Data sheet
L-9517-9110-04-C

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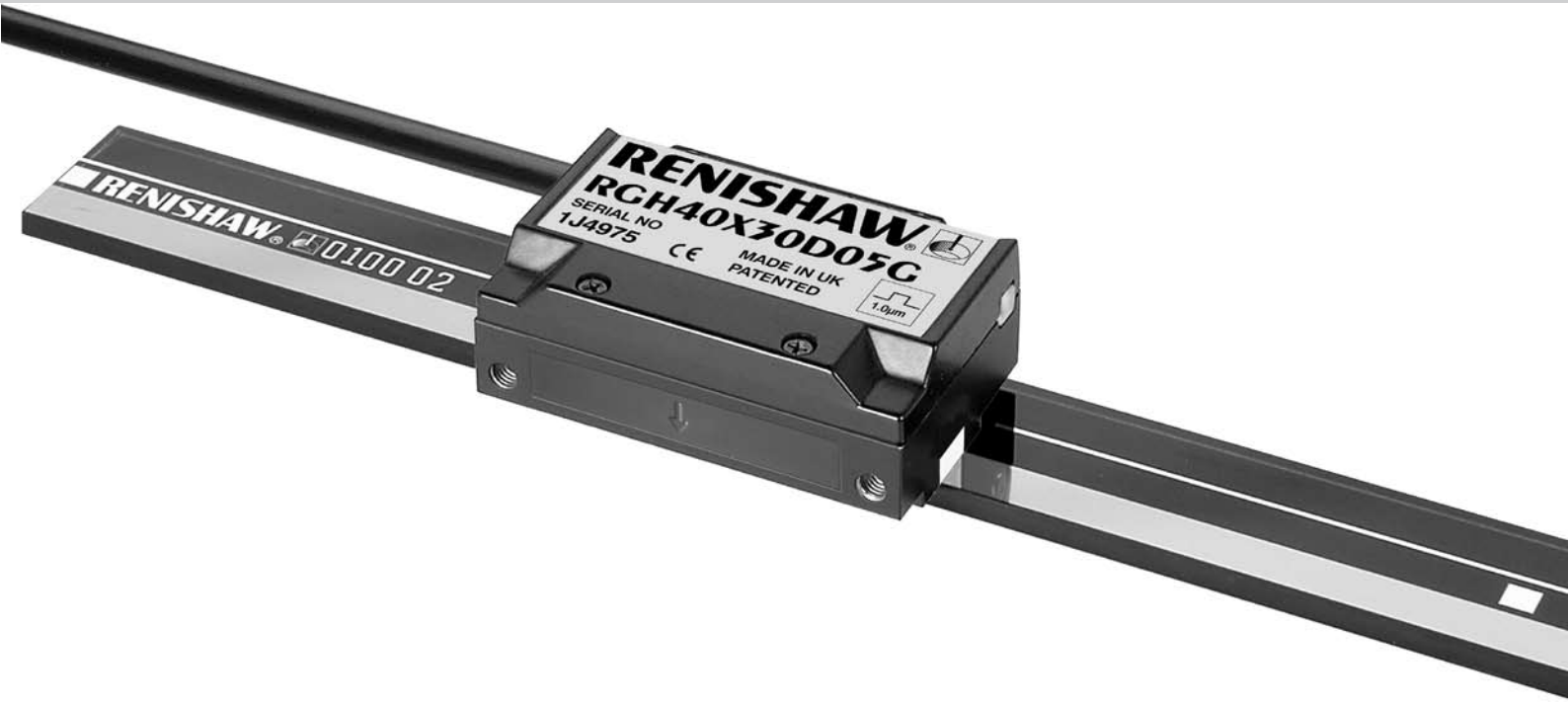
RGH40 series readhead



Renishaw's RGH40 readhead offers all the benefits of the market proven RG4 linear encoder system - high-speed, non-contact performance with filtering optics to guarantee reliable performance over light oils, dust and scratches.

The RGH40 readhead is designed for use with Renishaw's RGS40-G (40 µm pitch chrome grating) glass scale and RESR angle encoder. Enclosed within a rugged, die-cast housing, the readhead uses proven solid state components to give outstanding reliability.

