

**FD4 Infringement and Validity  
FINAL Mark Scheme 2022**

This mark scheme is a guideline. Examiners may give marks for answers that do not follow this exactly but still address the necessary points

**Construction**

		Marks
1. A method of heat treating a steel component, comprising:	Heat treatment = heating & cooling to modify chemical or physical properties p. 4, ll. 11-13	1
	Steel component e.g. a component made from an alloy of iron with carbon content of 0.002 – 2.1 % p. 4, ll. 4-5; high and low carbon contents included	1
	Comprises = open wording so can contain other components	1
heating the steel component in a treatment atmosphere to an elevated temperature for a period of time sufficient to form a modified layer on the surface of the steel component;	Elevated temperature and period defined only by effect (“sufficient to ...”), no limit; a sufficient period of time for modification (carbonitriding) to take place	1
	“an elevated temperature” – carbonitriding temperature (because of definition of treatment atmosphere later in claim has both gases), e.g. 815-900° C p. 5, l. 37-38 (“elevated temperature” should not be limited to this specific range) elevated is a relative term	1
	Modified layer = physical or chemical properties different compared to properties of inner (i.e. unmodified) part of component p. 4, ll 15-17 Description describes 2-step process but claim not limited to this. p. 5, ll. 19-22	1
wherein the treatment atmosphere comprises:		
a carbon-containing gas suitable for creating a carbon-enriched layer on the surface of the steel component; and	Carbon-containing not defined, description only mentions carbon-rich. Carbon-rich = “The carbon-rich environment can be a gas that dissociates to provide carbon atoms” p. 4, ll. 25-26 e.g. Endothermic gas p. 3, ll. 31-33	1
	carbon-enriched layer = carburized layer p. 3. ll. 26-29; p. 4, ll. 4-5	1



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	“the balance” - no longer open wording, cannot contain components other than the carbon-containing gas and nitrogen-containing gas (all of the remaining gas is endothermic gas)	
	<b>Total for claim 4</b>	<b>2</b>
5. A method as claimed in any preceding claim comprising:		
heating the steel component in the carbon-containing gas at a temperature of 900 – 955 Celsius for a first period;	1 <sup>st</sup> period not defined, examples give “about 2 hours” p. 6, l. 30 + 50% p. 7, ll. 5-7, but not limited to this example, sufficient to produce a <u>carburised</u> layer p. 6, ll. 28-31	1
introducing the nitrogen-containing gas; and	Suggests after 1 <sup>st</sup> period p. 6, ll. 33-34 Introduction of nitrogen-containing gas provides the treatment atmosphere of claim 1	1
heating the steel component in the treatment atmosphere including the nitrogen-containing gas at a temperature of about 850 Celsius for a second period.	2 <sup>nd</sup> period not defined, examples give “up to 3 hours” p. 6, l. 34-36 +50% p. 7, ll. 5-7, but not limited to this example “about 850” – some leeway p. 6, ll. 35-36 to produce a layer of adsorbed carbon and nitrogen	1
	<b>Total for claim 5</b>	<b>3</b>
	Dependencies	<b>1</b>
	<b>Total for Construction</b>	<b>20</b>

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**Infringement**

Standard Gastride process not relevant for infringement:

no carbon-containing gas (does not need full analysis of infringement as long as this point is noted)

1 mark

- 5 pre-dates patent, in use for over 10 years p.10, l. 10  
(may be discussed in advice section to get marks)

