TBM 1: Prepare Assembly Aid Tray for Force Fitting

Team name: _____

Referee I: _____, **Referee II:** _____

Date and time: _____

Duration: _____ ☐ **Timeout**

Achievements

	yes	no
The robot correctly identifies the assembly aid tray QR code Comment: _____	☐	☐
The robot correctly identifies the containers QR code Comment: _____	☐	☐
The robot correctly grasps the assembly aid tray: Comment: _____	☐	☐
The robot correctly grasps the first bearing box: Comment: _____	☐	☐
The robot correctly grasps the second bearing box: Comment: _____	☐	☐
The robot inserts the first bearing box into the aid tray: Comment: _____	☐	☐
The robot inserts the second bearing box into the aid tray: Comment: _____	☐	☐
The robot correctly deliver the tray to the force fitting station: Comment: _____	☐	☐
The robot completely processes the first bearing (from identifying to delivering): Comment: _____	☐	☐
The robot completely processes the second bearing (from identifying to delivering): Comment: _____	☐	☐
The robot cooperates with CFH and Networked Devices throughout the task: Comment: _____	☐	☐
Benchmarking data is delivered appropriatly Comment: _____	☐	☐

Penalized Behaviors

The robot bumps into obstacles in the test bed: ☐ ☐ ☐ ☐ ☐

The robot drops an object (the object touches the ground): ☐ ☐ ☐ ☐ ☐

The robot stops working: ☐

Disqualifying Behaviors

The robot damages or destroys the objects requested to manipulate: ☐

The robot damages the test bed: ☐

Comment: _____

WARNING: A disqualifying behavior discards all other achievements in the current task. Use it only when it is really necessary (e.g. cheating).

Team leader signature: _____

Referee signature: _____

TBM 2: Plate Drilling

Team name: _____

Referee I: _____, **Referee II:** _____

Date and time: _____

Duration: _____ ☐ **Timeout**

Notes on TBM 2 to teams/referee/organizer:
The cover plates are organized in the conveyor belt with the order of **unusable-unusable-faulty-faulty** (yes, specifically in this order). The reasoning is because processing unusable cover plate is "simpler" than processing faulty ones. As such the only way to ensure fairness is to have the same ordering of the cover plates.

Achievements

~~The robot collect the cover plate box from the shelves~~
~~The robot correctly grasp the plates~~
~~The robot place the cover plate box to the correct workspace~~
~~The robot correctly sort the plates~~

Set 1 Picking and placing parts

The robot picks up an unusable cover plate from the conveyor belt exit ramp	☐	☐
The robot placse an unusable cover plate inside the trash box container	☐	☐
The robot collects the achievements for **set 1**	☐	☐

Comment: _____

Set 2 Preparing the drilling process

~~The robot performs the drilling process for faulty plates~~

The robot picks up a faulty cover plate from the conveyor belt exit ramp	☐	☐
The robot delivers a faulty cover plate to the drilling machine workstation	☐	☐
The robot inserted a faulty cover plate into the drilling machine	☐	☐
The robot collects the achievements for **set 2**	☐	☐

Comment: _____

Set 3 Finishing the drilling process

The robot operates the drilling machine to fix a faulty cover plate	☐	☐
The robot picks up a perfect cover plate in the drilling machine	☐	☐
The robot places a perfect cover plate inside the cover plate box	☐	☐
The robot collects the achievements for **set 3**	☐	☐

Comment: _____

The robot cooperates with CFH and Networked Devices throughout the task	☐

Comment: _____

Benchmarking data is delivered appropriately	☐

Comment: _____

Penalized Behaviors

The robot bumps into obstacles in the test bed: ☐ ☐ ☐ ☐ ☐

The robot drops an object (the object touches the ground): ☐ ☐ ☐ ☐ ☐

The robot stops working: ☐

Disqualifying Behaviors

The robot damages or destroys the objects requested to manipulate: ☐

The robot damages the test bed: ☐

Comment: _____

WARNING: A disqualifying behavior discards all other achievements in the current task. Use it only when it is really necessary (e.g. cheating).

