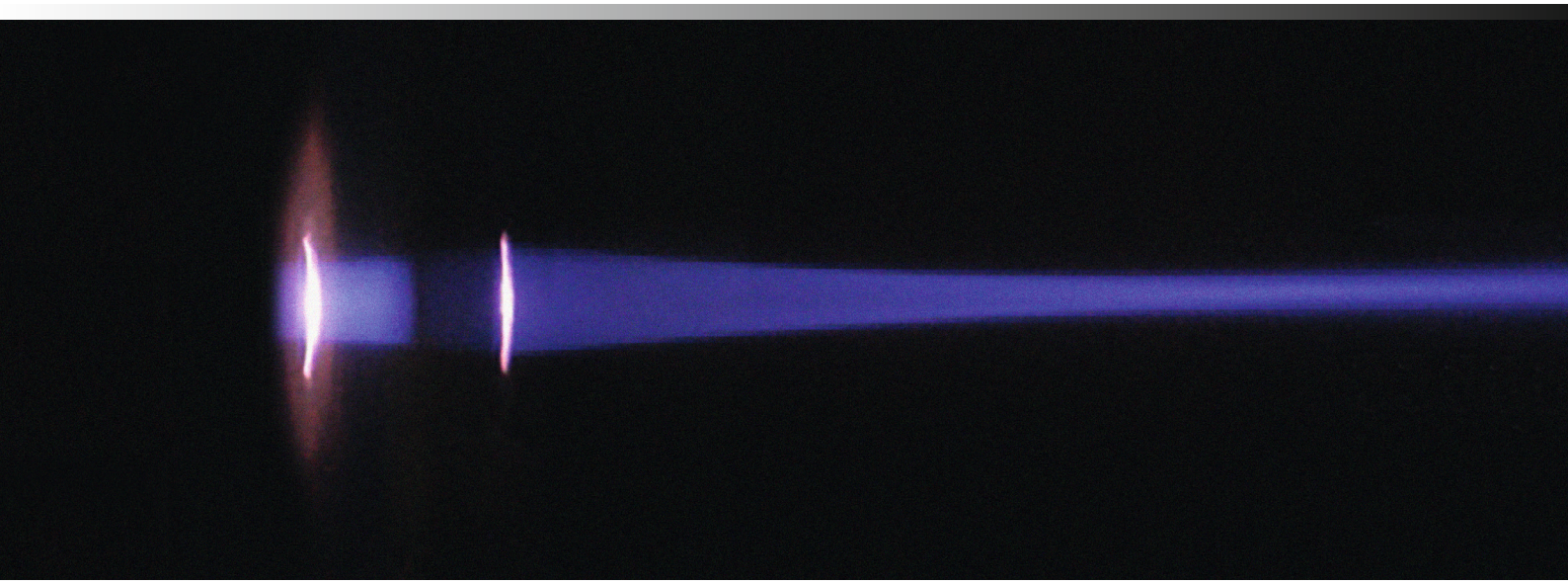
Ion Beam Processing



NTG

Know–how from more than 50 years of practical experience

Ion Beam Processing

The world‘s most renowned manufacturers of precision optics rely on:

- Sophisticated systems for the ultra–precise shape correction of surfaces using ion beams (IBF – Ion Beam Figuring and IBE – Ion Beam Etching)
- Turnkey plant engineering for all dimensions from < 1mm to > 2000mm workpiece diameter
- Low–maintenance, almost wear–free machines with low operating costs
- Experience from over 30 years of ion beam treatment
- Intensive training and support
- Maximum flexibility in adapting to customer requirements due to in–house development and production of almost all parts
- Research, development and job order production in our own IBF / IBE laboratory

The IBF–5 is designed for nano–meter exact correction of smallest optical surfaces. This plant was de–veloped to improve optical compo–nents in shortest time. Beside figure error correction the machine is also suitable for MSF roughness correc–tion and aspherization of smallest samples. Multiprocessing of several optics is available.

IBF5

TECHNICAL DATA

WORK PIECE DATA

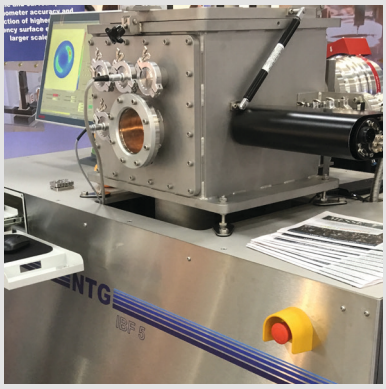
Diameter:	<Ø1 mm – Ø5 mm
	(Ø0.04'' – Ø0.2'')
Thickness:	7 mm (0.275'')
Weight:	max. 750 g (1.65 lbs)
Contact angle:	max. 63°
Shape:	plane, spherical, aspherical, freeform
Batch processing:	multiple work pieces on one carrier

AXIS SYSTEM

Type IBF 5:	X, Y, Z
Travel:	X = 75 mm
	Y = 50 mm
	Z = 25 mm

DIMENSIONS

Weight:	700 kg (1543 lbs)
WxHxD:	1.7 m x 1.5 m x 0.9 m
	(67'' x 59'' x 35'')
Footprint:	3 m x 2.5 m
	(118'' x 98'')



The IBF–100 is designed for nano–meter exact correction of small optical surfaces. This plant was developed to improve optical com–ponents in shortest time.

IBF**100**

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø5 mm – Ø70 mm (Ø0.2'' – Ø2.75'')
Direct loading:	Ø100 mm (4'')
Thickness:	45 mm (1.8'')
Weight:	max. 750 g (1.65 lbs)
Contact angle:	max. 63°
Shape:	plane, spherical, aspherical, freeform

SINGLE LOAD LOCK SYSTEM

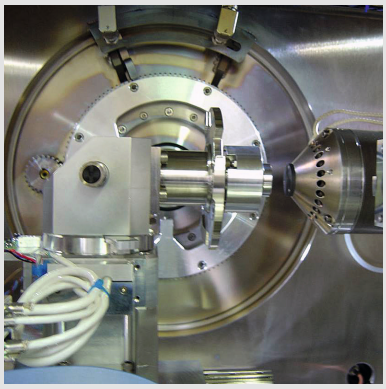
Loading time:	< 2 min.

AXIS SYSTEM

Type: 100–3	X, Y, Z, A
Type: 100–5	X, Y, Z, A, B
Travel:	X = 300 mm Y = 250 mm Z = 150 mm A ± 60° B ± 95°

DIMENSIONS

Weight:	1850 kg (4079 lbs)
WxHxD:	1.56 m x 2.17 m x 1.30 m (61'' x 85'' x 51'')
Footprint:	3 m x 3 m (118'' x 118'')



The IBF–200 is a plant for nano–meter exact correction of small to medium sized optical surfaces. In the 200–S configuration it is pos–sible to process substrates with a contact angle up to 90°. Beside this direct ion beam smoothing and re–active etching can be performed on this plant, too. This makes it most interesting for institutes and univer–sities.

