

# FORTiS-N™ enclosed encoder system


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## Specification

<b>Measuring standard</b>	Renishaw stainless steel scale with single track absolute encoding
<b>Coefficient of thermal expansion</b> (at 20 °C)	10.1 ±0.2 µm/m/°C
<b>Thermal datum</b>	At centre position (encoder position of 0.5 × measuring length)
<b>Measuring lengths available (mm)</b>	70, 120, 170, 220, 270, 320, 370, 420, 470, 520, 570, 620, 670, 720, 770, 820, 920, 1020, 1140, 1240, 1340, 1440, 1540, 1640, 1740, 1840, 2040 (mounting spar available – recommended for > 620 mm length)
<b>Accuracy grades</b>	High grade: ±3 µm Standard grade: ±5 µm
<b>Resolution*</b>	0.5 nm, 1 nm, 1.25 nm, 10 nm, 12.5 nm, 25 nm, 50 nm
<b>Sub-Divisional Error (typical)</b>	±40 nm
<b>Jitter (RMS)</b>	10 nm
<b>Absolute position serial interface</b>	BiSS C, FANUC ( $\alpha/\alpha i$ ), Mitsubishi, Panasonic, Siemens DRIVE-CLiQ (with external interface)
<b>Encoder electrical connection</b>	Cable connector M12 custom
<b>Controller electrical connection</b>	8-way M12, FANUC 20-way, 10-way Mitsubishi, 17-way M23, 9-way D-Type, 14-way LEMO, flying lead
<b>Cable length</b>	Up to 100 m (with extension cable)
<b>Power supply</b>	5 V ±10% 1.25 W maximum (250 mA @ 5 V)
<b>Set-up LED</b>	Signal strength indicator LED
<b>Maximum speed</b>	4 m/s
<b>Acceleration</b> (readhead relative to scale)	< 200 m/s <sup>2</sup> in measuring direction
<b>Moving force</b> (maximum force required to move the readhead through the seals)	< 4 N
<b>Vibration</b> (55 Hz to 2000 Hz)	Readhead: < 300 m/s <sup>2</sup> to IEC 60068-2-6 Housing without mounting spar: < 200 m/s <sup>2</sup> to IEC 60068-2-6 Housing with mounting spar: < 300 m/s <sup>2</sup> to IEC 60068-2-6
<b>Shock 11 ms half-sine</b>	< 300 m/s <sup>2</sup> IEC 60068-2-27
<b>Operating temperature</b>	0 °C to 50 °C
<b>Environment protection</b>	IP53 when installed correctly, IP64 with air purge
<b>Air purge requirements</b>	Air supply pressure = 1 bar at encoder At correct supply pressure the supplied air connection fitting restricts the air flow rate to 2 l/min
<b>Weight</b>	0.11 kg + 0.45 kg/m

\* See page 2.

