

Project 1: Assembly, programming and commissioning of a Handling station with electrical drive and stack magazine

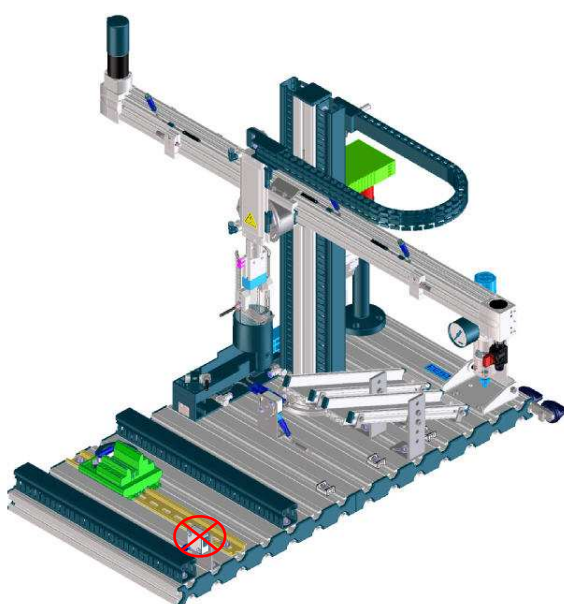
Weighting (points out of total) 15/100

t max 180 min

All big pictures are also on USB-Stick

■ Scenario

You are responsible for the delivery of a Handling station purchased by a customer in the world to be used in the partial automation of its production process.



■ Task

Assemble, wire and tube the Handling station on the profile plate according to the following guidelines and the technical information.

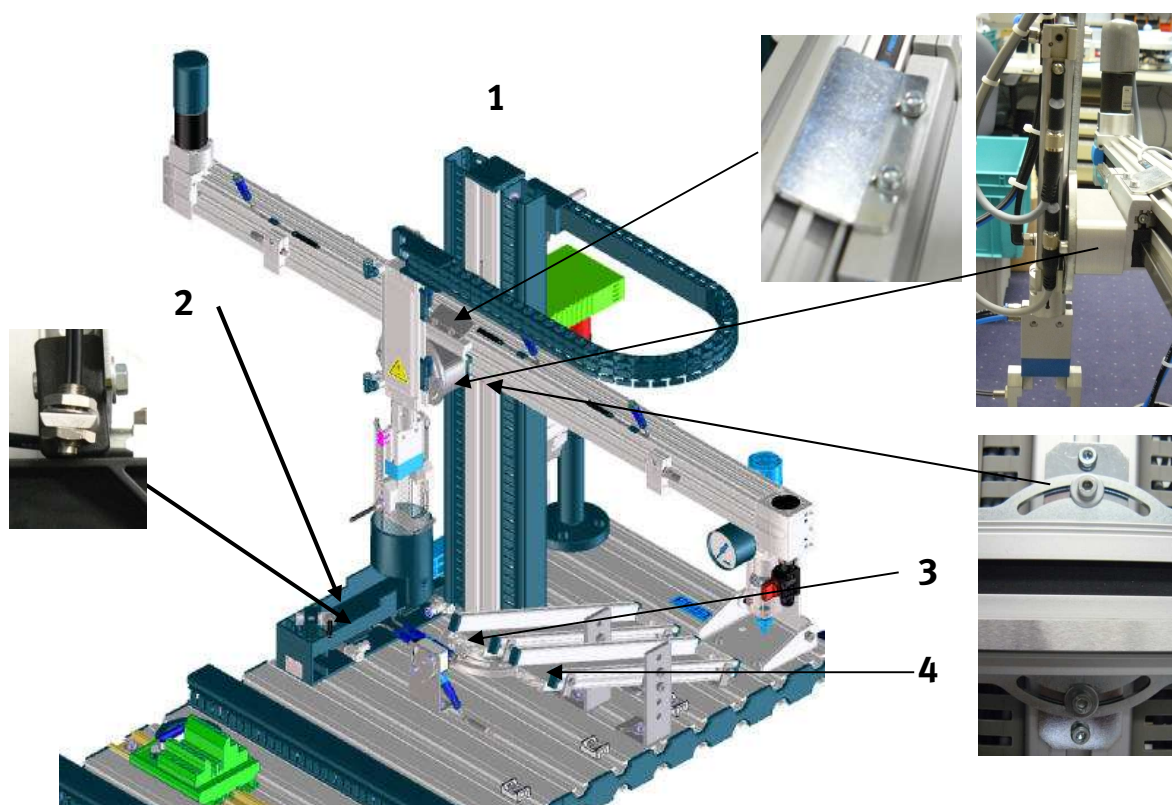
Develop a program and commission the system.

