Budker INP Workshop

selected production capabilities

A. Steshov 31/01/2017

Contents

The Experimental Workshop comprises 150 technological divisions, sectors and specialized shops located in three production areas (~ 60 000 m^2). About 650 workers, technologists and engineers work at the Workshop.

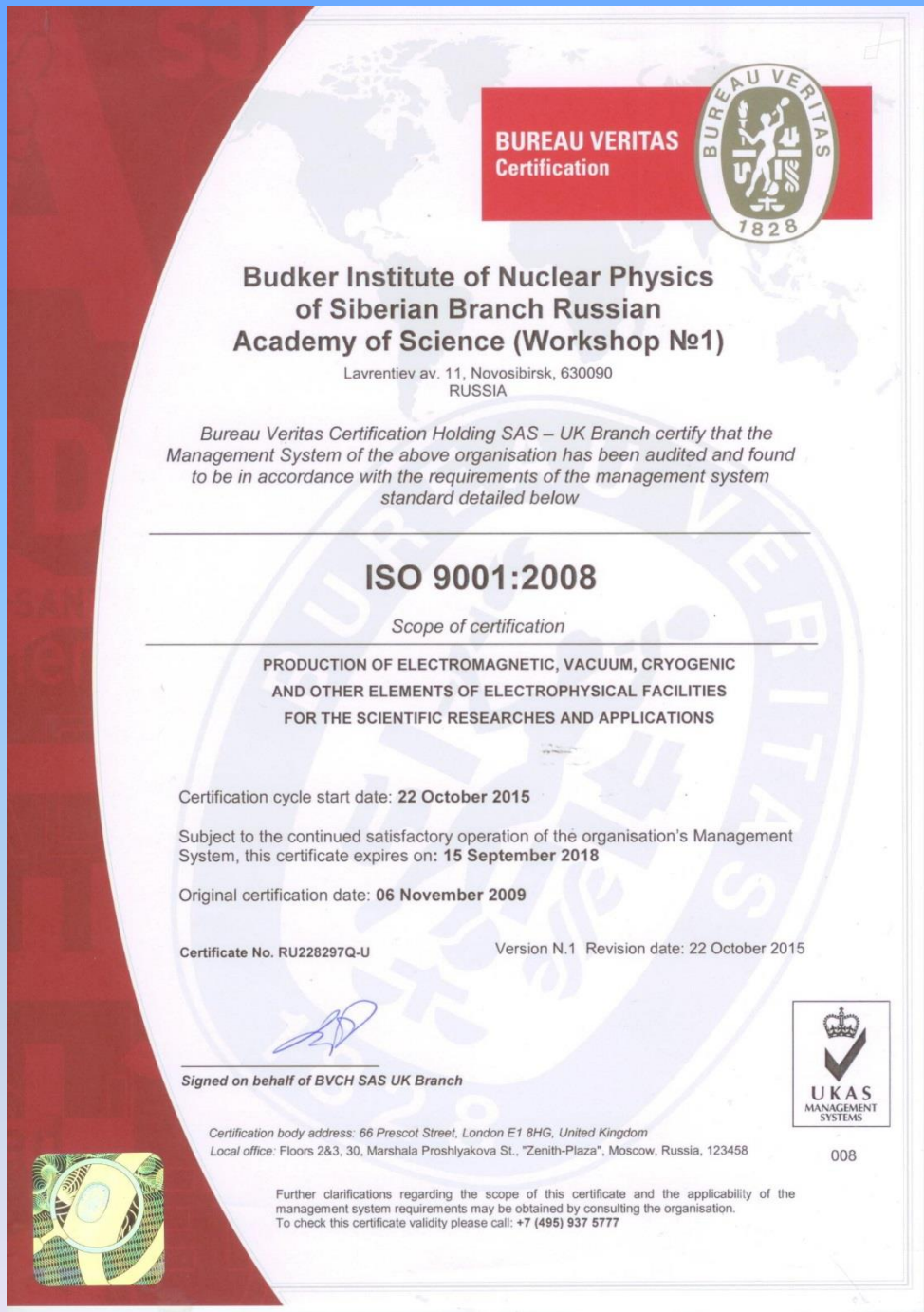
Certification

- ISO 9001:2008 certificate Bureau Veritas
- ГОСТ ISO 9001-2011 и ГОСТ РВ 0015-002-2012 (Russia)
- Certificates (TUV, BV, NACW) for welding shop, welders, inspection tests, technologists, etc.

ISO 9001:2008

Scope of certification

PRODUCTION OF ELECTROMAGNETIC, VACUUM, CRYOGENIC AND OTHER ELEMENTS OF ELECTROPHYSICAL FACILITIES FOR THE SCIENTIFIC RESEARCHES AND APPLICATIONS



BUREAU VERITAS Certification

Budker Institute of Nuclear Physics of Siberian Branch Russian Academy of Science (Workshop №1)

Lavrentiev av. 11, Novosibirsk, 630090
RUSSIA

Bureau Veritas Certification Holding SAS – UK Branch certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standard detailed below

ISO 9001:2008

Scope of certification

PRODUCTION OF ELECTROMAGNETIC, VACUUM, CRYOGENIC AND OTHER ELEMENTS OF ELECTROPHYSICAL FACILITIES FOR THE SCIENTIFIC RESEARCHES AND APPLICATIONS

Certification cycle start date: **22 October 2015**

Subject to the continued satisfactory operation of the organisation's Management System, this certificate expires on: **15 September 2018**

Original certification date: **06 November 2009**

Certificate No. RU228297Q-U Version N.1 Revision date: 22 October 2015

Signed on behalf of BVCH SAS UK Branch

UKAS MANAGEMENT SYSTEMS

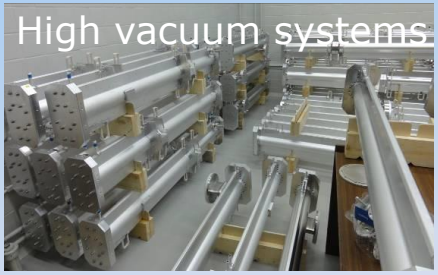
008

Certification body address: 66 Prescot Street, London E1 8HG, United Kingdom
Local office: Floors 2&3, 30, Marshala Proshlyakova St., "Zenith-Plaza", Moscow, Russia, 123458

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation.
To check this certificate validity please call: **+7 (495) 937 5777**

Experimental Workshop short description

Product groups



Top view on machining workshops

CNC Vertical Lathe TVL-12 DCM (TOPPER, Taiwan, 2007)

Performance spec:

chuck size - 1250 mm

Max. part diameter - 1600 mm

Max. cutting diameter - 1600 mm

Max. cutting height - 1250 mm

Max. part weight - 4500 kg

Special features: mill capability, particular accuracy equipment, diamond turning capability for copper (Ra =0,05…0,08 µm).

