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RGH22 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 patented optical scheme is used in all readhead series and gives proven performance benefits together with high tolerance to scale contamination.

The RGH22 range is suitable for use in a broad range of applications, offering high resolution and high speed with stability and reliability.

A dual limit sensor option is also available offering two dedicated signal outputs, left and right end-of-axis travel indication.

RGH22 is an ideal feedback solution wherever precision controlled movement is required. The RGH22 readheads offer the full set of RG2 features and integral interpolation in a robust package, with an integral set-up LED for quick and easy installation.

Common applications include co-ordinate measuring and layout machines, semi-conductor/electronics manufacturing and inspection, height gauges, electronics assembly and test, linear motors, digital image setters and a variety of custom linear motion solutions.

Single limit range

RGH22D - 5 µm resolution
RGH22X - 1 µm resolution
RGH22Z - 0.5 µm resolution
RGH22Y - 0.1 µm resolution
RGH22B - 1 Vpp differential
RGH22C - 12 µA differential (no limit)

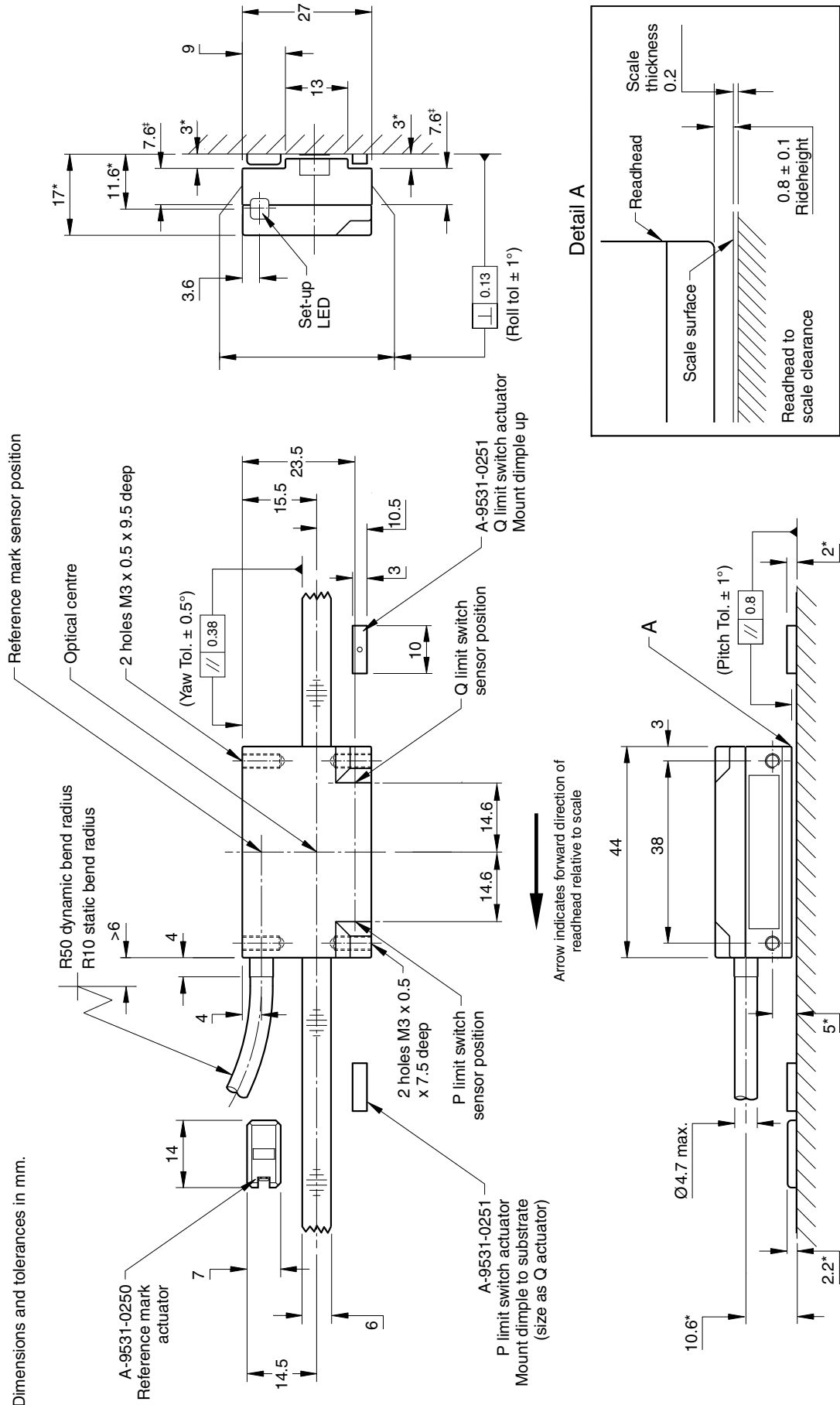
Dual limit range

RGH22P - 5 µm resolution
RGH22Q - 1 µm resolution
RGH22R - 0.5 µm resolution
RGH22S - 0.1 µm resolution
RGH22H - 50 nm resolution
RGH22A - 1 Vpp differential

- Non-contact open optical system
- Integral interpolation
- Industry standard digital and analogue output options
- Resolutions from 5 µm to 50 nm
- Integral reference and limit sensors
- Dual limit sensor option
- Integral set-up LED
- Uses RGS20-S self-adhesive scale

RGH22 Installation drawing

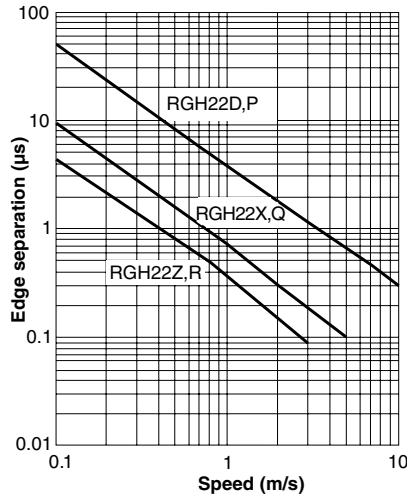
Dimensions and tolerances in mm.



* Dimensions measured from substrate. † Alternative mounting faces

Operating and electrical specifications

Edge separation - digital readheads

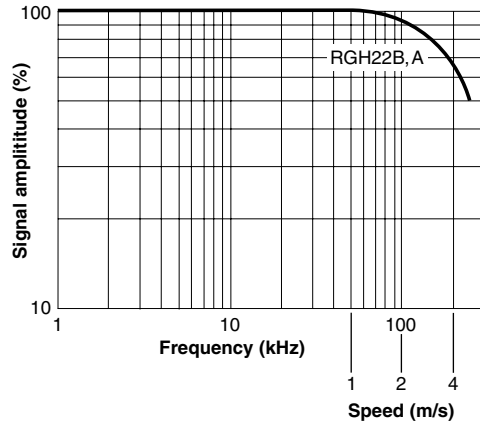


Clocked output readheads.

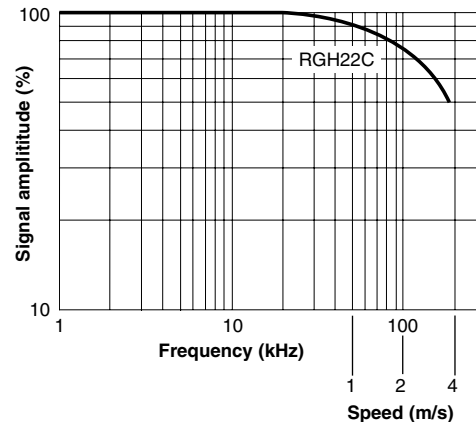
The RGH22Y, S, H readheads are available with a variety of different clocked outputs. The clocked options have been designed to prevent fine edge separations being missed by receiving electronics utilising slower clock speeds. Depending on the clock frequency chosen, each option has a different maximum speed and associated minimum recommended counter clock frequency.

