

# RGH24 series readhead



## Renishaw's RG2 linear encoder system is a non-contact optical encoder designed for position feedback solutions.

The system uses a common reflective tape scale scanned by a readhead chosen from a range of options offering industry standard digital square wave or analogue sinusoidal output signal formats.

Renishaw's unique patented optical scheme is used in all readhead series to provide high tolerance to scale contamination.

RGH24 is an ideal feedback solution wherever precision controlled movement is required.

The RGH24 readheads offer a wide selection of output configurations and their compact size and low mass makes the system ideal for small XY stages and actuators.

An integral set-up LED enables quick and easy installation.

Common applications include semiconductor/electronics manufacturing and inspection, coordinate measuring and layout machines, height gauges, linear motors, pre-press printing and a variety of custom linear motion solutions.

### Digital range

RGH24D - 5  $\mu$ m resolution

RGH24X - 1  $\mu$ m resolution

RGH24Z - 0.5  $\mu$ m resolution

RGH24W - 0.2  $\mu$ m resolution

RGH24Y - 0.1  $\mu$ m resolution

RGH24H - 50 nm resolution

RGH24I - 20 nm resolution

RGH24O - 10 nm resolution

### Analogue range

RGH24B - 1 Vpp differential

RGH24C - 12  $\mu$ A differential

- **Non-contact open optical system**
- **Compact size**
- **Low mass**
- **Integral interpolation**
- **Digital and analogue output options**
- **Resolutions from 5  $\mu$ m to 10 nm**
- **Integral set-up LED**
- **Uses RGS20-S self-adhesive scale**
- **Reference mark or limit switch capability**



## Operating and electrical specifications

### Clocked outputs

The RGH24W (0.2 µm), RGH24Y (0.1 µm), RGH24H (50 nm), RGH24I (20 nm) and RGH24O (10 nm) readheads have clocked outputs. These are designed to prevent fine edge separations being missed by receiving electronics utilising slower clock speeds. The table below shows the maximum speed and associated minimum recommended counter clock frequency for these readheads.

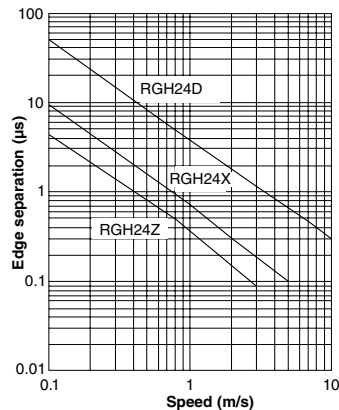
Head type	Maximum speed (m/s)	Minimum recommended counter clock frequency (MHz)
D (5 µm)	10	$\left( \frac{\text{encoder velocity (m/s)}}{\text{resolution (µm)}} \right) \times 4 \text{ safety factor}$
X (1 µm)	5	
Z (0.5 µm)	3	

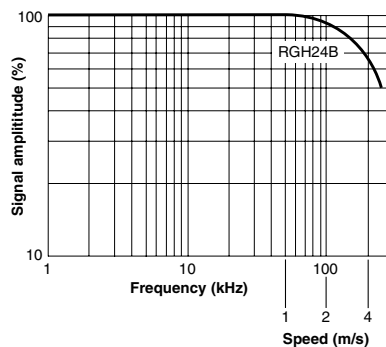
Std. option Head type	JST option Head type	Maximum speed (mm/s)					Minimum recommended counter clock frequency (MHz)
		W (0.2 µm)	Y (0.1 µm)	H (50 nm)	I (20 nm)	O (10 nm)	
30	35	—	700	350	130	65	12
31	36	—	500	250	90	45	8
32	37	700	—	—	—	—	6
33	38	500	250	120	40	20	4

**NOTE:** Maximum speeds of clocked output variants assume 3 m maximum cable length and minimum 5 V supply at readhead connector.

