

The First World Vocational College Skills Competition

Competition Rules

I. Name of the Skill

No.: W02

Chinese name: 智能产线安装与调试

English name: Installation and Debugging of Intelligent production line

Industry: Equipment manufacturing

II. Competition Purpose

This is an innovative competition based on an event mechanism integrating competition, competition certification and competition exhibition under the background of the International Summit and Exhibition for Vocational Education. Through the competition, exchange, and cooperation among participating countries, the Competition aims to serve as a platform for teachers and students from domestic and foreign vocational colleges to compete, cooperate, and exchange, improve the international influence of China's vocational education, and promote the building of world skills community.

The Installation and Debugging of Intelligent Production Line connects the teaching process with the actual work process, deepens the international

development of specialty construction and teaching reform of vocational education, actively introduces new technologies, new processes and new specifications for the purpose of industrial development, lead the fusion of teaching contents and demands for industrial technologies and skills, and promotes the innovative training mode of international talents with the integration of production and education.

III. Competition Content

Taking the tasks implemented by industrial enterprises as the carrier, the Competition fulfills the tasks such as assembly of mechanical components in the intelligent production line, circuit installation (including communication network), installation of pneumatic components and systems, PLC control program writing, optimization and debugging of industrial robot program, use of touch screen, motor driver setting, and overall debugging of E&M equipment to exhibit the professionalism and overall quality of competitors and test the competitor's capability of analyzing and handling actual problems, organizing ability and teamwork skills.

(I) Work contents

The Competition Method integrating theory with practice is adopted in the Installation and Debugging of Intelligent Production Line, and the specific tasks are as follows:

1. Assemble the intelligent production line and the relevant modules and

components according to the assembly drawing.

2. Connect the circuit according to the electrical control of the intelligent production line, realize the electrical control of equipment in combination with the task requirements, and draw the schematic diagram of circuit according to the circumstances; connect the network according to the equipment network topology diagram to realize the communication among various components of the equipment.
3. Connect the air duct according to the pneumatic system diagram of the intelligent production line.
4. Write the PLC control program, optimize and debug the industrial robot program, and set the parameters of frequency converter, stepper driver and servo driver according to the statement of work and requirements of the intelligent production line.
5. Create the touch screen page, set the communication parameters, and realize the human-machine interaction of the intelligent production line.
6. Debug the intelligent production line until the work requirements and technical requirements stipulated in the Test Project are met.
7. Apply new technologies, realize the upgrading of intelligent manufacturing technology of the intelligent production line, and complete the preparation and presentation of relevant schemes.

(II) Competition modules and time of task completion

Competition module

Competition module	Task	Time
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Module I	Design and implementation of intelligent production line	3 hours
Module II	Technical upgrading and optimization of intelligent production line	3 hours
Module III	Presentation and reporting of intelligent production line	2.5 hours

Task 1: Each team works together to complete the assembly of the intelligent production line as per the task requirements, mainly including assembly of mechanical components, installation of electrical circuit and air duct, and parameter setting of motor driver, and complete the writing and debugging of PLC control program and touch screen monitoring program.

Task 2: Based on the requirements of the Test Project, each team applies RFID, machine vision, robot and other technologies to carry out the technical upgrading of intelligent manufacturing of the intelligent production line and complete the PPT preparation for presentation and reporting of technical upgrading of equipment in both Chinese and English.

Task 3: Each team is required to present and report the technical upgrading scheme of the intelligent production line via PPT and answer the questions asked by judges and experts and exchange ideas.

IV. Competition Method

(I) Skill competition method

1. The Competition adopts the “1+1” mode, namely, one group of Chinese competitors (from Chinese schools) and one group of foreign competitors (from foreign schools) join hands to form a team (“Chinese-foreign joint team”). Each group consists of one student and one

teacher. Competitors should sign up, compete and win prizes in teams.

2. Domestic competitors must be registered full-time students and full-time teachers from higher vocational colleges, as well as vocational education undergraduate colleges. Students and teachers of one group should come from the same school.

3. Competitor replacement: If a competitor is unable to participate for any reason during the preparation, the relevant department should issue a written explanation ten working days before the start of the corresponding Competition. The competitor will be replaced after verification by the office of the Executive Committee of the First World Vocational Colleges Skills Competition (the “Executive Committee”). After the Competition starts, the teams are not allowed to replace the competitor.

(II) Competition method

The Competition will be conducted in the forms of on-site Competition + recorded broadcast. Domestic competitors will compete on site; if foreign competitors are unable to attend the on-site competition, they may compete through recorded broadcast. Foreign competitors should send the competition videos that meet the competition requirements to the mailbox designated by the Executive Committee seven days before the official competition day, and the Executive Committee will uniformly conduct examination and trial broadcast of the videos and seal them for the record. On the official competition day, the videos should be unsealed by the jury, and those from the foreign competitors will be broadcast on the big screen on site. The marking criteria will be the same as those for on-site competition.

Requirements for competition video: The file format should be MP4; the resolution should not be lower than 1280*720; the recommended aspect ratio

should be 16:9, and the video content should fully display the competition process.

(III) Skill display method

Two competitors (one Chinese competitor and one foreign competitor) from each competition group should explain and display the technologies and skill points of the intelligent manufacturing scheme of intelligent production line via PPT (not exceeding 5 minutes) and answer the questions asked by the judge, reflecting the competitors' understanding of the development trend of intelligent manufacturing technology.

(IV) Demonstration and experience methods

Competitors should demonstrate the functions of the intelligent production line in the workshop, and the guests on site may experience the production procedure of the equipment under the guidance of competitors. Competitors of each team can share programming experience and skills.

