Installation guide
M-9553-9433-08-B

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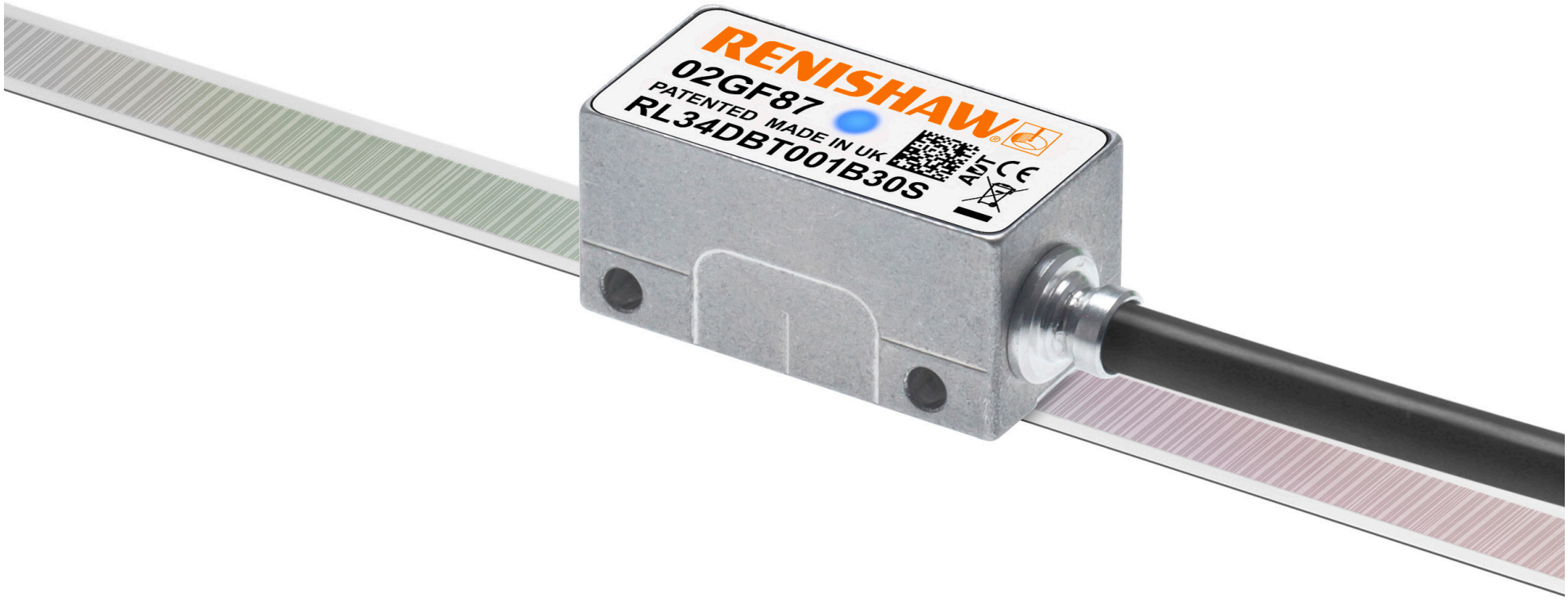
RESOLUTE™ RTLA30-S absolute linear encoder system



www.renishaw.com/resolutedownloads

#renishaw

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Contents

Legal notices

Patents

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

CN1260551	EP2350570	JP5659220	JP6074392	DE2390045
DE10296644	JP5480284	KR1701535	KR1851015	EP1469969
GB2395005	KR1630471	US10132657	US20120072169	EP2390045
JP4008356	US8505210	CN102460077	EP01103791	JP5002559
US7499827	CN102388295	EP2438402	US6465773	US8466943
CN102197282	EP2417423	JP5755223	CN1314511	US8987633

Terms and conditions and warranty

Unless you and Renishaw have agreed and signed a separate written agreement, the equipment and/or software are sold subject to the Renishaw Standard Terms and Conditions supplied with such equipment and/or software, or available on request from your local Renishaw office.

Renishaw warrants its equipment and software for a limited period (as set out in the Standard Terms and Conditions), provided that they are installed and used exactly as defined in associated Renishaw documentation. You should consult these Standard Terms and Conditions to find out the full details of your warranty.

Equipment and/or software purchased by you from a third-party supplier is subject to separate terms and conditions supplied with such equipment and/or software. You should contact your third-party supplier for details.

Declaration of Conformity

Renishaw plc hereby declares that the RESOLUTE™ encoder system is in compliance with the essential requirements and other relevant provisions of:

- the applicable EU directives
- the relevant statutory instruments under UK law

The full text of the declaration of conformity is available at: **www.renishaw.com/productcompliance**.

Compliance

Federal Code Of Regulation (CFR) FCC Part 15 – RADIO FREQUENCY DEVICES

47 CFR Section 15.19

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.

47 CFR Section 15.21

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.

47 CFR Section 15.105

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.

47 CFR Section 15.27

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

Supplier's Declaration of Conformity

47 CFR § 2.1077 Compliance Information

Unique Identifier: RESOLUTE

Responsible Party - U.S. Contact Information

Renishaw Inc.
1001 Wesemann Drive
West Dundee
Illinois
IL 60118
United States
Telephone number: +1 847 286 9953
Email: usa@renishaw.com

ICES-003 — Industrial, Scientific and Medical (ISM) Equipment (Canada)

This ISM device complies with CAN ICES-003.

Cet appareil ISM est conforme à la norme ICES-003 du Canada.

Intended use

The RESOLUTE encoder system is designed to measure position and provide that information to a drive or controller in applications requiring motion control. It must be installed, operated, and maintained as specified in Renishaw documentation and in accordance with the Standard Terms and Conditions of the Warranty and all other relevant legal requirements.

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/resolutedownloads and are also available from your local Renishaw representative.

Packaging

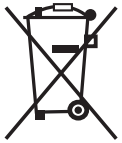
The packaging of our products contains the following materials and can be recycled.

Packing 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

REACH regulation

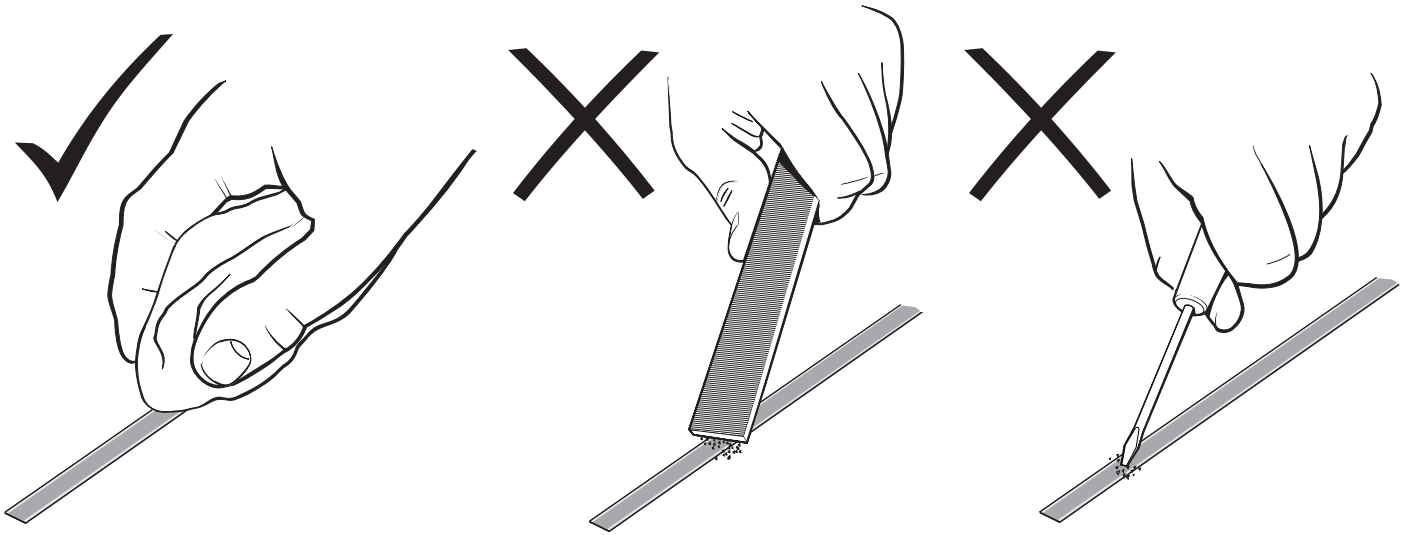
Information required by Article 33(1) of Regulation (EC) No. 1907/2006 ("REACH") relating to products containing substances of very high concern (SVHCs) is available at www.renishaw.com/REACH.

