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Installation guide
M-9531-2050-04-E

RENISHAW
apply innovation™

RGH22 series readhead



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CE

EMC compliance

The RG2 encoder system conforms to the relevant harmonised European standards for electromagnetic compatibility as detailed below.

BS EN 61326-1: 2006

Patents

Features of Renishaw's encoder systems and similar products are the subjects of the following patents and patent applications:

EP 0207121	JP 1549396	US 4959542	EP 0274491
US 4,974,962	EP 0274492	US 4926566	EP 0383901
JP 2,963,926	US 5,088,209	EP 0388453	JP 2837483
US 5,063,685	EP 0514081	JP 3,202,316	US 5,241,173
EP 0543513	JP 248,895/1993	US 5,302,820	EP 0748436
US 5,861,953	EP 826138 B	JP 506,211/1999	US 6,051,971
EP 1147377	JP 2003-512,611	US 6,588,333 B1	

Further information

For further information relating to the installation of RGH22 readheads, see also the RGH22 Data sheet (Part number L-9517-0182), and the Scale installation guide (Part number M-9517-2855). These can be downloaded from our website www.renishaw.com/encoder and are also available from your local representative.

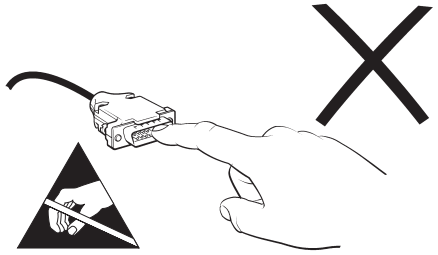
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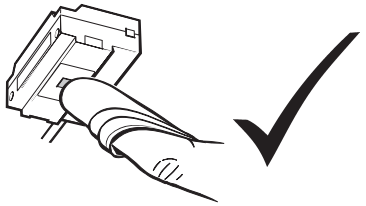
Disclaimer

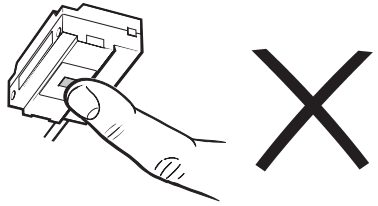
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Storage and handling

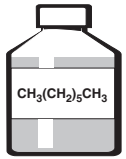


Storage and handling (continued)

