

RGH41 series readhead



Renishaw's 40 µm RGH41 series readheads offer all the benefits of the established 20 µm RG2 linear encoder system, such as reflective tape scale, patented filtering optics, set-up LED, good dirt immunity and high speed.

These compact readheads with integral interpolation provide an increased range of resolutions to match the demands of a wide range of applications, whilst their high speed enables an increase in the productivity of the end-user's system.

The 40 µm RGH41 increases the already generous set-up tolerances of the RG2, whilst maintaining Renishaw's famous contamination immunity.

For added flexibility, dual limit switch sensing is included as standard to enable dedicated signals for each end-of-axis indication, along with a repeatable reference or datum mark.

These benefits give the RGH41 greater flexibility complementing the breadth of applications in which the RG2 is already used, from co-ordinate measuring and layout machines to electronics assembly and test, linear motors and a host of custom linear motor solutions.

Digital range

RGH41T - 10 µm resolution
RGH41D - 5 µm resolution
RGH41G - 2 µm resolution
RGH41X - 1 µm resolution
RGH41N - 0.4 µm resolution
RGH41W - 0.2 µm resolution
RGH41Y - 0.1 µm resolution
RGH41H - 50 nm resolution

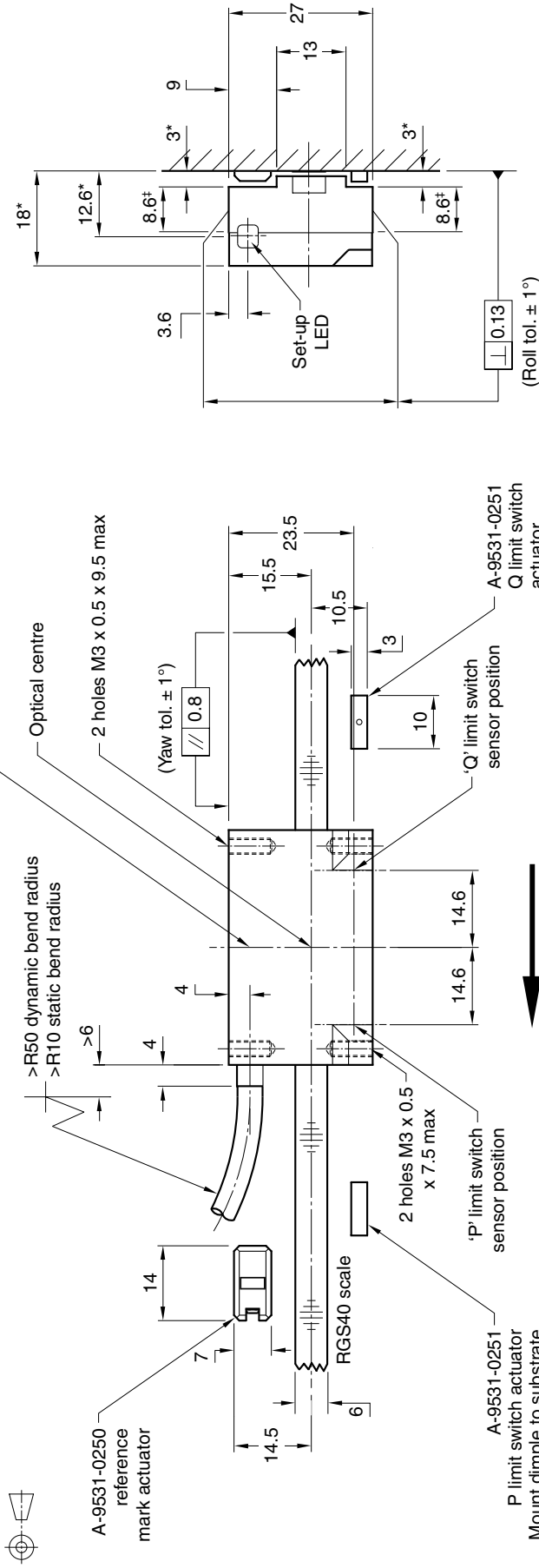
Analogue range

RGH41B - 1 Vpp differential (single limit)
RGH41A - 1 Vpp differential (dual limit)