IBF200

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø5 mm – Ø200 mm (Ø0.2'' – Ø2.75'')
Thickness:	100 mm (4'')
Weight:	max. 10 kg (22 lbs)
Contact angle:	max. 63° (standard version) max. 90° (type 200–5)
Shape:	plane, spherical, aspherical, freeform

SINGLE LOAD LOCK SYSTEM

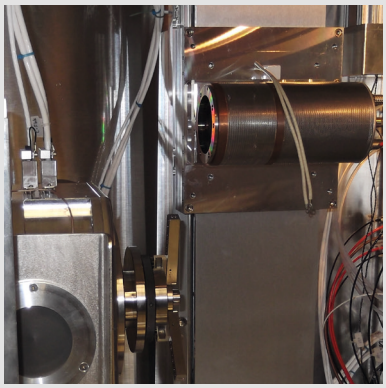
Loading time:	< 2 min.

AXIS SYSTEM

Type: 200–3	X, Y, Z, A
Type: 200–S	X, Y, Z, A, B
Travel:	X = 400 mm
	Y = 400 mm
	Z = 400 mm
	A ± 45°
	B = continuous

DIMENSIONS

Weight:	2450 kg (5390 lbs)
WxHxD:	3.75 m x 2.2 m x 1.7 m (148'' x 87'' x 67'')
Footprint:	5.75 m x 3.7 m (226'' x 146'')



The IBF–200SE was launched in 2016 and is especially designed for industrial use. This new developed plant is for nanometer exact cor–rection of small to medium sized optical surfaces.

IBF200SE

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø5 mm – Ø200 mm
	(Ø0.2'' – Ø2.75'')
	Ø300 mm (12'') – direct loading
Thickness:	100 mm (4'')
Weight:	max. 10 kg (22 lbs)
Contact angle:	max. 63°
Shape:	plane, spherical, aspherical, freeform

SINGLE LOAD LOCK SYSTEM

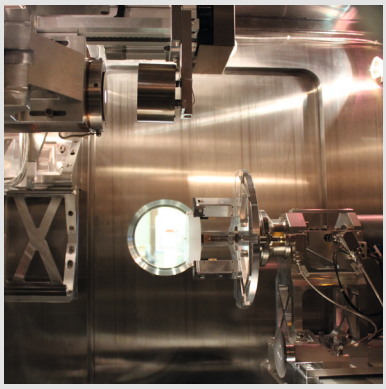
Loading time:	< 2 min.

AXIS SYSTEM

Type: 200 SE	X, Y, Z
Travel:	X = 400 mm
	Y = 400 mm
	Z = 400 mm

DIMENSIONS

Weight:	3500 kg (7700 lbs)
WxHxD:	1.42 m x 2.46 m x 4.34 m
	(56'' x 97'' x 171'')
Footprint:	5.8 m x 3.4 m (228'' x 133'')



The IBF–300 is the mother of all IBF plants. Over a period of more than 25 years it has shown its capabil–ities in various applications. The plant was designed for multi–shift operation (24/7) and series produc–tion. Modifications during the last years improved this machine in a way that it is still a state–of–the–art manufacturing tool.

IBF300

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø5 mm – Ø300 mm
	(Ø0.2'' – Ø12'')
Thickness:	125 mm (5'')
Weight:	max. 30 kg (66 lbs)
Contact angle:	max. 63°
Shape:	plane, spherical, aspherical, freeform

DOUBLE LOAD LOCK SYSTEM

Load lock for two substrates, continuous process

AXIS SYSTEM

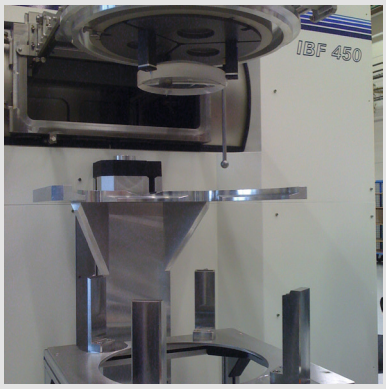
Type: 300–3	X, Y, Z
Type: 300–5	X, Y, Z, A, B
Travel:	X > 300 mm
	Y > 300 mm
	Z = 150 mm
	A ± 50°
	B ± 50°

DIMENSIONS

Weight:	2600 kg (5720 lbs)
WxHxD:	3.2 m x 2.5 m x 2.57 m
	(126'' x 98'' x 101'')
Footprint:	4.2 m x 3.5 m
	(165'' x 138'')

The IBF–450/500 is the enhanced version of the IBF 300. Approved design was kept only the diame–ters and weights of the workpieces were increased.

IBF**450**
IBF**500**



TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø70 mm – Ø450 mm (Ø500 mm) (Ø2.75'' – Ø18'' / Ø20'')
Thickness:	125 mm (5'')
Weight:	max. 40 kg (88 lbs)/50 kg (110 lbs)
Contact angle:	max. 63°
Shape:	plane, spherical, aspherical, freeform

DOUBLE LOAD LOCK SYSTEM

Load lock for two substrates, continuous process

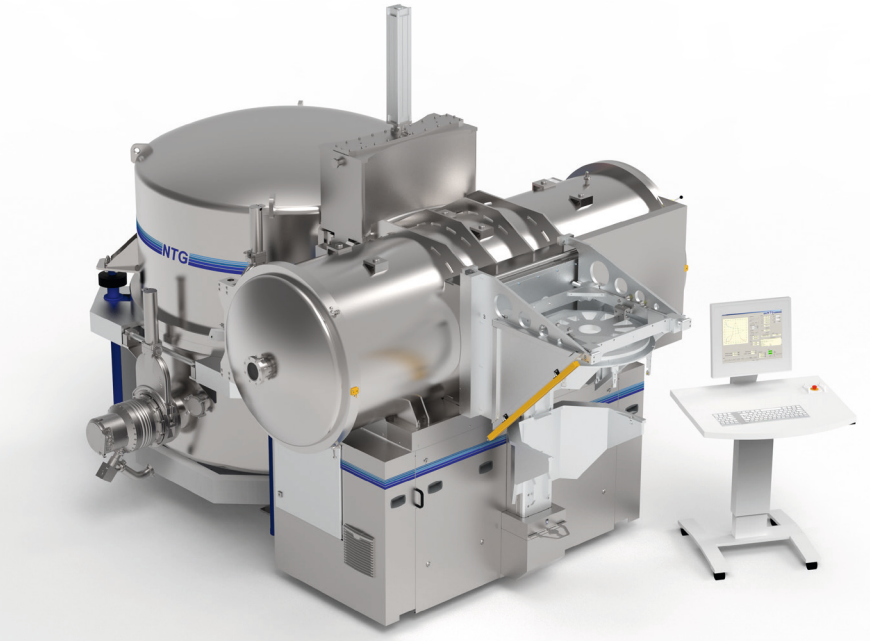
AXIS SYSTEM

Type: 450–3	X, Y, Z
Type: 450–5	X, Y, Z, A, B
Travel:	X > 450 mm / 500 mm
	Y > 450 mm / 500 mm
	Z = 150 mm
	A ± 50°
	B ± 50°

