

Assessment Evidence Guide

For

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Level-2

Module name
(Formative Assessment)

8th-12th March 2021



**National Vocational & Technical
Training Commission**

Title of Qualification: Powder Metallurgy	CS Code:	Level:4	Version:01
Competency Standard Title: Handle Powder for required process	Assessment Date (DD/MM/YY): Assessment Time:		

Candidate Details	Name: Registration/Roll Number:.....
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to: Identify the particle size and morphology of powder.</p> <p>Assessment Task 2: Candidate is required to: Identify the required weight of powder and binder.</p> <p>And complete:</p> <ol style="list-style-type: none"> 1. Knowledge assessment test (Written or Oral) 2. Portfolios at the time of assessment (if any)
Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>P1. Ensure appropriate PPE to control chemical hazards.</p> <p>P2. Select the required particle size from the powder material supplier catalogue</p> <p>P3. Select the powder morphology from the powder material supplier catalogue.</p>

	<p>Assessment Task 2</p> <p>P1. Identify the density of actual metal.</p> <p>P2. Identify the volume of required part.</p> <p>P3. Apply formula of density to calculate the required mass of powder.</p> <p>P4. Calculate the percentage of binder.</p> <p>P5. Make use of weighing scale to weight the right amount of powder and binder.</p> <p>P6. Check the balance of scale and tare the reading to zero.</p>
	<p>Portfolios required at the time of assessment (if any) for</p>

Continued on following page

Assessors Judgment Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name: Registration/Roll Number: Candidate Signature:
Assessment Outcome	COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Assessment Summary (to be filled by the assessor)							
Activity	Method					Result	
Nature of Activity	Written	Oral	Observation	Portfolio	Role Play	Competent	Not Yet Competent
Practical Skill Demonstration			✓				
Knowledge Assessment	✓	✓					
Other Requirement							

Each Assessment Task (with performance criteria)				
Assessment Task 1		Description of assessment task 1		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
	P1. Ensure appropriate PPE to control chemical hazards.			
	P2. Select the required particle size from the powder material supplier catalogue.			
	P3. Select the powder morphology from the powder material supplier catalogue.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 2		Description of assessment task 2		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
	P1. Identify the density of actual metal.			
	P2. Identify the volume of required part.			
	P3. Apply formula of density to calculate the required mass of powder.			
	P4. Calculate the percentage of binder.			
	P5. Make use of weighing scale to weight the right amount of powder and binder.			
	P6. Check the balance of scale and tare the reading to zero.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Title of Qualification: Powder Metallurgy	CS Code:	Level:	Version: 01
Competency Standard Title: Handle Powder for required process	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

Guidance for Candidate	To complete your assessment for this Competency Standard, you need to answer the questions on the following pages successfully.
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Assessors Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name:.....Registration/Roll Number: Candidate Signature:
Written Assessment Outcome	<p>COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/></p> <p>Name of the Assessor:Assessor's code:</p> <p>Signature of the Assessor:</p>

Title of Qualification: Powder Metallurgy	CS Code:	Level:	Version: 01
Competency Standard Title: Handle Powder for required process	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

WRITTEN ASSESSMENT

Question	Candidate's answer
1. What are the different shapes of powder particles ?	<ul style="list-style-type: none"> • Regular shape • Irregular shape • Spherical • Flakes
2. Describe the densities?	<ul style="list-style-type: none"> • Bulk Density • Apparent Density • True Density • Relative Density
3. Describe relationship between volume of part and weight of powder particles	<ul style="list-style-type: none"> • Calculate the volume of required part • Know the density of given metal powder • Calculate the required mass of the given metal powder

Title of Qualification: Powder Metallurgy	CS Code:	Level:4	Version:01
Competency Standard Title: Perform Consolidation Operation	Assessment Date (DD/MM/YY): Assessment Time:		

