PRO TO PRO
CONTINUING EDUCATION

EYEGLASSES: FIT AND DISPENSING GUIDE

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THIS COURSE IS SUPPORTED BY AN EDUCATIONAL GRANT FROM SIGNET ARMORLITE/ KODAK LENS

LEARNING OBJECTIVES:

Upon completion of this course, the participant should be able to:

1. Describe standard alignment.
2. Properly adjust frames for correct alignment and comfortable fit.
3. Take frame fit metrics and biometrics.

TO EARN CONTINUING EDUCATION CREDIT:

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This course will guide the optician through frame selection, standard alignment and fitting triangle adjustments, frame fit measurements, and the why and how of lens pantoscopic tilt, wrap and back vertex distance, also known as position-of-wear measurements.

FRAME SELECTION

Let's begin with frame selection. A frame is both a fashion accessory and visual aid. A properly chosen frame that fits well is essential for good vision. Always remember to check the three key aspects of a well fitting frame:

1. Width is correct (eyes centered).
2. Bridge fits comfortably on the nose.
3. Temples are neither too long nor too short, nor too tight or loose.

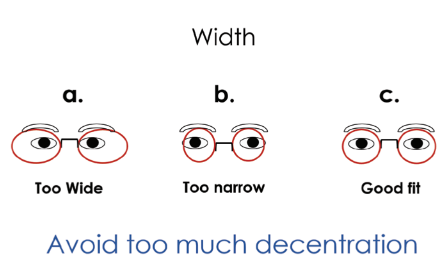

FIG. 1

Eye centration: Optimizing eye centration within the eyewire of the frame is best for optics and cosmetics. The frame in illustration Fig. 1 "a" is too wide, and the eyes are significantly displaced toward the bridge. Consequently, the patient will experience poor peripheral optics and unnecessary lens thickness on the temporal edge in minus prescriptions and on the nasal edge for plus prescriptions. In illustration "b," the frame is too narrow, and the eyes are displaced toward the temples. This can result in poor central vision and unnecessary thickness in plus-powered lenses. Finally, in illustration "c," the eyes are well centered with little to no decentration of the optical center of the lens. Therefore, illustration "c" is an ideal frame selection for this patient.

Decentration considerations in high power lenses: When decentration is extreme in a larger frame, the optician should determine the minimum blank size needed and check for availability to ensure cutout. Decentration is the degree to which the optical center of a lens must be displaced from the geometric center of the frame to align with the patient's pupillary center.

FIG. 2 A high-powered lens can be decentered so much that the added thickness at the bridge or temple side interferes with nosepad adjustment/ splay or prevents the closure of the temples

In a minus lens (Fig. 2), the edge opposite the direction of decentration, usually the temporal edge, becomes thicker. In a plus lens, the edge toward the direction of decentration, usually the nasal edge, becomes thicker. Lenses are generally decentered inward. The eyes are typically closer to the bridge than the temples. Minus lenses are thickest furthest away from the optical center, toward the temple, while plus lenses are thickest at the optical center, toward the bridge.

Multifocal lens cutout: When choosing a frame for a progressive wearer, it is ideal if there is a minimum of 10 mm above the pupil center to the top of the lens, and the reading reference circle is inside the eyewire. Use the manufacturer's layout chart (Fig. 3) to ensure there is at least 10 mm above the fitting cross for a PAL lens design, and then confirm that the near reference circle in the lower part of the lens isn't cut off. Use a marking pen to draw a cross on the demo lens that intersects at the marked pupillary center location in the lens. These lines should perfectly bisect the patient's pupil when the frame is worn. You should also confirm that the lens "b" measurement accommodates the minimum fitting height for the chosen progressive lens design.

You must confirm cutout before the patient makes their final frame selection. If the frame does not cut out or the entire reading area does not fit within the eyewire, a different frame or lens design must be chosen.

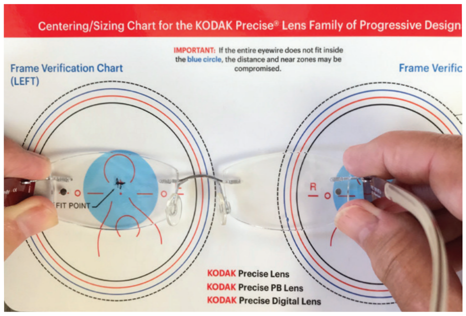

FIG. 3

STANDARD ALIGNMENT

Four point touch: The frames on display should be in standard alignment, which means that when the frame is laid on a table upside down, four points of the frame touch the table. You will know it's correct if the frame doesn't rock. All frames should be in standard alignment for try-on and then adjusted to the patient's face.

