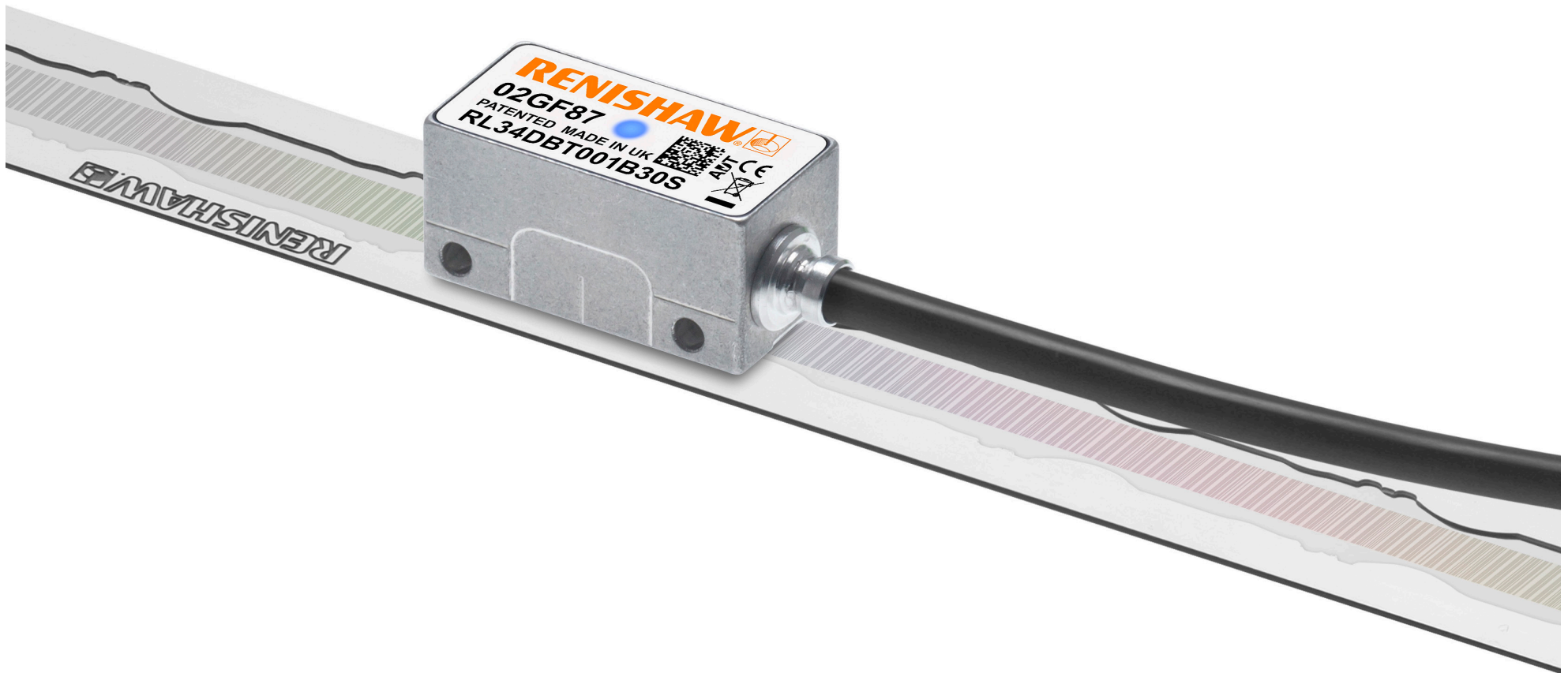


RESOLUTE™ RTLA30 and *FASTRACK*™ absolute linear encoder system



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Legal notices

Patents

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

CN1260551	KR1630471	EP2438402	CN1314511	CN102057256
DE10296644	US8505210	JP5755223	DE2390045	EP2294363
GB2395005	CN102388295	JP6074392	EP1469969	EP2894438
JP4008356	EP2417423	KR1851015	EP2390045	JP5475759
US7499827	JP5659220	US20120072169	JP5002559	JP5755299
CN102197282	KR1701535	EP01103791	US8466943	KR1550483
EP2350570	US10132657	US6465773	US8987633	US8141265
JP5480284	CN102460077			

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

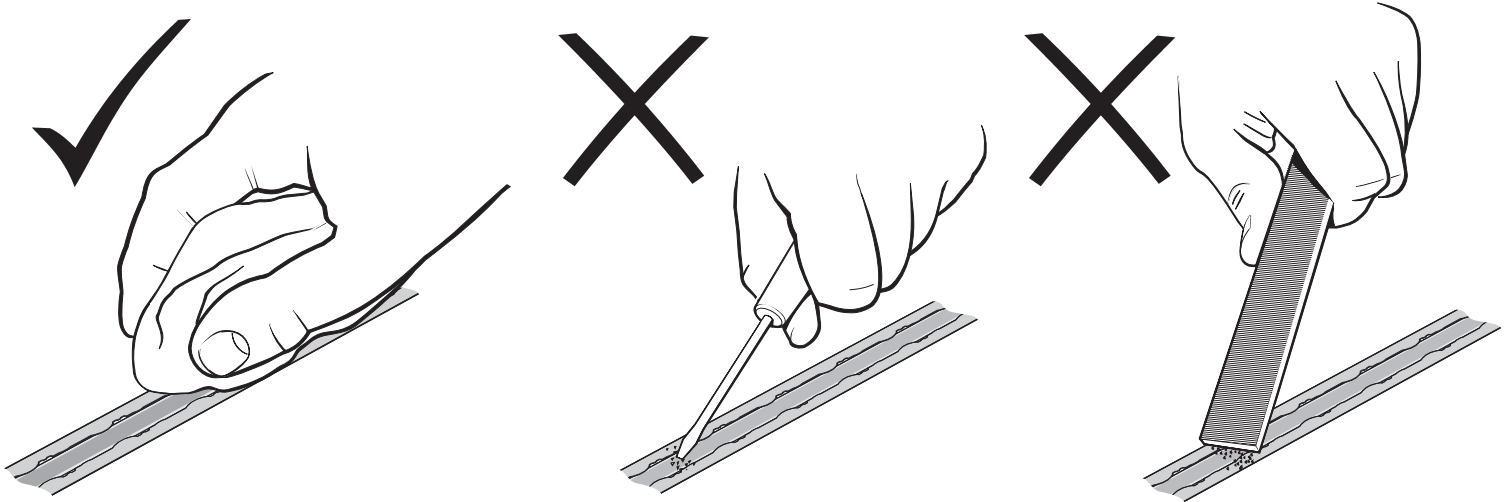
Information required by Article 33(1) of Regulation (EC) No. 1907/2006 ("REACH") relating to products containing substances of very high concern (SVHCs) is available at www.renishaw.com/REACH.

Disposal of waste electrical and electronic equipment



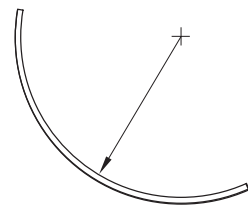
The use of this symbol on Renishaw products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic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



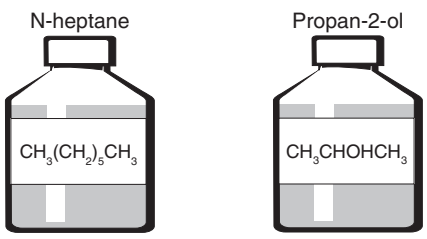
Minimum bend radius

RTLA30 scale - 50 mm
 FASTRACK™ carrier - 200 mm

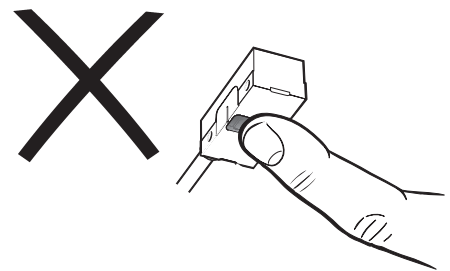
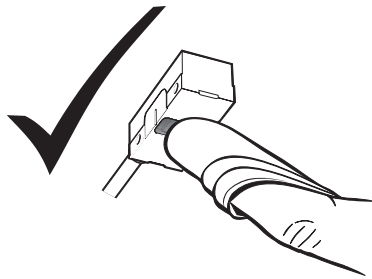


NOTE: Ensure self-adhesive tape is on outside of bend.

