



Skill India
कौशल भारत - कुशल भारत



Sample Test Project

Regional Skill Competition – Level 3

Skill 19 – Industrial Control

Category: Manufacturing and Engineering Technology

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SAMPLE

Section - A

A. Preface

Skill Explained:

Industrial control describes a variety of Control Systems along with their associated Instrumentation. Industrial controls monitor, control, safeguard and operate Industrial processes like Manufacture of Automobiles, Machines, Chemical, Refineries, Petroleum Products, Pharmaceutical, Steel, Power plants, Water, Waste water etc. to name a few.

Typically Industrial control deals with:

Continuous control, in which the variables and parameters are continuous and analog.

Discrete control, in which the variables and parameters are discrete, mostly binary discrete.

In practice most operations in the process and discrete manufacturing industries tend to include both continuous as well as discrete variables and parameters. Therefore many industrial controllers are designed with the capability to receive, operate on, and transmit both types of signals and data. Industrial Control contains elements of both electrical installations and automation installations, with greater emphasis on automation installation. An Industrial control practitioner must have an overall knowledge of preparing and interpreting design & engineering documents and drawings and technical skills for installation, testing, commissioning, maintenance and troubleshooting of the industrial controls of the associated plant/project.

The industrial control practitioner requires a wide range of technical skills, such as installing conduits, cables, instruments, I/O devices and Programmable Logic Controllers. The industrial control practitioner also designs electrical circuits, programs Programmable Logic Controllers, parameterizes bus systems and configures Human Machine Interfaces. The working environment is likely to be one that is potentially very dangerous and hazardous.

The industrial control practitioner proactively promotes best practices in health and safety and rigorously adheres to health and safety legislation.

Trouble-shooting is an important skill of the industrial control practitioner and includes identifying problems during equipment installations in a new plant or remedying problems within an existing plant.

Eligibility Criteria (for IndiaSkills 2018 and WorldSkills 2019):

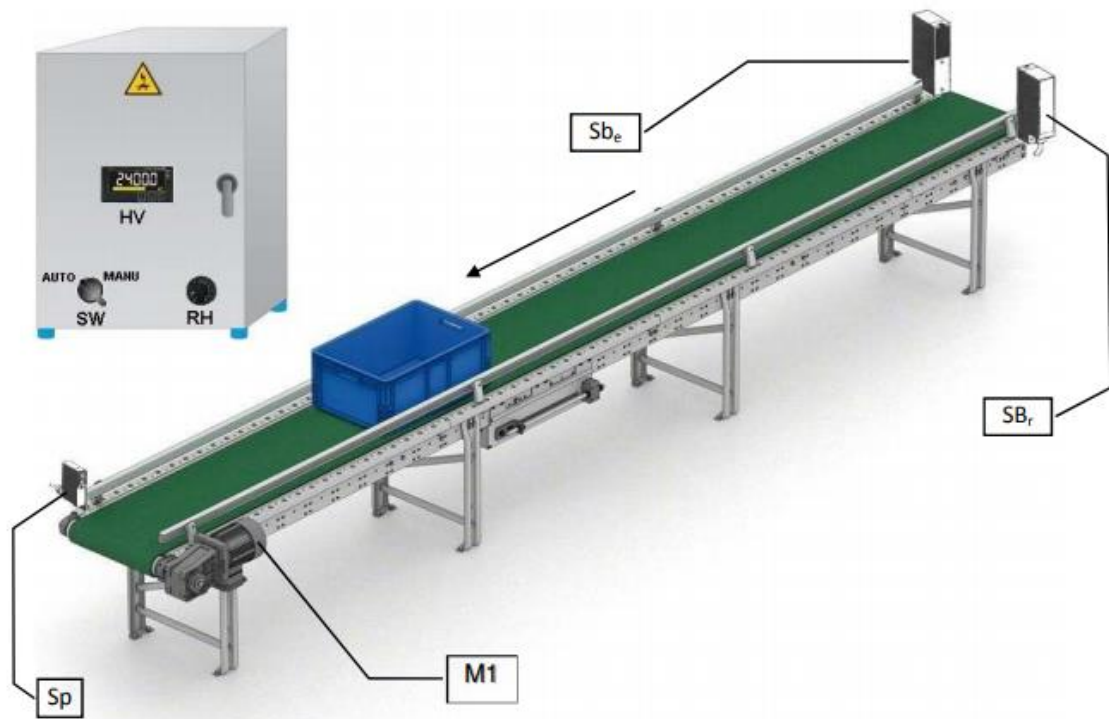
Competitors born on or after 01 Jan 1997 are only eligible to attend the Competition. The team consists of 1 competitor.

