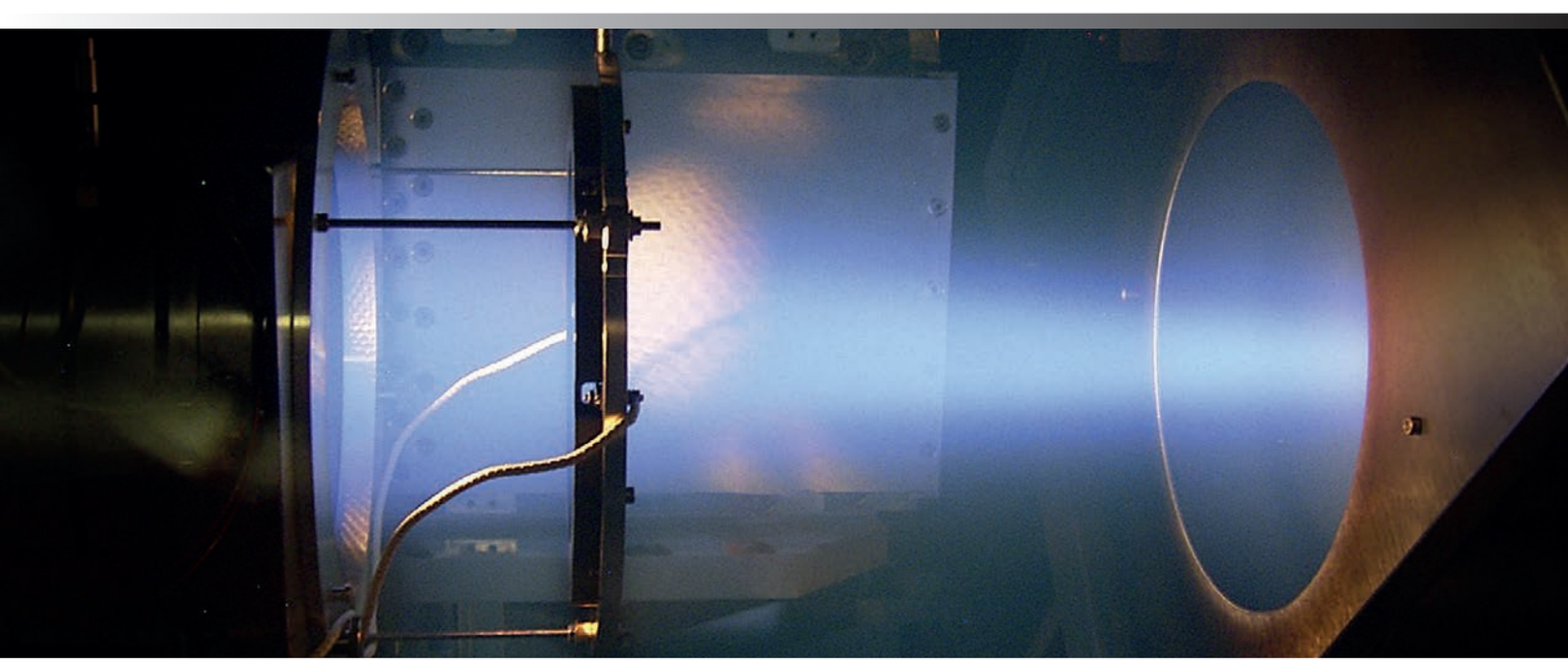
Ion Beam Processing



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 < 1 mm to > 2000 mm workpiece diameter
- Long maintenance intervals, 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

NTG NTG NTG NTG

The IBF 5 is designed for nanometer exact correction of smallest optical surfaces. This plant was developed to improve optical components in shortest time. Beside figure error correction the machine is also suitable for MSF roughness correction and aspherization of smallest samples. Multiprocessing of several optics is standard. Load lock is available.

IBF 5

TECHNICAL DATA

WORK PIECE DATA

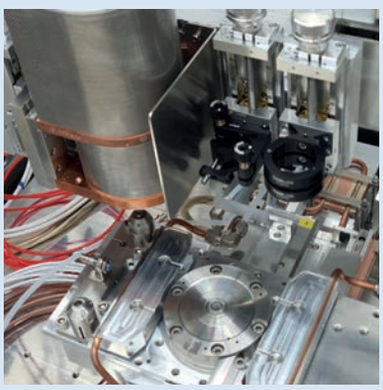
Diameter:	< Ø 200 mm
Treatment Area:	100 mm x 100 mm
Thickness:	45 mm (optional extendable)
Weight:	max. 2.5 kg
Shape:	freeform
Batch processing:	multiple work pieces on one carrier

AXIS SYSTEM

Type IBF 5:	X, Y, Z
Travel:	X = 200 mm
	Y = 250 mm
	Z = 25 mm

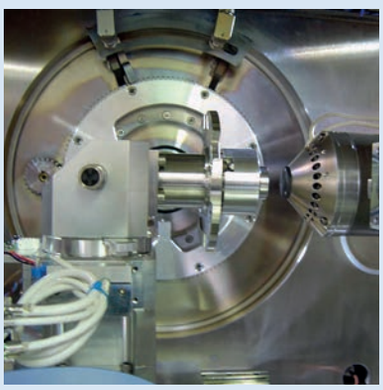
DIMENSIONS

Weight:	2000 kg
WxHxD:	1.3 m x 1.9 m x 1.6 m
Footprint:	2.8 m x 2.0 m



The IBF 100 is designed for nano–meter exact correction of small op–tical surfaces. This plant was devel–oped to improve optical components in shortest time.

IBF **100**



TECHNICAL DATA

WORK PIECE DATA

Diameter:	≤ Ø 70 mm
Direct loading:	Ø 100 mm
Thickness:	45 mm
Weight:	max. 750 g
Shape:	freeform

SINGLE LOAD LOCK SYSTEM

Loading time:	< 2 min

AXIS SYSTEM

Type: 100–3	X, Y, Z, A (manually)
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
WxHxD:	1.6 m x 2.2 m x 1.3 m
Footprint:	3.0 m x 3.0 m

The IBF 200SE was launched in 2016 and is especially designed for industrial use. This plant is for na–nometer exact correction of small to medium sized optical surfaces.

