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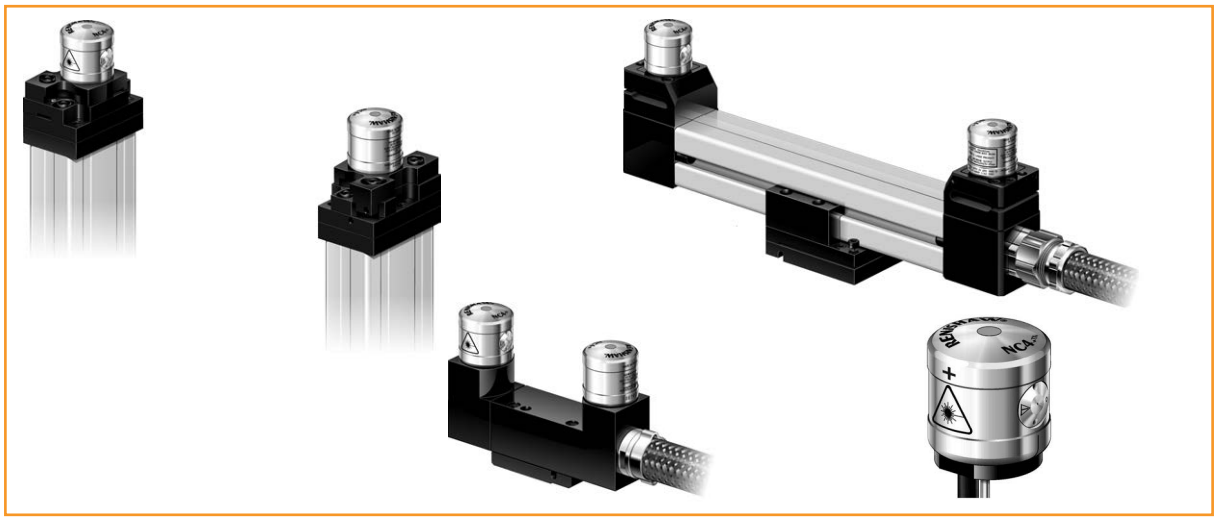
NC4 non-contact tool setting system

www.renishaw.com/nc4



Tool measurement and broken tool detection anywhere along the beam.

The NC4 allows fast, non-contact tool setting and tool breakage detection on a variety of machining centres. Available as fixed system and separate system variants, the NC4 incorporates the unique MicroHole™ protection system and the innovative failsafe PassiveSeal™, maintaining IPX8 environmental protection.

With all NC4 systems, precision optics are supplied as standard. These enable the compact series to achieve unsurpassed performance in a unit particularly suited to small machines and machines where space is at a premium.

NC4+ key benefits

- Excellent tool to tool accuracy.
- Suitable for applications using small diameter tools.

System components

- **NC4 tool setting system**
  A compact 2-axis non-contact tool setting system (±X or ±Y and ±Z) that can operate in any orientation.
- **NCi-5 interface**
  Processes the signals from the NC4 and CNC machine control.
- **Air filter/regulator**
  Provides the NC4 with clean dry air to protect it against coolant and swarf. Simple to install and no M-codes are required.
- **Software for tool setting/broken tool detection**
  Renishaw's dedicated software for NC4 systems is compatible with a wide range of machines and controllers and is designed to provide accurate measurement results in the machining environment.
- **Air blast and solenoid kits**
  For greatest consistency, the Renishaw air blast kit is strongly recommended to ensure measured tools are coolant free. A solenoid valve is available to turn the air on and off, which can be controlled by the NCi-5 interface.

System features

- Compact design Ø30 mm x 35 mm high.
- Measurement of tools and detection of broken tools Ø0.03 mm and larger. *
- If the air is switched off, the PassiveSeal™ failsafe sealing device prevents contamination, maintaining IPX8 protection.
- Stainless steel body – resistant to the hostile machining environment.
- Proven MicroHole™ technology – no moving parts.
- Single conduit exit from product – electrical and pneumatic cables enter via single conduit.
- Measurement of tool length and diameter at normal spindle cutting speeds.
- Drip rejection mode – rejects signals from random drops of coolant falling through the beam.
- Up to 5 m separation (separate system only).
- Modular and compact fixed systems – 95 mm to 300 mm overall length. Other ranges available on request.

* dependent on system, separation and mounting.

