Faculty of Engineering Stellenbosch University Fakulteit Ingenieurswese Universiteit Stellenbosch	ENGINEERING EZOBUNJINELI INGENIEURSWESE

Introductory Machine Design 254 **Inleidende Masjienontwerp 254**			**Drawing Project Report 2** September 2025 **Tekenprojek Verslag 2** September 2025
Duration **Tydsduur**	**Until / Tot: 24 Oct/Okt 2025 @ 17:00**	**Full marks** **Volpunte**	**100**

	Names **Name**	**Signatures to confirm: Question paper and marking scheme are correct and aligned with module outcomes** **Handtekeninge ter bevestiging: Vraestel en merkskema is korrek en belyn met module uitkomste**
Examiner(s) Eksaminator(e)	Prof. C. Coetzee Mr S. Fataar	
Moderator(s) Moderator(e)	Prof. K. Schreve	

PLEASE NOTE THE INSTRUCTIONS ON THE NEXT PAGE
LET ASSEBLIEF OP DIE INSTRUKSIES OP DIE VOLGENDE BLADSY

Engineering Faculty **Rules and Instructions** **(Specific to this module)**	**Fakulteit Ingenieurswese** **Reëls en Voorskrifte** **(Spesifiek vir hierdie module)**

• The Engineering Faculty's "General Stipulations for Under- and Postgraduate Modules" apply to this assessment.
• All questions must be answered with CAD.
• Not that this is a **team assignment**. Teams consist of two persons. You can choose your own teammate.
• Strict measures will be taken against any person who commit plagiarism. Each team member must sign and submit the plagiarism declaration as part of the report.
• Submit the following, in this sequence, in PDF format using the provided template:
  ○ A title page indicating the full names, surnames and student numbers of both team members. There must also be a list of drawings (title & drawing number) made by each student.
  ○ The completed plagiarism declaration.
  ○ All the drawings as requested. On each drawing the draftsperson (team member) must be clearly indicated.
	• Die Fakulteit Ingenieurswese se "Algemene Bepalings vir Voor- en Nagraadse Modules" is op hierdie assessering van toepassing.
	• Alle vrae moet met CAD beantwoord word.
	• Let daarop dat dit 'n **span projek** is. Spanne bestaan uit twee persone. U kan u eie spanmaat kies.
	• Daar sal streng opgetree word teen enige persoon wat plagiaat pleeg. Elke spanlid moet die plagiaat verklaring onderteken en inhandig as deel van die verslag.
	• Handig die volgende, in hierdie volgorde, in PDF formaat in en gebruik die templaat verskaf:
	  ○ 'n Titelblad met die volle name, vanne en studente nommers van elke spanlid aangedui. Dit moet ook 'n lys bevat van elke tekening (titel & tekening nommer) wat deur elke student gemaak is.
	  ○ Die voltooide plagiaatverklaring.
	  ○ Al die tekeninge soos versoek. Op elke tekening moet die tekenaar (spanlid) duidelik aangedui wees.

Direct any questions about the project by e-mail to Prof Coetzee (ccoetzee@sun.ac.za). Late submissions will be deducted 5 marks per hour, or part thereof.	Indien u vrae oor die projek het, rig dit per e-pos aan Prof Coetzee (ccoetzee@sun.ac.za). Take wat laat ingehandig word, sal 5 punte per uur, of deel daarvan verloor.

Assignment

You must complete the manufacturing drawings for selected parts of a drive head and bracket. The drive head has four parts that must be manufactured. You must make complete manufacturing drawings for each of these components, as well as an assembly drawing which includes the standard components (bearings, seals, etc.). Partial drawings are given.

The emphasis in this project is on the proper location of the shaft (how it is held in position) and the correct annotation of all the drawings. The perpendicularity of the SHAFT relative to the bottom of the BASE COVER, as well as the concentricity of the SHAFT relative to the parts holding it, are very important. Take assembly and manufacturing into consideration. Note, *annotation* here refers to all dimensions, labels, tolerance tables, ISO symbols, Bills of Materials, tolerances, geometric tolerances, title blocks, center lines, hatching, surface finish, etc. as may be necessary in each drawing to ensure that it is a proper manufacturing drawing.

Catalogue excerpts for the seals, circlips and keys will be provided in separate PDF documents. Use the bearings selected from the SKF catalogue in the first part of this project (Report 1). The team can choose to use any of the two team members' set of bearings (the correct answers will be provided). The bearing at the side of the end cap must take all of the axial load. Only components from these catalogues may be used. When choosing limits and fits, use the guidelines in "Typical Applications of Limits and Fits", on STEMLearn.

You may use your own drawing numbers, but the drawing titles must be the same as in this project brief.

Opdrag

U moet die vervaardigingstekeninge van geselekteerde onderdele van 'n aandryfkop en haakstuk voltooi. Die aandryfkop bestaan uit vier komponente wat vervaardig moet word. U moet volledige werkstekeninge vir elkeen van hierdie onderdele maak, asook 'n samestellingstekening wat ook die standaard komponente (laers, seëls, ens.) insluit. Gedeeltelike tekeninge word gegee.

Die klem in die projek is op die korrekte bevestiging van die as (hoe dit in posisie gehou word) en die korrekte annotering van al die tekeninge. Die haaksheid van die AS relatief tot die basis van die VOETSTUK, asook die konsentrisiteit van die AS relatief tot die onderdele waarin dit bevestig word, is baie belangrik. Neem vervaardiging en samestelling in ag. Let op dat *annotering* hier verwys na dimensies, notas, toleransie tabelle, ISO simbole, onderdelelyste, toleransies, geometriese toleransies, titel blokke, hartlyne, arsering, oppervlakafwerking, ens. soos nodig om te verseker dat elke tekening 'n behoortlike vervaardigingstekening is.

Katalogusuittreksels vir die seëls, borgringe en spye sal gegee word in 'n aparte PDF dokument. Gebruik die laers gekies vanuit die SKF katalogus gedurende die eerste deel van hierdie projek (Verslag 1). Die span kan kies watter een van die spanlede se stel laers gebruik word (die korrekte antwoorde sal verskaf word). Die laer aan die kant van die deksel moet al die aksiale las opneem. Slegs komponente uit hierdie katalogusse mag gebruik word. Gebruik die riglyne in "Typical Applications of Limits and Fits", op STEMLearn vir die keuse van grense en passings.

U mag u eie tekeningnommers gebruik, maar die tekeningtitels moet dieselfde as in hierdie opdrag wees.

