Drawing No. WEAVE Lens 4

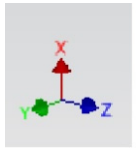
This details the manufacture of the lens only. It does not infer any Decentres or tilts of lens surfaces wrt to the M1/PFC optical axis. Those decentres or tilts are achieved on assembly.

LENS 4 Manufacturing Details. As Built

Nominally with respect to the mechanical axis: *Surface 2 not tilted.*

Design:Surface 1 tilted by 0.652 deg (decentred 18.756 mm)

As Built:Surface 1 tilted by 0.649 deg (decentred 18.69 mm)



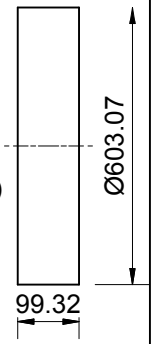
Decentres (tilts) in X, Z Plane.
For Use in CAD and Zemax @ Zenith ADCs 0 deg Rotation.

Blank 4

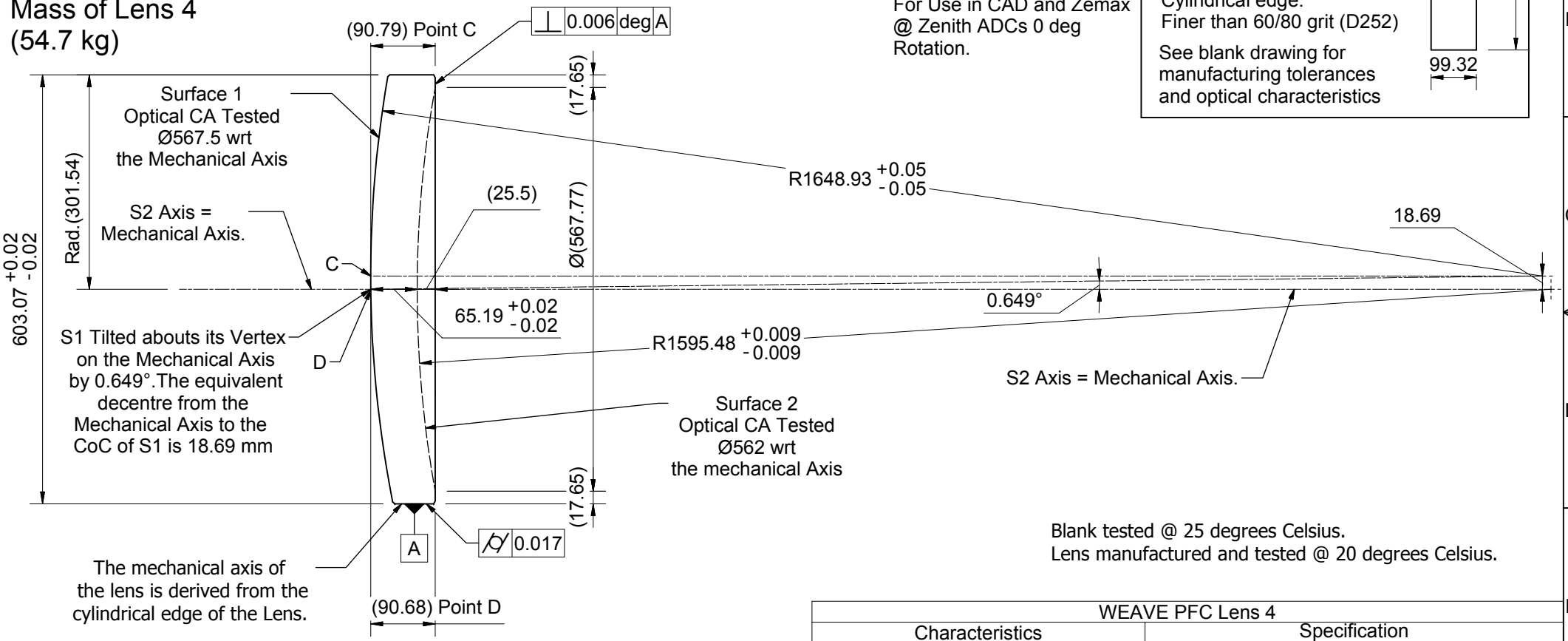
82 kg

Surface Finish of the Blank.
Ground Matt Finish.
General Surfaces:
Finer than 100/120 grit (D151)
Cylindrical edge:
Finer than 60/80 grit (D252)

See blank drawing for manufacturing tolerances and optical characteristics



Mass of Lens 4
(54.7 kg)



Blank tested @ 25 degrees Celsius.
Lens manufactured and tested @ 20 degrees Celsius.

