

**SKILLS FRAMEWORK FOR PRECISION ENGINEERING  
TECHNICAL SKILLS AND COMPETENCIES (TSC) REFERENCE DOCUMENT**

<b>TSC Category</b>	Automation Management					
<b>TSC</b>	Automated Operation Monitoring					
<b>TSC Description</b>	Ensure smooth automation operations by maintaining and monitoring the automated systems and manufacturing process flows					
<b>TSC Proficiency Description</b>	<b>Level 1</b>	<b>Level 2</b>	<b>Level 3</b>	<b>Level 4</b>	<b>Level 5</b>	<b>Level 6</b>
	<b>PRE-RAO-1002-1.1</b>	<b>PRE-RAO-2002-1.1</b>	<b>PRE-RAO-3002-1.1</b>	<b>PRE-RAO-4002-1.1</b>		
	Operate automated robots and system to monitor the performance of robots and systems to maximise manufacturing efficiency	Set up programmable logic control (PLC) based on control requirements to monitor inputs and outputs, and make logic-based decisions for automated processes or machines	Rectify automation system breakdowns to achieve minimum disruption to operation problems	Manage the operations of the manufacturing execution system (MES) using tracking tools to track tools and lot status and determine follow-up actions for abnormalities		
<b>Knowledge</b>	<ul style="list-style-type: none"> <li>• Operation terminologies</li> <li>• Functions of robots and smart automated tools</li> <li>• Manufacturing execution systems</li> <li>• Application of statistical and sampling rules to dashboards</li> <li>• Manufacturing process flows</li> <li>• Safety in day-to-day robotic operations</li> </ul>	<ul style="list-style-type: none"> <li>• Control requirements interpretation</li> <li>• Types, characteristics and operating principles of input and output devices</li> <li>• Types of connections</li> <li>• Types and characteristics of PLCs and programming input devices</li> <li>• Selection of types of general purpose equipment, tools and materials</li> <li>• Electrical symbols and schematic diagrams interpretation</li> <li>• Power supply voltage analysis</li> <li>• Safe practices in assembling and operating PLC control systems</li> </ul>	<ul style="list-style-type: none"> <li>• Systematic troubleshooting approach (top-down or bottom-up) and component level verification</li> <li>• Electrical alternating current /direct current (AC/DC) wiring diagram and electronics components circuitry for troubleshooting purposes</li> <li>• Programmable logic control (PLC) and micro-processor system structure, driver and input/output (I/O) signal testing</li> <li>• Pneumatics and hydraulics functionality</li> <li>• Robot axis and/or motion calibrations</li> <li>• PLC programming and controls</li> <li>• Automation simulation software</li> <li>• Common process control applications</li> </ul>	<ul style="list-style-type: none"> <li>• Terminologies used in the manufacturing plants</li> <li>• Functions of the MES</li> <li>• Manufacturing process flow</li> </ul>		
<b>Abilities</b>	<ul style="list-style-type: none"> <li>• Perform basic operations on user interfaces</li> </ul>	<ul style="list-style-type: none"> <li>• Plan work activities and requirements in</li> </ul>	<ul style="list-style-type: none"> <li>• Handle and/or set up simple measuring tools</li> </ul>	<ul style="list-style-type: none"> <li>• Identify MES functions</li> </ul>		

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	<ul style="list-style-type: none"> <li>Operate required operation systems and machines to support manufacturing operations</li> <li>Monitor performance of automated robots and systems in assigned manufacturing areas</li> </ul>	<p>accordance with organisational procedures</p> <ul style="list-style-type: none"> <li>Select appropriate input/output (I/O) devices and related items in accordance with control requirements</li> <li>Set up PLCs</li> <li>Assemble control systems in accordance with design requirements</li> <li>Test set-up of PLCs</li> <li>Conclude testing of PLCs</li> <li>Apply safe work practices while operating and testing the control system</li> </ul>	<ul style="list-style-type: none"> <li>Troubleshoot robot failure issues</li> <li>Optimise basic robot motions and functions</li> <li>Optimise robot movement and routes</li> <li>Calibrate robot motors, sensors and encoders</li> <li>Calibrate X-Y-Z axes of robot arm mechanical alignment</li> </ul>	<ul style="list-style-type: none"> <li>Track tool status using MES</li> <li>Track lot status using MES</li> <li>Identify problems encountered in the MES</li> <li>Determine follow-up actions to recover problems</li> </ul>		
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