Experimental Workshop short description

Rotary drawing CNC lathe LEIFELD SC 310 (Germany, 2011)

Performance spec:

Number of axis - 9

Max. blank diameter - 1000 mm

Max. center distance - 1200 mm

Processing method – cold rotary drawing

Blank thickness – up to 10 mm for cooper

up to 6 mm for stainless steel

Vertical milling CNC machine Hardford PRO – 3150 (Taiwan, 2012)

Performance spec:

Spindle:

lengthwise movement (X) - 3060 mm

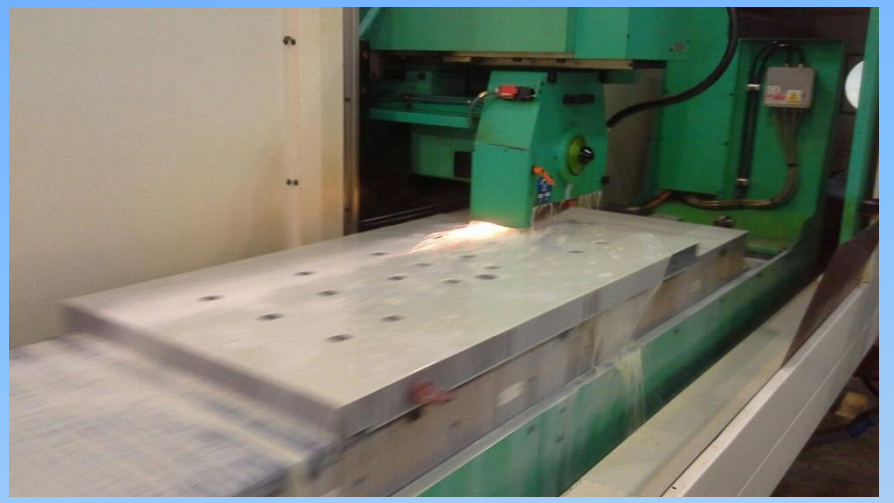
traverse movement (Y) - 1560 mm

vertical movement (Z) – 1070 mm

Machine table - 3100×1450 mm

Max. part weight - 6000 kg

Surface-grinding CNC machine LINEA SILVER 30.9 CNC (ROSA ERMANDO, Italy, 2012)



Performance spec:

lengthwise grinding – 3250 mm
traverse grinding – 950 mm
vertical grinding – 900 mm
Machine table - 3100×700 mm
Spindle to table distance - 1125 mm
Max. part weight – 3800 kg.

Experimental Workshop short description

Lathe CNC machine HAAS SL-30 THE (USA, 2006, 2 item)

Performance spec:

Max. part diameter - 406 mm

Max. part length - 864 mm

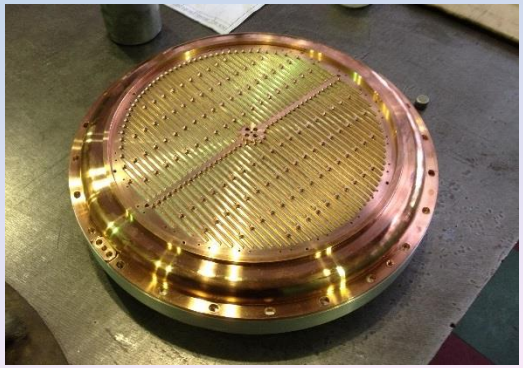
Machine accuracy:

positioning accuracy - ± 5 µm

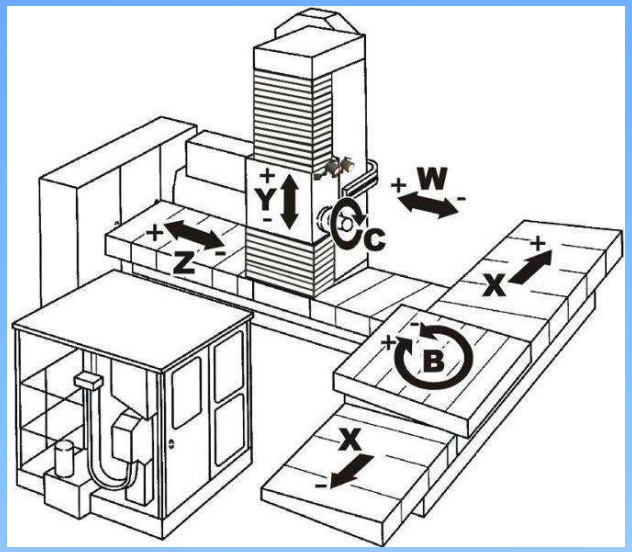
accuracy of positioning repeatability - ± 2,5 µm

Special features: particular accuracy equipment,

diamond turning capability for copper (Ra =0,05…0,08 µm)



Horizontally boring and turning mill WHN-13 CNC (TOS Varnsdorf, Czech Republic, 2016)



Performance spec:

spindle turns: 10-3000 turns/min

Axis movement:

Y=2000 mm, W=800 mm, Z=1250 mm, X=3500mm

Machine table - 3000×2000 mm

Max. part weight – 18 000 kg.

Special features: deep drilling function, bore diameter 10-30 mm, max. depth - 1 m.

Commissioning is planned for February, 2017

Universal bending machine UV-1800

Performance spec:
3 roll bending system
Roll diameter – 268/240 mm
Blank thickness – 5 … 20 mm (steel)
Min. bending radius – 400 mm
Max. part length - 1800 mm

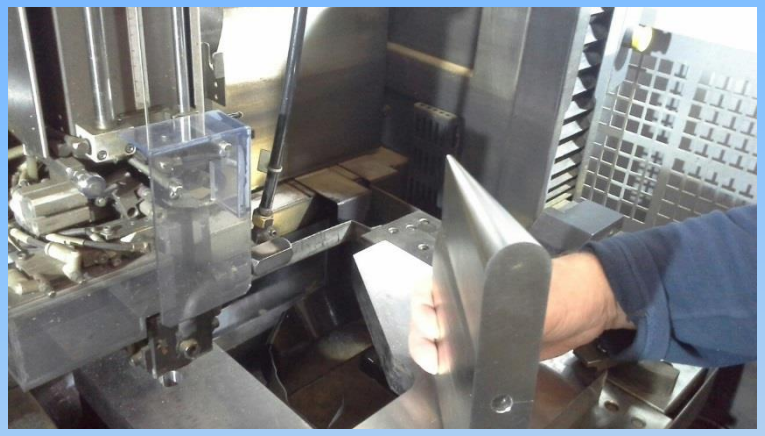
Section bending CNC machine «MG» AR 160L (Italy, 2012).

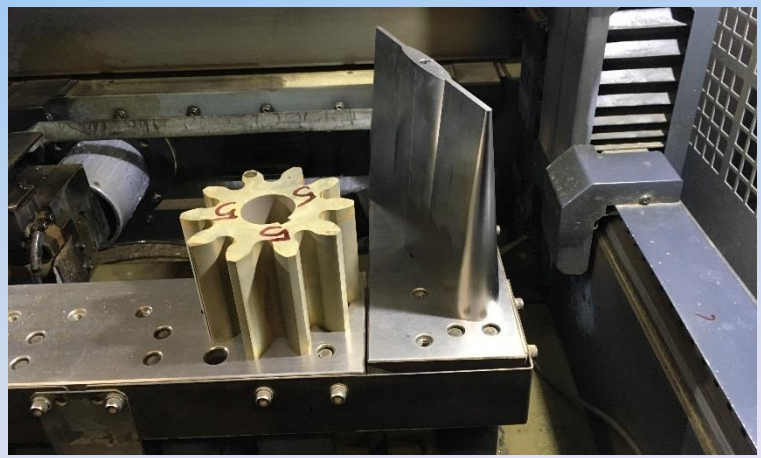
Performance spec:
3 roll bending system
Roll diameter - 485 mm
Engine power - 18,5 kW
Bending rate - 5 m/min
Blank thickness – 5 … 40 mm (steel)
Min. bending radius – 500 mm
Max. part length – 500 mm

Wire cut EDM CNC AQ327L Premium (Sodick, Japan, 2008)

Performance spec:

Max. part dimensions (l x w x h)
570 × 420 × 240 mm
Max. part weight – 500 kg
Machine accuracy ± 2.5 µm
Surface roughness Ra 0.1 µm





Welding & brazing

Certificate

Inspection of a Welding Shop

Certificate no.: 01 202 HU/A 15 3029

Name and address of the manufacturer:
BUDKER INSTITUTE OF NUCLEAR PHYSICS
Lavrentiev av. 11
630090 Novosibirsk, Russia

It is hereby certified that the manufacturer has furnished proof of the comprehensive quality requirements to be met for his welding activity.

