

MANUFACTURABILITY REVIEW & CHANGE REQUEST

Machined armature · Ø65.32 outside diameter, 53 mm across flats, turned and milled, phosphate coated · reviewed against the customer drawing and the STEP model supplied on 2026-08-03

1 · PURPOSE OF THIS REVIEW

Balford reviewed the drawing and the 3D model listed below before quoting and before process planning. The part is machined from free-cutting steel and phosphate coated. Four points were identified where the printed requirement, the process that makes the part and the method that measures it do not line up.

This sheet states what was found, what we ask the customer to change, and what happens if the printed requirement is kept. Nothing else in the drawing is questioned: all remaining dimensions, tolerances, surface requirements, material and coating are accepted as printed. **Items 1–4 need a customer decision** before we release the process plan and start production.

2 · DOCUMENTS AND DATA REVIEWED

DOCUMENT	REFERENCE	USED FOR
Customer drawing	Customer drawing — A2 sheet, dimensioned in mm	Dimensions, tolerances, notes and title-block data
3D model	Customer STEP model — AP214 solid	Verification of diameters, across-flats geometry, edge radii and feature counts
Standards applied	ISO 8015 · ISO 1302:2002 · ISO 13715 · ISO 2768:1989-mK · ISO 16016	As named on the drawing
Review	Balford engineering (machining and tooling), 16 September 2026	Feasibility, process routing and inspection capability

3 · PART DATA AS READ FROM THE DRAWING

Part designation	Armature	Process	Turning and milling
Part type	Machined component, sample anonymised	Origin	Customer enquiry, 2026
Material	1.7015 (11SMn30), material specification W1030-33	Semi-finished product	Round bar Rd 70
Coating and post treatment	Phosphate coating Fe/Znph/5-W0172-02	Finished part	160.46 g · volume 20.44 cm ³ · surface 108.16 cm ²
General tolerance	ISO 2768:1989-mK	Below 0.5 mm	linear ±0.05 · radii and chamfer heights ±0.1 · angles ±2°
Surface roughness	Rz 16 · Rt max 25 general; Rz 4 called in the detail view	Edges	No sharp edges, no burrs permitted (0.03–0.05), ISO 13715
Delivery documentation	Inspection certificate 3.1 per DIN EN 10204	Process on drawing	Machining (spanende Bearbeitung)

4 · GEOMETRY VERIFIED IN THE 3D MODEL

FEATURE	VALUE	RELEVANCE
Outside diameter	Ø65.32	Item 4 — clamping traces
Across-flats profile	12 faces at 30° pitch, 53.0 mm across flats (26.50 mm from the axis to each flat)	Items 1 and 3
Edge radius on the flats	R0.2 on both edges of each face — 24 edges in the model	Item 1
End-face step	0.05 ±0.02 at both end faces (drawing, left and right views)	Item 2
Other features	Ø55 and Ø58 cylindrical faces · 12 × Ø6 holes with R0.2 edge fillets · 45° and 10° chamfers · M2, M3 and M4 threaded features	Unchanged

5 · SUMMARY OF REQUESTED CHANGES

#	FEATURE	BALFORD REQUEST	PRIORITY	EFFECT ON PRICE
1	R0.2 radius on the 53 mm across-flats edges	Cancel the R0.2 requirement; keep a deburred edge inside the printed 0.05 mm burr limit	Medium	Lower if cancelled
2	0.05 ±0.02 step at both end faces	Increase to 0.10 mm min, or delete the step, or define it as 0.05 max (visual)	High	No change if accepted
3	Rz 4 on the milled 53 mm across-flats faces	Accept Rz 6 on those faces; general Rz 16 / Rt max 25 unchanged	Medium	Lower if accepted
4	Clamping traces on the Ø65.32 outside diameter	Accept light clamping traces, or define an acceptance criterion or boundary sample	Low	Higher if rejected

Priorities: **High** — the printed requirement cannot be guaranteed with the present process and measuring equipment. **Medium** — an extra operation is needed, or the inspection result will vary. **Low** — cosmetic only.

