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HPMA and TSI 3 / TSI 3-C motorised arm and interface



HPMA specification

Variant		Standard rear exit	Standard side exit
Principal application		Tool measuring and broken tool detection on 2-axis and 3-axis CNC lathes	
Transmission type		Hard-wired transmission	
Weight		≈ 5 kg (176 oz)	
Probe		RP3 [1]	
Compatible interfaces		TSI 3 or TSI 3-C	
Cable (arm to interface)	Type	Ø7.3 mm (0.29 in), 5-core screened cable, each core is 0.75 mm^2	Ø4.35 mm (0.17 in), 4-core screened cable, each core is 0.22 mm^2
	Length	2 m (6.5 ft), 5 m (16.4 ft), 10 m (32.8 ft)	7 m (22.9 ft)
Sense directions		±X, ±Y, +Z (refer to **page 2**, "HPMA dimensions", for axes definition)	
Typical positional repeatability [2] [3]		5 µm (197 µin) 2σ X/Y (arms for machines with 6 in to 15 in chucks) 8 µm (315 µin) 2σ X/Y (arms for machines with 18 in to 24 in chucks)	
Stylus trigger force [4] [5] XY low force XY high force +Z direction		 1.5 N, 153 gf (5.4 ozf) 3.5 N, 357 gf (12.59 ozf) 12 N, 1224 gf (43.16 ozf)	
Arm sweep motion		Motorised	
Arm sweep time		Typically 3 seconds in each direction	
Arm sweep angle		90°	
Mounting		M8 bolts (× 3)	
Probe pocket mounting		M6 bolts (× 2)	
Environment	IP rating	IPX6 and IPX8, BS EN 60529:1992+A2:2013	
	Storage temperature	–25 °C to +70 °C (–13 °F to +158 °F)	
	Operating temperature	+5 °C to +55 °C (+41 °F to +131 °F)	

1 Where the RP3 is to be used in the probe's Z axis, a five-faced stylus is available to order from the Renishaw Online store at **www.renishaw.com/shop**.

2 Test conditions: Stylus length: 22 mm (0.87 in)
Stylus velocity: 36 mm/min (1.42 in/min)

3 Repeatability performance is not specified in the arm rotational axis. Refer to **page 2**, "HPMA dimensions", to identify this axis.

4 Trigger force, which is critical in some applications, is the force exerted on the stylus by the tool when the probe triggers. The maximum force applied will occur after the trigger point (overtravel). The force value depends on related variables including measuring speed and machine deceleration.

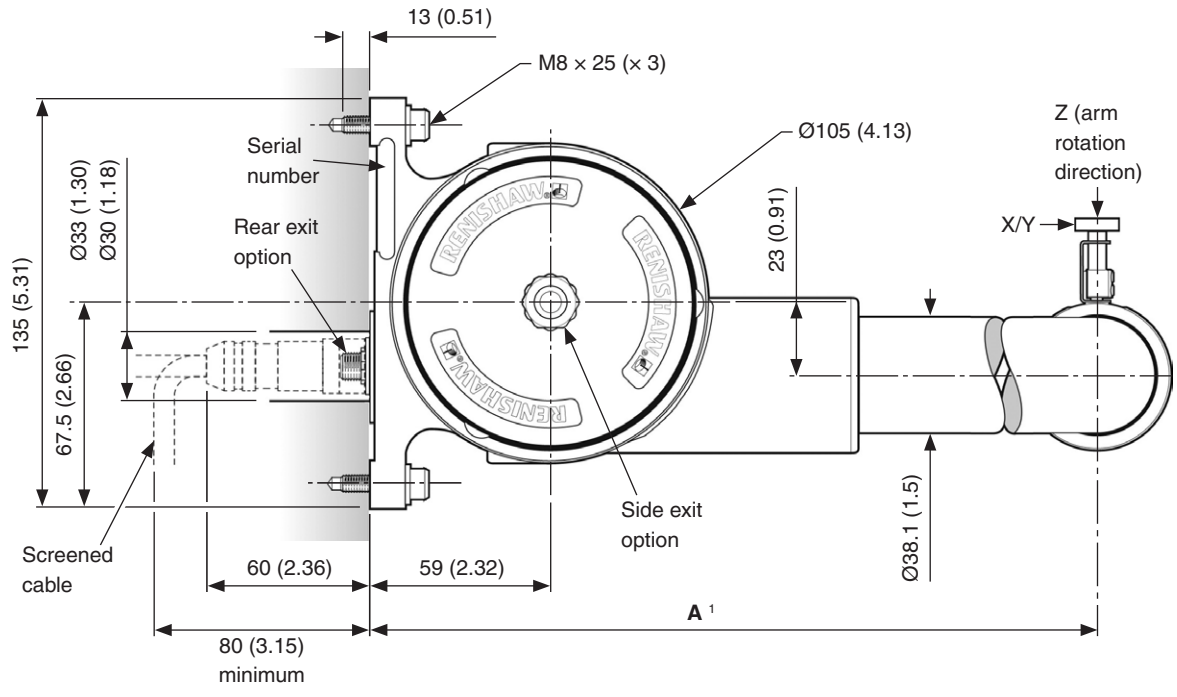
5 These are the factory settings; manual adjustment is not possible.