V. Competition Process

(I) Skill competition timeline and procedure

1. Competition process

Registration for teams——organize competitors to familiarize themselves with the venue and introduce Competition Rules prior to the start of the Competition——hold the opening ceremony——formal competition (during which observation and exchange activities are organized)——end of the Competition (teams submit the competition results)——result evaluation by judges——hold the prize-giving and closing ceremonies——convene the

summary meeting of the Competition Executive Committee

2. Time schedule

Competition Milestones and Timeline

Date	Time	Content
Day 1	08:00-11:00	Judge and expert meeting
	14:00-15:00	Competitors familiarize themselves with the venue and equipment
	15:00-16:30	Pre-competition briefing session
Day 2	07:20-7:40	Competitor check-in and drawing lots for workstations
	07:40-8:00	Entry of competitors into the workshop, and checking the equipment, components, tools, etc. at workstations
	08:00-11:00	Module I Competition
	12:30-16:30	Competition result evaluation
Day 3	07:40-8:00	Competitor check-in and drawing lots for workstations
	08:00-11:00	Module II Competition
	12:30-16:30	Competition result evaluation
	13:30-16:00	Module III Presentation & reporting + Question & Answer

Note: The workshops should be arranged by the Organizing Committee in a unified way, and the Jury President may adjust workshops as the case may be. Foreign teams are allowed to participate in the Competition in the form of video recording, and their videos for competition will be collected and

submitted by Chinese teams; full exchange and communication will be conducted before the Competition, and the advantages of relevant communication links can be introduced in the presentation and reporting link of Chinese teams.

(II) Skill presentation timeline and procedure

It is the same as the timeline of Skill Competition Task 3.

(III) Experience timeline and procedure

It is the same as the timeline of Skill Competition Task 3.

VI. Competition Task Paper

The design expert panel appointed by the Skill Executive Committee is responsible for the design of Test Project. After the Test Projects are completed by the design experts, they should be submitted to the experts appointed by the Skill Executive Committee for review in accordance with the content requirements of the Competition Rules. Test Projects are made public through the information release platform one month before the start of the Competition.

VII. Competition Rules

(I) Familiarization rules

1. After the Executive Committee of the Division arranges teams to draw lots, various teams familiarize themselves with the workshop in a unified and orderly way, but familiarization is limited to the observation area, and no team

is allowed to enter the competition area.

2. It is strictly forbidden to communicate with the on-site staff during familiarization. Please refrain from making unfounded remarks that can cause damage to the overall image of the Competition.

3. All rules for the Competition should be strictly observed during familiarization. In order to avoid accidents, crowding and talking loudly are strictly forbidden.

(II) Entry rules

1. Competitors and instructors should assemble in the workshop punctually at the time specified by the Division. Competitors should draw the workstation number according to the lots drawn by the Team Leader. Competitors drawing the workstation number should wait in the designated area; after all competitors have drawn their workstation number, they should enter the workshop at the specified time and be seated according to their workstation number.

2. The check-in judges will check the identity of each competitor.

3. The time for equipment inspection and tool arrangement lasts for 10 minutes, and competitors must not inspect equipment or arrange tools before the judge announces the start of the operation.

4. The Test Project is distributed 10 minutes before the formal start of the Competition. Before the formal start of the Competition is announced, competitors can read the Test Project and complete equipment inspection and tool arrangement only.

5. Competitors should not enter the workshop 30 minutes after the start

of the Competition, and the competitors who are late must write time of arrival, excuse for being late and workstation number in the relevant columns of the workshop record sheet for confirmation. The competition time should be subject to the clock that can be seen by various workstations on site (the same as below).

6. Except for the tools, measuring instruments and stationery inspected by judges, competitors are not allowed to carry any communication and storage devices, paper materials and other articles in the workshop.

(III) Workshop rules

1. Competitors must obey the unified command of the on-site judge when they enter the workshop.

2. Competitors must not start any operation necessary for completing tasks before the on-site judge announces the start of the Competition.

3. During the Competition, competitors must strictly observe the safe operating procedure, ensure personal and equipment safety, and accept the supervision and warnings of the on-site judges and technicians. If a team wants to end the Competition early, its member should raise his/her hand to signal to the judge, and the time of end of the Competition should be recorded by the judge; after the end of the Competition, the team should not operate any more; if a competitor causes a personal safety accident or an equipment fault due to misoperation, the Jury President should have the right to suspend the competition of the team to which the competitor belongs.

4. During the Competition, if there is any illegible handwriting in the Test Project, competitors can indicate it to the on-site judge to solve it. If a

competitor determines that the competition equipment or device is faulty and should be replaced, he/she should write the name, specification & model, cause of replacement, time of replacement of the equipment or component and part to be replaced in the corresponding columns of the workshop record sheet and write his/her workstation number for confirmation, and then the on-site judge and technicians will replace it. If the replaced device is determined to be non-artificial damage after being tested by the jury, the time lost during the process will be compensated to the team at the discretion of the Jury President; if it is determined to be artificial damage or normal, 3 points will be deducted each time.

5. If the power-on check is required or the intelligent production line is to be debugged, it should be reported to the on-site judge or technician, and with the consent of the on-site judge or technician, persons are appointed for supervision, and then the power-on check or debugging can be conducted, and records should be kept by the on-site judge.

6. Based on the inspection by the on-site judge and technician, if the equipment or device is determined to be replaced due to a fault or damage and the time from reporting to the on-site judge to the completion of replacement exceeds 5 minutes, the time lost will be compensated to the team after the end of the Competition.

7. During the Competition, the data processed by the computer should be stored in real time, and data loss caused by unforeseen circumstances such as sudden power failure should be avoided. If the whole competition is affected by unforeseen circumstances, the same amount of time will be compensated

to all competitors according to the duration of such unforeseen circumstances.

8. During the Competition, competitors are not allowed to leave their workstations at will or communicate with other competitors. A competitor who has to leave the workshop due to the termination of the Competition or early completion of tasks should report to the on-site judge and write the time and reason of leaving the workshop in the corresponding columns of the workshop record form, and the on-site judge shall sign and the student shall write the workstation number for confirmation.

9. During the Competition, if a competitor seriously violates the workshop discipline to affect other competitors, violates the operating procedure and is deaf to all advice, or intentionally damage the competition equipment or facilities, the on-site judge should report it to the Jury President, and with the consent of the director of the Division Executive Committee, the Jury President will announce the disqualification of this competitor.

