

**ISO/IEC JTC 1/SC 29/WG 11**

**Coding of moving pictures and audio**

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**INTERNATIONAL ORGANISATION FOR STANDARDISATION**

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**ISO/IEC JTC 1/SC 29/WG 11**

**CODING OF MOVING PICTURES AND AUDIO**

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**Data compression for machine tools**

Machine tools play an important role in modern manufacturing. In order to increase efficiency of production, reduce the amount of rejects and enable on-demand maintenance, more and more continuously monitoring sensors are used in machine tools. Although the data of these sensors is used for immediate control of the tools (Figure 1) it is also stored for later analysis in order to optimize the operation of the tools and of the entire production line (Figure 2).

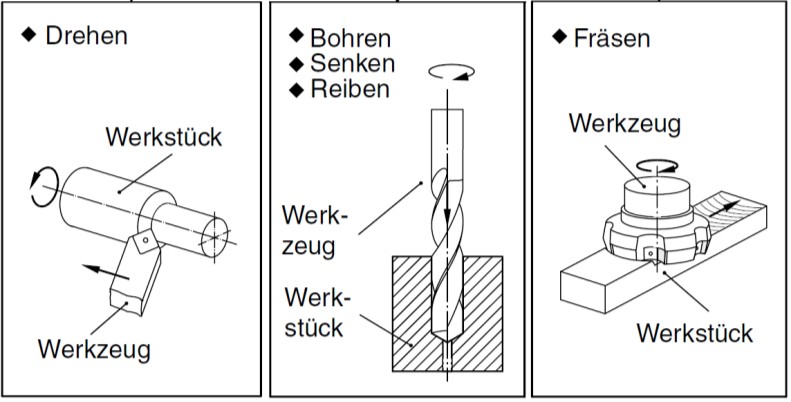


Figure 1 Machining of pieces (turning, drilling, and milling)

Sensors for the control of a machine tool that measure parameters like current for the engine, torque, positions, etc. often are operated at sampling intervals of more than 1ms. However, other sensors like temperature, acceleration, temperature, acoustic emissions work at much higher sampling rates. As an example, sensors for acceleration can have a bandwidth of 36 kHz and an amplitude resolution of 10bits (Figure 3). Understanding the sensor data, the required accuracy and the parameters which eventually are extracted from the sensor data, require domain knowledge and collaboration with machine tool manufactures and operators.

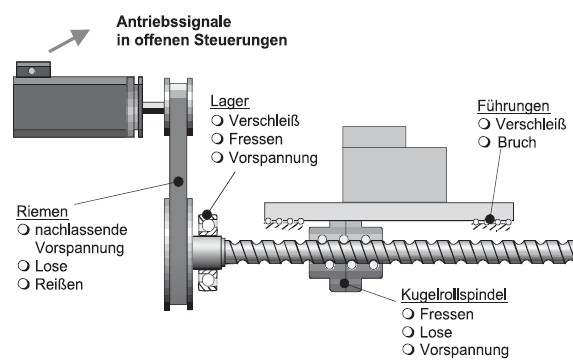


Figure 2 Parts of a machine tool that are effected by wear and tear.

Data acquisition in a machine tool includes collection of signals internal to the machine as well as signals of external sensors like force and acceleration sensors. Often this data is processed using filters, signal fusion, and feature extraction. Since a machine tool easily produces more than one terabyte of data per year, the need for efficient storage and random access arises. While efficient access is a function of the file format, storage will be lossless or lossy depending of the type of data.