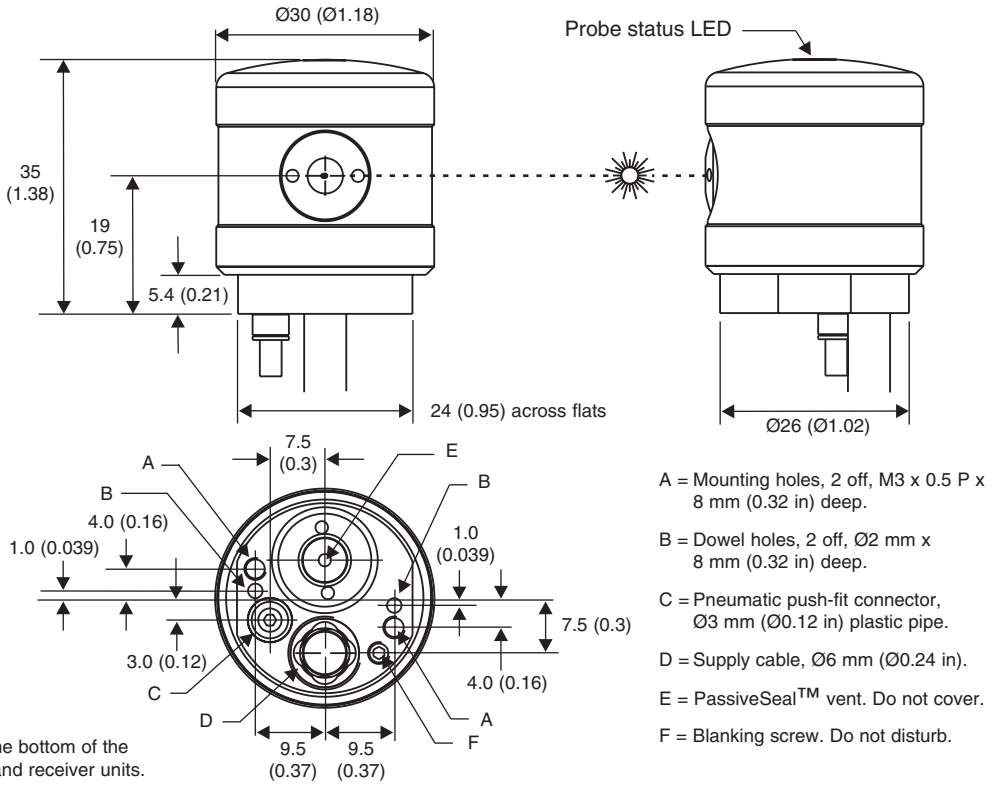
Specification

Principal application	High-precision, high-speed, non-contact tool measuring and broken tool detection on vertical and horizontal machining centres.	
Laser type	Class 2 laser product.	
Electrical connection arrangement	Separate system:	Hardwired cable on the underside of the unit.
	Fixed systems:	Hardwired cable on the end of the unit. Other configurations are available on request.
Sealing	IPX8 (air on or off).	
Laser beam alignment	Separate system:	Various optional adjuster packs are available.
	Fixed systems:	The unit is supplied with an adjustable mounting plate on the underside.
Specified repeatability	NC4:	±1 µm (0.00004 in) 2σ at 1 m (3.28 ft) separation.
	NC4+ F145:	±1 µm (0.00004 in) 2σ at 85 mm (3.35 in) separation.
Tool measurement	Ø0.03 mm (0.0012 in) or larger depending on the separation and set-up.	
Tool breakage detection	Ø0.03 mm (0.0012 in) or larger depending on the separation and set-up.	
Power supply	120 mA @ 12 V, 70 mA @ 24 V	
Output signal (from interface unit)	2 voltage-free, solid state relays (SSR). Each can be either normally open or normally closed (selectable via a switch). Current (max.) 50 mA, voltage (max.) ±50 V. The interface contains an auxiliary relay which can be used for switching the output between the NC4 and a spindle probe. This relay could also be used to control an air blast kit (not supplied).	
Temperature limit	Storage:	–25 °C to +70 °C (-13 °F to +158 °F).
	Operating:	+5 °C to +55 °C (+41 °F to +131 °F).
Life	Tested to >1 million on/off cycles.	
Pneumatic supply	Ø3 mm air pipe, 3 bar (43 psi) min., 6 bar (87 psi) max. The air supply to the NC4 must conform to ISO 8573-1: Class 1.7.2.	
Cable	Two twisted pairs, 2 individual cores plus screen. Each core 18/0.1 insulated. Ø6.0 mm (0.24 in) x 12.5 m (39.36 ft) long.	
Weight (single transmitter or receiver unit with cable)	0.5 kg (1.1 lb)	
Mounting	Separate system:	2 off M3 x 0.5 P fixing holes plus 2 off Ø2 mm (0.079 in) dowel holes.
	Fixed systems:	Single M10 (3/8 in) or M12 (½ in) fixing. Alternative fixing arrangements available.
Supply protection	Resettable fuses. Reset by removing power and cause of fault.	