10. Competitors must meet the requirements of the safety standard for professional qualifications of electricians and wear insulating shoes exclusive for electricians to enter the workshop; female competitors should tie their hair and wear caps provided by the workshop during the Competition.

(IV) Rules for leaving the workshop

1. The Jury President will remind all competitors of the remaining competition time 15 minutes before the end of the Competition.

2. The Jury President will announce the end of the Competition as the signal of end of competition is sent.

3. When the Jury President announces the end of the Competition, all

competitors (including those competitors requiring time compensation) should stop the operation necessary for the completion of tasks except for storage of computer data. The Test Project, assembly and debugging records, workshop records and Marking Form should be placed on the workbench and should not be carried outside the workshop. Tools, universal meters and stationery for answering questions should be required to maintain the status quo, without being sorted out.

4. After the Jury President announces the end of the Competition, the on-site judge should organize and supervise competitors to stand up, exit from their workstations, and stand in the aisle beside their workstations. When the Jury President announces that competitors can leave the workshop, the on-site judge will direct competitors to leave the workshop at the same time.

5. After all competitors leave the workshop, the competitors requiring time compensation should enter their workstations again, and after the on-site judge announces the start of time compensation, these competitors should start operating. After the on-site judge announces the end of time compensation, competitors should stop operating and leave the workshop.

6. After leaving the workshop, competitors will dine in the designated rest area and wait for the competition results.

7. The competitor whose workstation number is called by the marking judge enters the workshop to evaluate the results of equipment functions together with the marking judge. Competitors should strictly obey the instructions of the marking judge and according to the instructions, operate the relevant components of the intelligent production line and realize the

functions of the intelligent production line.

8. The competitors completing the result evaluation of equipment functions should clean up the tools in their workstations, tidy up workstations and clean the surroundings as per the requirements for professional posts of E&M equipment installation so as to conform to the occupational code.

9. Only the competitors that complete the result evaluation of equipment functions can leave the workshop and the designated rest area.

XIII. Competition Environment

The environmental requirements for workshops are as follows:

1. The workshop area should not be less than 400m².
2. Each workstation should be marked with the logo and workstation number of each team, and the space area of each workstation should not be less than 20m².
3. Each workstation should be equipped with 1 set of competition platform for installation and debugging of intelligent production line, 1 workbench, 4 chairs, 1 380V 3-phase 5-wire power socket, 1 220V single-phase 3-pin socket, 2 220V computer power sockets of independent line power supply, and 1 0.5Mpa compressed air line. One packing box for placing parts and components, 1 waste container for collecting wire ends and other wastes, and 1 set of cleaning tools are also provided.
4. The overload protection, short-circuit protection and electrical leakage protection of main power should be provided in the workshop; the overload protection, short-circuit protection and electrical leakage protection should be

provided for each workstation; if tripping occurs in a workstation, the normal operation of other workstations should not be affected.

5. The workshop's power supply system should have a good earthing system, with the earth resistance of not more than 4Ω .

IX. Technical Specifications

(I) Requirements for professional knowledge and skills

1. Mechanical assembly

Assemble the intelligent production line, relevant modules and components in line with the mechanical assembly diagram as well as the process flow and technical requirements of mechanical assembly.

2. Circuit installation

Install the electrical control circuit of the intelligent production line in line with the schematic diagram and installation drawing of electrical control as well as the technological process and process requirements of electrical installation. In line with the topology diagram of communication connection, connect communication lines and set communication parameters to realize the interconnection among equipment components.

3. Sensor and its application

Based on the working requirements of the intelligent production line, use the common digital sensors (e.g. inductive sensor, capacitive sensor, photoelectric sensor, fiber optic sensor, temperature sensor, pressure sensor, ultrasonic proximity sensor and vision sensor) to detect the relevant physical quantities in the working process.

4. Programmable logic controller (PLC) and its application

Based on the working process of the intelligent production line, use basic instructions, step instructions and common function instructions to process switching signals, analog signals and digital signals, and write the PLC control program according to the working requirements.

5. Application of touch screen

Make the widgets on the touch screen page and set relevant parameters; create the touch screen page to realize the switching between pages; use the touch screen to monitor the intelligent production line.

6. Use of motor driver

Connect the motor driver circuit according to the circuit diagram; according to the working requirements of equipment, set the relevant parameters of the driver to realize the corresponding control functions;

7. Programming and debugging of industrial robot

Master the general methods for industrial robot debugging, and be able to write and optimize the industrial robot control program according to the actual environmental circumstances and requirements of the site.

8. Installation and debugging of pneumatic system

Be able to assemble pneumatic components such as air source processing unit and solenoid valve group, and install the air duct of the intelligent production line according to the pneumatic system diagram of the intelligent production line.

9. E&M equipment debugging

Adjust the relative positions of mechanical parts and components

according to the working requirements of E&M equipment to coordinate the actions of various mechanicals; be able to modify the parameters of the control program or relevant devices according to the production process and requirements of E&M equipment to realize the equipment functions.

(II) Technical standards and technical specifications

1. Technical standards

ISO 12100: Safety of Machinery - General Principles for Design - Risk Assessment and Risk Reduction

IEC 60204-1: Safety of Machinery - Electrical Equipment of Machines

IEC 61508 series: Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems

ISO 13849-1: Safety of Machinery - Safety-related Parts of Control Systems - Part 1: General Principles for Design

IEC 62061: Safety of Machinery - Functional Safety of Safety-related Electrical, Electronic and Programmable Electronic Control Systems

X. Technology Platform

(I) Composition of technology platform

The competition platform adopts the practical training assessment devices of the intelligent production line, including 5 working units: feed unit, processing simulation unit, assembly unit, conveying unit and sorting unit.

1. Platform overview

The practical training assessment devices of the intelligent production line consist of 5 units installed on the guide-rail practical training platform of aluminium alloy: feed unit, processing unit, assembly unit, conveying unit and sorting unit. The dual-drawer electrical layout is adopted, and all electrical controllers are installed on the mesh-plate drawer. This mode of electromechanical dissociation is more suitable for the actual industrial circumstances.