Specifications: **DIN EN ISO 3834-2**

Test Report no.: **E 122/0526/2015**

Scope: **Manufacturing of welded constructions, steel constructions, pressure equipments, see annex.**

Manufacturing Plant:
BUDKER INSTITUTE OF NUCLEAR PHYSICS
Tikhaya str. 5
630058 Novosibirsk, Russia

Valid until: **15.04.2018**

Budapest, 06.05.2015

Eng. Gyula PALUSKA
Certifier

TÜV Rheinland-Zertifizierungsstelle
für Druckgeräte der
TÜV Rheinland Industrie Service GmbH
D-51105 Köln, Am Grauen Stein

Branch office:
TÜV Rheinland InterCert Kft.
H-1132 Budapest, Váci út 48/a-b
tel.: +36-(1) 4611-100, fax: +36-(1) 4611-199
E-mail: tuv@hu.tuv.com, Internet: www.tuv.hu

TÜV Rheinland InterCert Kft. Ipari szolgáltatások üzletág – H-1132 Budapest, Váci út 48/a-b
tel.: +36-1/4611-170, fax: +36-1/4611-199, e-mail: tuv@hu.tuv.com, honlap: www.tuv.hu
UA 20-Je_4_1 1 / 1 (rev. 2013.05.21-16)

www.tuv.hu

TÜVRheinland®
Precisely Right.

Welding shop was certified by TUV Rheinland for EN ISO 3834-2, 4 specialists has TIG welding certificates and 4 specialists has high-temperature flux brazing certificates

Hand shielded-metal arc welding

- Using for structural steel, stainless steel, low-carbon steel welding
- Welded part thickness 2…30 mm

Semi-automatic inert gas welding

- Aluminum and aluminum alloys (4….40 mm)
- Alloyed steel welding (4…60 mm)

Semi-automatic CO_2-welding

- Low-carbon steel welding
- Welded part thickness 3…..30 mm

Hand welding, semi-automatic welding & brazing

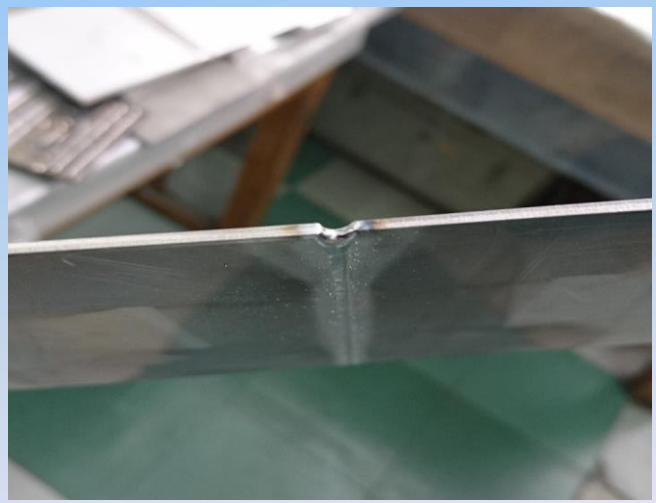
TIG (Tungsten inert gas arc welding) without filler material

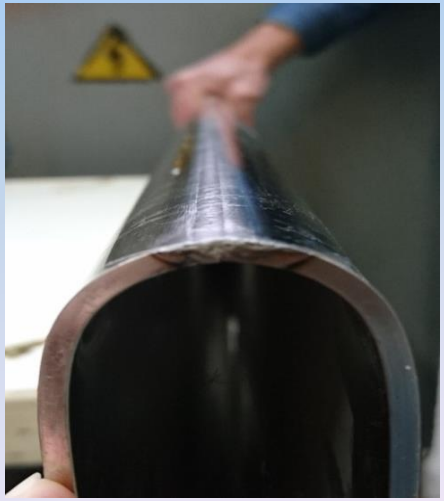
- Vacuum components from stainless steel (12X18H10T, 304,316L,316LN), kovar alloy (Fe-Ni-Co), oxygen-free copper, copper and titanium (0,5…2 mm)
- Aluminum and aluminum alloys (1….2 mm)

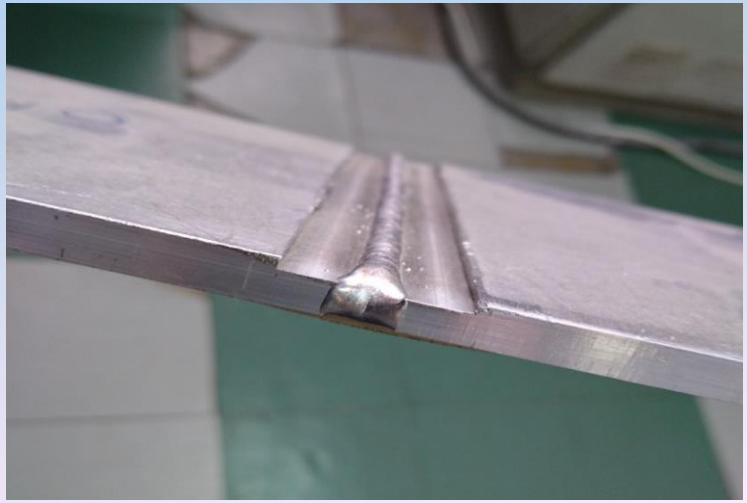
TIG (Tungsten inert gas arc welding) with filler material

- Aluminum and aluminum alloys (thickness 2…20 mm)
- Vacuum components from stainless steel (12X18H10T, 304, 316L,316LN), oxygen-free copper, copper and titanium (welded thickness 1,6…20 mm)

Examples of welded pats







Hand welding, semi-automatic welding & brazing

Equipment for welding

VD - 301u3, VD – 306u3 4 pieces

DC equipment for hand shielded-metal arc welding

Kemppi Master TIG ac/dc 3500w 6 pieces

Equipment for hand TIG welding

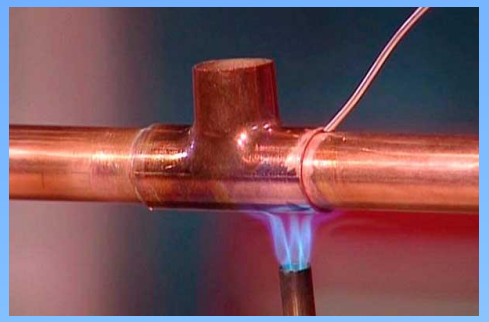
Kemppi Master TIG MLS TM4000 2 pieces

Equipment for hand TIG welding

Kemppi PRO 4200 EVOLUTION 3 pieces

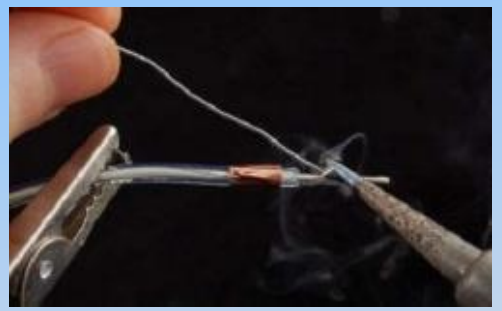
Equipment for semi-automatic MIG (Metal-arc inert gas welding), pulse MIG and TIG welding.

High-temperature flux brazing



- Temperature 650-900 °C
- Braze depth 3…10 mm
- Copper+copper, copper+copper alloys, steel+copper, steel+copper alloys steel+steel

Flux soft soldering



- Temperature 150-200 °C
- Braze depth 5…20 mm
- Copper+copper, copper+copper alloys, steel+copper, steel+copper alloys steel+steel

High-temperature brazing

- Temperature 710 °C
- Braze depth 5…20 mm
- Copper+copper

Electron beam welding

Electron-beam welding

Equipment of electron-beam welding on the basis of an electron gun developed at Paton Electric Welding Institute was commissioned in 1994. Equipment is intended for precision welding of vacuum components.

Welded materials: copper, oxygen-free copper, copper alloys, stainless steel, niobium, aluminum, aluminum alloys and titanium

Max. welded part dimensions: diameter/width - 700 mm, length - 1500 mm

Electron beam welding

Main components of equipment:

Electron gun ELA-15, produced by Paton Electric Welding Institute

Vacuum chamber, pumping system, electromechanical drives, power and control systems, produced by Budker INP.

