RKB
BEARING INDUSTRIES

GENERAL QUALITY PROGRAM

No. GQP0211AE

RKB BEARING INDUSTRIES

General Quality Program

Contents

Materials

RKB makes use of SAE 52100 steel to manufacture rolling bearings for common applications. Under certain circumstances and most of all for medium and large size bearings, SAE 52100/A is adopted. Regarding critical applications, a special bearing steel (SAE A485 or RKB Type.RAV), with higher cleanliness and specific mechanical properties, is used. This steel, obtained through the Vacuum Degassed Electroslag Remelting process (VAC-ESR), has lower levels of non-metallic inclusions and ensures premium product reliability and performance. As for the manufacture of rollers, the RKB Group can use SAE 52100/A.F forged steel (Tough Roller Technology) to guarantee better resistance to corrosion, wear, fatigue and stationary loads, especially in harsh conditions.
For special industrial applications, RKB can exploit the properties of the SAE 9315 case-hardened steel, which is a nickel-chrome-molybdenum steel.
The RKB Group is committed to continuously improving its knowledge on bearing steel through the scientific research carried out by its Technical Department. The unceasing collaboration between the RKB Group and its steel suppliers has allowed our through-hardened and case-hardened steels to have a further decrease in the content of oxygen and non-metallic inclusions, ensuring high cleanliness and a better rolling contact fatigue resistance. According to our technical material specifications (JX80X), the quality control performed by RKB on its steel and final products takes place on a multilevel basis by means of non-destructive tests, chemical composition controls, macro and microstructure evaluations, mechanical properties measurements and reports for traceability.

All raw materials and process materials are selected by the PAC (Products Approval Control) and identified by a computer integrated alphanumeric code system. All received materials are checked in laboratory before approval. If tests are negative, the material is put aside *sub iudice*. The recordings of quality features are regularly provided by RKB's Approved Suppliers with the various lots for the cross-check procedure. All raw and process materials are strictly supplied by RKB's Certified Suppliers only.

Before raw material is accepted in the production line, samples are checked in laboratory by chemical analyses, hardening tests, macro and microstructure evaluations etc. Besides, dimensional controls of semi-finished products, bars, forgings etc. are made by qualified operators before approval for production. Process materials are subject to frequent in-line controls according to the RKB specifications on the basis of stated production lots.
Moreover, every single component is subject to an acceptance control for its conformance to the specifications and drawings stated by RKB.

Heat treatments

All RKB bearing steels are hardened and heat treated to obtain optimum mechanical properties. In addition to the conventional thermal cycles, RKB can perform two special heat treatments on its products: RKB Bainite Treatment (HB) for decreasing ring crack incidence and RKB Dimensional Stabilization Treatment (S) for ring dimensional stability up to an operating temperature of 350 °C. Finally, two thermo-chemical surface treatments are available: RKB Anti-Wear Treatment (AWT), essential to reduce the metal-on-metal friction between contact surfaces, and RKB Phosphate Treatment (PT), suitable for bearings operating in highly corrosive environments.

Bearing components enter the heat treatment area accompanied by a control data sheet for every lot. The correct heat treatment process and the related furnace are chosen according to the protocol planning data. Before the heating process starts, the furnace atmosphere, treatment time curve and hardening conditions are established, and the details of every lot are recorded in the related computer file system.
Samples of treated items are checked and all data are registered. If test results are not in accordance with the specifications set by the related international standards and RKB internal protocol, the cause of error is determined and all suspected components, if recoverable, are treated once again, after the corrective action is applied.
The hardness test is executed as established in the RKB process specifications, in order to be sure that test results are in accordance with the appropriate hardness scale provided for the current ISO regulations. Generally in-line controls are made by the Rockwell method, but sample inspections are made by the Brinell method.
After any new installation, setting-up and fixing, each furnace undergoes strict approval controls, including temperature and atmosphere checks, inspection of temperature measurement equipment etc.
After hardening, all components are tempered according to the instructions established in the RKB specific guidelines.
After heat treatment, all documents related to each lot are collected in the central MRP file, to trace that heat treatment was properly carried out according to the procedure.

Dimensional features

As for dimensional accuracy, generally a batch of tests and in-line controls is carried out.
First of all, each machine is predisposed to the RKB production method. Afterwards components are tested by the RKB QC (Quality Control) Staff. The operator is expected to make the choice personally, where possible, and, with the help of the QC Staff, to verify that these choices are properly made at regular breaks during production.
At the end of every turning cycle and grinding cycle, a security control system is launched and a check for compliance with the close tolerances of the masterpieces is performed. This system ensures the quality of every lot before it is transferred to the next operation and, in these phases, specific sampling schemes are used according to ISO standards and RKB standards.
There are cases where bearings or special assemblies need to be produced with particular quality requirements not scheduled by the RKB standard procedures; in these cases the special control and quality programs required by the client can be defined by the RKB's QTS (Quality Technical Service). This situation can occur for new products, new processes, and bearings for critical applications.
Special programs include a general quality program with a detailed control protocol, and every supplementary control step is entirely registered. If required by the specific bearing application, additional programs can be established (e.g. QCCDS or Quality Certificate of Conformity Data Sheet). This also encompasses the heat stabilization process, when necessary, so that inadmissible changes in dimensions do not occur as a result of structural changes.
During the production process, dimensional control is executed by an integral calibration system that ensures all measures are within the standard tolerances and in accordance with RKB internal manufacturing drawings.

Controls and final tests

Visual checks on all surfaces of manufactured products, finished and ready for assembly, are regularly carried out to avoid any visually noticeable anomaly. Selection of rolling elements in groups with defined grade and raceway values measurement of internal and external rings for the correct matching with radial clearance determined on the production order are made by the RKB Assembling Department.
Specific controls with related tables and charts, including possible residual magnetism limits and non-destructive controls with MPI (Magnetic Particle Inspection) and UMD (Ultrasonic Micro-crack Detection) are regularly performed.
The final control of bearing factors, such as dimensional and running accuracy grade and surface parameters, is carried out on 100 percent of the bearings with bore over 250 mm.
Deep cleaning, marking, protective anti-rust oil lubrication and packing follow.
Constantly the RKB QC Staff verifies finished products, while flawed ones, if recoverable, undergo a corrective action.
As for miniature and small size precision ball bearings, special vibration and noise control equipment is available at the RKB QC Division.

General quality policy

All the systems, procedures, programs and protocols followed by the RKB Group are in conformity with ISO 9001 and ISO 14001.
These systems are based on the total quality concept having as guidelines the principles of Total Quality System (TQS), Company Wide Quality Control (CWQC) and Quick Response Manufacturing (QRM), at all levels of research, development, engineering, manufacturing, control, traceability and repeatability.
These systems are executed on the basis of regular plans and corrective feedbacks are implemented in the event of any negative variance with the aim to reduce the statistic percentage of unpassed and/or scraped production.
All RKB manufacturing plants are homologated by many key clients and certified by British certification bodies officially recognized worldwide.
The Quality Control Division, which directly belongs to the RKB Technical Department, has the responsibility for the Group policy with regard to process and product quality.

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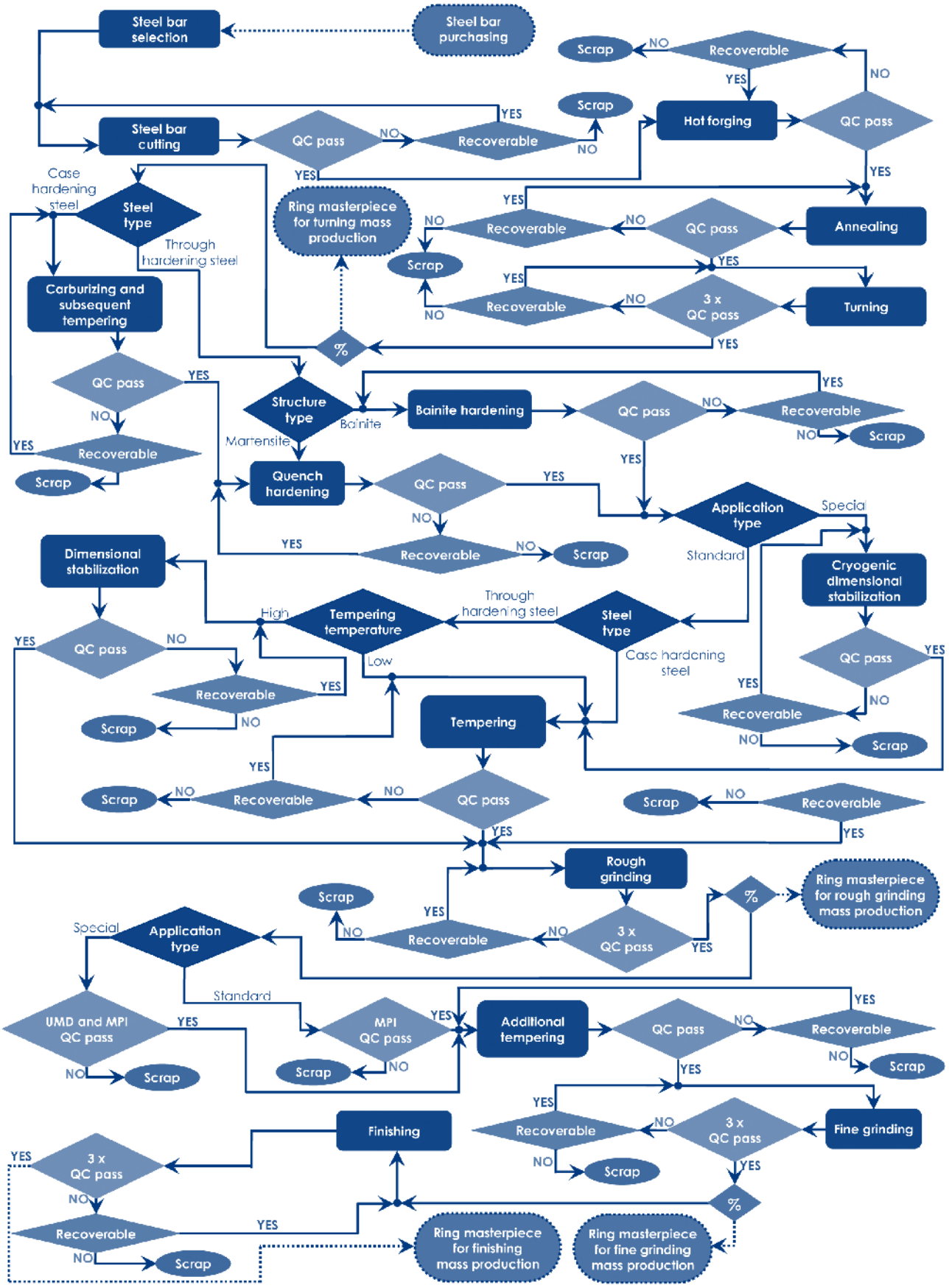
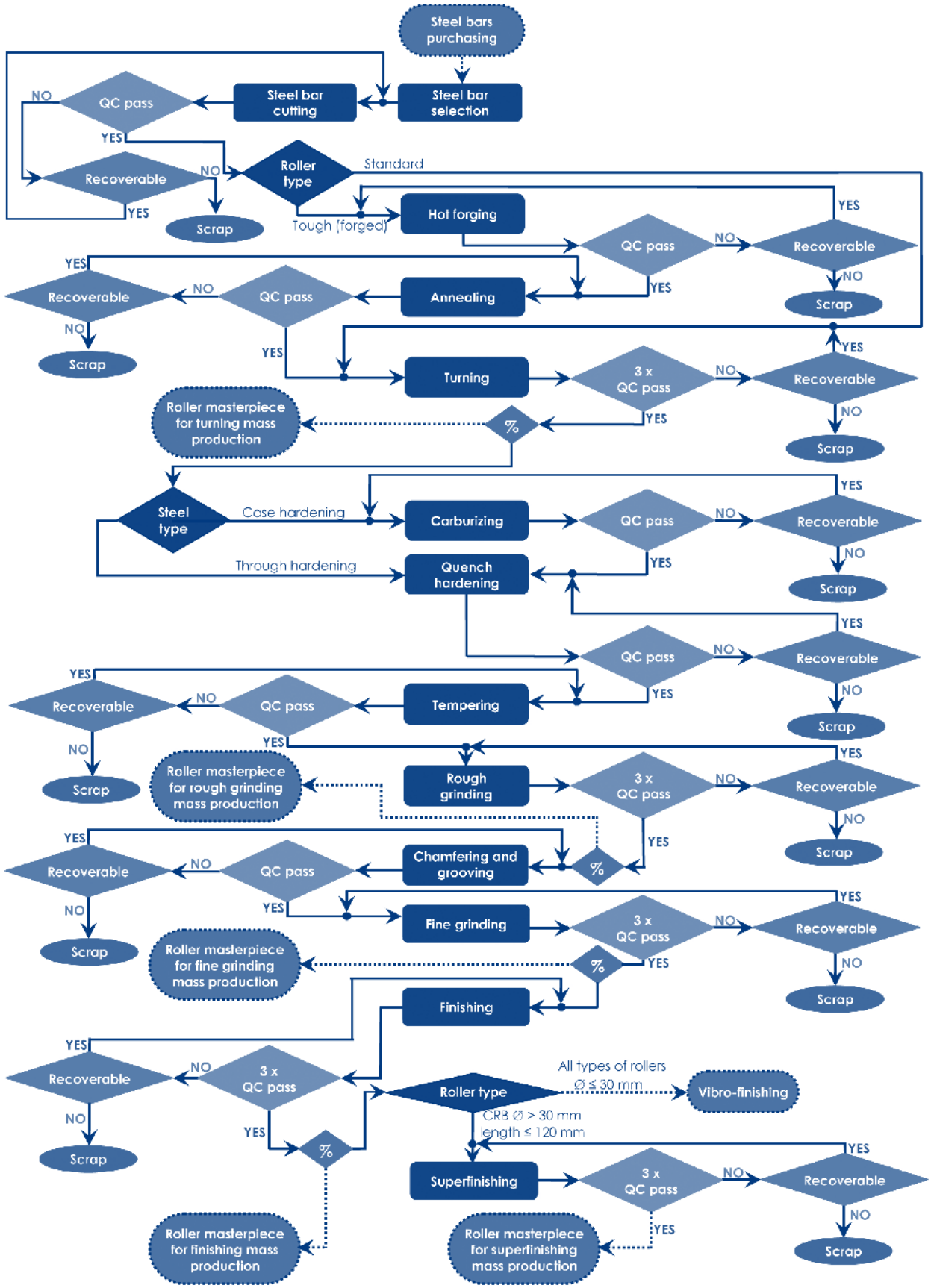
APPENDIX:
PRODUCTION FLOWCHARTS