Candidate Details	Name: Registration/Roll Number:.....
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to: Mix and Blend powder with binder.</p> <p>Assessment Task 2: Candidate is required to: Operate Hydraulic Press.</p> <p>And complete:</p> <p>3. Knowledge assessment test (Written or Oral) 4. Portfolios at the time of assessment (if any)</p>
Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>P1. Make use of mixer machine for proper mixing and blending of powder and binder.</p> <p>P2. Set the time of mixer.</p> <p>P3. Add powder with binder and start the mixer.</p> <p>P4. Fill the die with blended powder and close the die.</p>

	<p>Assessment Task 2</p> <p>Performance Criteria 1:</p> <ul style="list-style-type: none"> P1. Raise the front safety guard of press. P2. Place the die filled with powder on the lower pressing face. P3. Lower the front safety guard. P4. Lower the pressing face by turning the screw handle clockwise. P5. Pull and push the pump handle to smoothly build up required pressure and hold the applied tonnage as long as required. P6. Release the pressure load. P7. Turn the screw handle anticlockwise to raise the pressing face. P8. Open the front safety guard and remove the die from hydraulic press. P9. Remove the green compact part from the die. P10. Analyze the density of green compact. <p>Portfolios required at the time of assessment (if any) for</p>
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Assessors Judgment Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name: Registration/Roll Number: Candidate Signature:
Assessment Outcome	COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Assessment Summary (to be filled by the assessor)							
Activity	Method					Result	
Nature of Activity	Written	Oral	Observation	Portfolio	Role Play	Competent	Not Yet Competent
Practical Skill Demonstration			✓				
Knowledge Assessment	✓	✓					
Other Requirement							

Each Assessment Task (with performance criteria)				
Assessment Task 1		Description of assessment task 1		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
	P1. Make use of mixer machine for proper mixing and blending of powder and binder.			
	P2. Set the time of mixer.			
	P3. Add powder with binder and start the mixer.			
	P4. Fill the die with blended powder and close the die.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 2		Description of assessment task 2		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
	P1. Raise the front safety guard of press.			
	P2. Place the die filled with powder on the lower pressing face.			
	P3. Lower the front safety guard.			
	P4. Lower the pressing face by turning the screw handle clockwise.			
	P5. Pull and push the pump handle to smoothly build up required pressure and hold the applied tonnage as long as required.			
	P6. Release the pressure load.			
	P7. Turn the screw handle anticlockwise to raise the pressing face.			
	P8. Open the front safety guard and remove the die from hydraulic press.			
	P9. Remove the green compact part from the die.			
	P10. Analyze the density of green compact.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Title of Qualification: Powder Metallurgy	CS Code:	Level:	Version: 01
Competency Standard Title: Perform Consolidation Operation	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

Guidance for Candidate	To complete your assessment for this Competency Standard, you need to answer the questions on the following pages successfully.
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Assessors Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name: Registration/Roll Number: Candidate Signature:
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Written Assessment Outcome	COMPETENT <input type="checkbox"/>	NOT YET COMPETENT <input type="checkbox"/>
	Name of the Assessor: Assessor's code:	
	Signature of the Assessor:	

Title of Qualification: Powder Metallurgy	CS Code:	Level:	Version: 01
Competency Standard Title: Perform Consolidation Operation	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

WRITTEN ASSESSMENT

Question	Candidate's answer
1 Describe the packing of particles in pressed form?	<ul style="list-style-type: none"> • Mixing regular shape particles • Mixing regular and irregular shape particles • Particle size distribution
2 Describe the effect of binder in pressing ?	<ul style="list-style-type: none"> • Amount of Binder • Type of binder • Binder chemistry with metal powder
3 Explain the operating principle of hydraulic press ?	<ul style="list-style-type: none"> • Safety guards of press • smoothly build up required pressure • Hold the applied tonnage as long as required. • Release the pressure load • Open the safety guard and remove the die from hydraulic press.
4 Describe the relative density	<ul style="list-style-type: none"> • Calculate the apparent density of powder • Calculate the density of green compact • Calculate the relative density from apparent and green density.