DIMENSIONS

Weight:	4100 kg (9020 lbs)
WxHxD:	3.70 m x 3.70 m x 2.57 m (146'' x 146'' x 101'')
Footprint:	4.2 m x 5.2 m (165'' x 205'')

The IBF–700 is the largest IBF plant with a double load lock chamber. It is the third generation of IBF plants at NTG based on the design of the IBF 300 and IBF 450/500. This plant also was designed and is approved for multi–shift operation (24/7) and series production.



IBF700

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø70 mm – Ø700 mm (Ø2.75'' – Ø27.5'')
Thickness:	200 mm (8'')
Weight:	max. 100 kg (220 lbs)
Contact angle:	max. 63°
Shape:	plane, spherical, aspherical, freeform

DOUBLE LOAD LOCK SYSTEM

Load lock for two substrates, continuous process

AXIS SYSTEM

Type: 700–3	X, Y, Z
Type: 700–5	X, Y, Z, A, B
Travel:	X > 700 mm
	Y > 700 mm
	Z = 400 mm
	A ± 50°
	B ± 50°

DIMENSIONS

Weight:	5950 kg (13091 lbs)
WxHxD:	4.65 m x 5 m x 2.75 m
	(183'' x 197'' x 108'')
Footprint:	6 m x 6 m
	(236'' x 236'')

The IBF–700R is designed for nanometer exact correction of rectangle optical surfaces up to 700x700mm. The plant is equipped with a high speed pumping system to minimize loading and unloading times.

IBF700R

TECHNICAL DATA

WORK PIECE DATA

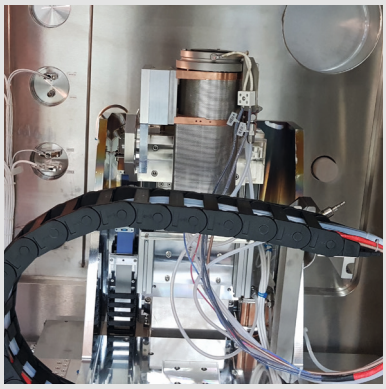
Size:	700 mm x 700 mm
	(27.5'' x 27.5'')
Thickness:	200 mm (8'')
Weight:	max. 250 kg (551 lbs)
Contact angle:	max. 63°
Shape:	plane, spherical, aspherical, freeform

HIGH SPEED PUMPING SYSTEM

No load lock but a high speed pumping system

AXIS SYSTEM

Type: 700R	X, Y, Z
Travel:	X > 700 mm
	Y > 700 mm
	Z > 200 mm



DIMENSIONS

Weight:	9000 kg (19840 lbs)
WxHxD:	6.6 m x 2.5 m x 5.7 m
	(260'' x 98'' x 224'')
Footprint:	6.6 m x 5.7 m
	(260'' x 245'')

The IBF–1000 is designed for nanometer exact correction of large optical surfaces, especially mirrors. The orientation of the work piece during the process is face down. It is the smallest IBF plant based on the new modular system.

IBF1000

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø5 mm – Ø1000 mm
	(Ø0.2'' – Ø39'')
Thickness:	300 mm (12'')
Weight:	max. 500 kg (1102 lbs)
Contact angle:	max. 63°
Shape:	plane, spherical, aspherical, freeform

HIGH SPEED PUMPING SYSTEM

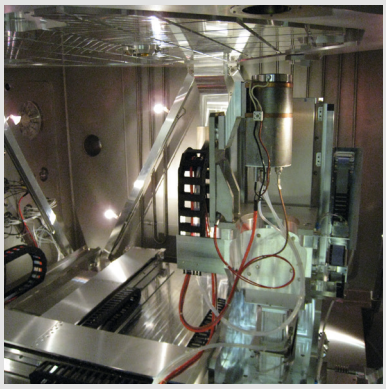
No load lock but a high speed pumping system

AXIS SYSTEM

Type: 1000–3	X, Y, Z
Travel:	X > 1000 mm
	Y > 1000 mm
	Z > 200 mm

DIMENSIONS

Weight:	19500 kg (42904 lbs)
WxHxD:	2.7 m x 2.7 m x 2.4 m (chamber)
	(106'' x 106'' x 94'')
Footprint:	6.5 m x 5 m
	(256'' x 197'')



The IBF–1000R is designed for nanometer exact correction of rectangle optical surfaces up to 1000 x 1000mm. The plant is equipped with a high speed pum–ping system to minimize loading and unloading times.

IBF**1000R**

TECHNICAL DATA

WORK PIECE DATA

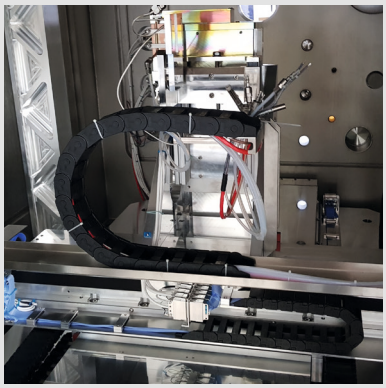
Size:	1000 mm x 1000 mm
	(39.3'' x 39.3'')
Thickness:	200 mm (8'')
Weight:	max. 350kg (771 lbs)
Contact angle:	max. 63°
Shape:	plane, spherical, aspherical, freeform

HIGH SPEED PUMPING SYSTEM

No load lock but a high speed pumping system

AXIS SYSTEM

Type: 1000R	X, Y, Z
Travel:	X > 1000 mm
	Y > 1000 mm
	Z > 200 mm



DIMENSIONS

Weight:	10000 kg (22046 lbs.)
WxHxD:	9.2 m x 2.5 m x 6.2 m
	(362'' x 98'' x 244'')
Footprint:	6.5 m x 9 m
	(256 x 355'')

The IBF–1500 is designed for nanometer exact correction of large optical surfaces, especially mir–rors. Orientation of the work piece is vertical.

