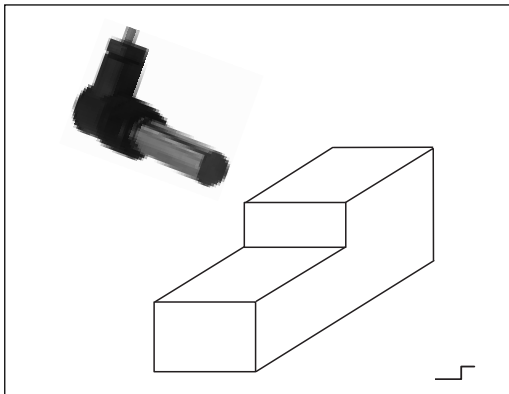
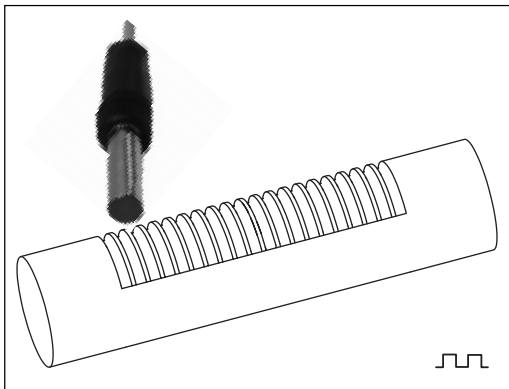
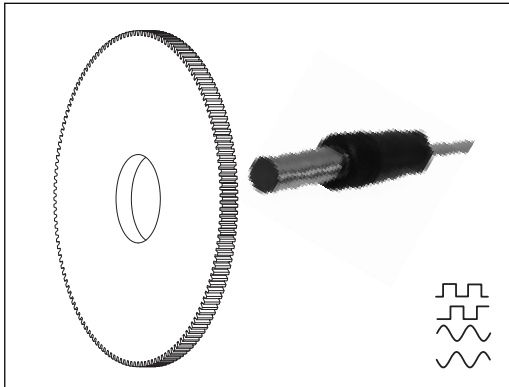


MiniCoder GEL 243

- Incremental encoder with sine-wave and square-wave output
- precision initiator



08/99



General Information

- contactless measurement of rotary movements and linear motion
- toothed wheel with module 0.5 or 1.0 and measuring rod with pitch 1.0 mm, 1.6 mm, 2.0 mm as measure
- can be used under very harsh conditions
- very high protection class IP 67, chemical stability and a compression-proof measuring side
- high EMC and resistance to EMI because of its internal structure and a consistent screening

Fields of application

- spindles
- hydraulics
- contactless measurement of speed and position at machines and motors
- can be used as magnetic precision initiator

Measuring principle

- integrated magnetoresistors for the contactless scanning of a toothed wheel
- internal enhancement of the magnetoresistor signals
- measuring frequency 0 ... approx. 200 kHz

Output signals

- output as sine-wave-, square-wave- or switch signals
- reverse battery protection of supply voltage
- short-circuit-proof outputs
- waveforms:
 - two square-wave signals dephased by 90° and their inverse signal
 - sine-wave signal
 - reference signals are available in addition

