Installation guide
M-9553-9433-05-A

RENISHAW
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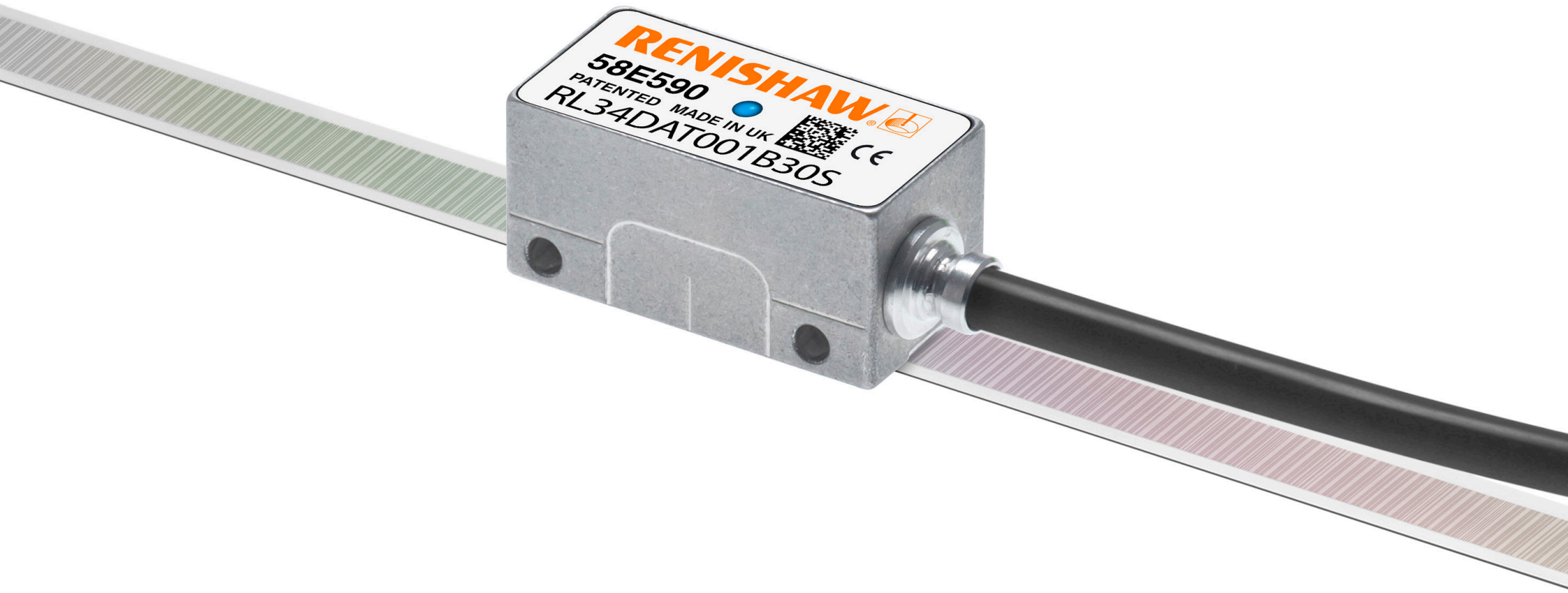
RESOLUTE™ RTLA-S absolute linear encoder system



Contents

Product compliance

CE

Renishaw plc declares that RESOLUTE complies with the applicable standards and regulations.
A copy of the EC Declaration of Conformity is available on request.

FCC compliance

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The user is cautioned that any changes or modifications not expressly approved by Renishaw plc or authorised representative could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

NOTE: This unit was tested with shielded cables on the peripheral devices. Shielded cables must be used with the unit to ensure compliance.

RoHS compliance

Compliant with EC directive 2011/65/EU (RoHS)

Patents

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

CN1260551	US7499827	JP4008356	GB2395005	CN1314511
EP1469969	JP5002559	CN102197282	EP2350570	JP2012507028
US20110173832	KR20110088506	CN102388295	EP2417423	KR20120014902
US2012007980	CN102460077	EP2438402	US20120072169	KR20120026579

Further information

Further information relating to the RESOLUTE encoder range can be found in the RESOLUTE Data sheets. These can be downloaded from our website www.renishaw.com/encoder and are also available from your local representative. This document may not be copied or reproduced in whole or in part, or transferred to any other media or language, by any means without the written prior permission of Renishaw.
The publication of material within this document does not imply freedom from the patent rights of Renishaw plc.

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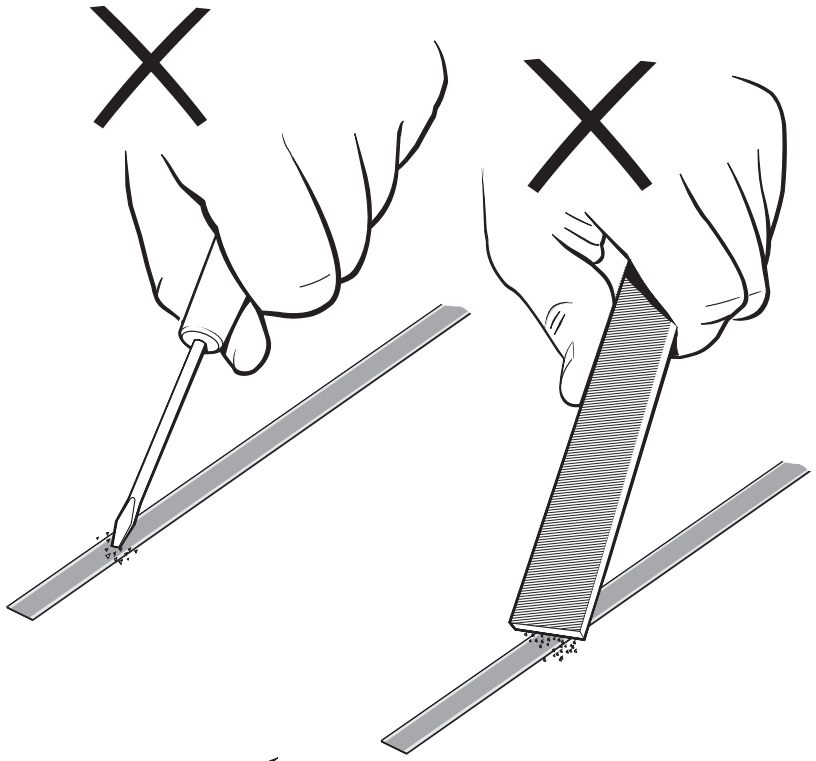
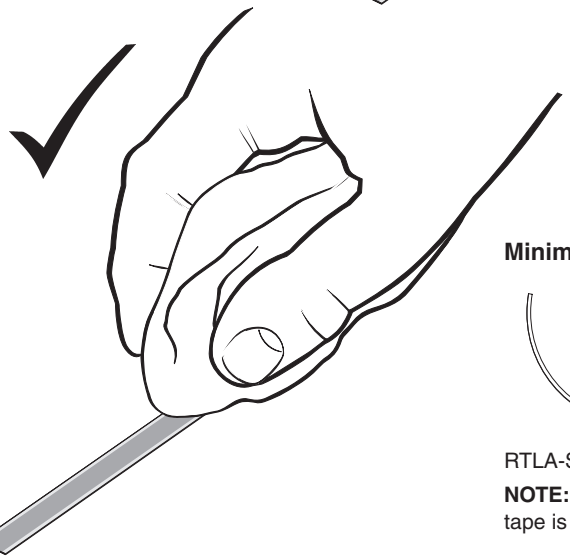
The packaging of our products contains the following materials and can be recycled.