6 · PLANNED PROCESS ROUTE

STEP	OPERATION	CONTENT COVERED
1	Bar stock and sawing	Round bar Rd 70 · 1.7015 (11SMn30) per material specification W1030-33
2	CNC turning	Ø65.32 OD · Ø55 and Ø58 faces · both end faces and the end-face step (items 2 and 4)
3	CNC milling	12-face profile, 53 mm across flats at 30° pitch · 45° and 10° chamfers (items 1 and 3)
4	Drilling and tapping	12 × Ø6 holes · M2, M3 and M4 threaded features
5	Deburr, coat, inspect	Deburr per ISO 13715, 0.05 mm max burr (item 1) · phosphate Fe/Znph/5-W0172-02 (item 4) · final inspection and certificate 3.1 per DIN EN 10204

The route above is Balford's planned sequence; steps marked with an item number are the ones the requested changes affect, and the remaining steps follow the drawing as printed. Inspection covers the diameters, the 53 mm across-flats profile, the end faces and the coating, and a first-article inspection report is issued with the first delivery.

7 · FINDINGS AND REQUESTED CHANGES

1 R0.2 EDGE RADIUS ON THE 53 MM ACROSS-FLATS PROFILE

DECISION REQUIRED

PRINTED REQUIREMENT

A 12-face profile ($12 \times 30^\circ = 360^\circ$) with 53 mm across flats, R0.2 called on both edges of every face — 24 edges, confirmed in the 3D model as 24 cylindrical R0.2 faces.

BALFORD FINDING

The R0.2 radius is generated by the same milling pass that forms the flats, on an interrupted profile. The radius is of the same order as the cutting-edge preparation and sits directly beside the 0.05 mm end-face step, so it cannot be held repeatably: it moves with tool wear and has to be checked edge by edge. The drawing already limits edges to “no sharp edge, no burr” in the 0.03–0.05 mm range, which a controlled deburr satisfies.

REQUESTED CHANGE

Cancel the R0.2 radius on the 53 mm across-flats edges. Balford proposes a deburred edge held within the drawing's existing limit of 0.05 mm maximum burr, in accordance with ISO 13715.

EFFECT

Cancelling removes 24 controlled radii from machining and from inspection — shorter cycle time, fewer rejects. If the R0.2 is functional and has to stay, the edges need an additional manual finishing operation, which adds cost and lead time.

☐ Accepted ☐ Not accepted ☐ Comment attached

2 0.05 ±0.02 STEP ON BOTH END FACES

DECISION REQUIRED

PRINTED REQUIREMENT

0.05 ±0.02 step at both end faces (left and right views). The drawing's own general tolerance for dimensions below 0.5 mm is ±0.05.

BALFORD FINDING

The face is machined with a 0.1 mm tool nose radius. A 0.05 mm step is half of the nose radius, so the tool cannot generate a defined shoulder — what is produced is a blended radius rather than a step that can be measured. Even if it could be cut, the ±0.02 band is narrower than the general tolerance the drawing allows for dimensions of this size, and it cannot be verified reliably in production.

REQUESTED CHANGE – PLEASE SELECT ONE

- **Preferred:** increase the step to 0.10 mm minimum, keeping the present tolerance concept.
- Delete the step and leave the face flat within the general tolerance of ±0.05 mm.
- Keep 0.05 mm but define it as a maximum only (0.05 max, no minimum) with visual acceptance, if the step is only there to break the edge.

EFFECT

No cost impact if the definition is changed. If the present definition is kept, Balford cannot guarantee conformance: the feature would have to be measured on every part and parts outside the band would be rejected.

☐ Accepted ☐ Not accepted ☐ Comment attached

7 · FINDINGS AND REQUESTED CHANGES (CONTINUED)

3 ROUGHNESS ON THE MILLED 53 MM ACROSS-FLATS FACES

DECISION REQUIRED

PRINTED REQUIREMENT

Rz 4 called in the detail view; Rz 16 and Rt max 25 as the general requirement for the part.

