

FINAL INSPECTION REPORT & CERTIFICATE OF CONFORMANCE

UNEW's capital part refurbishment operations are governed by proprietary engineering technologies, precision standards, and rigorous QA/QC procedures developed for aviationgrade manufacturing. While refurbishment work is normally conducted at UNEW's U.S. facility, certain components from restricted regions are not eligible for import under U.S. national security and export control regulations.

To maintain uninterrupted service and consistent product quality, UNEW has partnered with EthosEnergy (United Kingdom)—a world-class turbine repair and overhaul organization operating one of the most advanced facilities in the industry. The EthosEnergy shop is equipped with fully automated precision systems, vacuum furnaces, electron beam welders, and advanced HVOF/TBC coating cells. Its quality system is certified to ISO 9001:2015, ISO 14001:2015, ISO 45001:2018, and ISO 17025:2017, ensuring full traceability, environmental stewardship, and occupational safety compliance.

All repair activities performed at EthosEnergy strictly follow UNEW's proprietary refurbishment procedures, material specifications, and inspection standards. The physical repair processes are executed by EthosEnergy, while UNEW retains full technical authority over repair methodology, metallurgical control, quality benchmarks, and final acceptance. This partnership guarantees that every refurbished component meets UNEW's aviationgrade quality and reliability standards for power generation service.

Customer Name: Nghi Son Refinery & Petrochemical, LLC.
WORK ORDER #: PO04102025-HGP
Component type: MS6001FA 2nd STAGE SHROUD BLOCK
Date of Report: 27 October, 2025

Responsible Product Engineer:  _____ Report prepared by:  _____
Mr. Chaowarit Junjorhor Sr. Engineer Ms. Chamaiporn Butsabong Report writer

Report reviewed and approved by:  _____
Mr. Pheerayawat Muadna (Engineering Manager)

FINAL INSPECTION REPORT

1. INTRODUCTION

24 pcs. of MS6001FA 2nd stage Shroud block have been fully refurbished based on the requirements of the incoming inspection report findings.

Order Information	
EE Work Order no.	824032
Date of report	27 October 2025
Customer P.O. no.	PO04102025-HGP
Component Details	
Engine type	MS6001FA
Component type	2nd Shroud block
Component part number	146E3480 G001, 146E3480 G002, 146E3480 G003
Qty. received	24
Material type	Haynes HR-120
As received coating type (s)	No
As received seal applied	Honeycomb seals
Additional items received with main set (if any)	-
Customer supplied component history	
Total fired hours	24,000
Total starts	(No information supplied)
Total factor fired hours	(No information supplied)
# of previous repairs	(No information supplied)
Hours of operation since last repair interval	(No information supplied)
Operational fuel type	(No information supplied)
Mode of operation (base load / peaking)	(No information supplied)
Maintenance Intervals Combustion	(No information supplied)
Maintenance Intervals Hot gas path	(No information supplied)
Unloaded condition	
Incoming packing / container condition	Good
Signs of transit damage (if damaged upon receipt photos to be included within report)	No

Work Order: 824032	MS6001FA 2nd STAGE SHROUD BLOCK
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FINAL INSPECTION REPORT

2. INSPECTION SUMMARY

Based on the results of the detailed final inspection, all repair actions have been completed and verified in full accordance with UNEW's proprietary engineering standards, including specialized coating applications, defined repair categories, and strict QA/QC procedures as outlined in the UNEW Technical Brochure.

All components were inspected post-repair and found to be within the approved dimensional, metallurgical, and coating tolerance limits. The applied processes and final measurements confirm full compliance with the EthosEnergy-approved Work Scope of Repair and UNEW's release criteria.

Final inspection confirms that the 2nd Stage Shroud Block meets all technical, visual, and quality requirements, and is certified as service-ready for reinstallation and operation under normal turbine service conditions.

