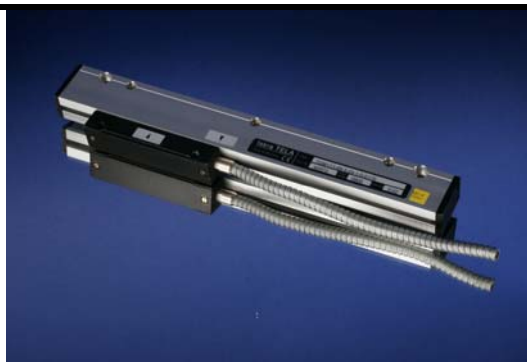


INCREMENTAL LINEAR SCALES

TGM111

Optoelectronic

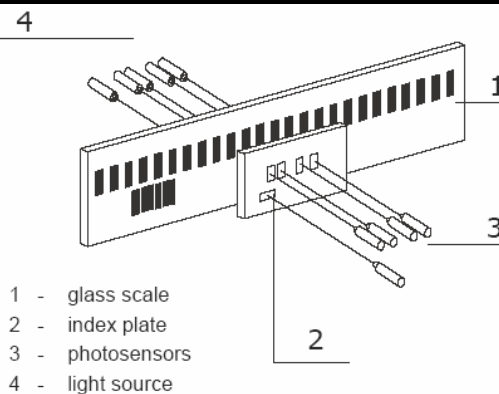


GENERAL DESCRIPTION:

The TGM 111 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: 170 to 2220 mm
Cross section: 20 x 32 mm (47.6 mm)
Accuracy: ± 10 , ± 5 , ± 3 μm (for $L_m < 520$ mm)
Resolution: 1, 2, 5, 10 μm
Output signals: DO (square wave)
 SO (sine-wave voltage)
 DI (square wave inverted signals)

OPERATING PRINCIPLE:



MECHANICAL DATA:

Standard measuring length "Lm" (mm)	170/220/250/270/320/370/420/470/520/620/720/820/920/1020/1120/1220/1320/1420/1520/1620/1720/1820/2020/2220
Reference mark	Standard position in centre. Other positions optional at spacing of 100 mm along the measuring length.
Accuracy class	± 10 μm , ± 5 μm , (± 3 μm only for $L_m < 520$ mm)
Interval	20 μm or 40 μm
Resolution	1 μm , 2 μm , 5 μm , 10 μm (for DO and DI output signal version)
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 50 m
Mass	0,4 kg + 1 kg/m measuring length

ELECTRICAL DATA:

Output signals	Voltage Un	Current In
DI - square-wave inverted signals	5 V $\pm 5\%$	< 100 mA
DO - square-wave signals	12 V $\pm 5\%$	< 120 mA
SO - sine-wave voltage signals	+/-12V $\pm 5\%$	< 70 mA (+12V) < 20 mA (-12V)

INCREMENTAL LINEAR SCALES

Optoelectronic

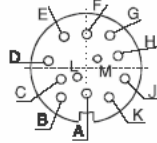
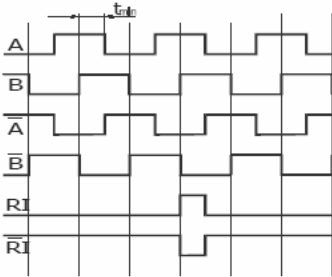
TGM111

ELECTRICAL DATA:

Square-wave signals with inverted signals:

Square-wave output signals – DO:

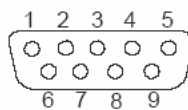
Square-wave output signals- DI



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}

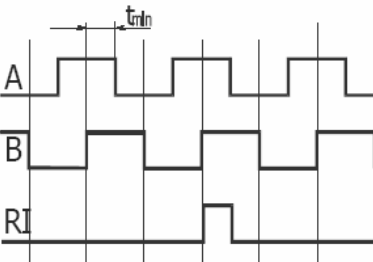
Signal level ... TTL	
$I_{sink} = 15 \text{ mA}$	$U_{OL} \leq 0.5 \text{ V}$
$I_{source} = -15 \text{ mA}$	$U_{OH} \geq 4.0 \text{ V}$
Transition time:	
$t_{tLH} = t_{tHL} \leq 60 \text{ ns}$; without load	
$t_{min} = f(v)$	



