INSTITUTE OF MACHINE
AND INDUSTRIAL DESIGN

FME

Faculty of Mechanical Engineering
Brno University of Technology

Review of Doctoral Thesis

1. PhD candidate
Ing. Jan Foltýn / Jan.Foltyn@vut.cz
2. Name of PhD programme
Design and Process Engineering
3. Title of PhD thesis
Operational Safety and Reliability Enhancement of Large-Scale Hydrostatic Bearings

4. Principal supervisor
doc. Ing. Petr Svoboda, Ph.D. / Petr.Svoboda@vut.cz
5. Co-supervisor
Ing. Petr Šperka, Ph.D./ Petr.Sperka@vut.cz

6. Reviewer
dr. hab. inż. Michal Wodtke/ michal.wodtke@pg.edu.pl
Politechnika Gdańska

7. Overview of the scope of PhD thesis[1]
Very good
The reviewed thesis investigated, through a series of experiments, the impact of geometric imperfections or operational issues (e.g. bearing pad sliding surfaces offset or hydraulic system malfunction) on the operational safety of the large-size hydrostatic bearing oil film distribution, which is the key parameter directly linked with the factor of safe bearing operation. Tests were performed in the lab conditions as well as in the field, on the hydrostatic bearing of the Very Large Telescope (VLT, Chile) with the use of different techniques for lubricating film thickness measurements (optical methods, dial indicators or contactless inductive sensors). It was confirmed with the obtained results that it is possible to increase the margin of safe operation of the large-scale hydrostatic bearings by the continuous film thickness diagnostic or levelling of the bearing pads during assembly using precise optical methods. The scientific achievement of the thesis is the extension of the knowledge through a series of experimental investigations (both with the use of a test rig and field tests) about influential factors impacting large hydrostatic bearing performance, and the proposition of techniques and approaches for increasing safe operation and reliability of large-size bearings.

[1] Overview of the scope of PhD thesis is a short description of objectives of PhD thesis's research and summary of main findings and scientific achievements.

8. Significance of the topic and clarity of problem statement
Very good
Large hydrostatic bearings are components of systems that, due to their size, are subject to operational challenges resulting from factors that are not typically taken into account when designing smaller systems (e.g., assembly errors in segmented structures). This peer-reviewed doctoral dissertation focused on investigating the impact of such parameters on the overall system performance and demonstrates that monitoring the thickness of the hydrostatic oil film in the gap is a highly effective method for enhancing the operational safety of large hydrostatic bearings. The existing literature on this topic is very limited; therefore, from this perspective, the research issue addressed in this thesis is significant for the scientific community. The problem was clearly described in the thesis using several research questions, which were supported by a literature review and a precise identification of the knowledge gap.

9. Knowledge of existing literature
Good
The dissertation contains a literature review focused on the practical implementation of the hydrostatic lubrication principle to carry external loads in real machinery. It covers issues related to types of hydraulic systems that meet in practice (constant flow and constant pressure), the role of the flow restrictors and their types, and known examples of large hydrostatic bearings and lubrication or design-related failure issues. It is an interesting summary of practical difficulties described in the literature, confirming good knowledge and understanding of the problems related to the undertaken topic by the PhD candidate. On the other hand, probably intentionally, cited literature omits theoretical works (dealing, e.g., with the effect of the shape of the recess or sliding speed on overall system performance). However, it would be valuable to mention them as well, even only with a short summary, to show the whole picture of the knowledge about hydrostatic lubrication problems in the existing literature.

10. Choice of methods and technical soundness
Good
Experimental methods were used to investigate the topic addressed in the doctoral dissertation. In addition to well-known and proven methods (such as dial gauges and inductive sensors for measuring the hydrostatic lubricating film), innovative solutions were also proposed and successfully verified (optical point tracking (OPT) for estimating film thickness and optical coordinate measurement (OCMM) for aligning bearing raceways). Through the measurements conducted with the appropriate selection of methods and the results presented, the doctoral candidate demonstrated skills, knowledge, and a high level of competence in experimental work. Theoretical methods (e.g., Computational Fluid Dynamics CFD for studying fluid flow or the Finite Element Method FEM for studying the stiffness of structural components: bearing pads or the slider) would also constitute an interesting and valuable option for expanding the research to confirm the assumptions made for the measurements (e.g., the stiffness of components) or to investigate system parameters that are difficult to measure or are not recorded at all (e.g., the velocity fields of lubricating oil in the recess and lubrication gap).

