




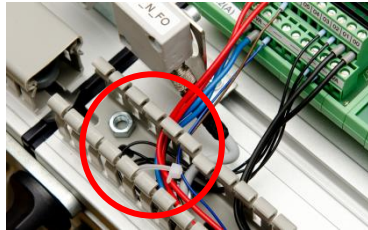














## Skill Mechatronic

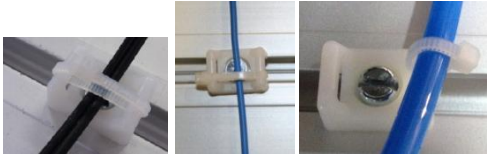

### Guideline Professional practice judgment 2019







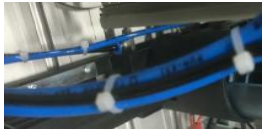


#### Ver. 1.4.1


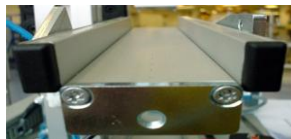


1. Cleanliness of the workplace and the station	3 Points:	2 Points:	1 Point:	0 Points:
	excellence	professional	Optimization / rework necessary	Not acceptable
<u>Guidelines for marking the aspect</u> 3: If all conditions below are fulfilled. To award a mark less than 3 the experts must show the competitors what they need to improve. 2: If there are one or a few minor deviations. 1: If there is a major deviation or more than a few minor deviations. 0: If the work is far from the standard specified.	<i>ok</i>		<i>not ok</i>	
Tools must not be left on the stations, chairs, or the floor of workspace.			  	
Unused components and workpieces must be removed from the stations.			 	
Stations must be free of waste, off-cuts or any other debris. This also includes the inside of cable channels.				

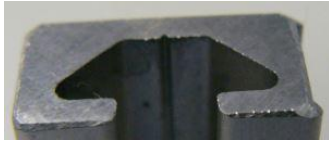
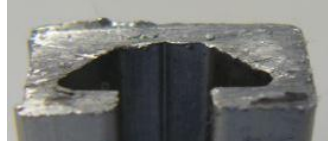

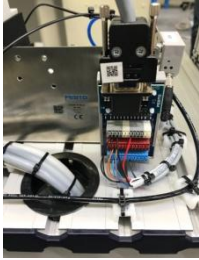
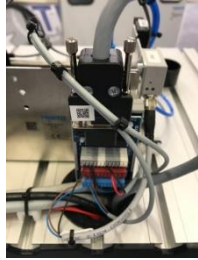
<p>Unused parts have to be placed together on the table or in a box. Unused parts shall be separated from tools, waste, and consumables that the team have supplied.</p>		 
<p>Markings (tape, pencil, etc.) may be used during the tasks, but in that case, they must be removed completely before evaluation.</p>		
<p>The floor of the workspace shall be clean from waste generated from the competitors work.</p>		

2. Routing of tubes and cables	3 Points:	2 Points:	1 Point:	0 Points:
	excellence	professional	Optimization / rework necessary	Not acceptable
<p><u>Guidelines for marking the aspect</u></p> <p>3: If all conditions below are fulfilled. To award a mark less than 3 the experts must show the competitors what they need to improve.</p> <p>2: If there are one or a few minor deviations.</p> <p>1: If there is a major deviation or more than a few minor deviations.</p> <p>0: If the work is far from the standard specified, or if the work is not completed.</p>	ok		not ok	
<p>Cable, tubes and water piping must be routed separately.</p> <p>Optical cables may be tied to electrical cables.</p> <p>Exception to this rule when the cables and tubes are connected to a moving module. In this case routing all cables and tubes together is preferred.</p>				
<p>Remaining length of cut cable ties, A:</p> <p><math>A \leq 1 \text{ mm}</math></p>				
<p>All cables and tubes going downwards on a profile e.g. at the "Pick &amp; Place" station have to be mounted with cable clips.</p>				
<p>Distance between cable ties: <math>\leq 50 \text{ mm}</math>.</p> <p>This also applies to cables under the profile plate.</p>				