IBF1500

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø5 mm – Ø1500 mm (Ø0.2'' – Ø59'')
Thickness:	520 mm (20.5'')
Weight:	max. 1000 kg (4545 lbs) Radius of
curvature:	≥ 2250 mm (88.5'')
Shape:	plane, spherical, aspherical, freeform

HIGH SPEED PUMPING SYSTEM

No load lock but a high speed pumping system

AXIS SYSTEM

Type: 1500–3	X, Y, Z, A (manually)
Travel:	X = 1650 mm
	Y = 1800 mm
	Z = 200 mm

DIMENSIONS

Weight:	21300 kg (4700 lbs)
WxHxD:	7.40 m x 7 m x 3.95 m (291'' x 276'' x 156'')
Footprint:	8 m x 8 m (315 x 315'')

The IBF–1500R is designed for nanometer exact correction of rectangle optical surfaces (e.g. synchrotron mirrors). The plant is equipped with a high speed pump–ing system to minimize loading and unloading times.

IBF**1500R**

TECHNICAL DATA

WORK PIECE DATA

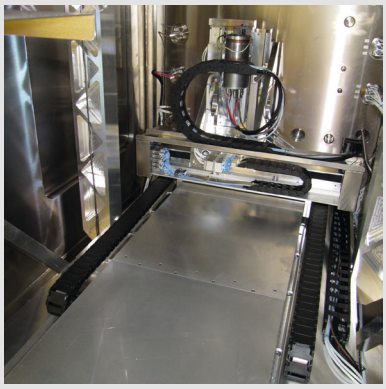
Size:	1500 mm x 400 mm (60'' x 16'')
Thickness:	200 mm (8'')
Weight:	max. 50 kg (110 lbs)
Contact angle:	max. 63°
Shape:	plane, spherical, aspherical, freeform

HIGH SPEED PUMPING SYSTEM

No load lock but a high speed pumping system

AXIS SYSTEM

Type: 1500R	X, Y, Z
Travel:	X > 1600 mm Y > 450 mm Z > 200 mm



DIMENSIONS

Weight:	8100 kg (17821 lbs)
WxHxD:	3.87 m x 2.5 m x 2.95 m (152'' x 98'' x 116'')
Footprint:	5.85 m x 3 m (230'' x 118'')

The IBF–2000 is designed for nano–meter exact correction of large optical surfaces, especially mirrors. The orientation of the work piece during the process is face down. In the moment it is the biggest NTG IBF plant, larger ones can be offered upon request.

IBF2000

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø5 mm – Ø2000 mm
	Ø0.2'' – Ø80'')
Thickness:	600 mm (24'')
Weight:	max. 1000 kg (4545 lbs)
Contact angle:	max. 63°
Shape:	plane, spherical, aspherical, freeform

HIGH SPEED PUMPING SYSTEM

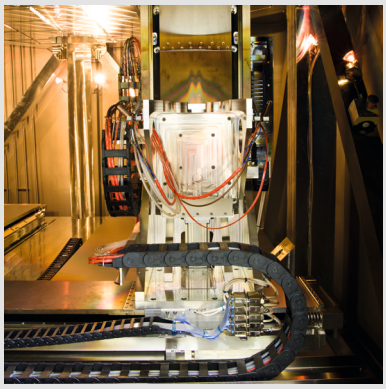
No load lock but a high speed pumping system

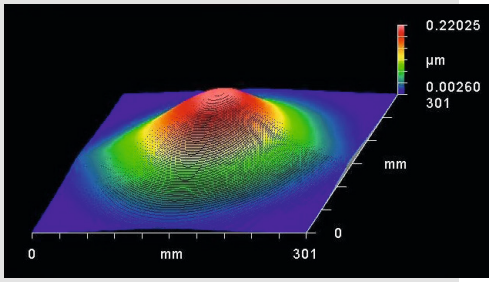
AXIS SYSTEM

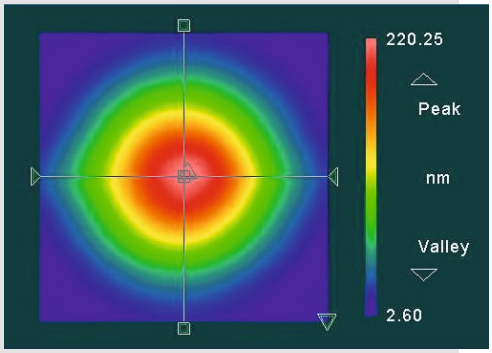
Type: 1000–3	X, Y, Z
Travel:	X = 2100 mm
	Y = 2100 mm
	Z = 400 mm

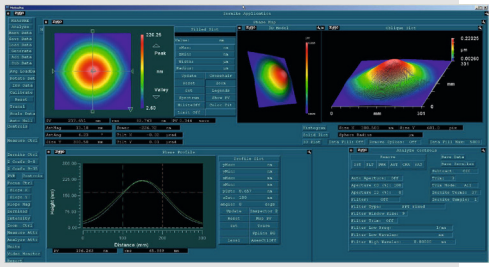
DIMENSIONS

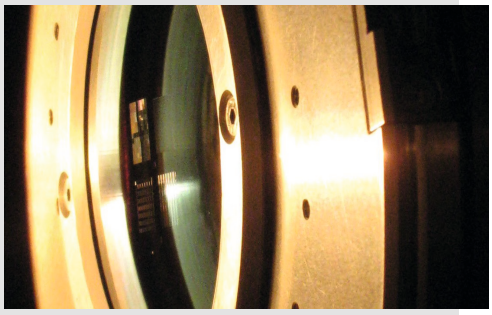
Weight:	26500 kg (58305 lbs)
WxHxD:	3.9 m x 3.9 m x 2.6 m – chamber
	(153'' x 153'' x 102'')
Footprint:	8.5 m x 6 m
	(315'' x 315'')

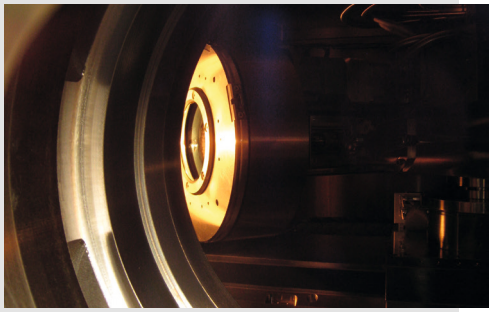












ION BEAM ETCHING FOR MICRO STRUCTURING AND SMOOTHING OF OPTICAL SURFACES

ION BEAM ETCHING PLANT (R)IBE 215:

Substrate dimensions: up to 215 mm diameter
thickness 20 mm, 2 kg max.

