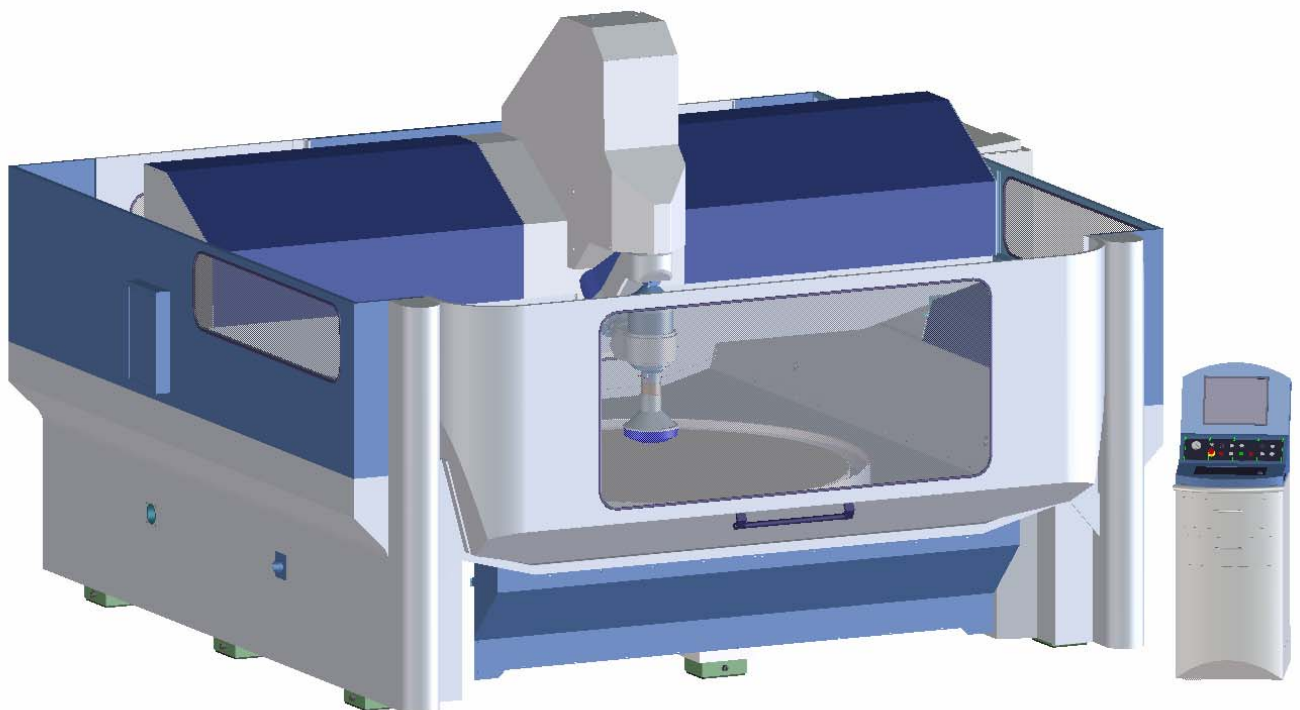


ZEEKO^{Ltd}



IRP1600 Machine Specification - Release 2

1.	Machine description	3
2.	Machine base	3
3.	Machine bridge	3
4.	Arrangement of the machine axes	3
5.	X axis	4
6.	Y axis	4
7.	Z axis	5
8.	Axes alignment	5
9.	A axis	5
10.	B axis	6
11.	C axis	6
12.	H axis	7
13.	Machine enclosure and doors	7
14.	Guards, covers, and safety features	8
15.	Control system and software	8

1. Machine description

The IRP1600 is a bridge based, 7 axes CNC optical polishing/forming machine capable of producing ultra-precise surfaces on a variety of optical materials and surface forms. The machine axes can be used for traditional spiral polishing or raster polishing.

Overall size: 4500mm wide x 4500mm long x 3500mm high

Mass: 32 000 kg

2. Machine base

Precision cast and machined epoxy-granite composite structures with hybrid RHS/ epoxy-granite centre span.

3. Machine bridge

Precision cast and machined epoxy-granite composite.

4. Arrangement of the machine axes

The arrangement and definition of the 7 machine axes:

X: Linear axis horizontally mounted on the machine bridge.

Y: Linear axis horizontally mounted on the machine base, perpendicular to X.

Z: Linear axis vertically mounted from X, normal to the C axis turntable surface.

C: Rotational, mounted on the base - Work piece mounting axis.

A: Rotational, mounted on Z, alignment axis for H

B: Rotational, mounted on A, alignment axis for H

H: Rotational, mounted on B - Machine polishing tool axis.

5. X axis

Travel: 1800 mm

Slide type: THK, SNS 45 – LC caged ball, linear motion rail.

Ball screw: Ø50-12 caged ball, precision ground.

Motor type: Fanuc Alpha 30 H/s

Positioning: Heidenhain absolute linear encoder type LC181

Max velocity: $0.1\text{m}^{-1}\text{sec}$

Max accel: $0.2\text{m}^{-1}\text{sec}^2$

Horizontal straightness: $<40\mu\text{m}$ over full travel

Vertical straightness: $<40\mu\text{m}$ over full travel

Positioning error: $<20\mu\text{m}$ over full travel

Bi-dir repeatability: $< 20\mu\text{m}$

6. Y axis

Travel: 1800 mm

Slide type: THK, SNS 55 – R caged ball, linear motion rail.