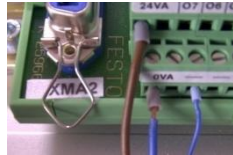


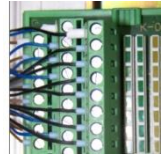
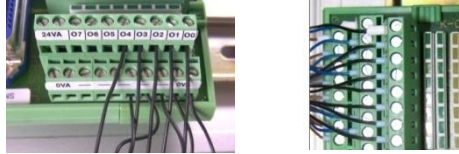
<p>The only acceptable method for binding Cable / Wire / Optical Cables / Tubes is to use cable holders. Cables and tubes shall be tightened to the cable holder. The cable tie shall go through both sides of the holder. For single wire it is allowed to use just one side.</p>		
<p>Distance between cable holders <math>\leq 120</math> mm Short connections between optical sensor and transmitter are also allowed. No coiling of the cables, if proper cut to length is possible. Exceptions can be announced in special cases.</p>		
<p>Conductors passing over DIN rails or routed around sharp corners must be secured using 2 cable holders.</p>		
<p>Airflow must not be restricted by kinks in the tubing, over-tight cable ties, etc.</p>		
<p>No pneumatic tubes routed through cable channels.</p>		

All cables and tubes routed through a flexible cable duct / drag chain must be fixed to the end of the chain, using cable ties.		
Distance from the shortest pneumatic connection to the first cable tie: 60 mm +/- 5mm		
Pneumatic and water connections must be leak-free.		
Bending radius of light conductor > 25 mm		<div>Radius too small but sensor works</div>  <div>Light conductor broken because of too small bending radius.</div>
Cables and tubes tied together do not cross each other more than necessary.	 	 


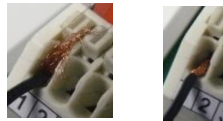

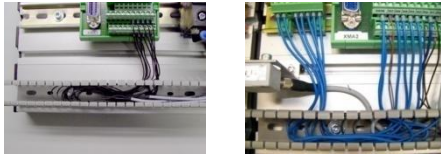
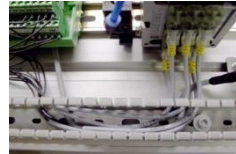

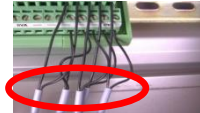
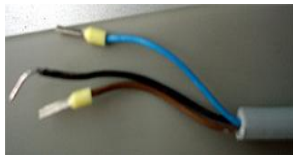
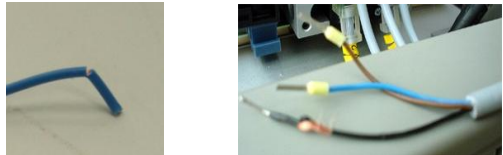
3. Mechanical implementation	3 Points:	2 Points:	1 Point:	0 Points:
	excellence	professional	Optimization / rework necessary	Not acceptable
<p><u>Guidelines for marking the aspect</u></p> <p>3: If all conditions below are fulfilled. To award a mark less than 3 the experts must show the competitors what they need to improve.</p> <p>2: If there are one or a few minor deviations.</p> <p>1: If there is a major deviation or more than a few minor deviations.</p> <p>0: If the work is far from the standard specified, or if the work is not completed.</p>	ok		not ok	
<p>All system components and modules must be secured (fixed)</p> <p>➤ Check by Hand of Expert</p>				
<p>All actors and workpieces have to move without collisions.</p> <p>Note: This must be noted by PLC evaluation team</p>	Free movement of all actuators, cables, tubing and workpieces.	Minor collision, for example tubing touching a moving part, not affecting the function.	Major collision, for example if gripper crashes to the workpiece, or workpieces fall off the system.	
<p>Adjoining stations must be connected with at least 2 connectors.</p>				
<p>All ends of profiles must be fitted with caps.</p>				
<p>Use at least 2 screws with washers to secure any section of cable channel.</p> <p>➤ Expert will open the cable channel to see that.</p>				

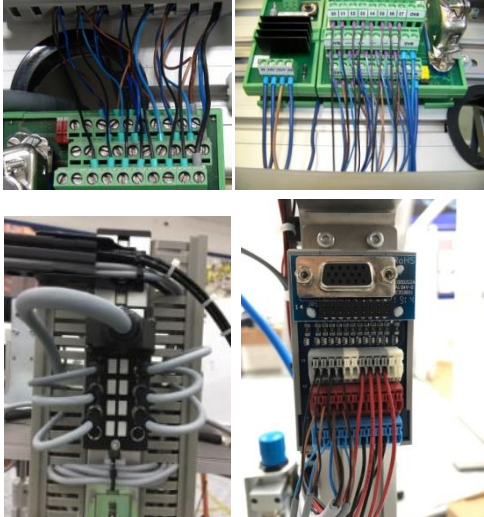
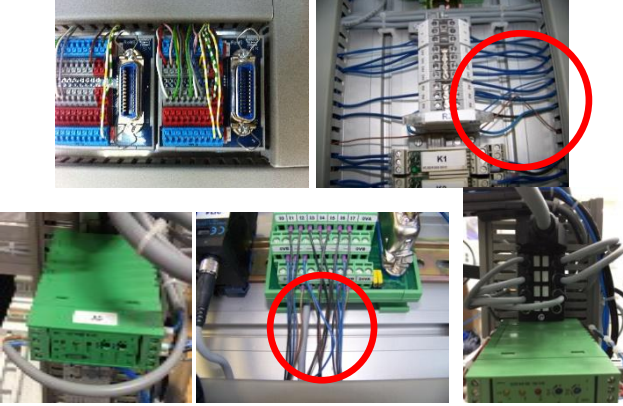
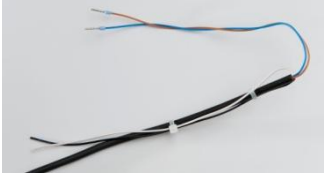