Separate system

Refer to the NC4 accessories data sheet (H-2000-2223) for mounting details.

Dimensions in mm (in)



View from the bottom of the transmitter and receiver units.

A = Mounting holes, 2 off, M3 x 0.5 P x 8 mm (0.32 in) deep.

B = Dowel holes, 2 off, Ø2 mm x 8 mm (0.32 in) deep.

C = Pneumatic push-fit connector, Ø3 mm (Ø0.12 in) plastic pipe.

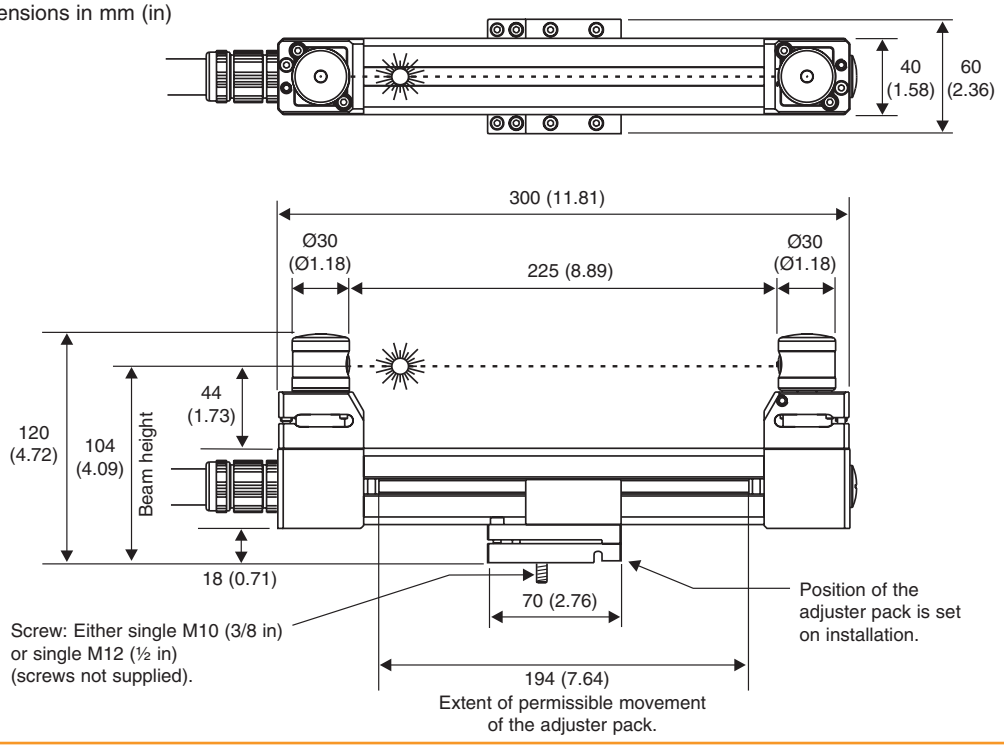
D = Supply cable, Ø6 mm (Ø0.24 in).

E = PassiveSeal™ vent. Do not cover.

F = Blanking screw. Do not disturb.

Modular fixed system

Dimensions in mm (in)



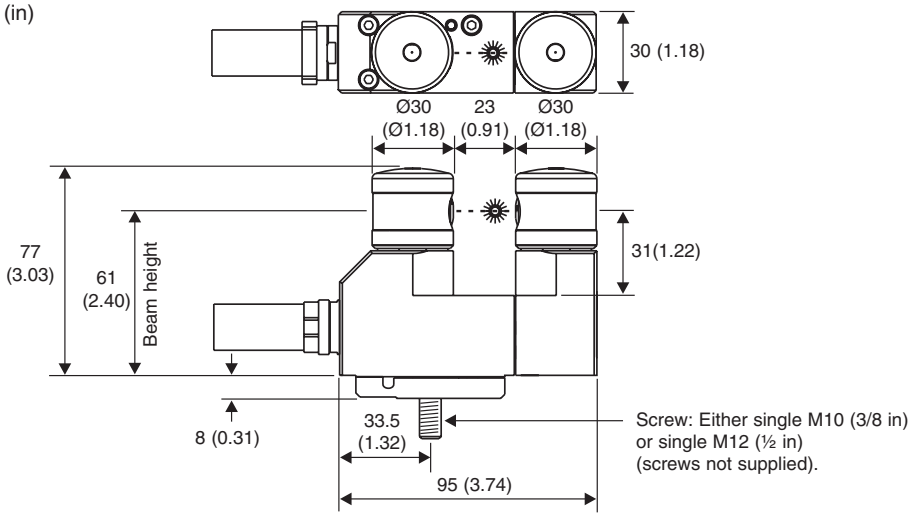
Screw: Either single M10 (3/8 in) or single M12 (½ in) (screws not supplied).