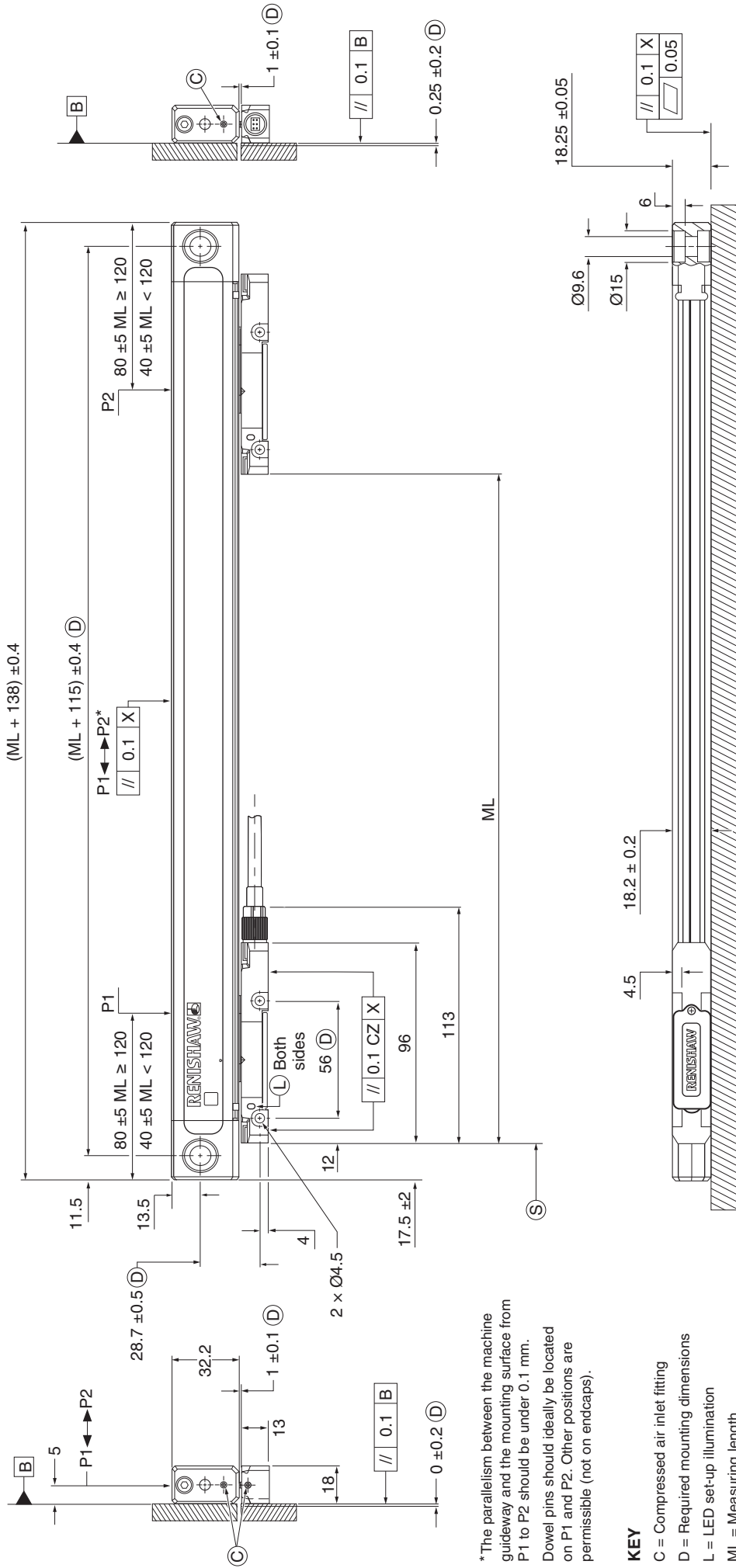
## Resolution per accuracy grade and serial interface – standard options

Accuracy grade	Serial interface	Resolution nm	
		Single	Dual
3 $\mu\text{m}$	BiSS C, Mitsubishi, Panasonic, Siemens DRIVE-CLiQ	1	
	FANUC		1 / 0.5
5 $\mu\text{m}$	BiSS C, Mitsubishi, Panasonic, Siemens DRIVE-CLiQ	10	
		50	
	FANUC		50 / 12.5
			50 / 25

# System installation drawings – standard end caps

(ML 320 mm shown)

Dimensions and tolerances in mm



\*The parallelism between the machine guideway and the mounting surface from P1 to P2 should be under 0.1 mm. Dowel pins should ideally be located on P1 and P2. Other positions are permissible (not on endcaps).

