter and design of the target wheel determine the strength or the maximum permissible rotational speed. Due to the forces acting on the reference lug, the use of this variant is only permissible in a very limited rotational speed range.

When submitting an enquiry for a target wheel, please state the maximum rotational speed.

In special cases we use FEM⁽¹⁾ to perform a calculation.

Typical rotational speed range for target wheels depending on inside diameter and reference mark

Tooth number z	Module m	Inside diameter d _i [mm]	Outside diameter d _a [mm]	Reference mark, refer- ence signal	Maximum rotational speed ^(a) n _{max} [1/min]
128	0.3	10	39	Z	113,000
128	0.3	20	39	Z	86,000
200	0.3	40	60.6	Z	47,000
256	0.3	12	77.4	Z	62,000
256	0.3	50	77.4	Z	39,000
360	0.3	70	108.6	Z	28,000
512	0.3	100	154.2	Z	20,000
512	0.3	120	154.2	Z	17,000
80	0.5	10	41	Z	111,000
128	0.5	30	65	Z	54,000
200	0.5	12	101	Z	52,000
256	0.5	50	129	Z	30,000
256	0.5	80	129	Z	23,000
360	0.5	120	181	Z	16,000
512	0.5	100	257	Z	16,000
512	0.5	257	257	Z	14,000

^(a) bores, thread, feather keyways not considered

Identifier

All precision target wheels are marked with a part number and a serial number. The serial number structure is the same for all target wheels.

Article number as per type code

Example: ZAZ3.0256050.0	ZA: Standard target wheel Z: Reference mark tooth 3.: Module 0.3 0256: Tooth number (256) 050.0: Inside diameter 50.0 mm
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Article number as per drawing

Example: ZfZ1122	ZF: customer-specific target wheel Z: Reference mark tooth 1122.: Target wheel number
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Serial number – construction

jjwwppppp ⇒ 2005000238	j: Production year ⇒ (20)20 w: Calendar week ⇒ 05 p: unique production number ⇒ 238
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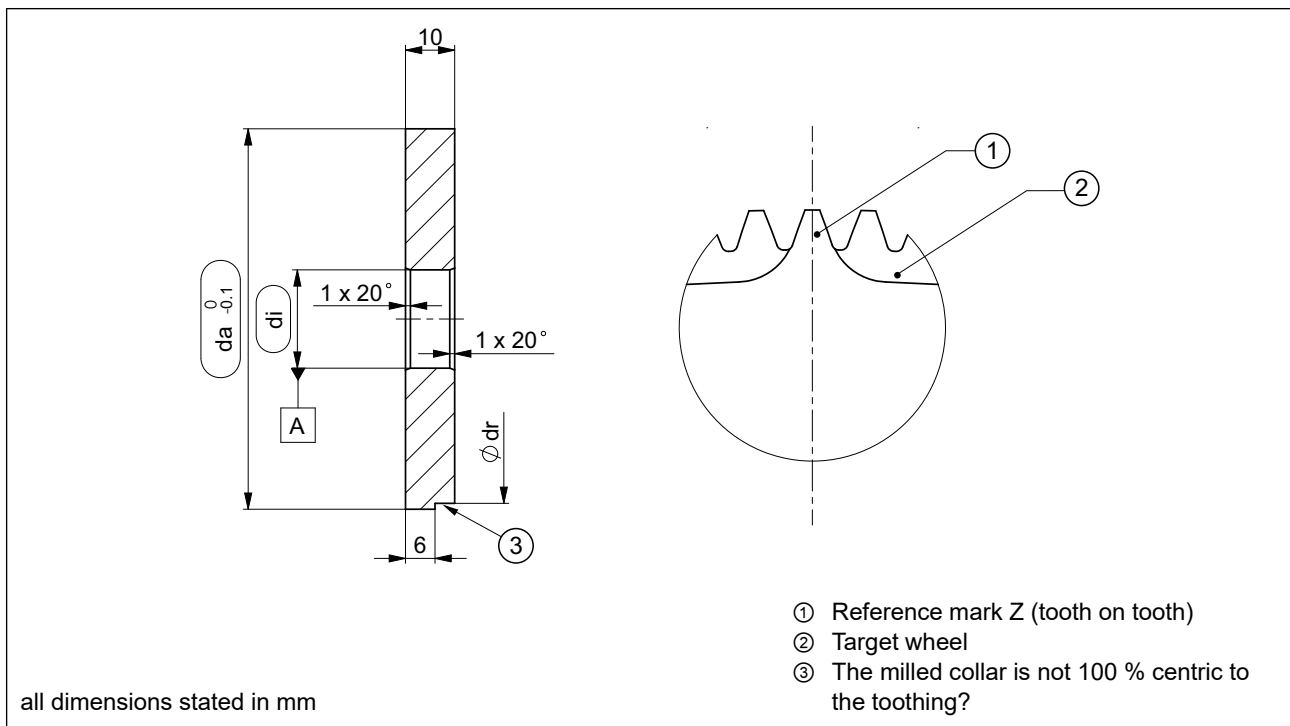
⁽¹⁾ Finite Element Method