IBF **200SE**

TECHNICAL DATA

WORK PIECE DATA

Diameter:	≤ Ø 200 mm
	~ Ø 300 mm – direct loading
Thickness:	100 mm
Weight:	max. 10 kg
Shape:	freeform

SINGLE LOAD LOCK SYSTEM

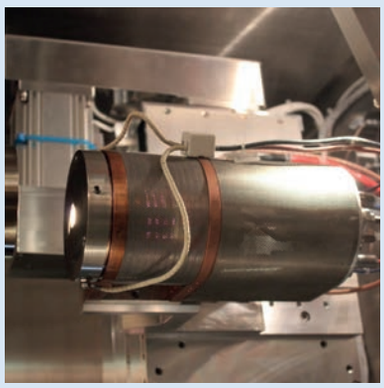
Loading time:	< 3 min

AXIS SYSTEM

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

DIMENSIONS

Weight:	3500 kg
WxHxD:	1.4 m x 2.5 m x 4.3 m
Footprint:	5.8 m x 3.4 m



The IBF 300 is the mother of all IBF plants. Over a period of more than 30 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.

IBF **300**

TECHNICAL DATA

WORK PIECE DATA

Diameter:	≤ Ø 300 mm
Thickness:	125 mm
Weight:	max. 30 kg
Shape:	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
WxHxD:	3.2 m x 2.5 m x 2.6 m
Footprint:	4.2 m x 3.5 m

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

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

TECHNICAL DATA

WORK PIECE DATA

Diameter:	≤ 450 mm / ≤ 500 mm
Thickness:	IBF 450 / 125 mm
	IBF 500 / 150 mm
Weight:	max. 40 kg / 50 kg
Shape:	freeform

DOUBLE LOAD LOCK SYSTEM

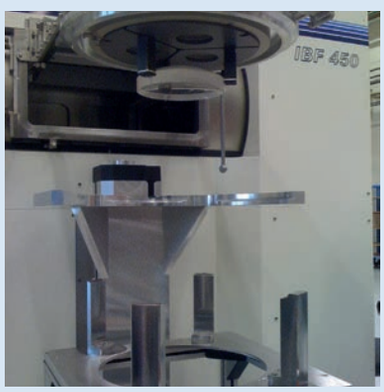
Load lock for two substrates, continuous process

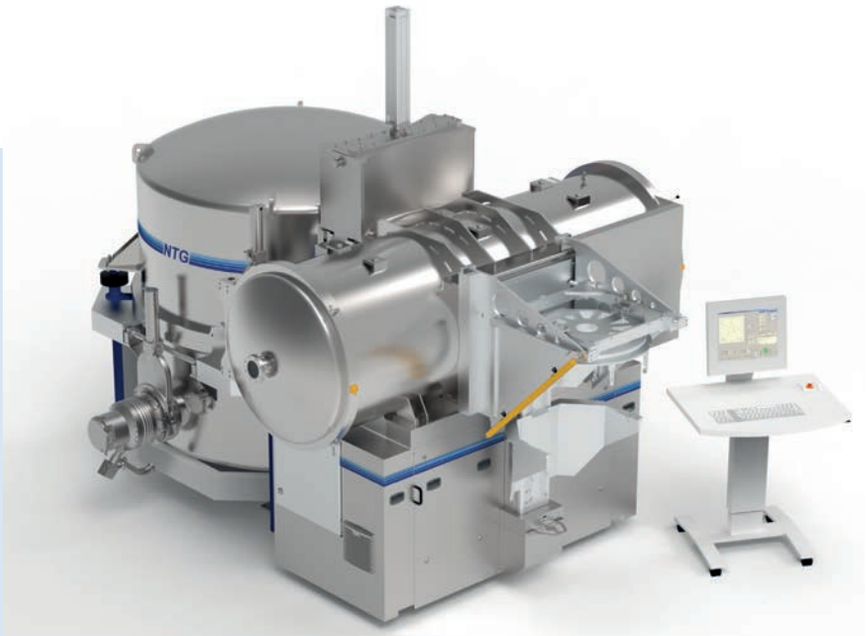
AXIS SYSTEM

Type: 450–3 / 500–3	X, Y, Z
Type: 450–5 / 500–5	X, Y, Z, A, B
Travel:	X > 450 mm / 500 mm
	Y > 450 mm / 500 mm
	Z = 200 mm
	A ± 50°
	B ± 50°

DIMENSIONS

Weight:	4100 kg
WxHxD:	3.7 m x 3.7 m x 2.6 m
Footprint:	4.2 m x 5.2 m





The IBF 700 is a large 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 is approved for multi–shift operation (24/7) and series production.

IBF **700**

TECHNICAL DATA

WORK PIECE DATA

Diameter:	≤ Ø 700 mm
Thickness:	200 mm
Weight:	max. 100 kg
Shape:	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 = 300 mm
	A ± 50°
	B ± 50°

DIMENSIONS

Weight:	5950 kg
WxHxD:	4.7 m x 5.0 m x 2.8 m
Footprint:	6.0 m x 6.0 m

The IBF 700R is designed for nano–meter exact correction of rectang–le optical surfaces up to 700 mm x 700 mm. The plant is equipped with a high speed pumping system to minimize loading and unloading times.

