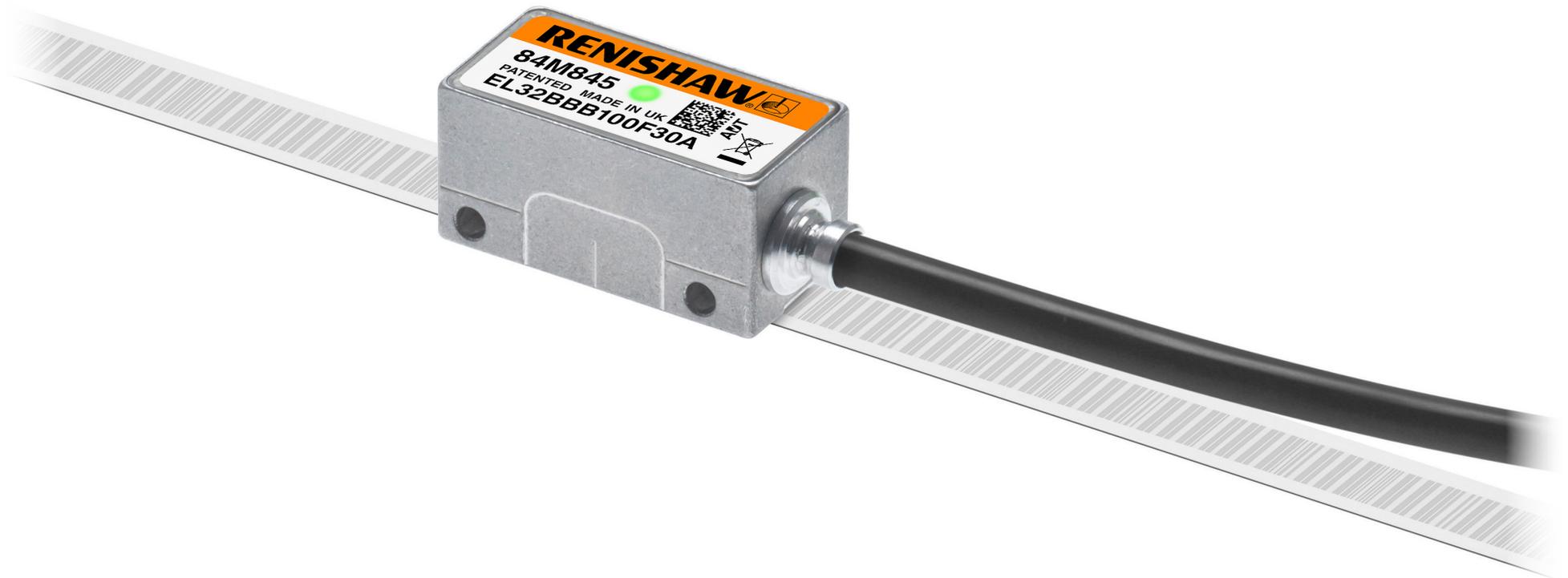


# EVOLUTE™ and RTLA50-S absolute linear encoder system



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## Legal notices

### Patents

Features of Renishaw's EVOLUTE 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
US8141265	EP2294363	CN102057256	JP2011524534	KR20110033204

### 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 EVOLUTE 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](http://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:** EVOLUTE

#### 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](mailto:usa@renishaw.com)

### ICES-003 – Information Technology Equipment (including Digital Apparatus)

This ISM device complies with Canadian ICES-003(A).

Cet appareil ISM est conforme à la norme ICES-003(A).

## Intended use

The EVOLUTE 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 EVOLUTE encoder range can be found in the following documents:

<i>EVOLUTE™ absolute optical encoder system</i> data sheet (Renishaw part no. L-9518-0027)
<i>ADTa-100 Advanced Diagnostic Tool</i> data sheet (Renishaw part no. L-9517-9834)
<i>Advanced Diagnostic Tools and ADT View software</i> user guide (Renishaw part no. M-6195-9413)

These can be downloaded from our website at [www.renishaw.com/evolutedownloads](http://www.renishaw.com/evolutedownloads) 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

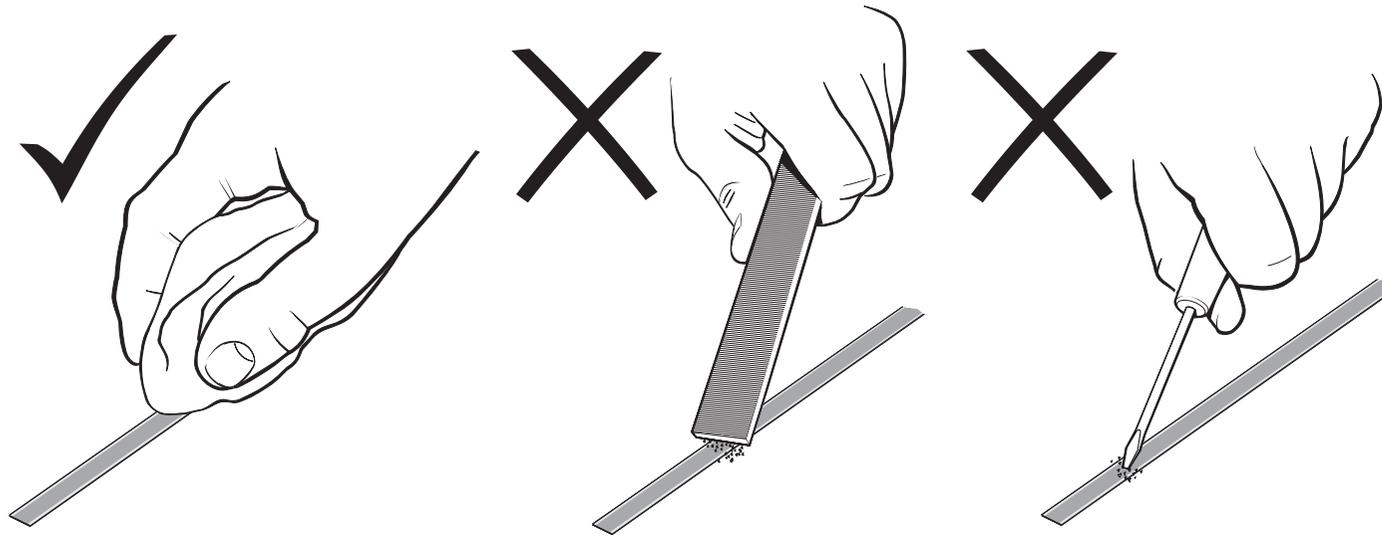
Information required by Article 33(1) of Regulation (EC) No. 1907/2006 ("REACH") relating to products containing substances of very high concern (SVHCs) is available at [www.renishaw.com/REACH](http://www.renishaw.com/REACH).

