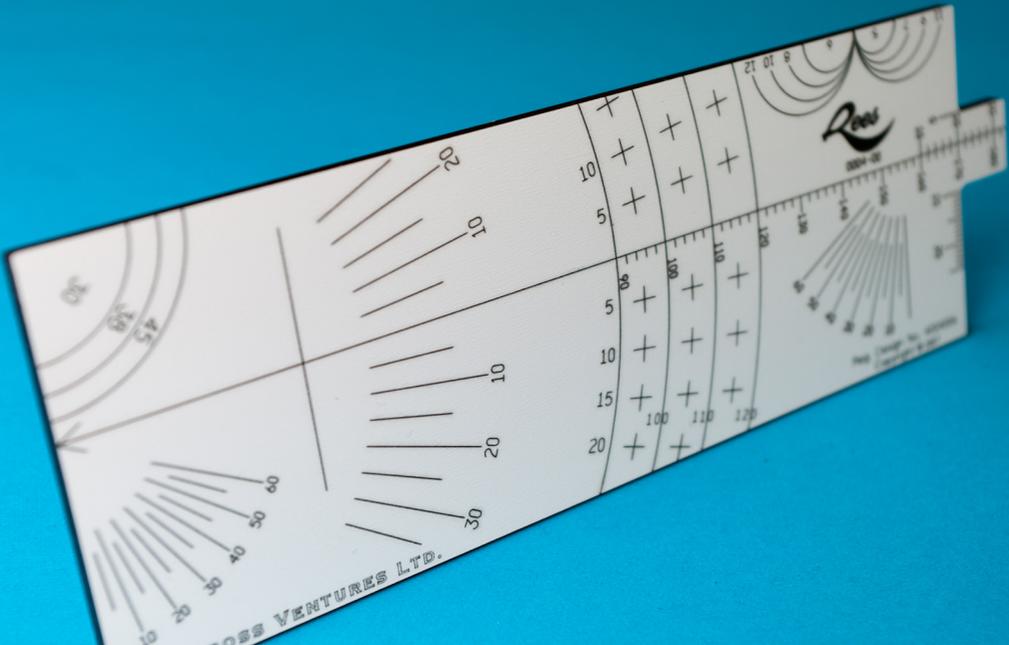




The Rees-Fairbanks Datum Rule User Guide



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Notes on Standards

Frame measurement standards have previously been provided in the United Kingdom by British Standards BS 3199, and latterly BS 3521-2, but latterly the International Standards Organization's specifications has been instituted as the formal standard in both the UK and Europe since 1999. The equivalent ISO documents are 13666 and 8624 (respectively, but with some terms interchanged).

This manual is complete to the specifications of BS EN ISO 8624:2011 and BS EN ISO 13666:2012 (current at time of writing).

Paul Fairbanks' original handbook refers to an older standard (BS 3199). Sub-section numbers from this standard are provided where applicable; some remain without a superseding definition.

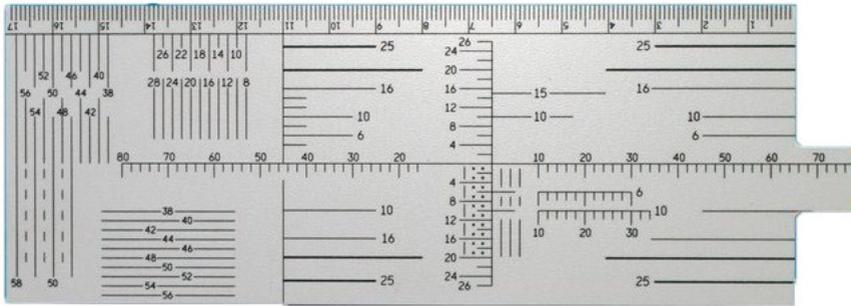
This manual will cover the process taking of these measurements, which will infer their definition, but not state them; please consult the relevant standard for full definitions.

History of the Datum Rule

The most significant change effected in the transition from BS 3199 to BS 3521 is the introduction of the Boxed Lens System, and the Horizontal Centre Line. The HCL line is sometimes described synonymously with the Datum Line, as recorded in the older standard.

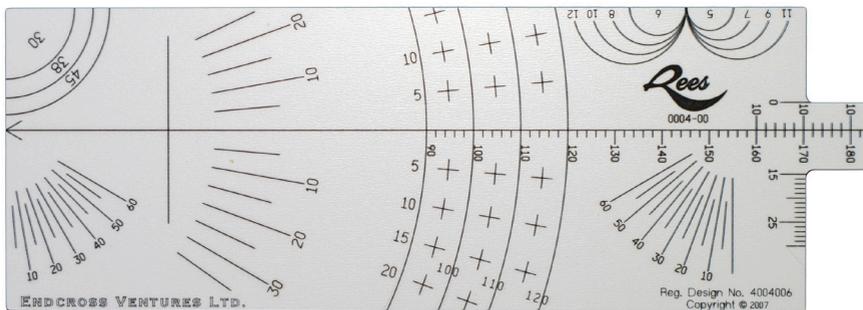
Throughout this handbook, we have updated the instructions to allow measurement according to the newer system, but retains terms from the old system when instructions relate to the ruler itself. Where the older standard is not superseded, old terms are also retained.