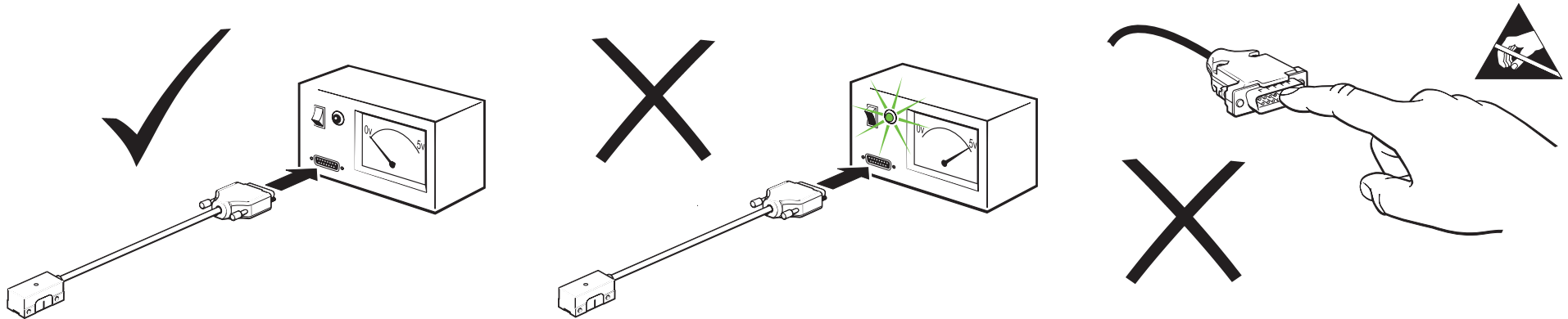
System



Readhead

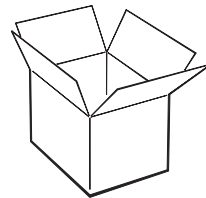


Readhead and DRIVE-CLiQ interface

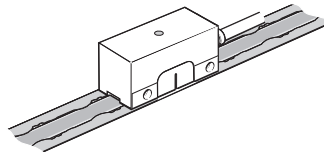


Temperature

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

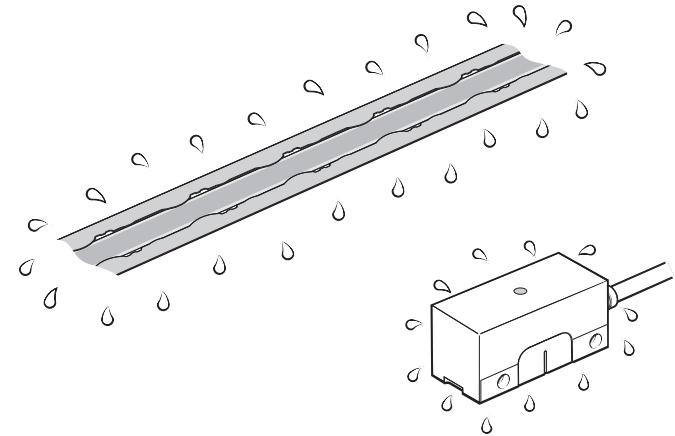


Operating	
Standard readhead, RTLA30 scale, and FASTRACK carrier	0 °C to +80 °C
UHV readhead	0 °C to +75 °C
DRIVE-CLiQ interface	0 °C to +55 °C



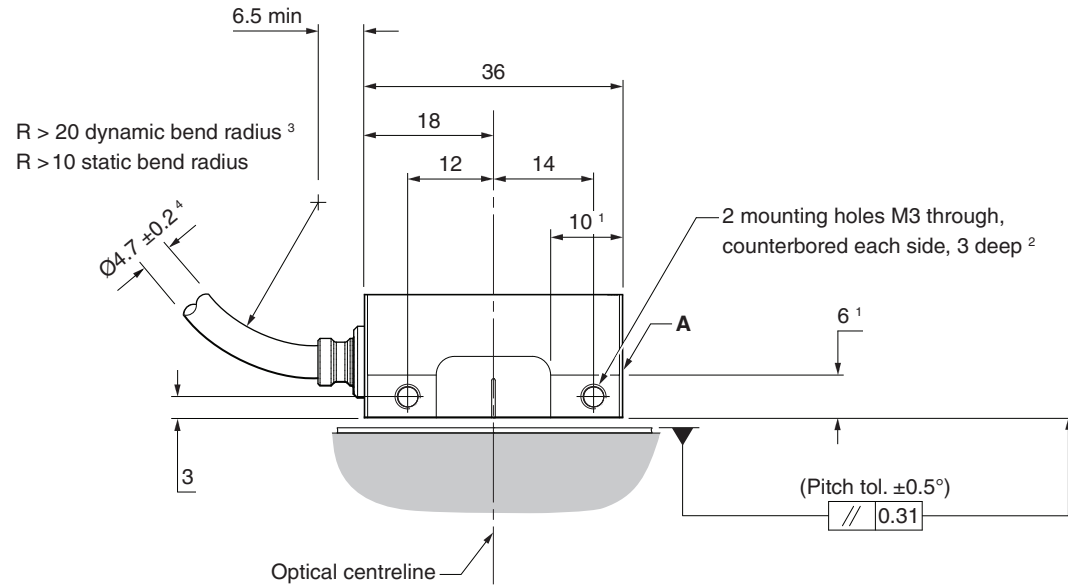
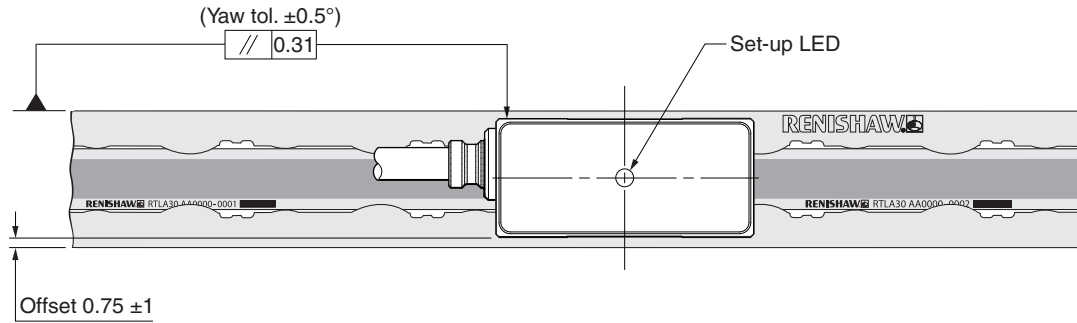
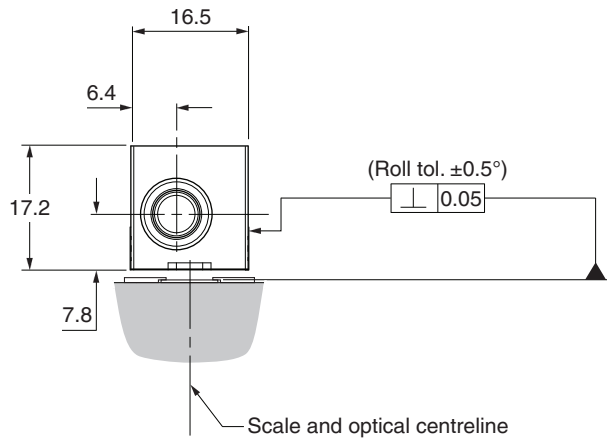
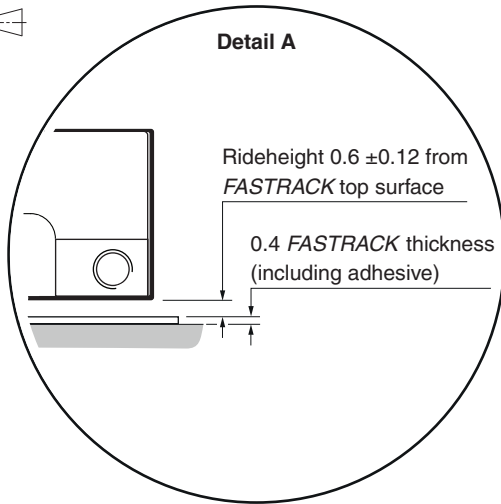
Humidity

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.

