Data sheet
L-9517-0182-04-A

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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)

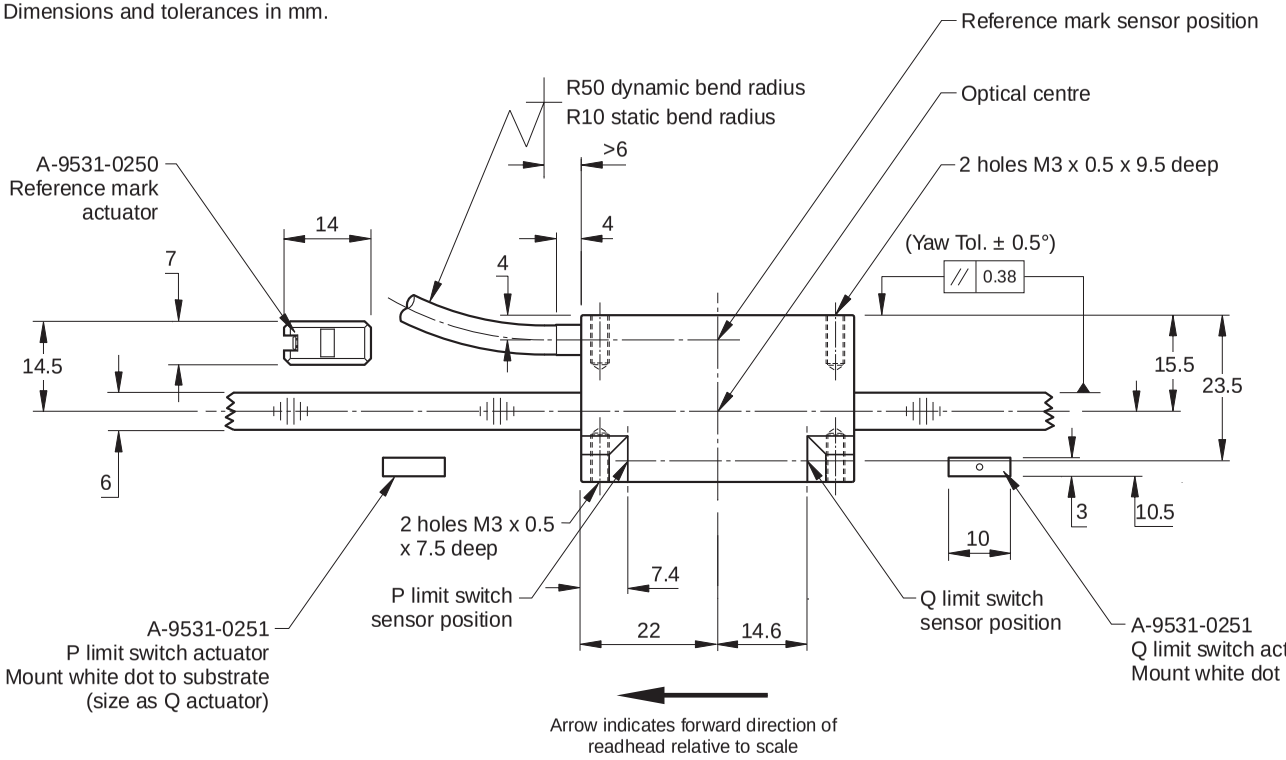
Dual limit range

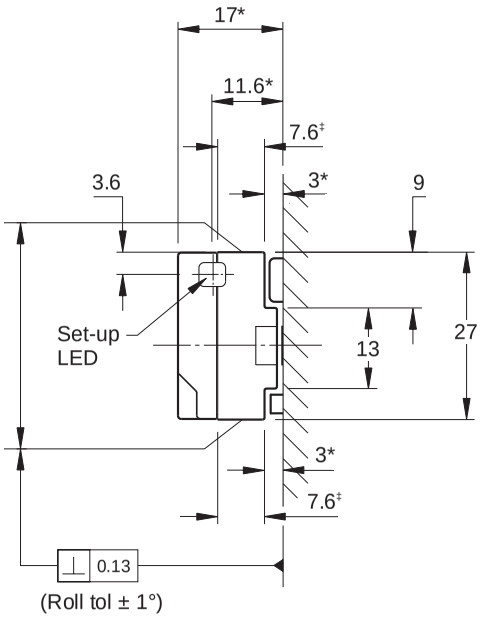
RGH22P - 5 µm resolution
RGH22Q - 1 µm resolution
RGH22R - 0.5 µm resolution
RGH22S - 0.1 µm resolution
RGH22A - 1 Vpp differential