Design

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

Technical data

Type	Signal outputs	Output signals	Fields of application
GEL 243 T	<p>$U_B = +5 V \pm 10 \%$</p> <p>do not connect pole 4</p>	<p>two square-wave signals dephased by 90° and their inverse signal, short-circuit-proof</p>	<ul style="list-style-type: none"> - measurement of distance, angle and speed with precision toothed wheels with module 0.5 or module 1 - lengths measured with measuring rods having a pitch of $p = 1.0$ or $p = 2.0$
GEL 243 L	<p>$U_B = +5 V \pm 5 \%$</p> <p>do not connect pole 4</p>	<p>two sine-wave signals dephased by 90°, short-circuit-proof</p>	<ul style="list-style-type: none"> - measurement of distance, angle and speed with precision toothed wheels with module 0.5 or module 1 - lengths measured with measuring rods with a pitch of $p = 1.6$
GEL 243 M, N	<p>$U_B = +5 V \pm 10 \%$</p> <p>do not connect pole 4, 6 and 7</p>	<p>square-wave signal (M, N), short-circuit-proof</p>	<p>A flag (N) or a groove (M) is recognized and a digital reference signal is emitted, e.g. for setting a reference measure.</p>
GEL 243 Q1, Q2	<p>$U_B = +5 V \pm 10 \%$</p> <p>do not connect pole 4, 6 and 7</p>	<p>high-/low-impulse short-circuit-proof</p>	<p>The transition from the tooth surface to the dedendum surface is recognized and output Q1 is switched.</p> <p>The transition from the tooth partition to full material is recognized and output Q2 is switched.</p>
GEL 243 P	<p>$U_B = +5 V \pm 10 \%$</p> <p>do not connect pole 4, 6 and 7</p>	<p>high-/low-impulse short-circuit-proof</p>	<p>The effect of this device is equivalent to the functions of a proximity switch for ferromagnetic material. It works, however, much more precisely because of the considerably lower switching hysteresis (0.1 mm).</p>

Technical data (for each type)

outputs	RS 422-A
measuring scale	toothed-wheel or measuring rod
width of toothed face	min. 4.0 mm
module, pitch	$m = 0.5; 1.0$ $p = 1.0$ mm; 2.0 mm

output level	500 mV corresponds to 1 V_{SS} as difference signals
measuring scale	toothed-wheel or measuring rod
width of toothed face	min. 4.0 mm
module, pitches	$m = 0.5$ $p = 1.6$ mm
offset (static)	< 60 mV
amplitude tolerance	-20 ... + 10 %
amplitude ratio U_A / U_B	0.9 ... 1.1

output	analogue digital reference signal
measuring scales signal pattern m signal pattern n	recognition of a zero groove 1.2 mm \pm 0.1 mm recognition of a zero flag 1.0 mm \pm 0.1 mm
measuring scale active breadth	> 4.0 mm
measuring scale active depth	> 1.0 mm
permissible air gap	0.15 mm \pm 0.03 mm
error limit acc. to DIN 32878	0.1 mm
rise time / delay time	2 μ s

output	RS 422-A
measuring scale	recognition of a length mark
pitch p	$p = 1.6$ mm; 2.0 mm
depth of teeth	0.5 mm
permissible air gap	0.10 mm \pm 0.02 mm

output	RS 422-A
measuring scale	recognition of an area modification
permissible air gap	0.10 mm \pm 0.02 mm

Technical data (general)

supply voltage U_B	5 V DC \pm 5%, reverse battery protected
measuring frequency	0 ... max. 200 kHz
power consumption without load	0.6 W
measure material	ferromagnetic steel
max. admissible cable length (take into account the voltage drop via the supply voltage)	approx. 100 m The cable length depends on the frequency and the cable capacity.
bearing temperature range	-20 ... +85°
operating and storage temperature range	-20 ... +85°
protection class connection side	IP 65
protection class measuring side	IP 67
electromagnetic compatibility (EMC)	EN 50081-1 and 2 EN 50082-1 and 2
insulation strength	500 V
vibration protection (EN 50155)	200 m/s ²
shock protection(IEC 68-T2-27)	2000 m/s ²
weight	20 g

Assembly instructions

EMC assembly instructions



Assembly instructions

- The MiniCoder must be **symmetrically** adjusted and centered to the toothed wheel. Dissymmetry causes measuring errors.
- Avoid any mechanical contact between the measuring scale 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.
- 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 0.5 or module 1.0.
 - Bear in mind that mechanical inaccuracies of tooth period, tooth shape and true running 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.