Your task is complete when:

1. The production line has been mechanically assembled, correctly wired, connected and its correct operation is guaranteed (based on evaluation using the simulation box).
2. Correct execution of the program with PLC activation (based on evaluation with PLC) is guaranteed.
3. The system meets the specifications (in accordance with the 'Agreement on Professional Practice' which has been handed out separately).

The system will be sent to the customer as soon as you are finished. You will have no opportunity to make improvements later.

■ Mechanical information - Production line layout:



1. Handling station (HS)
2. Magazine pickup position
3. Slide drop down position №1(HS)
4. Slide drop down position №2(HS)

Initial position:

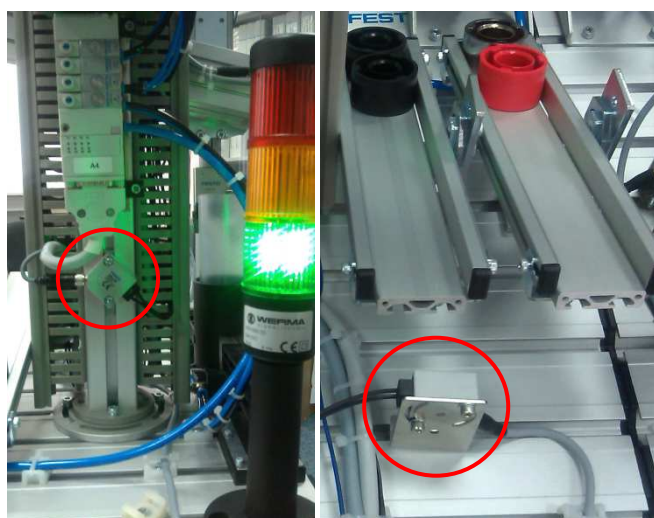
Handling Station (HS):

- Stack magazine ejecting arm retracted (cylinder extended)
- Gripper unit in position slide №2(HS)
- Gripper open
- Gripper up