IBF **700R**

TECHNICAL DATA

WORK PIECE DATA

Size:	max. 700 mm x 700 mm
Thickness:	200 mm / 300 mm (optional)
Weight:	max. 350 kg
Shape:	freeform

HIGH SPEED PUMPING SYSTEM

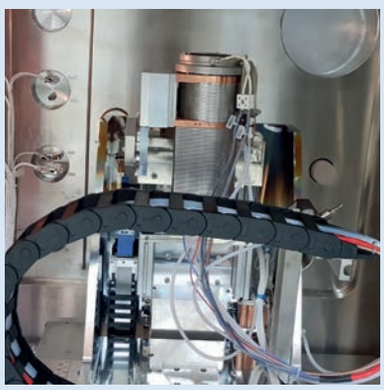
No load lock, but a high speed pumping system

AXIS SYSTEM

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

DIMENSIONS

Weight:	9000 kg
WxHxD:	3.1 m x 2.4 m x 2.0 m
Footprint:	6.6 m x 5.7 m



The IBF1000 is designed for nano–meter exact correction of large opti–cal surfaces, especially mirrors. The orientation of the work piece during the process is face down.

IBF **1000**

TECHNICAL DATA

WORK PIECE DATA

Diameter:	≤ Ø 1000 mm
Thickness:	300 mm
Weight:	max. 500 kg
Shape:	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
WxHxD:	2.7 m x 2.7 m x 2.4 m (chamber)
Footprint:	6.5 m x 5.0 m

The IBF 1000R is designed for nano–meter exact correction of rectang–le optical surfaces up to 1000 mm x 1000 mm. The plant is equipped with a high speed pumping system to minimize loading and unloading times.

IBF **1000R**

TECHNICAL DATA

WORK PIECE DATA

Size:	max. 1000 mm x 1000 mm
Thickness:	200 mm, 300 mm (optional)
Weight:	max. 350 kg
Shape:	freeform

HIGH SPEED PUMPING SYSTEM

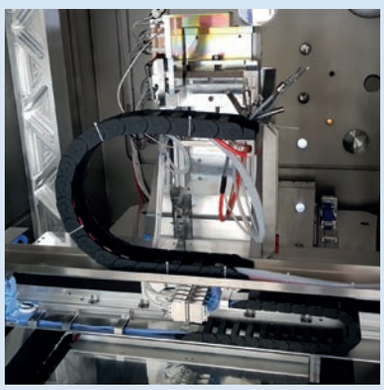
No load lock, but a high speed pumping system

AXIS SYSTEM

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

DIMENSIONS

Weight:	10000 kg
WxHxD:	3.5 m x 2.7 m x 2.0 m
Footprint:	6.5 m x 9.0 m



The IBF 1000R / 500LLC is designed for nanometer exact correction of rectangle optical surfaces up to 1000 mm x 1000 mm. The plant is equipped with a high speed pumping system to minimize loading and unloading times.
In addition, it is possible to feed workpieces with a diameter of up to 500 mm directly into the vacuum via a laterally mounted loadlock. This offers the advantage of shorter pumpdown times and the ion source does not require any additional warm–up times.

IBF **1000R**/ LLC **500**

TECHNICAL DATA

WORK PIECE DATA

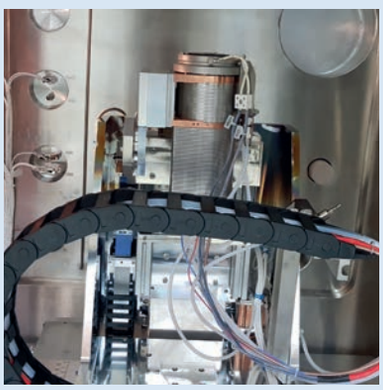
Size:	max. 1000 mm x 1000 mm
Thickness:	200 mm / 300 mm (optional)
Weight:	max. 350 kg
Shape:	feeform

HIGH SPEES PUMPING SYSTEM

Load look and high speed pumping system

AXIS SYSTEM

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



DIMENSIONS

Weight:	11300 kg
WxHxD:	3.5 m x 3.8 m x 2.4 m
Footprint:	9.5 m x 8.5 m

The IBF 1500 is designed for nano–meter exact correction of large op–tical surfaces, especially mirrors. Orientation of the work piece is ver–tical.

IBF **1500**

TECHNICAL DATA

WORK PIECE DATA

Diameter:	≤ Ø 1500 mm
Thickness:	520 mm
Weight:	max. 1000 kg
Shape:	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
WxHxD:	3.5 m x 3.2 m x 3.9 m
Footprint:	8.0 m x 8.0 m

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

IBF **1500R**

TECHNICAL DATA

WORK PIECE DATA

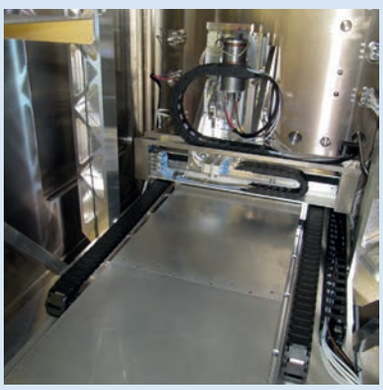
Size:	1500 mm x 400 mm
	1500 mm x 500 mm
Thickness:	200 mm / 300 mm (optional)
Weight:	max. 50 kg
Shape:	freeform

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 / > 550 mm
	Z > 200 mm



DIMENSIONS

Weight:	8100 kg
WxHxD:	3.9 m x 2.5 m x 3.0 m
Footprint:	5.9 m x 3.0 m

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. It is the biggest NTG IBF plant, larger ones can be offered upon request.