Title of Qualification: Powder Metallurgy	CS Code:	Level:4	Version:01
Competency Standard Title: Perform Sintering Operation	Assessment Date (DD/MM/YY): Assessment Time:		

Candidate Details	Name: Registration/Roll Number:.....
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the given time frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to: Set the furnace temperature and time</p> <p>Assessment Task 2: Candidate is required to: Set the furnace environmental conditions.</p> <p>Assessment Task 3: Candidate is required to: Place the green compact in furnace</p> <p>And complete:</p> <p>5. Knowledge assessment test (Written or Oral) 6. Portfolios at the time of assessment (if any)</p>
Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>P1. Identify the right furnace for sintering</p> <p>P2. Identify the controls of the furnace i-e water flow, heating chamber, heating coils, thermocouple and exhaust system</p> <p>P3. Set the furnace to desired temperature.</p> <p>P4. Set the heating rate of the furnace.</p> <p>P5. Set the holding time of the furnace.</p>

	<p>Assessment Task 2</p> <p>Performance Criteria 1:</p> <p>P1. Identify the required inert gas for environmental conditions.</p> <p>P2. Connect the gas cylinder with furnace.</p> <p>P3. Set the proper pressure of gas.</p> <p>P4. Connect the vacuum pump to the furnace heating chamber if vacuum is required.</p>
	<p>Assessment Task 3</p> <p>P1. Set the furnace to required environmental conditions</p> <p>P2. Place the green compact in the heating chamber of furnace</p> <p>P3. Close the door of heating chamber</p> <p>P4. Set ON the furnace power supply.</p> <p>P5. Note the time of start.</p> <p>P6. Take out the sintered par from the furnace after process completion.</p>
	<p>Portfolios required at the time of assessment (if any) for</p>

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Assessors Judgment Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name: Registration/Roll Number: Candidate Signature:
Assessment Outcome	COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Assessment Summary (to be filled by the assessor)							
Activity	Method					Result	
Nature of Activity	Written	Oral	Observation	Portfolio	Role Play	Competent	Not Yet Competent
Practical Skill Demonstration			✓				
Knowledge Assessment	✓	✓					
Other Requirement							

Each Assessment Task (with performance criteria)				
Assessment Task 1		Description of assessment task 1		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
	P1. Identify the right furnace for sintering.			
	P2. Identify the controls of the furnace i-e water flow, heating chamber, heating coils, thermocouple and exhaust system			
	P3. Set the furnace to desired temperature.			
	P4. Set the heating rate of the furnace.			
	P5. Set the holding time of the furnace.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 2		Description of assessment task 2		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
	P1. Identify the required inert gas for environmental conditions			
	P2. Connect the gas cylinder with furnace			
	P3. Set the proper pressure of gas			
	P4. Connect the vacuum pump to the furnace heating chamber if vacuum is required			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 3		Description of assessment task 3		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
	P1. Set the furnace to required environmental conditions			
	P2. Place the green compact in the heating chamber of furnace			
	P3. Close the door of heating chamber			
	P4. Set ON the furnace power supply.			
	P5. Note the time of start.			
	P6. Take out the sintered par from the Furnace after process completion.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Title of Qualification: Powder Metallurgy	CS Code:	Level:	Version: 01
Competency Standard Title: Perform Sintering Operation	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

Guidance for Candidate	To complete your assessment for this Competency Standard, you need to answer the questions on the following pages successfully.
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Assessors Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name: Registration/Roll Number: Candidate Signature:
Written Assessment Outcome	COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Title of Qualification: Powder Metallurgy	CS Code:	Level:	Version: 01
Competency Standard Title: Perform Sintering Operation	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

WRITTEN ASSESSMENT

Question	Candidate's answer
4. Explain the effect of sintering ?	<ul style="list-style-type: none"> • Reduce the porosity • Increase the strength • Increase thermal conductivity • Particles diffusion takes place
5. Describe sintering furnaces?	<ul style="list-style-type: none"> • Box furnace • Vacuum furnace • Controlled environment furnace
6. Describe inert gases and vacuum	<ul style="list-style-type: none"> • Nitrogen, Helium, Argon • Pressure less than 1 Atmospheric pressure.

