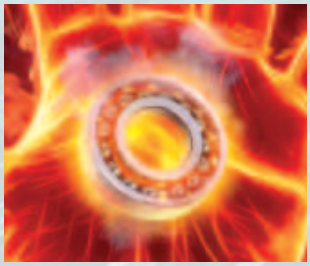
Volume 1/2011

GRW rotation

The magazine of Gebr. Reinfurt GmbH & Co. KG - Extreme-Precision Ball Bearings

Applications:
EXTREME



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GRWrotation
Volume 1, 2011

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MMP, Essen

Dear Customers, Dear Employees,

The moment has finally arrived. It is with great pleasure that we present to you today the first release of our brand new company magazine Rotation, which will be published three times yearly. Our new magazine keeps you informed at all times about new and interesting developments at GRW and in GRW´s activity field. This will contribute to an even better cooperation in the future as clear information will substitute misunderstandings.

GRW has reached its planned goals in 2010. This accomplishment has more than justified an increase of nearly 100 new employees, investments in machinery in Prachatice and Rimpar as well as continued expansion of our USA office in Draper, Utah.

Currently growing incoming orders are evidence for customers´ confidence in GRW and help to boost our further maximum performance. Continued investments of new technologies in ring production and assembly are scheduled for 2011. These investments will, on the one hand, allow further expansion of our product spectrum and, on the other hand, secure employment for all GRW sites.

Our goal for 2011 is to continue to increase our turnover over that of 2010. Therefore we will offer to our customers reliable and short lead times along with a constantly high quality product.

Together our employees are highly motivated to meet our goals. I think that this magazine will also contribute to achieving our goals.

Yours sincerely

Dr. Volker Bartelt
CEO, Gebrüder Reinfurt GmbH & Co. KG

WORKFORCE EXPANSION 2010

2009 presented many challenges for GRW's workforce. Due to global economic situations, necessary reductions to our work week were restored to 96% of capacity by January of 2010. By February of 2010 it was necessary to support our workforce with 20 outside contractors to reinforce production requirements. The number of contractors increased to 30 by summer. Workforce levels remained stable throughout the remainder of the year and 16 contractors were rewarded with permanent employment.

GRW filled additional positions in administration and other critical departments. Specific organizational changes to our Sales Staff into three focused teams along with a Central Order Management Department were necessary. Ancillary departments such as Marketing, Strategic Purchasing, Production Management and Production Planning have also been reorganized.

At our division in the Czech Republic, through expanding our facility capabilities, our workforce more than doubled from 37 to 81 employees.

In total our workforce numbers increased by 26 employees in Rimpar and by 44 employees in the Czech Republic. Together with the 31 contractors the total workforce expansion in 2010 is about 100 employees. This represents more than a 20 % growth overall. This increase in workforce represents a decisive commitment to our growth strategy for 2011 as well as a long term dedication to our production facilities.

Stephan Meixner

CHRISTMAS IN BLUE-SILVER

In the Advent season GRW's Christmas celebration was held in a banquet-hall in Würzburg, decorated in company colors of blue & silver. Like last year, Dr. Bartelt's Christmas speech was a classic. Apart from congratulatory and motivating words, in the spirit of the season, Dr Bartelt impressively demonstrated how to use the present which was shared out to the gathered GRW-team afterwards. He presented distinguished service and performance awards to well deserving GRW team members. GRW's trainees and apprentices complemented the program by performing several Christmas songs.

Martina Steffen

Christmas spirit at GRW

IT'S A LONG WAY TO THE TOP (AC/DC – Angus Young)

GRW's trainees and apprentices

Each year GRW offers young and talented prospective employees the chance to training as administrative assistants or through apprenticeships as industrial machinists.

For GRW the training of junior level employees plays an important role. Imparting of sound basic knowledge and the opportunity of taking part in the highly toleranced state of the art manufacturing of high precision miniature ball bearings are unparalleled. Upon completion of their training, motivated trainees could be rewarded with a permanent position at GRW. This program provides GRW with the opportunity to identify quality, production ready, potential employees.

In addition to the five commercial apprentices GRW hired another three for training as administrative assistants in September 2010. During their training period of 2 ½ years these assistants will rotate through all important administration departments.

In the manufacturing department the three existing apprentices were joined by four additional trainees in 2010.

