

TECHNICAL APPLICATION GUIDE

MKTECH INDUSTRY SDN BHD

AEROSPACE SURFACE INTEGRITY

Abrasive finishing for controlled MRO and manufacturing

Repair boundaries, material removal, thermal control and inspection. Includes a worked trial and two reusable worksheets.

For maintenance planners, manufacturing engineers, technicians and quality teams.

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01 / PURPOSE AND NAVIGATION

Control the surface at every stage

Aerospace abrasive work changes the condition of a component. Define what may be removed, which features must be protected and how the result will be measured before choosing a tool.

Plan the work

Identify the exact part, damage and governing data. Map the permitted work area and establish the as-found measurements.

Control the cut

Hold the approved abrasive, tool and operating window. Check geometry and surface condition at the prescribed stops.

Verify the result

Record the measured evidence, deviations and disposition. Route maintenance release through the organisation's authorised process.

Find the right section

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Which instructions govern the job

For maintenance, start with the applicable current maintenance data

Confirm that the organisation has the capability and authority for the work. Use the applicable maintenance data and the approved repair data required for the task, together with the organisation's controlled work instructions. For production, use the governing engineering drawing, process specification and customer requirements. Resolve missing or conflicting instructions with the responsible engineering or quality team before work. [1-3]

MRO = maintenance, repair and overhaul. OEM = original equipment manufacturer. QA = quality assurance. NDT = non-destructive testing. FOD = foreign object debris or damage.

02 / PROCESS ENGINEERING

Define the handover at each step

A work pack should make the next decision clear. Link each step to its controlling instruction, the evidence to capture and the person authorised to accept it. [1-3]

STAGE	CONTROL THE OPERATION	EVIDENCE BEFORE PROCEEDING
1. Identify and assess	Confirm identity, configuration, material and surface treatment. Check required repair history and map the as-found condition.	Part identity, damage location, images or readings, current document references and initial disposition.
2. Plan and protect	Confirm repair route, work zone, removal and geometry limits, protected features and inspection order.	Work card, boundary map, baseline measurements and applicable hold points.
3. Set up and check	Check tool, holder, abrasive, fixture, extraction and gauges. Record required setup values and IDs.	Approved configuration and current check/calibration status. Work area ready for the task.
4. Correct and refine	Follow the documented sequence and holds. Record tool changes, feature condition and deviations.	Geometry and surface condition at each checkpoint. Previous-stage marks cleared as required.
5. Verify and account	Clean and verify as specified. Complete required NDT and account for tools, masking and debris.	Actual readings, test reports, calibration references, photos where required and FOD clearance.
6. Disposition and hand over	Resolve deviations and compile the completed records for the responsible authority.	Accepted step or hold, next operation and maintenance release where applicable.

Carry the work state across shifts

Record the last accepted stage, remaining work, in-process readings, protected features and any open hold. Keep the work card and attachments together so the next operator can verify the state before touching the part.

An in-process sign-off records the step completed

For maintenance, the organisation's authorised certifying staff make the applicable maintenance release decision using the completed work and inspection records. [1, 3]

03 / DAMAGE ASSESSMENT

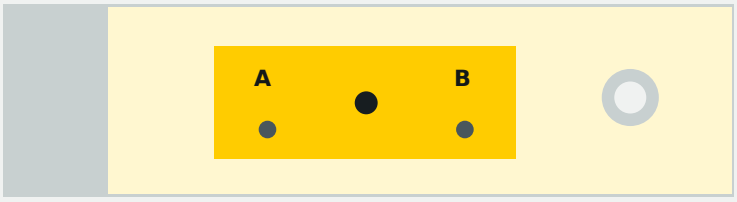
Map the repair boundary

The same mark can call for a different decision at an edge, fillet or mating face. Use the task data to define the work zone and inspection locations. [1-3]

FEATURE OR CONDITION	WHAT TO ESTABLISH	EVIDENCE TO CAPTURE
Airfoil, radius or thin edge	Location, protected edge or profile, required contour and any restrictions on blending or direction.	Datum or station, initial profile/edge condition and the specified gauge or inspection program.
Bore, root or mating face	Fit, contact surface, fillet, coating boundary and restricted tool access.	Bore, land or radius dimensions and the location of each measurement relative to the datum.
Coated or treated surface	Treatment or coating identity, allowable exposure and any required restoration sequence.	As-found layer/condition, protection map and reference for restoration or engineering disposition.
Uncertain indication	Whether the defect type, depth and extent can be established with the specified assessment route.	Photograph or map, observed condition and written disposition before abrasive work.