1. **Design the SHAFT.**

The SHAFT in the attached drawings is illustrative. Your design will be a much more complex shaft. Only the part of the SHAFT marked with a thick green line in the assembly drawing (DRIVE HEAD, #005, SHEET 3) may be changed. Add the necessary annotation. The design must make provision for bearing seating and radial shaft seals (choose from the VP series in the catalogue) for the END CAP and BASE COVER. You must also incorporate the use of at least one circlip in the shaft design. The SHAFT will be manufactured from STEEL 1431/350WA.

2. **Make a complete assembly drawing of the DRIVE HEAD.**

Draw the SHAFT, the END CAP, BASE COVER, BODY, bearings, seals, and circlip(s) in appropriate views (front, side, sectioned views, etc.). The location features of the bearings and seals must be clearly visible. Annotate the drawing. This drawing excludes the BRACKET.

3. **Make the END CAP drawing.**

Annotate the holes for the shaft and the M8 bolts used to connect the END CAP to the BODY. Design the seating for the radial shaft seal (choose from the VP series in the catalogue) housed in the END CAP, with annotation as necessary. Design and annotate the interface between the END CAP and the BODY, and between the END CAP and the bearing. No other dimensions necessary. Only the parts marked with the thick blue line in the assembly drawing (DRIVE HEAD, #005, SHEET 3) may be changed. The END CAP will be manufactured from cast iron.

1. **Ontwerp die AS.**

Die AS in die aangehegte tekeninge is slegs ter illustrasie. U ontwerp sal baie meer kompleks wees. Slegs die deel van die AS wat met ’n dik groen lyn gemerk is in die samestellingstekening kan verander word (AANDRYFKOP, #005, VEL 3). Annoteer die tekening soos nodig. Die ontwerp moet voorsiening maak vir laer passing en radiale as seëls (kies van die VP reeks in die katalogus) vir die DEKSEL en VOETSTUK. U moet ook ten minste een borgring gebruik op die as. Die AS sal van STAAL 1431/350WA vervaardig word.

2. **Maak ’n volledige samestellingstekening van die AANDRYFKOP.**

Die AS, die DEKSEL, VOETSTUK, ROMP, laers, seëls, en borgring(e) moet in gepaste aansigte getoon word (voor-, sy-, snit-aansigte, ens.). Die bevestiging van die laers en seëls moet duidelik sigbaar wees. Annoteer die tekening. Hierdie tekeninge sluit die HAAKSTUK uit.

3. **Maak die DEKSEL tekening.**

Annoteer die gate vir die as en die M8 boute wat die DEKSEL aan die ROMP verbind. Ontwerp die bedding/intervlak vir die radiale as seël (kies van die VP reeks in die katalogus) in die DEKSEL, met annotasie soos nodig. Ontwerp en annoteer die intervlak tussen die DEKSEL en die ROMP, en tussen die DEKSEL en die laer. Geen ander dimensies is nodig nie. Slegs die dele gemerk met die ’n dik blou lyn in die samestellingstekening (AANDRYFKOP, #005, VEL 3) mag verander word. Die DEKSEL sal van gietyster vervaardig word.

4. **Make the BASE COVER drawing.**
Annotate the holes for the shaft and the M8 bolts connecting the BASE COVER to the BODY. Design the seating for the radial shaft seal (choose from the VP series in the catalogue) housed in the BASE COVER, with annotation as necessary. Design and annotate the interface between the BASE COVER and the BODY, and between the BASE COVER and the bearing. No other dimensions necessary. Only the parts marked with the thick blue line in the assembly drawing (DRIVE HEAD, #005, SHEET 3) may be changed. The CASING COVER will be manufactured from cast iron.

5. **Make the BODY drawing.**
Design and annotate the interfaces between the BODY and the END CAP and BASE COVER. Design and annotate the internal parts of the BODY, making provision for bearing seating. Annotate the holes for the M8 bolts connecting the END CAP and the BASE COVER to the BODY. Annotate the holes for the M10 bolts connecting the BODY to the BRACKET. No other dimensions necessary. Only the parts marked with the thick red line in the assembly drawing (DRIVE HEAD, #005, SHEET 3) may be changed. The BODY will be made of cast iron.

6. **Make a complete welded assembly drawing of the BRACKET (#009).**
Choose an appropriate thickness for the weld seams. All the weld seams must be present on both sides of all the parts. Add appropriate welding symbols for all weld seams. The weld seams require a 4×4 mm chamfer weld preparation. It is not necessary to make detail manufacturing drawings for the three parts of the BRACKET.

4. **Maak die VOETSTUK tekening.**
Annoteer die gate vir die as en die M8 boute wat die VOETSTUK aan die ROMP heg. Ontwerp die bedding/intervlak vir die radiale as seël (kies van die VP reeks in die katalogus) in die VOETSTUK, met annotasie soos nodig. Ontwerp en annoteer die intervlak tussen die VOETSTUK en die ROMP, en tussen die VOETSTUK en die laer. Geen ander dimensies nodig nie. Slegs die dele gemerk met die ’n dik blou lyn in die samestellingstekening (AANDRYFKOP, #005, VEL 3) mag verander word. Die VOETSTUK sal van gietyster vervaardig word.

5. **Maak die ROMP tekening.**
Ontwerp en annoteer die intervlakke tussen die ROMP en die DEKSEL en VOETSTUK. Ontwerp en annoteer die binne kant van die ROMP, en maak voorsiening vir laer beddings/intervlakke. Annoteer die gate vir die M8 boute wat die DEKSEL en VOETSTUK aan die ROMP heg. Annoteer die gate vir die M10 boute wat die ROMP aan die HAAKSTUK heg. Geen ander dimensies nodig nie. Slegs die dele gemerk met die ’n dik rooi lyn in die samestellingstekening (AANDRYFKOP, #005, VEL 3) mag verander word. Die ROMP sal van gietyster gemaak word.

6. **Maak ’n volledige sweissamestellingstekening van die HAAKSTUK (#009).**
Kies ’n gepaste dikte vir die sweisnate. Al die sweisnate moet beide kante van die onderdele wees. Verskaf gepaste simbole vir al die sweisnate. Die sweisnate moet ’n 4×4 mm afkanting sweisvoorbereiding kry. Dis nie nodig om detail vervaardigingstekeninge vir die drie onderdele van die HAAKSTUK te maak nie.

Assessment Criteria

A detailed marking scheme is not provided since it will lead you to the "right" answer, while this project is essentially about determining what you need to think about.

