

## Vertical Turning Machine with integrated automation for an increased competitiveness



On the left of the VERTICAL VT 400, the drag frame belt conveys the parts that are to be processed, as well as those which have been completed; on the right is the central chip disposal.

### The MFO Metallic Goods Factory, Forchtenberg

This family business, founded as a turnery in 1937, is today a specialised supplier for machine, machine tool, equipment and vehicle construction. Highly precise standard parts such as clamp and extractor sleeves, securable shaft nuts or lock plates are generally sought for the installation of rolling contact bearings. The company, now being managed by the third generation of owners and based in Forchtenberg in Baden-Württemberg, has created its core competency in this area: It manufactures these parts, among others, for global leaders in the rolling contact bearing industry and, within this, MFO managers and employees benefit from practical knowledge gained over seven decades. The production of turned parts to customer drawings is another business area.



Metallwarenfabrik Forchtenberg  
Hermann Armbruster GmbH + Co. KG  
Allmand 21 · 74670 Forchtenberg · Germany  
Phone +49 7947 91020 · Fax +49 7947 7602  
info@mfo-waelzlager.com · www.mfo-waelzlager.com

### Requirements profile

- Premium components up to  $\varnothing$  400 mm
- High level of variance among components for both small and medium size batches
- Complete machining
- Low manpower production



Production Manager Frank Nebe (right) discusses the ideal process operations with the fitter.

## This vertical machine helps strengthen your competitive edge

Complete solutions are characteristic features at the metallic goods factory of Forchtenberg Hermann Armbruster GmbH + Co. KG – abbreviated to MFO: when work began with swivel plates 77 years ago, it was the company's philosophy, as is the case with the components manufactured today for rolling contact bearing, to focus on partnership, reliability and sustainability, as well as concentrating on specific needs of rolling contact bearing manufacturers and users. The investment in a new manufacturing machine is also intended as a complete solution. The challenge: Increasing competitiveness through flexible manufacturing, including small and medium-size batch volumes, with the simultaneous replacement of manual with automated work. In order to fill these expectations, the approach of those responsible at MFO was both very in-depth and target-oriented. They selected the EMCO VERTICAL VT 400.

Rolling contact bearings turn about, on and in assembly parts supplied by MFO. For this, extractor sleeves, clamp sleeves, groove nuts, securable shaft nuts and lock plates are typically used – from the standard, duplicate part to the demanding, individual speciality model. „We're small, but fine. Instead of large-scale production, we create specific components for customers, including global market leaders. A company that has been an A-list supplier to large-scale rolling contact bearing manufacturers for over 75 years can only achieve this with tried and tested continuity in technical innovation, a high level of quality in its products, and reliability as a partner.“ This is how Barbara Schweizer, Managing director and grand daughter of the company founder Hermann Armbruster, describes just one part of the company strategy. She refers to another part as humane values. She adds, „We deal with our customers, partners, suppliers and service providers ethically

– and this is an integral component of our company culture.“ And Alexander Brichta, MFO Sales Manager, defines the implementation of the strategy, based on in-house production and the products: „Continuity and innovation complement one another. The optimisation of manufacturing processes can mean innovation in established, tried and tested products. The same applies for increases in accuracy, durability, service life, and safe operation. These aspects influence our decisions on strategic alignment and planning.“

## Defining the task and examining options for solutions

Market research, including in-house research, let us know: On the one hand, the majority of the rolling contact bearing offered in the smaller diameter range comes from Asiatic and Eastern European countries – on the other hand, there is demand for premium components in the larger diameter range, up to 400 mm. This product group, e.g. groove nuts and clamp sleeves, represents a high proportion of turning work combined with a low level of milling. Following these observations, research was carried out as to which machines were able to produce these parts highly efficiently at relatively low unit costs, with, simultaneously, a high level of variance among the components.

In large workpieces that are to be tensioned in chucks, horizontal turning machines take on the load of one worker per machine. The alternative of automation would require a higher level of outlay. Working vertical rotary machines with milling units for chuck parts are a productive solution. This design can be relatively straightforwardly loaded and unloaded, i.e. without having to use costly devices for changing the workpiece each time. It is similarly straightforward to link

up this type of machine to the production flow with other machines, with feeding devices or robots. The steps of manufacturer and machine selection follow the analytical preparation work.

### Expectations and selection criteria

„In connection with choosing a vertical turning machine – our first, by the way – we looked around at trade fairs and got in touch with manufacturers. Our goal was to meet a selection of three to four manufacturers who offered the ideal machines for our products. Four manufacturers ultimately made it to the shortlist,“ reports Frank Nebe, Production and Technology Manager. The manufacturing experts from MFO brought their workpiece data and raw material with them to the manufacturers' visits. They arranged for concrete workpieces to be produced from these on-site. Specialist discussions about the manufacturing processes, accuracy, capacity, part production time, and other subjects, followed. Those responsible at MFO selected the two best options for their products in accordance with these results and experiences in the preliminary decision-making stage.