Disposal of waste electrical and electronic equipment

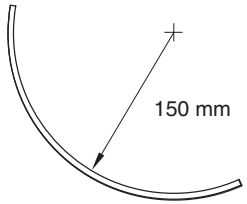


The use of this symbol on Renishaw products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic 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, contact your local waste disposal service or Renishaw distributor.

Storage and handling

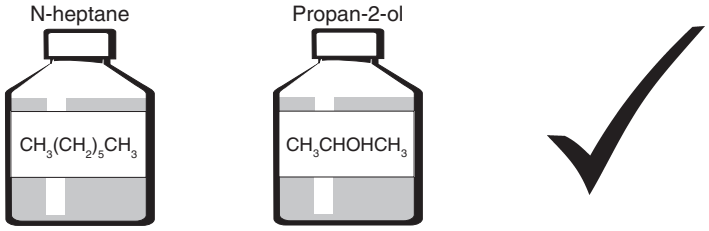


Minimum bend radius



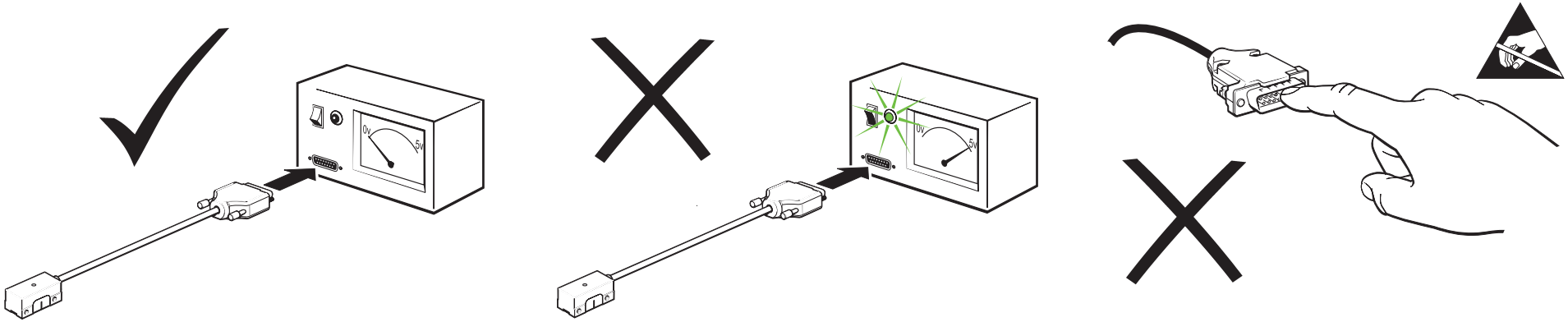
NOTE: During storage ensure self-adhesive tape is on outside of bend.

System



Readhead

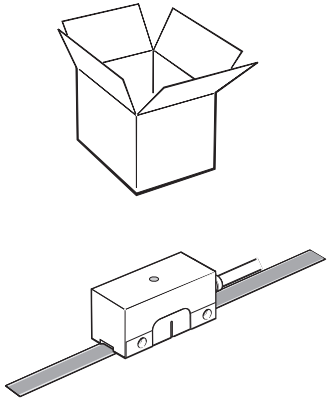
Readhead and DRIVE-CLiQ interface



Temperature

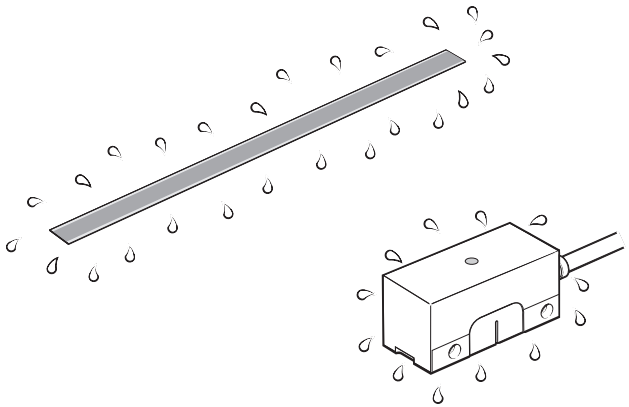
Storage	
Standard readhead, DRIVE-CLiQ interface, and RTLA30-S scale	–20 °C to +80 °C
UHV readhead	0 °C to +80 °C
Bakeout	+120 °C

Operating	
Standard readhead and RTLA30-S scale	0 °C to +80 °C
UHV readhead	0 °C to +75 °C
DRIVE-CLiQ interface	0 °C to +55 °C