Packaging Component	Material	ISO 11469	Recycling Guidance
Outer box	Cardboard	Not applicable	Recyclable
	Polypropylene	PP	Recyclable
Inserts	Low Density Polyethylene Foam	LDPE	Recyclable
	Cardboard	Not applicable	Recyclable
Bags	High Density Polyethylene Bag	HDPE	Recyclable
	Metalised Polyethylene	PE	Recyclable

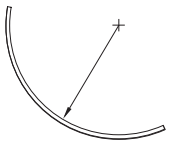
The use of this symbol on Renishaw products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic equipment (WEEE) to enable reuse or recycling. Correct disposal of this product will help to save valuable resources and prevent potential negative effects on the environment. For more information, please contact your local waste disposal service or Renishaw distributor.

Storage and handling





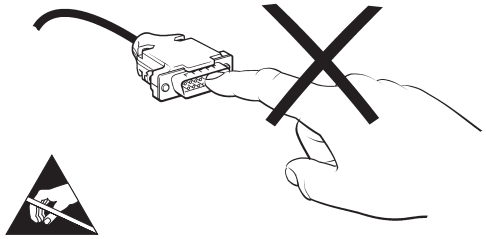
Minimum bend radius

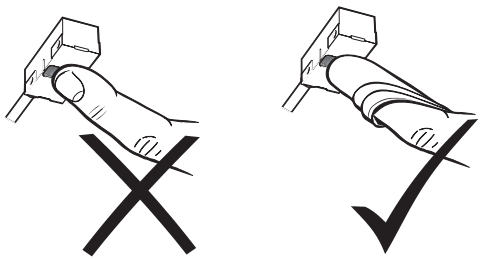


RTLA-S – 150 mm

NOTE: Ensure self-adhesive tape is on outside of bend.

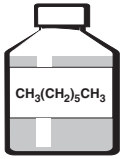
Readhead and DRIVE-CLiQ interface



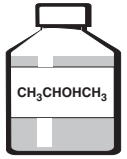


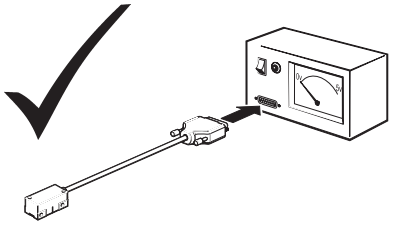
Scale and readhead

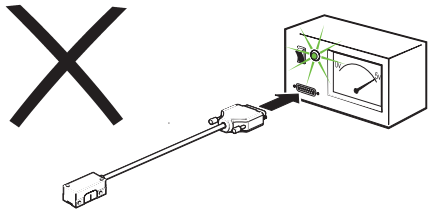
N-heptane



Propan-2-ol

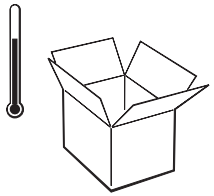






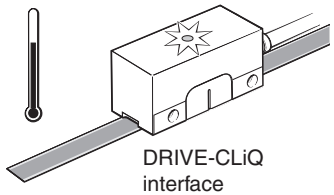
Storage

System
Standard UHV
+80 °C +80 °C
-20 °C 0 °C
Bakeout +120 °C



Operating

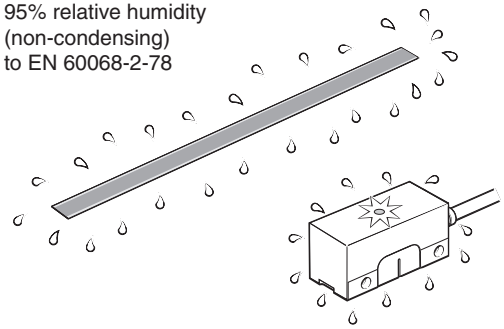
Standard
Readhead UHV
+80 °C +75 °C
0 °C 0 °C