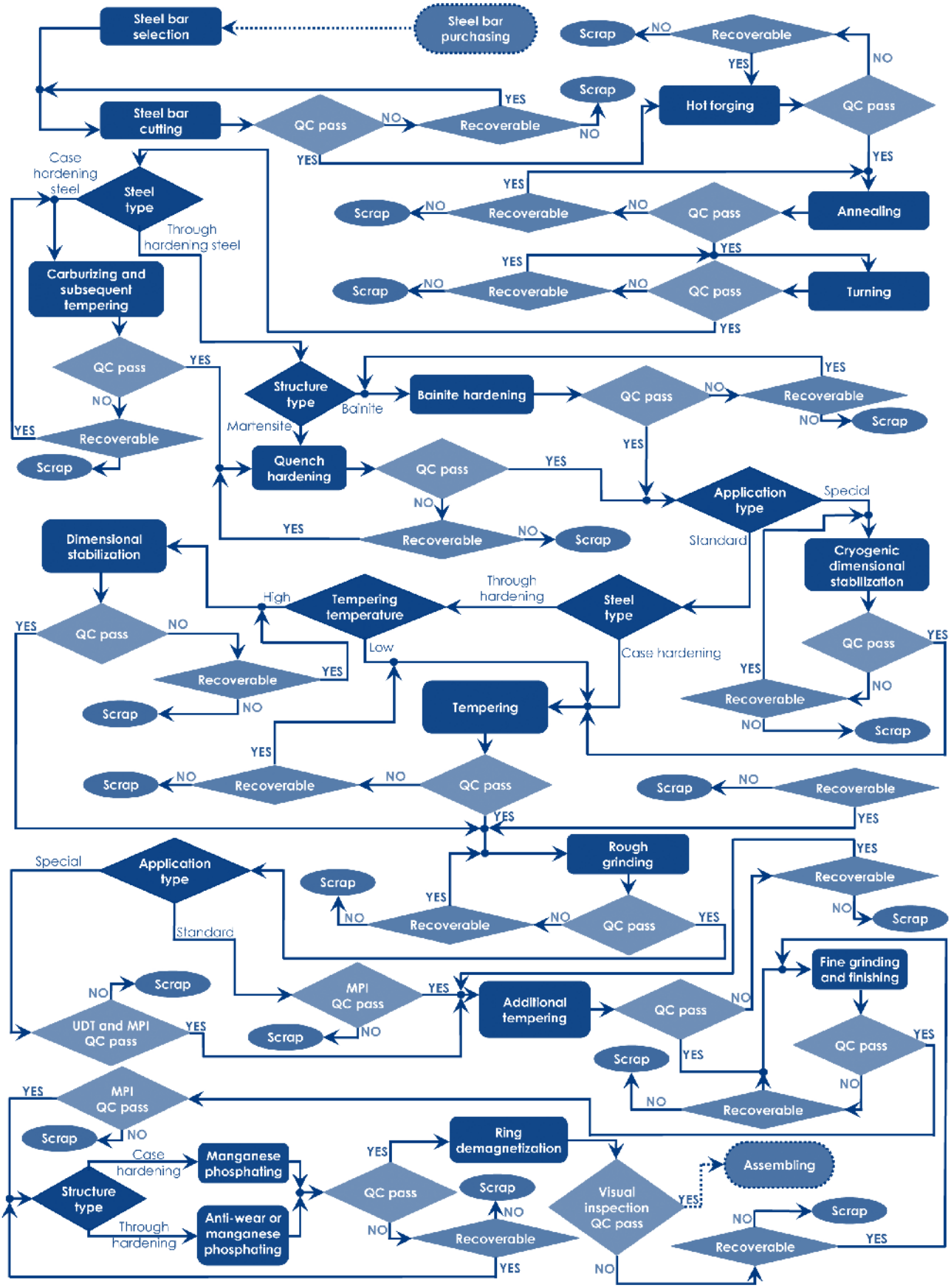
RKB rolling bearing rings masterpieces production flowchart



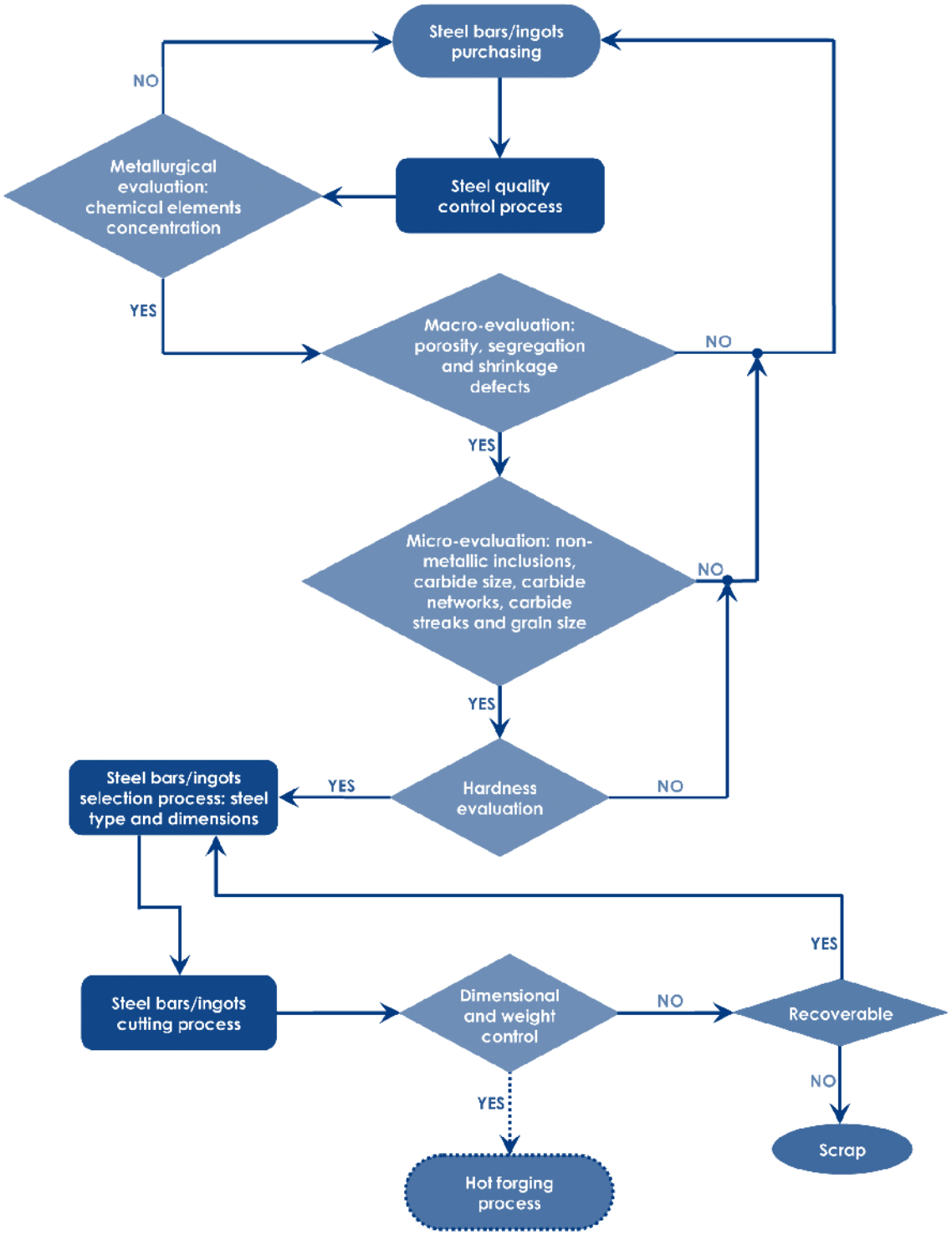
RKB rolling bearing rollers masterpieces production flowchart



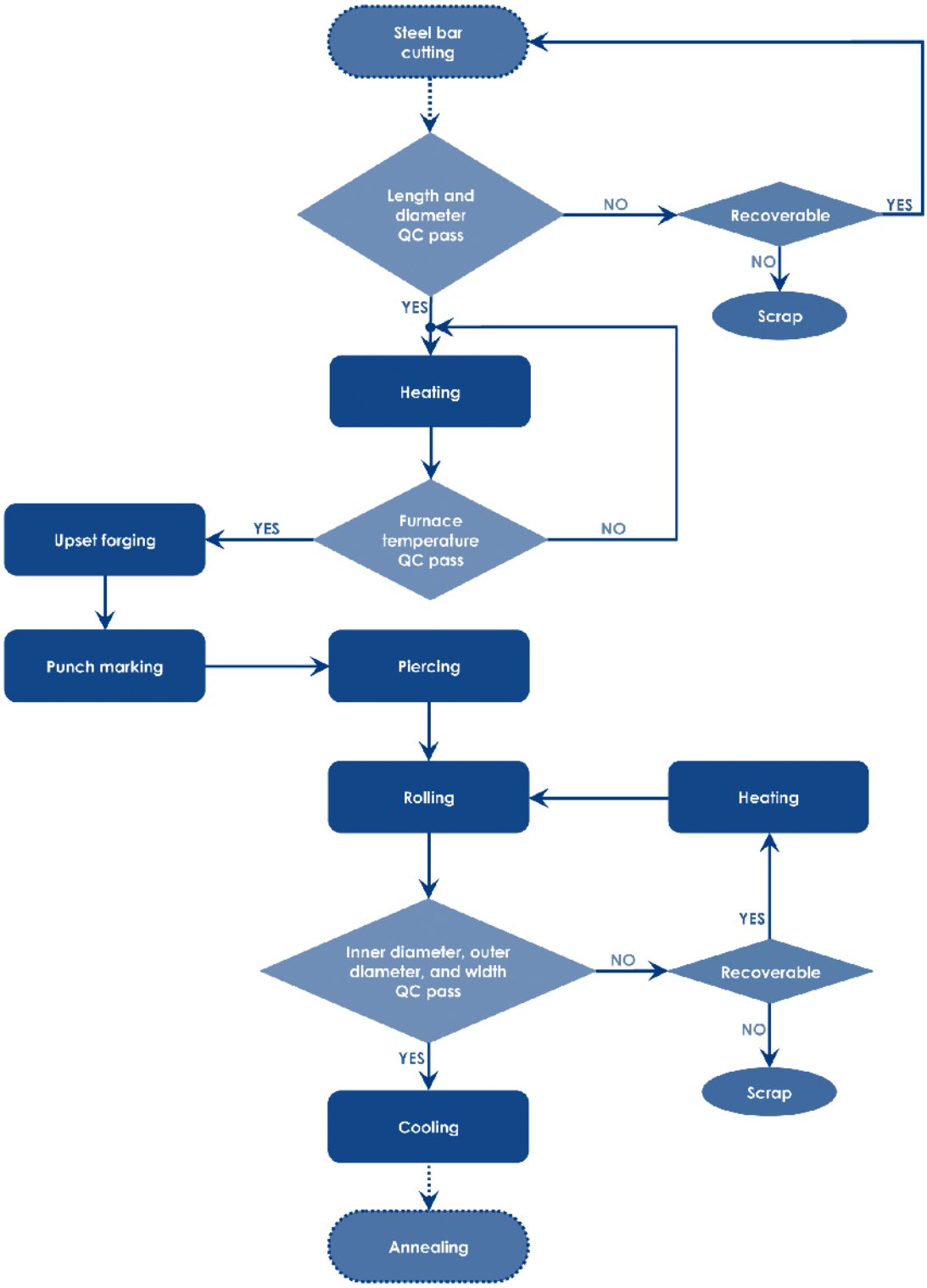
RKB rolling bearing rings production flowchart



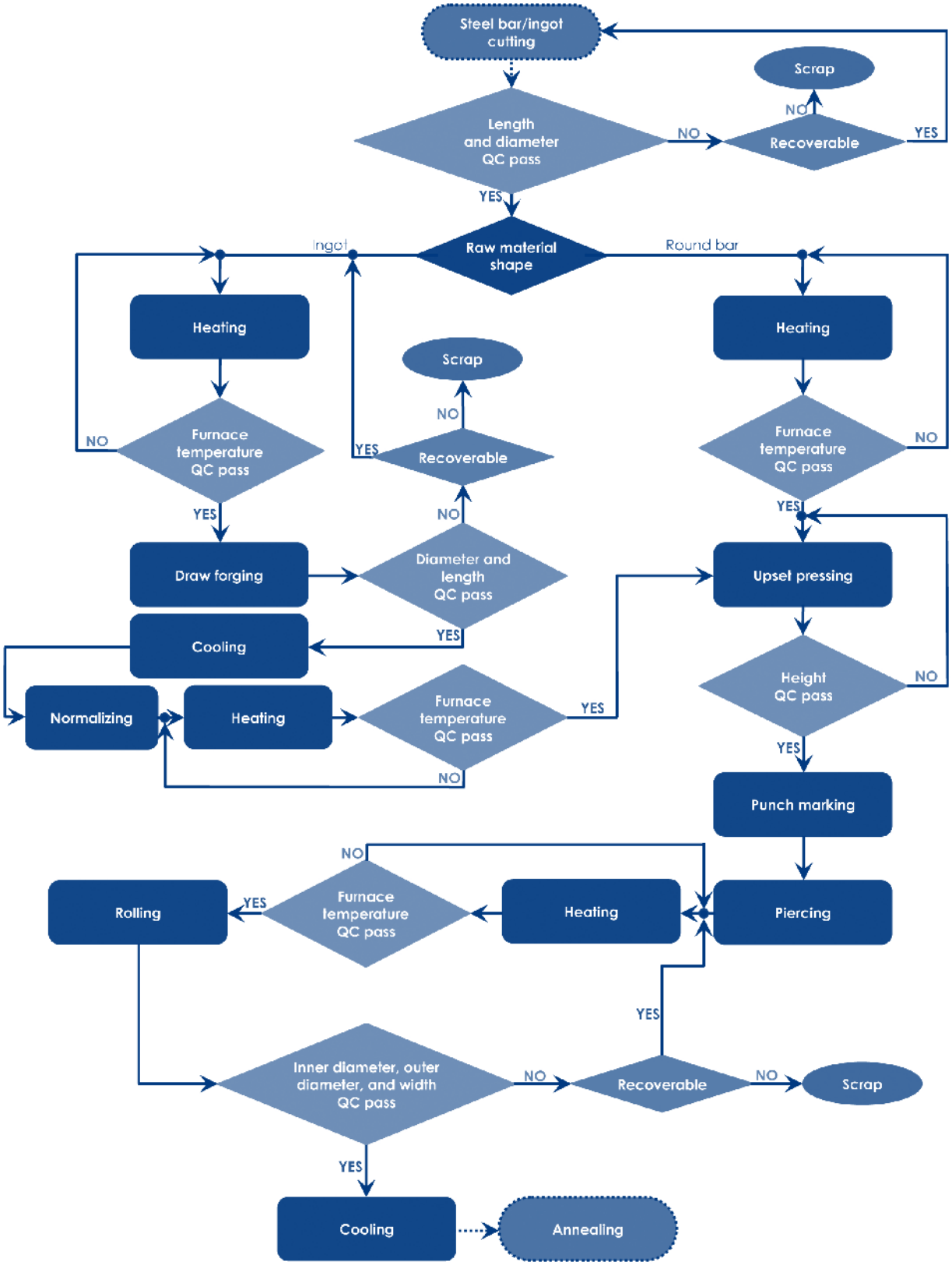
RKB rolling bearing rings steel bar cutting flowchart



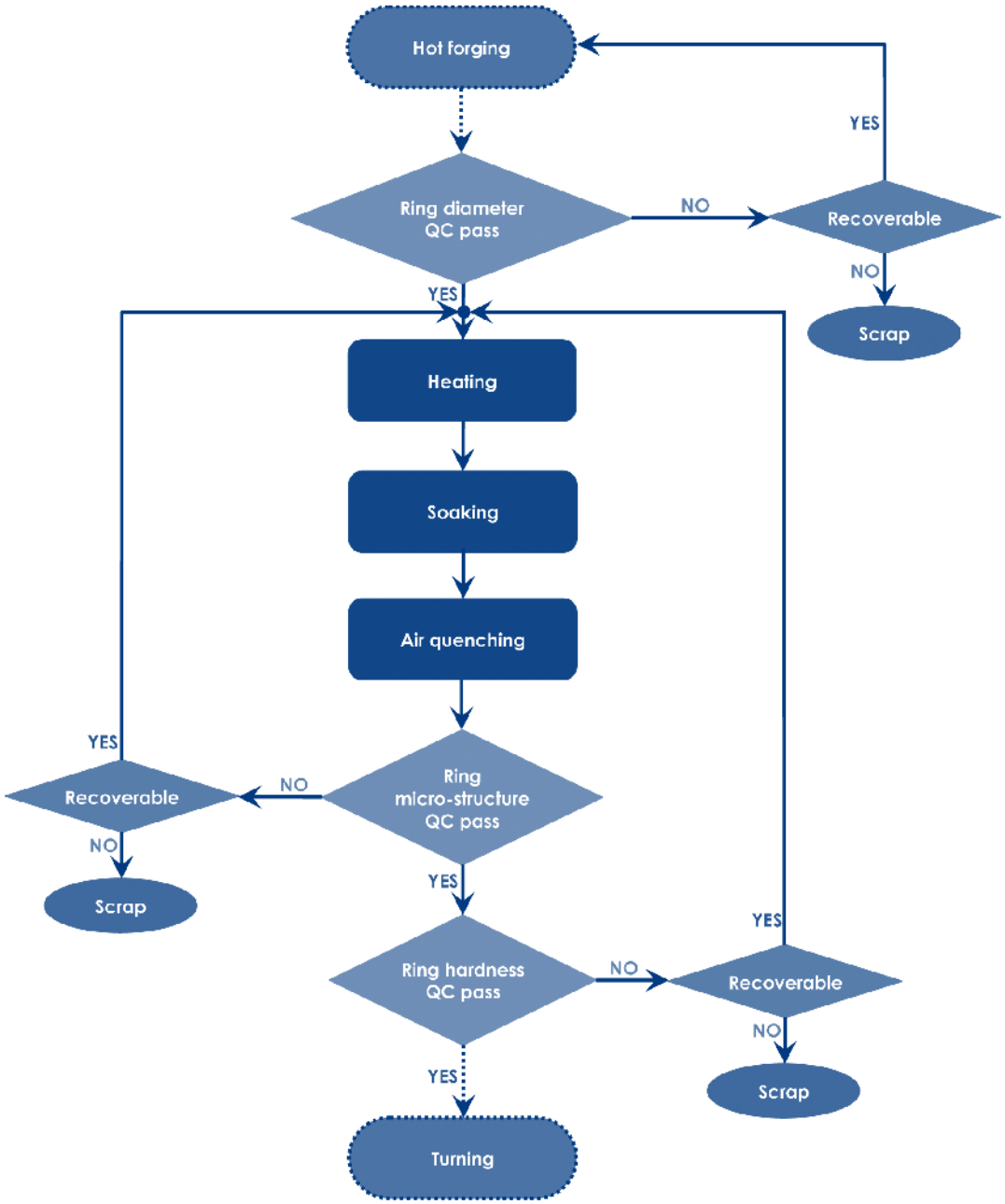
RKB small and medium size rolling bearing rings hot forging flowchart