Rule Guide



Linear Surface

Linear Surface
Containing scales A to K



Angular Surface

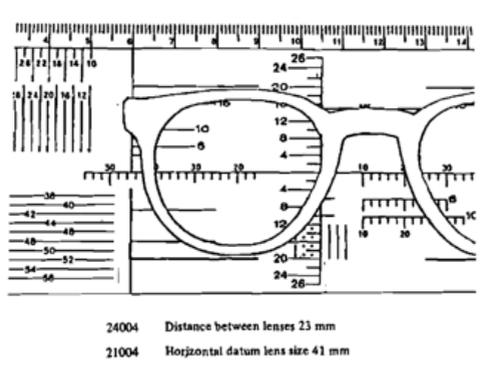
Distance Between Lenses (DBL)

Ref: BS EN ISO 8624

Equiv: BS 3199:1972 24005 Minimum between lenses (MBL)

See also: BS 3199:1972 24004 Distance between lenses (DBL)

Scale K



Place the front down on the rule with the upper aperture tangential to base line F. Move the nasal edge of right aperture up to line G serving as the vertical tangent to the shape. The vertical tangent to the nasal edge of left aperture is represented by scale K, from which the measurement is taken.

Distance Between Lenses (DBL)

i Note that for full-rimmed frames the groove depth is usually $\frac{1}{2}$ mm, in which case DBL is found by deducting 1mm from the measured result. This is the convention when the groove depth is not known accurately.

i The current standards render BS 3199:1972/24004 obsolete.

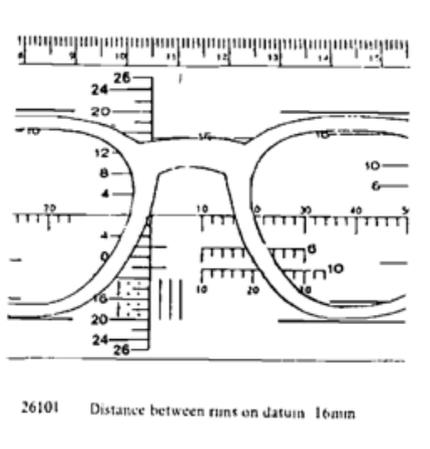
For distance between lenses on datum, place the front face down on the rule, equidistant between the datum reference lines, so that scale A represents the datum line for the front. Move the front horizontally so that the inner nasal side of the left aperture is at line B, read off the scale A at the nasal side of the right aperture on datum.

i Note that for full-rimmed frames the groove depth is usually $\frac{1}{2}$ mm, in which case DBL on datum is found by deducting 1mm from the measured result. This is the convention when the groove depth is not known accurately.

Ref: BS EN ISO 8624

See Also: BS 3199:1972 25201 Distance between rims
(regular bridge);

BS 3199:1972 26101 Distance between rims (DBR)
Scale A, B and C



Place the front face down on the rule, equidistant between the datum reference lines, so that scale A represents the Horizontal Centre Line for the front. Move the front horizontally so that the left rim is up to the lower half of scale B, intersecting the 6mm below datum mark. An estimation of the bridge width may then be read off scale C.

Slide the front horizontally, still in the datum position, so that the left nasal edge of the bearing surface is just up to the zero on scale A, and read off the measurement where the right nasal edge crosses the scale. This is the DBR on datum.

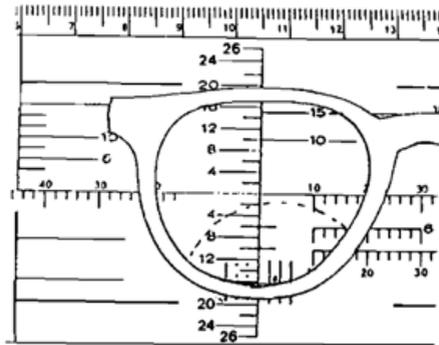
i Place the front face down on the rule, equidistant between the datum reference lines, so that scale A represents the Horizontal Centre Line for the front. Move the front horizontally so that the left rim is up to the lower half of scale B, intersecting the 6mm below datum mark. An estimation of the bridge width may then be read off scale C.

i In the archaic standards, the DBR did not have a specified position. The above instructions can be repeated with the frame intersecting the 10mm below datum mark on scale B, to then read off the DBR at 10mm below datum on scale E.

i In the archaic standards, the DBR was specified (for a regular bridge) to be measured at 10 or 15mm below crest, and so can be done using the ruler's two crest references are marked on the right of the upper half of scale B. Place the mid-point of the lower edge of the bridge on the 10mm scale or 15mm scale as required, and so position the frame horizontally, that the inner left edge of the arch is at the position of intersection of scales A and B. The result is then read on scale A.