(1) Feed unit

The feed unit is the starting unit in the intelligent production line, serving for feeding raw materials into other units in the system.

(2) Processing unit

The processing unit is one of the workpiece processing units in the intelligent production line, which is used to stamp the workpieces conveyed from the conveying station or used for more complicated processing control of virtual simulation in the whole system.

(3) Assembly unit

The assembly unit is another one of the workpiece processing units in the intelligent production line, which is used to assemble the workpieces conveyed from the conveying station and feed materials into small workpieces in the whole system.

(4) Sorting unit

This unit is used to complete the sorting of those processed and assembled workpieces conveyed from the previous unit, so that the

workpieces of different colors and materials can be separated from different feed chutes and separately combined.

(5) Conveying unit

This unit has the functions of accurately positioning the material platform of the designated unit, grabbing workpieces on this material platform and conveying these grabbed workpieces to the designated place and releasing them.

2. Technical indicators

(1) working power supply: 3-phase 5-wire system AC 380 V \pm 10% 50 Hz;

(2) Overall dimensions of equipment: L \times W \times H = 2,100mm \times 1,000mm \times 1,500mm;

(3) Overall dimensions of computer desk: L \times W \times H = 600mm \times 530mm \times 1,000mm;

(4) Workbench material: aluminium steel structure;

(5) Apparent power consumed by the machine: \leq 2kVA;

(6) Safety protection measures: have the functions of earthing protection, electrical leakage protection, overload protection and misoperation protection; safety complies with relevant national standards and all materials comply with the environmental protection standards.

(II) Basic parameter requirements of controllers

The basic parameter requirements of the relevant controllers in the intelligent production line are described in the table below.

Basic parameter requirements of relevant controllers in the intelligent

production line

No.	Name	Model/specification/No.	Unit	Qty.
1	Programmable logic controller (PLC)	100 KB working memory; 120/240VAC power supply, onboard DI14 x 24VDC sink/source, DQ10 x relay and AI2; onboard 6 high-speed counters and 4-way pulse output; signal board expansion board I/O; up to 3 communication modules for serial communication; up to 8 signal modules for I/O expansion; 0.04ms/1000 instructions; PROFINET interface, for programming, HMI and data communication between PLCs	pce.	4
2	Programmable logic controller (PLC)	100 KB working memory; 24VDC power supply, onboard DI14 x 24VDC sink/source, DQ10 x 24VDC and AI2; onboard 6 high-speed counters and 4-way pulse output; signal board expansion board I/O; up to 3 communication modules for serial communication; up to 8 signal modules for I/O expansion; 0.04ms/1000 instructions; PROFINET interface, for programming, HMI and data communication between PLCs	pce.	1
3	DI/DO module	Digital input/output module DI8 x 24VDC sink/source and DQ8 x relay; configurable input delay; plug-in terminal block	pce.	2
4	Analog signal board	Analog output module AQ1 x 12 digits; plug-in terminal block; output: +/-10V, 0 ~ 20mA; diagnosable & configurable; optional output replacement value	pce.	1
5	Frequency converter	Power 0.75KW, supporting Modbus/US communication protocol	pce.	1

6	Servo drive system	Supply voltage AC 220V, rated power 200W, command pulse input, RS232/485 communication	pce.	1
7	Touch screen	This is a set of high-performance embedded integrated touch screen with the advanced Cortex-A8 CPU as the core (main frequency: 600MHz). This product is designed with a 7-inch high-brightness TFT LCD screen (resolution: 800x480) and a four-wire resistive touch screen (resolution: 4096x4096). It has the strong functions of image display and data processing.	pce.	1
8	3D design software	The 3D design software offers a range of industrial-grade intermediate data interchange interfaces such as JT, ipt, ifc, igs, prt, step, 3MF, sldprt and stl, contains the data interfaces used for the 3D software such as Solid Edge, Solidworks, Pro/E, NX and Catia, integrates three major modelling cores: sequence modeling, synchronous modeling and convergent modeling, and has the capacity of forward design and reversal design.	Set	1
9	PLC programming software	It is characterized by totally integrated automation and is open to international standards and third-party systems. The system architecture has the advantages of excellent integrity and abundant product series and supports programming languages such as LAD, FBD, SCL and STL.	Set	1

XI.Result evaluation

In order to implement the competition principles of openness, fairness and impartiality and promote the standardized, high-efficiency and scientific competition result management, the specific principles of the Competition are formulated in terms of assessment criteria formulation principles, marking method and marking rules by reference to relevant provisions.

(I) Assessment criteria

Assessment Criteria of Installation and Debugging of Intelligent Production Line

Level 1 assessment item	Level 2 assessment item	Level 3 assessment item	Assessment standard and requirement
Professionalism Quality 20 points	Environmental protection and conservation (4 points)	/	Environmental awareness; conservation awareness;
	Standardization awareness (6 points)	/	Operating specifications; use of tools; safety specifications; workshop 5S
	Workmanship (6 points)	/	Professional dedication, constant improvement, concentration and innovation;
	Workshop performance (4 points)	/	Working attitude; labor discipline;
Design and implementation of intelligent production	Assembly of mechanical components and	Feed unit assembly (5 points)	Parts are complete and installed in place; upper and lower cross beams are perpendicular to vertical columns, and left and right cross beams are perpendicular to vertical columns; the supports connecting vertical columns are tightened with set