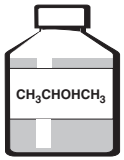




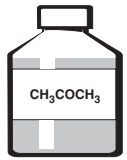
N-heptane



Propan-2-ol



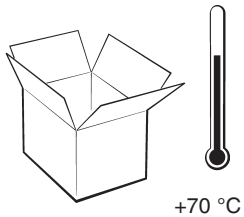
Acetone



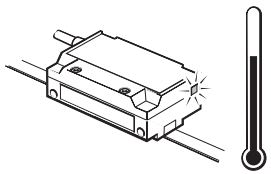




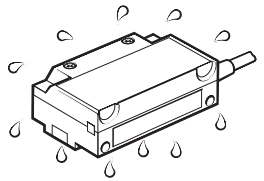




+70 °C
-20 °C



+55 °C
0 °C

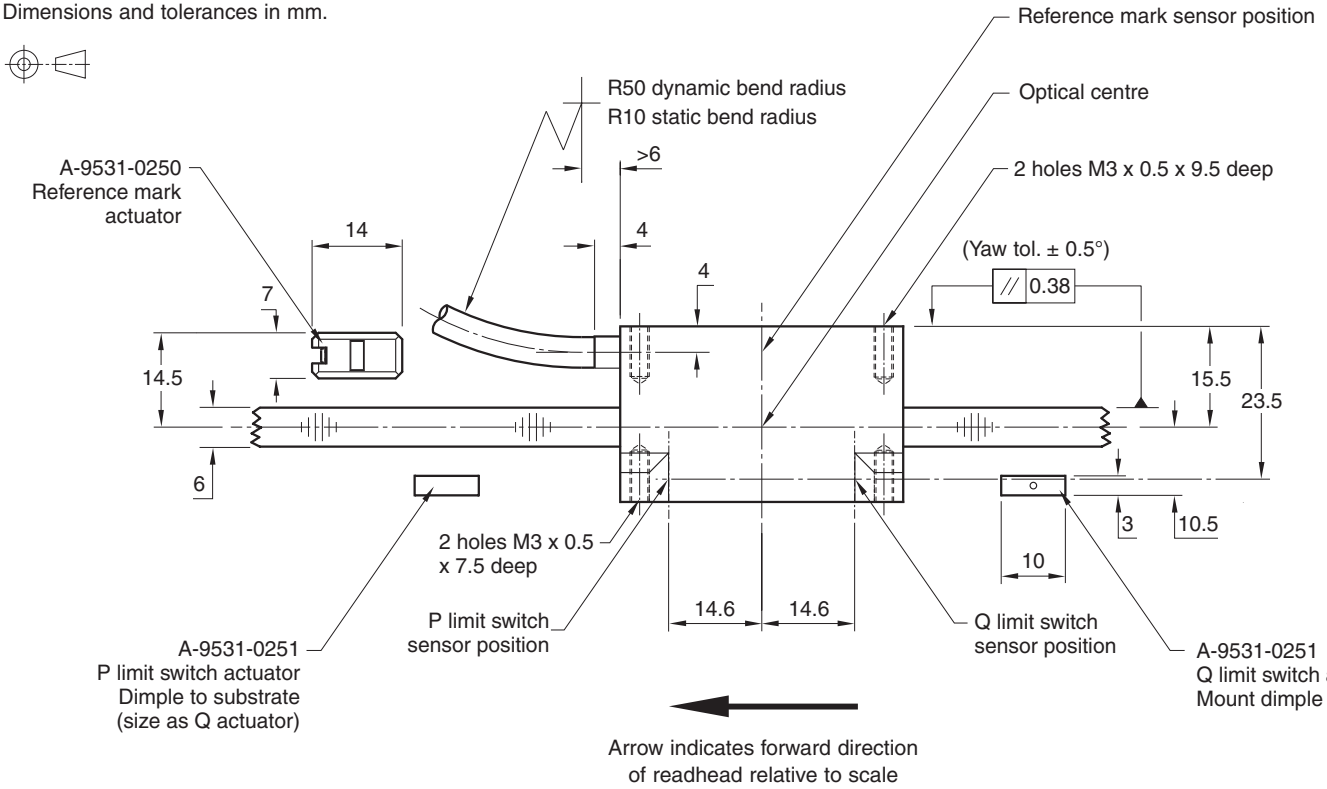


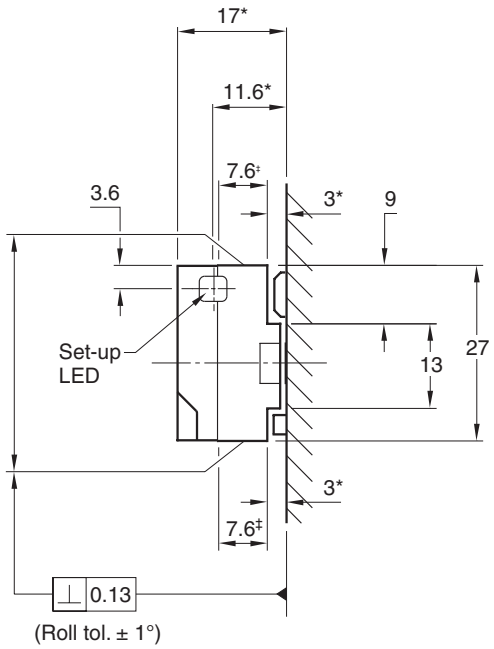
Storage <95% RH
Operating <80% RH

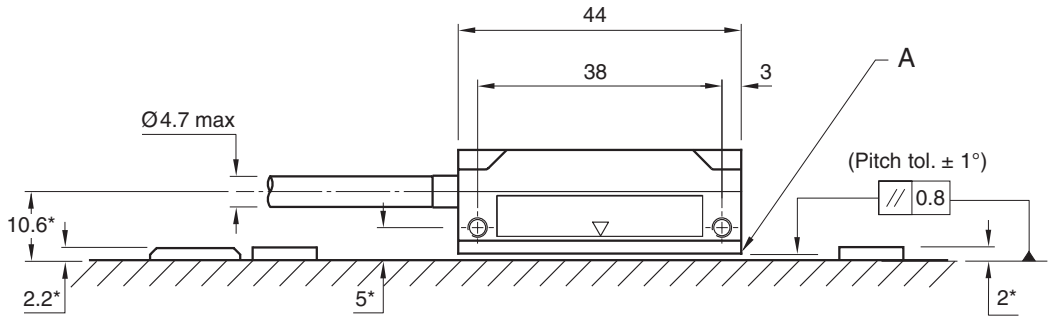
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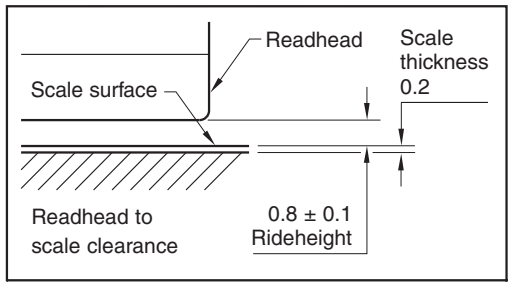
RGH22 Installation drawing

Dimensions and tolerances in mm.









* Dimensions measured from substrate
‡ Alternative mounting faces

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Readhead mounting/installation

Mounting brackets

The bracket must have a flat mounting surface, ensure conformance to the installation tolerances, allow adjustment to the rideheight of the readhead, and be sufficiently stiff to prevent deflection of the readhead during operation. For easier installation, the bracket should be adjusted for roll