**Data sheet**
L-9518-0027-01-A

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# EVOLUTE™ absolute optical encoder system


**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.

- **True-absolute non-contact optical encoder system: no batteries required**
- **EVOLUTE is available with the following serial interfaces: BiSS C (unidirectional), FANUC, Mitsubishi, Panasonic, Siemens DRIVE-CLiQ and Yaskawa**
- **Wide set-up tolerances for quick and easy installation**
- **Enhanced immunity to dirt, scratches and light oils**
- **Resolution options of 50 nm, 100 nm or 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**
- **Integral set-up LED enables easy installation and provides diagnostics at a glance**
- **Operates up to 80 °C**
- **Integral over-temperature alarm**
- **Compatible with the RTLA50-S self-adhesive tape scale or the RTLA50 scale and *FASTRACK*™ carrier**
- **Scale lengths up to 10.02 m**
- **Optional Advanced Diagnostic Tool ADTa-100**

**www.renishaw.com/evolutedownloads**

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# Compatible linear scales

| | RTLA50-S [1] | RTLA50 (with *FASTRACK*™ carrier) |
|---|---|---|
| | **Self-adhesive mounted stainless steel tape scale** | **Stainless steel tape scale and self-adhesive mounted carrier** |
| |  |  |
| **Form (height × width)** | 0.4 mm × 8 mm including adhesive | RTLA50 scale: 0.2 mm × 8 mm<br>*FASTRACK* carrier: 0.4 mm × 18 mm including adhesive |
| **Accuracy (at 20 °C)** | ±10 µm/m | ±10 µm/m |
| **Maximum length [2]** | 10.02 m | RTLA50 lengths up to 10.02 m<br>*FASTRACK* carrier lengths up to 25 m |
| **Coefficient of thermal expansion (at 20 °C)** | 10.1 ±0.2 µm/m/°C | 10.1 ±0.2 µm/m/°C |

For more information about the scales refer to the *RTLA50 absolute linear encoder scale system for EVOLUTE*™ data sheet (Renishaw part no. L-9517-9628) which can be downloaded from **www.renishaw.com/evolutedownloads**.

[1] For RTLA50-S axis lengths > 2 m, the *FASTRACK* carrier with RTLA50 is recommended.

[2] The maximum scale length may be limited for some serial interfaces and resolutions; refer to 'Resolution and scale lengths' on page 3 for details.

# Linear encoder system

## Resolution and scale lengths

The maximum scale length depends upon the serial interface, readhead resolution and the number of position bits.

The table below shows the maximum scale length for each system:

| | | Resolution | | |
|---|---|---|---|---|
| **Serial interfaces** | **Position bits** | **50 nm** | **100 nm** | **500 nm** |
| **BiSS C (uni-directional)** | 26 bit | 3.35 m | 6.7 m | 10.02 m |
| | 32 bit | 10.02 m | 10.02 m | 10.02 m |
| | 36 bit | 10.02 m | 10.02 m | 10.02 m |
| **FANUC** | 37 bit | 10.02 m | 10.02 m | 10.02 m |
| **Mitsubishi** | 40 bit | 10.02 m | 10.02 m | 10.02 m |
| **Panasonic** | 48 bit | 10.02 m | 10.02 m | 10.02 m |
| **Siemens DRIVE-CLiQ** | 28 bit | 10.02 m | - | - |
| **Yaskawa** | 36 bit | 10.02 m | 10.02 m | 10.02 m |

## Speed

The table below shows the maximum speed for each system:

| | | Resolution | | |
|---|---|---|---|---|
| **Serial interfaces** | **Position bits** | **50 nm** | **100 nm** | **500 nm** |
| **BiSS C (uni-directional)** | 26 bit | 100 m/s | 100 m/s | 100 m/s |
| | 32 bit | 100 m/s | 100 m/s | 100 m/s |
| | 36 bit | 100 m/s | 100 m/s | 100 m/s |
| **FANUC** | 37 bit | 100 m/s | 100 m/s | 100 m/s |
| **Mitsubishi** | 40 bit | 100 m/s | 100 m/s | 100 m/s |
| **Panasonic** | 48 bit (when used with A5 series) | 20 m/s | 40 m/s | 100 m/s |
| | 48 bit (when used with A6 series) | 100 m/s | 100 m/s | 100 m/s |
| **Siemens DRIVE-CLiQ** | 28 bit | 100 m/s | - | - |
| **Yaskawa** | 36 bit | 100 m/s | 100 m/s | 100 m/s |

# General specifications

| | | BiSS C (undirectional), FANUC, Mitsubishi, Panasonic and Yaskawa | Siemens DRIVE-CLiQ |
|---|---|---|---|
| **Power supply** | | 5 V ±10% 1.25 W maximum (250 mA @ 5 V) [1]<br>Ripple: 200 mVpp maximum @ frequency up to 500 kHz maximum | 3.05 W maximum (readhead: 1.25 W + single input interface: 1.8 W). [2]<br>24 Vdc power is provided by the DRIVE-CLiQ network.<br>Ripple: 200 mVpp maximum @ frequency up to 500 kHz maximum |
| **Temperature** | Storage (system) | –20 °C to +80 °C | –20 °C to +70 °C |
| | Readhead (operating) | 0 °C to +80 °C | 0 °C to +80 °C |
| | Interface (operating) | N/A | 0 °C to +55 °C |
| **Humidity** | | 95% relative humidity (non-condensing) to IEC 60068-2-78 | |
| **Sealing** | Readhead | IP64 | IP64 |
| | Interface | N/A | IP67 |
| **Acceleration** | Operating | 500 m/s², 3 axes (readhead only) | |
| **Maximum acceleration of scale with respect to readhead** [3] | | 2000 m/s² | |
| **Vibration** | Readhead (operating) | Sinusoidal 300 m/s², 55 Hz to 2000 Hz, 3 axes | Sinusoidal 300 m/s², 55 Hz to 2000 Hz, 3 axes |
| | Interface (operating) | N/A | Sinusoidal 100 m/s², 55 Hz to 2000 Hz, 3 axes |
| **Shock** | Non-operating (system) | 1000 m/s², 6 ms, ½ sine, 3 axes | |
| **Mass** | Readhead | 18 g | 18 g |
| | Readhead cable | 32 g/m | 32 g/m |
| | Interface | N/A | 218 g |
| **EMC compliance** | | IEC 61800-5-2 Annex E | |
| **Readhead cable** | | 7 core, tinned and annealed copper, 28 AWG<br>Single-shielded, outside diameter 4.7 ±0.2 mm<br>Flex life > 40 × 10⁶ cycles at 20 mm bend radius<br>UL recognised component | |
| **Maximum readhead cable length** | | 3 m | 3 m (to controller or interface)<br>(refer to Siemens DRIVE-CLiQ specifications for maximum cable length from 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

1 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.