1 mark

	Doc B Gastride Plus	Marks
1. A method of heat treating a steel component, comprising:	Present "steel nitriding" p.10 l.2-4	1
heating the steel component in a treatment atmosphere to an elevated temperature for a period of time sufficient to form a modified layer on the surface of the steel component;	Present "gas feed" p. 10, ll. 17-20, "duration" p. 10, l. 18 Enrichment of surface, compound layer, diffusion zone, p. 10, ll. 19-20 Elevated temperature 560°C – 720°C p. p. 10, l. 21	1
wherein the treatment atmosphere comprises:		
a carbon-containing gas suitable for creating a carbon-enriched layer on the surface of the steel component; and	Present Endothermic gas p. 10, l. 4-7, 17-22	1
a nitrogen-containing gas suitable for creating a nitrogen enriched layer on the surface of the steel component.	Present Ammonia p. 10, l. 4-7, 17-22	1
	<b>Infringed</b>	
	<b>Total for claim 1</b>	<b>4</b>
2. A method as claimed in claim 1, wherein the elevated temperature is no more than 900 Celsius.	Sensible answer depending on construction e.g. Present - Max temp mentioned is 720 °C so less than 900 Celsius p. 10, l. 21 e.g. Not present if construction includes 815 C lower limit	1
	<b>Infringed or Not Infringed (depending on construction of "elevated")</b>	
	<b>Total for claim 2</b>	<b>1</b>
3. A method as claimed in claim 1 or 2, wherein the carbon-containing gas is endothermic gas, and the nitrogen-containing gas is ammonia.	Present Endothermic gas p. 10, ll. 25-28 Ammonia p. 10, ll. 25-28	1

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	<b>Infringed/not infringed (depending on conclusion for claim 2 dependency)</b>	
	<b>Total for claim 3</b>	<b>1</b>
4. A method as claimed in claim 3, wherein the treatment atmosphere contains up to 11% by volume ammonia, the balance being endothermic gas.	Not present p. 10, ll 25-28, ammonia = 50%	1
	<b>Not infringed</b>	
	<b>Total for claim 4</b>	<b>1</b>
5. A method as claimed in any preceding claim comprising:		
heating the steel component in the carbon-containing gas at a temperature of 900 – 955 Celsius for a first period;	Not present No separate endothermic gas, no carburising step/layer No heating at 900 – 955 Celsius	1 1
introducing the nitrogen-containing gas into the treatment atmosphere; and		
heating the steel component in the treatment atmosphere including the nitrogen-containing gas at a temperature of about 850 Celsius for a second period.	Not present Temperature 560-720, p. 10, ll. 20-22 No “second period”, not a 2 step process	1 1
	<b>Not infringed</b>	
	<b>Total for claim 5</b>	<b>4</b>
Conclusions (may be found in advice section, give marks here)	Conclusions including consistency and dependencies, and discussion of non-infringing use of furnace p. 10, ll. 30-32 suggests potential to be configured in infringing way but no actual evidence that it can or has been Is Actavis needed for non-infringed claims? Explain why	<b>2</b>  <b>1</b>
	<b>Total for Infringement</b>	<b>16</b>

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**Novelty**

Date for assessing novelty: Filing Date 1

Prior Art: CGK p. 4, l. 11 – p. 5, l. 11; Doc. C 1

5

	CGK	Mark	Doc C	Marks
1. A method of heat treating a steel component, comprising:	Present p. 4, ll. 14-22	1	Present p. 12, ll. 2-3	1
heating the steel component in a treatment atmosphere to an elevated temperature for a period of time sufficient to form a modified layer on the surface of the steel component;	Identify features consistent with construction p. 4. ll. 14-22	1	Identify features consistent with construction of “elevated” p. 12, ll. 8-10 explicit temperature not given but e.g. “Carbonitriding is used primarily to impart a hard, wear-resistant case layer, generally from 0.08 to 0.8 mm deep.” p. 12, ll. 13-14	1
wherein the treatment atmosphere comprises:				
a carbon-containing gas suitable for creating a carbon-enriched layer on the surface of the steel component; and	Present p. 4, ll. 23-25	1	Present “gas carburizing atmosphere” p 12, l. 4	1
a nitrogen-containing gas suitable for creating a nitrogen enriched layer on the surface of the steel component.	Not present (nitrogen in endothermic gas is not a nitrogen-containing gas as defined in the claim)	1	Present Ammonia, p. 12, ll. 3-4	1
	Novel		Not Novel	
	Sub-total	4	Sub-total	4
			Total Claim 1	<b>8</b>
2. A method as claimed in claim 1, wherein the elevated temperature is no more than 900 Celsius.	Present: upper limit temp. of claim is same as lower limit temp. of range in CGK p. 5, l. 2	1	Not Present (not enough information) No explicit temperature given. CGK suggests 900-950 but p. 12. ll. 7-8	1