The following criteria must be considered. It is the basis on which the marking scheme is built.

- If the drawing pack is taken to our workshop, will the artisans be able to manufacture a working (function and accuracy) product without asking you any further questions? (Casting excluded.)
- Do the drawings comply to the standards as taught in this module?
- General neatness.
- Is it easy to find information?
- Can the components be assembled?
- Are the catalogue items clearly indicated such that a buyer can order the items in the correct quantities?
- Was there a fair division of work, both in terms of quantity and difficulty, between team members, and is each member's contribution clearly indicated?
- It is very important that the team works well together since the interfaces between components are critical. Since there are only two team members, it is not possible to do an anonymous buddy rating. The list of drawings done by each student, with the names of the draftsperson on the drawings, will be used to judge each member's contribution.

  If any team member's contribution was insufficient, you can inform the lecturer confidentially by e-mail (ccoetzee@sun.ac.za) before 27 October. Groups may also be requested to participate in an oral related to their project if the examiners are uncertain about the individual contribution, whether due to plagiarism, poor work distribution, or otherwise.

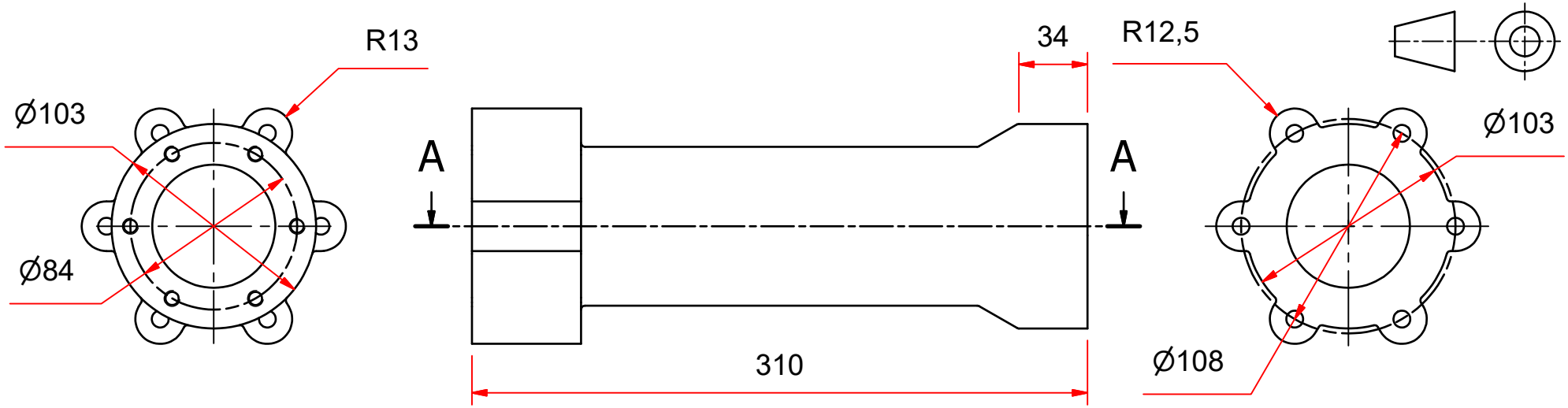
Assesseringskriteria

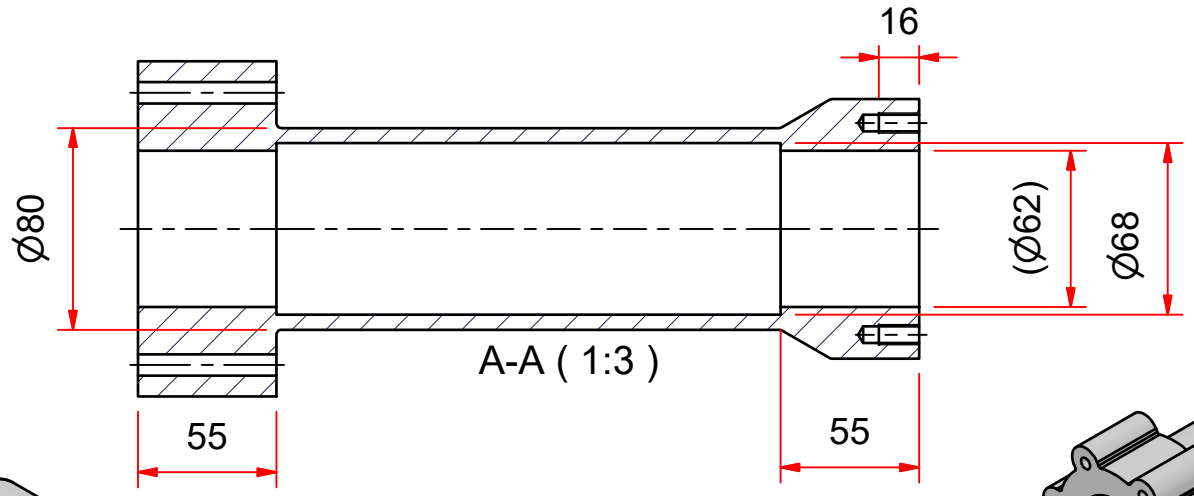
'n Detail merkskema word nie verskaf nie, want dit sal u lei na die "regte" antwoord, terwyl dit hier juis daaroor gaan dat u self moet bepaal waaraan gedink moet word.

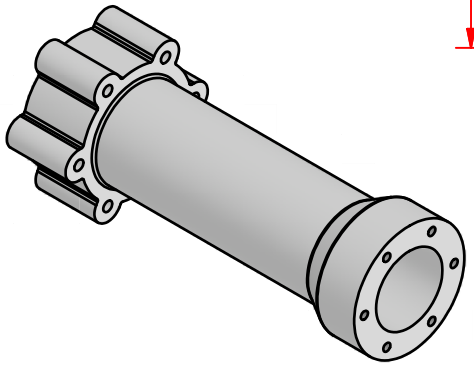
Die volgende kriteria moet egter in ag geneem word, en vorm die basis waarop die merkskema gebou is.