Total Duration: 2 Days, each of 4 to 5 hour duration

Section - B

B. Test Project

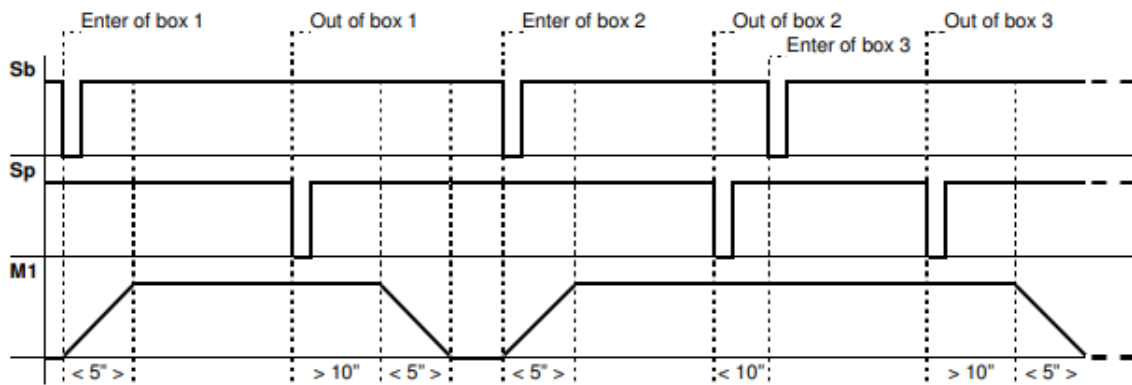
Competitors are required to design, construct, install, configure, test and demonstrate the operation of an industrial conveyor of empty boxes on the guidelines of the declared test project. The Sample Test Project is subjected to a 10 to 20% change. However, changes shall not require any change in the infrastructure requirements. The schematic of the conveyor is given below:



Description of operation:

- If there is no box to convey, the device is off;
- If a box is detected by Sb , the conveyor is turned on and the speed of the treadmill must be reached in 5 seconds;
- The box is conveyed at a speed of 25 cm/s in auto mode;
- Speed can be regulated by user in manual mode with a potentiometer and displayed on the front door of the control box;
- The conveyor is turned off if the box finished its course on the treadmill detected by sensor Sp AND no new box has been inserted for 10 seconds;

Operation chronogram



Description of contents

- M1 is a three-phase asynchronous motor 230 V / 400 V, 0, 18 kW;
- Sp is a photo-electric sensor, diffuse system, 24 VDC, negative;
- Sb is a photo-electric sensor, thru-beam, (Sbe = Emitter; Sbr = Receiver) 24 VDC, negative
- SW is a selector switches with 2 NO contacts and standard or long handle.
- RH is a potentiometer to regulate speed in manual mode;
- Speed driver is a SCHNEIDER Altivar ATV12 H018 M3;
- HV is a digital display of the speed.

