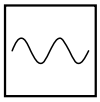
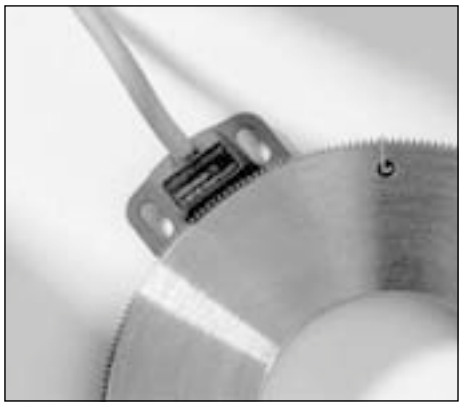
Precise encoder kit
MiniCoder GEL 244

High resolution, frequency range 0 ... 200 kHz,
with reference signal

Technical Information

Version 05.01





General Information

Contactless measurement of rotation motions

- toothed wheel as measure with module 0.3 or module 0.5
- high EMC and immunity to electromagnetic disturbance by the internal structure and a consistent screening
- very high protection class IP 68 and chemical resistance
- can be used under very harsh conditions
- very high temperature range -40 °C ... +120 °C
- certificate „safety integrated“

Fields of application

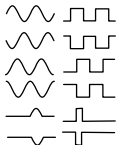
- C-axle operation
- high-speed spindle
- mechanical - and motors engineering
- special mechanical engineering

Measuring principle

- integrated magnetoresistors for the contactless scanning of a toothed wheel
- internal enhancement of the magnetoresistor signals and temperature compensation

Output signals

- output as sine- or square wave signal
- frequency range from zero to max. 200 kHz
- reverse battery protection of supply voltage
- short-circuit-proof outputs
- waveforms:
  - two signals dephased by 90° for detection control
  - sine- or square wave signal
  - all signals are inverted in addition
  - option: reference signal



Design

- temperature-resistant plastic housing
- completely sealed
- cable outlet

Internet: http://www.lenord.de
E-Mail: info@lenord.de

Lenord, Bauer & Co. GmbH
Dohlenstrasse 32
46145 Oberhausen, Germany
Phone +49-208-99 63-0
Fax +49-208- 67 62 92

...automates motion

Technical data

Technical data GEL 244

supply voltage U_B	5 V DC $\pm$ 5%, reverse battery protected
power consumption without load	$\leq$ 1 W
permissible air gap	**0.10 mm $\pm$ 0.02 mm at module 0.3** **0.15 mm $\pm$ 0.03 mm at module 0.5**
measuring toothed-wheel breadth	min. 4.0 mm
material measuring toothed-wheel	ferromagnetic steel
max. permissible cable length	100 m (take into account the voltage drop in the supply cable)
operating temperature range	-30°C ... +85°C
operating- and storage temperature range	-40°C ... +120°C
protection class	IP 68
electromagnetic compatibility	EN 50081-1 and 2; EN 50082-1 and 2
insulation strength	500 V
vibration protection (EN 50155)	200 m/s²
shock protection (IEC 68-T2-27)	2000 m/s²
weight	10 g
housing material	polyphenylene sulfide (PPS) glassfibre reinforced
connection cable	9-core cable, cross section 0.14 mm²

The declared technical data apply to the operating temperature range.

Specific technical data GEL 244 K/KM/KN (sine-wave output)

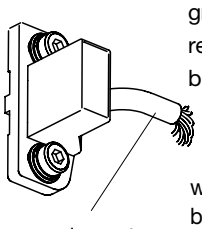
output level	500 mV_{PP} corresponds to 1 V_{PP} as difference signals
output signals	two sine-wave signals, by 90° out of phase, and their inverse signal short-circuit-proof, option: reference pulse
output frequency	0 ... 200 kHz for C_L = 5 nF
offset (static)	$\leq$ |60 mV|
amplitude tolerance	-20 ... +10 %
amplitude ratio U_A/U_B	0.9 ... 1.1