Dual limit switch sensing is also included as standard to provide dedicated signals for each end-of-axis indication, together with a repeatable reference or datum mark.

Installation is quick and easy to achieve thanks to generous set-up tolerances and Renishaw's unique set-up LED that indicates when optimum conditions have been achieved. This removes the need for expensive oscilloscopes or set-up equipment.

These added benefits give RGH40 readheads greater flexibility, broadening the range of applications of the existing RG2 and RG4 systems, from co-ordinate measuring and layout machines to electronics assembly and test, high speed motion control, semiconductor manufacture and a host of custom linear motors.

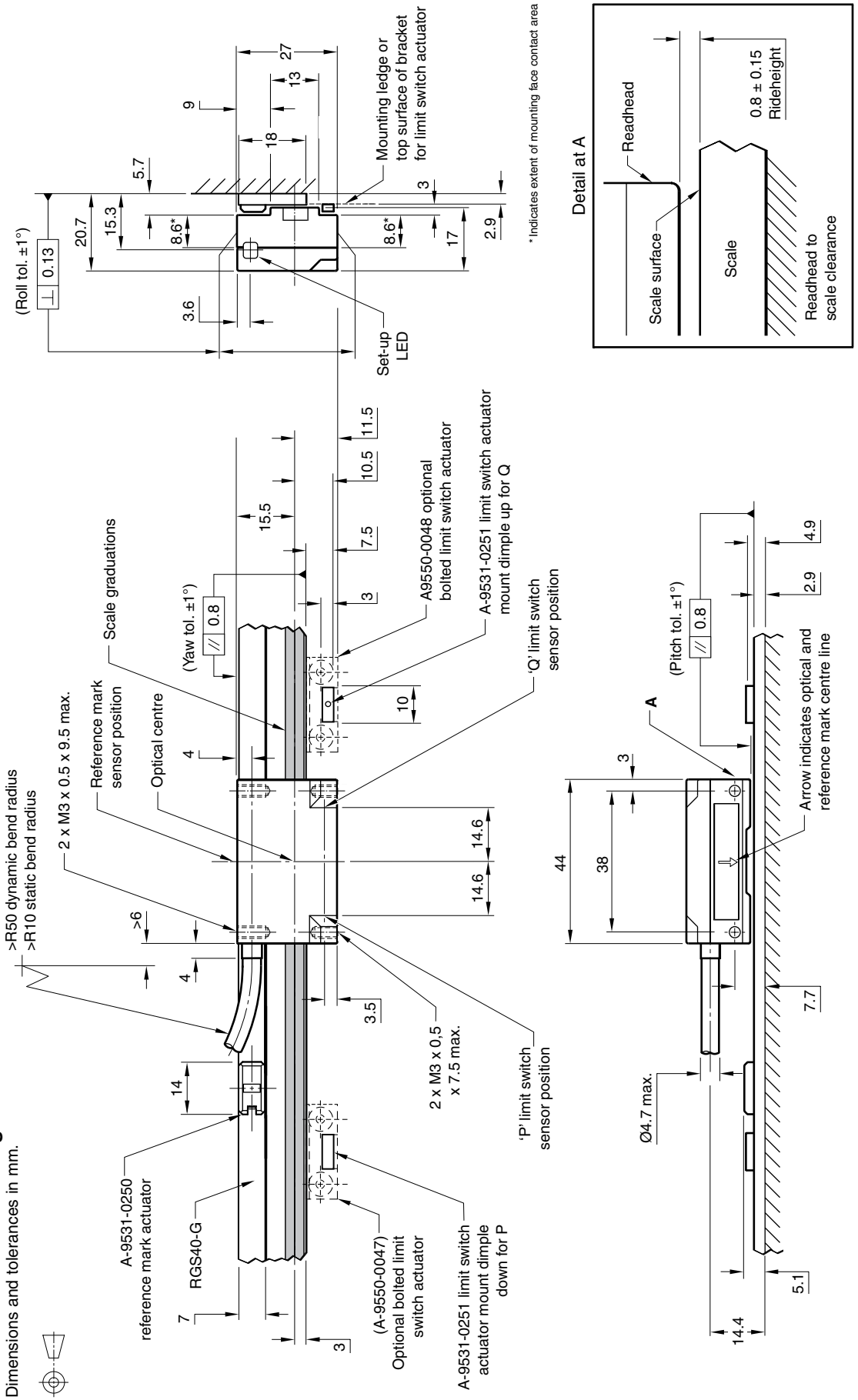
Digital range
RGH40T - 10 µm resolution
RGH40D - 5 µm resolution
RGH40G - 2 µm resolution
RGH40X - 1 µm resolution
RGH40N - 0.4 µm resolution
RGH40W - 0.2 µm resolution
RGH40Y - 0.1 µm resolution
RGH40H - 50 nm resolution

