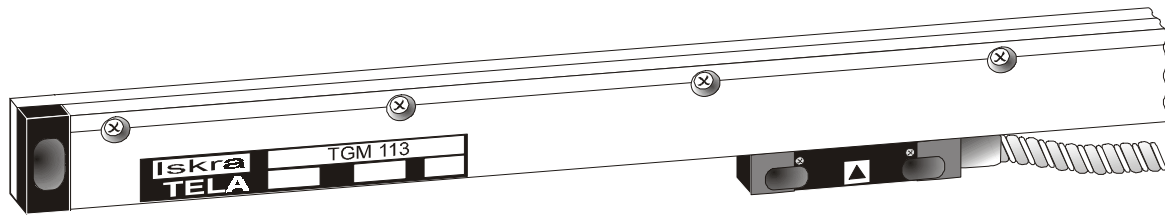


INCREMENTAL LINEAR SCALES

TGM 113

Optoelectronic



GENERAL DESCRIPTION:

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

Measuring lengths: 70 to 1120 mm

Cross section: 16.3 x 29 mm (45 mm)

Accuracy: ± 10 , ± 5 , ± 3

Resolution: 0.5, 1, 2, 5, 10 μm

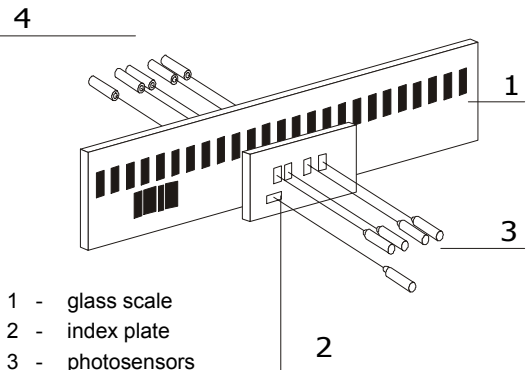
Output signals: DO (square wave)

SO (sine-wave voltage)

DI (square wave inverted signals)

DS (square wave inverted signals RS422A)

OPERATING PRINCIPLE:



- 1 - glass scale
- 2 - index plate
- 3 - photosensors
- 4 - light source

MECHANICAL DATA:

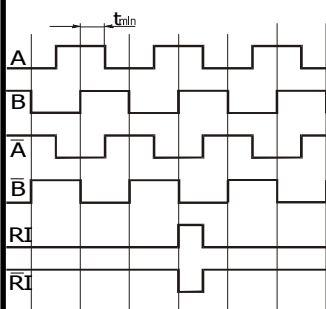
Standard measuring length "Lm" (mm)	70/120/170/220/250/270/320/370/420/470/520/620/720/820/920/1020/1120
Reference mark	Standard position in centre. Other positions optional at spacing of 50 mm along the measuring length.
Accuracy class	$\pm 10 \mu\text{m}$, $\pm 5 \mu\text{m}$, $\pm 3 \mu\text{m}$
Interval	20 μm or 40 μm
Resolution	0.5 μm , 1 μm , 2 μm , 5 μm , 10 μm (for DI,DS); 5 μm , 10 μm only for DO
Maximal speed	45 m/min
Permissible acceleration	30 m/s ²
Moving force for scanning unit	$\leq 4\text{N}$
Degree of mechanical protection	IP 53 (in compliance with mounting instructions), IP 64 with compressed air purge
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 + 0.7 kg/m measuring length

ELECTRICAL DATA:

Output signals	Voltage U_n	Current I_n
DI - square-wave inverted signals	5 V $\pm 5\%$	$\leq 100 \text{ mA}$
DO - square-wave signals	12 V $\pm 5\%$	$\leq 120 \text{ mA}$
DS - square-wave inverted signals with RS422	5 V $\pm 5\%$	$\leq 130 \text{ mA}$
SO - sine-wave voltage signals	+/-12V $\pm 5\%$	$\leq 70 \text{ mA (+12V)}$ $\leq 20 \text{ mA (-12V)}$

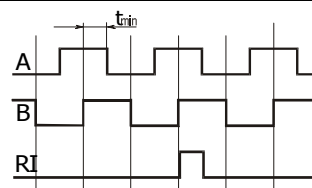
ELECTRICAL DATA:

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

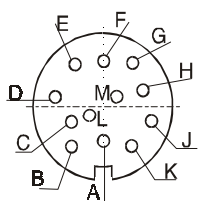


DS (RS- 422 A)	
$I_{sink} = 20 \text{ mA}$	$U_{OL} \leq 0,5 \text{ V}$
$I_{source} = -20 \text{ mA}$	$U_{OH} \geq 2,5 \text{ V}$
$t_{tLH} = t_{tHL} \leq 30 \text{ ns; without load}$	
DI	
$I_{sink} = 15 \text{ mA}$	$U_{OL} \leq 0,5 \text{ V}$
$I_{source} = -15 \text{ mA}$	$U_{OH} \geq 4,0 \text{ V}$
$t_{tLH} = t_{tHL} \leq 60 \text{ ns; without load}$	

Square-wave output signals - DO:

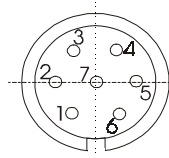


Signal level ...	HTL	Transition time:
$I_{sink} = 1 \text{ mA}$	$U_{OL} \leq 0,5 \text{ V}$	$t_{tHL} \leq 2 \mu\text{s}$
$I_{source} = 4 \text{ mA}$	$U_{OH} \geq 11 \text{ V}$	$t_{tHL} \leq 250 \text{ ns; without load}$



12 pole connector (Amphenol) square-wave output signals (DI, DS)

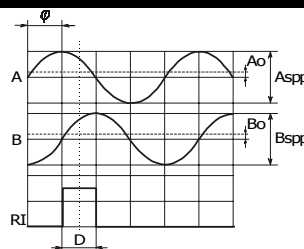
contact	A	B	C	D	E	G	H	K	L
signal	shield	0 V	A	\bar{A}	B	RI	\bar{RI}	+ V	\bar{B}



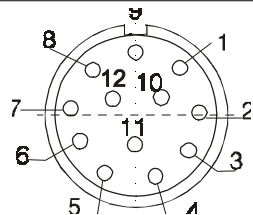
7 pole connector (Amphenol) square-wave output signals (DO)

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

Sinusoidal output signals - SO:

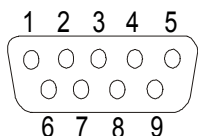


Amplitude characteristics	Phase shift of signals
$ A_0 - B_0 \leq 0,25 \text{ V}$	A_s and B_s
$ A_{spp} - B_{spp} \leq 0,5 \text{ V}$	
$A_{spp} = B_{spp} = 15 - 16 \text{ V at } f \leq 15 \text{ kHz}$	$j = 90^\circ \pm 15^\circ \text{ f} < 15 \text{ kHz}$
$7 - 8 \text{ V at } f = 50 \text{ kHz}$	$j =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



12 pole connector (Contact) square-wave output signals (DI, DS)

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) square-wave output signals (DI, DS)

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

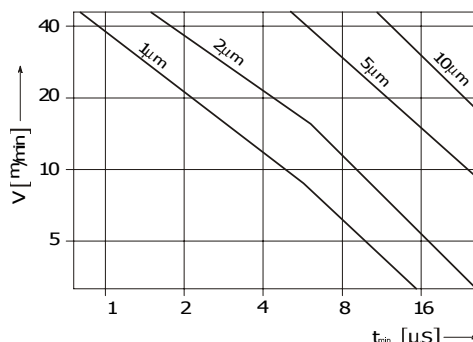
7 pole connector (Amphenol) sine-wave voltage output signals (SO)

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

SPEED AND SCANNING UNIT

The maximum measuring speed allowed by the mechanical construction is given in the mechanical data table.

The dependence of minimum time interval between two neighboring fronts of square-wave output signals is given at right.



ORDERING DATA:

Standard requirements						Special requirements				
TGM113	- XX -	X -	XX -	X -	X -	XXXX-	XX-	X-	X-	X-
										<p>Air inlet connection [special requirement]: 0 ... without 1 ... with</p> <p>Metal flexible tube: 0 ... without 1 ... with</p> <p>Connector is defined with electrical versions DO, DS, DI 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>Reference mark: 0 ... without 1 ... in the middle 2 ... on agreement</p> <p>Output signals: DI, DS, SO, DO</p> <p>Resolution (DI, DO, DS): 0.5 ... 0.5 µm 1 ... 1 µm 5 ... 5 µm 2 ... 2 µm 0 ... 10 µm</p> <p>Periode (SO): 20 ... 20 µm 40 ... 40 µm</p> <p>Voltage supply: 05 ... 5 V 12 ... 12 V</p>
<div style="border: 1px solid black; padding: 5px;"> <p>Remark Standard delivery includes: 3 m cable length with metal flexible tube 12 pole Amphenol connector (for DI, DS) 7 pole Amphenol connector (for DO, SO)</p> </div>										

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