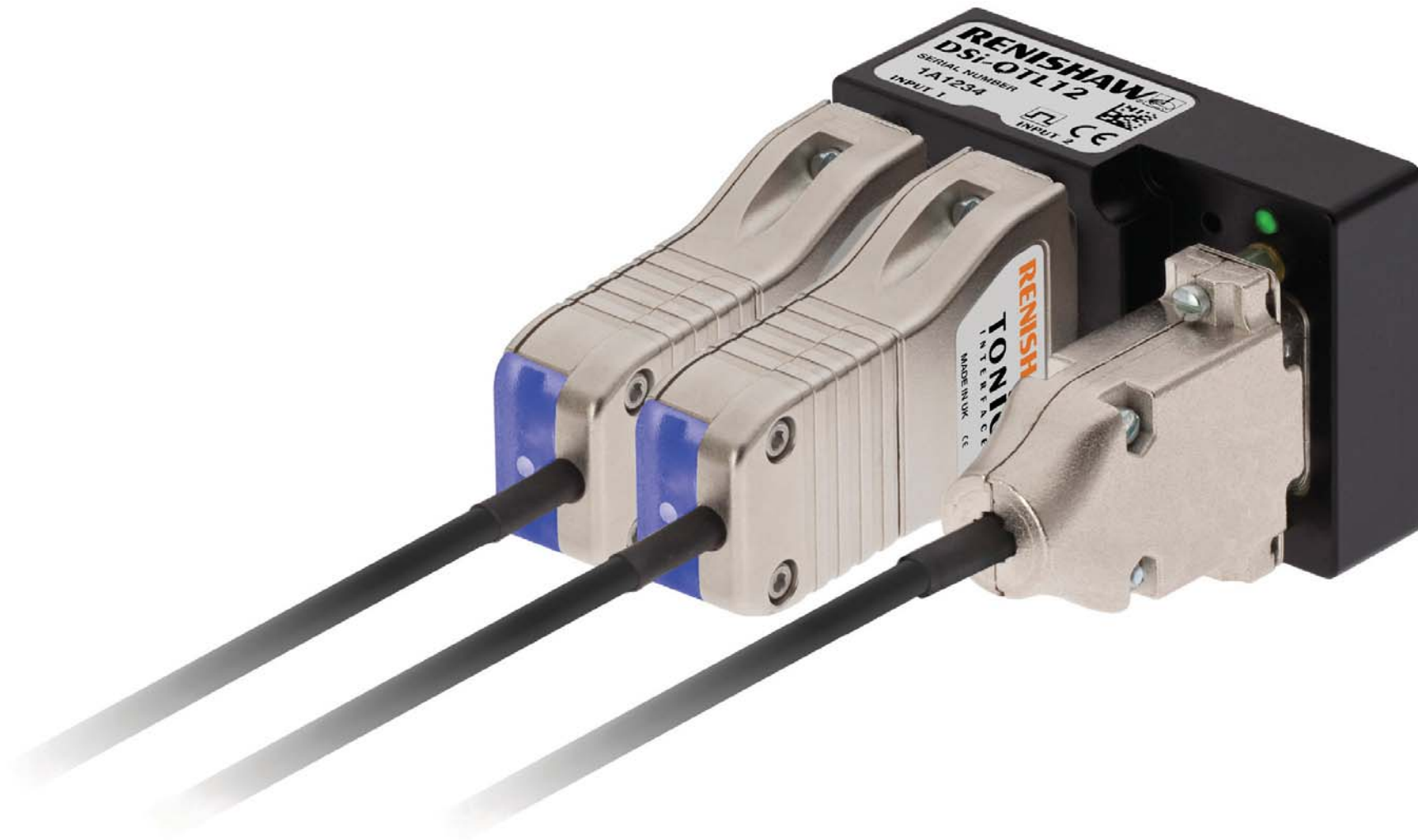


# TONIC™ DSi dual readhead rotary encoder system





Renishaw plc declares that TONiC encoder system complies with the applicable standards and regulations. A copy of the EC Declaration of Conformity is available on request.

### FCC compliance

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.

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.

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.

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

### RoHS compliance

Compliant with EC directive 2002/95/EC (RoHS)

### Readhead LED classification

Class 1 LED product. Invisible LED radiation.

