

INCREMENTAL LINEAR SCALES

TGM113

Optoelectronic



GENERAL DESCRIPTION:

The TGM 113 is an optoelectronic incremental sealed linear scale; applied in numerous industrial areas for high-precision position measuring(machine tool industry, positioning systems, robotics, etc.).

Measuring lengths: 70 to 1120 mm

Cross section: 16.3 x 29 mm (45 mm))

Accuracy: $\pm 10, \pm 5, \pm 3$

Resolution: 0.5, 1, 2, 5, 10 μm

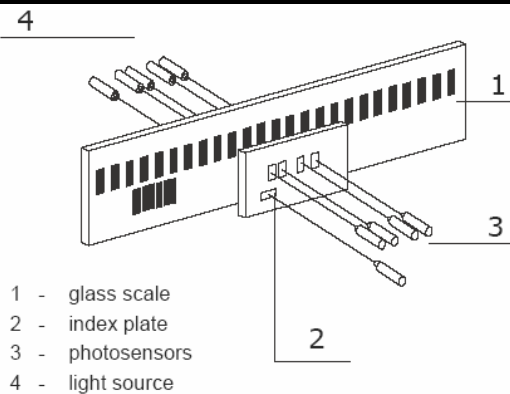
Output signals: DO (square wave)

SO (sine-wave voltage)

SI (sine-wave current signals)

DS (square wave inverted signals RS422A)

OPERATING PRINCIPLE:



MECHANICAL DATA:

Standard measuring length "Lm" (mm)	70/120/170/220/250/270/320/370/420/470/520/620/720/820/920/1020/1120
Reference mark	Standard position in centre. Other positions optional at spacing of 100 mm along the measuring length.
Accuracy class	$\pm 10 \mu\text{m}, \pm 5 \mu\text{m}, (\pm 3 \mu\text{m} \text{ only for } l_m \leq 520\text{mm})$
Interval	20 μm or 40 μm
Resolution	0.5 $\mu\text{m}, 1 \mu\text{m}, 2 \mu\text{m}, 5 \mu\text{m}, 10 \mu\text{m}$ (for DI,DS); 5 $\mu\text{m}, 10\mu\text{m}$ only for DO
Maximal speed	45 m/min
Permissible acceleration	30 m/s ²
Moving force for scanning unit	< 4N
Degree of mechanical protection	IP 53 (in compliance with mounting instructions)
Vibrations (50...2000 Hz)	30 m/s ²
Shocks (11ms)	100 m/s ²
Temperature	operating: 0°C to 50°C storage: -30°C to + 70°C
Permissible relative humidity	20% - 70%
Cable length	standard 3 m, extension on order to 20 m (SI output signals), extension on order to 50 m (DS output signals)
Mass	0,4 kg + 0.7 kg/m measuring length

ELECTRICAL DATA:

Output signals	Voltage Un	Current In
DO - square-wave signals	12 V $\pm 5\%$	< 120 mA
DS - square-wave inverted signals with RS422	5 V $\pm 5\%$	< 130 mA
SO - sine-wave voltage signals	+/-12V $\pm 5\%$	< 70 mA (+12V) < 20 mA (-12V)
SI - sine-wave current	$\pm 5\% 5 \text{ V} \pm 5\%$	< 70 mA

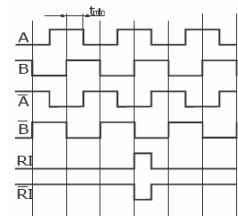
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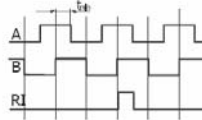
ELECTRICAL DATA:

Square-wave signals with inverted signals and RS 422A - DS:

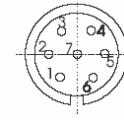


DS (RS- 422 A)	
$I_{sink} = 20 \text{ mA}$	$U_{OL} \leq 0.5 \text{ V}$
$I_{source} = -20 \text{ mA}$	$U_{OH} \geq 2.5 \text{ V}$
$t_{rLH} = t_{rHL} \leq 30 \text{ ns}$; without load	

Square-wave output signals – DO:

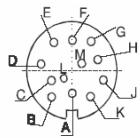


Signal level ...	HTL	Transition time:
$I_{sink} = 1 \text{ mA}$	$U_{OL} \leq 0.5 \text{ V}$	$t_{rLH} = t_{rHL} \leq 60 \text{ ns}$, without load
$I_{source} = 4 \text{ mA}$	$U_{OH} \geq 11 \text{ V}$	$t_{min} = f(V)$



7 pole connector (Amphenol)

