



## Automotive Smart Manufacturing Engineer

QP Code: ASC/Q8307

Version: 1.0

NSQF Level: 6

Automotive Skills Development Council || 153, Gr Floor, Okhla Industrial Area, Phase - III, Leela Building, New Delhi - 110020

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## ASC/Q8307:Automotive Smart Manufacturing Engineer

### Brief Job Description

The individual at this job is responsible for managing and developing automated and non-automation systems, IIoT sensors, IO-link trans-receivers, and IO-Link based electronic communication for dashboards. They also establish healthy communication using industrial networking standard for machine integration to fetch vital machine data using IIoT edge devices within the organization for all its manufacturing process new developments.

### Personal Attributes

The person should be result oriented with good technical and analytical skills, should have Excellent Interpersonal Skills, communication and presentation skills and a good team player. They should have ability to manage projects, prioritizing of work and mentoring the budding engineers.

### Applicable National Occupational Standards (NOS)

#### Compulsory NOS:

1. [ASC/N9810: Manage work and resources \(Manufacturing\)](#)
2. [ASC/N9812: Interact effectively with team, customers and others](#)
3. [ASC/N8320: Selection and designing of IIoT sensors, dashboard and automation systems](#)
4. [ASC/N8321: Manage integration of IIoT sensors, edge devices and machines with robots and industrial automated systems](#)
5. [ASC/N8322: Manage remote monitoring, controlling and data acquisition through IIoT sensors and edge devices](#)

### Qualification Pack (QP) Parameters

Sector	Automotive
Sub-Sector	Manufacturing
Occupation	Automotive Product Development
Country	India
NSQF Level	6
Aligned to NCO/ISCO/ISIC Code	NCO-2015/NIL
Minimum Educational Qualification & Experience	M.E./M.Tech in the relevant field OR B.E./B.Tech in the relevant field with 1 Year of

	<p>relevant experience, OR 3 years Diploma (Mechanical/Automobile/Electrical / Electronics) from recognized regulatory body after class 12th with 3 years of relevant experience OR Certificate-NSQF (Automotive Prototype Manufacturing Lead Technician Level 5) with 3 Years of relevant experience</p>
<b>Minimum Level of Education for Training in School</b>	
<b>Pre-Requisite License or Training</b>	NA
<b>Minimum Job Entry Age</b>	22 Years
<b>Last Reviewed On</b>	28 <sup>th</sup> July,2022
<b>Next Review Date</b>	28 <sup>th</sup> July,2025
<b>NSQC Approval Date</b>	28 <sup>th</sup> July,2022
<b>Version</b>	1.0

## ASC/N9810: Manage work and resources (Manufacturing)

### Description

This NOS unit is about implementing safety, planning work, adopting sustainable practices for optimising the use of resources.

### Scope

The scope covers the following :

- Maintain safe and secure working environment
- Maintain Health and Hygiene
- Effective waste management practices
- Material/energy conservation practices

### Elements and Performance Criteria

#### *Maintain safe and secure working environment*

To be competent, the user/individual on the job must be able to:

- PC1. identify hazardous activities and the possible causes of risks or accidents in the workplace
- PC2. implement safe working practices for dealing with hazards to ensure safety of self and others
- PC3. conduct regular checks of the machines with support of the maintenance team to identify potential hazards
- PC4. ensure that all the tools/equipment/fasteners/spare parts are arranged as per specifications/utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions
- PC5. organise safety drills or training sessions to create awareness amongst others on the identified risks and safety practices
- PC6. fill daily check sheet to report improvements done and risks identified
- PC7. ensure that relevant safety boards/signs are placed on the shop floor for the safety of self and others
- PC8. report any identified breaches in health, safety and security policies and procedures to the designated person

#### *Maintain Health and Hygiene*

To be competent, the user/individual on the job must be able to:

- PC9. ensure workplace, equipment, restrooms etc. are sanitized regularly
- PC10. ensure team is aware about hygiene and sanitation regulations and following them on the shop floor
- PC11. ensure availability of running water, hand wash and alcohol-based sanitizers at the workplace
- PC12. report advanced hygiene and sanitation issues to appropriate authority
- PC13. follow stress and anxiety management techniques and support employees to cope with stress, anxiety etc
- PC14. wear and dispose PPEs regularly and appropriately

#### *Effective waste management practices*

To be competent, the user/individual on the job must be able to:

PC15. ensure recyclable, non-recyclable and hazardous wastes are segregated as per SOP

