

# Focus on IFA's work

Issue 04/2021

617.0-IFA:638.22

## Correct evaluation of collaborative robot safety

### Problem

Human beings and robots increasingly work in close proximity to each other. This enables the potential of human beings and technology to be exploited in combination to the full and the ergonomics of the workplace improved, repetitive, strenuous activities in unfavourable postures reduced, and work processes adapted to human beings.

When human beings and robots work together in shared spaces, collisions between them cannot be ruled out. In these cases, it must be ensured that workers do not suffer harm as a result of the collision and are able to continue their work promptly and with no detriment to their health. To assess the risks correctly, manufacturers and operators require technical, normative and informative specifications. Measurements can be used to check whether the hazards have been adequately reduced.

### Activities

Within the EU's COVR project (*being safe around collaborative and versatile robots in shared spaces*, [www.safearoundrobots.com](http://www.safearoundrobots.com)), a toolkit is being developed containing information on the safety of collaborative robots. The toolkit is geared to specific target groups and is available free of charge throughout Europe.



Testing the collision forces of a collaborative robot system

In addition to the basic steps of a risk assessment, current standards and legislation and relevant literature can also be found on this site. Example applications are particularly helpful in making the subject accessible. Predefined test protocols provide guidance on validation of a robot system.

The IFA played a major role in producing the protocols for force and power limitation. For evaluation of the collision forces to which collaborative robots give rise, studies must be conducted with use of a force/pressure measuring instrument. For this purpose, a test bench was developed and put into operation at the IFA in which a potential collision between a human being and a robot is simulated. The test bench permits selective simulation of collisions and instrumented analysis of their effects.

## Results and use

The test bench developed at the IFA was used to apply forces and pressure mechanically to a range of instruments. One instrument was deliberately manipulated to yield information on the effect of certain instrument parameters on the measurement results. Manipulation involved variation in the stiffness of the springs fitted and the masses of the moving parts of the instrument. This enabled various damping and filtering effects and natural oscillations to be observed.

A comparison of instruments from different manufacturers showed deviations of typically between 5% and 10% of the measured maximum force at a given load.

The results were used to improve the force and power limitation protocols in the COVR toolkit and to formulate a unified measurement and instrument specification. They support manufacturers in the development of force/pressure measuring instruments and robot systems, and serve as a basis for the revision of relevant standards governing robots (such as EN ISO 10218, ISO TS 15066).

The protocols for validating collaborative robots can be accessed through the toolkit on the Internet and are thus publicly available throughout Europe. They are to be developed continuously and will take up amendments to standards and the results of new research.

## User group

End users, system integrators and manufacturers of robot applications and instruments, standards bodies

## Further information

- COVR toolkit: [toolkit.safearoundrobots.com](http://toolkit.safearoundrobots.com)
- Project description on the EU website: <https://cordis.europa.eu/project/id/779966>
- IFA Technical Information on collaborative robots, <https://www.dguv.de/ifa>, Webcode e141826
- Project IFA 5151: Analysis of force/pressure measuring instruments for uniform evaluation of force- and power-limited robots, <https://www.dguv.de/ifa>, Webcode ep1199541
- DGUV-Information of the expert committee woodworking and metalworking **FB HM-080**: Collaborative robot systems – Design of systems with „Power and Force Limiting“ function (08/2017)

## Technical enquiries:

IFA, Department "Accident Prevention: Digitalisation – Technologies"

## Literature enquiries:

IFA, Department "Interdisciplinary Services"