## Disposal of waste electrical and electronic equipment

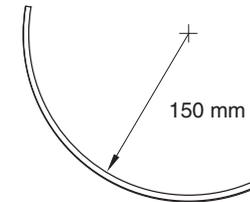


The use of this symbol on Renishaw products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic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

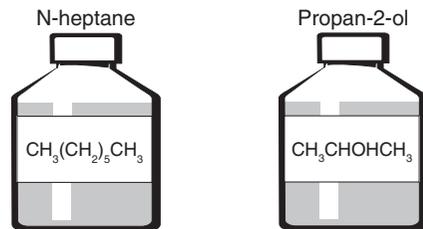


### Minimum bend radius

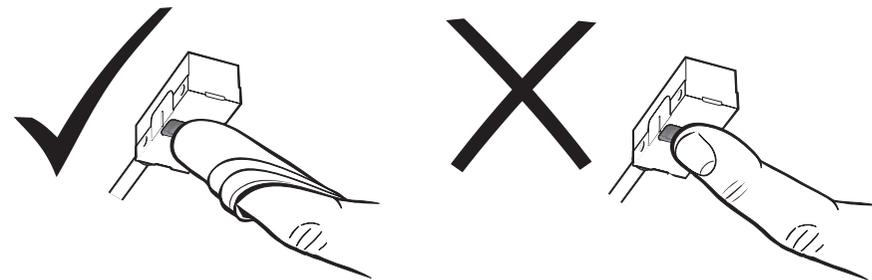


**NOTE:** During storage ensure the self-adhesive tape is on the outside of the bend.

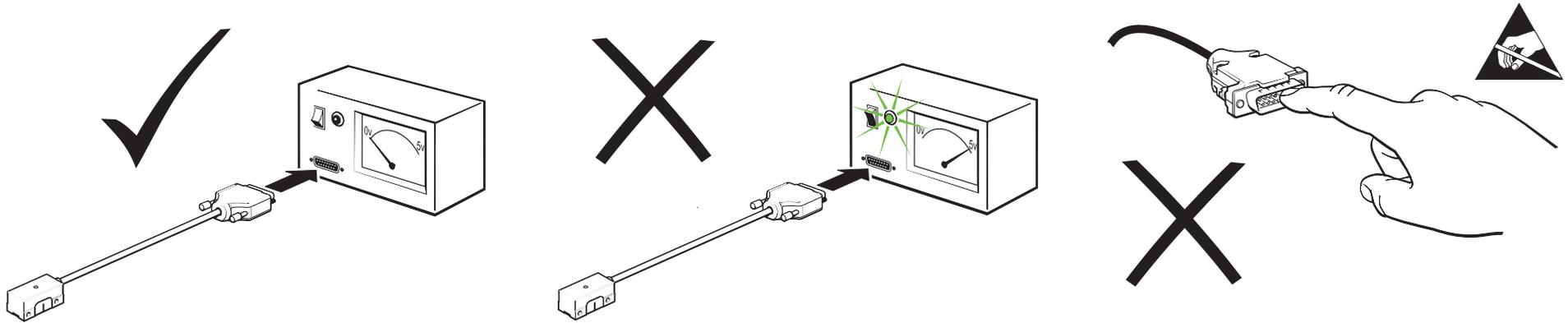
## System



## Readhead



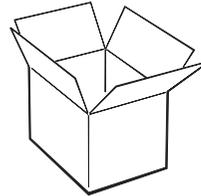
## Readhead and DRIVE-CLiQ interface



## Temperature

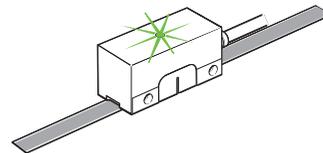
### Storage

EVOLUTE readhead, DRIVE-CLiQ interface, and RTLA50-S scale	-20 °C to +80 °C
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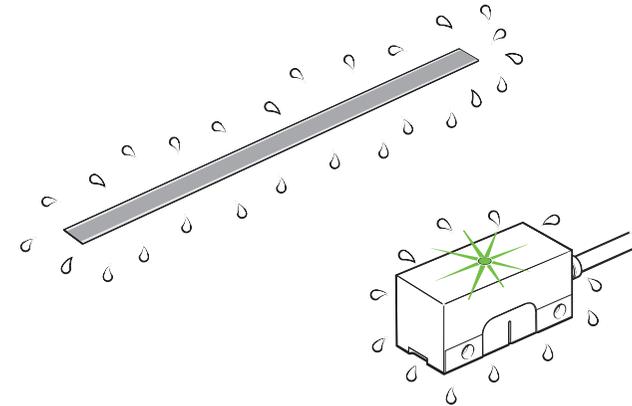
### Operating

EVOLUTE readhead and RTLA50-S scale	0 °C to +80 °C
DRIVE-CLiQ interface	0 °C to +55 °C