TSI 3 / TSI 3-C specification

Variant		TSI 3	TSI 3-C
Principal application		Input and output interfacing between the HPMA arm and the host CNC controller	
Weight		≈ 0.2 kg (7 oz)	
Mounting		DIN rail preferred; alternatively M4 screw (× 2)	
I/O connector type		25-way D-sub, 4-40 UNC (× 2)	
Inputs		Opto isolated drive commands and probe inhibit command, 15 Vdc to 30 Vdc	
Outputs		OCT active high for ARO, MRO and X+, X–, Z+, Z– (machine axes)	Voltage-free SSRs for probe status, arm ready and arm stowed
Four-wire I/O probe option (for example, Fanuc automatic length measurement input XAE, ZAE)		Four internally pulled down active high inputs, four OCT active high outputs	N/A
Power supply requirement	Voltage	24 Vdc	
	Current	3 A	
Environment	IP rating	IP20, BS EN 60529:1992+A2:2013	
	Storage temperature	–25 °C to +70 °C (–13 °F to +158 °F)	
	Operating temperature	+5 °C to +55 °C (+41 °F to +131 °F)	

HPMA dimensions

The arm and probe holder arrangement shown is for illustration purposes only.

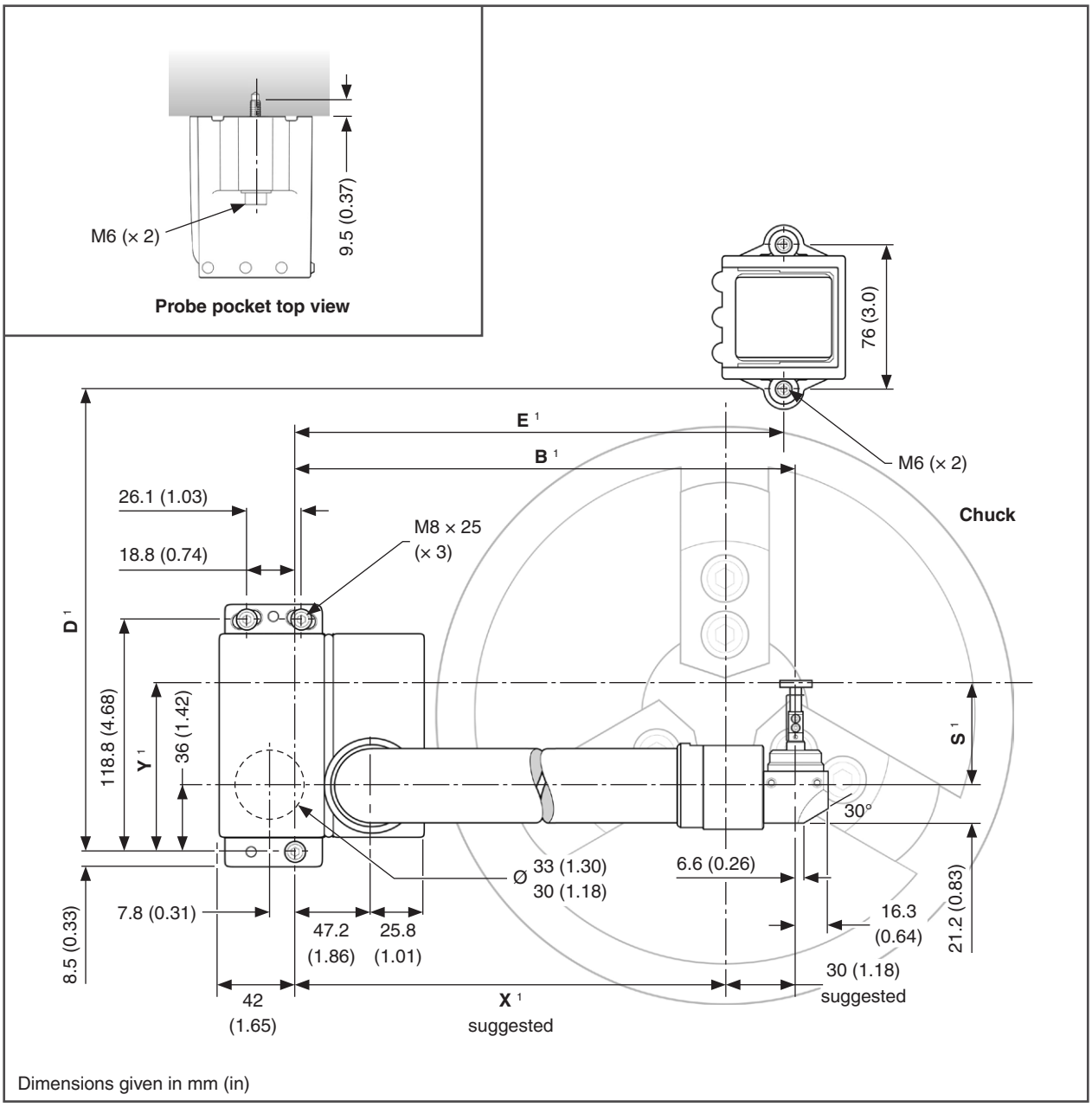


Dimensions given in mm (in)

[1] A range of standard sizes are available, with either a rear or side exit connection. See **page 4**, "Standard arms dimension table", for further information.

HPMA mounting details

The arm and probe holder arrangement shown is for illustration purposes only.



Dimensions given in mm (in)

[1] A range of standard sizes are available, with either a rear or side exit connection. See **page 4**, "Standard arms dimension table", for further information.