Example of a marked work zone

PLAN VIEW / ILLUSTRATIVE COUPON



- Work boundary from task data
- Protected edge and hole
- Mapped indication
- A and B measurement locations

Use the datum and measurement locations called up for the actual job.

When the boundary or allowance is unknown

Preserve the as-found evidence and hold the part for disposition. Include previous repair records when the governing data controls cumulative material removal. [1-3]

04 / ABRASIVE SYSTEM SELECTION

Match the tool to the feature

Start from the approved method, then review access, contact area, shape, finish and material. The product families below describe selection factors for an authorised application or trial. [1, 3, 6, 7]

TOOL OR ABRASIVE FAMILY	WHAT TO CHECK WHEN SELECTING	WHAT TO RECORD
Mounted grinding point	Fit to the radius and access path, point shape, bond, grain and grade. Verify the point's permitted mounting and overhang conditions for the tool.	Point code and shape, shank/collet, tool ID, configured speed and any applicable dressing/change criteria.
Carbide burr	Cut geometry, head shape, reach and chip path. Check whether the task permits a cutting tool and whether it can be controlled near the protected feature.	Burr cut, head/shank dimensions, lot as required and setup in the work instruction.
Coated belt, disc or sheet	Grade system, backing stiffness and contact wheel or pad support. Consider access, direction of lay and the risk of edge rounding.	Product/grade designation, size, backing, interface, pad or contact wheel and orientation.
Bonded or superabrasive wheel	Wheel specification, compatible machine and mounting. Confirm the specified truing, dressing and coolant arrangements where applicable.	Wheel specification, machine, mounting and dressing record, and fluid/setup references.
Nonwoven finishing media	Confirm the task permits conditioning or blending and identify the product's cut and support. A compliant medium can reach areas beyond the intended contact zone.	Product grade, density or construction, support and accepted endpoint for the stage.

Control substitutions by product and setup

Compare the full product specification and tool assembly. Two products with the same nominal grit can differ in abrasive system, grain, backing, bond or cut. Treat a change to any controlled item as a change to the process and route it through the applicable review.

Check the whole assembly

Use the current tool and abrasive instructions for mounting, guards and operating limits. Confirm the work instruction's setting is within the limits for every installed item, including the holder, pad or mounted point. Escalate conflicts before use. [1, 6]

05 / MATERIAL AND WORK-AREA CONTROL

Prevent cross-contamination

Confirm the alloy or substrate, heat treatment and finish from the job record. Match media, cleaning and extraction to the authorised process and the work-area risk assessment.

MATERIAL OR SURFACE	RISK TO REVIEW	PLANNING CONTROL
Aluminium alloys	Loaded media, surface smearing, unintended edge loss or transferred particles.	Confirm the permitted abrasive and cleaning route. Check for a change in cut or residue at stage holds.
Titanium alloys	Heat at contact, material transfer and potential combustible dust from the operation.	Confirm the allowed media and heat controls. Verify the facility's approved dust handling for this material. [8, 9]
Nickel superalloys	Heat and abrasive wear can change near-surface condition, including residual stress, in some grinding routes. [7]	Use the specified tool-condition and thermal controls. Plan any surface-integrity test called for by the process.
Hardened or treated steel	Grinding damage, local geometry loss and disturbance to a protective or treated layer.	Identify the heat treatment and surface condition. Verify required burn, layer or geometry checks with QA.
Coated or peened surfaces	Local breakthrough or loss of a functional surface condition.	Identify protected areas and the approved restoration or disposition route before any permitted touch-up.
Composites and mixed structures	Fibre exposure, layer damage or dust contamination. The metal finishing route may be unsuitable.	Use the applicable composite procedure and its inspection, dust-control and repair requirements.

