XRZ PRECISION

ENGINEERING-LED PRECISION HOLEMAKING

PCD Reamers & Solid Carbide Drills

Selection and RFQ Guide

A practical project brief for cutting tool distributors, OEM/ODM buyers and engineering procurement teams.

01 SELECT

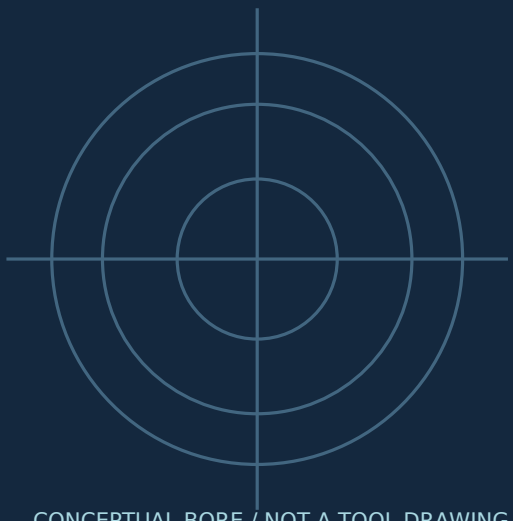
Define the application.

02 VALIDATE

Agree how success is measured.

03 REQUEST

Send a complete technical brief.



CONCEPTUAL BORE / NOT A TOOL DRAWING

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Selection guidance only. No universal cutting parameters or performance guarantees.

01 / QUICK SELECTION

Start with the hole requirement

Choose the machining task before choosing a tool material. A drill creates a hole; a reamer finishes a prepared hole. The two may belong in one process rather than compete for the same job. [1, 4]

Application question	Initial route to evaluate	Bring to the review
Finish a prepared aluminum bore?	PCD reamer concept	Alloy, pre-hole condition, size limits and surface requirement.
Drill steel or stainless steel?	Application-matched solid carbide drill	Exact grade/hardness, depth, entry/exit geometry and coolant.
Drill an aluminum component?	Material-matched drill; review any later finishing step	Chip behavior, burr limit, hole quality and production volume.
Combine several bore features?	Custom step or drill-reamer concept	Complete feature drawing, available travel and process baseline.
Unknown material or special application?	Engineering review before selection	Material identification, coating/insert layers and restricted conditions.

These are starting routes, not approved tool specifications. In this guide, PCD selection is focused on aluminum and suitable non-ferrous applications; other material systems require a separate review. [5]

Find the right section

02 / APPLICATION INPUTS

Define the workpiece and hole

An accurate quotation starts with an unambiguous feature specification. A material family or nominal diameter alone is not a complete design brief.

Input	What to record
Material and condition	Exact grade and standard; heat treatment or temper; hardness and method; casting or wrought condition. Include silicon content when known and relevant.
Hole geometry	Diameter limits, depth definition, through/blind condition, steps, shoulders, cross holes, entry/exit angle and required edge breaks.
Functional requirements	Datums, position, roundness, cylindricity and surface texture exactly as specified on the drawing. Keep their units and referenced standard.
Starting condition	Pre-hole size range, stock distribution, previous operation, interrupted features and any visible damage.
Production context	Lot size, annual demand, material variation, current failure mode and the actual bottleneck.

Resolve ambiguity before tool design

• Identify which document controls: a dimensioned drawing, CAD model, approved marked-up print or customer specification. Record its revision.

• State whether hole depth means full-diameter depth or drill-tip depth. Distinguish a hole depth from tool reach and flute length.

• Keep one authoritative unit system. If a conversion is added, label it as reference only and retain the original tolerance limits.

• Separate mandatory acceptance criteria from improvement targets. A desired shorter cycle does not override a required bore specification.

RFQ OUTPUT

One feature map with drawing revision, material condition, acceptance limits and unresolved questions. Use Appendix A; attach a controlled drawing instead of squeezing every dimension into a message.

03 / PCD REAMER CONCEPT

Select a PCD reamer concept

Review the complete bore sequence: pre-machining, finishing, inspection and repeat supply. A PCD edge is only one part of the system.