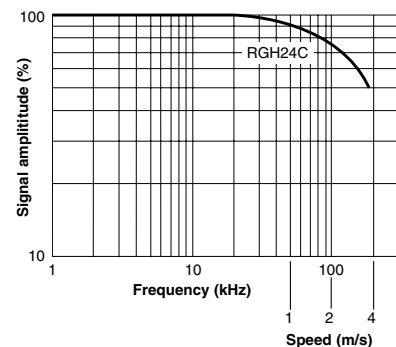
### Edge separation - digital readheads



### Speed - analogue type B readheads (1Vpp)



### Speed - analogue type C readheads (12µA)

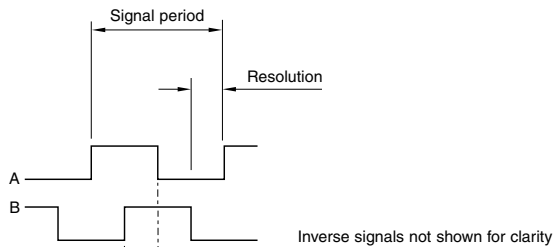


<b>Power supply</b>	5 V ± 5%	120 mA
	Ripple	200 mVpp maximum @ frequency up to 500 kHz maximum <b>NOTE:</b> For digital outputs, current consumption figures refer to unterminated readheads. A further 25 mA per channel pair (eg A+, A-) will be drawn when terminated with 120 Ω. For analogue type B readheads, a further 20 mA will be drawn when terminated with 120 Ω. Renishaw encoder systems must be powered from a 5 V dc supply complying with the requirements for SELV of standard EN (IEC) 60950.
<b>Temperature</b>	Storage -20 °C to +70 °C    Operating 0 °C to +55 °C	
<b>Humidity</b>	Storage 95% maximum relative humidity (non-condensing) Operating 80% maximum relative humidity (non-condensing)	
<b>Sealing</b>	IP40	
<b>Acceleration</b>	Operating 500 m/s²    BS EN 60068-2-7:1993    (IEC 68-2-7:1983)	
<b>Shock (non-operating)</b>	1000 m/s², 6 ms, ½ sine    BS EN 60068-2-27:1993    (IEC 68-2-27:1987)	
<b>Vibration (operating)</b>	100 m/s² max @ 55 Hz to 2000 Hz    BS EN 60068-2-6:1996    (IEC 68-2-6:1995)	
<b>Mass</b>	Readhead 11 g    Cable 34 g/m	
<b>EMC compliance (system)</b>	BS EN 61000    BS EN 55011	
<b>Cable</b>	Double-shielded maximum diameter 4.4 mm cable. Flex life >20 x 10⁶ cycles at 20 mm bend radius	
<b>Connector options</b>	<b>Code - connector type</b>	<b>Application</b>
	A - 9 pin D type plug C - 9 pin circular plug D - 15 pin D type plug L - 15 pin D type plug F - Flying lead Z - JST Connector	All readheads RGH24C RGH24D, X, Z, W, Y, H, I, O RGH24B All readheads RGH24D, X, Z, W, Y, H, I, O
<b>Electrical integration (JST connector versions)</b>	The RGH24 JST connector series readheads have been designed to the relevant EMC standards but must be correctly integrated to achieve EMC compliance. In particular attention to shielding and earthing arrangements is critical. Renishaw recommends the use of a double screened cable as used in the cable variants of the RGH24. Refer to RGH24 readhead installation guide for electrical connection information for these readheads.	

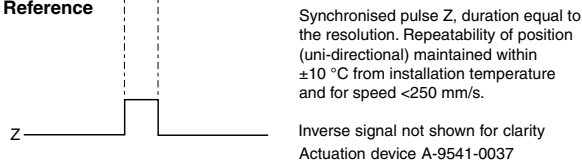
## Output specifications

### Digital output signals - type RGH24D, X, Z, W, Y, H, I, O Form - Square wave differential line driver to EIA RS422A

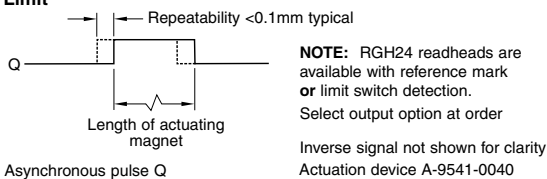
**Incremental** 2 channels A and B in quadrature (90° phase shifted)



#### Reference



#### Limit



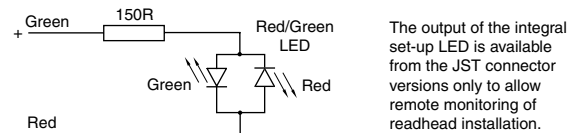
#### Alarm

3-state alarm

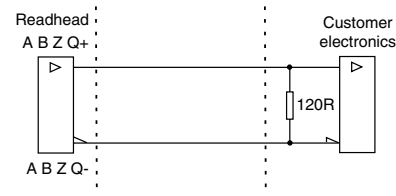
Incremental channels forced open circuit for >20 ms when signal too low for reliable operation. For RGH24W, Y, H, I and O only, incremental channels forced open circuit for >10ms when signal, too low or speed too high for reliable operation.

#### Remote LED driver

Recommended termination



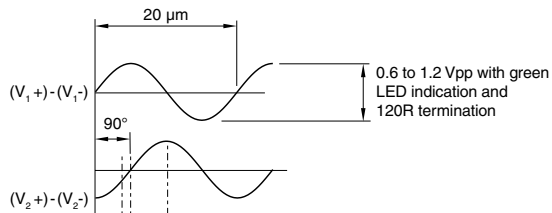
#### Recommended signal termination



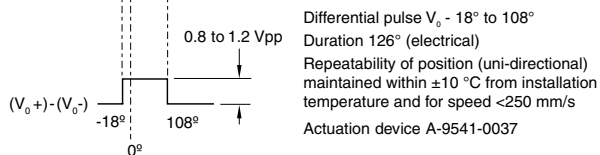
Standard RS422A line receiver circuitry. Contact Renishaw for further details on receiver termination for 3-state output

### Analogue output signals type RGH24B (1Vpp)

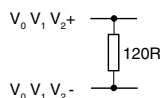
**Incremental** 2 channels  $V_1$  and  $V_2$  differential sinusoids in quadrature (90° phase shifted)



#### Reference

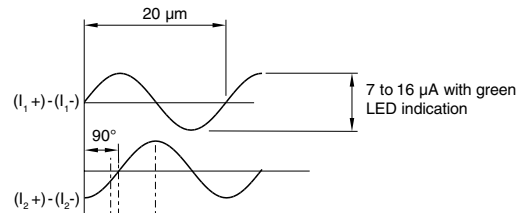


#### Termination

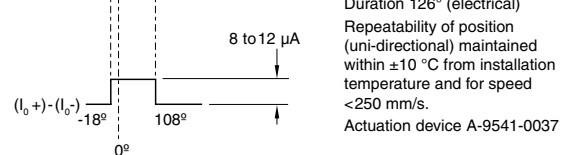


### Analogue output signals type RGH24C (12μA)

**Incremental** 2 channels  $I_1$  and  $I_2$  differential sinusoids in quadrature (90° phase shifted)



#### Reference



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