

## Working group members

### Machine tool manufacturers:



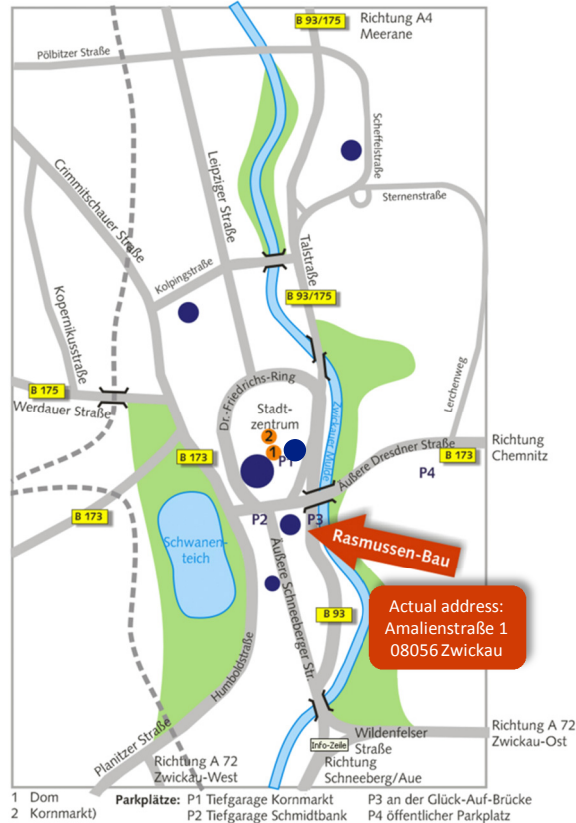
### System technology and suppliers:



### Tool manufacturers:



## In association with



## You need further information? Please contact us:

Research and Technology Association  
at the West Saxon University of  
Applied Sciences Zwickau

Post address:  
Dr.-Friedrichs-Ring 2A  
08056 Zwickau

### Contact person

Prof. Dr. sc. techn. Michael Schneeweiß  
Tel.: 0375 / 536 1720

E-Mail: [michael.schneeweiss@fh-zwickau.de](mailto:michael.schneeweiss@fh-zwickau.de)

Dipl.-Ing. (FH) Thomas Weitzel  
Tel.: 0375 / 536 1663

E-Mail: [thomas.weitzel@fh-zwickau.de](mailto:thomas.weitzel@fh-zwickau.de)



Research and Technology Association at  
the West Saxon University of Applied  
Sciences Zwickau

## Safe machining with cryogenic cooling (CO<sub>2</sub>)

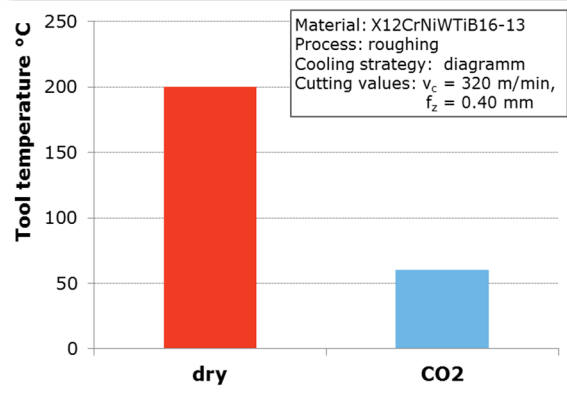


Occupational safety  
&  
Process reliability

Concept development of  
Industry and University

## Advantages of CO<sub>2</sub>-Cooling

- significant cooling of machining process



- significant increase of productivity without reduction of tool life time, especially for materials with bad machinability

Material: X12CrNiWTiB16-13 (1.4962)  
Process: roughing

conventional, dry	cryogenic (CO <sub>2</sub> )
$v_c = 320$ m/min	$v_c = 400$ m/min
$f_z = 0.40$ mm	$f_z = 0.55$ mm

**50 - 70% removal rate** ↑

- simple integration of cryogenic technology into existing machine tools

## Deficits of implementation

**Regulations, safety instructions and technical solutions for safe machining with CO<sub>2</sub>-cooling are currently not available!**

**Transfer into production standards by safety officers complicated due to unknown regulations.**

## Content and objectives of the industry work group

- industrial development of a security concept (CO<sub>2</sub>)
- creation and modification of documents for hazard- and risk analysis
- execution of a hazard analysis (work safety)
- execution of a risk analysis (work and process safety)
- definition of safety measures
- development of a safety master plan
- realisation of a pilot system
- technical and safety recommendations for machining with CO<sub>2</sub> (incl. all necessary documents)

## Results

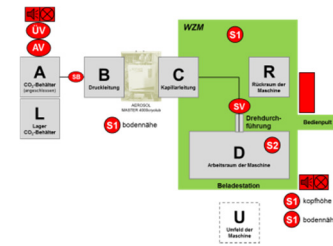
### Hazard- and risk analysis



### Measures

- technological
- organisational
- personal

### General concept



### Realisation of a pilot system



### Documentation

- guidance
- safety instructions
- instruction for employees
- regulations and technical solutions