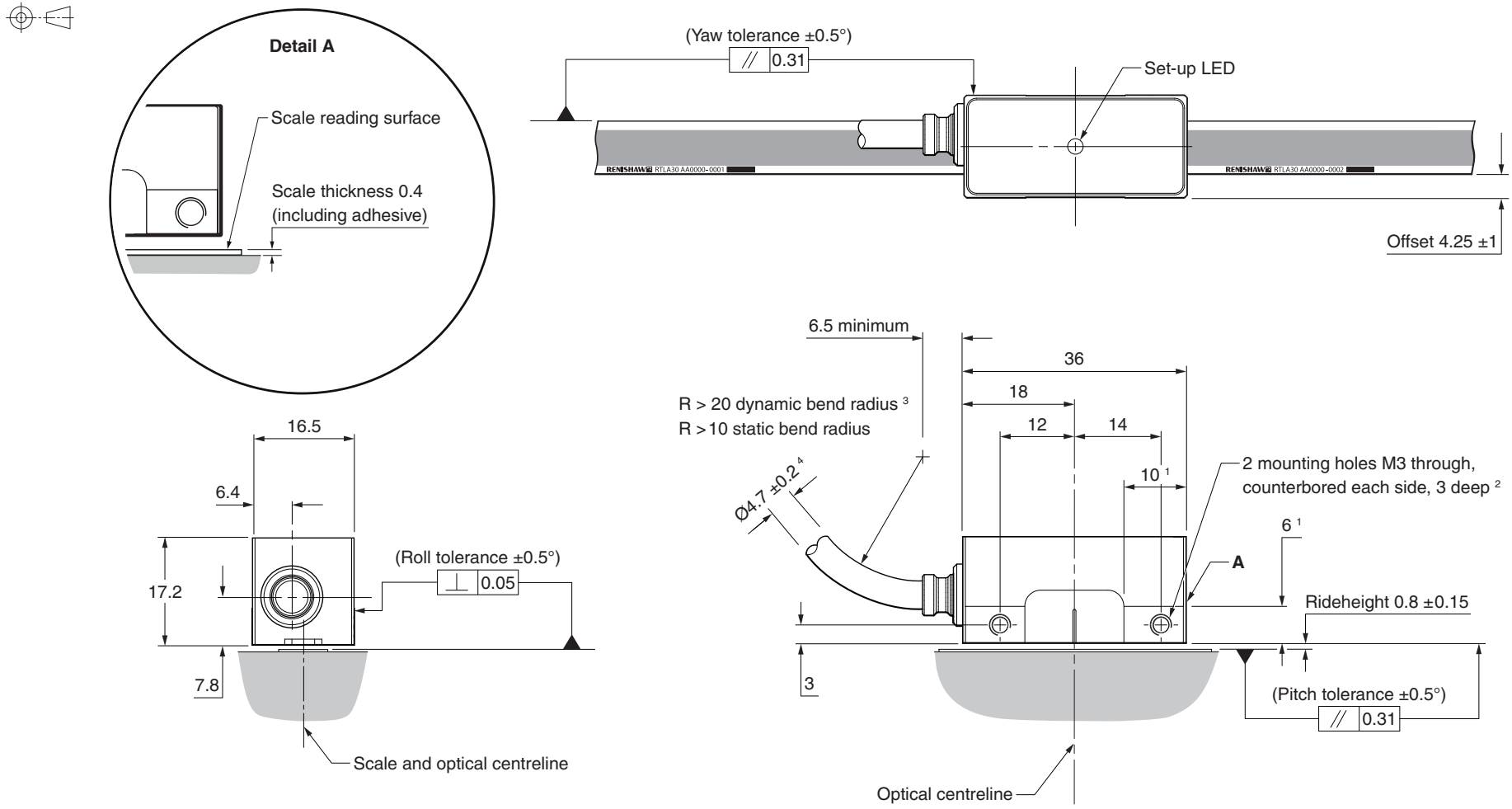
Humidity

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



RESOLUTE readhead installation drawing – standard cable outlet

Dimensions and tolerances in mm



1 Extent of mounting faces.

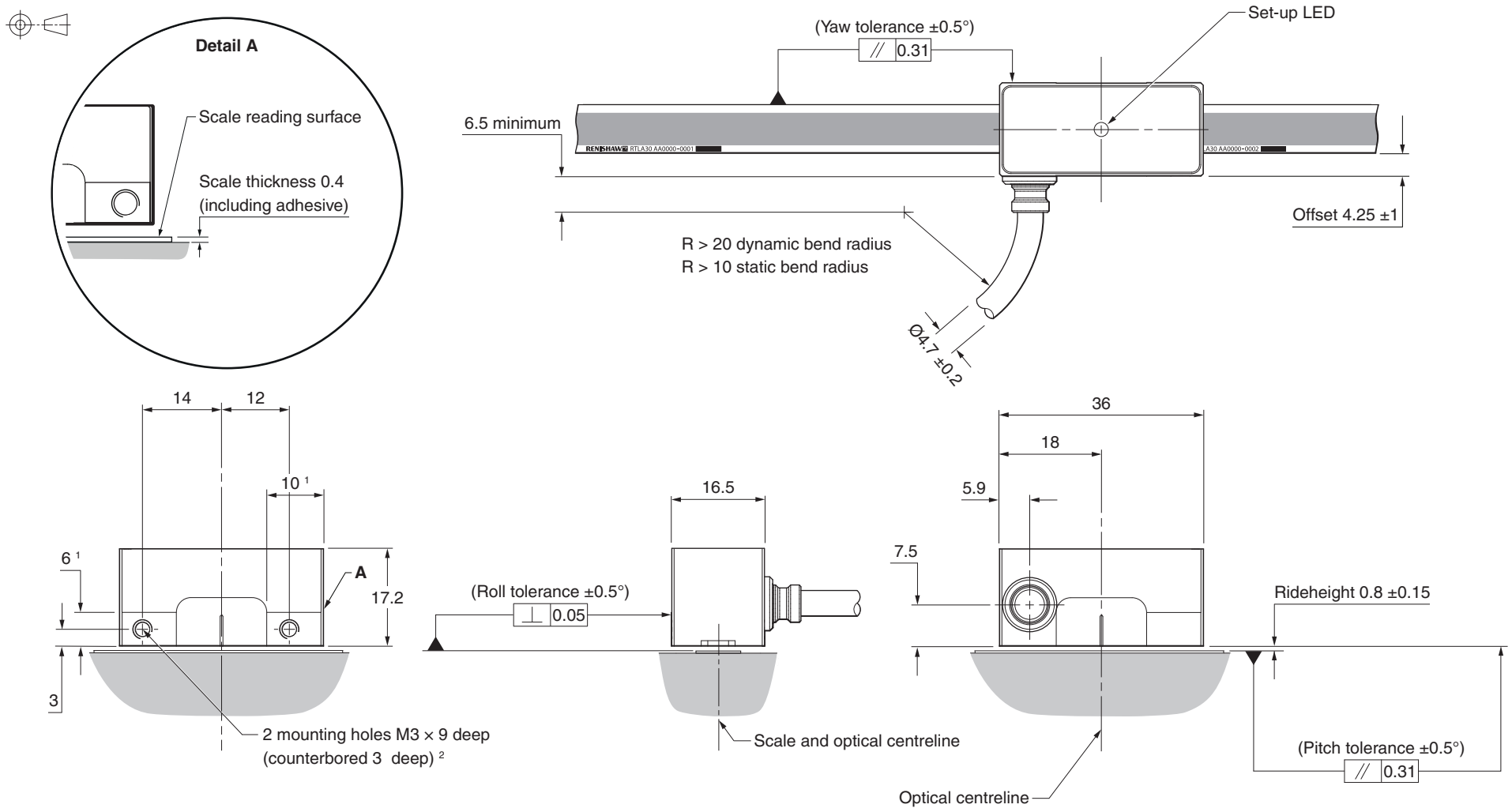
2 The recommended thread engagement is 5 mm minimum (8 mm including counterbore) and the recommended tightening torque is 0.5 Nm to 0.7 Nm.

3 Dynamic bend radius not applicable for UHV cables.

4 UHV cable diameter 2.7 mm.

RESOLUTE readhead installation drawing – side cable outlet

Dimensions and tolerances in mm

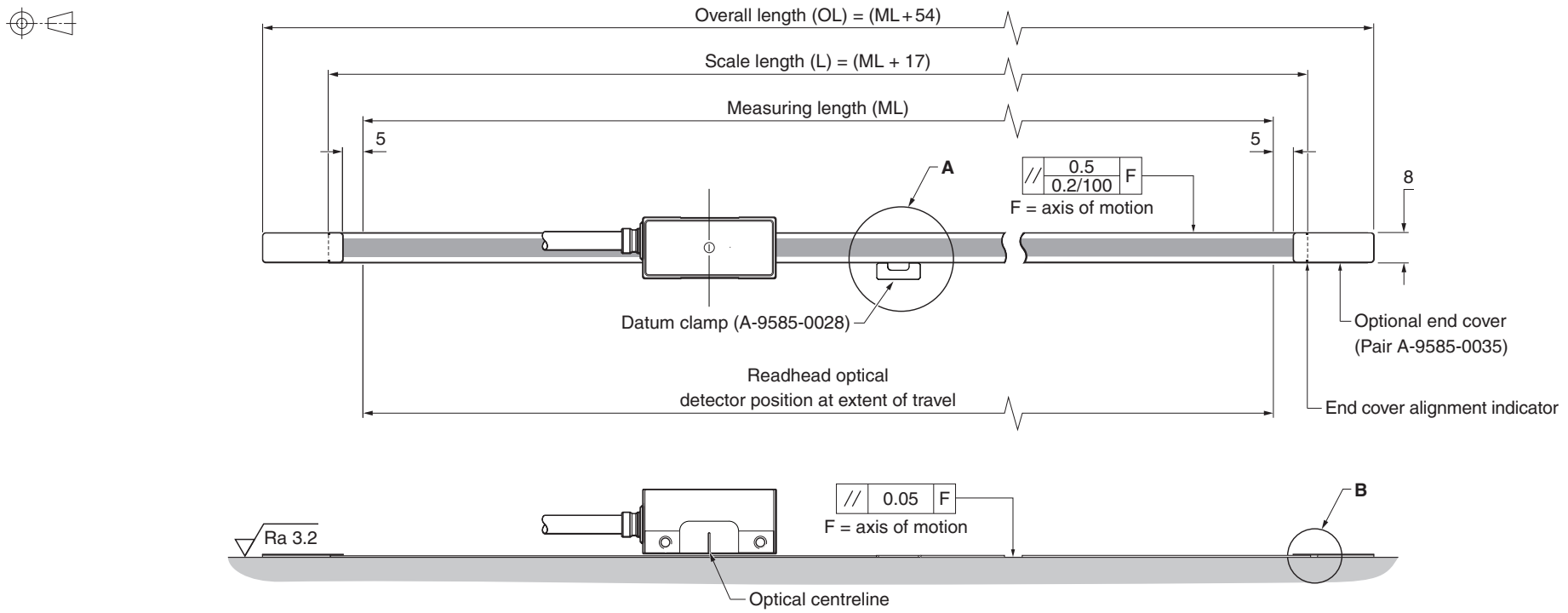


1 Extent of mounting faces

2 The recommended thread engagement is 5 mm minimum (8 mm including counterbore) and the recommended tightening torque is 0.5 Nm to 0.7 Nm

