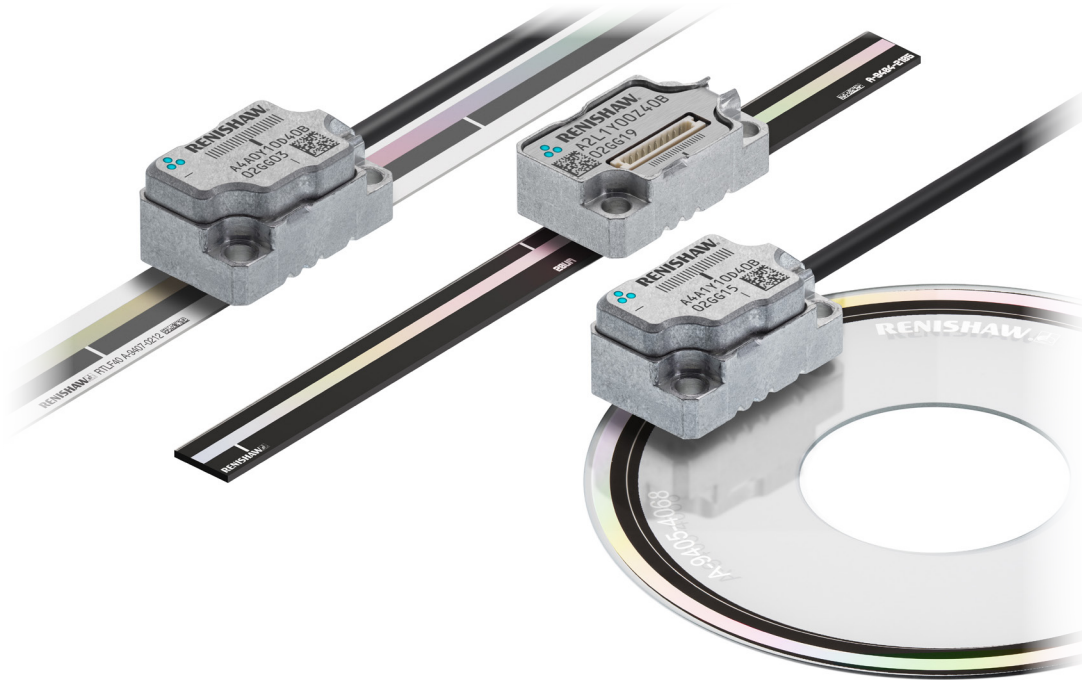


ATOM DX™ miniature encoder system



The ATOM DX™ encoder series is Renishaw's smallest incremental optical encoder with digital output direct from the readhead, providing positional feedback, onboard interpolation, and filtering optics all in a miniature package.

ATOM DX incorporates the market proven filtering optical system of the ATOM™ encoder series, and integrates Renishaw's high-performance interpolation technology, reducing system size and removing the need for additional adaptors and interfaces. This makes ATOM DX suitable for the most space constrained applications where performance cannot be compromised.

Constructed with Renishaw's integrated set-up LED for an intuitive and simple installation process based on the well-established auto-calibration routine, ATOM DX is ready to install straight from the box. It is compatible with the optional ADTi-100 Advanced Diagnostic Tool and ADT View software to give in-depth advanced diagnostic information to aid optimisation of encoder installation and in-field fault finding to satisfy the most demanding motion control applications.

ATOM DX can be used with the ATOM series of linear, partial arc and rotary scales to meet most application requirements.

- Miniature, all-in-one, digital output optical encoder with resolutions down to 2.5 nm
- Class leading signal stability and dirt immunity due to filtering optics
- Long-term stability provided by integral Auto Gain Control (AGC) and Auto Offset Control (AOC)
- Low sub-divisional error (SDE) and jitter
- Integrated set-up LED for ease of installation
- Maximum speed up to 20 m/s (3.63 m/s @ 0.1 µm resolution)
- Available in 20 µm and 40 µm scale pitch versions
- Range of high accuracy linear, partial arc and rotary scales with auto-phase bi-directional optical reference mark
- Optional Advanced Diagnostic Tool ADTi-100 to optimize set-up and assist with system diagnostics
- Available in two variants; cabled and top exit, for the most demanding space constrained installations

System features

High performance

- **Performance in speed**

ATOM DX encoders offer maximum speeds up to 20 m/s and a range of high-speed interpolation options.

- **Performance in scale**

ATOM DX offers linear tape scales with specified overall accuracy to $\pm 5 \mu\text{m/m}$ @20 °C, reducing the need for 2-point compensation.

- **Performance in velocity control**

ATOM DX incorporates Renishaw's latest interpolation technology with updated signal processing algorithms to reduce sub-divisional error (SDE). This helps to reduce velocity ripple and improve closed loop feedback in motion control systems.

- **Performance in a miniature head**

ATOM DX fits in to the smallest applications with heights as low as 7.85 mm. The top exit variant offers all the benefits and features of the cabled ATOM DX encoder, but in an even smaller package. The top exit variant is a component encoder with the cable assembly integrated separately to the readhead, making the ATOM DX top exit suitable for the smallest spaces.

- **Performance over contamination**

ATOM DX features the proven filtering optics of the ATOM encoder range. This optical scheme is tuned to a specific spatial frequency, so it rejects other harmonics, including those caused by dirt or other contaminants. The result is a Lissajous with high purity, that retains its fidelity even when the scale is exposed to contamination: ideal for applications where reliability is critical.

Optional Advanced Diagnostic Tool ADTi-100



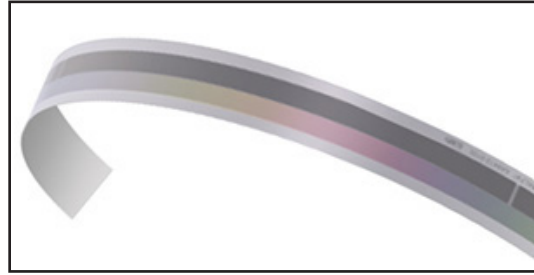
The ATOM DX encoder system is compatible with the Advanced Diagnostic Tool ADTi-100 and ADT View software, which provides comprehensive real-time encoder data feedback to aid more challenging installations and diagnostics. The intuitive software interface can be used for:

- Remote calibration
- Signal optimization over the entire axis length
- Reference mark indication
- Digital readout of encoder position (relative to scale)
- Monitoring velocity
- Exporting and saving data

Compatible scales

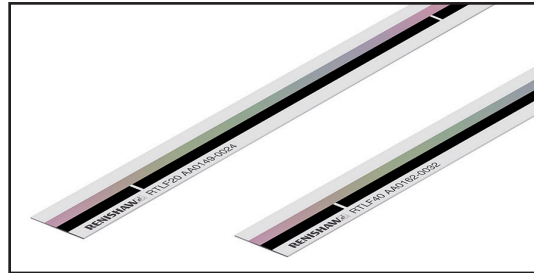
- **Stainless-steel tape scale (RKLF):**

Self-adhesive mounted stainless steel tape scales that can be wrapped around drums, arcs or shafts with radii down to 26 mm.



- **Stainless-steel tape scale (RTLFL):**

High-accuracy scales with graduations directly marked onto the steel tape surface. Available on reels for cut-to-length convenience.



- **Glass linear spars (RCLC):**

Conventional glass spars, available in lengths up to 130 mm.



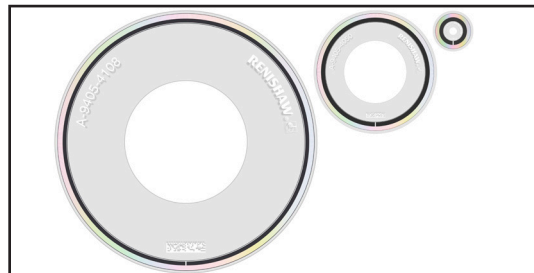
- **Stainless-steel discs (CENTRUM™ CSF40):**

Self-centring rotary scales that are quick and easy to install.