Both lenses should have equal vertex distance: The vertex distance must be the same in each eye for proper fit (Fig. 4). If a frame sits closer to the eye on one side, an adjustment must be made to equalize the vertex distance for both eyes. To pull a lens closer to the face, adjust the temple by bending the temple butt end out. To move it further from the face, bend it in.

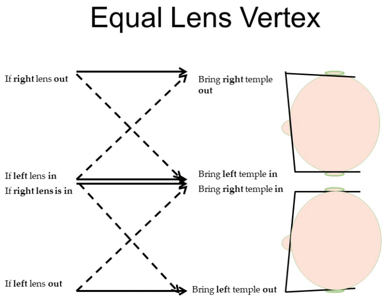

FIG. 4

Temples parallel to each other and perpendicular (at a 90-degree angle) to the frame: Temples should be parallel to each other and at right angles to the frame front (Fig. 5). On occasion, you may be required to bow the temples slightly to fit frames on patients with wide heads. Your goal should be to always create a fitting triangle with the frame touching only three points on the patient's face/head, the bridge of the nose and the sides of the head behind each ear. Practice this with an experienced optician.

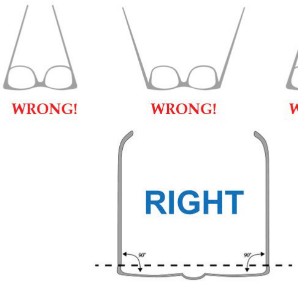

FIG. 5 Temples should be at 90 to 95 angle to frame front

Temples have equal pantoscopic angle: Standard alignment means that the pantoscopic angle of each eyewire must be the same for both eyes (Fig.6). To increase the pantoscopic angle, bend the temple down. To decrease it, bend the temple up.

THE FITTING TRIANGLE

Three points of contact: When a frame is adjusted correctly to fit the patient, there are three contact points: the nose bridge and the sides of the head behind each ear. This is known as the fitting triangle (Fig.7). Each of the three points should share in supporting the frame's weight to ensure comfort for the patient.

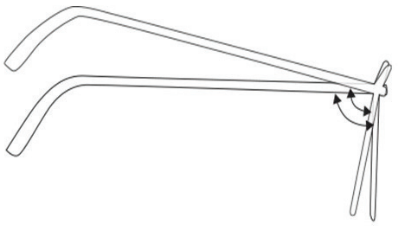

FIG. 6 Both sides of frame front must have equal pantoscopic angle

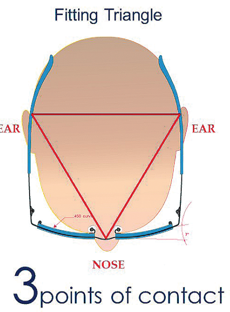

FIG. 7

TOOLS AND ADJUSTMENTS TO ACHIEVE 3-POINT TOUCH

Bending temple tips: Temples on both metal and cellulose acetate or zyl frames should be adjusted for the wearer (Fig. 8a and Fig. 8b). Frames made of injection-molded plastic are generally built to fit as is and are not adjustable. Most

FIG. 8a

cellulose acetate frames have skull temples. The end of the temple is made to conform with the curve and contour of the ear.

Heat plastic before bending: Cellulose acetate temples and plastic temple covers on metal frames must be warmed before bending to make them

FIG. 8b

pliable (Fig. 9). Plastic may crack if bent while cold.

FIG. 9

Temple fit: For proper fit, the temple bend should occur just behind the junction of the top of the ear and the skull. The temple should follow the ear's natural curve, gently touching but not pressing on the mastoid bone. Temples should not pull on the soft tissue on the back of the ear. When the temple length and bend are correct, the temple will end half to two thirds down the length of the ear. Gently pull on the frame front; the temples should hold the frame from behind the ear. Practice this with an experienced optician.

Nosepads: You can change the frame's position on the patients' face by adjusting the nosepads using nosepad pliers (Fig. 10). Move the nosepads closer together to raise the frame.

FIG. 10

Move them further apart to lower the frame. Finally, pull them further from the frame to push the frame away from the patient's face. (This can be useful when eyelashes are touching as it can increase pantoscopic tilt). The angle and position of the nosepads can also be adjusted to ensure that the flat side of the pad is flush against the side of the nose for a comfortable fit.