and yaw with respect to the axis of readhead travel before the scale is applied using the appropriate applicator. This can be done with a clock gauge and a precision square.

Readhead set-up

To set nominal rideheight, either the blue or orange readhead spacer should be positioned with the aperture under the optical centre to allow normal LED function during set-up procedure. The orange spacer also helps to position readhead with respect to offset and yaw relative to the scale. The scale, readhead optical window and mounting face should be clean and free from obstructions.

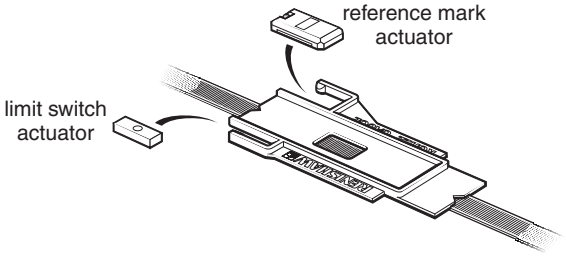
NOTE: Ensure readhead fixing screws are tightened to 0.5 Nm - 0.7 Nm.

When correctly installed, the set-up LED should be GREEN. The readhead should be moved slowly to ensure the set-up LED remains GREEN along the full axis travel.

An external set-up signal (X or V) is also available on RGH22 readheads for use where the LED is not visible. In this case, 5 V indicates optimum set-up, while a 0 V signal indicates that the set-up should be adjusted.