PC16. ensure proper mechanism is followed while collecting and disposing of non-recyclable, recyclable and reusable waste

#### *Material/energy conservation practices*

To be competent, the user/individual on the job must be able to:

PC17. ensure malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment are resolved effectively

PC18. prepare and analyze material and energy audit reports to decipher excessive consumption of material and water

PC19. identify possibilities of using renewable energy and environment friendly fuels

PC20. identify processes where material and energy/electricity utilization can be optimized

### **Knowledge and Understanding (KU)**

The individual on the job needs to know and understand:

KU1. organisation procedures for health, safety and security, individual role and responsibilities in this context

KU2. the organisation's emergency procedures for different emergency situations and the importance of following the same

KU3. evacuation procedures for workers and visitors

KU4. how and when to report hazards as well as the limits of responsibility for dealing with hazards

KU5. potential hazards, risks and threats based on the nature of work

KU6. various types of fire extinguisher

KU7. various types of safety signs and their meaning

KU8. appropriate first aid treatment relevant to different condition e.g. bleeding, minor burns, eye injuries etc.

KU9. relevant standards, procedures and policies related to 5S followed in the company

KU10. the various materials used and their storage norms

KU11. importance of efficient utilisation of material and water

KU12. basics of electricity and prevalent energy efficient devices

KU13. common practices of conserving electricity

KU14. common sources and ways to minimize pollution

KU15. categorisation of waste into dry, wet, recyclable, non-recyclable and items of single-use plastics

KU16. waste management techniques

KU17. significance of greening

### **Generic Skills (GS)**

User/individual on the job needs to know how to:

- GS1. read safety instructions/guidelines
- GS2. modify work practices to improve them
- GS3. work with supervisors/team members to carry out work related tasks
- GS4. complete tasks efficiently and accurately within stipulated time
- GS5. inform/report to concerned person in case of any problem
- GS6. make timely decisions for efficient utilization of resources
- GS7. write reports such as accident report, in at least English/regional language

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Maintain safe and secure working environment</i>	20	13	-	8
PC1. identify hazardous activities and the possible causes of risks or accidents in the workplace	4	2	-	2
PC2. implement safe working practices for dealing with hazards to ensure safety of self and others	3	1	-	2
PC3. conduct regular checks of the machines with support of the maintenance team to identify potential hazards	2	2	-	1
PC4. ensure that all the tools/equipment/fasteners/spare parts are arranged as per specifications/utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions	3	2	-	1
PC5. organise safety drills or training sessions to create awareness amongst others on the identified risks and safety practices	2	-	-	-
PC6. fill daily check sheet to report improvements done and risks identified	2	2	-	-
PC7. ensure that relevant safety boards/signs are placed on the shop floor for the safety of self and others	2	2	-	1
PC8. report any identified breaches in health, safety and security policies and procedures to the designated person	2	2	-	1
<i>Maintain Health and Hygiene</i>	13	7	-	5
PC9. ensure workplace, equipment, restrooms etc. are sanitized regularly	3	2	-	1
PC10. ensure team is aware about hygiene and sanitation regulations and following them on the shop floor	2	1	-	-
PC11. ensure availability of running water, hand wash and alcohol-based sanitizers at the workplace	2	2	-	1
PC12. report advanced hygiene and sanitation issues to appropriate authority	1	1	-	1



Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. follow stress and anxiety management techniques and support employees to cope with stress, anxiety etc	2	1	-	1
PC14. wear and dispose PPEs regularly and appropriately	3	-	-	1
<i>Effective waste management practices</i>	6	4	-	1
PC15. ensure recyclable, non-recyclable and hazardous wastes are segregated as per SOP	3	2	-	-
PC16. ensure proper mechanism is followed while collecting and disposing of non-recyclable, recyclable and reusable waste	3	2	-	1
<i>Material/energy conservation practices</i>	11	6	-	6
PC17. ensure malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment are resolved effectively	2	2	-	1
PC18. prepare and analyze material and energy audit reports to decipher excessive consumption of material and water	3	2	-	1
PC19. identify possibilities of using renewable energy and environment friendly fuels	3	1	-	2
PC20. identify processes where material and energy/electricity utilization can be optimized	3	1	-	2
<b>NOS Total</b>	<b>50</b>	<b>30</b>	<b>-</b>	<b>20</b>

## National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	ASC/N9810
<b>NOS Name</b>	Manage work and resources (Manufacturing)
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Generic
<b>Occupation</b>	Generic
<b>NSQF Level</b>	6
<b>Credits</b>	TBD
<b>Version</b>	1.0
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## ASC/N9812: Interact effectively with team, customers and others

### Description

This unit is about communicating with team members, superior and others.