n line 40 points	module installatio n (5 points)		screws, without loosening;
	Circuit connection of feed unit (7 points)	Control circuit connection (2 points)	The cylinders controlled by various solenoid valves comply with the requirements of the Test Project, and I/O signals comply with the task requirements.
		Circuit connection process (5 points)	Wires are laid in the wiring duct; each wire corresponds to each wiring terminal and is firmly pressed with a cold-pressed terminal; on the incoming part of each terminal, each wire must be configured with a cable marker, and the cable marker should be reasonably numbered; the interval of wire binding is 60-80mm; there are no more than 2 plug wires in each plug wire hole; the length of copper exposed on the terminal cannot exceed 2mm; the wires on the desktop should not be suspended in the air, the distance from the raceway fixing point to each end should not exceed 50mm, and the center-to-center spacing should not exceed 500mm; the interval of fixing cable clamps is 60-80mm;
	Pneumatic system connection (5 points)	Air duct connection and direction (2 points)	The pneumatic component should be reasonably selected according to the pneumatic schematic diagram; the air duct should be laid reasonably, ensuring that it is set neatly; the air duct cannot pass through equipment, and the air duct and circuit in the same movable mechanism are reasonably bundled up;
		Air duct connection process (3 points)	The air duct length is reasonable, the binding interval is 60-80mm, and cable clamps are used to fix the air duct; the inlet/outlet throttle valves of the cylinders are reasonably adjusted, and the cylinder operates stably; there should be no air leakage;
Intelligent production line design (5 points)	Feed unit (5 points)	The 3D modeling dimensions of positioning block pushed by workpieces and falling hopper base are correct, and there is no missing part in the model	

			rigging.
	Intelligent production line function (18 points)	Working process of feed unit (4 points)	Consistent with the Test Project;
		Working process of sorting unit (6 points)	Consistent with the Test Project;
		On-line production process (8 points)	Consistent with the Test Project;
Reconstruction and optimization of intelligent production line (30 points)	Intelligent production line function (30 points)	Visual inspection function (9 points)	Consistent with the Test Project;
		Single conveying station function (11 points)	Consistent with the Test Project;
		On-line production process (10 points)	Consistent with the Test Project;
Presentation and reporting 10 points		Peer evaluation of competitors	Marking is made according to language expression, PPT aesthetics, and scheme design. Marking is made by other teams, and the average score is taken.

(II) Organization and division of responsibilities

(1) The organizations involved in the management of the competition results include the jury and the supervision and arbitration team, which are led by the Skill Executive Committee.

(2) The jury is under the “jury president responsibility system” with 1 Jury President, 8 on-site judges, and 8 marking judges (marking by team), i.e. a total of 17 judges.

(3) The check-in staff is responsible for registration, identity verification, etc. of teams (competitors); the on-site judges make the workshop records properly, maintain the workshop discipline, and record the time used by each team to complete its task; the marking judges are responsible for evaluating the competition works and performance of the teams (competitors) according to the skill assessment criteria.

(4) The supervision and arbitration team is responsible for supervising the work of the jury and reviewing the results of the Competition by sampling.

(5) The supervision and arbitration team is responsible for accepting written appeals against the competition process submitted by Team Leaders, organizing reviews and providing timely feedback on the results of the reviews.

The requirements and professional competency of judges are shown in the table below.

No.	Technical specialization	Knowledge and capacity requirements	Judging, teaching, and work experience	Professional and technical titles (level of professional qualification)	Number of persons
1	Relevant technical directions such as mechatronics, industrial robot and industrial automation	Have the relevant knowledge background, the capability of building and maintenance of the intelligent production line, and good verbal communication	Have teaching experience in relevant specialties of international partner universities and colleges or judge experience in relevant competitions	Deputy senior professional title and above	17

		n skills in English.			
Total number of judges	17				

(III) Marking method

In order to avoid an error in marking results caused by the differences in understanding and measure of the Marking Form during the marking process and realize the fairness and impartiality of marking, the assembly-line marking method is used for the installation and debugging of intelligent production line.

The result marking method is adopted for the modules of mechanical assembly of equipment and installation of circuit and air duct, and judges should mark the results of installation by competitors against the Marking Form; the result marking method is adopted for the program function module, and each competitor operates the equipment according to the functional description of the Test Project, while marking judges mark timely against the Marking Form, and all step results are summarized as the final score of the competitor; the result marking method is also used for assembly and debugging records and workshop records, and judges make the marking according to the records.

Under the unified command of the team leader, each marking team only marks the projects in the charge of this team according to the marking contents and assessment criteria listed in the Marking Form. If there are

different opinions on the understanding of the Marking Form or the measure of criteria is inaccurate, it should be submitted to the Jury President, and the Marking Form should be understood and the assessment criteria measured according to the Jury President's opinions.

(IV) Result calculation

Chinese and foreign team members cooperate to complete all competition tasks, and the total competition result is the sum of results of all tasks completed by each competition group. If the total result is tied, the competition group with a higher result of Task 2 ranks higher than that with a lower result. In addition to the total result, if the result of Task 2 is also tied, the competition group with a higher result of Task 1 ranks higher than that with a lower result. In addition to the total result and the result of Task 2, if the result of Task 1 is also tied, the competition group with a higher result of Task 3 ranks higher than that with a lower result.

(V) Ranking of competition groups

Competition groups should be ranked by their competition results from high to low. If the competition results of two groups are the same, the group that has spent less time completing all tasks should be ranked higher; if two groups are the same in terms of competition result and time used for completing all tasks, the two groups will have the same rank.

(VI) Result announcement

The Jury President will submit the marking results of all workstations (competition works) within 8 hours after the end of the Competition, and after the results are reviewed and no error is found, the results will be announced

with the signatures of the Jury President, the supervision personnel and the arbitration personnel for confirmation.

Note: For the foreign teams that are not present at the workshop, they can participate in the Competition through playing videos on the large screen in the workshop, and the judges will mark on site according to their videos.

XII. Awards and Prizes

A gold, silver and bronze medal will be awarded to each different group, and the competition groups in the top 50% of the total results (other than the top three) will be awarded the Medallion for Excellence.

XIII. Preliminary Plans for the Competition Venue

The plans are implemented in accordance with the relevant rules of the World Vocational College Skills Competition.

1. The Competition hardware and software environment and computers are stress tested before the Competition to verify normal functions. The Competition site is prepared with one to two sets of complete competition environments to ensure that in case of damage not caused by the competitors, the technical support staff in the workshop will replace them in time after the on-site judges have determined and the jury president has confirmed.

2. In the event of equipment power failure, faults, and other accidents during the Competition, the on-site judges need to promptly confirm the situation and arrange technical support personnel in the workshop to handle

the problem. Moreover, they should record the details and fill in the registration form for the make-up time. After reporting to the Jury President for approval, they can arrange to give additional time to the corresponding competitors to make up for the delay.

