

# INCREMENTAL LINEAR SCALES

# TGM170, TGM180

## Optoelectronic



### GENERAL DESCRIPTION

The TGM170 and TGM180 are optoelectronic incremental sealed linear scales. They can be applied in numerous industrial areas for high-precision position measuring in machine tool industry, positioning systems, robotics.

**Measuring lengths:** 170 to 3040 mm

**Cross section:** 37 x 51.5 mm (77,5 mm)

**Accuracy:**  $\pm 10$ ,  $\pm 5$ ,  $\pm 3\mu\text{m}$

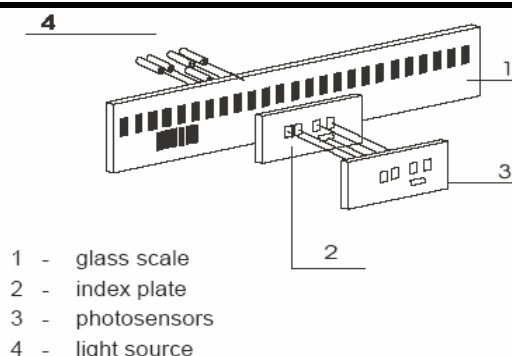
**Resolution:** 0.5, 1, 2, 5, 10  $\mu\text{m}$  (DS)

**Output signals:** DS (square inverted signals RS 422)

SI (sine-wave current 11 $\mu\text{A}$  signals)

SV (sine-wave voltage 1Vpp signals)

### OPERATING PRINCIPLE



### MECHANICAL DATA

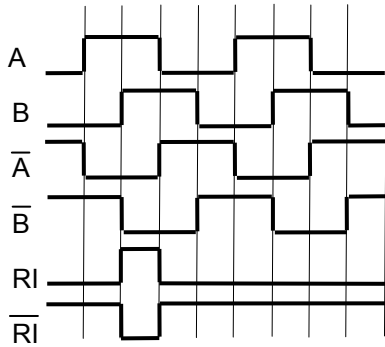
<b>Standard measuring length "Lm" (mm)</b>	170/220/270/320/370/420/470/520/620/720/770/820/920/ 1020/1140/1240/1340/1440/1540/1640/1740/1840/2040/ 2240/2440/2640/2840/3040	
<b>Interval</b>	<b>TGM170</b> 40 $\mu\text{m}$	<b>TGM180</b> 20 $\mu\text{m}$
<b>Reference mark</b>	<b>TGM170</b> - in the centre - on extremities 35mm ( $L_m \leq 1020$ ) or 45mm ( $L_m \geq 1140$ ) - other positions optional at spacing of 100mm along the measuring length	<b>TGM180</b> - DCR (distance coded reference) - in the centre - on extremities 35mm ( $L_m \leq 1020$ ) or 45mm ( $L_m \geq 1140$ ) - other positions optional at spacing of approximately 10 mm
<b>Accuracy class</b>	$\pm 10 \mu\text{m}$ , $\pm 5 \mu\text{m}$ , $\pm 3 \mu\text{m}$	
<b>Resolution (for DS signals)</b>	<b>TGM170</b> 2, 10 $\mu\text{m}$	<b>TGM180</b> 0.5, 1, 5 $\mu\text{m}$
<b>Maximal speed</b>	45 m/min continuously, 60 m/min temporarily	
<b>Permissible acceleration</b>	30 m/s <sup>2</sup>	
<b>Moving force for scanning unit</b>	< 6N	
<b>Mechanical protection</b>	IP 53, IP 64 (in compliance with mounting instructions)	
<b>Vibrations (50...2000 Hz)</b>	150 m/s <sup>2</sup>	
<b>Shocks (11ms)</b>	100 m/s <sup>2</sup>	
<b>Temperature</b>	operating: 0°C to 50°C storage: -30°C to + 70°C	
<b>Permissible relative humidity</b>	20% - 70%	
<b>Cable length</b>	standard 3 m; maximal extension 20 m (SI signals), 50 m (DS signals), 100 m (SV signals)	
<b>Mass</b>	0.4 kg + 2.2 kg/m measuring length	

### ELECTRICAL DATA

Output signals	Voltage Un	Current In
DS - square-wave signals RS422	5 V $\pm$ 5%	< 130 mA
SI - sine-wave current 11 $\mu\text{A}$	5 V $\pm$ 5%	< 70 mA
SV - sine-wave voltage 1Vpp	5 V $\pm$ 5%	< 100 mA

