

# APPLICATION OF A TRAVELING REST AT THREAD GRINDING

Lachezar Stoev<sup>1</sup>

<sup>1</sup>Faculty of Industrial Technology and Faculty of German Engineering and Industrial Management,  
Technical University of Sofia, Bulgaria

\* Corresponding author e-mail: [lstoev@tu-sofia.bg](mailto:lstoev@tu-sofia.bg)

## Abstract

The usual technology for longitudinal grinding of parts with poor rigidity like piston rods, lead screws, drills, taps, broaches, etc. is characterized with application of one or several rests. They are mounted on the machine tool's table and are relatively still with respect to the workpiece. To increase the accuracy and productivity of thread grinding of precision lead screws for machine tools, attachments and tools it's suitable to apply a method for multipass longitudinal machining with a traveling rest and double sided support of the workpiece.

## Keywords:

*traveling rest, thread grinding, lead screw*

## 1. Introduction

In general grinding of thread profiles of long lead screws for machine tools causes serious technological problems. Most often specialized machines are used and on their work tables several steady rests are fixed, Fig.1a [1]. Similar are the problems connected with longitudinal

machining of piston rods and tools with low rigidity, which imposes additional support of the workpieces. To grind threaded surfaces, the abrasive tools are tilted digitally or positioned at required lead angle of the thread line, Fig. 1b [1].



a) Grinding of long lead screws with steady rests

b) Work zone of a grinding machine for machining of short threaded profiles

Figure 1. Thread grinding machines produced by Doimak [1]

The aim of this work is to present the possibility to apply the method for multipass longitudinal machining with traveling rest [2] when executing operations for external circular and thread grinding of components of lead screw type. In such cases is suitable to apply a rest with double support of the workpiece [3]. In the publication is presented the possibility for rough and finish machining of threaded profiles of screws with poor rigidity at

single positioning when using multioperational machines of S242 (CombiGrind h) type [4] produced by Studer and Schaudt and the machining center presented in [5, 6]. Additional accent is imposed on the opportunity for profile longitudinal grinding of shafts with poor stability and continuous support of the machined surface, which is provided by the two carriage option of the multifunction machining center [5, 6].

## 2. Application of traveling rest with double sided support of the workpiece at thread grinding

The traveling rest presented in [3] is suitable for application at longitudinal machining and thread

grinding. The unit supports on two sides the pliable screw in the same position in which it's

encompassed by the "split" nut in general purpose lathes. The technological idea of the design presented in the next paragraph is a guarantee for high accuracy of diameter and pitch of the lead screw along its whole length, regardless of its

pliability due to forces caused by machining or by its own weight. When using a traveling rest [3] for double sided support, the machined section is always coaxial with the bearing journals.

### 3. Cylindrical grinding and thread grinding

The sequence of the suggested technological process for finish machining of lead screw type components is as follows: cylindrical grinding of the external surface of the workpiece with a straight profile wheel, followed by a thread grinding with a traveling rest for double sided support. The machining can be executed at one or two

positioning, depending on the equipment of the customers. To execute both operations at one setting is necessary to use single or double carriage machine with two tools. On Fig. 2 in two views is presented the first operation for external grinding of a screw with trapezoidal thread using a rest for double sided support.

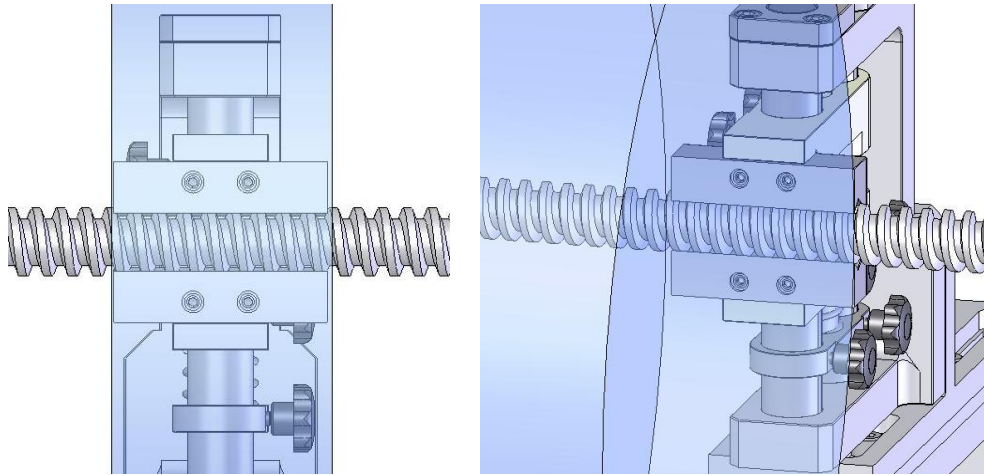


Figure 2. External grinding of a screw with trapezoidal thread with traveling rest for double sided support