### Patents

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

JP 3,202,316	US 5,241,173	EP 0514081	EP 0543513	US 5302820
US 5,861,953	EP 0748436	US 6,481,115 B1	IL 138995	US 6,775,008 B2
EP 1173731	IL146001	GB 2397040	US 7723629	CN 1293983C
US 7,367,128	JP2005533247	CN 100543424	US 7659992	US 7624513
CN 101300463				

### Further information

Further information relating to the TONiC encoder range can be found in the TONiC system Data sheet (L-9517-9337). This can be downloaded from our website [www.renishaw.com/encoder](http://www.renishaw.com/encoder) and is also available from your local representative. This document may not be copied or reproduced in whole or in part, or transferred to any other media or language, by any means without the written prior permission of Renishaw. The publication of material within this document does not imply freedom from the patent rights of Renishaw plc.

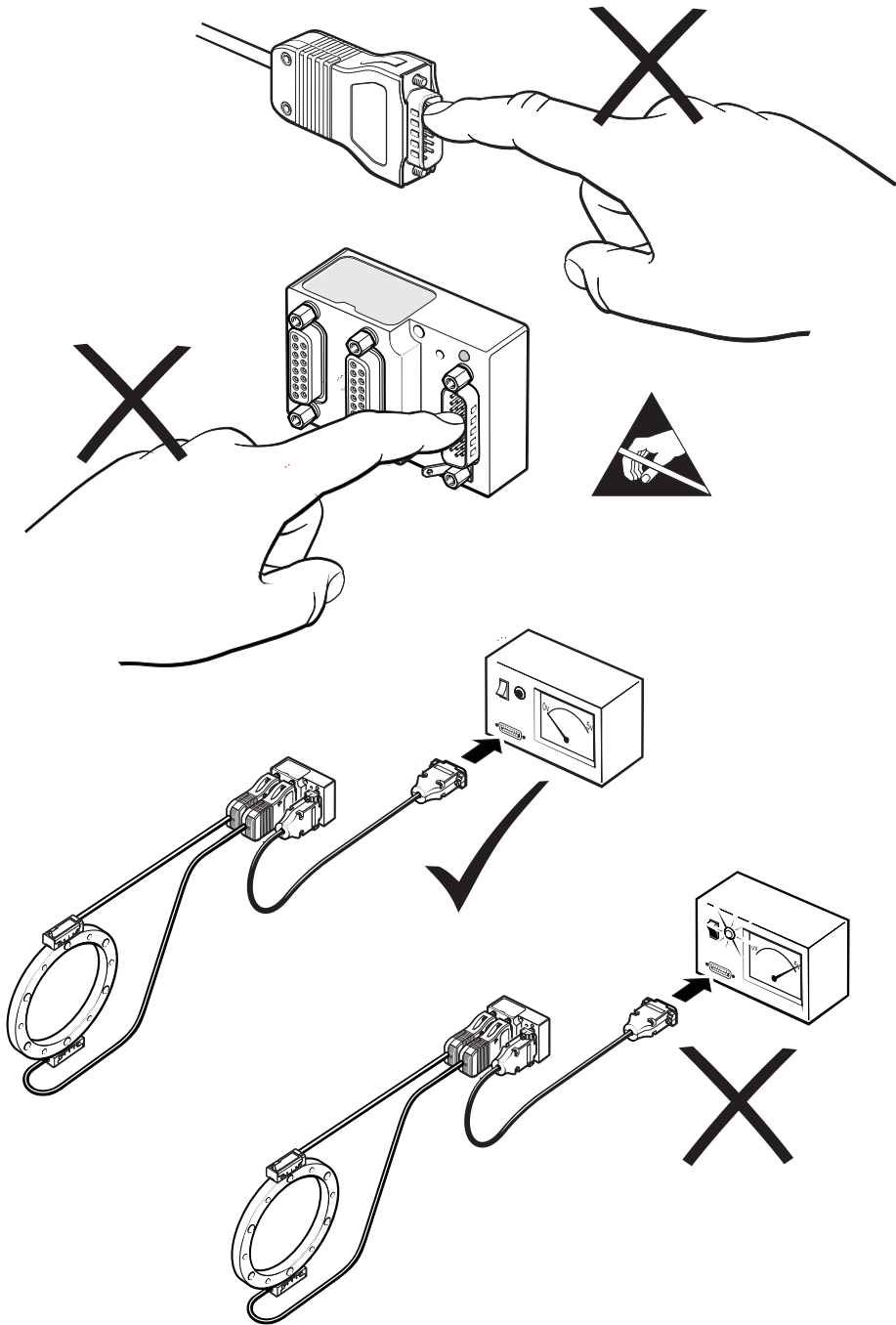
### Disclaimer

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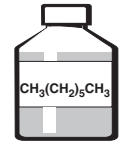
The use of this symbol on Renishaw products and/or accompanying documentation indicates that the product should not be mixed with general household waste upon disposal. It is the responsibility of the end user to dispose of this product at a designated collection point for waste electrical and electronic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