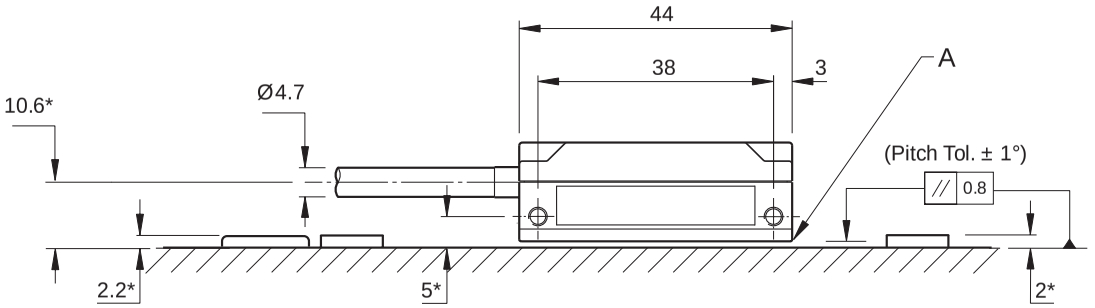
- **Non-contact open optical system**
- **Integral interpolation**
- **Industry standard digital and analogue output options**
- **Resolutions from 5 µm to 0.1 µm**
- **Integral reference and limit sensors**
- **Dual limit sensor option**
- **Integral set-up LED**
- **Uses RGS20-S self-adhesive scale**

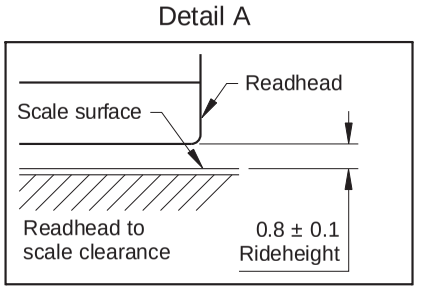
RGH22 Installation drawing

Dimensions and tolerances in mm.





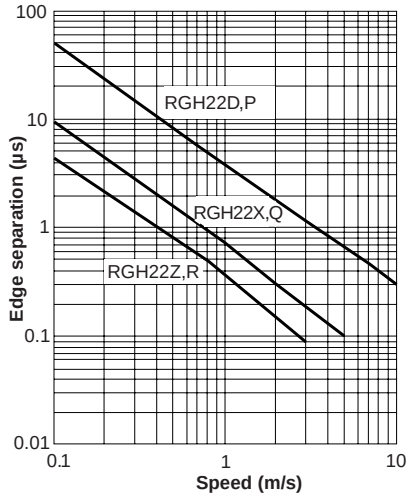




* Dimensions measured from substrate allowing for a 0.2 mm nominal scale thickness
‡ Alternative mounting faces

Operating and electrical specifications

Edge separation - digital readheads

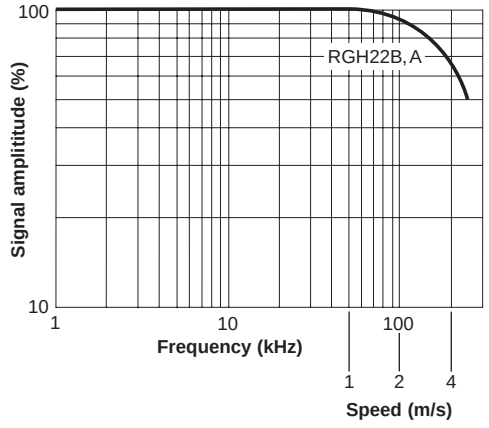


Re-timed (0.1 µm) readhead.

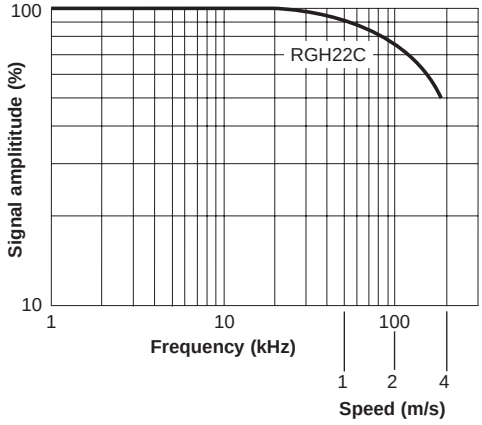
The RGH22Y,S (0.1 µm) readheads are available with a variety of different clocked or re-timed outputs. The re-timed options have been designed to prevent fine edge separations being missed by receiving electronics utilising slower clock speeds. Depending on the clock frequency chosen, each option has 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 X Z	10 5 3	$\left(\frac{\text{Encoder velocity (m/s)}}{\text{Resolution (µm)}}\right)$ x 4 safety factor
Y,S option		
00	0.7	40
15	1	20
16	0.4	8

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



Speed - analogue type C readheads (12µA)



Power supply	5 V ± 5%	120 mA (typical), 250 mA RGH22Y, S options 15 and 16 only. **NOTE:** For digital outputs, current consumption figures refer to unterminated readheads/interfaces. A further 25 mA per channel pair (eg A+, A-) will be drawn when terminated with 120 Ω. Current consumption to BS EN 61010.
	Ripple	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) (BS EN 61010-1) Operating 80% maximum relative humidity (non-condensing) (BS EN 61010-1)	
Sealing	IP50	
Acceleration	Operating 500 m/s² BS EN 60068-2-7:1993 (IEC 68-2-7:1983)	
Shock (non-operating)	1000 m/s², 6 ms, ½ sine BS EN 60068-2-27:1993 (IEC 68-2-27:1987)	
Vibration (operating)	100 m/s² 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 61326	
Cable	12 core, double shield, 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	RGH22D X, Z, Y, P, Q, R, S
	R - 12 pin circular plug	RGH22D X, Z, Y, P, Q, R, S
	C - 9 pin circular plug	RGH22C
	L - 15 pin D type plug	RGH22B, A
	V - 12 pin circular plug	RGH22B
	W - 12 pin circular coupling	RGH22B
	F - unterminated cable	all readheads
	X - 16 pin in-line connector	all readheads

