RENISHAW®

apply innovation™

EVOLUTE™ absolute optical encoder with Panasonic serial communications

- **True absolute non-contact optical encoder system: no batteries required**

- **Wide set-up tolerances for quick and easy installation**

- **Integral set-up LED enables easy installation and provides diagnostics at a glance**

- **Enhanced immunity to dirt, scratches and light oils**

- **Resolution options of 50 nm, 100 nm and 500 nm**

- **100 m/s maximum speed for all resolutions**

- **±150 nm sub-divisional error for smooth velocity control**

- **Less than 10 nm RMS jitter for improved positional stability**

- **Built-in separate position-checking algorithm provides inherent safety**

- **Readhead is reversible for flexible mounting. Scale orientation defines count direction only**

- **Scale lengths up to 10.02 m**

- **Operates up to 80 °C**

- **Integral over-temperature alarm**

Compatible with:

- **RTLA50-S self-adhesive tape scale**

- **RTLA50 with *FASTRACK* carrier**

- **Optional Advanced Diagnostic Tool ADTa-100**

Incorporating industry-proven technology from the RESOLUTE™ encoder series, EVOLUTE™ is a true-absolute 50 µm scale period optical encoder with wide installation tolerances and high immunity to dirt.

Using a scale period of 50 µm gives the EVOLUTE encoder system a generous 500 µm rideheight tolerance and its single-track optics are optimised for contamination resistance. Data redundancy encoded into the robust scale minimises the risk of positional error while sophisticated error checking mechanisms ensure an error flag is always asserted when the position cannot be determined.

The EVOLUTE system provides absolute position with resolution options down to 50 nm. Advanced optical design and high-speed signal processing mean sub-divisional error (SDE) is as low as ±150 nm with noise (jitter) below 10 nm RMS.

EVOLUTE encoders are mechanically identical to RESOLUTE encoders and are supplied with the RTLA50 scale that can be used, either in its self-adhesive form, RTLA50-S, or in the *FASTRACK*™ scale carrier system.

Resolutions and scale lengths

EVOLUTE with Panasonic serial comms is available with 50 nm, 100 nm, and 500 nm resolution options.

The maximum scale length is as described in the scale specifications below: i.e., it is not limited by absolute word length.

Contact your local Renishaw representative for details of other serial protocols.

Resolution	Maximum reading speed (m/s)	
	Panasonic A5 series	Panasonic A6 series
50 nm	20	100
100 nm	40	100
500 nm	100	100

Scale specifications

For more detailed scale information refer to the relevant scale data sheet.

Description	RTLA50-S	Self-adhesive hardened stainless-steel tape scale for high performance motion control systems requiring easiest installation. Lengths up to 10.02 m
	RTLA50/*FASTRACK*	Carrier-mounted hardened stainless-steel tape scale for high performance motion control systems requiring easier and faster scale installation and field replacement. RTLA50 lengths up to 10.02 m *FASTRACK* lengths up to 25 m
Accuracy (at 20 °C)		±10 µm/m
Coefficient of thermal expansion (at 20 °C)		10.1 ±0.2 µm/m/°C

General specifications

Power supply	5 V ±10%	1.25 W maximum (250 mA @ 5V)
		NOTE: Current consumption figures refer to terminated EVOLUTE systems. EVOLUTE encoder systems must be powered from a 5 Vdc supply complying with the requirements for SELV of standard IEC 60950-1
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
Temperature	Storage	−20 °C to +80 °C
	Operating	0 °C to +80 °C
Humidity		95% relative humidity (non-condensing) to EN 60068-2-78
Sealing		IP64
Acceleration (readhead)	Operating	500 m/s^2, 3 axes
Shock (readhead)	Non-operating	1000 m/s^2, 6 ms, ½ sine, 3 axes
Maximum acceleration of scale with respect to readhead		2000 m/s^2
		NOTE: This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, contact your local Renishaw representative.
Vibration	Operating	300 m/s^2, 55 Hz to 2000 Hz, 3 axes
Mass	Readhead	18 g
	Cable	32 g/m
Readhead cable		7 core, tinned and annealed copper, 28 AWG
		Single-shielded, outside diameter 4.7 ±0.2 mm
		Flex life > 40 × 10^6 cycles at 20 mm bend radius
		UL recognised component **UL**

| : www.runcheng.net | : 010-84450370 | : 010-84450371 | : runcheng_emd@sina.com |

Data sheet
EVOLUTE absolute optical encoder (Panasonic)

RENISHAW®
apply innovation™

Optional Advanced Diagnostic Tool ADTa-100

The EVOLUTE encoder system is compatible with the Advanced Diagnostic Tool ADTa-100* and ADT View software, which acquire detailed real-time data from the readhead to allow easy set-up, optimisation and in-field fault finding.

The intuitive software interface provides:

▶ Digital readout of encoder position and signal strength

▶ Graph of signal strength over the entire axis travel

▶ Ability to set a new zero position for the encoder system
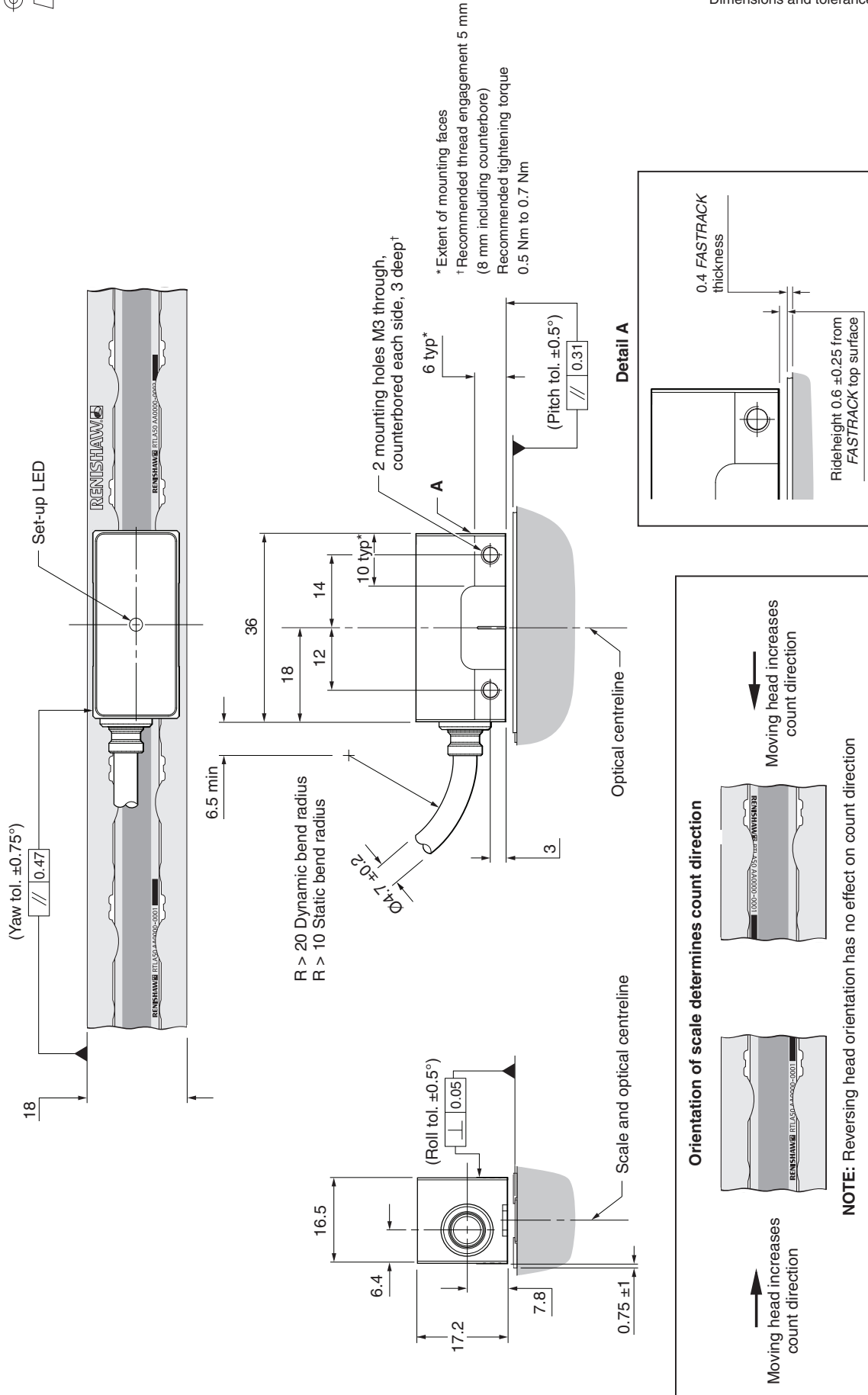
▶ System configuration information

*ADTa-100 compatible readheads are marked with the symbol **ADT**

3

RENISHAW
apply innovation™

EVOLUTE installation drawing (RTLA50 and *FASTRACK*)

For further details, including side-exit version, refer to EVOLUTE RTLA50/*FASTRACK* installation guide (M-6183-9040)

Dimensions and tolerances in mm

Set-up LED

(Yaw tol. ±0.75°)

// 0.47

18

* Extent of mounting faces
† Recommended thread engagement 5 mm
  (8 mm including counterbore)
Recommended tightening torque
0.5 Nm to 0.7 Nm

2 mounting holes M3 through,
counterbored each side, 3 deep†

6 typ*

(Pitch tol. ±0.5°)

// 0.31

A

10 typ*

14

36

18

12

Optical centreline

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

Φ4.7 ±0.2

3

Detail A

0.4 *FASTRACK*
thickness

Rideheight 0.6 ±0.25 from
FASTRACK top surface

(Roll tol. ±0.5°)

⊥ 0.05

16.5

6.4

17.2

7.8

0.75 ±1

Scale and optical centreline

Orientation of scale determines count direction

Moving head increases
count direction

Moving head increases
count direction

NOTE: Reversing head orientation has no effect on count direction

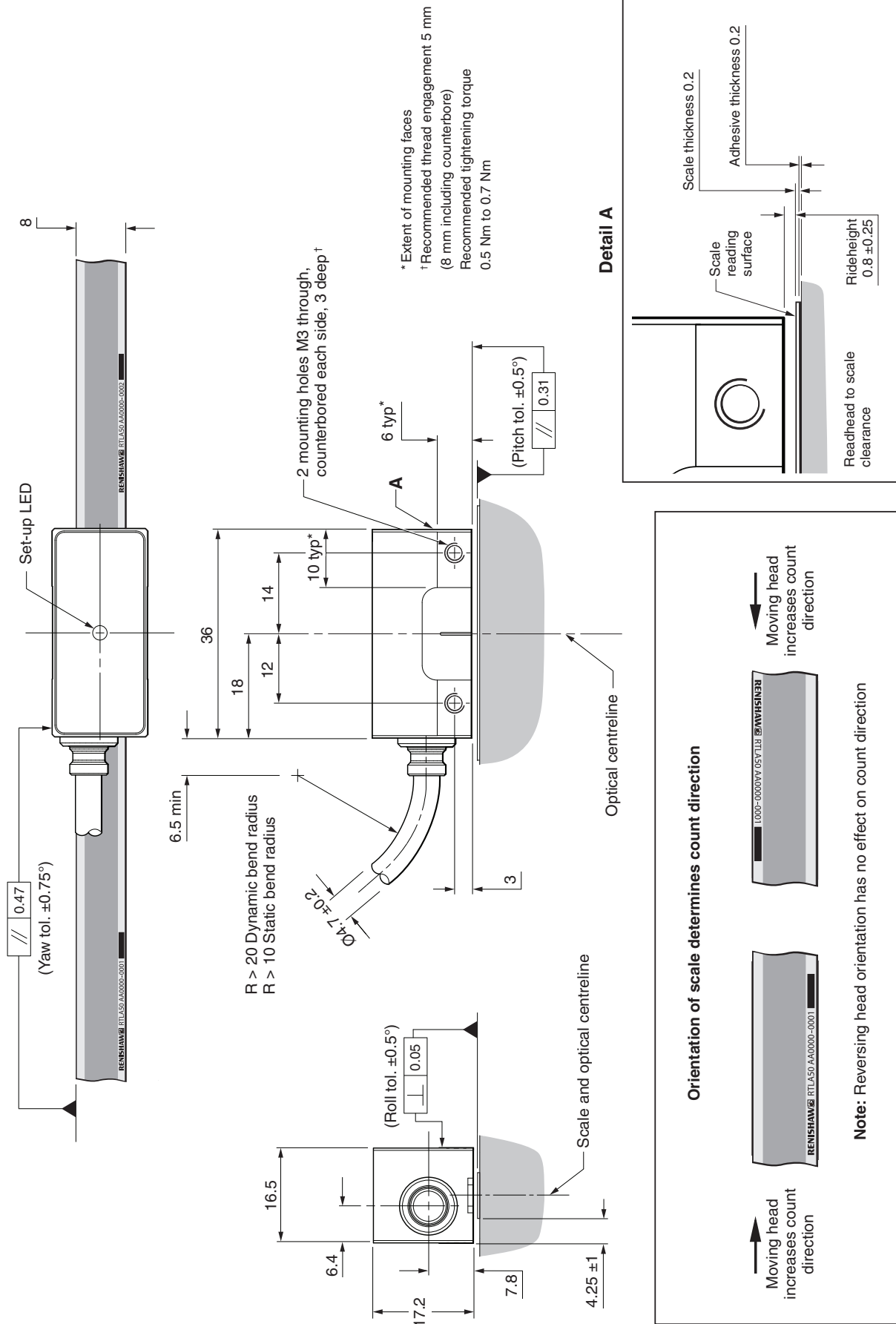Moving head increases
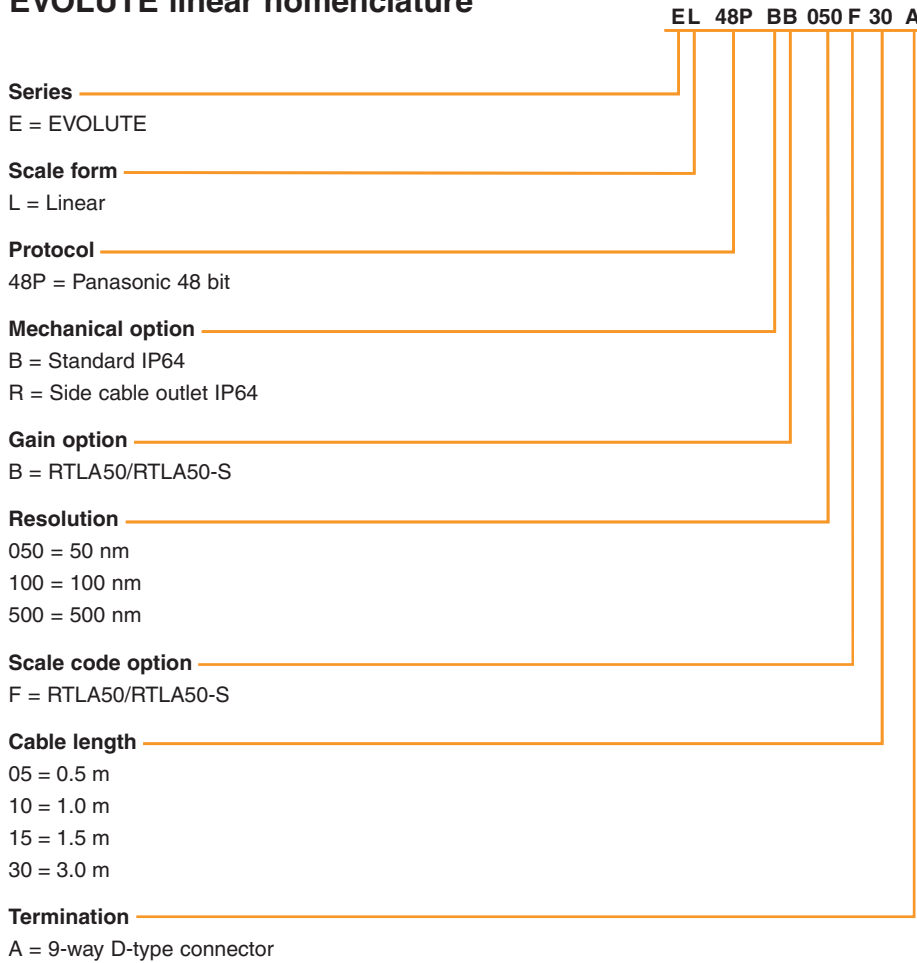count direction

4

EVOLUTE installation drawing (RTLA50-S)

For further details, including side-exit version, refer to EVOLUTE RTLA50-S installation guide (M-6183-9046)

Dimensions and tolerances in mm

Detail A

Scale thickness 0.2

Adhesive thickness 0.2

Scale reading surface

Rideheight 0.8 ±0.25

Readhead to scale clearance

8

Set-up LED

// 0.47

(Yaw tol. ±0.75°)

RENISHAW RTLA50 AA0000-0001

2 mounting holes M3 through, counterbored each side, 3 deep †

10 typ *

14

36

18

12

6 typ *

(Pitch tol. ±0.5°)

// 0.31

A

* Extent of mounting faces
† Recommended thread engagement 5 mm (8 mm including counterbore)
Recommended tightening torque 0.5 Nm to 0.7 Nm

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

Φ4.7 ±0.2

3

Optical centreline

16.5

6.4

17.2

7.8

4.25 ±1

(Roll tol. ±0.5°)

⊥ 0.05

Scale and optical centreline

Orientation of scale determines count direction

Moving head increases count direction

RENISHAW RTLA50 AA0000-0001

RENISHAW RTLA50 AA0000-0001

Moving head increases count direction

Note: Reversing head orientation has no effect on count direction

RENISHAW®
apply innovation™

EVOLUTE linear nomenclature

EL 48P BB 050 F 30 A

Series
E = EVOLUTE

Scale form
L = Linear

Protocol
48P = Panasonic 48 bit

Mechanical option
B = Standard IP64
R = Side cable outlet IP64

Gain option
B = RTLA50/RTLA50-S

Resolution
050 = 50 nm
100 = 100 nm
500 = 500 nm

Scale code option
F = RTLA50/RTLA50-S

Cable length
05 = 0.5 m
10 = 1.0 m
15 = 1.5 m
30 = 3.0 m

Termination
A = 9-way D-type connector

For scale nomenclature see RTLA50 data sheet L-9517-9628.