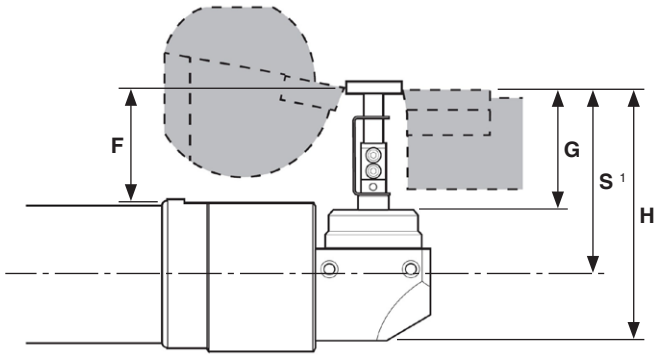
Standard arms dimension table

Chuck size	Tooling size	Arm size		D	E	S [1]	X	Y
		A	B					
6 in	16 mm 20 mm 25 mm 32 mm	250 (9.84)	219.2 (8.63)	212 (8.35)	212 (8.35)	35.7 (1.40) 41 (1.61) 51 (2.01) 56 (2.20)	189.2 (7.45)	71.7 (2.82) 77 (3.03) 87 (3.42) 92 (3.62)
8 in	16 mm 20 mm 25 mm 32 mm	286 (11.26)	249.2 (9.81)	248 (9.76)	242 (9.53)	35.7 (1.40) 41 (1.61) 51 (2.01) 56 (2.20)	219.2 (8.63)	71.7 (2.82) 77 (3.03) 87 (3.42) 92 (3.62)
10 in	16 mm 20 mm 25 mm 32 mm 40 mm	335 (13.19)	298.2 (11.74)	297 (11.69)	291 (11.46)	35.7 (1.40) 41 (1.61) 51 (2.01) 56 (2.20) 61 (2.40)	268.2 (10.56)	71.7 (2.82) 77 (3.03) 87 (3.42) 92 (3.62) 97 (3.82)
12 in	16 mm 20 mm 25 mm 32 mm 40 mm 50 mm	368 (14.49)	298.2 (11.74)	330 (12.99)	291 (11.46)	35.7 (1.40) 41 (1.61) 51 (2.01) 56 (2.20) 61 (2.40) 71 (2.80)	268.2 (10.56)	71.7 (2.82) 77 (3.03) 87 (3.42) 92 (3.62) 97 (3.82) 107 (4.21)
15 in	20 mm 25 mm 32 mm 40 mm 50 mm	400 (15.75)	343.2 (13.51)	362 (14.25)	336 (13.23)	41 (1.61) 51 (2.01) 56 (2.20) 61 (2.40) 71 (2.80)	313.2 (12.33)	77 (3.03) 87 (3.42) 92 (3.62) 97 (3.82) 107 (4.21)
18 in	25 mm 32 mm 40 mm 50 mm	469 (18.46)	383.2 (15.09)	431 (16.97)	376 (14.80)	51 (2.01) 56 (2.20) 61 (2.40) 71 (2.80)	353.2 (13.91)	87 (3.42) 92 (3.62) 97 (3.82) 107 (4.21)
24 in	25 mm 32 mm 40 mm 50 mm	555 (21.85)	458.2 (18.04)	517 (20.35)	451 (17.76)	51 (2.01) 56 (2.20) 61 (2.40) 71 (2.80)	428.2 (16.86)	87 (3.42) 92 (3.62) 97 (3.82) 107 (4.21)

Dimensions given in mm (in)

[1] Stylus height, S, is adjustable.