# Storage and handling

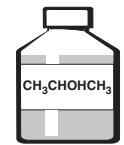


## System

N-heptane

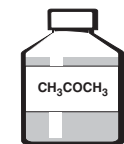


Propan-2-ol

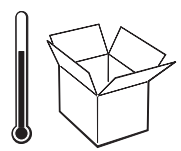


## Readhead only

Acetone



## Storage

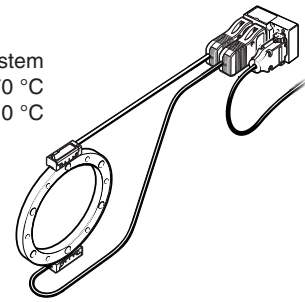


System  
+70 °C  
-20 °C

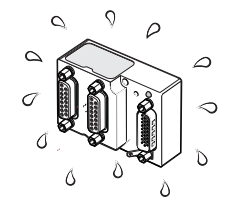
## Operating



System  
+70 °C  
0 °C



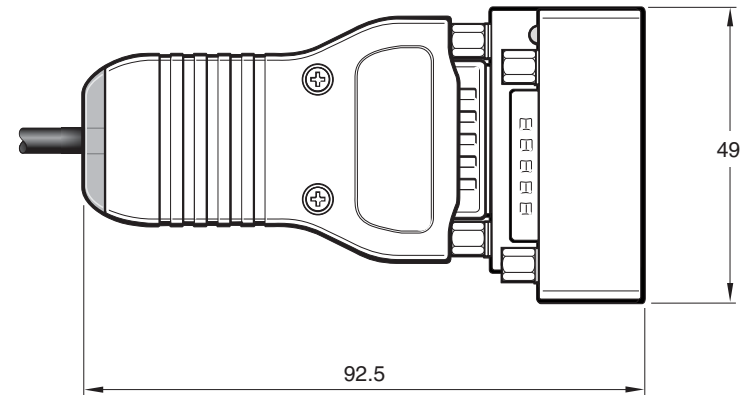
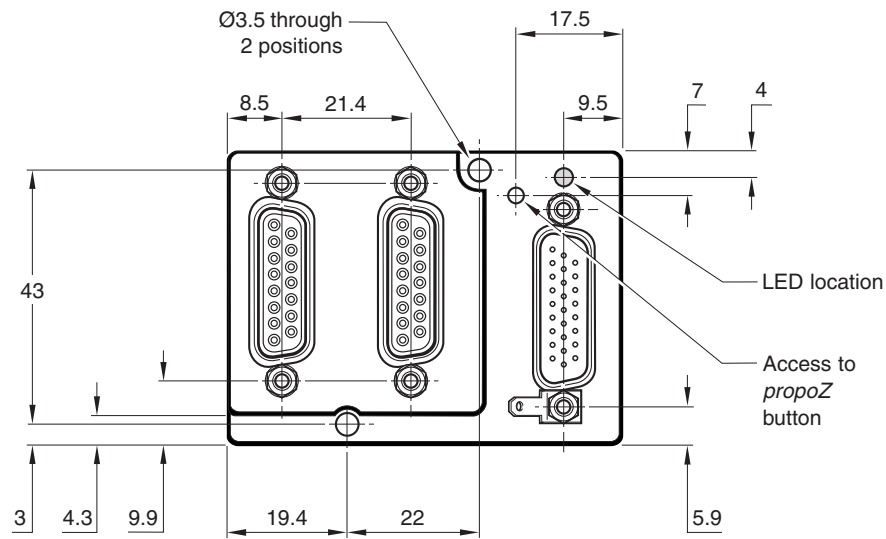
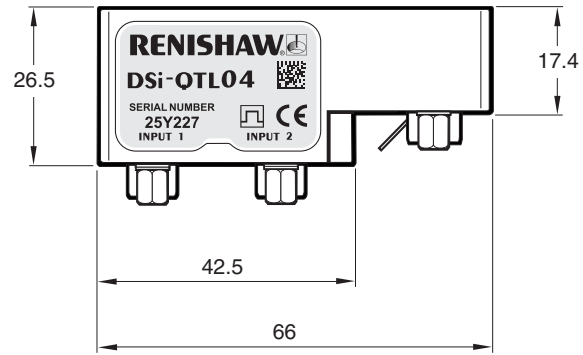
## Humidity