EVOLUTE compatible products

RENISHAW
84M845
PATENTED MADE IN UK
EL48PBB100F30A

BiSS
FANUC
Mitsubishi
Panasonic
Siemens DRIVE-CLiQ
Yaskawa

**RTLA50-S self-adhesive
tape scale**

**RTLA50 tape scale
and *FASTRACK* carrier**

**Advanced Diagnostic Tool
ADTa-100 (A-6525-0100)**

For more information about ADTa-100 and the scale refer to the relevant data sheets and installation guides which can be downloaded from **www.renishaw.com/opticalencoders**

For worldwide contact details, visit www.renishaw.com/contact

L-9517-9805-02

RENISHAW®
apply innovation™

EVOLUTE™ absolute optical encoder with Yaskawa serial communications

- **True absolute non-contact optical encoder system: no batteries required**

- **Wide set-up tolerances for quick and easy installation**

- **Integral set-up LED enables easy installation and provides diagnostics at a glance**

- **Enhanced immunity to dirt, scratches and light oils**

- **Resolution options of 50 nm, 100 nm and 500 nm**

- **100 m/s maximum speed for all resolutions**

- **±150 nm sub-divisional error for smooth velocity control**

- **Less than 10 nm RMS jitter for improved positional stability**

- **Built-in separate position-checking algorithm provides inherent safety**

- **Readhead is reversible for flexible mounting. Scale orientation defines count direction only**

- **Scale lengths up to 10.02 m**

- **Operates up to 80 °C**

- **Integral over-temperature alarm**

Compatible with:

- **RTLA50-S self-adhesive tape scale**

- **RTLA50 with *FASTRACK* carrier**

- **Optional Advanced Diagnostic Tool ADTa-100**

Incorporating industry-proven technology from the RESOLUTE™ encoder series, EVOLUTE™ is a true-absolute 50 µm scale period optical encoder with wide installation tolerances and high immunity to dirt.

Using a scale period of 50 µm gives the EVOLUTE encoder system a generous 500 µm rideheight tolerance and its single-track optics are optimised for contamination resistance. Data redundancy encoded into the robust scale minimises the risk of positional error while sophisticated error checking mechanisms ensure an error flag is always asserted when the position cannot be determined.

The EVOLUTE system provides absolute position with resolution options down to 50 nm. Advanced optical design and high-speed signal processing mean sub-divisional error (SDE) is as low as ±150 nm with noise (jitter) below 10 nm RMS.

EVOLUTE encoders are mechanically identical to RESOLUTE encoders and are supplied with the RTLA50 scale that can be used, either in its self-adhesive form, RTLA50-S, or in the *FASTRACK*™ scale carrier system.

Resolutions and scale lengths

EVOLUTE with Yaskawa serial comms is available with 50 nm, 100 nm, and 500 nm resolution options.

The maximum reading speed is 100 m/s.

The maximum scale length is as described in the scale specifications below: i.e., it is not limited by absolute word length.

Contact your local Renishaw representative for details of other serial protocols.

Scale specifications

For more detailed scale information refer to the relevant scale data sheet.

Description	RTLA50-S	Self-adhesive hardened stainless-steel tape scale for high performance motion control systems requiring easiest installation.
		Lengths up to 10.02 m
	RTLA50/*FASTRACK*	Carrier-mounted hardened stainless-steel tape scale for high performance motion control systems requiring easier and faster scale installation and field replacement.
		RTLA50 lengths up to 10.02 m
		FASTRACK lengths up to 25 m
Accuracy (at 20 °C)		±10 µm/m
Coefficient of thermal expansion (at 20 °C)		10.1 ±0.2 µm/m/°C

General specifications

Power supply	5 V ±10%	1.25 W maximum (250 mA @ 5V)
		NOTE: Current consumption figures refer to terminated EVOLUTE systems. EVOLUTE encoder systems must be powered from a 5 Vdc supply complying with the requirements for SELV of standard IEC 60950-1
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
Temperature	Storage	−20 °C to +80 °C
	Operating	0 °C to +80 °C
Humidity		95% relative humidity (non-condensing) to IEC 60068-2-78
Sealing		IP64
Acceleration (readhead)	Operating	500 m/s^2, 3 axes
Shock (readhead)	Non-operating	1000 m/s^2, 6 ms, ½ sine, 3 axes
Maximum acceleration of scale with respect to readhead		2000 m/s^2
		NOTE: This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, contact your local Renishaw representative.
Vibration	Operating	300 m/s^2, 55 Hz to 2000 Hz, 3 axes
Mass	Readhead	18 g
	Cable	32 g/m
Readhead cable		7 core, tinned and annealed copper, 28 AWG
		Single-shielded, outside diameter 4.7 ±0.2 mm
		Flex life > 40 × 10^6 cycles at 20 mm bend radius
		UL recognised component ⓤ

Optional Advanced Diagnostic Tool ADTa-100

The EVOLUTE encoder system is compatible with the Advanced Diagnostic Tool ADTa-100* and ADT View software, which acquire detailed real-time data from the readhead to allow easy set-up, optimisation and in-field fault finding.

The intuitive software interface provides:

▶ Digital readout of encoder position and signal strength

▶ Graph of signal strength over the entire axis travel

▶ Ability to set a new zero position for the encoder system
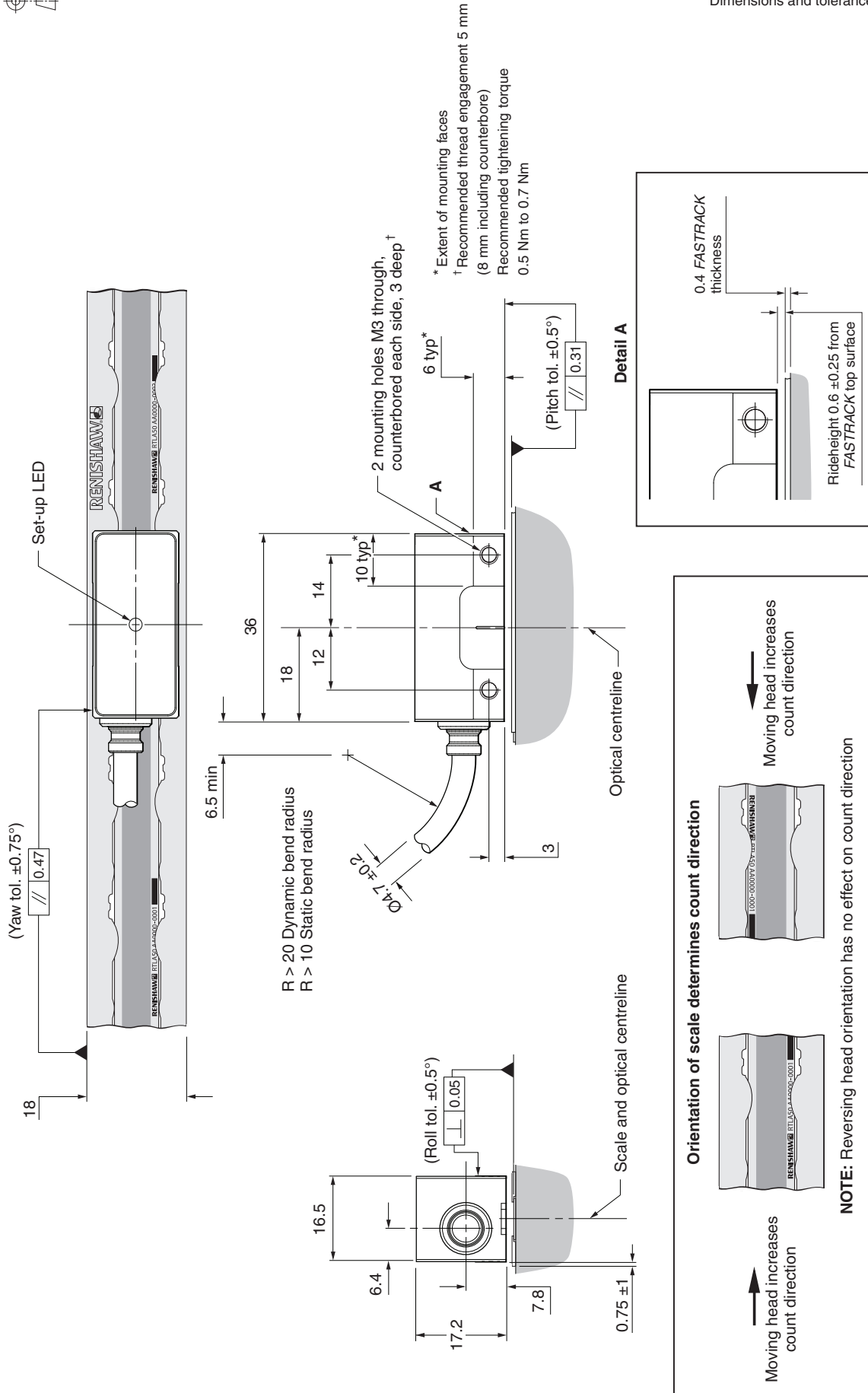
▶ System configuration information

*ADTa-100 compatible readheads are marked with the symbol **ADT**

3

RENISHAW
apply innovation™

EVOLUTE installation drawing (RTLA50 and *FASTRACK*)

For further details, including side-exit version, refer to EVOLUTE RTLA50/*FASTRACK* installation guide (M-6183-9040)

Dimensions and tolerances in mm

Set-up LED

RENISHAW RTLA50 AA0000-0001

(Yaw tol. ±0.75°)
// 0.47

18

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

* Extent of mounting faces
† Recommended thread engagement 5 mm
(8 mm including counterbore)
Recommended tightening torque
0.5 Nm to 0.7 Nm

2 mounting holes M3 through,
counterbored each side, 3 deep †

6 typ*

(Pitch tol. ±0.5°)
// 0.31

A

10 typ*

14

36

18

12

Ø4.1 ±0.2

3

Optical centreline

Scale and optical centreline

(Roll tol. ±0.5°)
⊥ 0.05

16.5

6.4

17.2

7.8

0.75 ±1

Detail A

0.4 *FASTRACK* thickness

Rideheight 0.6 ±0.25 from *FASTRACK* top surface

Orientation of scale determines count direction

Moving head increases count direction

RENISHAW RTLA50 AA0000-0001

Moving head increases count direction

RENISHAW RTLA50 AA0000-0001

Moving head increases count direction

NOTE: Reversing head orientation has no effect on count direction

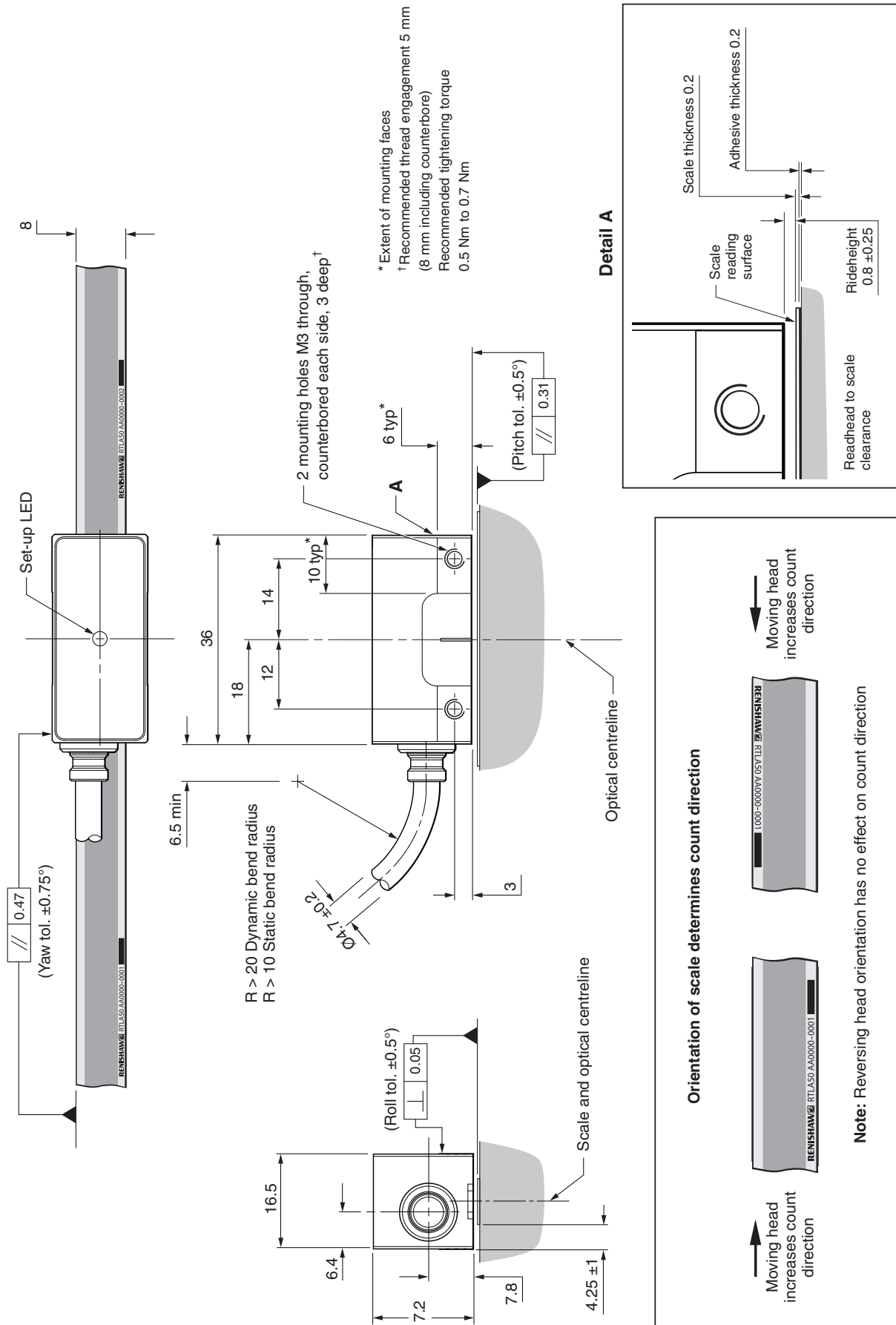# RENISHAW apply innovation™

EVOLUTE installation drawing (RTLA50-S)

For further details, including side-exit version, refer to EVOLUTE RTLA50-S installation guide (M-6183-9046)

Dimensions and tolerances in mm

Detail A

Scale thickness 0.2

Adhesive thickness 0.2

Scale reading surface

Rideheight 0.8 ±0.25

Readhead to scale clearance

* Extent of mounting faces
† Recommended thread engagement 5 mm (8 mm including counterbore)
Recommended tightening torque 0.5 Nm to 0.7 Nm

8

Set-up LED

// 0.47

(Yaw tol. ±0.75°)

2 mounting holes M3 through, counterbored each side, 3 deep †

6 typ *

(Pitch tol. ±0.5°)

// 0.31

A

10 typ *

14

36

18

12

Optical centreline

3

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

Φ4.7 ±0.2

Scale and optical centreline

(Roll tol. ±0.5°)

⊥ 0.05

16.5

6.4

17.2

7.8

4.25 ±1

Orientation of scale determines count direction

Moving head increases count direction

RENISHAW RTLA50 AA0000-0001

RENISHAW RTLA50 AA0000-0001

Note: Reversing head orientation has no effect on count direction

Moving head increases count direction

RENISHAW
apply innovation™

EVOLUTE linear nomenclature

EL 36Y BB 050 F 30 A

Series

E = EVOLUTE

Scale form

L = Linear

Protocol

36Y = Yaskawa 36 bit

Mechanical option

B = Standard IP64
R = Side cable outlet IP64

Gain option

B = RTLA50/RTLA50-S

Resolution

050 = 50 nm
100 = 100 nm
500 = 500 nm

Scale code option

F = RTLA50/RTLA50-S

Cable length

05 = 0.5 m
10 = 1.0 m
15 = 1.5 m
30 = 3.0 m

Termination

A = 9-way D-type connector

For scale nomenclature see RTLA50 data sheet L-9517-9628.

EVOLUTE compatible products

BiSS
FANUC
Mitsubishi
Panasonic
Siemens DRIVE-CLiQ
Yaskawa

**RTLA50-S self-adhesive
tape scale**

**RTLA50 tape scale
and *FASTRACK* carrier**

**Advanced Diagnostic Tool
ADTa-100 (A-6525-0100)**

For more information about ADTa-100 and the scale refer to the relevant data sheets and installation guides which can be downloaded from **www.renishaw.com/opticalencoders**

For worldwide contact details, visit www.renishaw.com/contact

L - 9517 - 9641 - 02

Part no.: L-9517-9641-02-A
Issued: 01.2020

RENISHAW®
apply innovation™

EVOLUTE™ absolute optical encoder with Mitsubishi serial communications

- True absolute non-contact optical encoder system: no batteries required

- Wide set-up tolerances for quick and easy installation

- Integral set-up LED enables easy installation and provides diagnostics at a glance

- Enhanced immunity to dirt, scratches and light oils

- Resolution options of 50 nm, 100 nm and 500 nm

- 100 m/s maximum speed for all resolutions

- ±150 nm sub-divisional error for smooth velocity control

- Less than 10 nm RMS jitter for improved positional stability

- Built-in separate position-checking algorithm provides inherent safety

- Readhead is reversible for flexible mounting. Scale orientation defines count direction only

- Scale lengths up to 10.02 m

- Operates up to 80 °C

- Integral over-temperature alarm

Compatible with:

- RTLA50-S self-adhesive tape scale

- RTLA50 with *FASTRACK* carrier

- Optional Advanced Diagnostic Tool ADTa-100

Incorporating industry-proven technology from the RESOLUTE™ encoder series, EVOLUTE™ is a true-absolute 50 µm scale period optical encoder with wide installation tolerances and high immunity to dirt.

Using a scale period of 50 µm gives the EVOLUTE encoder system a generous 500 µm rideheight tolerance and its single-track optics are optimised for contamination resistance. Data redundancy encoded into the robust scale minimises the risk of positional error while sophisticated error checking mechanisms ensure an error flag is always asserted when the position cannot be determined.

The EVOLUTE system provides absolute position with resolution options down to 50 nm. Advanced optical design and high-speed signal processing mean sub-divisional error (SDE) is as low as ±150 nm with noise (jitter) below 10 nm RMS.

EVOLUTE encoders are mechanically identical to RESOLUTE encoders and are supplied with the RTLA50 scale that can be used, either in its self-adhesive form, RTLA50-S, or in the *FASTRACK*™ scale carrier system.

RENISHAW.

apply innovation™

Resolutions and scale lengths

EVOLUTE with Mitsubishi serial comms is available with 50 nm, 100 nm, and 500 nm resolution options.

The maximum reading speed is 100 m/s.

The maximum scale length is as described in the scale specifications below: i.e., it is not limited by absolute word length.

Contact your local Renishaw representative for details of other serial protocols.