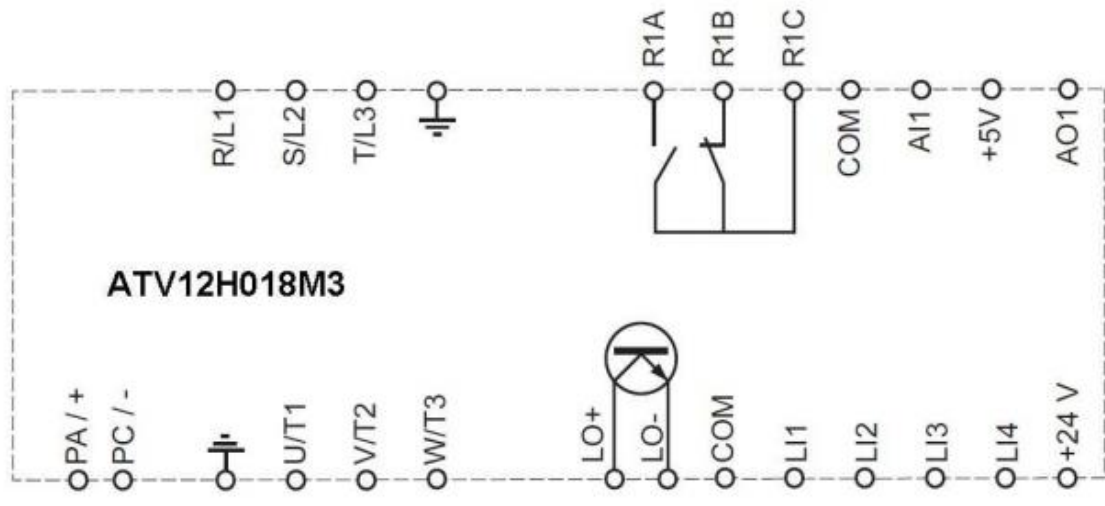
Competitor Instruction Sheet You have 8 to 10 hours to complete this task. Each competitor has to do following to complete the given task:

1. Design the electrical circuit and submit to the expert.
2. Do wiring, set up and installation as per the instruction while following the measurement guidelines.
3. Commissioning and testing of installation as per standard.
4. Do give utmost care to all personal and health safety while working.

Competitor need to do electrical wiring to achieve following functions described in the description of operation and chronogram chapters:

Competitors need to complete the given tasks, keep in the mind the following observations:

- a. Competitor need to draw the electrical circuit diagram on paper by giving all connection details of trash room wiring.
- b. The wiring and connection to be made on given board and motor bench by terminal block connector.
- c. The competitor should take care of all electrical and personal safety.



SAMPLE

Section – C

C. Marking Scheme

Evaluation of Design & documentation ---total marks =40

Sr.No	Operations	Marks	Score	Remarks
1.	Understand the concept of treadmill	4		
2.	Block diagram of PLC system configuration	3		
3.	P&I Diagram	5		
4.	Sketch for One page Graphic screen	3		
5.	Schematic diagram of logic circuit	5		
6.	PLC programming code	5		
7.	Input / Output List	3		
8.	Loop Diagrams	2		
9.	Power distribution scheme	2		
10.	Calibration Procedures	2		
11.	Loop testing procedure	2		
12.	Logic testing procedure	2		
13.	Data sheets	2		
14.	Total	40		

Practical Operation Evaluation ----total marks=40

Sr.No	Operations	Marks	Score	Remarks
1	Load/Reprogram the Sequence program in the PLC	8		
2	Develop the HMI graphics in SCADA and connect with PLC	7		
3	Installation of field items on the boiler skid	5		
4	Calibration/Testing of field items	4		
5	Loop Testing from PLC/SCADA	4		
6	Shutdown interlocks testing from PLC/SCADA	4		
7	Integrated Commissioning & operating the treadmill	4		
8	Shut down system as per procedure	4		
	Total	40		

Professional practice----total marks=10

Sr.No	Criteria	Description	Marks	Score	Remarks
1	Safety	Contestant injured himself	0.5		
2	Safety	Contestant injured another person	0.5		
3	Safety	Electrical power supply and circuit integrity with proper insulation, no bare wires or loose connection.	0.5		
4	Safety	Pneumatic and mechanical connection integrity firm and no leaks.	0.5		
5	Tools & Equipment usage	Work place neat and as per procedure and neat after completion of task	1.0		