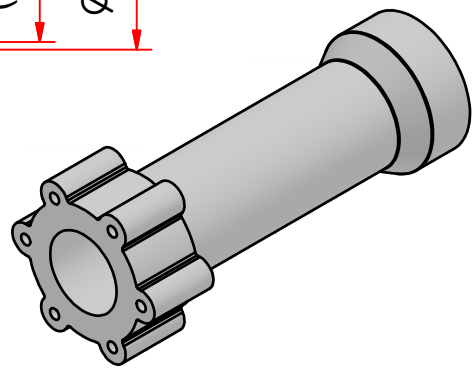
- Indien die tekeningpak na die werkswinkel geneem word, sal die werkswinkel in staat wees om 'n werkbare (funksie en akkuraatheid) produk te vervaardig sonder om enige verdere vrae aan u te vra? (Gietwerk uitgesluit.)
- Voldoen die tekeninge aan die standaarde wat in hierdie kursus behandel word?
- Algemene netheid.
- Is dit maklik om die nodige inligting te vind?
- Kan al die onderdele saamgestel word?
- Is die katalogus items duidelik aangedui sodat 'n aankoper presies sal weet watter item en hoeveel bestel moet word?
- Is die werk tussen die spanlede regverdig verdeel, beide in terme van hoeveelheid en moeilikheidsgraad, en is elkeen se bydrae duidelik bepaalbaar?
- Dit is baie belangrik dat spanlede goed saamwerk, omdat die intervlakke tussen die verskillende onderdele krities is. Omdat daar net 2 spanlede is, sal dit nie moontlik wees om 'n anonieme ewekniebeoordeling te doen nie. Daarom sal die lys van tekeninge deur elke student gedoen, saam met die name van die tekenaars op die tekeninge, gebruik word om elkeen se bydrae te beoordeel.

  Indien enige spanlid voel dat 'n spanmaat se bydrae onvoldoende is, kan 'n vertroulike e-pos na die dosent (ccoetzee@sun.ac.za) gestuur word voor 27 Oktober. Groepe kan ook versoek word om 'n mondeling oor hul projek by te woon indien die eksaminatore twyfel het oor die individuele bydraes, hetsy of dit plagiaat, swak werksverdeling, of andersins is.





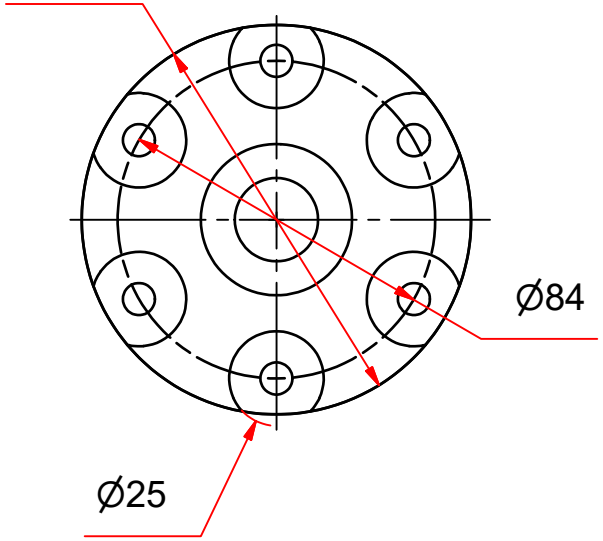


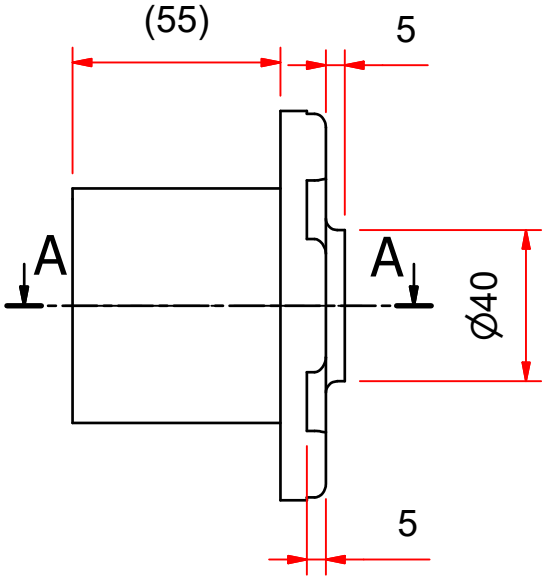


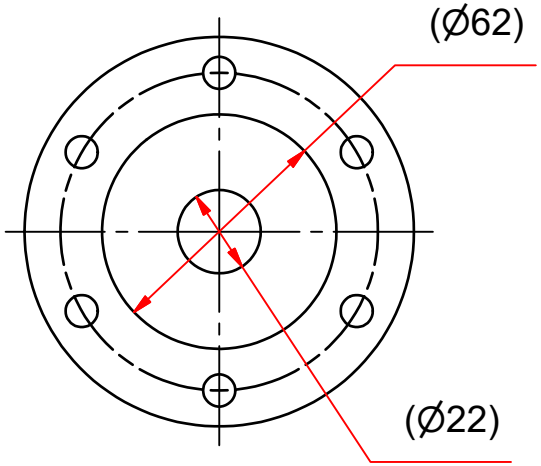
ALL FILLET RADII R2
ALLE VULSTRALE R2

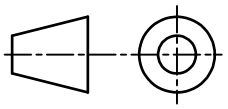
ITEM	DESCRIPTION	Qty.	MATERIAL / SPECIFICATIONS

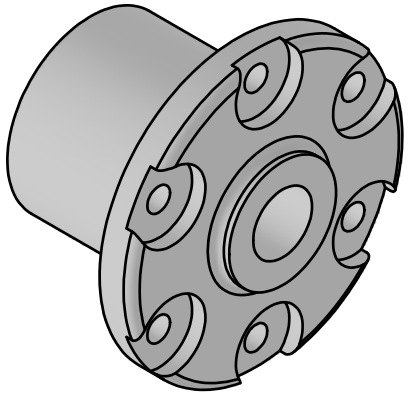
STELLENBOSCH UNIVERSITY	**REVISION NUMBER:**	**SCALE ON A4** 1:3	**TITLE:** ROMP / BODY
	NOTE: DEBURR ALL EDGES	**UNITS IN** mm	
STUDENT Nr.	**DRAWN BY** C COETZEE **CHECKED**	**DATE** 2025/07/15	**SHEET Nr. 1 OF 1 SHEETS** **Nr.** 001