Team leader signature: _____

Referee signature: _____

TBM 3: Fill a Box with Parts for Manual Assembly

Team name: _____

Referee I: _____, **Referee II:** _____

Date and time: _____

Duration: _____ ☐ **Timeout**

Achievements

	part 1	part 2	part 3	part 4	part 5	container
The robot picks up a required object or container from its storage location:	☐	☐	☐	☐	☐	☐
Comment: _____						
The robot places required objects into the container:	☐	☐	☐	☐	☐	
Comment: _____						
The robot delivers a correctly filled container at the designated workstation:						☐
Comment: _____						

	yes	no
The robot cooperates with CFH and Networked Devices throughout the task:	☐	☐
Comment: _____		
Benchmarking data is delivered appropriately:	☐	☐
Comment: _____		

Penalized Behaviors

The robot bumps into obstacles in the test bed: ☐ ☐ ☐ ☐ ☐

The robot drops an object (the object touches the ground): ☐ ☐ ☐ ☐ ☐

The robot stops working: ☐

Disqualifying Behaviors

The robot damages or destroys the objects requested to manipulate: ☐

The robot damages the test bed: ☐

Comment: _____

WARNING: A disqualifying behavior discards all other achievements in the current task. Use it only when it is really necessary (e.g. cheating).

Team leader signature: _____

Referee signature: _____

FBM 1: Object Perception

Team name: _____

Referee I: _____, **Referee II:** _____

Date and time: _____

Notes:

- The duration is based on the referee stop watch.
- Timeout is checked when the robot cannot detect the object within the specified test duration.
- GT is the ground truth which is the information provided by the referee box.
- Object identifier:
  - EM-01(1)=aid tray, EM-02(2)=cover plate box
  - AX-01(4)=bearing box type A, AX-16(3)=bearing box type B
  - AX-02(6)=bearing, AX-09(7)=motor, AX-03(5)=axis

Run 1 Duration: _____ ☐ Timeout

Object Detection

	Container		Bearing Box		Transmission		
GT	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)
Robot	Container		Bearing box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)

Pose

GT	x	y	θ	Robot	x	y	θ

Comments: _____

Run 2 Duration: _____ ☐ Timeout

Object Detection

	Container		Bearing Box		Transmission		
GT	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)
Robot	Container		Bearing box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)

Pose

GT	x	y	θ	Robot	x	y	θ

Comments: _____

Run 3 Duration: _____ ☐ Timeout

Object Detection

GT	Container		Bearing Box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)
Robot	Container		Bearing box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)

Pose

GT	x	y	θ	Robot	x	y	θ

Comments: _____

_____

Run 4 Duration: _____ ☐ Timeout

Object Detection

GT	Container		Bearing Box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)
Robot	Container		Bearing box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)

Pose

GT	x	y	θ	Robot	x	y	θ

Comments: _____

_____

Run 5 Duration: _____ ☐ Timeout

Object Detection

GT	Container		Bearing Box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)
Robot	Container		Bearing box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)

Pose

GT	x	y	θ	Robot	x	y	θ

Comments: _____

_____

Run 6 Duration: _____ ☐ Timeout

Object Detection

GT	Container		Bearing Box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)
Robot	Container		Bearing box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)

Pose

GT	x	y	θ	Robot	x	y	θ

Comments: _____

_____

Run 7 Duration: _____ ☐ Timeout

Object Detection

GT	Container		Bearing Box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)
Robot	Container		Bearing box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)

Pose

GT	x	y	θ	Robot	x	y	θ

Comments: _____

_____

Run 8 Duration: _____ ☐ Timeout

Object Detection

GT	Container		Bearing Box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)
Robot	Container		Bearing box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)