WEAVE PFC Lens 4	
Characteristics	Specification
Surface Roughness. Measured on a standard sample length of 20 mm	2 nm RMS
Surface Quality	Scratch: 60 / Dig: 40 over CA

Quantity 1

Project: WEAVE

Third Angle

UNLESS OTHERWISE STATED
All dimensions in mm
General Tol: ± 0.010
Angular Tol: ± 0.005
Surface Finish (microns):
REMOVE ALL SHARP EDGES
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Material: Ohara PBL1Y

Finish: AR Coated

Drawn by: Kmdee

Date: 28/01/2016

Revision: 1.5

Lens 4 Design 14.5

Item No. 4

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Apartado de correos 321
E-38700 Santa Cruz de la Palma
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Drawing No. WEAVE Lens 4

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Sheet 1 / 6

File Name WEAVE Lens 4 (As Built).dwg

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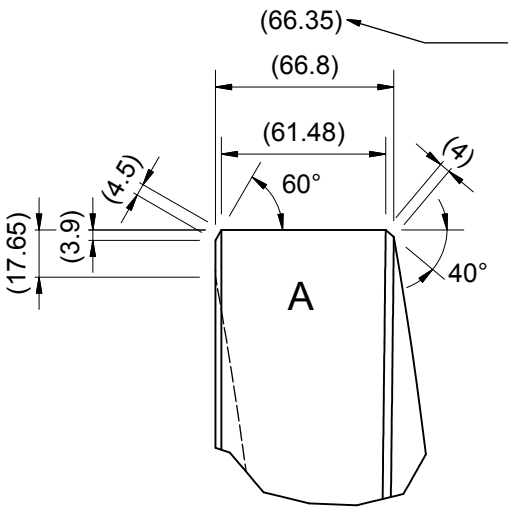
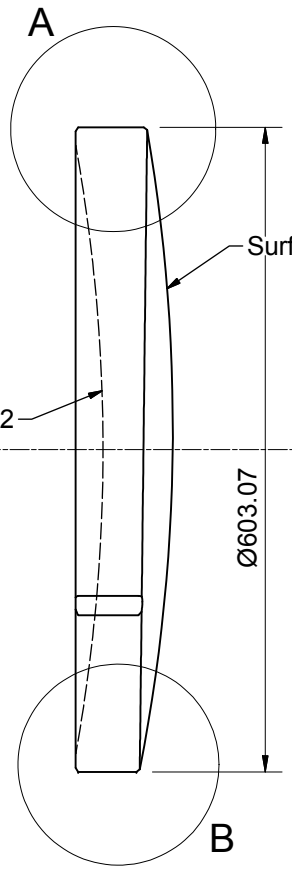
Drawing No. WEAVE Lens 4

Edging Detail Lens Cut Outs & Markings.