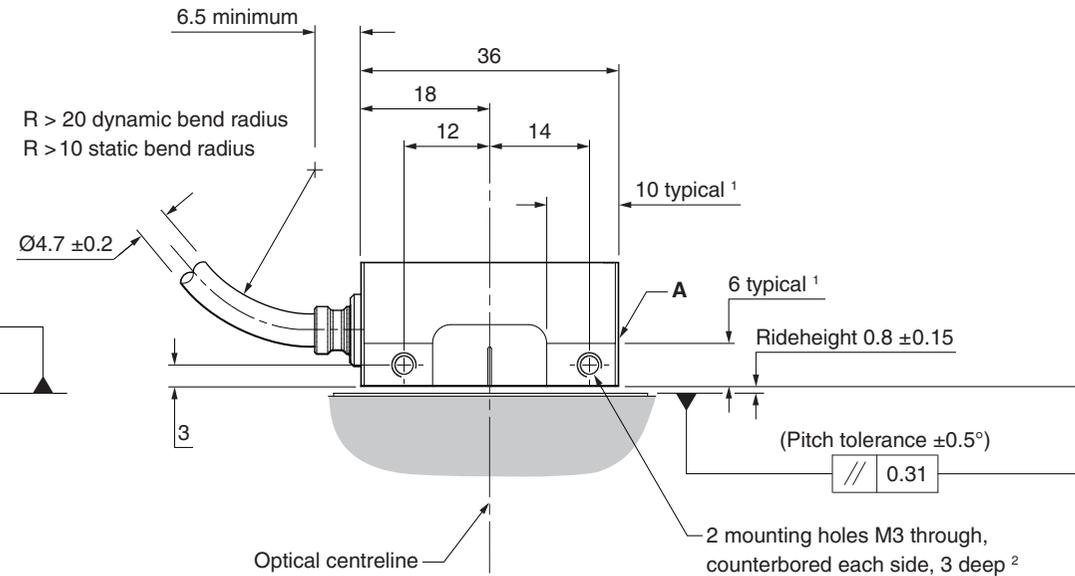
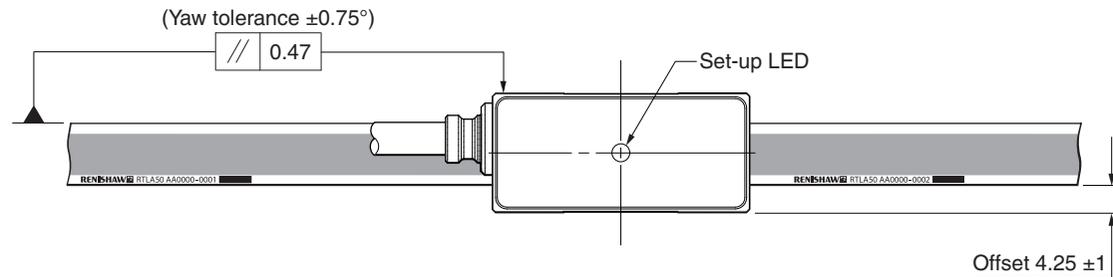
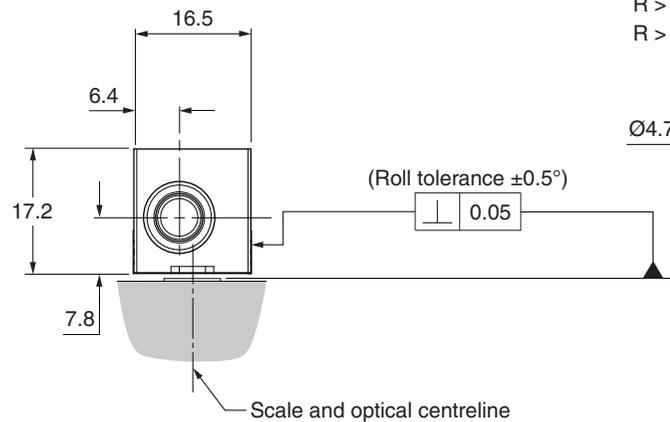
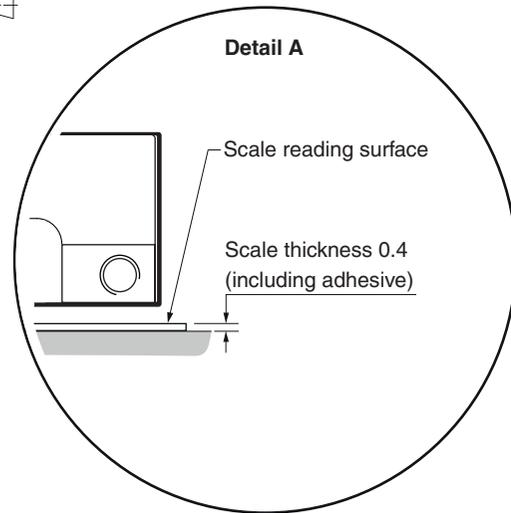
## Humidity

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



# EVOLUTE readhead installation drawing – standard cable outlet

Dimensions and tolerances in mm

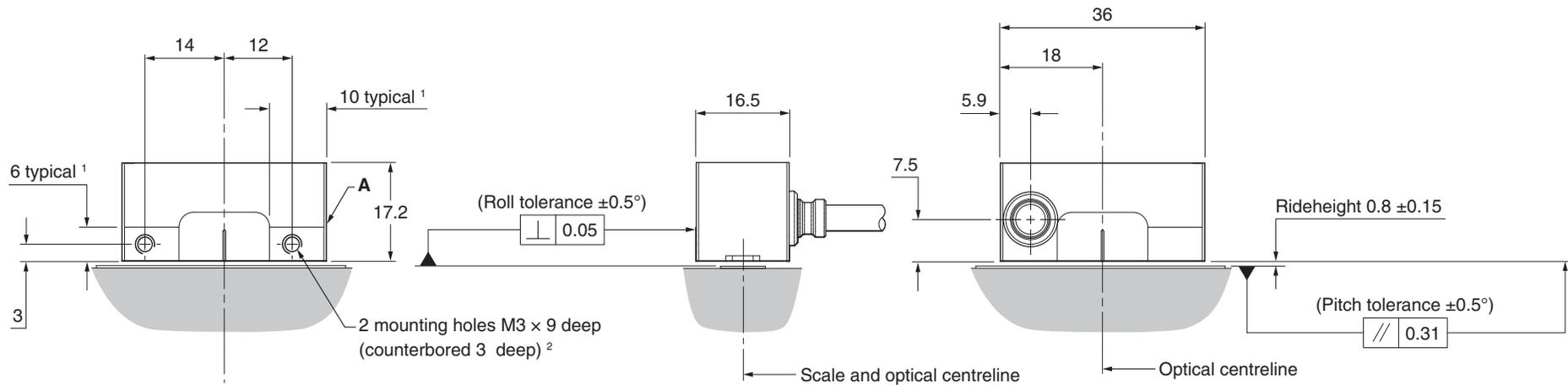
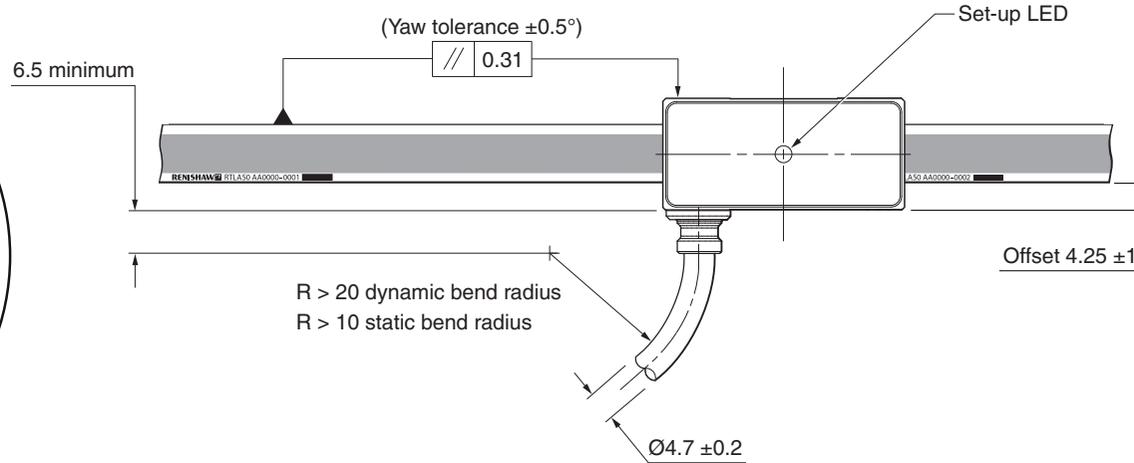
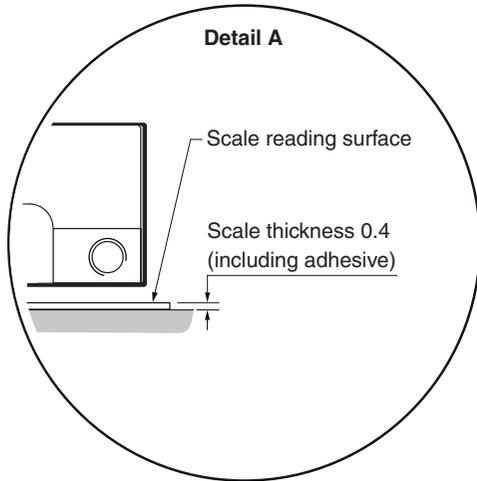