11. Quality, originality and significance of the results
Very good
The findings of the dissertation address various aspects of the operation of hydrostatically lubricated systems. They document the impact of the assembly method of segmented bearing pads on the hydrostatic oil film and the effect of the operating mode of a Very Large Telescope (VLT) on the measured lubrication

gap in a hydrostatic bearing, including simulated failure of the hydraulic system (clogging of the oil inlet to one hydrostatic pocket). Different measurement techniques and approaches of the oil gap were applied and compared, which gives occasion to evaluate efficiency and discuss the benefits and problems of their application. From that perspective, the obtained results are a set of comprehensive activities focused on operational problems of large hydrostatic bearings, which is unique and original. In addition, operational field data from the hydrostatic large bearing of a large telescope provides unique and significant information about the real system operation, also under failure conditions. The collected results are significant for the scientific and technical societies involved in large hydrostatic bearings research and application.

12. Quality of attached papers

Good

Three peer-reviewed papers were included with the dissertation. Two of them were published in renowned scientific journals in the field of tribology (Paper 1 in the journal IMechE Part J and Paper 3 in the ASME Journal of Tribology). All papers are of high quality and were written in accordance with the principles and best practices of scientific publishing, containing all the data necessary to understand the motivation, methodology used, and results obtained. One aspect that could be slightly expanded upon is the repeatability of the hydrostatic film thickness measurements obtained under various operating conditions (e.g., at different loads or oil flow rates; Papers 1 and 2). Regardless, it can be concluded that the attached scientific papers form a logical sequence in the development of research on the hydrostatic lubricating large-scale bearings with special emphasis on their operational safety and reliability, starting with laboratory tests and ending with measurements on an actual technical object, which, due to many limitations (e.g., cost, safety considerations, equipment availability), is quite rare in the available scientific literature.

13. Overall assessment, strengths and weaknesses (based upon the above evaluation categories 8–12)

Very good

The doctoral dissertation under review addresses issues related to the operational safety of large-scale hydrostatic bearings. It constitutes a comprehensive collection of scientific studies that have demonstrated that, through careful monitoring of the hydrostatic film thickness and the use of precise assembly procedures, the overall safety and reliability of the bearing can be improved. The main strengths of the thesis include: the comprehensiveness of the experimental research conducted on a significant problem concerning the operation of large hydrostatic bearings, the application of new measurement techniques to assess the thickness of the hydrostatic film and their verification and validation, and tests on a large-scale bearing. Among the few weaknesses of the study are: the limited scope of the literature review, which focuses mainly on experimental studies; the lack of use of theoretical methods to evaluate the investigated phenomena; and the lack of clarity regarding the reproducibility of the obtained results for measuring lubricant film thickness under laboratory conditions. However, this does not change the very high rating of the reviewed work, which is an interesting source of knowledge about the course of phenomena accompanying the operation of large hydrostatic bearings.

14. Questions and comments

The reviewed thesis investigates experimentally large-scale hydrostatic bearing properties. The main interest was paid to the estimation of the hydrostatic oil film distribution. This is a very challenging task, taking into account the size of the bearing pad and the lubricating film thickness, which can reach only a couple of dozen microns (and frequently even less, depending on operational conditions and application). In addition, oil film thickness measurement is usually very difficult (even in laboratory conditions) due to

many factors which can impact recordings, namely, e.g., thermal effects, limited stiffness of the components or sliding surface shape errors. From that perspective, the scope of the work was challenging; however, it is very important to understand the operational conditions of the system and learn more about the identification and the phenomena course of its critical states before potential failure.