REPAIR LEVEL REQUIREMENT			
Descriptions		Qty	Unit
Inspection	Incoming inspection	1	Set
Repair level	Medium Repair and replace honeycomb	1	Set
Required	Replace Honeycomb seal (EETH4066-01)	24	Pc/set
Required	Medium repair entire set	1	set
Optional,	Weld plug pin of old down holes, Need to weld if this set of shrouds is not to use the same turbine. Need to drill the holes during the inspection. Strongly recommend using this HGP set with the same turbine as it with previously.	1	p/set

3. SPARE PART (Repair / Replace):

Item	Part description	Received/ Required	Condition	Quantity	Remark
1	Honeycomb seal (EETH4066-01)	24/24	Replaced	24	Standard work scope

Work Order: 824032	MS6001FA 2nd STAGE SHROUD BLOCK
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4. ENGINEERING SUMMARY:

All components were inspected, repaired, and rejuvenated in full compliance with the approved EthosEnergy Work Scope of Repair, validated and supervised by UNEW Engineering. Each process step adhered strictly to UNEW's proprietary repair technologies and QA/QC standards to ensure structural integrity, reliability, and extended service life.

All repair activities were executed in accordance with the Defect Table Reference Chart, which defined the repair method for each defect, including blend repair, weld and blend repair, high-temperature braze repair, and dimensional restoration. Each method was applied in line with the engineering limits and metallurgical requirements of the component material.

For components with defects located in high-stress or weld-restricted areas, the maximum allowable blend limit was applied. Any defect exceeding these limits was documented, and corresponding components were identified as non-repairable in the addendum.

UNEW Engineering confirms the following:

- + All repair methods were reviewed and approved in accordance with UNEW's advanced engineering and coating technologies.
- + Quality control and metallurgical integrity were verified at all critical stages of the process.
- + All base materials underwent complete heat treatment per UNEW's certified procedure, based on material composition, component condition, and metallurgical sampling results.
- + Final inspection confirms that all repaired components meet UNEW's technical and dimensional standards and are released for service under UNEW Quality Assurance Certification.

FINAL INSPECTION REPORT

5. CERTIFICATE OF CONFORMANCE STATEMENT:

This is to certify that the 2nd Stage Shroud Block assembly has been inspected, repaired, and rejuvenated in full accordance with the approved EthosEnergy Work Scope of Repair, validated and overseen by UNEW Engineering. All processes were performed under UNEW's proprietary engineering technologies and strict QA/QC standards, ensuring complete compliance with applicable design, material, and dimensional requirements.

Summary of Work Performed

- + All components were inspected and found within repairable limits as defined by EthosEnergy and confirmed by UNEW Engineering.
- + Identified defects were corrected using approved methods including blend repair, weld and blend repair, high-temperature braze restoration, and dimensional recovery.
- + For weld-restricted or high-stress regions, blending was applied within the maximum allowable engineering limits.
- + Components exceeding repair limits were documented and classified as non-repairable per the Defect Table Reference Chart.
- + All base materials underwent full heat treatment based on composition and metallurgical condition to restore structural integrity.
- + Final dimensional, visual, and non-destructive examinations (FPI, hardness, and coating thickness) confirm full conformance with UNEW's technical acceptance criteria.

Quality Assurance Statement

- + All repair and inspection activities were conducted in accordance with UNEW's certified procedures.
- + The component meets or exceeds the UNEW Standard for Refurbished Hot Gas Path Components.
- + The 2nd Stage Shroud Block is released as Service-Ready and approved for installation and operation.

FINAL INSPECTION REPORT

6. COMPONENT CORRELATION:

CORRELATION SHEET			
Item	Part number	Serial number	Material
1	146E3480 G002	16259-21	Haynes HR-120
2	146E3480 G003	16259-20	Haynes HR-120
3	146E3480 G001	16259-19	Haynes HR-120
4	146E3480 G001	16259-18	Haynes HR-120
5	146E3480 G001	16259-17	Haynes HR-120
6	146E3480 G003	16259-16	Haynes HR-120
7	146E3480 G002	16259-15	Haynes HR-120
8	146E3480 G001	16259-14	Haynes HR-120
9	146E3480 G001	16259-13	Haynes HR-120
10	146E3480 G001	16259-12	Haynes HR-120
11	146E3480 G002	16259-11	Haynes HR-120
12	146E3480 G001	16259-10	Haynes HR-120
13	146E3480 G001	16259-9	Haynes HR-120
14	146E3480 G003	16259-8	Haynes HR-120
15	146E3480 G001	16259-7	Haynes HR-120
16	146E3480 G001	16259-6	Haynes HR-120
17	146E3480 G001	16259-5	Haynes HR-120
18	146E3480 G003	16259-4	Haynes HR-120
19	146E3480 G001	16259-3	Haynes HR-120
20	146E3480 G001	16259-2	Haynes HR-120
21	146E3480 G001	16259-1	Haynes HR-120
22	146E3480 G001	16128-22	Haynes HR-120
23	146E3480 G001	16283-1	Haynes HR-120
24	146E3480 G001	16283-2	Haynes HR-120