Esther Schenker

1 BALL BEARING, 7 PIECES

2 BILLION VARIETIES

At first glance the design of a ball bearing is clear: An inner ring is mounted with an outer ring, the appropriate balls and retainer. Then the ball bearing is combined with the lubricant adapted to the requirements of use and if necessary a shield to protect against contamination.

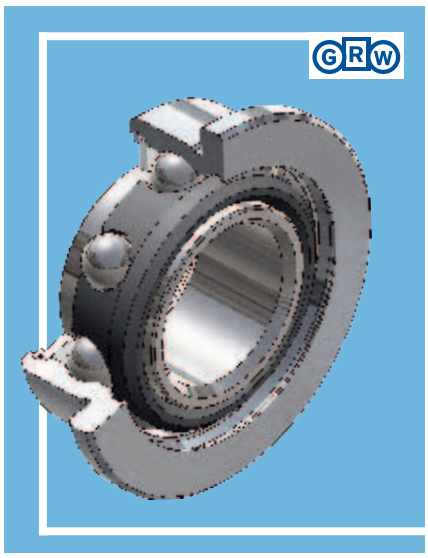
Due to the numerous norms and installation recommendations in the area of the rolling bearing the external dimensions of the various ball bearing manufacturers only differ in nuances. The big differences become obvious in the **internal values of the ball bearing**, the materials used for rings and retainers, number of balls and their diameter, surface structure and profile precision, as well as the lubricant used.

GRW has according to requirements three different **materials** to choose from for the **ball bearing rings**. You can choose between 100Cr6, X65Cr13 (SS) or X35CrMoN15-1 (SV). Regardless of whether the customer's focus is on hardness, operating temperature or corrosion resistance, in the hardening process developed by GRW the desired properties can be specifically called up and implemented in the in house hardening shop. In order to obtain further functional properties from the bearing ring, it can additionally be provided with coatings.

For a long time GRW has invested significant development effort in the **coating** of ball bearings. The aim of this development is amongst other things to improve the tribological behavior or increase the corrosion resistance. Whether as a dry lubricant to increase the dry runnig properties or for use in high vacuum, GRW offers the best solution for every requirement, with now over 90 different coating varieties. The newest development in this area is a metal - plastic hybrid band (patent: EP000001832765B1). Hereby a metal band is coated with a thin, solid PTFE sheet and then formed into a steel ribbon retainer. Due to the low friction coefficients of PTFE, ball bearings with the lowest friction moments and an excellent life span in dry operation can be realized with this retainer coating.

Furthermore the newest procedures via PVD (Physical Vapor Deposition) or CVD (Chemical Vapor Deposition) are used and fulfill the highest standards for the coating quality. An unwanted dissolution of the coating will result in a serious early failure of the bearing. Therefore all coating varieties are subject to the strict GRW quality norms and tests.

The **retainer** must hold the balls at an equal distance from each other and prevent them touching each other. Furthermore the retainer must have an appropriate design with defined material strengths and balanced elasticity, in order to endure the load in the ball bearing as best possible.



Torlon© snap retainer

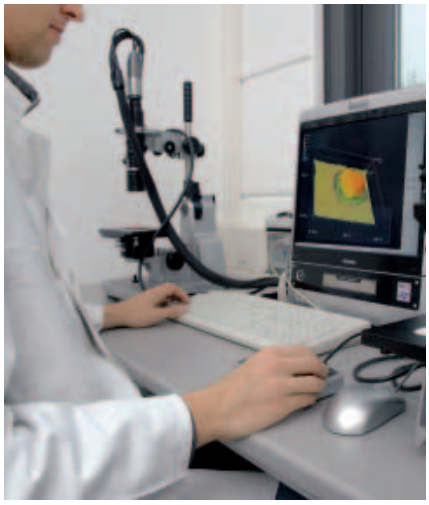
Apart from the tight tolerance specifications for GRW ball bearing rings regarding surface finish, form precision and steel purity, the same requirements apply to the design and production of the retainer. There are 3 basic variants for the retainers: Inner ring, outer ring or ball controlled retainer. These basic types can be combined with 21 different materials. The selection of materials covers the whole range from metal ribbon for steel ribbon retainers to special materials for aviation and space flight right up to chemically coupled heavy duty plastic „PAI - PTFE-cg" for applications with the highest standards for wear behavior, temperature resistance and sterilization ability.