The detailed comments/questions below were appended to the dissertation for further consideration and discussion:

1. What are the limitations of the optical techniques proposed to improve alignment of the bearing pads (OCMM method) and to measure lubricating hydrostatic film (OPT) in terms of the space required and other specific requirements (e.g. source of light)? Is it possible to implement them for the assembly and monitoring operation of real-scale objects in the field?
2. Is it possible to implement the Optical Point Tracking (OPT) method to also investigate (capture) possible deformations of the structures, not only for their movements?
3. What was the source of the difference in the measured values of lubricating oil film thickness for sensors A1 and A2 in the results presented in Figure 9 of Paper 1? Irrespective of the considered method, thicker film thickness was measured with the sensor A1 (positioned closer to the slider end) than with the use of sensor A2 (mounted in the space between pads).
4. Following the previous comment, what were the readings of proximity sensor A3 (positioned on the same side of the pads as sensor A1)? Did you notice the lateral movement (tilting) of the pad during tests (in the results of Papers 1 & 2)?
5. Were the sliding surfaces of the hydrostatic bearing pad, and especially the slider, from the 2PAD test rig measured to identify their topography (waviness or roughness)? It can be important to include the impact of potential manufacturing errors on the overall system behaviour and hydrostatic film thickness estimation.
6. Please comment on the resolution of the applied sensors in the laboratory tests (especially to monitor film thickness and pressure in the recess), taking into account the level of monitored parameters of the system.
7. Different levelling methods of the segmented pads of the hydrostatic bearing were verified with the use of measurements of the film thickness and assessment of its uniformity. What was the repeatability of applied methods? Did you try to repeat the same procedure a couple of times (conventional, constant pressure and optical) just to notice the difference in results and evaluate the ability to obtain similar values of film thickness?
8. As noted in Paper 3, sliding movement of the VLT bearing caused scattering of the hydrostatic oil film thickness measurements with the use of a contactless inductive sensor. The cause of this has been identified as the effect of the roughness and waviness of the slider's sliding surface. Is it possible that the magnetic irregularity of the slider was also a source of the observed scattering of the results?
9. In all measurements of the hydrostatic film thickness, distance sensors were fixed to the bearing pads near their edges or corners, outside the gap. It is not clear whether the actual sensor position was included in the evaluation of the oil film thickness (e.g. through interpolation of the readings to the borders of the bearing pads).
10. Is the pressure profile shown in the diagram in Figure 1 (Article 3) correct? Can the pressure value remain constant in the land area between hydrostatic pockets?
11. As stated in the comment to Table 2 in Paper 3, showing a comparison of measured film thickness for very large-scale VLT hydrostatic bearing with the use of different sensors (dial indicators and contactless sensors), the temperature of the oil has an impact on the results. That is the reason to control the supply temperature during such measurements (preferably keep it constant during the whole tests), which is probably difficult or even impossible during tests on real-scale objects. Was the lubricating system of the VLT equipped with temperature sensors at the oil supply line and inside the pads? What was the lubricating oil grade and its dependence on temperature? That data was missing in Paper 3.

15. Conclusion
PhD thesis is an independent scientific work that presents a novel solution to a significant problem in the research area and demonstrates the candidate's ability to conduct independent research.
YES

16. Date and signature	
05/06/2026	

Please note

A. *Evaluate categories 7 to 13 using the following scale: unacceptable, acceptable, satisfactory, good, very good, excellent. The qualification of 'excellent' should only be given for a PhD Thesis in the top 3% of the research in your field of expertise.*
B. *E-mail the completed form to:* Klara.Javorcekova@vut.cz

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Ing. Petr Šperka, Ph.D./ Petr.Sperka@vut.cz

6. Reviewer
Jean Bouyer, PhD, HdR / jean.bouyer@univ-poitiers.fr
Poitiers University

7. Overview of the scope of PhD thesis[1]
Very good
Mr. Jan FOLTYN's thesis addresses an important topic that has received little attention in recent years: the operational safety of large-scale hydrostatic thrust bearings. Through a well-structured approach, he outlines the operating principles applied to large-scale devices before examining the sources of contact issues that may arise in these machines. His experimental approach is scientifically rigorous, and he proposes several avenues for improvement that can limit or even prevent the occurrence of such contact issues, which can prove catastrophic for the operation of these machines. Following a brief introduction that allows the reader to quickly grasp the motivations behind the work by understanding its importance in the development of high-performance products suited to the context, the thesis consists of six main parts: a literature review followed by five chapters and, finally, a general conclusion.

