



HIGH-PRECISION BALL BEARINGS

Company presentation



Marketing

Company

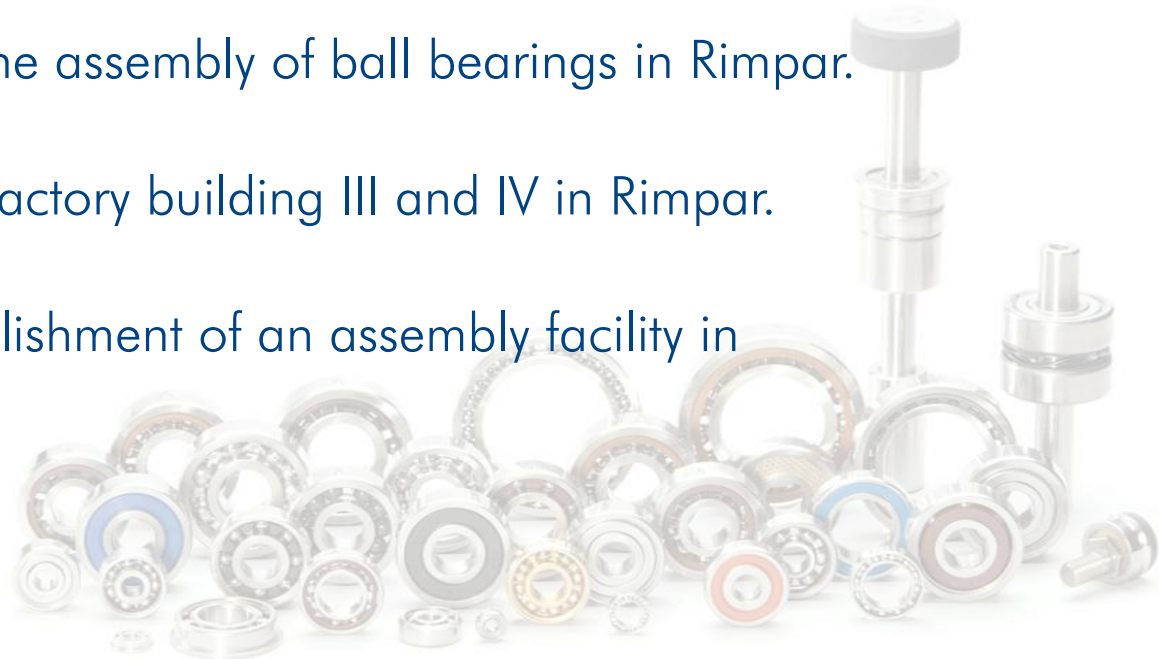
The company Gebrüder Reinfurt GmbH & Co. KG was founded in 1942.

For more than 70 years GRW has developed and produced miniature ball bearings.



Company ::: History

- 1942** Company founded in Würzburg Germany.
- 1958** Acquisition and establishment of the branch in Rimpar (factory building I and II).
- 1962** First clean room for the assembly of ball bearings in Rimpar.
- 1987** New construction of factory building III and IV in Rimpar.
- 1996** Acquisition and establishment of an assembly facility in the Czech Republic.



Company ::: History

- 2001 Construction of factory building V in Rimpar.
- 2002 Refocus of company strategy in in-house production and co-operation production.
- 2003 Foundation GRW USA with Ron Arbon as president.
- 2007 Investment and Growth of the production sites DE and CZ, 440 employees (D), 43 employees (CR)
44.6 Mio. € turnover, manufacturing at two locations.
- 2008 Purchase of the GRW by NIBC capital partners
Beginning of the new building in Rimpar 07/08
(building VI).



Company ::: History

- 2009** Implementation of a “Kardex shuttle”, a computer aided storage system. Completion of the new building in Rimpar. Administrative offices moved to new building in Rimpar, co-located with production.
- 2010** Implementation of ERP-System ProAlpha for comprehensive planning of all resources.
Expansion of the plant in Czech Republic.
- 2011** New Sales Structure.
- 2012** Completion of the new building in Czech Republic.
- 2013** Establishment of a second sales office in the USA.



Company ::: Locations

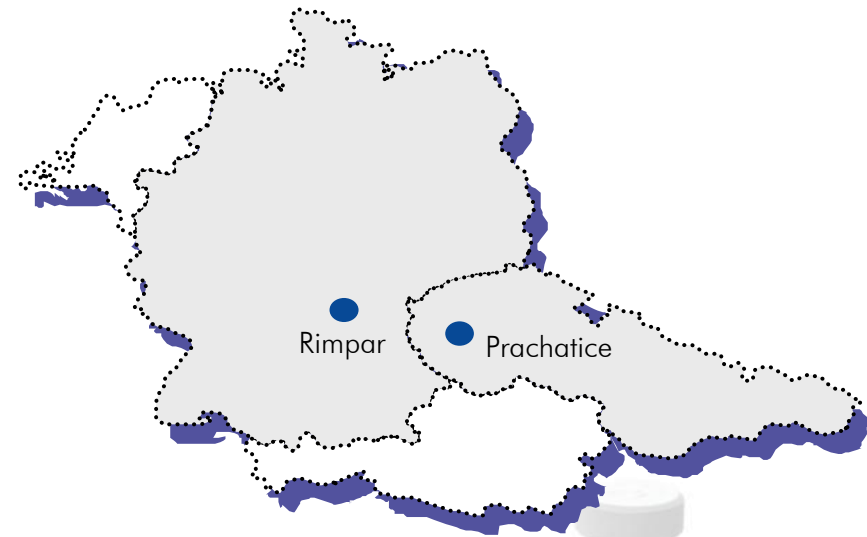
Production, Assembly and Administration: Rimpar



Company ::: Locations

Assembly: Prachatice (Czech Republic)

1.400m² cleanroom class R10.000
ISO-standard (ISO14644-1), class 7



Company ::: Location

Direct sales office: GRW-USA

Technical support and sales.



Draper, Utah (2009)



Richmond, Virginia (2013)

Company ::: Employees

With over 500 employees, high precision miniature ball bearings are made in two locations. In 2013 we achieved a turnover of over 40 million € (\approx \$52 million).

Our headquarters in Germany is in Rimpar (340 employees). A second assembly facility is in Prachatice in the Czech Republic (200 employees).

Two sales offices in the US (10 employees) complete the Team of GRW.



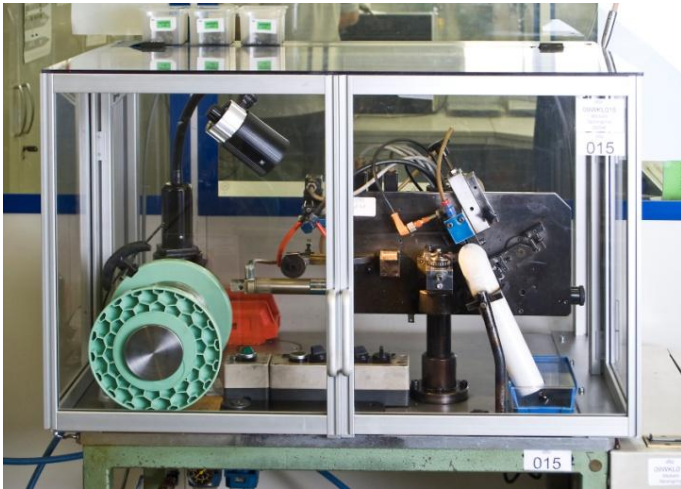
Manufacturing ::: Tool manufacturing department