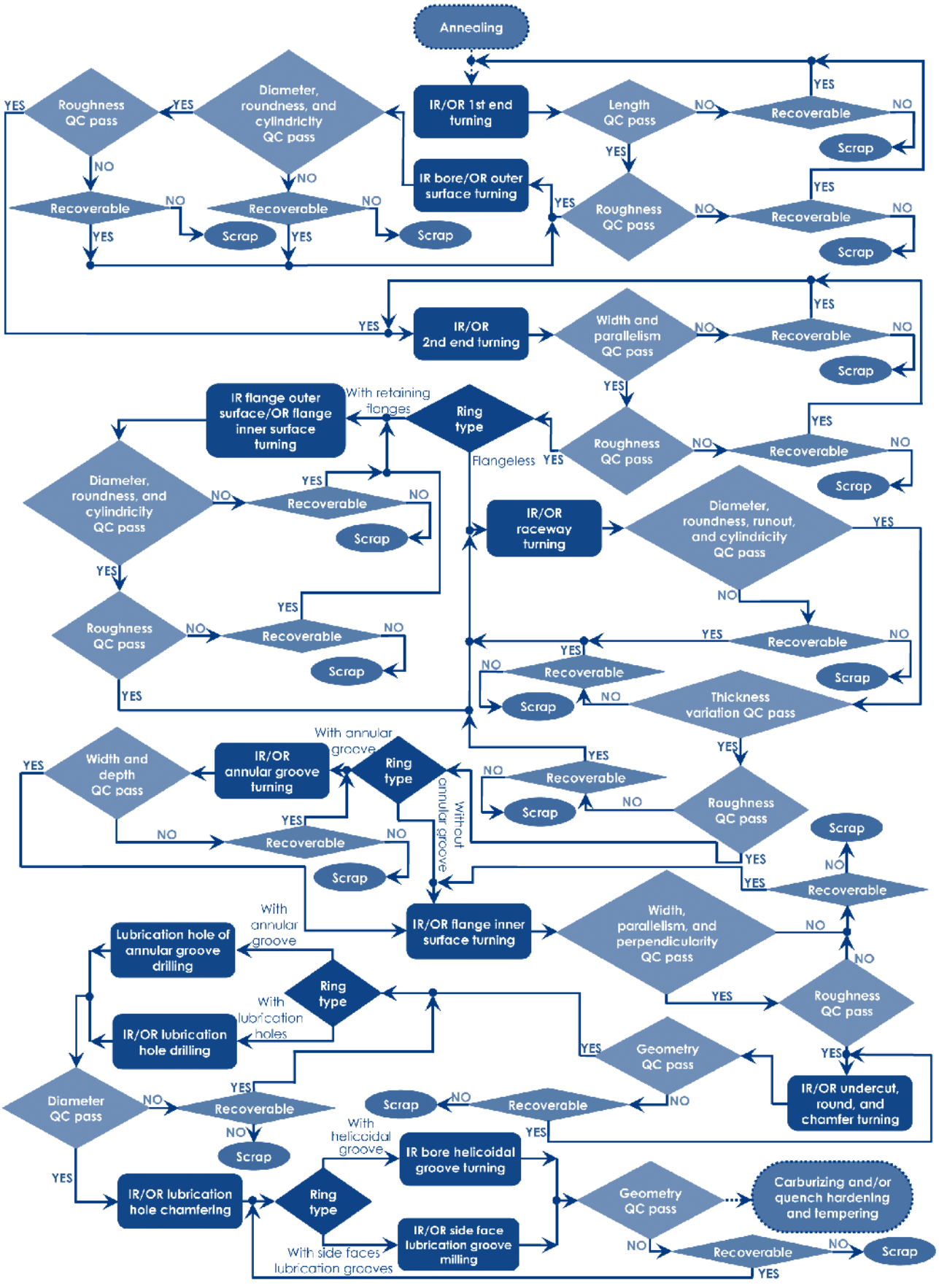
RKB large size rolling bearing rings hot forging flowchart



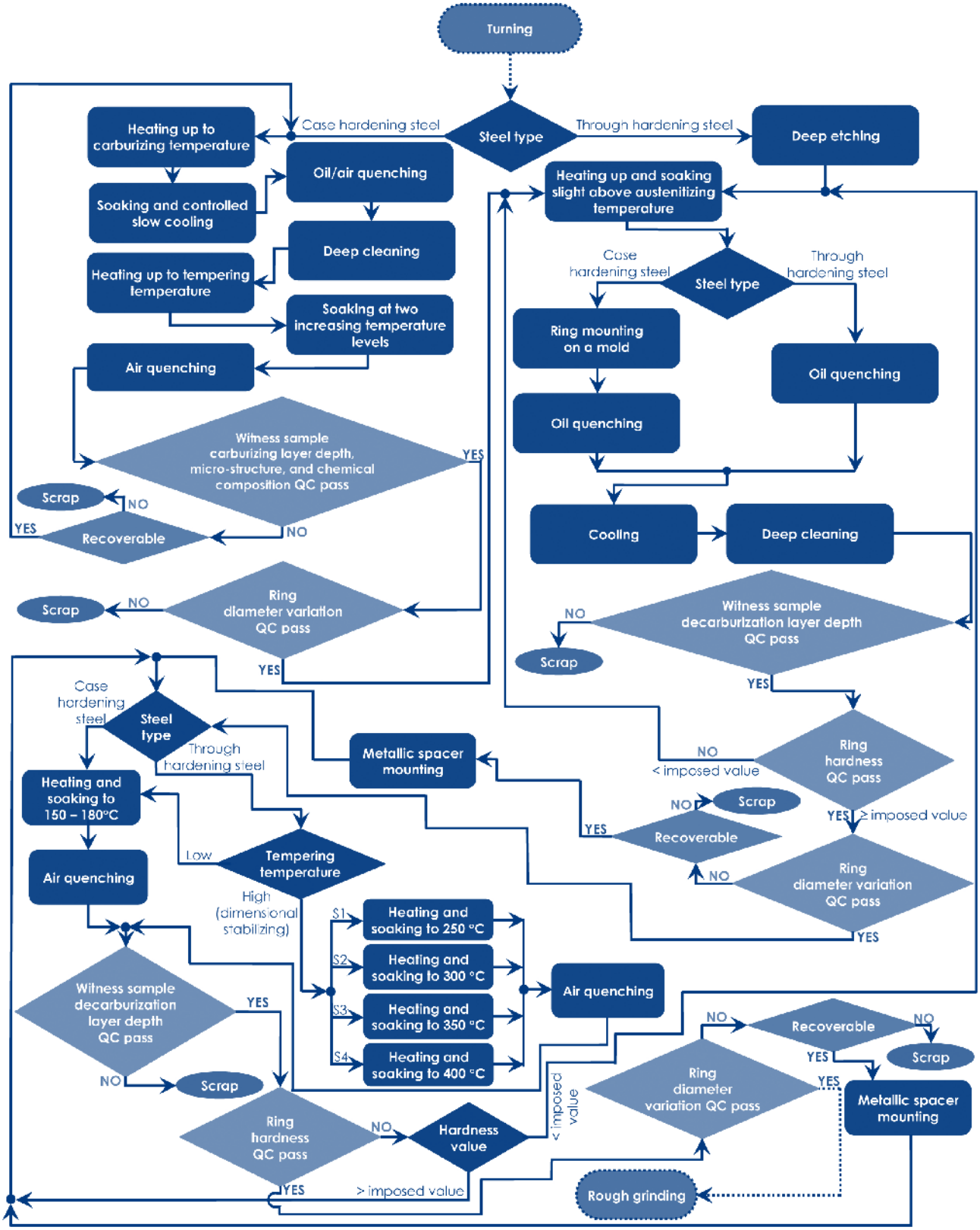
RKB rolling bearing rings annealing treatment flowchart



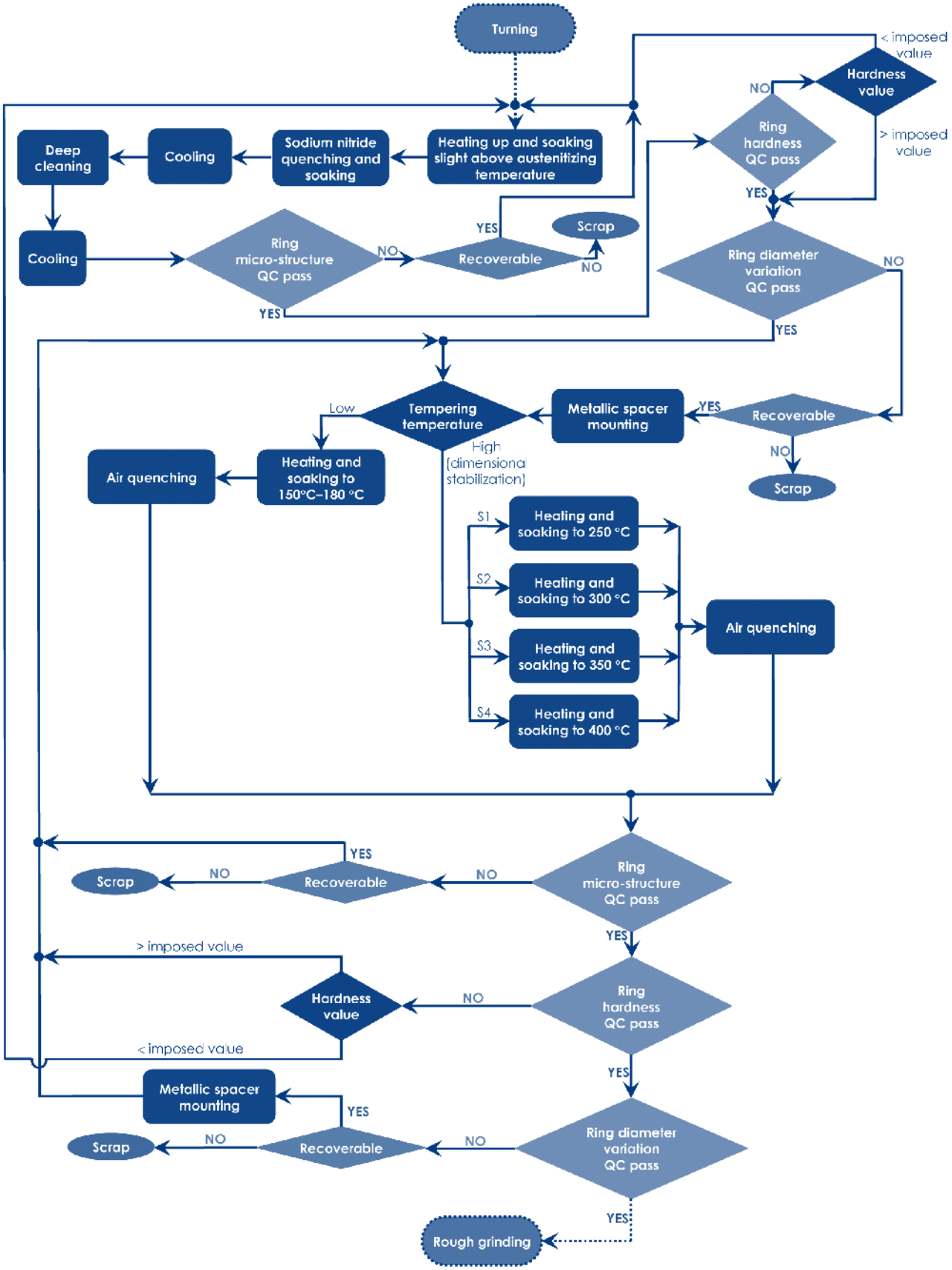
RKB rolling bearing inner/outer rings turning flowchart



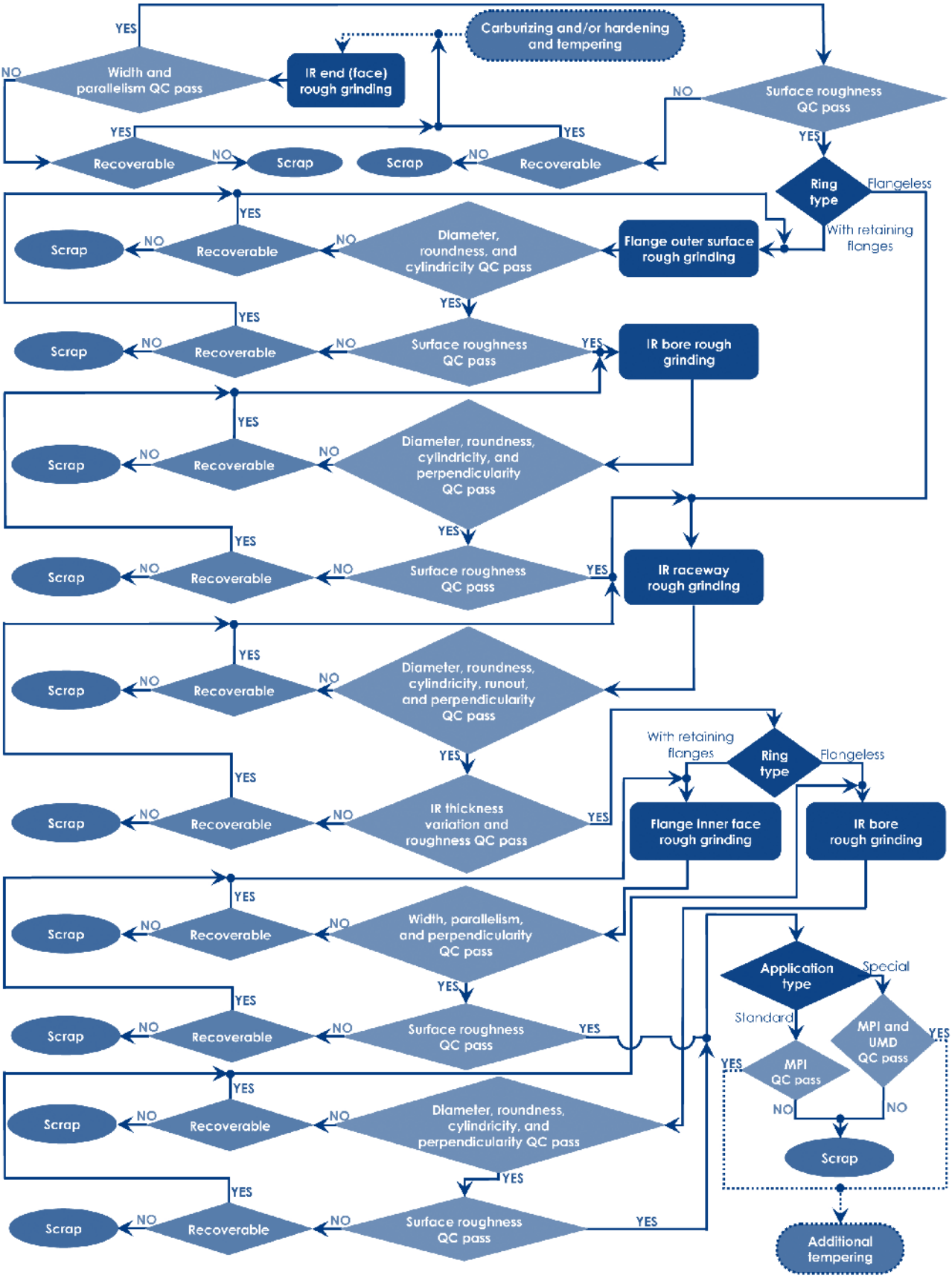
RKB rolling bearing rings
carburizing, quench hardening and tempering flowchart