Rated up to +40 °C,  
95% relative humidity  
(non-condensing)

# TONiC DSi installation drawing

Dimensions and tolerances in mm




## Summary of procedures

### Full rotation

#### Installation and calibration

When you first install the DSi:

Install and calibrate each TONiC encoder separately. Please refer to the TONiC REXM/T installation guide (M-9653-9248) for details.

Select the relevant head orientation switch position on the back of the DSi. 

Calibrate the DSi.

Optional: Select a new *propoZ* reference (index) position if desired.

### Initialisation

Upon subsequent power-ups of the DSi:

Rotate the axis in one direction until the LED goes solid green (K output goes 'high'). This may require up to 1 full turn.

The *propoZ* reference (index) output will now be given when the axis passes the *propoZ* output position.


### Partial arc

#### Installation and calibration

**IMPORTANT:** Install ring so reference marks are positioned correctly, relative to the readheads. Refer to the REXM/T Installation guide (M-9653-9248) for details.

When you first install the DSi:

Install and calibrate each TONiC encoder separately on their respective reference marks.

Select the relevant head orientation switch position on the back of the DSi. 

Calibrate the DSi.

Optional: Select a new *propoZ* reference (index) position if desired.

### Initialisation

Upon subsequent power-ups of the DSi:

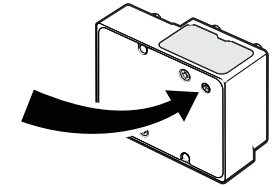
Rotate the axis to its maximum travel in both directions. The LED will go solid green (K output goes 'high') when initialized

The *propoZ* reference (index) output will now be given when the axis passes the *propoZ* output position.

## IMPORTANT


### Select the correct head orientation switch position

This switch can be found on the rear of the DSi. The DSi must be recalibrated if the switch position is changed.

