



## Introduction

These installation instructions are provided for the connection and starting procedure of your shaft encoders. You can get further informations from our Shaft Encoders Catalogue.

## Safety and Operating Instructions

- The incremental shaft encoders of the type RI 36 / RI 41 model series are quality products manufactured in accordance with established electrical engineering standards. The units have been delivered from the factory in perfect conformance to safety regulations.
- To maintain this condition and to ensure trouble-free operation, please observe the technical specifications of this document.
- Installation and mounting may only be performed by an electrotechnical expert!**
- The units may only be operated within the limits specified by the technical data.
- Maximum operating voltages must not be exceeded!**  
The units are designed complying with VDE 0160, protection class III. To prevent dangerous structure-borne currents, the equipment has to be run on safety extra-low voltage (SELV) and must be in an area of equipotential bonding.
- Application: Industrial processes and control systems.  
Overvoltage at the connecting terminals must be limited to the values within overvoltage category II.
- Please avoid shocks to the housing – especially to the encoder shaft – and axial or radial overload to the encoder shaft.
- Maximum accuracy and durability of our shaft encoders is only granted when using suitable couplings.
- The high-quality EMC-specifications are only valid together with standard-type cables and plugs. When using screened cables, the screen must broadly be connected with ground on both ends. Likewise, the voltage-supply cables should entirely be screened. If this is not possible you will have to take appropriate filtering measures.
- Installation environment and wiring are influential on the encoder's EMC: Thus the installer must secure EMC of the whole facility (device).
- Transient peaks on the power supply leads are to be limited by the preconnected power unit to a maximum of 1000 V.
- In electrostatically threatened areas please take care for neat ESD-protection of plug and connecting cable during installation work.
- Specified maximum shaft loads are only given under restrictions:
  - Full bearing life of  $1 \times 10^{10}$  revolutions (typ.) will be reached at 35% of full rated shaft load
  - a bearing life of  $1 \times 10^8$  revolutions (typ.) will be reached at 100% of full rated shaft load.
- For use in class II circuits only

## Connection diagram

Colour (TPE)	Colour (PVC)	Output circuit			
		RS 422 (T) + Sense	RS 422 (R) + Alarm	Push-pull (K)	Push-pull compl. (I)
brown	white	Channel A	Channel A	Channel A	Channel A
green	white/brown	Channel $\bar{A}$	Channel $\bar{A}$		Channel $\bar{A}$
grey	green	Channel B	Channel B	Channel B	Channel B
pink	green/brown	Channel $\bar{B}$	Channel $\bar{B}$		Channel $\bar{B}$
red	yellow	Channel N	Channel N	Channel N	Channel N
black	yellow/brown	Channel $\bar{N}$	Channel $\bar{N}$		Channel $\bar{N}$
violet (white) <sup>2)</sup>	yellow/black	Sense GND	$\bar{A}$ Alarm	Alarm	$\bar{A}$ Alarm
blue	yellow/red	Sense $V_{CC}$	Sense $V_{CC}$		Sense $V_{CC}$
brown/green red		5VDC=	5/10...30VDC=	5/10...30VDC=	10...30VDC=
white/green black		GND	GND	GND	GND
Screen <sup>1)</sup>	Screen <sup>1)</sup>	Screen <sup>1)</sup>	Screen <sup>1)</sup>	Screen <sup>1)</sup>	Screen <sup>1)</sup>

<sup>1)</sup> RI 36: connected to encoder housing; RI 41: not connected to encoder housing  
<sup>2)</sup> white for Sense (T)

## Ordering data (see identification plate)

<b>0</b> Standard	Supply voltage <b>A</b> 5 VDC <b>E</b> 10 ... 30VDC (Push-pull only)	Type of flange <b>S</b> Synchro flange <b>R</b> Round flange	Shaft diameter <b>1</b> 6 mm <b>5</b> 6.35 mm
<b>R I 3 6 - 0 /</b>			
Number of pulses <b>5 ... 3,600</b>	Output <b>T</b> RS 422 + Sense <b>K</b> Push-pull short circuit proof <b>R</b> RS 422 + Alarm	Type of connection ( <sup>1)</sup> push-pull only <b>A</b> Cable axial <b>B</b> Cable radial <b>N</b> BINDER, 6 pin, axial <sup>1)</sup> <b>J</b> BINDER, 6 pin, radial <sup>1)</sup>	
Protection class <b>1</b> IP 40 <b>3</b> IP 64	<b>D</b> Push-pull 5 V, 30 mA <b>I</b> Push-pull complementary		

\* Special types are additionally marked by an ordering code -S. In this case customer specifications are to be applied. If you don't know these please call us for the specifications, indicating the encoder ordering code.