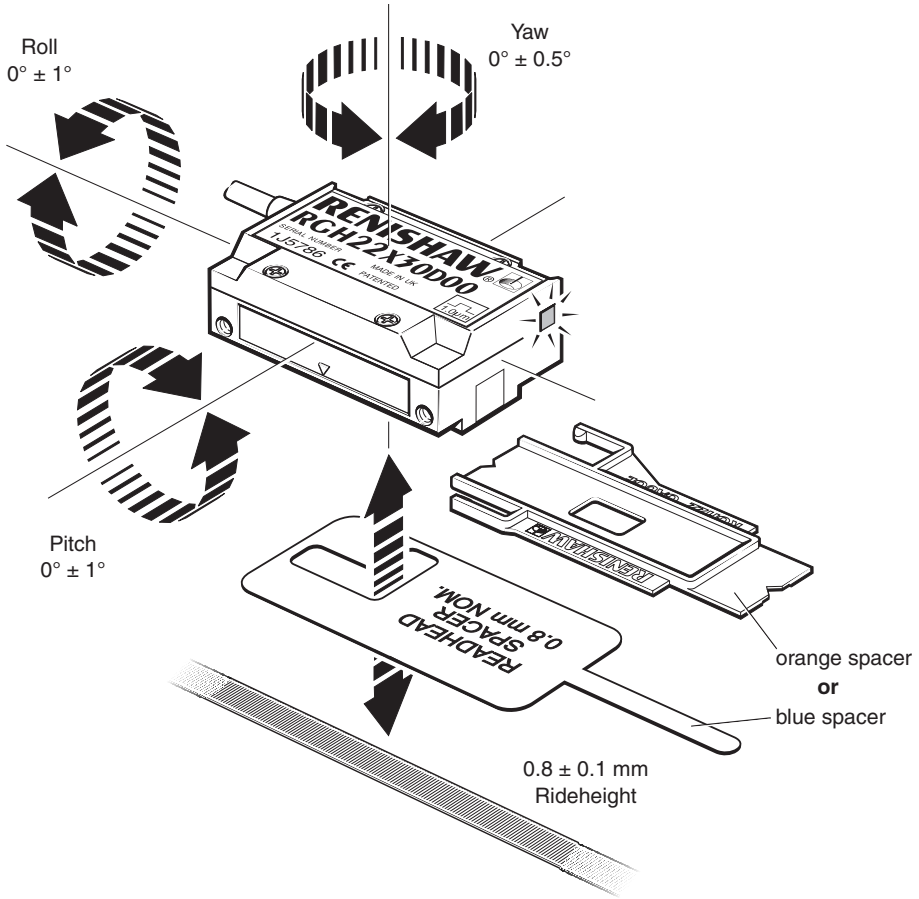
Reference mark and limit switch actuator installation

To aid location of reference mark and limit switches, the orange shim should be used as shown. For details of installation, refer to Scale installation guide (Part number M-9517-2855).



Limit switch

A limit switch signal is output when the readhead sensor passes over the magnetic actuator. For full output specification refer to RGH22 Data sheet (Part number L-9517-0182).





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Reference mark set-up

To ensure unidirectional repeatability, the reference mark requires phasing with the scale in the direction of normal datuming operation.

A reference pulse is output in both directions, but repeatability is guaranteed only in the phased direction.

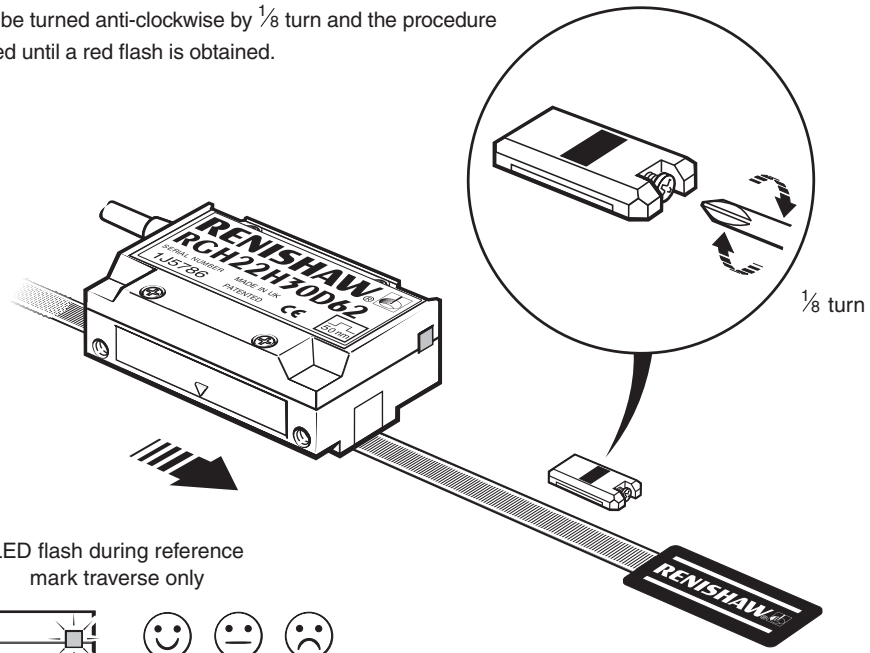
The readhead should be set up correctly ensuring a green LED indication over the full length of travel. The reference mark actuator should be installed as shown on the installation drawing.