Adding face form: The average frame has 5 to 7 degrees of face form (Fig. 11). To add face form, grasp both sides of the top of the frame with fingers supporting the back of the frame near the bridge and thumbs positioned at the front temple side of the frame chassis. This allows you to apply enough pressure to gently curve the frame front to follow the curve of your patient's face. Note: Plastic frames must be warmed before bending.

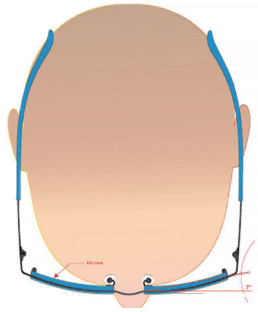

FIG. 11

If a frame is too loose or too tight on the sides of the head, the temple butt ends must be adjusted in or out. A half-padded plier (Fig. 12) is used to bend a metal frame. Butt ends on plastic frames should be warmed and adjusted by hand.

FIG. 12

TAKING MEASUREMENTS

PAL fitting height measurement: All fitting heights must be measured from the fitting cross to the deepest part of the eyewire. This will not be directly below the marked fitting height in some frame shapes, so be sure to always measure to the deepest part of the frame. The extreme examples are pilot or aviator shapes where the frame's temporal side has a much deeper b measurement than the center or nasal side of the lens (Fig. 13).

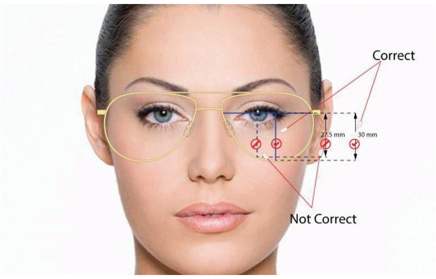

FIG. 13

Tip: Draw a horizontal line on the frame at the height of the fitting cross (Fig. 14) to make it easier and more accurate to measure to the deepest part of the frame. Have the patient put the frame on and ask them if they see the line. If they look straight through it, they'll say "no" unless the pen you used was red or blue. If the line is too low or too high, they'll quickly see it and tell you. Use a millimeter ruler to measure from the line to the bottom deepest edge of each lens for the right and left lens fitting height.

FIG. 14

Height measurements must be taken with you positioned directly across from the patient and at EYE LEVEL to avoid parallax error. One inch person to person height difference will equal a 1.7 mm fitting height difference. Measure monocular fitting heights at pupil center; some of us have one eye higher.

Tip: Shine a penlight on the patient's cornea and mark the location of the reflection.

Measure down from the corneal reflex to the deepest part of the frame eyewire. Another option is to dot the patient's pupil center on the demo lens and measure from the dot's height to the frame bottom but make sure you measure to the deepest 'B' measurement. But note that the corneal reflex is typically inset 1 mm nasally from the center pupil and should be subtracted when using the pupil center as the reference point.

Variable corridors: Take advantage of variable corridor designs when tailoring eyewear for the patient. The eyecare practitioner may request a specific corridor length or allow sophisticated software technology to select it based on the frame size, monocular PD and fitting height for each individual prescription. Signet Armorlite makes corridor length selection easy for KODAK Progressives. Simply mark the fitting height on the lens, then align the fitting mark of the left lens with the fitting cross on the various corridors pictured (Fig. 15) on the chart until you find the longest corridor with the entire near reference circle within the eyewire.

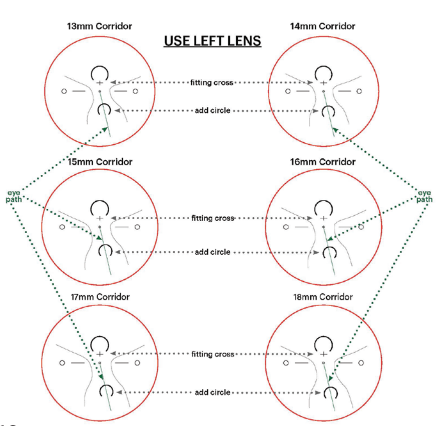

FIG. 15

Monocular PDs (MPD) measurement: Corneal reflex pupilometer (Fig. 16)—The pupilometer measures the distance between the patient's pupils. It can be set to take monocular readings. Note: It does not reflect the position of the patient's pupils in the eyewire relative to the as-worn frame's bridge center. For this reason, Signet Armorlite recommends taking the monocular PD with the pre-adjusted frame worn by the patient.