RTLA30-S scale installation drawing

Dimensions and tolerances in mm

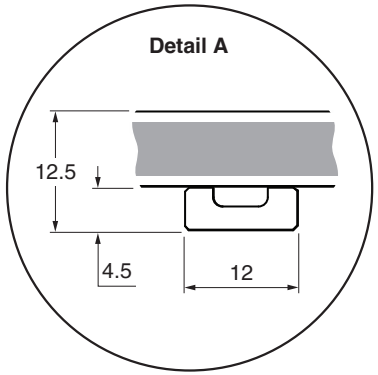


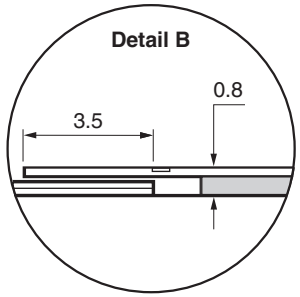
The orientation of the scale determines the count direction

Moving the readhead in this direction increases the count

Moving the readhead in this direction increases the count

NOTE: Reversing the readhead orientation has no effect on the count direction





Equipment required for installing the RTLA30-S scale

Required parts:

- Appropriate length of RTLA30-S scale (see 'RTLA30-S scale installation drawing' on page 10)
- Datum clamp (A-9585-0028)
- Loctite® 435™ (P-AD03-0012)
- Lint-free cloth
- Appropriate cleaning solvents (see 'Storage and handling' on page 6)
- RTLA30-S scale applicator (A-9589-0095)
- 2 × M3 screws

Optional parts:

- End cover kit (A-9585-0035)
- Renishaw scale wipes (A-9523-4040)
- Loctite® 435™ dispensing tip (P-TL50-0209)
- Guillotine (A-9589-0071) or shears (A-9589-0133) for cutting RTLA30-S to length required

Cutting the RTLA30-S scale

If required cut the RTLA30-S scale to length using the guillotine or shears.

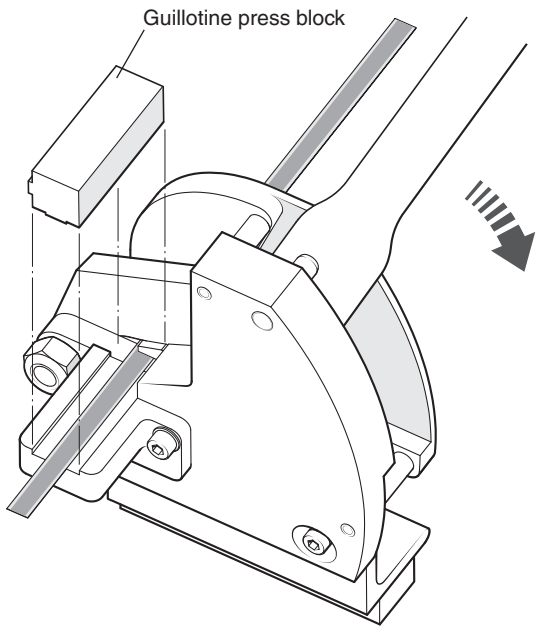
Using the guillotine

The guillotine should be held securely in place, using a suitable vice or clamping method.

Once secured, feed the RTLA30-S scale through the guillotine as shown, and place guillotine press block down onto the scale.

NOTE: Ensure the block is in the correct orientation (as shown below).

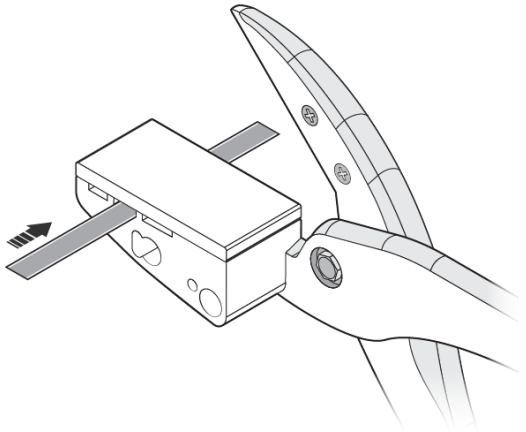
Guillotine press block orientation when cutting the RTLA30-S scale



Whilst holding the block in place, in a smooth motion, pull down the lever to cut through the scale.

Using the shears

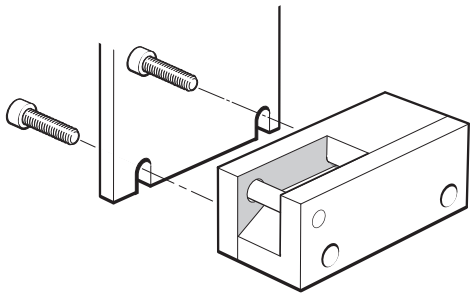
Feed the RTLA30-S scale through the middle apperture on the shears (as shown below).



Hold the scale in place and close the shears in a smooth motion to cut through the scale.

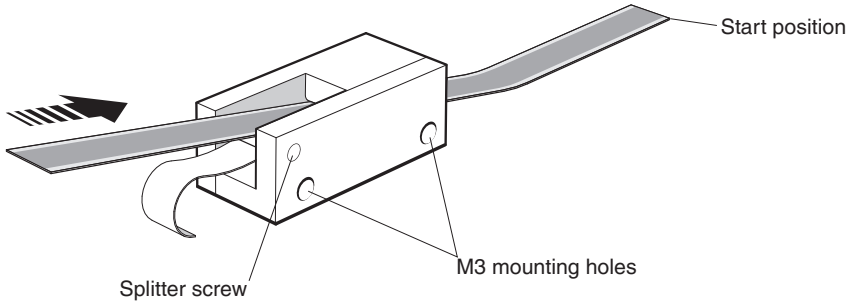
Applying the RTLA30-S scale

1. Allow the scale to acclimatise to the installation environment prior to installation.
2. Mark out the start position for the scale on the axis substrate - ensure that there is room for the optional end covers if required (see 'RTLA30-S scale installation drawing' on page 10).
3. Thoroughly clean and degrease the substrate using recommended solvents (see 'Storage and handling' on page 6). Allow the substrate to dry before applying the scale.
4. Mount the scale applicator to the readhead mounting bracket. Place the shim supplied with the readhead between the applicator and the substrate to set the nominal height.