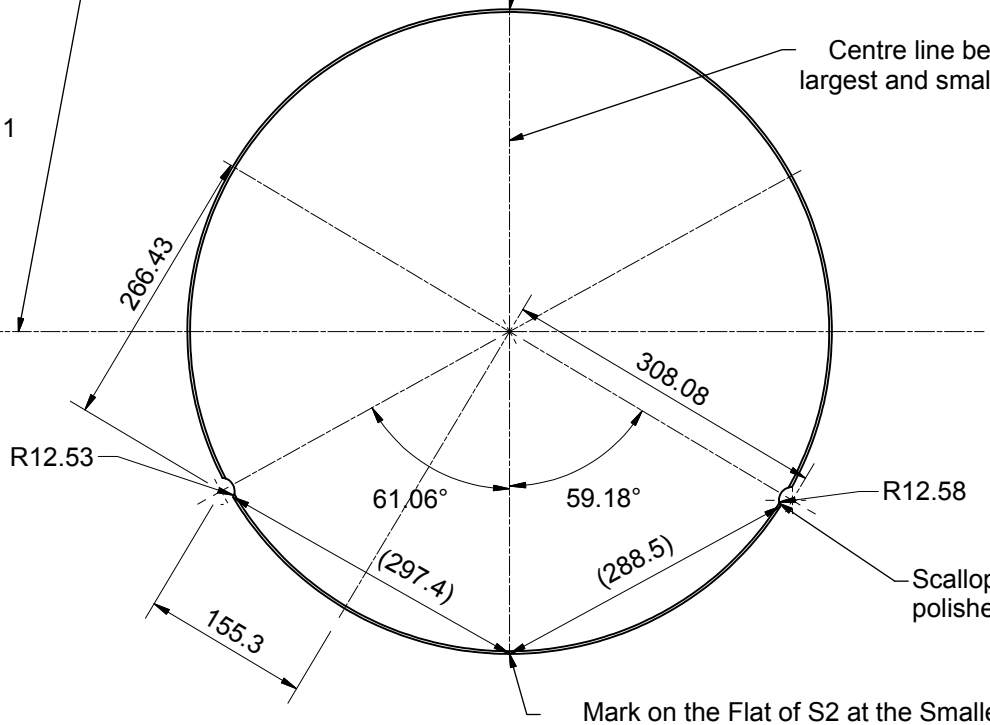
REF. Largest Edge thickness before production of Chamfer. Generated from Lens 3D model.



Mechanical Axis
S2 Axis

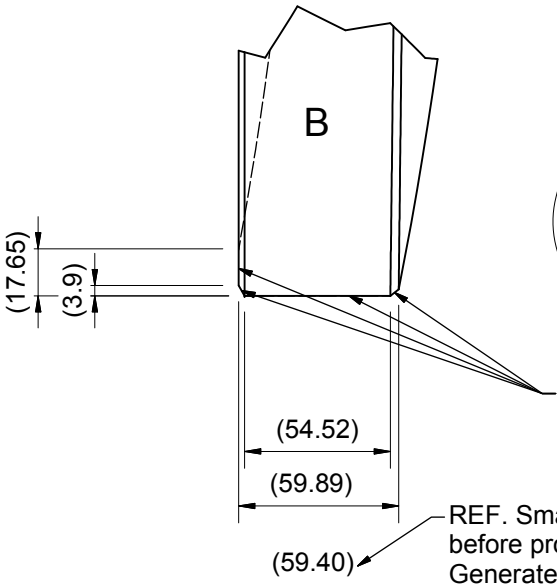
Mark on the Flat of S2 at the Largest edge distance a Line that represents the centre line.
The text "L IV | L.Y"
Interpretation Lens 4 (then the Centre Line) Largest Edge.
Y is an Identifier for Assembly

Centre line between largest and smallest edge



Scalloped edges are polished and bevelled

Mark on the Flat of S2 at the Smallest edge distance a Line that represents the centre line.
The text "L IV | S.Z"
Interpretation Lens 4 (then the Centre Line) Smallest Edge.
Z is an Identifier for Assembly



Surface finish of the flat, cylindrical edge and chamfers: finer than 60/80 grit

REF. Smallest Edge thickness before production of Chamfer. Generated from Lens 3D model.

UNLESS OTHERWISE STATED All dimensions in mm General Tol: ± 0.010 Angular Tol: ± 0.005 Surface Finish (microns): REMOVE ALL SHARP EDGES This document may not be copied, reproduced or displayed in whole or part without the express consent of the owner	Material: Ohara PBL1Y Finish: AR Coated	Drawn by: Kmdee	Date: 28/01/2016	Revision: 1.5	Project: WEAVE Lens 4 Design 14.5 Used ON Drawing No. WEAVE Lens 4	Third Angle Item No. 4 A3 Sheet 2 / 6

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Canary Islands. SPAIN

File Name WEAVE Lens 4 (As Built).dwg

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Drawing No. WEAVE Lens 4

LENS 4

As Built;Surface & Wave Front specifications.