ION BEAM ETCHING PLANT (R)IBE 450:

Substrate dimensions: up to 450 mm diameter
thickness 50 mm, 50 kg max.

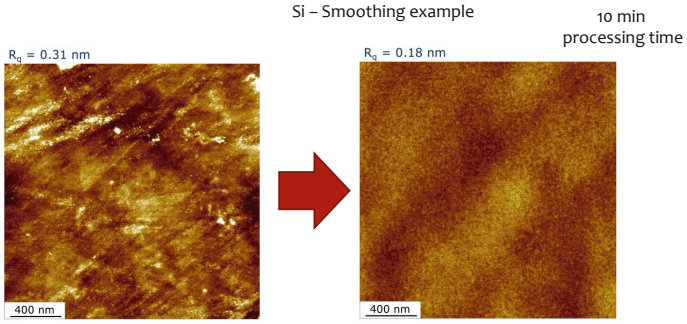
ION BEAM FIGURING AND ETCHING PLANT IBF 350 RE:

Substrate dimensions: up to 350 mm diameter
thickness 100 mm, 6 kg max.

GENERAL SPECIFICATIONS:

- Graphical user interface (including recipes)
- Helium–backside cooling or water cooling via contact pad
- Substrate rotatable: max. speed of 10 rpm, tilt 0° – 180°
- High current beam neutralizer
- Kaufman–type or RF–type ion beam source (both for IBF 350 RE)
- Beam–monitoring with faraday cup array
- Homogeneity of etching rate within 120 mm diameter < 5%
- Multi–gas IBE– and RIBE– processing with F– and O– containing gases
- Clean room interface upon request
- Load lock chamber

Ion Beam Etching transfer of CaF2 micro lens arrays from molten resist lens mask *.



The IBE–215 is designed for inert gas ion beam etching as well as for reactive ion beam etching. He–backside cooling, SIMS for end point detection, interface for clean room, beam monitoring with Faraday cup array and other helpful features are available.

(R)-IBE215

TECHNICAL DATA

WORK PIECE DATA

Size:	Ø215 mm – 152.4 mm x 152.4mm
	(Ø8.5'' – 6'' x 6'')
Thickness:	20 mm (0.8'')
Weight:	max. 2 kg (4.4 lbs)
Contact angle:	0 – 90°
Rotation speed:	0 – 10 rpm
Shape:	plane, spherical, aspherical, freeform

SINGLE LOAD LOCK SYSTEM

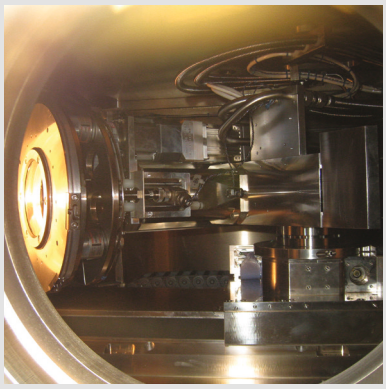
Loading time:	< 2min.

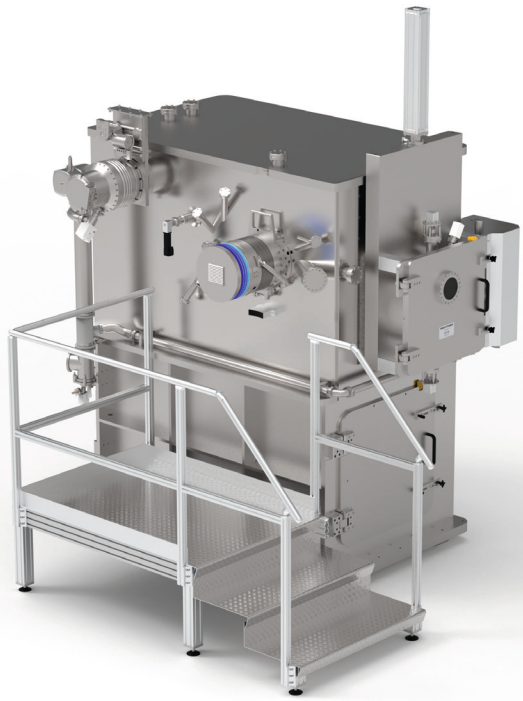
AXIS SYSTEM

Type: 215	X, Y, A, B
Travel:	X > 500 mm
	Y = 300 mm
	A ± 95°
	B = 360°

DIMENSIONS

Weight:	2000 kg (4400 lbs)
WxHxD:	2.8 m x 2.4 m x 1.4 m
	(110'' x 94'' x 55'')
Footprint:	4 m x 2 m
	(157'' x 79'')





The RIBE–450 is designed for inert gas ion beam etching as well as for reactive ion beam etching. Back–side cooling, SIMS for end point detection, interface for clean room, beam monitoring with Faraday cup array and other helpful features are available.

(R)-IBE**450**

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø450 mm (Ø18'')
Thickness:	50 mm (2'')
Weight:	max. 50 kg (110 lbs)
Contact angle:	0 – 90°
Rotation speed:	0 – 10 rpm
Shape:	plane, spherical, aspherical, freeform

SINGLE LOAD LOCK SYSTEM

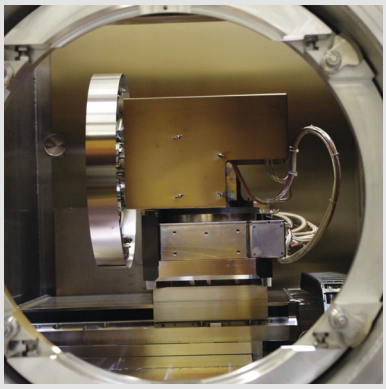
Loading time:	< 2min.

AXIS SYSTEM

Type: 450	X, Y, Z, A, B
Travel:	X = 1100 mm
	Y = 500 mm
	Z = 300 mm
	A = 0 – 90°
	B = 360°

DIMENSIONS

Weight:	7000 kg (15400 lbs)
WxHxD:	2.5 m x 3.6 m x 2.0 m
	(98'' x 142'' x 79'')
Footprint:	4 m x 4 m
	(157'' x 157'')



The ISA–200 is designed for in–ert gas ion beam etching as well as for reactive ion beam etching. He–backside cooling, work piece heating, SIMS for end point detec–tion, CAIBE, interface for clean room, beam monitoring with Faraday cup array and other helpful features are available. A second ion source can be attached to combine the etching process with an ion beam assisted coating process via up to four sput–ter targets.