Specific technical data GEL 244 T/TN (square wave output)

output signals	two square-wave signals, by 90° out of phase, and their inverse signal short-circuit-proof, option: reference pulse
outputs	TTL-, RS 422- and RS 485 compatible

Pin layouts, Dimensions

Sine-wave output signals K, KM, KN

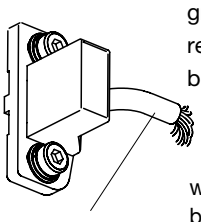


screening not connected on the MiniCoder side

green — sense
red — ⊕
blue — ⊥
U_B = +5 V ± 5 %

			K	KM KN
white	U_{A+}	track 1		
brown	U_{A-}	$\overline{\text{track 1}}$		
pink	U_{B+}	track 2		
black	U_{B-}	$\overline{\text{track 2}}$		
grey	U_{N+}	N		
yellow	U_{N-}	$\overline{N}$		

Square-wave output signals T, TN



screening not connected on the MiniCoder side

green — Sense
red — ⊕
blue — ⊥
U_B = +5 V ± 5 %

			T	TN
white	U_{A+}	track 1		
brown	U_{A-}	$\overline{\text{track 1}}$		
pink	U_{B+}	track 2		
black	U_{B-}	$\overline{\text{track 2}}$		
grey	U_{N+}	N		
yellow	U_{N-}	$\overline{N}$		

Sine-wave output signals (ideal case)

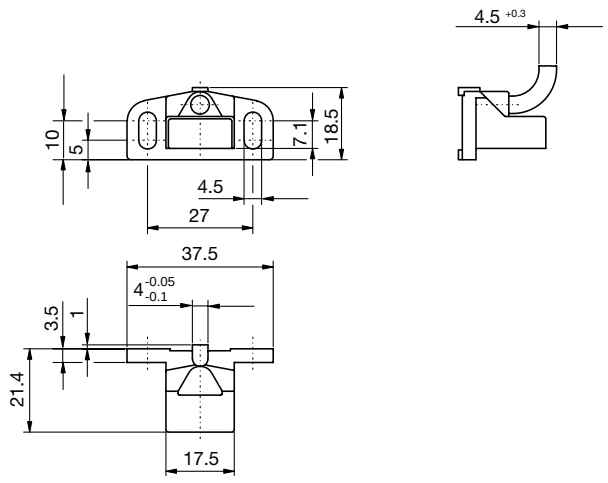
$\hat{u}$ = 250 mV
u_{N+} , u_{N-} = reference signal

$$u_{A+}(t) = U_B/2 + \hat{u} \cdot \sin(2\pi f_e \cdot t)$$
$$u_{A-}(t) = U_B/2 - \hat{u} \cdot \sin(2\pi f_e \cdot t)$$
$$u_{B+}(t) = U_B/2 \mp^{*)} \hat{u} \cdot \cos(2\pi f_e \cdot t)$$
$$u_{B-}(t) = U_B/2 \pm^{*)} \hat{u} \cdot \cos(2\pi f_e \cdot t)$$

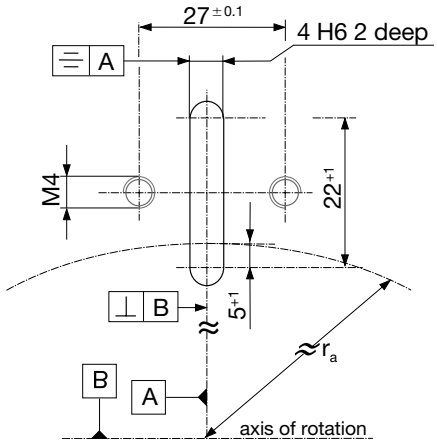
its difference comes up to a voltage of 1 V_{PP}
The indicated amplitude is valid in case of rated air gap.

