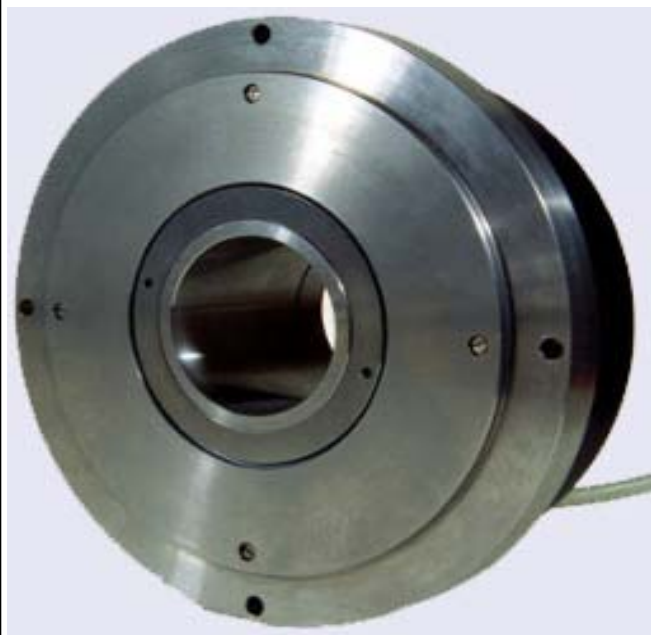


INCREMENTAL ANGLE ENCODERS

TGR72

Optoelectronic

72.6



GENERAL DESCRIPTION:

The incremental angle encoders TGR 72 transform mechanical rotation to a series of electrical pulses. Operating principle is shown in the drawing below. Periodic signals of approximate sine-wave shape are generated on the photosensors via photoelectric scanning. Reference signal is generated on the similar way and can be unique or distance coded.

Number of lines: 16384, 18000; 36000

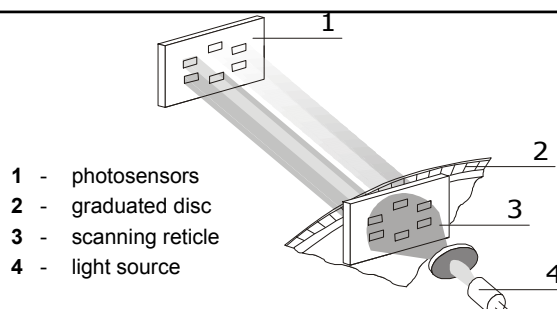
Reference mark: 1 or DCR (Distance coded)

Diameter: 170 mm

Accuracy: $\pm 2,5''$

Output signals: DS (square wave signals, RS422)
SV (sine wave 1Vpp output signals)
SI (sine wave 11 μ A signals)

OPERATING PRINCIPLE:



APPLICATION AREA:

Incremental rotary encoders are applied in numerous industrial areas for high-precision measuring of angles, positions and rotation speed. Most frequent application areas: machine tool industry, positioning devices, robotics, telescopes, antennas etc.

MECHANICAL DATA:

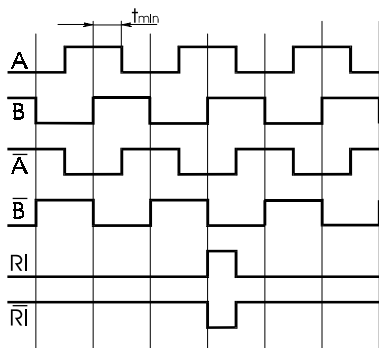
Number of lines:		16384	18000	36000
Number of perodes SI, SV:		16384	18000	36000
Number of perodes DS: (with integrated interpolation electronics)			18000, 36000, 90000 180000, 450000, 900000	72000, 360000 1800000
DCR	Number of reference marks:		36	72
	Nominal increment (lines):		1000	1000
	Maximal rotation angle to determine position:		20°	10°
Maximum shaft displacement		0,05 mm axial; $\pm 0,05$ mm radial		
Rotor inertia moment		$\leq 1.5 \times 10^{-3} \text{ kgm}^2$		
Starting moment at 20°C		$\leq 0.5 \text{ Nm}$		
Life time of bearings		4×10^9 revolutions		
Admissible rotation speed		1000 min^{-1}		
Weight		3.5 kg		
Operating temperature		0°C to 70°C		
Relative humidity		max 95% (IP 64) (no condensation)		
Protection class (IEC 60529)		IP 64		
Shocks		300 m/s^2		
Admissible vibrations (50 - 2000 Hz)		100 m/s^2		

