9th International
Abilympics
Bordeaux 2016

Vocational Skills Contest

V40 Mechatronic (Group of 2)

1. Task Assignment

Design

The Test Project will be designed from industrial components in a specification.
Optimization can be part of the project

Assembly and connection

The purpose of the Test Project is to build a project using industrial components according to instructions in the documentation, or according to design criteria provided in the test.
The assembly time of known stations will not be assessed. Assessing the quality of work will consist of industry standard supported in the "Professional Practice".
If there is a robot in the Competition, the model will be disclosed once it is confirmed.
The electrical connections must be in accordance with the instructions and documentation to ensure proper operation of the machine. All necessary electrical schematics will be provided.

Switching

Machines will operate according to instructions, documentation and "Professional Practice". No faulty component will be used.
Any robot cell used during the Competition should be adequately used to ensure safe operation without limiting the functionality of the robot in anyway.

Troubleshooting

There may be one or more sections requiring multiple problem troubleshooting. These failures are drawn from a list of outages prepared in advance, preferably a selection drawn at random by computer immediately before testing. These sections of the Test Project will also include the introduction of the principles of Total Productive Maintenance (called TPM) so that the operation of the machine is self-diagnosed. It may also consist of repairing or replacement of defective parts.

Information Technology

Some tasks will test the ability of Competitors to program systems. The documentation (the code) produced by Competitors and their presentation can be assessed.

Optimisation

Improved processes to increase operational efficiency of a system can be evaluated.

Contestants will have to perform 4 different tasks:

- Task 1: Assembly, programming and commissioning of a Transfer line module with application ‘module 1’
- Task 2: Maintenance and troubleshooting of a Transfer line module with application ‘module 1’
- Task 3: Assembly, programming and commissioning of a Transfer line module with application ‘module 2’
- Task 4: Maintenance and troubleshooting of a Transfer line module with application ‘module 2’

2. Allocated time: 10h00 maximum divided in 2 modules of 5 hours (2 days)

3. Requirements

Theoretical knowledge is required but not tested explicitly.

Mechanical Design

Competitors must be able to understand designing and assembling mechanical systems. This must include knowledge of pneumatic and/or hydraulic systems, their standards and their documentation.

Circuit Design

Competitors must be able to understand designing and assembling electrical circuits in machine/controller systems.

Industrial Controllers

Competitors must have an understanding of the configuration of the industrial controller and how a software program relates to a machine action. They must be able to configure all aspects of their PLC as required and the associated control circuitry for correct operation.

Software Programming

Competitors must be able to write programs to control a machine, and visualize the process and operation using software.

Analytical Techniques

Competitors must be able to demonstrate mastery of problem-solving techniques to ensure correct and safe machine operation.

Contestants must use the provided materials. They can use their own tools if they want. These tools are checked during the briefing at day one. It is not allowed to take any tools out of the competition area or to bring new tools during the competition.
Safety rules must be respected.
Refer to Host Country Health & Safety documentation for Host Country regulations.

- In the case of using electrical screwdrivers with battery drive to be used with a drill bit, no safety glasses are necessary.
- A first-aid kit must be available throughout the Competition.
- The use of knives and cutters is prohibited due to the risk of injury.
- Experts will use the appropriate personal safety equipment when inspecting, checking or working with a competitor's project.
- Candidates must wear closed shoes.

Each team is allowed to take during Task 1 and Task3 a recovery break of max. 20 minutes. The time will be stopped during the break. When a team has finished a task, they have to inform an expert to stop and note the time. After finishing no further changes are allowed, the team has to move out of its competition area.
In all tasks it will be checked whether the professional practice needs are fulfilled. Before the competition during the briefing a list of professional practice requirements will be handed out and explained.
After each task an evaluation of the task takes place.

4. Procedure

Day -1 (March 24th): On the day before the competition, contestants will be welcomed by the members of the jury. A briefing about the organization of the contest and the safety rules will be arranged.

Day 1 (March 25th):

- Task 1: Assembly, programming and commissioning of a Transfer line module with application ‘module 1’ (time 3h max.)
- Task 2: Maintenance and troubleshooting of a Transfer line module with application ‘module 1’ (time 2h max)

Day 2 (March 26th):

- Task 3: Assembly, programming and commissioning of a Transfer line module with application ‘module 2’ (time 3h max.)
- Task 4: Maintenance and troubleshooting of a Transfer line module with application ‘module 2’ (time 2h max)

5. List of the provided equipment

Non-exhaustive list.