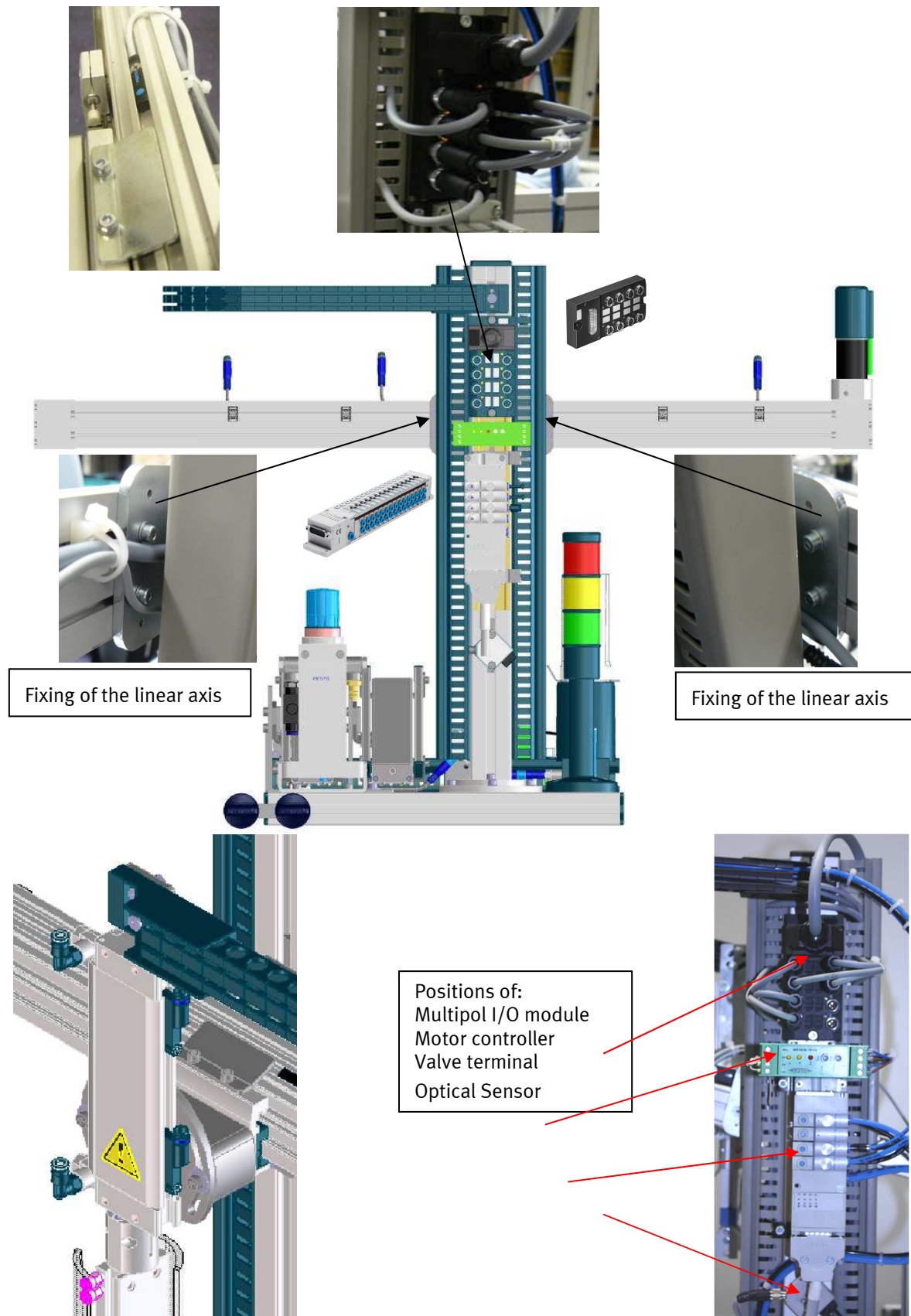
■ Mechanical information – optical sensors at gripper:



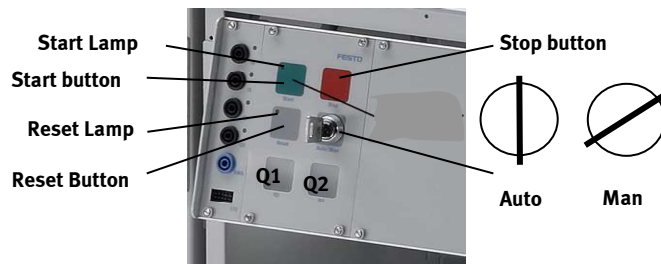
Two optical wires from sensors are installed into gripper jaws.
Sensor «black/not black workpiece» is installed on the vertical profile column.
Sensor «Part AV» is installed near slide №2(HS).



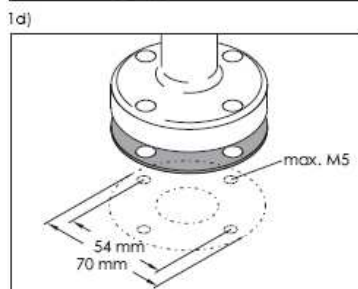
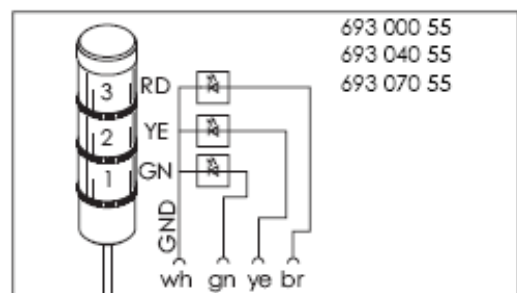
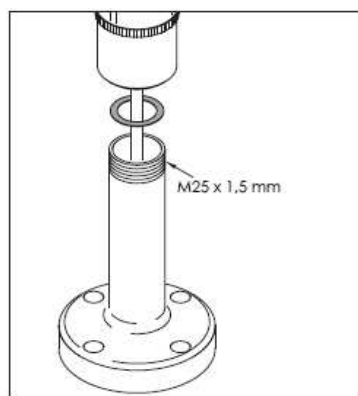
■ Mechanical information - Back side of the Handling unit