<sup>1</sup> Extent of mounting faces.

<sup>2</sup> 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.

# EVOLUTE readhead installation drawing – side cable outlet

Dimensions and tolerances in mm

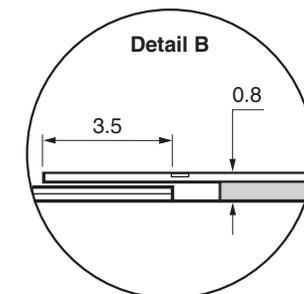
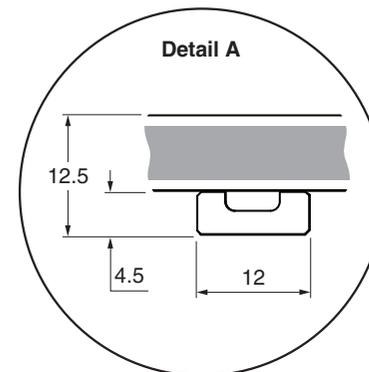
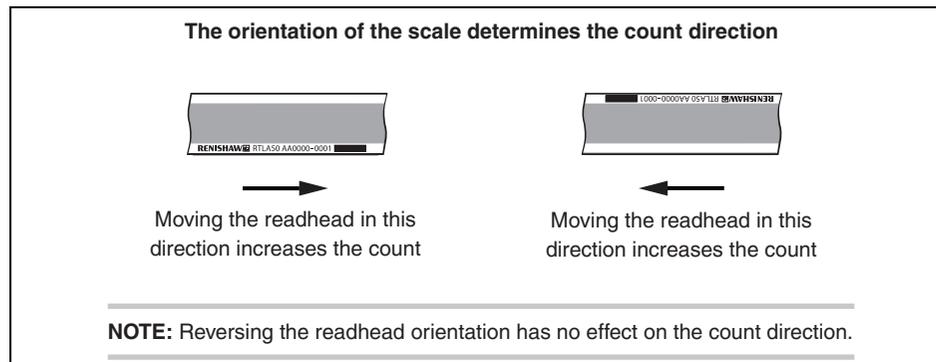
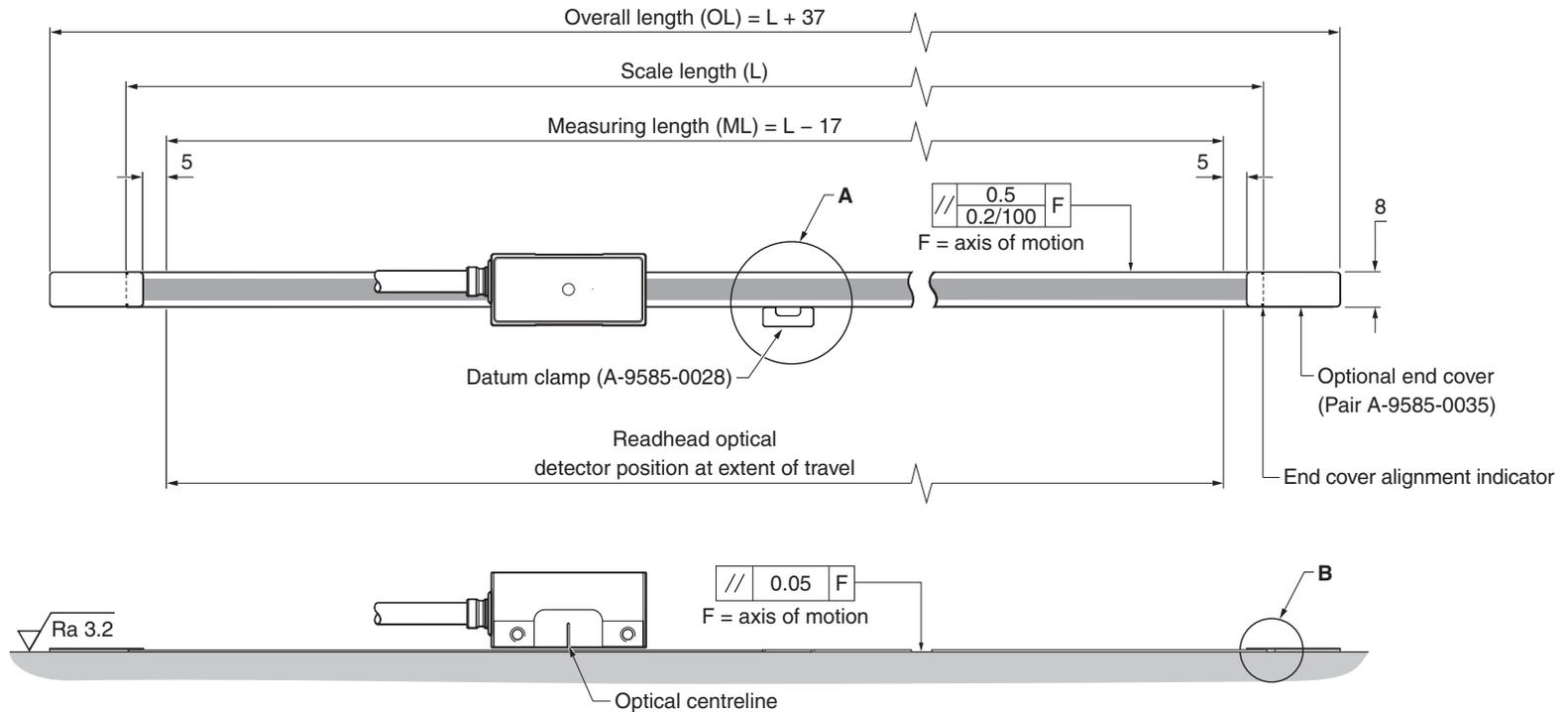