Position of the adjuster pack is set on installation.

Extent of permissible movement of the adjuster pack.

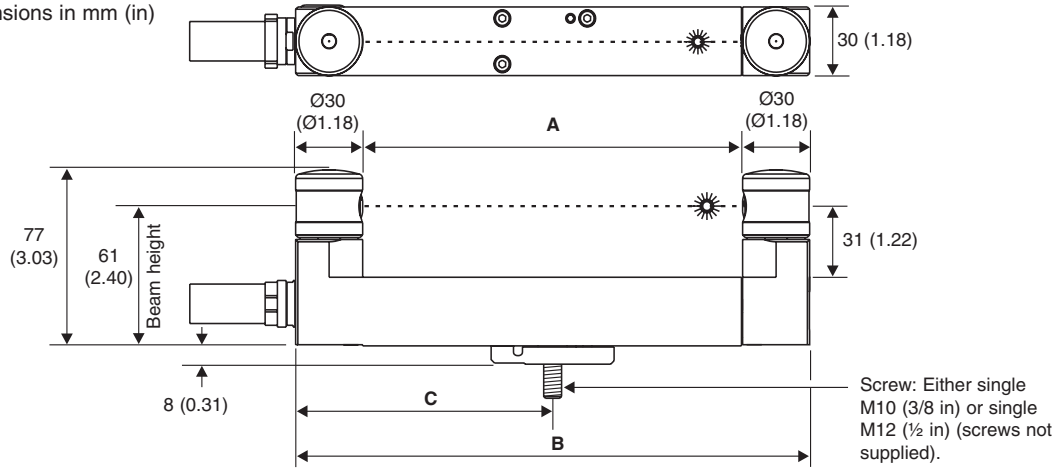
Compact fixed system - F95 model

Dimensions in mm (in)



Compact fixed system - F115, F145, F230 and F300 models

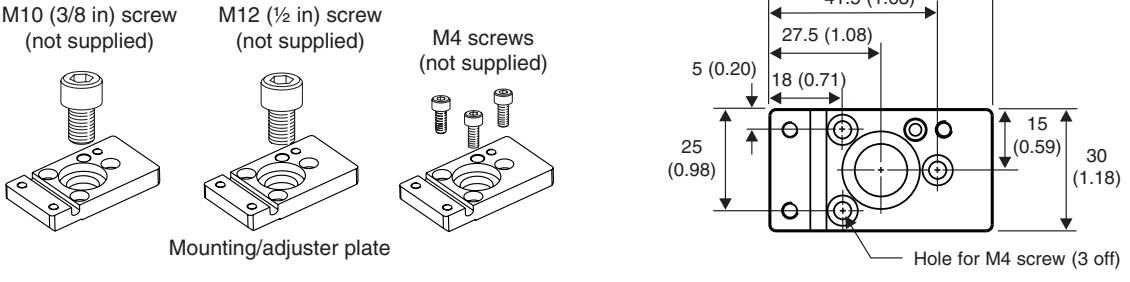
Dimensions in mm (in)



Model	F115	NC4/NC4+ F145	F230	F300
Dimension A	55 (2.17)	85 (3.34)	170 (6.69)	240 (9.45)
Dimension B	115 (4.53)	145 (5.71)	230 (9.06)	300 (11.81)
Dimension C	57.5 (2.27)	72.5 (2.85)	115 (4.53)	150 (5.91)

Mounting arrangements

Dimensions in mm (in)