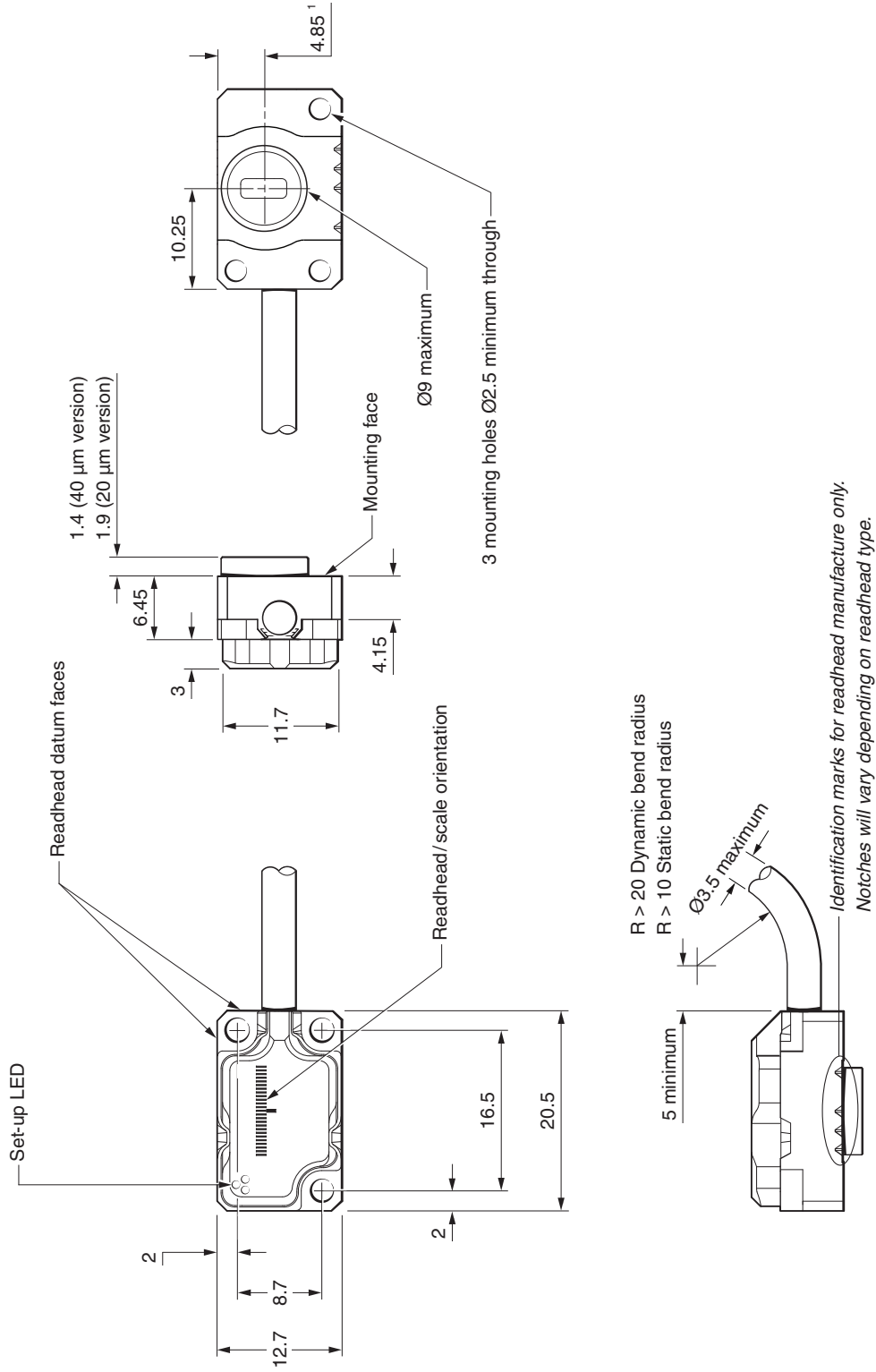
- **Glass discs (RCDM):**

High-accuracy rotary scales with outer diameters down to 17 mm.



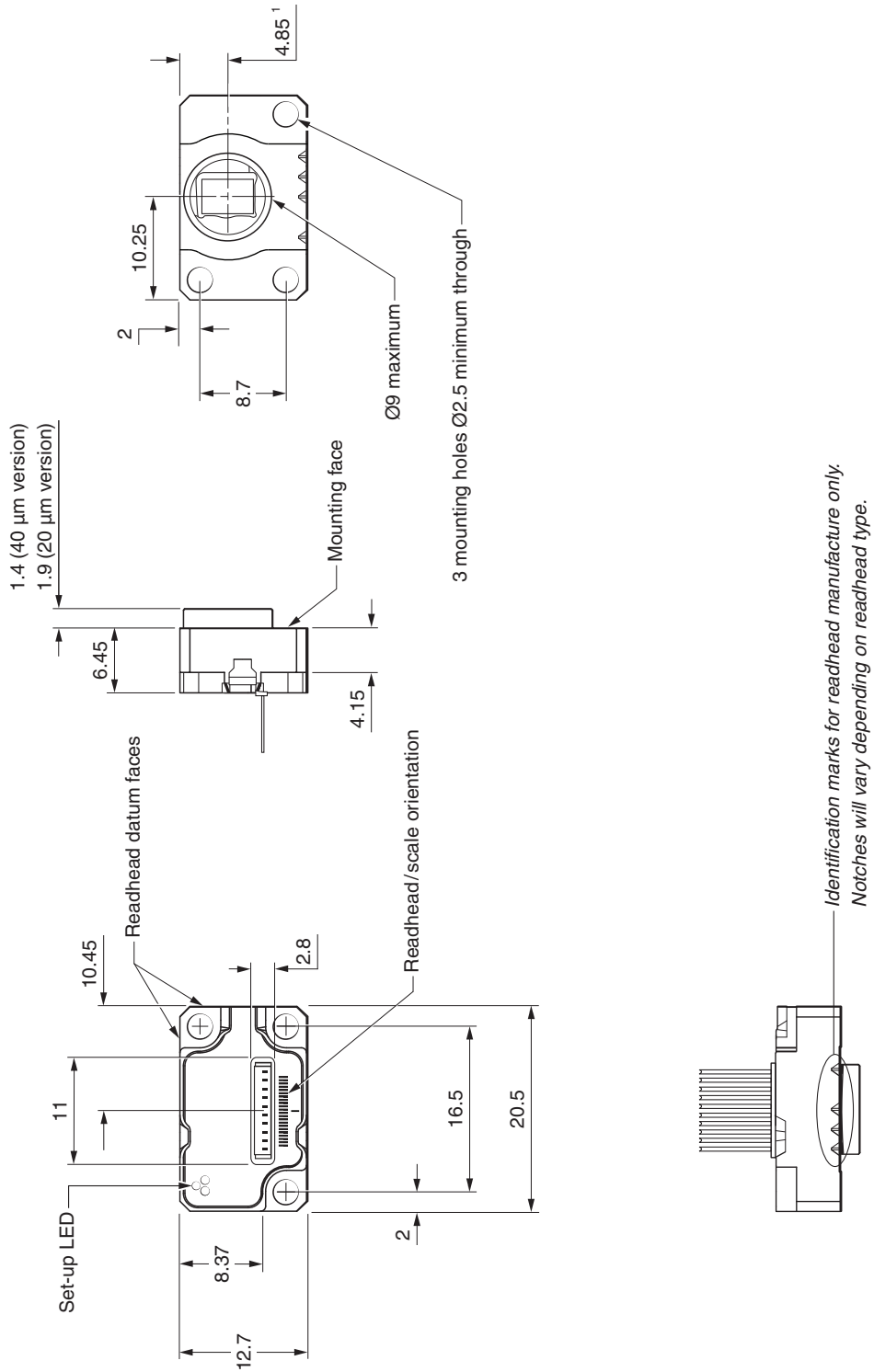
ATOM DX cabled readhead dimensions

Dimensions and tolerances in mm




ATOM DX top exit readhead dimensions

Dimensions and tolerances in mm



¹ Not the optical centreline.

General specifications

Power supply	5 V $-5 / +10\%$	Typically < 200 mA fully terminated Power 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	$-20\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$
	Operating	$0\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$
Humidity		95% relative humidity (non-condensing) to IEC 60068-2-78
Sealing		IP40
Acceleration (system) ¹	Operating	400 m/s ² , 3 axes
Shock (system)	Operating	500 m/s ² , 11 ms, ½ sine, 3 axes
Vibration	Operating	100 m/s ² max @ 55 Hz to 2000 Hz, 3 axes
Mass	Cabled readhead	3.2 g
	Top exit readhead	2.9 g
	Cable	18 g/m
EMC compliance		IEC 61326-1 (cabled readhead variant only)
Cable	Cabled readhead	10 core, high flex, EMI screened cable, outside diameter 3.5 mm maximum Flex life > 20×10^6 cycles at 20 mm bend radius, maximum length 3 m (Extension cable up to 25 m when using Renishaw approved extension cable) UL recognised component 
	Top exit readhead	Cables available in lengths from 0.5 m to 3 m with 15-way D-type or 10-way JST (SH) connector options
Connector options	Cabled readhead	9-way D-type 15-way D-type (standard and alternative pin-out) 10-way JST (SH)
	Top exit readhead	10-way JST (SUR)
Typical sub-divisional error (SDE)	20 μm version	< $\pm 75\text{ nm}$
	40 μm version	< $\pm 120\text{ nm}$

¹ CENTRUM CSF40 acceleration: 100 m/s² radial, 50 m/s² axial

RKLF tape scale technical specifications

Material		Hardened and tempered martensitic stainless steel fitted with a self-adhesive backing tape
Form (height x width)		0.15 mm x 6 mm (including adhesive)
Scale pitch ¹		20 µm and 40 µm
Reference mark		Auto-phase optical reference mark repeatable to unit of resolution throughout specified speed and temperature range Customer de-selectable reference marks at 50 mm spacing ² Reference mark in the centre of scale for lengths < 100 mm
Accuracy (at 20 °C)	RKLF20-S/RKLF40H-S RKLF40-S	±5 µm/m ±15 µm/m
Linearity (at 20 °C)	RKLF20-S/RKLF40H-S RKLF40-S	±2.5 µm/m achievable with two-point error correction ±3 µm/m achievable with two-point error correction
Installation temperature ³		+10 °C to +35 °C
Coefficient of thermal expansion (at 20 °C)		Matches that of substrate material when scale ends fixed by epoxy mounted end clamp
Length ⁴		20 mm to 1 m in 10 mm increments 1 m to 10 m in 1 m increments Overall length = measuring length + 70 mm Scale length = measuring length + 40 mm
Mass		4.6 g/m
End fixing		Epoxy mounted end clamps (A-9523-4015) Approved epoxy adhesive (A-9531-0342) Scale end movement typically < 1 µm ⁵

¹ 20 µm RKLF scale is not suitable for partial arc applications.