Manufacturing ::: Turning department



Manufacturing ::: Metal cage manufacturing department



Manufacturing ::: Hardening department



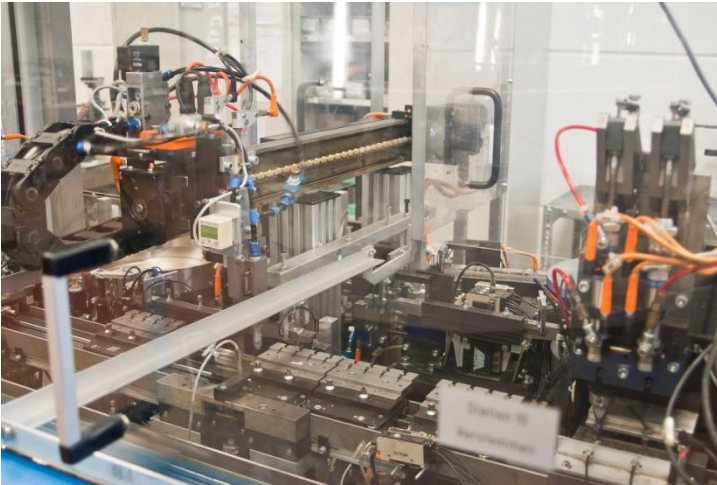
Manufacturing ::: Grinding department



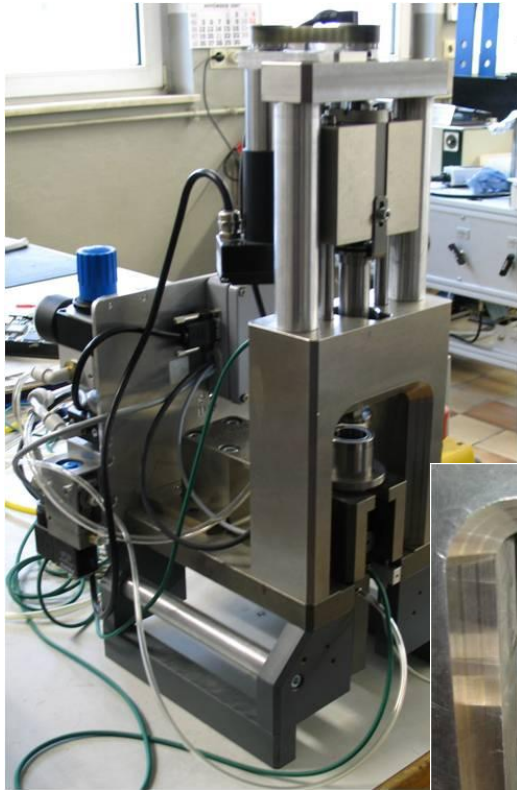
Manufacturing ::: Honing department



Manufacturing ::: Automated pre-assembly



Manufacturing ::: Tests preassembly

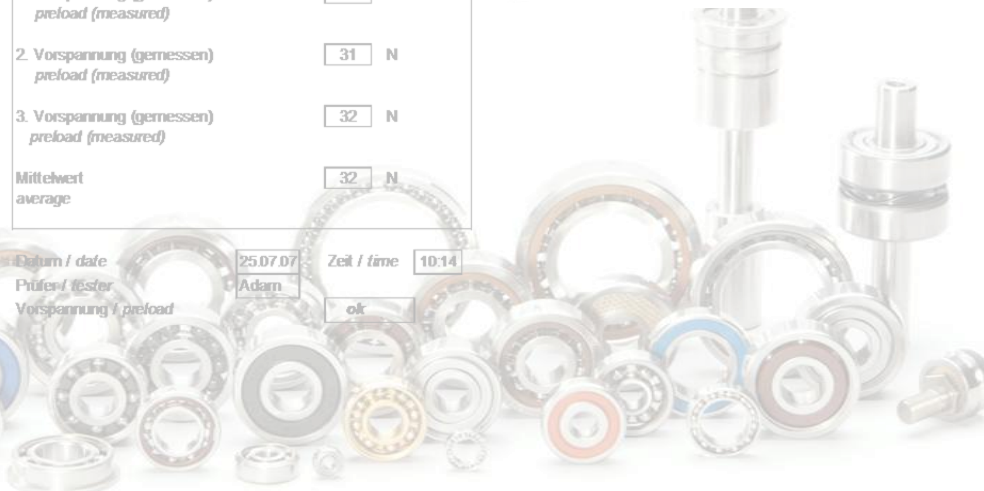


Kugellager / ball bearing	lfd. Nr. / no	1
Bezeichnung / designation	SS6000 P4 D15 GPR -1/28 ACTA L001	
Teilnr. / part no.	23	
Paarungsart -1 (db, O) / -2 (df, X) / matching type	-1	
Vorspannung (soll) / preload (nominal)	28 N	
Toleranz / tolerance	28 - 38 N	
Anzahl Messungen / repetition of measurements	3	

Auswertung / result		
1. Vorspannung (gemessen) / preload (measured)	34	N
2. Vorspannung (gemessen) / preload (measured)	31	N
3. Vorspannung (gemessen) / preload (measured)	32	N
Mittelwert / average	32	N

Datum / date	25.07.07	Zeit / time	10:14
Prüfer / tester	Adam		
Vorspannung / preload	ok		

Measuring of the preload
"broken curve" of matched bearings



Manufacturing ::: Tests preassembly

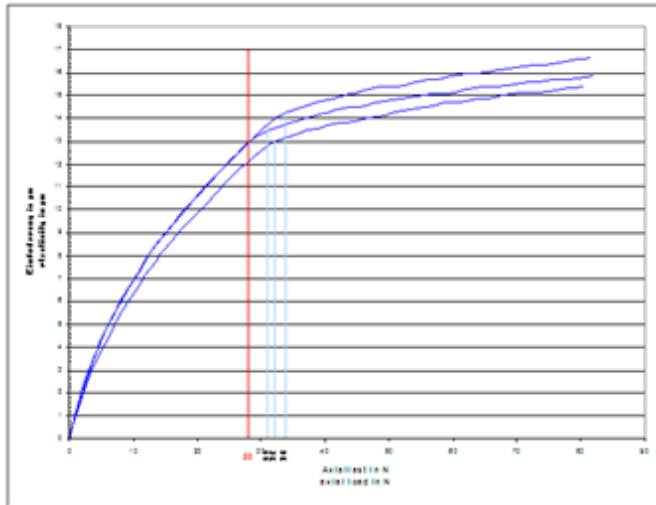


Kunden - Auftragsnr. / customer P/O
 interner Test
 GRW - Auftragsnr. / GRW order acc.no.
 WA 799899

Kugellager / ball bearing	Id. Nr. / no	1
Bezeichnung / designation	SS6000 P4 D15 GPR -1/28 ACTIA L001	
Teilenr. / part no.	<input type="text" value="23"/>	
Paarungsart -1 (d1, 0) / -2 (d1, X) / matching type	<input type="text" value="-1"/>	
Vorspannung (soll) / preload (nominal)	<input type="text" value="28"/>	N
Toleranz / tolerance	<input type="text" value="28"/> - <input type="text" value="38"/>	N
Anzahl Messungen / repetition of measurements	<input type="text" value="3"/>	

Auswertung / result		
1. Vorspannung (gemessen) / preload (measured)	<input type="text" value="34"/>	N
2. Vorspannung (gemessen) / preload (measured)	<input type="text" value="31"/>	N
3. Vorspannung (gemessen) / preload (measured)	<input type="text" value="32"/>	N
Mittelwert / average	<input type="text" value="32"/>	N

Datum / date Zeit / time
 Prüfer / tester
 Vorspannung / preload



Beschreibung / comment

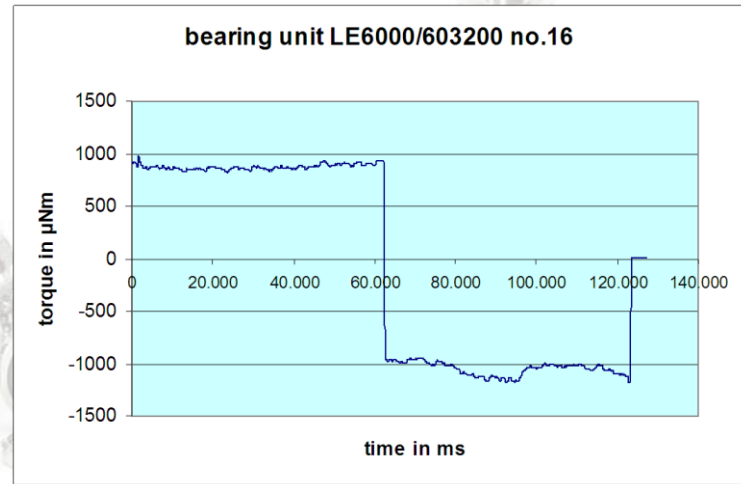
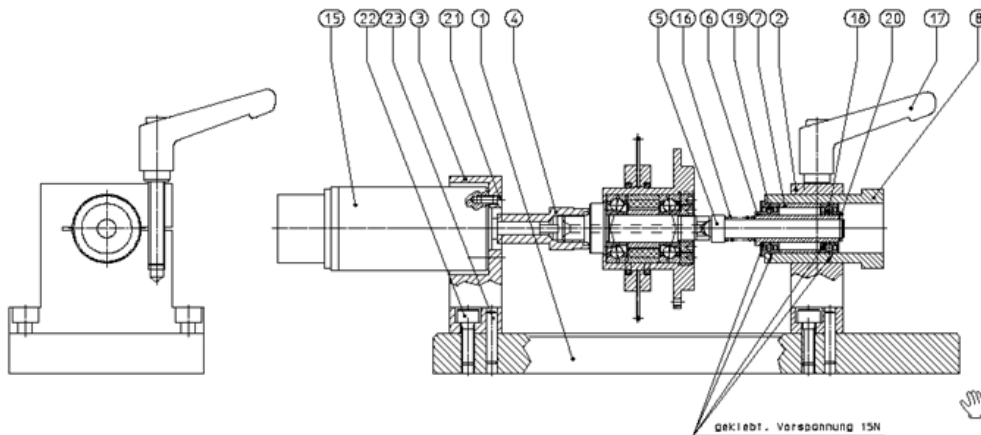
Measuring of the preload
 "broken curve" of
 matched bearings