Scale specifications

For more detailed scale information refer to the relevant scale data sheet.

Description	RTLA50-S	Self-adhesive hardened stainless-steel tape scale for high performance motion control systems requiring easiest installation.
		Lengths up to 10.02 m
	RTLA50/*FASTRACK*	Carrier-mounted hardened stainless-steel tape scale for high performance motion control systems requiring easier and faster scale installation and field replacement.
		RTLA50 lengths up to 10.02 m
		FASTRACK lengths up to 25 m
Accuracy (at 20 °C)		±10 µm/m
Coefficient of thermal expansion (at 20 °C)		10.1 ±0.2 µm/m/°C

General specifications

Power supply	5 V ±10%	1.25 W maximum (250 mA @ 5V)
		NOTE: Current consumption figures refer to terminated EVOLUTE systems. EVOLUTE encoder systems must be powered from a 5 Vdc supply complying with the requirements for SELV of standard IEC 60950-1
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
Temperature	Storage	−20 °C to +80 °C
	Operating	0 °C to +80 °C
Humidity		95% relative humidity (non-condensing) to IEC 60068-2-78
Sealing		IP64
Acceleration (readhead)	Operating	500 m/s^2, 3 axes
Shock (readhead)	Non-operating	1000 m/s^2, 6 ms, ½ sine, 3 axes
Maximum acceleration of scale with respect to readhead		2000 m/s^2
		NOTE: This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, contact your local Renishaw representative.
Vibration	Operating	300 m/s^2, 55 Hz to 2000 Hz, 3 axes
Mass	Readhead	18 g
	Cable	32 g/m
Readhead cable		7 core, tinned and annealed copper, 28 AWG
		Single-shielded, outside diameter 4.7 ±0.2 mm
		Flex life > 40 × 10^6 cycles at 20 mm bend radius
		UL recognised component $\boldsymbol{\mathcal{RU}}$

Optional Advanced Diagnostic Tool ADTa-100

The EVOLUTE encoder system is compatible with the Advanced Diagnostic Tool ADTa-100* and ADT View software, which acquire detailed real-time data from the readhead to allow easy set-up, optimisation and in-field fault finding.

The intuitive software interface provides:

▶ Digital readout of encoder position and signal strength

▶ Graph of signal strength over the entire axis travel

▶ Ability to set a new zero position for the encoder system
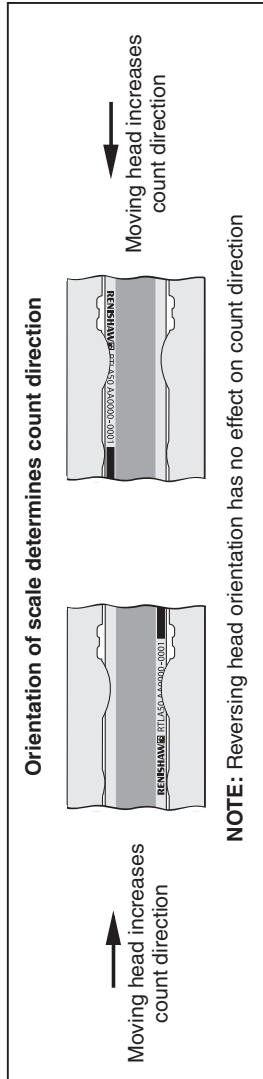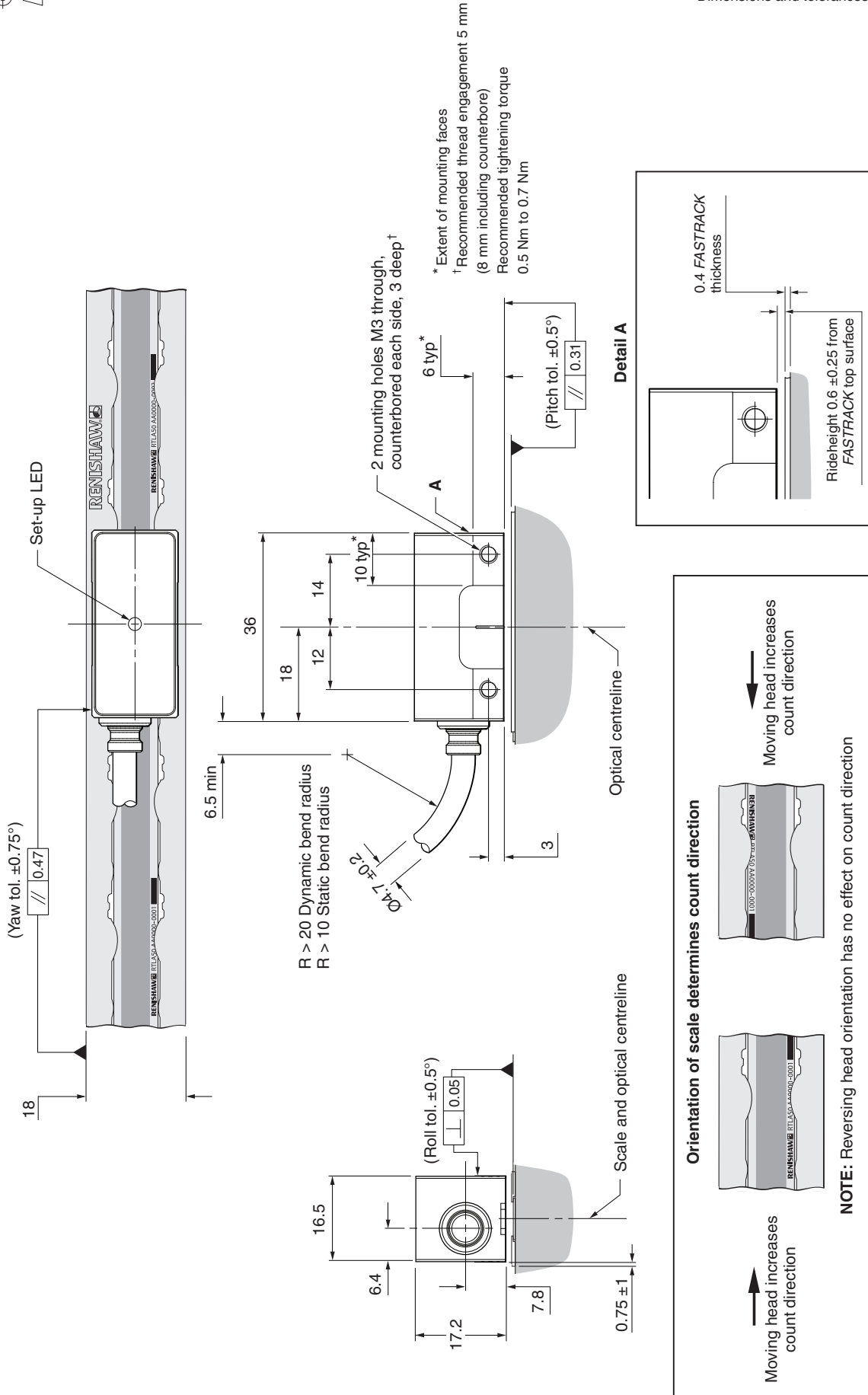
▶ System configuration information

*ADTa-100 compatible readheads are marked with the symbol **ADT**

EVOLUTE installation drawing (RTLA50 and *FASTRACK*)

For further details, including side-exit version, refer to EVOLUTE RTLA50/*FASTRACK* installation guide (M-6183-9040)

Dimensions and tolerances in mm

* Extent of mounting faces
† Recommended thread engagement 5 mm
(8 mm including counterbore)
Recommended tightening torque
0.5 Nm to 0.7 Nm

2 mounting holes M3 through,
counterbored each side, 3 deep †

6 typ*

(Pitch tol. ±0.5°)

// 0.31

Detail A

0.4 *FASTRACK*
thickness

Rideheight 0.6 ±0.25 from
FASTRACK top surface

Set-up LED

A

10 typ*

14

36

18

12

Optical centreline

3

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

Φ4.1 ±0.2

(Yaw tol. ±0.75°)

// 0.47

18

(Roll tol. ±0.5°)

⊥ 0.05

16.5

6.4

17.2

7.8

0.75 ±1

Scale and optical centreline

Orientation of scale determines count direction

Moving head increases
count direction

Moving head increases
count direction

NOTE: Reversing head orientation has no effect on count direction

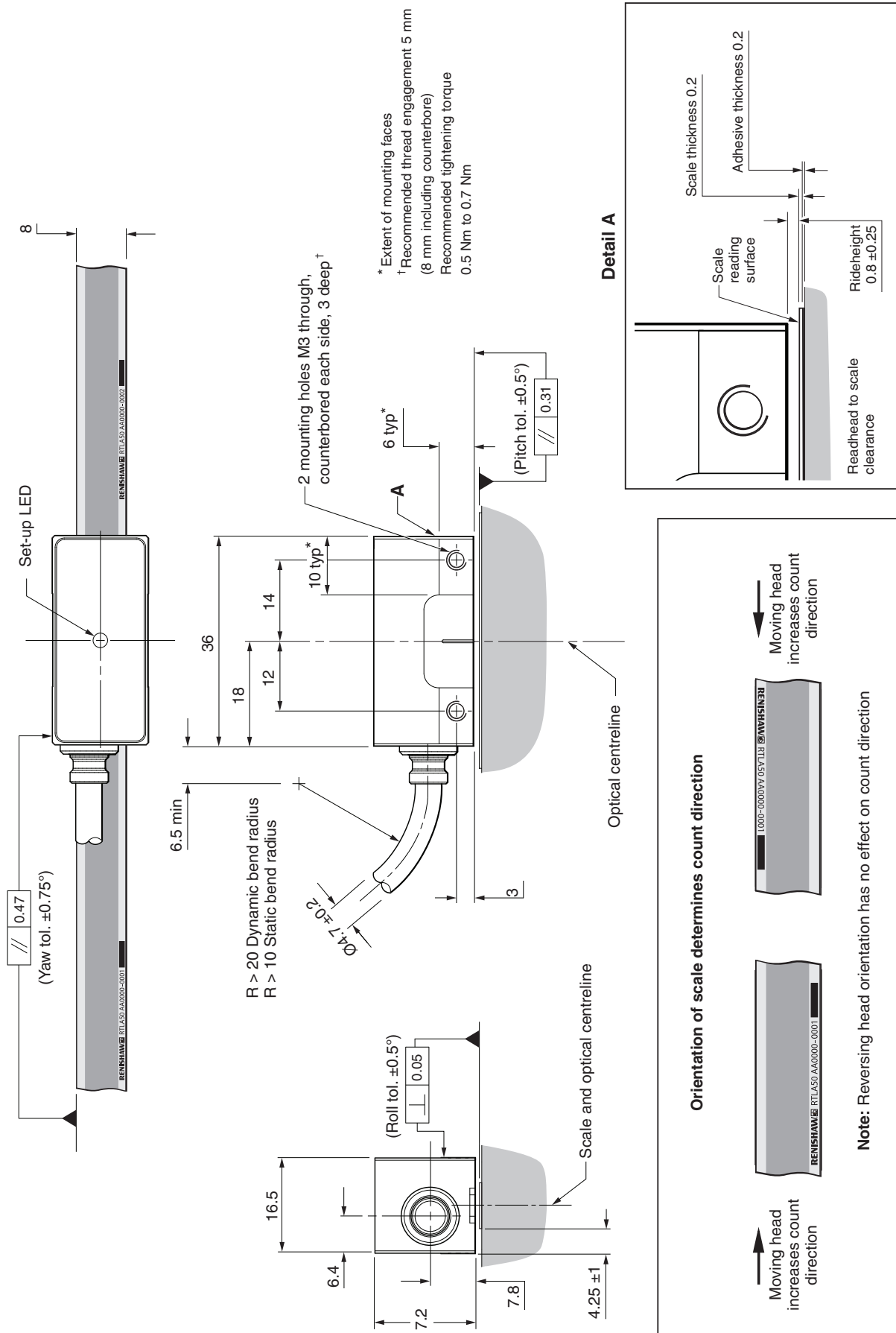Moving head increases
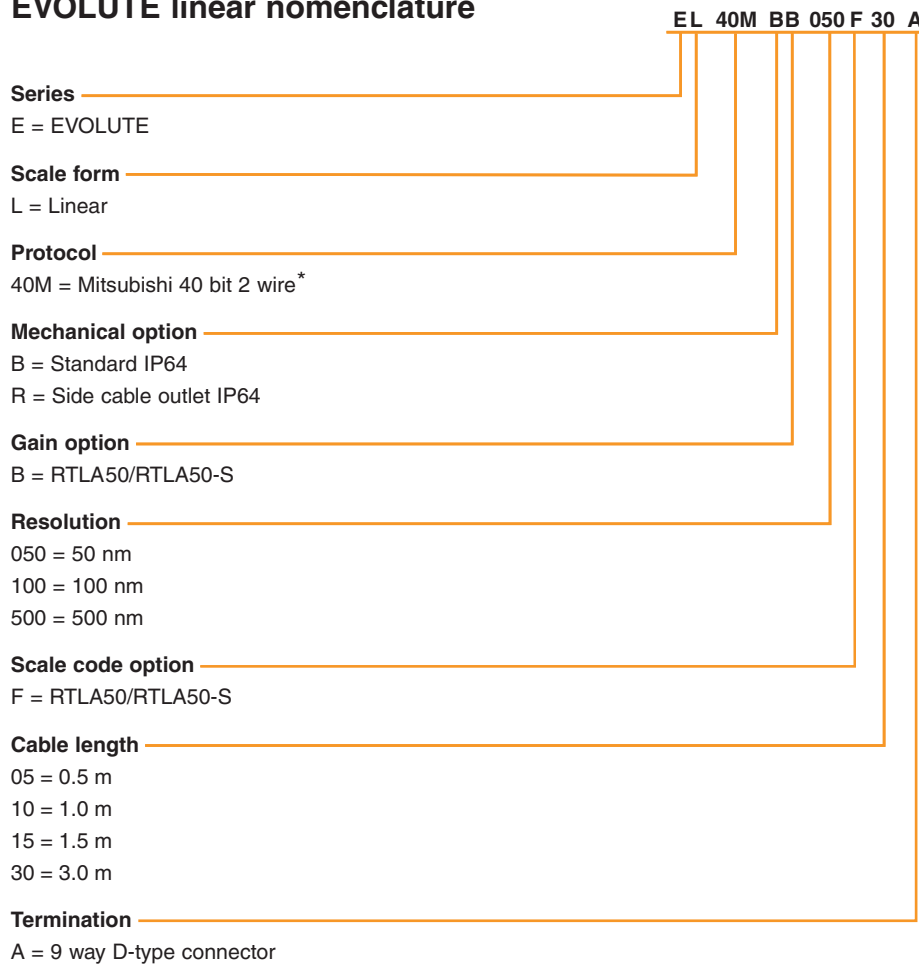count direction

4

EVOLUTE installation drawing (RTLA50-S)

For further details, including side-exit version, refer to EVOLUTE RTLA50-S installation guide (M-6183-9046)

Dimensions and tolerances in mm

Detail A

Scale thickness 0.2

Adhesive thickness 0.2

Scale thickness 0.2

Scale reading surface

Readhead to scale clearance

Rideheight 0.8 ±0.25

* Extent of mounting faces
† Recommended thread engagement 5 mm (8 mm including counterbore)
Recommended tightening torque 0.5 Nm to 0.7 Nm

8

Set-up LED

// 0.47

(Yaw tol. ±0.75°)

2 mounting holes M3 through, counterbored each side, 3 deep †

A

10 typ *

14

36

18

12

6 typ *

(Pitch tol. ±0.5°)

// 0.31

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

Φ4.7 ±0.2

3

Optical centreline

Orientation of scale determines count direction

Moving head increases count direction

RTLA50 AA0000-0001

RTLA50 AA0000-0001

Note: Reversing head orientation has no effect on count direction

Moving head increases count direction

(Roll tol. ±0.5°)

⊥ 0.05

16.5

6.4

17.2

7.8

4.25 ±1

Scale and optical centreline

RENISHAW
apply innovation™

EVOLUTE linear nomenclature

E L 40M BB 050 F 30 A

Series
E = EVOLUTE

Scale form
L = Linear

Protocol
40M = Mitsubishi 40 bit 2 wire[*]

Mechanical option
B = Standard IP64
R = Side cable outlet IP64

Gain option
B = RTLA50/RTLA50-S

Resolution
050 = 50 nm
100 = 100 nm
500 = 500 nm

Scale code option
F = RTLA50/RTLA50-S

Cable length
05 = 0.5 m
10 = 1.0 m
15 = 1.5 m
30 = 3.0 m

Termination
A = 9 way D-type connector

For scale nomenclature see RTLA50 data sheet L-9517-9628.

[*]2 wire: MR-J4 series/MR-J5 series

NOTE: For more information about Mitsubishi drives, contact Mitsubishi.

EVOLUTE compatible products

BiSS
FANUC
Mitsubishi
Panasonic
Siemens DRIVE-CLiQ
Yaskawa

**RTLA50-S self-adhesive
tape scale**

**RTLA50 tape scale
and *FASTRACK* carrier**

**Advanced Diagnostic Tool
ADTa-100 (A-6525-0100)**

For more information about ADTa-100 and the scale refer to the relevant data sheets and installation guides which can be downloaded from **www.renishaw.com/opticalencoders**

For worldwide contact details, visit www.renishaw.com/contact

L - 9 5 1 7 - 9 6 2 2 - 0 2

Part no.: L-9517-9622-02-A
Issued: 01.2020

RENISHAW

apply innovation™

EVOLUTE™ absolute optical encoder with BiSS serial communications

- **True absolute non-contact optical encoder system: no batteries required**

- **Wide set-up tolerances for quick and easy installation**

- **Integral set-up LED enables easy installation and provides diagnostics at a glance**

- **Enhanced immunity to dirt, scratches and light oils**

- **Resolution options of 50 nm, 100 nm and 500 nm**

- **100 m/s maximum speed for all resolutions**

- **±150 nm sub-divisional error for smooth velocity control**

- **Less than 10 nm RMS jitter for improved positional stability**

- **Built-in separate position-checking algorithm provides inherent safety**

- **Readhead is reversible for flexible mounting. Scale orientation defines count direction only**

- **Scale lengths up to 10.02 m**

- **Operates up to 80 °C**

- **Integral over-temperature alarm**

Compatible with:

- **RTLA50-S self-adhesive tape scale**

- **RTLA50 with *FASTRACK* carrier**

- **Optional Advanced Diagnostic Tool ADTa-100**

Incorporating industry-proven technology from the RESOLUTE™ encoder series, EVOLUTE™ is a true-absolute 50 µm scale period optical encoder with wide installation tolerances and high immunity to dirt.