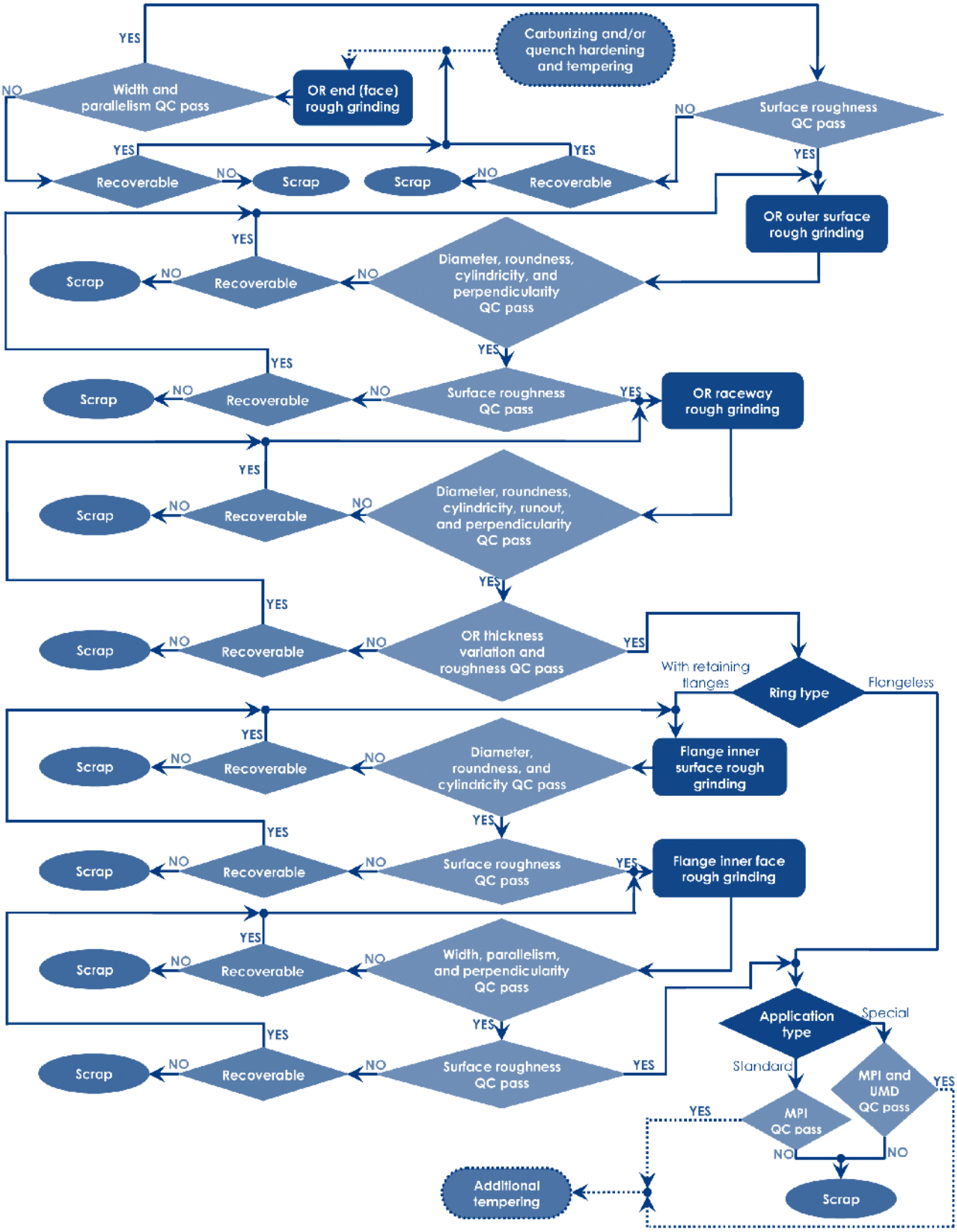
RKB rolling bearing rings
bainite and dimensional stabilizing treatment flowchart



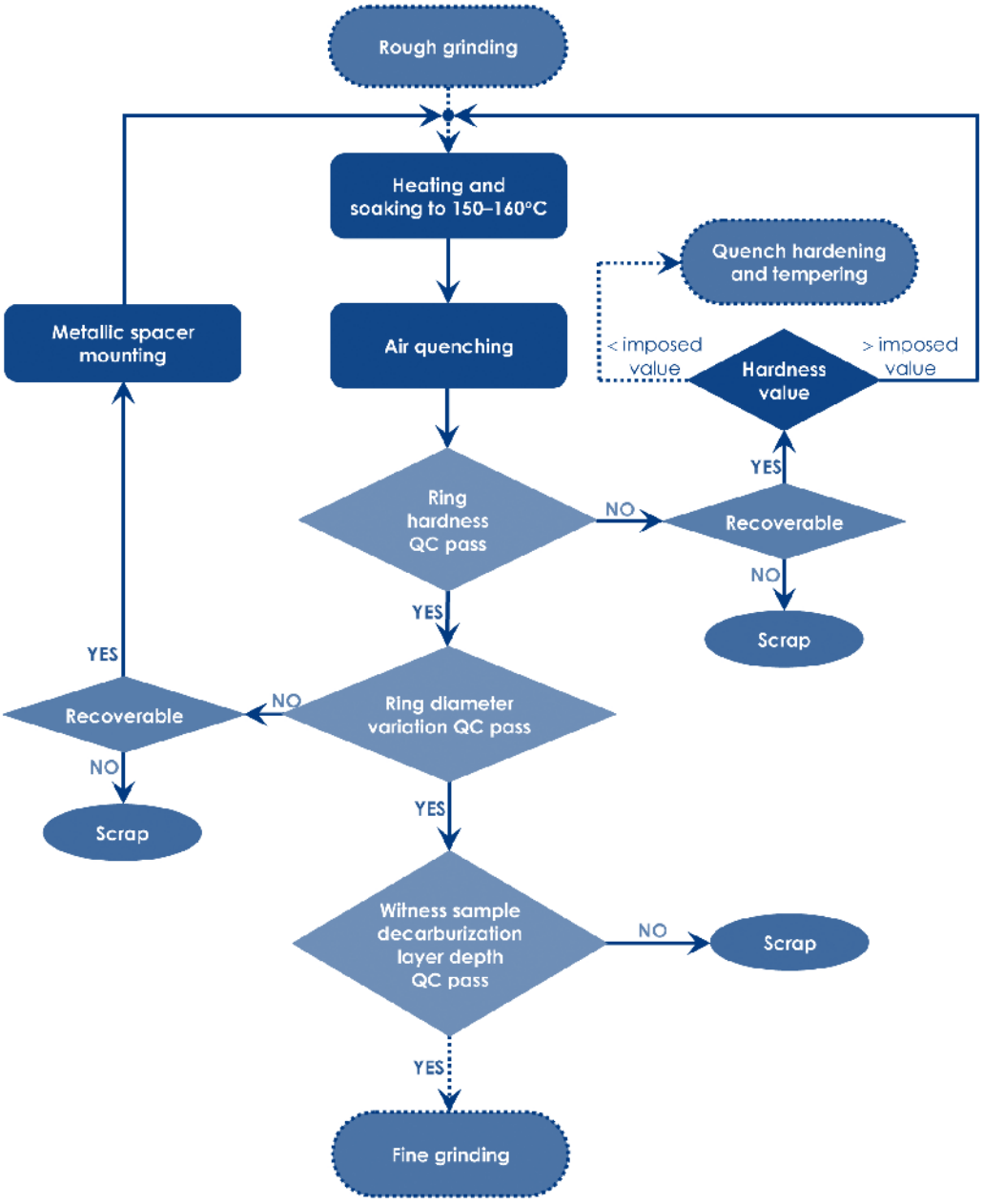
RKB cylindrical roller bearing inner rings rough grinding flowchart



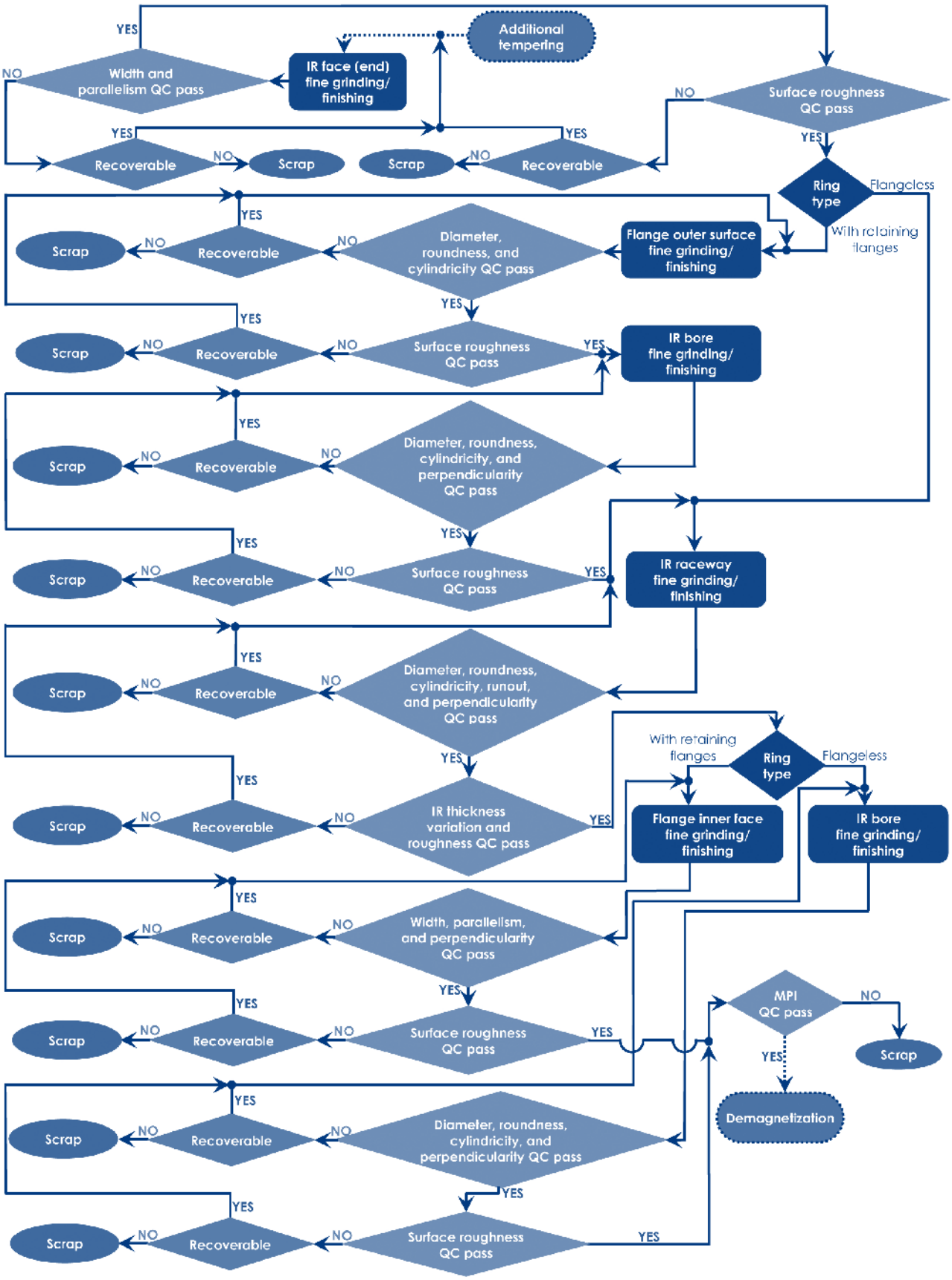
RKB cylindrical roller bearing outer rings rough grinding flowchart



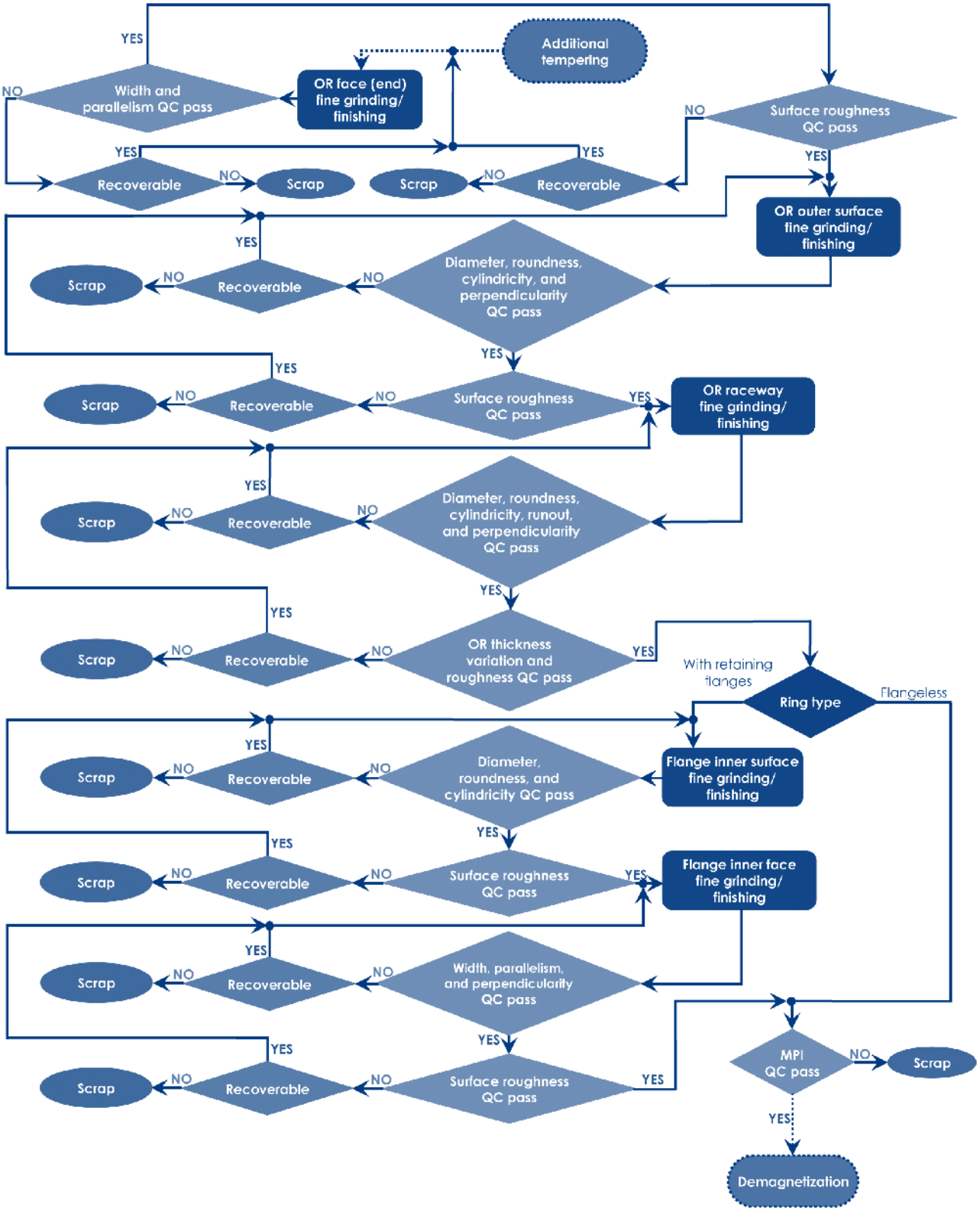
RKB rolling bearing rings
additional tempering treatment flowchart