Digital readheads			
Head type	Maximum speed (m/s)		Minimum recommended counter clock frequency (MHz)
D	10		$\left(\frac{\text{Encoder velocity (m/s)}}{\text{Resolution } (\mu\text{m})} \right) \times 4$ safety factor
X	5		
Z	3		
Y, S, H option	Y, S	H	
61	1.3	0.6	20
62	0.7	0.3	10
63	0.35	0.15	5

Speed - analogue type B, A readheads (1Vpp)



Speed - analogue type C readheads (12µA)



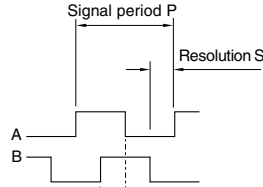
Power supply	5 V ± 5%	120 mA (typical), 200 mA RGH22Y, S, H
	Ripple	NOTE: For digital outputs, current consumption figures refer to unterminated readheads. A further 25 mA per channel pair (eg A+, A-) will be drawn when terminated with 120 Ω. Renishaw encoder systems must be powered from a 5 V dc supply complying with the requirements for SELV of standard EN (IEC) 60950. 200 mVpp @ frequency up to 500 kHz maximum.
Temperature	Storage -20 °C to +70 °C	Operating 0 °C to +55 °C
Humidity	Storage 95% maximum relative humidity (non-condensing) Operating 80% maximum relative humidity (non-condensing)	
Sealing	IP50	
Acceleration	Operating 500 m/s ² BS EN 60068-2-7:1993 (IEC 68-2-7:1983)	
Shock (non-operating)	1000 m/s ² , 6 ms, ½ sine BS EN 60068-2-27:1993 (IEC 68-2-27:1987)	
Vibration (operating)	100 m/s ² max @ 55 Hz to 2000 Hz BS EN 60068-2-6:1996 (IEC 68-2-6:1995)	
Mass	Readhead 45 g Cable 38 g/m	
EMC compliance (system)	BS EN 61000 BS EN 55011	
Cable	12 core, double shield, maximum diameter 4.7 mm. Flex life >20 x 10 ⁶ cycles at 50 mm bend radius.	
Connector options	Code - connector type	Application
	D - 15 pin D type plug R - 12 pin circular plug C - 9 pin circular plug L - 15 pin D type plug V - 12 pin circular plug W - 12 pin circular coupling F - unterminated cable X - 16 pin in-line connector	RGH22D X, Z, Y, H, P, Q, R, S RGH22D X, Z, Y, H, P, Q, R, S RGH22C RGH22B, A RGH22B RGH22B all readheads all readheads

Output specifications

Digital output signals - type RGH22D, X, Z, Y, H, P, Q, R, S

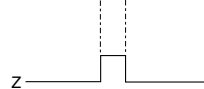
Form - Square wave differential line driver to EIA RS422A (except limit switches P, Q and external set-up signal X)

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



Model	P (µm)	S (µm)
RGH22D, P	20	5
RGH22X, Q	4	1
RGH22Z, R	2	0.5
RGH22Y, S	0.4	0.1
RGH22H	0.2	0.05

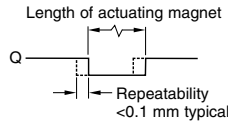
†Reference



Synchronised pulse Z, duration as resolution S. Repeatability of position (uni-directional) maintained within ±10 °C from installation temperature and for speed <250 mm/s. For RGH22Y, S, H only Z pulse re-synchronised at power-up with any one of the quadrature states (00, 01, 11, 10).

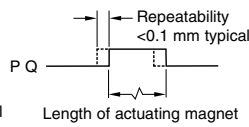
Limit open collector output

Single limit D, X, Z, Y



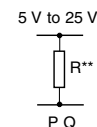
Asynchronous pulse Q
 Actuation device A-9531-0251, A-9531-2052, A-9531-2054.

Dual limit P, Q, R, S, H*



Asynchronous pulse P, Q

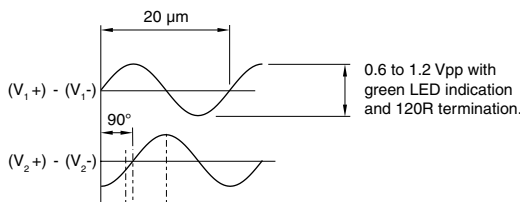
Termination



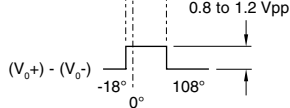
*Dual limit available with flying lead, 15 pin D connector or in-line X connector only.