Lubricants serve to reduce friction and wear, as well as cooling, shock absorption, seal effect and corrosion protection. Lubrication can be carried out using greases or oils and/or in special cases solid lubricants. All 3 types are recovered in the products of GRW. The installation situation of the ball bearing is crucial for the selection of a suitable lubricant. Grease lubrication is recommended for general use for low to medium speeds and is therefore the most frequently used lubrication type. The main part of lubricating grease consists of base oil and the smaller part consists of the appropriate thickener. Bearing lubrication is mostly carried out using base oil, which releases the thickener in small quantities over time. At GRW lime soaps, natron soaps, lithium soaps and complex soap greases are used.

Oil lubrication is used if grease lubrication can not be used for technical or economic reasons. This can be the case with high operating temperatures, caused by ambient temperature or frictional heat in the ball bearing. Oils are divided into mineral and synthetic oils. Animal or plant oils are not suitable or only suitable to a limited extent for use in ball bearings. In total at GRW **more than 400 lubricants** are used and therefore cover a large area of use, from the food industry to aviation and space flight.

Finally the **shield** is mounted on the ball bearing as the last component. This should keep impurities away from the high precision functional surfaces of the bearing and therefore produce the least possible friction. On the other hand this should keep the lubricant in the bearing. Impurities which get between the ball and the raceway will be rolled over and thereby damage the processed raceways. In order to prevent this, non contact shields and contact shields are offered, with various sealing qualities.

With the non contact shields no increase in torque occurs, as the shield creates a gap ring. It does not produce any friction and can therefore be used even at the highest speeds.



State-of-the-art 3D microscopy

With the contact shield the so called ball bearing seal touches the shoulder of the inner ring with a defined contact pressure and therefore causes an increased friction moment. Compared to the non contact shields, all contact shields will wear over time. Dust shields are primarily produced from stainless steel or steel sheet reinforced Perbunan rubber. Established seals are made of a glass fiber reinforced teflon disk or steel sheet reinforced synthetic fluorine rubber. In total there are 63 shield variants to choose from.

Separable ball bearing 350.000 rpm

At GRW **individual products** are made from these components for the special customer requirements. Due to a sensible combination strategy from standard and special components it is possible for GRW to serve the most diverse market requirements and ensure our customers a competitive advantage.

Extensive, competent advice and design of a ball bearing are the prerequisites for the highest fulfillment of the requirements set. Even in the development phase of new applications, GRW engineers can contribute valuable technical and mostly also cost saving information.

Alexander Strobl

Different shield variations

„ATTACK"

From the left: Michael Stürmer (GRW), Pat Parmalee (Mooney), Dr. Volker Bartelt (GRW), Howard Rubin (Mooney), Ron Arbon (GRW USA)

was our motto for 2010. Our goal was to markedly increase GRW's brand awareness and above all GRW's competitiveness by aggressively pursuing key markets.

The North American market occupies a key position in this process. Over a period of several years this market was stagnating to a large degree or only showing moderate growth. When considering the potential of this market, changes had to be made. One strong US distributor was not enough to support sustainable growth.

Our US subsidiary, GRW High Precision Bearings, LP, at the time had only one employee. Despite all efforts and dedication, a one man show could only provide GRW with limited growth.

GRW had to find a suitable partner, an organization that had extensive experience with miniature ball bearings and would represent GRW products exclusively. First contacts in February 2010 and a contractual agreement in April 2010 provided the necessary access to sales channels for GRW USA. In Mooney Industrials, Inc. a Manufacturer's Representative Organization established for almost 40 years in the US-American industrial supplies market, we found our partner. It is Mooney Industrials' tradition to thoroughly understand the products of each company to be represented with a strong technical team and to use this knowledge, in an advisory capacity, at potential customers.

What did GRW really achieve with this partnership? De facto we have multiplied the number of sales representatives who work for us on the US-market. With branches on the west coast, in Chicago and New York, 24 sales representatives are now working for GRW USA. After extensive training by GRW engineering staff, we are now ready to implement the necessary support for our multilevel sales strategy. Through exhibiting at industrial trade shows, three in 2010, and four in 2011, we are proving to our potential customers how important the North American market is for GRW. Above all, GRW can offer solutions, and for the most part, tailor-made products for this market. GRW has a broad range of products for potential customers in many high tech applications. Together with Mooney Industrials we are able to offer state of the art technical support, tailor-made solutions as well as the shortest lead times in the industry.