### Scope

The scope covers the following :

- Communicate effectively with team members
- Interact with superiors
- Respect gender and ability differences

### Elements and Performance Criteria

#### *Communicate effectively with team members*

To be competent, the user/individual on the job must be able to:

- PC1. implement ways to share information with team members in line with organisational requirements
- PC2. ensure that work requirements are clearly communicated to the team members through all means including face-to-face, telephonic and written
- PC3. manage and co-ordinate with team members to integrate work as per requirements
- PC4. work in a way that show respect for all team members and customers
- PC5. carry out commitments made to team members and let them know in good time if there is any discrepancy with reasons
- PC6. resolve conflicts within the team members at work to achieve smooth workflow
- PC7. guide the team members to follow the organisation's policies and procedures
- PC8. ensure team goals are given preference over individual goals
- PC9. respect personal space of colleagues and customers

#### *Interact with superiors*

To be competent, the user/individual on the job must be able to:

- PC10. report progress on job allocated and team performance to the superiors
- PC11. escalate problems to superiors that cannot be handled
- PC12. train the team members to report completed work and receive feedback on work done
- PC13. encourage team members to rectify errors as per feedback and minimize mistakes in future

#### *Respect gender and ability differences*

To be competent, the user/individual on the job must be able to:

- PC14. ensure team shows sensitivity towards all genders and PwD
- PC15. adjust communication styles to reflect gender sensitivity and sensitivity towards person with disability
- PC16. help PwD team members to overcome the challenges, if asked

### Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. the importance of effective communication and establishing good working relationships with team members and superiors
- KU2. different methods of communication as per the circumstances
- KU3. gender based concepts, issues and legislation
- KU4. organisation standards and guidelines to be followed for PwD
- KU5. rights and duties at workplace with respect to PwD
- KU6. organisation policies and procedures pertaining to written and verbal communication

### Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. read safety instructions/guidelines
- GS2. modify work practices to improve them
- GS3. work with supervisors/team members to carry out work related tasks
- GS4. complete tasks efficiently and accurately within stipulated time
- GS5. make timely decisions for efficient utilization of resources
- GS6. read instructions/guidelines/procedures
- GS7. write in English/any one language

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Communicate effectively with team members</i>	20	14	-	8
PC1. implement ways to share information with team members in line with organisational requirements	2	2	-	-
PC2. ensure that work requirements are clearly communicated to the team members through all means including face-to-face, telephonic and written	2	2	-	2
PC3. manage and co-ordinate with team members to integrate work as per requirements	2	1	-	2
PC4. work in a way that show respect for all team members and customers	3	1	-	2
PC5. carry out commitments made to team members and let them know in good time if there is any discrepancy with reasons	2	2	-	-
PC6. resolve conflicts within the team members at work to achieve smooth workflow	3	2	-	-
PC7. guide the team members to follow the organisation's policies and procedures	2	1	-	-
PC8. ensure team goals are given preference over individual goals	2	1	-	-
PC9. respect personal space of colleagues and customers	2	2	-	2
<i>Interact with superiors</i>	18	10	-	7
PC10. report progress on job allocated and team performance to the superiors	4	3	-	2
PC11. escalate problems to superiors that cannot be handled	4	2	-	1
PC12. train the team members to report completed work and receive feedback on work done	5	2	-	2
PC13. encourage team members to rectify errors as per feedback and minimize mistakes in future	5	3	-	2

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Respect gender and ability differences</i>	12	6	-	5
PC14. ensure team shows sensitivity towards all genders and PwD	4	2	-	2
PC15. adjust communication styles to reflect gender sensitivity and sensitivity towards person with disability	4	2	-	2
PC16. help PwD team members to overcome the challenges, if asked	4	2	-	1
<b>NOS Total</b>	<b>50</b>	<b>30</b>	-	<b>20</b>

## National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	ASC/N9812
<b>NOS Name</b>	Interact effectively with team, customers and others
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Generic
<b>Occupation</b>	Generic
<b>NSQF Level</b>	6
<b>Credits</b>	TBD
<b>Version</b>	1.0
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## ASC/N8320: Selection and designing of IIoT sensors, dashboard and automation systems

### Description

This NOS unit is about performing tasks related to designing, selection and integration of IIoT sensors with automation systems for the manufacturing processes to meet the specification set by the organization.