9 pole connector (D-Sub)
for LCD Readout

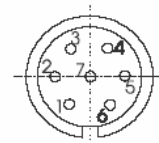
contact	1	2	3	4	5	6	7	8	9
signal	NC	\bar{A}	A	\bar{B}	B	0V	+5V	\bar{RI}	RI

Square-wave output signals - DO:



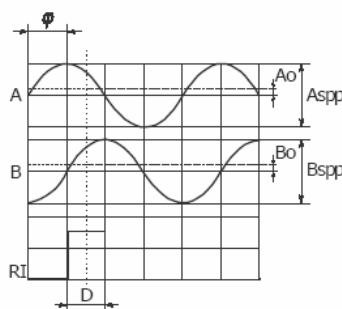
7 pole connector (Amphenol)

Signal level ... HTL		Transition time:	
$I_{sink} = 1 \text{ mA}$	$U_{OL} \leq 0.5 \text{ V}$	$t_{tHL} \leq 2 \mu\text{s}$	
$I_{source} = 4 \text{ mA}$	$U_{OH} \geq 11 \text{ V}$	$t_{tHL} \leq 250 \text{ ns}$; without load	



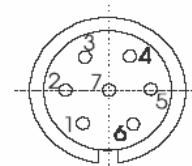
contact	1	2	3	4	5	6	7
signal	0 V		A	B	+V	RI	shield

Sine wave voltage output signals - SO:



Amplitude characteristics	
$ A_0 - B_0 \leq 0,25 \text{ V}$	
$ A_{spp} - B_{spp} \leq 0,5 \text{ V}$	
$A_{spp} = B_{spp} = 15 - 16 \text{ V}$ at $f \leq 15 \text{ kHz}$	
$7 - 8 \text{ V}$ at $f = 50 \text{ kHz}$	
Phase shift of signals A_s and B_s	
$\varphi = 90^\circ \pm 15^\circ$ $f < 15 \text{ kHz}$	
$\varphi = 90^\circ \pm 30^\circ$ $f = 50 \text{ kHz}$	

7 pole connector (Amphenol)