### KEY

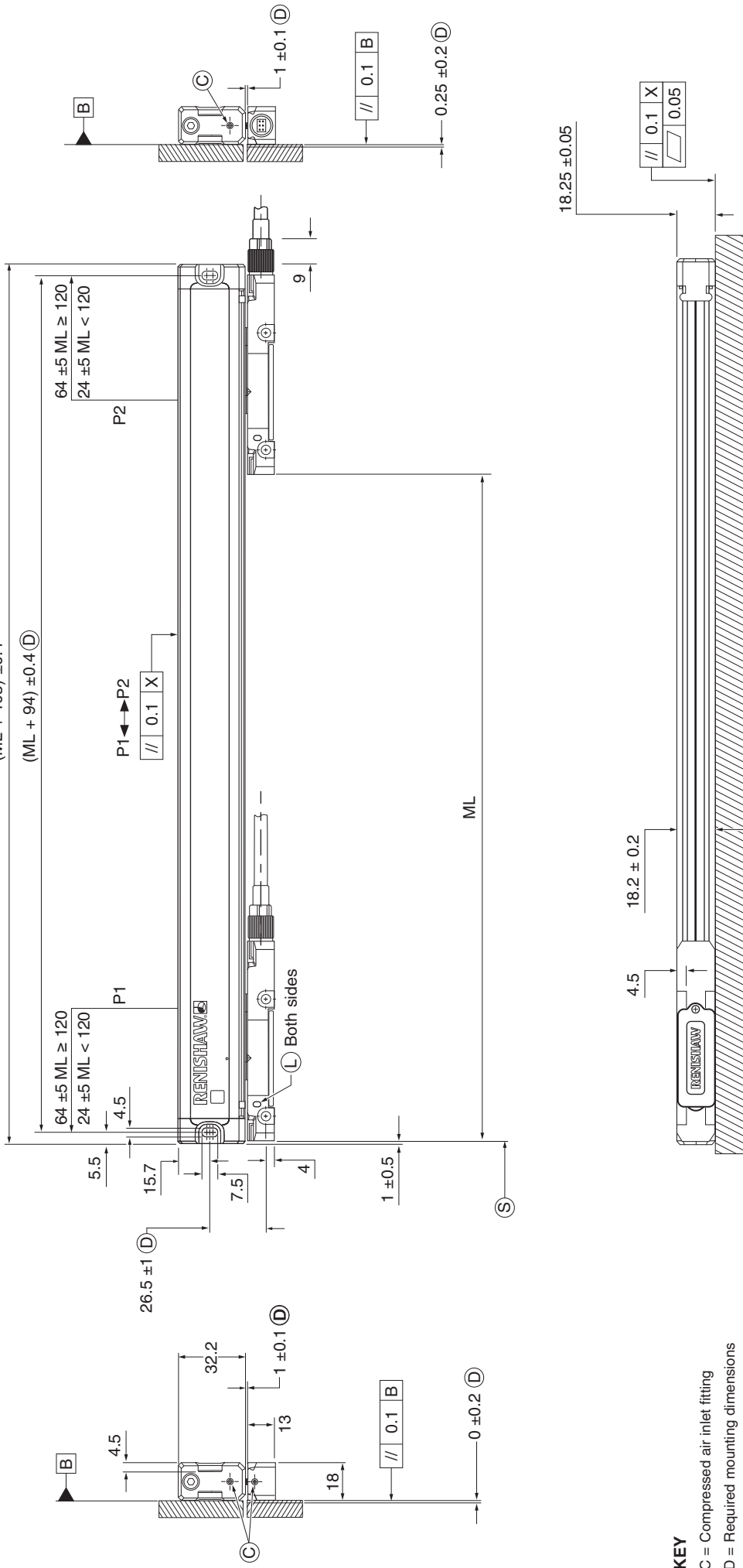
- C = Compressed air inlet fitting
- D = Required mounting dimensions
- L = LED set-up illumination
- ML = Measuring length
- P = Gauging points for alignment
- S = Start of measuring length
- X = Machine guideway/axis datum

ML	70	120	170	220	270	320	370	420	470	520	570	620	670	720	770	820	920	1020	1140	1240	1340	1440	1540	1640	1740	1840	2040
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# System installation drawings – short end caps

(ML 320 mm shown)