8. Significance of the topic and clarity of problem statement
Very good
Mr. Jan FOLTYN has conducted significant experimental work aimed at improving the reliability of large-scale hydrodynamic thrust bearings. Starting with an analysis of failure modes and their causes, he proposed monitoring and installation techniques that eliminate the risk of contact by using film thickness

[1] Overview of the scope of PhD thesis is a short description of objectives of PhD thesis's research and summary of main findings and scientific achievements.

as a criterion, and was able to test his conclusions on a real-world system. The experimental data obtained and published as part of this thesis offer a rare contribution to the understanding and characterization of film behavior under real operating and failure conditions.

9. Knowledge of existing literature

Very good

The first part of the thesis, devoted to the literature review, is very interesting. The candidate methodically presents previous research, beginning with a general introduction to the hydrostatic principle, which lays the groundwork for understanding the study, with a focus on the associated hydraulics. He then describes the specific characteristics of large-scale thrust bearings—the subject of this study—citing a number of applications for which they are essential, such as telescopes. The final section of this chapter helps readers understand potential reliability issues and their causes, particularly those related to large dimensions—such as misalignment of the thrust pads—as well as the various solutions that can be applied. The analysis reveals that, while the design and optimization of thrust pads have been extensively studied in the past (particularly through hydraulic criteria such as pressure, flow rate, or temperature), there is no reliability study that focuses on one of the major criteria: film thickness. Mr. FOLTYN thus demonstrates the importance of his work in filling this gap with a fairly comprehensive bibliography that allows the reader to understand the work objectively.

10. Choice of methods and technical soundness

Very good

In the second section, devoted to materials and methods, the various areas of scientific investigation are presented. The methods used for these scientific analyses are briefly described, with key details that usefully supplement the descriptions provided in each of the three publications associated with this work. Thus, the need to build a laboratory model to study the various phenomena related to the operation of hydrostatic skids becomes immediately clear. An original optical method for measuring film thickness by tracking markers is presented and explained. More conventional methods, such as the use of contact or non-contact displacement sensors, are also reviewed. Various pad alignment techniques are also presented, ranging from conventional methods—such as the method based on pressure in the cells or the mechanical leveling method— or innovative ones such as the method involving alignment via optical coordinates, which allows for a more uniform distribution of film thickness and greater geometric precision without the use of elastic elements that reduce stiffness and positioning accuracy. The results presented in this section confirm that precise geometric alignment is essential for the safety and operational accuracy of hydrostatic bearings.

11. Quality, originality and significance of the results

Very good

The third section devoted to results and discussion allows the reader to easily grasp the findings presented in the three subsequent publications by posing questions that help structure the discussion on safety, starting with the diagnosis and moving on to the treatment of problems that will ensure compliance with the safety criterion of minimum film thickness. The first publication describes the methods used to monitor film thickness, which serves as a safety criterion, including in particular an optical method that yields excellent results with high precision. The second publication confirms that the alignment of the pads is an essential prerequisite for the safe operation of large-scale bearings. The third publication presents an application to the specific case of a large-scale hydrostatic thrust bearing on an actual telescope. A

comparison of theory and experiment confirms that the analytical calculation method is far from sufficient to ensure the safety of the bearing when a power supply problem occurs.

12. Quality of attached papers
Very good
The experimental data obtained and published as part of this thesis offer a rare contribution to the understanding and characterization of film behaviour under real operating and failure conditions. Several future directions are outlined, demonstrating that this work could be highly useful but that its implementation in real systems will require further effort.