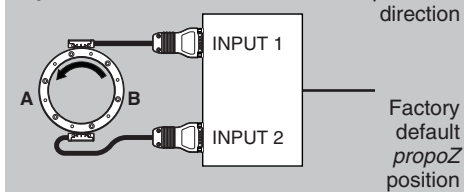


Factory setting

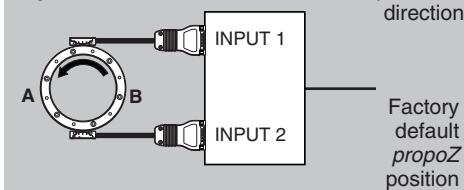


 Encoder forward rotation direction

#### Option 1: recommended

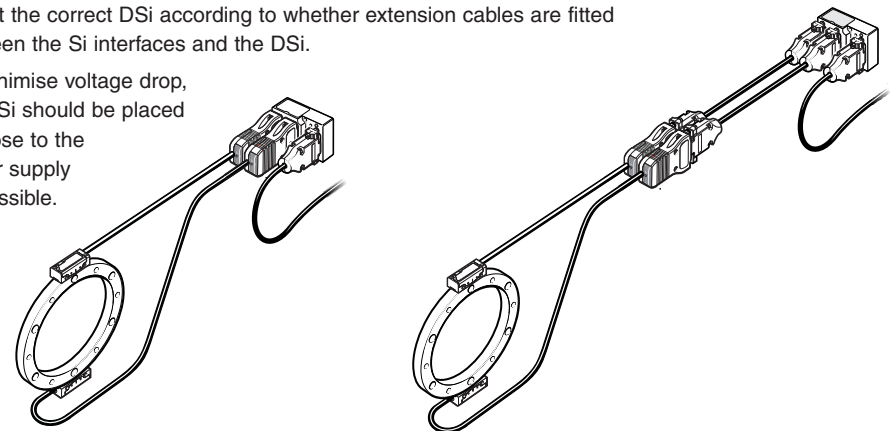


#### Option 2: alternative



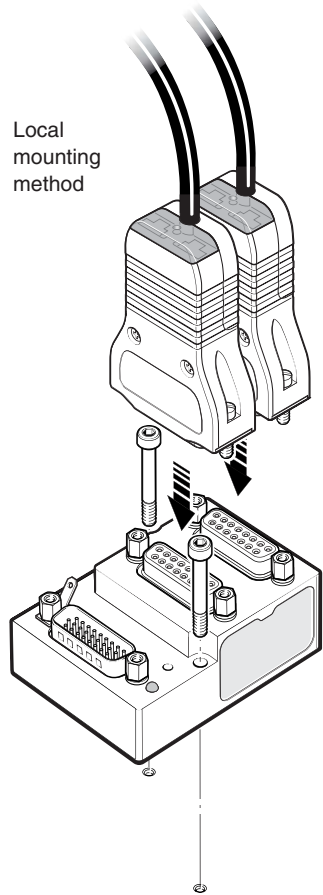
Select the correct DSi according to whether extension cables are fitted between the Si interfaces and the DSi.

To minimise voltage drop, the DSi should be placed as close to the power supply as possible.

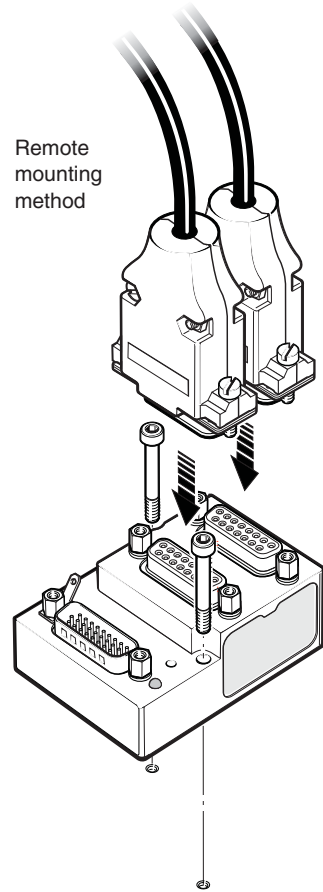


# TONiC DSi mounting

Local mounting method




Remote mounting method



## Calibration

The system must be calibrated if the installation is disturbed or if the DSi has been moved to a different axis.

- 1) Install the TONiC readheads as detailed in the TONiC REXM encoder system installation guide (M-9653-9428).
- 2) With the power off, connect the TONiC systems and output cable to the DSi. **NOTE:** The TONiC interfaces connected to the DSi must have identical part numbers.
- 3) Calibrate each TONiC system separately as detailed in the TONiC REXM encoder system installation guide (M-9653-9428).
- 4)  Check the relevant head orientation switch position on the back of the DSi.
- 5) Use a small hex-key (or other suitable implement) to press and hold the recessed *propoZ* button on the front of the DSi as the power is switched on. The LED on the DSi will show red. Now release the button and the LED will show orange, then start to flash green. The K output will be 'low'.
- 6) **For complete rotation:** Rotate the axis in one direction until the LED stops flashing (the K output will go 'high'). **NOTE:** The axis may need up to two full rotations to achieve this. The DSi has now memorised the number of counts per revolution and determined the factory default *propoZ* position.

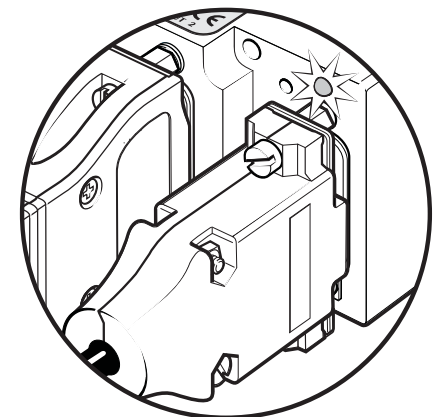
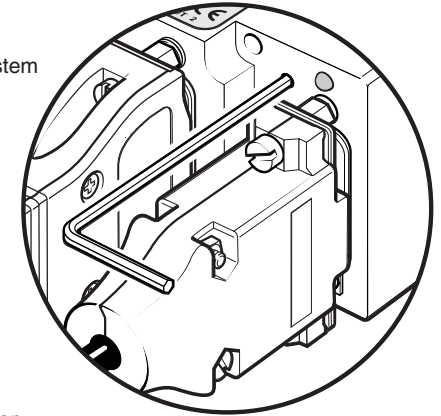
**For partial arc rotation:** Ensure the ring is installed so the reference marks are positioned correctly (Refer to the REXM/REXT Installation guide M-9653-9248). Rotate the axis in both directions to its maximum travel until the LED stops flashing (the K output will go 'high'). The factory default *propoZ* position has now been determined.