Dimensions and tolerances in mm



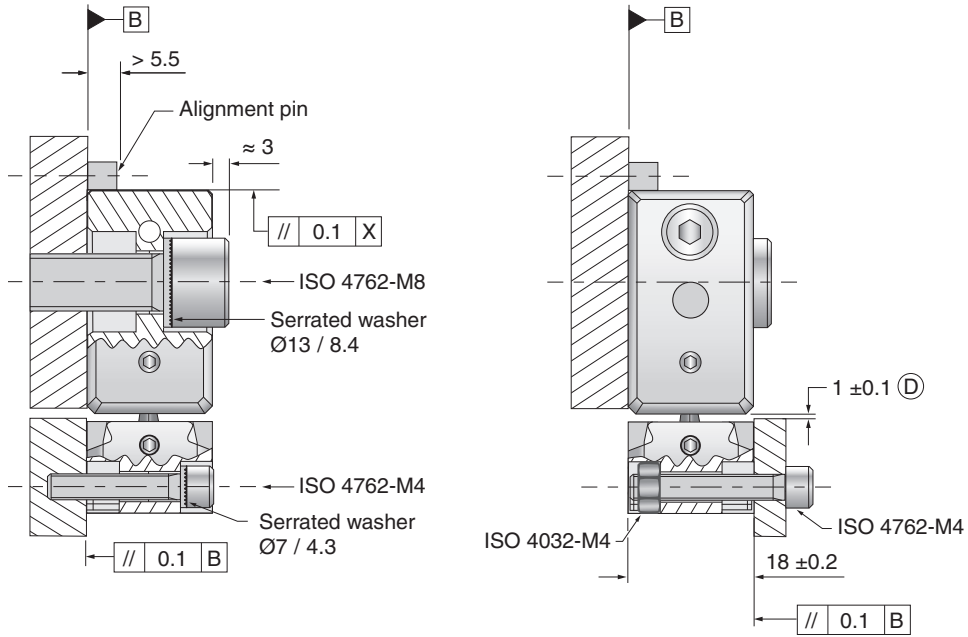
## KEY

- C = Compressed air inlet fitting
- D = Required mounting dimensions
- L = LED set-up illumination
- ML = Measuring length
- P = Gauging points for alignment
- S = Start of measuring length
- X = Machine guideway/axis datum

ML	70	120	170	220	270	320	370	420	470	520	570	620	670	720	770	820	920	1020	1140	1240	1340	1440	1540	1640	1740	1840	2040
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## Mounting orientations – standard end caps

Dimensions and tolerances in mm



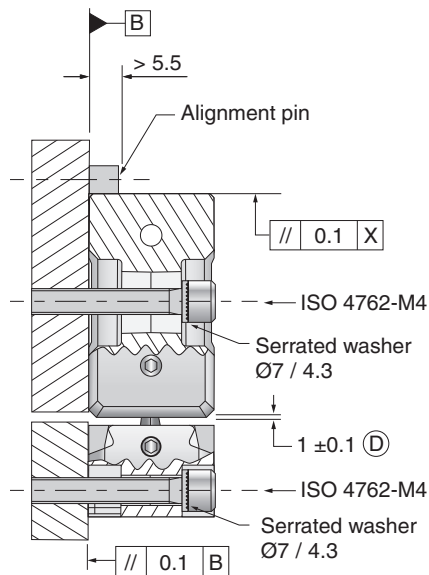
### KEY

D = Required mounting dimensions  
X = Machine guideway/axis datum

### NOTES

- ▶ Side elevations show alternative mounting orientations.
- ▶ Alignment pin and machine edge mounting options to mate directly to the top face of the extrusion.