Manufacturing ::: Tests preassembly



Measuring of dynamic friction torques of individual and matched bearings
 $n = 5 - 10.000 \text{ min}^{-1}$
 $F_r = G$
 $F_a = tbd$



Manufacturing ::: Ball bearing assembly clean room



Manual and automatized bearing assembly in clean room class R10.000 with laminar boxes class R100



Manufacturing ::: Cleanroom: special treatment of bearings



Vacuum impregnation process and centrifugation of retainers and entire ball bearings.

Centrifugation up to 2000G



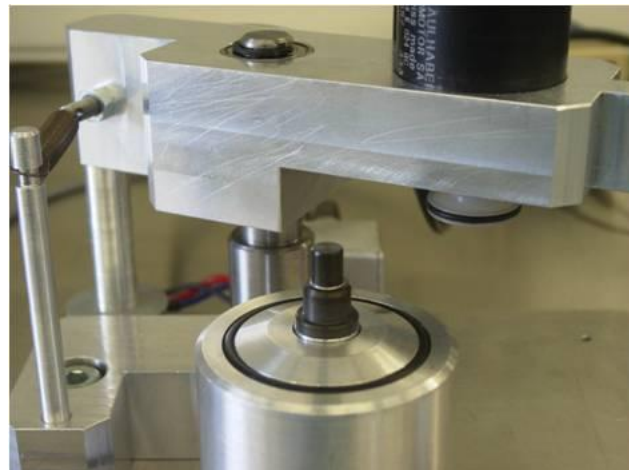
Manufacturing ::: Tests of ball bearings in the clean room



Function test **GPR** of every GRW bearing on the GRW noise tester.

GPA axial vibration test.

R Torque test according to MIL-PRF 6085 including documentation if needed.

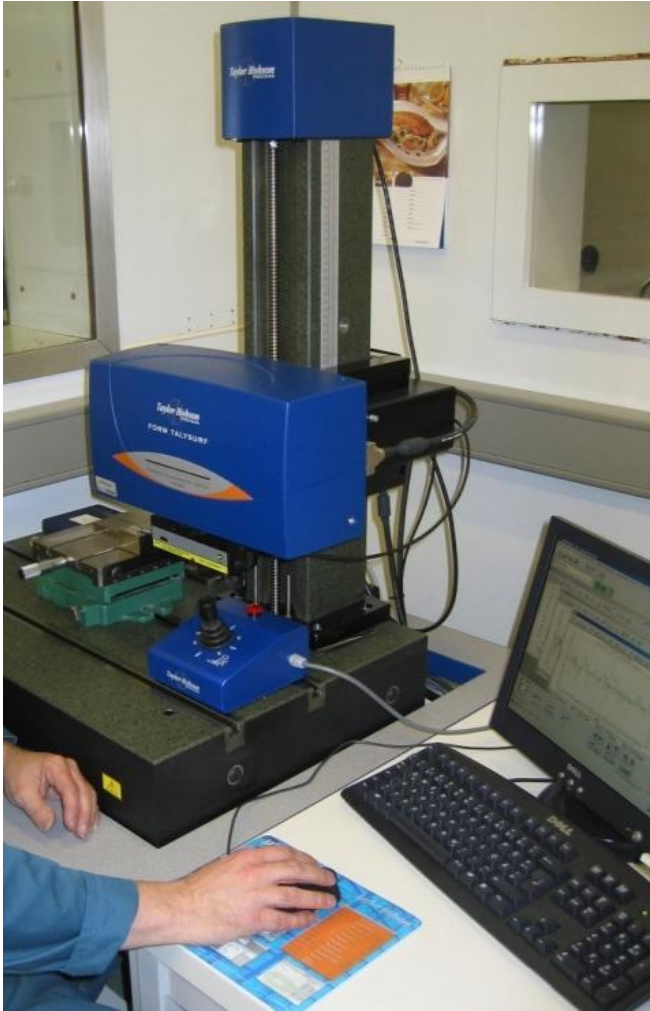


Manufacturing ::: Packaging of ball bearings in the clean room



Sealed plastic bags for clean storage and shipment from GRW packing station to the work place of the customer.

Manufacturing ::: Quality control



- Absolute accuracy
- Computerized measuring machines
- Test of the assembly batches
- Absolute dimensional check



Manufacturing ::: Stock / Kardex Shuttle



Manufacturing ::: Laboratory



Special surface treatments like gold plating and passivation of ball bearing parts.

Special cleaning treatments like soxhlett extraction.

Salt spray test acc. DIN 50021 / ASTM B117-73

Vacuum impregnation and high pressure impregnation.



Result of a salt spray test at GRW



100Cr6 X65 Cr13 SV30

Manufacturing ::: Prachatice (CZ)



Pre- and final assembly
in clean-room

Cleanroom class
R10.000
ISO-standard
ISO 14644-1, class 7



Manufacturing ::: Prachatice (CZ)



Automatisierte
Laufbahneinmessung

Measuring of the ring
raceways in groups of
 $1\mu\text{m}$.

Measuring of the radial
clearance.



Manufacturing ::: Prachatice (CZ)



Noise test - manual
100% noise test of our
miniature ball bearings,
manual.

Manufacturing ::: Prachatice (CZ)



Assembly of ball bearing units
Ball bearings are glued onto the shaft at the exact position.

Manufacturing ::: Prachatice (CZ)



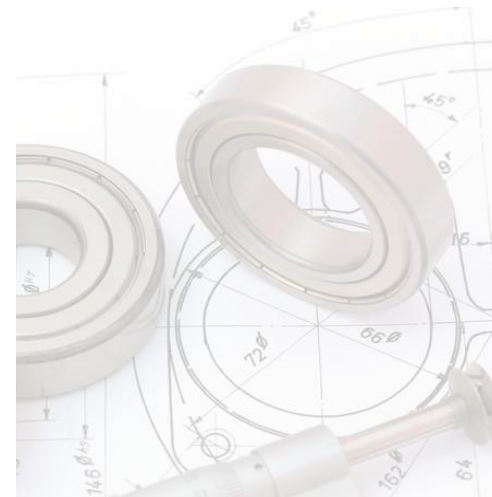
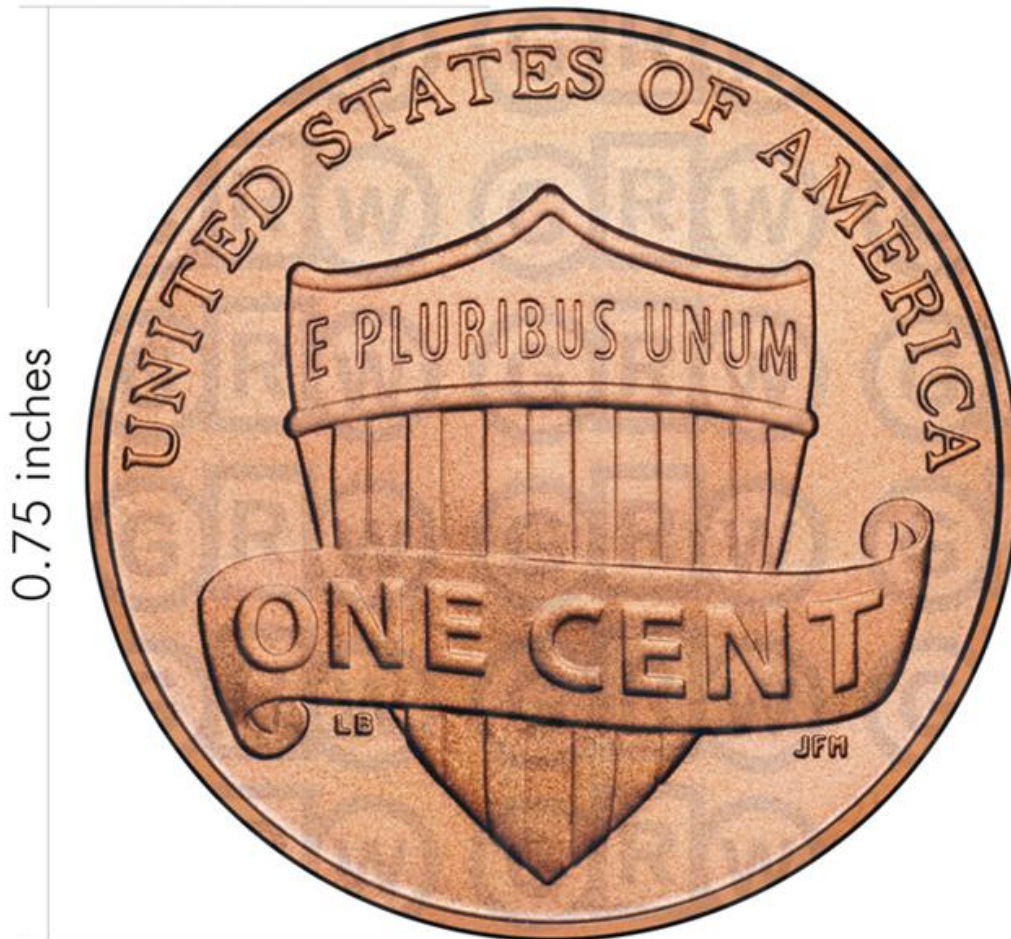
Production Control
The central control organ of the Assembly, provides transparency regarding all appointments and resources.