■ Electrical information - Control panel



■ Electrical information - Assembly and wiring of signal column



■ Electrical information - Motor controller R/L:

A1 : move to right side / A2 : move to left side

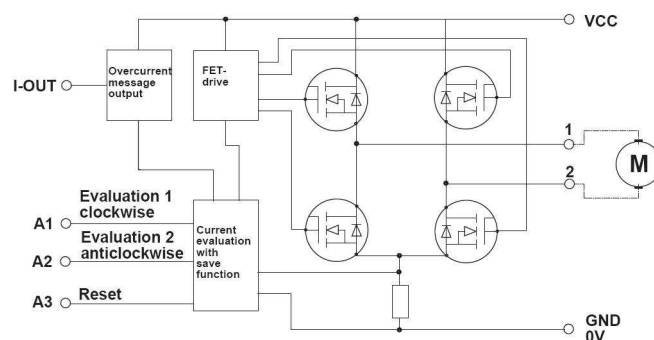
1, 2 : Motor

VCC: 24 V / GND: 0V

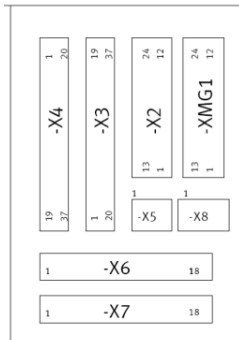
A3 error reset; I-OUT current overload



Block diagram

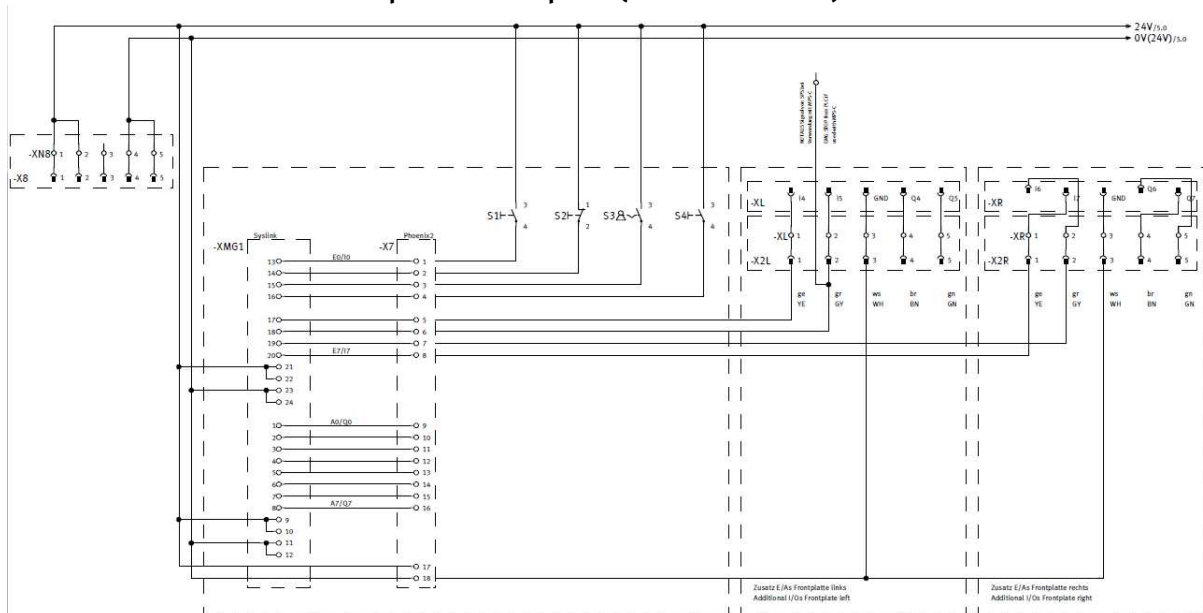


■ Electrical information - Wiring control panel

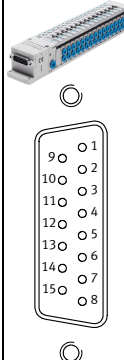


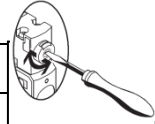
wiring additional signals to -X7 (pin 5-8 Input; pin 13-16 Output)