² Only the selected reference mark is bi-directionally repeatable.

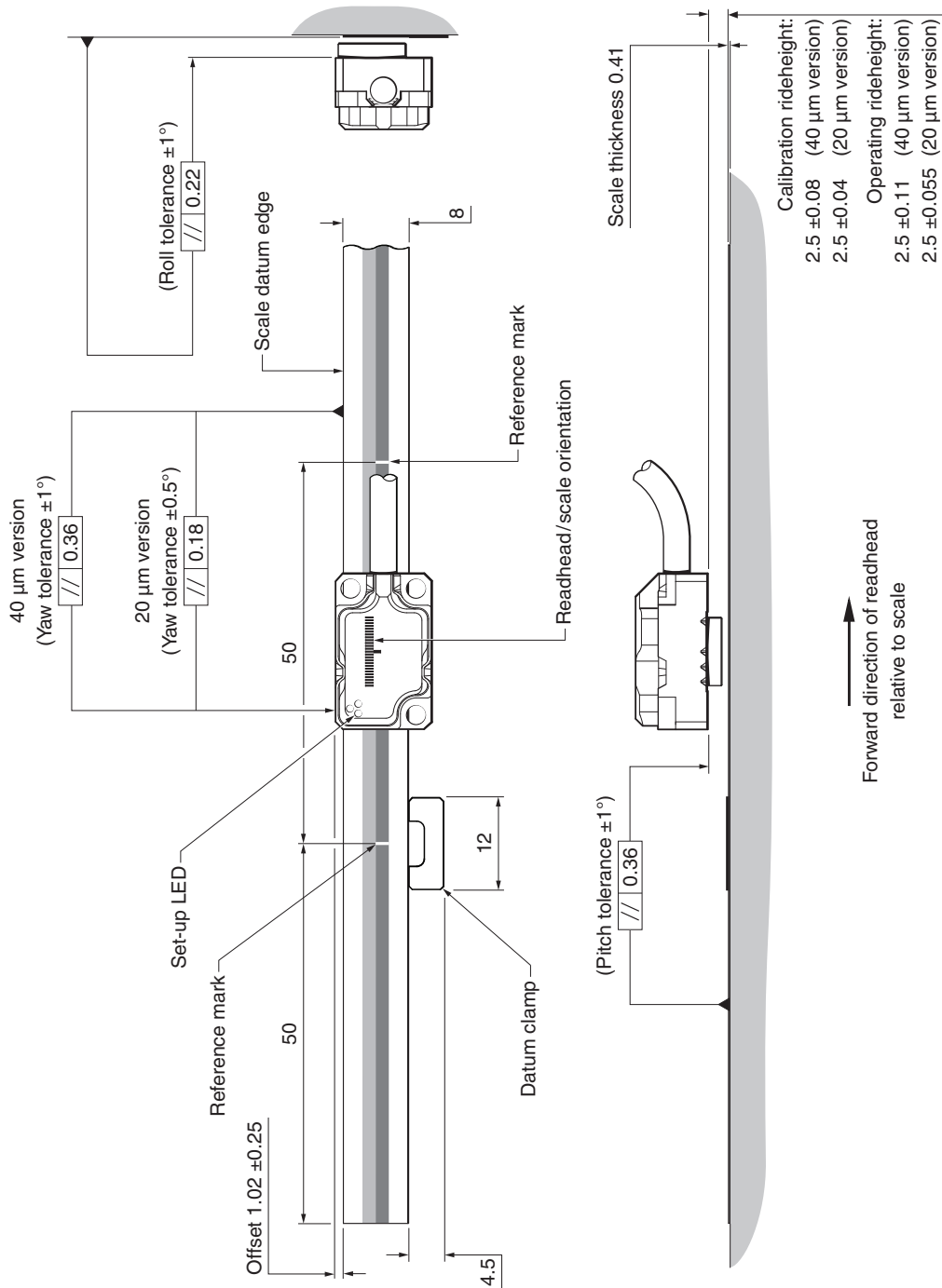
³ Ensure that the scale and end clamps are installed following the installation process described in the *ATOM DX™ linear encoder systems* installation guide (Renishaw part no. M-9414-9446).

⁴ The maximum recommended axis length is 1 m for 20 µm RKLF systems.

⁵ To limit the maximum tension in the scale $(CTE_{\text{substrate}} - CTE_{\text{scale}}) \times (T_{\text{use extreme}} - T_{\text{install}}) \leq 550 \mu\text{m/m}$ where $CTE_{\text{scale}} = \sim 10.1 \mu\text{m/m}^\circ\text{C}$.

RTLFL tape scale installation drawing

Dimensions and tolerances in mm



NOTE: ATOM DX cabled readhead variant shown.

RTLIF tape scale technical specifications

Material	Hardened and tempered martensitic stainless steel fitted with a self-adhesive backing tape
Form (height x width)	0.41 mm x 8 mm (including adhesive)
Scale pitch	20 µm and 40 µm
Datum fixing	Adhesive datum clamp A-9585-0028 secured with Loctite® 435
Reference mark	Auto-phase optical reference mark repeatable to unit of resolution throughout specified speed and temperature range Customer deselectable reference marks at 50 mm spacing ¹ Reference mark in the centre of scale for lengths < 100 mm
Accuracy (at 20 °C)	RTLIF20-S/RTLIF40H-S ±5 µm/m RTLIF40-S ±15 µm/m
Coefficient of thermal expansion (at 20 °C) ²	10.1 ±0.2 µm/m/°C
Length ³	20 mm to 1 m in 10 mm increments 1 m to 10 m in 1 m increments Scale length = measuring length + 6 mm (without optional end covers)
Mass	12.2 g/m

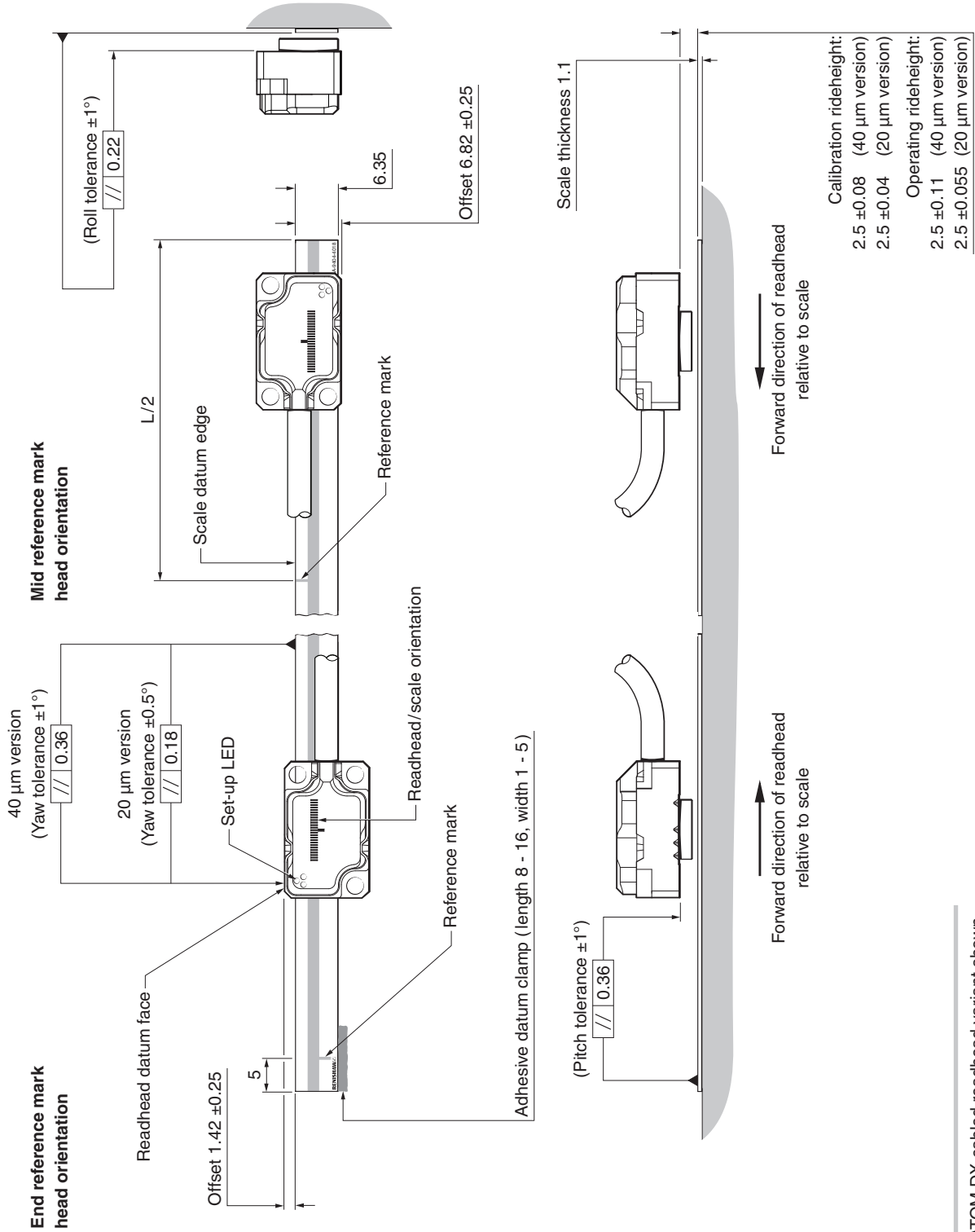
¹ Only the selected reference mark is bi-directionally repeatable.