Using a scale period of 50 µm gives the EVOLUTE encoder system a generous 500 µm rideheight tolerance and its single-track optics are optimised for contamination resistance. Data redundancy encoded into the robust scale minimises the risk of positional error while sophisticated error checking mechanisms ensure an error flag is always asserted when the position cannot be determined.

The EVOLUTE system provides absolute position with resolution options down to 50 nm. Advanced optical design and high-speed signal processing mean sub-divisional error (SDE) is as low as ±150 nm with noise (jitter) below 10 nm RMS.

EVOLUTE encoders are mechanically identical to RESOLUTE encoders and are supplied with the RTLA50 scale that can be used, either in its self-adhesive form, RTLA50-S, or in the *FASTRACK*™ scale carrier system.

BiSS INTERFACE

RENISHAW®
apply innovation™

Resolutions and scale lengths

The maximum scale length is determined by the readhead resolution and the number of position bits in the serial word. For EVOLUTE BiSS 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.

Contact your local Renishaw representative for details of other serial protocols.

Resolution	50 nm	100 nm	500 nm
Maximum scale length (L) with 36 bit position word	10.02 m	10.02 m	10.02 m
Maximum scale length (L) with 32 bit position word	10.02 m	10.02 m	10.02 m
Maximum scale length (L) with 26 bit position word	3.35 m	6.7 m	10.02 m
Maximum reading speed	100 m/s	100 m/s	100 m/s

Scale specifications

For more detailed scale information refer to the relevant scale data sheet.

Description	RTLA50-S	Self-adhesive hardened stainless steel tape scale for high performance motion control systems requiring easiest installation. Lengths up to 10.02 m
	RTLA50/*FASTRACK*	Carrier-mounted hardened stainless steel tape scale for high performance motion control systems requiring easier and faster scale installation and field replacement. RTLA50 lengths up to 10.02 m *FASTRACK* lengths up to 25 m
Accuracy (at 20 °C)		±10 µm/m
Coefficient of thermal expansion (at 20 °C)		10.1 ±0.2 µm/m/°C

General specifications

Power supply	5 V ±10%	1.25 W maximum (250 mA @ 5V)
		NOTE: Current consumption figures refer to terminated EVOLUTE systems. EVOLUTE encoder systems must be powered from a 5 Vdc supply complying with the requirements for SELV of standard IEC 60950-1
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
Temperature	Storage	−20 °C to +80 °C
	Operating	0 °C to +80 °C
Humidity		95% relative humidity (non-condensing) to IEC 60068-2-78
Sealing		IP64
Acceleration (readhead)	Operating	500 m/s^2, 3 axes
Shock (readhead)	Non-operating	1000 m/s^2, 6 ms, ½ sine, 3 axes
Maximum acceleration of scale with respect to readhead		2000 m/s^2
		NOTE: This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, contact your local Renishaw representative.
Vibration	Operating	300 m/s^2, 55 Hz to 2000 Hz, 3 axes
Mass	Readhead	18 g
	Cable	32 g/m
Readhead cable		7 core, tinned and annealed copper, 28 AWG
		Single-shielded, outside diameter 4.7 ±0.2 mm
		Flex life >40 × 10^6 cycles at 20 mm bend radius
		UL recognised component **ᴙⅬ**

Optional Advanced Diagnostic Tool ADTa-100

The EVOLUTE encoder system is compatible with the Advanced Diagnostic Tool ADTa-100* and ADT View software, which acquire detailed real-time data from the readhead to allow easy set-up, optimisation and in-field fault finding.

The intuitive software interface provides:

▶ Digital readout of encoder position and signal strength

▶ Graph of signal strength over the entire axis travel

▶ Ability to set a new zero position for the encoder system
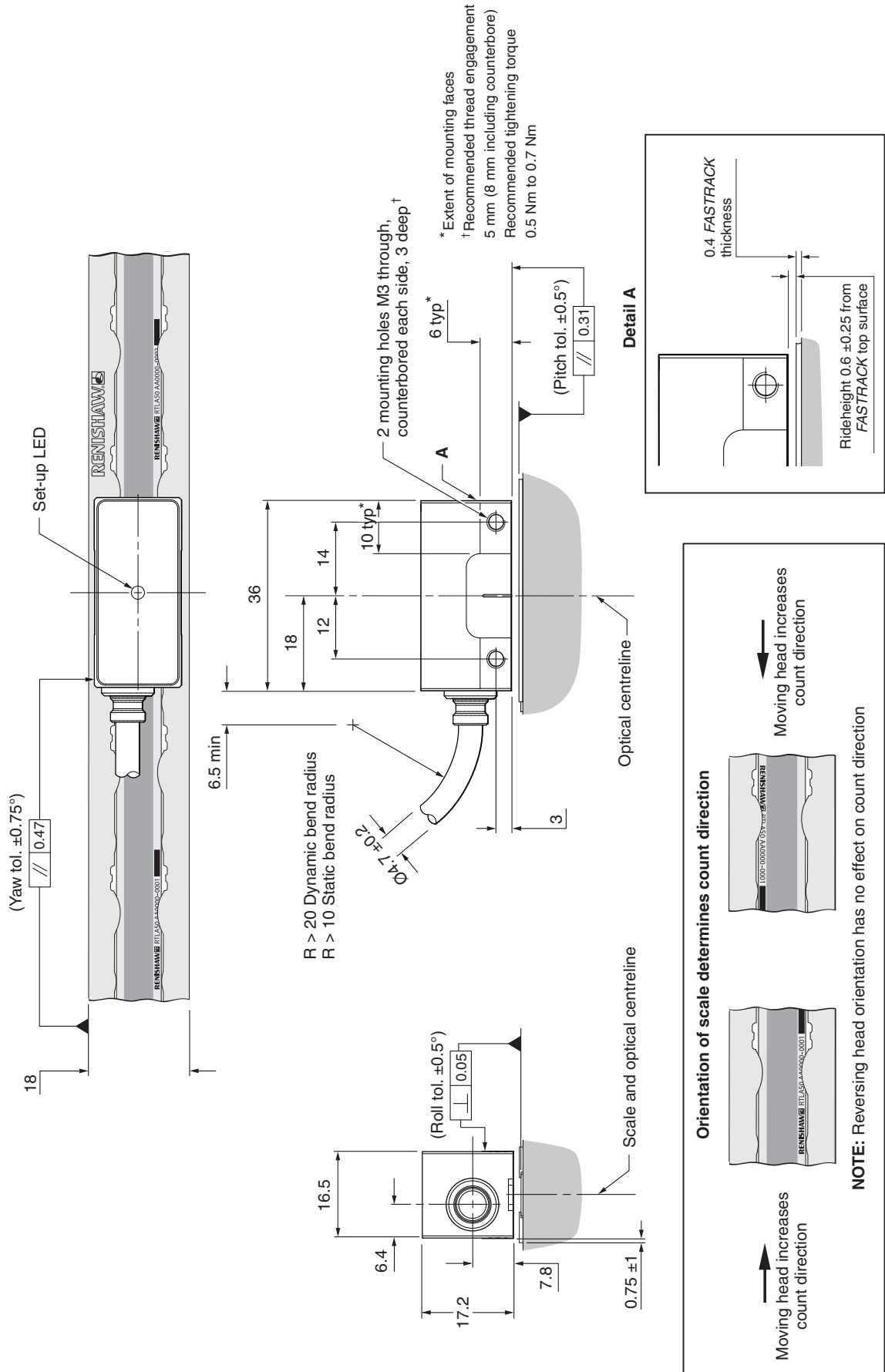
▶ System configuration information

*ADTa-100 compatible readheads are marked with the symbol **ADT**

EVOLUTE installation drawing (RTLA50 and *FASTRACK*)

For further details, including side-exit version, refer to EVOLUTE RTLA50/*FASTRACK* installation guide (M-96183-9040)
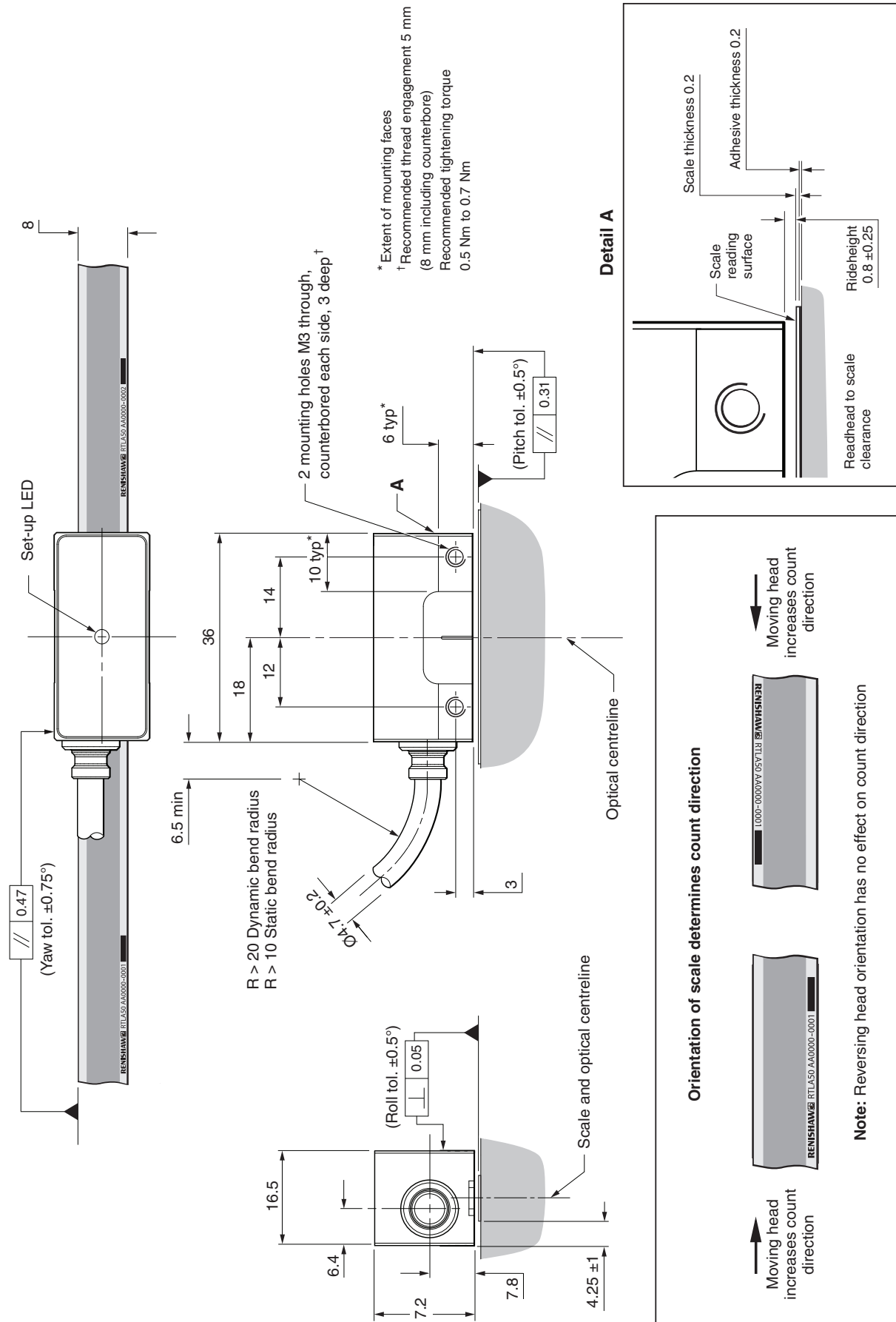
Dimensions and tolerances in mm

* Extent of mounting faces
† Recommended thread engagement
5 mm (8 mm including counterbore)
Recommended tightening torque
0.5 Nm to 0.7 Nm

2 mounting holes M3 through,
counterbored each side, 3 deep †

6 typ *

(Pitch tol. ±0.5°)

// 0.31

Detail A

0.4 *FASTRACK* thickness

Rideheight 0.6 ±0.25 from *FASTRACK* top surface

Set-up LED

A

10 typ *

14

36

18

12

Optical centreline

(Yaw tol. ±0.75°)

// 0.47

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

Ø4.7 ±0.2

3

18

Orientation of scale determines count direction

Moving head increases
count direction

NOTE: Reversing head orientation has no effect on count direction

Scale and optical centreline

(Roll tol. ±0.5°)

⊥ 0.05

16.5

6.4

7.8

17.2

0.75 ±1

Moving head increases
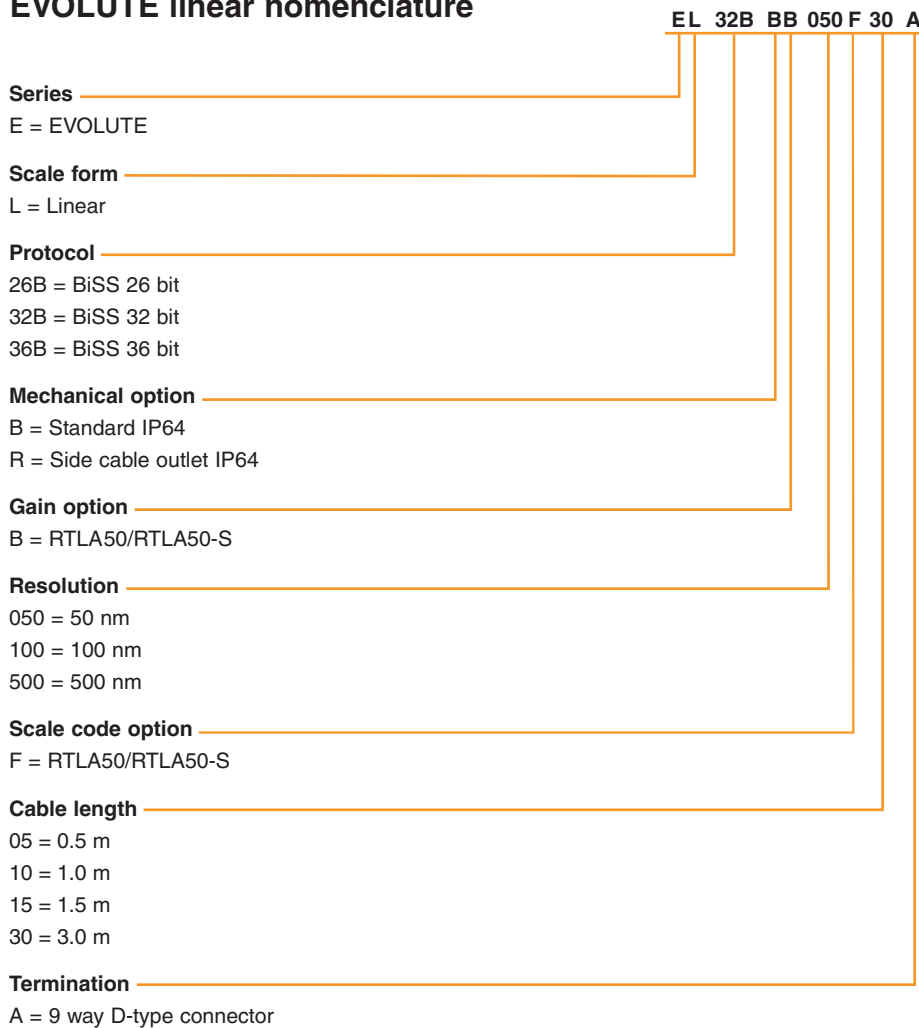count direction

EVOLUTE installation drawing (RTLA50-S)

For further details, including side-exit version, refer to EVOLUTE RTLA50-S installation guide (M-6183-9046)

Dimensions and tolerances in mm

Detail A

- Scale thickness 0.2
- Adhesive thickness 0.2
- Scale reading surface
- Rideheight 0.8 ±0.25
- Readhead to scale clearance

* Extent of mounting faces
† Recommended thread engagement 5 mm (8 mm including counterbore)
Recommended tightening torque 0.5 Nm to 0.7 Nm

8

Set-up LED

// 0.47
(Yaw tol. ±0.75°)

2 mounting holes M3 through, counterbored each side, 3 deep †

6 typ*

A

10 typ*

14

36

18

12

(Pitch tol. ±0.5°)
// 0.31

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

Φ4.7 ±0.2

3

Optical centreline

Scale and optical centreline

(Roll tol. ±0.5°)
⊥ 0.05

16.5

6.4

17.2

7.8

4.25 ±1

Orientation of scale determines count direction

Moving head increases count direction

Moving head increases count direction

Note: Reversing head orientation has no effect on count direction

RENISHAW®
apply innovation™

EVOLUTE linear nomenclature

E L 32B BB 050 F 30 A

Series

E = EVOLUTE

Scale form

L = Linear

Protocol

26B = BiSS 26 bit
32B = BiSS 32 bit
36B = BiSS 36 bit

Mechanical option

B = Standard IP64
R = Side cable outlet IP64

Gain option

B = RTLA50/RTLA50-S

Resolution

050 = 50 nm
100 = 100 nm
500 = 500 nm

Scale code option

F = RTLA50/RTLA50-S

Cable length

05 = 0.5 m
10 = 1.0 m
15 = 1.5 m
30 = 3.0 m

Termination

A = 9 way D-type connector

For scale nomenclature see *RTLA50 absolute linear encoder scale system for EVOLUTE™* data sheet
(Renishaw part no. L-9517-9628).

EVOLUTE compatible products

BiSS
FANUC
Mitsubishi
Panasonic
Siemens DRIVE-CLiQ
Yaskawa

**RTLA50-S self-adhesive
tape scale**

**RTLA50 tape scale
and *FASTRACK* carrier**

**Advanced Diagnostic Tool
ADTa-100 (A-6525-0100)**

For more information about ADTa-100 and the scale refer to the relevant data sheets and installation guides which can be
downloaded from **www.renishaw.com/evolutedownloads**

For worldwide contact details, visit **www.renishaw.com/contact**

L - 9 5 1 7 - 9 6 5 9 - 0 2

RENISHAW®
apply innovation™

BiSS® C-mode (unidirectional) for EVOLUTE™ encoders

For a full description of *BiSS* C-mode (unidirectional), please refer to *BiSS® C-mode (unidirectional) protocol description* data sheet (Renishaw part no. L-9709-9001). More information on *BiSS* protocols is available on the *BiSS* website: **www.biss-interface.com**

About EVOLUTE encoders

Renishaw EVOLUTE *BiSS* encoders use the C-mode (unidirectional) *BiSS* serial protocol.

- Linear encoders are available with a range of different resolutions (and maximum measuring lengths) as specified on the product data sheet.