BALFORD FINDING

The flats are milled as an interrupted 12-face profile. On this geometry the finish produced by the standard milling cycle is approximately **Rz 6** — slightly coarser than Rz 4 and still well inside the general Rz 16 / Rt max 25 requirement. Holding Rz 4 needs a second, slower finishing operation.

REQUESTED CHANGE

Accept Rz 6 on the 53 mm across-flats faces. Every other surface keeps the printed Rz 16 / Rt max 25.

EFFECT

Rz 6 comes out of the standard milling cycle, so the change removes an operation and shortens the route. Keeping Rz 4 adds a finishing operation and an extra setup; if Rz 4 is required on a functional face, please state which face and we will quote that operation separately.

☐ Accepted ☐ Not accepted ☐ Comment attached

4 CLAMPING TRACES ON THE Ø65.32 OUTSIDE DIAMETER

DECISION REQUIRED

PRINTED REQUIREMENT

Ø65.32 outside diameter, phosphate coated Fe/Znph/5-W0172-02. No cosmetic criterion is printed for this diameter.

BALFORD FINDING

The part is held in a collet or chuck while this diameter and the opposite features are machined. Light clamping traces — fine contact marks and local material pick-up on the held surface — remain visible on the Ø65.32 outside diameter after phosphating. They are cosmetic: diameter, concentricity and coating are not affected, and they are flagged here so that they are not treated as a defect at incoming inspection.

REQUESTED CHANGE

Confirm that light clamping traces on the Ø65.32 outside diameter are acceptable. If a mark-free diameter is required, please issue an acceptance criterion or a boundary sample; Balford will then use protected clamping (soft jaws, sleeves) and a finishing pass, which adds cost and lead time.

EFFECT

No cost impact if accepted; parts are packed in protective packaging so that no additional handling marks are added after machining. Protective clamping and finishing would add an operation and an inspection.

☐ Accepted ☐ Not accepted ☐ Comment attached

8 · CUSTOMER RESPONSE

Please record a decision for each of the four items and return this sheet, or reply by e-mail to shawn@balford.net. Process planning and tooling are released once items 1–4 are confirmed. If an item is not accepted, Balford will quote the additional operation it requires before production starts.

#	ITEM	BALFORD REQUEST	CUSTOMER DECISION	COMMENT
1	R0.2 edge radius on the 53 mm across-flats profile	Cancel the R0.2 requirement; deburred edge within the printed 0.05 mm burr limit	Accepted / not accepted	
2	0.05 ±0.02 step on both end faces	0.10 mm min, or deleted, or 0.05 max (visual)	Accepted / not accepted	
3	Roughness on the milled 53 mm across-flats faces	Rz 6 accepted on those faces	Accepted / not accepted	
4	Clamping traces on the Ø65.32 outside diameter	Light clamping traces accepted, or criterion issued	Accepted / not accepted	

If a printed requirement is kept unchanged, please note that in the comment column so that the additional operation, inspection effort and lead time can be quoted. No change is made to material, coating (Fe/Znph/5-W0172-02) or the 3.1 inspection certificate per DIN EN 10204.

Customer approval

Name and position

Signature

Date

Balford review

Reviewed by

Signature

Date

9 · BASIS OF THIS REVIEW

- Documents:** the review covers the customer drawing and the STEP model customer STEP model exactly as received on 2026-08-03. A later revision of either file needs a new review.
- Process limits:** the values quoted for the 0.05 mm step (item 2) and the R0.2 edge radius (item 1) are limits of the equipment assigned to this part. They are stated so that the drawing and the process can be brought into line before production, not as a rejection of the drawing.
- Cost and lead time:** the effects named in this review are qualitative. Prices, MOQ and delivery are confirmed separately once items 1–4 are decided.
- Unchanged scope:** material 1.7015 (11SMn30), coating Fe/Znph/5-W0172-02, the general tolerances ISO 2768:1989-mK, the edge requirement per ISO 13715 and the inspection certificate 3.1 per DIN EN 10204 all remain as printed and are not part of this change request.