Screw heads have to be undamaged.		
Saw-cuts must be burr-free.		
Parts of devices and components should not extend beyond the profile plate. Exceptions will be announced by the expert team.		
All components shown in the 3D sketches and photos have to be assembled on the MPS-stations.		Missing component not affecting the function of the system.
The station elements must not prevent the cables from escaping from the mounting hole		


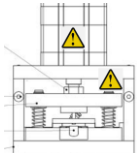





4. Electrical installation and wiring of the components	3 Points:	2 Points:	1 Point:	0 Points:
	excellence	professional	Optimization / rework necessary	Not acceptable
<p><u>Guidelines for marking the aspect</u></p> <p>3: If all conditions below are fulfilled. To award a mark less than 3 the experts must show the competitors what they need to improve.</p> <p>2: If there are one or a few minor deviations.</p> <p>1: If there is a major deviation or more than a few minor deviations.</p> <p>0: If the work is far from the standard specified, or if the work is not completed.</p>	ok		not ok	
<p>All signal terminations must be secured.</p> <p>➤ Check by Hand of Expert</p>				
Bare conductors must not be visible at end sleeves.				
Insertion of end sleeves into terminals			<p>Uninsulated portion of end sleeve visible</p> 	
<p>Insulated end sleeves of the correct size for the wire must be used on all screw terminals</p> <p>Available sizes are: 0.25, 0.5, 0.75 mm<sup>2</sup></p> <p>Exceptions for clamp connections (only for screws)</p>				



<p>Clamp type connections may be made without the use of end sleeves.</p>		<p>Bare conductors must not extend beyond terminal.</p> 
<p>The cable channel should not be overfilled. The cover of the channel cable should be opened and closed easily.</p> <p>➤ Check by Hand of Expert</p>		
<p>Electrical cables must have a minimum of 100 mm reserve in the cable channel.</p> <p>Unnecessary when it is a bridge in the same cable channel.</p> <p>➤ Expert will open the cable channel to see that.</p>		
<p>Outer cable insulation must not extend beyond cable channel.</p>		
<p>No damage to wire insulation or exposure of bare conductors.</p>		

<p>Conductors between cable channel and terminals must not cross. One sensor / actuator connection per cable duct slot is allowed. No wiring over components</p>		
<p>Loose ends of wire must be tied back to cable and must have the same length as used wires. Insulation must be left to prevent any contact being made. This applies both inside and outside of the cable channel.</p>		
<p>Cable channels must be completely closed with all teeth under the cover.</p>		
<p>Removal of cable channel teeth. Note: There will be no replacement of the channel.</p>		

5. Special cases, announced by experts and the overall impression	3 Points:	2 Points:	1 Point:	0 Points:
	excellence	professional	Optimization / rework necessary	Not acceptable
<p><u>Guidelines for marking the aspect</u></p> <p>3: If all conditions below are fulfilled. To award a mark less than 3 the experts must show the competitors what they need to improve.</p> <p>2: If there are one or a few minor deviations.</p> <p>1: If there is a major deviation or more than a few minor deviations.</p> <p>0: If the work is far from the standard specified.</p>	ok		not ok	
<p>No parts or components should be lost or damaged during assembly of equipment.</p> <p>Note: This must be noted by the time keeper if replacements need to be supplied.</p>				
<p>Competitors shall not work in a way where they risk injury to themselves, or other people. This includes the use of prohibited tools and cleaning with compressed air.</p> <p>Note: This must be noted by the time keeper and verified by the ESR for H&amp;S.</p>				
<p>All warning labels must be affixed and in the specified positions.</p>				

<p>For the evaluation the profile plate has to be in the lowest possible position.</p>		
<p>It is not allowed to prepare workpieces with tape or similar additives. Note: This must be noted by PLC evaluation team Exceptions will be announced by the expert team.</p>		
<p>For each station, a separate PLC (distributed I/O module) is used, which must be located in the mobile base of the station for which it is intended</p>	