13. Overall assessment, strengths and weaknesses (based upon the above evaluation categories 8–12)
Very good
Mr. Jan FOLTYN has conducted significant experimental work aimed at improving the reliability of large-scale hydrodynamic thrust bearings. Starting with an analysis of failure modes and their causes, he proposed monitoring and installation techniques that eliminate the risk of contact by using film thickness as a criterion, and was able to test his conclusions on a real-world system. Mr. FOLTYN's work is of high quality and demonstrates his strong knowledge of the subject. Through his work, he has successfully addressed the problem posed to him by proposing a relevant analysis based on numerous and complex experiments.

14. Questions and comments
A very nice work, congratulations. I have only few questions on the experiments but I will keep them for the defense.

15. Conclusion
PhD thesis is an independent scientific work that presents a novel solution to a significant problem in the research area and demonstrates the candidate's ability to conduct independent research.
YES

16. Date and signature	
05/06/2026	

Please note

A. *Evaluate categories 7 to 13 using the following scale: unacceptable, acceptable, satisfactory, good, very good, excellent. The qualification of 'excellent' should only be given for a PhD Thesis in the top 3% of the research in your field of expertise.*
B. *E-mail the completed form to:* Klara.Javorcekova@vut.cz

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Faculty of Mechanical Engineering
Brno University of Technology

Principal supervisor's final report on the PhD study

1. PhD candidate
Ing. Jan Foltýn / jan.foltyn@vut.cz
2. Name of PhD programme
D-KPI-P Design and Process Engineering
3. Title of PhD thesis
Operational Safety and Reliability Enhancement of Large-Scale Hydrostatic Bearings

4. Principal supervisor
doc. Ing. Petr Svoboda, Ph.D. / petr.svoboda@vut.cz
5. Co-supervisor
Ing. Petr Šperka, Ph.D. / sperka@fme.vutbr.cz

6. Stays at other institutions (min. 7 days)
Gdańsk University of Technology / Poland / 29.1.2023 / 17.2.2023 Free University of Bozen-Bolzano / Italy / 28.5.2023 / 12.6.2023 European Southern Observatory/ Chile / 2.3.2024 / 28.9.2024 Free University of Bozen-Bolzano / Italy / 11.5.2025 / 17.5.2025 Gdańsk University of Technology / Poland / 1.6.2025 / 14.6.2025

7. Teaching activities
2021 – 2025 3CD - CAD / 364 hr **2021 – 2026** 4KC - Design and CAD / 157 hr **2026 – 2026** 4KC-A - Design and CAD / 26 hr

8. List of main publications
Publications related to the thesis topic: **FOLTÝN, J.**; MACCIONI, L.; MICHALEC, M.; CONCLI, F.; SVOBODA, P. Uncertainty analysis of hydrostatic bearing working conditions with experimental, CFD, and analytical approach. *Forschung im Ingenieurwesen,* 2025, vol. 89, no. 5, p. 1-10. ISSN: 1434-0860. **FOLTÝN, J.**; FLORES, E.; TAPIA, M.; ÁLVAREZ, N.; MICHALEC, M.; SVOBODA, P. Failure prevention procedure of the Very Large Telescope hydrostatic bearing pads based on lubricating film thickness measurement. *JOURNAL OF TRIBOLOGY-TRANSACTIONS OF THE ASME,* 2025, vol. 147, no. 11, p. 1-8.

FOLTÝN, J.; HURNÍK, J.; MICHALEC, M.; SVOBODA, P.; KŘUPKA, I.; HARTL, M. Pad Alignment Methods and Their Impact on Large Hydrostatic Bearing Precision. *Machines,* 2024, vol. 12, no. 8, p. 1-10. ISSN: 2075-1702.