Ref. #	Requirement	Criteria	Pass/Fail or TBD
WEAVE PFC Lens 4 Surface 2			
WEAVE LENS 4	Total Surface Form Errors	50 nm RMS	Pass
WEAVE LENS 4	Low Frequencies Surface Form Errors (Z4-Z11)	45 nm RMS	Pass
WEAVE LENS 4	Mid Frequencies Surface Form Errors (Z12-Z211)	20 nm RMS	Pass, (Z12 to Z190)
WEAVE LENS 4	High Frequencies Surface Form Errors (>Z212)	10 nm RMS	Unable to measure/fit **

Ref. #	Requirement	Criteria	Pass/Fail or TBD
WEAVE PFC Lens 4 Transmitted Wavefront Error			
WEAVE LENS 4	Total Surface Form Errors	78 nm RMS	Pass
WEAVE LENS 4	Low Frequencies Surface Form Errors (Z4-Z11)	70 nm RMS	Pass (average of 3 measurements)
WEAVE LENS 4	Mid Frequencies Surface Form Errors (Z12-Z211)	31 nm RMS	Pass, (Z12 to Z190)
WEAVE LENS 4	High Frequencies Surface Form Errors (>Z212)	15 nm RMS	Unable to measure/fit**

** Intelliwave is only able to process/fit Perkin Elmer coefficients up to the 18th order, term 190.

Coatings.

Coating specification:

Both surfaces shall have an average reflectivity of less than 1% over the [370-1000]nm wavelength bandpass, for the range of angles of incidence and diameters mentioned in the table below. Furthermore, any peaks over 1% should stay below 1.5%.

Coating samples are not provided by the Customer.

	Angles of incidence with respect to the normal of the surface considered	Min. diameter [mm]	Max. diameter [mm]
Surface 1	From 0 to 15 degrees max.	570	574
Surface 2	From 0 to 17 degrees max.	564	N/A

File Name WEAVE Lens 4 (As Built).dwg

Current Status Released

Manufacturing Approval		
REV	DESCRIPTION	ISSUE DATE
1.5	Edits & Typos input from Emilie	28/01/16
1.4	As Built Drawing Issued	22/01/16
1.3	Sheet 1. Perpendicular tolerance changed to 0.013 deg to reflect measured value of the lens blank. Typos corrected. Sheet 2 Emails approvals included. Sheet 3 typos corrected	25/03/2015
1.2	Sheet 3/3. Assembly tilts corrected. Sheet 2 updated. Sheet 1 Concentricity tolerance removed.	10/03/2015
1.0	Sheet 1/3. Lens 4 Manufacturing drawing	05/02/2015

Approval by Email
Record of Email Reply

On 09/02/2015 12:14, Tibor Agocs wrote:
Hi Kevin,

Thanks for the drawings, I checked them. Have some remarks regarding alignment, we can discuss them later. The important is the manufacturing aspect at the moment.

I Tibor Agocs approve manufacturing drawings for Lens 3 and 4. Version 1.1 and issue date 05/02/2015. --- Cheers,
Tibor
On 25/03/2015 04:55, Peter Connor wrote:
Hi Kevin
I approve the manufacturing drawings for WEAVE lenses L3 and L4, Revision 1.2, 10 March 2015.

Regards
Peter Connor

Re: WEAVE L3 and L4 drawings
On 25/03/2015 09:20, Don Carlos Abrams wrote:
Sorry, I thought that I'd responded. My fault - approved.
DC

From: Dave Cochrane <Dave.Cochrane@callaghaninnovation.govt.nz>
Date: 24 March 2015 20:33:40 GMT
Subject: RE: Latest versions of drawings 3 & 4
Hi Kevin
Thanks for the drawings. I have checked the drawings and approve the manufacturing drawings for lens 3 and lens 4, version 1.2, issue date 10/03/2015.

Cheers
Dave

Subject: Re: Latest versions of drawings 3 & 4
Date: Thu, 12 Mar 2015 12:27:19 +0000
From: Gavin Dalton <gavin.dalton@stfc.ac.uk>
To: Kevin Dee <kmd@ing.iac.es>

Hi Kevin,
I note we still have the index marks defined on the last page under the heading of 'Assembly information only. Not relevant for lens manufacture' -Don't remember what we'd decided about that…?