DRIVE-CLiQ
interface
+55 °C
0 °C

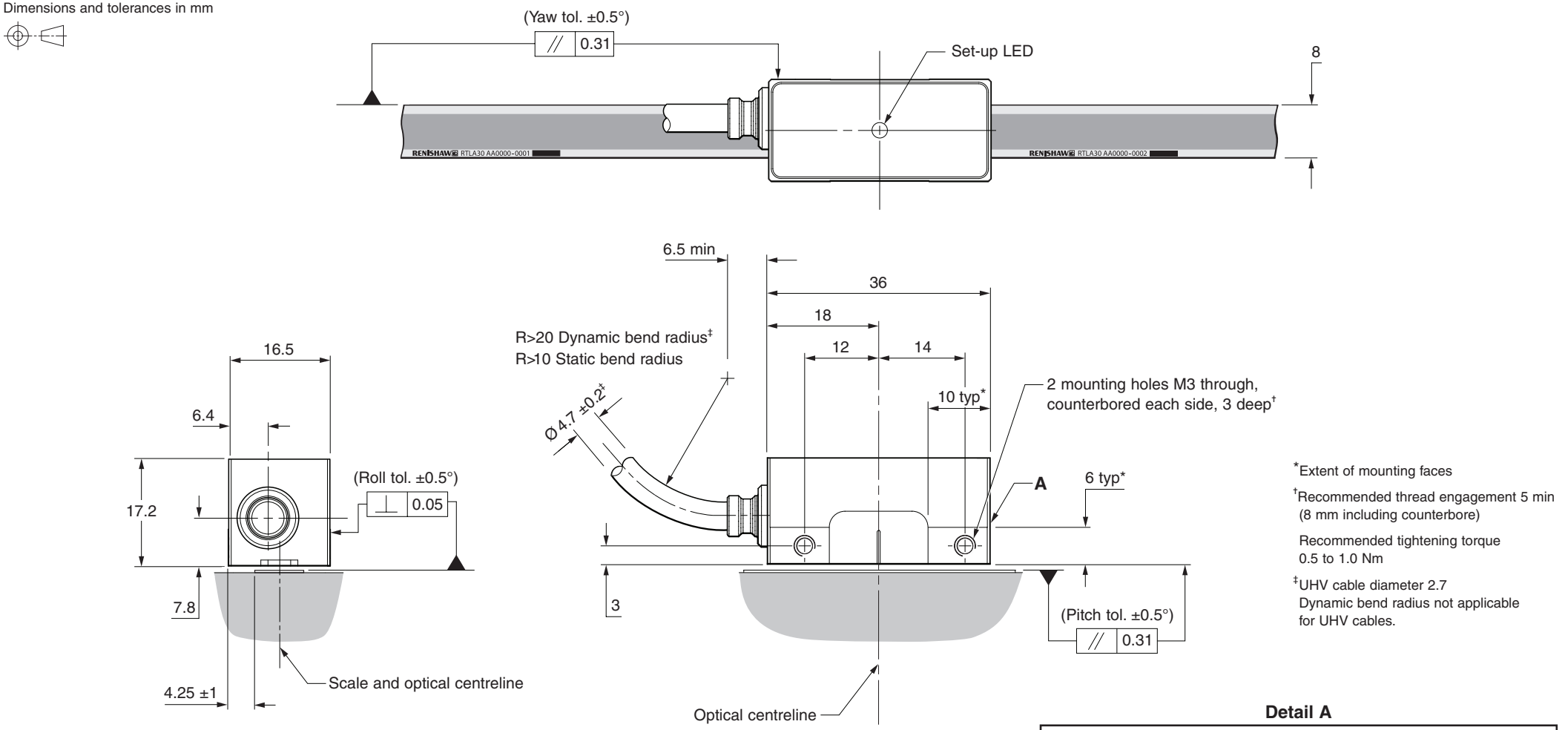
Humidity

95% relative humidity
(non-condensing)
to EN 60068-2-78



Installation drawing: RESOLUTE readhead

Dimensions and tolerances in mm



*Extent of mounting faces

†Recommended thread engagement 5 min (8 mm including counterbore)

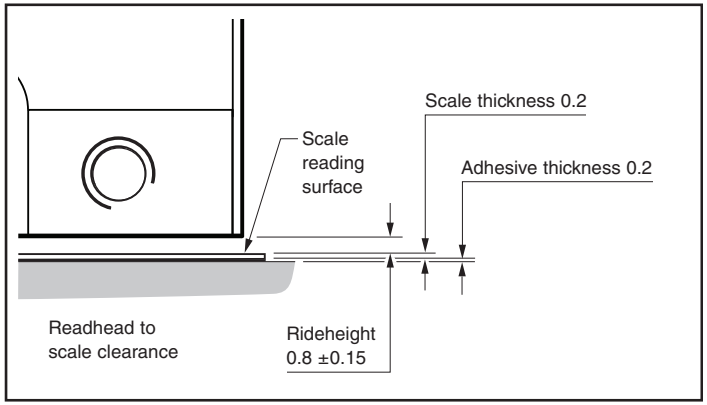
Recommended tightening torque 0.5 to 1.0 Nm

‡UHV cable diameter 2.7
Dynamic bend radius not applicable for UHV cables.

Orientation of scale determines count direction

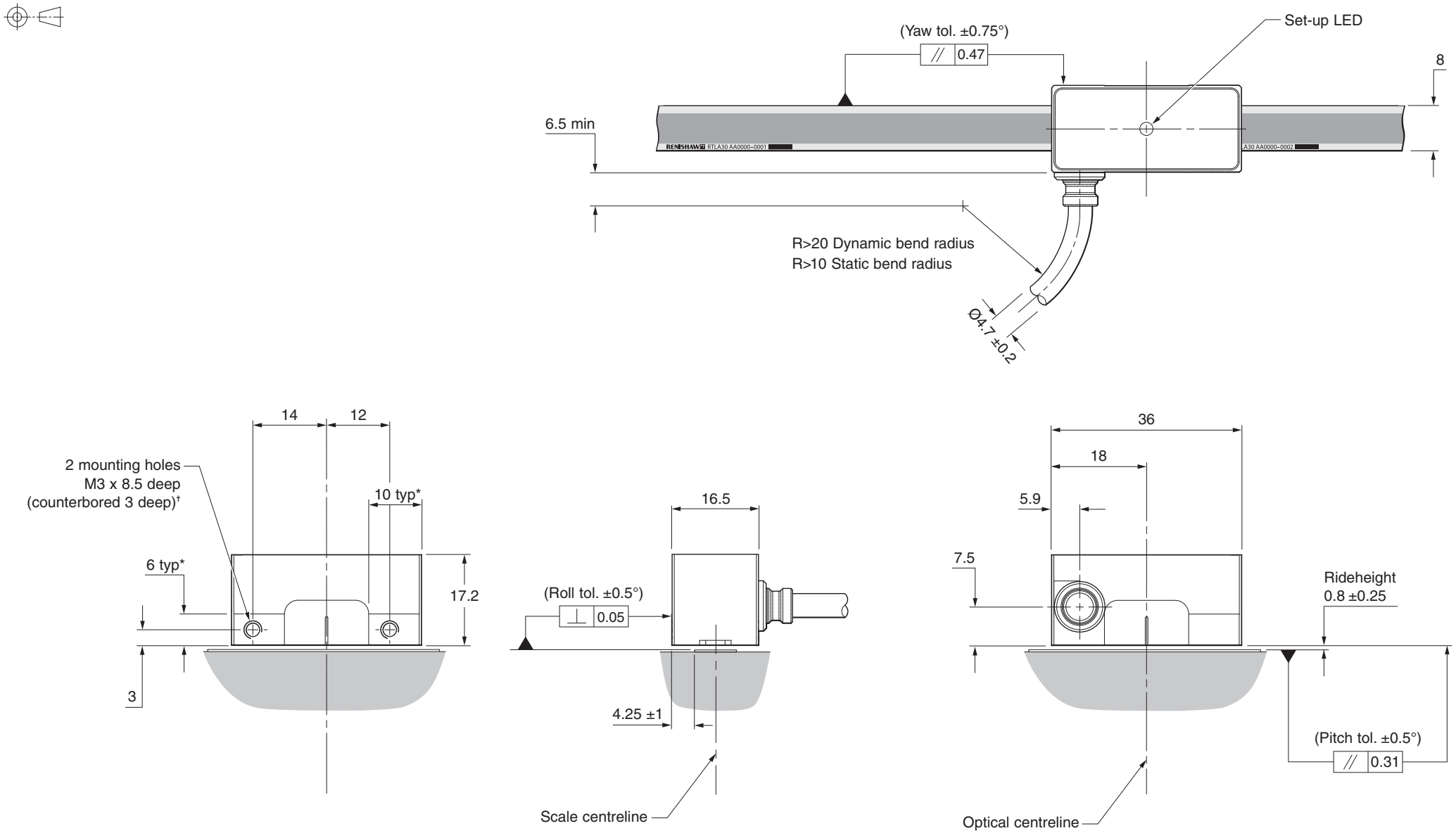
NOTE: Reversing head orientation has no effect on count direction