FOLTÝN, J.; MACCIONI, L.; MICHALEC, M.; CONCLI, F.; SVOBODA, P. The Influence of Measurement Uncertainties and Input Parameters on Hydrostatic Bearing Performance: Analytical, Experimental, and Numerical Comparison. In *Latest Advancements in Mechanical Engineering. ISIEA 2024. Lecture Notes in Networks and Systems.* 1. Springer, 2024. p. 12-22. ISBN: 978-3-031-70461-1.

MICHALEC, M.; HURNÍK, J.; **FOLTÝN, J.**; SVOBODA, P. Contactless measurement of hydrostatic bearing lubricating film using optical point tracking method. *PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART J-JOURNAL OF ENGINEERING TRIBOLOGY,* 2023, vol. 237, no. 1, p. 76-84. ISSN: 2041-305X.

MICHALEC, M.; **FOLTÝN, J.**; SVOBODA, P.; KŘUPKA, I.; HARTL, M. Performance and stability comparison of hydrostatic bearing pad geometry optimization approaches. *Forschung im Ingenieurwesen,* 2025, vol. 89, no. 4, p. 1-10. ISSN: 1434-0860.

MICHALEC, M.; DANĚK, L.; **FOLTÝN, J.**; SVOBODA, P.; GACHOT, C.; HARTL, M.; KŘUPKA, I. Comparative Wear and Friction Analysis of Sliding Surface Materials for Hydrostatic Bearing under Oil Supply Failure Conditions. *Advanced engineering materials,* 2025, vol. 27, no. 23, p. 1-10.

MICHALEC, M.; **FOLTÝN, J.**; SVOBODA, P.; KŘUPKA, I.; HARTL, M. Experimental Comparison of Hydrostatic Bearing Pad Geometry Optimization Approaches Under Static Conditions. In *Latest Advancements in Mechanical Engineering. ISIEA 2024. Lecture Notes in Networks and Systems.* Springer, 2024. p. 1-11. ISBN: 978-3-031-70461-1.

MICHALEC, M.; **FOLTÝN, J.**; DRYML, T.; SNOPEK, L.; JAVORSKÝ, D.; ČUPR, M.; SVOBODA, P. Assembly Error Tolerance Estimation for Large-Scale Hydrostatic Bearing Segmented Sliders under Static and Low-Speed Conditions. *Machines,* 2023, vol. 11, no. 11, 14 p. ISSN: 2075-1702.

MICHALEC, M.; POLNICKÝ, V.; **FOLTÝN, J.**; SVOBODA, P.; ŠPERKA, P.; HURNÍK, J. The prediction of large-scale hydrostatic bearing pad misalignment error and its compensation using compliant support. *PRECISION ENGINEERING-JOURNAL OF THE INTERNATIONAL SOCIETIES FOR PRECISION ENGINEERING AND NANOTECHNOLOGY,* 2022, vol. 75, no. May 2022, p. 67-79. ISSN: 0141-6359.

Other publications, applied outputs and patents:

BLAHUT, J.; SVOBODA, P.; MICHALEC, M.; **FOLTÝN, J.**; SCHNEIDER, D.; MENČÍK, P.; ZMEŠKAL, O. *Organic Electrochemical Transistor as a Device for Studying Electrical Properties of Smart Ionic Liquids.* 9th Meeting on Chemistry and Life for Sustainable Future. Brno: Vysoké učení technické v Brně, fakulta chemická, 2024. p. 85-85.

FOLTÝN, J.; MICHALEC, M.; POLNICKÝ, V.; SVOBODA, P.; MARTINEK, J.; ROBENEK, V.; DRHA, V.: *Hydrostatická točna s mechatronickými systémy na bázi adaptivních regulačních smyček.* URL: https://intranet.ustavkonstruovani.cz/file-download/get-project-pdf/468. (Funkční vzorek)

FOLTÝN, J.; POLNICKÝ, V.; MICHALEC, M.; SVOBODA, P.; MARTINEK, J.; ROBENEK, V.: *Hydrostatické ložisko se zpětnovazebním řízením tloušťky mazacího filmu.* URL: https://intranet.ustavkonstruovani.cz/file-download/get-project-pdf/467. (Funkční vzorek)