Stock allowance and entry condition

Define both the nominal reaming allowance and the variation in the incoming hole. State whether allowance is diametral or radial. The appropriate value depends on the material, diameter, incoming surface and selected tool; do not copy an allowance from an unrelated application. [2]

Guidance, steps and chip path

Concept	Review before approval
Guide-pad reamer	Available guiding length, interrupted sections, contact surfaces, lubrication and how the tool will be set. Guide pads support the tool in the bore; they are not proof of achieved workpiece accuracy. [5]
Multi-step reamer	Which diameters engage at the same time; access to each shoulder; chip clearance; tool reach and measurement of every critical feature.
Combination drill-reamer	Which operations are truly removed; whether drilling chips can affect the finishing edges; machine travel, power, coolant route and reconditioning feasibility.

Compare design alternatives, not slogans

Ask the supplier to explain the proposed cutting material, edge preparation, guidance and coolant layout against the observed problem. Record fixed versus adjustable dimensions, presetting responsibility and the approved method for checking each step. A simpler tool may remain preferable where volume, geometry or setup does not justify integration.

> **DESIGN REVIEW OUTPUT**
>
> An approved tool concept, feature-to-edge map, interface definition and trial plan. No promised tolerance, surface finish or life multiplier is implied by the term PCD.

Related XRZ product: PCD Reamers

04 / SOLID CARBIDE DRILL

Select a solid carbide drill

Match the drill to the material, hole and machine. Diameter, depth and required hole quality are key inputs when comparing drill types. [4]

Decision	Questions to resolve
Material / substrate / coating	What is the exact material condition? Which substrate, edge preparation and coating are proposed for that condition, and what evidence supports the choice?
Depth and reach	State drilled depth divided by nominal diameter (L/D), full-diameter depth, flute length and required reach separately. Use the shortest suitable supported assembly.
Chip evacuation and coolant	Confirm through-tool or external supply, flow at the tool, fluid condition and outlet access. Depth and chip behavior affect the cooling strategy. [3]
Entry, exit and interruptions	Identify inclined faces, cross holes, interrupted exits and thin walls. Ask for a tool-specific entry, feed and withdrawal strategy.
Finish requirement	Determine whether drilling alone can meet the agreed requirement or whether a separate finishing operation must remain.

Coating is a decision, not a product upgrade label

Request the coating designation and its application rationale. Evaluate the complete combination of substrate, geometry, edge preparation and coating; do not choose by color or a claim of universal suitability. For aluminum, assess adhesion and chip evacuation alongside wear. For steel and stainless steel, keep material-specific recommendations separate. [3]

> **PARAMETER RELEASE**
>
> Obtain a starting window for the exact tool and application. Record speed, feed convention, coolant and cycle strategy before the trial. This guide deliberately supplies no universal speed/feed table or maximum drilling-depth claim.

Related XRZ product: Solid Carbide Drills

05 / SETUP REVIEW

Check the machine and process

A change in tooling does not remove machine, fixture or coolant constraints. Stabilize and record the assembly before comparing results.

Check	Evidence to retain
Machine and spindle	Machine ID, interface, maintenance condition and relevant speed, power or travel restrictions.
Holder and overhang	Holder type, assembly ID, clamping procedure, tool projection and clearances. Verify the supplier-approved setup.
Runout	Measurement location, method, instrument and assembled value. Do not compare numbers measured at different locations as though they were equivalent.
Workholding and pre-hole	Part support, datum repeatability, clamping distortion, incoming hole variation and available finishing stock.
Coolant delivery	Fluid type and concentration where applicable; supply method; pressure/flow conditions and filter condition.
Program and operation	Program revision, speed/feed units, entry/exit sequence, tool changes, inspection pauses and cycle-time boundary.

Reaming guidance emphasizes rigid workholding, sound spindle/holder condition and limited overhang. Drilling guidance links coolant and chip evacuation to hole quality and tool reliability. Use these principles as checks, not substitute acceptance limits. [1, 3]

When a trial becomes unstable

Pause according to the agreed stop criteria. Preserve the tool, chips, affected parts and settings before changing anything. Record the first observed symptom and when it appeared. Change one controlled factor at a time where practicable, so the team can distinguish a setup problem from a tool-design problem.