More detailed tests at the selected manufacturers' sites clarified the criteria relevant for practice in future. As Frank Nebe explains: „We observed how the machines work in small-series production.“ The production manager sums up the focal points of the tests and explains: „We wanted to know how accuracy changed depending on heat in the machine; first and foremost, how does splintering function for long-splinter materials? Would there be splinter residues forming in the machine? It was also important for us to know how the technology would be implemented – what would the fitter need to take into consideration during modification and how good is accessibility in the machine?“

Frank Nebe then adds a soft criterion, but one which is important in terms of the company philosophy: „For technically comparable offers, service aspects play a separate role, also shaped by future human relationships. During our visit and tests, we got to know how people interacted with those within the business as well as with external partners. For these reasons, and together with the favourable price-performance ratio, we then made a clear decision in favour of EMCO and the VERTICAL VT machine series.“

### Practical test and operational example

For production engineer Nebe, the acquired machine must be tested at the manufacturer's site in advance – this is of primary importance in the selection process. He would also absolutely recommend the following to a colleague when facing an investment decision: „I would never recommend making an initial purchase without a test. We know our own workpieces and the workflows. The manufacturers' applications engineers

know their own machines and the associated technology. Both benefit from the synergy of our experiences and the implementation of the manufacturer's production strategy.“ The employees of MFO invested two test days each at the EMCO location in Hallein in Austria. The cost for EMCO in terms of time ran to around one week. „The temporal and financial cost was worth it for us,“ sums up Frank Nebe. Alongside the security in the investment, shorter machine introduction and initiation times for employees also made a significant difference at MFO.

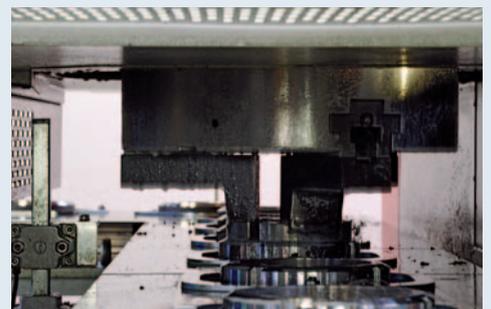
A typical workpiece to be processed at MFO on the VT 400 (see box below) is a groove nut. While one employee is continually required with the conventional horizontal turning machine, the VT 400 removes up to 24 raw pieces from the drag frame of the conveyor belt and independently moves the workpieces, once processing is complete, back into it. This means that the employee performing loading is able to operate at least one additional machine.

MFO is planning the acquisition of a second EMCO Vertical VT 400 – either a smaller VT 250 for workpieces with a diameter up to 250 mm, or an additional VT 400.

### Experiences and outlook

Since May 2013, Frank Nebe and his employees have been gaining experience with the VT 400. They have been particularly impressed by certain features and functions: „Our fitters have been particularly pleased with the size of the working space and the accessibility of all built-in parts and tools. Because we receive some materials only as bulk materials, the high level of output in combination with the maximum permissible workpiece weight prove advantageous for us. We ascribe the short part times and the high level of productivity to the short path between the loading- and unloading as well as the work-position. The large spindle bearings of course also play a role here.“ Alongside these details, the Production and Technology Manager also mentioned the experience gained by MFO. He briefly summarises: „Our expectations on the VT 400 have been met.“

Asked about potentials and developments in the turning machine market, the manufacturing expert Nebe brings in his experiences and sees a few trends: „Vertical turning machines also produce small batch sizes up to size one entirely economically, in contrast to common opinion. For precisely this reason, they gain slightly and proportionately in comparison to horizontal turning machines. I can see potential in the development of even higher-capacity cutting tools. Better cutting characteristics, better chip breaking and longer idle times result in shorter part times and increases in productivity. This requires that there is still enough capacity reserved in the machine. And, here, I am confident that our investment is a safe one.“



The chuck travels at a 1.2-minute cycle speed out of the working position in the machine interior to the exterior via the drag frame belt, deposits a finished, processed groove nut and receives the next piece to be processed.

# [Technical data]

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## EMCO VERTICAL VT 400

Work area	
Chuck size	400 mm
Maximum work piece diameter	400 mm
Maximum work piece length	200 mm
Travel	
Travel X / Y / Z axis	960 / +- 90 / 400 mm
Rapid motion speed X / Y / Z	45 / 15 / 30 m/min
Main spindle - ISM	
Speed range	0 – 4000 rpm
Drive power	36 kW
Torque	600 Nm
Spindle nose / DIN 55026	A2-8
Tool turret	
Number of tool holders	12
Tool shaft according VDI (DIN 69880)	VDI40

Tool turret	
Driven tools	12
Speed range	0 – 4000 rpm
Drive power	8,5 kW
Torque	40 Nm
Coolant system	
Tank volume	320 litres
Coolant pressure standard / optional	3,7 / 14 bar
Dimensions and weight	
Overall height	2940 mm
Floor space L x D (w/o chip conveyor and part feeder)	3482 x 2511 mm
Machine weight	8500 kg



EMCO Maier Ges.m.b.H.

[www.emco-world.com](http://www.emco-world.com)

Salzburger Str. 80  
5400 Hallein  
AUSTRIA  
Phone: +43 6245 891-0  
Fax: +43 6245 86965  
[info@emco.at](mailto:info@emco.at)