IBF **2000**

TECHNICAL DATA

WORK PIECE DATA

Size:	max. 2000 mm x 2000 mm
Thickness:	600 mm
Weight:	max. 1000 kg
Shape:	freeform

HIGH SPEED PUMPING SYSTEM

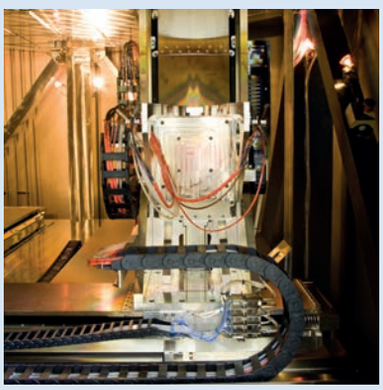
No load lock, but a high speed pumping system

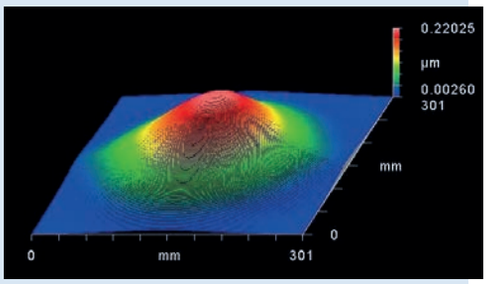
AXIS SYSTEM

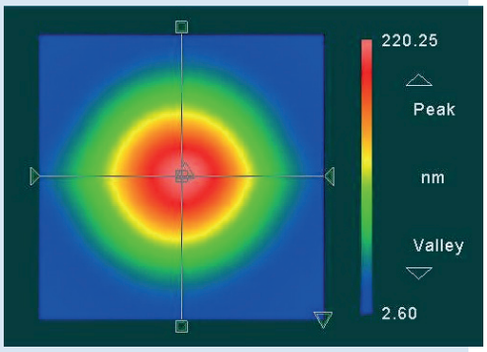
Type: 2000–3	X, Y, Z
Travel:	X = 2100 mm
	Y = 2100 mm
	Z = 400 mm

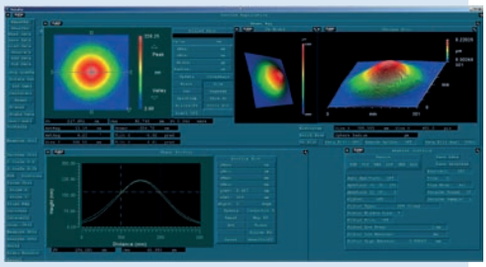
DIMENSIONS

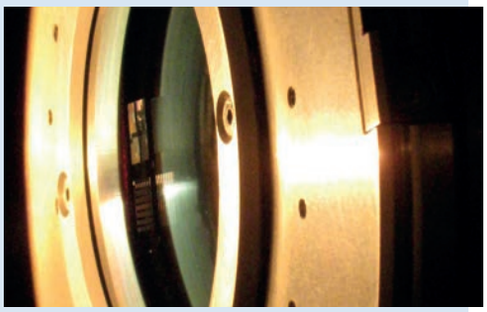
Weight:	26500 kg
WxHxD:	3.9 m x 3.9 m x 2.6 m – chamber
Footprint:	8.5 m x 6.0 m

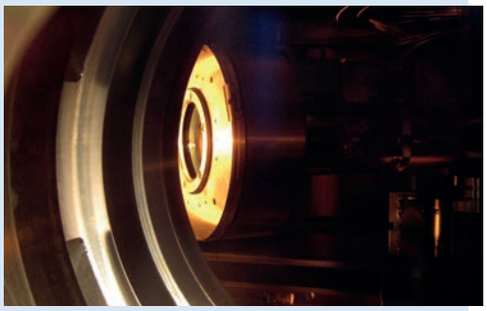












ION BEAM ETCHING FOR MICRO STRUCTURING AND SMOOTHING OF OPTICAL SURFACES

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:

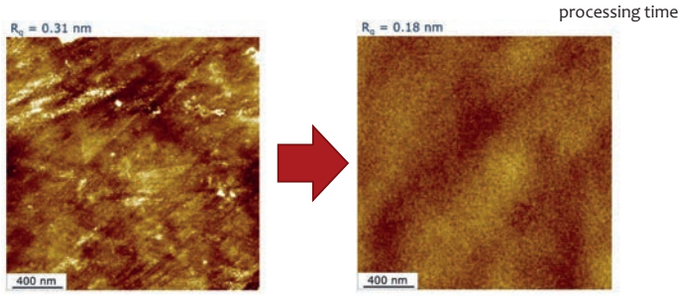
Substrate dimensions: up to 350 mm diameter
thickness 150 mm, 6 kg max.

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

Si – Smoothing example

10 min
processing time



The (R)–IBE 215 is designed for in–ert 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)-IBE **215**

TECHNICAL DATA

WORK PIECE DATA

Size:	Ø 215 mm – 152.4 mm x 152.4 mm
Thickness:	20 mm
Weight:	max. 2 kg
Contact angle:	0 – 90°
Rotation speed:	0 – 10 rpm
Shape:	freeform

SINGLE LOAD LOCK SYSTEM

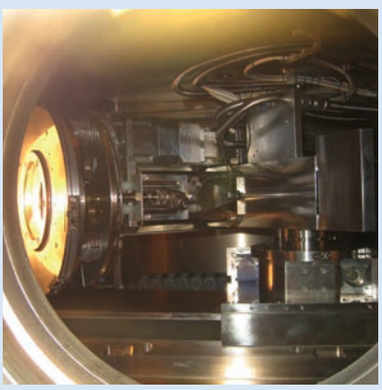
Loading time:	< 2 min

AXIS SYSTEM

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

DIMENSIONS

Weight:	2000 kg
WxHxD:	2.8 m x 2.4 m x 1.4 m
Footprint:	4.0 m x 2.0 m



The (R)–IBE 450 is designed for inert gas ion beam etching as well as for reactive ion beam etching. Backside 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:	Ø 450 mm
Thickness:	50 mm
Weight:	max. 50 kg
Contact angle:	0 – 90°
Rotation speed:	0 – 10 rpm
Shape:	freeform

SINGLE LOAD LOCK SYSTEM

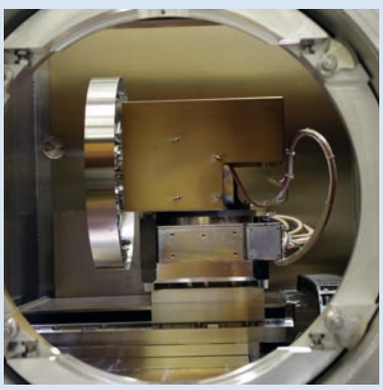
Loading time:	< 2 min

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
WxHxD:	2.5 m x 3.6 m x 2.0 m
Footprint:	4.0 m x 4.0 m



The ISA 200 is designed for inert gas ion beam etching as well as for reactive ion beam etching. He–backside cooling, work piece heating, SIMS for end point detection, 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 sputter targets.