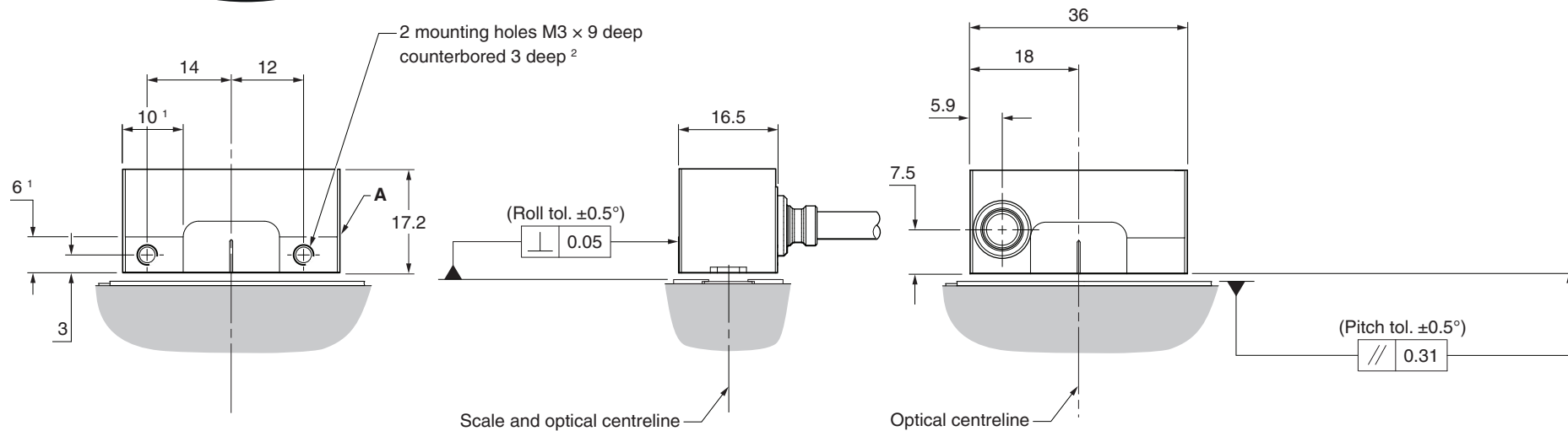
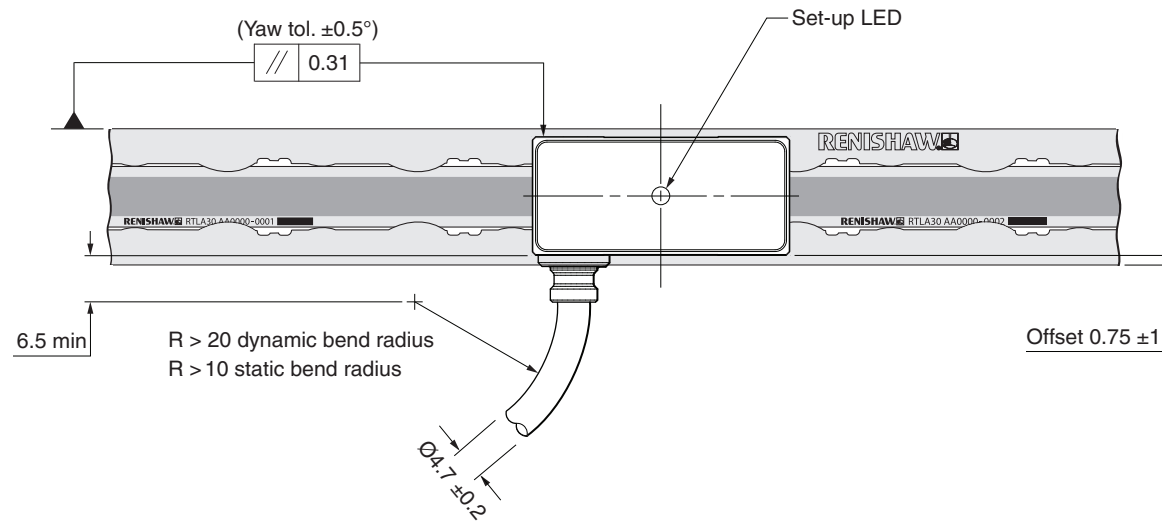
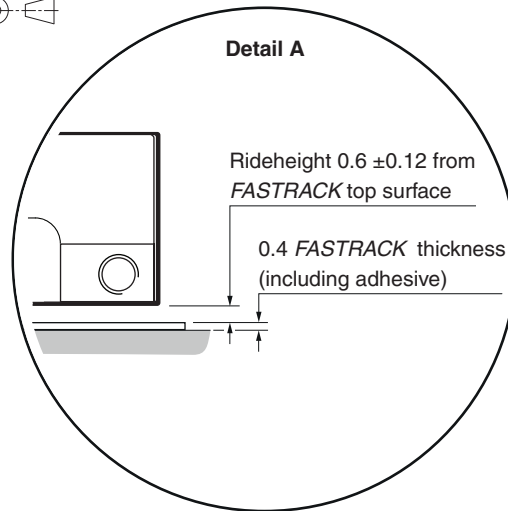
² The recommended thread engagement is 5 mm minimum (8 mm including counterbore) and the recommended tightening torque is 0.5 Nm to 0.7 Nm.