Segregate the abrasive system and clear the part

Follow the work instruction for dedicated abrasives, fixtures, cleaning materials and storage. Remove residue between stages by the specified method. Check masking, recesses and openings as required, and account for tools and loose items at closeout. [1, 3]

Plan dust and exposure controls with the facility

The responsible safety team should review dust type, extraction, housekeeping, fire and exposure controls for the actual materials and task. Obtain a suitable approved arrangement before starting. [6, 8, 9]

06 / PREPARATION WORK INSTRUCTION

Make the setup reproducible

Put the job-specific values and acceptance criteria in the work pack. Agree who checks the setup and who can disposition a deviation. [1-3]

01 **Establish the controlling references**
Enter the work order, part identification, applicable manual or repair instruction with revision, local work-card revision, acceptance references and any special process requirements.

02 **Capture the starting condition**
Record the defect, starting finish, prior repair evidence where applicable and baseline values at the specified locations. Make the work zone and protected features identifiable.

03 **Verify fixture, tool and consumable**
Use the specified support and attachment. Confirm tool condition, compatibility, configured limits and abrasive identity and lot if required. Record the fixture/datum and equipment IDs.

04 **Prepare controls for the actual task**
Confirm permitted dry or fluid-assisted operation, extraction, contamination segregation, cleaning materials and PPE. Follow the current product and site instructions. [6, 8, 9]

05 **Make inspection ready**
Check gauge suitability and calibration status, reference standards and the inspection setup. Confirm measurement locations, who performs the checks and what triggers a hold.

06 **Document what a restart requires**
Specify required checks after a tool change, interruption or shift handover. Record the last completed step and open issues so the job can restart under control.

Set up the record for the next check

Tool configuration

Record the actual tool, holder, abrasive code, support and process values required by the instruction.

Inspection configuration

Record the fixture or datum, gauge ID, measurement locations and the acceptance reference.

Use the part verification worksheet to organise supporting evidence for the controlled work card.

07 / MATERIAL REMOVAL AND HEAT

Protect form during every pass

Treat geometry, scratch refinement and heat as separate controls. A change in one may affect the others, especially near thin edges, radii and restricted-access features. [4, 7]

Track the removal allowance by location

Use the specified datum and record readings at the same locations before and after each required check. Use comparable measurements to track local thickness change. Apply the specified profile method for a shaped feature and include prior work where the data controls cumulative removal.

Review the remaining allowance before another correction. If a mark remains when the permitted removal is reached, or the available margin is uncertain, retain the evidence and stop for disposition.

Advance the abrasive stage only after inspection

STAGE	CONTROL	CHECK BEFORE PROCEEDING
Correct within the zone	Use the authorised contact path and tool support. Watch the boundary and protected features.	Defect disposition and measured shape are within the stage criteria.
Refine the scratch pattern	Follow the approved sequence and clean between stages. Use the specified direction where lay matters.	Previous-stage marks have cleared to the specified criterion. Inspect transition areas.
Finish for the next operation	Use the required final abrasive or surface preparation. Keep the surface condition appropriate for the inspection, treatment or coating that follows.	Required texture, dimensions, cleanliness and handover conditions recorded.

Watch for drift as the tool wears

Loss of cut, loading, chatter, unexpected heat or a changed scratch pattern can indicate a change in contact or tool condition. Stop and review the tool, support and permitted operating window. Use only the specified change, dressing and restart criteria. Capture the last known acceptable check.