On Fig. 3 is presented in two different views the second operation for thread grinding. The tool is tilted at the lead angle of the thread. The support

of the component is done using the grinded surface. In this way is provided its coaxiality with the machined threaded profile.

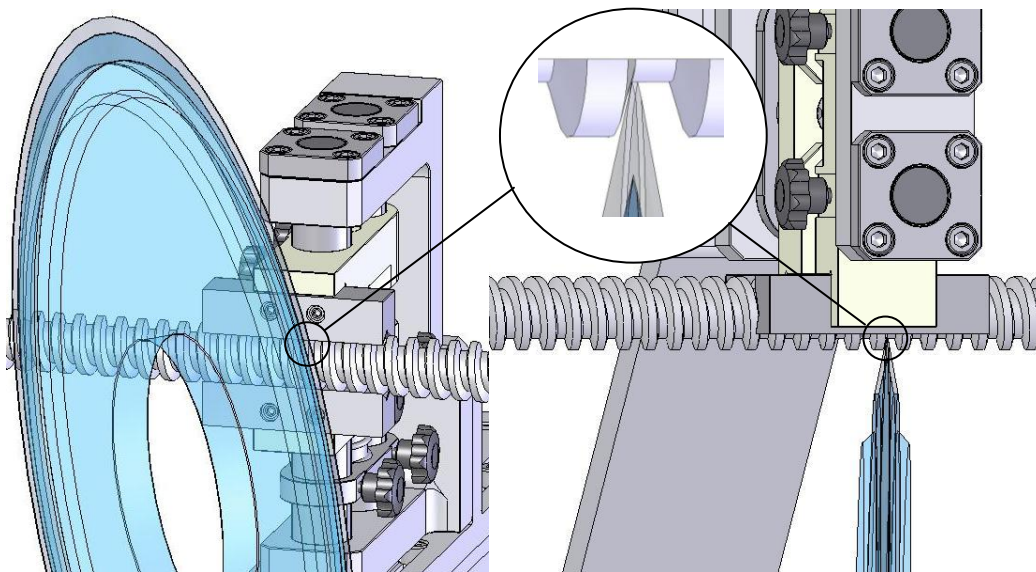


Figure 3. Thread grinding of a trapezoidal screw with a traveling rest for double sided support

The method can be applied for machining of all kinds of threaded profiles. For screws with substantial lengths is advisable to use CBN wheels. The higher dimensional life of these tools will positively affect the accuracy and productivity

of the thread grinding operation. On Fig. 4 is illustrated in two views machining of a threaded profile of a screw with metric thread with CBN wheel.