**NOTE:** For optimum system accuracy and performance at higher speeds ensure that the AGC is switched off on the interfaces.

## Initialisation (Required at each power-up and after an error)

- 1) The axis must be rotated in one direction (either clockwise or anti-clockwise) until the physical *IN-TRAC*™ feature on the ring passes both readheads. The LED will then go solid green and the K output will go 'high'.
- 2) Initialisation is now complete. The *propoZ* reference (index) output will be given when the axis next passes the *propoZ* output position.

If an alarm occurs, DSi will automatically re-enter initialisation mode when the alarm condition is removed.



## Selecting a new *propoZ* position

The *propoZ* position can be re-programmed as many times as the user requires.

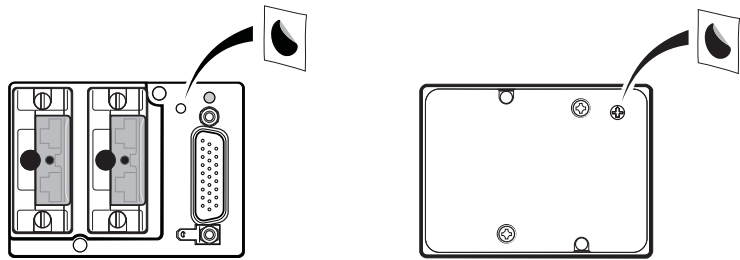
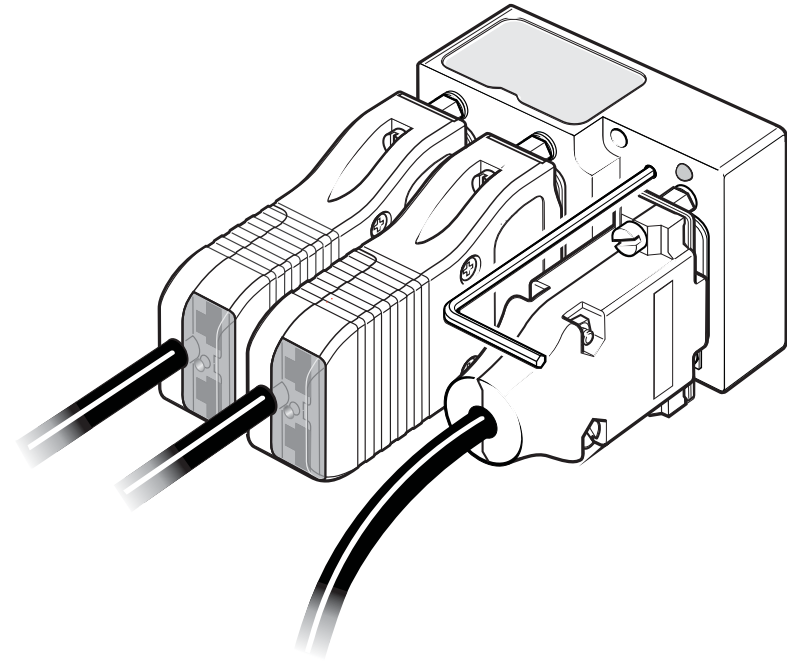
Ensure the DSi is calibrated and has completed the initialisation routine. You will notice that the LED on the DSi flashes 'blank' as it passes the last programmed *propoZ* position.

To change the *propoZ* position...

- 1) Rotate the axis to the position where you would ideally like the reference (index) position to be.
- 2) Using a hex-key or other suitable tool, press the recessed *propoZ* button on the front of the DSi. The LED will show orange while the button is pressed. The new *propoZ* position is stored as the button is released. If the axis remains at that position, the LED shows blank after the button is released, indicating that the axis is at the *propoZ* position.

**Hint:** you may find it useful to press and hold the *propoZ* button while you adjust the axis position slightly, then release the button at the optimum point.

