



# ERL Industrial Robots Test Bed Certification Form

**b-it-bots@Work**



This project has received funding from the European Union's Horizon 2020 Programme for research, technological development and demonstration under grant agreement n° 688441

**Test bed name:** b-it-bots@Work

**Test bed web page URL:** [mas-group.inf.h-brs.de](http://mas-group.inf.h-brs.de)

**Name of Institution where test bed is hosted:** Bonn-Rhein-Sieg University of Applied Science

**Designation of the lab/department/group where test bed is located:** Autonomous Systems

**Name of responsible person:** Prof. Dr. Gerhard K. Kraetzschmar

**Contacts of responsible person:**

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**Test bed overview pictures**

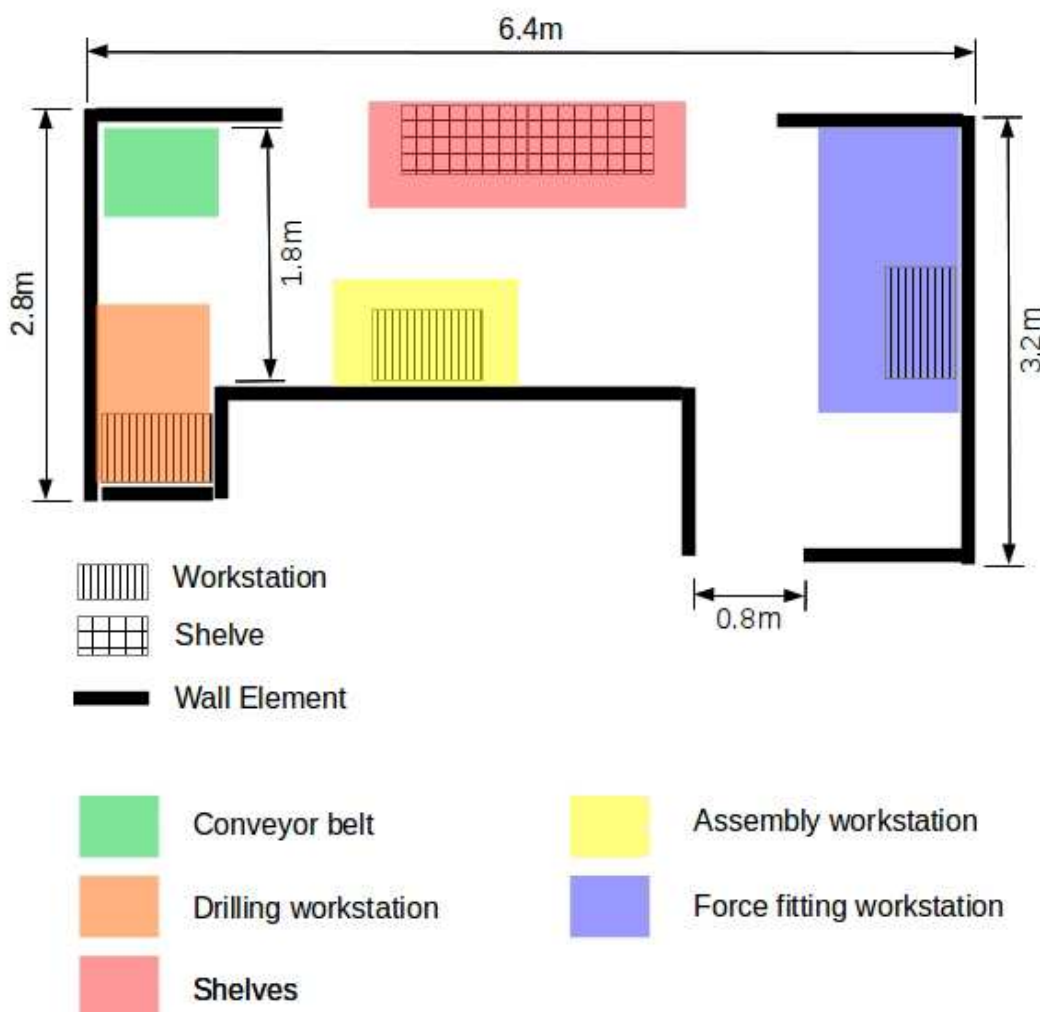


**Short description of the facility**

The testbed main function is for research and development projects in the domain of mobile manipulation tasks intended for flexible manufacturing, modular production processes and smart factory environments. The main robot platform used in such experiments is the KUKA youBot. The testbed is modular and flexible which enabled it to be used in different configuration. The testbed has been used for different events and workshops including the RoboCup@Work and the RoCKIn@Work competition.

The b-it-bots@Work testbed size is 20 m<sup>2</sup> which includes 3 workstations, 4 shelves and walls (total length is 25 meter). The workstations’ surface are made of 18 mm medium density fiber board with the dimension of 80x50x10 cm. The walls are made of 6mm PVC board with the height of 30 cm. The shelves have two level and they are made of the same material as the workstation. All of the environment elements (workstation, shelve, wall) are available commercially. To further simulate the industrial production environment, the testbed is filled with mechanical parts and industrial objects such as bolt, nuts, screw, motor and containers. Additionally, the testbed also has the entire set of objects used in ERL-IR (small aluminium profile, bearing, axis).

**Test bed layout**



b-it-bots@Work Layout, Dimension and Area Designation



### Available networked devices

There are three networked devices available in the test bed:

- Rotating table. The rotating table is a customized system operated by a motor with a single board computer (Raspberry Pi).
- Drilling machine. Similar to the rotating table, the drilling machine is also a customized drill operated by a motor with a single board computer (Raspberry Pi)
- Conveyor belt. The conveyor belt is the type KF-D 44 small conveyor belt from ASP Automationstechnik ING. PRENNER GmbH. The belt size is 100x18 cm with configurable direction.

All the networked devices are connected to central factory hub with communication protocol as specified in the ERL-IR.

### Available Motion Capture system

The motion capture system uses the Flex 3 capture camera with Motive software from OptiTrack. There are 18 unit of Flex 3 available to be used for the related functional benchmark. The capture camera is placed with fixed camera holder which are equally distributed surrounding the testbed for precise data acquisition.

**Table with the current list of ERL-IR TBMs and FBMs, checking those for which the test bed is certified** (i.e., meets both the rulebook specifications and has available the required devices).

Benchmark	Minimum required system / devices	Available in Test Bed
TBM1: Assembly Aid Tray	Test objects, CFH	Yes
TBM2: Plate Drilling	Test objects, CFH, conveyor belt, drilling machine	Yes
TBM3: Fill a Box	Test objects, CFH	Yes
FBM1: Object Perception	Test objects, MoCap	Yes
FBM2: Manipulation	Test objects	Yes
FBM3: Control	MoCap	Yes
FBM4: Navigation	MoCap	Yes

*Table 1: List of the ERL-IR benchmarks with their corresponding required systems*