Treat a suspected thermal excursion as a hold

Retain the part and the process evidence. Have the responsible team determine the required assessment and any follow-up test. Where thermal or near-surface effects matter, confirm them by the specified method. [7]

08 / INSPECTION AND VERIFICATION

Match the check to the requirement

Build the inspection plan before work. Specify the location, timing, method and acceptance source for every characteristic. Record actual results and preserve the link to the part. [1, 4, 5]

CHARACTERISTIC	WHAT THE METHOD ANSWERS	RECORD FOR VERIFICATION
Visual surface condition	Where are visible scratches, discoloration, residual defect indications, breakthrough or foreign material?	Surface condition, zone, lighting or magnification if specified, images and disposition of indications.
Dimension and profile	Are the required thickness, radius, fit or contour still within the defined limits?	Datum and location, calibrated method, values and units. Use a profile method when the characteristic requires it.
Surface texture and lay	Does the specified texture parameter and directional finish meet the requirement in the stated area?	Parameter such as Ra if specified, units, instrument, filter/cutoff, evaluation length, traverse direction and individual results.
NDT when required	Does the applicable method indicate relevant discontinuities within its qualified scope?	Method, procedure and revision, coverage, report and disposition by the required personnel.
Near-surface condition when specified	Are the required material-condition characteristics acceptable after the process?	Test method and report for the specified property, with part or coupon traceability.

Make readings comparable

Record the inspection orientation and setup with the result. If a probe cannot reach the required area, or a result is close to a limit and its validity is uncertain, follow the organisation's measurement decision procedure and obtain disposition before proceeding.

Keep the sequence intact

Perform required inspections at the specified stages. Resolve unexpected indications before any further operation that could change the evidence.

Close every requirement

A texture reading, a dimension and a test report each cover a different characteristic. Check each required result against its own acceptance reference.

The applicable procedure governs inspection method, preparation, personnel and acceptance. Sources [1, 4, 5] and handbook chapters are linked on page 15.

09 / TROUBLESHOOTING AND ESCALATION

Diagnose the defect before rework

Use the symptom to plan the investigation. Capture the condition, affected part IDs, last acceptable check and setup records. The authorised disposition determines further work. [1-3]

OBSERVED SYMPTOM	INVESTIGATE	IMMEDIATE RESPONSE
Discoloration or suspected heat	Check the stage, tool loading, contact, configured values and fluid delivery where applicable.	Hold the part. Preserve the surface and route the evidence for the prescribed assessment.
Rounded edge or profile shift	Review the fixture and datum, work boundary, abrasive support and the cumulative removal record.	Hold the part. Verify geometry using the specified method and obtain disposition.
Deep or isolated new scratches	Check previous-stage marks, transferred particles, tool debris and the condition of the media and support.	Record location and appearance. Confirm remaining allowance and authorised correction before further work.
Chatter or loss of cutting action	Review tool and holder condition, seating, fixture stability and loading or wear.	Stop the operation and verify setup. Review affected parts since the last accepted check as required.
Inconsistent texture readings	Check measurement location, direction, settings, contact, fixture and calibration or verification status.	Retain the readings and repeat only as the inspection procedure directs. Escalate method uncertainty.
Residue, lost item or debris	Check consumable condition, segregation, masking, recesses and tool or item accountability.	Apply the organisation's contamination or FOD process. Keep the part on hold until cleared.

Establish the affected population

Link the issue to the tool, abrasive lot, operator, shift and time window where relevant. Follow the quality procedure to identify and contain other potentially affected work. Document the disposition and any required occurrence reporting through the organisation. [1, 3]

> **A suspected crack or uncertain indication needs disposition**
>
> Keep the as-found condition available for evaluation. Use the specified inspection route and obtain authorisation before resuming abrasive work.

10 / WORKED ENGINEERING EXAMPLE

A local blend on a training coupon

An engineering team wants to compare two supported abrasives near a protected radius. The objective is to clear the mapped mark while preserving profile, texture and the specified boundary.

Illustrative trial on non-flight material

The team uses a representative coupon with a machined radius and a marked restricted area. Its trial protocol defines the targets and permissible process window. Flight hardware requires the applicable approved route.

01 **Set up the comparison**

Use coupons from the same material condition with comparable starting geometry and marks. Record the fixture, measurement program, abrasive identification and the initial readings at A and B.

02 **Record the baseline**

Run the established method within the protocol. At the intermediate check, confirm the boundary and record the profile readings, surface observations, tool condition and active time.