Otherwise I'm happy if everyone else is…

G.

On 25/03/2015 16:13, Emilie LHOME wrote:
Hi Kevin,
Thanks for the updated drawings. They look fine to me.
I, Emilie Lhome, approve manufacturing drawings for Lens 3 and Lens 4. Version 1.3 and issue date 25/03/2015.
Cheers,
Emilie.

On 25/03/2015 20:36, Kevin Dee wrote:
I approve lens 3 & 4 manufacturing drawings V 1.3
Kevin Dee

UNLESS OTHERWISE STATED
All dimensions in mm
General Tol: ± 0.010
Angular Tol: ± 0.005
Surface Finish (microns):
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Finish: AR Coated

Drawn by: Kmdee
Date: 28/01/2016
Revision: 1.5

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Canary Islands. SPAIN

Project: WEAVE
Third Angle
Lens 4 Design 14.5
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Drawing No. WEAVE Lens 4
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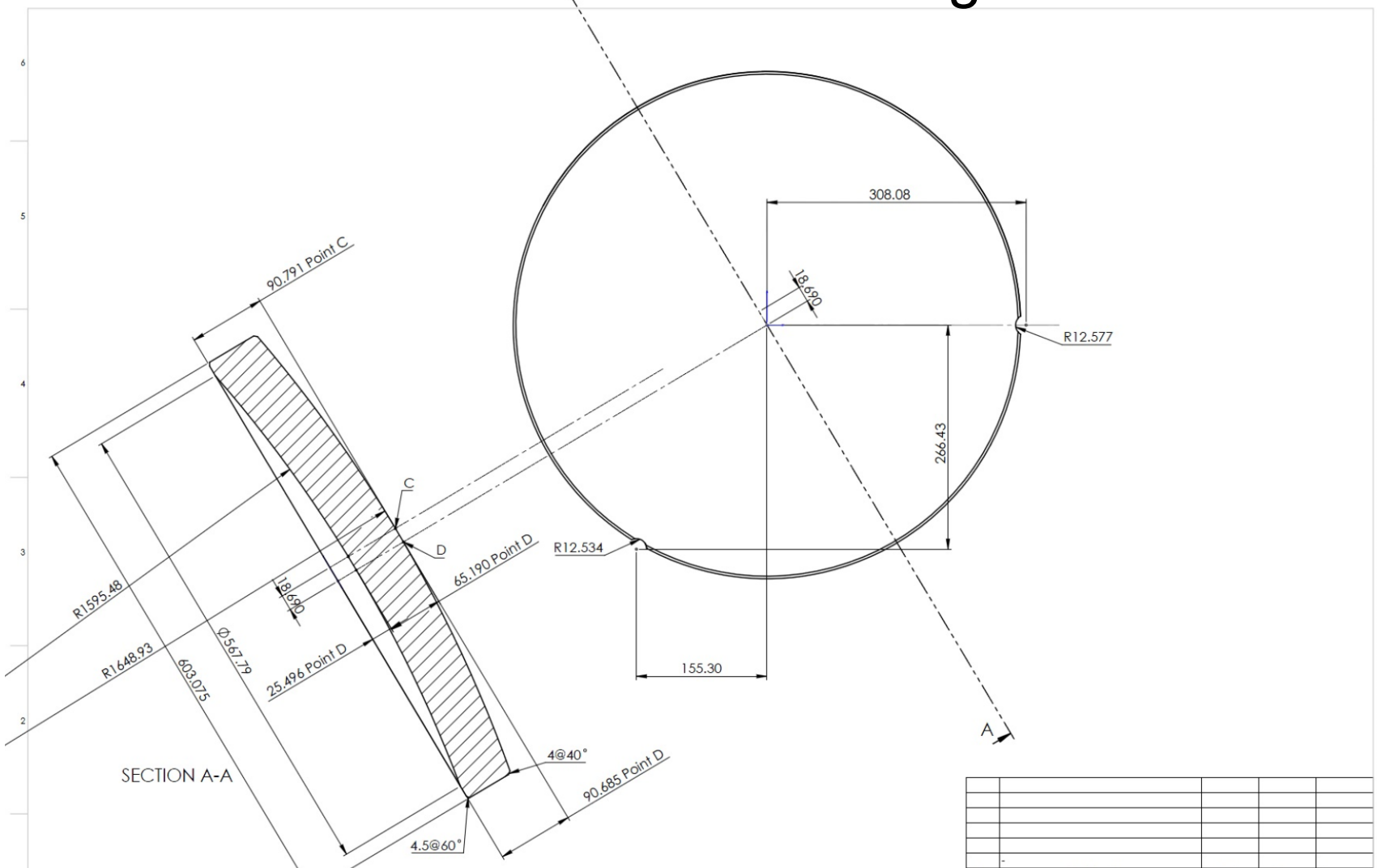
Drawing No. WEAVE Lens 4