Analogue output signals type RGH22B, A (1Vpp)

Incremental 2 channels V₁ and V₂ differential sinusoids in quadrature (90° phase shifted)



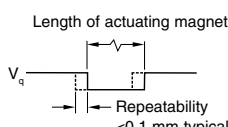
Reference



Differential pulse V₀ - 18° to 108°. Duration 126° (electrical). Repeatability of position (uni-directional) maintained within ±10 °C from installation temperature and for speed <250 mm/s. Actuation device A-9531-0250.

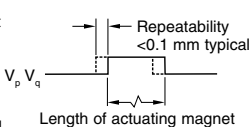
Limit open collector output

Single limit RGH22B



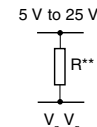
Asynchronous pulse V_q
 Actuation device A-9531-0251, A-9531-2052, A-9531-2054.

Dual limit RGH22A



Asynchronous pulse V_p, V_q

Termination

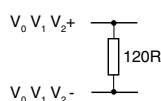


**Select R so that maximum current does not exceed 20 mA. Alternatively, use a relay or opto-isolator.

Set-up

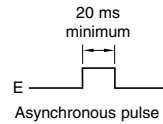
Refer to RGH22C set-up information opposite.

Termination



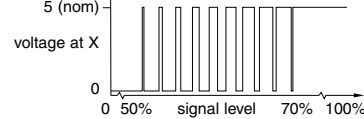
†Inverse signals not shown for clarity.

†Alarm differential line driven output for single limit readheads single ended (E-only) line driven output for dual limit readheads



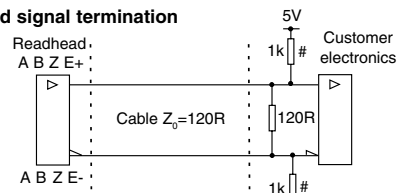
For RGH22D, X, Z, P, Q, R, - alarm asserted when signal amplitude <15%.
 For RGH22Y, S, H - alarm asserted when:
 - Signal amplitude >150%
 - Readhead exceeds specified maximum speed
 Also, outputs are 3-stated at signal amplitude <15%

Set-up



Between 50% and 70% signal level, X is a duty cycle, 20 µm duration. Time spent at 5 V increases with signal level. At >70% signal level X is nominal 5V.

Recommended signal termination

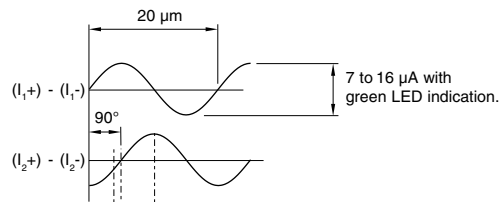


Standard RS422A line receiver circuitry.

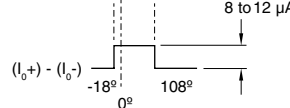
#Only required on alarm channel E for fail safe operation and to ensure alarm signal is asserted at low signal amplitude on RGH22Y, S, H when output is 3-stated.

Analogue output signals type RGH22C (12µA)

Incremental 2 channels I₁ and I₂ differential sinusoids in quadrature (90° phase shifted)

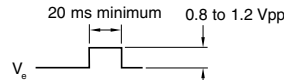


Reference



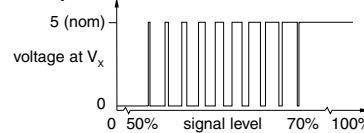
Differential pulse V₀ - 18° to 108°. Duration 126° (electrical). Repeatability of position (uni-directional) maintained within ±10 °C from installation temperature and for speed <250 mm/s. Actuation device A-9531-0250.

Alarm



Asynchronous pulse V₀
 Trigger level 15% nominal analogue signal.

Set-up



Between 50% and 70% signal level, V_x is a duty cycle, 20 µm duration. Time spent at 5 V increases with signal level. At >70% signal level V_x is nominal 5V.

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