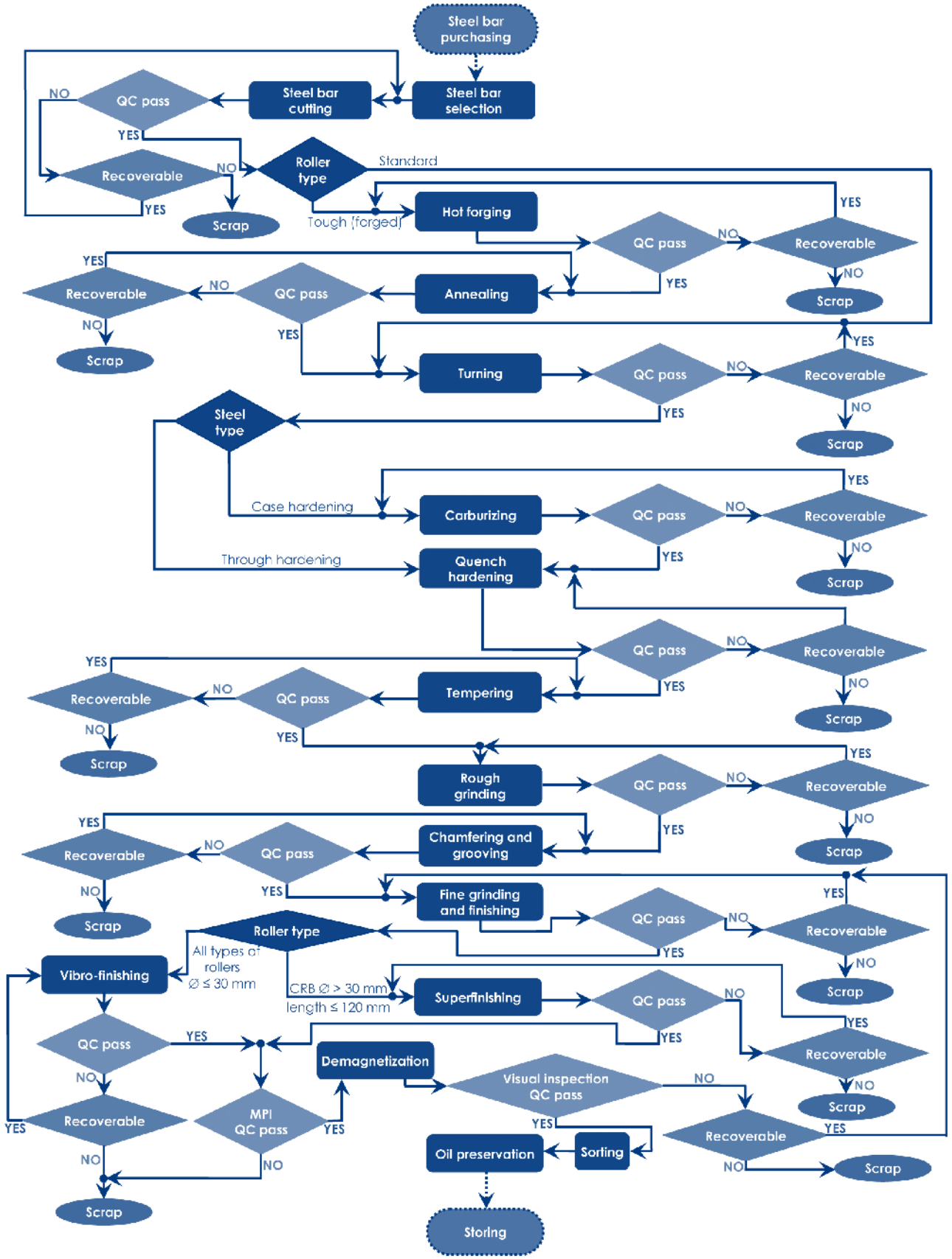
RKB cylindrical roller bearing inner rings fine grinding and finishing flowchart



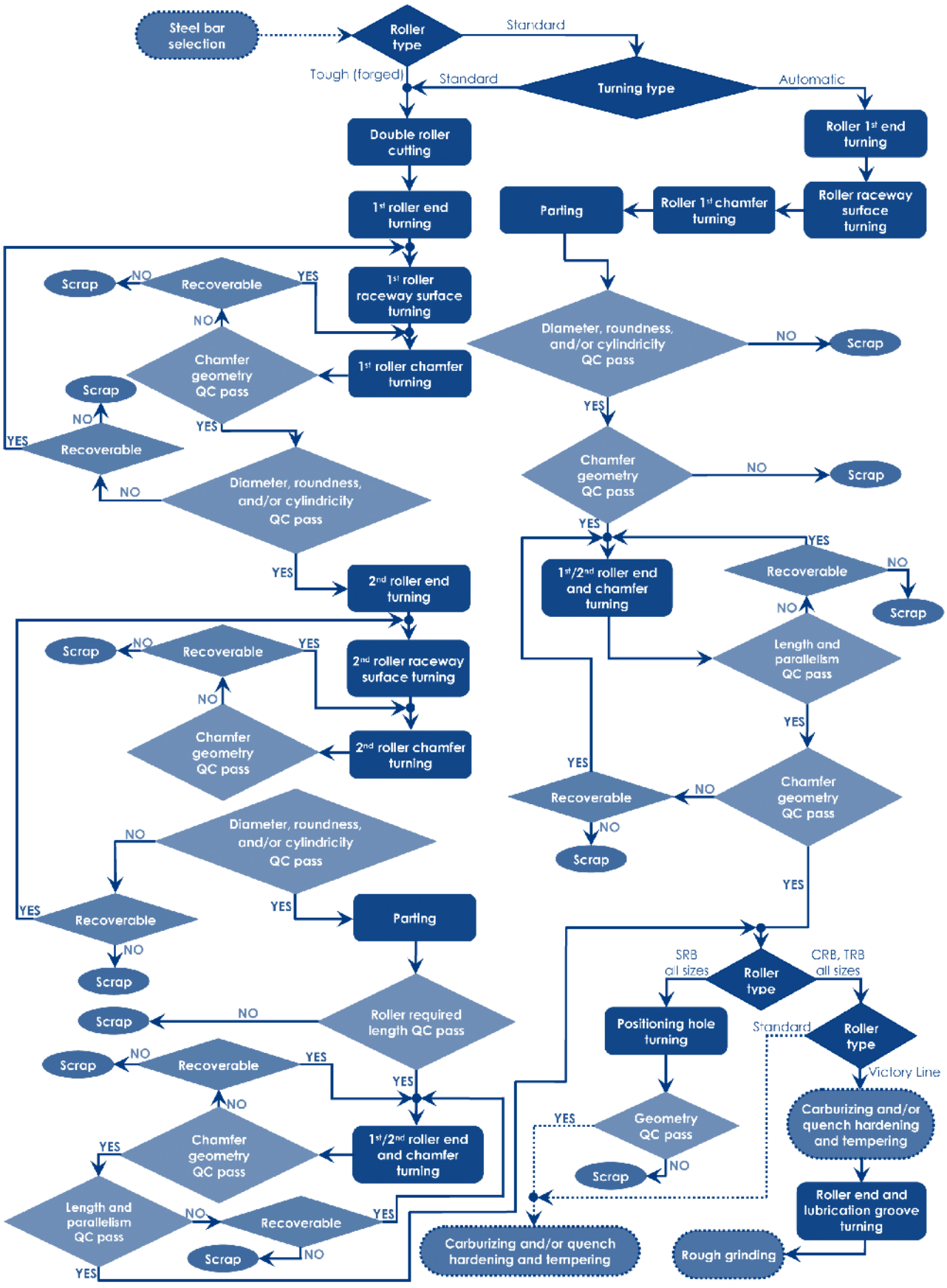
RKB cylindrical roller bearing outer rings rough grinding flowchart



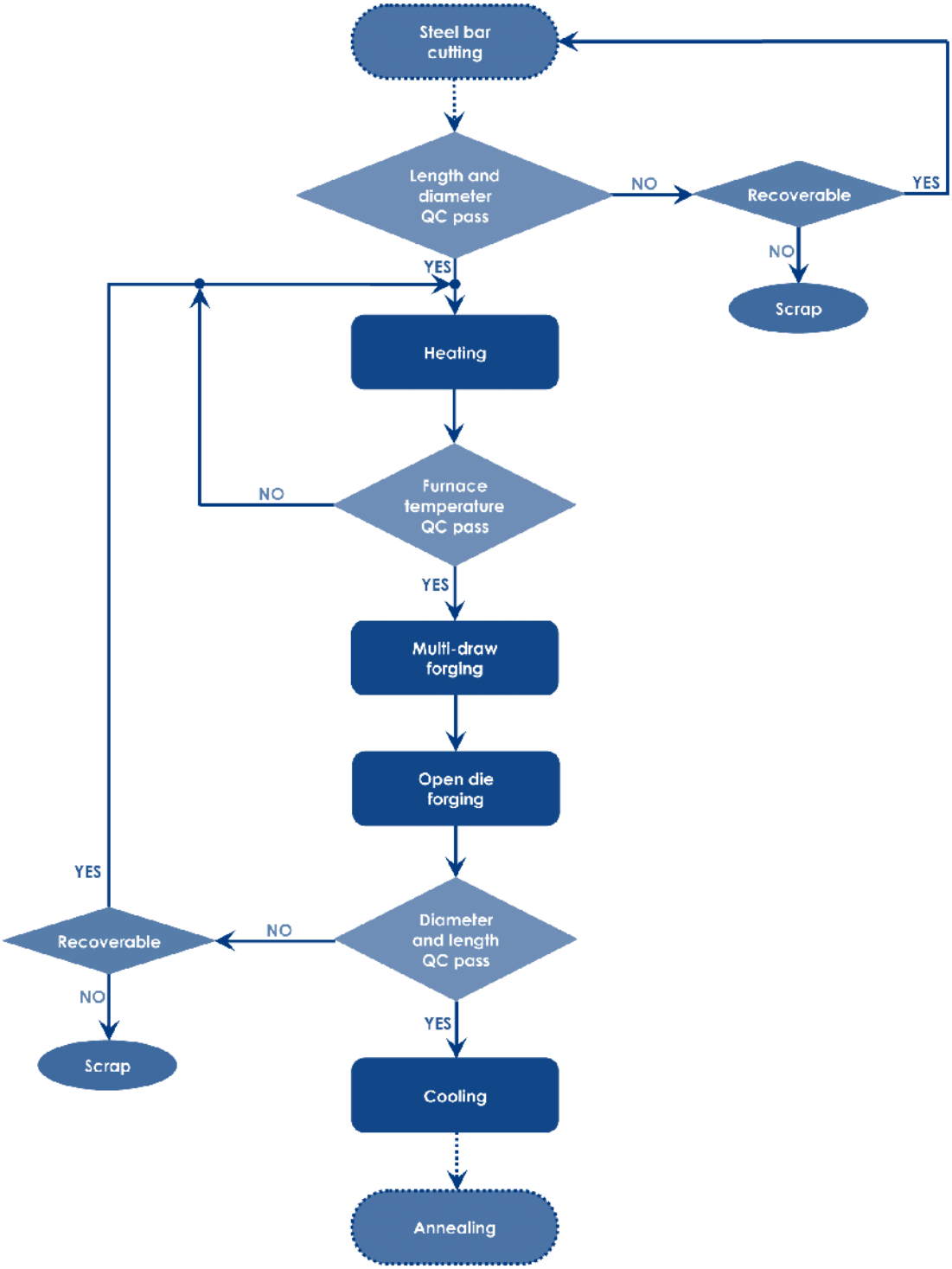
RKB rolling bearing rollers production flowchart



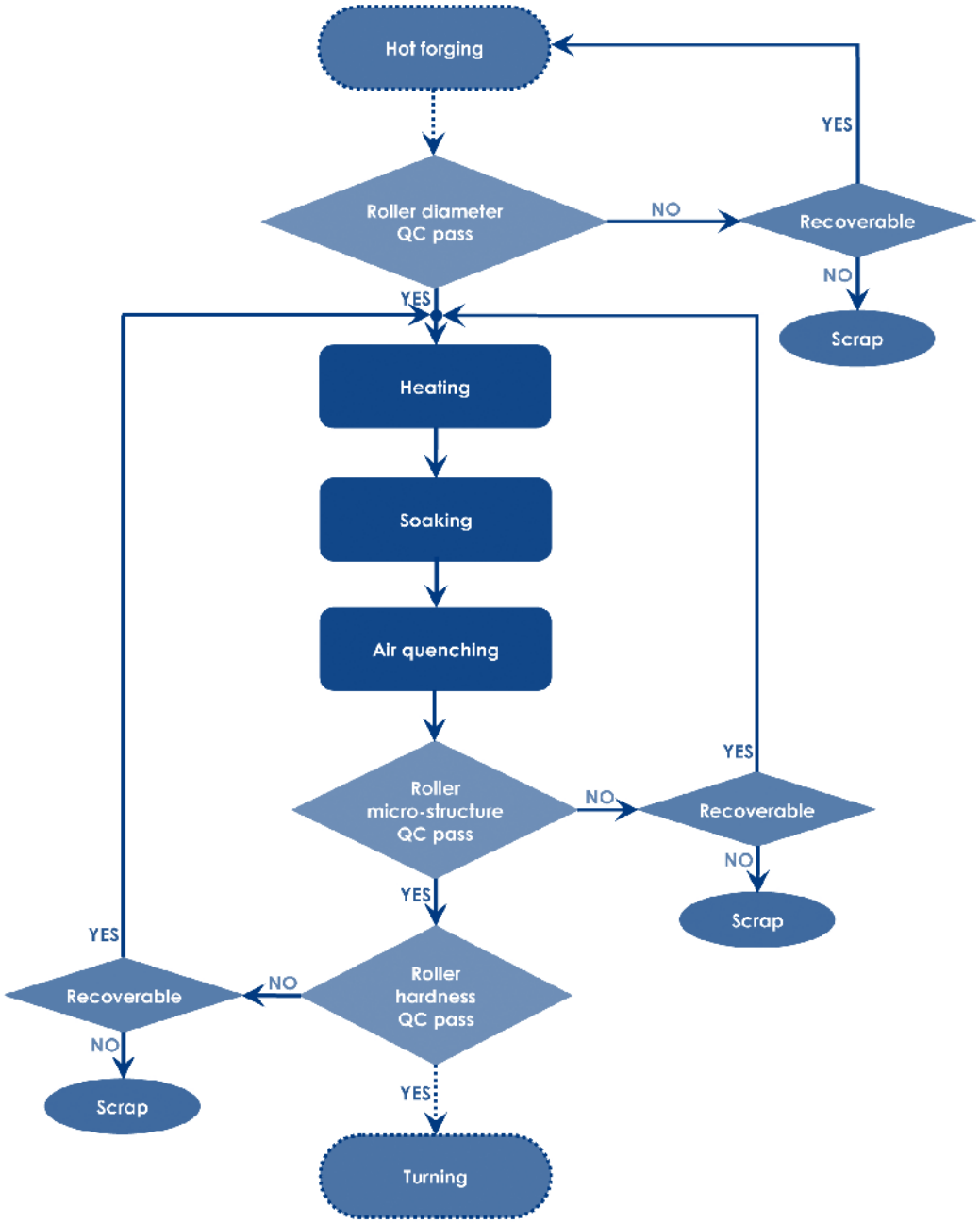
RKB rolling bearing rollers turning flowchart