Detail A



Installation drawing: RESOLUTE readhead side cable outlet

Dimensions and tolerances in mm

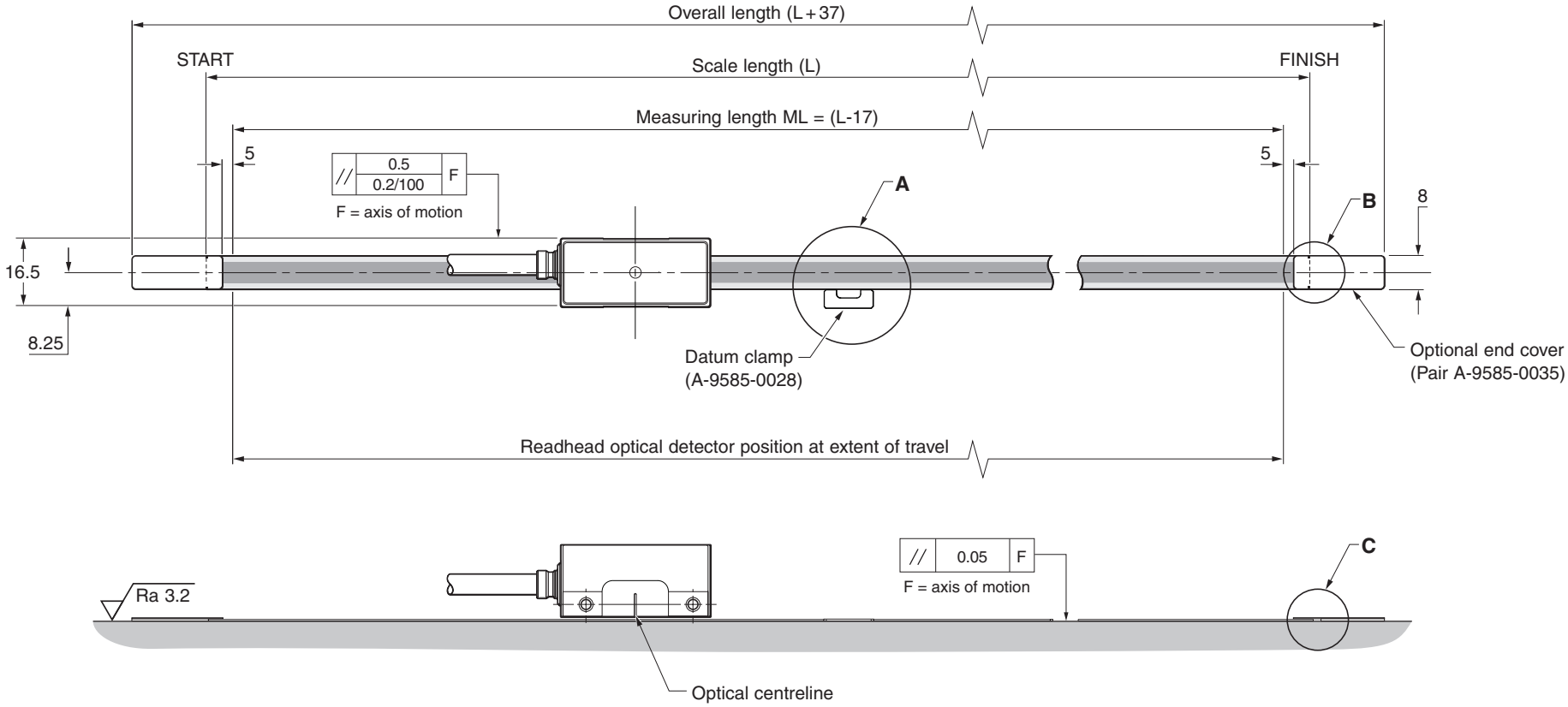


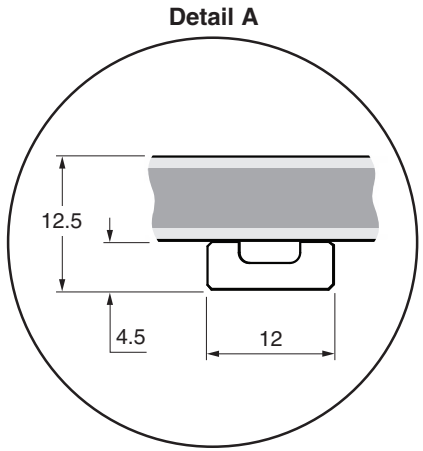
*Extent of mounting faces.

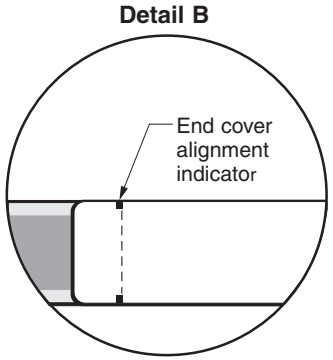
†Thread depth from mounting face. Recommended thread engagement 5 mm (8 including counterbore). Recommended tightening torque 0.5 to 1 Nm.

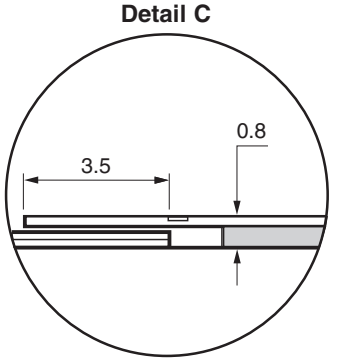
Installation drawing: RTLA-S (adhesive datum clamp)

Dimensions and tolerances in mm





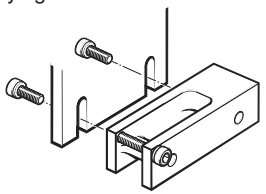




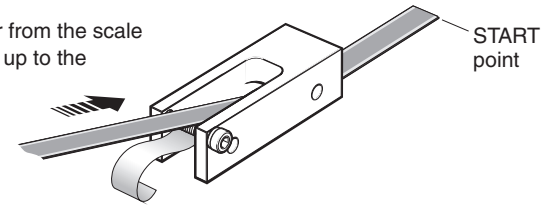
Scale application

The scale applicator A-9589-0095 is designed specifically for use with RESOLUTE readheads and RTLA-S scale.

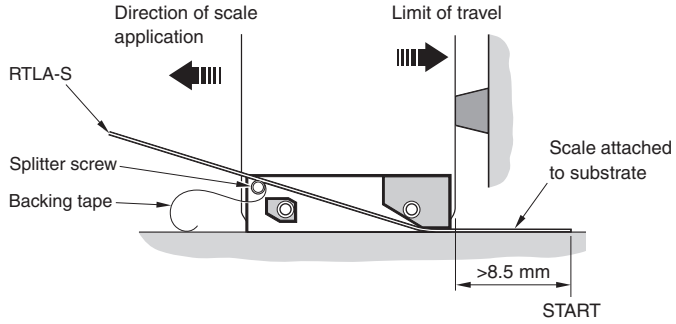
1. Allow scale to acclimatize to installation environment prior to installation.
2. Mark out the 'START' and 'FINISH' points for the scale on the axis substrate – ensure that there is room for the optional end covers if required (see 'RTLA-S installation drawing').
3. Thoroughly clean and degrease the substrate using recommended solvents see 'Storage and handling'). Allow substrate to dry before applying scale.
4. Mount the appropriate scale applicator to the readhead mounting bracket using M2.5 screws. Place the shim supplied with the readhead between the applicator and substrate to set the nominal height.
   NOTE: Scale applicator can be mounted either way round to enable easiest orientation for scale installation.