Standard target wheels ZA-/ZAZ/ZAN

Type code

Reference mark	N with lug reference mark, position: between two teeth
	Z with tooth reference mark, position: congruent with one tooth
	- without reference mark
	Module
3 Module 0.3	
5 Module 0.5	
Tooth number	as per table (Design – standard target wheels)
	Inside diameter in mm details concerning maximum and minimum diameter, see table Design
ZA	

Dimensional drawing – standard target wheel with reference mark tooth – ZAZ



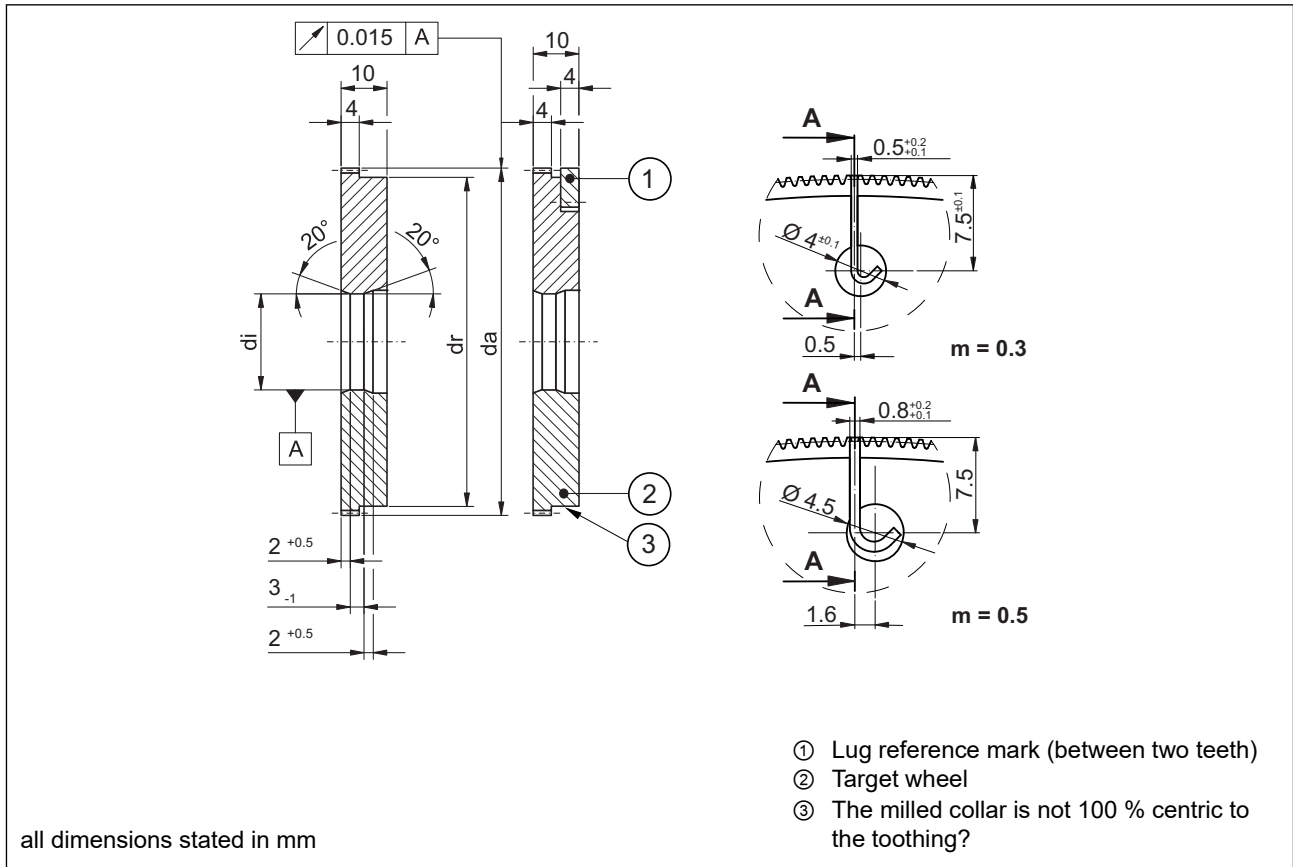
Design – standard target wheel ZAZ

Tooth number z	Module m [mm]	Outside Ø da [mm]	Inside Ø di min [mm]	Inside Ø di max. [mm]	CollarØ dr [mm]
100	0.5	51.0	12 (H7)	30 (H7)	48
125	0.5	63.5	12 (H7)	40 (H7)	60.5
128	0.5	65.0	12 (H7)	40 (H7)	62
200	0.5	101	12 (H7)	70 (H7)	98
250	0.5	126	12 (H7)	85 (H7)	123
256	0.3	129	12 (H7)	90 (H7)	126
250	0.3	75.6	12 (H7)	45 (H7)	72.6
256	0.3	77.4	12 (H7)	50 (H7)	105.6
360	0.3	108.6	12 (H7)	70 (H7)	105.6
500	0.3	150.6	12 (H7)	110 (H7)	148.2
512	0.3	154.2	12 (H7)	110 (H7)	151