Title of Qualification: Powder Metallurgy	CS Code:	Level:4	Version:01
Competency Standard Title: Perform Finishing Operations	Assessment Date (DD/MM/YY): Assessment Time:		

Candidate Details	Name: Registration/Roll Number:.....
Guidance for Candidate	<p>To meet this standard, you are required to complete the following within the giventime frame (for practical demonstration & assessment):</p> <p>Assessment Task 1: Candidate is required to: Identify the size tolerance after sintering.</p> <p>Assessment Task 2: Candidate is required to: Carry out machining of sintered components.</p> <p>And complete:</p> <p>7. Knowledge assessment test (Written or Oral) 8. Portfolios at the time of assessment (if any)</p>
Minimum Evidence Required	<p>During a practical assessment, under observation by an assessor, you will complete:</p> <p>Assessment Task 1</p> <p>P1. Inspect the component visually for any defects</p> <p>P2. Inspect the dimensions of the component by using measuring scale or devices</p> <p>P3. Separate the defected and non defected components.</p> <hr/> <p>Assessment Task 2</p> <p>P1. Make use of grinder to refine tolerance.</p> <p>P2. Make use of buffing operation to improve surface finish.</p> <hr/> <p>Portfolios required at the time of assessment (if any) for</p>

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Assessors Judgment Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name: Registration/Roll Number: Candidate Signature:
Assessment Outcome	COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Assessment Summary (to be filled by the assessor)							
Activity	Method					Result	
Nature of Activity	Written	Oral	Observation	Portfolio	Role Play	Competent	Not Yet Competent
Practical Skill Demonstration			✓				
Knowledge Assessment	✓	✓					
Other Requirement							

Each Assessment Task (with performance criteria)				
Assessment Task 1		Description of assessment task 1		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
	P1. Inspect the component visually for any defects			
	P2. Inspect the dimensions of the component by using measuring scale or devices			
	P3. Separate the defected and non defected components.			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Assessment Task 2		Description of assessment task 2		
During the practical assessment, candidate demonstrated the following:		Yes	No	Remarks
	P1. Make use of grinder to refine tolerance			
	P2. Make use of buffing operation to improve surface finish			
Competent <input type="checkbox"/>		Not Yet Competent <input type="checkbox"/>		

Title of Qualification: Powder Metallurgy	CS Code:	Level:	Version: 01
Competency Standard Title: Perform Finishing Operations	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

Guidance for Candidate	To complete your assessment for this Competency Standard, you need to answer the questions on the following pages successfully.
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Assessors Guide (to be completed by the Assessor and signed both by the assessor and the candidate after the assessment)

Candidate Details	Name:..... Registration/Roll Number: Candidate Signature:
Written Assessment Outcome	COMPETENT <input type="checkbox"/> NOT YET COMPETENT <input type="checkbox"/> Name of the Assessor: Assessor's code: Signature of the Assessor:

Title of Qualification: Powder Metallurgy	CS Code:	Level:	Version: 01
Competency Standard Title: Perform Finishing Operations	Assessment Date (DD/MM/YY): Assessment Time: 30 min		

WRITTEN ASSESSMENT

Question	Candidate's answer
7. Describe the size tolerance ?	<ul style="list-style-type: none"> • Physical Dimensions • Allowable variations for any given size
8. Explain finishing operations?	<ul style="list-style-type: none"> • Sizing • Machining • Deburring • Coining • Impregnation • Plating • Shot-penning • Steam treating