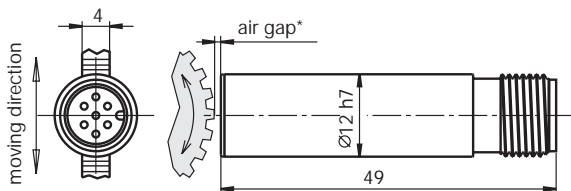
EMC assembly instructions

To avoid influencing the certified electromagnetic compatibility (EMC) the following assembly instructions must be observed.

- The screening at the cable end must have **large-surface** contact. The cable screen applied to the sensor housing inside the MiniCoder.
- Keep all unscreened lines **as short as possible**.
- Provide for earth connections being **as short as possible** and having a **large cross-section** (e. g. low-inductance metal-alloy tape, flat-band conductor).
- Should there be any **potential difference** between the earth connection of the machine and the electronics, appropriate measures must be taken to ensure that no **compensating currents** can flow (e. g. lay potential equalization line with large cross-section (see below) or cable with separated duplex screening - the screens should be connected at one side only).
- Signal and control conduits must be laid away from the power conduits.
- The power supply must comply with installation class 0 or 1 according to point B.3 of the EN 61000-4-5 from 1995.

Assembly drawing GEL 243

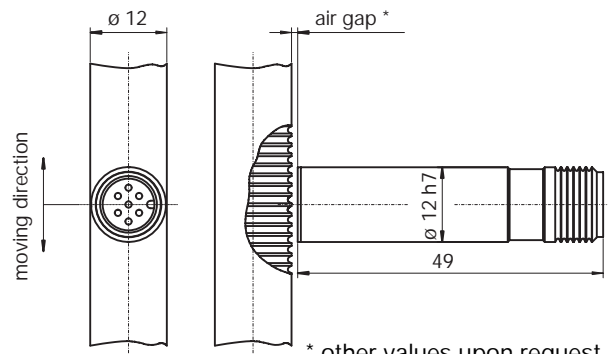
module [mm]	pitch [mm]	air gap * preset measure	distance tolerance *
0.5	-	0.15 mm	± 0.03 mm
1.0	-	0.30 mm	± 0.10 mm



* other values upon request

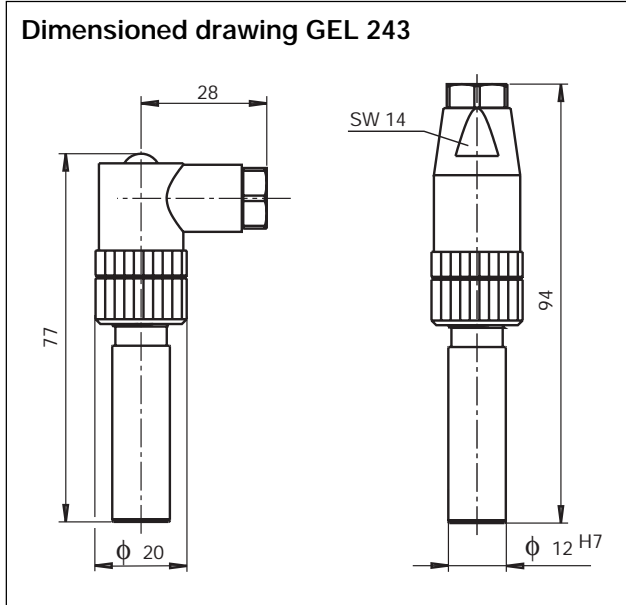
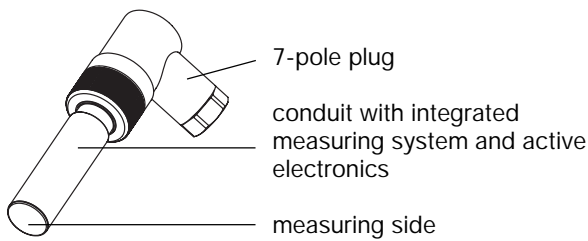
Assembly drawing GEL 243

module [mm]	pitch [mm]	air gap * preset measure	distance tolerance *
-	1.0	0.10 mm	± 0.02 mm
-	1.6	0.15 mm	± 0.03 mm
-	2.0	0.15 mm	± 0.03 mm