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

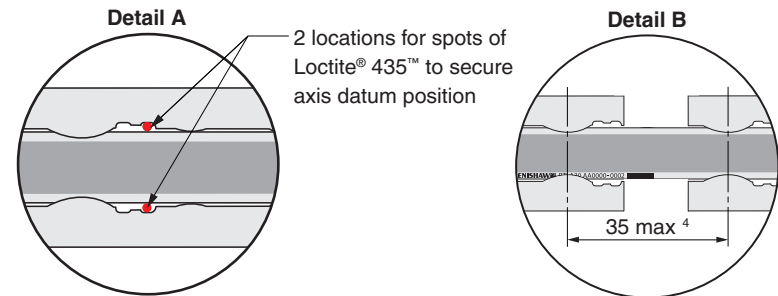
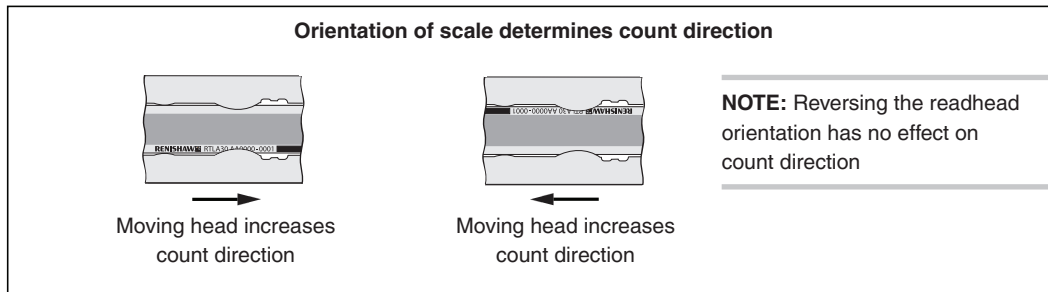
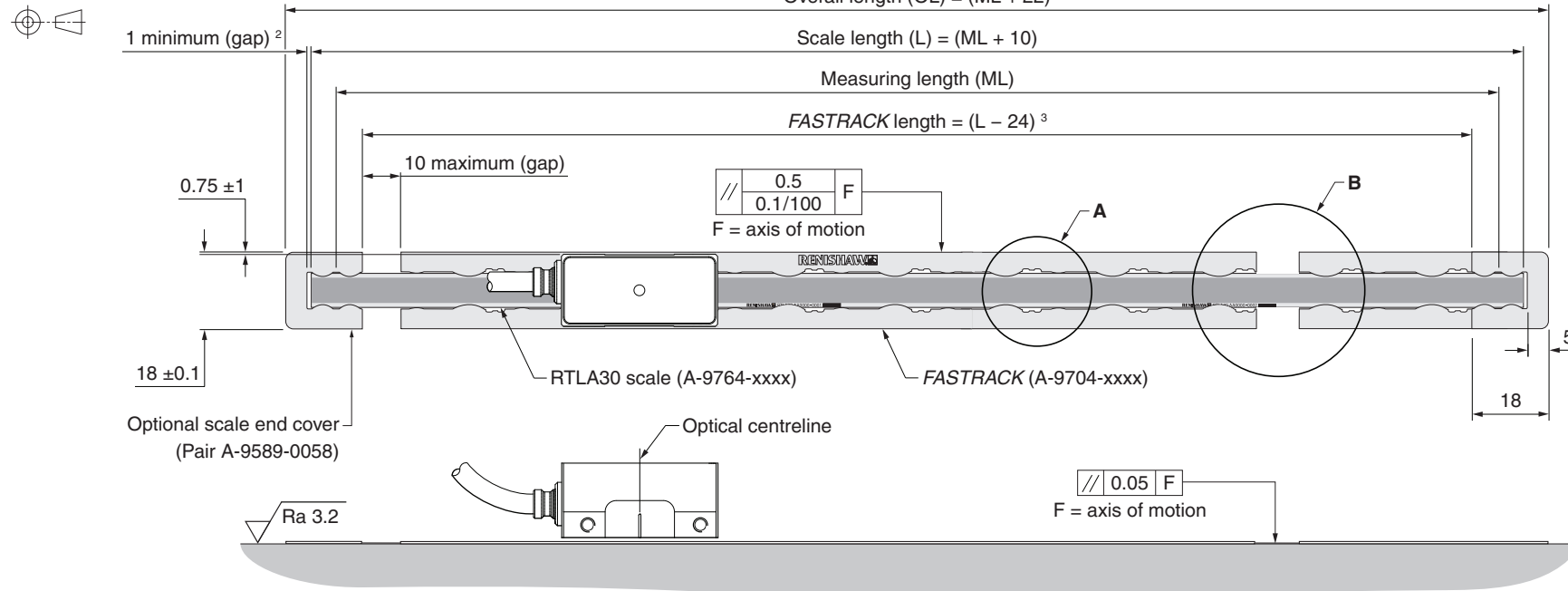


¹ Extent of mounting faces.

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/FASTRACK scale system installation drawing

Dimensions and tolerances in mm ¹



¹ All dimensions applicable when using side cable outlet version.

² For thermal expansion.

³ Assumes 1 mm gap between the scale and the end covers and zero gap between the FASTRACK carrier and the end covers. The minimum recommended FASTRACK carrier length = 100 mm.

⁴ Only required for sectional installations.

Equipment required for installing the RTLA30 and *FASTRACK* scale system

Required parts:

- Appropriate length of RTLA30 scale (see '[RTLA30/FASTRACK scale system installation drawing](#)' on page 10)
- Appropriate length of *FASTRACK* carrier ¹ (see '[RTLA30/FASTRACK scale system installation drawing](#)' on page 10)
- Loctite® 435™ (P-AD03-0012)
- Lint-free cloth
- Appropriate cleaning solvents (see '[Storage and handling](#)' on page 6)
- Centre section removal tool (A-9589-0122)
- Small pair of pliers
- Dial test indicator (DTi)
- Protective gloves

Optional parts:

- Scale end cover (A-9589-0058)
- Renishaw scale wipes (A-9523-4040)
- Loctite® 435™ dispensing tip (P-TL50-0209)
- RTL scale installation tool (A-9589-0420)
- Guillotine (A-9589-0071) or shears (A-9589-0133) for cutting RTLA30 scale and *FASTRACK* carrier to length required

¹ Minimum recommended length of *FASTRACK* is 100 mm.

Cutting the RTLA30 scale and *FASTRACK* carrier

CAUTION: During handling or installation of *FASTRACK*, suitable gloves should be worn to protect against injury from sharp edges.

If required cut the *FASTRACK* carrier and RTLA30 scale to length (separately) using the guillotine or the shears after referring to the installation drawing. Refer to the '[RTLA30/*FASTRACK* scale system installation drawing](#)' on page 10.

Using the guillotine

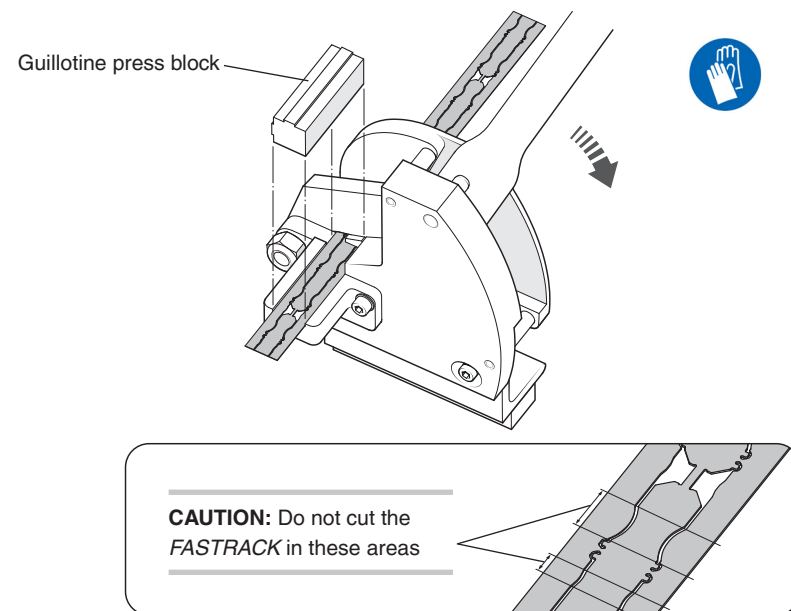
The guillotine should be held securely in place, using a suitable vice or clamping method.

Once secured, feed the *FASTRACK* or the scale through the guillotine as shown, and place the guillotine press block down onto the *FASTRACK*/scale.

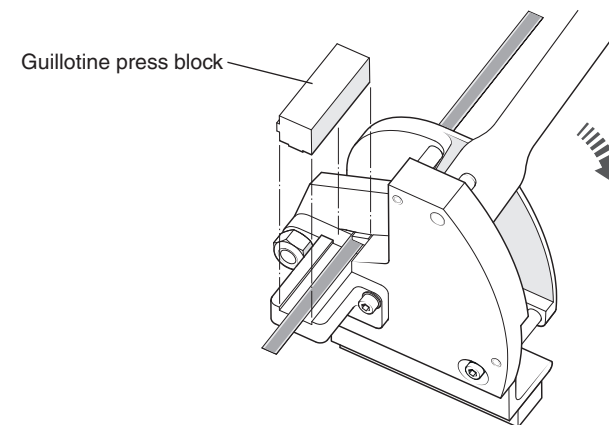
NOTE: Ensure the block is in the correct orientation (as shown below).