Products ::: Overview

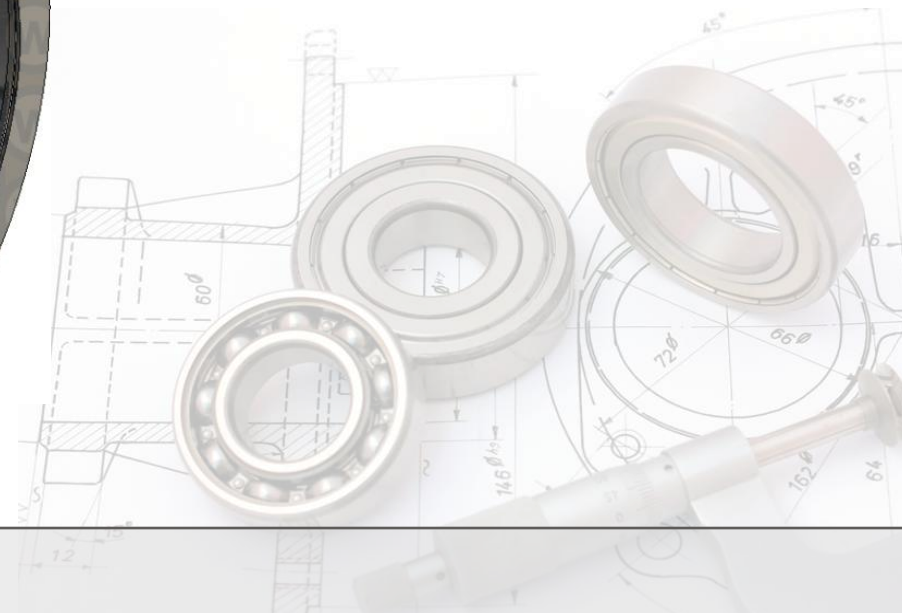
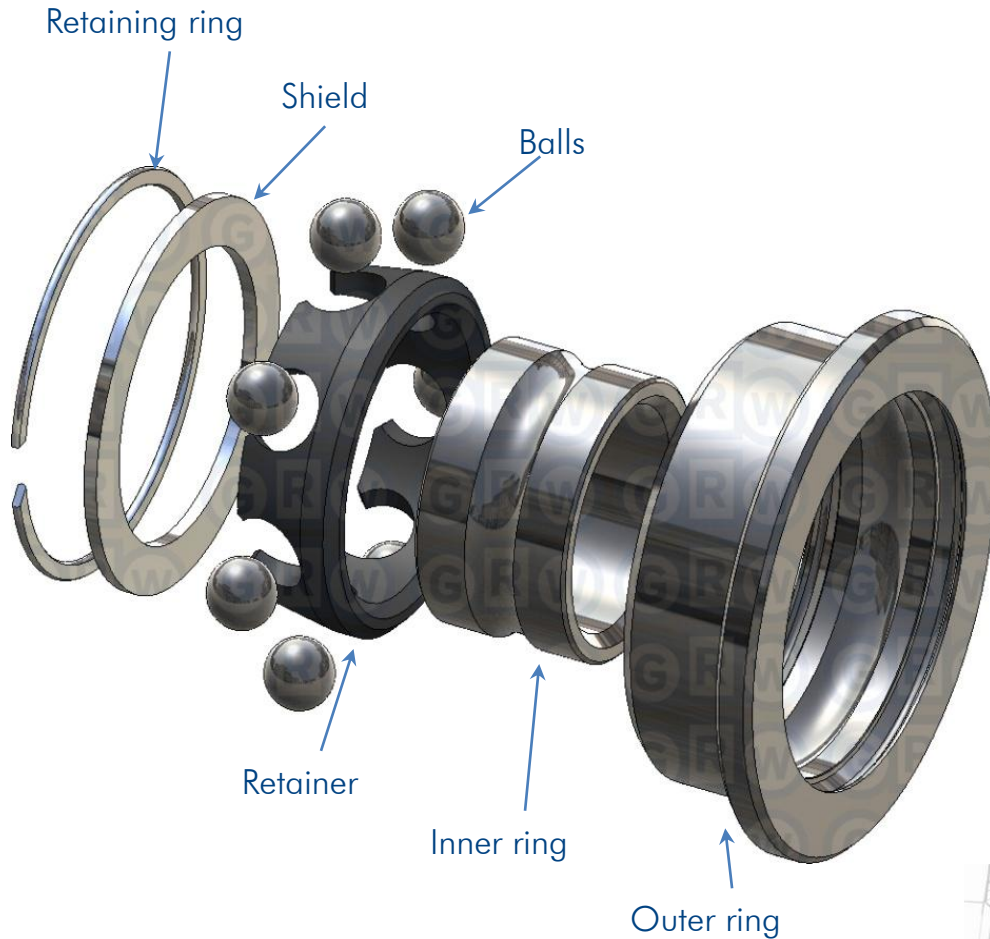
- Radial ball bearings
- Angular contact ball bearings
- Bearing units
- Customized parts



Products ::: High Precision Miniature Ball Bearings



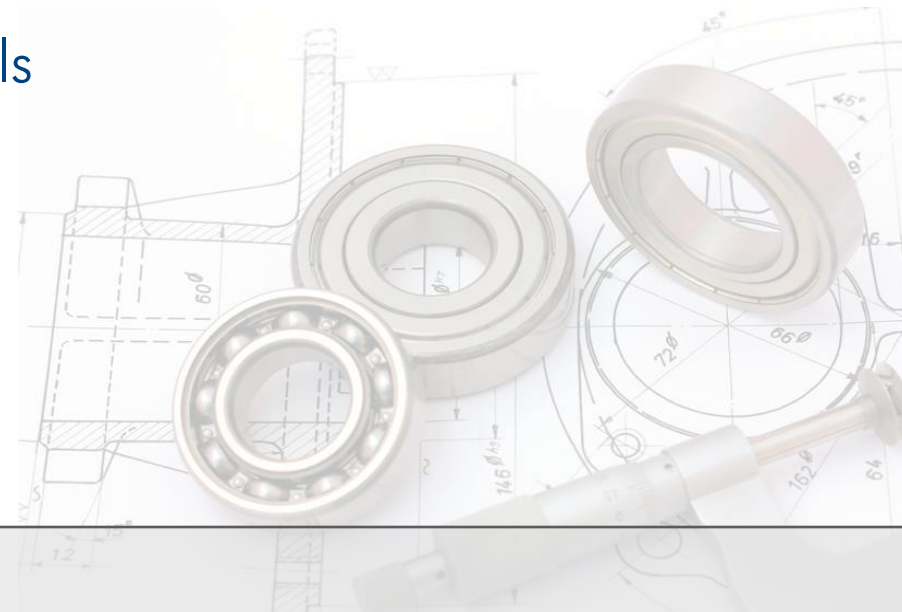
Products ::: High Precision Miniature Ball Bearings