Description of the *BiSS* interface

BiSS C-mode (unidirectional) is a fast synchronous serial interface for acquiring position data from an encoder.
It is a master-slave interface. The master controls the timing of position acquisition and the data transmission speed, and the encoder is the slave. The interface consists of two unidirectional differential pairs of lines:

- "MA" transmits position acquisition requests and timing information (clock) from master to encoder
- "SLO" transfers position data from encoder to master, synchronised to MA.

The diagram below shows the data transmitted.

Data format
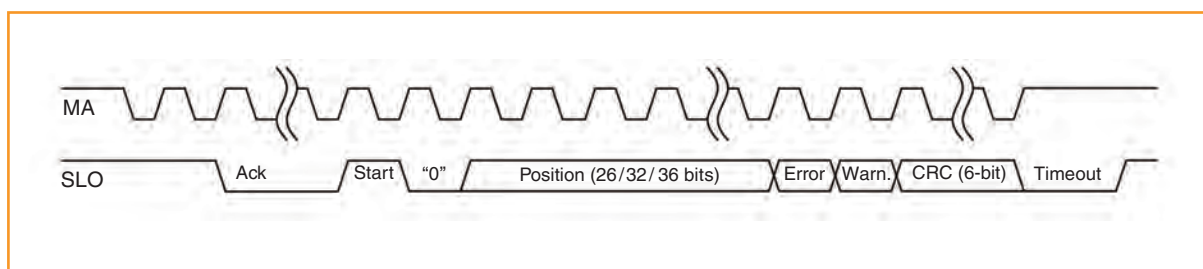
A typical request cycle proceeds as follows:

1. When idle, the master holds MA high. The encoder indicates it is ready by holding SLO high.
2. The master requests position acquisition by starting to transmit clock pulses on MA.
3. The encoder responds by setting SLO low on the second rising edge on MA.
4. After the "Ack" period is complete, the encoder transmits data to the master synchronised with the clock as shown in the diagrams above.
5. When all data has been transferred, the master stops the clock and sets MA high.
6. If the encoder is not yet ready for the next request cycle, it sets SLO low (the Timeout period).
7. When the encoder is ready for the next request cycle, it indicates this to the master by setting SLO high.

Description of data

- **Ack**

    This is the period during which the readhead calculates the absolute position.

    See the timing information table below.

- **Start and "0" (1 bit each)**

    The encoder transmits the start bit to signal to the master that it is starting to transmit data.

    The start bit is always high and the "0" bit is always low.

- **Position (26, 32 or 36 bits)**

    The absolute position data is in binary format and sent MSB first [Lower resolutions may be achieved by ignoring the least significant bit(s) of the position data].

- **Error (1 bit)**

    The error bit is active low: "1" indicates that the transmitted position information has been verified by the readhead's internal safety checking algorithm and is correct; "0" indicates that the internal check has failed and the position information should not be trusted. The error bit is also set to "0" if the temperature exceeds the maximum specified for the product.

    Note that the operating temperature limits of EVOLUTE systems are specified in the product datasheets.

- **Warning (1 bit)**

    The warning bit is active low: "0" indicates that the encoder scale (and/or reading window) should be cleaned.

    Note that the warning bit is not an indication of the trustworthiness of the position data. Only the error bit should be used for this purpose.

- **CRC for position data (6 bit)**

    The CRC polynomial for position, error and warning data is: $x^6 + x^1 + x^0$. It is transmitted MSB first and inverted. The start bit and "0" bit are omitted from the CRC calculation.

- **Timeout**

    EVOLUTE encoders are capable of acquiring a new position reading every 31.25 µs (a maximum request cycle rate of 32 kHz).

    Therefore 31.25 µs must elapse between the start of one request cycle and the start of the next.

    Nominal timeout is 1.5 x MA clock period.

    However, it is possible for data transmission to be complete before 31.25 µs have elapsed. In this case, the encoder signals this to the master by holding the SLO line low until 31.25 µs have elapsed. This extends the timeout period.

Resetting the encoder

The master may reset the encoder at any time during a request cycle by stopping the clock and setting MA high.

MA must be held high for the remaining duration of the full request cycle, including timeout period if applicable.

Note that SLO may be high or low during resetting (typically depending on the state of the last bit transmitted).

RENISHAW
apply innovation™

Line delay compensation

Signals travelling between master and encoder experience a time delay due to the cable length and signal propagation delays within the master and encoder. The time delay has no effect at low clock speeds (where the time delay is much shorter than the clock period). However, for high clock speeds, it is necessary for the master to implement line delay compensation.

The master determines the round-trip time delay by measuring the time between transmitting the second rising edge on MA and receiving the falling edge of "Ack" on SLO.

MA clock speed	Maximum cable length	
	Without line delay compensation	With line delay compensation
250 kHz	95 m	100
1 MHz	20 m	100
2 MHz	8 m	100
5 MHz	0.5 m	100
10 MHz	-	50

NOTES:

1. All figures relate to installations using EVOLUTE readheads with original Renishaw cable up to 10 m in length, with the remainder cable length consisting of Renishaw 14-core extension cable (A-9531-0238).

2. Care should be taken to ensure supply voltage is maintained within 5 V ±10% at the readhead connector.

    For extension cable lengths greater than 50 m, it is recommended that the spare 8 x 26 awg cores are also used for power supply and the EVOLUTE readhead cable should be limited to 5 m to minimise voltage drop.

3. This table makes no allowance for propagation delays within the master.

Timing information

	Min	Typical	Max	Units	NOTES
Ack time	-	-	20	µs	Note that Ack period always ends on a rising edge of MA. Therefore at low MA clock frequencies, the Ack time may exceed 20 µs
MA clock frequency	0.25	-	10	MHz	Within any one request cycle, the MA clock frequency must be constant. The duty cycle should be 1:1
Request cycle rate	-	-	32	kHz	Note that 32 kHz is not achievable for all MA clock frequencies (because data transmission takes too long).
Sampling moment	3.225	3.250	3.275	µs	Timed from the first rising edge on MA
EVOLUTE internal line delay	-	-	42.5	ns	This is the internal propagation delay (MA-SLO) within EVOLUTE encoders.
Line delay due to cable length	-	10	-	ns/m	This is the round-trip delay experienced by signals travelling through EVOLUTE cable (i.e. from master to encoder and back to master again).

For worldwide contact details, please visit our main website at www.renishaw.com/contact

L-9517-9665-01

Part no.: L-9517-9665-01-B
Issued: 02.2021

RENISHAW®

apply innovation™

EVOLUTE™ absolute optical encoder with FANUC serial communications

- **True absolute non-contact optical encoder system: no batteries required**

- **Wide set-up tolerances for quick and easy installation**

- **Integral set-up LED enables easy installation and provides diagnostics at a glance**

- **Enhanced immunity to dirt, scratches and light oils**

- **Resolution options of 50 nm, 100 nm and 500 nm**

- **100 m/s maximum speed for all resolutions**

- **±150 nm sub-divisional error for smooth velocity control**

- **Less than 10 nm RMS jitter for improved positional stability**

- **Built-in separate position-checking algorithm provides inherent safety**

- **Readhead is reversible for flexible mounting. Scale orientation defines count direction only**

- **Scale lengths up to 10.02 m**

- **Operates up to 80 °C**

- **Integral over-temperature alarm**

Compatible with:

- **RTLA50-S self-adhesive tape scale**

- **RTLA50 with *FASTRACK*™ carrier**

- **Optional Advanced Diagnostic Tool ADTa-100**

Incorporating industry-proven technology from the RESOLUTE™ encoder series, EVOLUTE™ is a true absolute 50 µm scale period optical encoder with wide installation tolerances and high immunity to dirt.

Using a scale period of 50 µm gives the EVOLUTE encoder system a generous 500 µm rideheight tolerance and its single-track optics are optimised for contamination resistance. Data redundancy encoded into the robust scale minimises the risk of positional error while sophisticated error checking mechanisms ensure an error flag is always asserted when the position cannot be determined.

The EVOLUTE system provides absolute position with resolution options down to 50 nm. Advanced optical design and high-speed signal processing mean sub-divisional error (SDE) is as low as ±150 nm with noise (jitter) below 10 nm RMS.

EVOLUTE encoders are mechanically identical to RESOLUTE encoders and are supplied with the RTLA50 scale that can be used, either in its self-adhesive form, RTLA50-S, or in the *FASTRACK*™ scale carrier system.

FANUC

RENISHAW®
apply innovation™

Resolutions and scale lengths

EVOLUTE with FANUC serial comms is available with 50 nm, 100 nm, and 500 nm resolution options.

The maximum reading speed is 100 m/s.

The maximum scale length is as described in the scale specifications below: i.e., it is not limited by absolute word length.

Contact your local Renishaw representative for details of other serial protocols.

Scale specifications

For more detailed scale information refer to relevant scale data sheet.

Description	RTLA50-S	Self-adhesive hardened stainless steel tape scale for high-performance motion control systems requiring easiest installation
		Lengths up to 10.02 m
	RTLA50/*FASTRACK*	Carrier-mounted hardened stainless steel tape scale for high performance motion control systems requiring easier and faster scale installation and field replacement.
		RTLA50 lengths up to 10.02 m
		FASTRACK lengths up to 25 m
Accuracy (at 20 °C)		±10 µm/m
Coefficient of thermal expansion (at 20 °C)		10.1 ±0.2 µm/m/°C

General specifications

Power supply	5 V ±10%	1.25 W maximum (250 mA @ 5V)
		NOTE: Current consumption figures refer to terminated EVOLUTE systems. EVOLUTE encoder systems must be powered from a 5 Vdc supply complying with the requirements for SELV of standard IEC 60950-1
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
Temperature	Storage	−20 °C to +80 °C
	Operating	0 °C to +80 °C
Humidity		95% relative humidity (non-condensing) to IEC 60068-2-78
Sealing		IP64
Acceleration (readhead)	Operating	500 m/s^2, 3 axes
Shock (readhead)	Non-operating	1000 m/s^2, 6 ms, ½ sine, 3 axes
Maximum acceleration of scale with respect to readhead		2000 m/s^2
		NOTE: This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, contact your local Renishaw representative.
Vibration	Operating	300 m/s^2, 55 Hz to 2000 Hz, 3 axes
Mass	Readhead	18 g
	Cable	32 g/m
Readhead cable		7 core, tinned and annealed copper, 28 AWG
		Single-shielded, outside diameter 4.7 ±0.2 mm
		Flex life > 40 × 10^6 cycles at 20 mm bend radius
		UL recognised component **RU**

RENISHAW
apply innovation™

Optional Advanced Diagnostic Tool ADTa-100

The EVOLUTE encoder system is compatible with the Advanced Diagnostic Tool ADTa-100* and ADT View software, which acquire detailed real-time data from the readhead to allow easy set-up, optimisation and in-field fault finding.

The intuitive software interface provides:

▶ Digital readout of encoder position and signal strength

▶ Graph of signal strength over the entire axis travel

▶ Ability to set a new zero position for the encoder system
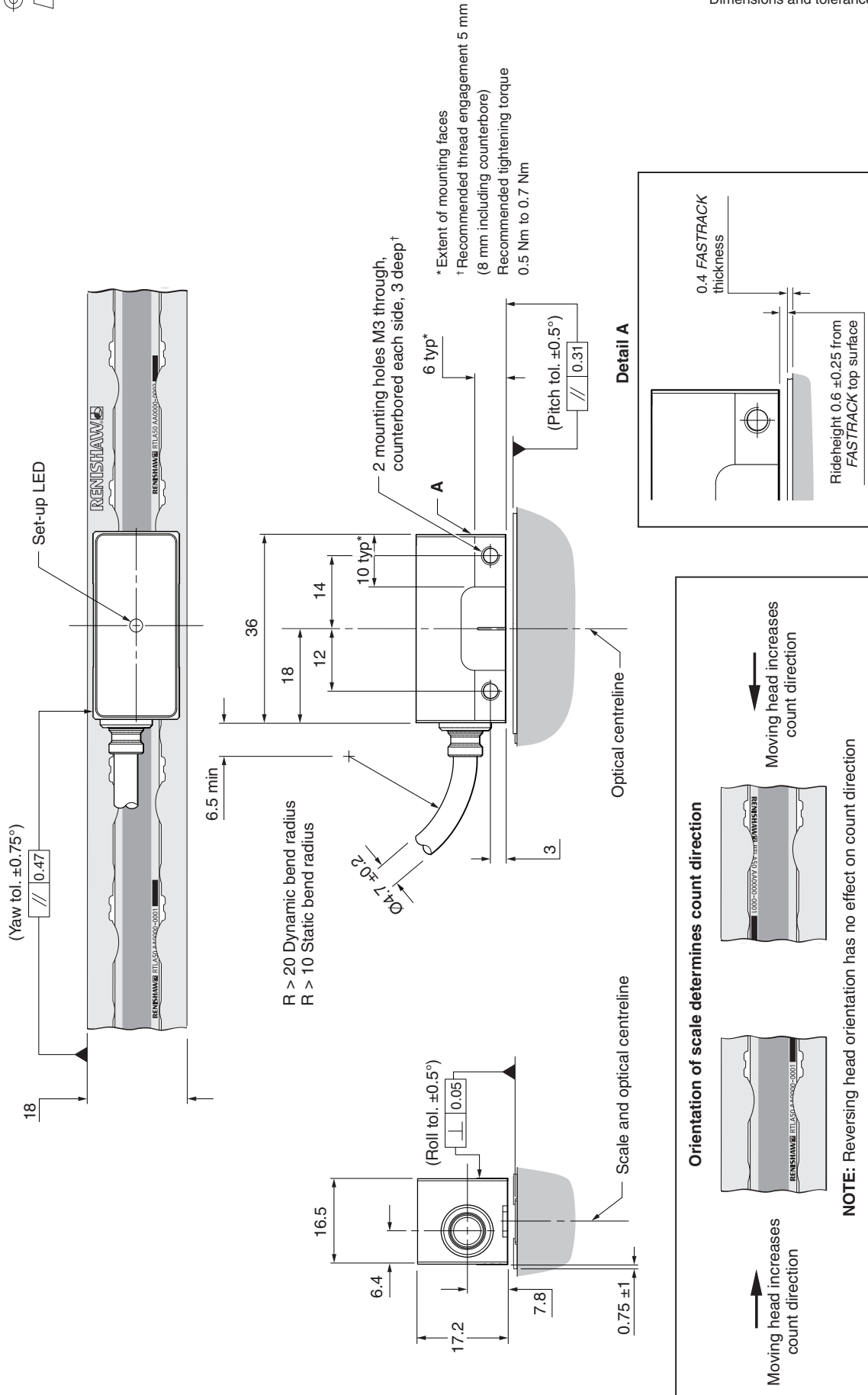
▶ System configuration information

*ADTa-100 compatible readheads are marked with the symbol **ADT**

EVOLUTE installation drawing (RTLA50 and *FASTRACK*)

For further details, including side-exit version, refer to EVOLUTE RTLA50/*FASTRACK* installation guide (M-6183-9040)

Dimensions and tolerances in mm

Set-up LED

(Yaw tol. ±0.75°)

// 0.47

18

RENISHAW

RENISHAW RTLA50 AA0000-0001

RENISHAW RTLA50 AA0000-0001

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

Φ4.7 ±0.2

* Extent of mounting faces
† Recommended thread engagement 5 mm
(8 mm including counterbore)
Recommended tightening torque
0.5 Nm to 0.7 Nm

2 mounting holes M3 through,
counterbored each side, 3 deep†

6 typ*

(Pitch tol. ±0.5°)

// 0.31

A

10 typ*

14

36

18

12

3

Optical centreline

Detail A

0.4 *FASTRACK*
thickness

Rideheight 0.6 ±0.25 from
FASTRACK top surface

(Roll tol. ±0.5°)

0.05

16.5

6.4

17.2

7.8

0.75 ±1

Scale and optical centreline

Orientation of scale determines count direction

Moving head increases
count direction

RENISHAW RTLA50 AA0000-0001

RENISHAW RTLA50 AA0000-0001

Moving head increases
count direction

NOTE: Reversing head orientation has no effect on count direction
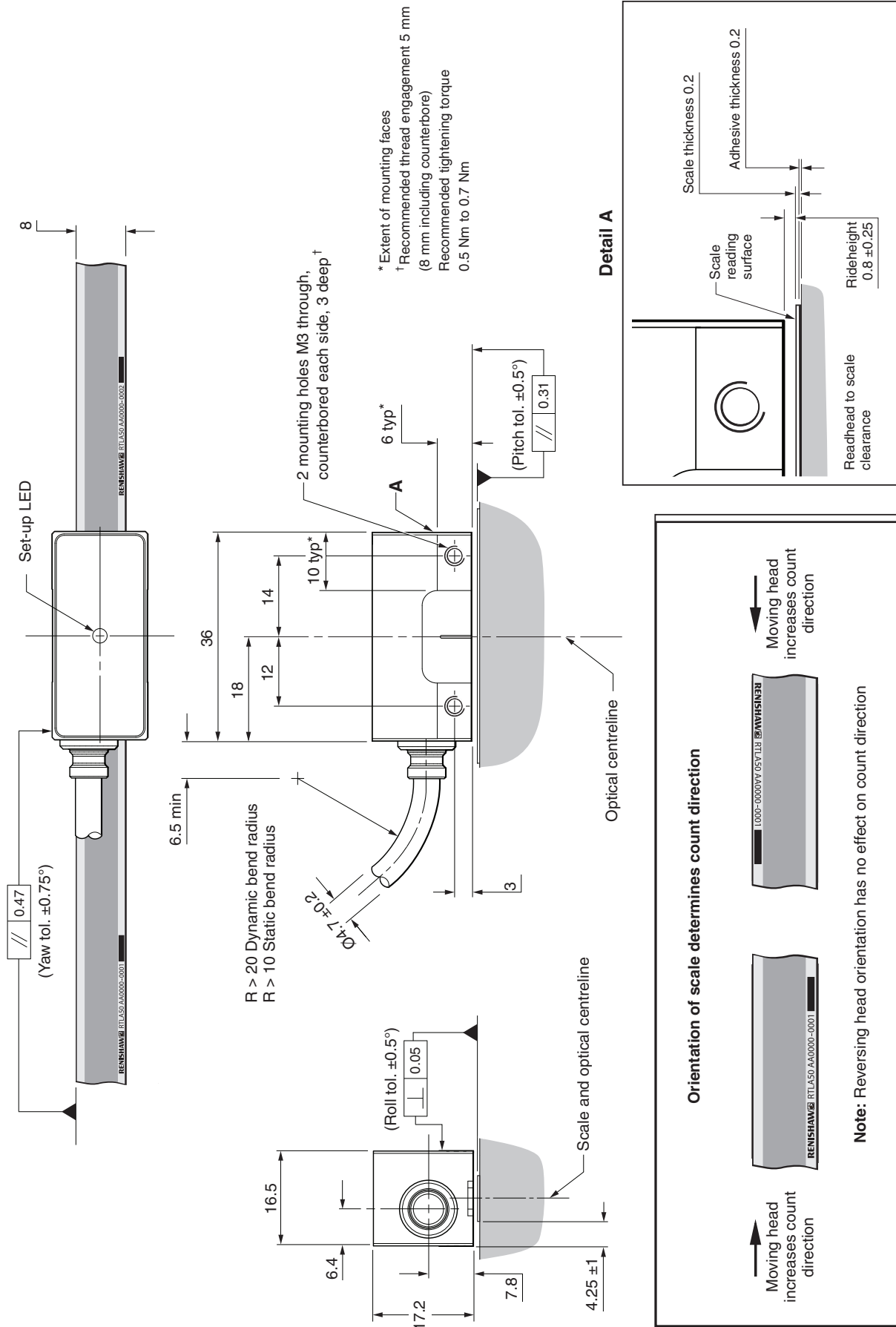
RENISHAW