3. During the Competition, if a competitor suspects a problem with equipment and has clear evidence to prove that this problem is not caused by competitors, he/she may submit a written statement to the judge, and with the judgement of technicians and the approval of the Jury President, the equipment can be replaced, and the Jury President decides whether to make up time and the length of time; if there is no clear evidence to prove that it is not damaged by competitors, the equipment will not be replaced and time not compensated.

4. Each competition workstation is independently powered during the Competition, and each team uses an independent network for the Competition. If an accident happens to a team but has no impact on other workstations during the Competition, the team's result will not be affected.

5. In the event of a large-scale accident or safety issue during the Competition, the identifier should report it to the Skill Executive Committee immediately. The Skill Executive Committee should take measures such as suspending the competition and quickly evacuating the crowd to avoid further escalation, and report it to the Division Executive Committee immediately. Competition may be suspended in case of a major safety issue, and whether to suspend it should be determined by the Division Executive Committee. After the event, the Division Executive Committee should report the details to the

Competition Executive Committee.

6. In the event of a sudden event during the Competition, competitors should keep calm and follow the instructions of the workshop staff to evacuate the workshop as orderly as possible.

7. If the security personnel detect any potential safety hazard, it should be reported to the Division in time.

8. A medical station should be set in the workshop, and essential medicines should be provided.

XIV. Safety

(I) Competition safety management

(1) A safety management team led by the director of the Skill Executive Committee should be formed to be responsible for competition safety management.

(2) The safety management team should establish the coordination mechanism with different authorities such as administrative, transport, public security, judicial, fire protection, food hygiene and quality supervision departments, develop emergency response plans, and handle emergencies to ensure the safety of the Division and the Competition.

(3) The safety management team should appoint staff to conduct the safety inspection for power supply lines, fire facilities and competition equipment in the workshop one week before the Competition and put forward the rectification requirements. The safety management team should organize

the safety acceptance of the workshop one day before the Competition, and after all indicators are qualified, it will sign on the acceptance certificate for confirmation and put them into use. The staff signing on the acceptance certificate should be responsible to the safety of power supply lines, fire facilities and competition equipment in the workshop.

(4) Emergency accesses for emergency evacuation should be set in the workshop and should be unobstructed during the Competition.

(5) Based on the power demands of the Competition, 1 vehicle-mounted power plant should be provided, which will be used in case of a fault in the power supply line.

(6) One ambulance should be provided and park outside the workshop, so that it can take patients or the injured to a nearby hospital from the workshop.

(7) One fire truck should be provided, so as to call the fire department and use this fire truck to fight a fire if people are organized to extinguish a fire with fire extinguishers but fail to extinguish it.

(8) Coordinate with the food hygiene authority to inspect the food hygiene of the place where competitors live, ensuring the food safety of competitors.

(9) Coordinate with the transport authority to monitor the transport lines of teams and students for visits, competition and attending meetings, ensuring the transport safety of the Competition.

(10) Coordinate with the public security authority to maintain the public security of the Division and the place where competitors live, ensuring the safety of competitors and their property.

(11) The first person that detects a sudden event should immediately

notify the Jury President of the workshop or the person responsible for the Division of the scene, state, development trend and possible consequences of this event. The safety management team will determine whether to initiate the emergency response plan depending on the state of events.

(II) Workshop safety management

The on-site judges, marking judges and technicians in the workshop are the safety guardians of competitors and are responsible for supervising the safety of competitors in the completion of tasks.

The safety operating regulations are as follows:

(1) Competitors should observe the safe operating procedures for E&M equipment installation and debugging and the safety procedures for electrical work and also conform to the safety operating regulations of the workshop.

(2) Competitors must wear work clothes, insulating shoes and safety helmets in the completion of tasks.

(3) Competitors are strictly prohibited from connecting circuits and removing electrical faults when power is connected. They must conduct power-on equipment debugging under the supervision of workshop technicians, with the consent of the on-site judge of the workshop. They must carry out power-on equipment debugging in accordance with the operating procedures for live-wire operation.

(4) Competitors should use a wooden mallet, rubber mallet, red copper hammer or special assembly tool to assemble or disassemble mechanical mechanisms, rather than an iron hammer.

(5) Prior to power-on debugging of equipment, competitors should inspect

circuits, check whether there are any iron filings, other dirt, parts and tools on workbenches and guide rails, and notify unrelated persons to leave the equipment to prevent any accident from happening in the operation of equipment.

(6) Competitors must familiarize themselves with the safety protection measures and safe operating procedures of E&M equipment and monitor the running of equipment at any time. If a problem is found, the equipment should stop operating immediately, and after troubleshooting, the equipment can operate again.

(7) Various measuring tools should be correctly used to prevent collision and falling. The measuring instruments such as universal meter should be correctly used to avoid these instruments from being damaged due to improper operation. Before using tools and measuring instruments, competitors should completely wipe oil and sweat from their hands to prevent accidents arising from the loss of control by slip from their hands.

(8) It is strictly forbidden to knock on the workbench at will and straighten and correct mechanical mechanisms when the equipment is operating. When the mechanical mechanism is adjusted and the gearing is replaced, the equipment must be stopped and the main power supply cut off so as to prevent an accident by sudden energization.

(9) Various exposed parts, such as screws, pins, labels and axle heads, on mechanical components, as well as blue and electroplated parts should be complete and intact, without being damaged, so as to ensure the equipment is in good condition.

(10) If a sign of abnormality or faults occurs during operation, the equipment should stop operating immediately and the scene should be preserved, and meanwhile, it should be reported to the judge forthwith, and then troubleshooting should be performed.

(11) Before starting up the E&M equipment, competitors must raise their hands to signal to the judge for safety inspection of mechanical conditions and protection, and with the permission of the judge, they can start power-on operation.

(12) In case of fire, the equipment power supply should be cut off immediately and powder fire extinguishers in the workshop should be used to extinguish a fire.

(13) In the event of a sudden event, competitors should keep calm and follow the instructions of the workshop staff to evacuate the workshop as safely and as orderly as possible.