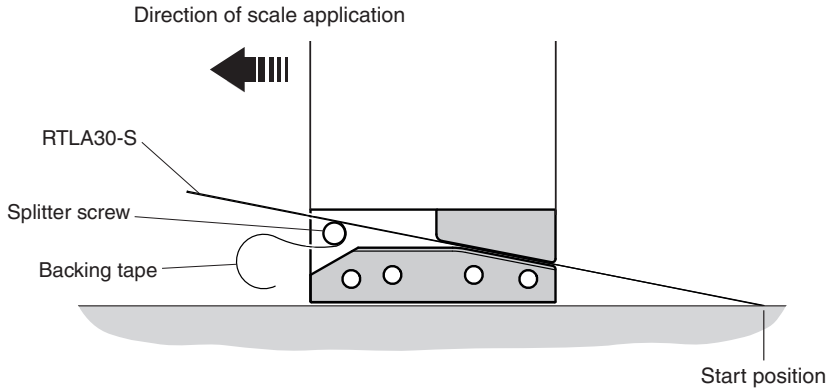


NOTE: The scale applicator can be mounted either way round to enable easiest orientation for the scale installation.

5. Move the axis to the start of travel leaving enough room for the scale to be inserted through the applicator, as shown below.
6. Begin to remove the backing paper from the scale and insert the scale into the applicator up to the start position. Ensure the backing tape is routed under the splitter screw.



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



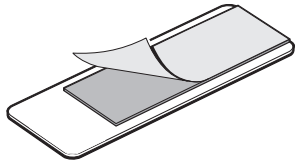
9. During installation ensure the scale is adhered to the substrate using light finger pressure.
10. Remove the applicator and, if necessary, adhere the remaining scale manually.
11. Apply firm finger pressure via a clean lint-free cloth along the length of the scale after application to ensure complete adhesion.
12. Clean the scale using Renishaw scale cleaning wipes or a clean, dry, lint-free cloth.
13. Fit the end covers if required (see 'Fitting the end covers' on page 14).
14. Allow 24 hours for complete adhesion of the scale before fitting the datum clamp (see 'Fitting the datum clamp' on page 14).

Fitting the end covers

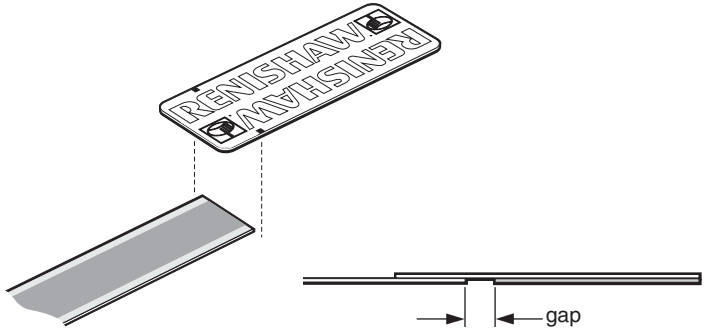
The end cover kit is designed to be used with the RTLA30-S scale to provide protection for exposed scale ends.

NOTE: The 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 the 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.

Fitting the datum clamp

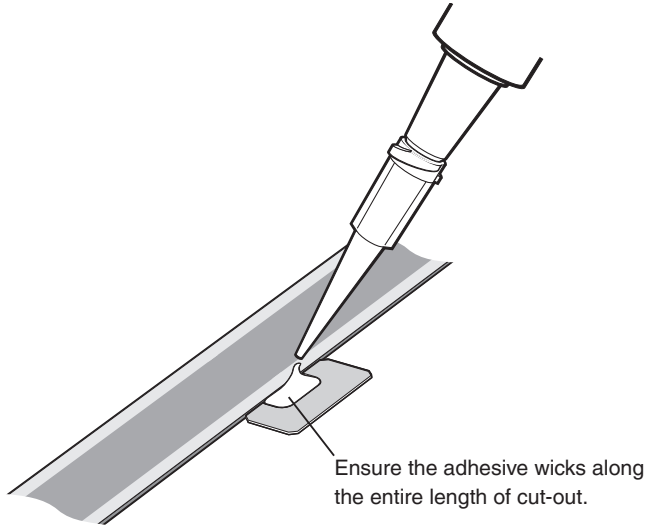
The datum clamp fixes the RTLA30-S scale rigidly to the substrate at the location chosen.

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. Remove the backing paper from the datum clamp.
2. Place the datum clamp with cut-out against the scale at the chosen location.

3. 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 for the adhesive are available.



RESOLUTE readhead mounting and alignment

Mounting brackets

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

Readhead set-up

Ensure that the scale, readhead optical window and mounting face are clean and free from obstructions.

NOTE: When cleaning the readhead and scale apply cleaning fluid sparingly, do not soak.

To set nominal rideheight, place the blue spacer with the aperture under the optical centre of the readhead to allow normal LED function during set-up procedure. Adjust the readhead to maximize the signal strength along the full axis of travel to achieve a green or blue LED.

NOTES:

- Flashing of the set-up LED indicates scale reading error. The flashing state is latched for some serial protocols; remove power to reset.
- The optional Advanced Diagnostic Tool ADTa-100 [1] (A-6525-0100) and ADT View software [2] can be used to aid installation. The ADTa-100 and ADT View software are only compatible with RESOLUTE readheads showing the ADT mark. Contact your local Renishaw representative for other readhead compatibility.

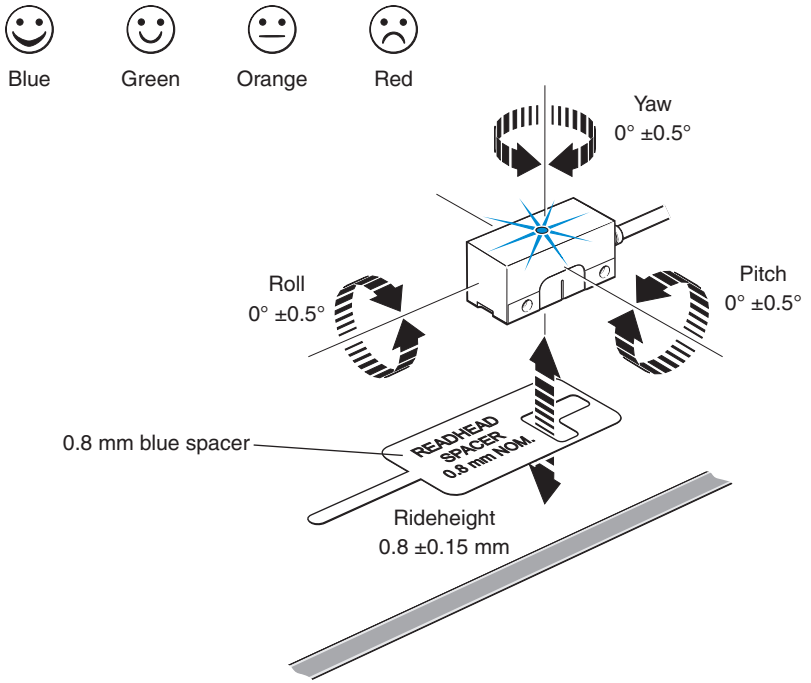
[1] For more details refer to the Advanced Diagnostic Tools and ADT View software User guide (Renishaw part no. M-6195-9413).

[2] The software can be downloaded for free from www.renishaw.com/adt.

[3] The LED is activated regardless of whether the corresponding messages have been reconfigured.

[4] The colour depends upon the LED status when component recognition is activated via p0144=1.

RESOLUTE readhead and DRIVE-CLiQ interface status LEDs



DRIVE-CLiQ interface 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 [3]
Green/orange or red/orange	Flashing light	Component recognition via LED is activated (p0144) [4]

RESOLUTE readhead signals

BiSS C serial interface

Function		Signal [1]	Wire colour	Pin			
				9-way D-type (A)	LEMO (L)	M12 (S)	13-way JST (F)
Power		5 V	Brown	4, 5	11	2	9
		0 V	White	8, 9	8, 12	5, 8	5, 7
			Green				
Serial communications		MA+	Violet	2	2	3	11
		MA–	Yellow	3	1	4	13
		SLO+	Grey	6	3	7	1
		SLO–	Pink	7	4	6	3
Shield	Single	Shield	Shield	Case	Case	Case	External
	Double	Inner	Inner shield	1	10	1	External
		Outer	Outer shield	Case	Case	Case	External

[1] For details, refer to *BiSS C-mode (unidirectional) for RESOLUTE encoders* data sheet (Renishaw part no. L-9709-9005).