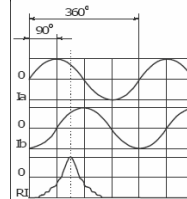
contact	1	2	3	4	5	6	7
signal	0 V		A	B	+V	RI	shield



12 pole connector (Amphenol)

contact	A	B	C	D	E	G	H	K	L
signal	shield	0 V	A	\bar{A}	B	RI	\bar{RI}	+V	\bar{B}

Sinusoidal output signals - SI

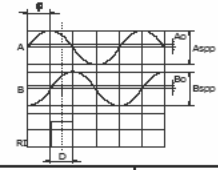


Amplitude of signals	
$I_a = I_b = 7 - 16 \mu A_{app}$	at load 1 k Ω
$I_{ri} = 2 - 8 \mu A_{app}$	used component

9 pole connector (Contact) sine-wave output signals (SI)

contact	1	2	3	4	5	6	7	8	9
signal	I_{a+}	I_{a-}	+5 V	0 V	I_{b+}	I_{b-}	I_{ri+}	I_{ri-}	shield

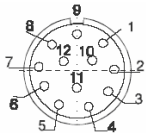
Sinusoidal output signals - SO



Amplitude characteristics	Phase shift of signals A_s and B_s
$ A_a - B_b \leq 0,25 \text{ V}$	$j = 90^\circ \pm 15^\circ$ $f < 15 \text{ kHz}$
$ A_{app} - B_{app} \leq 0,5 \text{ V}$	$j = 90^\circ \pm 30^\circ$ $f = 50 \text{ kHz}$
$A_{app} = B_{app} = 15 - 16 \text{ V}$ at $f \leq 15 \text{ kHz}$	
$7 - 8 \text{ V}$ at $f = 50 \text{ kHz}$	

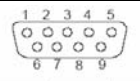
7 pole connector (Amphenol)

contact	1	2	3	4	5	6	7
signal	0 V	-V	A_s	B_s	+V	RI	shield



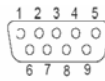
12 pole connector (Contact)

contact	1	2	3	4	5	6	7	8	9	10	11	12
signal	\bar{B}	+5V	RI	\bar{RI}	A	\bar{A}	B	shield	0V	0V	+5V	



9 pole connector (D-Sub) for LCD Readout

contact	1	2	3	4	5	6	7	8	9
signal	NC	\bar{A}	A	\bar{B}	B	0V	+5V	\bar{RI}	RI



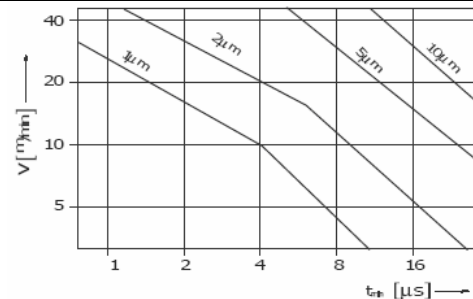
9 pole connector (D-Sub)

contact	1	2	3	4	5	6	7	8	9
signal	I_{a-}	0V	I_{b-}	chase	I_{ri-}	I_{a+}	+5V	I_{b+}	I_{ri+}