XV. Competition Notice

(I) Notice for teams

1. Each team should use the specified regional team name, and any school name or any other organization or group name is not allowed.

2. Team members should not be replaced, in principle, after their sign-ups are examined and confirmed. However, if a member fails to join the Competition during the preparation for the Competition, his/her provincial competent educational authorities should issue a written explanation, replace him/her with a substitute in line with relevant provisions, and have the

substitute reviewed. After the Competition starts, teams should not replace their members. Team members are allowed to miss the Competition.

3. Teams should hold entry cards issued by the Organizing Committee and valid IDs to participate in the Competition and relevant activities in accordance with the competition process.

4. The Organizing Committee will arrange various teams to participate in the familiarization activities before the Competition.

5. In accordance with the unified requirements of the Organizing Committee, all teams should attend the pre-competition team leader meeting punctually, on which the draw ceremony will be held.

6. All teams should pay great attention to food hygiene and prevent food poisoning.

7. During the Competition, all teams should ensure the safety of all competitors, protect competitors from traffic accidents and other accidents, and purchase personal accident insurance for competitors.

8. All teams should carry forward good moral norms, follow the instructions, obey judges and not cheat.

9. All Team Leaders, instructors and competitors should actively take precautions against the pandemic and comply with the requirements for pandemic prevention and control of the place where the Competition is held.

(II) Notice for instructors

1. All instructors should carry forward good moral norms, follow the instructions, obey judges and not cheat. Instructors should not be replaced after they have been reviewed and their sign-ups are confirmed.

2. Team Leaders and instructors should set a good example to obey and execute the arbitration results of the appeal and also persuade competitors to do so.

3. Instructors should carefully study and master the technical rules and workshop requirements of the Competition and instruct competitors to make all necessary preparation before the Competition.

4. Team Leaders and instructors should give technical summaries and work summaries after the Competition.

(III) Notice for competitors

1. Competitors should observe competition rules, respect judges and workshop staff, abide by the discipline of the workshop, and obey the leaders of the Executive Committee and the judges.

2. Competitors should hold their entry cards, ID cards and registered student cards. They should dress in the workshop in accordance with the occupational requirements. They should wear insulated shoes with insulation marks and accept the inspection by judges, and their clothing should not contain any logos representing school and province. Their performance in the workshop should reflect their good professional habits and quality.

3. Before entering the workshop, competitors must not carry cell phones and other communication devices to the workshop and put them in the custody of the relevant workshop staff. Any tools and electronic storage devices not inspected as well as other items that cannot be carried to the workshop should not be brought into the workshop.

4. During the Competition, different groups should neither talk with each

other nor talk loudly; any behaviors of a competitor should not affect other competitors, and no act of cheating is allowed, such as peeping and smuggling.

5. Competitors should observe the safe operating procedures and operate in a courteous manner during the Competition. The power-on debugging of equipment should be carried out under the supervision of technicians, with the permission of the on-site judge.

6. If a competitor determines that any component or part should be replaced, he/she should report to the on-site judge, write the name, specification and model of this component or part as well as cause of replacement in the workshop record sheet, verify the time from reporting to completion of replacement, and write his/her workstation number for confirmation, so as to make up the time spent. In the event of inconsistency with the cause of replacement written after the component or part to be replaced is inspected by the on-site judge and technicians, points will be deducted from his/her competition result.

7. Competitors should not connect circuits or inspect equipment when they are electrified; before the start of power-on debugging of equipment, competitors should inspect the circuit and determine that no error is found in the circuit, and then it can be powered on. During the debugging of equipment, the points for safe and ethical operation should be deducted if tripping is caused or the melt fuses due to a circuit problem or improper operation.

8. Competitors should assemble components, adjust mechanical structures, use tools and adopt operating methods in accordance with the

specifications. The points for safe and ethical operation should be deducted if parts are damaged or other competitors are affected due to improper selection and use of tools; if a work accident is caused by a competitor, his/her competition result should be cancelled.

9. During the Competition, competitors should save the written PLC control program and the created touch screen interface at any time and store the parameters of components and parts set. If data loss arises from power failure or tripping caused by misoperation by competitors, time spent will not be made up.

10. If a competitor needs to use the restroom during the Competition, he/she should report to the on-site judge and then leave the workshop with a judge or workshop staff.

11. After completing all tasks, competitors should leave the workshop before the end of the Competition. Competitors should signal to the on-site judge and write the time of leaving the workshop and the workstation number in the workshop record sheet for confirmation, and then leave the workshop and wait for marking in the designated area, and they cannot re-enter the workshop after leaving the workshop. If a competitor needs to terminate the competition and leave the workshop because of illness or for other reasons before completing his/her tasks, he/she should obtain the permission of the Jury President and write the cause and time of leaving the workshop in the corresponding columns of the workshop record sheet and his/her workstation number for confirmation before leaving the workshop; he/she cannot enter the workshop again after leaving the workshop.

12. When the Jury President gives a command to stop the Competition, all competitors (including those competitors requiring time compensation) should stop their operation without delay, enter the passage, leave the workshop under the command of the on-site judges and wait for marking in the designated area. After leaving the workshop, the competitors requiring time compensation will be summoned by the on-site judges to re-enter the workshop for time compensation.

13. Once the competitors who are waiting for marking and waiting for the workshop staff to call their workstation numbers hear their numbers, they should enter the workshop quickly and complete the competition result evaluation together with the marking judges. During the marking process, competitors should cooperate with the marking judges and operate equipment as required; they are allowed to communicate with judges to explain the problems in the operation of equipment; they should not argue with judges or compete for points to affect marking.

14. If a competitor raises an objection to the judgement of judges, his/her Team Leader may file an appeal, in writing, to the Supervision and Arbitration Committee within 2 hours.

15. In the event of a sudden event, it should be reported to the judges and the workshop staff and actions should be taken according to the instructions of the workshop judges and staff.