ISA **200**

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø 200 mm
Thickness:	50 mm
Weight:	max. 2 kg
Contact angle:	0 – 180°
Rotation speed:	0 – 10 rpm
Shape:	freeform

SINGLE LOAD LOCK SYSTEM

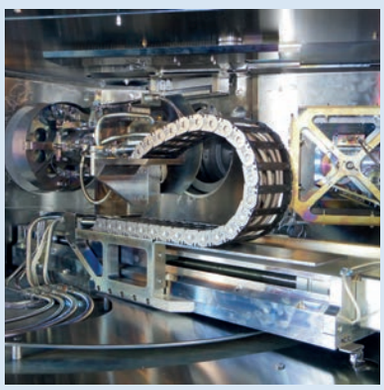
Loading time:	< 2 min

AXIS SYSTEM

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

DIMENSIONS

Weight:	2200 kg
WxHxD:	2.6 m x 2.5 m x 2.5 m
Footprint:	3.5 m x 3.0 m



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 reactive 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 reactive gas ion beam etching.

IBF **350RE**

TECHNICAL DATA

WORK PIECE DATA

Diameter:	Ø 350 mm
Thickness:	150 mm
Weight:	max. 8.5 kg
Contact angle:	0 – 90°
Rotation speed:	0 – 10 rpm
Shape:	freeform

LOAD LOCK SYSTEM

Loading time:	< 2 min

AXIS SYSTEM

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

ION BEAM SOURCES

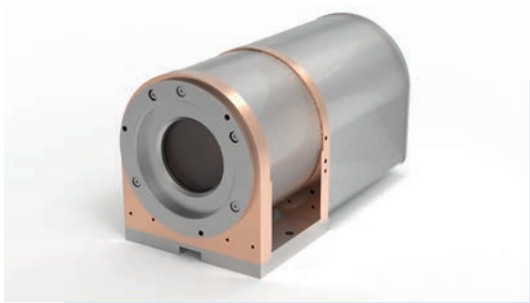
Type K 100 and type RF 40

DIMENSIONS

Weight:	5000 kg
WxHxD:	4.2 m x 2.4 m x 3.4 m
Footprint:	6.0 m x 4.0 m

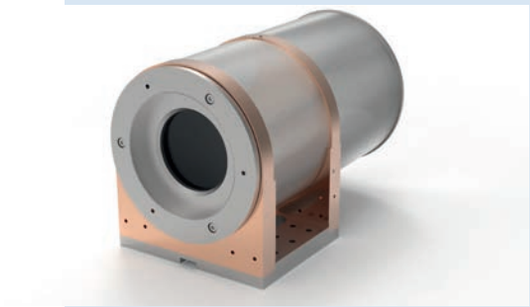
ION BEAM SOURCES AND ACCESSORIES

The RF 40, RF 60 and K 100 and RF 5 Ion Beam Sources are especially designed for the use in our IBF and IBE plants. Besi–de a proven long–term stability they are maintenance free for about at least 500 working hours (50 h 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 $2e^{-5}$ 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

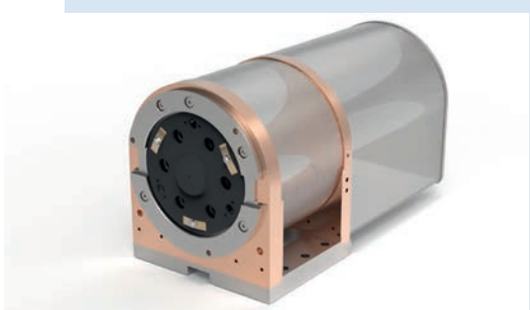
Designed for IBF plants:	IBF 300 – IBF 2000
Ion energy:	600 eV – 1300 eV (Argon)
Ion beam:	Gaussian shape
	Ø 30 mm – Ø 60 mm (FWHM)
Typ. volume removal rate:	0.6 mm³/min – 1.2 mm³/min
Maintenance free	> 250 hours
Long–term stability	> 97 % / 10 h