Along with gaining a new partner we have expanded our GRW USA facilities in 2011. By moving to new offices with spacious store rooms and by hiring additional personnel we have demonstrated our commitment to the US-market.

„Together we develop and constantly prepare ourselves to achieve the best possible starting position in order to work the present but above all the future market as well."- Quotation (Herb Mooney). After our joint efforts we achieved a 70% growth in 2010, in 2011 it also means with our partner Mooney Industrials: „Attack".

Michael Stürmer

SGM MACHINERY

SGM & GRW teamwork, from the left: Huili Gong (SGM), Michael Stürmer, Marcel von der Gönna (both GRW)

For several years, SGM Machinery, headquartered in Hamburg, has been a reliable partner of GRW in China. In November 2010 SGM finally became the official agent of GRW products in China, more accurately China, Hong Kong, Taiwan and Macao. Mrs. Huili Gong, the Chinese-born manager of SGM and her husband Dr. Ing. Minzhen Ye have the perfect qualifications for doing business in these regions. SGM, together with the sales staff of GRW, successfully offer customized and consultation-intensive products to a very complex market. In order to provide the Chinese customer with the optimal service, SGM Machinery has continuously founded branch offices in China in the past years – near the large metropolitan areas of Beijing, Shanghai, Xi´an and Shenzhen. Currently, 3 administrative staff members in Hamburg and 12 employees located at the specific sites are working for SGM.

Exhibitation stand of SGM and GRW

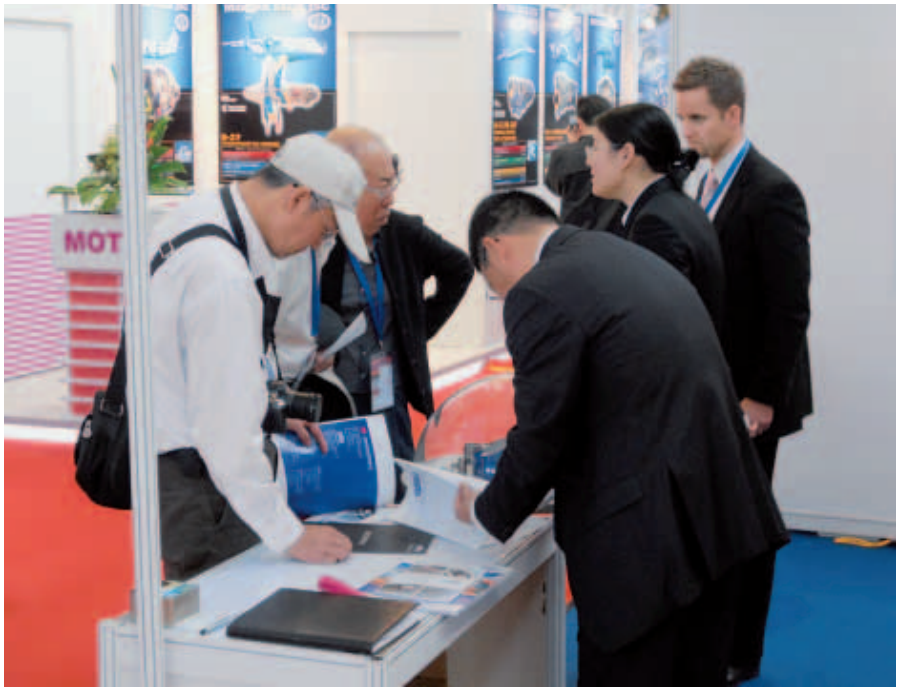
It is a fallacy to think that only cheap bearings are sold to China. The brand „Made in Germany" is extremely important in the Middle Kingdom. For example, GRW is the largest supplier of high precision bearings for gas meters for all of China. These special applications require minimal friction and long life, also in combination with difficult environmental conditions such as corrosive gases.

GRW is also in the medical field, e.g. dental applications, and is the main supplier of high speed turbine bearings for export to the largest producers of dental handpieces in China. In order to achieve the specified bearing life, at a speed of 500,000 rpm, special customized high precision ball bearings are required.