N°	Equipment	Photo	Qty per team/contestant	Notes
01	MPS Transfer system		1	
02	Application module 1		1	
03	Application module 2		1	
04	Set of workpieces		1	
05	Simulation box, digital		1	
06	PLC Edu. Trainer		1	Pre-programmed, no programming necessary
07	Trolley		1	

6. List of tools to be brought for each contestant

N°	Tool	Photo	Qty per team/contestant	Notes
01	Recommended tool set: – 200 mm steel rule – Open-jawed spanners size 7, 8, 9, 10 – Adjustable spanner – Side cutter – Insulation-stripping pliers – Wire end sleeve pliers – Screwdriver set, hex, 1.5 – 6 – Screwdriver, hex, 0.9; 1.3 – Screwdriver, cross-head, PZ02 – short – Screwdriver, flat, 2.5 x 75; 4.0 x 100 – Screwdriver, flat, 1.2 – 1.6 – Tubing cutter – Fibre-optic cable cutter – 100 x cable binders 2.5 x 100 – 100 x wire end sleeves 0.25 – 100 x wire end sleeves 0.75		1	The recommended tool set is supplied by Festo, further tools are allowed and can be brought and used from the contestants. (* see also tool comments)

02	Standard multi-meter for basic measurements in electrical engineering. Automatic and manual range selection, 4-digit illuminated LCD display for measuring voltage, current, resistance, continuity, frequency, capacitance, diode test,		1	The recommended multi-meter is supplied by Festo, further multi-meters are allowed and can be brought and used by the contestants.

* Tool comments:

- Any commercially available tool may be used. This is subject to approval by the Safety Officer, but must not take away from commonly used "tools of the trade" as used by the competitors in their every day job.
- Competitors must supply their own tools.
- Competitors must bring all software required to program their PLC.
- It is the responsibility of the team's expert to check software compatibility with the PCs to be supplied by the host country.
- The team is responsible for the provision of connectors, adaptors, plugs, and interfaces suitable for the host country and for the PLC to any station.

7. List of facilities installed at the contest site

General installations:

Description	Quantity	Manufacturer & type	Supplier	comments
Storage and preparation area	1		Hosting country	
Briefing area	1		Hosting country	
Workshop installation	1		Hosting country	

Storage and preparation area

Description	Quantity	Manufacturer & type	Supplier	comments
Compressed air outlet with shut off valve and 1/4" female quick connect	1		Hosting country	
Door with lock	1		Hosting country	
Chair	3		Hosting country	
Working table (1400*600)	2		Hosting country	
Electrical Circuit (120V/230V, single phase/50 Hz, 15amp, with 2 duplex socket	2		Hosting country	

Briefing area:

Description	Quantity	Manufacturer & type	Supplier	comments
Working table (1800x900)	1		Hosting country	
Chair	2 per team		Hosting country	
Projector and screen	2		Hosting country	
Whiteboard	1		Hosting country	
Flipchart	1		Hosting country	
Electrical Circuit (120V/230V,	1		Hosting country	

single phase/50 Hz, 15amp, with 2 duplex socket				
Clock	1		Hosting country	
Colour laser printer A4	1		Hosting country	
First aid kit	1		Hosting country	
Fire extinguisher	1		Hosting country	

Workshop installations:

Description	Quantity	Manufacturer & type	Supplier	comments
Stopwatch with lap times	1 per team		Hosting country	
MPS Workstations (700x700x900) fully equipped	1 per team	Festo Didactic	Festo Didactic	
Working table (1800x900)	1 per team		Hosting country	
Chair	2 per team		Hosting country	
Compressed air outlet with shut off valve and 1/4" female quick connect	1 per team		Hosting country	
Working table (1400*600)	1 per team		Hosting country	
Workplace 3m x5m	1 per team		Hosting country	
Power extension cable 4 way	1 per team		Hosting country	
Electrical	1 per team		Hosting	

Circuit (120V/230V, single phase/50 Hz, 15amp, with 2 duplex socket			country	

8. Evaluation Criteria

This section defines the assessment criteria and the number of marks (subjective and objective) awarded. The total number of marks for all assessment criteria must be 100.

Section	Criterion	Marks		
		Subjective	Objective	Total
A	Function		70	70
B	Professional practice		10	10
C	Time		20	20
Total			100	100

Section	Criterion	Marks		
		Subjective	Objective	Total
A1	Items for operation based on PLC		30	30
A2	Items for operation based on the simulation box		20	20
A3	Mechanical assembly		10	10
A4	Electric connection		10	10
Total			100	100

This mark distribution is given as an example only and doesn't match the evaluation sheets provided by Festo for each task.
The following criterions have to be added for the evaluation:

- Mechanical assembling (given mechanical dimension on drawing must be correct on the MPS station of the competitor after the assembling task)
- The wiring of I/O must follow the given I/O table