

Technical Manual: Precise Pressure Control for Seamless Workout Wear

1. Overview

This manual specifies the core technologies and implementation methods for achieving precise pressure control in seamless workout wear. The "precise pressure" refers to the uniform, stable, and gradient pressure distribution on different body parts of the garment, which is integrated through seamless knitting technology—providing targeted support, shaping, and comfort without tightness or looseness during sports.

The pressure of seamless workout wear is determined by the combination of fabric elastic retraction force, structure density, segmented gram weight variation, and spandex content gradient. It is the key technical barrier distinguishing high-end seamless products from ordinary ones.

2. Core Technologies for Precise Pressure Control

2.1 Segmented Spandex Content Control (Most Critical)

Instead of a uniform spandex content throughout the garment, computer-programmed yarn feeding is adopted to adjust the spandex ratio in different areas, achieving gradient elasticity and targeted pressure. This technology is called "segmented yarn feeding" in factory terms.

Recommended Spandex Ratio by Area:

- Waist/Abdomen Shaping Area: 14%–18% Spandex → High pressure for tightening and shaping
- Hip/Thigh Support Area: 10%–14% Spandex → Medium pressure for support and lifting
- Knee Crease/Joint Activity Area: 6%–10% Spandex → Low pressure for flexibility and comfort

Key Requirement: Ensure accurate spandex content in each segment without underfilling or overfilling, so that the pressure transition is smooth and consistent.

2.2 Structural Density Difference (Stitch Size Control)

Seamless knitting machines control the tightness of stitches through needle tracks and density motors, and the stitch size directly determines the pressure intensity of the fabric.

- Dense Knitting (Small Stitches): High density → Strong elastic retraction → High pressure (suitable for waist, abdomen shaping areas)
- Loose Knitting/Mesh (Large Stitches): Low density → Weak pressure, good breathability (suitable for knee creases, armpits, and other activity areas)

High-end Product Design: The front abdomen adopts high-density knitting for pressure application, the back waist uses medium density for support, and the side waist and knee creases adopt low-density knitting for pressure relief, balancing shaping and comfort.

2.3 Segmented Gram Weight Control

Seamless knitting technology enables multiple gram weights in a single garment without splicing, realizing pressure differentiation through thickness variation of the fabric.

Recommended Gram Weight by Area (Fabric Weight):

- Waist/Abdomen: 220–260 g/m² → High pressure for effective shaping
- Hip/Thigh: 190–220 g/m² → Medium pressure for support
- Knee/Ankle: 160–190 g/m² → Low pressure for flexibility and fit

Advantage: This design ensures the waist does not loosen, the legs are not tight, and there is no jamming when squatting or bending.

2.4 Special Knitting Structure: Integrated Pressure Bands

Instead of sewing elastic bands or adhesive strips, seamless knitting directly weaves pressure-enhancing structures into the garment, including abdomen-shaping strips, hip-lifting bands, side shaping lines, and waist-stabilizing structures.

Principle: Local double-layer knitting or reinforced knitting increases the local fabric density and elastic retraction force, forming targeted pressure bands that are soft, non-marking, and have no pressure gaps.

2.5 Digital Pattern and Process Parameter Programming

Precise pressure control relies on professional CAD pattern design software and seamless knitting machine parameters, converting pressure requirements into programmable production instructions to ensure consistency in mass production.

Key Programmable Parameters:

- Yarn feeding amount of each yarn path
- Density value of each segment
- Stitch length
- Spandex drafting ratio (usually 1:2.8, 1:3.0, or 1:3.2)

Key Requirement: Each stitch of the machine operates according to the preset program to ensure stable pressure distribution, uniform size, and strong consistency of bulk products.

3. Pressure Control Requirements for Key Parts

Body Part	Pressure Requirement	Implementation Method
Waist	Medium-high pressure, uniform distribution, no curling, no slipping	Double-layer wide edge + dense knitting + 14%–18% Spandex; appropriate spandex drafting to avoid excessive tightness
Abdomen	Shaping pressure, not stuffy; light pressure on upper abdomen, slightly stronger on lower abdomen	High-density knitting on front panel + segmented pressure control
Hip	Medium pressure, lifting and supporting, no sagging, no pinching	U-shaped/butterfly-shaped reinforced area; slightly higher density at hip peaks, softer elasticity at hip grooves
Thigh/Calf	Medium support pressure, no shaking, no friction; slight gradient from top to bottom	Slightly dense knitting on outer side for stability; slightly loose knitting on inner side to reduce friction
Joints (Knee, Elbow, Armpit)	Lowest pressure, no restriction on bending, good breathability	Mesh, hollow, or loose knitting; 6%–10% Spandex

4. Inspection Indicators for Precise Pressure

To ensure the quality of pressure control, the following indicators must be inspected during production and inspection:

1. Pressure Consistency: The pressure difference between the left and right sides of the same size and the same part shall not be excessive (testable by hand feel and professional pressure testing instruments).

2. **Pressure Stability After Washing:** No loosening or deformation after 5–10 washes; the elastic retraction force and pressure intensity remain unchanged (related to spandex quality and drafting process).
3. **Smooth Pressure Gradient:** The transition between high-pressure areas and low-pressure areas shall be smooth without sudden pressure changes, avoiding indentations or discomfort after long-term wearing.

5. Factory Key Words & Notes

5.1 Key Words for Communication with Factories

Segmented yarn feeding, zonal spandex, gradient elasticity, stitch density control, segmented gram weight, integrated pressure band, CAD pattern programming, spandex drafting ratio

5.2 Important Notes

- All pressure control technologies must be compatible with seamless knitting processes (circular knitting machine/single-sided seamless machine) to ensure integrated forming without splicing.
- Spandex must be high-temperature resistant, chlorine resistant, and high-recovery to avoid pressure loss due to spandex relaxation after washing or exposure.
- The yarn fineness should match the knitting machine's needle gauge (usually 30D/40D/70D fine denier yarn) to ensure the fabric is delicate, seamless, and the pressure is evenly distributed.