5. Move axis to 'START' of travel.
6. Begin to remove the backing paper from the scale and insert scale into the applicator up to the 'START' point (as shown).



7. Apply finger pressure via a clean lint-free cloth to ensure scale end adheres well to the substrate.
8. Slowly and smoothly move the applicator through the entire axis of travel, ensuring the backing paper is pulled manually from the scale and does not catch under the applicator.



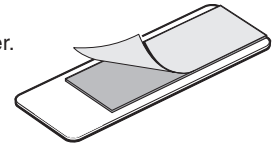
9. Remove applicator and, if necessary, adhere the remaining scale manually. Apply firm finger pressure via a clean lint-free cloth along the length of the scale after application to ensure complete adhesion.
10. Clean scale using Renishaw scale cleaning wipes (A-9523-4040) or a clean, dry, lint-free cloth.
11. Fit end covers.
12. Allow 24 hours for complete adhesion of scale before fitting reference mark selector magnet, limits and datum clamps.

End covers

The end cover kit A-9585-0035 is designed to be used with RTLA-S scale to provide protection for exposed scale ends.

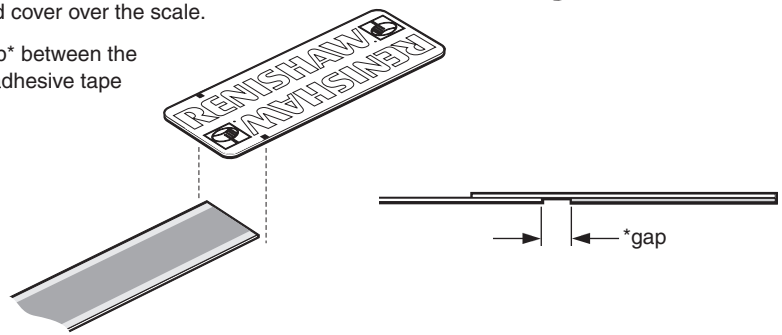
NOTE: End covers are optional and can be fitted before or after readhead installation.

1. Remove the backing tape from the adhesive tape on the back of the end cover.



2. Align markers on the edges of the end cover with the end of the scale and place end cover over the scale.

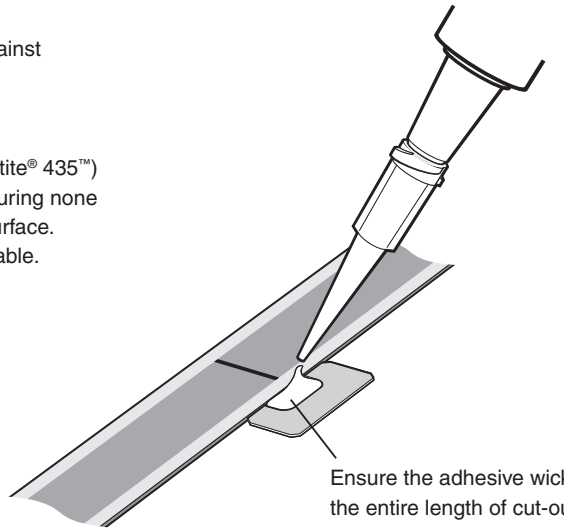
   NOTE: There will be a gap* between the end of the scale and the adhesive tape on the end cover.



Datum clamp (A-9585-0028)

The datum clamp fixes the RTLA-S scale rigidly to the substrate at the location chosen.
The metrology of the system may be compromised if the datum clamp is not used.
It can be positioned anywhere along the axis depending upon the customers' requirements.

1. Place the datum clamp with cut-out against the scale at the chosen location.
2. Place a small amount of adhesive (Loctite® 435™) in the cut-out on the datum clamp, ensuring none of the adhesive wicks onto the scale surface. Dispensing tips P-TL50-0209 are available.



Readhead mounting/installation

Mounting brackets

The bracket must have a flat mounting surface, enable conformance to the installation tolerances, allow adjustment of the rideheight of the readhead, and be sufficiently stiff to prevent deflection of the readhead during operation.

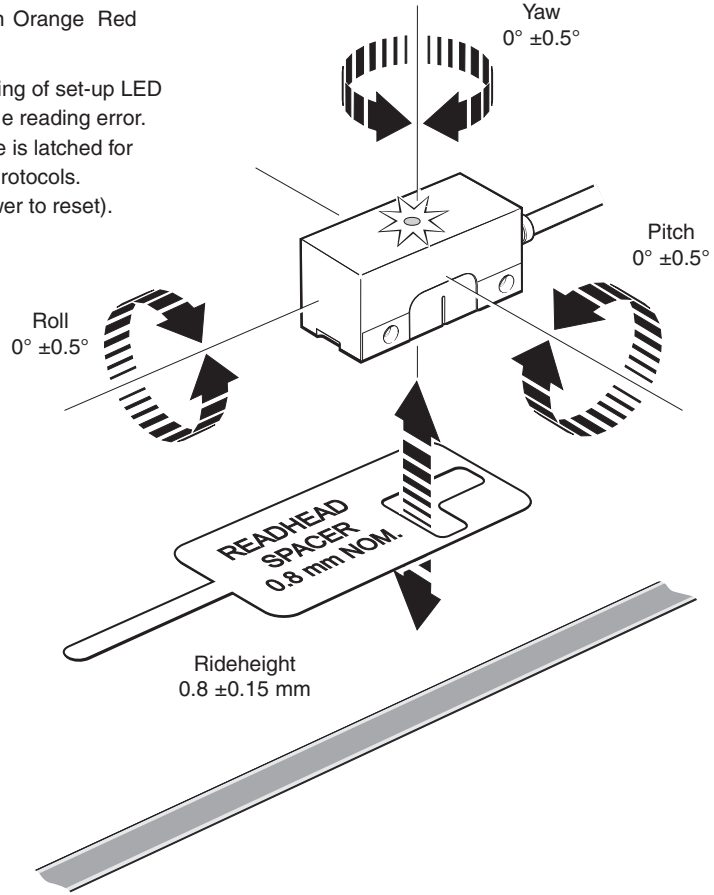
Readhead set-up

Ensure that the scale, readhead optical window and mounting face are clean and free from obstructions. To set nominal rideheight for RTLA-S installations, use the Blue 0.8 mm readhead spacer to set rideheight. Adjust the readhead to maximize the signal strength along the full axis of travel to achieve a Green or Blue LED.

Readhead set-up LED and DRIVE-CLiQ interface set-up STATUS LED status

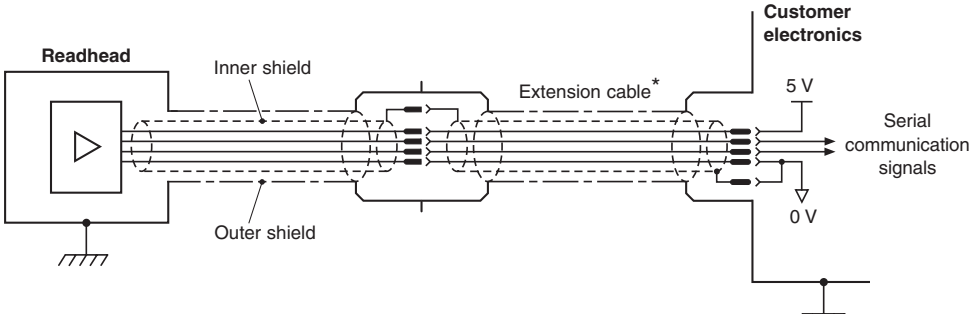
Blue Green Orange Red

NOTE: Flashing of set-up LED indicates scale reading error. Flashing state is latched for some serial protocols. (Remove power to reset).