Manufacturers Drawing Issue 1



Rev	Modifications	Date	Drawn	Approved
-				

CallaghanInnovation

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Wellington: 69 Gracefield Rd, Lower Hutt, PO Box 31310, Lower Hutt 5040 Ph: +64 4 931 3000 Fax: +64 4 566 6004
Christchurch: 44 Mandeville St, Riccarton, PO Box 20028, Christchurch 8543 Ph: +64 3 358 9189 Fax: +64 3 358 9506

DO NOT SCALE FROM DRAWING
Third Angle Projection

General Tolerance to ISO2768-m

0.5 to 6	±0.1
>6 to 30	±0.2
>30 to 120	±0.3
>120 to 400	±0.5
>400 to 1000	±0.8
>1000 to 2000	±1.2
>2000 to 4000	±2.0

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STANDARD NOTES
1. All dimensions in mm, unless otherwise shown.
2. All sharp edges and burrs removed.
3. Surface Finish:
4. Mass: kg

CALLAGHAN INNOVATION PROJECT NUMBER
PROJECT NAME
FILE NAME LensL4-000-001 AS BUILT
DESCRIPTION lens4 as made
CONFIGURATION Default
SCALE 1:4
SHEET SIZE A3
SHEET 1 OF 1

Project: WEAVE

Third Angle

UNLESS OTHERWISE STATED
All dimensions in mm
General Tol: ± 0.010
Angular Tol: ± 0.005
Surface Finish (microns):
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Finish: AR Coated

Drawn by: Kmdee
Date: 28/01/2016
Revision: 1.5

Lens 4 Design 14.5

Item No. 4

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Drawing No. WEAVE Lens 4

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File Name WEAVE Lens 4 (As Built).dwg