Electron gun ELA-15

power of electron beam up to 15 kW

electron beam energy - 60 kV

welding current range up 0,5 to 250 mA

welding current deviation $\pm 0{,}5 \times 10^{-2}$ mA

Vacuum chamber – rectangular tank welded from stainless steel

dimensions - 1200 × 1500 × 2000 mm

Chamber has face door and transport system with rails

Vacuum pumping system provides rate of pumping up to 16000 l/sec and vacuum up to 10^{-6} Torr

backing vacuum pumps NVZ-20 and AVR-150

turbomolecular pump and ion getter pump: TMN - 1500 и NMDN – 16/40

Guidance system provides gun moving with accuracy 0,1 mm

Electronic video system developed by Budker INP (accuracy about 0,01 mm), small laser and optical systems.

New electron beam welding machine developed and produced at BINP

Electronics, HV source and e- gun

Parameter	Units	Value
Maximum beam power	kW	60
Energy	kV	30÷60
Energy spread	%	0.5
Beam current	mA	1÷1000
Beam current stability	%	± 2
Cathode lifetime	hours	≈100
Beam deflection	rad	0.12
Power consumption	kW	72
Vac. chamber dimensions (d×L)	m	1×3.5
Maximum weight of weld assembly	kg	200

Example of stainless steel electron beam weld

Equipment for vacuum bakeing, diffusion welding & brazing metals and alloys in vacuum or hydrogen furnace

Vertical vacuum furnace 1800/850

Operating vacuum volume:
diameter - 1800 mm, height - 850 mm
Temperature up to 900 °C.
Deviation of temperature +/- 10 °C

Min. residual pressure:
1 x 10^{-5} Torr in cold empty furnace
1 x 10^{-4} Torr in hot empty furnace

Vacuum pumping system:
backing oil vacuum pump and
steam-oil vacuum pump with liquid nitrogen trap (pumping rate 3000 l/sec)

Manual control system with visual control through special window.

Manufacturing capabilities:
- high-temperature vacuum bakeout nonferrous, ferrous metals and alloys.
- vacuum soldering by solder alloy ПСрМПд 68-27-5 (Ag-68%, Cu-27%, Pd-5%)
- vacuum soldering by solder alloy ПСр 72 (Ag-72%, Cu-28%)
- vacuum soldering by solder alloy ПМФС-6-0,15 (P-6%, Si-0,15%, Cu-93,85%)

Equipment for vacuum bakeout, diffusion welding & brazing metals and alloys in vacuum or hydrogen furnace

Vertical vacuum –hydrogen furnace XERION (Germany, 2016)

Operating vacuum volume: diameter - 800 mm, height - 1000 mm
Temperature up to 1200 °C.
Deviation of temperature +/- 5 °C
Min. residual pressure in operating volume:
1 x 10^{-5} Torr in cold empty furnace
1 x 10^{-4} Torr in hot empty furnace
Tool for pressing with force: 150000 N
Vacuum pumping system:
backing oil-free vacuum pump and high-vacuum turbomolecular pump
Computer control system based on Eurotherm 2704, interface RS232 with visualization process on monitor.

Manufacturing capabilities:

- high-temperature vacuum bakeout nonferrous, ferrous metals and alloys
- diffusion welding metals and alloys
- vacuum soldering by solder oxygen-free copper (Cu-100%)
- vacuum soldering by gold (Au-100%)
- vacuum soldering by solder alloy ПЗлМ 50 (Au-50%, Cu-50%)
- vacuum soldering by solder alloy ПМГрН 10-1,5 (Ge-10%, Ni-1,5%, Cu-88,5%)
- vacuum soldering by solder alloy ПМ17 (Mn-17%, Ni-12%, Sn-5%, Fe-2%, Cu-64%)
- vacuum soldering by silver (Ag-100%)
- vacuum soldering by solder alloy Nioro (Au-82%, Ni-18%)
- vacuum soldering by solder alloy ПСрМПд 68-27-5 (Ag-68%, Cu-27%, Pd-5%)
- vacuum soldering by solder alloy ПСр 72 (Ag-72%, Cu-28%)
- vacuum soldering by solder alloy ПМФС-6-0,15 (P-6%, Si-0,15%, Cu-93,85%)

Equipment for vacuum bakeing, diffusion welding & brazing metals and alloys in vacuum or hydrogen furnace

Vertical vacuum furnace 500/800

Operating vacuum volume:
diameter - 500 mm, height - 800 mm

Vertical vacuum furnace 400/1800

Operating vacuum volume:
diameter - 400 mm, height - 1800 mm

Temperature up to 900 °C
Deviation of temperature +/- 10 °C
Tool for pressing with force: 10000 N

Min. residual pressure in operating volume :
1 x 10^{-5} Torr in cold empty furnace
1 x 10^{-4} Torr in hot empty furnace
Vacuum pumping system:
backing oil vacuum pump and
steam-oil vacuum pump with liquid nitrogen trap
(pumping rate 2000 l/sec)
Manual control system with visual control through special window.
Manufacturing capabilities:
- high-temperature vacuum bakeout metals and alloys.
- diffusion welding metals and alloys
- vacuum soldering by solder alloy ПСрМПд (Ag-68%, Cu-27%, Pd-5%)
- vacuum soldering by solder alloy ПСр 72 (Ag-72%, Cu-28%)
- vacuum soldering by solder alloy ПМФС (P-6%, Si-0,15%, Cu-93,85%)

Equipment for vacuum bakeing, diffusion welding & brazing metals and alloys in vacuum or hydrogen furnace

Vertical vacuum furnace 400/500

Operating vacuum volume: diameter - 400 mm, height - 500 mm
Temperature up to 1100 °C.
Deviation of temperature +/- 5 °C
Min. residual pressure in operating volume:
1 x 10^{-5} Torr in cold empty furnace
1 x 10^{-4} Torr in hot empty furnace
Tool for pressing with force: 12000 N
Vacuum pumping system:
backing oil vacuum pump and steam-oil vacuum pump with liquid nitrogen trap (pumping rate 2000 l/sec)

Manufacturing capabilities:
- high-temperature vacuum bakeing nonferrous, ferrous metals and alloys
- diffusion welding metals and alloys
- vacuum soldering by solder oxygen-free copper (Cu-100%)
- vacuum soldering by gold (Au-100%)
- vacuum soldering by solder alloy ПЗлМ 50 (Au-50%, Cu-50%)
- vacuum soldering by solder alloy ПМГрН 10-1,5 (Ge-10%, Ni-1,5%, Cu-88,5%)
- vacuum soldering by solder alloy ПМ17 (Mn-17%, Ni-12%, Sn-5%, Fe-2%, Cu-64%)
- vacuum soldering by silver (Ag-100%)
- vacuum soldering by solder alloy Nioro (Au-82%, Ni-18%)
- vacuum soldering by solder alloy ПСрМПд 68-27-5 (Ag-68%, Cu-27%, Pd-5%)
- vacuum soldering by solder alloy ПСр 72 (Ag-72%, Cu-28%)
- vacuum soldering by solder alloy ПМФС-6-0,15 (P-6%, Si-0,15%, Cu-93,85%)

Equipment for vacuum bakeing, diffusion welding & brazing metals and alloys in vacuum or hydrogen furnace

Vertical vacuum furnace 200/800/500

Operating vacuum volume: 200x800x500 mm
Temperature up to 1200 ^{o}C.
Deviation of temperature +/- 5 ^{o}C

Min. residual pressure in operating volume:
1 x 10 $^{-5}$ Torr in cold empty furnace
1 x 10 $^{-4}$ Torr in hot empty furnace
Tool for pressing with force: 50000 N

Vacuum pumping system:
backing oil vacuum pump and steam-oil vacuum pump with liquid nitrogen trap (pumping rate 2000 l/sec)

Manual control system with visual control through special window

Manufacturing capabilities: diffusion welding metals and alloys in vacuum with using graphite heaters

Ultrasonic cleaning

For high vacuum component we usually use cleaning in ultrasonic baths. Ultrasonic baths have built-in heaters of the washing liquid and analog timers to control the cleaning time. The tanks are made of stainless steel. Cleaning is done by various acid and alkaline washing liquids, trichlorethylene, the distilled and demineralized water with a high electric resistance (to 10-14 kOhm).

