

INCREMENTAL LINEAR SCALES

TGM115

Optoelectronic



GENERAL DESCRIPTION:

The TGM 115 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 1740

Cross section: 16 x 29(45)

Accuracy: ± 10 , ± 5 , ± 3

Resolution: 0.5, 1, 2, 5, 10 μm

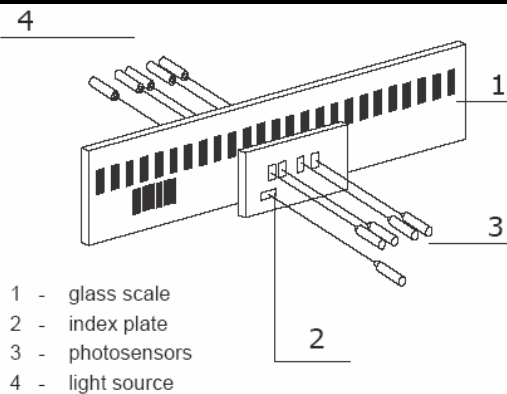
Output signals: DO (square wave)

SO (sine-wave voltage)

SI (sine-wave current signals)

DS (square wave inverted signals RS422A)

OPERATING PRINCIPLE:



MECHANICAL DATA:

Standard measuring length "Lm" (mm)	170/220/250/270/320/370/420/470/520/620/720/820/920/1020/1140/1240/1340/1440/1540/1640/1740/
Reference mark	Standard position in centre. Other positions optional at spacing of 100 mm along the measuring length.
Accuracy class	$\pm 10 \mu\text{m}$, $\pm 5 \mu\text{m}$, ($\pm 3 \mu\text{m}$ only for $L_m < 520 \text{ mm}$)
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 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 V $\pm 5\%$	< 70 mA

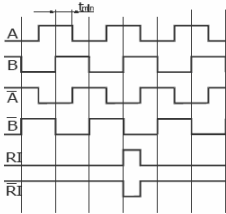
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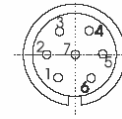
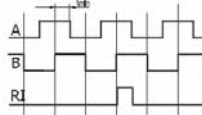
ELECTRICAL DATA:

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



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	

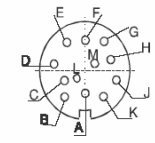
Square-wave output signals – DO:



7 pole connector (Amphenol)

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

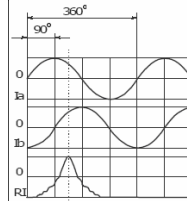
Signal level ... HTL		Transition time:	
$I_{sink} = 1 \text{ mA}$	$U_{OL} \leq 0.5 \text{ V}$	$t_{rLH} = t_{rHL} \leq 60 \text{ ns}$, without load	
$I_{source} = 4 \text{ mA}$	$U_{OH} \geq 11 \text{ V}$	$t_{min} = f(v)$	



12 pole connector (Amphenol)

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

Sinusoidal output signals - SI

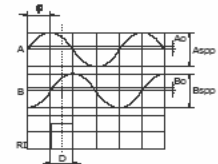


Amplitude of signals	
$I_b = I_a = 7 - 16 \mu A_{pp}$	at load 1 kΩ
$I_{ri} = 2 - 8 \mu A_{pp}$ used component	

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

contact	1	2	3	4	5	6	7	8	9
signal	Ia+	Ia-	+5 V	0 V	Ib+	Ib-	Iri+	Iri-	shield

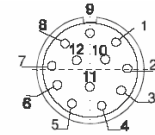
Sinusoidal output signals - SO



Amplitude characteristics		Phase shift of signals A _s and B _s	
$ A_s - B_s \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 $f = 50 \text{ kHz}$			

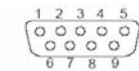
7 pole connector (Amphenol)

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



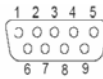
12 pole connector (Contact)

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



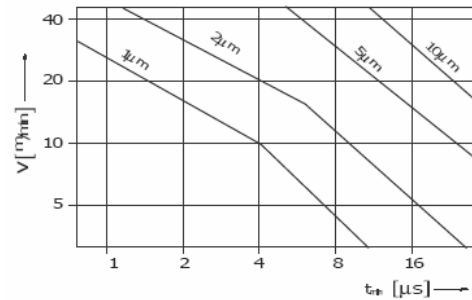
9 pole connector (D-Sub)

contact	1	2	3	4	5	6	7	8	9
signal	Ia-	0V	Ib-	chase	Iri-	Ia+	+5V	Ib+	Iri+

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.

