



CONTEST DESCRIPTION / DESCRIPTION DE CONCOURS

# MECATRONICS MÉCATRONIQUE

POST-SECONDARY /  
NIVEAU POSTSECONDAIRE

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## 1 THE ESSENTIAL SKILLS FOR CAREERS IN THE SKILLED TRADES AND TECHNOLOGY

SCC is currently working with Employment and Social Development Canada (ESDC) in order to bring awareness to the importance of Essential Skills that are absolutely crucial for success in the workforce. Part of this ongoing initiative requires the integration and identification of Essential Skills in contest descriptions, projects, and project documents. The next phase and very important aspect of our Essential Skills (ES) initiative is to provide an ES report card to each competitor at the Skills Canada National Competition. The purpose of the ES report card is to inform the competitor about their current level of essential skills based on their competition scores. With this knowledge, the competitor will be made aware which essential skill may require improvement. Full implementation is expected in the 2017 Skills Canada National Competition.

The following 9 skills have been identified and validated as key essential skills for the workplace in the legend below:

*<sup>1</sup>Numeracy, <sup>2</sup>Oral Communication, <sup>3</sup>Working with Others, <sup>4</sup>Continuous Learning, <sup>5</sup>Reading Text, <sup>6</sup>Writing, <sup>7</sup>Thinking, <sup>8</sup>Document Use, <sup>9</sup>Digital*

These essential skills have been identified within section 2.3 and/or 3.2 of your Contest Description. The top three Essential Skills for your area of competition have been identified on your Project and all other supporting project documents.

## 2 CONTEST INTRODUCTION

### 2.1 Description of the associated work role(s) or occupation(s).

<http://skillscompetencescanada.com/en/careers/manufacturingengineering/mechatronics/>

### 2.2 Purpose of the Challenge.

- The goal is to provide competitors with the opportunity to demonstrate certain skills and knowledge that every technician must have in the field of Industrial Automation and Control Technology.
- Mechatronics skills will be judged on a practical demonstration of abilities to complete the mechanical, electrical and pneumatic assembly of a manufacturing production system as well as creating and commissioning the controls based on a documented working sequence using Programmable Logic Controllers (PLC). Team of two participants.
- Open to Mechatronics, Industrial Automation & Robotics, and related Technologies sectors.

**2.3** Duration of contest.  
12 hours (6 hours a day for 2 days)

**2.4** Skills and Knowledge to be tested.

- General Electrical and Mechanical knowledge
- Interpret and use electronic, electrical or mechanical schematics.<sup>8</sup>
- Render operational and modify sequential mechanisms that have a PLC.
- Commissioning electrical, pneumatic and mechanical systems.
- Programming PLCs<sup>9</sup>
- Skilful troubleshooting techniques<sup>7</sup>
- Speed of execution
- Wiring skills
- System Optimization (increasing the system performance)
- Professional workmanship
- Professional practices
- Know-how to look for information efficiently in industrial equipment documentation<sup>8</sup>

*Essential Skills – <sup>7</sup>Thinking(Problem Solving) <sup>8</sup>Document Use <sup>9</sup>Digital*

### 3 CONTEST DESCRIPTION

**3.1** List of documents produced and timeline for when competitors have access to the documents.

DOCUMENT	DATE OF DISTRIBUTION VIA WEBSITE
Professional Practice	January, 2017
Test Project template	March, 2017
PLC Wiring	October, 2016

**3.2** Tasks that may be performed during the contest

- Unpacking and preparation of components including cutting cables to length, stripping of insulation and crimping of ferrules<sup>1</sup>
- Install mechanical modules with proper alignment<sup>1</sup>
- Wire solenoid valves and sensors according to schematics<sup>8</sup>
- Pneumatic tubing for cylinders, valves terminals and service unit according to schematics<sup>8</sup>
- Write PLC programs according to instructions<sup>5</sup>
- Conduct maintenance task by replacing various components in the system
- Debug and troubleshoot the assembly to operate according to instructions
- Optimize the system performance

*Essential Skills – <sup>1</sup>Numeracy, <sup>5</sup>Reading Text, <sup>8</sup>Document Use*

## 4 EQUIPMENT, MATERIAL, CLOTHING

### 4.1 Equipment and material provided by Skills/Compétences Canada

- Manufacturing Production Stations (MPS®): A model of a real production system from Festo Didactic.
- Pneumatic Tubing
- Wires
- Ferrules
- Tie-wraps
- Compressed Air
- A 120 VAC power bar will be provided to each team complete with electrical power (15 amps).
- Tubing cutter
- Work pieces (Cylinder and Meter Bodies)