² The substrate coefficient of thermal expansion does not need to match that of the scale.

³ The maximum recommended axis length is 1 m for 20 µm RTLIF systems.

RCLC glass spar installation drawing

Dimensions and tolerances in mm



NOTE: ATOM DX cabled readhead variant shown.

RCLC glass spar technical specifications

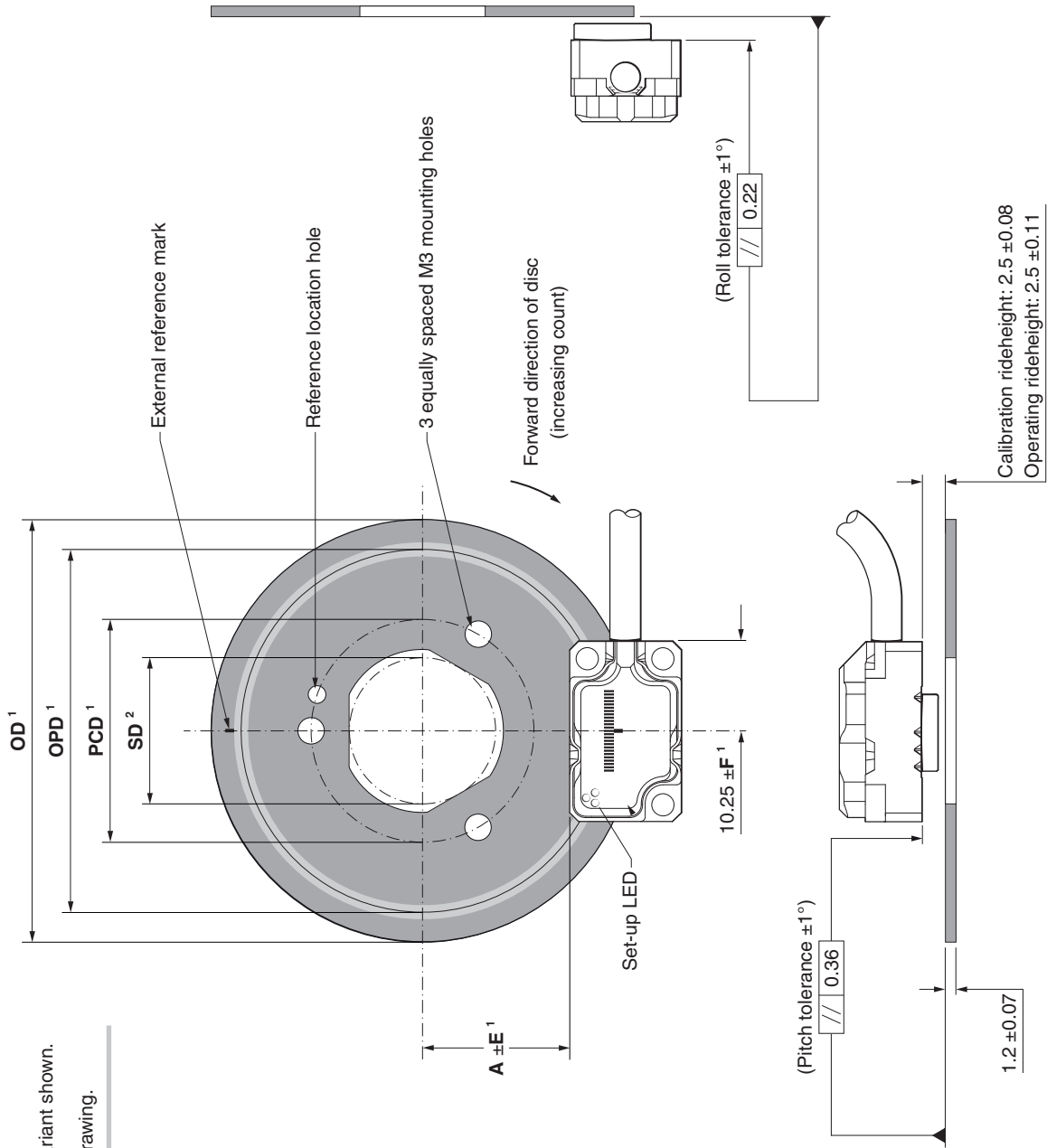
Material	Soda-lime glass fitted with a self-adhesive backing tape
Form (height x width)	1.1 mm x 6.35 mm (including adhesive)
Pitch	20 µm and 40 µm
Datum fixing	Fillet of adhesive (A-9531-0342) on one side of the scale
Reference mark	Auto-phase optical reference mark repeatable to unit of resolution throughout specified speed and temperature range Either mid or one end of travel; determined by orientation of the readhead
Accuracy (at 20 °C)	±3 µm
Coefficient of thermal expansion	~8 µm/m/°C
Mass	13.9 g/m

RCLC glass spar lengths

Overall length L (mm)	Measuring length ML (mm)
10	7
18	15
30	27
55	52
80	77
100	97
105	102
130	127

CENTRUM CSF40 rotary disc with external reference mark installation drawing

Dimensions and tolerances in mm



NOTES:

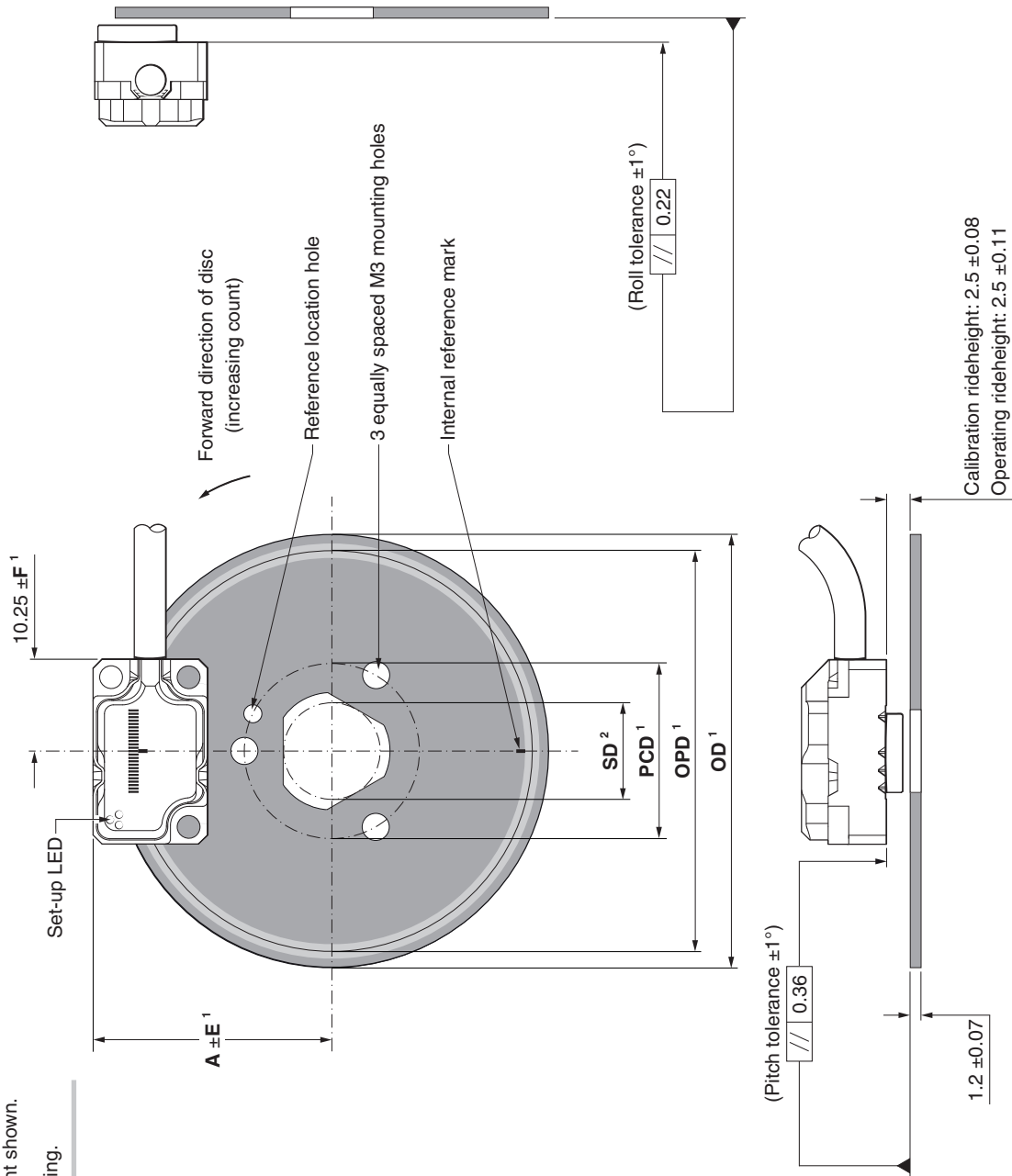
- ATOM DX cabled readhead variant shown.
- Flexure design omitted from drawing.

¹ The dimensions of A, OD (outer diameter), OPD (optical diameter) and PCD (bolt hole diameter) for available disc sizes are defined on page 15. For the dimensions relating to custom discs see page 16.

² The inner diameter of the disc is designed to fit a shaft diameter equal to SD with a tolerance of h6. The dimension of SD is defined on page 15 for available disc sizes and on page 16 for custom discs.