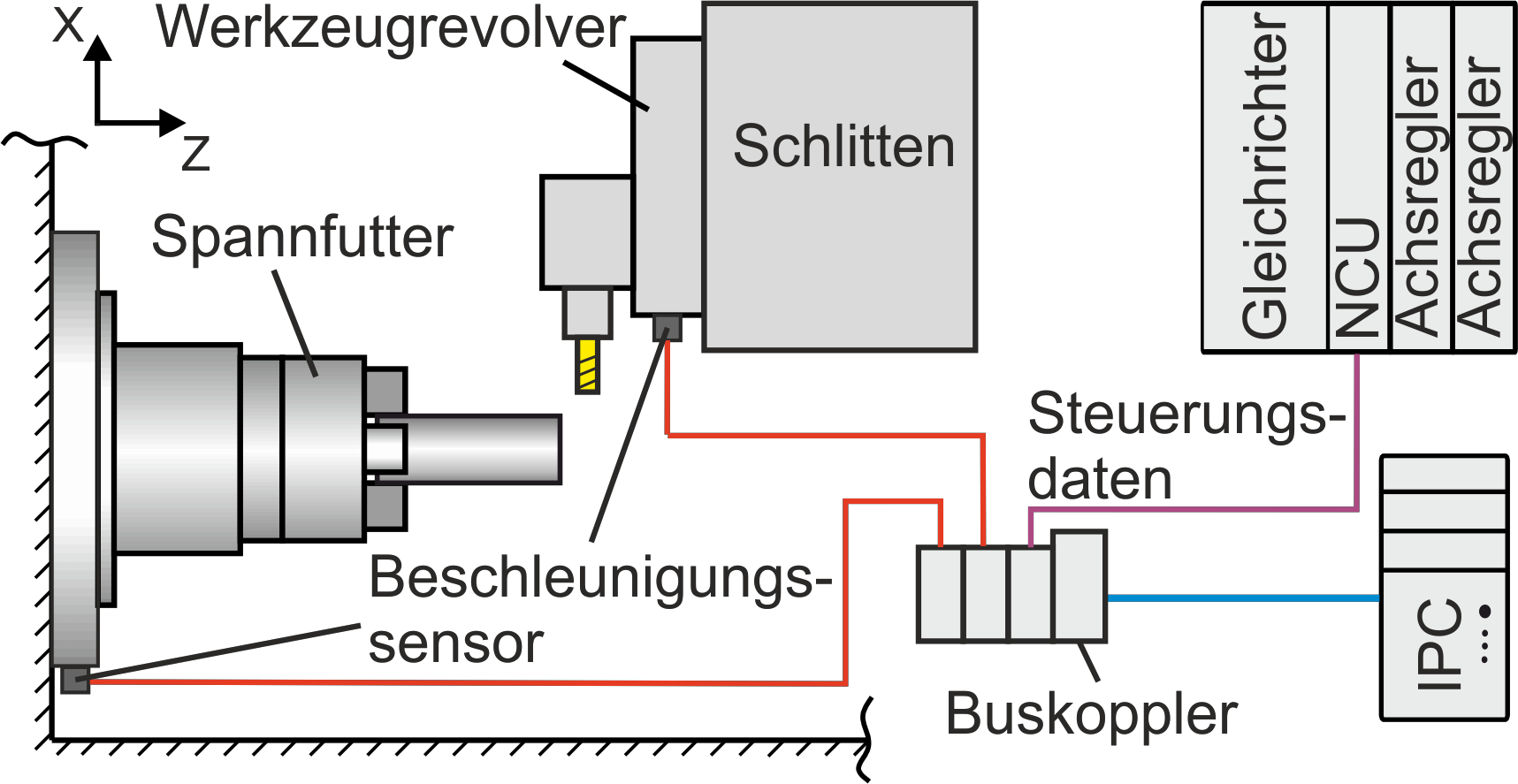


Figure 3 Machine with two acceleration sensors: left at base of chuck, middle at base of tool turret.

An incomplete list of manufacturer specific interfaces to the bus of the machine tool is: DS, Open Core Interface, Focas2, DNC, NIO, FastDDE, CAP, Compilezyklen, DDE. There are also open interfaces like MTConnect and OPC Unified Architecture. OPC Unified Architecture (OPC UA) is a machine to machine communication protocol for industrial automation developed by the OPC Foundation. Applications include communication with industrial equipment and systems for data collection and control.

**Next steps**

In order to understand the need for data compression in the context of machine tools, an understanding of the individual sensor data and the signal processing chain using this data is required. As a first step, MPEG issued the following resolution at its 126th meeting in March 2019:

**The Requirements subgroup requests interested parties to provide relevant data from machine tools such that potential data compression algorithms can be evaluated.**