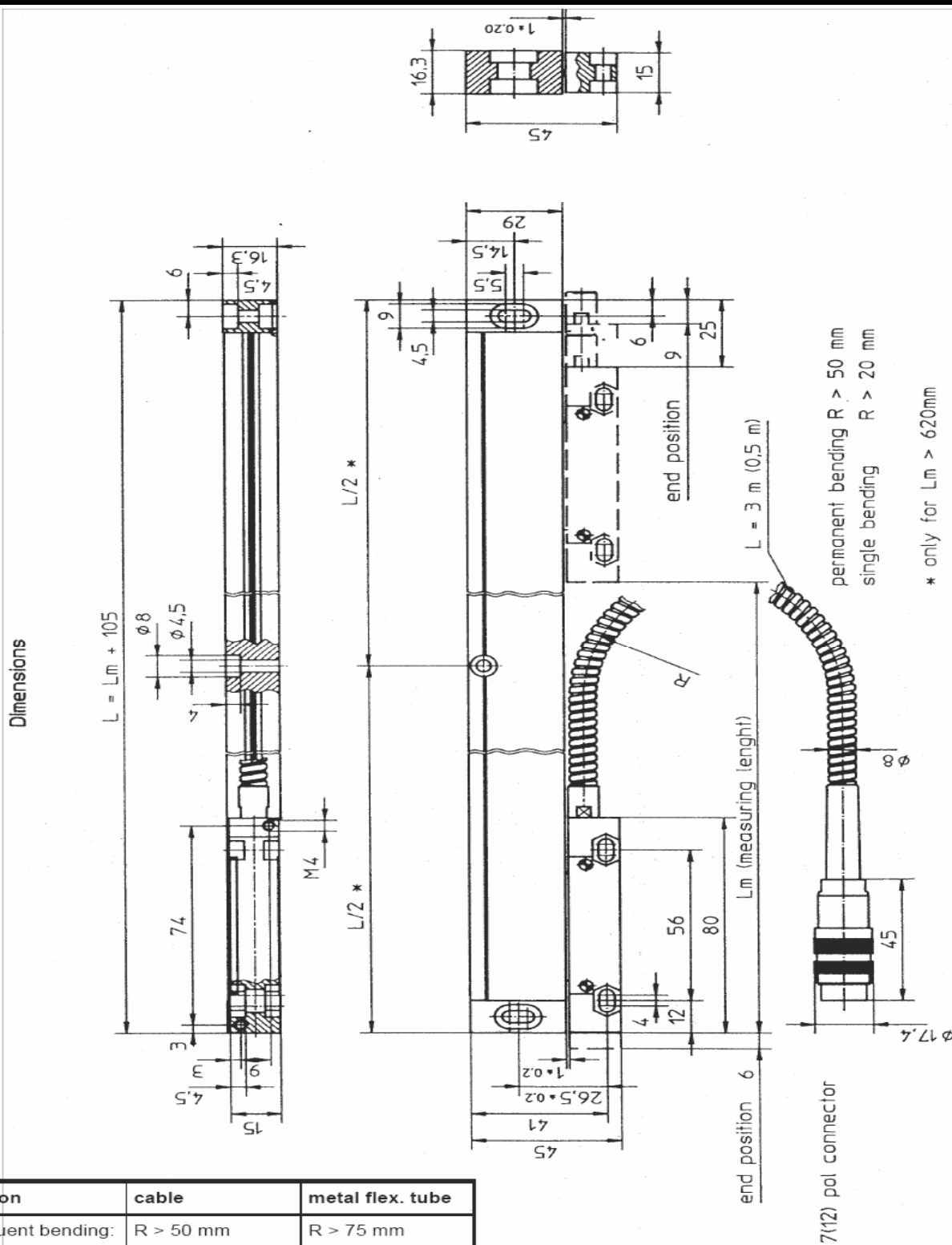
PERMISSIBLE SCANNING VELOCITY

The maximum scanning velocity allowed by mechanical construction is given in mechanical date.

Diagram on the right shows correlation between scanning velocity and minimum time interval of square-wave output signals.



DIMENSIONS:



option	cable	metal flex. tube
frequent bending:	$R > 50$ mm	$R > 75$ mm
rigid bending:	$R > 20$ mm	$R > 20$ mm

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ORDERING DATA

Standard requirements						Special requirements			
TGM113	-XX-	X-	XX-	X-	X-	XXXX-	XX-	X-	X-

Metal flexible tube:
 0 ... without
 1 ... with

Connector is defined with electrical versions DO, DS or SO:

- 1 ... Amphenol pole connector (male)
- 2 ... Amphenol pole connector (male)
- 4 ... Contact 12 pole connector (male)
- 5 ... Contact 9 pole connector (male)
- 7 ... D-Sub 9 pole
- 9 ... other (specify)
- 0 ... without connector

Cable length in [m]:

Standard 3 m : 03

Example: 1.5 m : 15

25 m : 25

Measuring length:

see Mechanical Data

Accuracy:

3 ... $\pm 3 \mu\text{m}$

5 ... $\pm 5 \mu\text{m}$

0 ... $\pm 10 \mu\text{m}$

Reference mark:

0 ... without

1 ... in the middle

2 ... on agreement

Output signals:

DS, SO, DO, SI

Resolution (DO, DS, SI):

0.5 ... $0.5 \mu\text{m}$

1 ... $1 \mu\text{m}$ 5 ... $5 \mu\text{m}$

2 ... $2 \mu\text{m}$ 0 ... $10 \mu\text{m}$

Periode (SO, SI):

20 ... $20 \mu\text{m}$

40 ... $40 \mu\text{m}$

Voltage supply:

05 ... 5 V

12 ... 12 V

Remark

Standard delivery includes:

3 m

cable length with metal flexible tube

12 pole

Amphenol connector (for DS)

7 pole

Amphenol connector (for DO, SO)

9 pole

Contact connector (for SI)



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