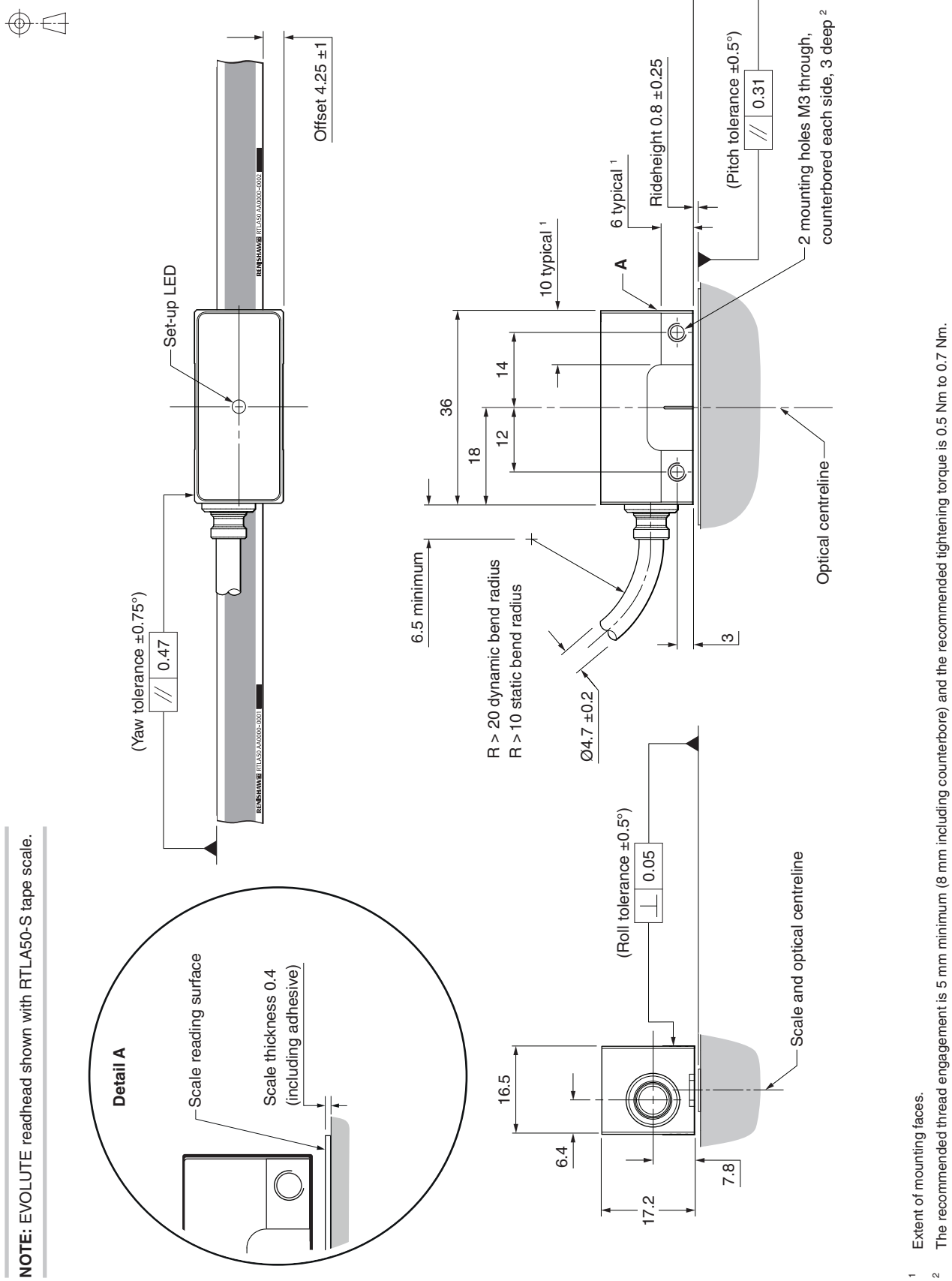
2 Current consumption figures refer to terminated EVOLUTE Siemens DRIVE-CLiQ systems. EVOLUTE Siemens DRIVE-CLiQ systems must be powered from a 24 Vdc supply complying with the requirements for SELV of standard IEC 60950-1.

3 This is the worst case figure that is correct for the slowest communications clock rates. For faster clock rates, the maximum acceleration of scale with respect to the readhead can be higher. For more details, contact your local Renishaw representative.