<sup>1</sup> Extent of mounting faces

<sup>2</sup> 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

# RTLA50-S scale installation drawing

Dimensions and tolerances in mm



# Equipment required for installing the RTLA50-S scale

## Required parts:

- Appropriate length of RTLA50-S scale (see '[RTLA50-S scale installation drawing](#)' on page 11)
- Datum clamp (A-9585-0028)
- Loctite® 435™ (P-AD03-0012)
- Lint-free cloth
- Appropriate cleaning solvents (see '[Storage and handling](#)' on page 7)
- RTLA50-S scale applicator (A-9589-0095)
- Two 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 RTLA50-S to required length

## Cutting the RTLA50-S scale

If required cut the RTLA50-S scale to length using the guillotine or shears after referring to the 'RTLA50-S scale installation drawing' on page 11.

### Using the guillotine

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

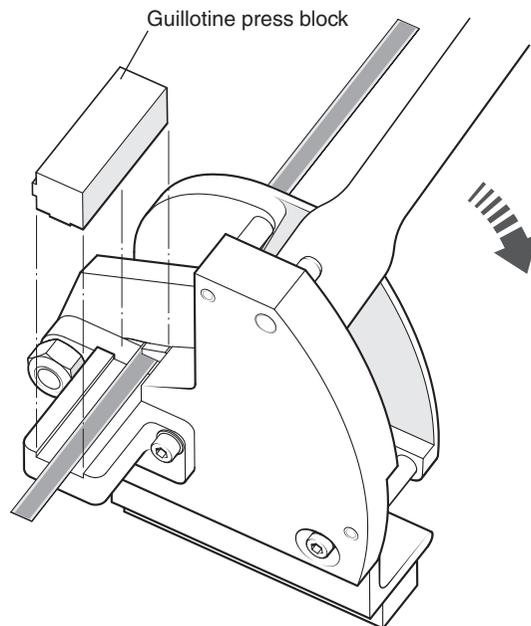
Once secured, feed the RTLA50-S scale through the guillotine as shown, and place guillotine press block down onto the scale.

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

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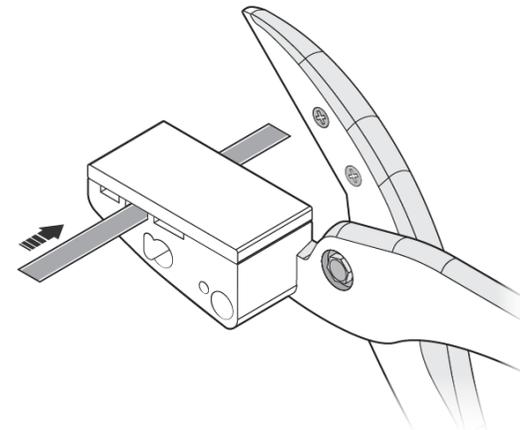
#### Guillotine press block orientation when cutting the RTLA50-S scale



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

### Using the shears

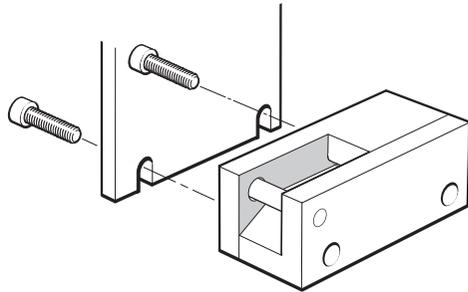
Feed the RTLA50-S scale through the middle aperture on the shears (as shown below).



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

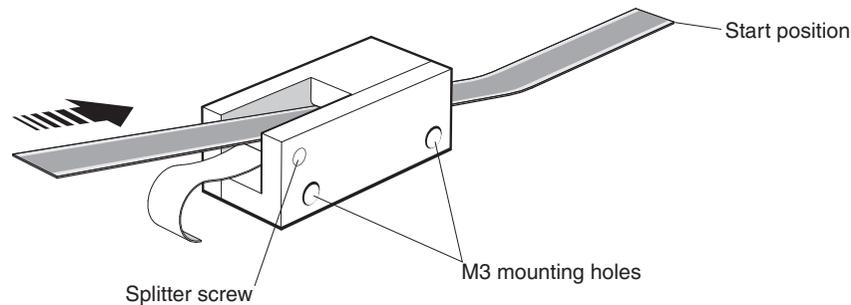
## Applying the RTLA50-S scale

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 'RTLA50-S scale installation drawing' on page 11).
3. Thoroughly clean and degrease the substrate using recommended solvents (see 'Storage and handling' on page 7). 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.