Geometrical Inset

Ref: BS EN ISO 13666
 Equiv: BS 3199:1972 23004 Geometrical inset (G in.)
 Scale W



23004 Geometrical inset 3mm
 23008 Segment top position 1½ mm

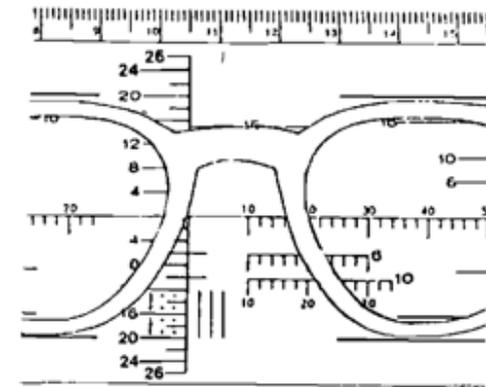
- Relates to bifocal spectacle lenses
- The distance centration point may need to be located using a focimeter. Inaccuracy in its location may lead to an inaccurate measurement.

Dot the distance centration point (if located at the datum centre this may be found by the method used in measurement of datum lens size – 21004). Dot the mid-point of the segment.

Place the distance centration point on the vertical **scale B** with the horizontal lens axis in line with **scale A**. The inset (or outset) may be ascertained by noting the position of the segment centre dot with reference to line 3 on **scale W**.

Bridge Height

Ref: BS EN ISO 8624
 Equiv: BS 3199:1972 24008 Height of Bridge (ht)
 Scale B



26101 Distance between runs on datum 16mm

Place the front face down on the rule, equidistant between the datum reference lines, so that scale A represents the Horizontal Centre Line for the front. Move the front horizontally so that the bridge lies symmetrically astride scale B. Read the scale at the mid-point of the lower edge of the bridge. Above HCL, this measurement should be prefixed by a plus sign, and below HCL always by a minus sign.

Ref: BS EN ISO 8624
Equiv: BS 3199:1972 23005 Boxed Lens Size
See also: BS 3199:1972 21004 Datum lens size
Scale H, Scale J

With the front down on the rule, place the uppermost edges of both lens apertures on the base line of the bevel edge, scale F. Move the left eye along so that the extreme inner nasal edge of the aperture has line G as its vertical tangent.

The horizontal box size is the distance between G and the extreme inner temporal edge of the aperture coinciding with scale H from which the measurement is taken.

Similarly the vertical dimension is the distance between F base line and scale J, each acting as a horizontal tangent to the shape.

i Note that for full-rimmed frames the groove depth is usually ½mm, in which case the dimensions of the lens are found by adding 1mm to the above-measured result. This is the convention when the groove depth is not known accurately.

i The current standards render BS 3199:1972/21004 obsolete. 21004 defines the datum length and mid-datum depth of the lenses.

The datum centre through which these measurements are taken is at the intersection of scales A and B. Place the eye or lens to be measured in the datum position and symmetrically astride scale B. The sum of the two measurements on each side, horizontally, of the datum centre is the horizontal datum length, always recorded first. The sum of the two measurements above and below scale A along B is the mid-datum depth.

i The current standards render BS 3199:1972/21004 obsolete. 21004 defines the datum length and mid-datum depth of the lenses.

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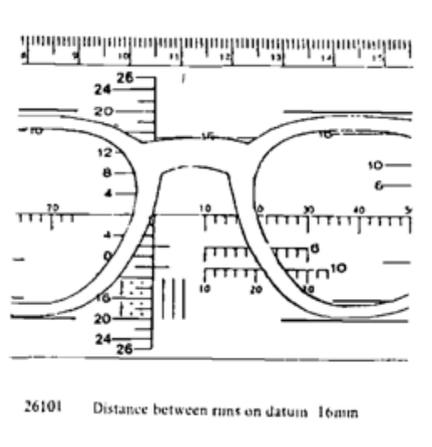
i The current standards render BS 3199:1972/21004 obsolete. 21004 defines the datum length and mid-datum depth of the lenses.

Ref: BS EN ISO 8624

See Also: BS 3199:1972 25201 Distance between rims
(regular bridge);

BS 3199:1972 26101 Distance between rims (DBR)

Scale A, B and C



Place the front face down on the rule, equidistant between the datum reference lines, so that scale A represents the Horizontal Centre Line for the front. Move the front horizontally so that the left rim is up to the lower half of scale B, intersecting the 6mm below datum mark. An estimation of the bridge width may then be read off scale C.

Slide the front horizontally, still in the datum position, so that the left nasal edge of the bearing surface is just up to the zero on scale A, and read off the measurement where the right nasal edge crosses the scale. This is the DBR on datum.

i Place the front face down on the rule, equidistant between the datum reference lines, so that scale A represents the Horizontal Centre Line for the front. Move the front horizontally so that the left rim is up to the lower half of scale B, intersecting the 6mm below datum mark. An estimation of the bridge width may then be read off scale C.

i In the archaic standards, the DBR did not have a specified position. The above instructions can be repeated with the frame intersecting the 10mm below datum mark on scale B, to then read off the DBR at 10mm below datum on scale E.

i In the archaic standards, the DBR was specified (for a regular bridge) to be measured at 10 or 15mm below crest, and so can be done using the ruler's two crest references are marked on the right of the upper half of scale B. Place the mid-point of the lower edge of the bridge on the 10mm scale or 15mm scale as required, and so position the frame horizontally, that the inner left edge of the arch is at the position of intersection of scales A and B. The result is then read on scale A.