Analogue range
RGH40A - 1 Vpp differential

- Non-contact open optical system
- Large installation tolerances
- High speed operation - up to 10 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-G glass scale and RESR angle encoder

RGH40 Installation drawing

Dimensions and tolerances in mm.



NOTE: For use with RESR, see RESR installation guide (M-9559-0675)

NOTE: Mounting ledge not shown on front view

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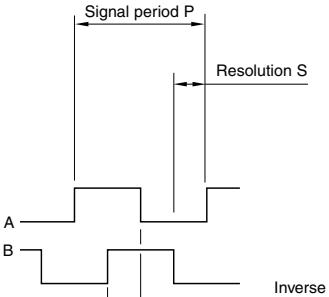
Output specifications

Digital output signals - RGH40T, 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)

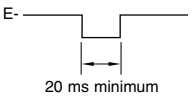
Incremental 2 channels A and B in quadrature (90° phase shifted)



Model	P (µm)	S (µm)
RGH40T	40	10
RGH40D	20	5
RGH40G	8	2
RGH40X	4	1
RGH40N	1.6	0.4
RGH40W	0.8	0.2
RGH40Y	0.4	0.1
RGH40H	0.2	0.05

Inverse signal not shown for clarity

Alarm single-ended line driver output



For RGH40T, G, X alarm asserted for signal amplitude <15%.
Either asynchronous pulse E- as shown (option 05) or line driver channels 3-state (option 06)

For RGH40N, W, Y, H - alarm E- asserted when:
- Signal amplitude >150%
- Readhead exceeds specified maximum speed

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

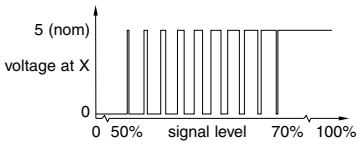
Reference

Synchronised pulse Z, duration as resolution S. Repeatability of position (uni-directional) maintained within ±20 °C from temperature at time of phasing and for speeds <0.5 m/s.

For RGH40N, W, Y, H only Z pulse re-synchronised at power-up with any one of the quadrature states (00, 01, 11, 10).

Inverse signal not shown for clarity

Set-up



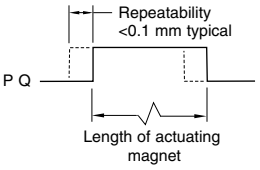
Between 50% and 70% signal level, X is a duty cycle.

Time spent at 5 V increases with signal level.

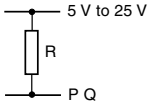
At >70% signal level X is nominal 5V.

Limit open collector output

Dual limit



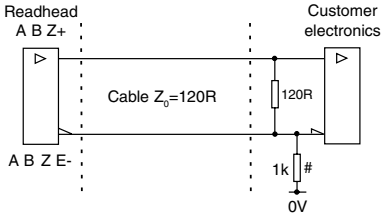
Termination



Select R so that the maximum current does not exceed 20 mA. Alternatively, a suitable relay or opto-isolator may be used

Asynchronous pulse P, Q Actuation device A-9531-0251, A-9550-0047, A-9550-0048, A-9531-2052, A-9531-2054

Recommended signal termination

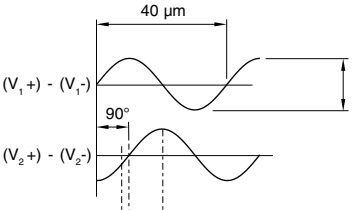


Standard RS422A line receiver circuitry.