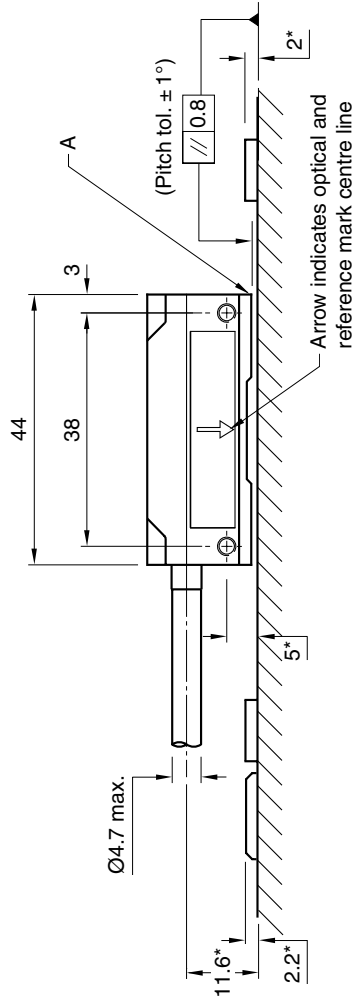
- **Non-contact open optical system**
- **Large installation tolerances**
- **High speed operation up to 15 m/s**
- **Industry standard digital and analogue output options**
- **Resolutions from 10 µm to 50 nm**
- **Integral reference and dual limit sensors**
- **Integral set-up LED**
- **Uses Renishaw RGS40-S self-adhesive scale**

RGH41 Installation drawing

Dimensions and tolerances in mm.



Arrow indicates forward direction of readhead relative to scale



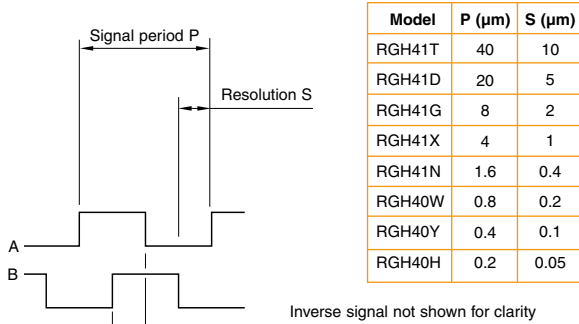
*Dimension measured from substrate
† Alternative mounting faces

Output specifications

Digital output signals - RGH41T, D, G, X, N, W, Y, H

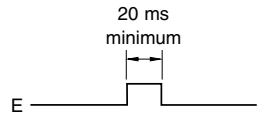
Form - square wave differential line driver to EIA RS422A (except limit switch P, Q, Alarm E- and external set-up signal X)

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



Alarm

single limit readheads - differential line driven output
dual limit readheads - single-ended line driven output



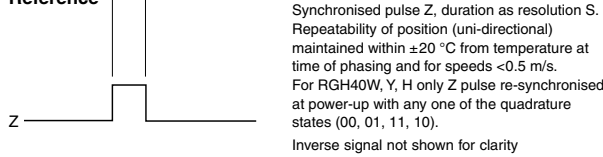
Inverse signal not shown for clarity
E- only on dual limit readheads (option 05/06)

For RGH41T, G, X alarm asserted for signal amplitude <15%. Either asynchronous pulse E as shown (options 03/05) or line driver channels 3-state (options 04-06).

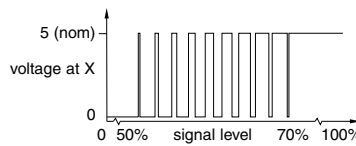
For RGH41N, W, Y, H - alarm E- asserted when:
- Signal amplitude >150%
- Readhead exceeds specified maximum speed

Also, outputs are 3-stated at signal amplitude <15%

Reference



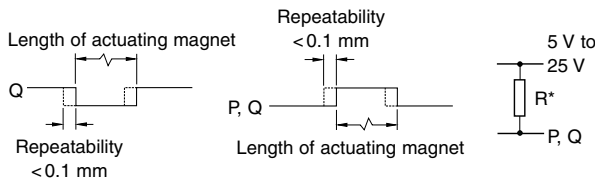
External set-up



Between 50% and 70% signal level, X is a duty cycle, 40 µm duration. Time spent at 5 V increases with signal level. At >70% signal level X is nominal 5V.

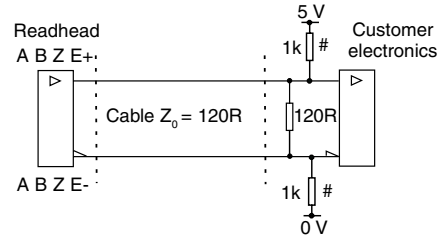
Limit open collector output

Single limit (option 03/04) Dual limit (option 05/06) Termination



Asynchronous pulse P, Q.
Actuation device A-9531-0251, A-9531-2052, A-9531-2054.
*Select R so that the maximum current does not exceed 20 mA.
Alternatively, a suitable relay or opto-isolator may be used.