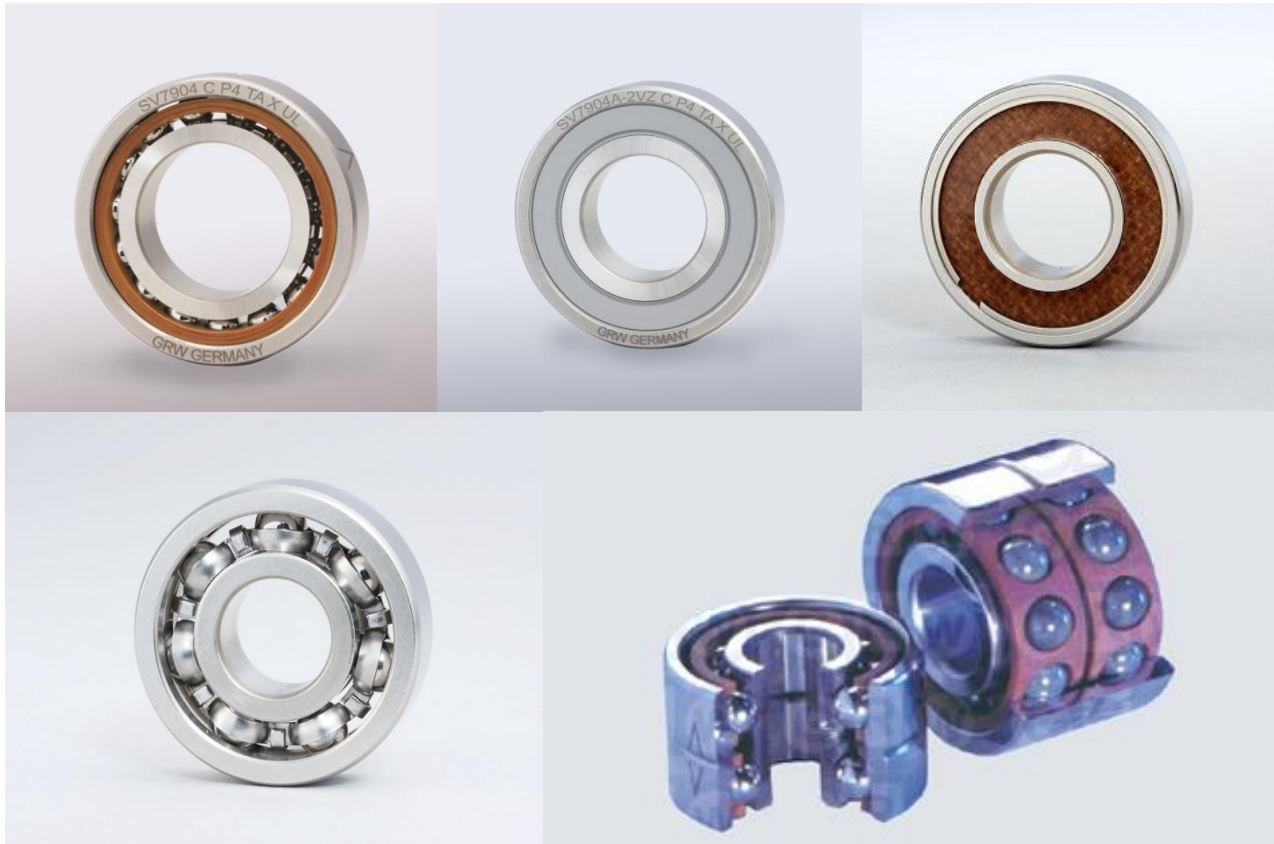
Products ::: Standard Production

Standard program:

- Ball bearings from 1 up to 35 mm bore and 3 up to 47 mm outer diameter. Special request up to 55 mm.
- Metric and inch sizes
- Flange outer ring
extended inner ring
- Different Cages and Shields or Seals
- Bearing Quality up to P2/ABEC9
- 100% noise tested (GPR)



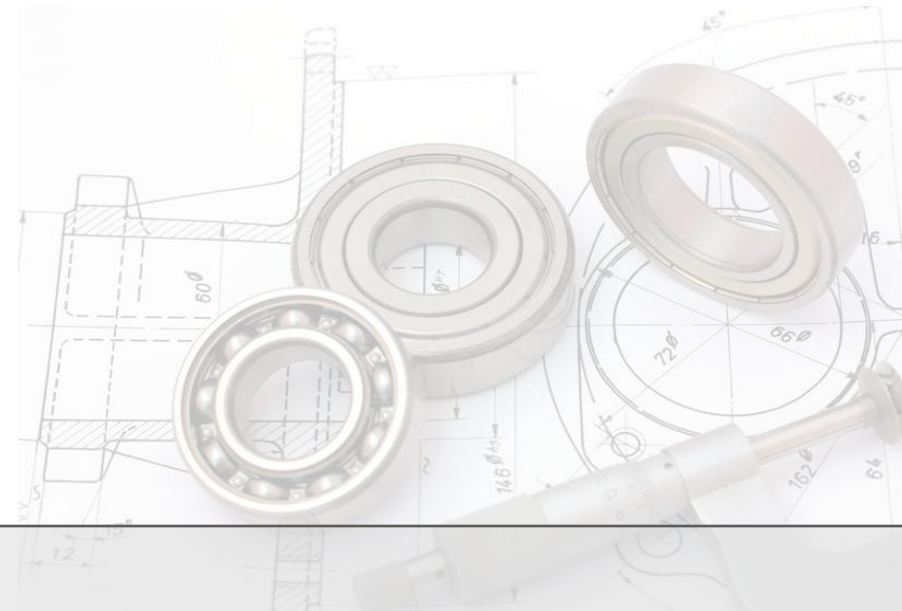
Products ::: Design Variations



- Separable and non-separable spindle ball Bearings
- Bearing units and hybrid bearings (steel rings with ceramic balls)
- Matched bearings like duplex or super duplex ball bearings

Products ::: Strategic markets

- Dental Equipment
- Medical Equipment
- Turbo Molecular Pumps
- Spindle Ball Bearing
- Flow Meters
- Aerospace
- Higher Level Assemblies
- Electric Motors



Products ::: GRW bearings in medical & dental applications

turbines / straight and
contra-angle handpieces



Examples for applications:

- hand pieces for dental technicians
- turbines for dentists

Maximum requirements:

- running smoothness at maximum speeds
- sterilization
- starved lubrication

Use of state-of-the-art materials

Products::: Application: Dental engineering



Test rig for dental instruments (Orakel 2)



Examples for applications:

- hand pieces for dental technicians
- turbines for dentists

Maximum requirements:

- running smoothness at maximum speeds
- sterilization
- starved lubrication

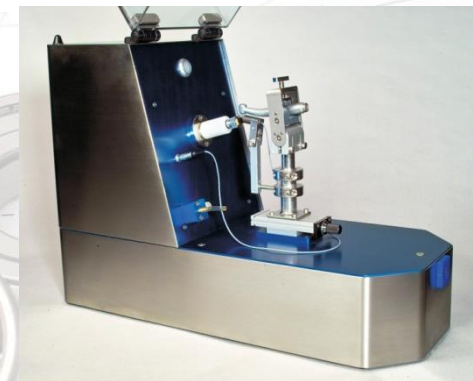
Use of state-of-the-art materials



Products::: Application: Dental engineering



Orakel 3



Products::: Application: Medical engineering



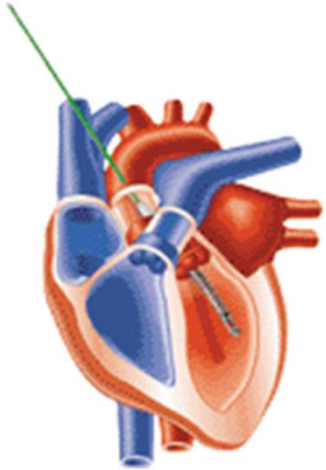
surgical instruments

Products::: Application: Medical engineering

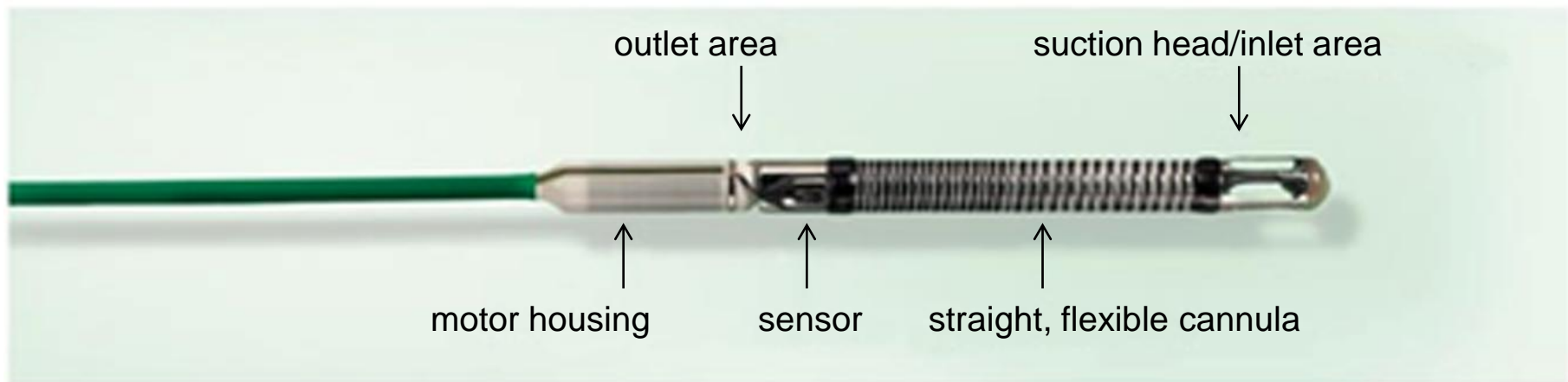


Surgical instruments

Products::: Applicaton: Medical engineering



Intracardiac pumping system



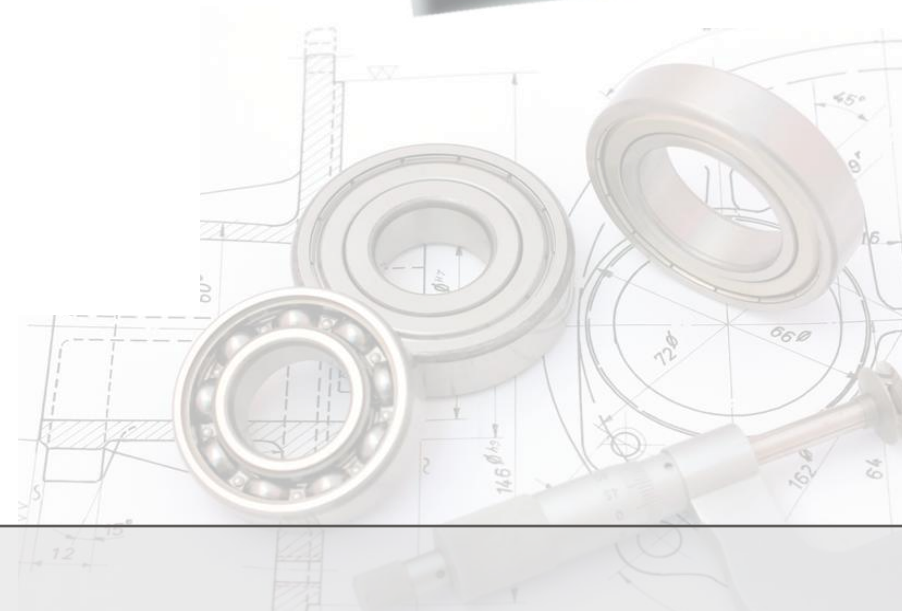
Products::: Application: Medical engineering



Produkte ::: Applications: Vacuum application



Turbo molecular pump
- Special lubricants for vacuum, dry lubricants
- Special retainer material for vacuum



Produkte ::: Application: Industrial spindles



Application:

- Machine tool
- Medical and dental

Highest Precision:

- High speeds
- Duplexed and preloaded bearings
- Stiffness

Produkte ::: Application: Measurement systems



Gas volume
measurement equipment

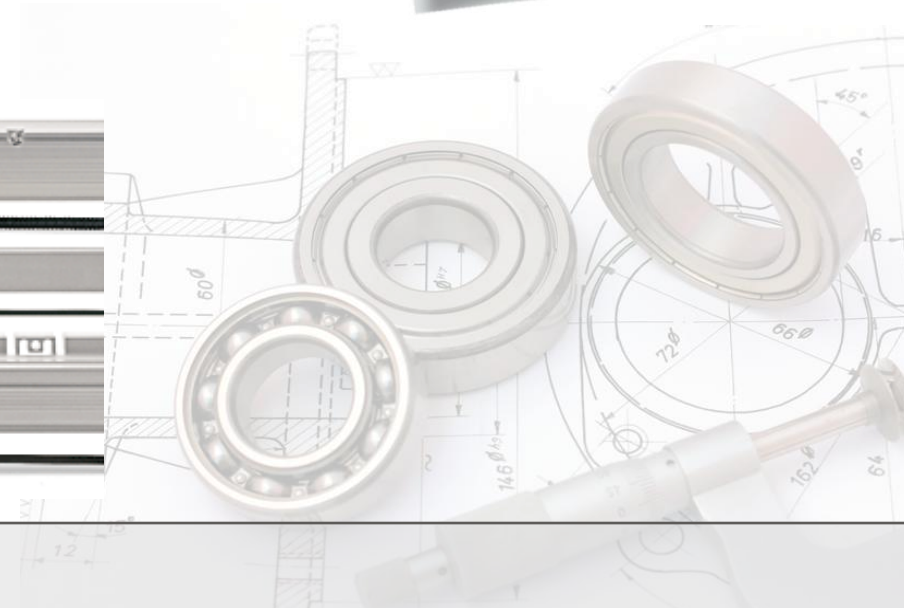
- Minimum friction
- Long life time
- Corrosion resistance

Products::: Application: Measurement and control technology

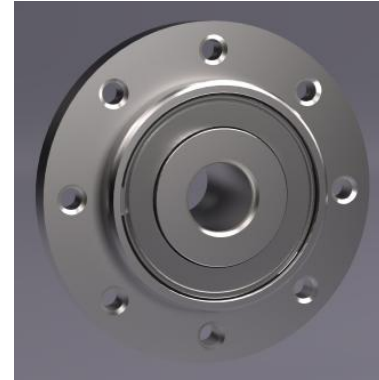


rotary encoders and
multiphase motors

cased length measuring
devices



Produkte ::: GRW special bearings



Applications: a.o.

- vacuum (Chip-production, Laseroptic)
- navigation instruments for aerospace
- modell jet turbines

Extraordinary demands:

- minimum oscillating movements / vibrations
- big temperature range
- highest precision and highest speeds

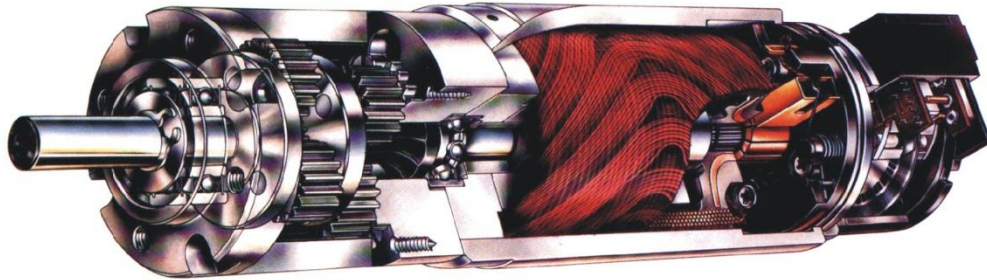
Lots of variations



Products::: Application: Aeronautics



Produkte ::: GRW electric motor, fans



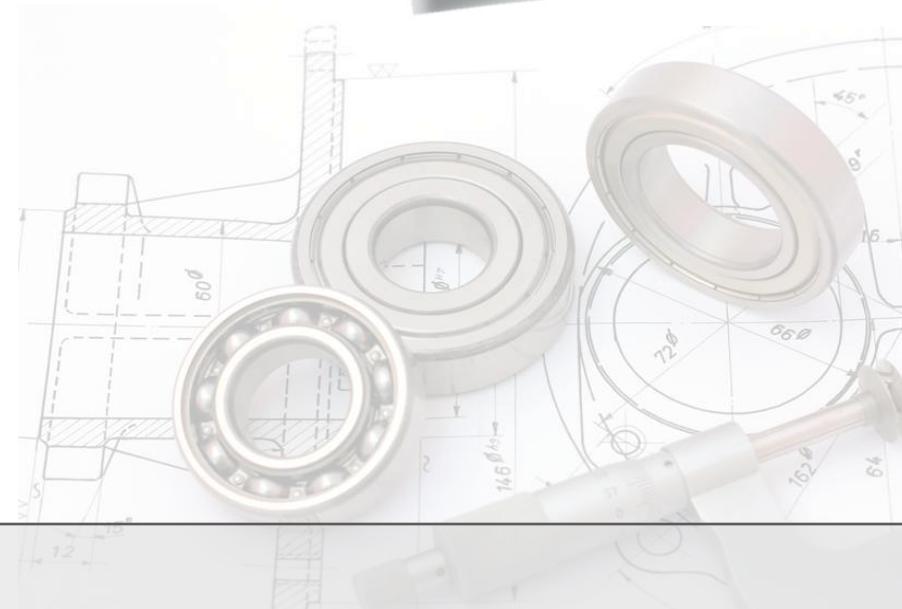
Application: a.o.