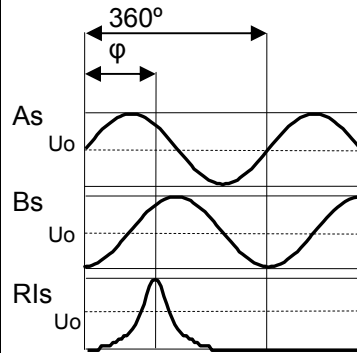
## ELECTRICAL DATA

### Square-wave output signals RS 422A - DS

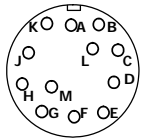


$I_{source} = -20\text{mA}$   
 $I_{sink} = 20\text{mA}$   
 $U_{OL} \leq 0,5\text{V}$   
 $U_{OH} \geq 2,5\text{V}$

### Sine-wave voltage output signals - SV

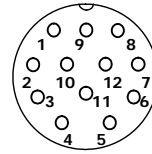


$A_s = B_s = 0,6 - 1,2\text{Vpp}$   
 $R_{Is} = 0,2 - 0,8\text{Vpp}$   
 $\phi = 135^\circ \pm 35^\circ$   
 $U_o \approx 2,5\text{V}$



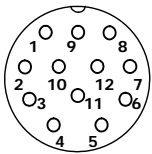
12 pin connector Amphenol (solder view)

pin signal	A shield	B 0V	C A+	D A-	E B+	F /	G RI+	H RI-	J /	K 5V	L B-	M /
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12 pin connector Contact (solder view)

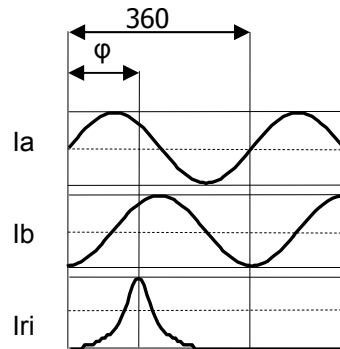
pin signal	1 Ub-	2 5Vs	3 Uri+	4 Uri-	5 Ua+	6 Ua-	7 /	8 Ub+	9 shield	10 0V	11 0Vs	12 5V
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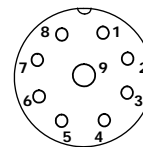
12 pin connector Contact (solder view)

pin signal	1 B-	2 5V	3 RI+	4 RI-	5 A+	6 A-	7 -	8 B+	9 shield	10 0V	11 0V	12 5V
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### Sine-wave current output signals - SI

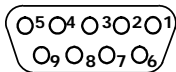


$I_a = I_b = 7 - 16\mu\text{A}$   
 $I_{ri} = 2 - 8\mu\text{A}$   
 $\phi = 135^\circ \pm 35^\circ$   
 option  
 $I_a = I_b = 15 - 35\mu\text{A}$   
 $I_{ri} = 4 - 15\mu\text{A}$   
 $\phi = 135^\circ \pm 35^\circ$



9 pin connector Contact (solder view)

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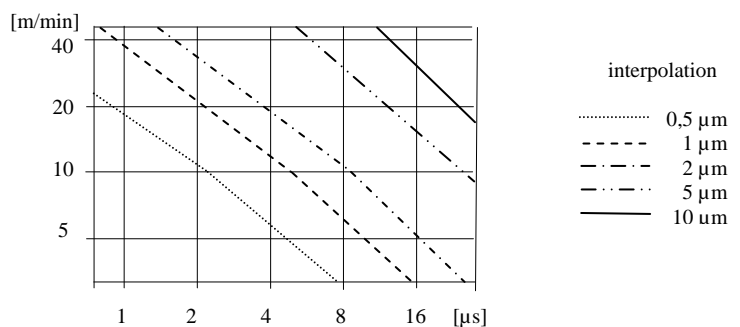


9 pin D-sub connector (solder view)