CENTRUM CSF40 rotary disc with internal reference mark installation drawing

Dimensions and tolerances in mm



NOTES:

- ATOM DX cabled readhead variant shown.
- Flexure design omitted from drawing.

¹ The dimensions of A, OD (outer diameter), OPD (optical diameter) and PCD (pitch circle diameter) are defined on page 16.

² The inner diameter of the disc is designed to fit a shaft diameter equal to SD with a tolerance of h6. The dimension of SD is defined on page 16.

CENTRUM CSF40 rotary disc dimensions and tolerances

	Part numbers		
	A-9400-1035	A-9400-1030	A-9400-1025
Reference mark	External	External	External
Line count	3 860	6 360	8 880
Optical diameter (mm) - OPD	49.15	80.98	113.06
Shaft diameter (mm) - SD ¹	24.5	56.5	88.5
Outer diameter (mm) - OD	56	88	120
Bolt holes diameter (mm) - PCD	34.5	66.0	98.5
Readhead installation (mm) - A	20.46	36.38	52.42

See *ATOM DX™ CENTRUM™ rotary encoder system* installation guide (Renishaw part no. M-9414-9814) for recommended shaft geometry.

For other disc sizes, contact your local Renishaw representative.

Radial and longitudinal tolerances

Optical diameter (mm)	Radial tolerance (mm)
OPD	E
< 20	0.100
< 30	0.125
< 40	0.175
≥ 40	0.200

Optical diameter (mm)	Longitudinal tolerance (mm)
OPD	F
< 30	0.100
< 45	0.150
< 60	0.200
≥ 60	0.300

¹ The inner diameter of the disc is designed to fit a shaft diameter equal to SD with a tolerance of h6.

Customising a CSF40 disc

CSF40 discs can be customised to fit most applications. The limits and dependencies specified below can be used to create a dimensionally representative approximation of a custom CSF40 disc.

The absolute limits are the physical limitations that dictate the maximum and minimum possible size for a CSF40 disc. The dependencies limit the parameter values in relation to each other.

NOTE: This information does not provide a total and comprehensive guide on how to design a disc. Contact your local Renishaw representative for additional support.

Absolute limits

	External reference mark		Internal reference mark	
	Minimum	Maximum	Minimum	Maximum
Line count	2 482	8 890	3 204	9 142
Optical diameter (mm)	31.6	113.2	40.8	116.4
Shaft diameter (mm)	7.0	88.6	7.0	82.6
Outer diameter (mm)	38.4	120.0	44.4	120.0

Dependencies

IMPORTANT: The line count must always be a whole number

	External reference mark	Internal reference mark
Optical diameter (OPD)	$\frac{LC \times 0.04}{\pi}$	
Shaft diameter (SD) ¹	$\leq \frac{19}{24} OD$ and $\leq OPD - 24.6$	$\leq \frac{19}{24} OD$ and $\leq OPD - 33.8$
Optical diameter (OPD) – shaft diameter (SD)	≤ 40	
Outer diameter (OD)	$\geq OPD + 6.8$	$\geq OPD + 3.6$
Bolt hole diameter (PCD)	$\leq OPD - 15.9$ and $\geq SD + 8.7$	$\leq OPD - 25.1$ and $\geq SD + 8.7$
Readhead installation (A)	$\frac{OPD}{2} - 4.11$	$\frac{OPD}{2} + 4.11$

Where LC = Line count, OPD = Optical diameter, OD = Outer diameter, and SD = Shaft diameter.

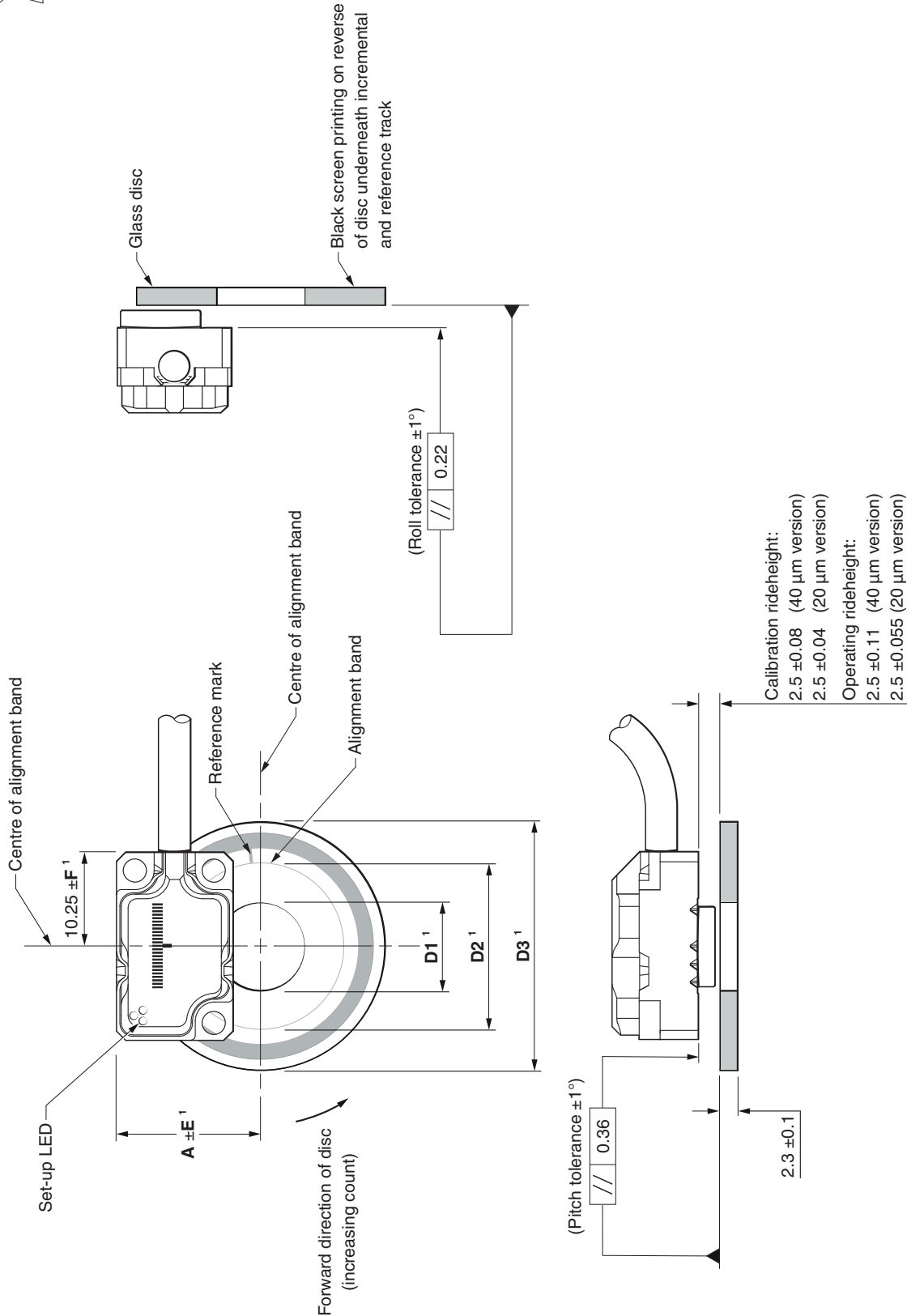
¹ The shaft diameter tolerance is h6.

CENTRUM CSF40 rotary disc technical specifications

Material	304 grade stainless-steel
Form	1.2 mm thick
Pitch	40 μm
Reference mark	Single reference mark, external or internal
Installed accuracy (scale to shaft)	$\pm 10 \mu\text{m}$
Eccentricity (scale to shaft)	Typically $\pm 5 \mu\text{m}$
Graduation accuracy	Typically $\pm 0.5 \mu\text{m}$
Coefficient of thermal expansion (at 20 °C)	$15.5 \pm 0.5 \mu\text{m}/\text{m}/^\circ\text{C}$
Density	$8000 \text{ kg}/\text{m}^3$

RCDM rotary disc installation drawing

Dimensions and tolerances in mm



NOTE: ATOM DX cabled readhead variant shown.

¹ For the dimensions of A, D1, D2, D3, and the tolerances E and F see the following page.

For detailed information see the ATOM DX™ rotary encoder systems installation guide (Renishaw part no. M-9414-9447).