ELECTRICAL DATA:

Output signals	Voltage U_n	Current I_n	Max. cable length
DS - square wave inverted RS422A standard	$5 \text{ V} \pm 5\%$	$\leq 100 \text{ mA}$	50 m
SV - sine-wave voltage 1Vpp	$5 \text{ V} \pm 5\%$	$\leq 100 \text{ mA}$	150 m
SI - sine-current wave	$5 \text{ V} \pm 5\%$	$\leq 100 \text{ mA}$	30 m

ELECTRICAL DATA:

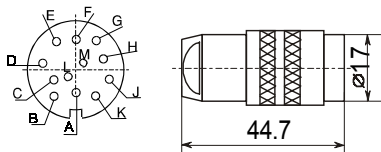
Square-wave signals - DS (RS 422A):



DS (RS - 422 A)

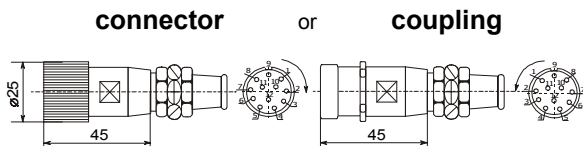
$I_{\text{sink}} = 20 \text{ mA}$	$U_{\text{OL}} \leq 0,5 \text{ V}$
$I_{\text{source}} = -20 \text{ mA}$	$U_{\text{OH}} \geq 2,5 \text{ V}$
$t_{\text{tLH}} = t_{\text{tHL}} \leq 30 \text{ ns; without load}$	

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



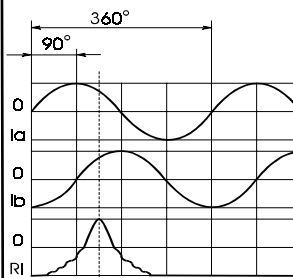
contact	A	B	C	D	E	G	H	K	L
signal	shield	0V	A	\bar{A}	B	RI	\bar{RI}	+V	\bar{B}

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



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

Sinusoidal output signals SI (11 μA):



Amplitude of signals

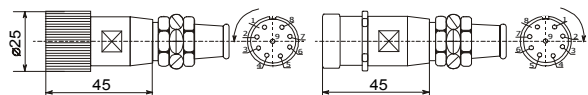
$I_b = I_a = 7 - 16 \mu\text{A}_{\text{pp}}$ at load 1 kOhm
 $I_{\text{ri}} = 2 - 8 \mu\text{A}_{\text{pp}}$ used component

Phase - shift of signals I_a and I_b :

$\varphi = 90^\circ \pm 10^\circ$

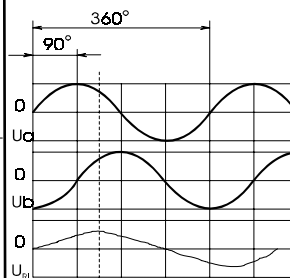
9 pole connector (Contact) sine-wave output signals SI

connector or coupling



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

Sine-wave voltage signals, 1Vpp (SV):



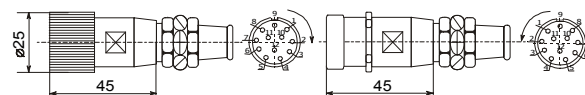
Amplitude of signals

$U_b = U_a = 0,6 - 1,2 \text{ V}_{\text{pp}}$

$U_{\text{ri}} = 0,5 \text{ V}_{\text{pp}}$ 0,2 - 0,8 V on termination imp. 120Ohm