NOTE: For RESOLUTE BiSS UHV readheads only 13-way JST (F) option is available.

FANUC serial interface

Function		Signal	Wire colour	Pin			
				9-way D-type (A)	LEMO (L)	20-way (H)	13-way JST (F)
Power		5 V	Brown	4, 5	11	9, 20	9
		0 V	White	8, 9	8, 12	12, 14	5, 7
			Green				
Serial communications		REQ	Violet	2	2	5	11
		*REQ	Yellow	3	1	6	13
		SD	Grey	6	3	1	1
		*SD	Pink	7	4	2	3
Shield	Single	Shield	Shield	Case	Case	External, 16	External
	Double	Inner	Inner shield	1	10	16	External
		Outer	Outer shield	Case	Case	External	External

Mitsubishi serial interface

Function		Signal	Wire colour	Pin				
				9-way D-type (A)	10-way Mitsubishi (P)	15-way D-type (N)	LEMO (L)	13-way JST (F)
Power		5 V	Brown	4, 5	1	7, 8	11	9
		0 V	White	8, 9	2	2, 9	8, 12	5, 7
			Green					
Serial communications		MR	Violet	2	3	10	2	11
		MRR	Yellow	3	4	1	1	13
		MD [1]	Grey	6	7	11	3	1
		MDR [1]	Pink	7	8	3	4	3
Shield	Single	Shield	Shield	Case	Case	Case	Case	External
	Double	Inner	Inner shield	1	Not applicable	15	10	External
		Outer	Outer shield	Case		Case	Case	External

[1] For 2 wire RESOLUTE Mitsubishi readheads do not connect MD and MDR.

Panasonic/Omron serial interface

Function		Signal	Wire colour	Pin			
				9-way D-type (A)	LEMO (L)	M12 (S)	13-way JST (F)
Power		5 V	Brown	4, 5	11	2	9
		0 V	White	8, 9	8, 12	5, 8	5, 7
			Green				
Serial communications		PS	Violet	2	2	3	11
		$\overline{\text{PS}}$	Yellow	3	1	4	13
Shield	Single	Shield	Shield	Case	Case	Case	External
	Double	Inner	Inner shield	1	10	1	External
		Outer	Outer shield	Case	Case	Case	External
Reserved		**Do not connect**	Grey	6	3	7	1
			Pink	7	4	6	3

NOTE: For RESOLUTE Panasonic UHV readheads only 13-way JST (F) option is available.

Siemens DRIVE-CLiQ serial interface

DRIVE-CLiQ readhead output

Function		Signal	Wire colour	Pin	
				M12 (S)	13-way JST (F)
Power		5 V	Brown	2	9
		0 V	White	5, 8	5, 7
			Green		
Serial communications		A+	Violet	3	11
		A–	Yellow	4	13
Shield	Single	Shield	Shield	Case	External
	Double	Inner	Inner shield	1	External
		Outer	Outer shield	Case	External
Reserved		**Do not connect**	Grey	7	1
			Pink	6	3

DRIVE-CLiQ interface output

Function	Signal	Pin M12
Power	24 V	1
	0 V	5
DRIVE-CLiQ communications	RX+	3
	RX–	4
	TX+	7
	TX–	6
Shield	Shield	Case

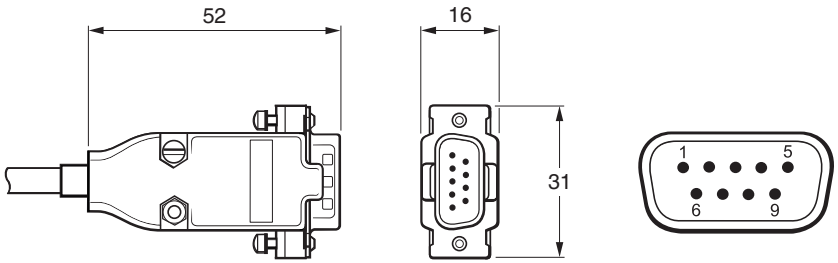
Yaskawa serial interface

Function	Signal	Wire colour	Pin			
			9-way D-type (A)	LEMO (L)	M12 (S)	13-way JST (F)
Power	5 V	Brown	4, 5	11	2	9
	0 V	White	8, 9	8, 12	5, 8	5, 7
		Green				
Serial communications	S	Violet	2	2	3	11
	$\overline{S}$	Yellow	3	1	4	13
Shield	Shield	Shield	Case	Case	Case	External
Reserved	**Do not connect**	Grey	6	3	7	1
		Pink	7	4	6	3

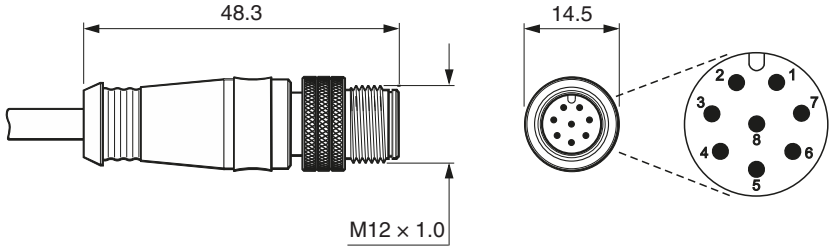
RESOLUTE readhead termination options

9-way D-type connector (Termination code A)

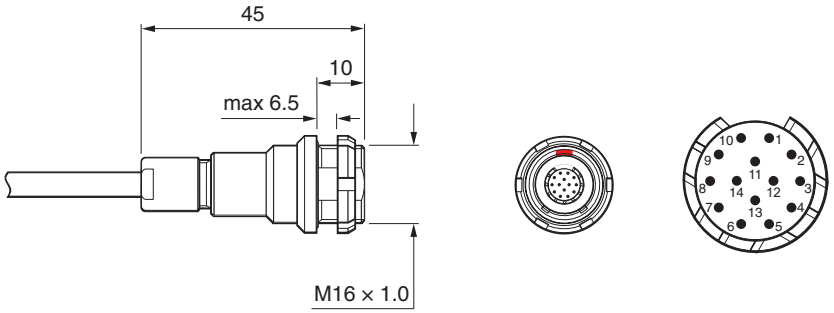
Plugs directly into the optional Advanced Diagnostic Tool ADTa-100 [1]
(ADT compatible readheads only)



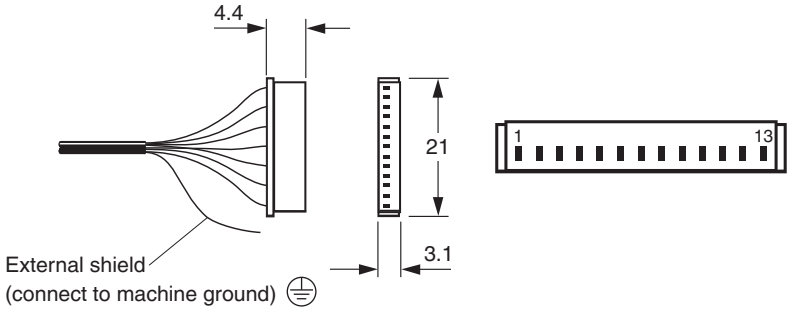
M12 (sealed) connector (Termination code S)



LEMO in-line connector (Termination code L)



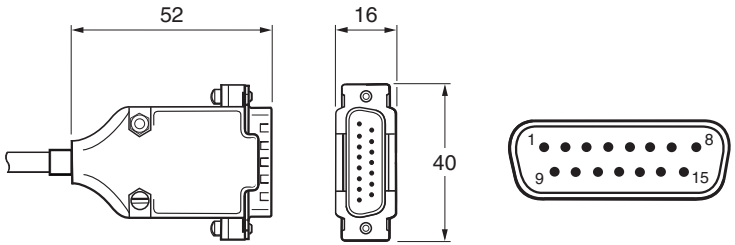
13-way flying lead [2] (Termination code F) (single-shielded cable shown)