- 3) The controller may now 'emergency stop' as the reference (index) is output at a new position. It is recommended that the controller is restarted to ensure the controller is using the new reference (index) position.
- 4) After the controller has been restarted, the DSi will start the initialisation routine, indicated by a flashing green LED and a 'low' K output. Rotate the axis in one direction (either clockwise or anti-clockwise) until the LED goes solid green and the K output goes 'high'. The new *propoZ* position will be indicated by a blank flash of the LED.  
**NOTE:** you can select a new *propoZ* position at any time when the LED is solid green, simply by pressing the *propoZ* button.
- 5) Small black adhesive covers are provided for the *propoZ* button and head orientation switch to reduce ingress of dust.



LED colour	Meaning
<b>Green</b> (flashing)	DSi is in initialisation mode. Rotate the axis in one direction until the LED turns solid green to exit initialisation mode. <b>NOTE:</b> during high-speed rotation, the blank flash of the LED as the axis passes the <i>propoz</i> position may appear like a flashing green LED. If the LED continues flashing green check for correct position of the orientation switch and press and hold the <i>propoz</i> button on switch-on.
<b>Green</b> (solid)	DSi is in normal working mode.
<b>Blank</b>	Axis is at the <i>propoz</i> reference (index) output position. <b>NOTE:</b> if you drive the axis past the <i>propoz</i> position, the blank LED will appear as a 0.25 second flash.
<b>Orange</b> ( <i>propoz</i> button is being pressed)	A new <i>propoz</i> position is being programmed. When the <i>propoz</i> button is released, the LED will normally show blank unless the axis is moved from the <i>propoz</i> position.
<b>Red</b> (solid)	Pulse count alarm has been asserted. The number of counts in the last revolution is different to the value stored during the automatic calibration routine when the DSi was first installed. This could be caused by a miscount from one of the TONiC encoders. If the pulse count alarm is asserted repeatedly, it is possible that an incorrect count is stored inside the DSi, in which case the DSi should be powered-up with the <i>propoz</i> button pushed in to restore factory defaults. Re-calibrate the DSi as per the initial installation. <b>NOTE:</b> on re-calibration, the old <i>propoz</i> position will be lost.
<b>Red</b> (flashing)	An alarm has occurred on one or both of the TONiC interfaces.
<b>Red, then orange, then flashing green</b>	The DSi has returned to factory default settings. This is triggered by pressing and holding the <i>propoz</i> button while the DSi is being powered up.

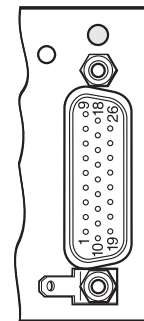
## Connections

### DSi output

Function	Output type	Signal	Output
<b>Power</b>		5 V power	26
		5 V sense	18
		0 V power	9
		0 V sense	8
<b>Incremental signals</b>	RS422A	A+	24
		A-	6
		B+	7
		B-	16
<b>Reference mark</b>	RS422A	Z+	15
		Z-	23
<b>Alarm*</b>	RS422A	E+	25
		E-	17
<b>Limits*</b>	Open collector	P	4
		Q	13
<b>Initialization status</b>	Open collector	K	3
<b>Shield</b>	–	Inner	Not connected
	–	Outer	Case
<b>Do not connect</b>	–	–	1, 2, 5, 10, 11, 12, 14, 19, 20, 21, 22

\*Alarm format can be 3-state or line driven. Please specify at time of ordering.

\*Limit switch outputs are taken directly from the readhead connected to input 1.



26 pin high density 'D' type plug




## General specifications

<b>Power supply</b>	5 V ±10%	1 Amp maximum when terminated with 120 Ohms. Renishaw encoder systems must be powered from a 5 V dc supply complying with the requirements for SELV of standard EN (IEC) 60950.
	Ripple	200 mVpp maximum @ frequency up to 500 kHz
<b>Sealing (readhead)</b>		IP40
	(interface)	IP20
	(DSi)	IP20
<b>Acceleration (readhead)</b>	Operating	500 m/s <sup>2</sup> BS EN 60068-2-7:1993 (IEC 68-2-7:1983)

### DSi unit only

<b>Shock</b>	Non-operating	1000 m/s <sup>2</sup> , 6 ms, ½ sine	BS EN 60068-2-27:1993 (IEC 68-2-27:1987)
<b>Vibration</b>	Operating	50 m/s <sup>2</sup> , 55 Hz to 2000 Hz	BS EN 60068-2-6:1996 (IEC 68-2-6:1995)