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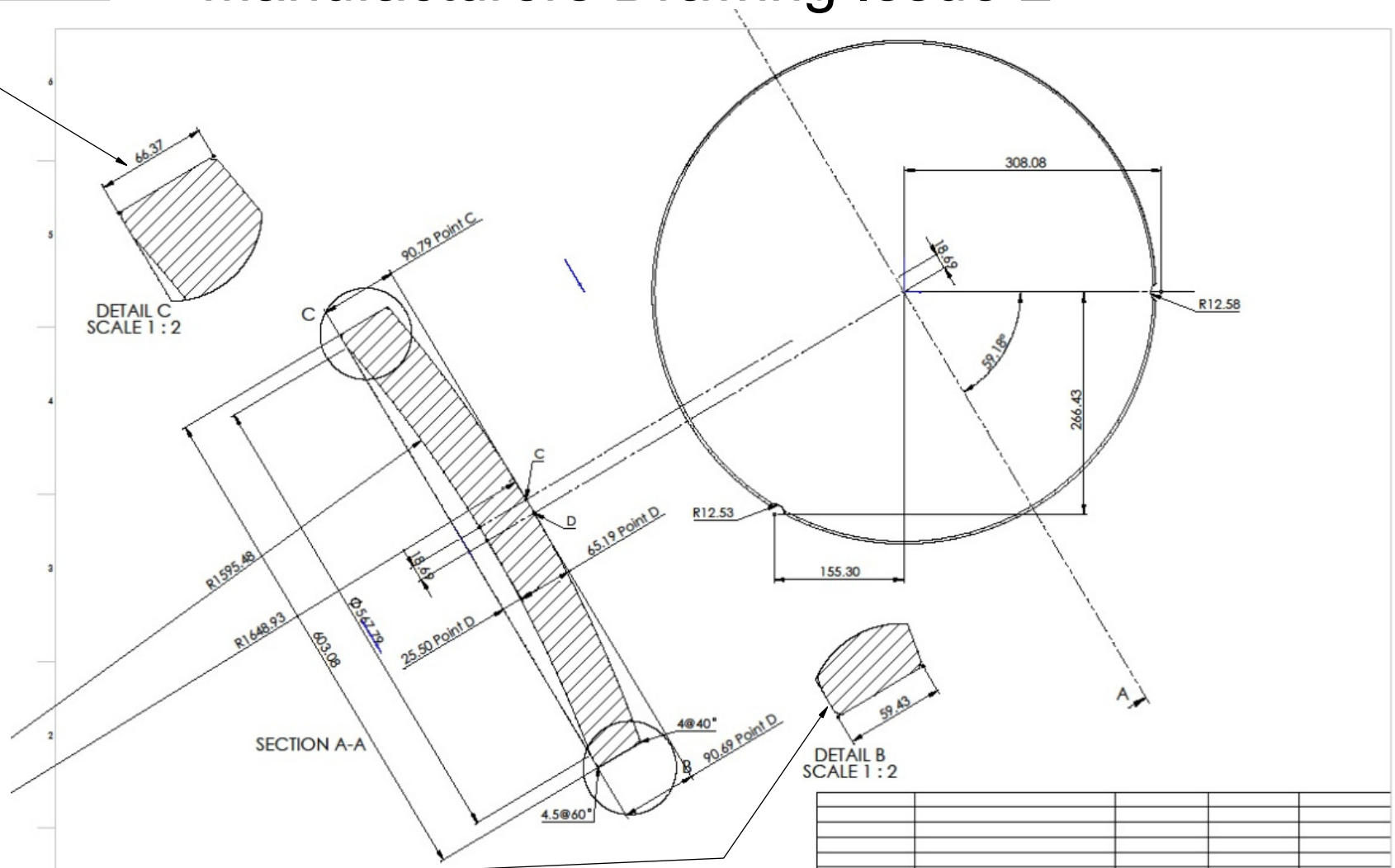
Drawing No. WEAVE Lens 4

Manufacturers Drawing Issue 2

Additional Info.
Estimated value of Edge thickness
prior to production of chamfer.
Model driven value 66.35 mm



Additional Info.
Estimated value of Edge thickness
prior to production of chamfer.
Model driven value 59.40 mm

Rev	Modifications	Date	Drawn	Approved

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DO NOT SCALE FROM DRAWING
Third Angle Projection

General Tolerance to ISO2768-m

0.5 to 6	±0.1
>6 to 30	±0.2
>30 to 120	±0.3
>120 to 400	±0.5
>400 to 1000	±0.8
>1000 to 2000	±1.2
>2000 to 4000	±2.0

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STANDARD NOTES
1. All dimensions in mm, unless otherwise shown.
2. All sharp edges and burrs removed.
2. Material:
3. Surface Finish:
4. Mass: kg

CALLAGHAN INNOVATION PROJECT NUMBER:
PROJECT NAME:
FILE NAME: LensL4-000-001 AS BUILT
DESCRIPTION: lens4 as made
CONFIGURATION: Default
SCALE: 1:4
SHEET SIZE: A3
SHEET 1 OF 1

Project: WEAVE

Third Angle

UNLESS OTHERWISE STATED
All dimensions in mm
General Tol: ± 0.010
Angular Tol: ± 0.005
Surface Finish (microns):
REMOVE ALL SHARP EDGES

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Finish: AR Coated

Drawn by: Kmdee
Date: 28/01/2016
Revision: 1.5

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Lens 4 Design 14.5

Item No. 4

Used ON

Drawing No. WEAVE Lens 4

A3

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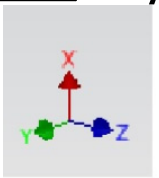
File Name WEAVE Lens 4 (As Built).dwg