12 pole connector (Contact) sine-wave voltage 1Vpp signals

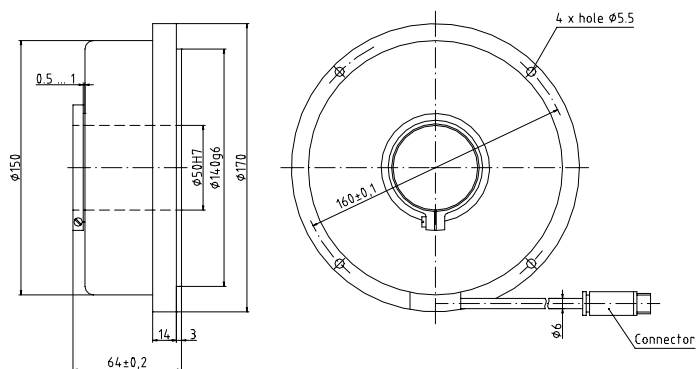
connector or coupling



contact	1	2	3	4	5	6	7	8	9	10	11	12
signal	U_b	sense +5V	U_{RI^+}	U_{RI^-}	U_{A^+}	U_{A^-}	—	U_{B^+}	—	0V	sense +0V	+5V

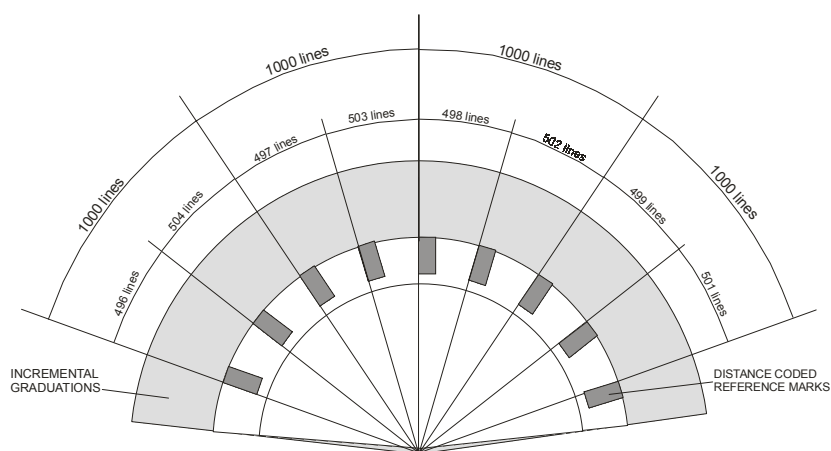
DIMENSIONS:

TGR 72.6



Cable length 3 m
 Permanent bending radius ≥ 100 mm
 Single bending radius ≥ 40 mm

DISTANCE CODED REFERENCE:



TGR72

Optoelectronic

72.6

ORDERING DATA (example: TGR72.X₁-XX₂-XX₃-X₄-XX₅-XXXXXX₆-XX₇-X₈)

X ₁	Version:	6 ... cable radial			
XX ₂	Voltage supply:	05 ... 5V			
XX ₃	Output signals:	DS	SI	SV	
X ₄	Reference mark:	0 ... without 1 ... 1. reference 4 ... Distance Coded RI			
XX ₅	Accuracy:	2.5... ± 2,5"			
XXXXXX ₆	No. of lines:	Enter no. of lines (SI, SV) / output signal periods (DS) per revolution (see mechanical data)			
XX ₇	Cable length:	Standard 03 ... 3 m Example: 1.5 ... 1.5 m 25 ... 25 m			
X ₈	Connector is defined with electrical versions: DS or SI, other type under special requirement	1 ... Amphenol 12 pole 2 ... Amphenol 7 pole	3 ... Contact 9 pole (COUPLING) 4 ... Contact 12 pole (CONNECTOR) 5 ... Contact 9 pole (CONNECTOR) 6 ... Contact 12 pole (COUPLING)	7 ... D-Sub 9 pole 8 ... D-Sub 15 pole	9 ... other(specify) 0... without connector

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