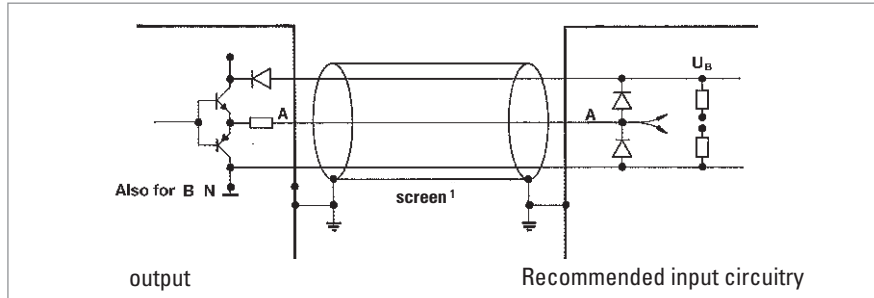


## Basics of Incremental Encoders

### Outputs - Push-pull

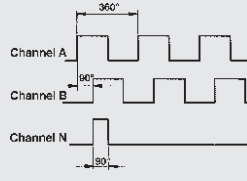
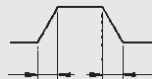

#### OUTPUT CIRCUIT



<sup>1</sup> Cable screen:

- not existing for RI 32, 38, 42
- Not connected to encoder housing for bei RI 41
- Connected to encoder housing for RI 30, 36, 58, 59, 76 and RA 70

#### TECHNICAL DATA

Code letter	K = push-pull, 10 mA with $U_B = DC 5 V$ or push-pull, 30 mA with $U_B = DC 10 - 30 V$ D = push-pull, 30 mA with $U_B = DC 5 V$		
Output signals shaft turning clockwise (cw) seen from front of encoder	 <p>Square wave pulses (TTL or HTL) for channels A, B, N</p>		
Delay times at 1,5 m cable	 <ul style="list-style-type: none"> <li>▣ <math>\leq 100 \text{ ns}</math> (DC 5 V, push-pull D)</li> <li>▣ <math>\leq 250 \text{ ns}</math> (DC 5 V, push-pull K)</li> <li>▣ <math>\leq 2 \mu\text{s}</math> (DC 10 - 30 V, push-pull K)</li> </ul>		
Pulse shape			
Pulse duty factor	1:1		
Phasing	$90^\circ \pm 25^\circ$ electrical		
Symmetry	$180^\circ \pm 25^\circ$ electrical		
Max. Output frequency	300 kHz (see cable length)		
Output voltage	$0 \dots + U_B$		
Output level	K	K	D
	push-pull (DC 10 - 30 V)	push-pull (DC 5 V)	push-pull (DC 5 V)
	$H \geq U_B - 3V$	$H \geq 2,5 V$	$H \geq 2,5 V$
	$L \leq 2 V$	$L \leq 0,5 V$	$L \leq 0,5 V$
Output load max.	$\pm 30 \text{ mA}$	$\pm 10 \text{ mA}$	$\pm 30 \text{ mA}$
Short circuit protection	all channels	all channels	1 channel <sup>2</sup>
Pole protection of $U_B$	yes	yes	no

<sup>1</sup> Distance A to B is at least  $0,45 \mu\text{s}$  (at 300 kHz)

<sup>2</sup> only 1 channel at a time for max. 1 s

#### CABLE LENGTH

depending on voltage and frequency (at 25 °C) <sup>1</sup> :			
Length	push-pull (K) DC 5 V, 10 mA	push-pull (D) DC 5 V, 30 mA	push-pull (K) DC 10 - 30 V, 30 mA
10 m	300 kHz	300 kHz	DC 12 V, 200 kHz
			DC 24 V, 200 kHz
			DC 30 V, 200 kHz
50 m	300 kHz	300 kHz	DC 12 V, 200 kHz
			DC 24 V, 200 kHz
			DC 30 V, 100 kHz
100 m	300 kHz	300 kHz	DC 12 V, 200 kHz
			DC 24 V, 100 kHz
			DC 30 V, 50 kHz

<sup>1</sup> with Hengstler accessory cables