Electrical connections

RESOLUTE grounding and shielding



IMPORTANT: The outer shield should be connected to the machine earth (Field ground). The inner shield should be connected to 0 V at customer electronics only. 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 0 V and earth, which could cause electrical noise issues.

IMPORTANT: If the flying lead variant is used or the connector is modified or replaced, the customer must ensure both 0 V cores (White and Green) are connected to 0 V.

*For Siemens DRIVE-CLiQ please refer to Siemens DRIVE-CLiQ specifications for maximum cable length.

Scale technical specifications

RTLA-S

Form	0.4 mm x 8 mm (H x W) (including adhesive)
Datum fixing	Datum clamp (A-9585-0028) secured with Loctite 435
Material	Hardened and tempered martensitic stainless steel fitted with a self-adhesive backing tape
Accuracy (at 20 °C)	±5 µm/m, calibration traceable to International Standards
Coefficient of thermal expansion (at 20 °C)	10.1 ±0.2 µm/m/°C
Maximum length*	21 m
Mass	12.2 g/m
Installation temperature	15 °C to 35 °C

*For lengths >5 m contact your local Renishaw representative.

BiSS-C serial comms

General specifications

Power supply (standard and UHV)	5 V ±10%	1.25 W maximum (250 mA@5 V) **NOTE:** Current consumption figures refer to terminated RESOLUTE systems. Renishaw encoder systems must be powered from a 5 V dc supply complying with the requirements for SELV of standard IEC BS EN 60950-1
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
Sealing (standard)		IP64
(UHV)		IP30
Acceleration	Operating	500 m/s², 3 axes
Shock	Non-operating	1000 m/s², 3 axes, 6 ms, ½ sine
Maximum acceleration of scale with respect to readhead		2000 m/s² **NOTE:** This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, please contact your local representative.
Vibration (standard)	Operating	300 m/s², 3 axes, 55 Hz to 2000 Hz
(UHV)	Operating	100 m/s², 3 axes, 55 Hz to 2000 Hz
Mass (standard)		Readhead 18 g Cable 32 g/m
(UHV)		Readhead 19 g Cable 19 g/m
Readhead cable (standard)		Double shielded, outside diameter 4.7 ± 0.2 mm Flex life >20 x 10⁶ cycles at 20 mm bend radius UL recognised component
(UHV)		Silver-coated copper braided single screen FEP core insulation over tin-plated copper wire
Maximum readhead cable length		20 m For maximum extension cable length, contact your local Renishaw representative.

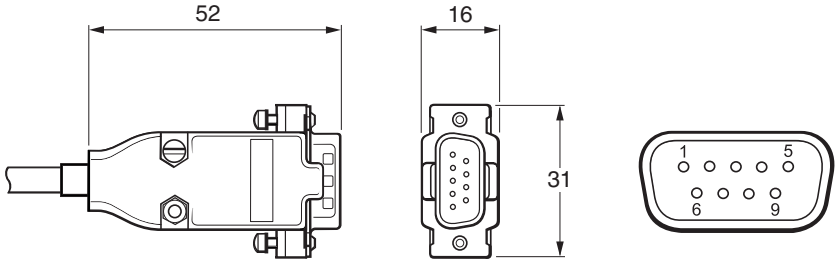
The RESOLUTE encoder system has been designed to the relevant EMC standards, but must be correctly integrated to achieve EMC compliance. In particular, attention to shielding arrangements is essential.

Output signals

Function	Signal†	Wire colour	Pin 9 way D-type
Power	5 V	Brown	4, 5
	0 V	White	8, 9
		Green	
Serial communications	MA+	Violet	2
	MA-	Yellow	3
	SLO+	Grey	6
	SLO-	Pink	7
Shield	Inner	Inner shield	1
	Outer	Outer shield	Case

†For details, refer to *BiSS* Data sheet L-9709-9005.
NOTE: For UHV readhead only flying lead option available.

9 way D-type



FANUC serial comms

General specifications

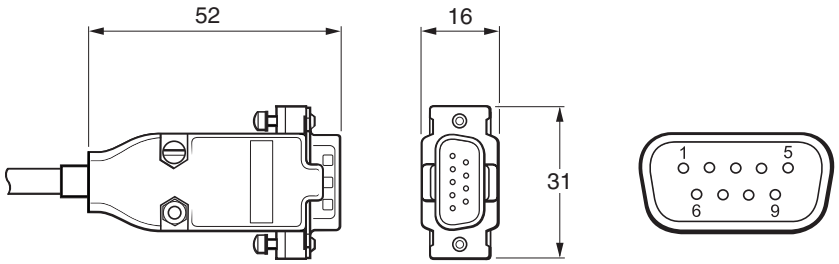
Power supply	5 V ±10%	1.25 W maximum (250 mA@5 V) **NOTE:** Current consumption figures refer to terminated RESOLUTE systems. Renishaw encoder systems must be powered from a 5 V dc supply complying with the requirements for SELV of standard IEC BS EN 60950-1.
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
Sealing		IP64
Acceleration	Operating	500 m/s², 3 axes
Shock	Non-operating	1000 m/s², 3 axes, 6 ms, ½ sine
Maximum acceleration of scale with respect to readhead		690 m/s² **NOTE:** This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, please contact your local representative.
Vibration	Operating	300 m/s², 3 axes, 55 Hz to 2000 Hz
Mass		Readhead 18 g Cable 32 g/m
Readhead cable		Double shielded, outside diameter 4.7 ±0.2 mm Flex life >20 x 10^6 cycles at 20 mm bend radius UL recognised component
Maximum readhead cable length		20 m For maximum extension cable length, contact your local Renishaw representative.

The RESOLUTE encoder system has been designed to the relevant EMC standards, but must be correctly integrated to achieve EMC compliance. In particular, attention to shielding arrangements is essential.