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			says lower temperature so may be outside this range	
			Novel	
	Sub-total	1	Sub-Total	1
			<b>Total Claim 2</b>	<b>2</b>
3. A method as claimed in claim 1 or 2, wherein the carbon-containing gas is endothermic gas, and the nitrogen-containing gas is ammonia.	Not present Endothermic gas but no ammonia	1	Not Present Ammonia p. 13, l. 3 but does not mention endothermic gas. CGK says number of gases used p. 4, l. 26-27 so not implicit	1
			Novel	
	Sub-total	1	Sub-total	1
			<b>Total Claim 3</b>	<b>2</b>
4. A method as claimed in claim 3, wherein the treatment atmosphere contains up to 11% by volume ammonia, the balance being endothermic gas.	Not present No ammonia	1	Not present no mention of amount of ammonia in atmosphere	1
			Novel	
	Sub-total	1	Sub-total	1
			<b>Total Claim 4</b>	<b>2</b>
5. A method as claimed in any preceding claim comprising:				
heating the steel component in the carbon-containing gas at a temperature of 900 – 955 Celsius for a first period;	Present: upper limit temp. of claim is same as lower limit temp. of range in CGK p. 5, l. 2 Must be consistent with claim 2 for this reason	1	Not Present (not enough information) No explicit temperature given. CGK suggests 900-950 but p. 12. ll. 7-8 says lower temperature so may be outside this range Must be consistent with claim 2 for this reason	1
introducing the nitrogen-containing gas into the treatment atmosphere; and	Not present No nitrogen-containing gas	1	Present: Ammonia p. 12, ll. 3-5	1

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heating the steel component in the treatment atmosphere including the nitrogen-containing gas at a temperature of about 850 Celsius for a second period.	Not present No mention of temperature rage with this level		Not present Temperature not explicit.	1
			850 is lower than CGK carburizing temperature so possibly not present Doc C mentions "lower processing temperature" but does not give details	1
			No mention of 2 <sup>nd</sup> period, "add nitrogen to the carburized surface case layer as it is being produced" suggests single step	1
			Novel	
	Sub-total	2	Sub-total	5
			<b>Total Claim 5</b>	<b>7</b>
			Conclusions	<b>1</b>
			<b>Total for Novelty</b>	<b>24</b>



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**Inventive Step**

	Marks
Date for assessment of IS = Filing Date	1
PSA = engineer skilled in heat treatment processes for use on steel	1
CGK = Carburizing p. 4, l. 11 – p. 5, l. 11, (Doc C is not CGK despite age); Prior art = Doc. C	1 ½ mark if doc C identified as CGK
	<b>3</b>

Claim 1		Marks
Concept	Give basis from patent e.g. Reduce distortion p. 5, ll. 14-18	1
State of the art	Doc C	
Difference	As claimed: none. Description suggests 2 stage process but claim not limited to this OR: temp range (Doc C does not explicitly mention 2 stage process)	1
Obviousness	e.g. If novel because of temperature range – this is known in the CGK therefore not inventive	1
	<b>Total for claim 1</b>	<b>3</b>
Claim 2		
Concept	Provide carbonitrided case while maintaining carburization p. 6, ll. 1-3	1
State of the Art	Doc C	
Difference	Specific temperature limit ( $\leq 900$ Celsius)	
Obviousness	Doc C says “lower processing temperature” p. 12, ll. 7-9 in comparison to carburization. Lower range for carburization is 900 C from CGK p. 5, l. 2. Therefore $\leq 900$ C is obvious.	2