SVOBODA, P.; POLNICKÝ, V.; MICHALEC, M.; **FOLTÝN, J.**; MARTINEK, J.; ROBENEK, V.; DRHA, V.; Vysoké učení technické v Brně, Brno, Veveří, CZ Bosch Rexroth, spol. s r.o., Brno, Černovice, CZ: *Zařízení k testování provozních stavů hydrostatického uložení.* 37631, Užitný vzor. (2024)

9. Assessment of the supervision process

Very good

The supervision process followed the pre-set rules for PhD study. The process was based meetings and on-demand discussions with supervisor, co-supervisor and colleagues from a Hydrostatic Research Group. The candidate was always well prepared to discuss the issue of the dissertation including reflection of critical comments. The final PhD thesis and research papers were prepared in time and in sufficient quality. The output of the dissertation was three main Jimp research papers (Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology, Journal of tribology-transactions of the ASME, Machines) supplemented by a conference paper from 2024 ISIEA conference (Latest Advancements in Mechanical Engineering. ISIEA 2024. Lecture Notes in Networks and Systems). The teaching activities of candidate were focused especially on tutorials of courses of 3CD - CAD and 4KC - Design and CAD. The candidate attended two international conferences where he presented partial results of his research: 7th World Tribology Congress 2022, Lyon, France and 9th International Tribology Conference 2023, Fukuoka, Japan.

10. Assessment of the candidate's ability to work independently

Very good

The candidate worked independently, based on the discussion with me and my colleagues from the lab and other experts from universities and companies in the field of mechanical engineering. I would like to highlight his cooperation with foreign experts in the field of HSL: Dr. Michal Wodtke (Gdansk University of Technology) and prof. Traian Cicone (Universitae Politehnica Bucharest). The candidate independently designed a methodology of experiments based on the state of the art, performed experiments, and, according to the results analyses, he formulated conclusions. All publications in which the candidate is listed as the main author were prepared independently based on original research findings. The candidate also supervised two bachelor theses, one diploma thesis and significantly participated in the other research projects of our small Hydrostatic Research Group with Bosch Rexroth company. The candidate also participated in work and study abroad internships (Free University of Bozen-Bolzano, Gdańsk University of Technology, European Southern Observatory in Chile).

11. Assessment of the contribution that the research makes to knowledge in the field

Very good

The PhD thesis is composed from three main research papers in the journals with impact factor (Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology, Journal of tribology-transactions of the ASME, Machines) supplemented by the state of the art. However, the candidate is also author and co-author of other publications in the field of tribology in journals with impact factor (see 8. List of main publications). He also participated in applied research outcomes (utility model and two functional samples). The main scientific output of this thesis is the safety of large-scale hydrostatic bearings by addressing critical aspects of lubricating film integrity under realistic operating, assembly, and fault conditions. The developed optical point tracking method demonstrated that non-contact optical techniques can provide film thickness measurements with accuracy and repeatability comparable to proximity sensors, while exhibiting reduced measurement dispersion. Alignment accuracy has a direct and

measurable impact on film uniformity. The results confirm that addressing assembly inaccuracies through precise geometric alignment, rather than compensating them through elastic deformation, is essential for maintaining both safety and precision in rigid, segmented hydrostatic bearings. These findings are missing in current methodologies for the design of HSB. This work helps to find answers to some of the questions regarding the HSB design. I believe that the obtained scientific findings will suite the future development of HSB for better design and safety.

12. Other comments
none

13. Conclusion
PhD thesis is an independent scientific work that presents a novel solution to a significant problem in the research area and demonstrates the candidate's ability to conduct independent research.
YES

14. Date and signature	
30/03/2026	

Please note

A. *Evaluate categories 9 to 11 using the following scale: unacceptable, acceptable, satisfactory, good, very good, excellent.*
B. *In each category 9 to 11 explain reasons for evaluation using between 100–200 words.*
C. *E-mail the completed form to: Klara.Javorcekova@vut.cz*