### Scope

The scope covers the following :

- Assess project requirements
- Design and develop IIoT sensors with IO-Link and interactive dashboards
- Define and design network protocol and their parameters
- Perform testing of the developed sensors in automation system and dashboard

### Elements and Performance Criteria

#### *Assess project requirements*

To be competent, the user/individual on the job must be able to:

- PC1. evaluate the requirements of the IIoT network, sensors, to work with automation system in manufacturing
- PC2. interpret the project's module design by obtaining information from mechanical drawings and layout diagram
- PC3. identify appropriate technology, devices, and deployment model to meet the overall needs of the IIoT network for smart manufacturing process
- PC4. identify and select required sensors, specific hardware, components and type of materials as per the system requirements
- PC5. select appropriate core and auxiliary support process as per specifications & drawings

#### *Design and development of IIoT sensors with IO-Link and interactive dashboards*

To be competent, the user/individual on the job must be able to:

- PC6. prepare design of hardware schematics and PCB dimension to integrate sensor, microcontroller and trans-receivers for development of IIoT sensors with IO-Links as per organization SOP and guidelines
- PC7. design IO-Link system for switch console as per design requirements
- PC8. prepare electrical wiring schematic diagram for connecting sensors, machines, robots and automation system and project documentation as per organizational SOP and guidelines
- PC9. design firmware for IIoT sensors IO-links, switch consoles for interfacing with the DATA-Link protocol

#### *Define and design network protocols and their parameters*

To be competent, the user/individual on the job must be able to:

- PC10. design network nodes (wired and wireless) to connect IIoT sensors and edge devices, and apply connectivity protocol for communication between devices and cloud server in permitted frequency band
- PC11. build interoperable networks across diverse components for end-to-end communication



- PC12. ensure that developed network should supports bulk configuration functionalities across the multiple solution components
- PC13. design fall-back mechanisms in case of network disruptions and outages
- PC14. address network redundancy considerations
- PC15. design and develop networking dashboards used for network monitoring

#### *Perform testing of the developed sensors in automation system and dashboard*

To be competent, the user/individual on the job must be able to:

- PC16. ensure the accuracy, repeatability, span, stability and loading effect of the developed sensors and modules through different test conditions
- PC17. perform tests on the sensors integrated in IIoT network and automation devices to test their synchronization for data transmission and properly visible on networking dashboard
- PC18. evaluate regulatory aspects of building network such as permitted frequency bands

### **Knowledge and Understanding (KU)**

The individual on the job needs to know and understand:

- KU1. organizational policies, procedures, and guidelines that relate to designing and maintaining networks
- KU2. organizational policies and procedures for sharing data
- KU3. organizational policies and procedures for documenting network designs and fall-back mechanisms
- KU4. who to involve while designing and developing networks for the solution
- KU5. range of standard templates and tools available and how to use them
- KU6. connectivity protocols for device-cloud communications (this may include protocols such as 5G, wi-fi, gsm, gprs, and satellite)
- KU7. wired/wireless connectivity protocols for device-device or device-gateway communications (this may include protocols such as nfc, nb-iot, bluetooth/ble, zigbee, mesh, and lora)
- KU8. network management dashboards and applications (such as hp open view)
- KU9. network topologies, wired and wireless technologies, fiber optics, etc.
- KU10. updated internal and external network regulations
- KU11. impacts of network on the environment and human health

### **Generic Skills (GS)**

User/individual on the job needs to know how to:

- GS1. follow instructions, guidelines, procedures, rules, and service level agreements
- GS2. listen effectively and communicate information accurately
- GS3. follow rule-based decision-making processes
- GS4. make decisions on suitable courses
- GS5. plan and organize the work to achieve targets and meet deadlines
- GS6. apply problem-solving approaches to different situations
- GS7. analyse the business impact and disseminate relevant information to others
- GS8. apply balanced judgments to different situations
- GS9. check the work is complete and free from errors

