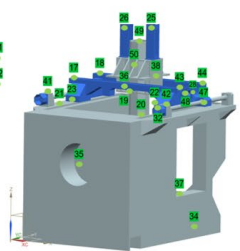
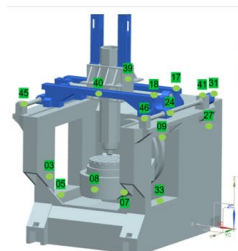
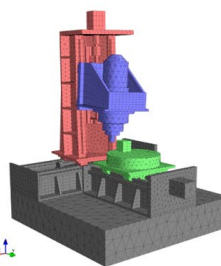
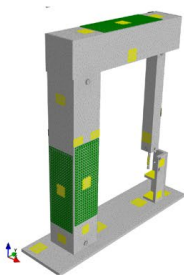
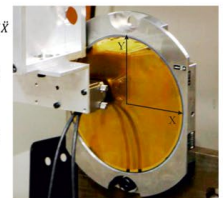
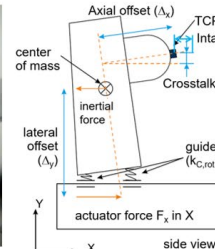
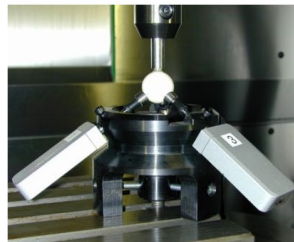
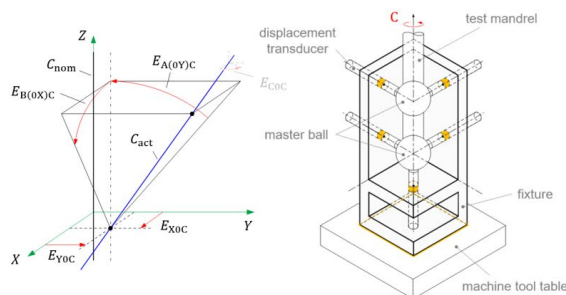




Announcement

Initiated and promoted by the president of the CIRP, Prof. Fengzhou Fang, the CIRP School was launched and organized by a taskforce consisting of Profs A. Balsamo, B. Cheung, F. Fang, R. Gao, N. Michailidis, L. Settineri, and K. Wegener. This is the announcement of the first edition happening in Zurich in Technopark. The local Organizing Committee cordially invites to acquire information and skills in the field of precision assessment and compensation of machine tools. The first CIRP School session takes up the topic of analysing and enhancing the accuracy of machines by model-based error compensation. It

covers the experimental analysis, the respective standards, error models and compensation strategies. The lectures are accompanied by hands-on experiments with insightful models and real machines. Compensation is discussed with respect to kinematic, thermal, dynamic and gravitational errors. The course provides a comprehensive overview of the field within 5 intensive days of lectures and exercises. The CIRP School targets PhD students and postdocs and is open to Research Affiliates and people from industry, Corporate Members in the first place.



1st CIRP School Program

	1. day	2. day	3. day	4. day	5. day
	Basics	Geometry WZM	Dynamics	Thermal	Compensation
8-10	Introduction, basics MT	Error Budgeting	Dynamics, Intalk, Crosstalk	Thermal issues ISO230-3	Compensation strategy
Coffee					
10-12	6-Point theory	Standards, Acceptance	FEM and MOR	Thermal issues theory	Lab: Thermal compensation
Lunch					
13-15	Measuring Technology	Lab : Straightness squareness etc. MT	Lab: Experimental modal analysis	Lab: Thermal behavior	Lab: Thermal compensation
Coffee					
15-17	Lab: Distorted machine	Lab: DBB, R-Test & interpretation	Lab: FEM and MOR	Lab: Thermal behavior	Overview & outlook: Age of Compensation

The aim of the course aligns with the intention of CIRP School is to provide profound knowledge in the field of compensation of manufacturing machines. The increase of machine accuracy as required by the diagram of Taniguchi requires more and more expensive measures when solved mechanically. Compensation is therefore rated to be the relief from this pressure. Today there is therefore no way around compensation for high precision and ultra-precision of MT. It is impossible to discuss compensation without basic knowledge on terminology of precision and measurement technology, which is provided therefore in the beginning. The relevant standards, ISO 230, ISO 10791, ISO 10360 are discussed. Basics of measuring technology, uncertainty estimation as stipulated by GUM (Guide to the expression of Uncertainty in Measurement) and error budgeting are provided. Compensation needs to be supported by models for the machine behavior, which can be exploited in real time. Models of different kinds

like FEM with model order reduction, artificial intelligence and phenomenological representation of physical behaviour are shown. Compensation is only possible for repeatable errors, but can be applied to kinematical, dynamical, thermal and gravitational deviations of MTs. For each of those error compensations a dedicated theory block is included. Teaching real competences is the aim of this course. This is the reason why a large share of the time is dedicated to hands-on practising the provided theory. Besides work on real MTs, teaching setups have been developed to see the effects of the errors and means to remove them. Labs cover axis errors and their measurement on a distorted machine, experimental modal analysis and means for dynamic compensation, and measuring, simulation and compensation of thermal errors. The overview of the course's timetable is given above, yellow fields are hands-on labs.

Important Information

- Registration open until 31st of January 2025
- Cost per participant: 600 €

Included is catering in lunch and coffee breaks as well as a teaming dinner.

Please apply per e-mail to CIRPSchool@inspire.ch

1st CIRP School venue

More than 2000 years ago, Zurich was founded by the Romans as a fortress. Today, Zurich has about 400'000 inhabitants and is the largest city in Switzerland. Zurich is the main town of a canton also named Zurich. With snow covered mountains in sight, the huge water reservoir of the Lake of Zurich, important and numerous historical monuments, and a rich cultural scene, Zurich is one of Europe's most attractive cities. Zurich is not only important for its universities but is also the commercial centre of Switzerland and a platform for international trade. In 1855, the Swiss Federal Institute of Technology (ETH) was founded mainly as a school for engineers, but also as compensation to Zurich for not becoming the capital city of Switzerland. Gottfried Semper designed the imposing main building, and it was built from 1861 to 1864. Since the founding of ETH Zurich, it has been a driving force behind

the Swiss industry, whose innovative products and services are in demand worldwide. The Technopark, founded in 1993, was the first institution of this kind in Switzerland and is acting as interface between science and industry. With around 260 high-tech-companies and a floor space of 47.000 square metres it is an important center for knowledge and technology transfer and the host of inspire AG as strategic partner for technology transfer of ETH Zurich. The Technopark is situated in the former industrial quarter of Zurich, where the old industrial halls, now protected monuments have been transformed into modern business centres and event halls.