NOTE: It is recommended that a datum procedure is performed as part of any power-up sequence to ensure the correct datum position is recorded.

NOTE: Reference mark output is synchronised with the incremental channels, giving unit of resolution pulse width. For further details see RGH22 Data sheet (Part number L-9517-0182).

Phasing procedure

The readhead must be moved over the reference mark in the direction to be used for the datuming operation. The reference mark is phased correctly when the set-up LED flashes red for 0.25 seconds. If it flashes orange or goes blank, the reference mark adjuster screw should be turned anti-clockwise by ⅛ turn and the procedure repeated until a red flash is obtained.



Connections

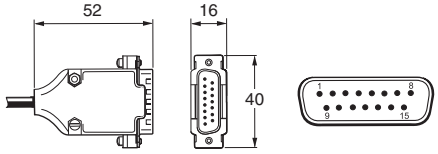
RGH22 D, X, Z, Y, H, P, Q, R, S, RS422A digital

Function	Signal		Colour	15 pin D type (D)	12 pin circular (R)	15 pin reversed count D type (E)	In-line connector (X)
Power	5 V		Brown	7	2	7	A
			Brown (link)	8	12	8	M
	0 V		White	2	10	2	B
			White (link)	9	11	9	N
Incremental signals	A	+	Green	14	5	13	G
		-	Yellow	6	6	5	D
	B	+	Blue	13	8	14	R
		-	Red	5	1	6	F
Reference mark	Z	+	Violet	12	3	12	K
		-	Grey	4	4	4	O
*Limit switch	Q		Pink	10	–	10	H
Alarm	E	+	Black	11	9	11	I
		-	Orange	3	7	3	P
External set-up	X		Clear	1	–	1	E
Shield	Inner		Green/Yellow	15	11 (link)	15	L
	Outer		–	Case	Case	Case	Case

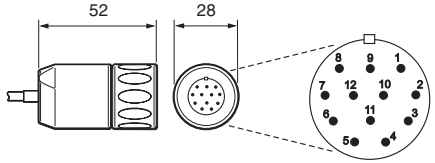
* **NOTE:** Dual limit versions (P, Q, R, S and H) utilise the black wire (pin 11) as the P limit output.
The 'E' alarm signal on these versions is only available at the orange wire as a single-ended E- output.
Dual limit readheads are only available with F, D, E or X terminations.

Alarm
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%

15 pin D type plug (termination code D, E, L)



12 pin circular plug (termination code R, V)



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Connections

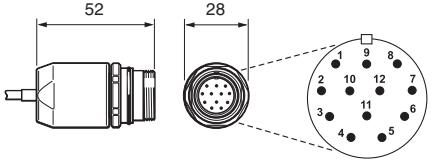
RGH22 A, B 1 Vpp analogue

Function	Signal		Colour	15 pin D type (L)	12 pin circular (V)	12 pin circular coupling (W)	In-line connector (X)
Power	5 V		Brown	4	2	2	A
			Brown (link)	5	12	12	M
	0 V		White	12	10	10	B
			White (link)	13	11	11	N
Incremental signals	V_1	+	Red	9	5	5	F
		-	Blue	1	6	6	R
	V_2	+	Yellow	10	8	8	D
		-	Green	2	1	1	G
Reference mark	V_0	+	Violet	3	3	3	K
		-	Grey	11	4	4	O
****Limit switch**	V_q		Pink	8	N/C	N/C	H
External set-up	V_x		Clear	7	N/C	N/C	E
Reference mark uni-directional operation	BID		Black	6	9†	9††	I
	DIR		Orange	14	7†	7††	P
Shield	Inner		Green/Yellow	15	11 (link)	11 (link)	L
	Outer		–	Case	Case	Case	Case

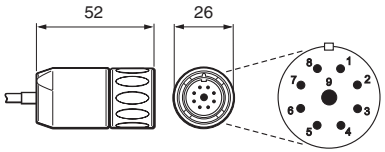
**NOTE: Dual limit versions (A) utilise the clear wire (pin 7) as the V_P limit output. The V_X external set-up signal on these versions is not available. Dual limit readheads are only available with F, L or X terminations.