Performance spec:
The ultrasonic bath with a frequency of 22 kHz is used for preliminary cleaning, operating volume:
width - 400 mm
length - 1300 mm
height - 400 mm

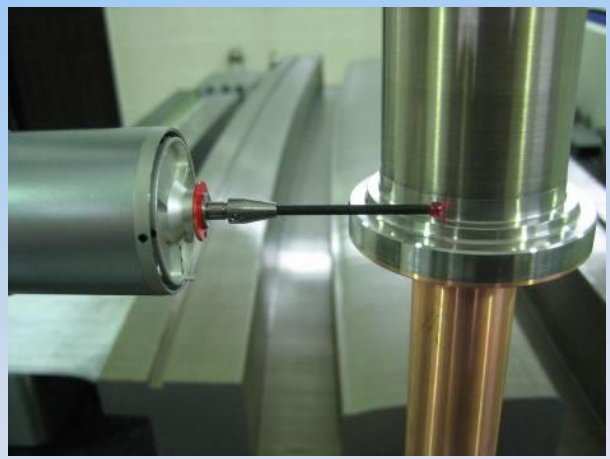
The ultrasonic bath with a frequency of 44 kHz is used for final cleaning.
For bath produced by Martin Walter Ultraschall technik AG, operating volume:
width - 700 mm
length - 1000 mm
height - 700 mm

For bath produced in St.Petersburg, operating volume:
width - 700 mm
length - 6000 mm
height - 700 mm

Clean rooms

For assembling of high vacuum devices and components specialized clean rooms are used. These rooms are located in production rooms of general purpose. By means of system of ventilation, conditioning, rough and thin purification of air with a laminar flow in these rooms the required purity is provided and supported. Control of concentration of the particles in air is made by means of the measuring device PC 3B-905. The device allows to determine quantity of particles of 0,5-1 µm in size per one cubic meter of air. According to ISO 14644-2002 these rooms are belong to 3-rd class (35 particles of 0,5 µm in size per 1 m^3). The maximum working area of these rooms: 3000 x 5500 mm at height - 2500 mm.

Special measurement instrumentation



Bureau of technical control and testing: equipment for precision 3D mechanical measurements

CMM Contura G2
Carl Zeiss

Measuring ranges in mm:
X = 1000
Y = 2100
Z = 600
Maximum workpiece weight in kg:
P = 1814
0.3 < d < 8 mm, L = 90 mm max.

CMM Contura G2
Sensors and Accuracy

RDS - Rotary Dynamic Sensor holder for optical, touch, and scanning sensor.

The 2.5° increments of rotation more than 20000 possible angular positions

ViScan - optical 2D image sensor with autofocus.

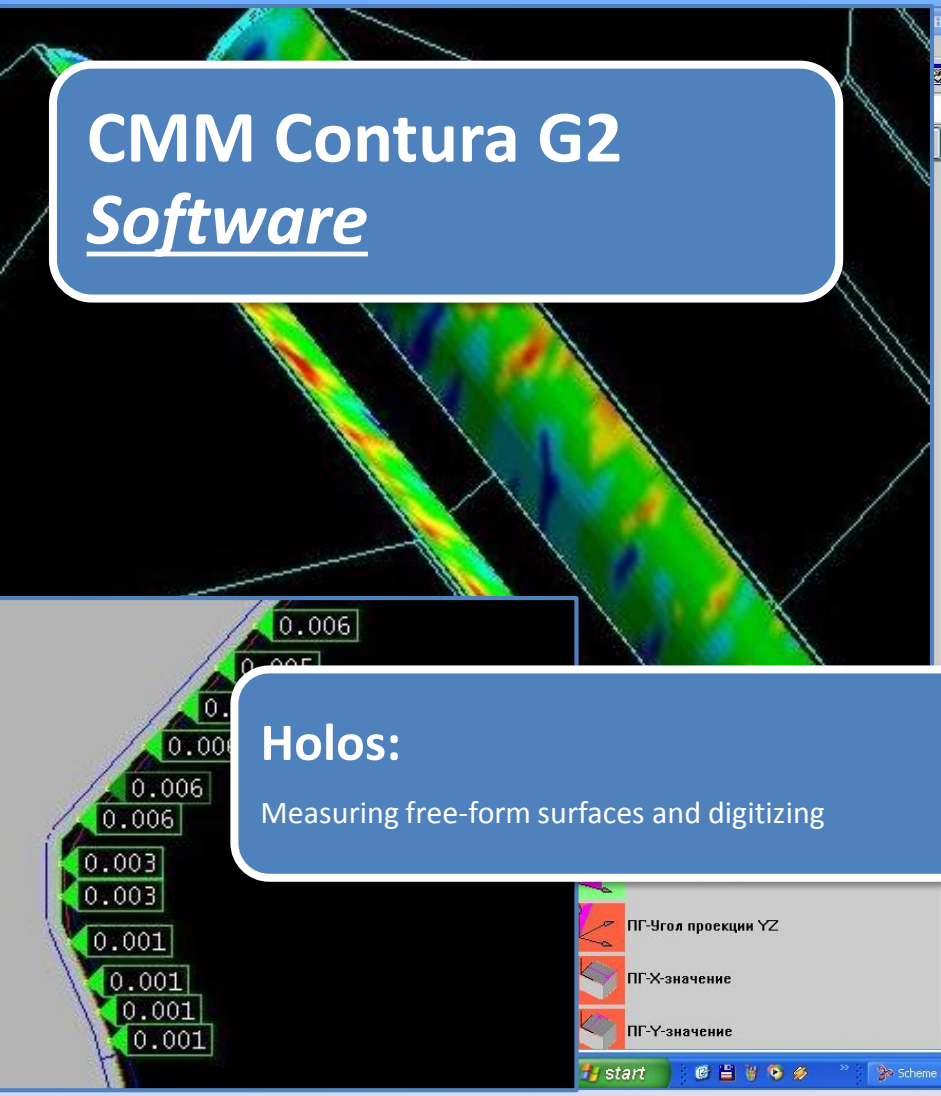
Probing error
2D probing uncertainty = **10 µm**
VDI/VDE 2617 Part 6