- disc drives, fans of PC
- autom. seat adjustment

Standard programme with modifications:

- tolerance range
- special lubricants
- low noise level

High volume

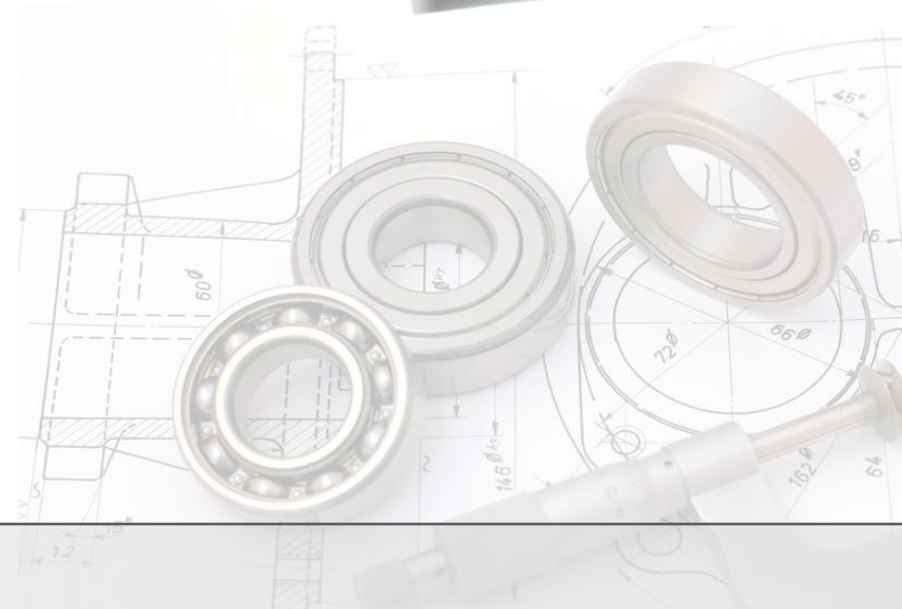


Produkte ::: GRW bearing units



Bearing units based on
standard components

Reduction of Costs and time
for developments



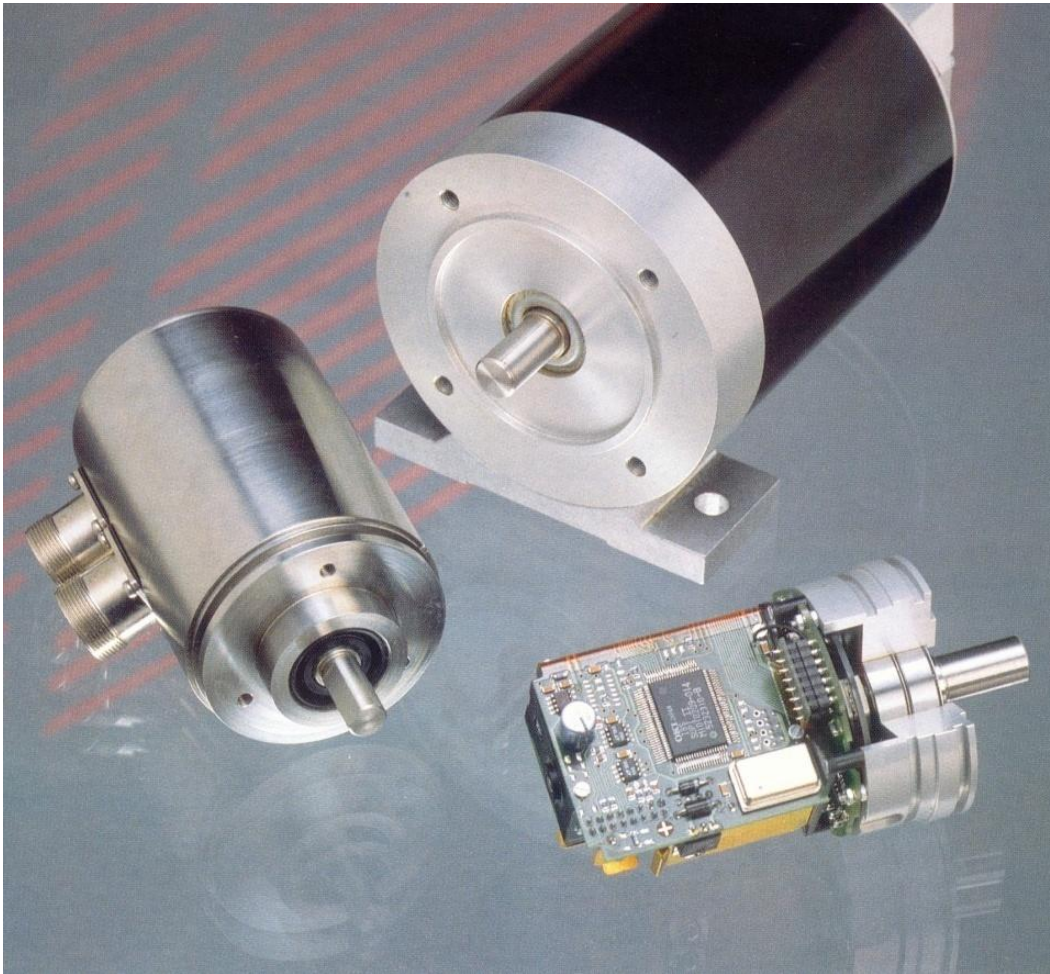
Produkte ::: GRW bearing units



Bearing units based on
standard components

Reduction of Costs and time
for developments

Produkte ::: GRW bearing units



Application: a.o.

- actuators, potentiometers
- linear guidings
- bearing solution for medical pumps

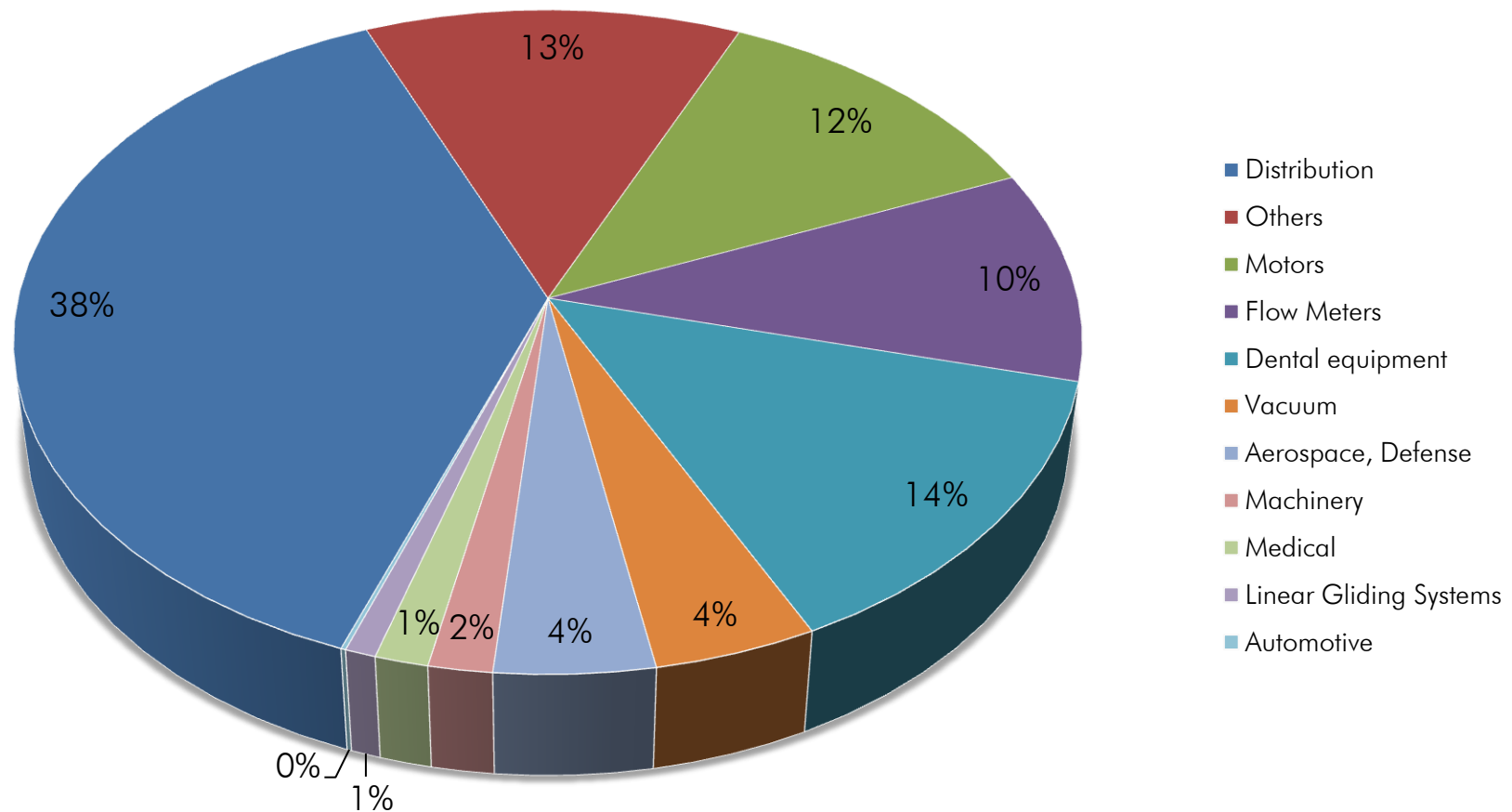
Individual system solutions:

- ready to fit unit
- defined preload

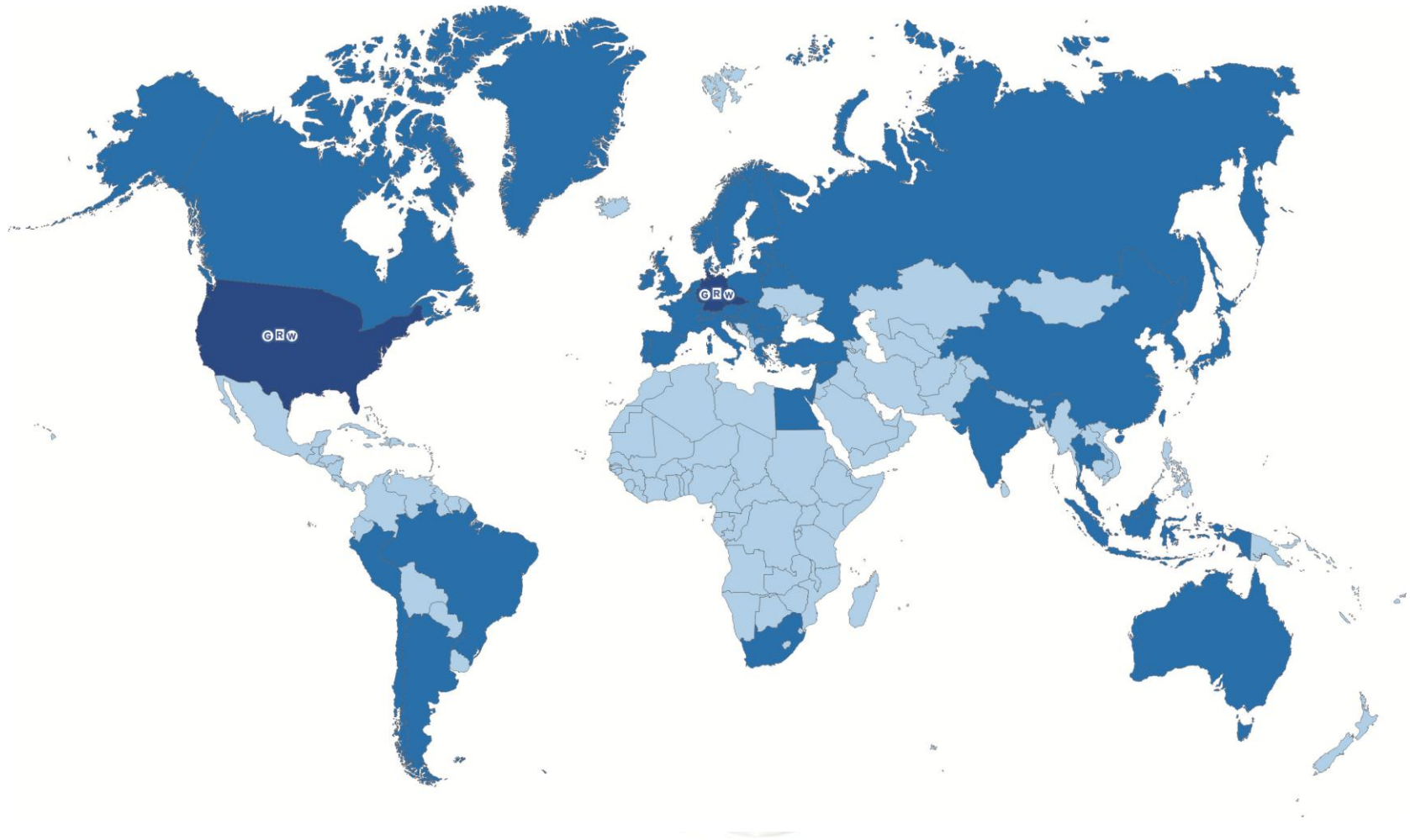
flexible production

GRW ::: Proportions of industries

2013



GRW ::: Global Supply Chain



GRW ::: Quality management




ZERTIFIKAT

Hiermit wird bescheinigt, dass



Gebr. Reinfurt GmbH & Co. KG
 Hochpräzisionskugellager
 Niederhofer Straße 105
 97222 Rimpfard
 Deutschland

mit der weiteren Firma

Reinfurt-ČR k.s.
 Průmyslová I/1366
 38301 Prachatice
 Tschechische Republik

ein **Qualitätsmanagementsystem** eingeführt hat und anwendet.

Geltungsbereich:
 Entwicklung, Produktion und Vertrieb von Hochpräzisionskugellagern, Lagereinheiten und kundenspezifischen Sonderlagern

Durch ein Audit, dokumentiert in einem Bericht, wurde der Nachweis erbracht, dass das Managementsystem die Forderungen des folgenden Regelwerks erfüllt:

ISO 9001 : 2008

Zertifikat-Registrier-Nr.	283913 QM08	
Zertifizierungsdatum	2012-12-15	
Gültig bis	2015-12-14	

TGA-ZM-02-90


 Michael Drechsel
 Geschäftsführer



Akreditierte Stelle: DQS GmbH, August-Schanz-Straße 21, 60433 Frankfurt am Main



THE INTERNATIONAL CERTIFICATION NETWORK[®]

CERTIFICATE

IQNet and
 DQS GmbH Deutsche Gesellschaft zur Zertifizierung von Managementsystemen
 hereby certify that the company

Gebr. Reinfurt GmbH & Co. KG
 High-Precision Ball Bearings
 Niederhofer Straße 105
 97222 Rimpfard
 Germany

Reinfurt-ČR k.s.
 Průmyslová I/1366
 38301 Prachatice
 Czech Republic

with the following company

has implemented and maintains a **Quality Management System**.

Scope:
 Development, production and sales of high precision ball bearings,
 bearing units and bearings according to customer specification

Through an audit, documented in a report, it was verified that the management system
 fulfills the requirements of the following standard:

ISO 9001 : 2008

Date of certification 2012-12-15
 Valid until 2015-12-14
 Registration Number: DE-283913 QM08


 Michael Drechsel
 Managing Director of DQS GmbH
 President of IQNet



IQNet Partners:
 AENOR Spain AFNOR Certification France AIB-Vincotte International Belgium ANCE Mexico APCER Portugal CCC Cyprus
 CISO Italy CQC China CCM China CQS Czech Republic Cro Cert Croatia DQS Holding GmbH Germany DS Denmark
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 Inspira Certification Finland IRAM Argentina JQA Japan KFD Korea MSZT Hungary Nemko AS Norway NSAI Ireland
 PCBQ Poland Quality Austria RIR Russia SII Israel SIO Slovenia SIRM OAS International Malaysia SGS Switzerland
 SRAC Romania TEST St. Petersburg Russia TSE Turkey YUCS Serbia
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 * The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certification.com



Customized Solutions for High Precision Ball Bearings!

www.grw.de