†Only connected with option 17
††Only connected with option 18

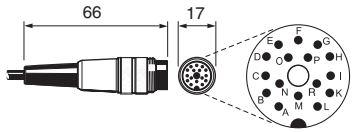
12 pin circular coupling plug (termination code W)



9 pin circular plug (termination code C)



In-line connector plug (termination code X)



RGH22 A, B 1 Vpp analogue (continued)

The RGH22 reference mark output is not repeatable in both directions. Certain controllers will flag an error when they see different reference mark positions in the forward and reverse directions.
BID DIR pins allow the readhead to be configured to ignore the reference pulse output in the unphased direction (see section Reference mark set-up).

BID/DIR connections

BID/DIR connection	To:-	Reference mark output direction
For bi-directional operation (normal)		
BID	+5 V or not connected	Forward **and** reverse
DIR	Do not connect	
For uni-directional operation		
BID	0 V	
DIR	+5 V or not connected	Forward **only**
DIR	0 V	Reverse **only**

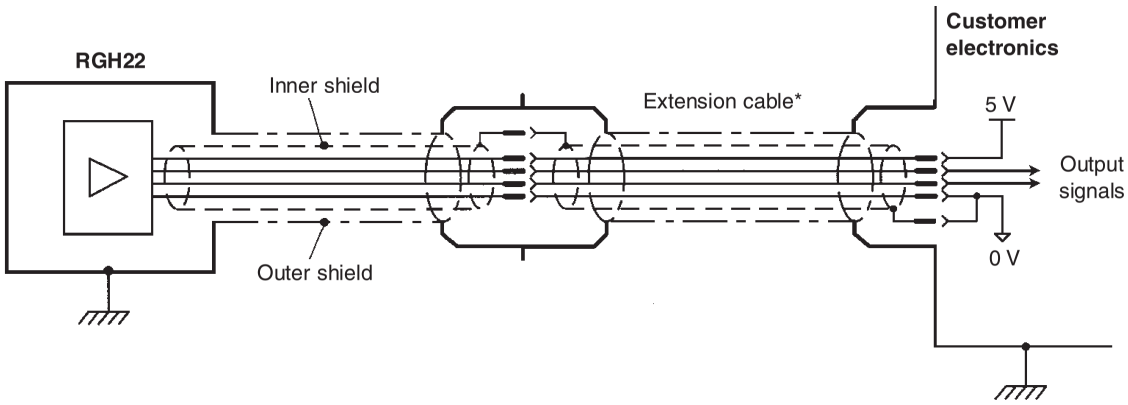
RGH22C 12 µA analogue

Function	Signal		Colour	9 pin circular (C)	In-line connector (X)
Power	5 V		Brown	6	A
			Orange	–	E
	0 V		White	5	B
			Pink	–	H
Incremental signals	I_1	+	Green	8	G
		-	Yellow	7	D
	I_2	+	Blue	4	R
		-	Red	3	F
Reference mark	I_0	+	Violet	2	K
		-	Grey	1	O
Alarm	V_e		Black	–	P
External set-up	V_x		Clear	–	I
Shield	Inner		Green/Yellow	9	L
	Outer		–	Case	Case