(IV) Notice for staff

1. Before the performance of their duties, judges should be trained to familiarize themselves with various tasks and their requirements and the

knowledge and skills to be assessed, carefully study the assessment criteria, and understand all assessment contents and standards in the Marking Form. Any judges failing to participate in the training should be disqualified.

2. During the performance of their duties, judges should wear uniforms and judge badges, be courteous and polite, and accept the supervision of competitors.

3. Judges should observe the execution discipline, perform their duties, enforce the Competition Rules, and keep their promises stated in the judge's letter of commitment. Judges should obey the Organizing Committee and the Jury President of the Competition. They should work according to the division of responsibilities and always stick to their posts, and cannot leave their post without permission.

4. Judges are responsible for maintaining the order of the workshop, enforcing the workshop discipline and also ensuring the safety of competitors. They should always pay attention to the safety of competitors during operation, stop any behavior violating safe operation, and prevent safety accidents.

5. Judges should not do anything to disturb competitors, give a hint about or answer any questions relating the Competition, or instruct or help competitors to complete their tasks.

6. Judges should regard all competitors as equals, whether close or distant and warm or indifferent.

7. If any competitor wants to inspect equipment or replace devices or parts, these requirements should be met. The devices to be replaced should be

inspected together with the workshop technicians to judge the replacement of devices by a competitor; In case of equipment inspection or device replacement, the name and model of each device replaced should be recorded in the workshop record sheet, time from replacement to the end of replacement, cause of replacement, and testing results of devices replaced, and competitors are required to write their workstation number for confirmation.

8. All problems encountered by competitors in the workshop include: violations against the workshop discipline, violations against the safe operating procedure, and leaving the workshop early, and these problems should be recorded in the workshop record sheet, and students are required to write their workstation number for confirmation.

9. Judges are allowed to take photographs of workstations and keep records during work, with the permission of the Jury President.

10. The assessment criteria of competitive projects should be strictly implemented, achieving fairness, impartiality, authenticity and accuracy, and it is strictly forbidden to mark at will; if there are difference in the understanding of the Marking Form and the measure of criteria, it should be submitted to the Jury President. It is strictly forbidden to take advantage of their work to cheat and commit illegal acts for personal gains.

11. During the Competition, if the Competition process fails to continue or the judgment results are not authentic due to irresponsible acts of judges, the Organizing Committee imposes penalties depending on the circumstances, such as circulating a notice of criticism or disqualification from judges and

notify the organizations involved to penalize these irresponsible judges.

XVI. Appeal and Arbitration

(I) Composition of arbitrators

The supervision and arbitration team of the Competition should be formed in accordance with the requirements and formation procedure for arbitrators. The supervision and arbitration team works under the leadership of the Skill Executive Committee and is responsible to Skill Executive Committee.

(II) Responsibilities of arbitrators

Arbitrators should familiarize themselves with the Competition Rules and regulations;

Arbitrators should master the progress of the Competition;

Arbitrators should accept the written appeals submitted by various teams;

Arbitrators should conduct in-depth investigation of the accepted appeals and make collective arbitration in an objective and fair manner.

(III) Appeal and arbitration procedures

Each team can submit an appeal to the supervision and arbitration team about instruments, equipment, tooling, materials, objects, computer software and hardware, tools and supplies used in the Competition, performance of competition judge duties, workshop management, competition results, and non-standard behaviors of staff that do not conform to the Competition Rules.

When an appeal is initiated, the written report signed by the team for

consent should be submitted to the supervision and arbitration team. The report should give a full and factual account of the incident, time, personnel involved and basis for the appeal. Non-written appeals will not be accepted;

An appeal should be filed within 2 hours after the end of the Competition. It will not be accepted after 2 hours;

The supervision and arbitration team should organize a review within two hours after receiving the appeal report and timely inform the Appellant in writing of the review result. If the Appellant still raises an objection to the review result, the provincial (municipal) team may file an appeal to the Arbitration Committee of the Division. The arbitration award of the Arbitration Committee of the Division should be final;

The Appellant should neither reject the arbitration award for any reason, nor disrupt the Competition through drastic actions for any reason; the arbitration award should be signed for by the Appellant and cannot be received on his/her behalf; if the Appellant leaves at the agreed time and place, he/she is considered to have waived the appeal;

the Appellant may waive the appeal at any time.

XVII. Competition Observation

(I) Open observation

Media and audience can be organized to visit the competition site along the designated observation route and understand the relevant technologies and the results of vocational education and teaching on the premise that competitors are not disturbed.

Open exhibition areas are set outside the workshop with the aim to popularize and publicize the relevant technologies of the Competition and exhibit the intelligent production line technology to the public.

Cameras are reasonably installed on the competition site to broadcast the full process of the Competition live, so that leaders, guests, Team Leaders, coaches and some student representatives can watch the Competition in their lounges.

(II) Organization and arrangement

Observation teams are led by the competition staff to observe the Competition in the workshop in batches.

(III) Discipline requirements

All members of each observation team should keep quiet in the workshop and visit the competition site in an organized way along the designated observation route; they should not enter the competition area, touch any equipment or disturb any competitors.

Observers can neither carry cell phones, IPADs or any other communication devices to the workshop nor talk with any competitors or transmit messages; they should obey the workshop discipline.

XVIII. Live Competition

Full-process videoing and synchronous playing on the large screen should be adopted during the Competition. During the Competition, special persons should be organized to take videos and record the whole process of

the Competition. After the Competition, media will be invited to interview excellent competitors, excellent instructors, judges, experts or businessmen, and these interviews will be archived as one of the achievements of the Event.

XIX. Resource Conversion

Resource conversion should be handled by the Skill Executive Committee. In line with the relevant requirements, multiple means should be used to convert the excellent achievements of skill resources in an all-round way.

Resource conversion should include: construction of teaching resources, convening of specialized construction symposiums and special seminars on achievements of the Competition, faculty training, university-enterprise cooperation, and international cooperation, and part of excellent universities and colleges as well as relevant enterprises should join to complete them.

XX. Miscellaneous

1. Any work of the Competition should not damage the environment around the workshop.

2. The ideas of going green and environmental protection should be advocated, and all recyclable materials should be classified, treated and collected.