Stylus dimensions by tool size



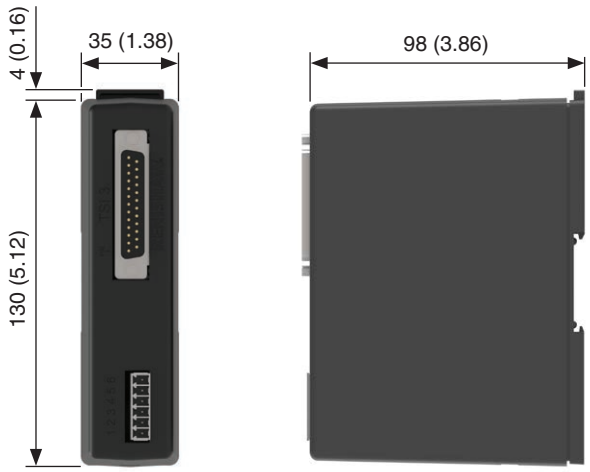
[1] Stylus height, S, is adjustable.

Tooling size	Stylus length	F	G	H	S
16 mm	14.2 (0.56)	14.2 (0.56)	19.1 (0.75)	56.9 (2.24)	35.7 (1.40)
20 mm	19.5 (0.77)	19.5 (0.77)	24.4 (0.96)	62.2 (2.45)	41 (1.61)
25 mm	29.5 (1.16)	29.5 (1.16)	34.4 (1.35)	72.2 (2.84)	51 (2.01)
32 mm	34.5 (1.36)	34.5 (1.36)	39.4 (1.55)	77.2 (3.04)	56 (2.20)
40 mm	39.5 (1.56)	39.5 (1.56)	44.4 (1.75)	82.2 (3.24)	61 (2.40)
50 mm	49.5 (1.95)	49.5 (1.95)	54.4 (2.14)	92.2 (3.63)	71 (2.80)

Dimensions given in mm (in)

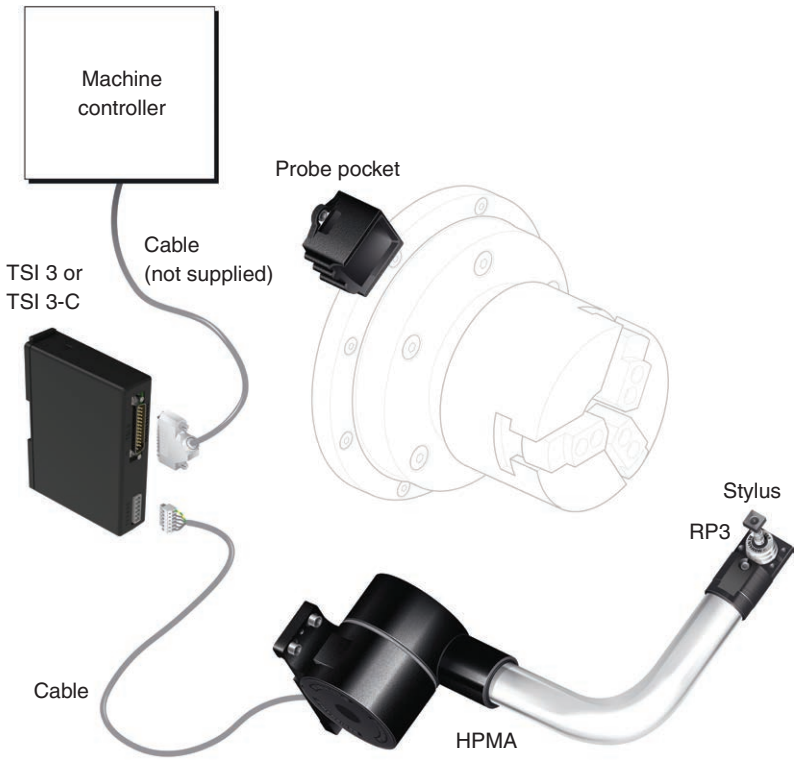
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TSI 3 and TSI 3-C dimensions



Dimensions given in mm (in)

Typical system



www.renishaw.com/hpma

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