# EVOLUTE readhead installation drawing

## Standard cable outlet

Dimensions and tolerances in mm




**NOTE:** EVOLUTE readhead shown with RTLA50-S tape scale.

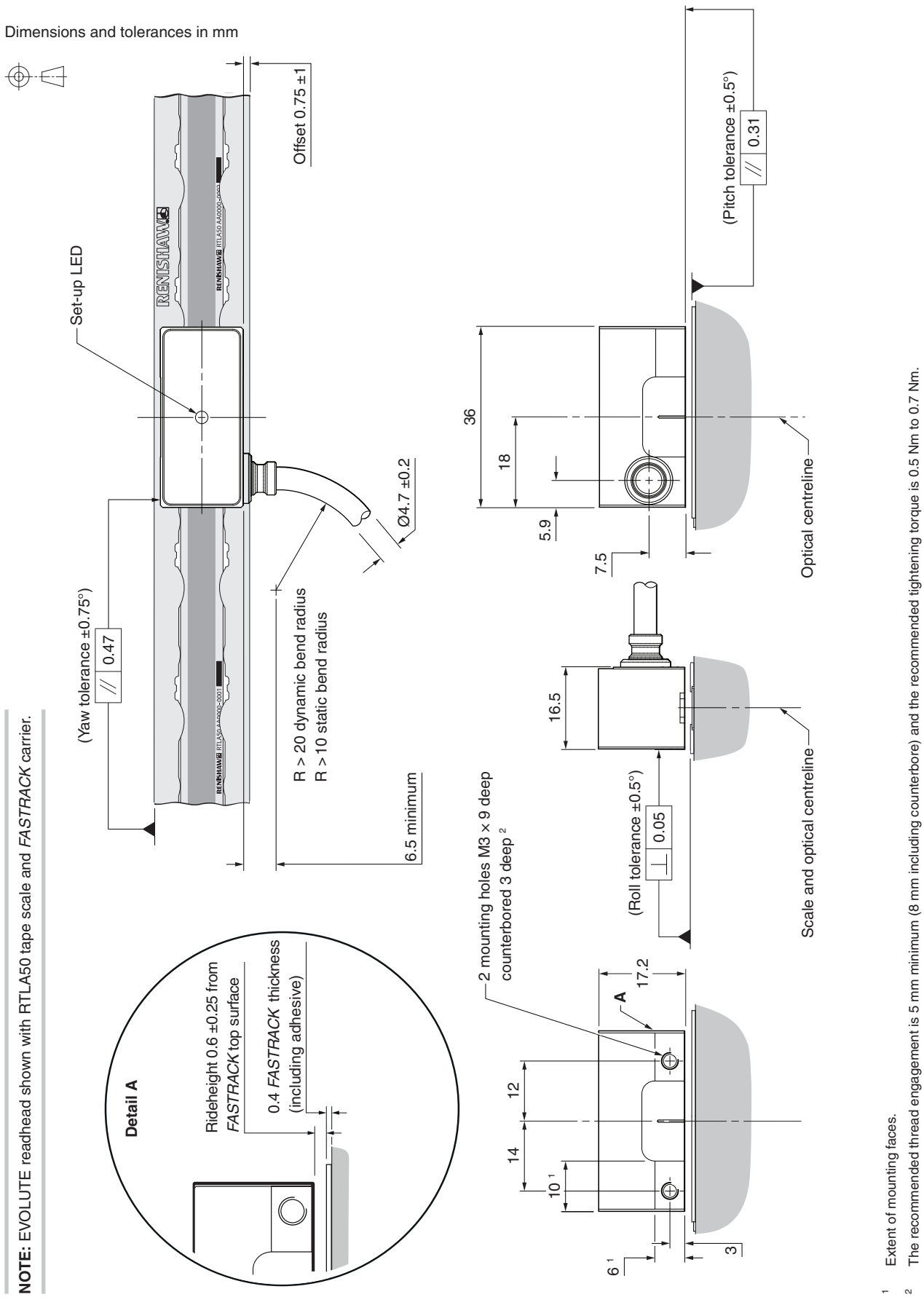
[1] Extent of mounting faces.

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

# EVOLUTE readhead installation drawing

## Side cable outlet

Dimensions and tolerances in mm




**NOTE:** EVOLUTE readhead shown with RTLA50 tape scale and *FASTRACK* carrier.

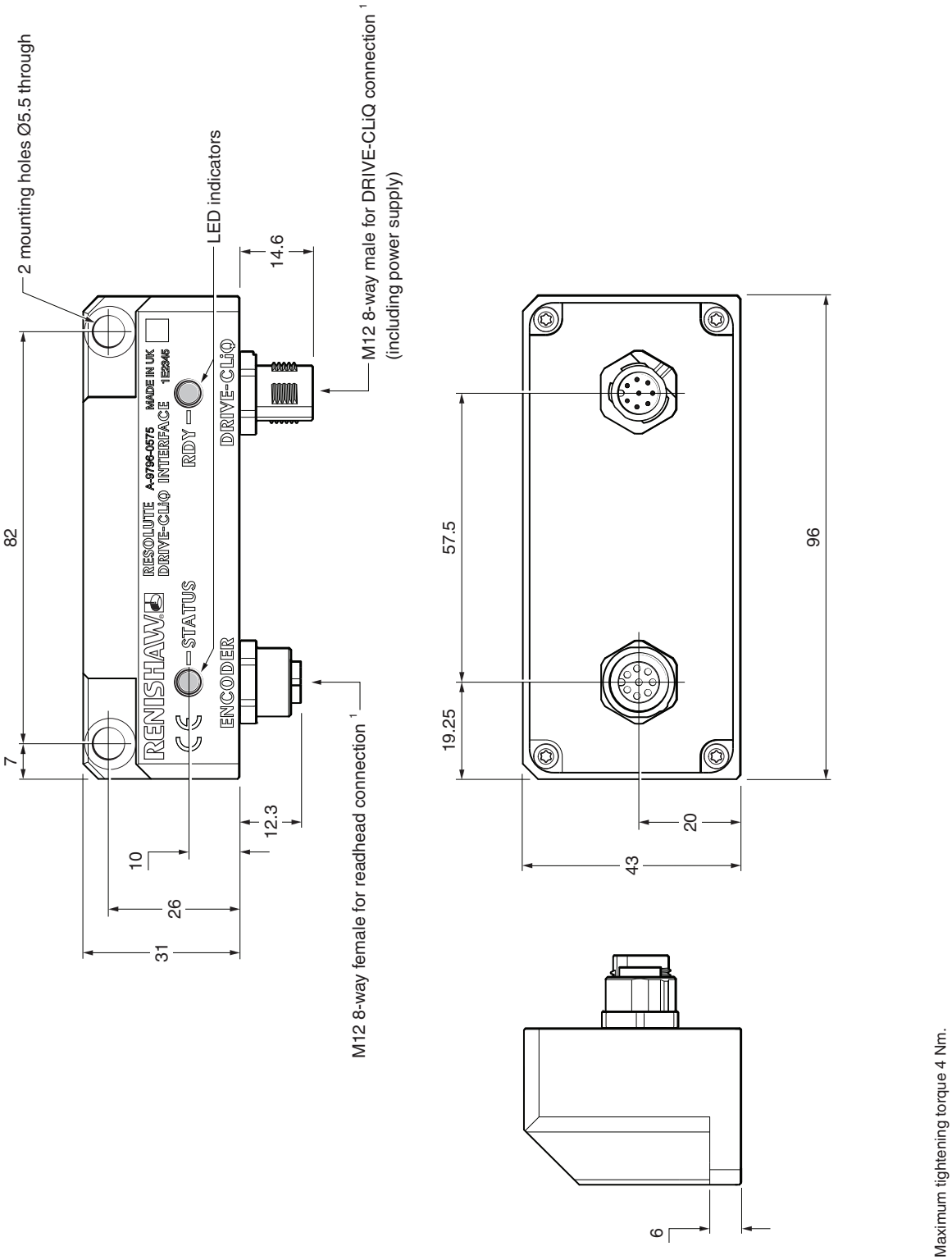
[1] Extent of mounting faces.