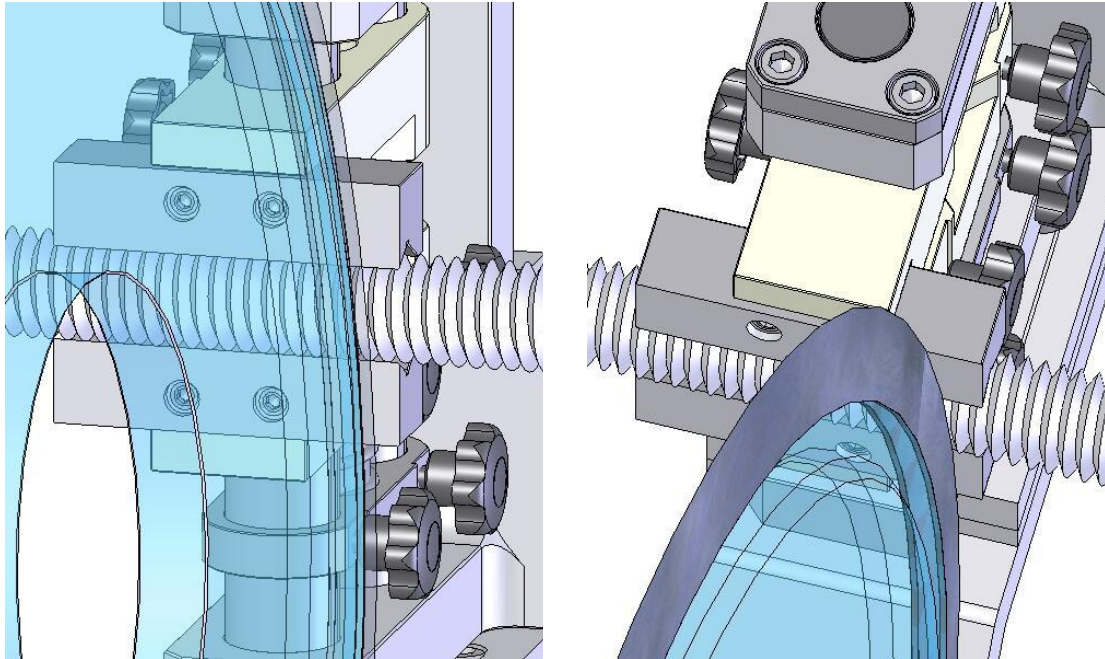
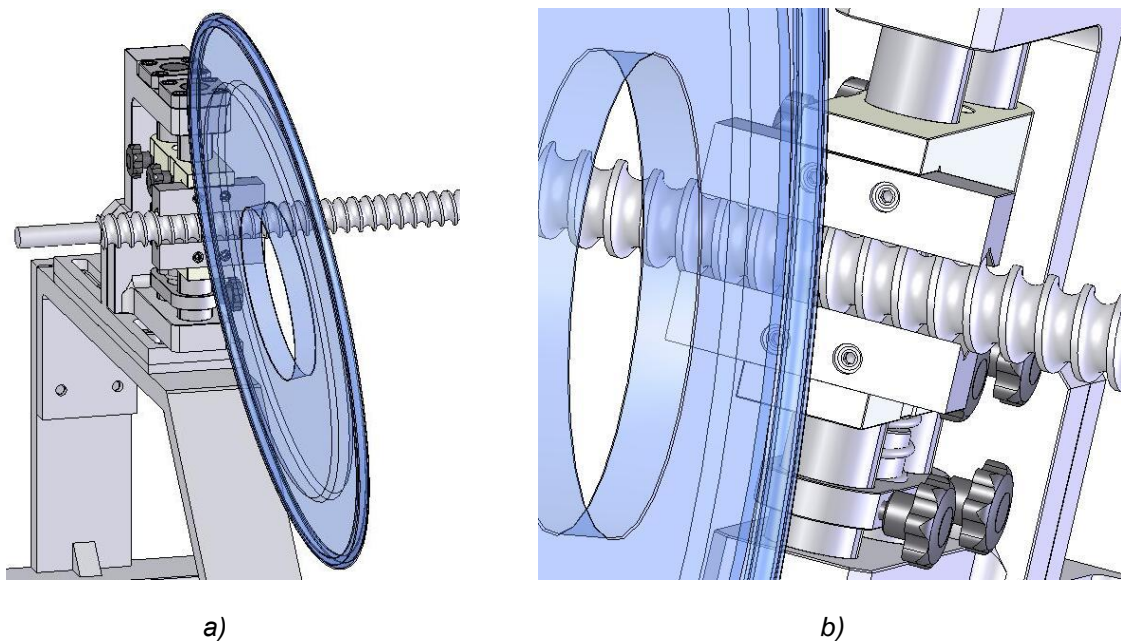


Figure 4. Longitudinal grinding of a metric thread at double sided support with a traveling rest

For CNC machine tools ball screws are widely used due to the high price of linear motors. The suggested method and device can be used for final machining of lead screws with different 'radii' profile of the thread. To clarify in full the positioning

of the traveling rest, the tool and the workpiece in the work zone of the thread grinder, the machining of a ball screw is given in four different views on Fig. 5.