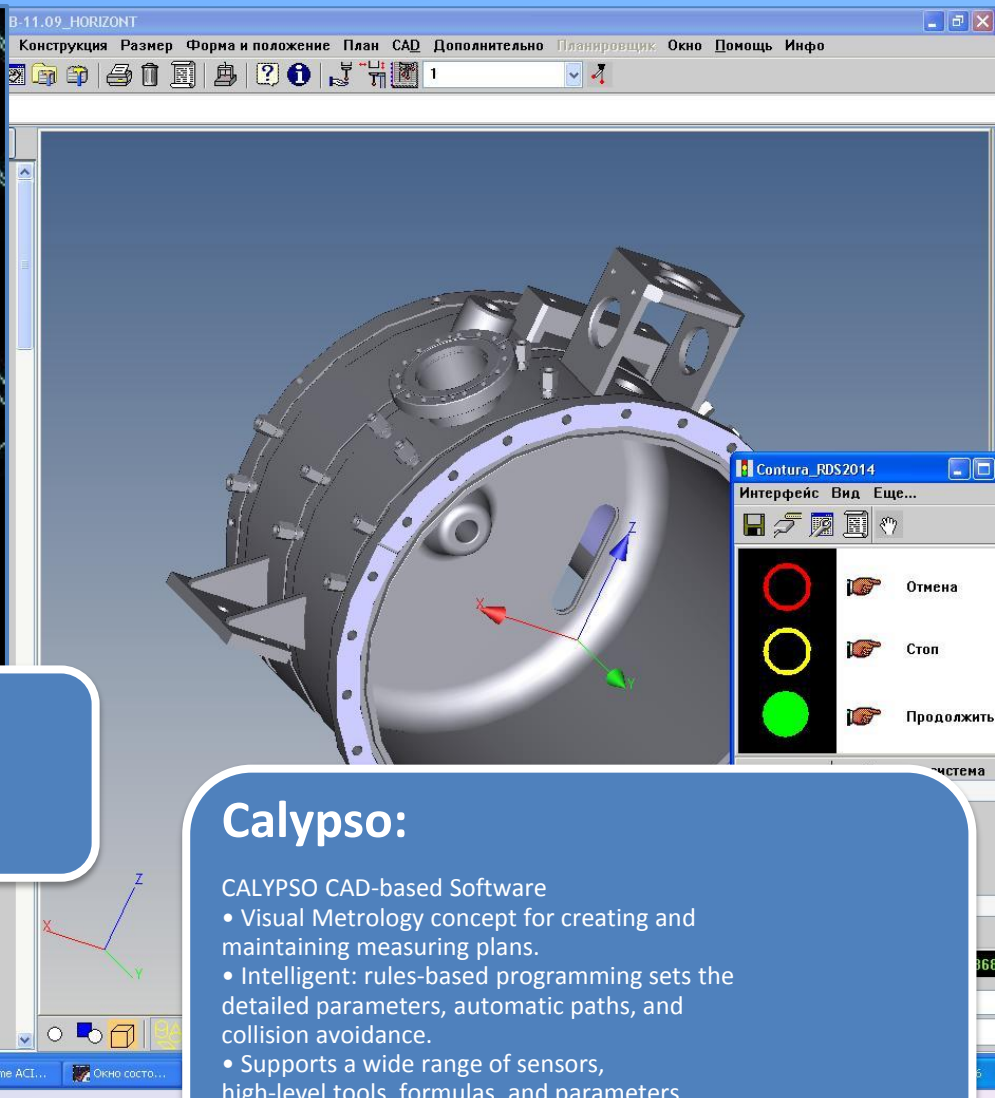
Vast XXT - passive scanning and single-point sensor.

Length (size) measuring error:
MPE_E =**1.9 + L/300 µm** EN ISO 10360-2

Special measurement instrumentation

CMM Contura G2
Software





Holos:

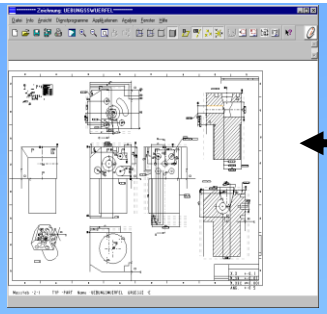
Measuring free-form surfaces and digitizing

Calypso:

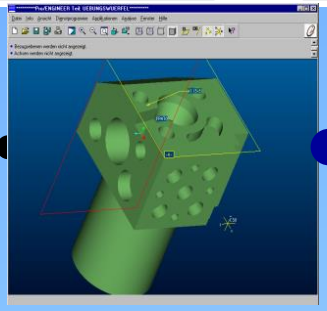
CALYPSO CAD-based Software
- Visual Metrology concept for creating and maintaining measuring plans.
- Intelligent: rules-based programming sets the detailed parameters, automatic paths, and collision avoidance.
- Supports a wide range of sensors, high-level tools, formulas, and parameters.
- Better performance with scanning technology.

Special measurement instrumentation

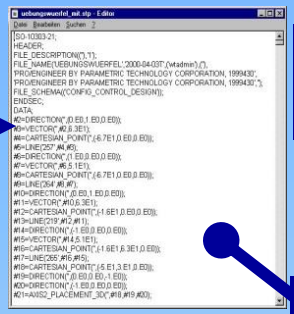
CALYPSO.



Drawing in 3D CAD system
automatic feature numbers

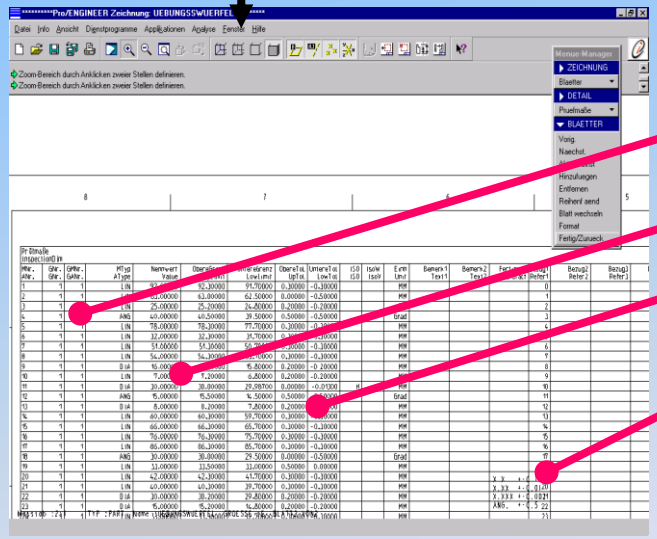


3D CAD system model



STEP file from the
3D CAD system

Geometry



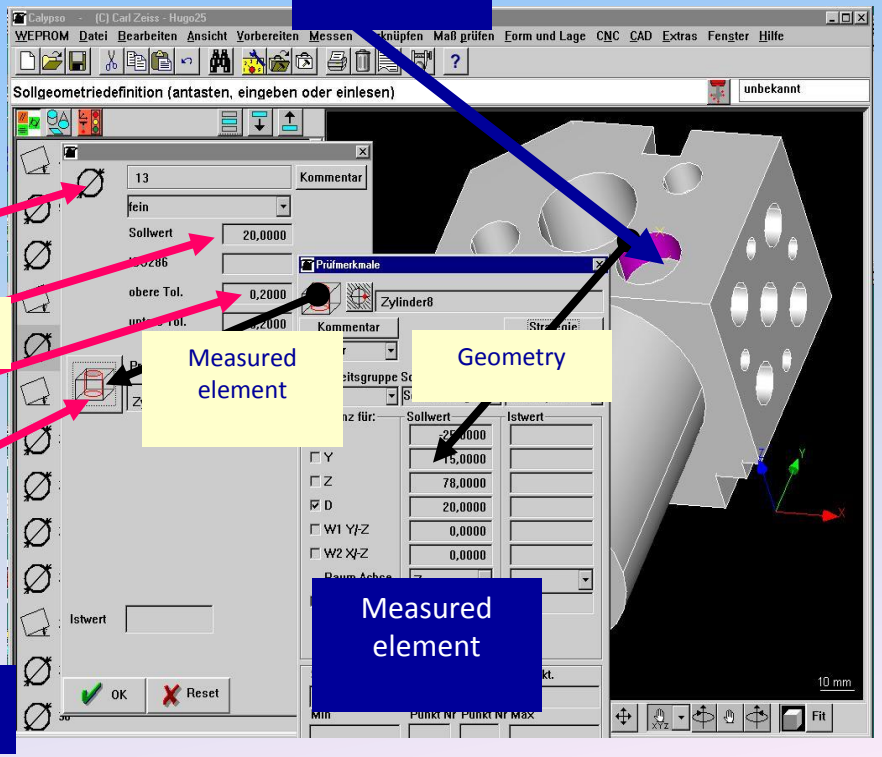
Feature

Nominal size

Tolerance

Reference

Test plan



Measured
element

Geometry

Measured
element

Special measurement instrumentation

Equipment for vacuum tests

Wide Range Active Vacuum Gauge CC-10

Measurement from 1 x 10-9 up to 1000 Torr

Helium leak detector ASM 380
With oil free backing pump & capacity 35 m3/h

Vacuum mode:

Minimum detectable Helium leak rate 5*10-12 mbar*l/s
Maximum inlet test pressure 15 mbar
Roughing capacity 35 m3/h (21cfm)
Helium pumping speed 7 l/s

Sniffing mode:

Minimum detectable Helium leak rate 1*10-7 mbar*l/s
Response time < 1 s

Special measurement instrumentation

Equipment for magnetic permeability tests

MAGNETOSCOP® 1.069

Portable, microprocessor controlled fluxgate magnetometer

Measuring range - μ_r 1.0 to 2.0

Dimensions, approx. - 266 x 144 x 64 mm

Weight, approx. - 0.86 kg

Temperature range - 0 to 40°C

Uncertainty of permeability measurement - 5% of measured value

Magnetic permeability μ is the degree of magnetization of material in response to a magnetic field. It is the ratio of magnetic flux density B and magnetic flux H. The physical constant μ_0 is the magnetic permeability in vacuum. Relative permeability μ_r is the ration of μ and μ_0. Magnetoscop with permeability probe will determine relative permeability of material and manufactured components in accordance with IEC 60404-15, ASTM A342M and VG 95578. It is not necessary to produce test specimen of specific size or shape.

Permeability probe
Part Number: 1668145
Measuring range μ_r 1.0 to 2.0

Equipment for roughness measurements

SURFTEST SJ-210

The Surftest SJ-210 is a user-friendly surface roughness measurement instrument designed as a handheld tool that can be carried with you and used on-site.

Size (W×D×H):
Display unit - 52.1×65.8×160mm
Drive unit - 115×23×26mm
Mass About - 500g (Display unit + Drive unit + Standard detector)

Measuring range	X axis	.69" (17.5mm)	.22" (5.6mm)
	Z axis (Detector) Range	14200 µin (-7900µin~+6300µin) / 360µm (-200µm ~ +160µm)	
	Z axis (Detector) Range / Resolution	14170µin /.8µin (360µm / 0.02µm), 4000µin / .2µin (100µm / 0.006µm), 1000µin /.08µin (25µm / 0.002µm)	
Measuring speed		Measuring: 0.01, 0.02, 0.03 in/s (0.25mm/s, 0.5mm/s, 0.75mm/s) Returning: 1mm/s	
Measuring force / Stylus tip		0.75mN type: 0.75mN / 2µmR 60°, 4mN type: 4mN / 5µmR 90°	
Skid force		Less than 400mN	
Applicable standards		JIS '82 / JIS '94 / JIS '01 / ISO '97 / ANSI / VDA	
Assessed profiles		Primary profile / Roughness profile / DF profile / Roughness profile-Motif	
Evaluation parameters		Ra, Rc, Ry, Rz, Rq, Rt, Rmax, Rp, Rv, R3z, Rsk, Rku, RPc, Rsm, Rmax, Rz1max, S, HSC, RzJIS, Rppi, RΔa, RΔq, Rlr, Rmr, Rmr(c), RδC, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo, Rpm, tp, Htp, R, Rx, AR, Possible Customize	
Analysis graphs		Bearing area curve / Amplitude distribution curve	
Filters		Gaussian, 2CR75, PC75	
Cut off length	λc	0.003, 0.01, 0.03, 0.1" (0.08 , 0.25 , 0.8 , 2.5mm)	
	λs	100, 300µin (2.5 , 8µm) or none	
Sampling length		0.003, 0.01, 0.03, .1 " (0.08 , 0.25 , 0.8 , 2.5mm)	

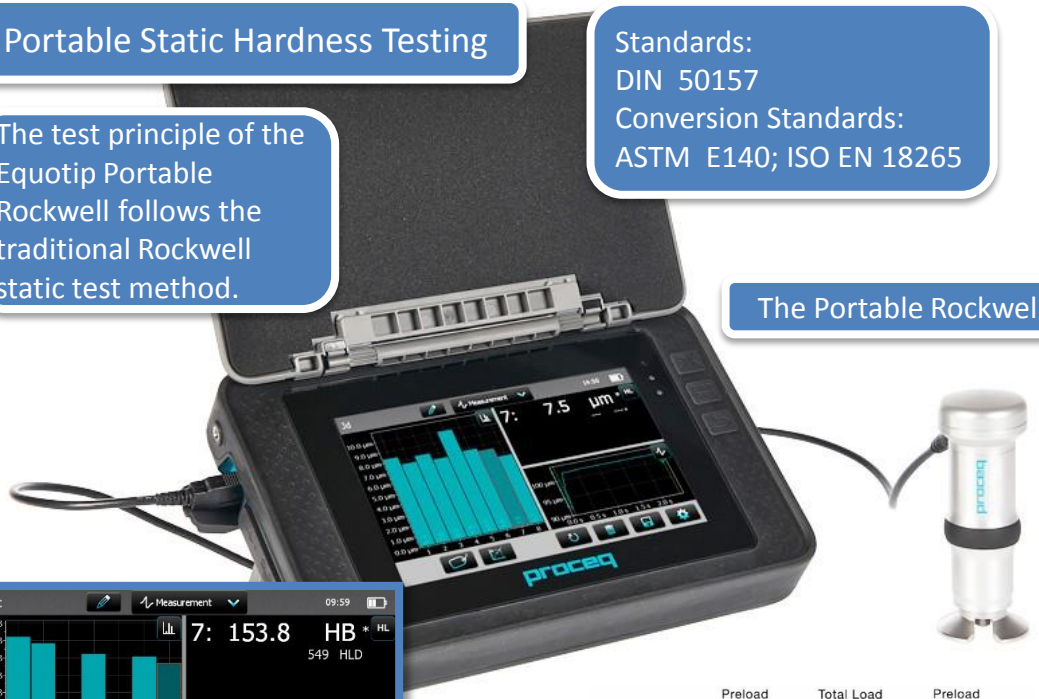
Equipment for static hardness tests

Equotip® 550 Portable Rockwell

Portable Static Hardness Testing

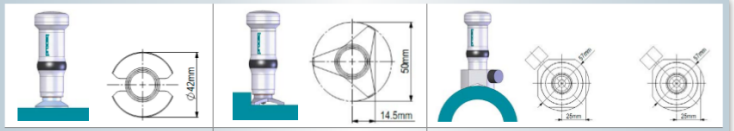
The test principle of the Equotip Portable Rockwell follows the traditional Rockwell static test method.

Standards:
DIN 50157
Conversion Standards:
ASTM E140; ISO EN 18265



Equotip® Portable Rockwell Probe and Accessories

Measuring range	0-100 µm; 19-70 HRC; 35-1'000 HV
Resolution	0.1 µm; 0.1 HRC; 1 HV
Measuring accuracy	± 0.8 µm; ~ ± 1.0 HRC over entire range
Test loads	Preload 10 N / Total Load 50 N
Diamond indenter	Angle 100.0° ± 0.5°, diameter of flat area of 60 µm ± 0.5 µm
Dimensions	Ø 40 mm, Length 115 mm

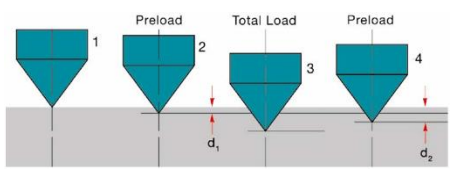


Round standard foot (magnetic)
Ideal for flat parts, and test locations more than 10 mm from an edge.

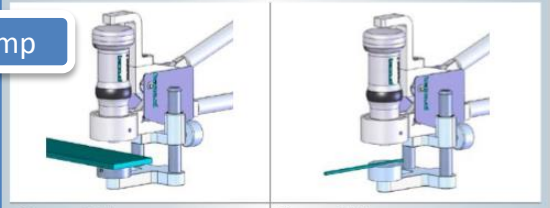
Tripod foot
Designed for tests that require accurate positioning (welds, heat-affected zones).