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

# Siemens DRIVE-CLiQ interface drawing

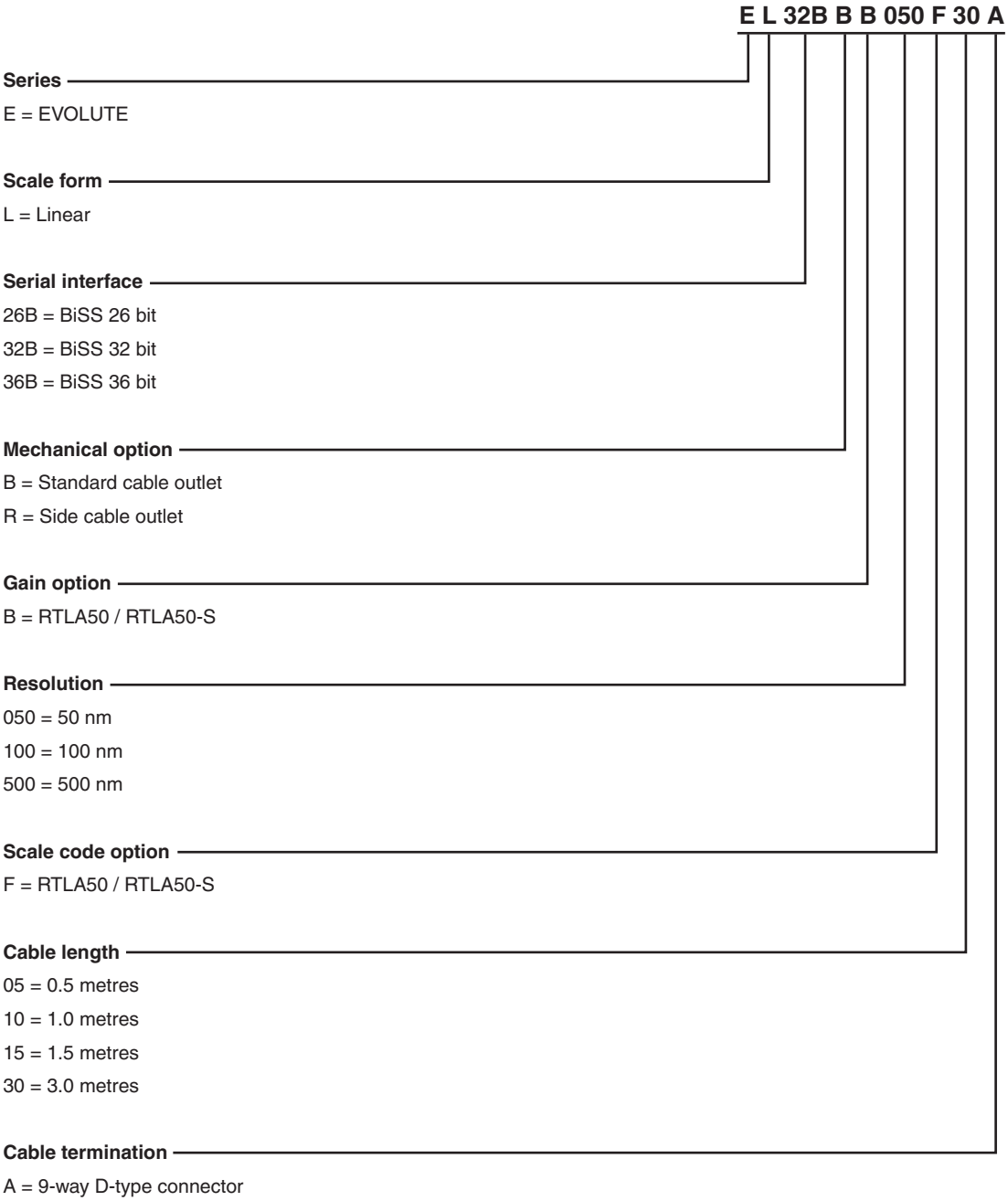
## Single readhead input (A-9796-0575)