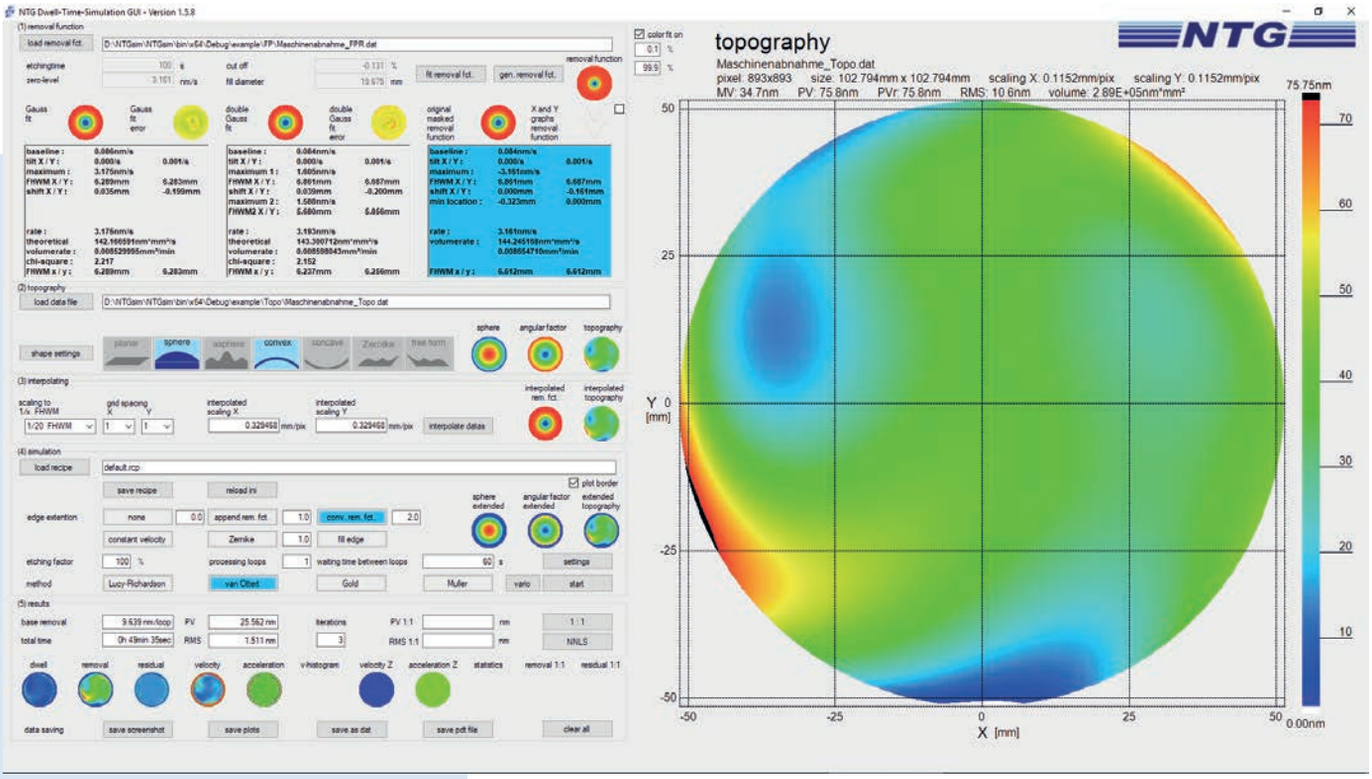
K 100 ION BEAM SOURCE

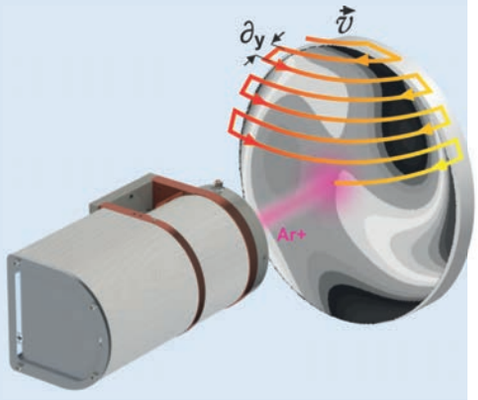
Designed for IBF plants:	IBE 215 / IBE 450 (flange mounted)
	(IBE 215 flange mounted)
Ion energy:	600 eV – 1200 eV (Argon)
Ion beam:	Gaussian shape
	Ø 60 mm – Ø 120 mm (FWHM)
Typ. volume removal rate:	1.0 mm³/min – 3.0 mm³/min
Maintenance free	~ 50 hours
Long–term stability	> 97 % / 10 h

RF 5 ION BEAM SOURCE

Designed for IBF plants:	IBF 5
Ion energy:	1000 eV – 3000 eV (Argon)
Ion beam:	Gaussian shape
	20 µm – 500 µm
Typ. volume removal rate:	$1e^{-5}$ mm³/min @ 40 µm
	$4e^{-5}$ mm³/min @ 150 µm
Maintenance free	~ 1500 hours
Long–term stability	> 97 % / 10 h







NTGsim - ION BEAM FIGURING SIMULATION SOFTWARE FOR OPTICAL SURFACE MANUFACTUING

***REMOVAL FUNCTION ESTIMATION**
***FIGURING EVALUATION**
***ETCH PROCESS SIMULATION**
***EXTENDED PROCESS DYNAMICS SIMULATION**

The “NTG IBF Simulation Program“ calculates the dwell times for the Ion Beam Figuring of surface on planar, spherical, conical, as–pherical and freeform work pieces using a linear 3– or 5–axis–system. It computes 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 to–pography. The moving path is provided meander–shaped (row– or column–wise). The path velocity is proportional to the desired ma–terial removal. The processing software developed at NTG is based on a direct forwarding calculation. All deconvolution methods are presented on an equidistant grid and can be calculated from dou–ble sums. These calculations are parallelised with the Intel Fortran Compiler, uses Intel® math kernel library and in addition OpenMP®.

MODULES FOR ION BEAM FIGURING SIMULATION SOFTWARE

- individual **filetypes**
- **freeform**
- **surface** descriptions
- **sphere approx**imation
- **orig**inal **f**oot**p**rint or **groove** usage
- **const**ant **rem**oval
- **one–to–one** calculation
- working **directions**
- **spiral** path
- **vari**ati**o**n of methods and edge extensions
- **user** permission
- **multi–file** workflow
- **multi–footprint** generator and analysis

filetypes

We can adapt our software to all specific customers datafiles, as standard binary MetroPro© files. It is possible to load different planar (XYdZ) ASCII formats with mask information optionally. Additionally, NTGsim can read the dZ information out of the colour scale from an image file.