ISA200

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø200 mm (Ø8'')
Thickness:	50 mm (2'')
Weight:	max. 2 kg (4.4 lbs)
Contact angle:	0 – 180°
Rotation speed:	0 – 10 rpm
Shape:	plane, spherical, aspherical, freeform

SINGLE LOAD LOCK SYSTEM

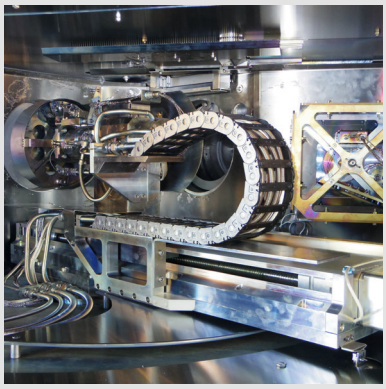
Loading time:	< 2min.

AXIS SYSTEM

Type: 200	X, A, B
Travel:	X = 300 mm
	A = 0 – 120°
	B = 360°

DIMENSIONS

Weight:	2200 kg (4840 lbs)
WxHxD:	2.55 m x 2.48 m x 2.25 m
	(100'' x 97'' x 89'')
Footprint:	3.5 m x 3 m
	(138'' x 118'')



The IBF–350 RE is designed for form error correction on nanometer scale and additionally for inert gas ion beam etching as well as for re–active ion beam etching. Backside cooling, work piece heating, SIMS for end point detection, interface for clean room, beam monitoring with Faraday cup array and other helpful features are available. This plant is able to perform sub–aperture re–active gas ion beam etching.

IBF350RE

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø350 mm (Ø14'')
Thickness:	150 mm (6'')
Weight:	max. 8.5 kg (16.5 lbs)
Contact angle:	0 – 90°
Rotation speed:	0 – 10 rpm
Shape:	plane, spherical, aspherical, freeform

LOAD LOCK SYSTEM

Loading time:	< 2min.

AXIS SYSTEM

Type: 350RE	X, Y, Z, B, C
Travel:	X > 500 mm
	Y = 500 mm
	Z = 600mm
	B = 0 – 90°
	C = 360°, continuous

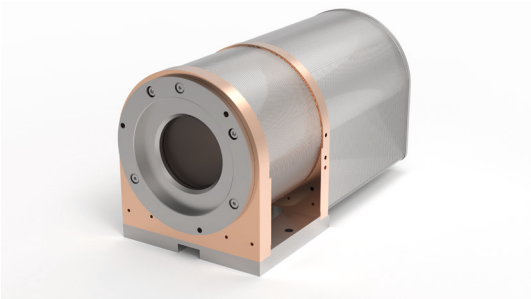
ION BEAM SOURCES

Type K100 and type RF40

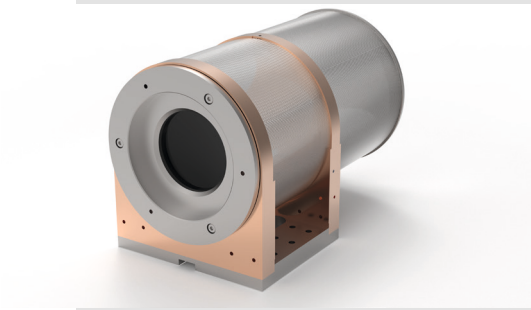
DIMENSIONS

Weight:	5000 kg (11023 lbs)
WxHxD:	4.2 m x 2.4 m x 3.35 m
	(165'' x 95'' x 131'')
Footprint:	6 m x 4 m
	(236'' x 157'')

ION BEAM SOURCES AND ACCESSORIES

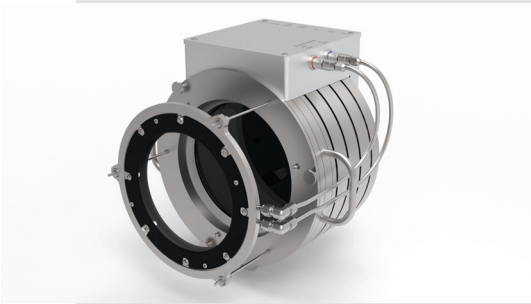


The RF 40, RF 60 and K 100 Ion Beam Sources are especially designed for the use in our IBF 100 to IBF 2000 plants. Beside a proven long–term stability they are maintenance free for about 500 working hours (50h for K 100).



RF 40 ION BEAM SOURCE

Designed for IBF plants:	IBF 100 – IBF 2000
Ion energy:	600 eV – 1600 eV (Argon)
Ion beam:	Gaussian shape
Small beam:	Ø 0.5 mm – Ø 4 mm (FWHM)
Standard:	Ø 6 mm– Ø 30 mm (FWHM)
Typ. volume removal rate:	
Ø 0.5 mm:	min 0.00002 mm³/min
Ø 25 mm:	max 0.3 mm³/min
Maintenance free	> 500 hours
Long–term stability	> 97 % / 10 h

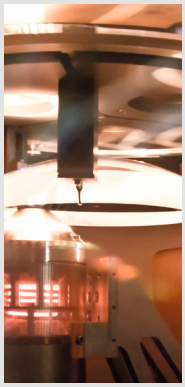


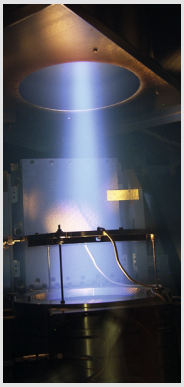
RF 60 ION BEAM SOURCE

Designed for IBF plants:	IBF 300 – IBF 2000
Ion energy:	600 eV – 1300 eV (Argon)
Ion beam:	Gaussian shape
	Ø 30 mm – Ø 60 mm (FWHM)
Typ. volume removal rate:	0.6 mm³/min – 1.2 mm³/min
Maintenance free	>250 hours
Long–term stability	> 97 % / 10 h

K 100 ION BEAM SOURCE

Designed for IBF plants:	IBF 1000 – IBF 2000 (Vacuum Version)
	(IBE 215 flange mounted)
Ion energy:	600 eV – 1200 eV (Argon)
Ion beam:	Gaussian shape
	Ø 60 mm – Ø 120 mm (FWHM)
Typ. volume removal rate:	1.0 mm³/min – 3.0 mm³/min
Maintenance free	~ 50 hours
Long–term stability	> 97 % / 10 h