Dimensions and tolerances in mm



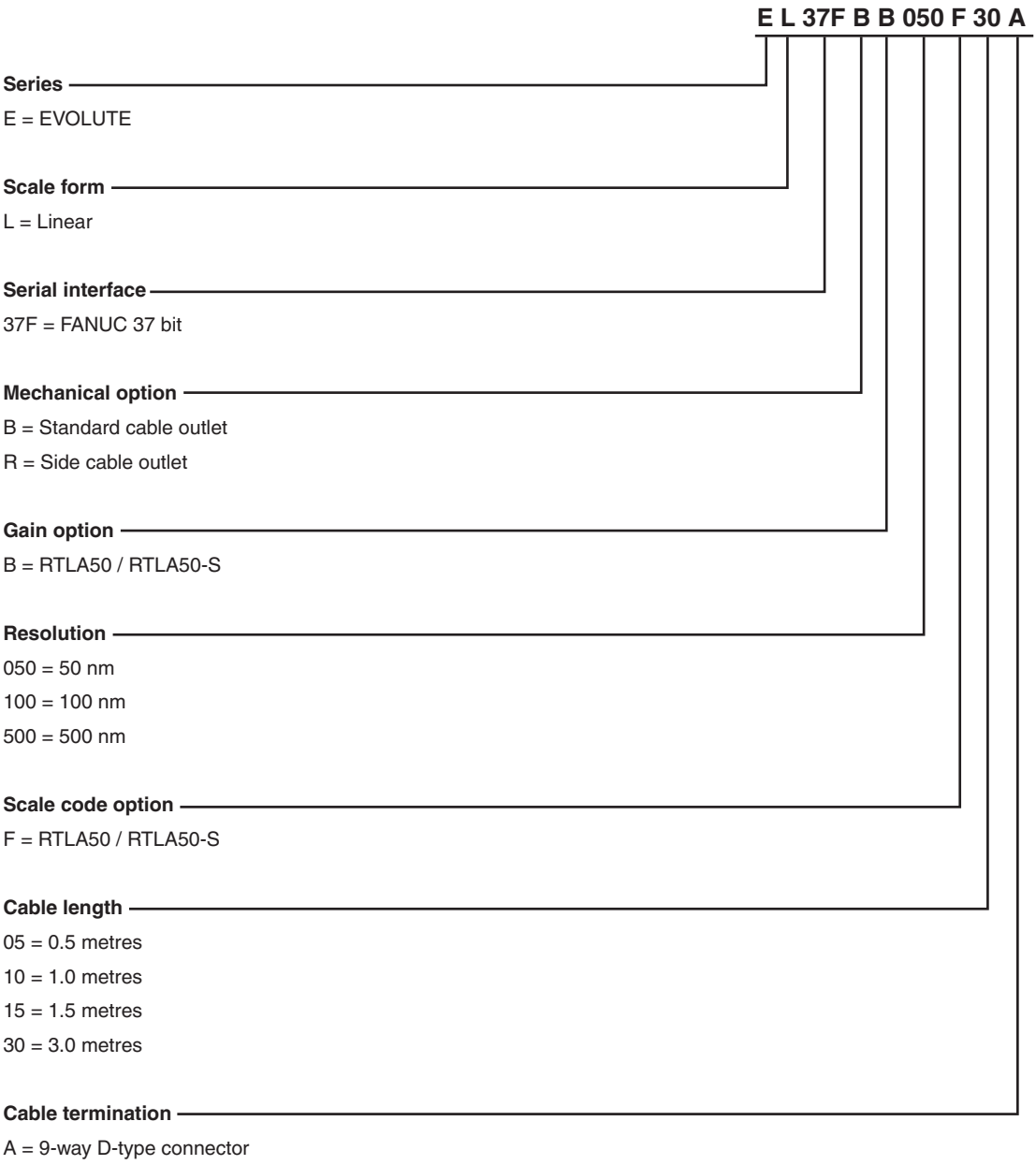

[1] Maximum tightening torque 4 Nm.