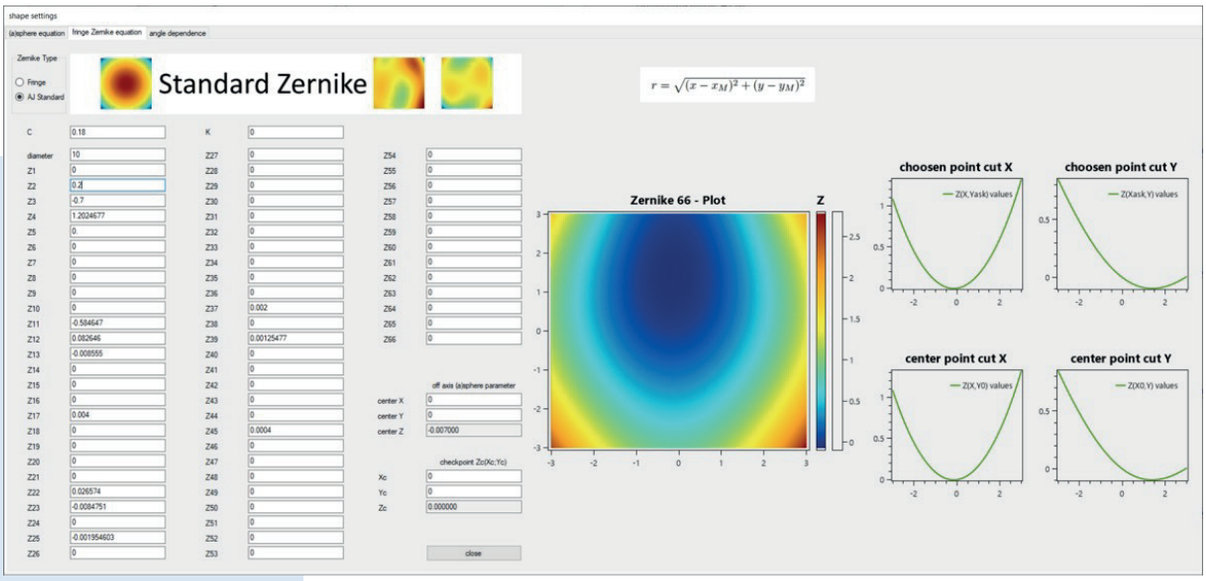
freeform

The description of freeform surfaces (XYZdZ) is possible with ASCII formats or UA3P© files.

surface descriptions

The surface (Z) of the sample can be descriped by several equations.

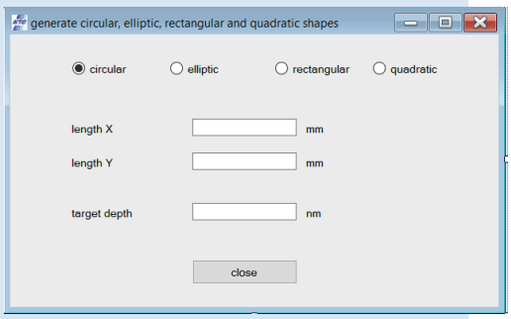
- radial **R – asphere**
- **X** dependence – **asphere**
- **Y** dependence – **asphere**
- mixed **XY – asphere**
- **Fringe Zernike** (Z0 – Z66) with **C** and **K**
- **standard Zernike** (Z0 – Z66)
- **polynomial**



sphere approximation
All surface descriptions can be approximated to a sphere. This can smooth the outer regions and the edge extension area.

original **f**oot**p**rint or **groove** usage
The original footprint data can be used if the Ion Beam is distorted in shape. It is possible to load X– or Y–groove etching data and the footprint shape is generated.

constant **rem**oval
Generates constant removals in circular and rectangular shape.



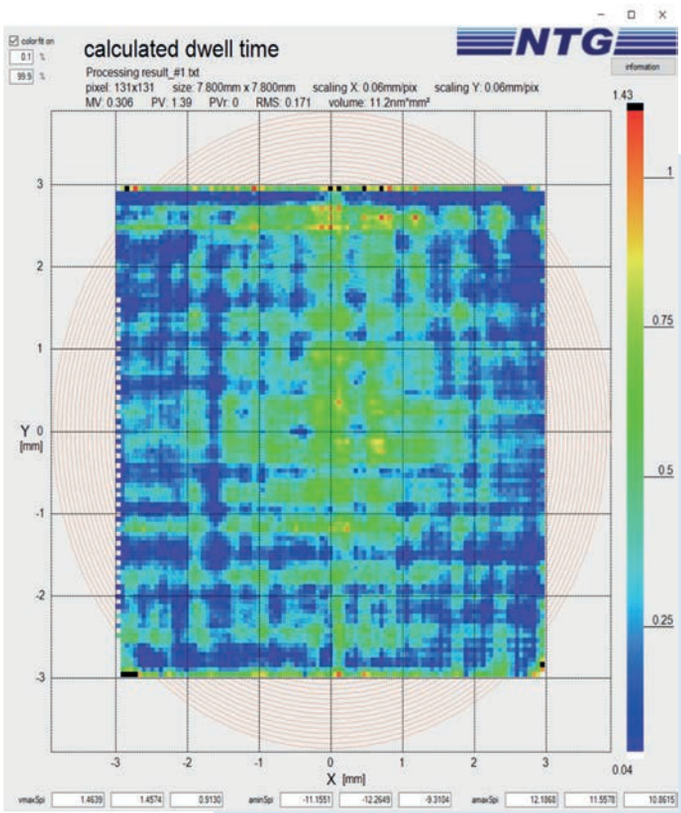
one-to-one calculation
After the simulation process the removal can be calculated in the original resolution of the topography. This enables checking various scalings and calculating the absolute etching depth.

working **directions**
Depending on topography data to be corrected, it can make sen–se to change the working direction in the calculation process for better results.

spiral path
The moving path is a spiral or a double spiral (in–and–out). It is possible to etch toric or ring surfaces.

variati**o**n of methods and edge extensions
The vario–module combines all methods, extensions, iteration steps and pertinent settings for finding the best result. The ratio between goal PV and RMS value can be weighted.

user permission
It is possible to award different permissions for Admin, Expert or Worker users. Settings are blocked and the automatic recipe mo–dus takes over.



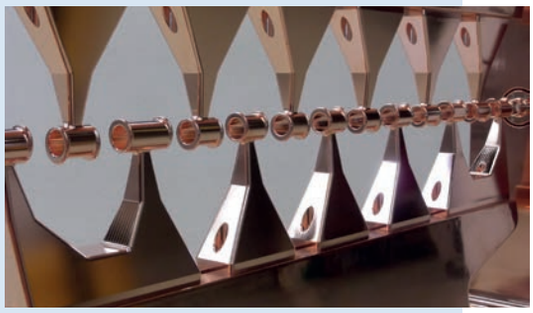
multi-file workflow
An extra GUI window allows the handling of many different sam–ples on one target holder. All sample files will be calculated indivi–dually but processed in one long run.