Not too long ago, GRW and SGM Machinery exhibited at the Airshow China 2010 in Zhuhai (near Hong Kong) sponsoring their own stand. Both companies want to become a partner for developments in the booming aviation and aerospace market right from the beginning. In order to have a direct presence, SGM has established an office for aviation and aerospace in Shenzhen. As a result GRW is on the ground floor for prototype development with all the large producers of navigation applications. Currently prototypes are being tested and qualified.

GRW's and SGM's next target is to cosponsor a stand at the largest trade show for measurement instruments and automation technology at Miconex in Beijing in August 2011.

Marcel von der Gönna



Avid interest in the extreme-precision miniature ball bearings

GRW GOES EXTREME!

GRW ranks among the global technology leaders for the development and production of high precision miniature ball bearings. The miniature ball bearing specialist shows his skills most notably when the use in demanding applications is concerned.

In all cases where there are extreme environmental conditions GRW is always ready with the appropriate ball bearing solution. In the new brochure „GRW EXTREME" we show our expertise in extreme applications.

Miniature

The production of high precision miniature ball bearings is GRW's core competence. With a bore diameter of only 1 mm and an outer diameter from 3 mm and more GRW bearings get blood pumps, miniature motors, and micro robotics up and running.
By comparison: A penny has a diameter a little more than ½ inch – GRW's "smallest" bearing only has an outer diameter of 1/8 inch!
A fingernail is approximately 2/64 inches thick – GRW's smallest ball bearings have a width of only 1/64 inches!

High Heat

In turbojets, furnaces and soldering installations extremely high temperatures are predominant. GRW uses special lubricants and coatings against blistering heat up to 842°F. Turbojets are combustion turbines which are mainly used as engines – here e.g. the GRW ball bearing size 608 runs at a speed of 150,000 rpm at a temperature of 392°F!

Frigid Temperatures

GRW ball bearings operate in applications in the vicinity of liquid helium, e.g. in telescopes on Hawaii or in the particle accelerator DESY. DESY's particle accelerator is a device in which charged particles are accelerated to high speeds by electrical fields. To achieve better conductivity the distance of acceleration is cooled down to approx. -454°F by liquid helium – a real challenge for ball bearings!
By comparison: Even at absolute zero of -460°F helium will not solidify – no other substance is able to achieve this.

Chemicals

Acids and Alkaline baths are not the only enemies that attack metals. Problem: ball bearings used in portable oxygen resuscitation applications were exposed to pure oxygen which dramatically accelerated any oxidation process. The lubrication broke down and the ball bearings failed. Solution: GRW solved this problem – after a battery of experiments, GRW specified the suitable lubricant and, in combination with special bearing materials, was able to provide a functional, durable and reliable ball bearing. Especially in medical applications this is a must.

Salt

To prevent salt corrosion of ball bearings, GRW has the solution. So, as a result you will find GRW ball bearings used in wind anemometers and professional fishing reels. Our salt resistant bearings are also used in a motor propelled surfboard. Consequently surfers are able to ride waves longer and with increased stability. These

motor driven surfboards can also be used by the Coastguard in rescue operations where getting to disaster victims fast is imperative.

Blood

Did you know that up to 1,500 liters of blood flow through our kidneys each day? Blood is also an extremely corrosive medium and aggressively attacks metals as well. In surgical instruments like drills or saws special bearings are used. Blood pumps,also known as ventricular assist devises, is a very special application field. Implantable blood pumps are medical devices used as a mechanical support for our circulatory system. These ball bearings have to be very small; in addition they have to be extremely resistant to blood corrosion and above all they have to be absolutely reliable.

Sterilization

Bearings used in medical and dental instruments are subjected to required sterilization processes. During the sterilization process high temperatures, chemicals or UV-radiation are applied to eliminate micro organisms. Not only are special materials used, particularly for the retainer, but GRW ball bearings exceed expectations in this field. Critical selection of suitable lubricants, determined through a battery of in house testing are combined to achieve optimal results.

Radiation

GRW bearings are found in emergency shutdown mechanisms for nuclear power plants. During the construction of nuclear power stations the TÜV, a German safety monitoring agency, discovered a serious design problem in the mechanism – a mechanical component in the emergency shutdown system seized during a test run. Within four days GRW produced a special three-piece bearing assembly. Immediately GRW's solution exceeded the number of functional cycles demanded by the TÜV by the factor 650! Consequently the emergency shut-down system has a reliable permanent solution.