FINAL INSPECTION REPORT

7. SCOPE OF WORK

Work scope	Inspect	Medium
Inspect		
Perform receipt inspection and record serial numbers	X	
Perform metallurgical evaluation of base material, report on condition	X	
Abrasive blast to clean all surfaces	X	
Performing incoming solution heat treatment in partial pressure vacuum environment	X	
Set in 3-pcs assembly fixture and perform dimensional inspection	X	
Perform fluorescent penetrant inspection	X	
Compile incoming inspection report and forward to customer	X	
Repair		
Remove thermocouple guide as required		X
MC/Blend to remove honeycomb section		X
Blend to remove oxidation product on external repairable areas		X
Prepare areas for weld repair as required		X
Perform weld repairs as required		X
Blend all repaired areas to restore component profile		X
Set in 3-pcs assembly fixture and perform dimensional inspection		X
Perform fluorescent penetrant inspection		X
Perform Age heat treatment based on material specification		X
Perform fluorescent penetrant inspection		X
Prepare and fit replacement honeycombs to pressure face surfaces		X
Perform braze heat treatment		X

FINAL INSPECTION REPORT

Perform visual inspection		X
Blend excess honeycomb section flush with shroud block side walls		X
Abrasive blast to clean all surfaces		X
Set in 3-pcs assembly fixture and perform dimensional inspection		X
Replace thermocouple guide as required		X
Perform final visual inspection		X
Compile final report, pack and ship components with all required documentation		X

8. ENGINEERING DETAIL WORK DONE:

The 2nd Stage Shroud Block forms part of the stationary turbine assembly surrounding the second-stage rotating blades. Its function is to maintain the sealing and gas flow geometry necessary for turbine efficiency while withstanding prolonged exposure to high temperatures and oxidation.

During service, these components typically experience oxidation, scaling, surface erosion, and thermal fatigue cracking, especially at the gas path, hook fit, and interlocking surfaces. The refurbishment objective is to fully restore structural integrity, dimensional accuracy, and fit-up capability, in compliance with UNEW proprietary engineering standards and EthosEnergy's approved Work Scope of Repair.

8.1. Incoming Inspection

- + Visual and dimensional inspections were performed to identify thermal distress, oxidation, and hook fit wear.
- + Non-Destructive Examination (FPI) was carried out to detect surface cracks and porosity.
- + Metallurgical sampling confirmed the base alloy as FSX-414 or equivalent nickel-based alloy, suitable for rejuvenation.
- + Defects were documented in the Defect Table Reference Chart for engineering disposition.

8.2. Cleaning and Preparation

- + Components underwent alkaline degreasing, oxide removal, and grit blasting using controlled alumina media to eliminate scale and combustion deposits.
- + All remaining residues and contaminants were completely removed before any repair or weld operation. Surfaces were inspected to confirm that base material was free of coating and oxidation layers.

FINAL INSPECTION REPORT

8.50 Crack Removal and Weld Restoration

- + Detected surface cracks and areas of localized damage were mechanically prepared by grinding or machining to expose clean metal.
- + Repairs were performed using Gas Tungsten Arc Welding (GTAW) with matching filler alloy under an inert environment to minimize heat-affected zone stress.
- + In zones where weld access was limited, vacuum brazing was applied to restore material continuity.
- + All welded areas were blended and contoured to original geometry, ensuring smooth transitions at the gas path and interlocking areas.

8.4. Dimensional Restoration and Machining

- + Hook fits, interlocks, and side seal faces were restored to original tolerances through precision machining and grinding.
- + CMM (Coordinate Measuring Machine) verification confirmed dimensional restoration within ± 0.05 mm tolerance of nominal drawing values.
- + Fit-up checks were performed with adjacent shroud segments to ensure alignment and sealing continuity.

8.5. J gcv'Vtgcwo gpy

- + Each segment was subjected to a controlled solution and stabilization heat treatment per the base alloy specification to restore mechanical strength and grain structure uniformity.
- + Post-heat-treatment hardness and metallographic analysis confirmed proper carbide distribution and absence of microcracking.