ø - diameter

Standard target wheels ZA-/ZAZ/ZAN

Dimensional drawing – standard target wheel with lug reference mark – ZAN

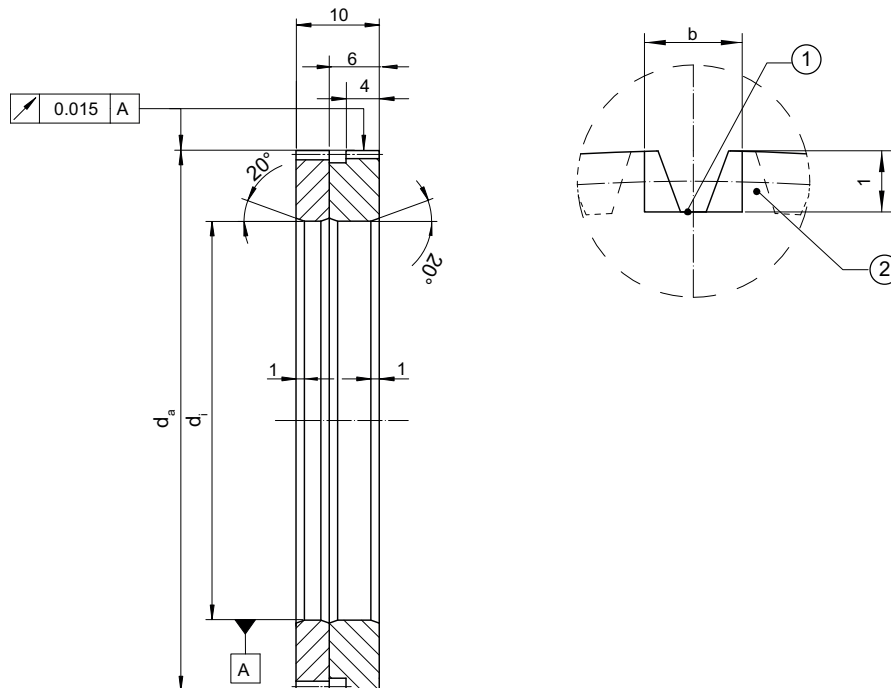


Design – standard target wheel ZAN

Tooth number z	Module m [mm]	Outside \varnothing d_a [mm]	Inside \varnothing standard [mm]	Inside \varnothing d_i max. [mm]	Collar \varnothing d_r [mm]
100	0.5	51.0	12 (H7)	30 (H7)	46.3
125	0.5	63.5	12 (H7)	40 (H7)	58.8
128	0.5	65.0	12 (H7)	40 (H7)	60.3
200	0.5	101.0	12 (H7)	70 (H7)	96.3
250	0.3	75.6	12 (H7)	45 (H7)	71.8
250	0.5	126.0	25 (H7)	85 (H7)	121.3
256	0.3	77.4	12 (H7)	50 (H7)	73.6
256	0.5	129.0	25 (H7)	90 (H7)	124.3
360	0.3	108.6	25 (H7)	70 (H7)	104.8
500	0.3	150.6	25 (H7)	110 (H7)	146.8
512	0.3	154.2	25 (H7)	110 (H7)	150.4

Customer-specific target wheels ZFM/ZFZ

Example of a dimensional drawing – target wheel with groove reference mark – ZFM

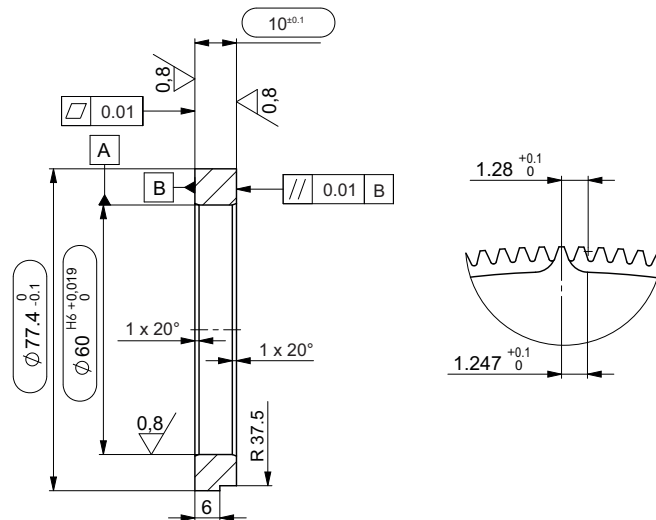


- b 1.2 to 1.6 (depending on the module)
- d_a Outside diameter (depending on module and number of teeth)
- d_i Inside diameter

- ① Reference mark M (groove)
- ② Target wheel

all dimensions stated in mm

Example of a dimensional drawing – target wheel with tooth reference mark – ZFZ





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