## Mechanical data

Mounting	synchro flange <sup>1)</sup> , round flange <sup>1)</sup>
Shaft diameter	<b>RI 36:</b> 6 mm/6.35 mm; <b>RI 41:</b> 6 mm
Absolute max. shaft load	radial 30 N (6.5 lbs), axial 15 N (3.3 lbs)
Max. speed	10,000 RPM
Torque	≤ 0.3 Ncm
Protection class housing/ball bearing	<b>RI 36:</b> IP 64/64 <sup>2)</sup> ; <b>RI 41:</b> IP 50/40
Operating temperature	-10 ... +70 °C
Storage temperature	-25 ... +85 °C
Vibration performance (IEC 68-2-6)	100 m/s <sup>2</sup> (10 ... 2,000 Hz)
Shock resistance (IEC 68-2-27)	1,000 m/s <sup>2</sup> (6 ms)
Connection	cable or flange box axial/radial
Housing	aluminium
Weight	<b>RI 36:</b> 80 g; <b>RI 41:</b> 60 g

<sup>1)</sup> use threads M3 for fastening

<sup>2)</sup> no standing water allowed at the shaft entrance or at the ball bearing

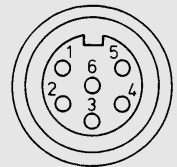
## Electrical data

General design	as per DIN VDE 0160, protection class III, contamination level 2, overvoltage class II				
Screening	connected to housing (RI 36 only)				
Power consumption	40 mA (5 V DC), 30 mA (24 V DC), 60 mA (10 V DC)				
Supply voltage $U_B$	5 V DC (SELV) ±10%		10 ... 30 V DC (SELV)		
Output circuit <sup>1)</sup>	PP	PP	RS422	PP	PP compl.
Code letter	K	D	R, T	K	I
Output load [mA]	±10	±30	±30	±30	±30
Output level [V]	High	≥2.5	≥2.5	≥2.5	$U_B - 3$
	Low	≤0.5	≤0.5	≤0.5	≤2
Pulse rise time [ns]	250	100	100	2000	2000
Max. pulse frequency [kHz]	300	300	300	200	200
Pole protection of $U_B$	yes	no	no	yes	yes
Short circuit proof	yes	1 channel	1 channel	yes	yes
Pulse duty factor	1 : 1				
Pulse width error	± 25° electrical				
Phase shift	90° (distance from Channel A to B is at least 0.45 µs, at 300 kHz)				
Pulse shape	rectangular				
Alarm output	Open Collector, NPN (5 mA, 24 V max. with $U_B = 5VDC$ ; 5 mA, 32 V max. with $U_B = 10...30VDC$ )				

<sup>1)</sup> PP=Push-pull; PP compl.=Push-pull complementary; RS422=Line driver

## Pinout of flange box (RI 36 only)

<b>Binder 6 poles</b>	
Pin	Push-pull (K, D)
1	5 V DC= / 10...30 V DC=
2	Channel A
3	Channel N
4	Channel B
5	Alarm
6	GND



<b>0</b> Standard	Supply voltage <b>A</b> 5 VDC <b>E</b> 10 ... 30VDC (Push-pull only)	Type of flange <b>R</b> Round flange	Shaft diameter <b>1</b> 6 mm
<b>R I 4 1 - 0 /</b>			
Number of pulses <b>5 ... 3,600</b>	Protection class <b>1</b> IP 40	Output <b>K</b> Push-pull short circuit proof <b>D</b> Push-pull 5 V, ± 30 mA	Type of connection <b>B</b> Cable radial