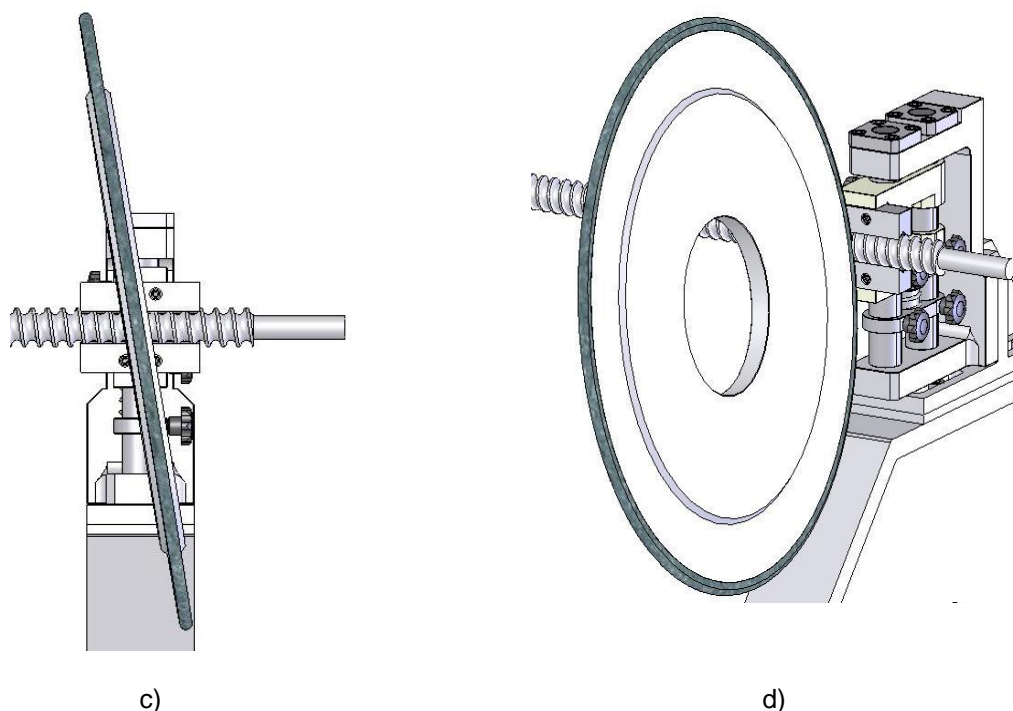


Figure 5. Grinding of a thread profile of a ball screw shaft with a CBN wheel with radial profile

## 5. Conclusion

The accuracy of positioning and the class of accuracy of a machine tool depend to a great extent on the limits of the technological possibilities to achieve precise shape and dimensions of the lead screws. In this publication is presented a new application of the method [2] for longitudinal grinding with a traveling rest [3] when machining thread profiles and cylindrical surfaces at one setting. The design and technological concept of the developed technological equipment, as well as the suggested and tested method for longitudinal

grinding using traveling rest are guarantee for expected productive machining of accurate shape and dimensions of lead screws, which determine the final accuracy of machining. In the present work are given technologies and equipment for multioperational machine tools for machining different types of lead screws and profile components with poor rigidity. For all of them applications for inventions are submitted in the Patent office of Republic of Bulgaria.

## 6. References

- [1] Site of the Spanish company for grinding machines Doimak, <http://www.doimak.es>, 18.01.2010.
- [2] Стоев Л. Метод и устройство за шлифване на детайли с ниска стабилност, сп. Машиностроене, бр. 1-2, стр. 41÷43, 1998.
- [3] Стоев Л., Ст. ХРИСТОВ Метод и технологична екипировка за двустранно поддържане на нестабилни детайли при надлъжно шлифване, международна научна конференция „Авангардни машиностроителни обработки“, АМО 2008, Кранево, сборник доклади, стр. 295-300, 18-20 юни 2008.
- [4] Site of the German association Schleifring Gruppe of companies producing grinding machines for the concern Körber Schleifring, <http://www.schleifring.net>, 17.03.2008.
- [5] Стоев Л. Метод и машина за многооперационно обработване на стъпални ротационни детайли, част 1 Описание на метода и машината, научна конференция с международно участие ТЕХСИС'2009, 29-30 май 2009 г., списание на Технически университет – София, филиал Пловдив, ISSN 1310-271, стр. 89-94, Vol. 14 (2), 2009.
- [6] Стоев Л., Метод и машина за многооперационно обработване на стъпални ротационни детайли, част 3 Нови технологични методи, международна конференция АМО 2009, Кранево, стр. 13-19, 24-28 юни 2009.