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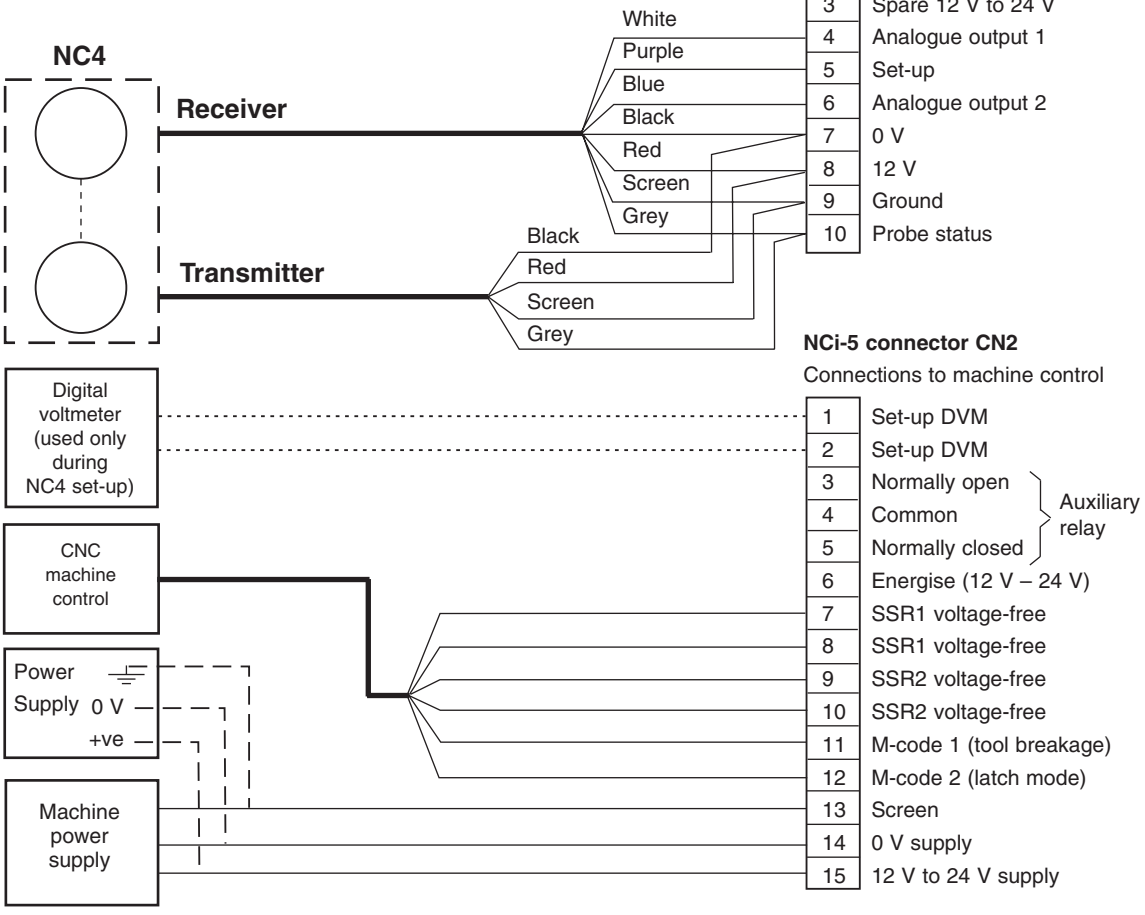
Electrical connections

The NC4 connects to the machine controller via the NCi-5 interface.

Refer to the NCi-5 interface data sheet (H-5259-8200) for more details.



NCi-5 connector CN1
Connections to NC4

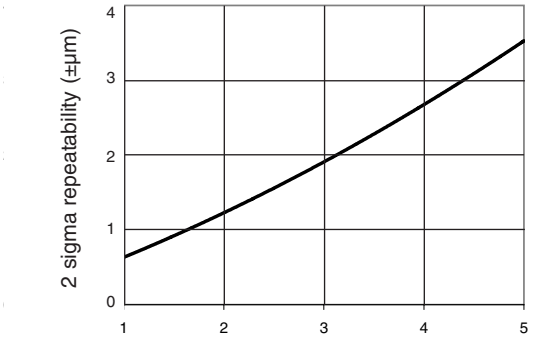
1	Not used
2	Spare 0 V
3	Spare 12 V to 24 V
4	Analogue output 1
5	Set-up
6	Analogue output 2
7	0 V
8	12 V
9	Ground
10	Probe status

NCi-5 connector CN2
Connections to machine control

1	Set-up DVM	
2	Set-up DVM	
3	Normally open	Auxiliary relay
4	Common	
5	Normally closed	
6	Energise (12 V – 24 V)	
7	SSR1 voltage-free	
8	SSR1 voltage-free	
9	SSR2 voltage-free	
10	SSR2 voltage-free	
11	M-code 1 (tool breakage)	
12	M-code 2 (latch mode)	
13	Screen	
14	0 V supply	
15	12 V to 24 V supply	

Performance - typical NC4 repeatability

NOTE: The trend line is calculated from the average 2 sigma repeatability values from 20 NC4 systems.