*) depending on the sense of rotation

Dimensions (mm)



Boring and milling sketch

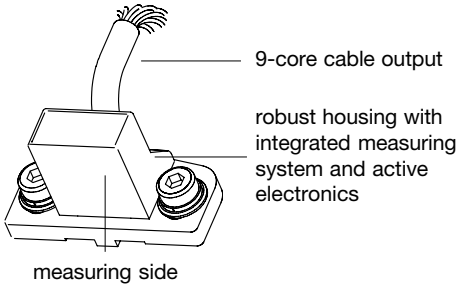


$r_a = d_a/2$; d_a = OD of toothed wheel

Type code

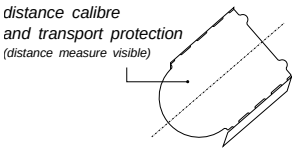
244	_ _	1	_	_	Description
					Module
				3	module 0.3
				5	module 0.5
					Cable connection
			G		cable length 30 cm
			S		customize cable connection on request
					Signal pattern
	K-				sine-wave signal pattern
	KN				sine-wave signal pattern with analogue reference signal (flag)
	KM				sine-wave signal pattern with analogue reference signal (groove)
	T-				square-wave signal pattern 5 V
	TN				square-wave signal pattern 5 V with digital reference signal 5 V

Assembly instructions



Assembly

- The MiniCoder must be **symmetrically** adjusted and centered to the toothed wheel.
  Dissymmetry causes measuring errors.
- M4 screws, washers and lock washers should be used for fastening. **The torque should be 60 Ncm.**
- Set the **air gap** in accordance with the table using the gap gauge which you will find attached to the MiniCoder serving as a transport protection.
- Avoid any mechanical contact between the



  toothed wheel and the 0.1 mm protective layer of the scanning system. **Scratches** on the protective layer may cause the **total failure** of the MiniCoder.
- Ferromagnetic chips influence the result of measurement. If necessary, use a collecting magnet.
- Do not damage the surface of the toothing. Do not allow any mechanical components to run on the surface of the toothing.

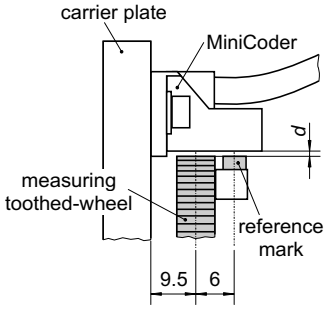
Disassembly

Prior to dismanting the sensor, i. e. before releasing the screws, you must slip on the distance gauge to avoid the sensor beeing pulled onto the toothed wheel by the magnet and thus being damaged.

Non-Lenord+Bauer supplied toothed wheels

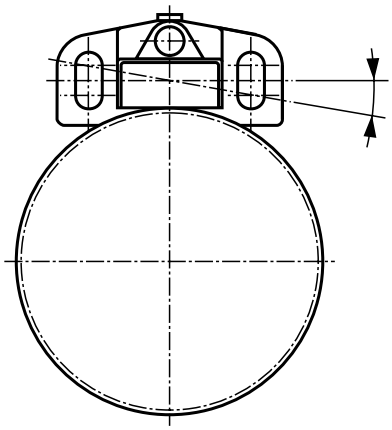
- If you make your own toothed wheels, please observe the following:
  - Provide an involute toothing as per DIN 867.
  - You can only use toothed wheels with module 0.3 or module 0.5.
  - Bear in mind that mechanical inaccuracies of tooth period, tooth shape and true running do affect the accuracy of the system.
  - The reference mark must be made of ferromagnetic material and must not jut out over the addendum circle of the toothed wheel.
  - If the toothed wheel has a (slight)eccentricity, the MiniCoder must be adjusted in such a way that the air gap tolerance is observed in case of the smallest distance between the MiniCoder and the toothed wheel.