Distance Between Boxed Centres

Ref: BS EN ISO 8624
Equiv: BS 3199:1972 24006 Datum centre distance (dat CD)
Scales A-K

This is measured by observing that the DBC is equivalent to the distance (measured parallel to the Horizontal Centre Line) between the inner nasal extremity of one lens aperture, and the inner temporal side of the other.

Place the front face down on the rule, equidistant between the datum reference lines, so that scale A represents the Horizontal Centre Line for the front. Move the front horizontally so that the vertical zero line B is precisely at the inner nasal side of the left lens aperture. The distance between centres is read off scale A at the inner temporal side of the right lens aperture.

Other Linear Surface Measurements

Distance Between Pad Centres

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 26202 Distance between pad centres (DBP)
Scale A

With the front down on the rule, place the left pad centre at the intersection of scales B and A, then place the right pad centre along scale A and read off the measurement.

Distance Between Pad Tops

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 26302 Distance between pad tops
Scale A

Move the front so that the left pad top is at the intersection of scales B and A and the right pad top on scale A. The measurement along scale A is the distance between pad tops.

Height of Pad Centre

BS 3521-2:1991 is not superseded
Equiv: BS 3199:1972 26201 Height of pad centre
Scale B

Place the front face down on the rule, equidistant between the datum reference lines, so that scale A represents the datum line for the front. Move the front horizontally to locate the pad centre on scale B; prefix distance above datum with a plus sign, below datum with a minus sign.

Other Linear Surface Measurements

Height of Pad Top

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 26301 Height of pad top
Scale B

Place the front face down on the rule, equidistant between the datum reference lines, so that scale A represents the datum line for the front. Move the front horizontally to locate the pad top on scale B; prefix distance above datum with a plus sign, below datum with a minus sign.

Joint Height

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 27101 Joint height (jt ht)
Scale D

Place the front face down on the rule, equidistant between the datum reference lines, so that scale A represents the Horizontal Centre Line for the front. Move the front horizontally to locate the centre of the joint on scale D; prefix distance above HCL with a plus sign, below HCL with a minus sign.

Joint Size

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 27102 Joint size (jt)
Scale F

Place scale F directly along the axis of the charniers.

Other Linear Surface Measurements

Frontal Width

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 24007 Frontal width (F W)
Scale F

This measurement is taken using scale F laid directly over the centre of the bottom of the dowel holes.

Length of Drop

Ref: BS EN ISO 8624
Equiv: BS 3199:1972 27203 Length of drop
Scale F

Use scale F and measure directly along the drop end from the ear point to the end of the side.

Segment Height from bottom rim (height f.b.r.)

Ref: BS 3521-1:1991
Equiv: BS 3199:1972 23009 Segment Height Scale B

i Relates to bifocal spectacle lenses

In the glazed rimmed frame place the lower edges of the shape apertures so that scale A is the lower horizontal tangent to the lens apertures. On scale B, an imaginary tangent to the segment top can be located and its distance from scale A is the segment height.

i Note that for full-rimmed frames the groove depth is usually $\frac{1}{2}$ mm, in which case the segment height is found by adding $\frac{1}{2}$ mm to the above-measured result. This is the convention when the groove depth is not known accurately.

Segment Extreme Point; Segment Depth

Ref: BS EN ISO 13666
Equiv: BS 3199:1972 23008 Segment top position; BS 3199:1972 23011 Segment bottom position Scale B

i Relates to bifocal spectacle lenses

Place the front face down on the rule, equidistant between the datum reference lines, so that scale A represents the Horizontal Centre Line for the front. Move the front horizontally so that the segment lies symmetrically astride scale B. This will allow the segment extremities in relation to the HCL to be read off on scale B. Record the measurement, adding “above HCL” or “below HCL” as appropriate.

The segment depth is the difference between the upper and lower extremities of the segment, as read off of scale B.

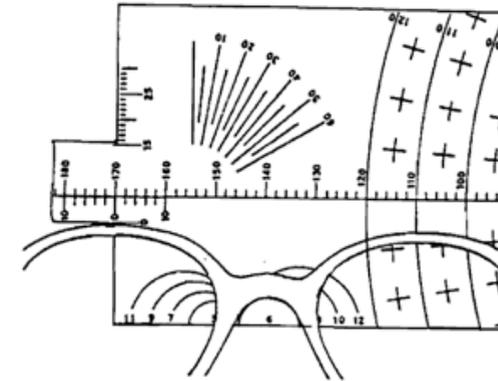
i The original Fairbanks manual pre-dates flat top segments, and used scale E and the radius of the round segment to find this measurement. Scale A, C or E can still be utilised for this measurement, if the frame is positioned on the rule turned left through 90° , and with the roles of scale A and scale B reversed.