RCDM rotary disc dimensions and tolerances

20 µm discs

Optical diameter (mm)	Line count	Nominal outer diameter (mm) ¹	D1 (mm)	D2 (mm)	D3 (mm)	A (mm)	Radial tolerance E (mm)	Longitudinal tolerance F (mm)
26.08	4 096	30	12.8	21.15	29.9	17.15	0.1	0.075
31.83	5 000	36	12.8	26.9	35.9	20.03	0.125	0.075
45.84	7 200	50	25.5	40.9	49.9	27.03	0.125	0.075
52.15	8 192	56	25.5	47.25	55.9	30.19	0.125	0.1
63.66	10 000	68	25.5	58.55	67.9	35.94	0.15	0.125
104.3	16 384	108	50.9	99.2	107.9	56.26	0.2	0.225

40 µm discs

Optical diameter (mm)	Line count	Nominal outer diameter (mm) ¹	D1 (mm)	D2 (mm)	D3 (mm)	A (mm)	Radial tolerance E (mm)	Longitudinal tolerance F (mm)
13.04	1 024	17	3.275	8.1	16.9	10.63	0.1	0.1
15.92	1 250	20	3.275	11	19.9	12.07	0.1	0.1
21.01	1 650	25	6.46	16.1	24.9	14.62	0.125	0.1
22.92	1 800	27	9.625	18	26.9	15.57	0.125	0.1
26.08	2 048	30	12.8	21.15	29.9	17.15	0.125	0.1
31.83	2 500	36	12.8	26.9	35.9	20.03	0.175	0.15
45.84	3 600	50	25.5	40.9	49.9	27.03	0.2	0.2
52.15	4 096	56	25.5	47.25	55.9	30.19	0.2	0.2
63.66	5 000	68	25.5	58.55	67.9	35.94	0.2	0.3
104.3	8 192	108	50.9	99.2	107.9	56.26	0.2	0.3

¹ Special disc sizes are available on request

RCDM rotary disc technical specifications

Material	Soda-lime glass
Form	2.3 mm thick
Pitch	20 µm and 40 µm
Reference mark	Single reference mark
Coefficient of thermal expansion	~8 µm/m/°C

RCDM rotary disc graduation accuracy

Optical diameter (mm)	Nominal outer diameter (mm)	Graduation accuracy (arc seconds)
13.04	17	15.81
15.92	20	12.95
21.01	25	9.82
22.92	27	9
26.08	30	7.91
31.83	36	6.49
45.84	50	4.5
52.15	56	3.95
63.66	68	3.24
104.3	108	2.78

Speed

20 µm encoder

Clocked output option (MHz)	Maximum speed (m/s)						Minimum edge separation ¹ (ns)
	Readhead type						
	D (5 µm)	X (1 µm)	Z (0.5 µm)	W (0.2 µm)	Y (0.1 µm)	H (50 nm)	
50	10	10	10	7.25	3.63	1.813	25.1
40	10	10	10	5.80	2.90	1.450	31.6
25	10	10	9.06	3.63	1.81	0.906	51.0
20	10	10	8.06	3.22	1.61	0.806	57.5
12	10	10	5.18	2.07	1.04	0.518	90.0
10	10	8.53	4.27	1.71	0.85	0.427	109
08	10	6.91	3.45	1.38	0.69	0.345	135
06	10	5.37	2.69	1.07	0.54	0.269	174
04	10	3.63	1.81	0.73	0.36	0.181	259
01	4.53	0.91	0.45	0.18	0.09	0.045	1038

Clocked output option (MHz)	Maximum speed (m/s)					Minimum edge separation ¹ (ns)
	Readhead type					
	M (40 nm)	I (20 nm)	O (10 nm)	Q (5 nm)	R (2.5 nm)	
50	1.450	0.725	0.363	0.181	0.091	25.1
40	1.160	0.580	0.290	0.145	0.073	31.6
25	0.725	0.363	0.181	0.091	0.045	51.0
20	0.645	0.322	0.161	0.081	0.040	57.5
12	0.414	0.207	0.104	0.052	0.026	90.0
10	0.341	0.171	0.085	0.043	0.021	109
08	0.276	0.138	0.069	0.035	0.017	135
06	0.215	0.107	0.054	0.027	0.013	174
04	0.145	0.073	0.036	0.018	0.009	259
01	0.036	0.018	0.009	0.005	0.002	1038

Angular speed depends on disc optical diameter. Use the following equation to convert to rev/min.

$$\text{Angular speed (rev/min)} = \frac{V \times 1000 \times 60}{\pi D} \quad \text{Where } V = \text{maximum linear speed (m/s)} \text{ and } D = \text{optical diameter of chosen disc in mm}$$

¹ For a readhead with a 1 m cable

40 µm encoder

Clocked output option (MHz)	Maximum speed (m/s)						Minimum edge separation ¹ (ns)
	Readhead type						
	T (10 µm)	D (5 µm)	G (2 µm)	X (1 µm)	Z (0.5 µm)	W (0.2 µm)	
50	20	20	20	20	18.13	7.25	25.1
40	20	20	20	20	14.50	5.80	31.6
25	20	20	20	18.13	9.06	3.63	51.0
20	20	20	20	16.11	8.06	3.22	57.5
12	20	20	20	10.36	5.18	2.07	90.0
10	20	20	17.06	8.53	4.27	1.71	109
08	20	20	13.81	6.91	3.45	1.38	135
06	20	20	10.74	5.37	2.69	1.07	174
04	20	18.13	7.25	3.63	1.81	0.73	259
01	9.06	4.53	1.81	0.91	0.45	0.18	1038

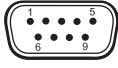
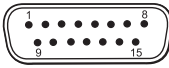
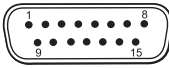


Clocked output option (MHz)	Maximum speed (m/s)						Minimum edge separation ¹ (ns)
	Readhead type						
	Y (0.1 µm)	H (50 nm)	M (40 nm)	I (20 nm)	O (10 nm)	Q (5 nm)	
50	3.63	1.813	1.450	0.725	0.363	0.181	25.1
40	2.90	1.450	1.160	0.580	0.290	0.145	31.6
25	1.81	0.906	0.725	0.363	0.181	0.091	51.0
20	1.61	0.806	0.645	0.322	0.161	0.081	57.5
12	1.04	0.518	0.414	0.207	0.104	0.052	90.0
10	0.85	0.427	0.341	0.171	0.085	0.043	109
08	0.69	0.345	0.276	0.138	0.069	0.035	135
06	0.54	0.269	0.215	0.107	0.054	0.027	174
04	0.36	0.181	0.145	0.073	0.036	0.018	259
01	0.09	0.045	0.036	0.018	0.009	0.005	1038

Angular speed depends on disc optical diameter. Use the following equation to convert to rev/min.

$$\text{Angular speed (rev/min)} = \frac{V \times 1000 \times 60}{\pi D} \quad \text{Where } V = \text{maximum linear speed (m/s) and } D = \text{optical diameter of chosen disc in mm}$$

¹ For a readhead with a 1 m cable

Output signals

			Cabled				Top Exit	
								
Function	Signal	Colour	9-way D-type (A)	15-way D-type (D)	15-way D-type alternative pin-out (H)	10-way JST ¹ (K)	10-way JST ² (Z)	
Power	5 V	Brown	5	7, 8	4, 12	10	10	
	0 V	White	1	2, 9	2, 10	2	9	
Incremental	A	+	2	14	1	9	5	
		-	6	6	9	7	6	
	B	+	4	13	3	4	8	
		-	Green	8	5	11	1	7
Reference mark	Z	+	3	12	14	8	4	
		-	Grey	7	4	7	5	3
Alarm	E	-	Orange	-	3	13	6	2
Remote CAL ³	CAL	Clear	9	1	5	3	1	
Shield	-	Screen	Case	Case	Case	Ferrule	-	

NOTE: Top exit cables are terminated with the 'K' pin-out or the 'D' pin-out dependent upon which top-exit readhead cable is used. See available top exit readhead cables on page 31.

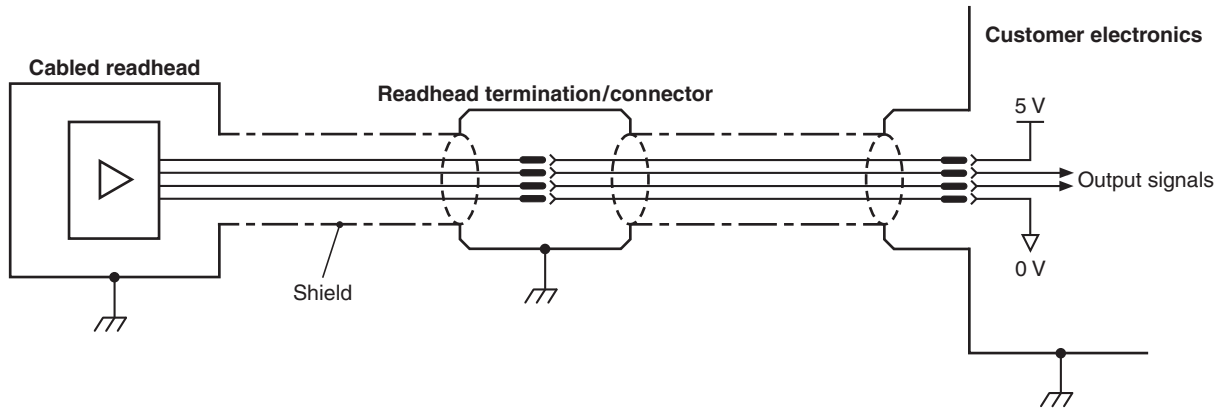
¹ PCB mount mating connectors: Top entry (BM10B-SRSS-TB); Side entry (SM10B-SRSS-TB).

² Connector on top exit readhead only: Mating connector (10SUR - 32S).