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

Guillotine press block orientation when cutting the *FASTRACK* carrier



Guillotine press block orientation when cutting the RTLA30 scale

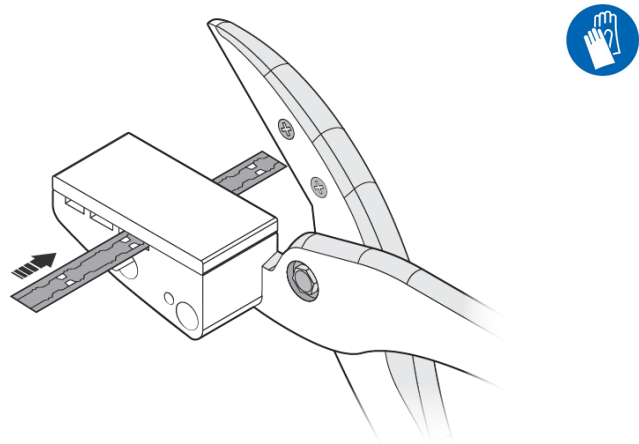


Using the shears

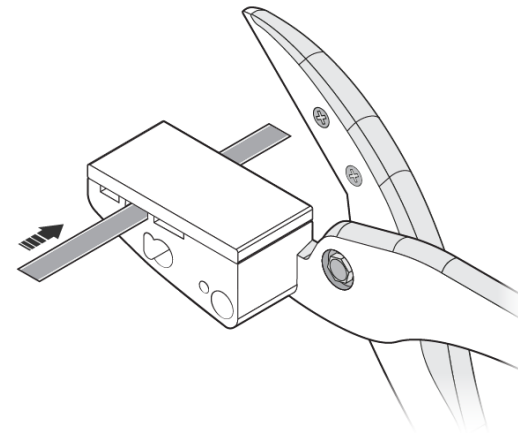
Feed the *FASTRACK* carrier or RTLA30 scale through the appropriately sized aperture on the shears (as shown below).

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

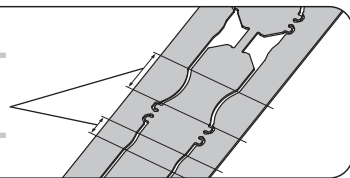
Insertion of the *FASTRACK* carrier through widest aperture



Insertion of the RTLA30 scale through the middle aperture



CAUTION: Do not cut
FASTRACK in these areas

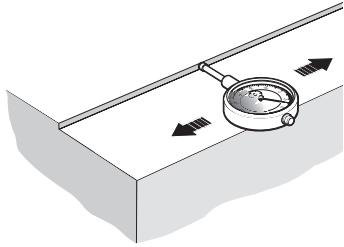


Applying the RTLA30 and *FASTRACK* scale system

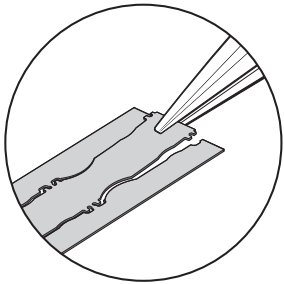
1. Thoroughly clean and degrease the substrate and allow to dry.

For *FASTRACK* location a ledge, separate straight edge(s) or dowels can be used.

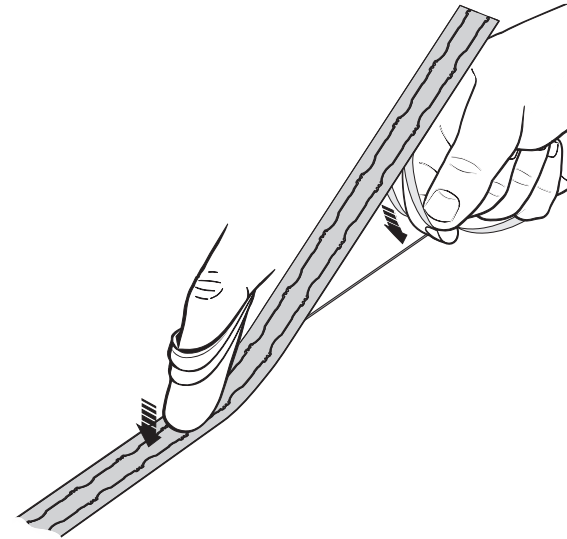
Check alignment of the ledge/separate straight edge(s) with respect to axis of motion (see '[RTLA30/*FASTRACK* scale system installation drawing](#)' on page 10).



2. Before sticking the *FASTRACK* to the substrate bend the centre section upwards slightly using a small pair of pliers.



3. Remove the backing liner and stick the *FASTRACK* to the substrate locating it against the ledge/separate straight edge(s) or dowels.



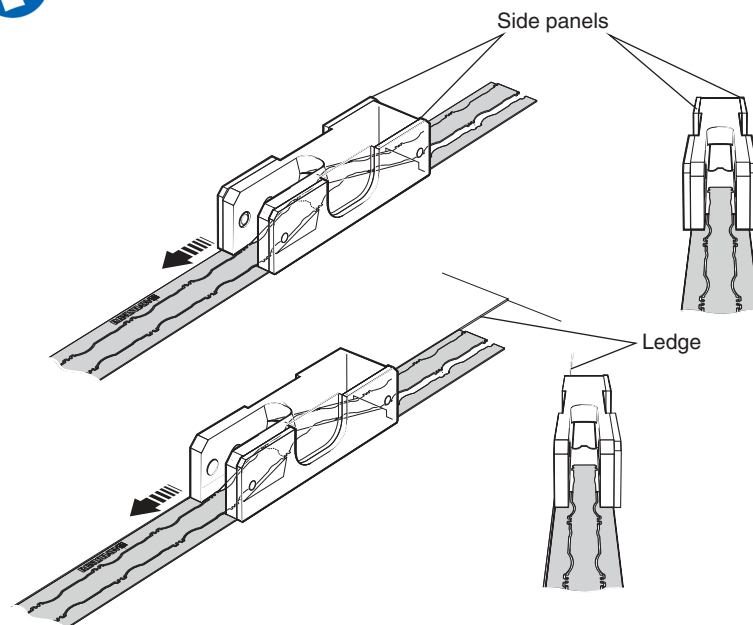
Ensure complete adhesion to the substrate by applying firm finger pressure along the length of the *FASTRACK* from the centre outwards towards each end using a lint-free cloth.

NOTE: Allow the *FASTRACK* a minimum of 20 minutes to adhere before removing the centre section.

- Engage the centre section removal tool and, with consistent forward pressure, remove the centre section of the *FASTRACK* carrier.

If the ledge method or similar is used then the appropriate side panel on the removal tool will need to be removed as shown below.

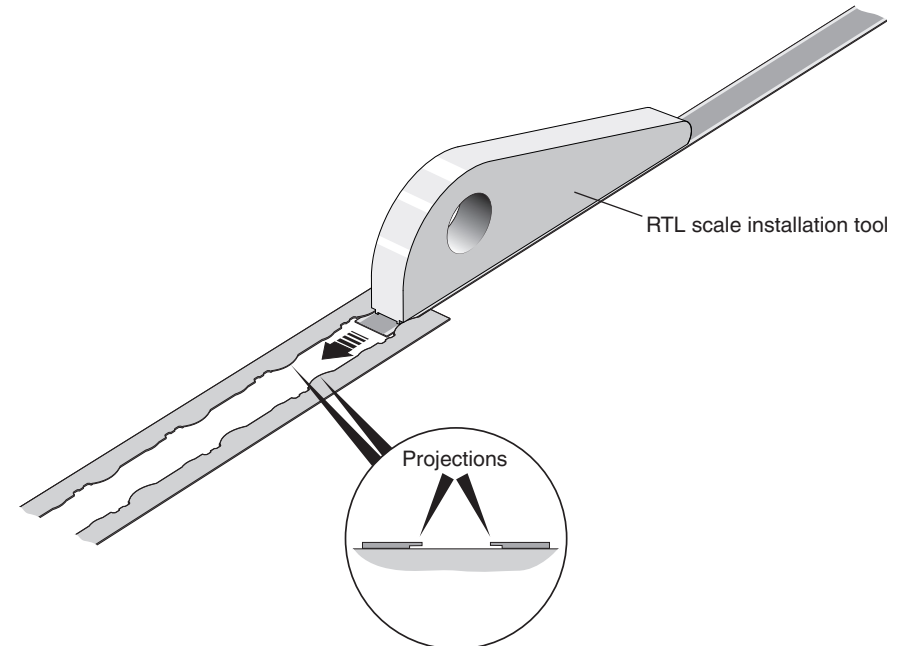
IMPORTANT: Wear suitable protective gloves whilst carrying out this procedure to avoid the risk of cuts.