Ref: BS 3521-2:1991

Equiv: BS 3199:1972 25202 Apical radius (AR) (regular bridge)

Scale R

Angular Surface Containing scales L to V



25202 Apical radius 6mm

Use scale R, with the plane of the front parallel to the surface of the rule.

- i** For a W bridge (BS 3199:1972 25103), measure as above, with the plane of the arch in the plane of the rule.

Base of W-Bridge

Ref: BS 3199:1972 25101 Base of bridge (B), W bridge
Scale L

Lay the arch of the bridge along the projecting portion of the rule with the bearing surface of the left bend at the zero on the left. The second bearing point then is placed on the scale L giving the measurement.

This is the one of Fairbanks' measures with no contemporary equivalent. Literature review suggests that the distance below the bridge or datum line at which the measurement is taken is not specified universally.

Angle of Crest

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 24010 Angle of Crest (AC) (W or regular bridge)
Scale O

The rule is held in the vertical plane with the arrow end of scale T towards the left.

Place the short flat edge of the rule along the line of the bearing surface of the bridge and note the position of the plane of the rim on scale O. This reading indicates the angle of crest of the bridge.

Projection of Bridge

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 24009 Projection (or inset) of bridge (proj)
Scale T

Hold the rule in the horizontal plane with its projecting portion, between the eyes so that the scale T bisects the bridge. Rest the back plane of the rims against the shoulders of scale L. Looking vertically from above, the bridge projection is measured, on the projecting position of the rule, from the shoulders to the inner edge of the bridge. The measurement is positive (+) when beyond the shoulders, negative (-) when behind them.

Depth of Bridge

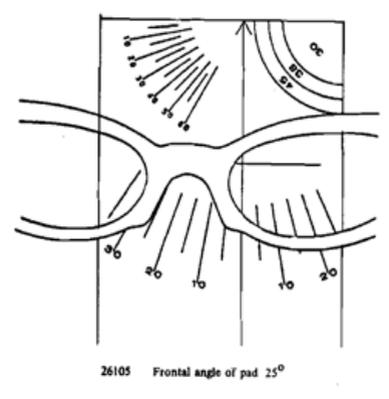
Ref: BS 3199:1972 25102 Depth of bridge (D)(W. bridge)
Scale T

With the bearing surface extremities on the shoulders of the rule and the arch lying flat on the projection, measure to the centre of the crest on the left side of scale T. The measurement is in the plane of the arch.

Similarly to the base of the bridge, this has no contemporary equivalent.

Front Angle of Pad

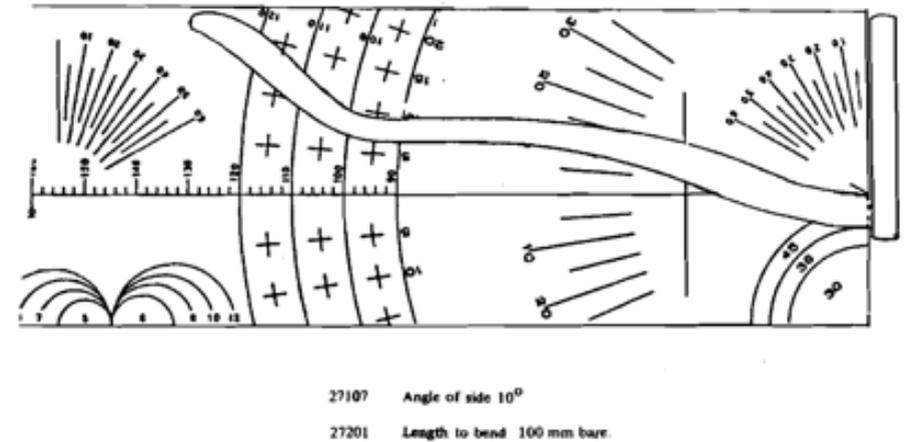
Ref: BS EN ISO 8624
Equiv: BS 3199:1972 27204 Downward angle of drop
Scale O and P



Place the rule down with the projection pointing downwards. Rest the frame face down on the rule, astride scale T. Place the bridge attachments or shoulders of the bends along line V so that the pads are aligned with the scale N. Horizontal movement of the frame should be made to obtain the best reading.

Angle of Side

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 27107 Angle of side
Scale M



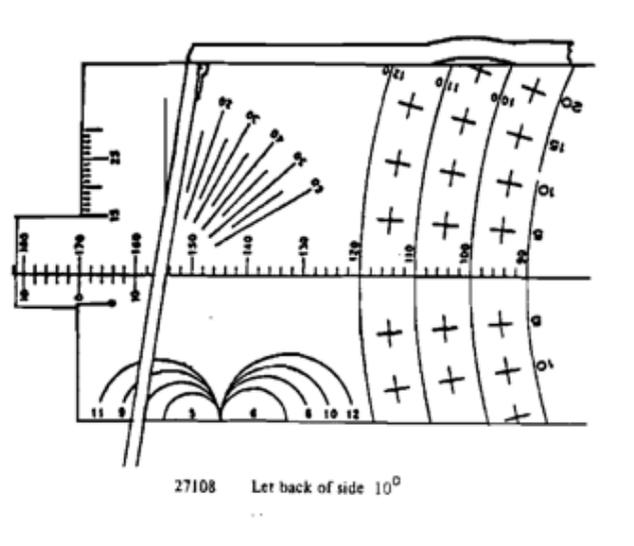
Place the short flat edge of the rule held in the vertical plane on the back plane of the lens with the arrow head of scale T at the dowel point. The angle of the line of the side is indicated on scale M.