Assembly drawing

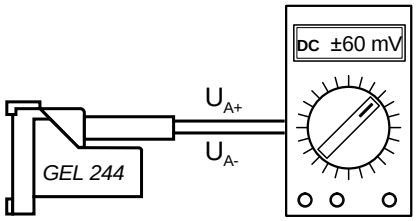


module	air gap d adjustment dimension	distance tolerance
0.3	0.10	± 0.02 mm
0.5	0.15	± 0.03 mm

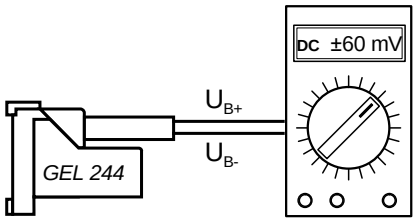
Offset



tolerance

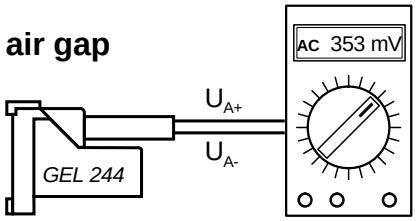


-60 ... + 60 mV



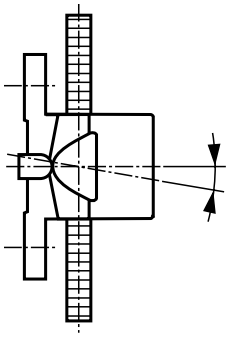
-60 ... + 60 mV

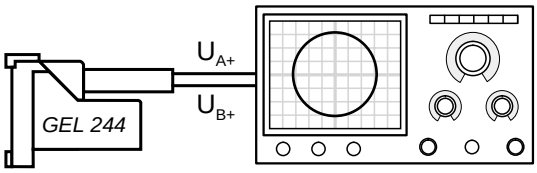
air gap



+290 ... + 400 mV

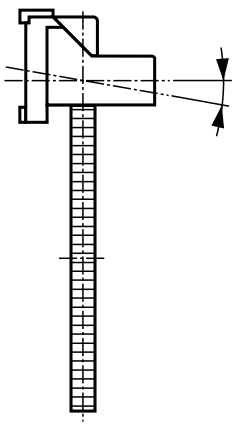
Phase

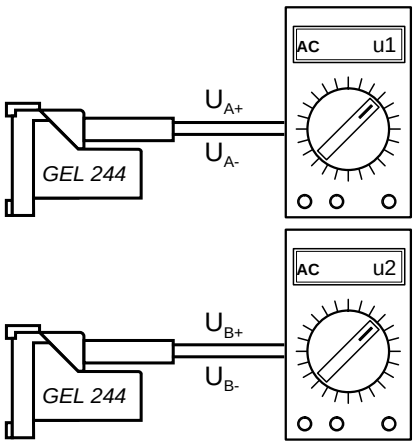




Lissajous figure: ideal circle

Amplitude





$$\frac{u1}{u2} = 0.9 \ldots 1.1$$

Reply-Fax
Custom-made measuring toothed-wheel

Fax: +49 (0)2 08 / 67 62 92

Transmitter

Name: ..... Contact/person in charge:

Street: ....

Postal code/City: ....

Phone: ..... Phone: .....

Fax: ..... Fax: .....

Measuring toothed-wheel

Measuring toothed-wheel types ☐ A ☐ B ☐ C
☐ AN
☐ BN
☐ CN

tooth number **z** .....

module **m** ☐ 0.3 ☐ 0.5

∅ OD **da**= m(z+2) ..... mm

∅ ID **di** + tolerance zone ..... mm

∅ shaft **dw** + tolerance field ..... mm

width of toothed face **zb** (≥ 4 mm) ..... mm

∅ right **dr** ..... mm
(≤ da- 29 mm with zero flag)

∅ left **dl** ..... mm

collar right **br** ..... mm

collar left **bl** ..... mm

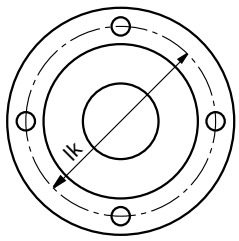
reference mark (flag) ☐ yes ☐ no

reference mark (groove) ☐ yes ☐ no

Hole circle/bores for mounting

☐ thread bore ☐ through bore ☐ cylindrical counterbore ☐ conical counterbore

Hole circle lk



∅ hole circle **lk** ..... mm

∅ bore/thread **b** ..... mm

∅ bore **b_1** ..... mm

depth **t** ..... mm

number of bores ..... pc. no.