- Slide the RTLA30 scale into the *FASTRACK* ensuring the scale is fed under the projections as shown below.

The RTLA30 scale can be installed manually by either pulling or pushing it through the *FASTRACK* carrier.

Alternatively, use the optional RTL scale installation tool as shown below.



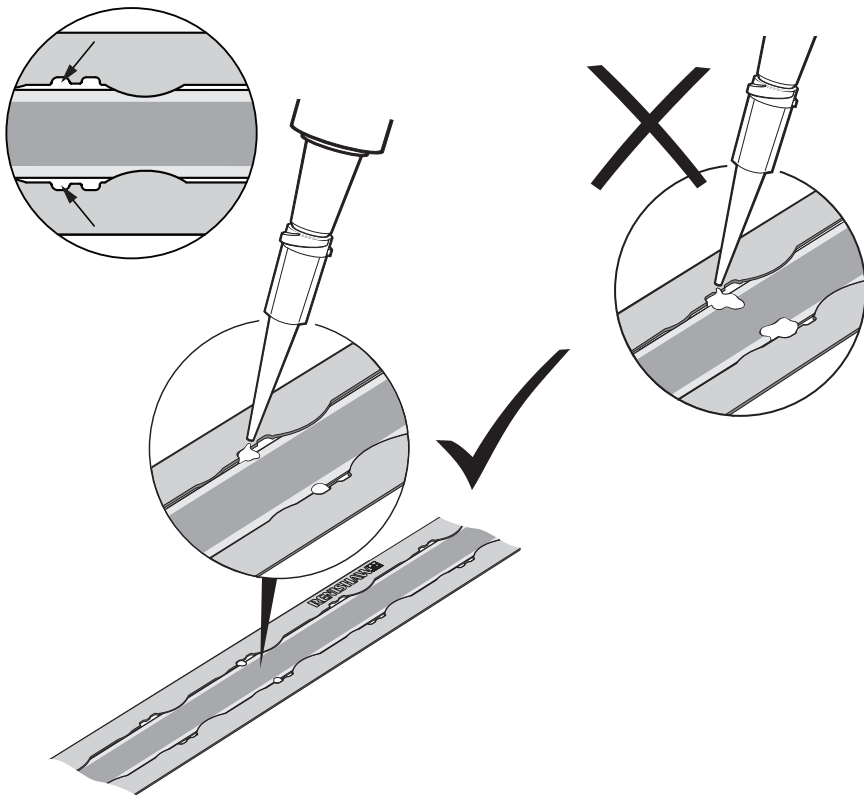
NOTE: For instructions on how to use the scale installation tool, download the *RTL* scale installation tool (A-9589-0420)* user guide (Renishaw part no. M-9589-9101) from the website at www.renishaw.com/resolutedownloads.

IMPORTANT: If manually installing the scale using fingers, suitable gloves should be worn to protect against injury from sharp edges.



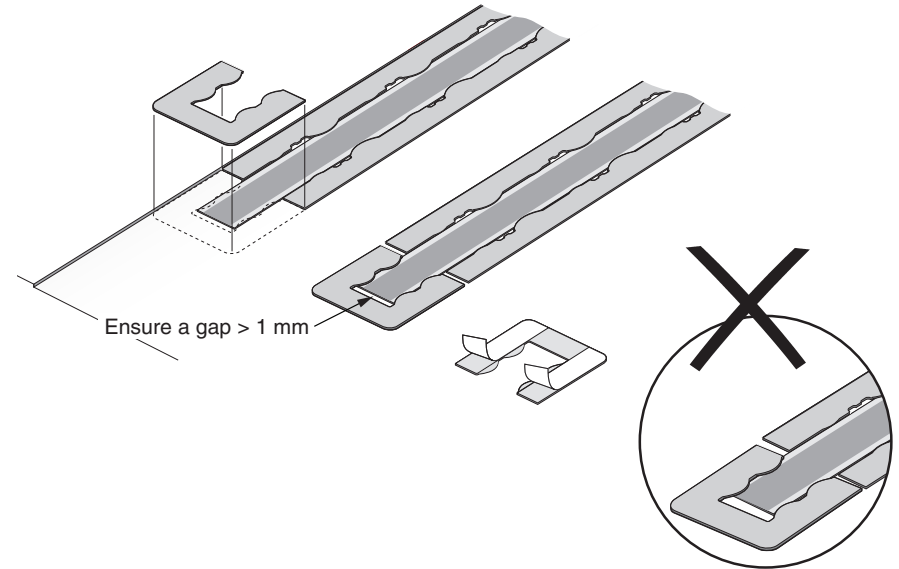
6. Create a scale datum. Using dispensing tip apply Loctite 435 between scale and *FASTRACK* so it wicks underneath the scale and *FASTRACK* adjacent to the user selected datum location as shown below.

NOTE: Only apply Loctite 435 in the locations shown below. Loctite 435 has been carefully selected as it will wick under the scale to lock it to the substrate. Dispensing tips are available.

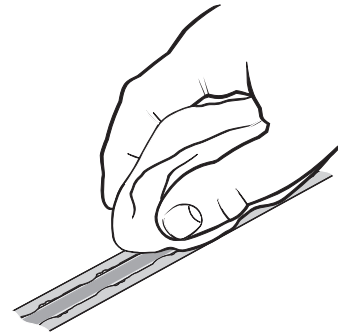


NOTE: Mechanical datum clamp also available. Contact your local Renishaw representative for more details.

7. Optional: Fix the self-adhesive end covers ensuring a gap of at least 1 mm.



8. Clean the *FASTRACK* and the scale using a lint-free cloth.



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 red 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-100¹ (A-6525-0100) and ADT View software² 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.

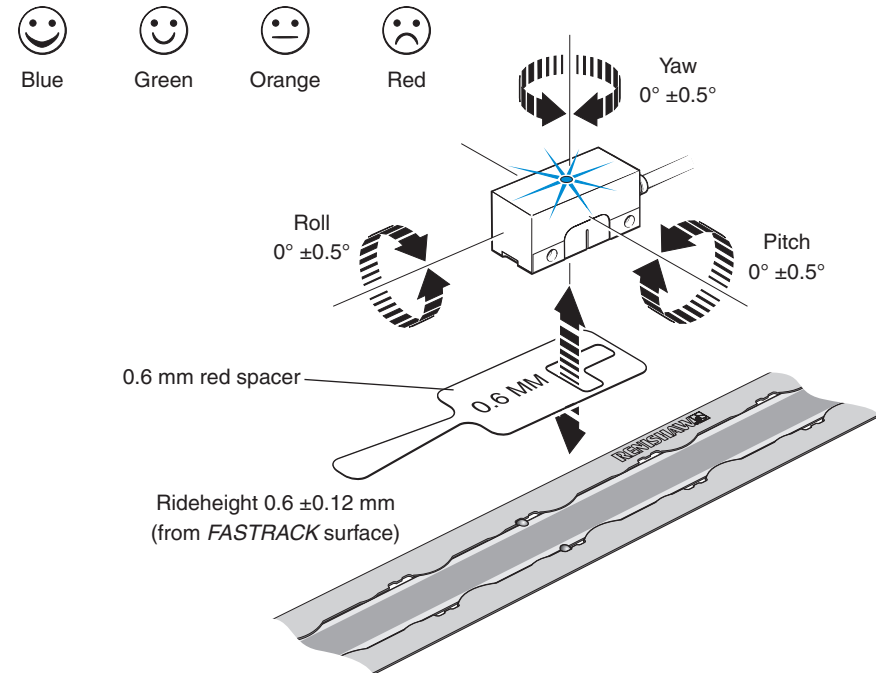
¹ For more details refer to the *Advanced Diagnostic Tools and ADT View software* user guide (Renishaw part no. M-6195-9413).