Let-back of side

Ref: BS 3521-2:1991

Equiv: BS 3199:1972 27108 Let-back of side

Scale O and P



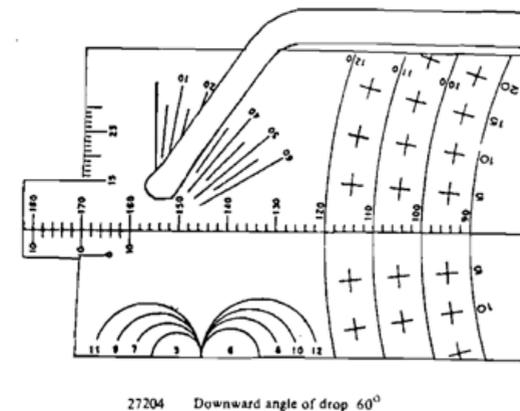
Place the front against the bevel edge of the rule with the sides lying on the surface of the rule and fully opened out. Slide the front laterally to enable an estimate of the angles made by the sides on scales O and P.

Downward Angle of Drop

Ref: BS EN ISO 8624

Equiv: BS 3199:1972 27204 Downward angle of drop

Scale O and P



Place the line of the R side and ear point along the bevel edge of the rule, the remainder of the frame above the rule, so that the drop end portion is projected on to scale O. Note the reading on the inner of the scale and subtract this measurement from 90° giving the downward angle.

Reverse the frame and repeat so that the L side drop end is projected on to scale P. Again subtract this measurement from 90° to obtain the L downward angle.

Segment Diameter

Ref: BS EN ISO 13666
Equiv: BS 3199:1972 23001 Segment diameter
Scale R, F and S

The diameter of the segment may be measured, according to size, in either of the following three ways:

When the full diameter of the segment is visible measure across the centre using scale F.

Place the segment over the scale R which is calibrated in radii and gives WWrs from 10 to 24mm.

Use scale S for segments of diameters 30, 38, or 45mm.

Projection of Bridge

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 24009 Projection (or inset) of
bridge (proj)
Scale T

Hold the rule in the horizontal plane with its projecting portion, between the eyes so that the scale T bisects the bridge. Rest the back plane of the rims against the shoulders of scale L. Looking vertically from above, the bridge projection is measured, on the projecting position of the rule, from the shoulders to the inner edge of the bridge. The measurement is positive (+) when beyond the shoulders, negative (-) when behind them.

Depth of Bridge

Ref: BS 3199:1972 25102 Depth of bridge (D)(W. bridge)
Scale T

With the bearing surface extremities on the shoulders of the rule and the arch lying flat on the projection, measure to the centre of the crest on the left side of scale T. The measurement is in the plane of the arch.

i Similarly to the base of the bridge, this has no contemporary equivalent.

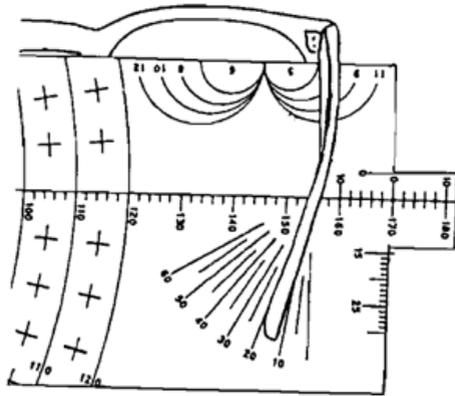
Length to Tangent

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 27302 Length to tangent
Scale T

Holding the rule in the left hand, with the frame upside down, place the thumb firmly over the tip of the left side set at the arrow head of scale T, straighten the side along the scale T, holding the frame with the right hand, and measure to the dowel point position on scale T.

Inward Angle of Drop

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 27205 Inward angle of drop
Scale O and P

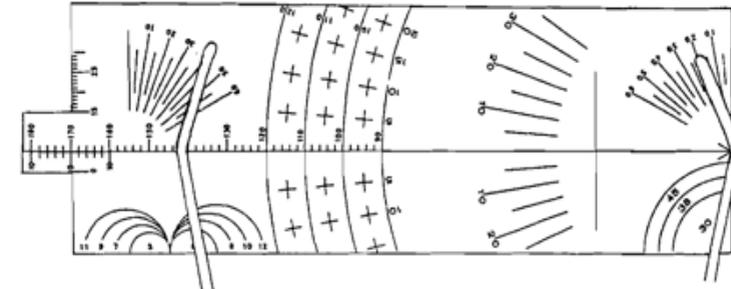


27205 Inward angle of drop 20°

Place the edge of the rule, marked with the radii, under the joint ends of the sides, with the rule flat on the back plane of the front. Allow the sides fully opened out to project forward over the rule. Tilt the rule and frame so that the ear point appears to be projected onto scale T and the inner edge of the right drop end is projected on scale P. Repeat with the left drop end on scale O.