High Speed

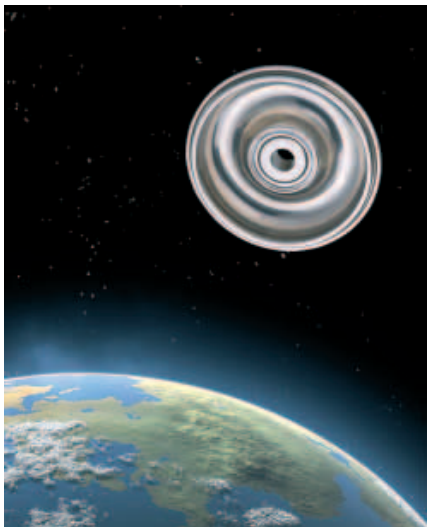
The dental turbine field is an application with extremely high speeds. GRW ball bearings reach speeds up to 500,000 rpm. Mounted in dental hand pieces, patients feel quality differences with GRW ball bearings . Not only does the hand piece run quieter – but the higher power output requires shorter drilling time and less patient discomfort .

Vibration

When a rocket is launched extreme forces and vibrations act on a ball bearing. The bearing has to withstand extreme vibrations and main-tain consistent operation. Bearings also have to withstand enormous forces when a satellite is placed into orbit. To prevent bearing damage due to these loads the proper bearing design is imperative . GRW has the knowledge and the technical knowhow to offer individual solutions for Aerospace.

Vacuum

If there are extreme temperatures or if it is about ultrahigh vacuum, conventional lubricants reach their limit. For these applications GRW uses dry film lubricants such as gold, silver, MoS2, teflon or resistant material coatings. In addition, the use of these special lubricants helps to avoid contamination in a vacuum environment.



Reliability

Did you know that manufacturers using GRW ball bearings in their dental hand pieces give a two-year warrantee? During the warrantee period GRW ball bearings have proven reliable!
GRW ball bearings not only operate dependably during their long life but they also receive high marks in applications where they are rarely used. But when their use becomes necessary, they have to operate on demand.

For Example: GRW ball bearings are also used where repair or replacement is impossible. Mounted in both Mars Rovers "Spirit" and "Opportunity" GRW ball bearings (over 70 bearings per vehicle) perform flawlessly on the planet Mars 35-60 million miles away from Earth.

Martina Steffen

TRADE FAIR IN ANAHEIM/CALIFORNIA

Ron Arbon (GRW USA) explains various application fields of GRW ball bearings

It was already the second time that GRW USA together with their representative Mooney Industrials exhibited at the „Design and Manufacturing" in Anaheim (California, USA). Again it marked the beginning of a series of trade fair participations in the USA in 2011. New York, Boston and Chicago will follow. With more than 100 promising contacts, with projects and even orders this fair trade proved to be extraordinarily successful again. This is part of various efforts to constantly improve GRW's brand awareness and name recognition. Also the participation of GRW's Management showed our customers and prospective customers that customer proximity and personal support are important topics for GRW.

Michael Stürmer

SPONSORED BY GRW:

PERFECT ROTATION

Hervé Viellermoz revs up with GRW

Originally developed as an off season training program for cross-country skiers, the roller ski sport has advanced to an independent competitive sport affiliated with the international ski association (FIS), who even organize roller ski world championships in the meantime.

Today, this endurance sport is not only well received by competitive athletes, but is also gaining popularity as a leisure sport as well. For example; a roller ski race for amateurs called "Cosne/Sancerre" has been brought into being in the French province Nièvre. The road between Cosne and Sancerre, a distance of 25.5 km (approx. 16 miles), serves every year as the course for a local roller ski race divided into four stages and ends with an ascent up the famous Sancerre hill. When this race took place for the nineteenth time last year, ball bearings sponsored and supplied by GRW, proved worthy on the course as well.

Roller skier, Hervé Vuillermoz, who had already been an advocate of GRW's quality bearings for his company, recognized GRW as a suitable partner and contacted GRW with a request for sponsorship of this race. Rolling on skiers equipped with GRW ball bearings, Hervé completed the course in just less than 20 minutes and placed first in his age group. As a result, he will once again be at the starting line next year – equipped with GRW Ball Bearings.

