<table>
<thead>
<tr>
<th>TSC Category</th>
<th>Automation Management</th>
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<tbody>
<tr>
<td>TSC</td>
<td>Automated Operation Monitoring</td>
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<tr>
<td>TSC Description</td>
<td>Ensure smooth automation operations by maintaining and monitoring the automated systems and manufacturing process flows</td>
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<tr>
<th>TSC Proficiency Description</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
<th>Level 6</th>
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<tr>
<td>Operate automated robots and system to monitor the performance of robots and systems to maximise manufacturing efficiency</td>
<td>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</td>
<td>Rectify automation system breakdowns to achieve minimum disruption to operation problems</td>
<td>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</td>
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**Knowledge**

- Operation terminologies
- Functions of robots and smart automated tools
- Manufacturing execution systems
- Application of statistical and sampling rules to dashboards
- Manufacturing process flows
- Safety in day-to-day robotic operations
- Control requirements interpretation
- Types, characteristics and operating principles of input and output devices
- Types of connections
- Types and characteristics of PLCs and programming input devices
- Selection of types of general purpose equipment, tools and materials
- Electrical symbols and schematic diagrams interpretation
- Power supply voltage analysis
- Safe practices in assembling and operating PLC control systems
- Systematic troubleshooting approach (top-down or bottom-up) and component level verification
- Electrical alternating current/direct current (AC/DC) wiring diagram and electronics components circuitry for troubleshooting purposes
- Programmable logic control (PLC) and microprocessor system structure, driver and input/output (I/O) signal testing
- Pneumatics and hydraulics functionality
- Robot axis and/or motion calibrations
- PLC programming and controls
- Automation simulation software
- Common process control applications

**Abilities**

- Perform basic operations on user interfaces
- Plan work activities and requirements in
- Handle and/or set up simple measuring tools
- Identify MES functions

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

- Operate required operation systems and machines to support manufacturing operations
- Monitor performance of automated robots and systems in assigned manufacturing areas
- Accurately control and operate PLCs
- Assemble control systems in accordance with design requirements
- Test set-up of PLCs
- Conclude testing of PLCs
- Apply safe work practices while operating and testing the control system
- Troubleshoot robot failure issues
- Optimise basic robot motions and functions
- Optimise robot movement and routes
- Calibrate robot motors, sensors and encoders
- Calibrate X-Y-Z axes of robot arm mechanical alignment
- Track tool status using MES
- Track lot status using MES
- Identify problems encountered in the MES
- Determine follow-up actions to recover problems