8.6. HpcrllKour gevklp'cpf 'Xgt Hlec vlqp

- + Final visual, dimensional, and FPI inspections verified that all repairs met UNEW's acceptance criteria.
- + Surface finish, geometry, and clearances were checked to ensure compatibility with turbine assembly requirements.

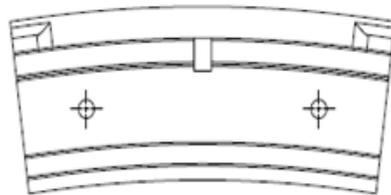
FINAL INSPECTION REPORT

10. PHOTOGRAPHS:

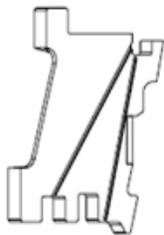
<p>Fig.1 Final inspection.</p>	<p>Fig.2 Final inspection.</p>
<p>Fig.3 Final inspection.</p>	<p>Fig.4 Final inspection.</p>
<p>Fig.5 Final inspection.</p>	<p>Fig.6 Fixture inspection.</p>

FINAL INSPECTION REPORT

11. DEFECT LEGEND TABLE:



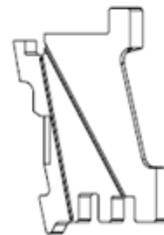
FWD SIDE



LEFT SIDE



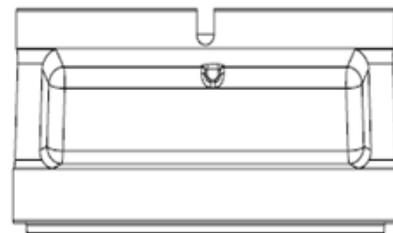
PRESSURE FACE



RIGHT SIDE



AFT SIDE



BACK SIDE

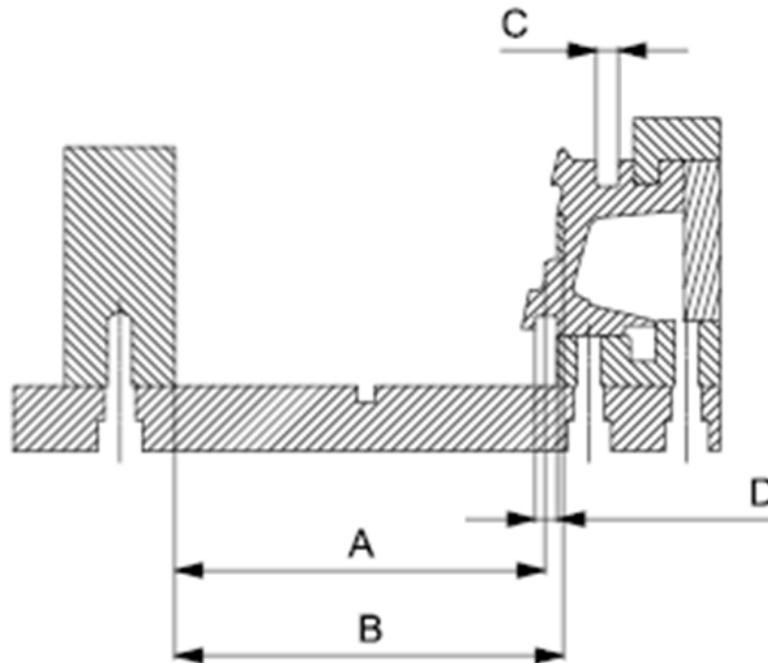
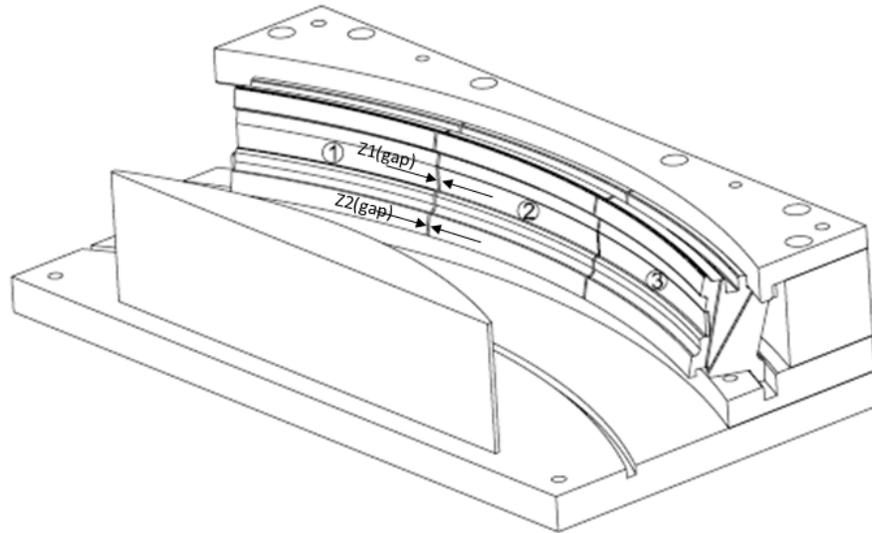
FINAL INSPECTION REPORT