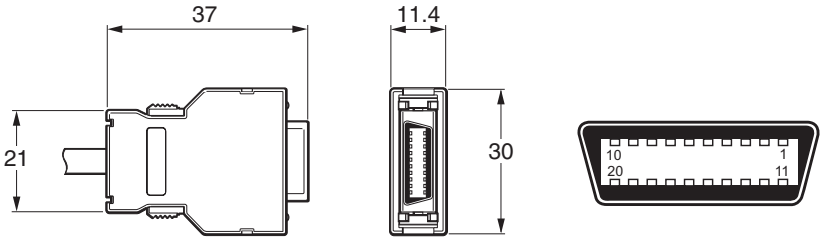
Output signals

Function	Signal	Wire colour	Pin		
			9 way D-type	Lemo	20 way
Power	5 V	Brown	4, 5	11	9, 20
	0 V	White	8, 9	12, 8	12, 14
		Green			
Serial communications	REQ	Violet	2	2	5
	*REQ	Yellow	3	1	6
	SD	Grey	6	3	1
	*SD	Pink	7	4	2
Shield	Inner	Inner shield	1	10	16
	Outer	Outer shield	Case	Case	External

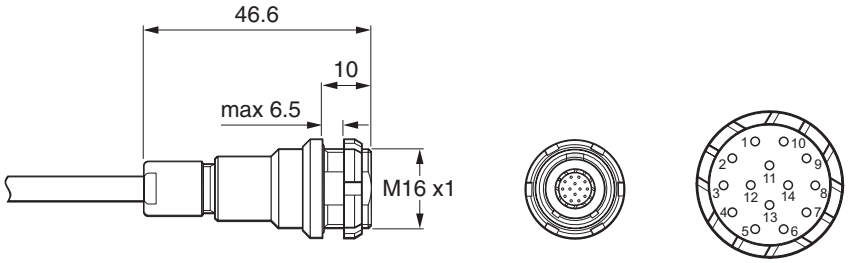
9 way D-type



20 way



Lemo



NOTE: For Lemo option, mating extension cables and sealing caps are available from your local Renishaw representative.

Mitsubishi serial comms

General specifications

Power supply (standard)	5 V ±10%	1.25 W maximum (250 mA@5 V) **NOTE:** Current consumption figures refer to terminated RESOLUTE systems. Renishaw encoder systems must be powered from a 5 V dc supply complying with the requirements for SELV of standard IEC BS EN 60950-1.
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
Sealing (standard)		IP64
Acceleration	Operating	500 m/s², 3 axes
Shock	Non-operating	1000 m/s², 3 axes, 6 ms, ½ sine
Maximum acceleration of scale with respect to readhead		2000 m/s² **NOTE:** This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, please contact your local representative.
Vibration (standard)	Operating	300 m/s², 3 axes, 55 Hz to 2000 Hz
Mass		Readhead 18 g Cable 32 g/m
Readhead cable (standard)		Double shielded, outside diameter 4.7 ± 0.2 mm Flex life >20 x 10⁶ cycles at 20 mm bend radius. UL recognised component
Maximum readhead cable length		1 m* For maximum extension cable length, contact your local Renishaw representative.

The RESOLUTE encoder system has been designed to the relevant EMC standards, but must be correctly integrated to achieve EMC compliance. In particular, attention to shielding arrangements is essential.

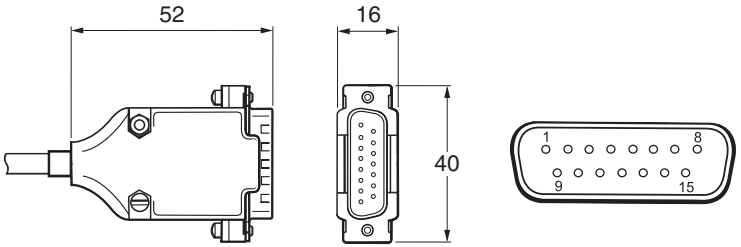
*Lengths above 1 m available on special order.

Output signals

Function	Signal	Wire colour	Pin 15 way D-type
Power	5 V	Brown	7, 8
	0 V	White	2, 9
		Green	
Serial communications	MR	Violet	10
	MRR	Yellow	1
	MD*	Grey	11
	MDR*	Pink	3
Shield	Inner	Inner shield	15
	Outer	Outer shield	Case

*For 2 wire do not connect MD and MDR.

15 way D-type



Panasonic serial comms

General specifications

Power supply (standard and UHV)	5 V ±10%	1.25 W maximum (250 mA@5 V) **NOTE:** Current consumption figures refer to terminated RESOLUTE systems. Renishaw encoder systems must be powered from a 5 V dc supply complying with the requirements for SELV of standard IEC BS EN 60950-1.
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
Sealing (standard)		IP64
(UHV)		IP30
Acceleration	Operating	500 m/s², 3 axes
Shock	Non-operating	1000 m/s², 3 axes, 6 ms, ½ sine
Maximum acceleration of scale with respect to readhead		2000 m/s² **NOTE:** This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, please contact your local representative.
Vibration (standard)	Operating	300 m/s², 3 axes, 55 Hz to 2000 Hz
(UHV)	Operating	100 m/s², 3 axes, 55 Hz to 2000 Hz
Mass (standard)		Readhead 18 g Cable 32 g/m
(UHV)		Readhead 19 g Cable 19 g/m
Readhead cable (standard)		Double shielded, outside diameter 4.7 ±0.2 mm Flex life >20 x 10⁶ cycles at 20 mm bend radius UL recognised component
(UHV)		Silver-coated copper braided single screen FEP core insulation over tin-plated copper wire
Maximum readhead cable length		20 m For maximum extension cable length, contact your local Renishaw representative.

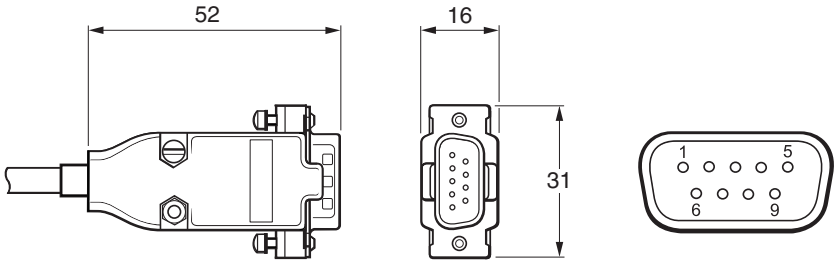
The RESOLUTE encoder system has been designed to the relevant EMC standards, but must be correctly integrated to achieve EMC compliance. In particular, attention to shielding arrangements is essential.

Output signals

Function	Signal	Wire colour	Pin 9 way D-type
Power	5 V	Brown	4, 5
	0 V	White	8, 9
		Green	
Serial communications	REQ+, SD+	Violet	2
	REQ-, SD-	Yellow	3
Shield	Inner	Inner shield	1
	Outer	Outer shield	Case
Reserved	**Do not connect**	Grey	6
		Pink	7

NOTE: For UHV readhead only flying lead option available.