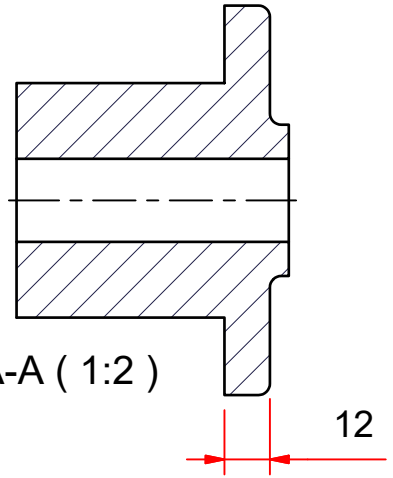


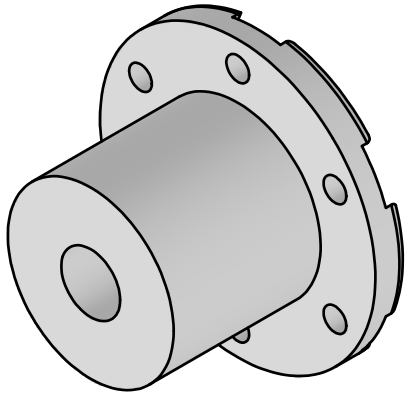








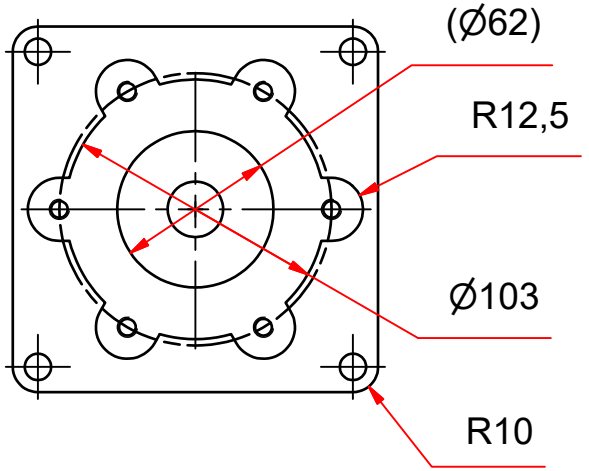


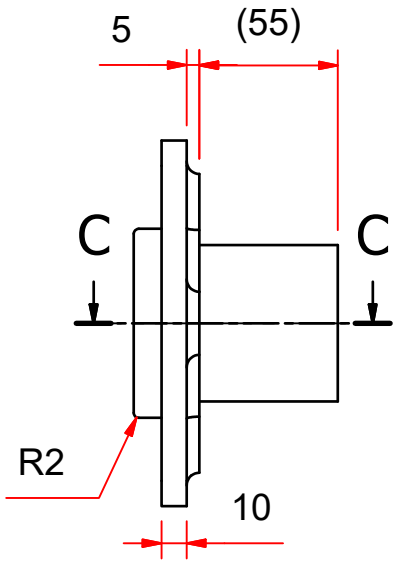


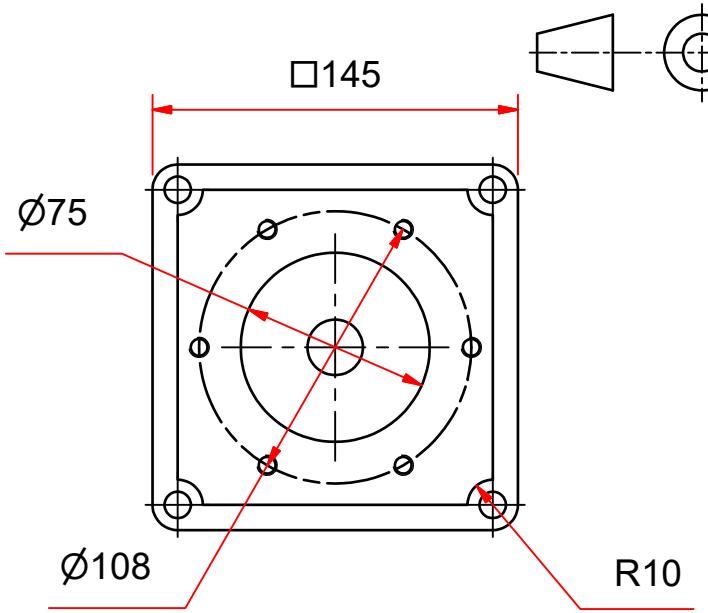
ALL FILLET RADII R3
ALLE VULSTRALE R3

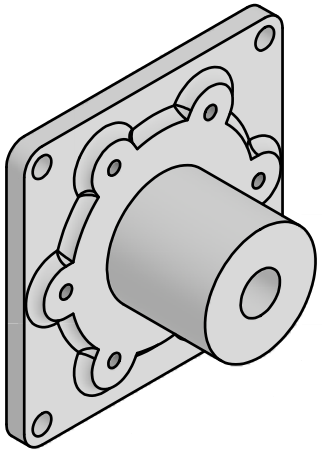
ITEM	DESCRIPTION	Qty.	MATERIAL / SPECIFICATIONS

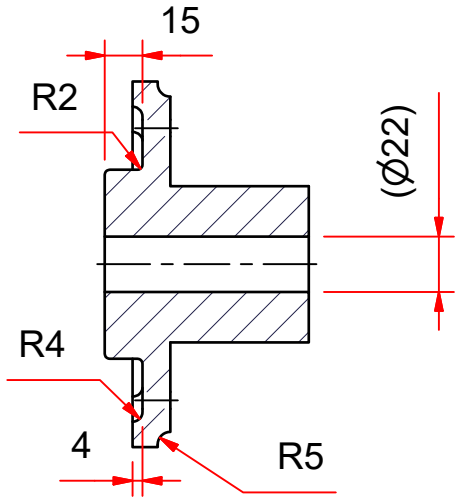
STELLENBOSCH UNIVERSITY	**REVISION NUMBER**: 1	**SCALE ON A4** 1:2	**TITLE:** DEKSEL / END CAP
	NOTE: DEBURR ALL EDGES	**UNITS IN** mm	
STUDENT Nr.	**DRAWN BY** C COETZEE **CHECKED**	**DATE** 2025/07/17	**SHEET Nr. 1 OF 1 SHEETS** **Nr.** 002