*For system specifications refer to DSi mounting options*

<b>Mass</b>	Readhead 10 g Interface 100 g DSi 85 g Cable 26 g/m
<b>Readhead cable</b>	Double shielded, outside diameter 4.25 ±0.25 mm. Flex life >20 x 10 <sup>6</sup> cycles at 20 mm bend radius. UL recognised component 

### Maximum cable length

Readhead to interface 10 m

Interface to DSi (remote version) and DSi to controller

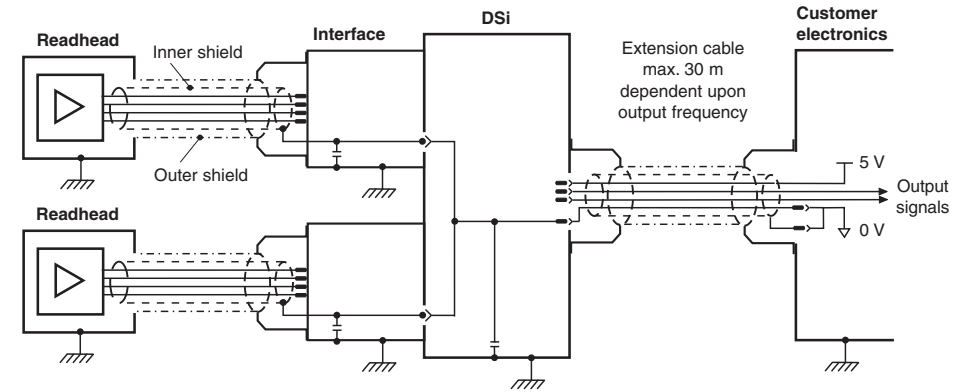
Output frequency (MHz)	Maximum cable length (m)
15 to 20	25
≤14	30

**NOTE:** When using extension cables customers should ensure correct voltage at DSi unit and also correct voltage at TONiC interface for remote versions.

The TONiC and DSi encoder system conforms to the relevant harmonised European standards for electromagnetic compatibility, but must be correctly integrated to achieve EMC compliance. In particular, attention to shielding arrangements is essential.

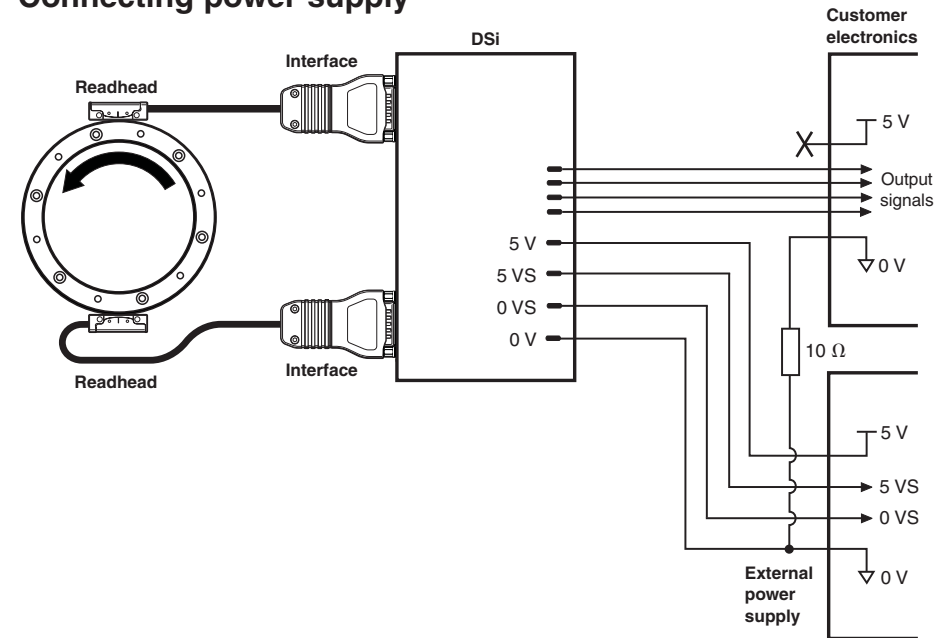
## Electrical connections

### Grounding and shielding



**NOTE:** Maximum cable lengths as detailed in the general specifications.

### Connecting power supply



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