2st stg Shroud block No.	INSPECTION FINDINGS																	INSPECTION FINDINGS							
	Pressure face				Left/Right side					Forward side				Aftward side				Back side			Honey comb				
	Cracking	Corrosion	Wear	FOD	Cracking	Corrosion	Wear	FOD	Missing material	Corrosion	Wear	FOD	Cracking	Corrosion	Wear	FOD	Cracking	Cracking	Wear	FOD	Cracking	Wear	FOD	Deformation	
1											B				B								R		
2											B				B								R		
3											B				B								R		
4											B				B								R		
5											B				B								R		
6											B				B								R		
7											B				B								R		
8											B				B								R		
9											B				B								R		
10											B				B								R		
11											B				B								R		
12											B/WB				B/WB								R		
13											B/WB				B								R		
14											B				B								R		
15											B/WB				B								R		
16											B/WB				B								R		
17											B/WB				B								R		
18											B/WB				B/WB								R		
19											B				B								R		
20											B				B								R		
21											B				B								R		
22											B				B								R		
23											B				B/WB								R		
24											B/WB				B/WB								R		

WE = Welding and Electric discharge machining (EDM) to be performed to build material dimensions and restore original dimensions.
 TPR = Transient Phase Restoration to be performed based on the defects detected.
 R = Replace with new.
 ACC = Acceptable as is.
 Rej = Dimension unacceptable and will require repair or cause of scrap.
 S = Non-repairable / Scrap
 L = Light repair category
 M = Medium repair category
 H = Heavy repair category
 EX = Salvation repair category

Work Order: 824032	MS6001FA 2nd STAGE SHROUD BLOCK
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12. DIMENSION INSPECTION:



FINAL INSPECTION REPORT

Dimension Inspection							
ITEM	POSITION (Unit : mm.)						Result
	A	B	C	D	G1(gap)	G1(gap)	
1	214.87	222.37	13.33	13.26	ACC	ACC	ACC
2	214.89	222.48	13.31	13.34	ACC	ACC	ACC
3	214.80	222.40	13.37	13.25	ACC	ACC	ACC
4	214.78	222.47	13.39	13.32	ACC	ACC	ACC
5	214.81	222.44	13.35	13.25	ACC	ACC	ACC
6	214.74	222.47	13.31	13.30	ACC	ACC	ACC
7	214.78	222.49	13.36	13.22	ACC	ACC	ACC
8	214.77	222.48	13.37	13.29	ACC	ACC	ACC
9	214.81	222.44	13.31	13.26	ACC	ACC	ACC
10	214.79	222.46	13.35	13.26	ACC	ACC	ACC
11	214.79	222.49	13.34	13.37	ACC	ACC	ACC
12	214.82	222.49	13.34	13.34	ACC	ACC	ACC
13	214.84	222.46	13.35	13.24	ACC	ACC	ACC
14	214.76	222.49	13.34	13.21	ACC	ACC	ACC
15	214.81	222.47	13.31	13.29	ACC	ACC	ACC
16	214.82	222.41	13.35	13.37	ACC	ACC	ACC
17	214.76	222.40	13.37	13.15	ACC	ACC	ACC
18	214.89	222.46	13.37	13.24	ACC	ACC	ACC
19	214.79	222.48	13.34	13.23	ACC	ACC	ACC
20	214.79	222.41	13.28	13.26	ACC	ACC	ACC
21	214.77	222.41	13.33	13.18	ACC	ACC	ACC
22	214.67	222.45	13.29	13.24	ACC	ACC	ACC
23	214.64	222.47	13.30	13.27	ACC	ACC	ACC
24	214.66	222.48	13.30	13.29	ACC	ACC	ACC