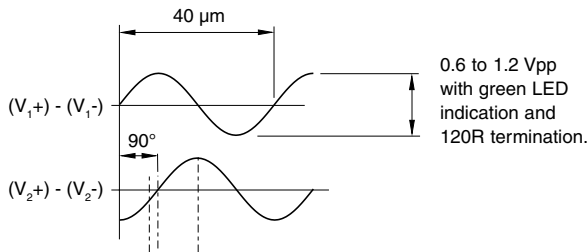
Recommended signal termination



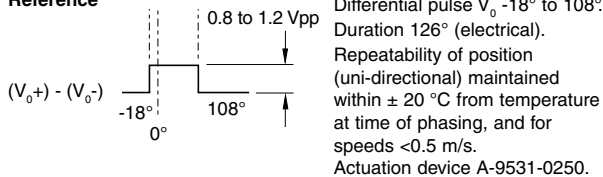
Standard RS422A line receiver circuitry.
#Only required on alarm channel E for fail safe operation and to ensure alarm signal is asserted at low signal amplitude on RGH41N, W, Y, H when output is 3-stated

Analogue output signals - RGH41A, B (1Vpp)

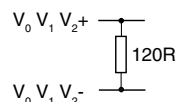
Incremental 2 channels V₁ and V₂ differential sinusoids in quadrature (90° phase shifted)



Reference

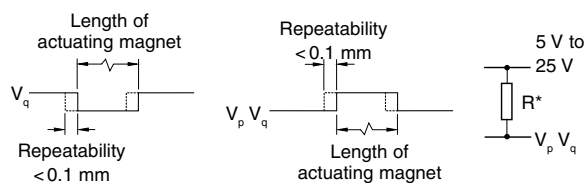


Recommended signal termination



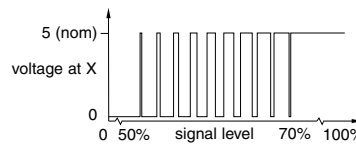
Limit open collector output

Single limit RGH41B Dual limit RGH41A Termination



Asynchronous pulse P, Q.
Actuation device A-9531-0251, A-9531-2052, A-9531-2054.
*Select R so that the maximum current does not exceed 20 mA.
Alternatively, a suitable relay or opto-isolator may be used.

External 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.

Operating and electrical specifications

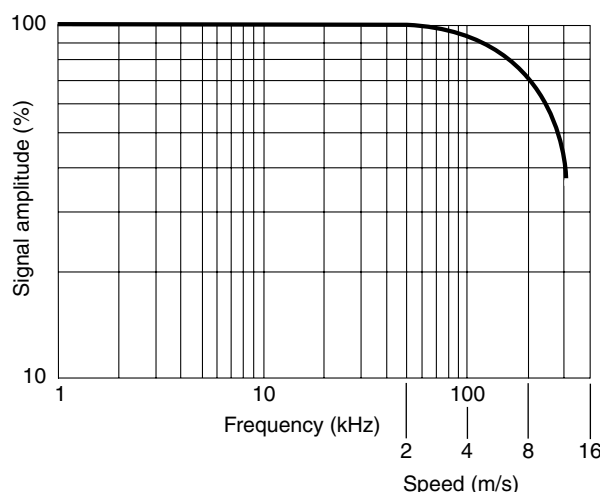
Speed performance

Clocked output readheads

The RGH41N, W, Y, 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)		
T	15		$\left(\frac{\text{Encoder velocity (m/s)}}{\text{Resolution } (\mu\text{m})} \right) \times 4$ safety factor		
D	12				
G	10				
X	6				
N, W, Y, H option	N	W	Y	H	Minimum recommended counter clock frequency (MHz)
61	3.0	2.5	1.3	0.6	20
62	2.6	1.3	0.7	0.3	10
63	1.3	0.7	0.35	0.15	5

Analogue type A/B readheads



Power supply

5 V ± 5% 120 mA (typical), 175 mA (RGH41N, W, Y, H)

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. Renishaw encoder systems must be powered from a 5 V dc supply complying with the requirements for SELV of standard EN (IEC) 60950.

Ripple <200 mVpp maximum @ 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/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 50 g Cable 38 g/m

EMC compliance (system)

BS EN 61000 BS EN 55011

Cable

12 core, double-shielded, maximum outside diameter 4.7 mm
Flex life >20 x 10⁶ cycles at 50 mm bend radius

Connector options

Code - connector type	Application
D - 15 pin 'D' type plug	RGH41T, D, G, X, N, W, Y, H
L - 15 pin 'D' type plug	RGH41A, B
V - 12 pin circular plug	RGH41B
W - 12 pin circular coupling plug	RGH41B
F - Flying lead	All readheads
X - 16 pin in line connector	All readheads

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