■ Electrical information - Input of control panel (also on USB-Stick)

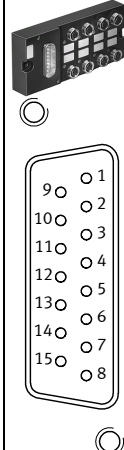


■ Electrical information - Wiring allocation valve terminal

	PIN	Core colour	Coil	Output	Function
	1	White	0	5	Move gripper down
	2	Brown	1	6	Open gripper
	3	Green	2		not used but switch for manual use is ON (-)
	4	Yellow	3	7	Ejecting arm push out workpiece
	5-13	–	–	–	–
	14	Brown-green		0V	
	15	White-yellow		0V	



■ Electrical information - Wiring allocation of sensors to Multipol (MPV)

	PIN	Core colour	M8 socket/ Pin	Output	Function
	1	White	0 / 4	1	Gripper unit in Slide №1 (HS) position
	2	Brown	1 / 4	2	Gripper unit in magazine position
	3	Green	2 / 4	3	Gripper unit in Slide №2 (HS) position
	4	Yellow	3 / 4	4	Gripper up
	5	Grey	4 / 4	5	Gripper down
	6	Pink	5 / 4	6	Workpiece is not black
	7	Blue	6 / 4		not used
	8	Red	7 / 4		not used
	9-12	–	–	–	–
	13	White-green	0-7 / 1	24V DC	
	14	Brown-green	0-7 / 3	0V	
	15	White-yello	0-7 / 3	0V	

Wiring to the Control panel

Connector I/O (IN)	Comment: 1 signal indicates	Connector I/O (OUT)	Comment: 1 signal set
DI 0 - 3	Used by Control panel	DO 0 - 3	Used by Control panel
DI 4 - 5	not used	DO 4 - 5	not used
DI 6	Ejecting cylinder extended	DO 6	not used
DI 7	Ejecting cylinder retracted	DO 7	not used


Evaluation sheet Project 1:


Assembly, programming and commissioning of a Handling station with electrical drive and stack magazine

Team: _____

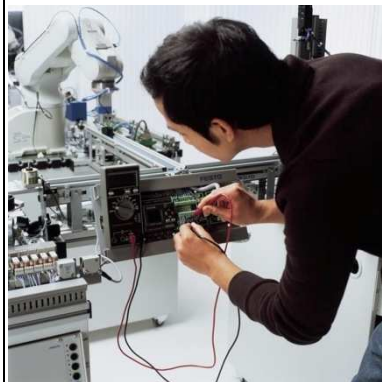
Verification of acceptance by experts (names, signatures): _____

Maximum time: 180 min. / Maximum points: 15

Description		Evaluation	
Function to be checked using simulation box and wiring of the I/O Terminal for the station			
Preparation: Connect the simulation box to the I/O terminal (Output 0 – 7: signal 1 or 0); (Input 0 – 7: signal 1 or 0)		Done	Max points
Connector I/O Terminal (IN)	Comment signal 1 indicates		
DI 0	Stack magazine ejecting arm retracted (cylinder extended)		0,4
DI 1	Gripper unit is in Slide 1(HS) position		0,4
DI 2	Gripper unit is in magazine position		0,4
DI 3	Gripper unit is in Slide 2(HS) position		0,4
DI 4	Gripper is up		0,4
DI 5	Gripper is down		0,4
DI 6	Workpiece is not black		0,4
DI 7	Workpiece is in magazine pickup position		0,4
Connector I/O Terminal (IN)	Comment signal 1 set	-	-
DO 0	Signal lamp Green		0,4
DO 1	Signal lamp Yellow		0,4
DO 2	Signal lamp Red		0,4
DO 3	Gripper unit to right hand side (Slide 1 and 2(HS) positions)		0,4
DO 4	Gripper unit to left hand side (magazine position)		0,4
DO 5	Gripper down		0,4
DO 6	Open gripper		0,4
DO 7	Ejecting arm push out workpiece		0,4
SimuBox Total			6,4