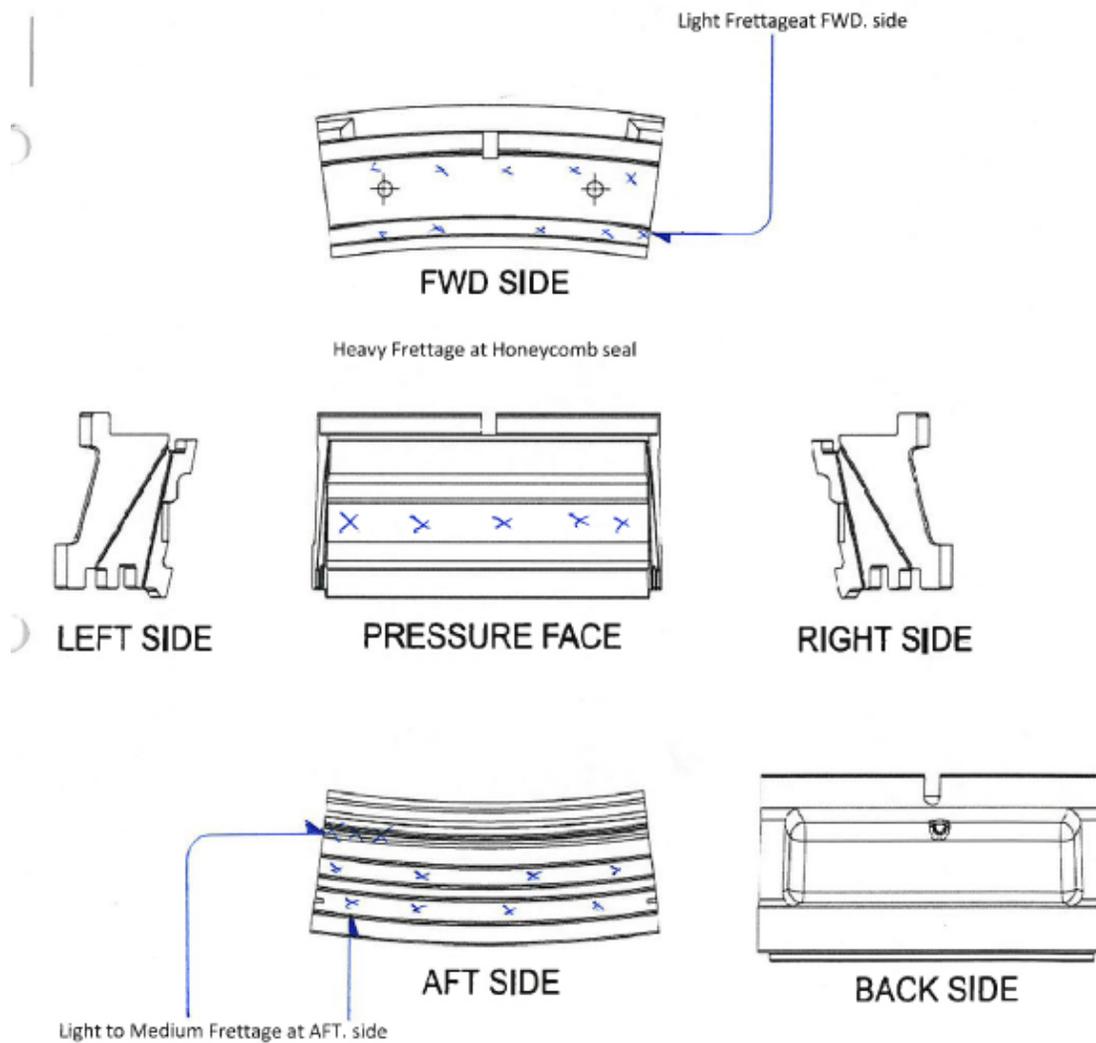
FINAL INSPECTION REPORT

13. DEFECT MAP:

INSPECTION AND PROCESS RECORD SHEET	MS6001FA STAGE 2 SHROUD BLOCK	IPRS NO.	3069-40
	PART NUMBER : GESB02M6FA	REV.	01
CUSTOMER :	NghiSon Refinery	CUSTOMER PO :	
JOB NUMBER :	824032	OP.	0080
INSPECTED BY :	Methee Ph.	DATE :	14/07/2025