Only required on alarm channel E- for fail safe operation and to ensure alarm signal is asserted at low signal amplitude on RGH40N, W, Y, H when output is 3-stated.

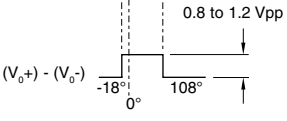
Analogue output signals - RGH40A

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



0.7 - 1.2 Vpp with green LED indication and 120R termination when signal is differentially received

Reference

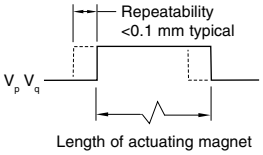


Differential pulse V_0 - 18° to 108°. Duration 126° (electrical). Repeatability of position (uni-directional) maintained within ±20 °C from temperature at time of phasing and for speeds <0.5 m/s.

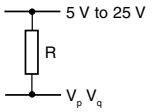
Actuation device A-9531-0250

Limit open collector output

Dual limit



Termination

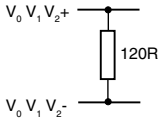


Select R so that the maximum current does not exceed 20 mA.

Alternatively, a suitable relay or opto-isolator may be used.

Asynchronous pulse V_p, V_q Actuation device A-9531-0251, A-9550-0047, A-9550-0048, A-9531-2052, A-9531-2054

Recommended signal termination



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Operating and electrical specifications

Speed performance

Clocked output readheads

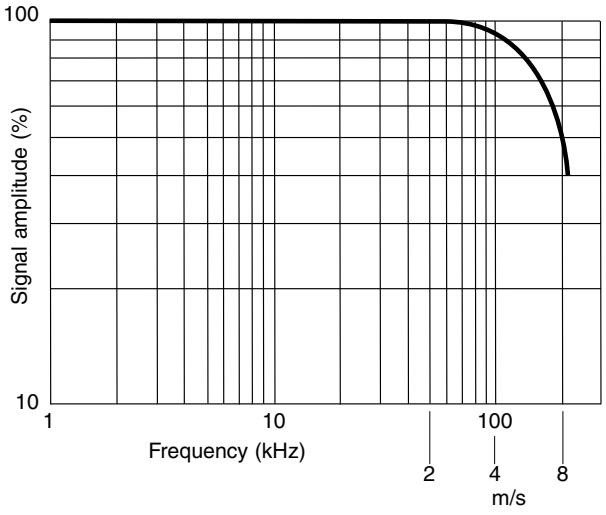
The RGH40N, W, Y, H readheads are available with a variety of different clocked outputs. The clocked options have been designed to prevent fine edge separations being missed by receiving electronics utilising slower clock speeds. Depending on the clock frequency chosen, each option has a different maximum speed and associated minimum recommended counter clock frequency.

Digital readheads

Head type	Maximum speed (m/s)		Minimum recommended counterclock frequency (MHz)		
T D G X	10 8 6 4		$\left(\frac{\text{Encoder velocity (m/s)}}{\text{Resolution (µm)}}\right)$ x 4 safety factor		
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 readheads

Characteristic applies to RGS40-G scale and RESR rings



Power supply	5 V ± 5 %	120 mA (typical), 175 mA (RGH40N, W, Y, H) **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.
	Ripple	200 mVpp @ frequency up to 500 kHz maximum.
Temperature	Storage -20 °C to +70 °C Operating 0 °C to +55 °C	
Humidity	Operating 80% maximum relative humidity (non-condensing) Storage 95% 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	BS EN 61000 BS EN 55011	
Cable	12 core, double shielded, maximum outside 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	RGH40T, D, G, X, N, W, Y, H
	L	15 pin D type plug	RGH40A
	V	12 pin circular plug	RGH40A
	W	12 pin circular coupling plug	RGH40A
	F	Unterminated cable	All readheads
	X	16 pin in-line connector	All readheads

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

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