### 4.2 Equipment and material provided by the competitor

- 2x PLCs with at least 24 Inputs and 24 Outputs **each** and a computer with PLC programming software and other necessary cables and tools. One PLC will be used for each or multiple MPS Workstations
  - A power supply (120 VAC to 24VDC) rated at least 4.5 amps should be used to power **each** PLC and the MPS station.
  - All PLC inputs shall be sinking inputs. The sensors and buttons shall switch (source) +24VDC to each PLC input. Sensors are PNP type and shall source the current and the PLC input module will sink the current.
  - All PLC outputs shall be sourcing outputs. The output shall switch (source) +24VDC to turn an individual load on. The load shall sink the current to 0VDC (Ground).
  - The PLC outputs should be at least 400 mA. All I/Os are 24VDC.
  - Each team will have their own table. Mounting the PLC on a back-plate is recommended.
  - See PLC Wiring document posted on the Skills/Compétences Canada web site for more information
- 3x SysLink cable connectors (IEEE 488) will be connected to **each** of the PLCs (6 cables in total)
  - Each cable will connect 8 Inputs and 8 Outputs to the PLC: One cable will connect from the PLC to the MPS station containing sensors and solenoid valves. The other cable will connect from the PLC to the control panel, which contains operator devices such as pushbuttons, switches and pilot lights.
  - Please see the last page of this document for the wiring details.
  - There are no restrictions on the wiring to the PLC but it is recommended to have the same wiring instruction that comes with the SysLink cables. The only wiring that is checked in the competition is wiring connected to the MPS station terminal.
  - These cables should be connected to the PLC before the competition.

- Multimeter (VOM)
- Set of Screwdrivers
  - Recommended
  - Pozi Drive PZ0, PZ1
    - Philips #0, #1
    - Flat 1.2, 1.6, 2.5, 6 mm
- Set of Hex metric keys.
  - Recommended Sizes
    - 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10 mm
- Set of Open ended metric wrenches
  - Recommended sizes
    - 7, 8, 9, 10, 19 mm
- Metric Socket wrenches and/or nut drivers
- Adjustable wrench
- Wire strippers
  - .25mm<sup>2</sup> to 1.5mm<sup>2</sup> (AGW 24 – 16)
- Side and flush cutters
- Measuring tape or ruler (metric)
- Ferrule crimping tool

**Note:** No Internet connection will be allowed on any computer and NO PDA or Cell phone can be used during the competition.

Computer and PLC to be free of all preprogramed PLC files. Only PLC software, and Windows will be allowed on computer. Computer will be inspected by Judges prior to usage

#### 4.3 Required clothing (provided by competitor)

- Competitors are to be dressed in a clean and appropriate manner. The Mechatronics contest recommends that you wear long pants, belt, socks, and must wear close toe shoes
- T-shirts and/or lab coats may be provided to competitors.
- Jewellery such as rings, bracelets and necklaces or any deemed unsafe by competition judges shall be removed
- Proper shop attire is to be worn (no loose straps, baggy sleeves etc.). Or any item deemed unsafe by competition judges

## 5 SAFETY REQUIREMENTS

### 5.1 Safety workshop

Upon arrival at the Skill area, Competitors will participate in a Safety workshop and they will be expected to work and maintain a safe working area during the competition. Any Competitor breaking any health, safety and environment rules, may be required to undertake a second safety workshop, this will not affect the Competitor's competition time.

### 5.2 List of required personal protective equipment (PPE) provided by Skills/Compétences Canada

- Safety glasses will be mandatory during competition – McCordick

At the discretion of the judges and technical chair any competitor can be removed from the competition site for not having the proper safety equipment and/or not acting in a safe manner

Competition judges will have final authority on matters of safety

## 6 ASSESSMENT

### 6.1 Point breakdown

POINT BREAKDOWN	/100
Professional Practice	15
Time Evaluation	20
I/O Check and Allocation	20
Expected functionality	45

## 7 ADDITIONAL INFORMATION

### 7.1 Consecutive translation

If consecutive translation is required on site, the Skills/Compétences Canada Provincial/Territorial offices must advise Skills/Compétences Canada National Secretariat a minimum of 1 month prior to the competition or this service might not be guaranteed.

### 7.2 Tie (No ties are allowed)

In the event of a tie, the team with the highest score in the expected functionality criteria over the 2 days will be declared the winner. If a second tie occurs, the team with the highest score in the Time Evaluation criteria will be declared the winner.

### 7.3 Test Project change at the Competition

Where the Test Project has been circulated to Competitors in advance, NTC shall change a maximum of 30% of the work content. Please refer to the Competition Rules

### 7.4 Competition Rules

Please refer to the competition rules of the Skills Canada National Competition.

## 8 NATIONAL TECHNICAL COMMITTEE MEMBERS

Member Organization	Name	Email address
Ontario - Chair	Greg James	Greg.james@festo.com
Alberta	Neil Wenger	
Newfoundland and Labrador	Rajendra Jani	
Nova Scotia	Kelly Tompkins	
Québec	Steve Collard	