Measure monocular PDs (MPD): Signet Armorlite provides an all-in-one tool, as shown

FIG. 16

that uses a millimeter ruler to measure the horizontal distance from the center of the frame bridge to the patient's pupillary centers (Fig. 17).

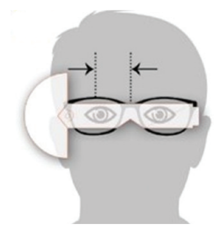

FIG. 17

PAL fitting height measurement: Use a millimeter ruler to measure the fitting height to measure from the height of the pupil to the deepest part of the eyewire groove (Fig. 18).

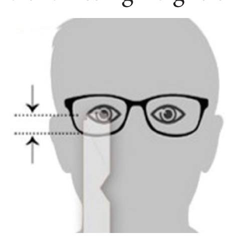

FIG. 18

Measure back vertex distance (BVD): Use a distometer tool, if available, to measure the back vertex distance from the back of the lens to the patient's corneal apex. If a distometer isn't available, use the millimeter ruler (Fig. 19). The standard default is typically 13 mm.

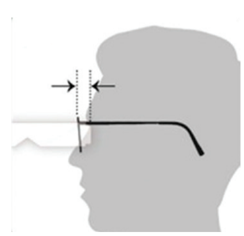

FIG. 19

Measure pantoscopic tilt angle: The pantoscopic tilt is the vertical angle formed between the frame front and the patient's optical axis (Fig. 20). To measure this angle, use an inclinator such as the one provided by Signet Armorlite. Place the ruler at a horizontal (180 degrees), then rotate the oscillating half-circle until the flat edge is aligned with the frame front tilt angle. The left point of the straight ruler points to the degree of tilt angle.

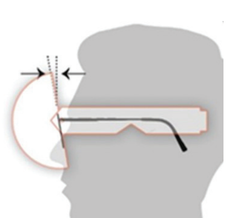

FIG. 20

The standard default is 7 to 10 degrees.

UNDERSTANDING POSITION OF WEAR – POW MEASUREMENTS

Position of wear measurements are used in personalized digital freeform designs to compensate the as worn effective power perceived by the wearer to match the prescribed power (Fig. 21).

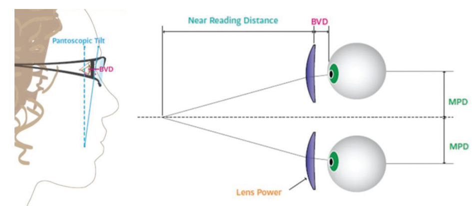

FIG. 21

BVD: The distance from the back of the lens to the corneal apex (Fig. 22). BVD affects the power of the lens. The power of a plus lens increases when moved further from the eye. The power of a minus lens increases when moved closer to the eye. Therefore, the difference in the refractive vertex distance and the actual worn distance can either increase or decrease the effective power of the lens.

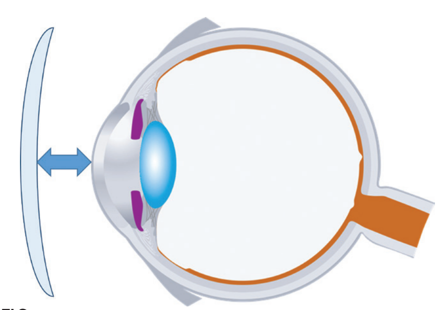

FIG. 22

Pantoscopic tilt: When frames are angled so that the bottom of the lens sits closer to the face, this is called pantoscopic tilt. Pantoscopic tilt is the angle formed by the lens tilt in the vertical plane relative to the patient's visual axis when worn. Pantoscopic tilt is a position of wear measurement that affects how the lens is positioned in front of the patient's visual axis in the primary gaze position (Fig. 23). The pantoscopic tilt changes the sphere power and introduces cylinder power at 180 degrees in this scenario. We learn about pantoscopic tilt when learning about Martins Rule of tilt in basic optics. We know that pantoscopic tilt effectively shifts/raises the OC of the