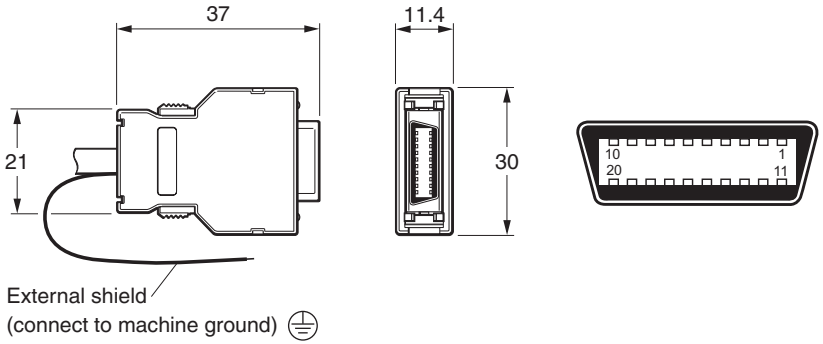
[1] For more details refer to the *Advanced Diagnostic Tools and ADT View software* User guide (Renishaw part no. M-6195-9413)

[2] JST part number: 13ZR-3H-P

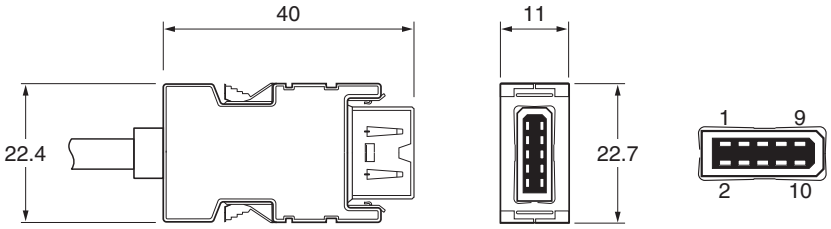
15-way D-type Mitsubishi connector (Termination code N)



20-way FANUC connector (Termination code H)

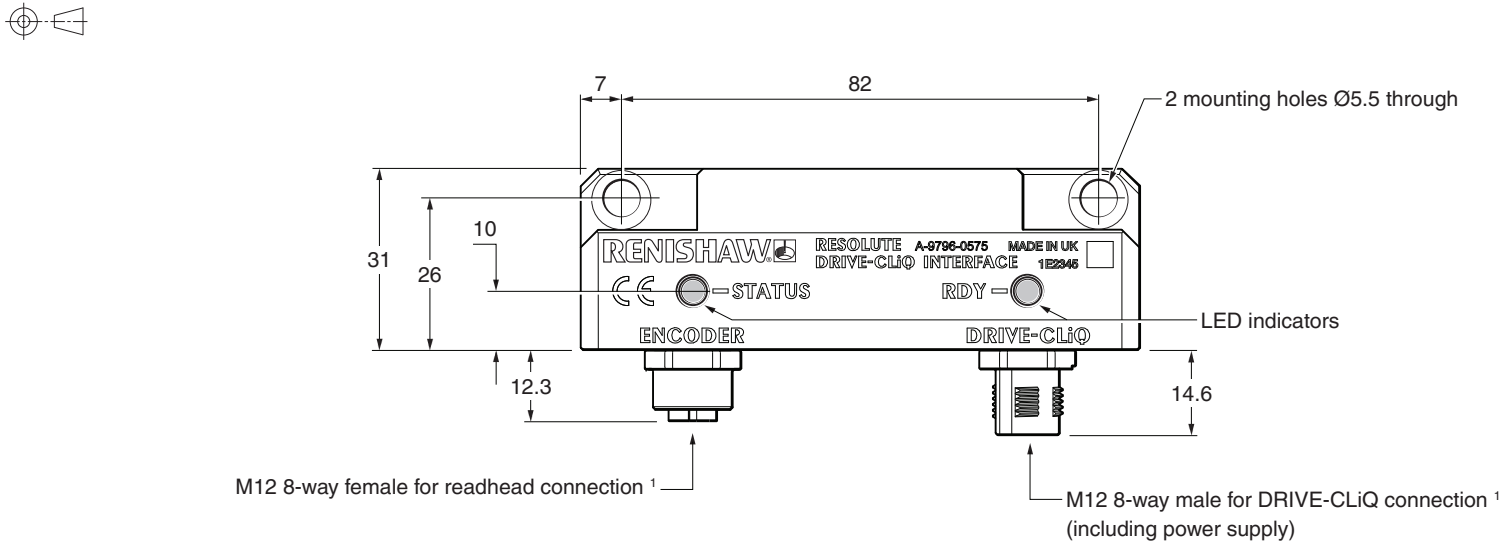


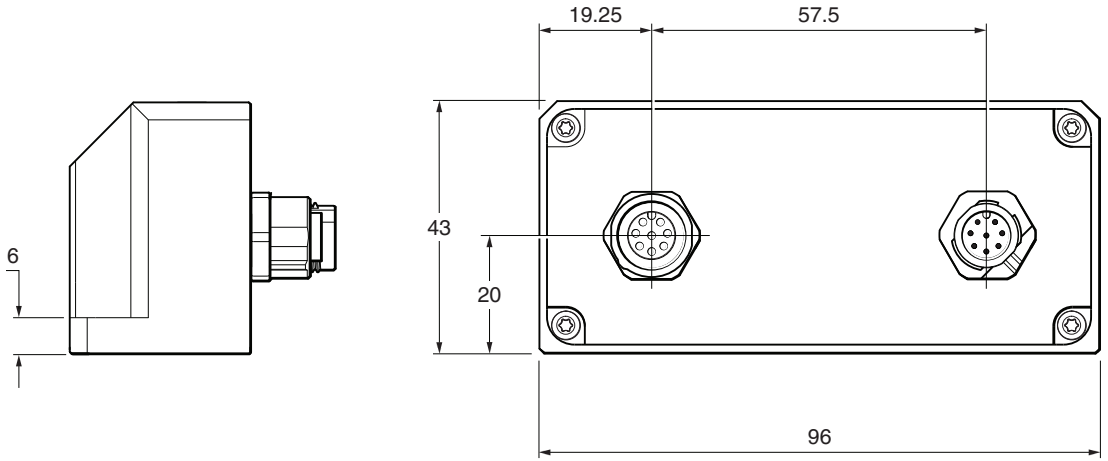
10-way Mitsubishi connector (Termination code P)



Siemens DRIVE-CLiQ interface drawing – single readhead input

Dimensions and tolerances in mm





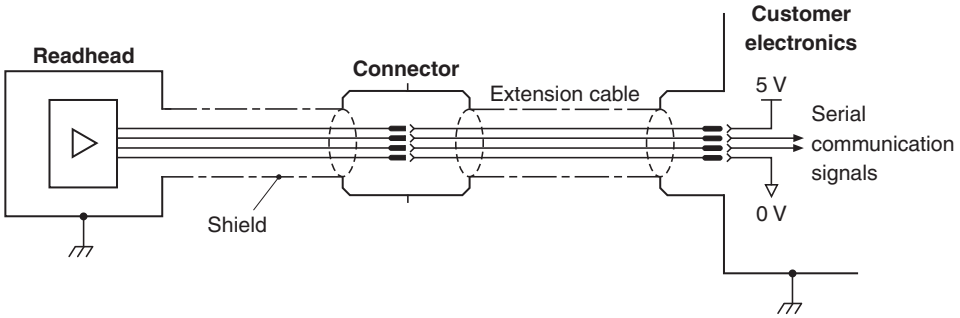
Interface part number	Compatible readheads
A-9777-0575	RLxxDA
	RLxxDS
A-9796-0575	RLxxDB
	RLxxDR

[1] Maximum tightening torque 4 Nm.