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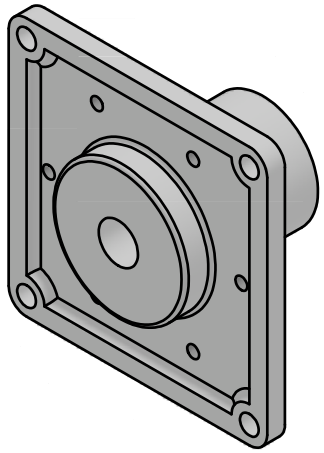
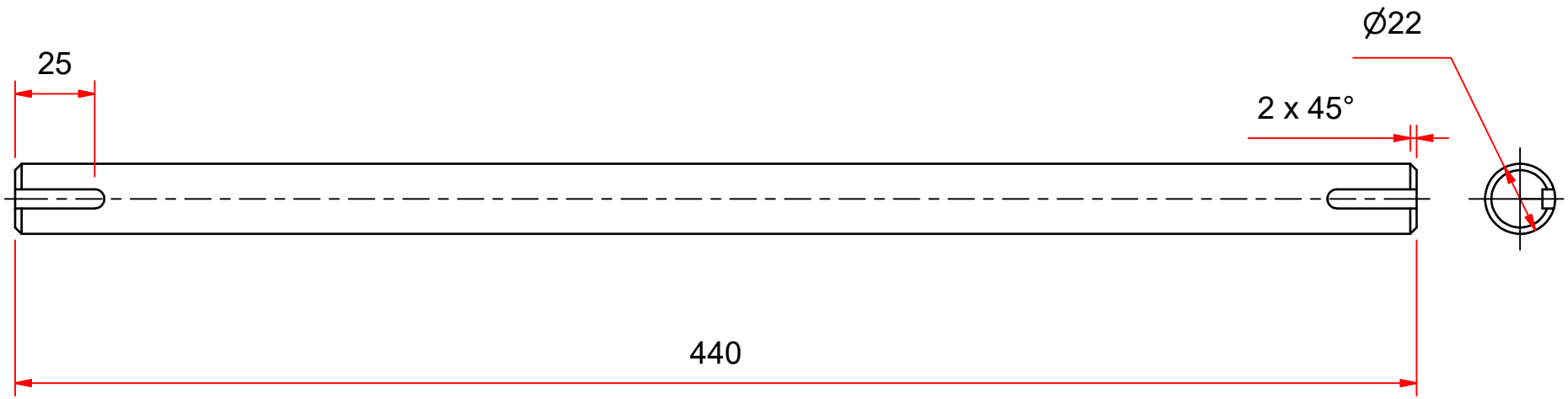


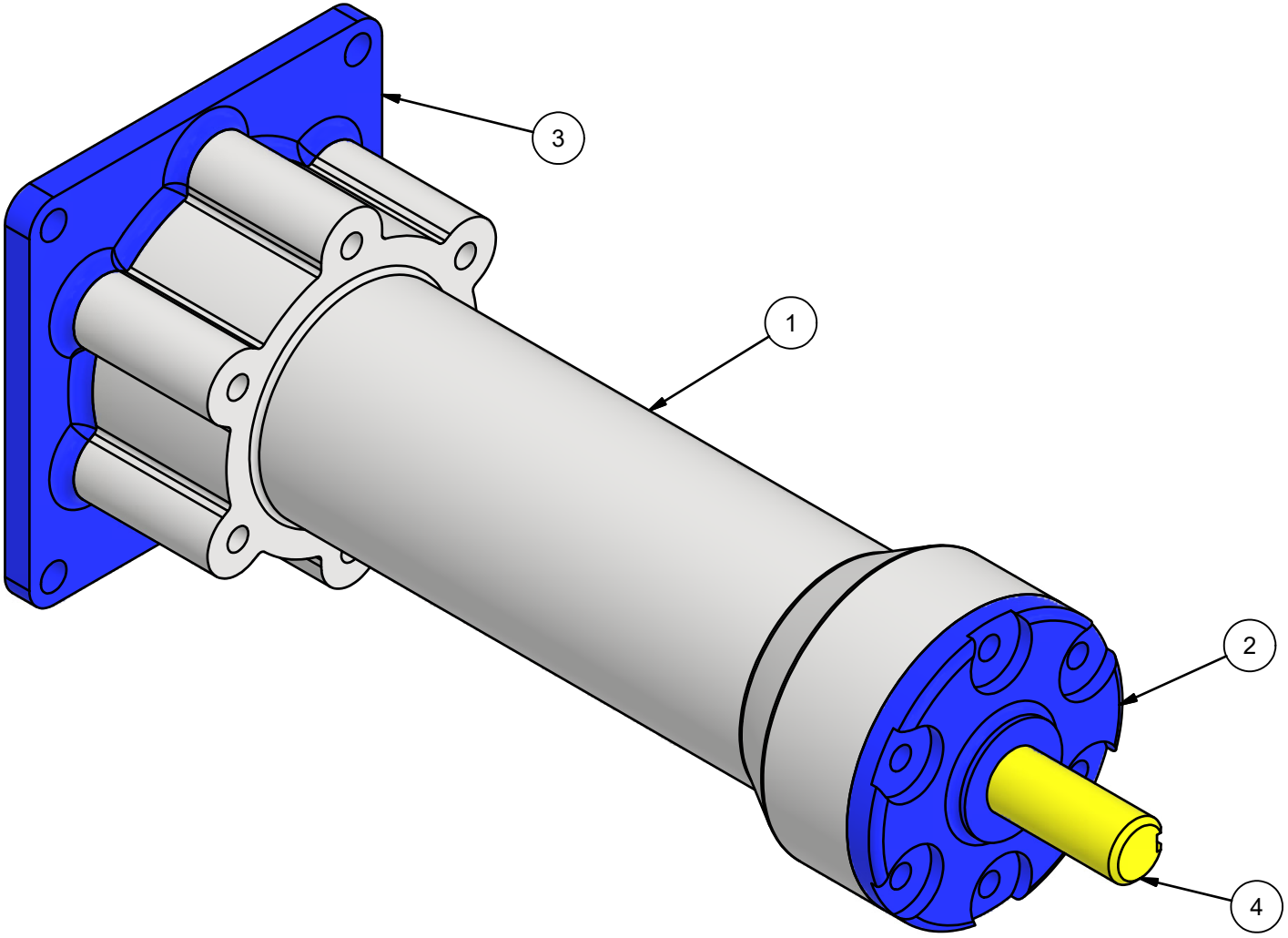
ITEM	DESCRIPTION	Qty.	MATERIAL / SPECIFICATIONS

STELLENBOSCH UNIVERSITY	**REVISION NUMBER**: 1	**SCALE ON A4** 1:3	**TITLE:** VOETSTUK / BASE COVER
	NOTE: DEBURR ALL EDGES	**UNITS IN** mm	
STUDENT Nr.	**DRAWN BY** C COETZEE **CHECKED**	**DATE** 2025/07/17	**SHEET Nr. 1 OF 1 SHEETS** **Nr.** 003