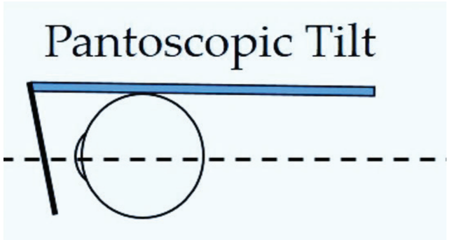

FIG. 23

lens by 1 mm for every 2 degrees of tilt, which means that the line of sight is at an angle to the lens in its primary position of gaze. Martins Rule states that the lens' optical center should be lower by 1 mm for 2 degrees of pantoscopic tilt to compensate. Easy enough for a spherical single vision lens, but less so for a spherocylindrical lens or a progressive. Fortunately, today's free-form lens design software compensates the lens surface for oblique aberrations induced by the tilt that occurs during normal frame wearing. This compensation changes the effective power to match the prescribed power ascertained during refraction with flat trial lenses positioned at a 90-degree angle perpendicular to the patient's visual axis. Another reason that most frames are fitted on the patient with pantoscopic tilt is that this angle provides a wider field of view in the near zone of a progressive lens and makes the reading area easier to access. Plus, it is more cosmetically appealing and aligns best with the eyes' visual axis.

Wrap angle: Frame wrap angle (also known as face form and panoramic angle) is the measurement to determine the amount of wrap angle of the frame. With high wrap frames, the lenses need to be digitally compensated to minimize distortions and power errors that occur when the eye and the visual axis and lens optical axis aren't aligned. High wrap frames can also cause lens mounting and cosmetic issues and lash impingement.

Frame wrap angle is defined as lens tilt around the vertical, or 'y' axis, with respect to the primary gaze angle. When we add faceform to the frame, we increase the frame wrap angle. Faceform is an important adjustment when the lens optical center has been decentered nasally. We add face form so that the wearer's visual axis and the lens optical axis line up. The worn tilt of the lens in front of the eye changes the position of the lens OC relative to the wearer's line of sight. With personalized digital designs, the lens design software (LDS) program will adjust the optical center of the lens to align with the wearer's line of sight (axis of rotation) based on the wrap angle measurements provided. Defaults are used when no pantoscopic tilt angle measurement is provided. Ask your lens provider for a wrap angle chart (Fig. 24) if you don't already have one.

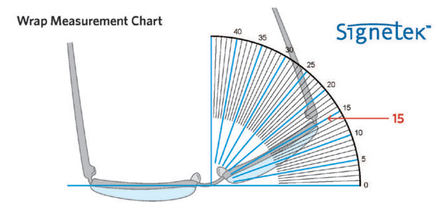

FIG. 24

VERIFICATION AND FINAL ADJUSTMENT

Step 1: Confirm the lens type, material, design, powers, centration and fitting reference points on the lens (Fig. 25). All PAL designs all have engraved markings by the manufacturer that help us identify the brand/design name, add power and the location of the axis alignment engravings.

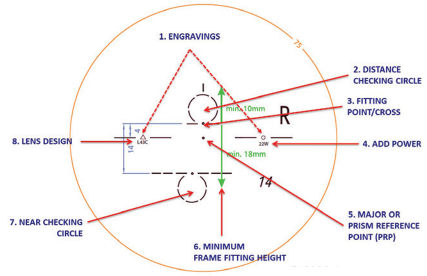

FIG. 25

Step 2: Alignment reference markings–two marks 34 mm apart, equal distance 17 mm from the prism reference point (PRP) in the vertical plane. While normally comprised of small engraved circles, other markings are used. The prism reference point or geometrical center of the lens lies exactly midway between these two markings.

Step 3: The add power is engraved on the temporal side under the axis alignment engraving. Step 4: The PAL design and manufacturer are indicated by the engraved manufacturer's symbol found under the engraved axis alignment markings on the nasal side. Other markings may be included to identify lens material or the corridor length when the design is available in variable corridor lengths.

All progressive lenses have axis alignment marks engraved on the finished lens and positioned 34 mm apart or 17 mm to either side of the prism reference point (Fig. 26). Dot and align these engraved circles/crosses with the lens mask reference points that correspond to the design ordered.

FIG. 26

The lenses will typically arrive from the lab with the reference markings on the lens. If removed, you can reapply by dotting the center of the axis alignment engravings. Line up the dots on the PAL design's centration/fitting chart and mark the fitting cross, distance and near verification zones (Fig. 27). Confirm that the monocular PDs and fitting heights match the ordered parameters.

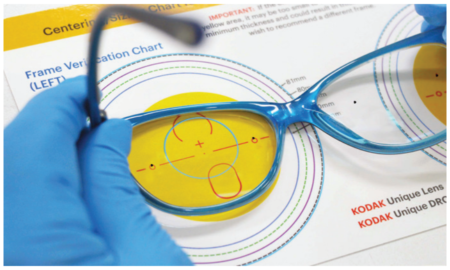

FIG. 27

Alternatively, if the correct lens mask isn't available, mark the position of these reference engravings on the lens with an AR marker and align them with the corresponding reference points on the manufacturer's centration chart. Remember to always use the centration chart for the design being dispensed.