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Assess project requirements</i>	<b>10</b>	<b>10</b>		<b>4</b>
PC1. evaluate the requirements of the IIoT network, sensors, to work with automation system in manufacturing	2	2		1
PC2. interpret the project's module design by obtaining information from mechanical drawings and layout diagram	2	2		1
PC3. identify appropriate technology, devices, and deployment model to meet the overall needs of the IIoT network for smart manufacturing process	2	2		1
PC4. identify and select required sensors, specific hardware, components and type of materials as per the system requirements	2	2		1
PC5. select appropriate core and auxiliary support process as per specifications & drawings	2	2		
<i>Design and development of IIoT sensors with IO-Link and interactive dashboards</i>	<b>10</b>	<b>10</b>		<b>6</b>
PC6. prepare design of hardware schematics and PCB dimension to integrate sensor, microcontroller and trans-receivers for development of IIoT sensors with IO-Links as per organization SOP and guidelines	2	3		1
PC7. design IO-Link system for switch console as per design requirements	3	2		2
PC8. prepare electrical wiring schematic diagram for connecting sensors, machines, robots and automation system and project documentation as per organizational SOP and guidelines	2	3		1
PC9. design firmware for IIoT sensors IO-links, switch consoles for interfacing with the DATA-Link protocol	3	2		2
<i>Define and design network protocols and their parameters</i>	<b>12</b>	<b>12</b>		<b>6</b>
PC10. design network nodes (wired and wireless) to connect IIoT sensors and edge devices, and apply connectivity protocol for communication between devices and cloud server in permitted frequency band	2	2		1

PC11. build interoperable networks across diverse components for end-to-end communication	2	2		1
PC12. ensure that developed network should supports bulk configuration functionalities across the multiple solution components	2	2		1
PC13. design fall-back mechanisms in case of network disruptions and outages	2	2		1
PC14. address network redundancy considerations	2	2		1
PC15. design and develop networking dashboards used for network monitoring	2	2		1
<i>Perform testing of the developed sensors in automation system and dashboard</i>	<b>8</b>	<b>8</b>		<b>4</b>
PC16. ensure the accuracy, repeatability, span, stability and loading effect of the developed sensors and modules through different test conditions	3	3		2
PC17. perform tests on the sensors integrated in IIoT network and automation devices to test their synchronization for data transmission and properly visible on networking dashboard	3	3		1
PC18. evaluate regulatory aspects of building network such as permitted frequency bands	2	2		1
<b>NOS Total</b>	<b>40</b>	<b>40</b>	-	<b>20</b>

## National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	ASC/N8320
<b>NOS Name</b>	Selection and designing of IIoT sensors, dashboard and automation systems
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Manufacturing
<b>Occupation</b>	Automotive Product Development
<b>NSQF Level</b>	6
<b>Credits</b>	TBD
<b>Version</b>	1.0
<b>Last Reviewed Date</b>	28 <sup>th</sup> July, 2022
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<b>NSQC Clearance Date</b>	28 <sup>th</sup> July, 2022

## ASC/N8321: Manage integration of IIoT sensors, edge devices and machines with robots and industrial automated systems

### Description

This NOS unit is about managing tasks related to integration of IIoT sensors, IO-Links, Machines, robots and automation systems using industrial networking protocols, IIOT devices used in manufacturing processes to meet the specification set by the organization.

### Scope

The scope covers the following :

- Installation of IIOT elements as per the industrial network architecture and protocols
- Integration and establishment of communication using I/O link master and network protocols
- Perform post-installation activities

### Elements and Performance Criteria

#### *Installation of IIOT elements as per the industrial network architecture and protocols*

To be competent, the user/individual on the job must be able to:

- PC1. design/interpret the network consists of devices, automation system and robots
- PC2. support the IIOT technicians during selection and installation of the suitable network protocols like MODBUS, CC-LINK, PROFINET, PROFIBUS, OPC UA, MQTT etc. based on the communication networking system required
- PC3. analyse the installed sensors, IO-Link trans-receivers, machines, automation elements, system and robots into different layers of network architecture like field devices, control devices, network
- PC4. verify the network that consists of devices, automation system and robots as per SOP
- PC5. ensure that IIOT technicians are connecting the appropriate intelligent devices and system using suitable network topology (STAR, LINE, RING) as per network design document

#### *Integration and establishment of communication using I/O link master and network protocols*

To be competent, the user/individual on the job must be able to:

- PC6. support the IIOT technicians during connecting the automation elements like sensors, machines, and field control devices to I/O link master as per SOP
- PC7. ensure that cable installed between devices is in align with the signaling parameters like bend radius, signal ground, terminal resistor, cable length etc.
- PC8. establish and check the communication between automation system, intelligent devices, and robots by doing parameter setting like baud rate, distance, station ID and station type
- PC9. support during setting of the network parameters of automation system on the device manufacturers software as per SOP and organizational guidelines
- PC10. start the automation devices, system in the network and look for healthy communication between them
- PC11. ensure physical security of the network contains IIOT edge devices, IIOT sensors, machines, robots and automation system
- PC12. ensure that network has appropriate protection from the unauthorized access or malicious internet activities
- PC13. ensure only authorized devices should be able to connect to the network

### *Perform post-installation activities*

To be competent, the user/individual on the job must be able to:

- PC14. conduct the trials of system as per the plan to align it with existing or new manufacturing process
- PC15. handover the system to production team & train them on it as per organizational guidelines and procedures
- PC16. prepare and maintain documents and records such as experience under development, TGW /TGR faced during process trials etc. As a reference for future development

### **Knowledge and Understanding (KU)**

The individual on the job needs to know and understand:

- KU1. product portfolio of organization
- KU2. company manufacturing processes
- KU3. Standard Operation Procedures (SOP) recommended by manufacturer for using equipment / machinery in use
- KU4. different layers of network architecture
- KU5. types of network protocols, topology and its significance
- KU6. Design of industrial network between devices based on protocols, topology and device parameters
- KU7. signaling parameters required to do cable installation between devices
- KU8. allocation of device parameters like station id, baud rate etc. To the devices connected to the network
- KU9. device manufacturer software for network parameter settings and device communication
- KU10. working and integration of different elements using i/o link master to the controller
- KU11. data types like machine, process and control data from robot and automation system in the network
- KU12. maintenance and troubleshooting procedures like hardware, self-loop back, link test etc.
- KU13. functioning of various network devices like routers, network switch, repeaters

### **Generic Skills (GS)**

User/individual on the job needs to know how to:

- GS1. follow instructions, guidelines, procedures, rules, and service level agreements
- GS2. listen effectively and communicate information accurately
- GS3. follow rule-based decision-making processes
- GS4. make decisions on suitable courses
- GS5. plan and organize the work to achieve targets and meet deadlines
- GS6. apply problem-solving approaches to different situations
- GS7. analyse the business impact and disseminate relevant information to others
- GS8. apply balanced judgments to different situations
- GS9. check the work is complete and free from errors

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Installation of IIOT elements as per the industrial network architecture and protocols</i>	<b>12</b>	<b>12</b>		<b>6</b>
PC1. design/interpret the network consists of devices, automation system and robots	3	2		1
PC2. support the IIOT technicians during selection and installation of the suitable network protocols like MODBUS, CC-LINK, PROFINET, PROFIBUS, OPC UA, MQTT etc. based on the communication networking system required	3	3		2
PC3. analyse the installed sensors, IO-Link trans-receivers, machines, automation elements, system and robots into different layers of network architecture like field devices, control devices, network	2	3		1
PC4. verify the network that consists of devices, automation system and robots as per SOP	2	2		1
PC5. ensure that IIOT technicians are connecting the appropriate intelligent devices and system using suitable network topology (STAR, LINE, RING) as per network design document	2	2		1
<i>Integration and establishment of communication using I/O link master and network protocols</i>	<b>18</b>	<b>18</b>		<b>8</b>
PC6. support the IIOT technicians during connecting the automation elements like sensors, machines, and field control devices to I/O link master as per SOP	3	3		1
PC7. ensure that cable installed between devices is in align with the signaling parameters like bend radius, signal ground, terminal resistor, cable length etc.	3	3		1
PC8. establish and check the communication between automation system, intelligent devices, and robots by doing parameter setting like baud rate, distance, station ID and station type	2	2		1
PC9. support during setting of the network parameters of automation system on the device manufacturers software as per SOP and organizational guidelines	2	2		1
PC10. start the automation devices, system in the network and look for healthy	2	2		1

communication between them				
PC11. ensure physical security of the network contains IIOT edge devices, IIOT sensors, machines, robots and automation system	2	2		1
PC12. ensure that network has appropriate protection from the unauthorized access or malicious internet activities	2	2		1
PC13. ensure only authorized devices should be able to connect to the network	2	2		1
<i>Perform post-installation activities</i>	<b>10</b>	<b>10</b>		<b>6</b>
PC14. conduct the trials of system as per the plan to align it with existing or new manufacturing process	3	3		2
PC15. handover the system to production team & train them on it as per organizational guidelines and procedures	3	3		2
PC16. prepare and maintain documents and records such as experience under development, TGW /TGR faced during process trials etc. As a reference for future development	4	4		2
<b>NOS Total</b>	<b>40</b>	<b>40</b>	<b>-</b>	<b>20</b>