> **BEFORE THE FIRST CUT**
>
> The machine operator must approve the program, clamping and operating conditions under the site procedures. This document is not a machine operating or safety instruction.

06 / ACCEPTANCE PLAN

Define inspection and acceptance

Agree what will be measured, by whom and against which limits before making the sample tool. Tool conformity and machining performance are different approvals.

Tool inspection	Workpiece acceptance
Tool drawing and revision; critical diameters, lengths, edge condition and specified interfaces.	Part drawing and revision; bore size, form, position and surface texture under agreed machining conditions.
Measurement method and instrument suited to the specified tool feature.	Inspection method suited to the actual hole; record access, datum setup, measurement locations and any method limitation.
Evidence that the supplied tool meets its approved specification.	Evidence that measured parts meet their acceptance criteria. This does not automatically establish long-run capability.

Create an acceptance matrix

• For each critical characteristic, list the drawing reference, lower/upper limit, unit, method, instrument ID and sampling frequency.

• Define when parts are measured, including any cleaning, stabilization or temperature conditions needed by the inspection method.

• For surface texture, retain the specified parameter and evaluation settings. Ra and Rz are different parameters: do not silently substitute one for the other. [6]

• Agree how borderline or conflicting measurements will be resolved. Keep the original readings, not only a pass/fail summary.

> **IMPORTANT DISTINCTION**
>
> A quoted IT grade, a tool runout result and a measured surface finish describe different things. They are not interchangeable evidence. State the actual drawing limits and validate the complete process.

Use the customer-specified standard and edition. The methods described here do not certify compliance with any inspection or quality-management standard.

07 / SAMPLE VALIDATION

Plan sample validation

Start with a bounded engineering question: can this tool and setup meet the agreed feature requirements under the stated conditions?

Gate	Required record	Decision
1. Freeze the trial	Tool/part revisions, machine setup, parameters, acceptance matrix, sample plan and stop rules.	Ready to run, or missing input.
2. Inspect first-off parts	Individual readings, part IDs, instrument details, chips and edge condition.	Continue, investigate or stop.
3. Run an agreed sequence	Part sequence, planned inspection intervals, wear observations, parameter changes and interruptions.	Continue only within agreed limits.
4. Review the evidence	Accepted/rejected counts, observed drift, test duration and any untested conditions.	Accepted for stated scope, conditional or not accepted.
5. Release or revise	Approved specification, change record, re-test scope and responsible people.	Repeat-order release or another trial.

Avoid false confidence

Define sample quantity and coverage with the customer; there is no universal sample size in this guide. A short successful run does not establish full tool life, process capability or performance across every material batch. A tool removed before its agreed end-of-life criterion provides a censored observation: report the achieved count and stop reason rather than claiming a completed life.

If a trial fails, link the nonconforming part to its sequence position and tool condition. Record the proposed correction and whether it changes the drawing, tool design, program or inspection method. Do not silently combine results from different revisions.

> **TRIAL OUTPUT**
>
> Use Appendix B and attach the detailed measurement log. The summary worksheet does not replace raw readings, the inspection plan or customer release.

Related XRZ process: Sample Validation

08 / TOOL ECONOMICS

Compare cost per acceptable hole

Use the same process boundary, currency and counting method for both options. The example below is invented to explain the arithmetic; it is not an XRZ result or quotation.

CALCULATION MODEL

Cost per acceptable hole = (allocated tooling cost + machine/process cost + additional quality cost) / accepted holes.
Accepted holes must be greater than zero. Add each cost once.

Illustrative batch: 10,000 attempts	Option A	Option B
Allocated tool purchase/reconditioning cost	$200	$600
Process time at $60 per hour	20 h = $1,200	16 h = $960
Additional quality cost, outside process time	$100	$60
Accepted holes	9,800	9,900
Total included cost	$1,500	$1,620
Cost per acceptable hole	$0.1531	$0.1636

Interpretation: Option B uses less process time in this hypothetical example, but its higher tooling allocation still makes its cost per acceptable hole higher. A faster cycle alone does not prove lower cost.