Important note: When a patient wants to replace an existing pair of lenses in a PAL design made elsewhere, or you need to remark lenses made elsewhere, to evaluate fit, there is a handy reference tool online from The Vision Council. You can use this site to identify the PAL design from its symbol or pull up its corresponding centration tool.

FIG. 28

Distance Rx: Whether using an auto lensmeter or manual (Fig. 28), confirm that the distance Rx power in the distance verification reference matches the power ordered. Note: If the lens is a personalized lens compensated for as-worn frame fit use the verification slip to verify power accuracy.

Verify add power: Check the engraved add power under the temporal side axis alignment engraving (Fig. 29).

Verify fit: Confirm the fit on the patient by verifying that the fitting cross is correctly positioned over the pupils (Fig. 30). Inform the patient that the markings on the lens will be removed after you confirm proper fit and alignment.

FIG. 30

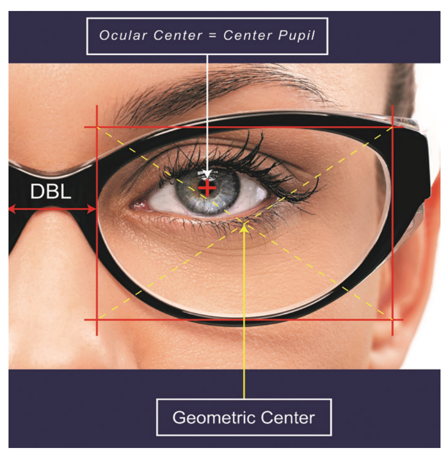

FIG. 31

Centration (Fig. 31) errors affect binocular vision and reduce the fields of view. Also, cosmetics can be affected due to thick edges on minus lenses and thick centers on plus lenses. The lens cutout may also be affected by poor centration or centration errors.

Important: When making the final fit adjustment for personalized and compensated progressive lenses, the frame fit parameters must match the parameters provided to the lab. The lens design incorporates these values into the final lens surface calculations. Therefore, the eyeglasses must fit as ordered for the lens to perform as designed. Note: Adjust the eyewear to match lens design default values if using defaults. The lens manufacturer can provide you with the default values.

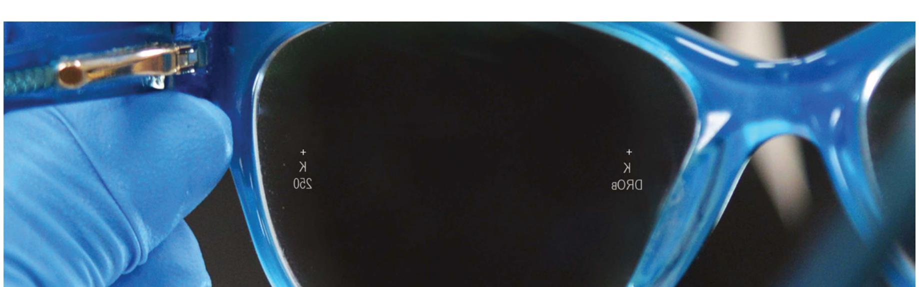

FIG. 29

QUICK TIPS

Most troubleshooting is related to adaptation issues for the progressive lens wearer, especially for first-time wearers and presbyopic emmetropes. Think about what they are experiencing if they aren't used to wearing eyeglasses or are switching to a PAL from single vision lenses. After checking that the lenses match the Rx and order, alignment and fit, it is okay to assure the patient that just as learning to ride a bike or to read became second nature, so will wearing a progressive lens.

Teach the patient how to use the lens. First, instruct them to point their nose in the direction they want to see for distance. (They must get used to turning their head). Then demonstrate how they must look through the lower part of the lens to read a book. Next, have them try reading their smartphone and viewing at an intermediate distance so that you can help them learn how to focus at these varying distances.

Adjusting for comfort: Remember, the eyeglasses should always be adjusted before the measurements are taken and returned to the original fit parameters shared with the lab before dispensing. When they get out of alignment, make the necessary adjustments to improve comfort. You can find these troubleshooting tips in the Quick Tips section of this course online at 2020mag.com. ■

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