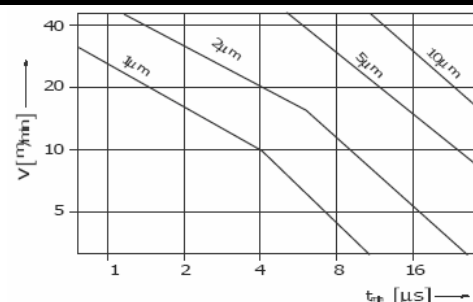


contact	1	2	3	4	5	6	7
signal	0 V	-V	A_s	B_s	+V	RI	shield

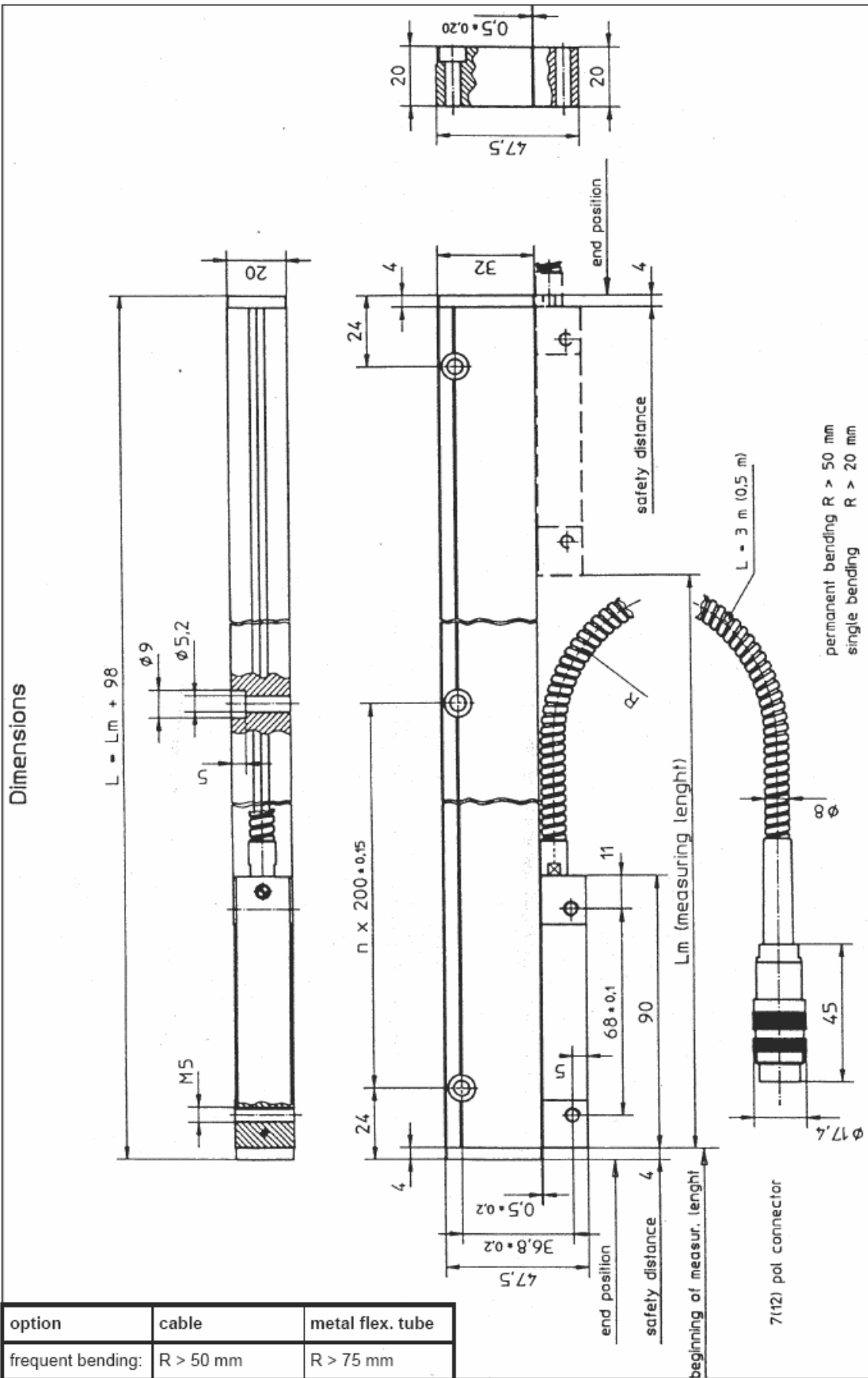
PERMISSIBLE SCANNING VELOCITY

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:	$R > 50 \text{ mm}$	$R > 75 \text{ mm}$
rigid bending:	$R > 20 \text{ mm}$	$R > 20 \text{ mm}$

INCREMENTAL LINEAR SCALES

TGM111

Optoelectronic

ORDERING DATA:

Standard requirements						Special requirements			
TGM111	- XX -	X -	XX -	X -	X -	XXXX-	XX-	X-	X-

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

Connector is defined with electrical versions (DO, DI or SO):
 1 ... Amphenol 12 pole for DI
 2 ... Amphenol 7 pole for DO/SO
 7 ... D-Sub 9 pole for DI
 0 ... without connector

Cable length in [m]:
 Standard 3 m : 03
 Example: 1.5 m : 1.5
 25 m : 25

Measuring length:
 see *Mechanical Data*

Accuracy:
 3 ... ±3 µm
 5 ... ±5 µm
 0 ... ±10 µm

Reference mark:
 0 ... without
 1 ... in the middle
 2 ... on agreement

Output signals:
 DI, DO, SO

Resolution (DI, DO): **Periode (SO):**
 1 ... 1 µm 5 ... 5 µm 20 ... 20 µm
 2 ... 2 µm 0 ... 10 µm 40 ... 40 µm

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 DI)
or
7 pole
Amphenol connector
(for DO, SO)



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