Additional remarks

.....

.....

.....

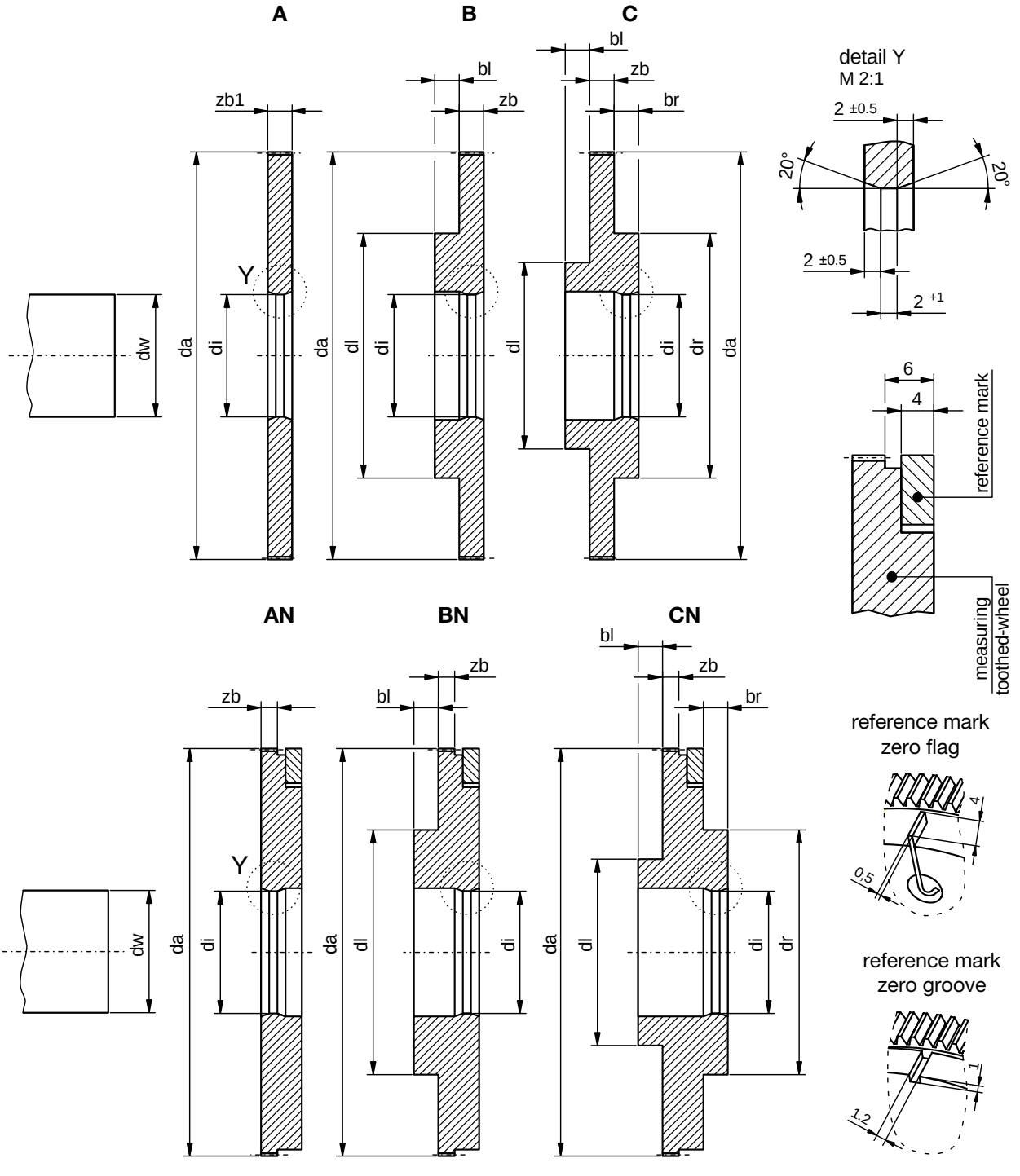
.....