Sr.No	Criteria	Description	Marks	Score	Remarks
6	Tools & Equipment usage	Used right tools and methods for electrical connections. Mounted hardware and circuit board properly without any make shift arrangements	1.0		
7	Tools & Equipment usage	Used right tools and method for fittings for pneumatic and mechanical connections. Checked for leaks before starting work.	1.0		
8	Tools & Equipment usage	No damage of tools or test equipment used.	1.0		
9	Methodology	Used a check list to ensure all items of Task were available and arranged.(This included all consumables for the exercise)	1.0		

10	Methodology	Used right instrument fittings for pneumatic and mechanical connections	1.0		
11	Methodology	Used proper terminal board and ferrules as required. Ensured proper mounting of control circuit and Solenoid Valve	1.0		
12	Methodology	Used right length of plastic tubing and cables/wires. Used electric insulation tapes as required for electrical work.	1.0		
		Professional Practice Total	10		

Section - D

D. Infrastructure List

Workshop Installation-Tools & Equipment provided by Organizers of Test Project

Mechanical equipment & Tubing

1. Consumables, cleaning material etc.

Instruments, Electrical items, Cables and accessories

1. A photo-electric sensor "Thru-beam system" with NO + NC contacts, to detect the box at the entrance.
2. A photo-electric sensor "Diffuse system" with NO + NC contacts, to detect the box at the exit
3. One three-phase AC Motor 230/400V 0.18KW
4. A Speed Driver ALTIVAR ATV12 H018 M3
5. Power supply 400V 3P+N+E
6. A voltage transformer single phase 100 VA - 400V/24V AC
7. Electrical accessories like switch/fuse units, junction boxes as required
 - Cables (different sections and colors), cable ends, glands, labels.
 - Wiring board, rails, cable ducts, terminal connections.
 - Screws, clips, miter box with saw Cable management accessories.

A metallic enclosure by competitor with complement accessories Tool Kit-Tool & Equipment allowed to be brought by competitors for competitions

- i. Set of Screw drivers
- ii. Tester
- iii. Nose plier
- iv. Multi-meter

- All other tools not mentioned in the list above to be provided by the organizers
- Competitors have to complete writing circuit within the time of first session
- Competitors have to connect the same circuit has written by them in answer paper, change in circuit with lead for reduction in points
- During practical session change in the written circuit is not allowed.
- Time will be allocated to check the working condition of the component, declaration on not working condition should be done that time
- The working methodologies are considered for marking
- Any damage in the component will not be replaced if declared after starting of the competition
- Competitors can check for the working of the circuit any number of time before declaration • If found short circuit in the circuit during evaluation, the evaluation will be stopped.

Section – E

E. Instructions for candidates

INSTRUCTIONS TO THE COMPETITOR

- Competitors have to complete writing circuit within the time of first session.
- Competitors have to connect the same circuit has written by them in answer paper, change in circuit with lead for reduction in points.
- During practical session change in the written circuit is not allowed
- Time will be allocated to check the working condition of the component, declaration on not working condition should be done that time
- The working methodologies are considered for marking
- Any damage in the component will not be replaced if declared after starting of the competition
- Competitors can check for the working of the circuit any number of time before declaration
- Competitors can check for the working of the circuit any number of time before declaration
- If found short circuit in the circuit during evaluation, the evaluation will be stopped
- When the Competition is over, Competitors shall be given time to exchange views and experiences with other Competitors and Experts.
- In case a Competitor has to withdraw due to illness or accident; marks will be awarded for the work completed.
- In the event of Competitor fall ill or has an accident must be informed to Expert (Jury member)

Section – F

F. Health, Safety, and Environment

1. All accredited participants and supporting volunteers will abide by rules and regulations with regards to Health, Safety, and Environment of the Competition venue.
2. All participants, technicians and supporting staff will wear the required protective Personnel clothing.
3. All participants will assume liability for all risks of injury and damage to property, loss of property, which might be associated with or result from participation in the event. The organizers will not be liable for any damage, however in case of Injury the competitor will immediately inform the immediate organizer for medical attention.