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Electrical connections

Grounding and shielding



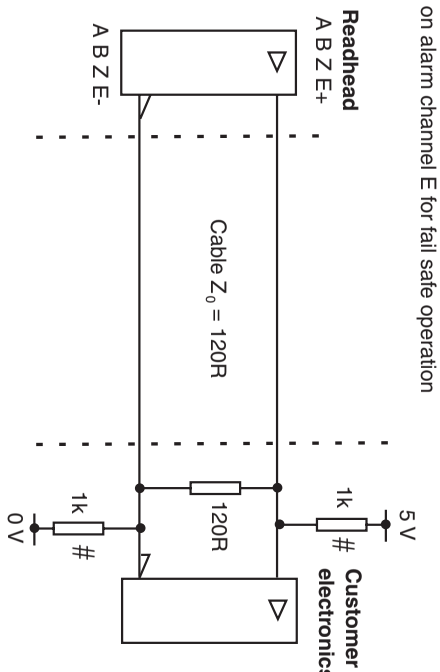
*Maximum extension cable length

RGH22B-100 m, RGH22D, X, Z, P, Q, R-50 m, RGH22C-30 m, RGH22Y, S, H-20 m

IMPORTANT: The outer shield should be connected to the machine earth (Field Ground). The inner shield should be connected to 0V. Care should be taken to ensure that the inner and outer shields are insulated from each other. If the inner and outer shields are connected together, this will cause a short between 0V and earth, which could cause electrical noise issues.

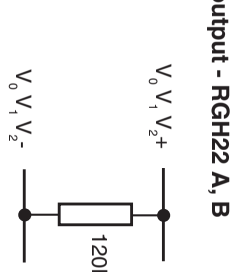
Recommended signal termination

Digital outputs - RGH22 D, X, Z, Y, H, P, Q, R, S, RS422A

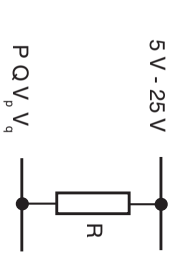


#Only required on alarm channel E for fail safe operation

Analogue output - RGH22 A, B



Limit output



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

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General specifications

Power supply	5 V ± 5%	120 mA typical 200 mA RGH22Y, S, 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
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, 1/2 sine BS EN 60068-2-27:1993 (IEC 68-2-27:1987)
Vibration	operating	100 m/s^2, 55 Hz to 2000 Hz BS EN 60068-2-6:1996 (IEC 68-2-6:1995)
Mass	Readhead	45 g
	Cable	38 g/m
Cable		12 core, double shielded, maximum diameter 4.7 mm Flex life >20 x 10^6 cycles at 50 mm bend radius

The RGH22 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 essential.

NOTE: Class 1M LED product. LED radiation. Do not view directly with optical instruments.

Readhead part numbers

RGH22 D 15 D 00A

Options

00A - standard (RGH22A, B, C, D, P, Q, R, X, and Z only)
17A - analogue output 1 Vpp, V termination with BID/DIR (RGH22B only)
18A - analogue output 1 Vpp, W termination with BID/DIR (RGH22B only)
20A - 3-state error annunciation (RGH22D, P, Q, R, X and Z only)
61A - 20 MHz customer clock, (RGH22Y, S, and H only)
62A - 10 MHz customer clock, (RGH22Y, S, and H only)
63A - 5 MHz customer clock, (RGH22Y, S, and H only)

Termination

C - 9 pin circular plug (RGH22C only)
D - 15 pin D type plug (RGH22D, H, P, Q, R, S, X, Y, and Z only)
F - unterminated cable
L - 15 pin D type plug (RGH22A and B only)
R - 12 pin circular plug (RGH22D, X, Y and Z only - limits not available)
S - to be used in conjuction with options 17A and 18A (RGH22B only - limits not available)
V - 12 pin circular plug for analogue (RGH22B only - limits not available)
W- 12 pin circular coupling (RGH22B only - limits not available)
X - 16 pin in-line connector

Cable length

05 - 0.5 m
10 - 1 m
15 - 1.5 m
20 - 2 m
30 - 3 m
50 - 5 m

Output

Analogue
A - 1 Vpp (dual limits)
B - 1 Vpp (single limit)
C - 12 µA (limits not available)

Digital
D - 5 µm (single limit)
P - 5 µm (dual limits)
X - 1 µm (single limit)
Q - 1 µm (dual limits)
Z - 0.5 µm (single limit)
R - 0.5 µm (dual limits)
Y - 0.1 µm (single limit)
S - 0.1 µm (dual limits)
H - 50 nm (dual limits)

Readhead series

NOTE: Not all combinations are valid. Check valid options online at www.renishaw.com/epc

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Renishaw plc
New Mills, Wotton-under-Edge,
Gloucestershire GL12 8JR
United Kingdom

T +44 (0)1453 524524
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E uk@renishaw.com

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