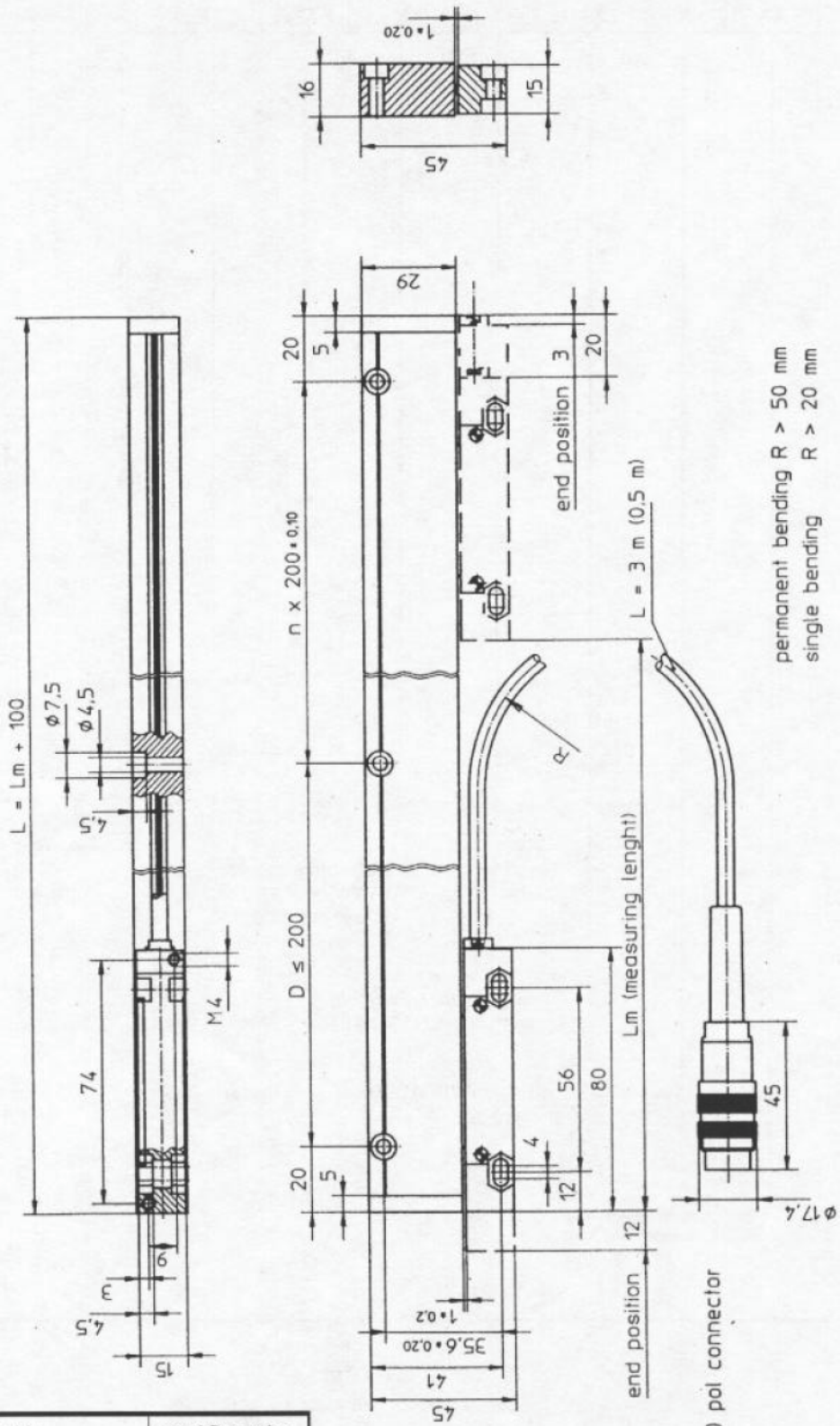


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DIMENSIONS:

Dimensions



permanent bending $R > 50$ mm
single bending $R > 20$ mm

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			
TGM115	-XX-	X-	XX-	X-	X-	XXXX-	XX-	X-	X-
									<p>Metal flexible tube: 0 ... without 1 ... with</p>
									<p>Connector is defined with electrical versions DO, DS or SO: 1 ... Amphenol 12 pole 2 ... Amphenol 7 pole 4 ... Contact 12 pole (female screw) 7 ... D-Sub 9 pole 9 ... other (specify) 0 ... without connector</p>
									<p>Cable length in [m]: Standard 3 m : 03 Example: 1.5 m : 1.5 25 m : 25</p>
									<p>Measuring length: see Mechanical Data</p>
									<p>Accuracy: 3 ... ±3 µm 5 ... ±5 µm 0 ... ±10 µm</p>
									<p>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)</p>
									<p>Reference mark: 0 ... without 1 ... in the middle 2 ... on agreement</p>
									<p>Output signals: DS, SI, SO, DO</p>
									<p>Resolution (DO, DS): 0.5 ... 0.5 µm 1 ... 1 µm 5 ... 5 µm 2 ... 2 µm 0 ... 10 µm</p>
									<p>Periode (SO, SI): 20 ... 20 µm 40 ... 40 µm</p>
									<p>Voltage supply: 05 ... 5 V 12 ... 12 V</p>



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