03 **Test the candidate within the agreed scope**

Change only the planned abrasive system variable. Use the same inspection methods and required holds. Log each pass or stage as specified, including consumable changes and observations.

04 **Resolve a mixed result**

The candidate clears the mark and meets the texture target, but the protected radius fails the profile check. Hold that coupon, retain the readings and investigate tool contact and backing support.

05 **Decide what further evidence is needed**

Keep the failed run in the record. If engineering permits another trial with a revised support, record it as a new configuration and repeat the agreed checks on a new set of coupons.

Record the decision in the trial file

Include the specific result, affected zone, supporting evidence, disposition and owner. A successful follow-up applies to the configuration and scope that were actually evaluated.

Use the trial planning worksheet to agree the scope and the part verification worksheet to record the outcome.

11 / CONTROLLED VALIDATION AND COST

Compare cost per accepted result

Quality gates decide whether a candidate qualifies for further review. Cost and time are useful once the baseline and candidate are measured on comparable work within the approved trial scope.

01

Agree the question and freeze the comparison

Define the feature, baseline, proposed change and intended benefit. Match material condition, geometry, starting surface and inspection method. Agree sample size and operator or shift coverage based on risk.

02

Set acceptance and stop rules before starting

Use the applicable criteria and agree who inspects, what is recorded, and which failures stop the trial. Use representative coupons or non-flight material where appropriate to the authorised protocol.

03

Capture the results and route the change

Log accepted, held and rejected items, plus time, consumables and rework. Assess variation and keep failed runs. Follow the organisation's change procedure and obtain required approvals before applying the change. [1, 3]

Illustrative cost comparison on two coupon runs

SAME INCLUDED COST SCOPE	BASELINE	CANDIDATE
Coupons processed	20	20
Accepted on first pass	17 / 20 (85%)	19 / 20 (95%)
Finally accepted after permitted rework	19	20
Abrasives + direct labour + added rework	RM90 + RM270 + RM60	RM120 + RM250 + RM30
Included cost / finally accepted coupon	RM420 / 19 = RM22.11	RM400 / 20 = RM20.00

Count initial labour and additional rework once each. State exclusions such as external inspection or scrap. Review every hold and rejection with the raw results before making a decision.

Keep the scope of approval explicit

Record the covered part or coupon family, material, geometry, product, setup and inspection route. Define what changes trigger further validation. The numbers above demonstrate the calculation.

12 / REUSABLE WORKSHEET A

Plan the controlled trial

Print or duplicate for each trial. Agree the protocol, authority and criteria before work. Attach the controlled approval and inspection plan.

TRIAL ID / REVISION / DATE

OWNER / QA REVIEWER

PART FAMILY OR COUPON ID / MATERIAL CONDITION / SURFACE TREATMENT

WORK INSTRUCTION, APPROVAL AND ACCEPTANCE REFERENCES / REVISIONS

FEATURE AND WORK ZONE / PROTECTED FEATURES / DEFECT OR STARTING CONDITION

TRIAL QUESTION / VARIABLE UNDER COMPARISON / INTENDED RESULT

CONTROL TO RECORD	BASELINE	CANDIDATE
Abrasive code, grade and lot		
Tool, support and fixture		
Process values / stage sequence		
Inspection method and criteria		

NUMBER AND RANGE OF COUPONS OR PARTS / OPERATORS / SEQUENCE OF RUNS

HOLD OR STOP CRITERIA / INSPECTION POINTS / OWNER FOR DISPOSITION

EVIDENCE TO RETAIN / TIMING AND CONSUMPTION TO CAPTURE / REPORT REFERENCE

PROTOCOL AUTHORISED BY / DATE / SCOPE RESTRICTIONS

Reference applicable work documents for actual operating limits. Use one part verification worksheet per item or attach the equivalent controlled record.

13 / REUSABLE WORKSHEET B

Record verification and handover

Use one copy per part or coupon. Enter values with units and cite the method and limit. Use the organisation's controlled work records for formal acceptance and release.