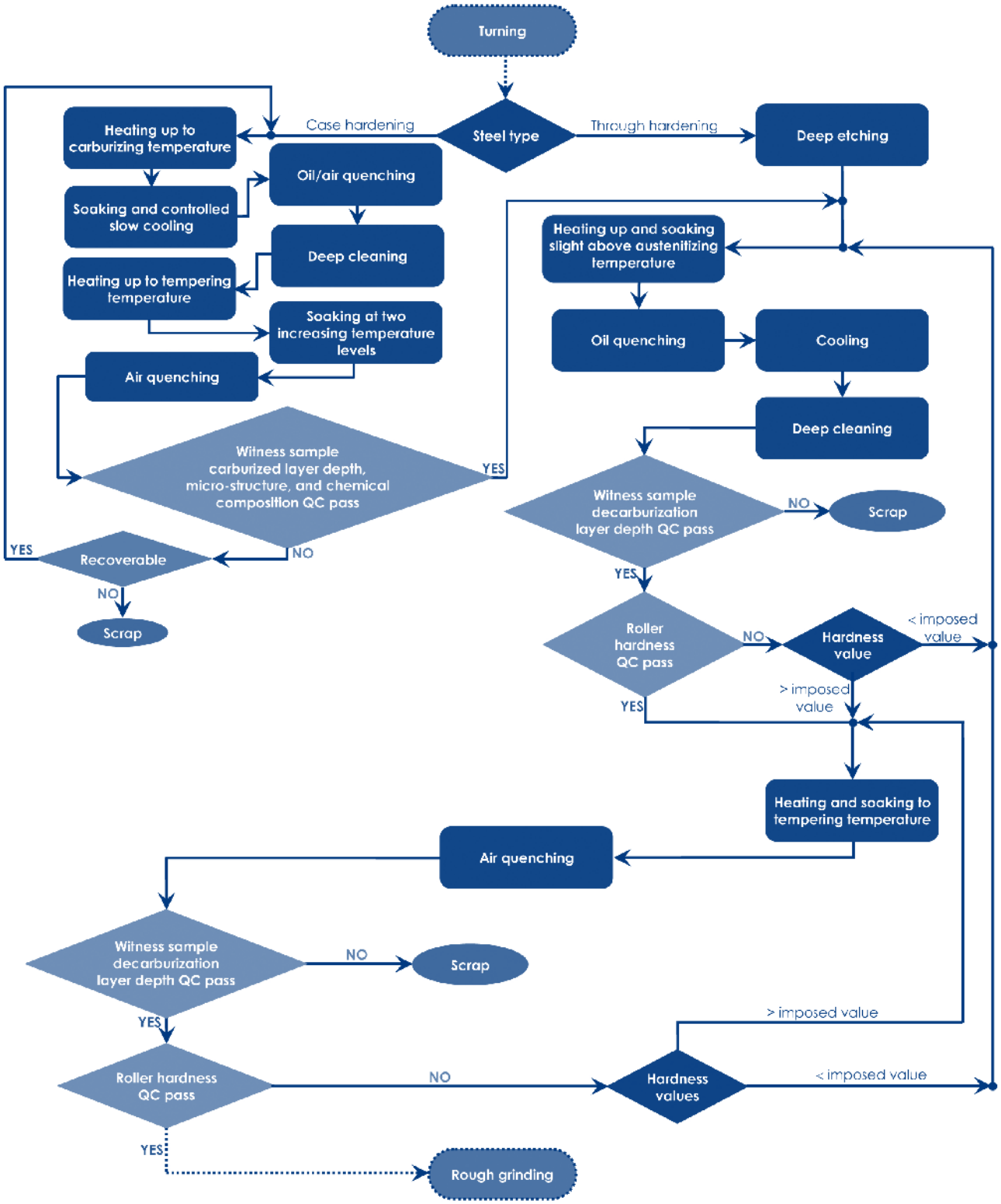
RKB rolling bearing rollers hot forging flowchart



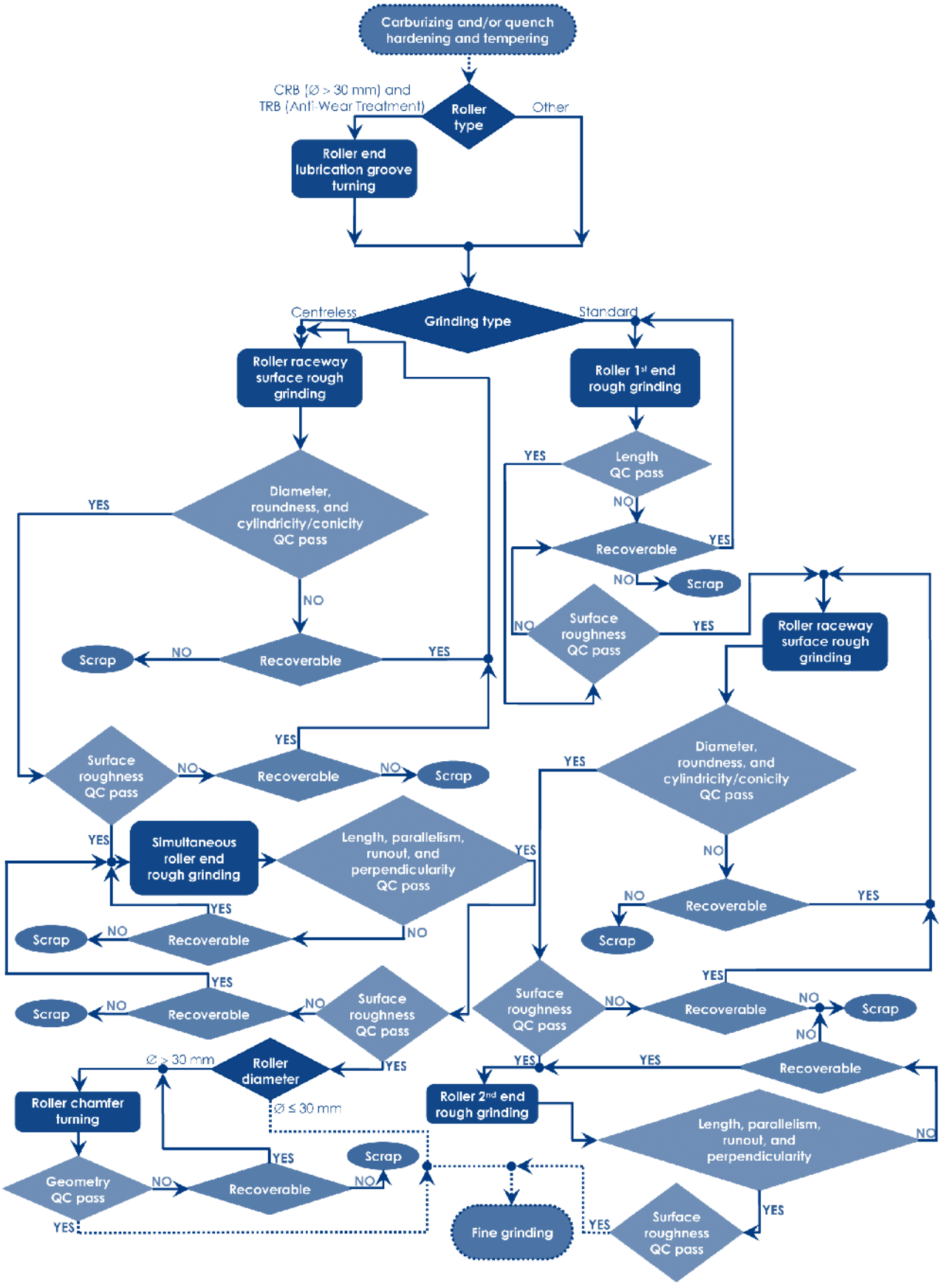
RKB rolling bearing rollers annealing treatment flowchart



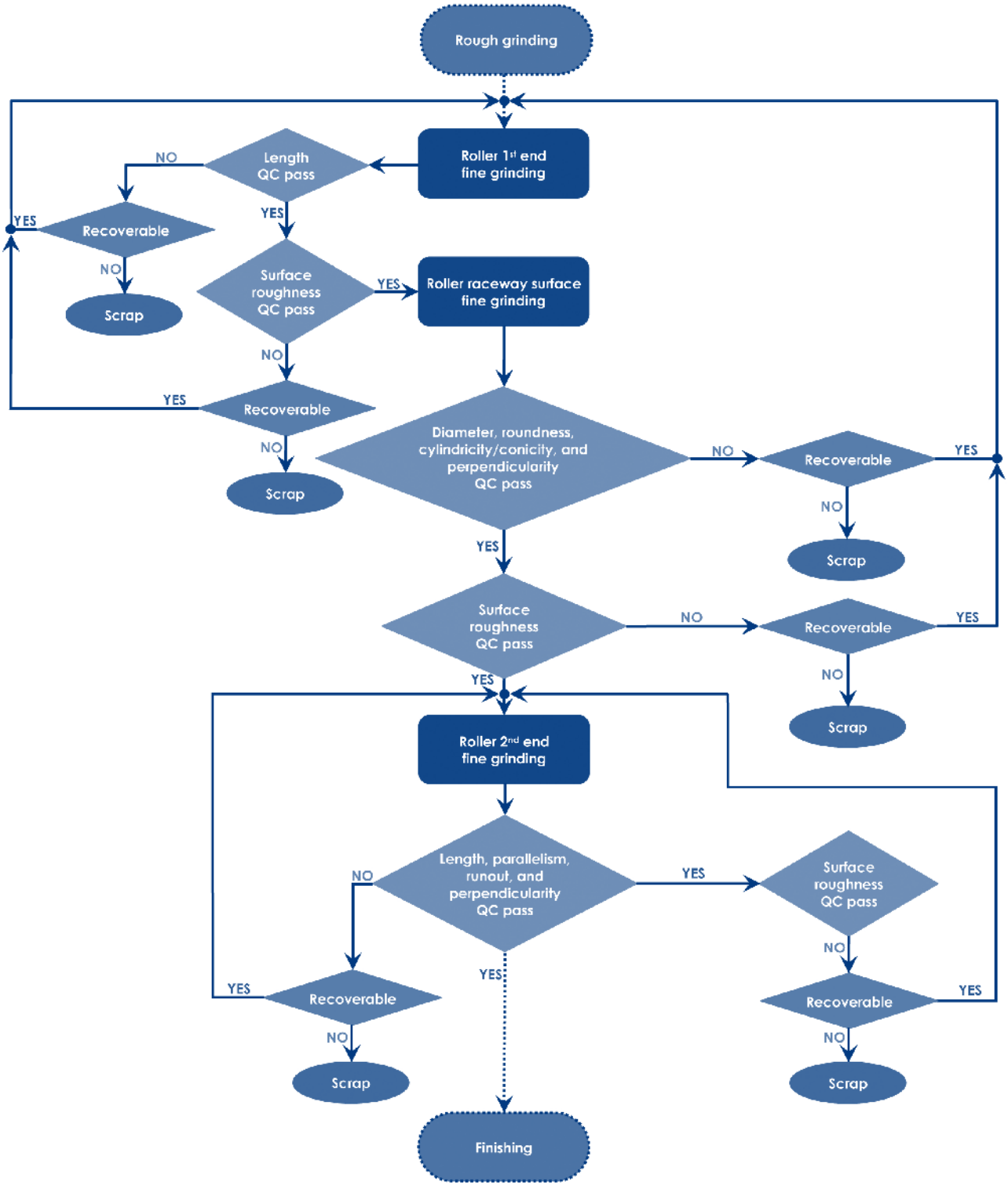
RKB rolling bearing rollers
carburizing and/or quench hardening and tempering flowchart



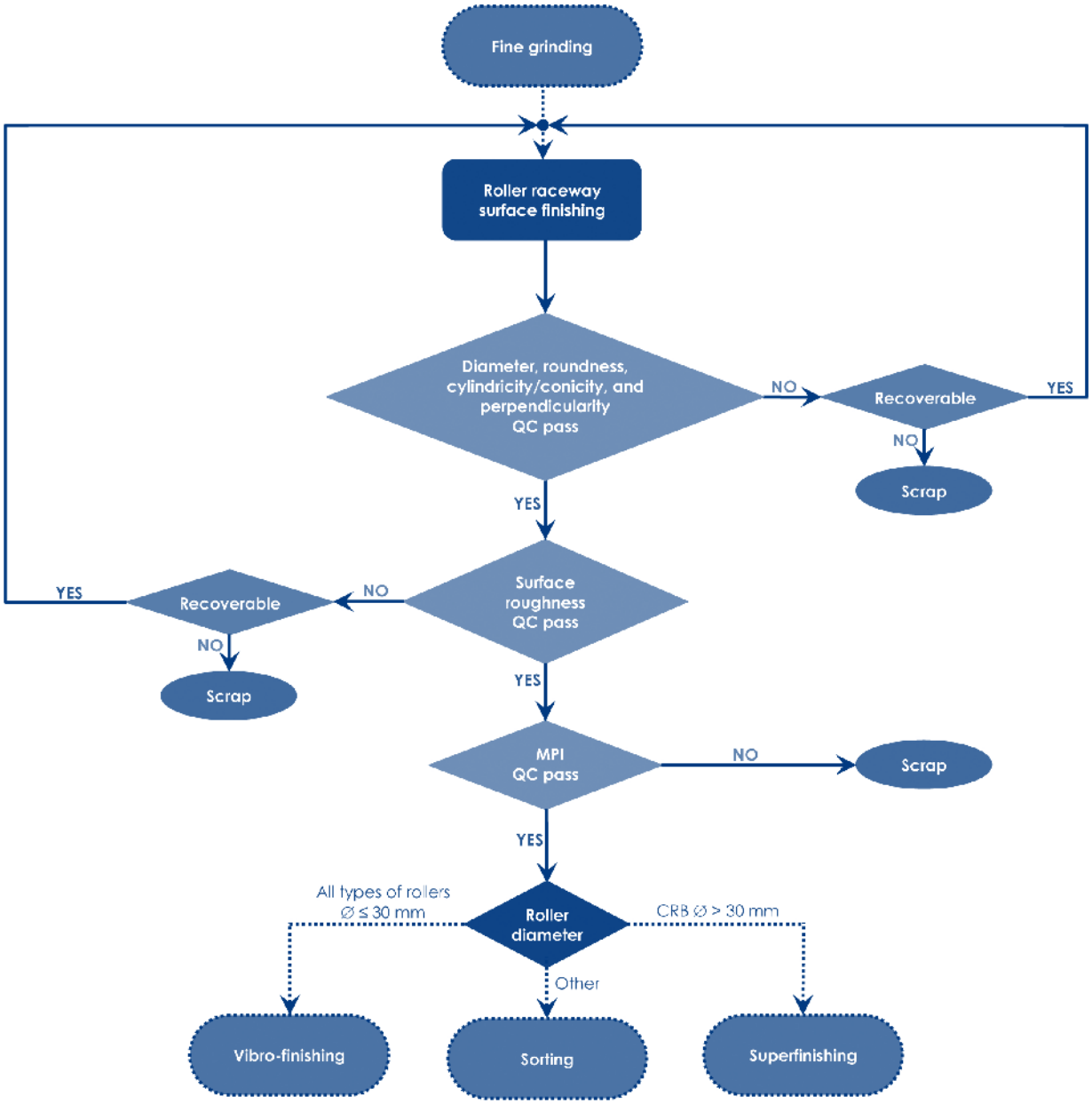
RKB rolling bearing rollers rough grinding flowchart



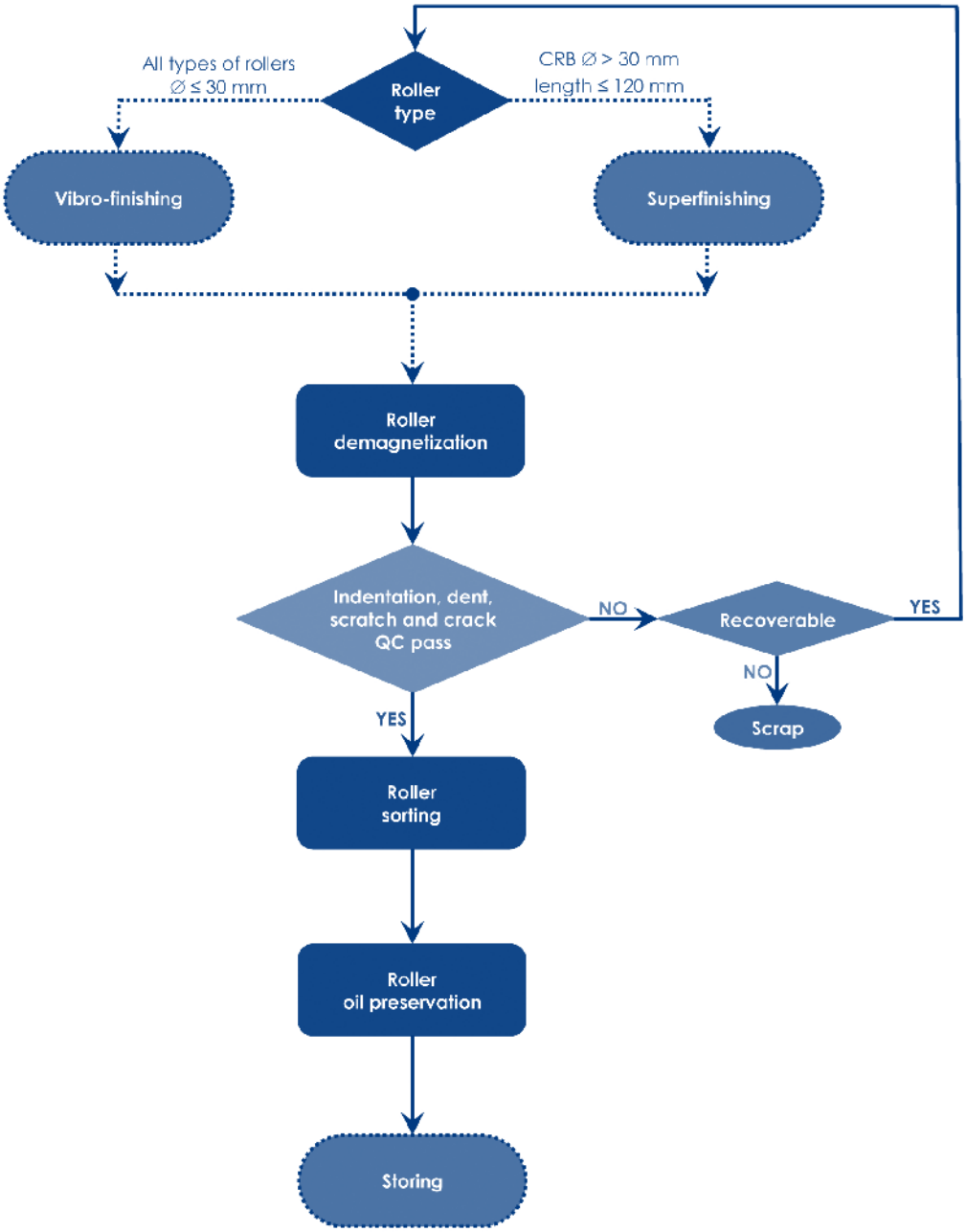
RKB rolling bearing rollers fine grinding flowchart