## Mounting orientation – short end caps



### KEY

D = Required mounting dimensions  
X = Machine guideway/axis datum

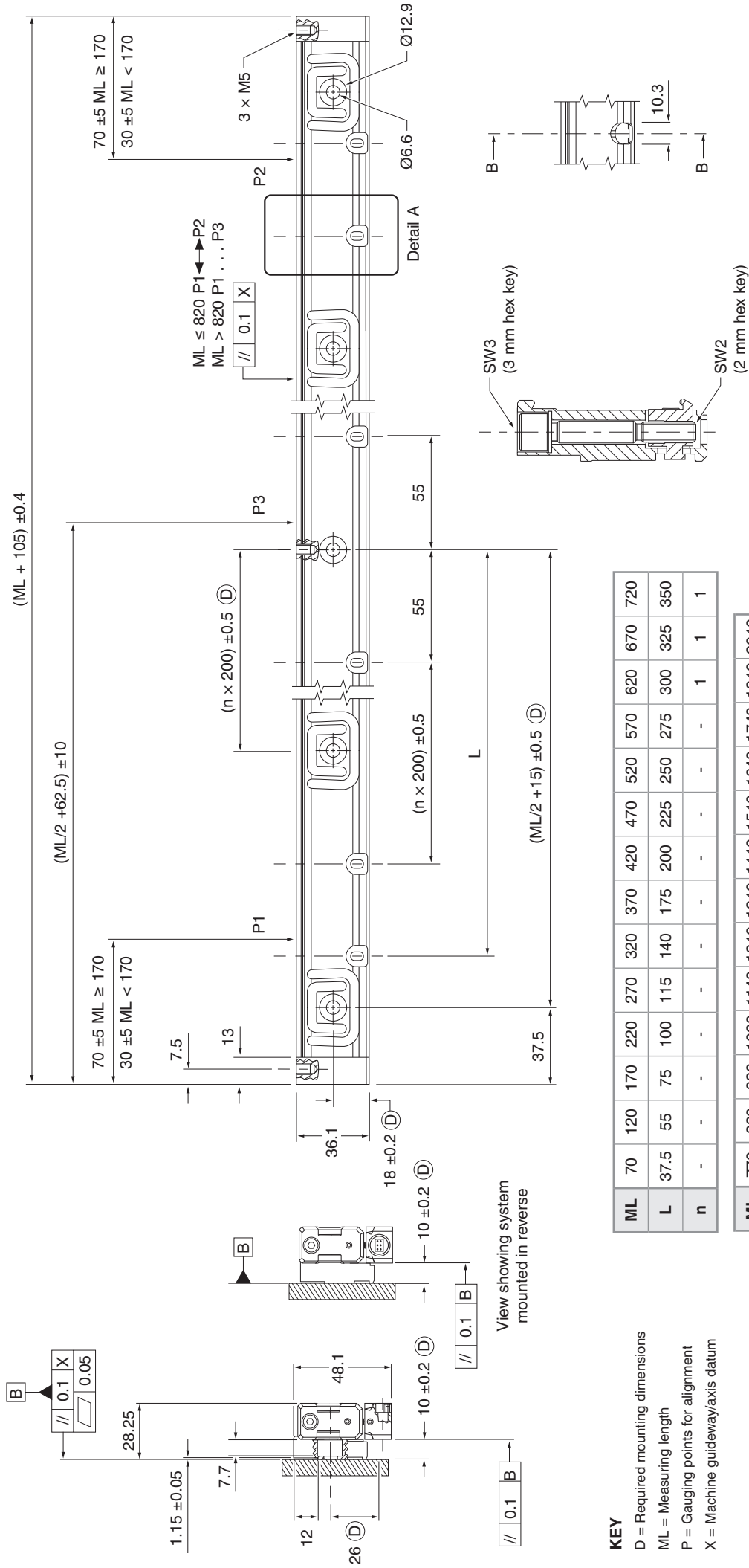
### NOTES

- ▶ Side elevation shows alternative mounting orientation.
- ▶ Extrusion mounting can be machine edge or dowel pins.

# Mounting spar installation drawing

(ML 620 mm shown)

Dimensions and tolerances in mm



## KEY

- D = Required mounting dimensions
- ML = Measuring length
- P = Gauging points for alignment
- X = Machine guideway/axis datum

ML	70	120	170	220	270	320	370	420	470	520	570	620	670	720
L	37.5	55	75	100	115	140	175	200	225	250	275	300	325	350
n	-	-	-	-	-	-	-	-	-	-	-	1	1	1

ML	770	820	920	1020	1140	1240	1340	1440	1540	1640	1740	1840	2040
L	375	400	450	500	550	640	655	710	760	810	855	910	1010
n	1	1	1	2	2	2	2	3	3	3	3	4	4