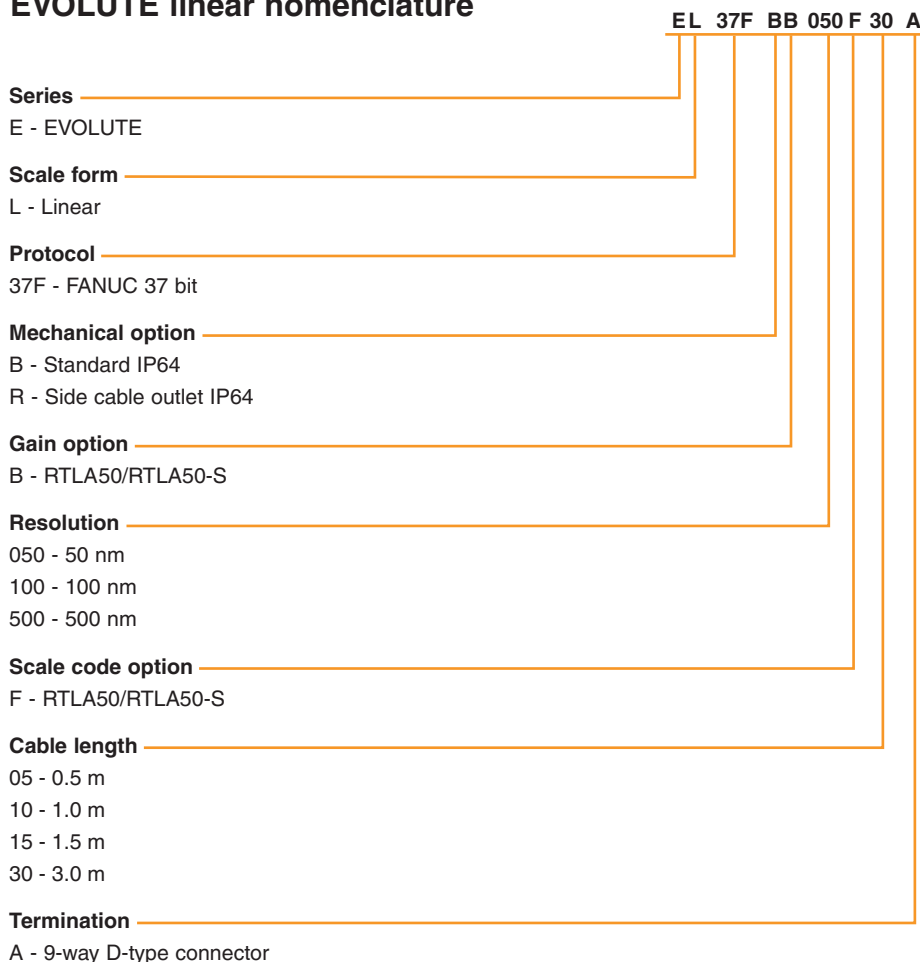apply innovation™

EVOLUTE installation drawing (RTLA50-S)

For further details, including side-exit version, refer to EVOLUTE RTLA50-S installation guide (M-6183-9046)
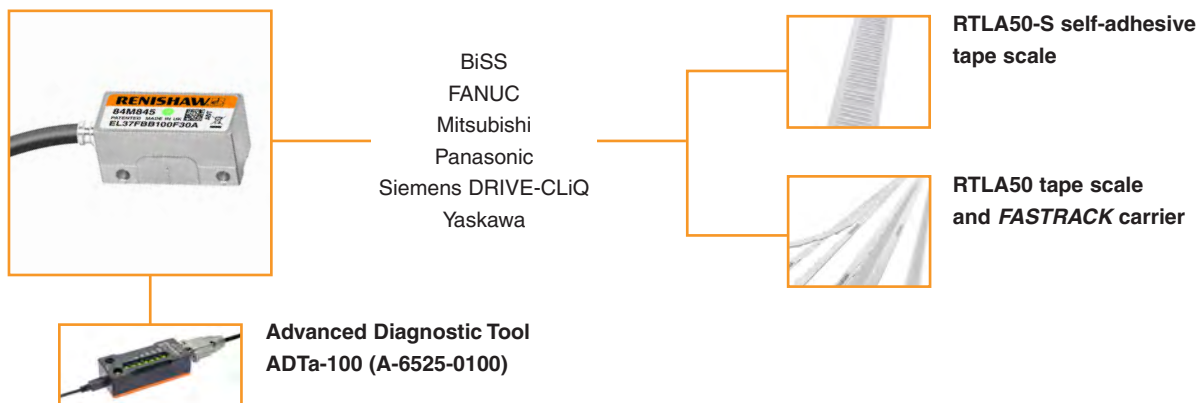
Dimensions and tolerances in mm

Detail A

Scale thickness 0.2

Adhesive thickness 0.2

Scale thickness 0.2

Scale reading surface

Rideheight 0.8 ±0.25

Readhead to scale clearance

8

Set-up LED

// 0.47

(Yaw tol. ±0.75°)

RENISHAW RTLA50 AA0000-0001

2 mounting holes M3 through, counterbored each side, 3 deep †

6 typ *

(Pitch tol. ±0.5°)

// 0.31

A

10 typ *

14

36

18

12

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

Φ4.7 ±0.2

3

Optical centreline

* Extent of mounting faces
† Recommended thread engagement 5 mm (8 mm including counterbore)
Recommended tightening torque 0.5 Nm to 0.7 Nm

(Roll tol. ±0.5°)

⊥ 0.05

16.5

6.4

17.2

7.8

4.25 ±1

Scale and optical centreline

Orientation of scale determines count direction

Moving head increases count direction

RENISHAW RTLA50 AA0000-0001

RENISHAW RTLA50 AA0000-0001

Moving head increases count direction

Note: Reversing head orientation has no effect on count direction

5

RENISHAW®
apply innovation™

EVOLUTE linear nomenclature

E L 37F BB 050 F 30 A

Series

E - EVOLUTE

Scale form

L - Linear

Protocol

37F - FANUC 37 bit

Mechanical option

B - Standard IP64
R - Side cable outlet IP64

Gain option

B - RTLA50/RTLA50-S

Resolution

050 - 50 nm
100 - 100 nm
500 - 500 nm

Scale code option

F - RTLA50/RTLA50-S

Cable length

05 - 0.5 m
10 - 1.0 m
15 - 1.5 m
30 - 3.0 m

Termination

A - 9-way D-type connector

For scale nomenclature see *RTLA50 absolute linear encoder scale system for EVOLUTE*™ data sheet
(Renishaw part no. L-9517-9628).

EVOLUTE compatible products

BiSS
FANUC
Mitsubishi
Panasonic
Siemens DRIVE-CLiQ
Yaskawa

**RTLA50-S self-adhesive
tape scale**

**RTLA50 tape scale
and *FASTRACK* carrier**

**Advanced Diagnostic Tool
ADTa-100 (A-6525-0100)**

For more information about ADTa-100 and the scale refer to the relevant data sheets and installation guides which can be downloaded from **www.renishaw.com/evolutedownloads**

For worldwide contact details, visit **www.renishaw.com/contact**

EVOLUTE™ absolute optical encoder with Siemens DRIVE-CLiQ serial communications

- **True absolute non-contact optical encoder system: no batteries required**

- **Wide set-up tolerances for quick and easy installation**

- **Integral set-up LED enables easy installation and provides diagnostics at a glance**

- **Enhanced immunity to dirt, scratches and light oils**

- **50 nm resolution**

- **100 m/s maximum speed for all resolutions**

- **±150 nm sub-divisional error for smooth velocity control**

- **Less than 10 nm RMS jitter for improved positional stability**

- **Built-in separate position-checking algorithm provides inherent safety**

- **Readhead is reversible for flexible mounting. Scale orientation defines count direction only**

- **Scale lengths up to 10.02 m**

- **Operates up to 80 °C**

- **Integral over-temperature alarm**

Compatible with:

- **RTLA50-S self-adhesive tape scale**

- **RTLA50 with *FASTRACK* carrier**

- **Optional Advanced Diagnostic Tool ADTa-100**

Incorporating industry-proven technology from the RESOLUTE™ encoder series, EVOLUTE™ is a true absolute 50 µm scale period optical encoder with wide installation tolerances and high immunity to dirt.

Using a scale period of 50 µm gives the EVOLUTE encoder system a generous 500 µm rideheight tolerance and its single-track optics are optimised for contamination resistance. Data redundancy encoded into the robust scale minimises the risk of positional error while sophisticated error checking mechanisms ensure an error flag is always asserted when the position cannot be determined.

The EVOLUTE system provides absolute position with 50 nm resolution. Advanced optical design and high-speed signal processing mean sub-divisional error (SDE) is as low as ±150 nm with noise (jitter) below 10 nm RMS.

EVOLUTE encoders are mechanically identical to RESOLUTE encoders and are supplied with RTLA50 scale that can be used, either in its self-adhesive form, RTLA50-S, or in the *FASTRACK*™ scale carrier system.

Resolutions and scale lengths

EVOLUTE with Siemens DRIVE-CLiQ serial comms is available with 50 nm resolution option.

The maximum reading speed is 100 m/s.

The maximum scale length is as described in the scale specifications below: i.e., it is not limited by absolute word length.

Contact your local Renishaw representative for details of other serial protocols.

Scale specifications

For more detailed scale information refer to the relevant scale data sheet.

Description	RTLA50-S	Self-adhesive hardened stainless steel tape scale for high-performance motion control systems requiring easiest installation.
		Lengths up to 10.02 m
	RTLA50/*FASTRACK*	Carrier-mounted hardened stainless steel tape scale for high-performance motion control systems requiring easier and faster scale installation and field replacement.
		RTLA50 lengths up to 10.02 m
		FASTRACK lengths up to 25 m
Accuracy (at 20 °C)		±10 μm/m
Coefficient of thermal expansion (at 20 °C)		10.1 ±0.2 μm/m/°C

General specifications

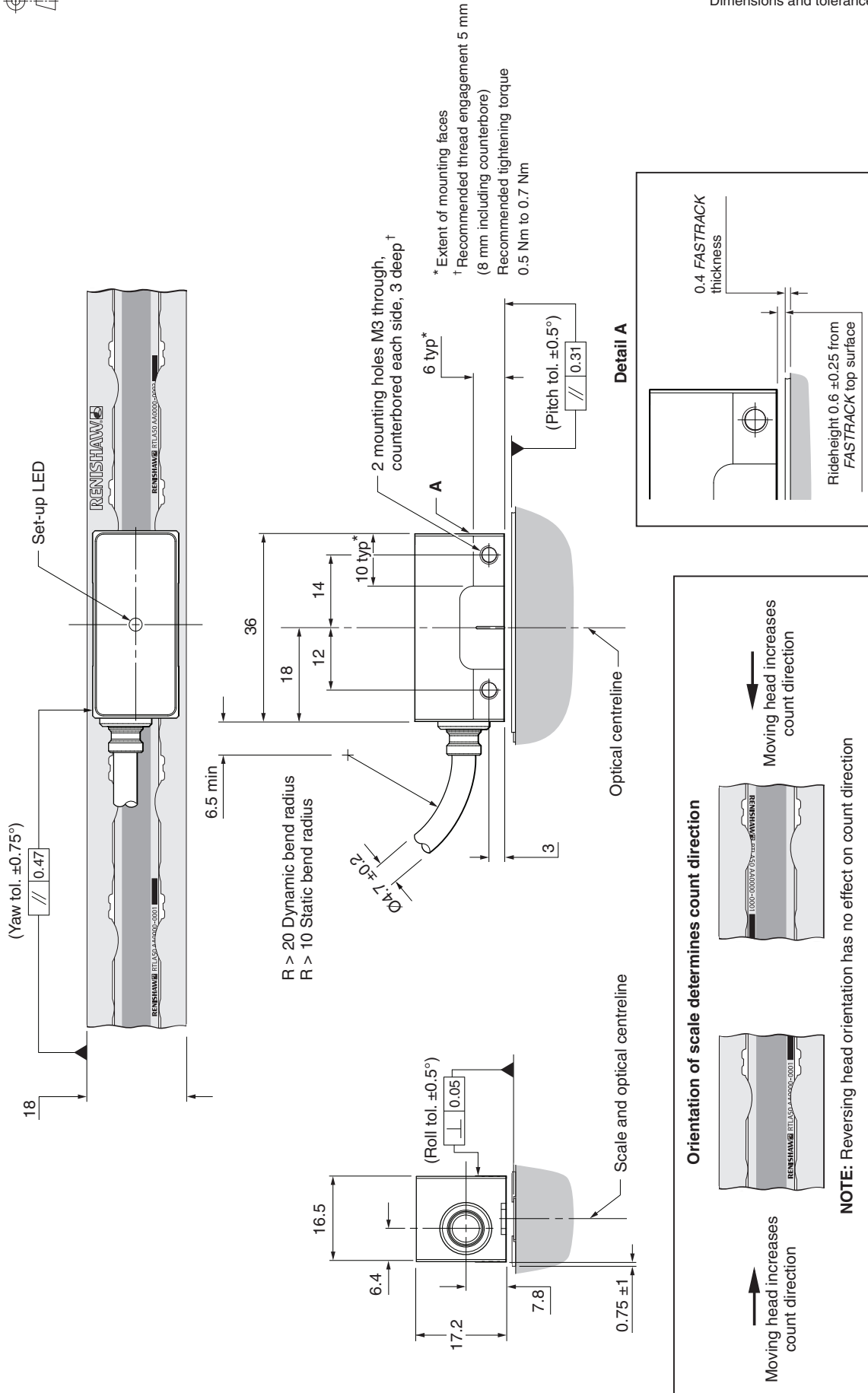| **Power supply**		24 V	3.05 W maximum (encoder: 1.25 W + interface: 1.8 W)
			24 Vdc power is provided by the DRIVE-CLiQ network
			NOTE: The Renishaw DRIVE-CLiQ interface must be powered from a 24 Vdc supply complying with the requirements for SELV of standard IEC 60950-1.
		Ripple	200 mVpp maximum @ frequency up to 500 kHz maximum
Temperature	(system)	Storage	−20 °C to +70 °C
	(readhead)	Operating	0 °C to +80 °C
	(interface)	Operating	0 °C to +55 °C
Humidity (system)			95% relative humidity (non-condensing) to IEC 60068-2-78
Sealing	(readhead)		IP64
	(interface)		IP67
Acceleration		Operating	500 m/s^2, 3 axes
Shock (readhead/interface)		Non-operating	500 m/s^2, 11 ms, ½ sine, 3 axes
Maximum acceleration of scale with respect to readhead			2000 m/s^2
			NOTE: This is the worst case figure that is correct for the slowest communications request rates. For faster request rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, contact your local Renishaw representative.
Vibration (readhead)		Operating	300 m/s^2, 55 Hz to 2000 Hz, 3 axes
	(interface)	Operating	100 m/s^2, 55 Hz to 2000 Hz, 3 axes
Mass		Readhead	18 g
		Interface	218 g
		Readhead cable	32 g/m
Cable (readhead to interface)			7 core, tinned and annealed copper, 28 AWG
			Single-shielded, outside diameter 4.7 ±0.2 mm
			Flex life > 40 × 10^6 cycles at 20 mm bend radius
			10 m maximum length (refer to Siemens DRIVE-CLiQ specifications for maximum cable length from interface to controller)
			UL recognised component Ⓘ

RENISHAW
apply innovation™

EVOLUTE installation drawing (RTLA50 and *FASTRACK*)

For further details, including side-exit version, refer to EVOLUTE RTLA50/*FASTRACK* installation guide (M-6183-9040)

Dimensions and tolerances in mm

Set-up LED

(Yaw tol. ±0.75°)

// 0.47

18

RENISHAW RTLA50 AA0000-0001

RENISHAW RTLA50 AA0000-0001

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

Ø4.17 ±0.2

36

18

14

12

10 typ*

A

6 typ*

(Pitch tol. ±0.5°)

// 0.31

3

Optical centreline

* Extent of mounting faces
† Recommended thread engagement 5 mm
(8 mm including counterbore)
Recommended tightening torque
0.5 Nm to 0.7 Nm

2 mounting holes M3 through,
counterbored each side, 3 deep †

Detail A

0.4 *FASTRACK*
thickness

Rideheight 0.6 ±0.25 from
FASTRACK top surface

(Roll tol. ±0.5°)