Head Width

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 27111 Head width
Scale T



27111 Head width 140mm

With the sides fully opened out, place one ear point at the arrow head of scale T and measure along scale T the distance to the other ear point.

Temple Width

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 27110 Temple width
Scale T

Scale is situated 25mm from the long flat edge of the rule i.e. on the radii scale side.

Place the back plane of the front against this edge with sides fully opened out and lying across the rule. Set the inner surface of one side at the arrow head and measure along scale T to the inner surface of the other side.

Length to Bend

Ref: BS EN ISO 8624
Equiv: BS 3199:1972 27201 Length to bend (LTB) (Drop-end sides)
Scale T

Place the rule in the vertical plane with the side extended along the face of the rule. The back plane should rest against the short flat edge of the rule with the dowel point set at the arrow head of scale T. The position of the ear point can be estimated on the radial scales M.

Front to Bend

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 27202 Front to bend (FTB)
Scale T

Place the rule in the vertical plane with the side extended along the face of the rule. The back plane of the lug should rest against the short flat edge of the rule. The position of the ear point can be estimated on the radial scales M.

Total Length

Ref: BS EN ISO 8624; BS 3521-2:1991
Equiv: BS 3199:1972 27301 Total length (curl side);
27401 Length of sides (Straight side)
Scale T

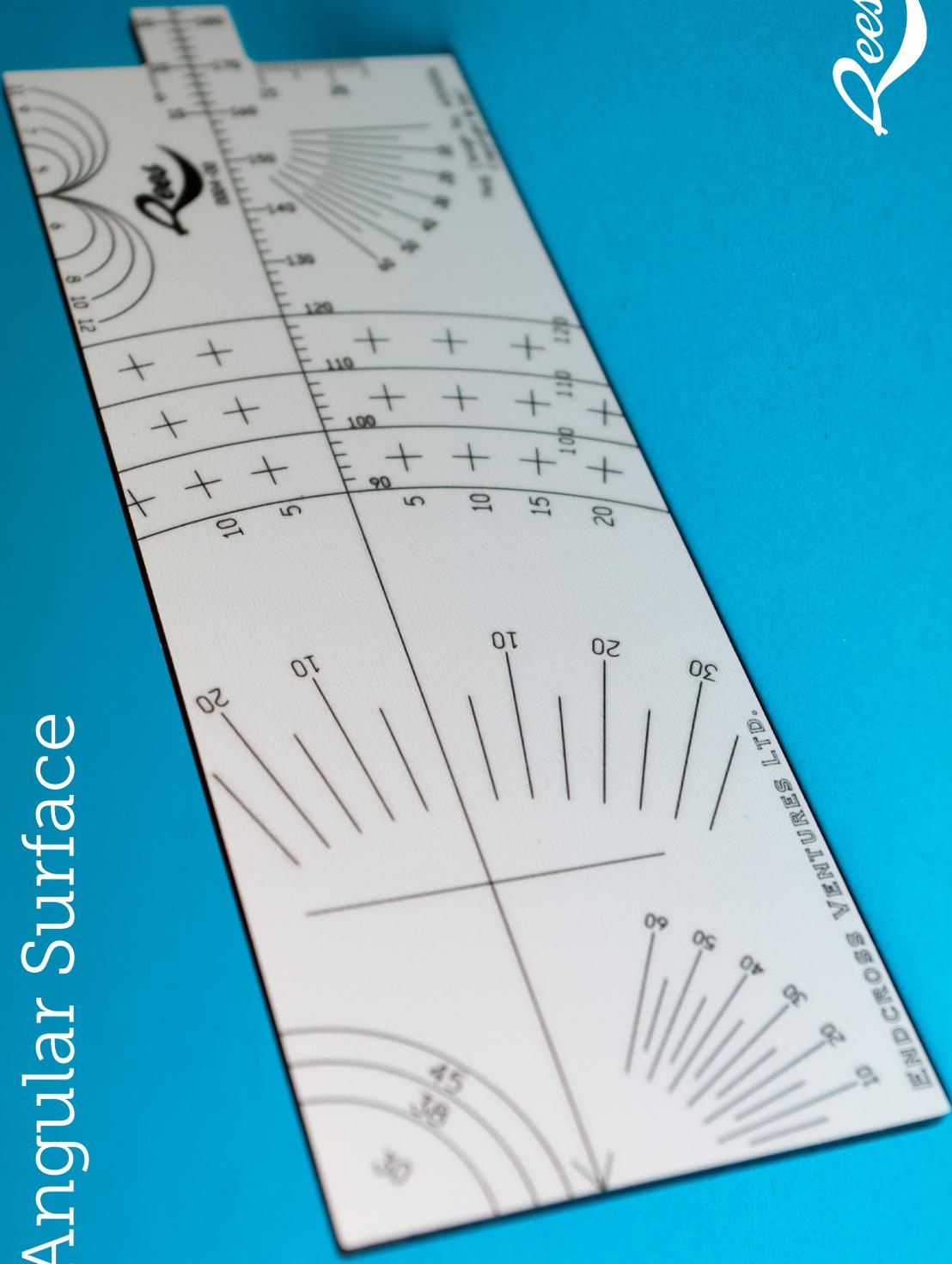
Holding the rule in the left hand, with the frame upside down, place the thumb firmly over the tip of the left side set at the arrow head of scale T, straighten the side along the scale T, holding the frame with the right hand, and measure to the dowel point position on scale T.