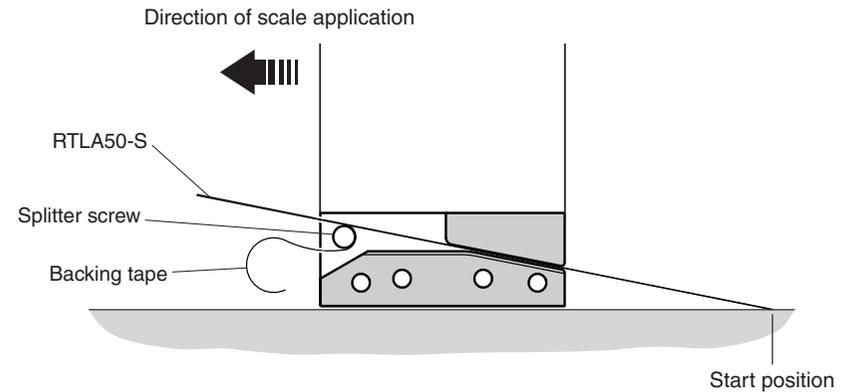


**NOTE:** The scale applicator can be mounted either way round to enable easiest orientation for the scale installation.

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 15).
14. Allow 24 hours for complete adhesion of the scale before fitting the datum clamp (see 'Fitting the datum clamp' on page 16).

## Fitting the end covers

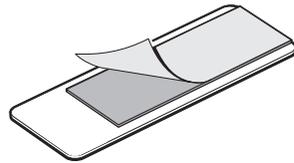
The end cover kit is designed to be used with the RTLA50-S scale to provide protection for exposed scale ends.

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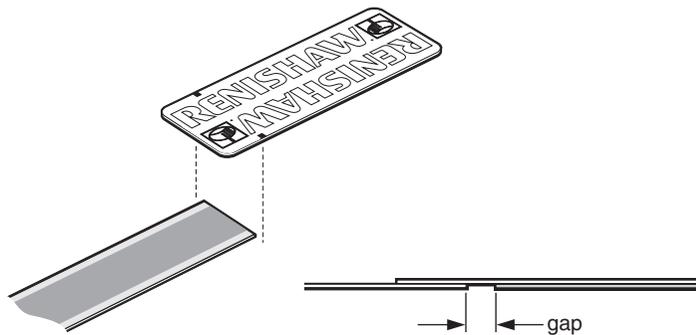
**NOTE:** The end covers are optional and can be fitted before or after readhead installation.

---

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.



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

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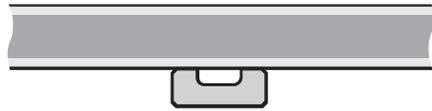
## Fitting the datum clamp

The datum clamp fixes the RTLA50-S scale rigidly to the substrate at the location chosen.

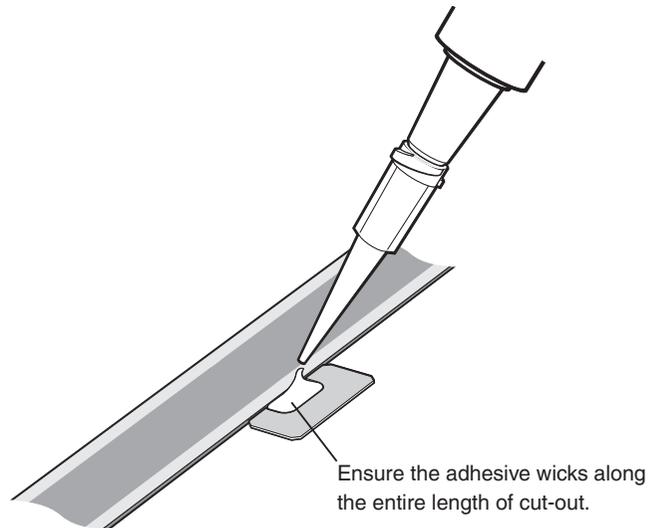
**The metrology of the system may be compromised if the datum clamp is not used.**

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.



Ensure the adhesive wicks along the entire length of cut-out.

# EVOLUTE 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 LED.

### NOTES:

- A position error will trigger the set-up LED to flash continuously until the error is no longer present AND:
  1. Power has been cycled OR
  2. A position request has been received from the controller
- The optional Advanced Diagnostic Tool ADTa-100 <sup>1</sup> (A-6525-0100) and ADT View software <sup>2</sup> can be used to aid installation.

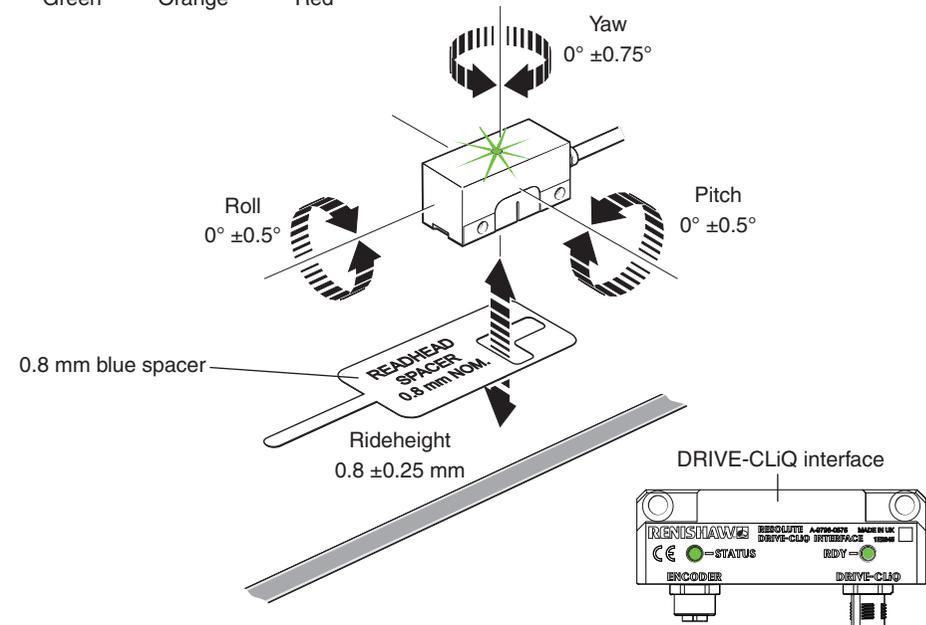
<sup>1</sup> For more details refer to the Advanced Diagnostic Tools and ADT View software User guide (Renishaw part no. M-6195-9413).

<sup>2</sup> The software can be downloaded for free from [www.renishaw.com/adt](http://www.renishaw.com/adt).

<sup>3</sup> The LED is activated regardless of whether the corresponding messages have been reconfigured.

<sup>4</sup> The colour depends upon the LED status when component recognition is activated via p0144=1.