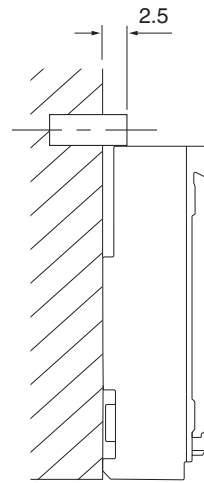
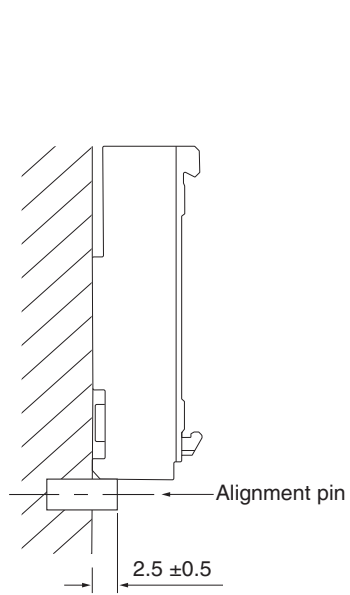
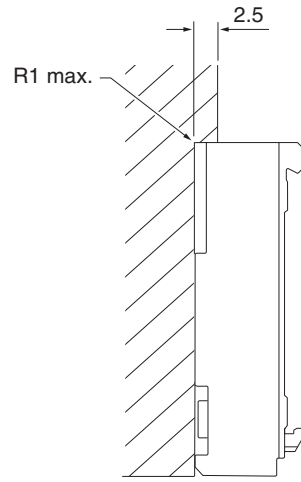
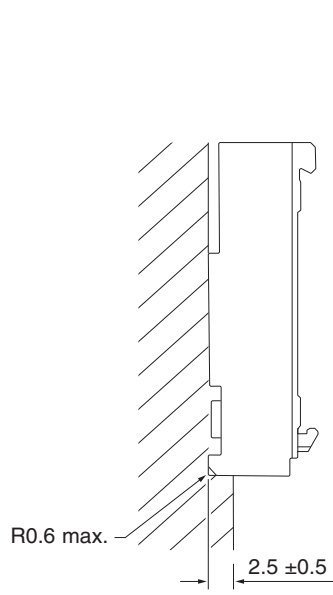
Section B-B through the spar

Detail A

Showing clamp installed

# Spar mounting options

Dimensions and tolerances in mm



## Nomenclature

	F	N	1	0	0	B	204	S	C	36B	X	001	X
<b>Product</b>													
F - FORTiS													
<b>Series</b>													
S - Standard (37 mm)													
N - Narrow (18 mm)													
<b>Encoder type</b>													
1 - Absolute													
<b>Scale type</b>													
0 - 30 µm B code RTLA													
<b>End caps</b>													
0 - Standard													
1 - Small end caps (N type only)													
<b>Lip seal configuration</b>													
A - DuraSeal™ × 1													
B - DuraSeal × 2 (S type only)													
<b>Measuring length*</b>													
FORTiS-S 014 = 140 mm to 304 = 3040 mm													
FORTiS-N 007 = 70 mm to 204 = 2040 mm													
<b>System accuracy</b>													
S - Standard accuracy													
H - High accuracy													
<b>Thermal datum position</b>													
C - Centrally located†													
<b>Serial interface</b>													
36B - BiSS 36 bit													
37F - 37 bit FANUC α and ai													
40N - 40 bit Mitsubishi 4 wire													
48P - 48 bit Panasonic													
28D - Siemens DRIVE-CLiQ 28 bit (50 nm only)													
30D - Siemens Drive-CLiQ 30 bit (10 nm only)													
34D - Siemens Drive-CLiQ 34 bit (1 nm only)													
<b>Functional Safety</b>													
X - Standard													
S - Functional Safety (BiSS Safety and Siemens DRIVE-CLiQ only)													
<b>Resolution</b>													
001 - 1 nm (all protocols except FANUC)													
010 - 10 nm (all protocols except FANUC)													
050 - 50 nm (all protocols except FANUC)													
T12 - 1 / 0.5 nm (FANUC only)													
108 - 10 / 1.25 nm (FANUC only)													
502 - 50 / 25 nm (FANUC only)													
504 - 50 / 12.5 nm (FANUC only)													
<b>Additional field</b>													
X - Standard, no option													
D - Standard encoder with one additional readhead													

\* For all permissible measuring length options refer to specification table.

† For other datum requirements contact your local Renishaw representative.

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