WORK ORDER OR TRIAL ID / DATE

PART OR COUPON ID / SERIAL / OPERATOR

JOB DATA / WORK-CARD REVISION / ZONE MAP / FIXTURE OR DATUM

ABRASIVE, LOT AND TOOL IDS / RECORDED SETUP / PROCESS LOG REFERENCE

FEATURE / LOCATION	METHOD / LIMIT REF.	AS FOUND	IN-PROCESS	FINAL / STATUS
Geometry point A				
Geometry point B				
Texture / lay location				
Other required check				

UNITS, INSTRUMENT / CALIBRATION ID AND SETUP / NDT OR OTHER REPORT REFERENCE

Close the checks required for this job

- ☐ Required stage checks completed and linked to the work record.
- ☐ Protected zones and specified surface conditions verified.
- ☐ Cleaning, masking removal and tool/debris accountability completed as required.
- ☐ Deviations and unresolved items identified for authorised disposition.

EVIDENCE REFERENCES / DEVIATION OR HOLD ID / DISPOSITION

VERIFIED BY / DATE / ACCEPTED STEP OR HOLD

NEXT OPERATION / CONTROLLED RECORD REFERENCE

For maintenance, route the record to authorised personnel under the applicable certification process. [1]

14 / TECHNICAL REFERENCES

Source notes and further reading

Use the current governing documents for the job. The references below explain the regulatory, measurement and process principles behind this guide.

[1] CAAM CAD 8601 | Maintenance Organisation Approval OPEN
Issue 01 / Rev 01. Chapter 5 covers tooling, maintenance data, performance, certification and records.

[2] CAAM CAD 6801 | Continuing Airworthiness of Aircraft OPEN
Issue 01 / Rev 02. See the provisions on continuing airworthiness and repair data.

[3] CAAM CAGM 8601 | Part 145 guidance OPEN
Chapters 7-9 cover maintenance data, planning and error-capturing methods.

[4] NIST | Surface roughness and step height calibrations OPEN
Measurement conditions, texture parameters and sources of uncertainty.

[5] FAA AC 43.13-1B | Chapter 5 inspection background OPEN
Background on NDT method capability. Apply the authority and task-data rules for the actual component.

[6] FEPA | Abrasive product safety instructions OPEN
Product-family safety resources. Use the instructions for the actual tool and abrasive assembly.

[7] Curtis et al. | Grinding wheel specification and Inconel 718 OPEN
2021 study on grinding conditions, surface integrity and residual stress. Results are study-specific.

[8] DOSH Malaysia | Chemical management guidance OPEN
Health risk assessment and workplace exposure control resources.

[9] OSHA | Combustible dust overview OPEN
Technical background on dust hazards, including combustible metal dust.

MKTECH Industrial Abrasives Handbook

023 Surface roughness →
024 Scratch refinement →
042 Surface inspection →
044 Measurement control →

Developed from MKTECH-WP-AERO-008. Images are retained from the supplied whitepaper and illustrate the topic. Web references accessed November 2026. Confirm revisions in the CAAM directives index.

15 / MKTECH APPLICATION SUPPORT

Specify the process behind the part

MKTech Industry Sdn Bhd supports industrial abrasive selection and enquiries from Petaling Jaya, Malaysia. The information below helps narrow a product enquiry or prepare an authorised comparison.



DEFINE THE APPLICATION

What must the operation achieve?

Share the feature, the current process and the measured outcome. Use the applicable engineering and quality process for product substitutions and component acceptance.

Include these details in an enquiry

Component and operation

Share the permitted material details, feature, starting condition, objective and inspection criteria.

Current tooling

Provide the abrasive code and grade, tool, support, wear or loading pattern and product documentation needed.

Trial and supply scope

State the authorised comparison, typical consumption, quantities and delivery location. Share customer data only where permitted.

Contact MKTECH →

Browse abrasives →

Open handbook →

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Keep technical decisions with the responsible team

MKTECH can discuss product specifications and the information needed for comparison. The responsible organisation controls repair authorisation, validation, inspection and release.