## EVOLUTE 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 <sup>3</sup>
Green/orange or red/orange	Flashing light	Component recognition via LED is activated (p0144) <sup>4</sup>

# EVOLUTE readhead signals

## BiSS C serial interface

Function	Signal <sup>1</sup>	Wire colour	Pin
			9-way D-type (A)
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	Shield	Shield	Case

## Mitsubishi serial interface

Function	Signal	Wire colour	Pin
			9-way D-type (A)
Power	5 V	Brown	4, 5
	0 V	White	8, 9
		Green	
Serial communications	MR	Violet	2
	MRR	Yellow	3
Shield	Shield	Shield	Case
Reserved	Do not connect	Grey	6
		Pink	7

## FANUC serial interface

Function	Signal	Wire colour	Pin
			9-way D-type (A)
Power	5 V	Brown	4, 5
	0 V	White	8, 9
		Green	
Serial communications	REQ	Violet	2
	*REQ	Yellow	3
	SD	Grey	6
	*SD	Pink	7
Shield	Shield	Shield	Case

## Panasonic serial interface

Function	Signal	Wire colour	Pin
			9-way D-type (A)
Power	5 V	Brown	4, 5
	0 V	White	8, 9
		Green	
Serial communications	PS	Violet	2
	$\overline{PS}$	Yellow	3
Shield	Shield	Shield	Case
Reserved	Do not connect	Grey	6
		Pink	7

<sup>1</sup> For details, refer to *BiSS C-mode (unidirectional) for EVOLUTE™ encoders* data sheet (Renishaw part no. L-9517-9665).

## Siemens DRIVE-CLiQ serial interface

### DRIVE-CLiQ readhead output

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

### 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

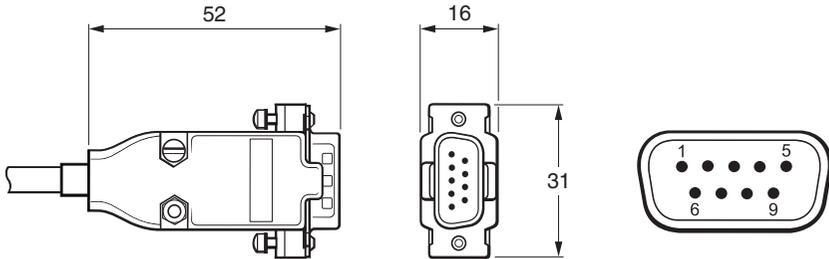
## Yaskawa serial interface

Function	Signal	Wire colour	Pin
			9-way D-type (A)
Power	5 V	Brown	4, 5
	0 V	White	8, 9
Green			
Serial communications	S	Violet	2
	$\bar{S}$	Yellow	3
Shield	Shield	Shield	Case
Reserved	Do not connect	Grey	6
		Pink	7

# EVOLUTE readhead termination options

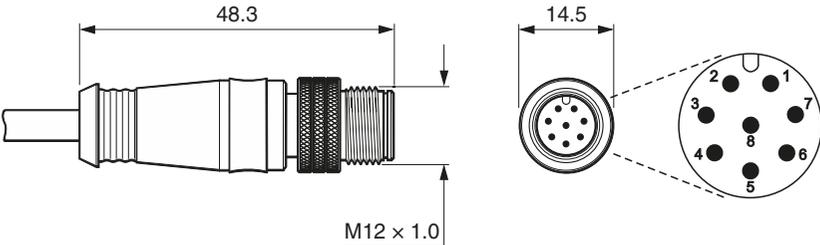
## 9-way D-type connector (Termination code A)

BiSS C (unidirectional), FANUC, Mitsubishi, Panasonic and Yaskawa systems only



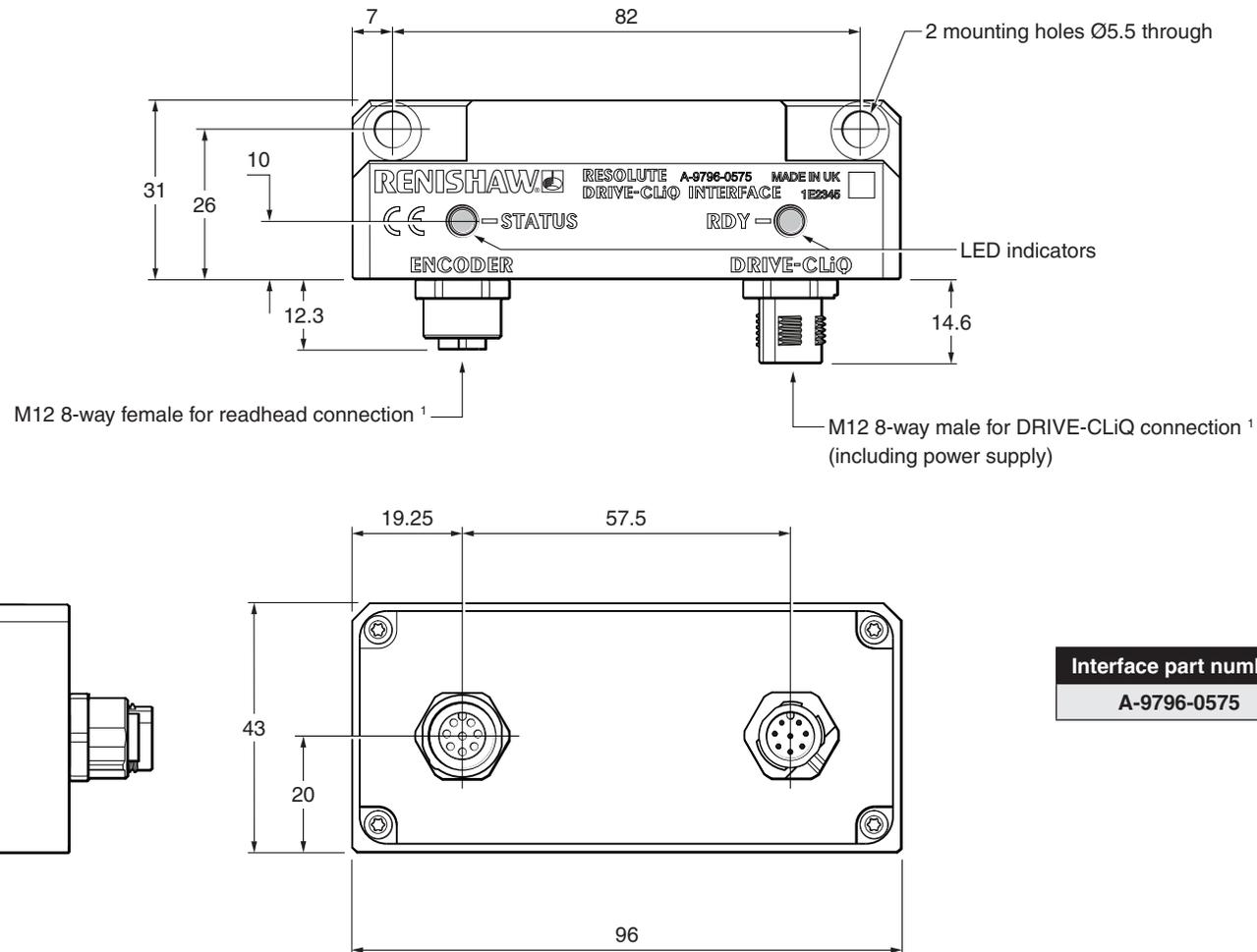
## M12 (sealed) connector (Termination code S)