Current Status Released

Drawing No. WEAVE Lens 4

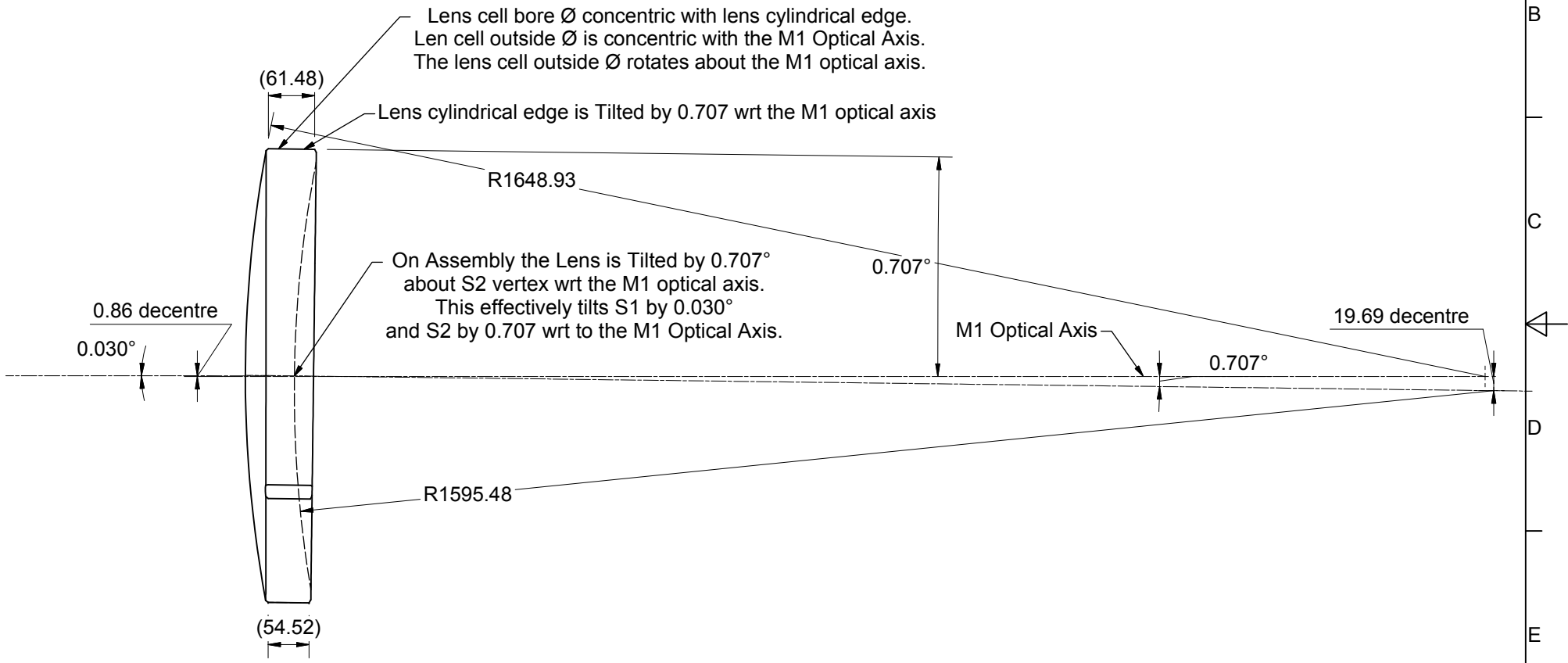
LENS 4

Assembly Information.



Decentres values along the X Axis on the X, Z plane.
Z is the optical axis. For use in Assembly.
For Use in CAD and Zemax @ Zenith ADCs 0 deg Rotation.

Most Dimensions are provided for reference assembly information only - they are not toleranced. Sheet 1 provides lens manufacturing details.



The M1 Optical axis is the primary mirror axis of the Telescope. The Prime focus corrector (PFC) axis = the M1 Optical axis. The optical axis of a lens surface is defined as the axis passing through its vertex and the centre of curvature. Mechanical axis is the Datum of the manufacturing axis.

File Name WEAVE Lens 4 (As Built).dwg

Current Status Released

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All dimensions in mm
General Tol: ± 0.010
Angular Tol: ± 0.005
Surface Finish (microns):
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Project: WEAVE

Third Angle

Lens 4 Design 14.5

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Used ON

Drawing No. WEAVE Lens 4

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