Ball screw: Twin Ø50-12 caged ball, precision ground.

Motor type: Twin Fanuc Alpha 50 H/s

Positioning: Heidenhain absolute linear encoder type LC181

Max velocity: $0.1\text{m}^{-1}\text{sec}$

Max accel: $0.2\text{m}^{-1}\text{sec}^2$

Horizontal straightness: $<40\mu\text{m}$ over full travel

Vertical straightness: $<40\mu\text{m}$ over full travel

Positioning error: $<20\mu\text{m}$ over full travel

Bi-dir repeatability: $< 20\mu\text{m}$

7. Z axis

Travel: 750 mm

Slide type: THK, SNS 35 – C caged ball, linear motion rail.

Ball screw: Ø32-5 precision ground.

Motor type: Fanuc Alpha 30 Hi/s with brake

Positioning: Heidenhain absolute linear encoder type LC481

Max velocity: $0.05\text{m}^{-1}\text{sec}$

Max accel: $0.1\text{m}^{-1}\text{sec}^2$

Horizontal straightness: $<40\mu\text{m}$ over full travel

Vertical straightness: $<40\mu\text{m}$ over full travel

Positioning error: $<20\mu\text{m}$ over full travel

Bi-dir repeatability: $< 20\mu\text{m}$

8. Axes Alignment.

Circular interpolation	X-Y	X-Z	Y-Z	A-Z
Max circularity error (μm)	<100	<100	<100	-
Squareness error ($\mu\text{m}/\text{m}$)	<75	<150	<150	<150

9. A axis

Rotation: Rolling element bearings.

Drive system: Harmonic FHC-40 AC servo drive unit with enhanced stiffness.

Rotation range: $\pm 360^\circ$

Max velocity: $15\text{r}^{-1}\text{min}$

Max accel: $1\text{rad}^{-1}\text{sec}^2$

Rotation accuracy: $\pm 2\text{arcmin}$

10. B axis

Rotation:	Rolling element bearings.
Drive system:	Harmonic FHC-40 AC servo drive unit with enhanced stiffness.
Rotation range:	$\pm 90^\circ$
Max velocity:	$15 \text{ r}^{-1}\text{min}$
Max accel:	$1 \text{ rad}^{-1}\text{sec}^2$
Rotation accuracy:	$\pm 2 \text{ arcmin}$

11. C axis

Spindle type:	Rolling element bearings
Motor type:	Fanuc D2100/150is ring motor
Continuous torque:	1250 Nm
Peak torque:	3000 Nm
Encoder type:	Heidenhain RCN 723 absolute encoder.
Speed range:	0 – 100 rpm
Max accel:	$5 \text{ rads}^{-1}\text{sec}^2$
Positioning:	$\pm 5 \text{ arcsec}$
Radial TIR:	$<10\mu\text{m}$ (measured at turntable mounting face)
Axial TIR:	$<25\mu\text{m}$ (measured at $R=800\text{mm}$)
Spindle growth:	$< 25\mu\text{m}$ over one hour (after warm up)
Cooling:	Water cooled motor stator

12. H axis

Head type: Precision classical - Zeeko jet compatible.

Spindle type: Rolling element bearings

Motor type: Fanuc frameless AC servo motor

Continuous torque: 70 Nm

Peak torque: 320 Nm

Encoder type: Heidenhain ERN 100 incremental encoder.

Speed range: 0 – 2000 rpm

Max accel: 2000 rads⁻¹sec²

Radial TIR: <15µm (measured at bonnet mounting face)

Axial TIR: <25µm (measured at bonnet mounting face)

Spindle growth: < 25µm over one hour (after warm up)

Bonnet range: R20 to R320

Tool holding: Schunk Ø40 hydraulic chuck

Part probing repeatability:

R20 and 40	<10µm
R80 and 120	<15µm
R320	<20µm

Cooling: Water cooled motor stator.

13. Machine enclosure and doors

Base mounted side walls with viewing windows

Base mounted rear enclosure with machine access door

Base mounted front enclosure with vertically opening machine door

Stand alone electrical-pneumatics enclosure and machine console

4. Guards, covers, and safety features

The equipment specified herein shall conform to requirements of EC and international safety regulations as required by current legislation.

Cover and guards will be provided to protect the operator from:

- Moving machine parts
- Slurry and spray

Electrical interlocks will prevent opening of the following:

- The polishing enclosure door when the machine is in motion.
- Electrical cabinet when the machine is energised

Emergency stop button readily accessible to the machine operator.

Built-in polishing head crash protection.

15. Control system and software

Fanuc 8 axis controller

15.4" colour TFT LCD with touch panel screen

64 bit Risc processor and dedicated DSP axes controllers

Min Pentium IV PC, minimum 3GHz, High Speed Serial Bus (HSSB)

Multi-axis NURBS interpolation

Ethernet port for data I/O and/or remote diagnostics / maintenance.