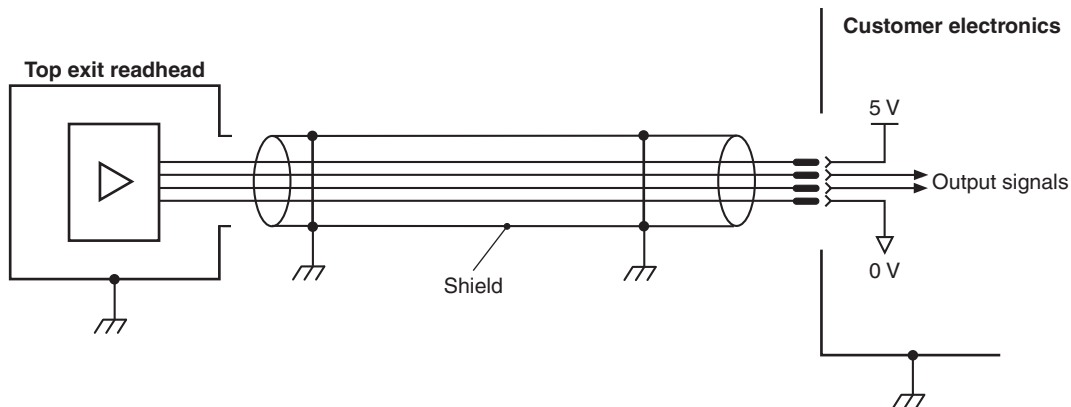
³ Remote CAL line must be connected for use with the ADTi-100.

Electrical connections

Grounding and shielding



IMPORTANT: The shield should be connected to the machine earth (Field Ground). For JST variants the ferrule should be connected to the machine earth.



For more information on top exit readheads refer to the relevant ATOM DX installation guide.

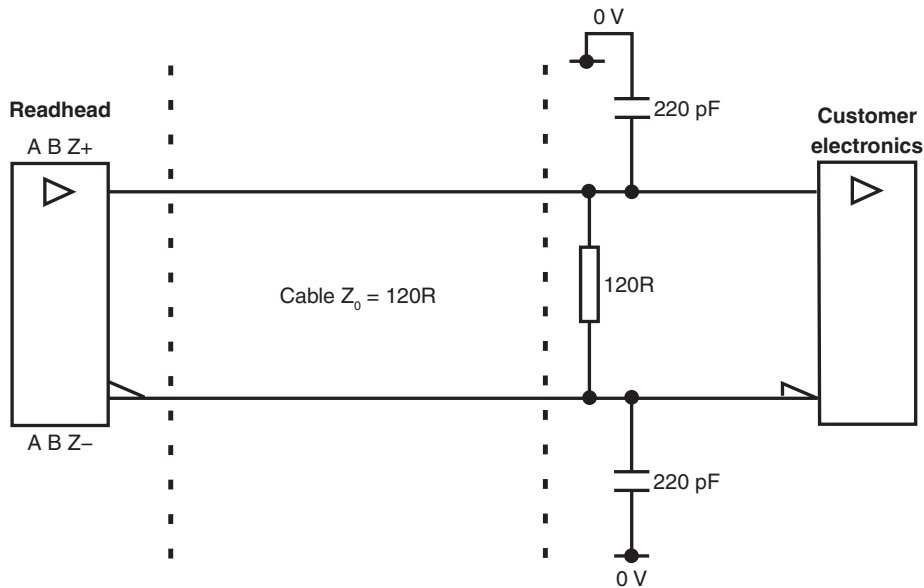
Maximum readhead cable length: 3 m

Maximum extension cable length: Dependent on cable type, readhead cable length and clock speed.
Contact your local Renishaw representative for more information.

NOTE: The maximum cable length between the readhead and the ADTi-100 is 3 m.

Recommended signal termination

Digital outputs

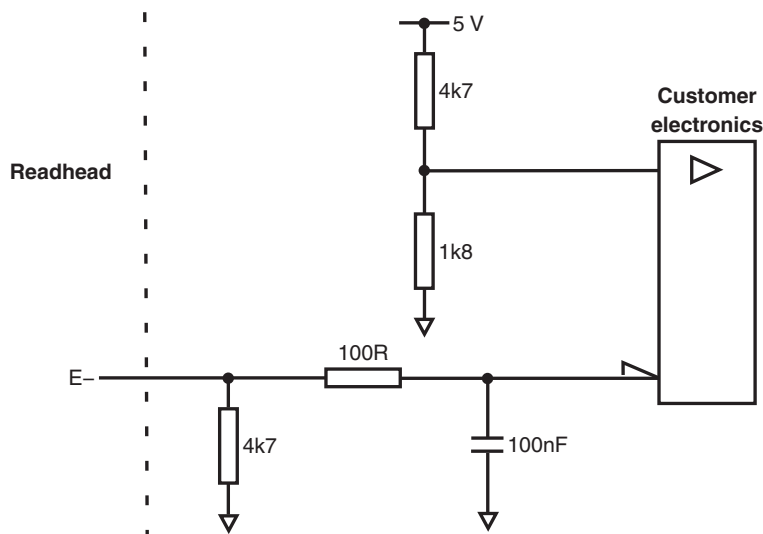


Standard RS422A line receiver circuitry.

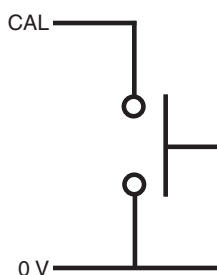
The capacitors are recommended for improved noise immunity.

Single ended alarm signal termination

(Not available with 'A' cable termination)



Remote CAL operation



Remote system calibration (CAL) is possible via the CAL pin.

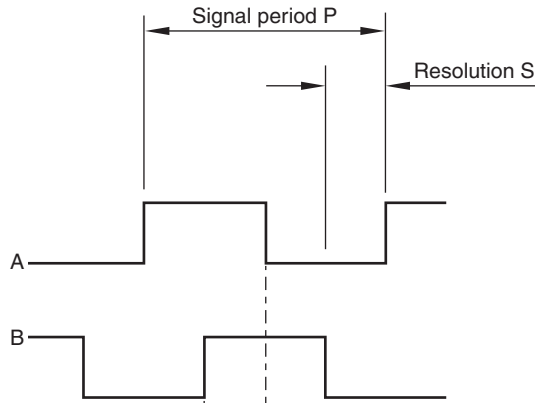
Output specifications

Digital output signals

Form – Square wave differential line driver to EIA RS422A

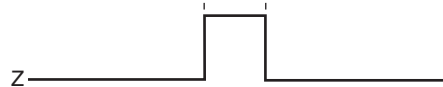
Incremental¹

2 channels A and B in quadrature (90° phase shifted)



Resolution option code	P (μm)	S (μm)
T ²	40	10
D	20	5
G ²	8	2
X	4	1
Z	2	0.5
W	0.8	0.2
Y	0.4	0.1
H	0.2	0.05
M	0.16	0.04
I	0.08	0.02
O	0.04	0.01
Q	0.02	0.005
R ³	0.01	0.0025

Reference¹



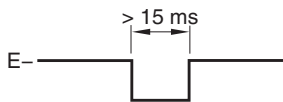
Synchronised pulse Z, duration as resolution.

Bi-directionally repeatable.⁴

Alarm

Line driven (Asynchronous pulse)

(Not available with 'A' cable termination)



Alarm asserted when:

- Signal amplitude < 20% or > 135%
- Readhead speed too high for reliable operation

or 3-state alarm

Differentially transmitted signals forced open circuit for > 15 ms when alarm conditions valid.

¹ For clarity, the inverse signals are not shown.

² 40 μm ATOM DX only

³ 20 μm ATOM DX only

⁴ Only the calibrated reference mark is bi-directionally repeatable.

ATOM DX 20 µm part numbers

A2 A 0 X 10 D 50 B

Series _____

A2 - 20 µm ATOM DX

Variant _____

A - Cabled

L - Top exit ('00' cable length and 'Z' cable termination only)

Scale type compatibility _____

Linear	Rotary
	RCDM20 glass disc
	Optical diameter
0 - RTLF20	1 - ≥ 77 mm
0 - RKLF20 ¹	2 - ≥ 42.4 mm to < 77 mm
1 - RCLC20 glass spar	3 - ≥ 31.4 mm to < 42.4 mm
-	4 - ≥ 26.1 mm to < 31.4 mm

Resolution _____

D - 5 µm	Y - 0.1 µm	O - 10 nm
X - 1 µm	H - 50 nm	Q - 5 nm
Z - 0.5 µm	M - 40 nm	R - 2.5 nm
W - 0.2 µm	I - 20 nm	

Cable length _____

00 - no cable ('L' variant and 'Z' cable termination only)	15 - 1.5 m
02 - 0.2 m	20 - 2.0 m
05 - 0.5 m	30 - 3.0 m
10 - 1.0 m	

Cable termination _____

A - 9-way D-type	K - 10-way JST
D - 15-way D-type (standard pin-out)	Z - 10-way JST readhead connector ('L' variant and '00' cable length only)
H - 15-way D-type (alternative pin-out)	

Clocked output option² _____

50 - 50 MHz	12 - 12 MHz	04 - 4 MHz
40 - 40 MHz	10 - 10 MHz	01 - 1 MHz
25 - 25 MHz	08 - 8 MHz	
20 - 20 MHz	06 - 6 MHz	

Alarm format _____

B - Line driven alarm³
F - 3-state alarm

NOTE: Not all the combinations are valid. Check valid configurations online at www.renishaw.com/epc.

¹ RKLF20 is not suitable for partial arc applications.

² Additional clocked output options available. Contact your local Renishaw representative for further details.