9 way D-type



Siemens DRIVE-CLiQ serial comms

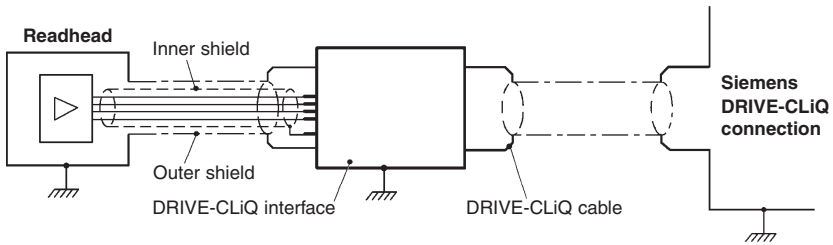
General specifications

Power supply (DRIVE-CLiQ system)	24 V	1.8 W maximum (75 mA @ 24V), 24 V as per DRIVE-CLiQ specification 24 V power is provided by the DRIVE-CLiQ network **NOTE:** The Renishaw DRIVE-CLiQ interface must be powered from a 24 V dc supply complying with the requirements for SELV of standard IEC BS EN 60950-1.
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
Sealing (readhead)		IP64
(interface)		IP67
Acceleration (readhead)	Operating	500 m/s², 3 axes
Shock (readhead and interface)	Non-operating	1000 m/s², 6 ms, 3 axes, ½ sine
Maximum acceleration of scale with respect to readhead		2000 m/s² **NOTE:** This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, please contact your local representative.
Vibration (readhead)	Operating	300 m/s², 3 axes, 55 Hz to 2000 Hz
(interface)	Operating	100 m/s², 3 axes, 55 Hz to 2000 Hz
Mass		Readhead 18 g Cable 32 g/m Interface 218 g
Readhead cable		Double shielded, outside diameter 4.7 ± 0.2 mm Flex life >20 x 10^6 cycles at 20 mm bend radius UL recognised component
Maximum readhead cable length		Readhead to DRIVE-CLiQ interface 10 m (Refer to Siemens DRIVE-CLiQ specifications for maximum cable length from interface to controller)
Connector tightening torque		M12 – 4 Nm

The RESOLUTE encoder system has been designed to the relevant EMC standards, but must be correctly integrated to achieve EMC compliance. In particular, attention to shielding arrangements is essential.

Electrical connections

RESOLUTE grounding and shielding



IMPORTANT: If reterminating readhead cable 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 0 V and earth, which could cause electrical noise issues.

Output signals

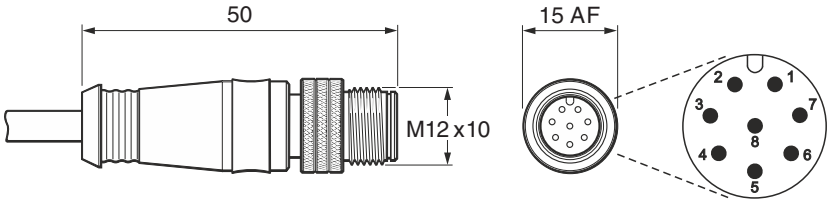
Signals between readhead and interface

Function	Signal	Wire colour	Pin M12 ('A' code)
Power	5 V	Brown	2
	0 V	White	5, 8
		Green	
Serial communications	A+	Violet	3
	A-	Yellow	4
Shield	Inner	Inner shield	1
	Outer	Outer shield	Case
Reserved	**Do not connect**	Grey	7
		Pink	6

Interface output

Function	Signal	Pin M12 ('A' code)
Power	24 V	1
	0 V	5
DRIVE-CLiQ communications	RX+	3
	RX-	4
	TX+	7
	TX-	6
Shield		Case

M12

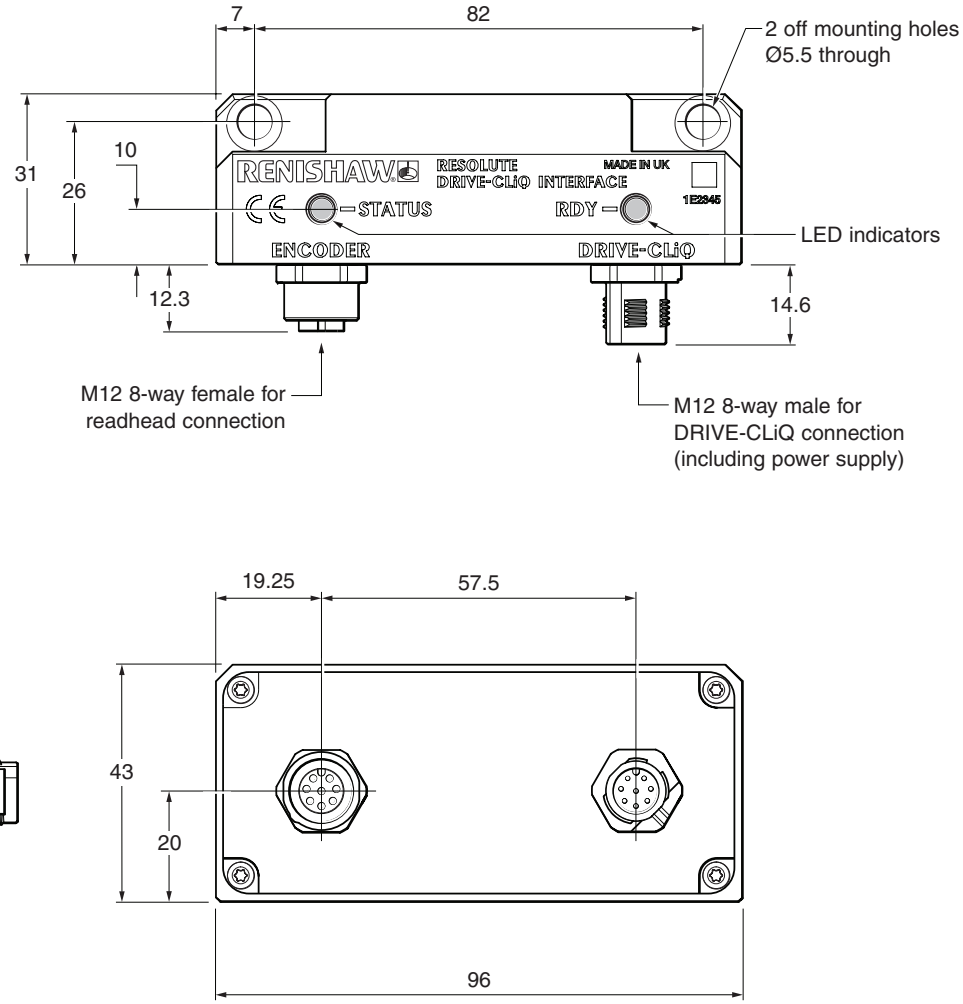


Siemens DRIVE-CLiQ interface

DRIVE-CLiQ interface installation drawing

Dimensions and tolerances in mm

Single readhead (A-9777-0575)



RDY LED functions

Colour	Status	Description
–	Off	Power supply is missing or outside of permissible tolerance range
Green	Continuous light	The component is ready for operation and cyclic DRIVE-CLiQ communication is taking place
Orange	Continuous light	DRIVE-CLiQ communication is being established
Red	Continuous light	At least one fault is present in this component. **NOTE:** The LED is activated regardless of whether the corresponding messages have been reconfigured
Green/Orange or Red/Orange	Flashing light	Component recognition via LED is activated (p0144) **NOTE:** Both options depend on the LED status when component recognition is activated via p0144=1

STATUS LED function

STATUS displays the readhead set-up status as shown on the readhead set-up LED

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