Set the accounting boundary

Process time here includes cutting, allocated setup, tool changes, stoppages and rework machine time. Additional quality cost includes only costs outside that time/rate, such as separately allocated inspection or rejected-part value. Do not charge rework machine time twice. State exclusions, including material or overhead omitted equally from both options.

This example allocates all listed tooling cost to the batch. If usable life remains, document a different allocation rule and test its effect. Include shipping/reconditioning costs consistently when applicable. For multi-hole parts, define how whole-part rejection is allocated; do not mix accepted parts and accepted holes.

Related XRZ reading: PCD Reamer vs Carbide Reamer

09 / COOPERATION BRIEF

Prepare distributor and OEM projects

Keep commercial agreement and technical release connected, but separate. A sample approval does not automatically settle branding, exclusivity, delivery or repeat-order terms.

Project track	Items to agree in writing
Distributor application support	Who gathers end-user data, reviews the application, coordinates trials and responds to technical issues. Define the approved product scope and local support responsibilities.
OEM / ODM development	Drawing ownership and permitted use; design responsibilities; review gates; acceptance evidence; handling of design changes and nonconformance.
Private-label supply	Approved marking, packaging, labels and documentation. Check that brand claims match verified capabilities and permitted market use.
Repeat orders	Released tool revision, order reference, approved changes, inspection scope, reorder quantity and reconditioning status where applicable.

Control information and versions

Identify the information that may be shared with the supplier and the end user. Resolve NDA or customer restrictions before sending restricted drawings. A confidentiality request does not create a signed NDA by itself. Use a project ID, revision register and named technical contact to avoid manufacturing from an obsolete attachment.

Keep promises project-specific

Confirm price, sample scope, delivery timing, payment, minimum order, warranty/claim procedure and any territory arrangement for the actual project. Do not describe a supplier as exclusive, certified or customer-approved without the corresponding current agreement or evidence.

> **REORDER CHECK**
>
> Repeat against the approved drawing and revision, not only the previous purchase-order number. Review material, machine, coolant or feature changes before treating the application as unchanged.

10 / QUOTATION BRIEF

Complete the RFQ checklist

Send a brief that lets the engineering team identify the application, evaluate feasibility and ask only the questions that remain.

Include in the initial request	Why it matters
Project ID, company and technical contact	Connects the drawing, correspondence and quotation.
Drawing/model with revision and units	Defines the controlling geometry and prevents version ambiguity.
Material grade, condition and hardness	Supports tool-material and geometry review.
Hole limits, depth, form and surface requirements	Defines the machining task and acceptance scope.
Machine, holder, coolant and pre-hole condition	Reveals application constraints before a tool concept is proposed.
Current problem and available baseline records	Distinguishes a quality, cycle, life or supply problem.
Sample quantity, demand and target timing	Allows scope and timing to be evaluated; it is not a delivery promise.
NDA restrictions and intended cooperation model	Clarifies permitted sharing and distributor/OEM responsibilities.

If information is missing

Mark an item as unknown instead of inventing a value. Identify who can supply it and whether it blocks quotation, tool design or trial release. A concept quotation may need to remain conditional until the drawing and machining conditions are complete.

> **SEND YOUR DRAWING**
>
> Start at xrzpcd.com/contact. Include the project reference and completed Application Data Sheet. Agree an appropriate transfer route before sending restricted files. Submitting an RFQ does not approve a tool design.

Related XRZ resource: Custom Cutting Tool RFQ Checklist

APPENDIX A / FILLABLE WORKSHEET

Application Data Sheet

One sheet per application. Use unknown where needed. Attach the controlled drawing; do not put restricted customer data in an unapproved sharing channel.

Project ID / date

Company / technical contact

Part drawing / revision / units

Material / condition / hardness

Diameter limits / tolerance / units

Full-diameter depth / through or blind

Form / position / datum requirements

Surface parameter / limit / units

Machine ID / spindle interface

Holder / projection / runout method

Coolant / pressure / flow / concentration

Pre-hole limits / finishing allowance

Current tool / program revision

Sample quantity / demand / timing

Problem, target, restrictions and attached records

Fill the fields in a PDF reader, save a copy, then reopen to check your entries. Fields do not upload data. Use an attachment for long notes. Retain the drawing revision and original units.