³ No alarm output on readheads with 'A' cable termination

ATOM DX 40 µm part numbers

A4 A 0 X 10 D 50 B

Series

A4 - 40 µm ATOM DX

Variant

A - Cabled

L - Top exit ('00' cable length and 'Z' cable termination only)

Scale type compatibility

Linear	Rotary	
	RCDM40 glass disc	CENTRUM CSF40 metal disc
	Optical diameter	Optical diameter
0 - RTLF40	1 - ≥ 30.6 mm	C - ≥ 47.0 mm
0 - RKLF40	2 - ≥ 19.7 mm to < 30.6 mm	D - ≥ 23.0 mm to < 47.0 mm
1 - RCLC40 glass spar	3 - ≥ 15.2 mm to < 19.7 mm	E - ≥ 16.0 mm to < 23.0 mm
-	4 - ≥ 13.0 mm to < 15.2 mm	-

Resolution

T - 10 µm	Z - 0.5 µm	M - 40 nm
D - 5 µm	W - 0.2 µm	I - 20 nm
G - 2 µm	Y - 0.1 µm	O - 10 nm
X - 1 µm	H - 50 nm	Q - 5 nm

Cable length

00 - no cable ('L' variant and 'Z' cable termination only)	15 - 1.5 m
02 - 0.2 m	20 - 2.0 m
05 - 0.5 m	30 - 3.0 m
10 - 1.0 m	

Cable termination

A - 9-way D-type	K - 10-way JST
D - 15-way D-type (standard pin-out)	Z - 10-way JST readhead connector ('L' variant and '00' cable length only)
H - 15-way D-type (alternative pin-out)	

Clocked output option ¹

50 - 50 MHz	12 - 12 MHz	04 - 4 MHz
40 - 40 MHz	10 - 10 MHz	01 - 1 MHz
25 - 25 MHz	08 - 8 MHz	
20 - 20 MHz	06 - 6 MHz	

Alarm format

B - Line driven alarm ²
F - 3-state alarm

NOTE: Not all the combinations are valid. Check valid configurations online at www.renishaw.com/epc.

¹ Additional clocked output options available. Contact your local Renishaw representative for further details.

² No alarm output on readheads with 'A' cable termination

Linear scale part numbers

RTLTF tape scale

Scale type	Scale pitch	Length	Increments	Part number (where xxxx is the length in cm) ¹	ATOM DX readhead scale type compatibility
RTLTF20-S	20 µm	20 mm to 1 m	10 mm	A-9406-xxxx	0
		1 m to 10 m ²	1 m		
RTLTF40H-S	40 µm (high accuracy)	20 mm to 1 m	10 mm	A-9408-xxxx	0
		1 m to 10 m ²	1 m		
RTLTF40-S	40 µm	20 mm to 1 m	10 mm	A-9407-xxxx	0
		1 m to 10 m ²	1 m		

RKLF mastered tape scale

Scale type	Scale pitch	Length	Increments	Part number (where xxxx is the length in cm) ³	ATOM DX readhead scale type compatibility
RKLF20-S	20 µm ⁴	20 mm to 1 m	10 mm	A-6767-xxxx	0
		1 m to 10 m	1 m		
RKLF40H-S	40 µm (high accuracy) ⁴	20 mm to 1 m	10 mm	A-6771-xxxx	0
		1 m to 10 m	1 m		
RKLF40	40 µm	20 mm to 1 m	10 mm	A-6769-xxxx	0
		1 m to 10 m	1 m		

RCLC glass spar

Length (mm)	20 µm	40 µm	ATOM DX readhead scale type compatibility
10	A-9404-2010	A-9404-4010	1
18	A-9404-2018	A-9404-4018	1
30	A-9404-2030	A-9404-4030	1
55	A-9404-2055	A-9404-4055	1
80	A-9404-2080	A-9404-4080	1
100	A-9404-2100	A-9404-4100	1
105	A-9404-2105	A-9404-4105	1
130	A-9404-2130	A-9404-4130	1

¹ Ordering A-9408-0070 for example will result in a 70 cm length of RTLTF40H-S scale.

² Lengths greater than 10 m are available on request.

³ Ordering A-6767-0070 for example will result in a 70 cm length of RKLF20-S scale.

⁴ Not recommended for partial arc applications.

Rotary disc part numbers

RCDM rotary discs (20 µm version)

Optical diameter (mm)	Nominal outer diameter (mm)	Part number	ATOM DX readhead scale type compatibility
26.08	30	A-9405-2030	4
31.83	36	A-9405-2036	3
45.84	50	A-9405-2050	2
52.15	56	A-9405-2056	2
63.66	68	A-9405-2068	2
104.3	108	A-9405-2108	1

RCDM rotary discs (40 µm version)

Optical diameter (mm)	Nominal outer diameter (mm)	Part number	ATOM DX readhead scale type compatibility
13.04	17	A-9405-4017	4
15.92	20	A-9405-4020	3
21.01	25	A-9405-4025	2
22.92	27	A-9405-4027	2
26.08	30	A-9405-4030	2
31.83	36	A-9405-4036	1
45.84	50	A-9405-4050	1
52.15	56	A-9405-4056	1
63.66	68	A-9405-4068	1
104.3	108	A-9405-4108	1

CSF40 rotary discs

Optical diameter (mm)	Nominal outer diameter (mm)	Part number	ATOM DX readhead scale type compatibility
49.15	56	A-9400-1035	C
80.98	88	A-9400-1030	C
113.06	120	A-9400-1025	C

NOTE: Other disc diameters are available; contact your local Renishaw representative for more information.

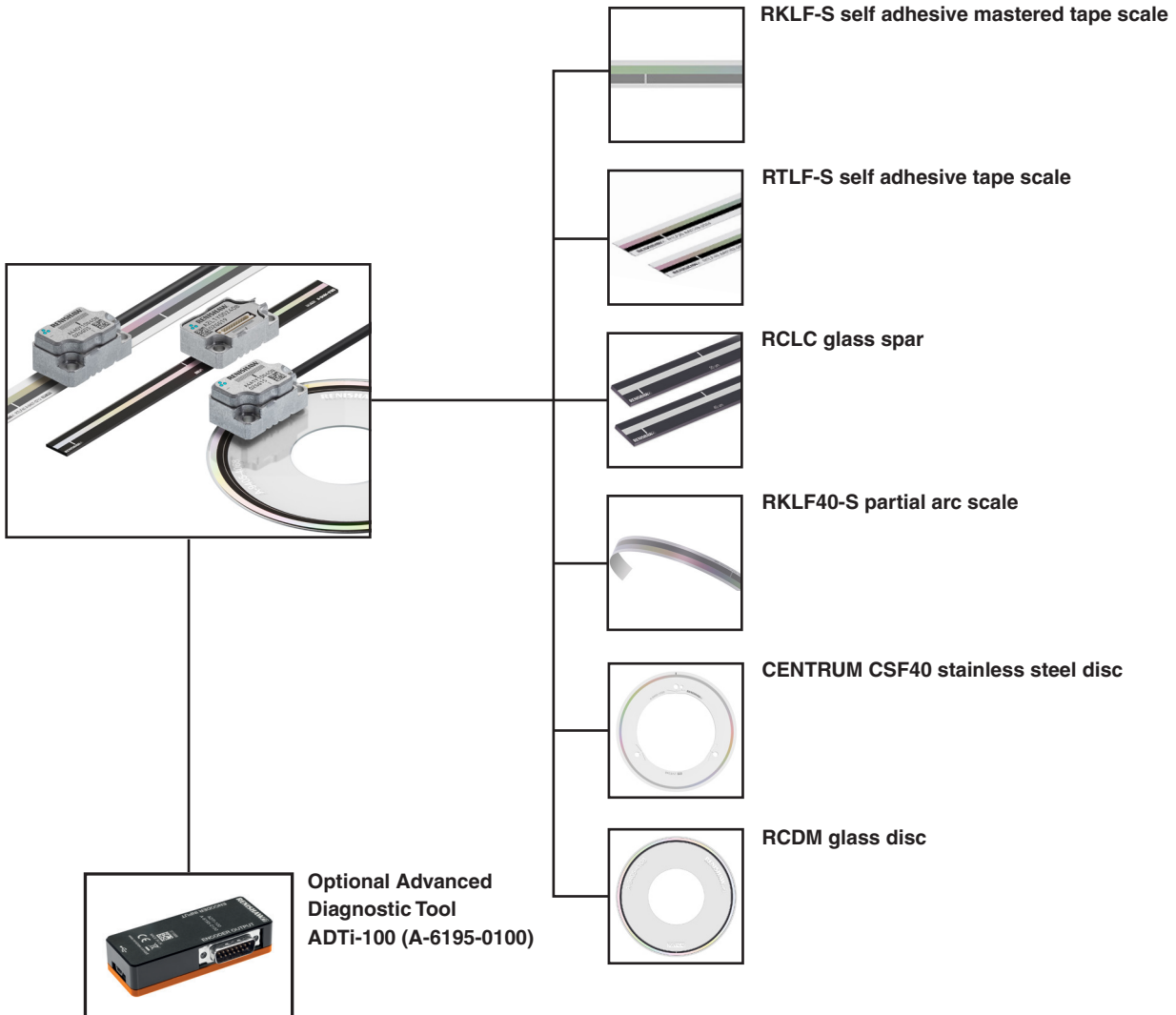
Top exit readhead cable part numbers

Cable length (m)	Cable termination	Part number
0.5	15-way D-type connector ¹	A-9414-1223
1.0		A-9414-1225
1.5		A-9414-1226
3.0		A-9414-1228
0.5	10-way JST connector ²	A-9414-1233
1.0		A-9414-1235
1.5		A-9414-1236
3.0		A-9414-1238

¹ Provided with 'D' pin-out

² Provided with 'K' pin-out

ATOM DX compatible products:



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