* other values upon request

Dimensioned drawing, Type code



Available types

- GEL 243 T -- 1 x 5
- GEL 243 T -- 1 x 1
- GEL 243 T -- 1 x B
- GEL 243 T -- 1 x C
- GEL 243 L -- 1 x 5
- GEL 243 L -- 1 x A

- GEL 243 - N- 1 x -
- GEL 243 - M- 1 x -
- GEL 243 - P- 1 x -
- GEL 243 - Q1 1 x A
- GEL 243 - Q1 1 x B
- GEL 243 - Q2 1 x A
- GEL 243 - Q2 1 x B

Type code

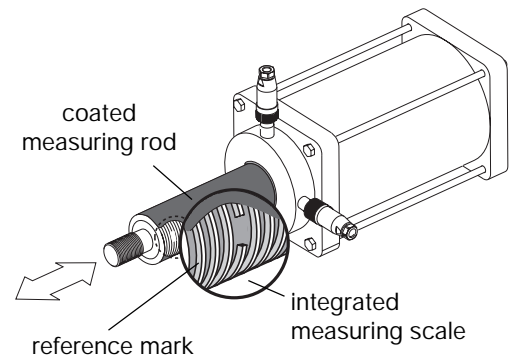
243	X	XX	1	X	X	description
						<p>module</p> <ul style="list-style-type: none"> - in case of reference signal (module and pitch are not feasible) 1 module m = 1.0 5 module m = 0.5 A pitch p=1.6 mm B pitch p=2.0 mm C pitch p=1.0 mm <p>plug outlet</p> <ul style="list-style-type: none"> A plug outlet straight B plug outlet 90° offset <p>reference signal</p> <ul style="list-style-type: none"> N- digital reference signal (flag) M- digital reference signal (zero groove) P- digital signal (area) Q1 digital signal length mark (tooth surface to dendum surface) Q2 digital signal length mark (tooth pitch on full material) -- no reference signal <p>signal pattern</p> <ul style="list-style-type: none"> L signal pattern L, sine-wave T signal pattern T, square-wave - no signal pattern

Accessories

GEL 212/213/214 External interpolation electronics for the conversion of sine-wave signals into square-wave signals. If you require further information on this product, please ask us for our corresponding data sheets.

Measuring scale

Measuring rod



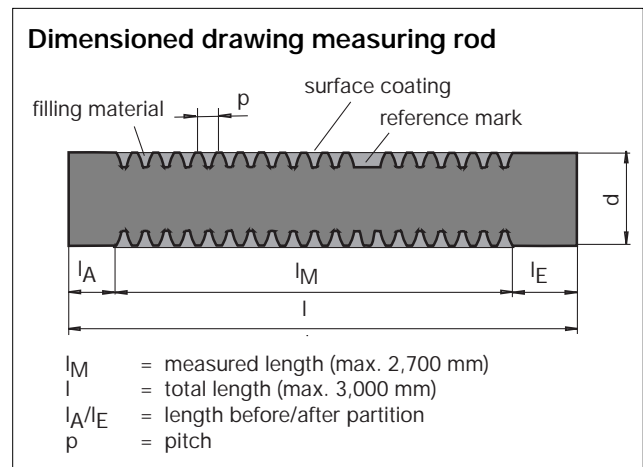
Measuring rods

For measuring linear movements and reference marks resp. for monitoring areas or end-of-travel positions MiniCoders, type GEL 243, may be used in connection with an initiator (e.g. attached to piston rods). The initiator is a dividing structure which can be applied to any ferromagnetic machine element. Initiators with various pitches or additional reference marks – provided that they are locked – make it easy to perform different measurements simultaneously (see picture). thanks to this extremely flexible technology piston rods or machine elements may be directly used as initiator. Where piston rods are concerned, the applied pitch structure is filled by employing a special production process and is then coated with a wear resistant hard chromium layer. Depending on the specific application other coating materials may be used. Thanks to this special process even toothed racks may be used for detecting position.