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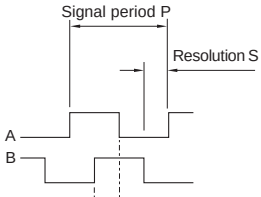
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Output specifications

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

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

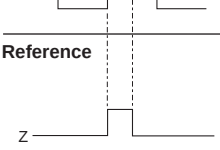
Incremental 2 channels A and B in quadrature (90° phase shifted)



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

Inverse signals not shown for clarity.

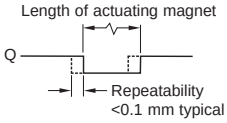
Reference



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.
Inverse signal not shown for clarity.

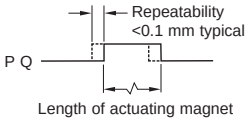
Limit open collector output

Single limit D, X, Z, Y



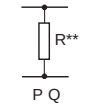
Asynchronous pulse Q

Dual limit P, Q, R, S*



Asynchronous pulse P, Q

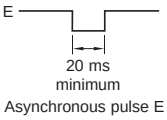
Termination



Actuation device A-9531-0251, A-9531-2052, A-9531-2054.

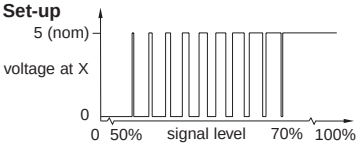
*Dual limit available with flying lead, 15 pin D connector or in-line X connector only.

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



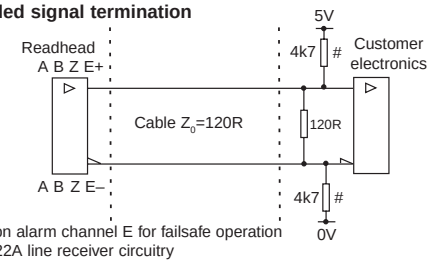
Alarm asserted for signal amplitude <15%.
For RGH22Y, S - alarm asserted when signal amplitude <45% and line driver channels 3-stated when signal amplitude <15%.
Inverse signal not shown for clarity.

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.

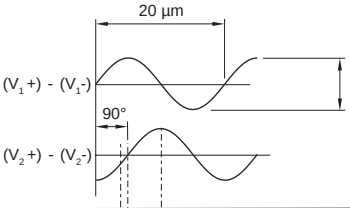
Recommended signal termination



#Only required on alarm channel E for failsafe operation
Standard RS422A line receiver circuitry

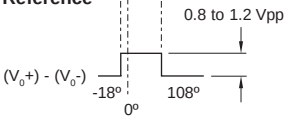
Analogue output signals type RGH22B, A (1Vpp)

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



0.6 to 1.2 Vpp with green LED indication and 120R termination.

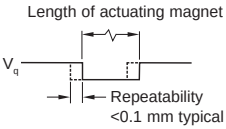
Reference



Differential pulse V_0 - 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.

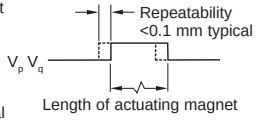
Limit open collector output

Single limit RGH22B



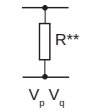
Asynchronous pulse V_q

Dual limit RGH22A



Asynchronous pulse V_p V_q

Termination



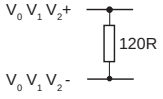
Actuation device A-9531-0251, A-9531-2052, A-9531-2054.

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

Set-up

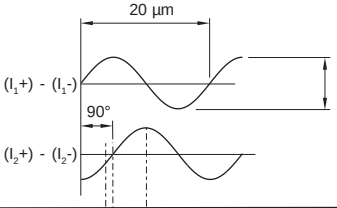
Refer to RGH22C set-up information opposite.

Termination



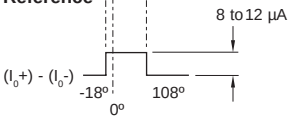
Analogue output signals type RGH22C (12µA)

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



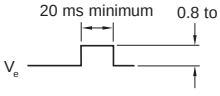
7 to 16 µA with green LED indication.

Reference



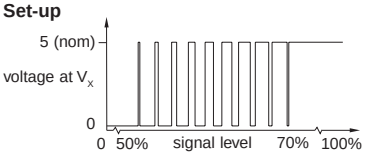
Differential pulse V_0 - 18° to 108°.
Duration 126° (electrical).
Repeatability of position (uni-directional) maintained within ±10 °C from installation temperature and for speed <250 mm/s.
Actuation device A-9531-0250.

Alarm



Asynchronous pulse V_e
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.

For worldwide contact details, please visit our main website at www.renishaw.com/contact

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