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	
	$\bar{P}S$	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	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

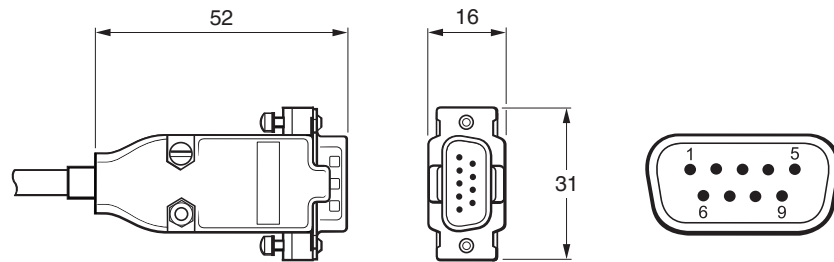
Yaskawa serial interface

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
	\bar{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

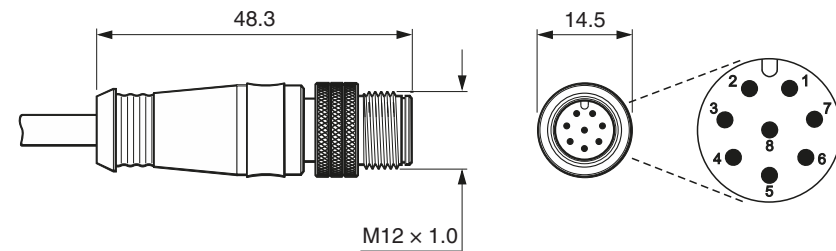
RESOLUTE readhead termination options

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

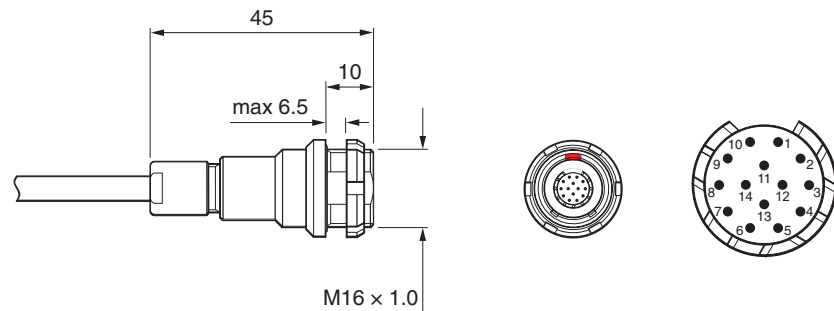
Plugs directly into the optional Advanced Diagnostic Tool ADTa-100 ¹
 (ADT compatible readheads only)



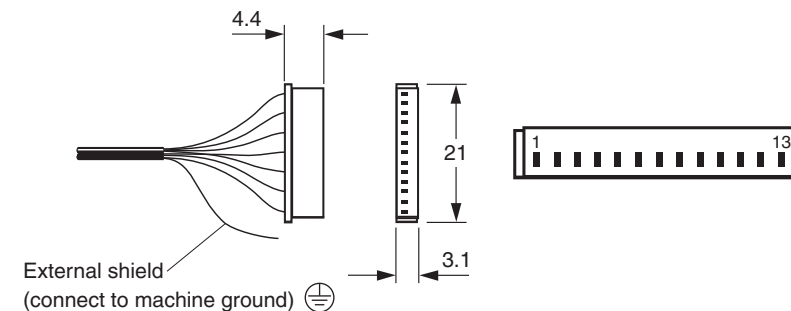
M12 (sealed) connector (Termination code S)



LEMO in-line connector (Termination code L)



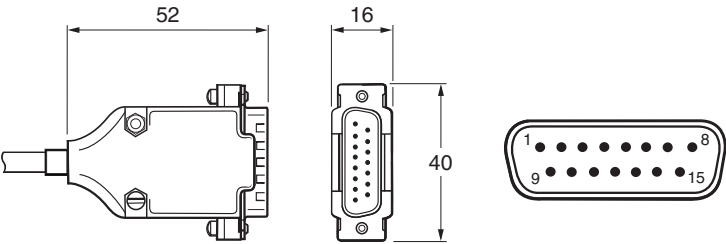
13-way flying lead ² (Termination code F) (single-shielded cable shown)



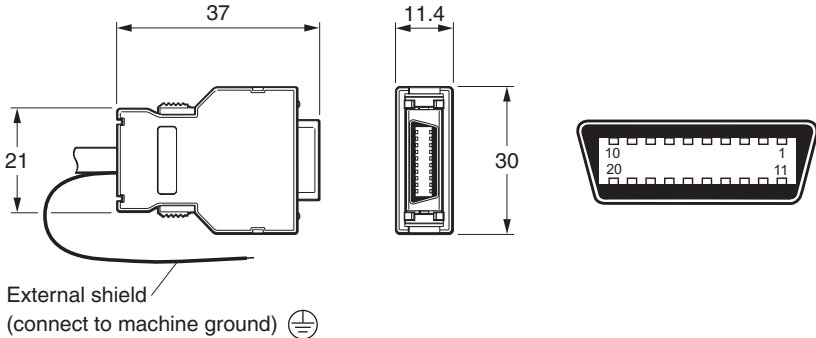
¹ For more details refer to the *Advanced Diagnostic Tools and ADT View software User guide* (Renishaw part no. M-6195-9413)

² JST part number: 13ZR-3H-P

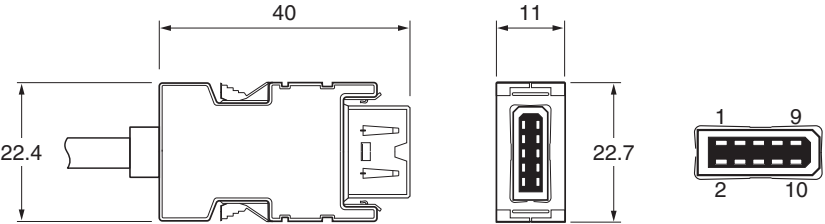
**15-way D-type Mitsubishi connector
(Termination code N)**



20-way FANUC connector (Termination code H)