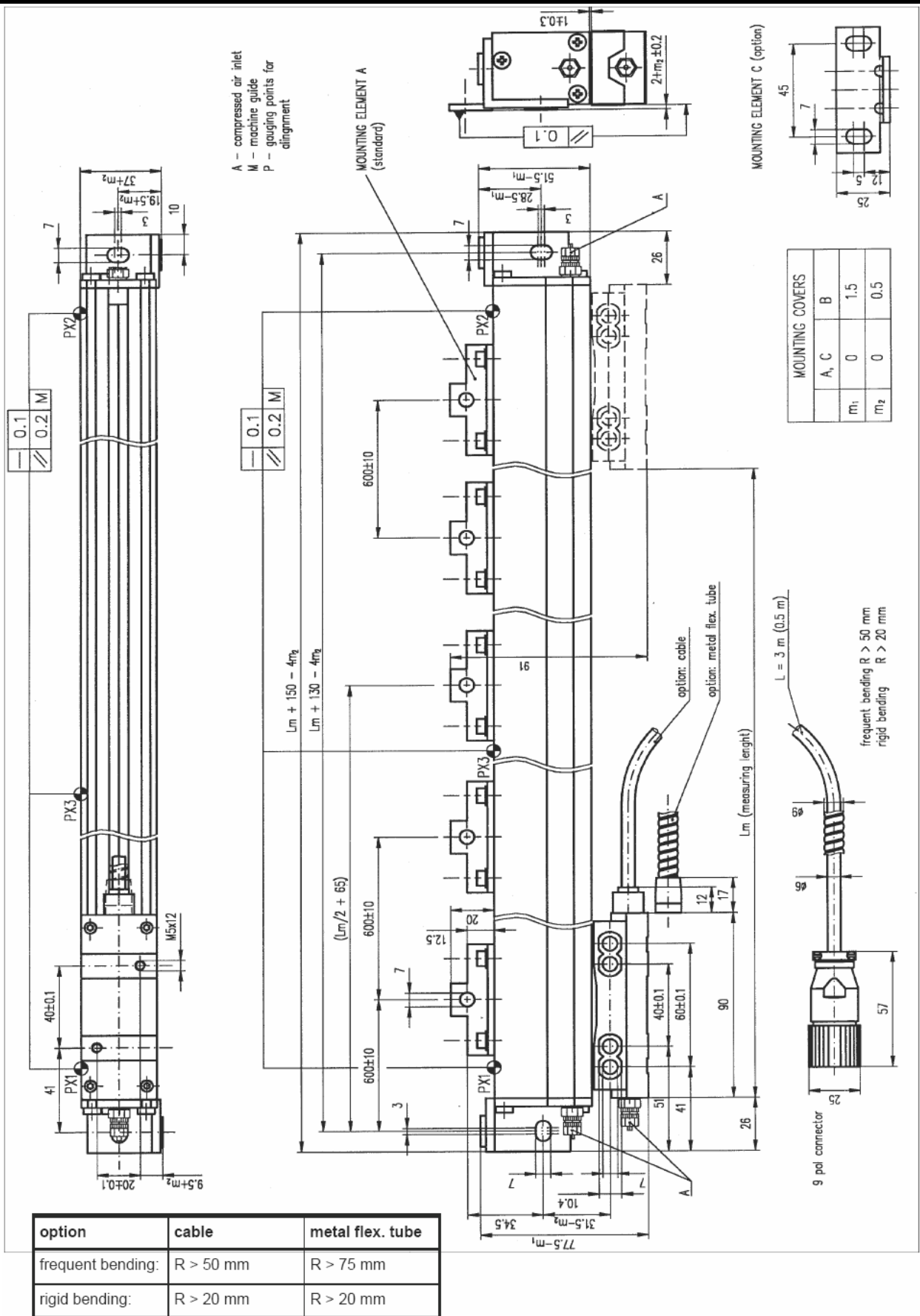
pin signal	1 shield	2 RI-	3 B-	4 A-	5 5V	6 RI	7 B	8 A	9 0V
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## SPEED AND SCANNING UNIT

A table shows minimum time interval between digital signals versus movement speed and interpolation factor.



## DIMENSIONS



# INCREMENTAL LINEAR SCALES

# TGM170, TGM180

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## ORDERING DATA

TGM170											special request	
TGM180	X	X	X	X	X	X	X	X	X	X	X	X

mounting element  
C - standard  
A - on request

air inlet on request

metal flexible tube  
0 - without  
1 - with

connection  
1 - Amphenol 12 pin  
4 - Contact 12 pin connector  
5 - Contact 9 pin connector  
6 - Contact 12 pin coupling  
7 - D-sub 9 pin  
9 - special requirement  
0 - without

cable length (m)  
01 - 1m  
03 - 3m (standard)  
other on order

measuring length  
- standard (see table)  
- other on special request

accuracy  
3 -  $\pm 3 \mu\text{m/m}$   
5 -  $\pm 5 \mu\text{m/m}$   
0 -  $\pm 10 \mu\text{m/m}$

reference mark  
1 in the middle  
2 special requirement  
3 on both extremities 35mm ( $L_m \leq 1020$ ) or 45 ( $L_m \geq 1140$ )  
4 DCR (only for TGM180)  
5 DCR but not from the beginning (only for TGM180)

output signals  
SI - sine current 11 $\mu\text{A}$ ; on request 15-35 $\mu\text{A}$   
SV - sine voltage 1Vpp  
DS - digital inverted TTL

resolution (DS) or period (SI, SV)  
TGM180  
0,5 0,5 $\mu\text{m}$  20  $\mu\text{m}$   
1 1  $\mu\text{m}$   
5 5  $\mu\text{m}$   
TGM170  
2 2  $\mu\text{m}$  40  $\mu\text{m}$   
0 10  $\mu\text{m}$

supply voltage  
05 - 5V



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