Mapping of FPI and Visual Inspection

- Crack (mm)
- Foreign Object Damage (L/M/H)
- Fretting (L/M/H)
- Deformation area(mm²)
- Corrosion (L/M/H)
- Missing Material (mm²)



TYPICAL DEFECT

Unit: mm

Work Order: 824032	MS6001FA 2nd STAGE SHROUD BLOCK
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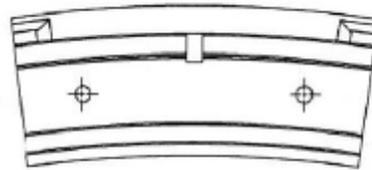
FINAL INSPECTION REPORT

INSPECTION AND PROCESS RECORD SHEET	MS6001FA STAGE 2 SHROUD BLOCK		IPRS NO. 3069-40
	PART NUMBER : GESB02M6FA		REV. 01
CUSTOMER :	NghiSon Refinery	CUSTOMER PO :	
JOB NUMBER :	824032	OP.	0080
INSPECTED BY :	Methee Ph.	DATE :	14/07/2025

Mapping of FPI and Visual Inspection

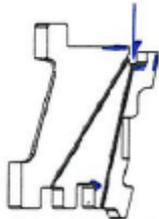
- Crack (mm)
- Foreign Object Damage (L/M/H)
- Fretting (L/M/H)
- Distortion (mm/m²)
- Corrosion (L/M/H)
- Missing Material (mm²)

(Incoming condition)

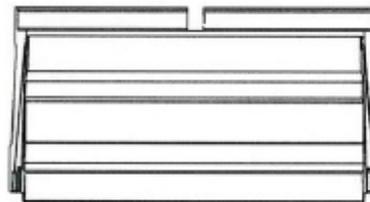


FWD SIDE

Medium F.O.D. at Left side
No.12,13,15,16,24

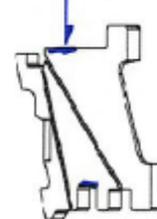


LEFT SIDE



PRESSURE FACE

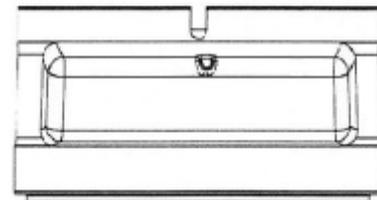
Medium F.O.D. at Right side
No.16,17,18



RIGHT SIDE



AFT SIDE



BACK SIDE

NON TYPICAL DEFECT

Unit: mm

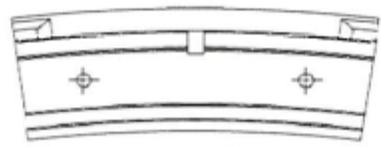
Work Order: 824032	MS6001FA 2nd STAGE SHROUD BLOCK
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FINAL INSPECTION REPORT

INSPECTION AND PROCESS RECORD SHEET	MS6001FA STAGE 2 SHROUD BLOCK	IPRS NO.	3069-40
	PART NUMBER : GESB02M6FA	REV.	01
CUSTOMER :	Nghi Son Refinery &	CUSTOMER PO :	PO04102025-HGP
JOB NUMBER :	824032	OP.	Final
INSPECTED BY :	<i>Kerim Kow</i>	DATE :	29 / 9 / 2025

Mapping of FPI and Visual Inspection

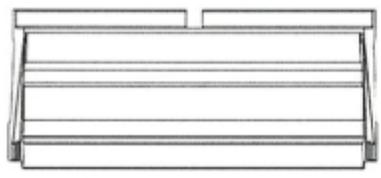
- Crack (mm)
- Foreign Object Damage (L/M/F)
- Fretting (L/M/F)
- Deformation area (mm²)
- Corrosion (L/M/F)
- Missing Material (mm²)



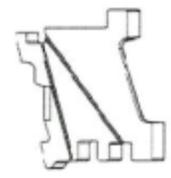
FWD SIDE



LEFT SIDE



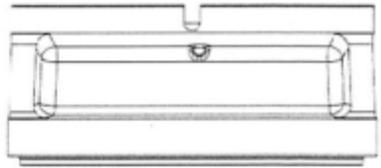
PRESSURE FACE



RIGHT SIDE



AFT SIDE



BACK SIDE