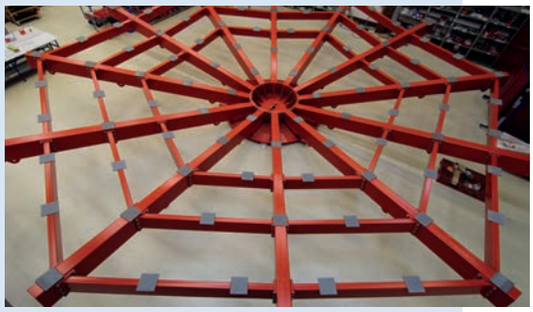
multi-footprint generator and analysis
A multiple process run with various footprint settings can be read and analysed. An Excel© sheet with all footprints parameters is generated.

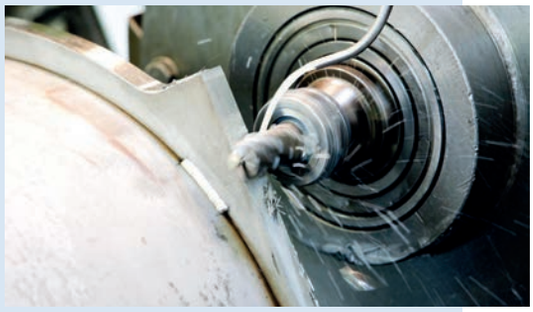
IBF LABORATORY

NTG owns four ion beam processing systems on which we can offer extensive services. This includes the finishing of high–per–formance optics and the implementation of customer–specific research as well as development projects for new materials and applications. Besides customer projects, we also push ahead with our own development projects in order to be able to offer our end customers ion beam technology that goes beyond the current state of the art – We push the limits!
In 2009, we established a measurement laboratory with excellent temperature stability (+/– 0.1°C). Also available are a Zygo Verifire AT+ interferometer, a Park XE–150 atomic force microscope and a Micro XAM 100 white–light interferometer. Of course, we can also process measurement data from customers or other certified measurement laboratories.

Describe your concern to us. We look forward to offering you a solution.







WHAT ELSE WE CAN DO?

VACUUM TECHNOLOGY

Vacuum Technology is one of the core 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 Aluminium –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 a speciality of NTG. NTG is your right partner to manufacture prototypes or other unique parts. NTG tries to make new ideas possible. 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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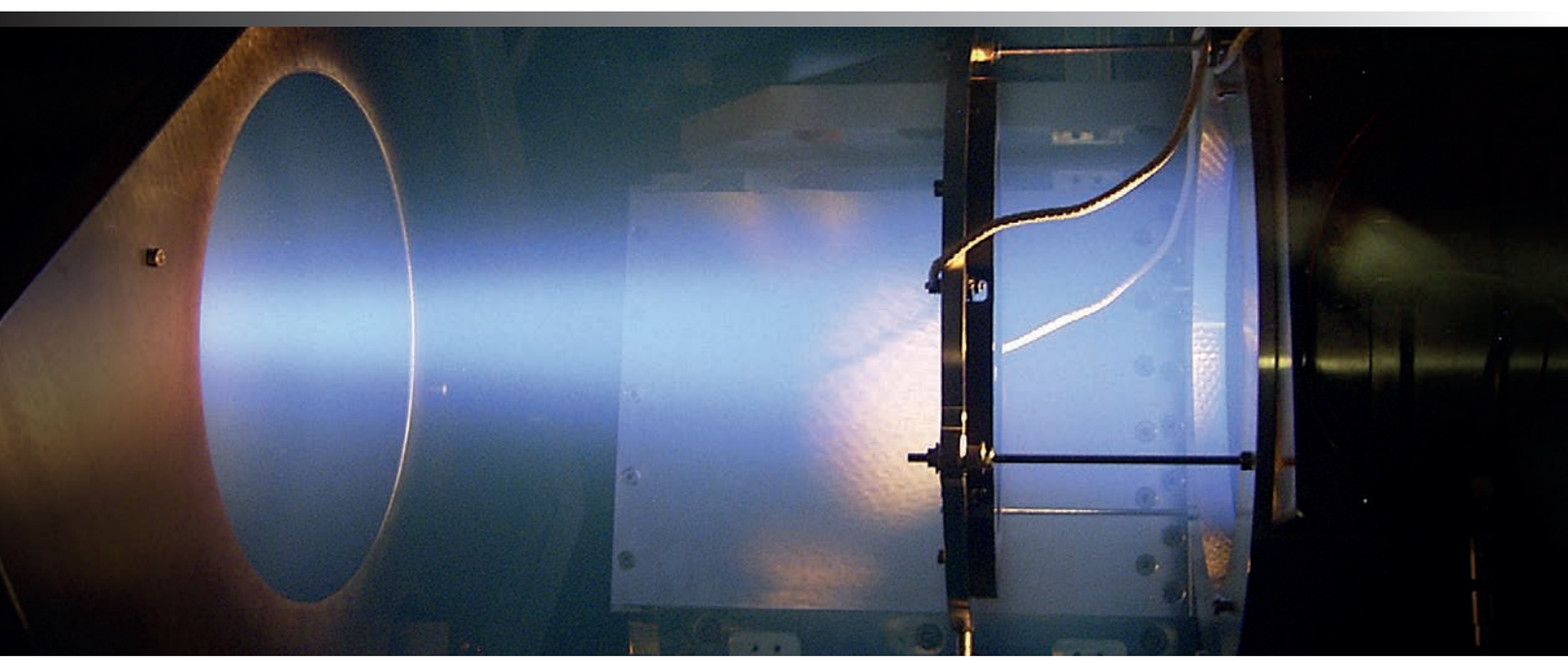

NTG

... we push the limits!