Siemens DRIVE-CLiQ systems only



## Siemens DRIVE-CLiQ interface drawing – single readhead input

Dimensions and tolerances in mm

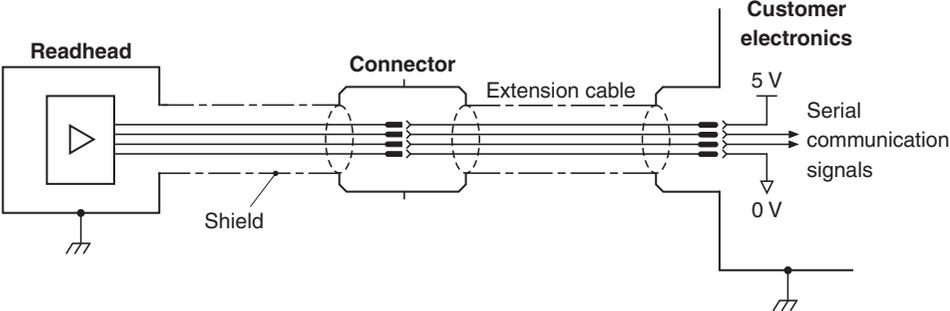


Interface part number	Compatible readheads
A-9796-0575	EL28D*

<sup>1</sup> Maximum tightening torque 4 Nm.

# Electrical connections

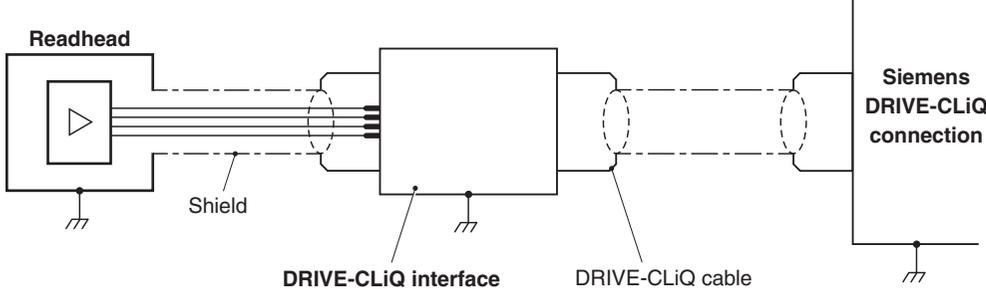
## Grounding and shielding – EVOLUTE BiSS C (unidirectional), FANUC, Mitsubishi, Panasonic and Yaskawa systems



**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.

## Grounding and shielding – EVOLUTE Siemens DRIVE-CLiQ systems only



## General specifications

<b>Power supply</b> <sup>1</sup>	5 V ±10%	1.25 W maximum (250 mA @ 5 V)
	24 V (DRIVE-CLiQ system only) <sup>2</sup>	1.8 W maximum (75mA @ 24 V). 24 V as per DRIVE-CLiQ specification. 24 V power is provided by the DRIVE-CLiQ network.
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
<b>Sealing</b>	Readhead	IP64
	DRIVE-CLiQ interface	IP67
<b>Acceleration</b>	Readhead (operating)	500 m/s <sup>2</sup> , 3 axes
<b>Shock</b>	Readhead and DRIVE-CLiQ interface (non-operating)	1000 m/s <sup>2</sup> , 6 ms, ½ sine, 3 axes
<b>Maximum acceleration of scale with respect to readhead</b> <sup>3</sup>		2000 m/s <sup>2</sup>
<b>Vibration</b>	Readhead (operating)	Sinusoidal 300 m/s <sup>2</sup> , 55 Hz to 2000 Hz, 3 axes
	DRIVE-CLiQ interface (operating)	Sinusoidal 100 m/s <sup>2</sup> , 55 Hz to 2000 Hz, 3 axes
<b>Mass</b>	Readhead	18 g
	Cable	32 g/m
	DRIVE-CLiQ interface	218 g
<b>Readhead cable</b>		7 core, tinned and annealed copper, 28 AWG Outside diameter 4.7 ±0.2 mm Flex life > 40 × 10 <sup>6</sup> cycles at 20 mm bend radius UL recognised component 
<b>Maximum readhead cable length</b> <sup>4</sup>		3 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 EVOLUTE 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.

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

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

<sup>3</sup> 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.

<sup>4</sup> Extension cables are available. For more details, contact your local Renishaw representative.

## RTLA50-S scale specifications

<b>Form (height × width)</b>	0.4 mm × 18 mm (including adhesive)
<b>Pitch</b>	50 µm
<b>Maximum scale length <sup>1</sup></b>	10.02 m
<b>Accuracy (at 20 °C)</b>	±10 µm/m, calibration traceable to International Standards
<b>Material</b>	Hardened and tempered martensitic stainless steel fitted with a self-adhesive backing tape
<b>Mass</b>	12.9 g/m
<b>Coefficient of thermal expansion (at 20 °C)</b>	10.1 ±0.2 µm/m/°C
<b>Datum fixing</b>	Datum clamp (A-9585-0028) secured with Loctite® 435™ (P-AD03-0012)

<sup>1</sup> For lengths > 2 m, RTLA50 scale with the *FASTRACK* carrier, is recommended.

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Part no.: M-6183-9046-04-A  
Issued: 06.2025