



What makes a good trunk support?

3. Measurement to fit

For a trunk support to be effective it needs to be the right size. Here we look at the measures involved for the accurate prescription of anterior and lateral trunk supports.

Manufacturers have traditionally ascribed sizing to their flexible postural support devices (PSDs) with letters (e.g. S, M, L) rather than numbers. However, one manufacturer's medium (M) is not necessarily the same as the next manufacturer's. To overcome this challenge, the recently published ISO/TS 16840-15¹ (the replacement for the older British standard BS 8625) has prescribed a standardised nomenclature for manufacturers to use when showing the size that will be appropriate for an individual client. The annexes to this standard cover a range of flexible postural support devices, but here we will consider just trunk supports. Annex A of the standard summarises the measures of the client, and Annex B the PSD measures to match the client.

Selecting the right size and type of anterior support, and choosing the correct placement is (aside from achieving the desired clinical outcome), critical to the health and safety of the client. Getting this wrong might lead to strangulation at worst, but also harm, such as skeletal deformation (e.g. misalignment of the spine) over time. The devices can either facilitate or impede bodily internal function and external activities, depending on their type and placement – the benefits of different aspects of dynamism were covered in Part 1. Never to be forgotten is that, for safety, a correctly positioned and adjusted pelvic positioning belt is essential before considering any upper body support.

Client measures for flexible PSDs

There are three types of anterior supports commonly available – shoulder harnesses, chest harnesses (for examples see Figure 1), and circumferential harnesses. For the shoulder and chest harnesses, the shoulder width should be measured as shown in Figure 2. This width is used to prescribe the size of the support.



Figure 1. Examples of a shoulder harness and a chest harness

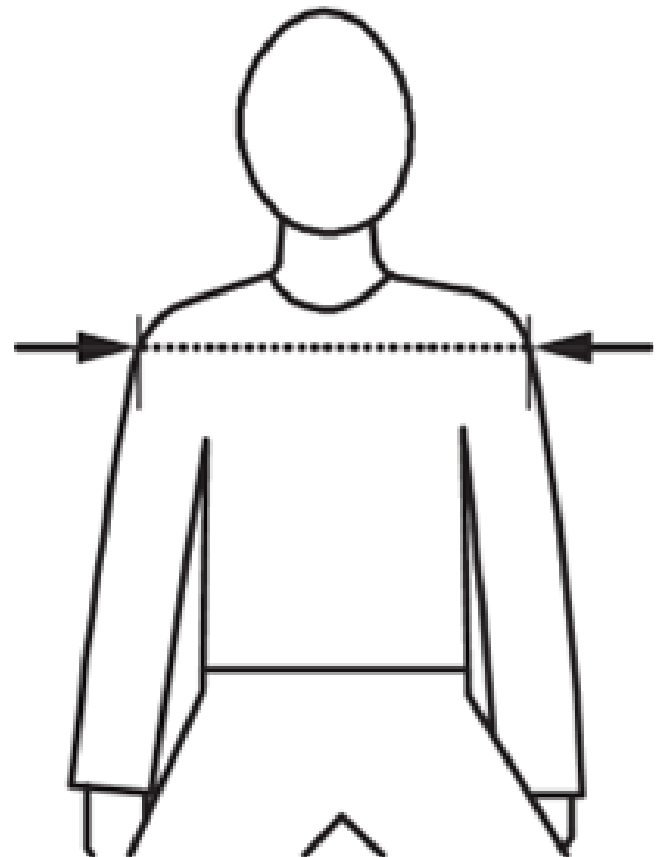


Figure 2. Measurement for an anterior trunk support (Fig A.6 from ISO/TS 16840-15¹)

In contrast, circumferential supports are the most flexible of the flexible PSDs, and do not involve straps over the shoulders – for examples see Figure 3.



Figure 3. Examples of circumferential trunk supports

Circumferential supports are used most commonly around the chest, where the rib cage protects the internal organs. Sometimes it will be necessary to support the soft tissues of the upper body which will involve mounting across the abdomen. Where an abdominal support is used, often this is to provide support, for example, for sagging abdominal muscles, strengthening abdominal muscles and weakened abdominal walls, reducing pain while laughing, avoiding discomfort while coughing, avoiding squeezing or cramping up of muscles, or assisting toning of abdominal muscles.

The circumferential distance needs to be measured with a flexible tape around the torso, from the back support upright on one side to the upright on the other side (Figure 4), at the height where the support is to be applied, to prescribe the appropriate size of support.



Figure 4. Measurement points for a circumferential chest support (Fig. A.7 from ISO/TS 16840-15¹)

Measures of flexible PSDs

An anterior trunk support shall be described by the range of shoulder width measures (Figure 2) for which it is designed. The shoulder width range for which the PSD is suitable becomes the 'size' of the PSD. If the selected shoulder width size range were, say, 250 to 290 mm, the PSD size would be 25-29. Further examples are given in Table 1.