We can supply piston rods and other initiators – depending on the specific application you have in mind – with the following pitch: 1 mm, 1.6 mm and 2 mm. For this purpose, we require precise drawings and information on the operating conditions. You may, however, also produce the initiators yourself in accordance with technical specifications supplied by Lenord + Bauer.

Standard measuring rods of various sizes, which have a

2.0 mm hard chromium surface, are available ex stock at short notice. Their diameter is produced in compliance with the ISO tolerance h6. The surface hardness is approx. 950 ± 50 HV, the surface quality is approx. $Ra = 0.2 \mu\text{m}$.



Type code

MS	-	X	XXXX	XXX	description
				000	diameter in mm e. g. 20 h6
				0000	length in mm e. g. 0500
				A	pitch p in mm p = 1.6
				B	p = 2.0
				C	p = 1.0

Measuring scale

Standard measuring toothed-wheel

Measuring toothed-wheel

For detecting rotary movements MiniCODERs and toothed wheels form a unit. The toothed wheel size and, consequently, its diameter directly depend on the module and the tooth number, i.e.:

$$z = (d_a / m) - 2$$

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

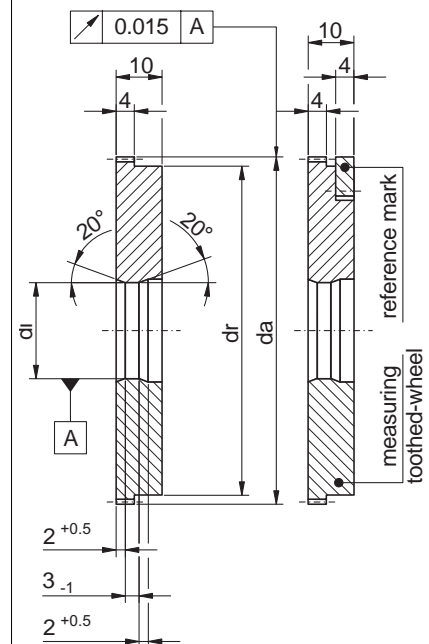
Standard toothed wheels (see chart) can be supplied short-term ex works.

Chart standard measuring toothed-wheel

tooth number z	module m [mm]	OD-Ø d _a [mm]	ID-Ø standard [mm]	ID-Ø di max. [mm]	collar-Ø d _r [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	0.5	126.0	25 H7	85 H7	122
256	0.5	129.0	25 H7	90 H7	125

Toothed wheels with module 1.0 can be supplied upon request (see attached fax form).

Dimensioned drawing
measuring toothed-wheel



Type code

ZA	X	X	XXXX	XXX.X	description
				012.0	inside diameter e. g. (see chart at the top)
				0100	tooth number e. g. (see chart at the top)
				5	module module 0.5
				1	module 1.0
				N	reference mark with reference mark
				-	without reference mark

This information is supplied without liability.
Printing and other errors excepted.

Reply-Fax

Custom-made measuring toothed-wheel



Fax: 02 08 / 67 62 92

Sender

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
 ($\leq da - 29$ 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

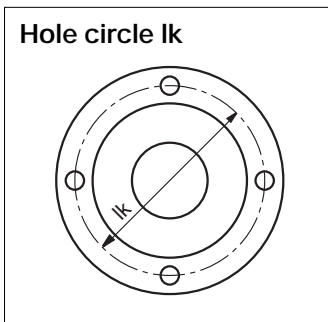
∅ hole circle **lk** mm

∅ bore/thread **b** mm

∅ bore **b₁** mm

depth **t** mm

number of bores



Additional remarks

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Mechanical data

Custom-made measuring toothed-wheel