# EVOLUTE BiSS readhead part numbers



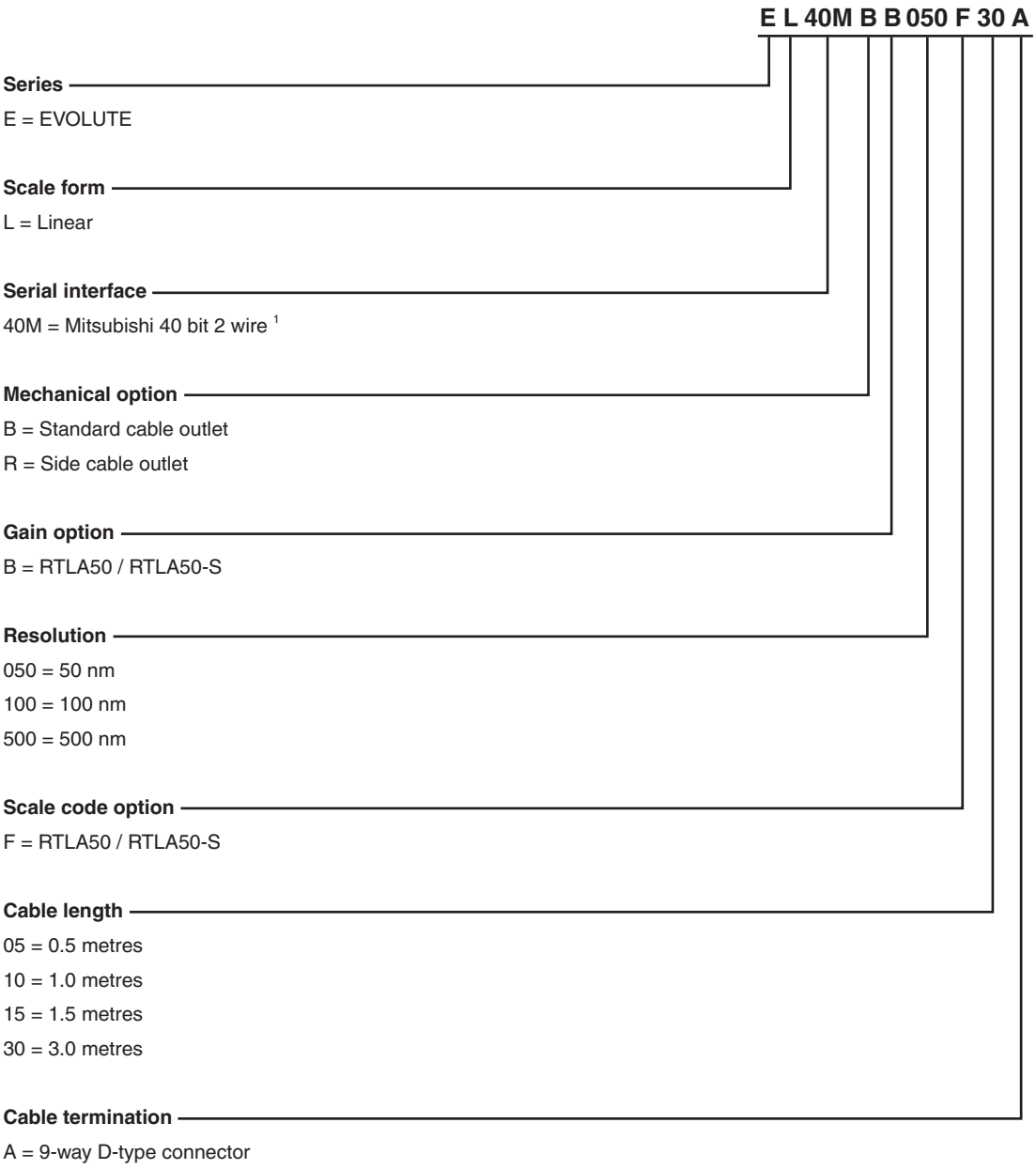

Valid system configurations (readheads and scale) can be checked at www.renishaw.com/epc.

# EVOLUTE FANUC readhead part numbers




Valid system configurations (readheads and scale) can be checked at www.renishaw.com/epc.

# EVOLUTE Mitsubishi readhead part numbers

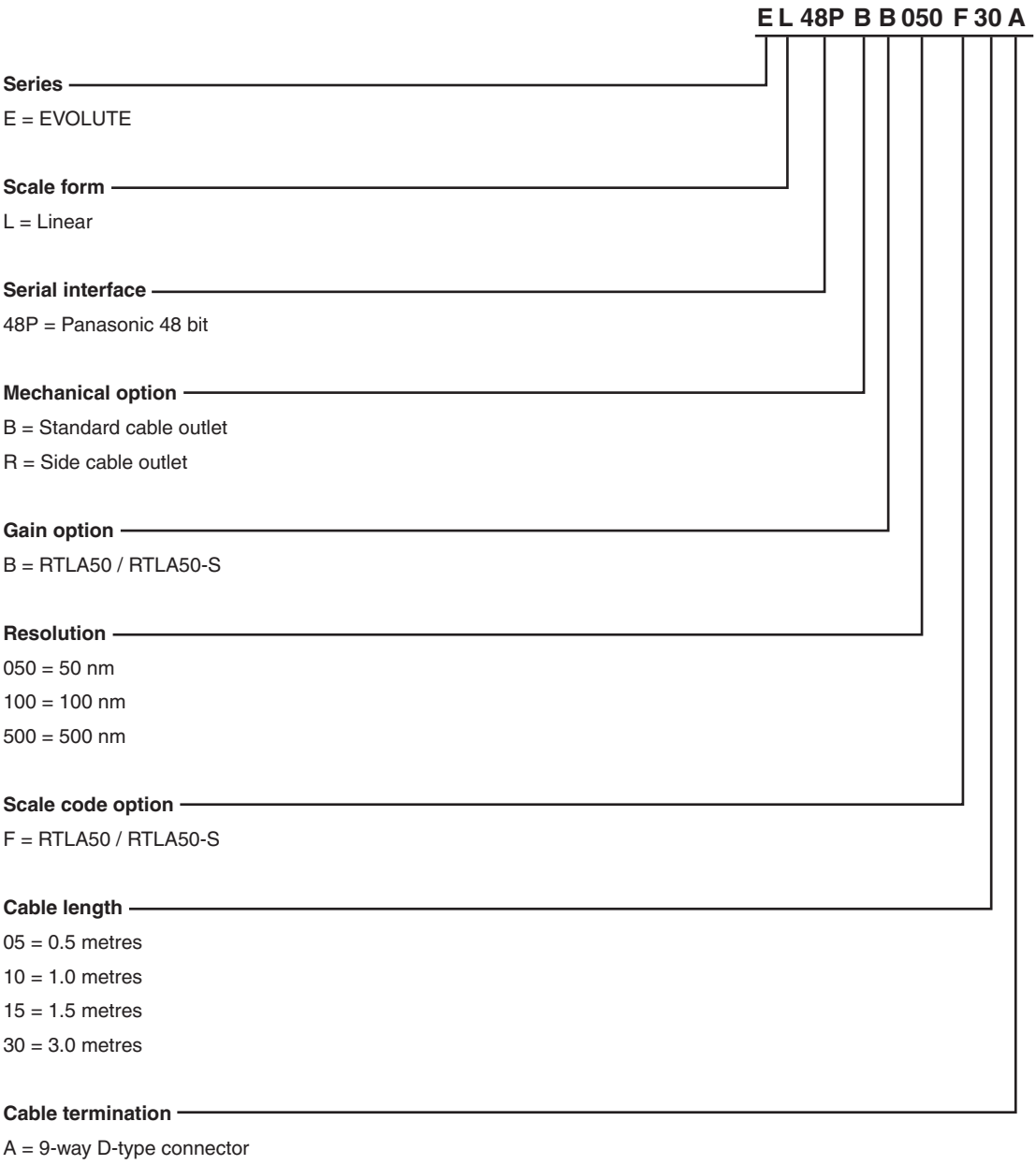



For more information about Mitsubishi drives, contact Mitsubishi.

Valid system configurations (readheads and scale) can be checked at **www.renishaw.com/epc**.