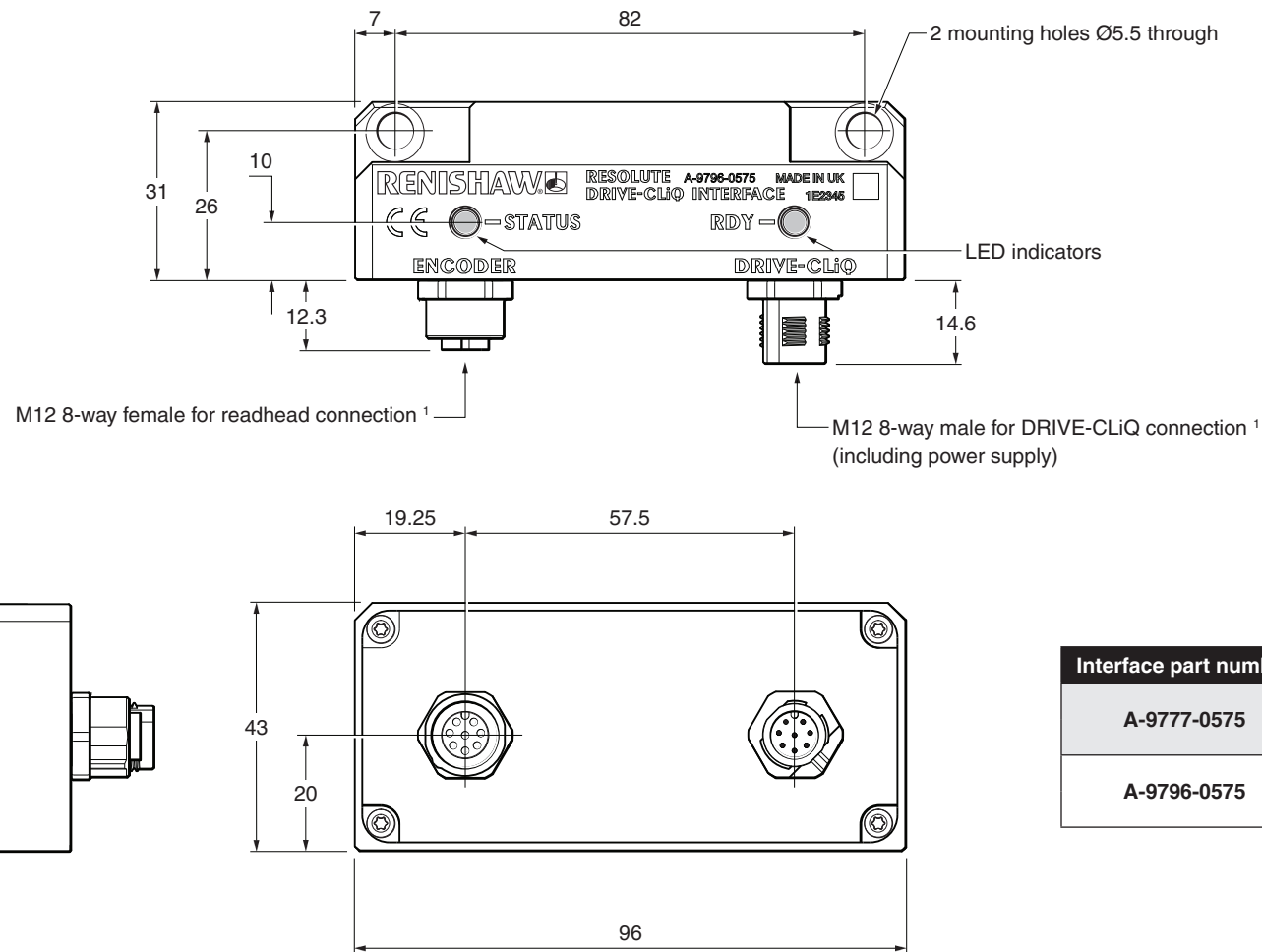


10-way Mitsubishi connector (Termination code P)



Siemens DRIVE-CLiQ interface drawing – single readhead input

Dimensions and tolerances in mm

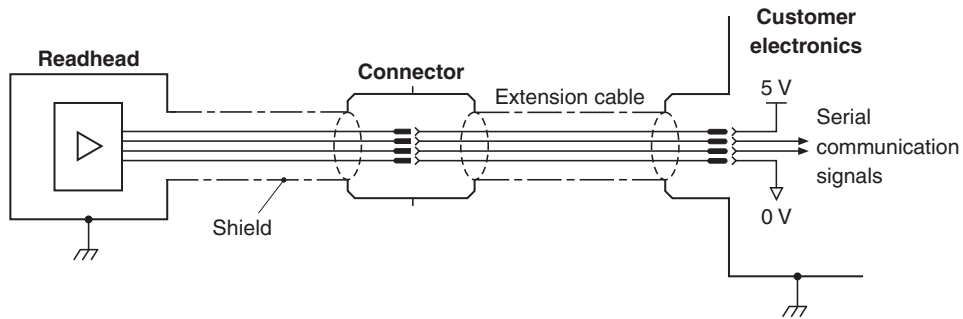


¹ Maximum tightening torque 4 Nm.

Electrical connections

Grounding and shielding ¹

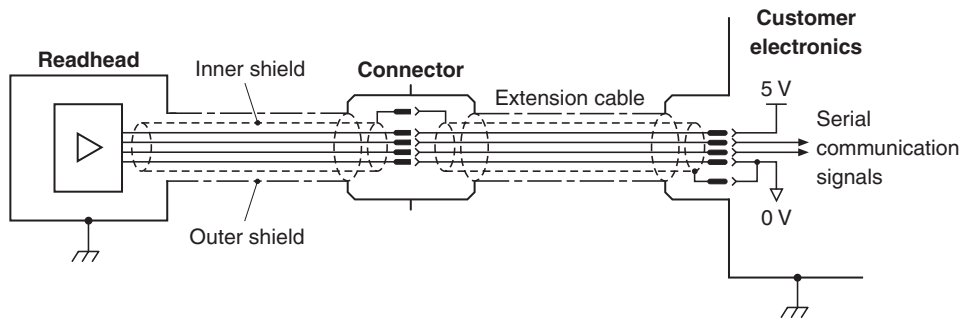
Single-shielded cable ²



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:

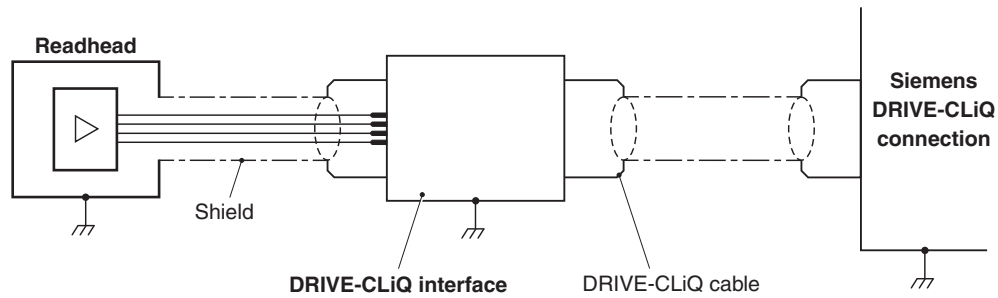
- The outer shield should be connected to the machine earth (Field ground). The inner shield should be connected to 0 V at customer electronics only. Care should be taken to ensure that the inner and outer shields are insulated from each other.
- If the connector is modified or replaced, the customer 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 25 for grounding and shielding arrangements.

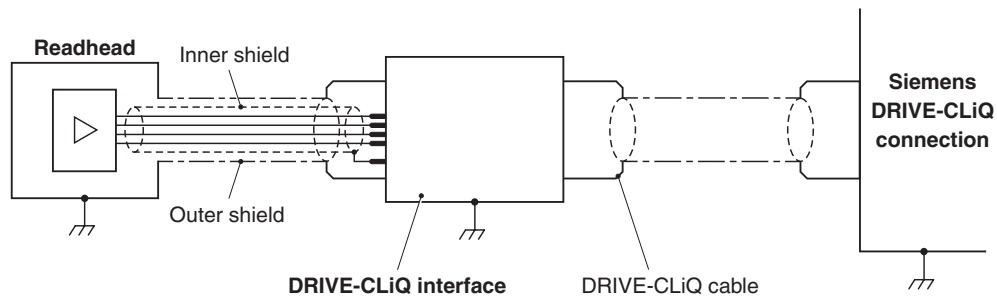
² RESOLUTE Yaskawa readheads are single-shielded cable only

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  Silver-coated copper braided single screen FEP core insulation over tin-plated copper wire.
	(UHV)		
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 scale and *FASTRACK* carrier specifications

	RTLA30 scale	<i>FASTRACK</i> carrier
Form (height x width)	0.2 mm x 8 mm	0.4 mm x 18 mm (including adhesive)
Pitch	30 µm	N/A
Accuracy (at 20 °C)	±5 µm/m, calibration traceable to International Standards	N/A
Material	Hardened and tempered martensitic stainless steel	
Mass	12.2 g/m	24 g/m
Coefficient of thermal expansion (at 20 °C)	10.1 ±0.2 µm/m/°C	
Mounting	Sits in the <i>FASTRACK</i> carrier	Self-adhesive backing tape
Installation temperature	+15 °C to +35 °C	
Datum fixing	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)			
		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	-

The *FASTRACK* carrier is supplied in lengths up to 25 m. The minimum recommended length is 100 mm.

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 #renishaw

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