Length to Tangent

Ref: BS 3521-2:1991
Equiv: BS 3199:1972 27302 Length to tangent
Scale T

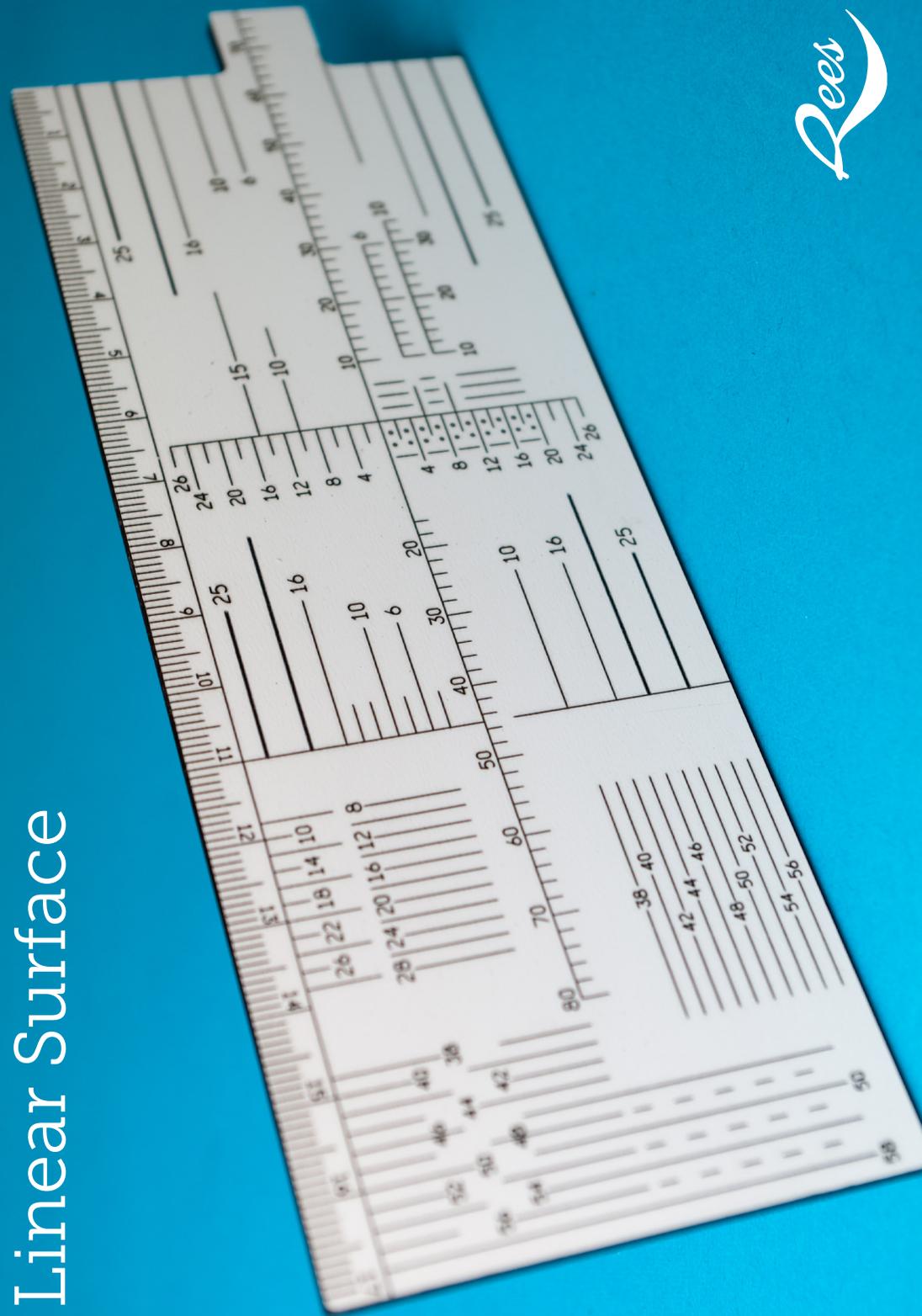
Holding the rule in the left hand, with the frame upside down, place the thumb firmly over the tip of the left side set at the arrow head of scale T, straighten the side along the scale T, holding the frame with the right hand, and measure to the dowel point position on scale T.

Angular Surface



Rees

Linear Surface



Rees

The Rees-Fairbanks Datum Rule

As designed by Paul Fairbanks FSMC
Manual adapted by Lewis Marshall BSc (Hons)
MCOptom

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