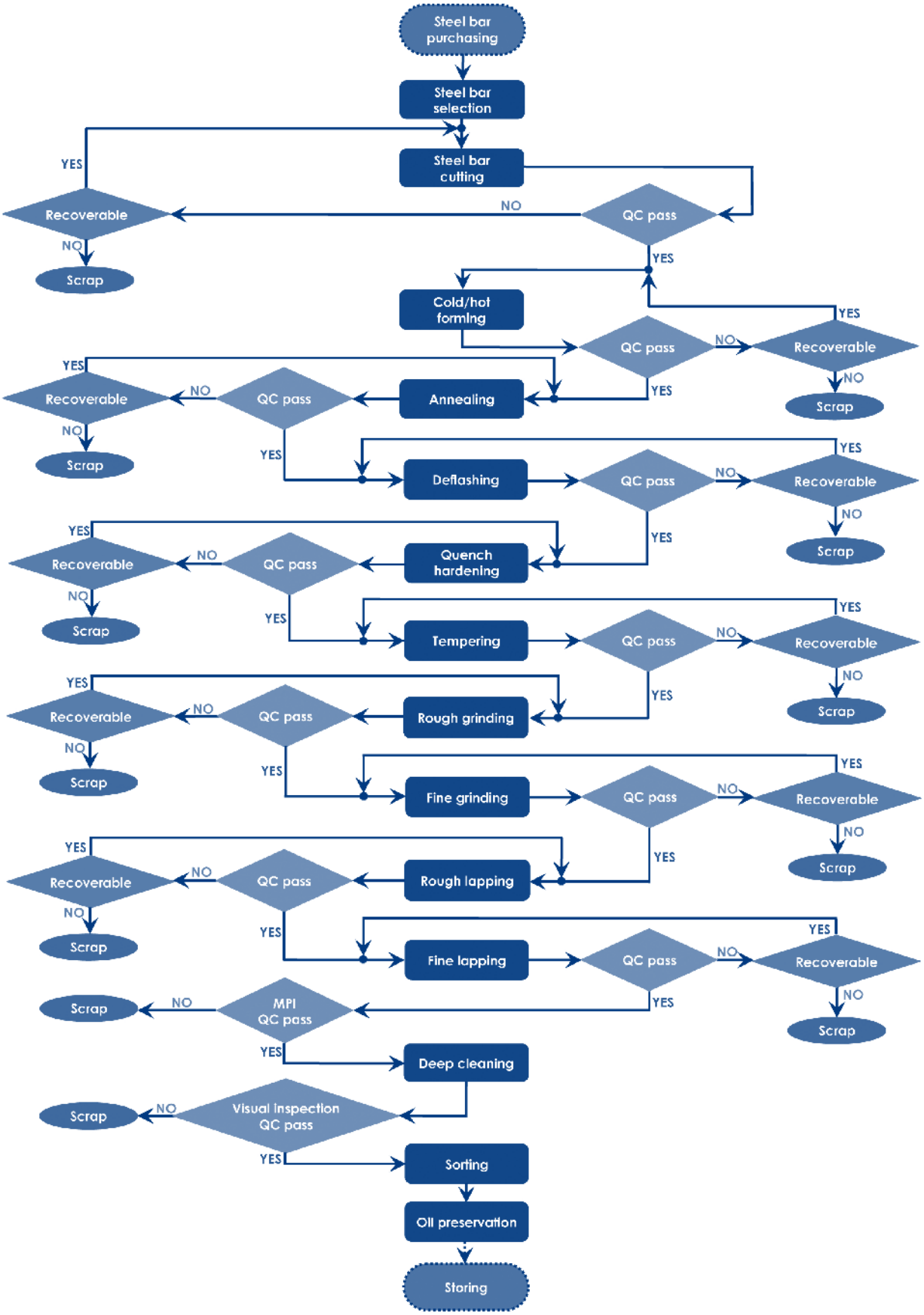
RKB rolling bearing rollers finishing flowchart



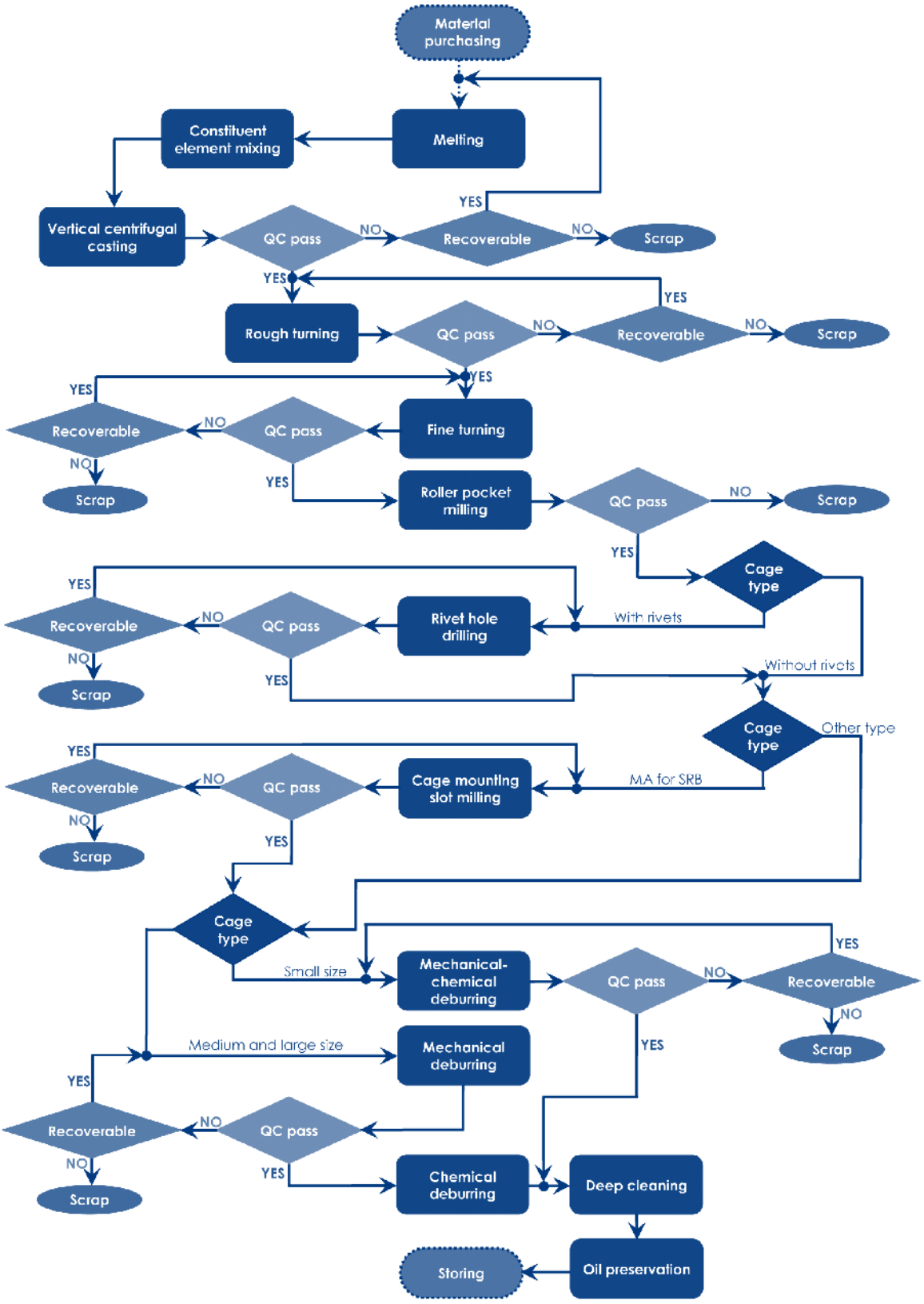
RKB rolling bearing rollers final quality control flowchart



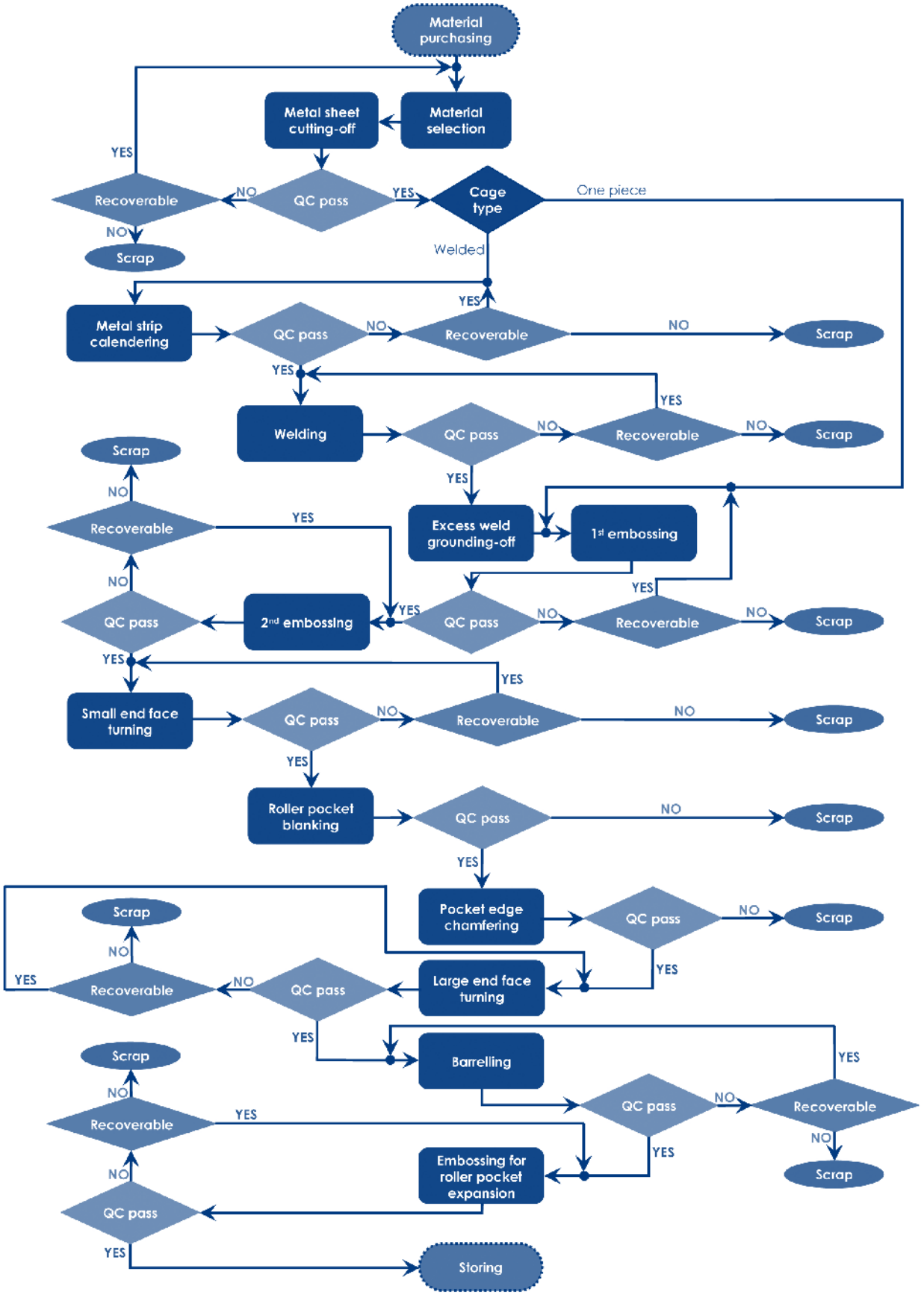
RKB rolling bearing steel balls production flowchart



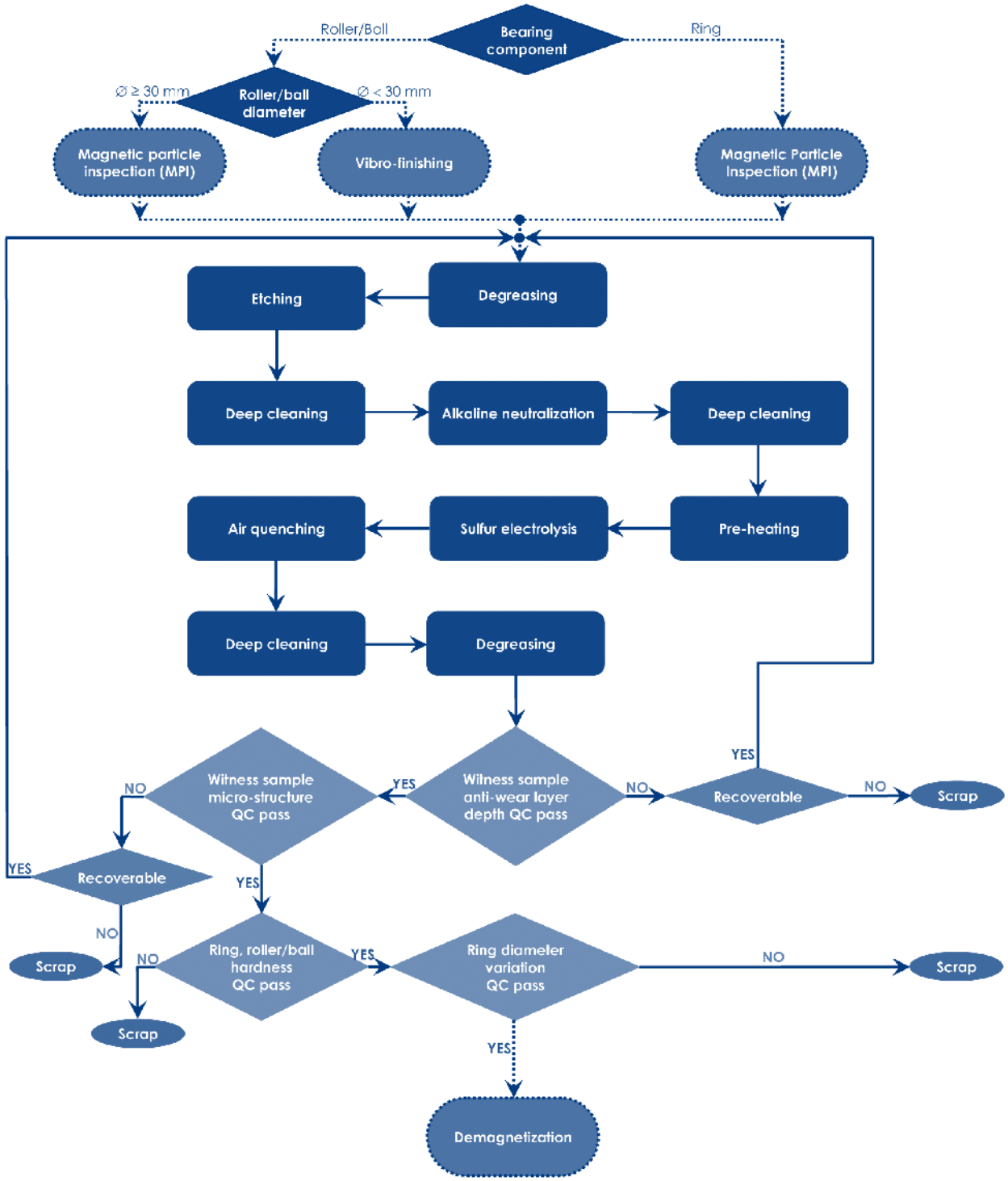
RKB rolling bearing machined brass cage production flowchart