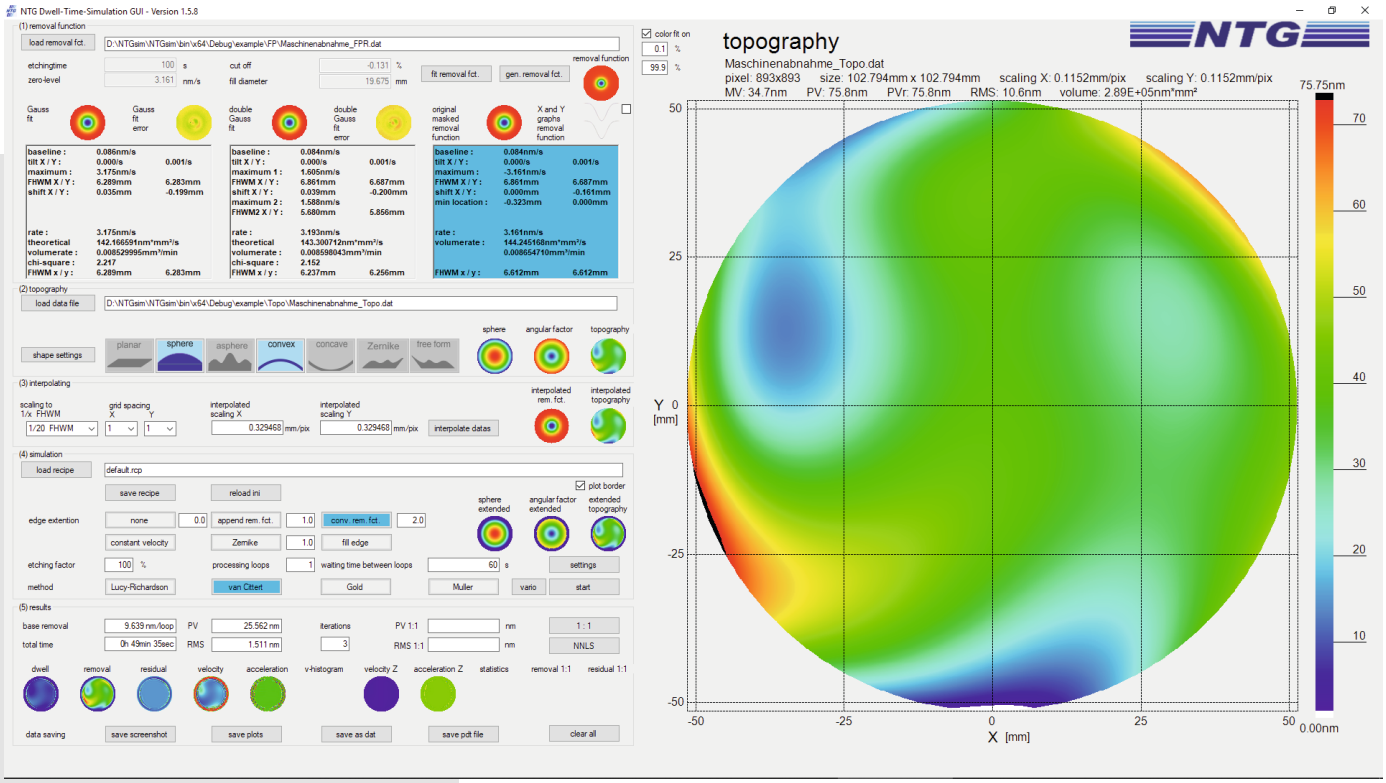


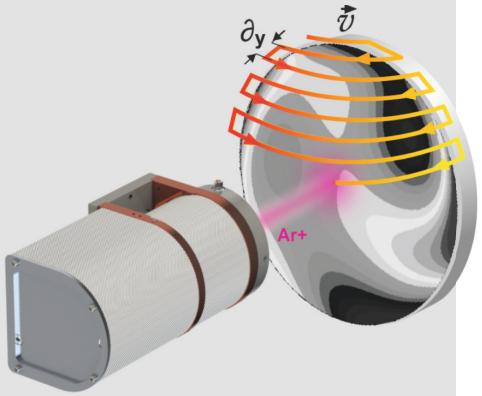


VACUTECT-K TEMPERATURE LOGGER

Sensor:	Type K (supports also J, T and N)
Logger measurement range:	–200 to +1370 °C (–328 to 2498 °F)
Sensor measurement range:	–65 to +250 °C (–85 to 482 °F)
Absolute Accuracy:	1 °C (2 °F)
Resolution:	0.01 °C (0.02 °F)
Sampling Rate:	1 s – 240 h
Storage capacity:	28k readings (~7:45 h @ 1 s rate)

Alarm LED trigger, rechargeable Li Ion battery, for IBF 100 to 2000





ION BEAM FIGURING SIMULATION SOFTWARE FOR OPTICAL SURFACE MANUFACTURING

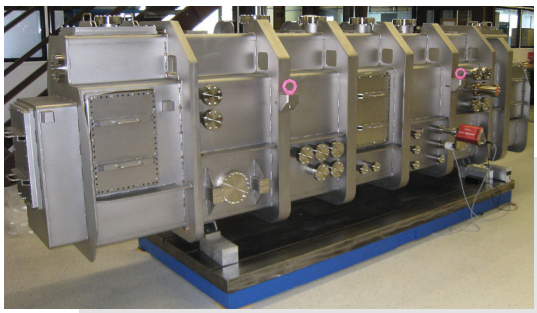
- *REMOVAL FUNCTION ESTIMATION
- *FIGURING EVALUATION
- *ETCH PROCESS SIMULATION
- *EXTENDED PROCESS DYNAMIC SIMULATION

The “NTG IBF Simulation Program“ calculates the dwell times for the Ion Beam Figuring (IBF) of surface on planar, spherical, conic, aspheric and freeform work pieces using a linear 3–axis–system. It calculates the matrix of the dwell times pre–setting the removal function and the output topography under consideration of the plant parameters and the quality parameters of the goal topography. The driving path is provided meander–shaped (row– or column–wise). The path velocity of the beam spot on the surface to treat results from a dwell time distribution proportional to the desired materi–al removal depth distribution. The local removal is defined by the varying speed (or by pixel spacing with different dwell times). The processing software developed at NTG is based on a direct for–warding calculation. All deconvolution methods are presented on an equidistant grid and can be calculated from double sums. These calculations are parallelised with the Intel Fortran Compiler, uses Intel® math kernel library and in addition OpenMP®.

WHAT ELSE WE CAN DO

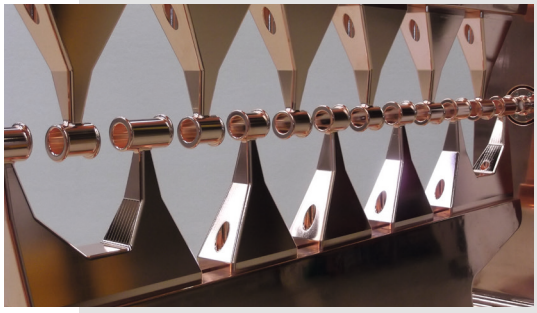
VACUUM TECHNOLOGY

Vacuum Technology is one of the main competences of NTG. Whenever "nothing" is required we can provide a solution, mainly in the field of Ultra High Vacuum applications. NTG can provide solutions for nearly any requirement.
Additionally to UHV–chambers we offer a wide range of accessories such as motion systems for any kind of vacuum application. As a speciality we offer Al–chambers with stainless steel CF–flanges. For this type of chambers we use the in–house developed Bi–Metal–flanges.