⊥ 0.05

16.5

6.4

17.2

7.8

0.75 ±1

Scale and optical centreline

Orientation of scale determines count direction

Moving head increases
count direction

RENISHAW RTLA50 AA0000-0001

RENISHAW RTLA50 AA0000-0001

Moving head increases
count direction

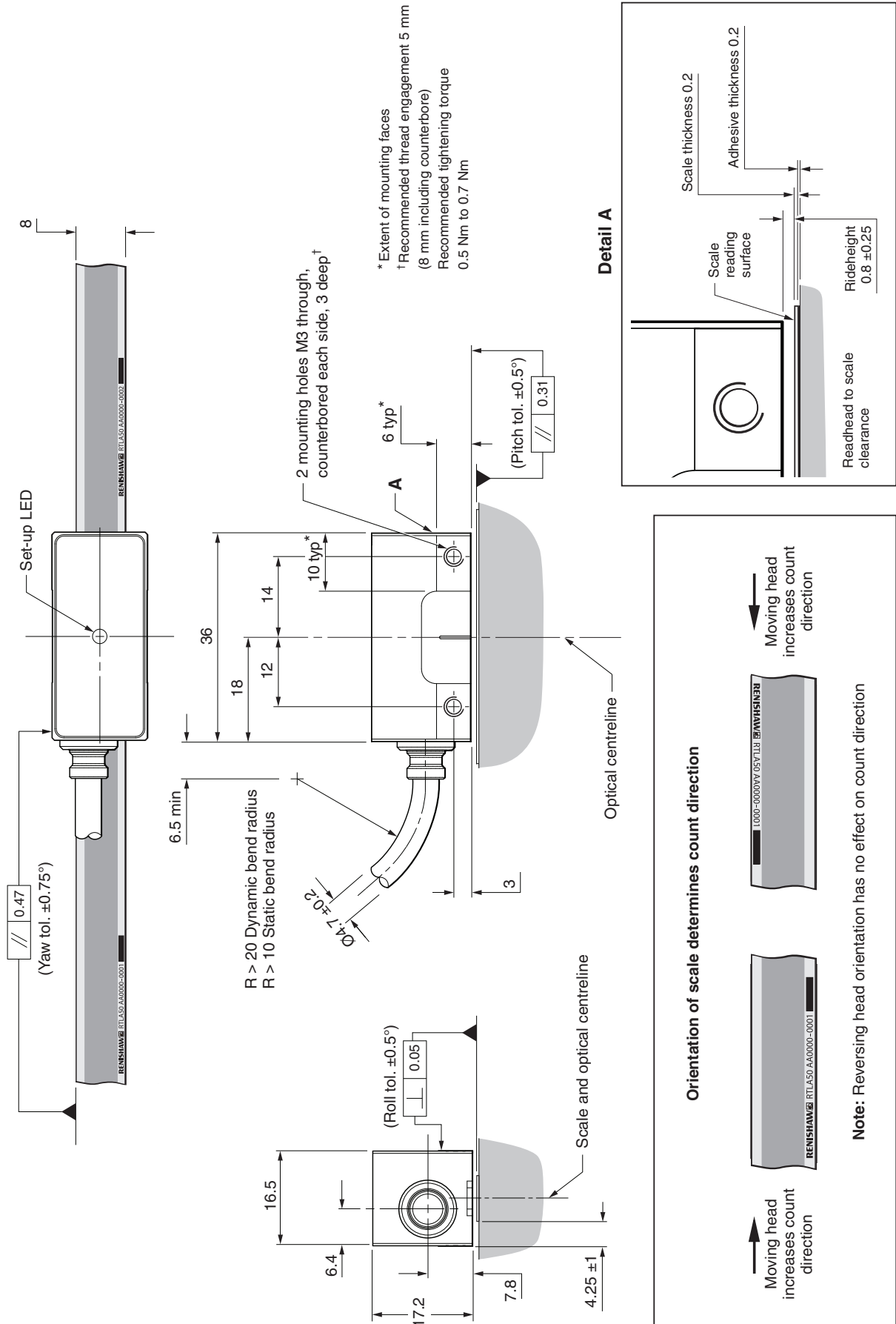**NOTE:** Reversing head orientation has no effect on count direction

EVOLUTE installation drawing (RTLA50-S)

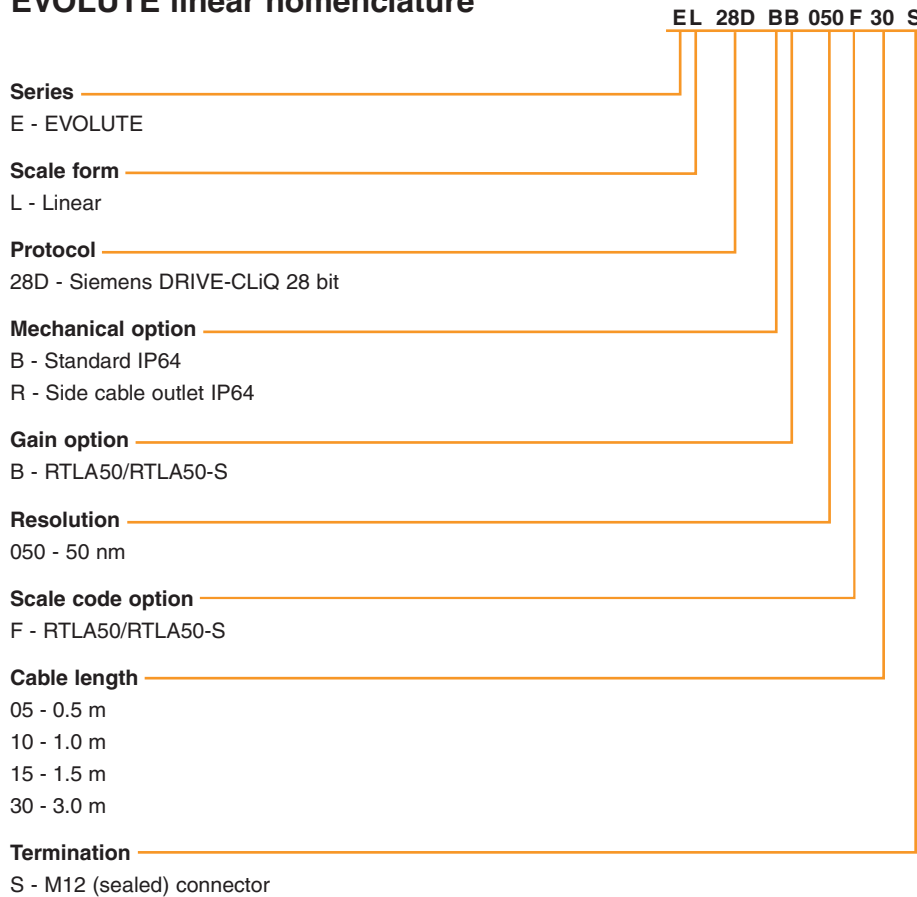For further details, including side-exit version, refer to EVOLUTE RTLA50-S installation guide (M-6183-9046)
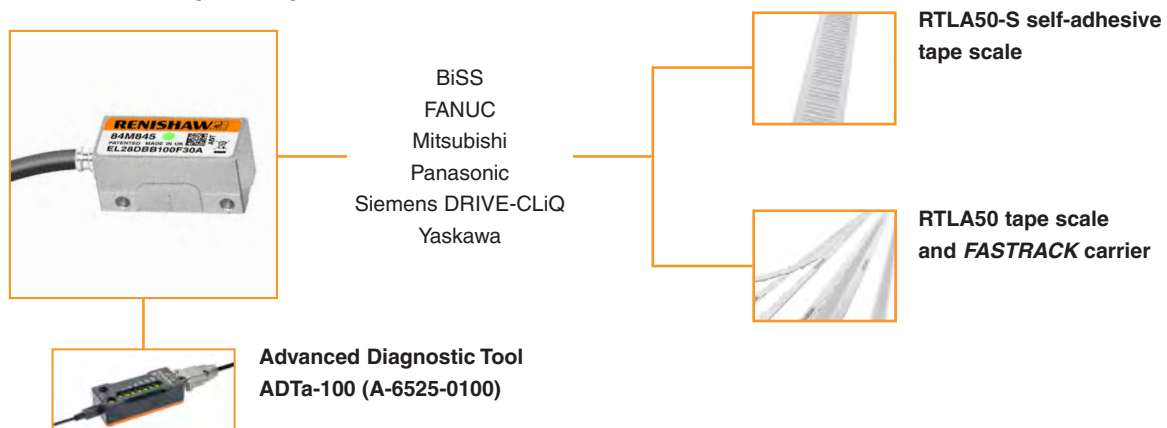
Dimensions and tolerances in mm

8

Set-up LED

(Yaw tol. ±0.75°)

// 0.47

RENISHAW RTLA50 AA0000-0001

* Extent of mounting faces
† Recommended thread engagement 5 mm
(8 mm including counterbore)
Recommended tightening torque
0.5 Nm to 0.7 Nm

2 mounting holes M3 through,
counterbored each side, 3 deep †

6 typ *

10 typ *

14

36

18

12

A

(Pitch tol. ±0.5°)

// 0.31

6.5 min

R > 20 Dynamic bend radius
R > 10 Static bend radius

Ø4.7 ±0.2

3

Optical centreline

Scale and optical centreline

(Roll tol. ±0.5°)

⊥ 0.05

16.5

6.4

17.2

7.8

4.25 ±1

Detail A

Scale thickness 0.2

Adhesive thickness 0.2

Scale
reading
surface

Rideheight
0.8 ±0.25

Readhead to scale
clearance

Orientation of scale determines count direction

Moving head
increases count
direction

RENISHAW RTLA50 AA0000-0001

RENISHAW RTLA50 AA0000-0001

Note: Reversing head orientation has no effect on count direction

Moving head
increases count
direction

RENISHAW®
apply innovation™

EVOLUTE linear nomenclature

E L 28D BB 050 F 30 S

Series
E - EVOLUTE

Scale form
L - Linear

Protocol
28D - Siemens DRIVE-CLiQ 28 bit

Mechanical option
B - Standard IP64
R - Side cable outlet IP64

Gain option
B - RTLA50/RTLA50-S

Resolution
050 - 50 nm

Scale code option
F - RTLA50/RTLA50-S

Cable length
05 - 0.5 m
10 - 1.0 m
15 - 1.5 m
30 - 3.0 m

Termination
S - M12 (sealed) connector

For scale nomenclature see *RTLA50 absolute linear encoder scale system for EVOLUTE™* data sheet
(Renishaw part no. L-9517-9628).

EVOLUTE compatible products

BiSS
FANUC
Mitsubishi
Panasonic
Siemens DRIVE-CLiQ
Yaskawa

RTLA50-S self-adhesive tape scale

RTLA50 tape scale and *FASTRACK* carrier

Advanced Diagnostic Tool ADTa-100 (A-6525-0100)

For more information about ADTa-100 and the scale refer to the relevant data sheets and installation guides which can be downloaded from **www.renishaw.com/evolutedownloads**

For worldwide contact details, visit **www.renishaw.com/contact**

L-9517-9909-01

Part no.: L-9517-9909-01-B
Issued: 02.2021

RENISHAW®

apply innovation™

RTLA50 absolute linear encoder scale system for EVOLUTE™

The range of RTLA50 absolute linear encoder scales from Renishaw give ±10 µm/m accuracy in the form of a rugged and easy-to-handle stainless-steel tape. RTLA50 scales can either be stuck to the substrate using their self-adhesive backing or mounted in the revolutionary *FASTRACK*™ track system to offer total design flexibility.

When combined with Renishaw's EVOLUTE readhead, the RTLA50 scales offer high accuracy and an independent expansion coefficient with resolutions down to 50 nm. The generous rideheight and installation tolerances, impressive dirt immunity and ease of assembly make this encoder ideally suited to a wide variety of applications.

RTLA50 can be used with *FASTRACK* carrier, Renishaw's cut-to-length track based mounting system, making it ideal for large machines that need to be sectioned for transportation. In this case the scale is held securely in place by two low-profile yet rugged guide rails and restrained at a single point to allow independent expansion with extremely low hysteresis, even over wide temperature ranges. If damaged, the scale can be slid out of the guide rails and quickly replaced, even where access is limited, thus reducing machine downtime.

When *FASTRACK* carrier is not used, an adhesive-backed version, RTLA50-S, can be laid directly onto the substrate using a patented application tool in a quick, simple and inexpensive process. Metrology is ensured by using the supplied clamp at a single point to lock the scale to the substrate.

RTLA50-S and RTLA50 with *FASTRACK* carrier are suitable for any application where thermal expansion of the scale must be independent of the machine structure, including FPD manufacturing and inspection machines, PV manufacturing, linear motors with aluminium substrates, large CMMs, axes that are exposed to potential damage, and any other machines that require the scale to be installed/removed for transit.

- **Flexible and easy-to-handle scale for use with EVOLUTE absolute readhead**

- **Stainless-steel tape scale accurate to ±10 µm/m. Further improvement possible with error compensation**

- **Independent RTLA50 scale expands at its own thermal coefficient (10.1 ±0.2 µm/m/°C @ 20 °C)**

- **Repeatable metrology: scale can be locked to the substrate at a single datum point anywhere along the axis**

- **High solvent immunity**

- **Scale lengths up to 10.02 m**

- **Quick installation. Use *FASTRACK* carrier for easy scale replacement**

- ***FASTRACK* carrier: sectional form is ideal for large machines and subassemblies**

- ***FASTRACK* guide rails are pre-aligned on reels for cut-to-suit flexibility**

System features

RTLA50 and RTLA50-S scale

▶ ±10 µm/m accuracy at 20 °C, including slope and linearity. Further improvement possible with error correction

▶ Hardened stainless steel construction is rugged and reliable, with high scratch and solvent resistance

▶ Independent expansion coefficient (10.1 ±0.2 µm/m/°C @ 20 °C)

▶ Very low hysteresis: sub-micron on a centre clamped 2 m axis over the entire operating temperature range

▶ Scale can be cut to length using a guillotine for easy customisation

▶ Track mounted using the revolutionary *FASTRACK* or self-adhesive mounted (RTLA50-S)

Error plot
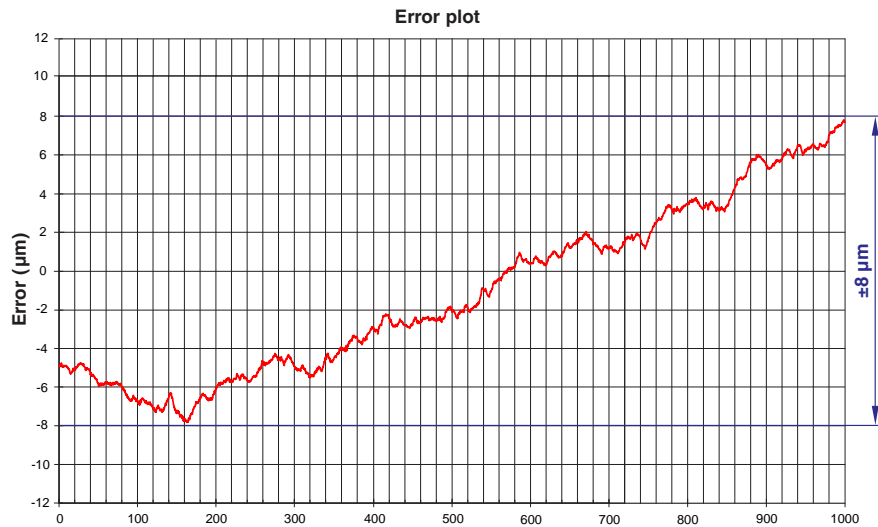
Example accuracy test result of 1000 mm length of RTLA50 scale

Compatible with EVOLUTE readheads

▶ True absolute optical encoder: absolute position is determined immediately at switch-on, eliminating reference returns

▶ Unique single track nominal 50 µm pitch optical scale combines absolute position and incremental phase information into one code resulting in wide yaw tolerance

▶ Resolutions to 50 nm

▶ Low sub-divisional error (SDE ±150 nm) and low jitter (10 nm RMS) for smooth velocity control and rock-solid positional stability

▶ 100 m/s maximum speed for all resolutions

▶ Wide set-up tolerances:
±250 µm rideheight,
±0.75° yaw, ±0.5° pitch and roll

RENISHAW®
apply innovation™

Installation drawing: RTLA50 in *FASTRACK* carrier

For further details, refer to EVOLUTE RTLA50/*FASTRACK* installation guide (M-6183-9040)
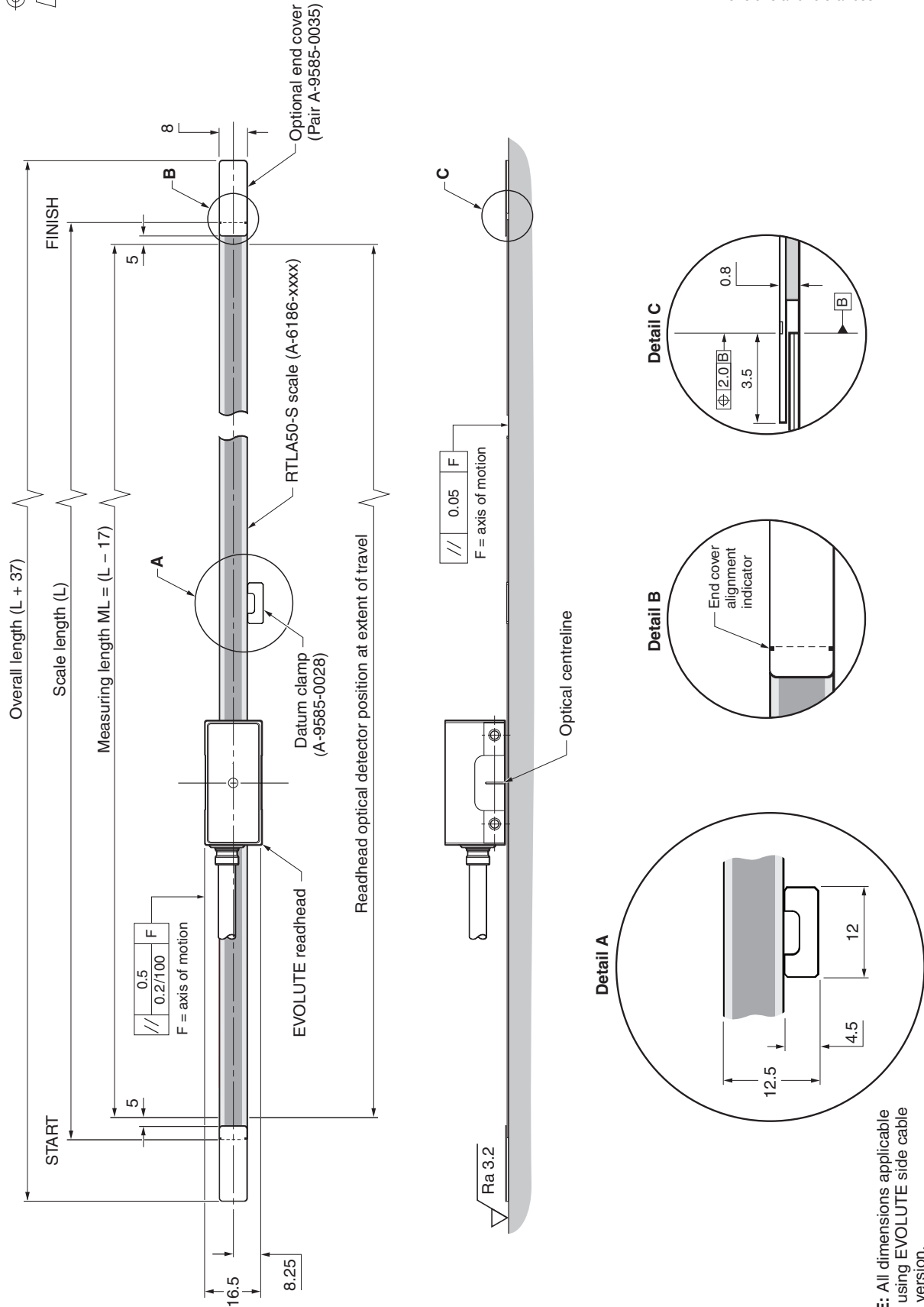
Dimensions and tolerances in mm