Daniel Waltert

WHO IS WHO

Dr. Volker Bartelt

Dr.-Ing. Volker Bartelt graduated from the Faculty of Electrical Engineering and Information Technology of the renowned RWTH Aachen University, where he completed his doctorate at the Laboratory of Machine Tools and Production Engineering. He has many years of experience in running international companies. He served as Technical Director of Oerlikon Geartec AG, Zürich, was Manager of Production and Logistics of Klingelnberg GmbH, Hückeswagen, and ran Baltic Metalltechnik GmbH as well as HAUNI Hungaria Kft with production sites in Germany and Hungary as General Manager. Recently he was employed by the Pfaff-silberblau-Group, Kissing as CEO and shareholder orchestrating the transition from a family-owned company to a future-oriented industrial enterprise. Since April of 2009 Dr. Volker Bartelt has not only been CEO but is also a shareholder of GRW Bearing GmbH and Gebr. Reinfurt GmbH & Co. KG.

Harald Kroeger

In October of 2010 Harald Kroeger started at GRW's as the Controlling Manager and has been responsible for administrative departments such as Controlling, Financial Accounting, Information Systems, Purchasing, Facility Management and Human Resources. Harald was promoted to Chief Financial Officer (CFO) in April of 2010.

Prior to GRW, Harald collected extensive experiences as Division Manager Controlling at Stahlgruber as well as Controlling Manager at Pfaff – silberblau Hebezeugfabrik. Not only has GRW benefited greatly from his specialized knowledge of corporate planning, annual financial statements and reporting, but also from his knowledge of EDP-systems like our current ERP program proAlpha.

Michael Stürmer

Michael Stürmer has been Chief Customer Officer (CCO) at GRW since January of 2010 and is responsible for Sales and Technology as well as Marketing. In addition he has been managing our Production Planning since January 2011.

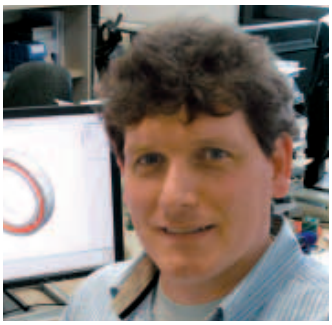
After graduating in Business Management from the University of Würzburg, he started as an Assistant to the Managing Director of Sales and Marketing at Koenig & Bauer. Starting in 1994 he was promoted to Manager of Sales and Service South and later he served as Director of Sales and Service for the countries Germany, Austria, Switzerland, Hungary, Ex-Yugoslavia as well as Israel.

Markus Lang

Markus Lang has been responsible as Manager for both, the department Manufacturing Technology as well as Production in Rimpar since December of 2010.

He is a graduate of Mechanical Engineering from the Mannheim University of Applied Sciences. Afterwards he worked as Project Manager for Heidelberger Druckmaschinen for several years. In 2008 he took over the production of Alltec Antriebstechnik GmbH as Technical Manager and was appointed their General Manager in 2009.

Wolfgang May



Wolfgang May has only been part of the GRW team since February of 2011 and currently is serving as Manager of our Technical Design department.

He graduated in Mechanical Engineering with a special emphasis on design and product development from the Würzburg University of Applied Sciences. Recently he worked for Schaeffler Technologies as Team Coordinator in the Development and Technical Design department. He also acquired a special working knowledge of miniature ball bearings through an extended stay at Schaeffler's subsidiary Barden Danbury/USA.

Stephan Meixner

GEBR. REINFURT GMBH & CO. KG
EXTREME-PRECISION BALL BEARINGS

The perfect bearing for each situation.

Whenever, the requirement demands precision, GRW's, Gebr. Reinfurt GmbH & Co. KG in Rimpar near Würzburg, extreme precision ball bearings find their special place.

GRW develops and produces ball bearings for unique system solutions as well as standard applications at their plant in Germany. Extreme environments and loads demand maximum performance at the highest quality. Particularly aerospace, and military applications, are examples of specialized applications requiring bore diameters from 1 to 25 mm and outer diameters from 3 to 40 mm.

Along with applications in aerospace, GRW ball bearings are also used in medical, dental, vacuum, microelectronics, high performance measuring instruments, navigation and many other broadly-based mechanical devices.

Feel free to challenge GRW, we will provide you with tailor-made solutions.

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