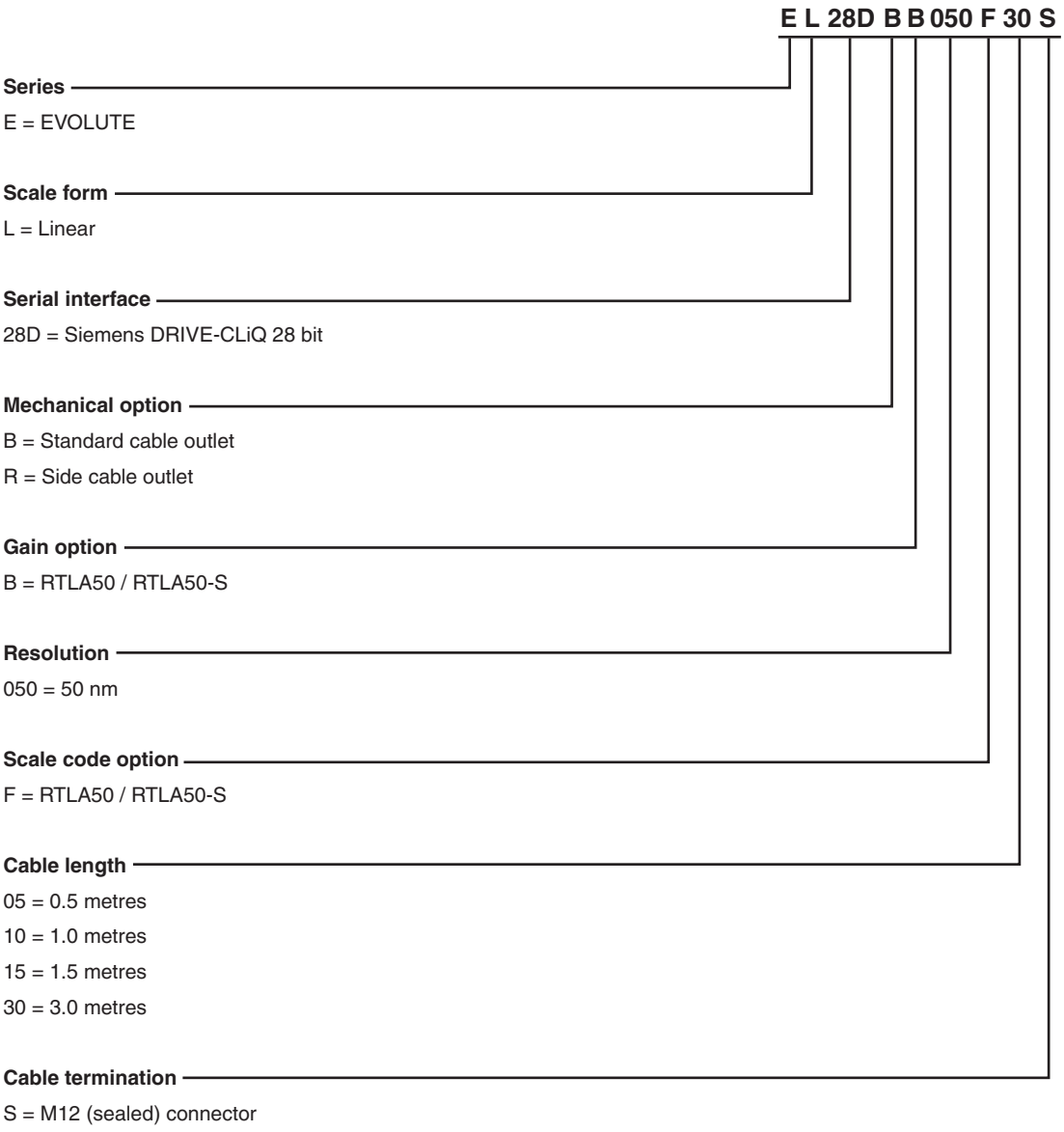
[1] 2 wire: MR-J4 series/MR-J5 series

# EVOLUTE Panasonic readhead part numbers



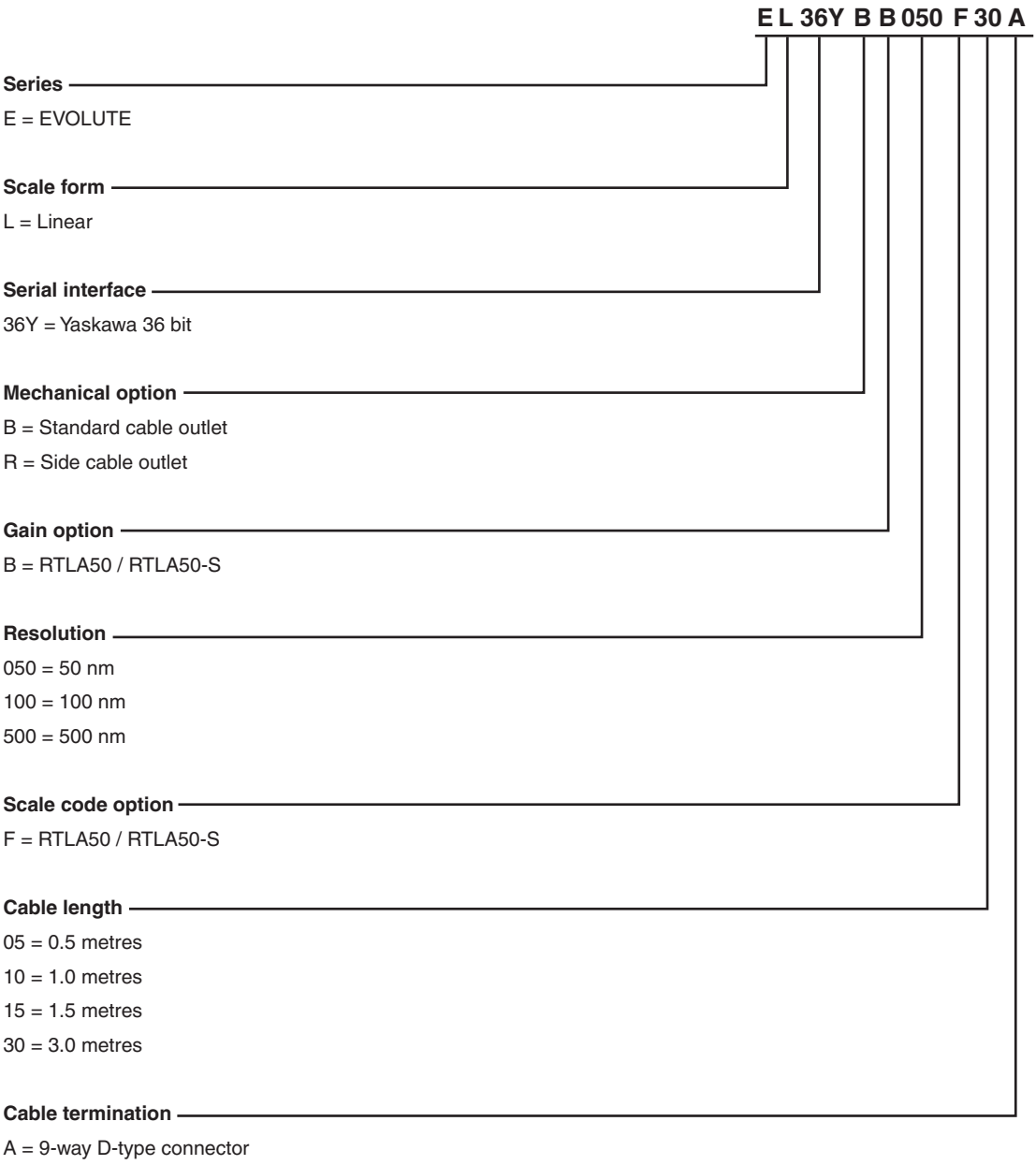

Valid system configurations (readheads and scale) can be checked at **www.renishaw.com/epc**.

# EVOLUTE Siemens DRIVE-CLiQ readhead part numbers




Valid system configurations (readheads and scale) can be checked at **www.renishaw.com/epc**.

# EVOLUTE Yaskawa readhead part numbers




Valid system configurations (readheads and scale) can be checked at www.renishaw.com/epc.