Electrical connections

Grounding and shielding [1]

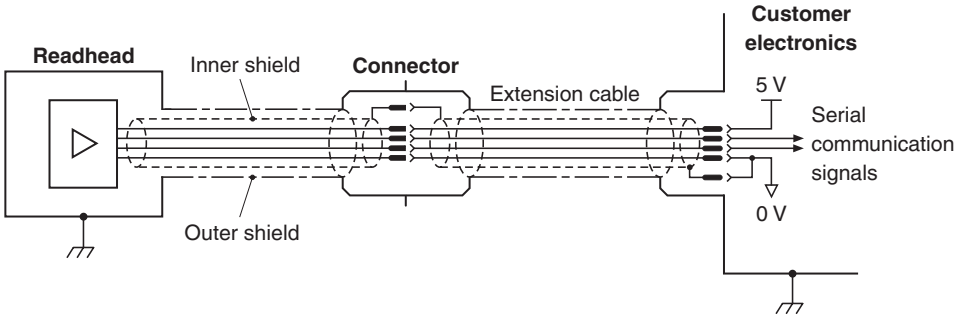
Single-shielded cable [2]



IMPORTANT:

- The shield should be connected to the machine earth (Field ground).
- If the connector is modified or replaced, the customer must ensure both 0 V cores (white and green) are connected to 0 V.

Double-shielded cable [2]



IMPORTANT:

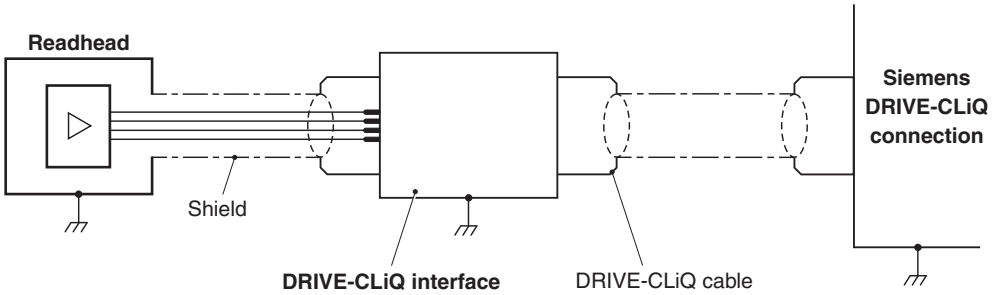
- The outer shield should be connected to the machine earth (Field ground). The inner shield should be connected to 0 V at customer electronics only. Care should be taken to ensure that the inner and outer shields are insulated from each other.
- If the connector is modified or replaced, the customer must ensure both 0 V cores (white and green) are connected to 0 V.

[1] RESOLUTE BiSS, FANUC, Mitsubishi, Panasonic/Omron, and Yaskawa readheads only. For RESOLUTE Siemens DRIVE-CLiQ systems, refer to page 23 for grounding and shielding arrangements.

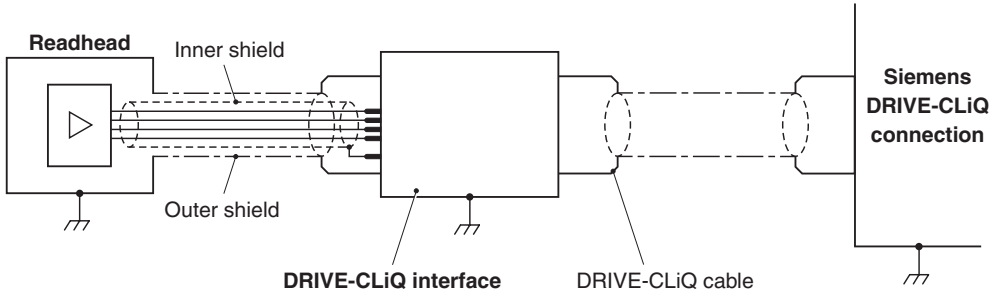
[2] RESOLUTE Yaskawa readheads are single-shielded cable only

Grounding and shielding – RESOLUTE Siemens DRIVE-CLiQ systems only

Single-shielded cable



Double-shielded cable



IMPORTANT: If reterminating double-shielded 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.

General specifications

Power supply [1]		5 V ±10%	1.25 W maximum (250 mA @ 5 V)
	(DRIVE-CLiQ system) [2]	24 V	3.05 W maximum (encoder: 1.25 W + interface: 1.8 W). 24 V power is provided by the DRIVE-CLiQ network.
		Ripple	200 mVpp maximum @ frequency up to 500 kHz
Sealing	(readhead - standard)		IP64
	(readhead - UHV)		IP30
	(DRIVE-CLiQ interface)		IP67
Acceleration	(readhead)	Operating	500 m/s^2, 3 axes
Shock	(readhead and interface)	Non-operating	1000 m/s^2, 6 ms, ½ sine, 3 axes
Maximum acceleration of scale with respect to readhead [3]			2000 m/s^2
Vibration	(readhead - standard)	Operating	300 m/s^2, 55 Hz to 2000 Hz, 3 axes
	(readhead - UHV)	Operating	100 m/s^2, 55 Hz to 2000 Hz, 3 axes
	(DRIVE-CLiQ interface)	Operating	100 m/s^2, 55 Hz to 2000 Hz, 3 axes
Mass	(readhead - standard)		18 g
	(readhead - UHV)		19 g
	(cable - standard)		32 g/m
	(cable - UHV)		19 g/m
	(DRIVE-CLiQ interface)		218 g
Readhead cable	(standard)		7 core, tinned and annealed copper, 28 AWG Outside diameter 4.7 ±0.2 mm Single-shielded: Flex life > 40 × 10^6 cycles at 20 mm bend radius Double-shielded: Flex life > 20 × 10^6 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			10 m (to controller or DRIVE-CLiQ interface) (Refer to Siemens DRIVE-CLiQ specifications for maximum cable length from DRIVE-CLiQ interface to controller)

CAUTION: 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.

1 Current consumption figures refer to terminated RESOLUTE systems. Renishaw encoder systems must be powered from a 5 Vdc supply complying with the requirements for SELV of standard IEC 60950-1.

2 The Renishaw DRIVE-CLiQ interface must be powered from a 24 Vdc supply complying with the requirements for SELV of standard IEC 60950-1.

3 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, contact your local Renishaw representative.

RTLA30-S scale specifications

Form (height × width)	0.4 mm × 8 mm (including adhesive)
Pitch	30 µm
Accuracy (at 20 °C)	±5 µm/m, calibration traceable to International Standards
Material	Hardened and tempered martensitic stainless steel fitted with a self-adhesive backing tape
Mass	12.9 g/m
Coefficient of thermal expansion (at 20 °C)	10.1 ±0.2 µm/m/°C
Installation temperature	+15 °C to +35 °C
Datum fixing	Datum clamp (A-9585-0028) secured with Loctite® 435™ (P-AD03-0012)

Maximum length

The maximum scale length is determined by the readhead resolution and the number of position bits in the serial word. For RESOLUTE readheads with fine resolution and short word length, the maximum scale length will be limited accordingly. Conversely, coarser resolutions or longer word lengths enable the use of longer scale lengths.

Serial protocol	Protocol word length	Maximum scale length (m) [1]			
		Resolution			
		1 nm	5 nm	50 nm	100 nm
BiSS	26 Bit	0.067	0.336	3.355	-
	32 Bit	4.295	21	21	-
	36 Bit	21	21	21	-
FANUC	37 Bit	21	-	21	-
Mitsubishi	40 Bit	2.1	-	21	-
Panasonic	48 Bit	21	-	21	21
Siemens DRIVE-CLiQ	28 Bit	-	-	13.42	-
	34 Bit	17.18	-	-	-
Yaskawa	36 Bit	1.8	-	21	-

[1] For lengths > 2 m, RTLA30 scale with the *FASTRACK* carrier, is recommended.

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