.....

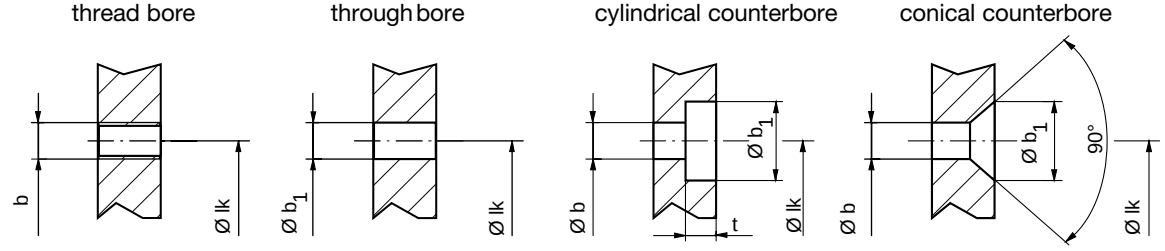
.....

.....

Measuring toothed-wheel



Bores for mounting



Standard measuring toothed-wheel

Measuring toothed-wheel

For detecting rotary movements Minicoders and toothed-wheel form a unit. The size of the measuring toothed-wheel and, consequently, its diameter directly depends on the module and the tooth number, i. e.:

$z = (d_a / m) - 2$

$d_a = m \cdot (z+2)$

Standard measuring toothed-wheels (see chart) can be supplied short-term ex works.

Dimensioned drawing
measuring toothed-wheel

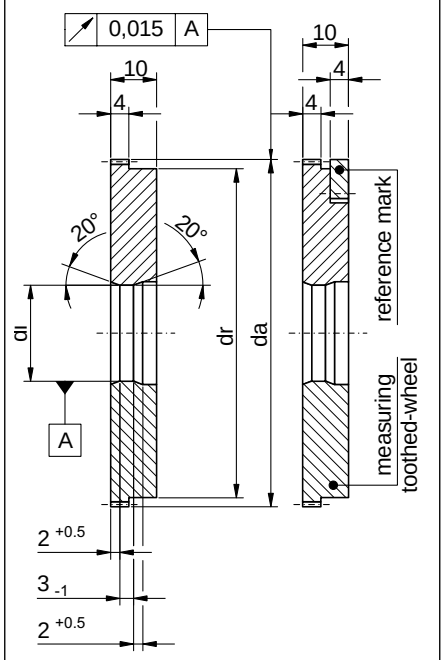


Chart standard measuring toothed-wheel

tooth number z	module m [mm]	OD da [mm]	ID standard [mm]	ID di max. [mm]	collar dr [mm]
100	0.5	51.0	12 H7	20 H7	47
125	0.5	63.5	12 H7	30 H7	60
128	0.5	65.0	12 H7	30 H7	61
200	0.5	101.0	12 H7	60 H7	97
250	0.3	75.6	12 H7	40 H7	72
250	0.5	126.0	25 H7	85 H7	122
256	0.3	77.4	12 H7	40 H7	74
256	0.5	129.0	25 H7	90 H7	125
360	0.3	108.6	25 H7	70 H7	105
500	0.3	150.6	25 H7	110 H7	147
512	0.3	154.2	25 H7	110 H7	151

Type code

ZA	_	_	_ _ _ _	_ _ _ . _	Description
					Inside diameter
				0 1 2 . 0	e. g. (see chart at the top)
					Tooth number
			0 1 0 0		e. g. (see chart at the top)
					Module
		3			module 0.3
		5			module 0.5
					Reference mark
	-				without reference mark
	N				with reference mark

Custom-made measuring toothed-wheel

We also supply custom-made measuring toothed-wheels according to our customers' specification. For this purpose we require precise data on the toothed wheel. Please fill in the form on pages 6/7.