## National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	ASC/N8321
<b>NOS Name</b>	Manage integration of IIoT sensors, edge devices and machines with robots and industrial automated systems
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Manufacturing
<b>Occupation</b>	Automotive Product Development
<b>NSQF Level</b>	6
<b>Credits</b>	TBD
<b>Version</b>	1.0
<b>Last Reviewed Date</b>	28 <sup>th</sup> July, 2022
<b>Next Review Date</b>	28 <sup>th</sup> July, 2025
<b>NSQC Clearance Date</b>	28 <sup>th</sup> July, 2022

## ASC/N8322: Manage remote monitoring, controlling and data acquisition through IIoT sensors and edge devices

### Description

This unit is about to manage the activities relate to data accusation through sensors and IIoT edge devices to the cloud server and fetching the processed data to the dashboards.

### Scope

The scope covers the following :

- Perform network assessment
- Monitor fetching of vital machine data from EDGE to cloud
- Perform remote monitoring and controlling the machines

### Elements and Performance Criteria

#### *Perform and monitor network assessment activities*

To be competent, the user/individual on the job must be able to:

- PC1. support during on-site surveys of the IIoT network, connected sensors and EDGE devices with machines in automation system
- PC2. monitor the field device status and published the data on the dashboards
- PC3. check for network interference sources and take precautionary measures so that it should not affect the communications
- PC4. generate network usage statistics and data traffic to find any congestion during data transmission and receiving

#### *Monitor fetching of vital machine data from EDGE to cloud*

To be competent, the user/individual on the job must be able to:

- PC5. generate report from the cloud as well on power consumption of the sensors, EDGE devices, machines, robots and other automated and non-automated systems
- PC6. create markers for defining the machine state as online, offline, ideal, error, busy, program mode etc.
- PC7. ensure that machine spare parts life utilization report is fetched properly
- PC8. analyse and evaluate the report to identify the reason for machine idealness, setup activity and machine breakdown
- PC9. analyse real-time feed override, consumable request, system alarm

#### *Perform remote monitoring and controlling the machines*

To be competent, the user/individual on the job must be able to:

- PC10. perform real-time monitoring of different warnings, alarms and machine status by creating forced error in the process
- PC11. monitor system logs of the IIoT network
- PC12. prepare a production, quality, and maintenance service plan for local and remote based devices
- PC13. monitor life of subsystems with user defined limits

- PC14. analyse the present condition of the machines, robots and automation system (cycling, idle, setup, and breakdown)
- PC15. prepare report on machine performance, communication network performance, and process performance as per SOP and organizational procedures

## Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1. organizational policies, procedures, and guidelines that relate to designing and maintaining networks
- KU2. organizational policies and procedures for sharing data
- KU3. organizational policies and procedures for documenting network designs and fall-back mechanisms
- KU4. who to involve while monitoring and troubleshooting the network
- KU5. range of standard templates and tools available and how to use them
- KU6. connectivity protocols for device-cloud communications (this may include protocols such as 5g, wi-fi, gsm, gprs, and satellite)
- KU7. wired/wireless connectivity protocols for device-device or device-gateway communications (this may include protocols such as nfc, nb-iot, bluetooth/ble, zigbee, mesh, and lora)
- KU8. network management dashboards and applications (such as hp open view)
- KU9. network topologies, wired and wireless technologies, fiber optics, etc.
- KU10. updated internal and external network regulations
- KU11. how to perform network assessments
- KU12. how to diagnose and resolve network issues
- KU13. how to identify network blind spots

## Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1. follow instructions, guidelines, procedures, rules, and service level agreements
- GS2. listen effectively and communicate information accurately
- GS3. follow rule-based decision-making processes
- GS4. make decisions on suitable courses
- GS5. plan and organize the work to achieve targets and meet deadlines
- GS6. apply problem-solving approaches to different situations
- GS7. analyse the business impact and disseminate relevant information to others
- GS8. apply balanced judgments to different situations
- GS9. check the work is complete and free from errors

## Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Perform and monitor network assessment activities</i>	<b>12</b>	<b>12</b>		<b>6</b>
PC1. support during on-site surveys of the IIoT network, connected sensors and EDGE devices with machines in automation system	3	3		2
PC2. monitor the field device status and published the data on the dashboards	3	3		1
PC3. check for network interference sources and take precautionary measures so that it should not affect the communications	3	3		1
PC4. generate network usage statistics and data traffic to find any congestion during data transmission and receiving	3	3		2
<i>Monitor fetching of vital machine data from EDGE to cloud</i>	<b>14</b>	<b>14</b>		<b>8</b>
PC5. generate report from the cloud as well on power consumption of the sensors, EDGE devices, machines, robots and other automated and non-automated systems	2	3		2
PC6. create markers for defining the machine state as online, offline, ideal, error, busy, program mode etc.	3	3		2
PC7. ensure that machine spare parts life utilization report is fetched properly	3	2		1
PC8. analyse and evaluate the report to identify the reason for machine idealness, setup activity and machine breakdown	3	3		2
PC9. analyse real-time feed override, consumable request, system alarm	3	3		1
<i>Perform remote monitoring and controlling the machines</i>	<b>14</b>	<b>14</b>		<b>6</b>
PC10. perform real-time monitoring of different warnings, alarms and machine status by creating forced error in the process	3	2		1
PC11. monitor system logs of the IIoT network	2	2		1
PC12. prepare a production, quality, and maintenance service plan for local and remote based devices	3	2		1
PC13. monitor life of subsystems with user defined limits	2	2		1

PC14. analyse the present condition of the machines, robots and automation system (cycling, idle, setup, and breakdown)	2	3		1
PC15. prepare report on machine performance, communication network performance, and process performance as per SOP and organizational procedures	2	3		1
<b>NOS Total</b>	<b>40</b>	<b>40</b>	-	<b>20</b>

## National Occupational Standards (NOS) Parameters

<b>NOS Code</b>	ASC/N8322
<b>NOS Name</b>	Manage remote monitoring, controlling and data acquisition through IIoT sensors and edge devices
<b>Sector</b>	Automotive
<b>Sub-Sector</b>	Manufacturing
<b>Occupation</b>	Automotive Product Development
<b>NSQF Level</b>	6
<b>Credits</b>	TBD
<b>Version</b>	1.0
<b>Last Reviewed Date</b>	28 <sup>th</sup> July, 2022
<b>Next Review Date</b>	28 <sup>th</sup> July, 2025
<b>NSQC Clearance Date</b>	28 <sup>th</sup> July, 2022

## Assessment Guidelines and Assessment Weightage

### Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training centre based on these criteria.
5. In case of successfully passing only certain number of NOSs, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.
6. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack

### Minimum Aggregate Passing % at QP Level : 70

(Please note: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

### Assessment Weightage

#### Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N9810.Manage work and resources (Manufacturing)	50	30	0	20	100	15
ASC/N9812.Interact effectively with team, customers and others	50	30	-	20	100	10
ASC/N8320: Selection and designing of IIoT sensors, dashboard and automation systems	40	40	-	20	100	25
ASC/N8321: Manage integration of IIoT sensors, edge devices and machines with robots and industrial automated	40	40	0	20	100	25

systems						
6. ASC/N8322: Manage remote monitoring, controlling and data acquisition through IIoT sensors and edge devices	40	40	-	20	100	25
<b>Total</b>	<b>220</b>	<b>180</b>	<b>-</b>	<b>100</b>	<b>500</b>	<b>100</b>



## Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
AMC	Annual Maintenance Contract
PPE	Personal Protective Equipment
ERP	Enterprise Resource Planning
PM	Predictive Maintenance
QMS	Quality Management System
TOPS	Team Oriented Problem Solving
QMS	Quality Management System
CFT	Complement Fixation Test

## Glossary

<b>Sector</b>	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
<b>Sub-sector</b>	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
<b>Occupation</b>	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
<b>Job role</b>	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
<b>Occupational Standards (OS)</b>	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
<b>Performance Criteria (PC)</b>	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
<b>National Occupational Standards (NOS)</b>	NOS are occupational standards which apply uniquely in the Indian context.
<b>Qualifications Pack (QP)</b>	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
<b>Unit Code</b>	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
<b>Unit Title</b>	Unit title gives a clear overall statement about what the incumbent should be able to do.
<b>Description</b>	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
<b>Scope</b>	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
<b>Knowledge and Understanding (KU)</b>	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.

<b>Organisational Context</b>	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
<b>Technical Knowledge</b>	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
<b>Core Skills/ Generic Skills (GS)</b>	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
<b>Electives</b>	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
<b>Options</b>	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.