Table 1 — Anterior trunk support size selection

Anterior trunk support size	Designed for shoulder width	Possibly described previously as
Size 15–24	150 mm to 240 mm	XX Small
Size 24–28	240 mm to 280 mm	X Small
Size 28–33	280 mm to 330 mm	Small
Size 33–41	330 mm to 410 mm	Medium
Size 41–48	410 mm to 480 mm	Large
Size 48–55	480 mm to 550 mm	X Large

The same principle applies to a circumferential chest support, the size of which is derived from the range of chest measures for which it is designed. Examples are given in Table 2.

Table 2 — Circumferential trunk support size selection

Chest support size	Circumferential measure of person's trunk	Possibly described previously as
Size 31–41	310 mm to 410 mm	X Small
Size 40–49	400 mm to 490 mm	Small
Size 47–58	470 mm to 580 mm	Medium
Size 55–66	550 mm to 660 mm	Large
Size 62–73	620 mm to 730 mm	X Large

Rigid supports

Most anterior supports are flexible in design to fit around the curves of the torso, but also need to allow a degree of movement for breathing and functional activities (all of which tend to be mostly in a forward direction). Circumferential supports will also supply a degree of lateral support and lateral movement.

Conversely, for stability of the upper body, most lateral and posterior supports are based on rigid structures. Being rigid structural items, primary measures will relate to their respective positions in space and relate to their points of fixation on the seating system or chair. The size of the pads on the supports will be important, but not as critical as the sizing for a flexible support. Back supports will have some aspects of lateral support, but for now let's cover standalone lateral trunk supports. (Describing the measures and positioning of posterior (back) supports is covered in Parts 4 and 5 of this series.)

Lateral trunk supports

Lateral trunk supports can be prescribed for different purposes. At the more simple level, they provide lateral boundaries to help position the trunk in the midline. The body measure for these will relate to the width of the trunk at the height at which they will be mounted. The support will usually be located alongside the ribcage to avoid interaction with soft tissues, but not too high as to impede arm movement or cause discomfort.

To provide information to the person placing the support onto the seating system or chair, the point at which the centre of the support surface touches the occupant is a point in space that is measured from the 'zero point' of the seating system. The zero point is designated as being at the junction of a vertical line down the centre of the surface of the back support with a horizontal line along the centre of the surface of the seat cushion (0,0,0s in Figure 5). The height of the PSD will be the height from the zero point to the centre point of the surface the PSD (Y_3). The 'depth' will be the distance forward from the zero point (X_3), and the width will be the sideways distance from the zero point – a positive value if to the right of the chair and a negative value if to the left.

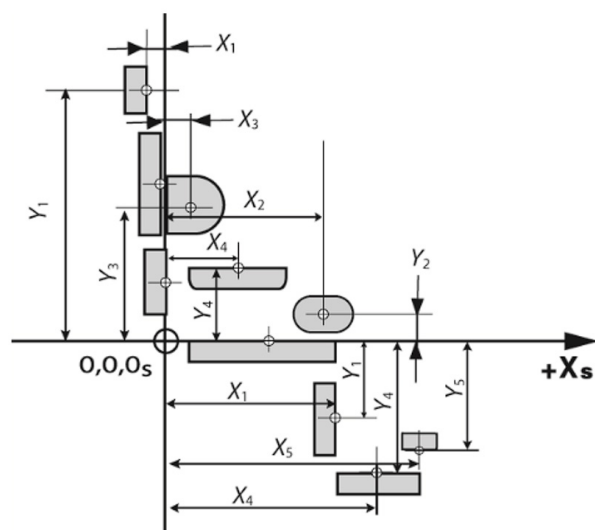


Figure 5. Height and depth location measures of PSDs

Adjustable lateral trunk supports

For a retaining role, the pads are usually mounted parallel with the 'orthogonal' axes of the seating system, i.e. with the X, Y, and Z axes. However, when the pads are being used as positioning devices to accommodate or correct scoliotic deformities of the spine, it is critical that the pad mounting systems allow the pads to be both positioned and angled to push along the line of the rib in its direction

towards the vertebra where the positioning action is required. In these instances, a vertical pad would push the rib in the wrong direction and exacerbate the scoliosis. Examples of systems which allow 3-dimensional positioning in space of the PSD pad are Symmetric Designs' Lateral Upper Body Support (LUBS) and Stealth's Full Surface Contact pad mount (FSC) (Figure 6). A further benefit of the pad of the LUBS is that it can be conformed to the occupant's body shape around the point of contact.



Figure 6. The Symmetric Designs' LUBS and Stealth's FSC lateral support mounts

Guidance as how to measure the required angle of the support in three dimensions is provided in Figures 5 to 7 in the THIIIS June 2023 article² in the Measurements in Seating series.

Conclusion

A full assessment of the client's physical and functional needs and abilities will dictate what is the most appropriate postural support device for that client. Obtaining the appropriate measures of a client, and then selecting and correctly positioning the respectively appropriate postural support device(s) is critical for the safety and long-term health of the client.

1. *ISO/TS 16840-15:2024 Wheelchair seating — Part 15: Selection, placement and fixation of flexible postural support devices in seating*
2. *THIIS June 2023 Measurements in Seating 4. Absolute angles in seating system measures (downloadable from <https://hiaus.net.au/knowledge-hub/measurements-in-seating-4-absolute-angle-seating-system-measures/>)*



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