Overall length (L + 12)

Scale length (L)

Measuring length ML = (L − 10)

FASTRACK length (L − 24)*

RTLA50 scale (A-6185-xxxx)

| // | 0.5 | |
| | 0.1/100 | F |

F = axis of motion

5

18

B

A

Detail B

Do not cut *FASTRACK* over shaded area

35 max†

Detail A

Spot of Loctite® 435™ (2 positions) to secure axis datum position

FASTRACK (A-9704-xxxx)

10 max (gap)†

EVOLUTE readhead

Optional end cover (Pair A-9589-0058)

1 min (gap)‡

0.75 ±1

18 ±0.1

Optical centreline

| // | 0.05 | F |

F = axis of motion

Ra 3.2
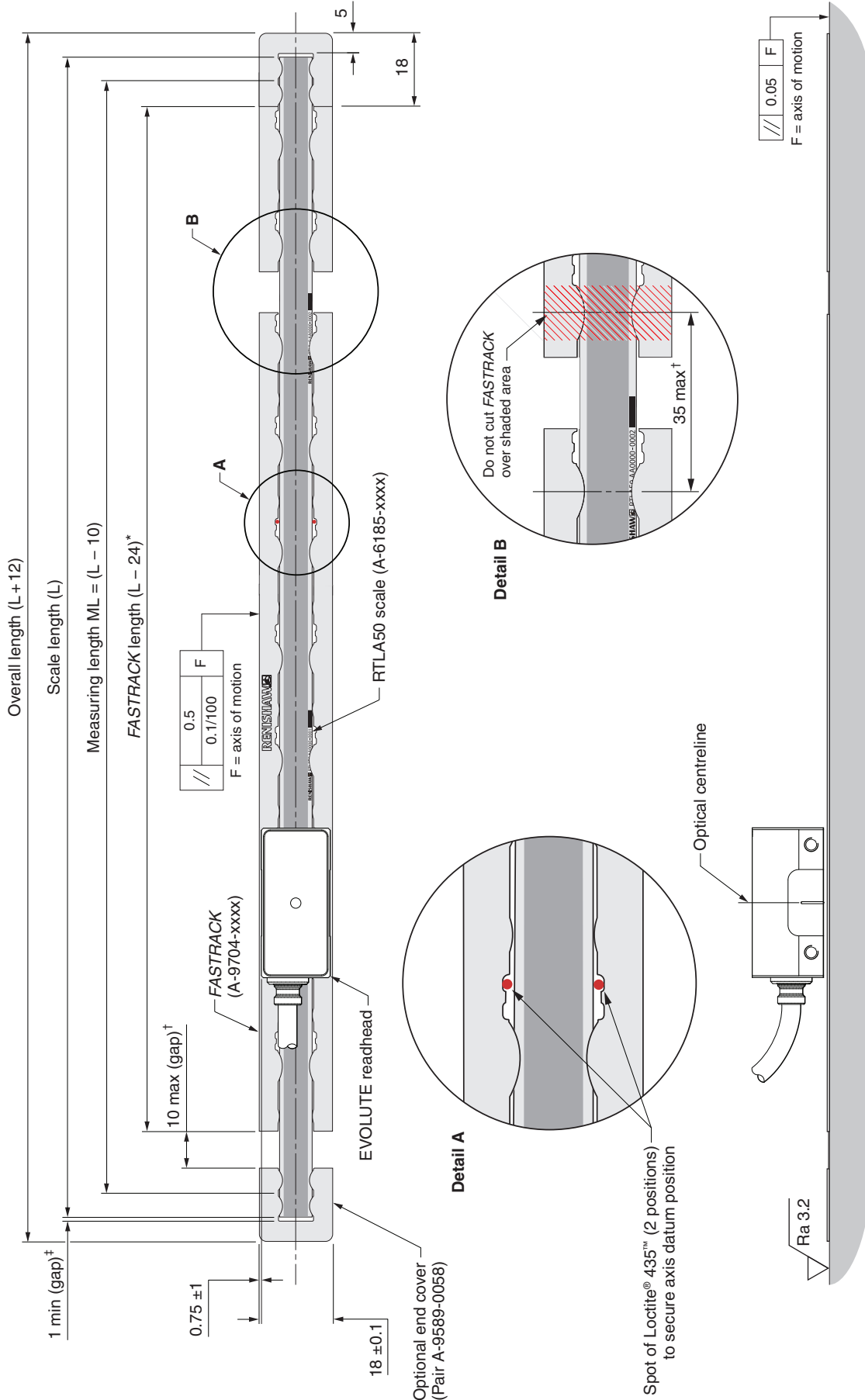
NOTE: Minimum recommended *FASTRACK* length = 100 mm. All dimensions applicable when using EVOLUTE side cable outlet version.
* Assumes 1 mm gap between scale and end covers and zero gap between *FASTRACK* and end covers. †Only required for sectional installations. ‡For thermal expansion.

RENISHAW

apply innovation™

Installation drawing: RTLA50-S (with adhesive datum clamp)

For further details, refer to EVOLUTE RTLA50-S installation guide (M-6183-9046)

Dimensions and tolerances in mm

Optional end cover
(Pair A-9585-0035)

8

B

FINISH

5

RTLA50-S scale (A-6186-xxxx)

Overall length (L + 37)

Scale length (L)

Measuring length ML = (L − 17)

A

Datum clamp
(A-9585-0028)

Readhead optical detector position at extent of travel

EVOLUTE readhead

// | 0.5
0.2/100 | F

F = axis of motion

5

START

16.5

8.25

C

// | 0.05 | F

F = axis of motion

Optical centreline

Ra 3.2

Detail C

0.8

⊕ | 2.0|B

3.5

B

Detail B

End cover
alignment
indicator

Detail A

12

4.5

12.5

NOTE: All dimensions applicable when using EVOLUTE side cable outlet version.

4

RTLA50-S, RTLA50 and *FASTRACK* specifications

Description	RTLA50-S	Self-adhesive absolute high-accuracy hardened and tempered martensitic stainless steel for use with EVOLUTE readheads.
	RTLA50	Absolute high-accuracy hardened and tempered martensitic stainless-steel scale for use with *FASTRACK* and EVOLUTE readheads.
	FASTRACK	Hardened and tempered stainless-steel guide rails with removable alignment strip and self-adhesive backing tape for easy installation.
Form (H × W)	RTLA50-S	0.4 mm × 8 mm (including adhesive)
	FASTRACK	0.4 mm × 18 mm (including adhesive)
Scale accuracy (at 20 °C)		±10 µm/m
Scale thermal expansion (at 20 °C)		10.1 ±0.2 µm/m/°C
Temperature (system)	Storage	−20 °C to +80 °C
	Operating	0 °C to +80 °C
Humidity (system)		95% maximum relative humidity (non-condensing) to IEC 60068-2-78
Shock (system)	Non-operating	1000 m/s^2, 6 ms, ½ sine, 3 axes
Vibration (system)	Operating	100 m/s^2 max @ 55 to 2000 Hz, 3 axes
Mass	RTLA50-S	12.9 g/m
	RTLA50	12.2 g/m
	FASTRACK	24 g/m
Minimum recommended length	*FASTRACK*	100 mm (including end covers)
Maximum supplied length	RTLA50-S	10.02 m
	RTLA50	10.02 m
	FASTRACK	25 m

Resolution and scale lengths

EVOLUTE is available with a variety of resolutions and scale lengths to meet the needs of a wide range of applications.

The choice of resolution depends on the serial protocol being used. Refer to the relevant EVOLUTE data sheet for more information.

For further information on installation and mounting options, refer to the EVOLUTE linear installation guides (M-6183-9046 or M-6183-9040), which are available from your local Renishaw representative or can be downloaded from **www.renishaw.com/encoderinstallationguides**

RENISHAW®
apply innovation™

RTLA50-S, RTLA50 and *FASTRACK* part numbers

Part type	Length	Available in increments of:	Part number (where **xxxx** is the length in cm)
RTLA50-S	20 mm to 10.02 m	10 mm	A-6186-xxxx
RTLA50	20 mm to 10.02 m	10 mm	A-6185-xxxx
FASTRACK	100 mm to 25 m	25 mm	A-9704-xxxx

*NOTE: Part numbers for *FASTRACK* lengths ending in 25 mm are: A-9704-xxx3

Part numbers for *FASTRACK* lengths ending in 75 mm are: A-9704-xxx8

Accessories

Datum clamp

Adhesive datum clamp (RTLA50-S only)	A-9585-0028
Adhesive for clamp (Loctite 435) 20 g	P-AD03-0012
18 gauge dispensing tip	P-TL50-0209
Bolted datum clamp (*FASTRACK* only)	A-9589-0096

Setting shim

FASTRACK with RTLA50 0.6 mm setting shim (red)	M-9589-0090
RTLA50-S 0.8 mm setting shim (blue)	M-9517-0122

Separator kit (*FASTRACK* only)

Centre section removal tool	A-9589-0066

End cover

End cover (for use with *FASTRACK* carrier)	A-9589-0058
End cover kit (for use with RTLA50-S only)	A-9585-0035

Scale/carrier cutting jig

Guillotine kit	A-9589-0071

EVOLUTE compatible products

RENISHAW
84M845
PATENTED MADE IN UK
EL32BBB100F30A

BiSS
FANUC
Mitsubishi
Panasonic
Siemens DRIVE-CLiQ
Yaskawa

RTLA50-S self-adhesive tape scale

RTLA50 tape scale and *FASTRACK* carrier

For worldwide contact details, visit www.renishaw.com/contact

L - 9 5 1 7 - 9 6 2 8 - 0 3

Part no.: L-9517-9628-03-A

Issued: 02.2020

RENISHAW®
apply innovation™

Advanced Diagnostic Tool ADTa-100

The ADTa-100 (A-6525-0100) is a set-up tool and diagnostic accessory specifically designed to be used with Renishaw absolute encoder products. It also allows for writing a new zero position.*
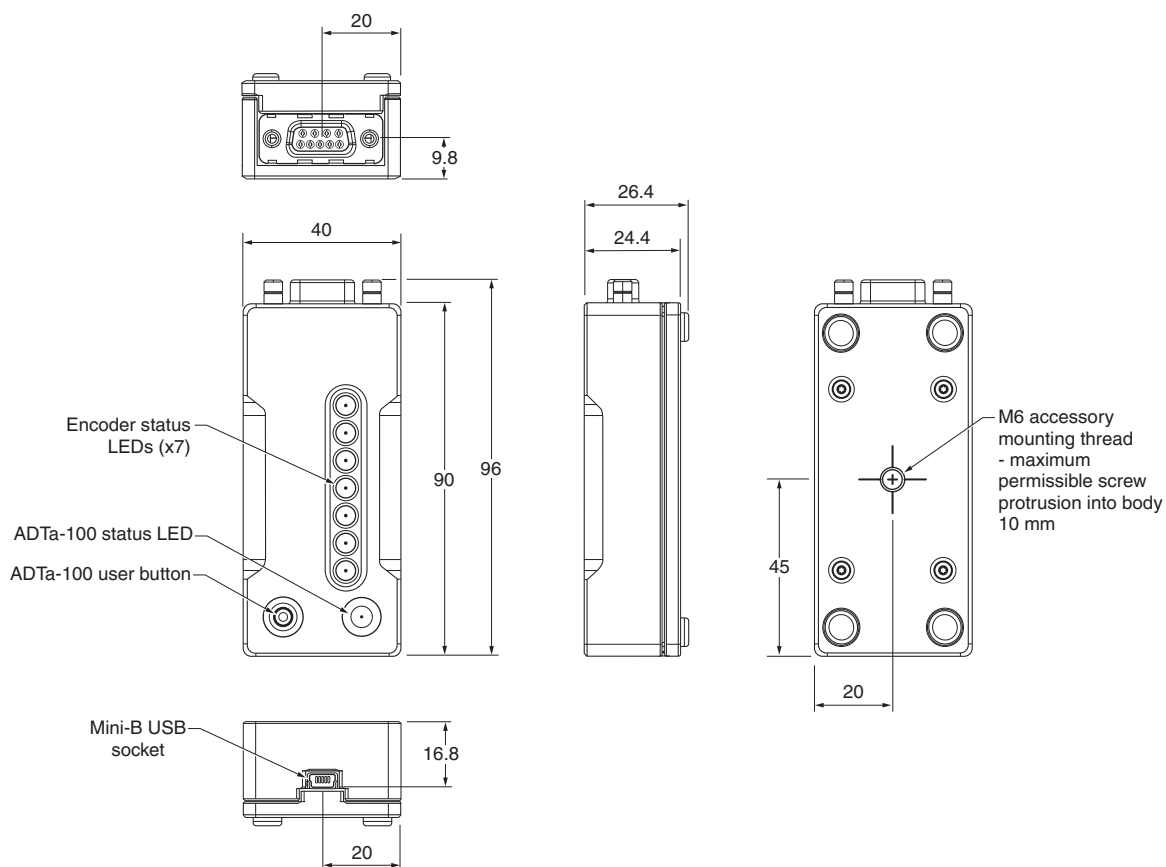
It can be used in a stand-alone mode or in conjunction with a PC‡ running the ADT View software.

*Write zero command is available only for BiSS C, Yaskawa and Panasonic protocols.
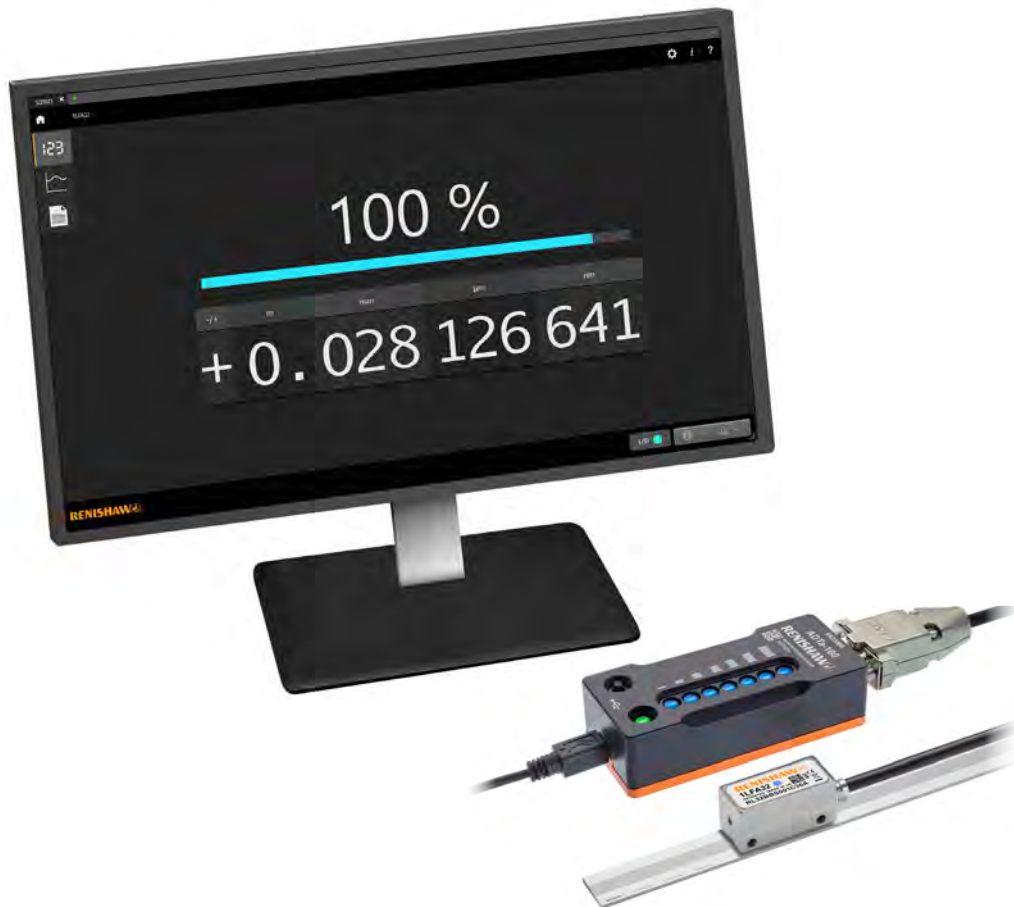‡ Supported Windows® operating systems (x86 or x64): 7 SP1, 8.1, 10.

Function	Signal		Encoder input pins
Power	5 V		4, 5
	0 V		8, 9
Serial communications	REQ/SD	+	2
		−	3
Shield (case)	Outer		Cable screen
Not connected	-		1, 6, 7

20

9.8

40

26.4

24.4

90 96

Encoder status LEDs (x7)

ADTa-100 status LED

ADTa-100 user button

M6 accessory mounting thread - maximum permissible screw protrusion into body 10 mm

45

20

Mini-B USB socket

16.8

20

Renishaw plc

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

T +44 (0)1453 524524
F +44 (0)1453 524901
E uk@renishaw.com

www.renishaw.com

RENISHAW®

apply innovation™

General specifications

Power supply	5V ±10%	Typically < 340 mA (ADTa-100 and readhead)
		Power from a 5 Vdc supply complying with the requirements for SELV of standard IEC 60950-1 or via PC's USB port
	Typical power consumption	< 1.25 W
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
Temperature	Storage	−20 °C to +70 °C
	Operating	0 °C to +55 °C
Humidity		95% relative humidity (non-condensing) to IEC 60068-2-78
Sealing		IP20
Shock	Operating	500 m/s², 11 ms, ½ sine, 3 axes
Vibration	Operating	40 m/s² max @ 55 Hz to 2000 Hz
Mass		155 g
EMC compliance		IEC 61326-1

For available adapter cables with alternative readhead terminations contact your local Renishaw representative.

Using the recommended USB cable (A-9572-0098) the ADTa-100 can be connected direct to a PC.

For worldwide contact details, visit www.renishaw.com/contact

L - 9 5 1 7 - 9 8 3 4 - 0 1

Part no.: L-9517-9834-01-D
Issued: 03 2020