Description / checked using PLC	Evaluation	
<p>1. Function Operation mode</p> <p>2. Function of the production in general</p> <p>3. Function Quality of production and signals (no evaluation in Project 1)</p> 	Done	Max points
<p>Preparation: Connect the PLC board with the I/O terminal and the control panel, switch key to the position AUTO, start the PLC, no programming cable and no communication between PC and PLC, valve for air opened, Handling linear between Magazine and slide №1(HS) position. Magazine is empty. You will get time to check that before the evaluation!</p>		
<p>1. Function Operation mode</p> <p>RED Signal lamp ON and <u>YELLOW</u> signal lamp ON and Reset lamp ON (1/3 marks for each aspect)</p> <p>Switch key to position MAN (HS), RED signal lamp OFF **</p> <p>Press Reset button (HS), then station moves to initial position</p> <p>Reset lamp OFF if the station is in the initial position</p> <p>Switch key to position AUTO (HS), GREEN signal lamp ON **, Start lamp flashing 1 Hz (1/2 marks for each aspect)</p> <p>**At any time only one lamp of the signal column is on**</p> <p>PLC board Operation mode total</p>	-	-
<p>2. Function of the production in general</p> <p>Station is in the initial position (competitors allowed to reach it manually or via control panel)</p> <p>Key is in position AUTO (HS)</p> <p>Competitor selects one workpiece for the evaluation and puts it into the magazine.</p> <p>Press Start button (HS) then Start lamp is OFF, workpiece distribute out of magazine, gripping, putting on the slide 1 or 2(HS) (1/4 marks for each aspect)</p> <p>Start lamp flashing 1 Hz if the station is in the initial position</p> <p>PLC board Function of the production in general total</p>	-	-
<p>PLC board total</p>		4,6

3. Function Quality of production and signals(no evaluation in Project 1)	-	-
Put 3 workpieces into the magazine (to be announced). Start from the initial position (competitors allowed to reach it manually or via control panel) Key is in position AUTO (HS). Attention: When the function stops with one of the workpieces then the evaluation is finished. (no manual help allowed)		
GREEN signal lamp ON **, Start lamp flashing 1 Hz (1/2 marks for each aspect)	-	-
A: Press Start button (HS), then Start lamp OFF (1/3 marks for each color)	-	-
Distribute workpiece out of the magazine (1/3 marks for each aspect)	-	-
If a workpiece is black:	-	-
Transport workpiece to the slide 1(HS), and lamp Q1 ON (1/2 marks for each aspect)	-	-
Workpiece placed to the slide 1(HS), and after placing lamp Q1 OFF ==> B: (1/2 marks for each aspect)	-	-
If a workpiece is silver:	-	-
Transport workpiece to the slide 2(HS), and lamp Q2 ON (1/2 marks for each aspect)	-	-
Workpiece placed to the slide 2(HS), and after placing lamp Q2 OFF ==> B: (1/2 marks for each aspect)	-	-
If a workpiece is red:	-	-
Transport workpiece to the slide 2(HS), and lamp Q2 ON (1/2 marks for each aspect)	-	-
Workpiece placed to the slide 2(HS), and after placing lamp Q2 OFF ==> B: (1/2 marks for each aspect)	-	-
B: After each process the station moves to initial position (1/3 marks for each color)	-	-
If station is in initial position Start lamp flashing 1 Hz (1/3 marks for each color)	-	-
Continue with A: (1/3 marks for each color)	-	-
At any time only one lamp of the signal column is on	-	-
PLC board Function Quality of production and signals total	-	-

Description		Evaluation	Max points
Professional Practice 		List of Professional Practice will be checked in samples	
PP item No	Description	-	-
*			0,4
*			0,4
*			0,4
*			0,4
*			0,4
*			0,4
*			0,4
*			0,4
*			0,4
Professional Practice total			4

* Each deviation will result in 0,4 points being deducted

Total evaluation Project 1:

Description / points for	Evaluation	Max points
Operation based on simulation box	_____	6,4
Operation based on PLC board: Function Operation mode	_____	2
Operation based on PLC board: Function of the production in general	_____	2,6
Professional Practice	_____	4
Total points Project 1	_____	15