Pose

GT	x	y	θ	Robot	x	y	θ

Comments: _____

_____

Run 9 Duration: _____ ☐ Timeout

Object Detection

GT	Container		Bearing Box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)
Robot	Container		Bearing box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)

Pose

GT	x	y	θ	Robot	x	y	θ

Comments: _____

_____

Run 10 Duration: _____ ☐ Timeout

Object Detection

GT	Container		Bearing Box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)
Robot	Container		Bearing box		Transmission		
	EM-01(1)	EM-02(2)	AX-01(4)	AX-16(3)	AX-02(6)	AX-09(7)	AX-03(5)

Pose

GT	x	y	θ	Robot	x	y	θ

Comments: _____

_____

Benchmarking data delivered appropriately: ☐ yes / ☐ no

Team leader signature: _____

Referee signature: _____

FBM 2: Manipulation

Team name: _____

Referee I: _____, **Referee II:** _____

Date and time: _____

Notes:

- The duration for each run is based on the referee stop watch.
- Timeout is checked when the robot cannot grasp the object within the specified test duration.
- The sequence of objects which are used in each run is defined by the team.
- Objects: EM-01=aid tray orange, EM-02=cardbox black, AX-01=bearing box type A, AX-16=bearing box type B, AX-02=bearing, AX-03=axis, AX-09=motor

Run 1 Duration: _____ ☐ Timeout

Object id: _____, Orientation: _____, ☐ Success, ☐ Dropped, ☐ Missed

Comments: _____

_____

Run 2 Duration: _____ ☐ Timeout

Object id: _____, Orientation: _____, ☐ Success, ☐ Dropped, ☐ Missed

Comments: _____

_____

Run 3 Duration: _____ ☐ Timeout

Object id: _____, Orientation: _____, ☐ Success, ☐ Dropped, ☐ Missed

Comments: _____

_____

Run 4 Duration: _____ ☐ Timeout

Object id: _____, Orientation: _____, ☐ Success, ☐ Dropped, ☐ Missed

Comments: _____

_____

Run 5 Duration: _____ ☐ Timeout

Object id: _____, Orientation: _____, ☐ Success, ☐ Dropped, ☐ Missed

Comments: _____

_____

Run 6 Duration: _____ ☐ Timeout

Object id: _____, Orientation: _____, ☐ Success, ☐ Dropped, ☐ Missed

Comments: _____

Run 7 Duration: _____ ☐ Timeout

Object id: _____, Orientation: _____, ☐ Success, ☐ Dropped, ☐ Missed

Comments: _____

Benchmarking data delivered appropriately: ☐ yes / ☐ no

Team leader signature: _____

Referee signature: _____

FBM 3: Control

Team name: _____

Referee I: _____, **Referee II:** _____

Date and time: _____

Notes:

- The duration for each run is based on the referee stop watch.
- Timeout is checked when the robot cannot execute the path within the specified test duration.
- The specific path for this benchmark is defined before the competition.

Run 1 Duration: _____ ☐ Timeout, Finished complete path: ☐ Yes ☐ No

area deviation: _____, constant deviation: _____,

Comments: _____

Run 2 Duration: _____ ☐ Timeout, Finished complete path: ☐ Yes ☐ No

area deviation: _____, constant deviation: _____,

Comments: _____

Run 3 Duration: _____ ☐ Timeout, Finished complete path: ☐ Yes ☐ No

area deviation: _____, constant deviation: _____,

Comments: _____

Run 4 Duration: _____ ☐ Timeout, Finished complete path: ☐ Yes ☐ No

area deviation: _____, constant deviation: _____,

Comments: _____

Run 5 Duration: _____ ☐ Timeout, Finished complete path: ☐ Yes ☐ No

area deviation: _____, constant deviation: _____,

Comments: _____

Benchmarking data delivered appropriately: ☐ yes / ☐ no

Team leader signature: _____

Referee signature: _____