## Optional Advanced Diagnostic Tool

The EVOLUTE encoder system is compatible with the Advanced Diagnostic Tool ADTa-100 [1] 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


[1] ADTa-100 compatible readheads are marked with the symbol ADT

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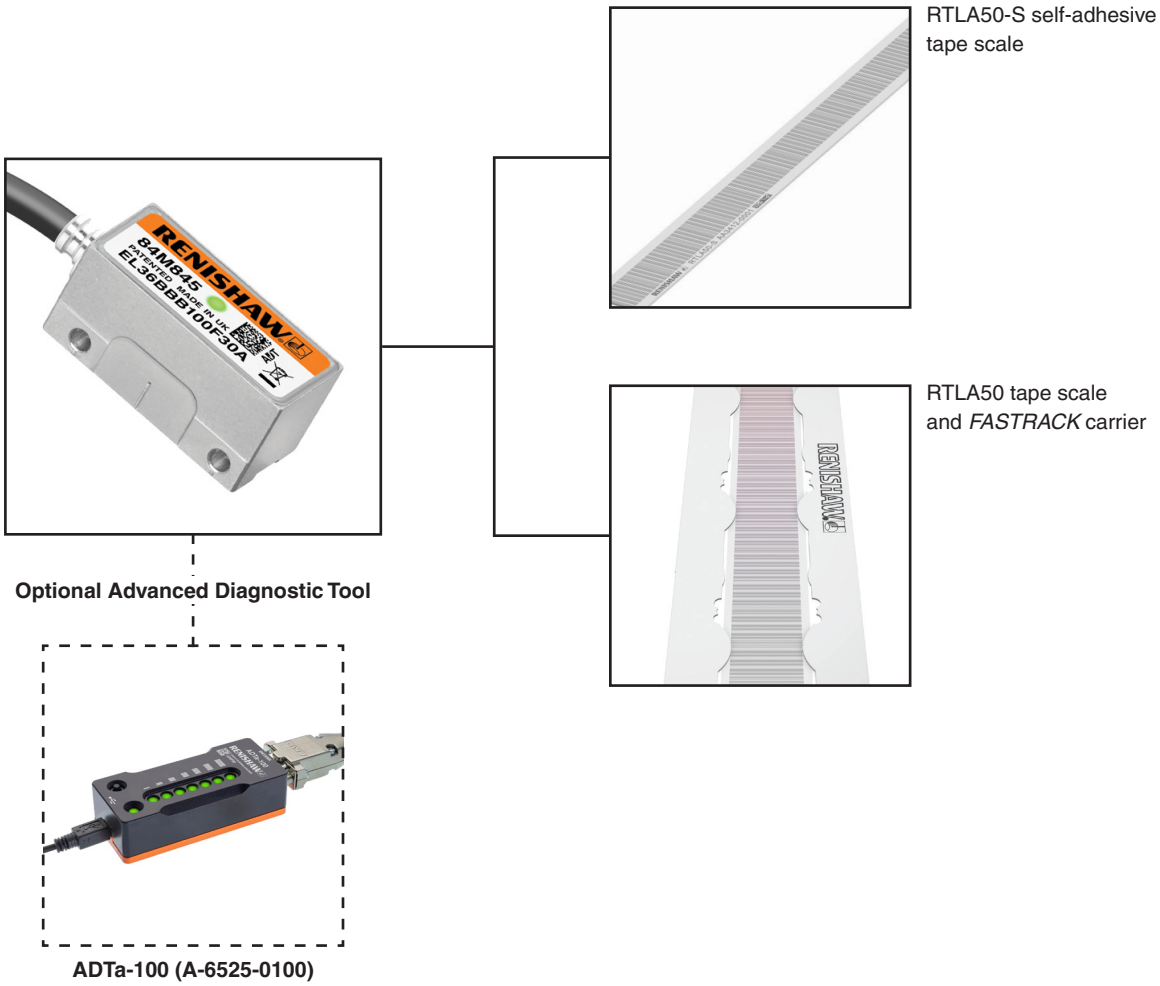
# EVOLUTE series compatible products




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

**www.renishaw.com/contact**

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Part no.: L-9518-0027-01-A
Issued: 05.2025