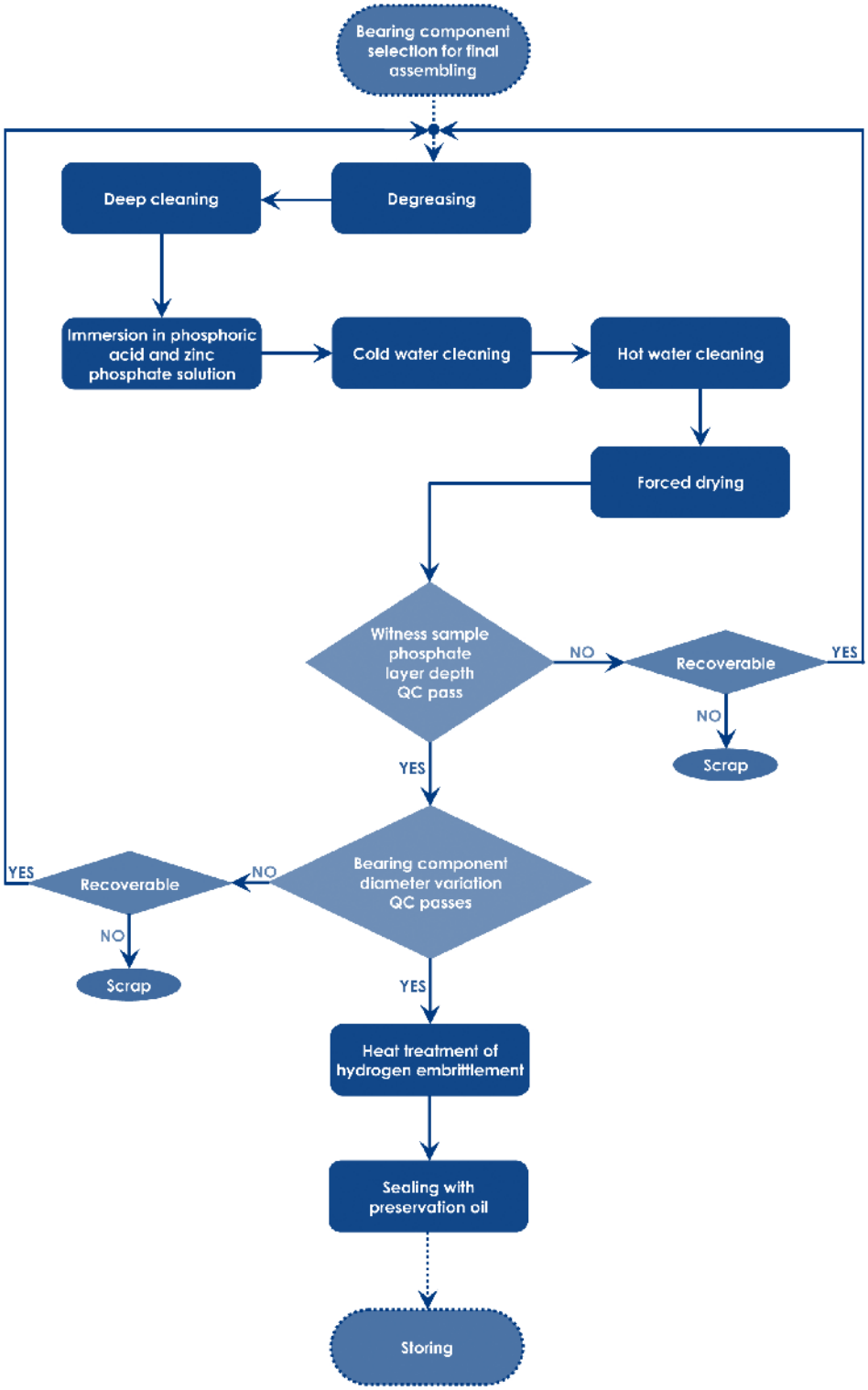
RKB rolling bearing pressed steel cages production flowchart



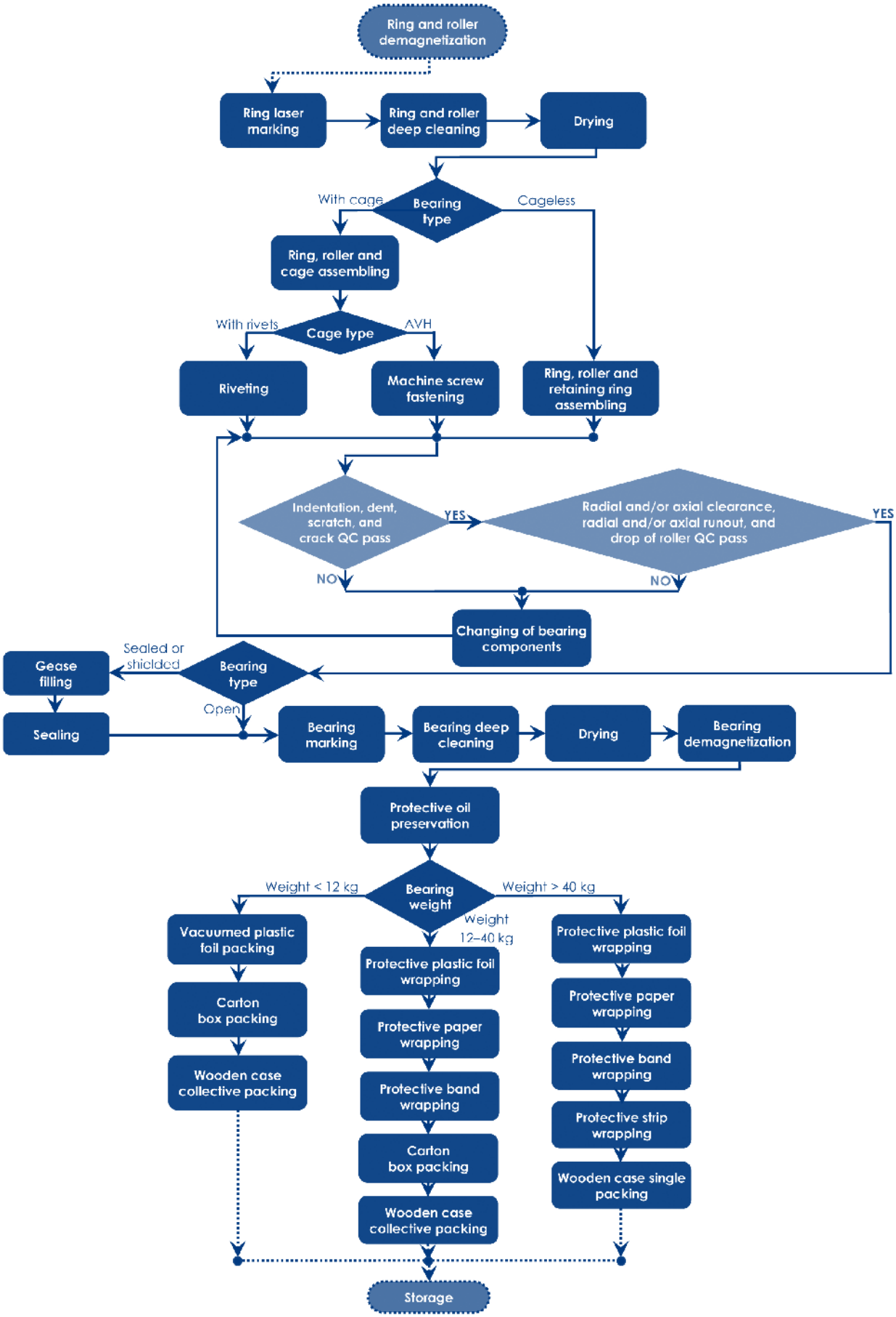
RKB rolling bearing rings and rollers/balls anti-wear treatment flowchart



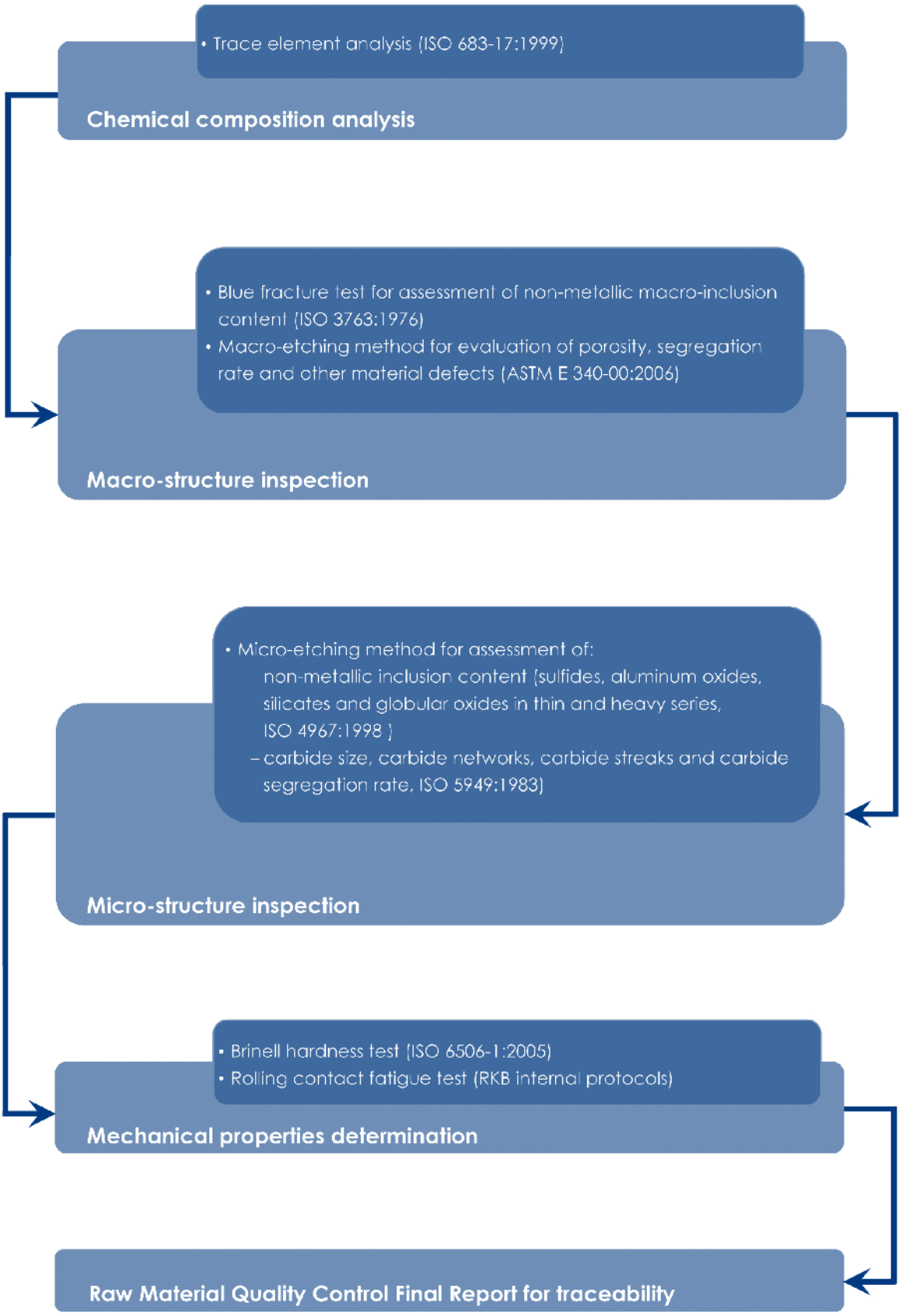
RKB rolling bearing ring, roller and cage zinc phosphating flowchart



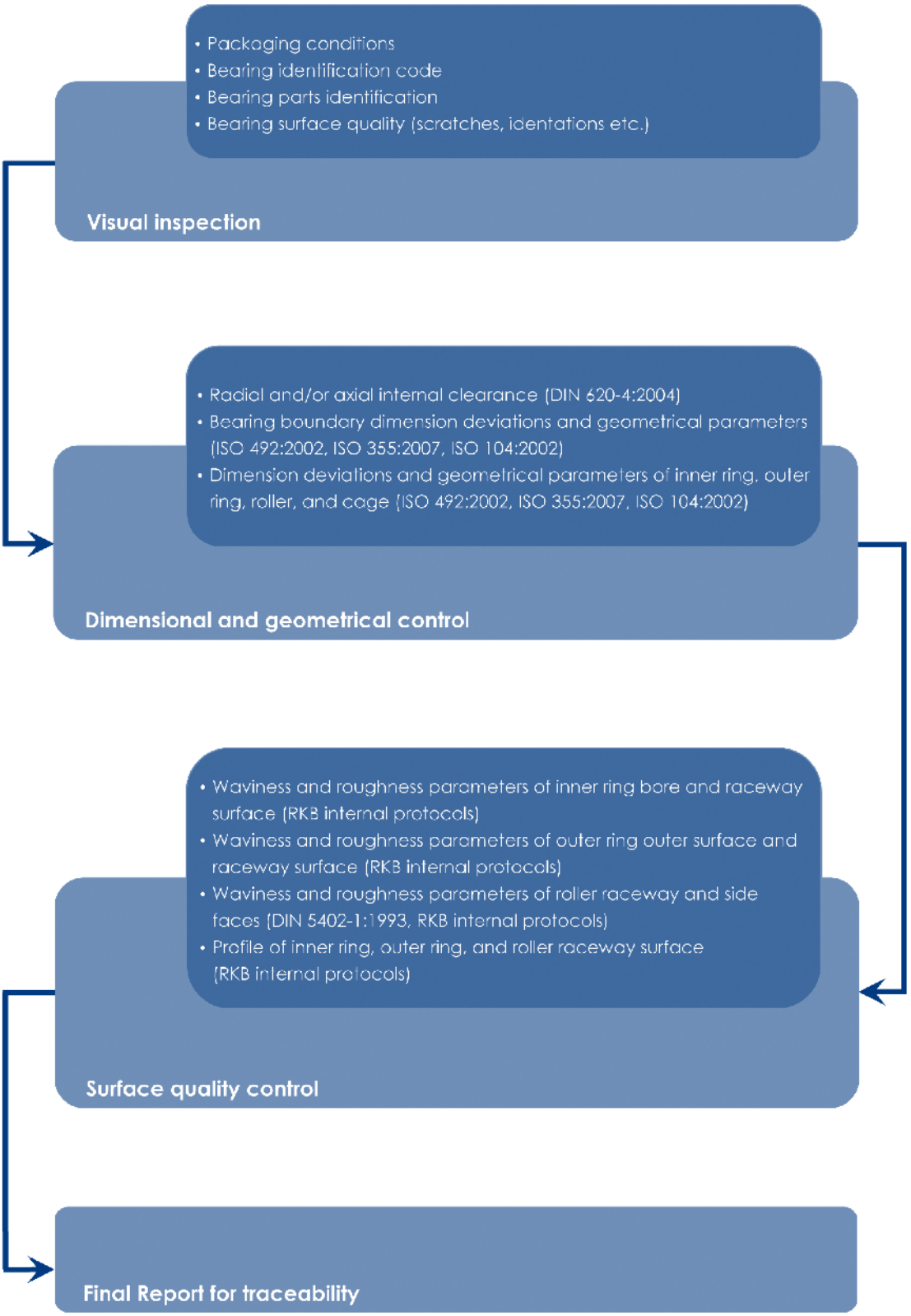
RKB rolling bearings assembly flowchart



RKB raw material metallographic multi-test quality control flowchart



RKB rolling bearings post-process multi-test visual and dimensional quality control flowchart



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