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	<b>Total for claim 2</b>	<b>3</b>
Claim 3		
Concept	Selection of gases to produce hardening by carbonitriding p. 6, ll. 7 – 9	1
State of the art	Doc C	
Difference	Use of endothermic gas	
Obviousness	Obvious selection from CGK p. 4, l. 26-28	1
	<b>Total for claim 3</b>	<b>2</b>
Claim 4		
Concept	To avoid decomposition of too much ammonia in gas and dilution of carburizing atmosphere p. 5, ll. 30-32	1
State of the art	Doc C	
Difference	Concentration of ammonia not mentioned	1
Obviousness	Claim is only an upper limit. e.g. Doc C mentions lower temperature and shorter times. Nothing to suggest 11% limit is unusual but no teaching in Doc C or CGK as to what amount of ammonia is used	2
	Not obvious	
	Total for claim 4	<b>4</b>
Claim 5		
Concept	Produce carburized layer with a harder layer of carbon and nitrogen on top for use with low carbon steels p. 6, ll. 7-9	1
State of the art	Doc C	
Difference	2 stage process, change of atmosphere, change of temperature	2
Obviousness	CGK does not disclose 2 stage process, or the idea of producing two distinct layers, mentions low carbon steels (p. 12, l.19) but for carburization only	1
	Doc C mentions higher carbon content steel (p. 4, l. 17-19).	1

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	Not obvious	
	<b>Total for claim 5</b>	<b>5</b>
	<b>Conclusions</b> Marks awarded for consistency of conclusions between claims for inventive step and consistency with conclusions in other parts of paper	<b>2</b>
	<b>Total for Inventive Step</b>	<b>22</b>

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**Sufficiency**

Client's letter suggests problems with sufficiency of patent p. 2, ll. 15-30 (1)

Limits on temperature range for 2<sup>nd</sup> stage appear critical to creating the modified layer. Operating outside range leads to unpredictability. Patent suggests higher temperatures can be used (p.5, l. 2). Discussion of point and possible actions to resolve (2)

- 5 Need to ensure component temperature in 2<sup>nd</sup> stage would appear to need reasonable experimentation as the thermal mass will depend on the component being treated. Discussion of point (2) (If addressed in Advice section, award marks here)

**Total for Sufficiency**

**5 Marks**

10 **Amendment**

Any amendment to improve novelty/inventive step position. e.g. Amending claim 1 to a 2 stage process (p. 5, ll. 19-23) resolves these issues but makes infringement position worse. Amendment to endothermic gas and ammonia gets novelty and infringement but still no inventive step. Mention possible deficiencies for full marks (If addressed in Advice section, award marks here)

15 Total for Amendment

**2 Marks**

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**Advice**

**11 Marks**

(Marks may be given for other advice points that address issues raised in the client's letter or arising from the preceding conclusions)

- 5 Respond to question from client to explain outline of options for enforcing patent: IPEC, HC, enforce against Ferrocasa for method. How about other parties dealing in treated products? Discuss possibility of interim relief (unlikely, why?) Credit may be given for other matters pertinent to answering the client's questions (3)
- 10 Explain patent does not cover any use of endothermic gas and ammonia, not infringed + problems with validity (1)  
Explain furnace can be used in a non-infringing manner so operator will not inevitably infringe (1)
- Possible defence to infringement.  
Ferrocasa began developing Gastride Plus in "early" 2019.  
15 Need to find out if this is before filing date. (1)  
Was this public? If so, may be prior art. (1)  
Even if not public, may have prior use defence under S. 64 (1)
- 20 Outline further information needed:  
Sufficiency – Does operating outside temperature limits for 2<sup>nd</sup> stage mean complete failure or just inferior results? (1)
- Put Ferrocasa on notice in case furnace can be configured to perform the claimed method (1)  
But do not to threaten (how?) (1)