APPENDIX B / FILLABLE WORKSHEET

Sample Validation Record

Summary only. Attach the agreed sampling plan and raw measurement log. A signature or typed name here does not replace the customer release process.

Project / trial ID / date

Operator / reviewing engineer

Part / tool / program revisions

Material lot / machine / setup ID

Speed / feed / units / coolant record

Inspection plan / instruments / settings

Planned sample / inspection intervals

Attempted / accepted / rejected counts

Trial duration / achieved holes / stop reason

Acceptance limits / report reference

Measured results and raw-log reference; include units and sample identifiers

Wear, chips, interruptions, nonconformance and controlled changes

Decision: accepted for stated scope / conditional / not accepted; owner and next action

Report the actual tested scope. Keep a completed-life result separate from a trial stopped early. Preserve failed readings and revision changes; do not replace them with a pass-only summary.

APPENDIX C / FILLABLE WORKSHEET

Before-and-After Comparison

Use the same feature, acceptance rules, units, cost boundary and accounting period. Record confounding changes; missing information is not zero.

Project / comparison period / currency / feature and drawing revision

	BEFORE / BASELINE	AFTER / TRIAL
Tool and process revision		
Material / machine / coolant		
Attempted / accepted holes		
Inspection / result log reference		
Process time / hourly rate		
Allocated tooling cost		
Additional quality cost		
Total included cost		
Cost per accepted hole		
Tool-life count / stop criterion		

Differences, exclusions, cost allocation, limits and review conclusion

No automatic calculation is performed. Divide total included cost by accepted holes only when accepted holes > 0. Do not double count machine time, rework or rejected-part costs. See the illustrative example on page 09.

REFERENCE NOTES

Sources and terminology

External references support general engineering principles only. They do not establish XRZ performance, certification, partnership or endorsement. Accessed 28 August 2026.

[1] Sandvik Coromant - Reaming
Operation definition and setup fundamentals.

[2] Sandvik Coromant - How to ream a hole
Stock allowance depends on application and incoming condition.

[3] Sandvik Coromant - Drilling tips
Coolant, chip evacuation and setup considerations.

[4] Sandvik Coromant - Drilling
Drill selection in relation to hole diameter, depth and tolerance.

[5] MAPAL - Tools with guide pads / Electrified drives
Guide-pad principles and examples of PCD-based aluminum tooling.

[6] Mitutoyo - Surface Roughness Measurement
Introductory terminology; legacy standard references. Use the customer-specified edition.

Additional source for [5]: MAPAL - Electrified drives

Working definitions

Term	Meaning in this guide
L/D	Drilled depth divided by nominal diameter; state the depth convention.
Runout	Measured rotational variation at a stated location and setup.
Accepted hole	A hole counted as conforming under the agreed inspection rules.
Tool life	Usable output until a defined endpoint; state stop criteria and conditions.
RFQ	Request for quotation; not a manufacturing or trial release.

The workflow, worksheets and numerical cost example are original editorial material for this guide. No external proprietary tables, product claims or customer case results are reproduced.

DOCUMENT CONTROL / NEXT STEP

From a guide to an application review

The next useful input is your drawing and process context - not a generic request for the highest accuracy or longest life.

SEND YOUR DRAWING

Open xrzpcd.com/contact and reference your application. Attach the completed Application Data Sheet and controlled drawing through an agreed channel. Identify confidentiality restrictions first.

Document record

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Use and revision control

- Reference this guide by title, version and date. Retain the sources, assumptions and application limitations.
- Submit project-specific inputs before tool selection, trial approval or quotation.
- Review new material, machine or drawing revisions before reusing an approved tooling route.

This is selection and RFQ preparation guidance, not a tooling warranty, operating procedure or certification. Final tool design, parameters, inspection criteria and commercial terms require project-specific agreement.