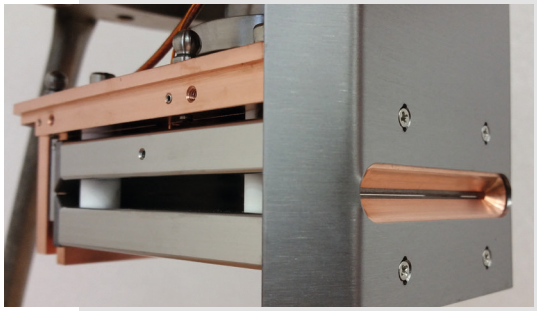
PARTICLE ACCELERATORS

NTG has a huge experience in the field of accelerator design and manufacturing. We cover all design aspects from beam dynamics layouts over RF–construction to thermal design and offer high precision manufacture of parts and assembly including adjustment with most modern measuring tools like laser trackers and can even accomplish RF–tuning of cavities following most sophisticated techniques like bead perturbation measurements.



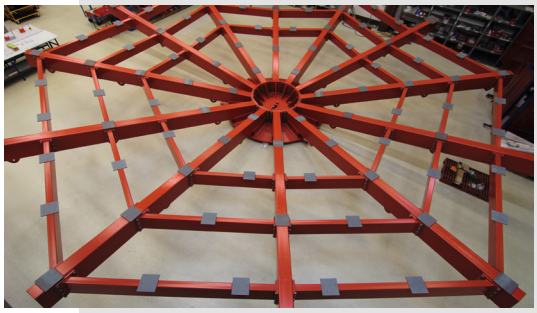
BEAM DIAGNOSTICS

Beam diagnostics have a long tradition at NTG. We offer almost the complete scope. Customized is our "standard". Provide us with your beam parameters and the quality to be measured and we come up with a tailored solution. Diagnostic elements like faraday cups (beam stopper or coaxial cups), profile grids, capacitive pick–ups like phase probes are all within our scope.



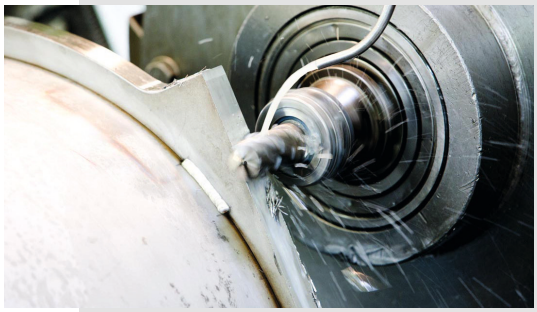
CUSTOMIZATION

We develop and manufacture many things others aren´t willing or aren´t able to do.
Customized products are an especially of NTG. NTG can help you to design resp. to realize a new idea. NTG is your right partner to manufacture prototypes or other unique parts. Tell us your requirement and we try to find a solution.



JOB ORDER PRODUCTION

In addition to the equipment and components described at our product pages, NTG provides capacities in the service sector. An extensive machine park allows work on a subcontract basis. The focus here is on stainless steel and aluminum processing. This results in a certain stock of materials. Thus, we are able to respond to customer requests on short term.
In addition to stainless steel processing, we are also capable of special materials, such as ...
tantalum, titanium, zirkaloy, copper, Inconel, oxide ceramic, etc.



WE LOOK FORWARD TO RECEIVE YOUR INQUIRIES.

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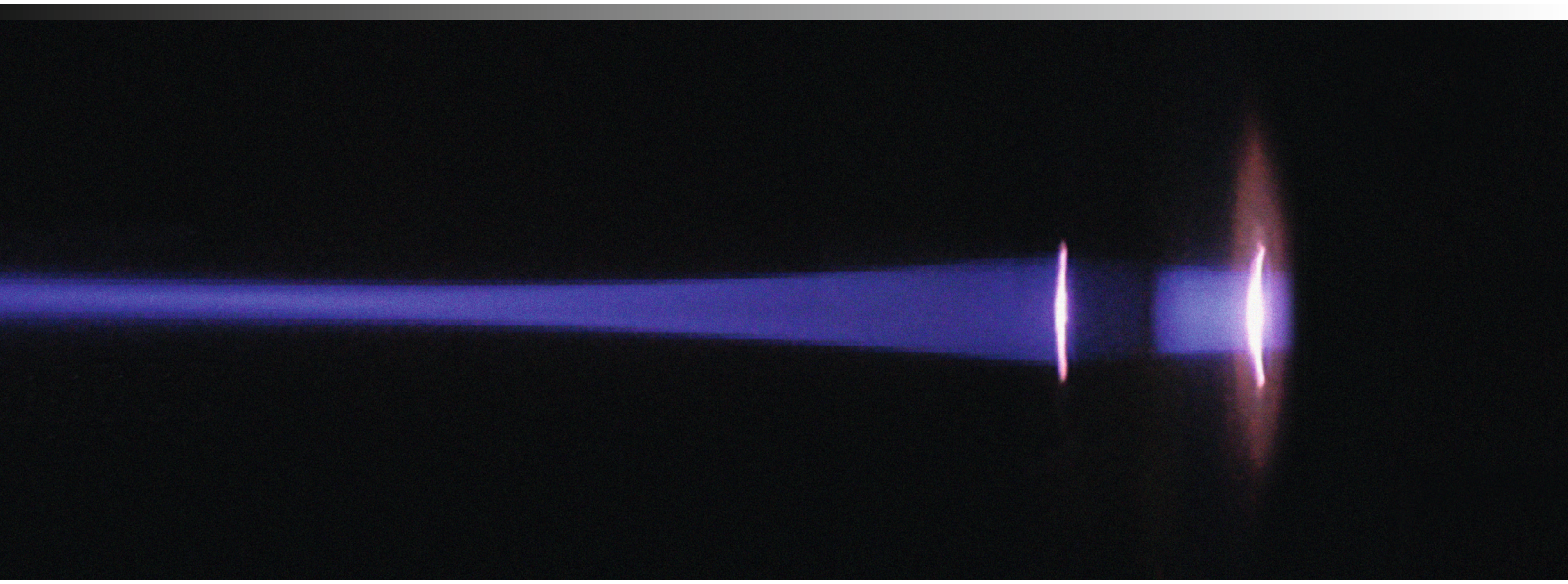

NTG

... we push the limits!