ITEM	DESCRIPTION	Qty.	MATERIAL / SPECIFICATIONS

STELLENBOSCH UNIVERSITY	**REVISION NUMBER**: 1	**SCALE ON A4** 1:2	**TITLE:** AS / SHAFT
	NOTE: DEBURR ALL EDGES	**UNITS IN** mm	
STUDENT Nr.	**DRAWN BY** C COETZEE **CHECKED**	**DATE** 2025/07/18	**SHEET Nr. 1 OF 1 SHEETS** **Nr.** 004



ITEM	DESCRIPTION	Qty.	MATERIAL / SPECIFICATIONS
4	AS / SHAFT	1	004
3	VOETSTUK / BASE COVER	1	003
2	DEKSEL / END CAP	1	002
1	ROMP / BODY	1	001

STELLENBOSCH UNIVERSITY

REVISION NUMBER: 1
NOTE: DEBURR ALL EDGES

SCALE ON A4 1:2
UNITS IN mm

TITLE: AANDRYFKOP / DRIVE HEAD

STUDENT Nr.

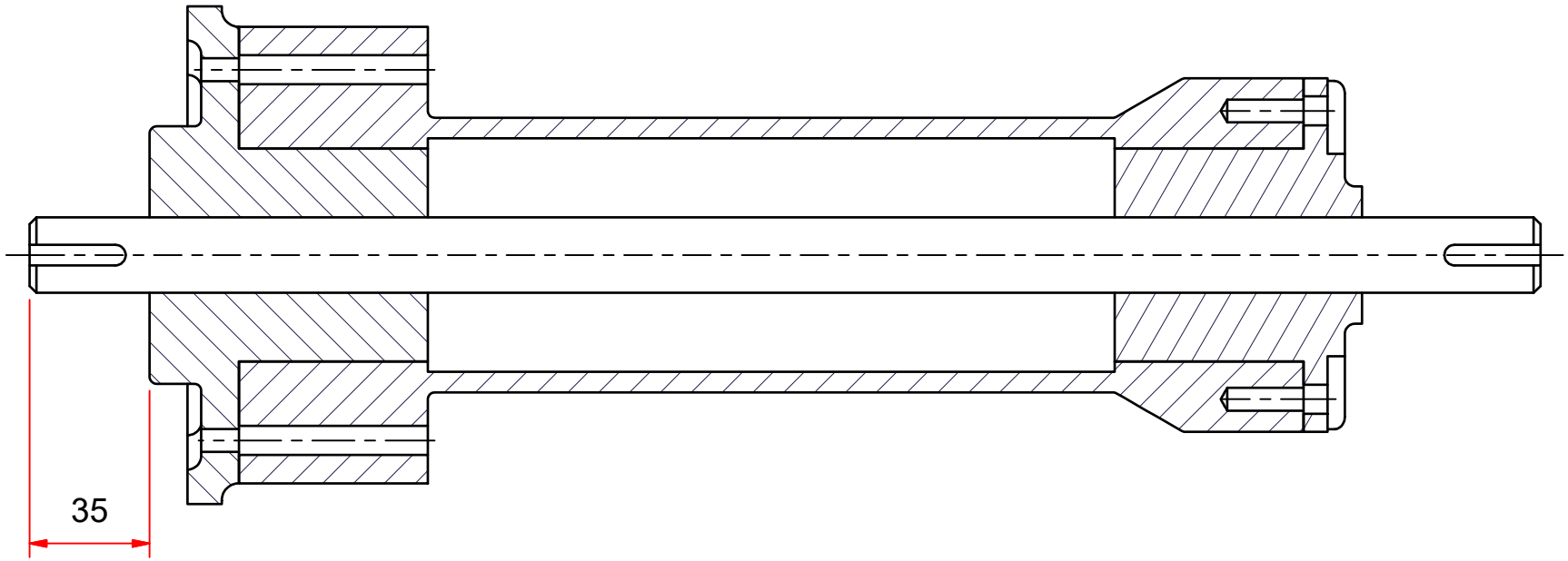
DRAWN BY C COETZEE

CHECKED

DATE 2025/07/17

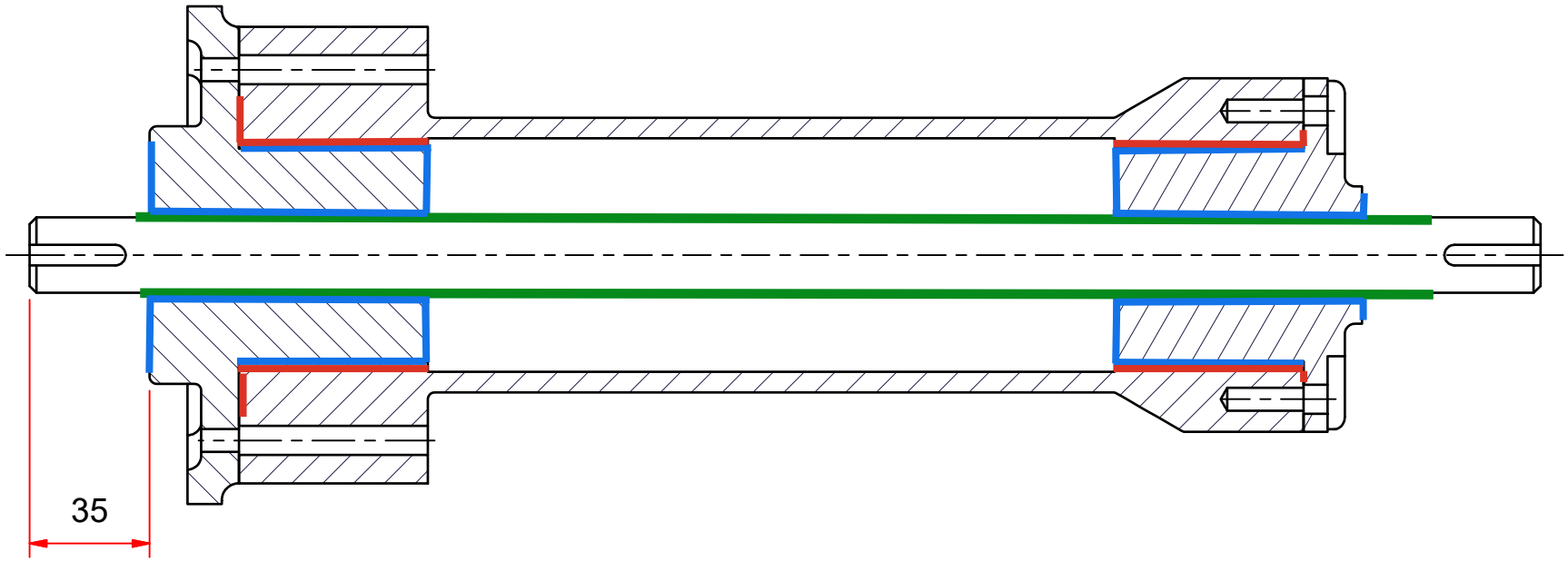
SHEET Nr. 1 OF 3 SHEETS

Nr. 005



ITEM	DESCRIPTION	Qty.	MATERIAL / SPECIFICATIONS

STELLENBOSCH UNIVERSITY	**REVISION NUMBER**: 1	**SCALE ON A4** 1:2	**TITLE:** AANDRYFKOP / DRIVE HEAD