Special feet RZ 18-70 and 70-∞
Designed for curved test pieces such as cylindrical parts, tubes, pipes.

The Portable Rockwell Measuring Clamp

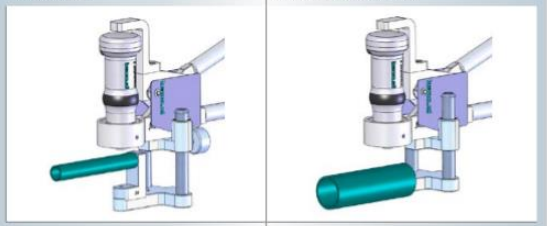


Clamp Adapters



Support Z1
for flat parts max. 40 mm thickness

Support Z2
for thin cylindical parts, wires, bolts min. Ø 3 mm



Support Z4
for tubes and pipes up to Ø 28 mm

Support Z4+28
for tubes and pipes over Ø 28 mm

Special measurement instrumentation

Equipment for chemical content analysis

PMI-MASTER Smart UVR

Transportable

Mobile

UVTouch probe

- Low levels of C, P, S, B, As and Sn in low alloy and stainless steels
- L grade separation
- Nitrogen in duplex steels
- Display of analysis results
- Control of main spectrometer functions
- Extended wavelength range of probe's optic: 170 to 200 nm

Spark probe

- Reliable spark analysis of standard elements
- Rugged construction
- Various sample adapters available

Arc probe

- Ideal for the sorting of different metals with arc in air atmosphere
- No Argon required
- Analysis in only 3 seconds
- For tubes, wires and small parts

Weight and dimensions:

- Weight: 15 kg
- Width: 425 mm
- Height: 235 mm
- Depth: 410 mm

Typical applications

- Steel alloys
- L grade segregation in stainless steel
- C, P*, S*, Sn*, As* and B* in steel
- N* in duplex steels
- Al alloys ~ Al-Si ~ Al-Si-Cu
- Cu-Sn ~ Cu-Zn ~ Cu-Ni
- Cu, Ni, Zn, Co, Mg, Pb, Sn and Ti alloys…

* With UVTouch probe

NDT weld inspection & incoming inspection of materials

Visual Testing

Radiography Testing

Ultrasonic Testing

Liquid Penetrant Testing

Certification

EN 473 - Non-destructive testing. Qualification and certification of NDT personnel. General principles

ISO 9712 - Non-destructive testing -- Qualification and certification of personnel

National certification

International certification

Visual Testing

VT is the widest NDT method. It is focused on inspection and evaluation of the surface by naked eye or using special equipment. VT is used by standard NDT control, where defects like cracks, cold laps, surface pores are to be found. We find deviation of shape – we measure and assess linear misalignment, excessive penetration of weld and offset of casting dye. We check the surface conditions.

ISO 6520 - Welding and allied processes -- Classification of geometric imperfections in metallic materials.

Certified specialists – 2

(National – ArcNK & International – TUV)

Used instruments and tools:

Measuring magnifying glasses, calipers, line measuring metal, inclinometers, triangles, probes, templates and others.

NDT weld inspection & incoming inspection of materials

Radiography Testing


TÜVRheinland®
Precisely Right.

CERTIFICATE
For NDT-Personal
According to Decree No. 9/2001, (IV. 5.) GM, Annex 6. chapter 3.1.3. as amended several times

Last name	First name
FADEEV	Denis
Place of birth	Date of birth
Germany	20.05.1977

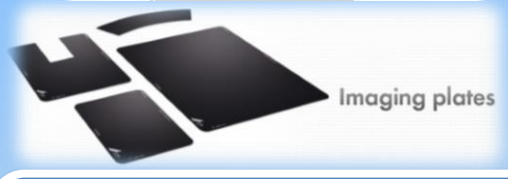
СЕРТИФИКАТ № 006

“МАРТ-250” weight – 12,5 kg

X-ray tube with constant anode voltage 160-250 kV

Steel penetration, maximum – 50 mm

The size of detected imperfection – 0,1mm min



Certified specialists – 2

(National – ArcNK & International – TUV)

CR 35 NDT weight – 21 kg

Image scanner

Resolution, theoretical max. ca. 15 line pairs/mm

ISO 5817 - Welding -- Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) -- Quality levels for imperfections

ISO 17636 - Non-destructive testing of welds -- Radiographic testing of fusion-welded joints

“АРИНА-3” weight – 10,5 kg

Pulsed X-ray with anode voltage 200 kV

Steel penetration, maximum – 30 mm

The size of detected imperfection – 0,1mm min

NDT weld inspection & incoming inspection of materials

Ultrasonic Testing

Planned purchase for 2017

Olympus OmniScan SX, with Phased Array

weight – 3,4 kg

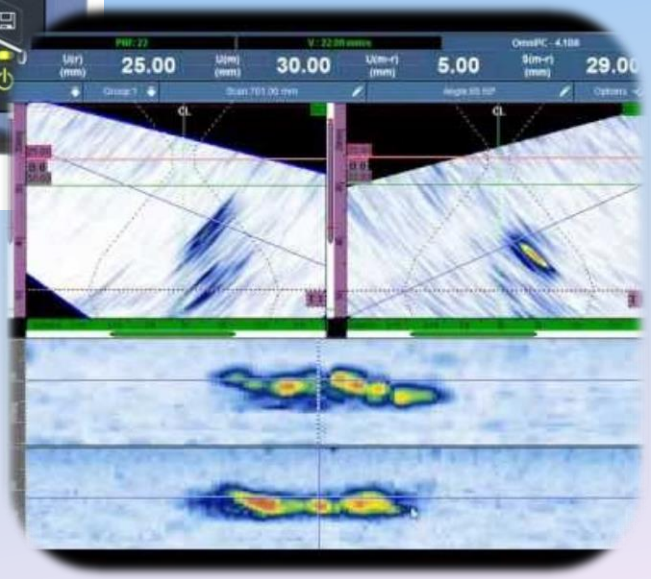
Steel penetration, min – 2 mm

The size of detected imperfection – 1 mm guaranteed

Certified specialists – 2

(National – ArcNK & planned International – TUV)

Scanner HST-X04

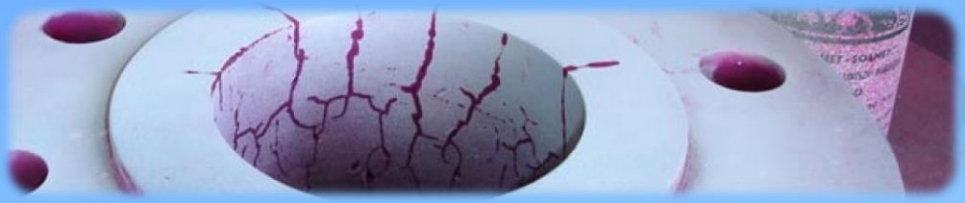


ISO 17640 - Non-destructive testing of welds -- Ultrasonic testing of welded joints

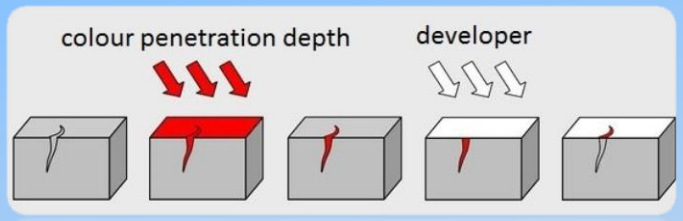
New Weld Series

NDT Instruments Small-footprint Probes

Liquid Penetrant Testing



ISO 3452 - Non-destructive testing -- Penetrant testing



- Water Based Penetrant
- Cleaner/Remover
- Developer

Defects detected by visual inspection with a magnifying glass; a minimum width of 1 micron, a depth of 10 microns and a length of 0.1 mm.


… and a lot more!
You are welcome to visit the BINP Workshop at any time!