System separation (m)

Transmitter/receiver separation (m)			Minimum tool diameter (mm) when …	
			… measured	… detected
Compact fixed system	F95	0.023	0.03	0.03
	F115	0.055	0.07	0.04
	F145	0.085	0.08	0.05
	NC4+ F145	0.085	0.03	0.03
	F230	0.170	0.20	0.07
	F300	0.240	0.20	0.10
Modular fixed system	F300	0.225	0.20	0.10
Separate system		0.50	0.30	0.10
		1.00	0.40	0.20
		2.00	0.50	0.20
		3.00	0.60	0.30
		4.00	1.00	0.30
		5.00	1.00	0.30

For guidance purposes only.

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Parts list – please quote the part number when ordering equipment

Separate systems - assembly only

Description: Transmitter and receiver, laser warning sign, installation and maintenance guide.

Type	Part number
S300 to 500 assembly	A-4114-5005
S500 to 800 assembly	A-4114-5010
S800 to 1500 assembly	A-4114-5015
S1500 to 2000 assembly	A-4114-5020
S2000 to 3000 assembly	A-4114-5025
S3000 to 5000 assembly	A-4114-5030

Separate system kits

Description: Transmitter and receiver, NCi-5 interface, air filter kit, conduit kit, tool kit, laser warning sign, installation and maintenance guide.

Type	Part number
S300 to 500 kit	A-4114-5055
S500 to 800 kit	A-4114-5060
S800 to 1500 kit	A-4114-5065
S1500 to 2000 kit	A-4114-5070
S2000 to 3000 kit	A-4114-5075
S3000 to 5000 kit	A-4114-5080

Separate system kits without air filters

Description: Transmitter and receiver, NCi-5 interface, conduit kit, tool kit, laser warning sign, installation and maintenance guide.

Type	Part number
S300 to 500 kit	A-4114-5555
S500 to 800 kit	A-4114-5560
S800 to 1500 kit	A-4114-5565
S1500 to 2000 kit	A-4114-5570
S2000 to 3000 kit	A-4114-5575
S3000 to 5000 kit	A-4114-5580

Modular fixed system

Type	Part number
F300 assembly	A-4114-5100
F300 kit	A-4114-5110
F300 kit without air filter kit	A-4114-5610

Compact fixed systems - assembly only

Description: Compact fixed unit, laser warning sign, installation and maintenance guide.

Type	Part number
F95 assembly	A-5299-5210
F115 assembly	A-5299-5010
F145 assembly	A-5299-5310
F145 90-degree assembly	A-5299-5410
NC4+ F145 assembly	A-5535-5310
NC4+ F145 90-degree assembly	A-5535-5410
F230 assembly	A-5299-5110
F300 assembly	A-5299-5710

Compact fixed system kits

Description: Compact fixed unit, NCi-5 interface, air filter kit, conduit kit, laser warning sign, installation and maintenance guide.

Type	Part number
F95 kit	A-5299-5200
F115 kit	A-5299-5000
F145 kit	A-5299-5300
F145 90-degree kit	A-5299-5400
NC4+ F145 kit	A-5535-5300
NC4+ F145 90-degree kit	A-5535-5400
F230 kit	A-5299-5100
F300 kit	A-5299-5705

Compact fixed system kits without air filters

Description: Compact fixed unit, NCi-5 interface, conduit kit, laser warning sign, installation and maintenance guide

Type	Part number
F95 kit	A-5299-5700
F115 kit	A-5299-5500
F145 kit	A-5299-1001
F145 90-degree kit	A-5299-5410
NC4+ F145 kit	A-5535-1001
NC4+ F145 90-degree kit	A-5535-1002
F230 kit	A-5299-5600
F300 kit	A-5299-5800

Publications. These can be downloaded from our website at www.renishaw.com

Type	Part number
NC4 accessories data sheet	H-2000-2223
NC4 installation and maintenance guide	H-2000-5230
NCi-5 interface installation and user's guide	H-5259-8500
NCi-5 interface data sheet	H-5259-8200
Software features data sheet	H-2000-2289
Software list data sheet	H-2000-2298

For worldwide contact details, please visit our main web site at www.renishaw.com/contact

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