	NOTE: DEBURR ALL EDGES	**UNITS IN** mm	
STUDENT Nr.	**DRAWN BY** C COETZEE **CHECKED**	**DATE** 2025/07/17	**SHEET Nr. 2 OF 3 SHEETS** **Nr.** 005



ITEM	DESCRIPTION	Qty.	MATERIAL / SPECIFICATIONS

STELLENBOSCH UNIVERSITY	**REVISION NUMBER**: 1	**SCALE ON A4** 1:2	**TITLE:** AANDRYFKOP / DRIVE HEAD
	NOTE: DEBURR ALL EDGES	**UNITS IN** mm	
STUDENT Nr.	**DRAWN BY** C COETZEE **CHECKED**	**DATE** 2025/07/17	**SHEET Nr. 3 OF 3 SHEETS** **Nr.** 005

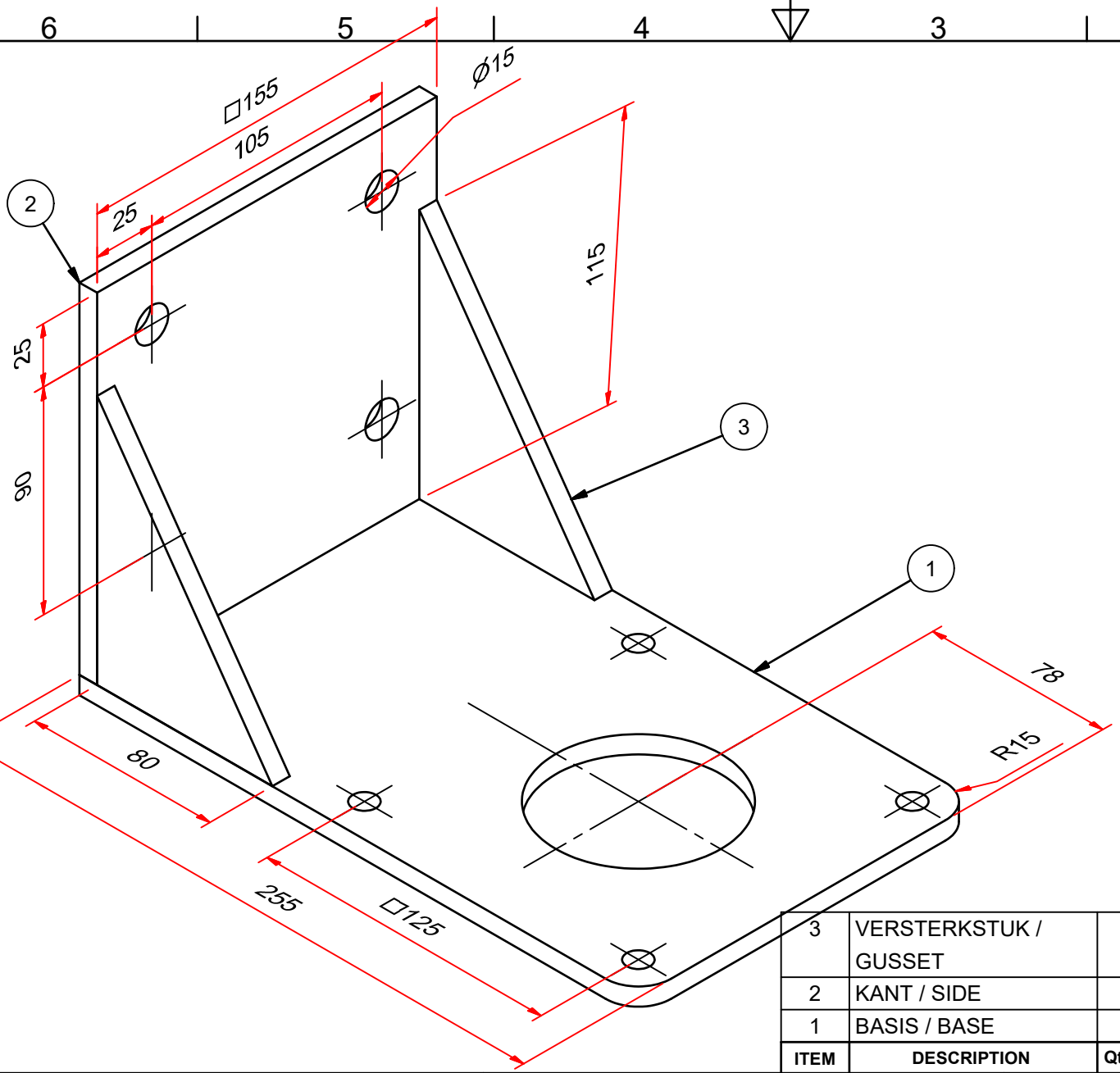


PLATE THICKNESS: 8 mm
PLAAT DIKTE: 8 mm

ITEM	DESCRIPTION	Qty.	MATERIAL / SPECIFICATIONS
3	VERSTERKSTUK / GUSSET	2	Steel, Mild
2	KANT / SIDE	1	Steel, Mild
1	BASIS / BASE	1	Steel, Mild

STELLENBOSCH UNIVERSITY

REVISION NUMBER: 1.3
NOTE: DEBURR ALL EDGES
SCALE ON A4 1 : 2
UNITS IN mm
TITLE: HAAKSTUK / BRACKET

STUDENT Nr.
DRAWN BY C COETZEE
CHECKED
DATE 2024/09/10
SHEET Nr. 1 OF 1 SHEETS
Nr. 009