

SHRINK LABEL FILM

SELECTION AND TECHNICAL REFERENCE GUIDE

PVC · PETG · cPET · Polyolefin

Shrink Performance · Sealing Parameters · Storage Requirements · Film Selection

PURPOSE AND SCOPE

This document provides a technical reference for the selection, sealing and storage of the four main shrink label film types used in the South African and broader sub-Saharan African packaging market: PVC, PETG, cPET and Polyolefin.

Film selection involves a combination of technical, operational and commercial factors. Shrink performance, printability, seam integrity, solvent compatibility, recycling implications, container type, shrink tunnel conditions and final pack appearance must all be considered. A film that meets specification on paper may still produce unacceptable results in production if sealing parameters, storage conditions or process controls are not properly managed.

This guide addresses each film type individually, followed by consolidated reference sections covering sealing parameters and failure modes, storage requirements, shelf life guidance and incoming material checks.

SECTION 1 — PVC SHRINK LABEL FILM

PVC (polyvinyl chloride) has historically been one of the most widely used shrink sleeve materials due to its ease of processing and broad compatibility with existing production infrastructure. Although PVC was traditionally the lowest-cost option, reduced demand — particularly for cast PVC grades — has narrowed the price differential relative to PETG, and the two materials are now frequently comparable in cost.

1.1 Technical Advantages

PVC shrinks at relatively low temperatures and is compatible with a wide range of shrink tunnel types, including older steam and hot-air systems. Its processing window is broad — it tolerates variation in tunnel temperature, steam pressure and dwell time without the dimensional sensitivity characteristic of higher-specification films.

PVC has historically been positioned as the lowest-cost shrink film option. However, reduced market demand — particularly for cast PVC grades — has narrowed the price differential relative to PETG, and the two are now frequently at comparable price levels. The material choice should therefore be evaluated primarily on technical and sustainability grounds rather than cost alone.

Seaming is reliable. PVC responds predictably to standard solvent seaming methods, providing consistent seam strength at production speeds. Printability is good across gravure, flexographic and digital methods, subject to appropriate ink system selection and surface treatment.

1.2 Limitations and Constraints

PVC contains chlorine, which raises concerns in waste management, incineration and recycling. PVC sleeves applied to PET bottles represent a documented recycling contamination risk: at PET reprocessing temperatures, PVC degrades and releases hydrochloric acid, which contaminates recycled resin streams.

Many brand owners and major retailers have adopted policies to reduce or eliminate PVC from their packaging specifications. Where customer sustainability requirements are explicit, PVC may not be an acceptable material regardless of its technical performance.

1.3 Seaming — PVC

PVC is the most straightforward shrink film to seam. Solvent seaming is the standard method. The solvent softens the film surface at the overlap zone, the edges are pressed together under controlled nip pressure, and the bond forms as the solvent evaporates.

Seaming solvent in South Africa: PVC is primarily seamed with THF (tetrahydrofuran) in South Africa. Cyclohexanone-based systems, MEK blends and proprietary PVC seaming solvents are used in other markets or specific applications, but THF is the dominant solvent for PVC seaming in local practice.

The critical variables are solvent application volume and machine consistency. Insufficient solvent produces a weak bond. Excess solvent results in blocking, seam haze, brittleness and retained odour. The processing window is wider than for PETG or cPET, but solvent discipline remains important.

Table 1.1 — PVC Sealing Failure Modes

Failure Mode	Primary Cause	Consequence
Weak seam	Insufficient solvent volume or inadequate nip pressure	Sleeve opens during application
Brittle seam	Excessive solvent volume or overly aggressive solvent blend	Seam cracks after exposure to shrink tunnel heat
Blocking	Excess solvent retained within the roll before rewinding	Sleeves adhere together in pack or on applicator
Poor lay-flat	Uneven seaming tension across the web	Erratic sleeve feeding on applicator
Seam whitening	Localised solvent stress or surface attack	Visual defect on finished pack

1.4 Storage — PVC

PVC is the least sensitive of the four film types in storage, but is susceptible to heat. Prolonged heat exposure can cause dimensional loss before the film reaches the shrink tunnel. Storage temperature should be maintained between 15°C and 25°C. Rolls should be kept in original packaging, away from direct sunlight, heat sources and damp conditions. FIFO stock rotation should be observed. Allow a minimum of 24 hours acclimatisation in the production environment before printing, seaming or application.

1.5 Film Properties — Cast Grade Reference Data

The following property data is drawn from the Termoencogible Internacional cast PVC (Printing Grade) technical data sheet and applies to the Ti-Cast grade supplied for shrink label applications. Values should be confirmed against the specific product data sheet for each consignment.

Table 1.2 — PVC Cast Grade: Film Properties

Property	Value / Specification	Notes
Film Thickness	0.030–0.080 mm (30–80 µm)	Tolerance ±5%
Width	Up to 2000 mm	
Roll Length	Up to 7000 m	
TD Shrinkage	56–60%	Transverse direction
MD Shrinkage	4.5–5%	Machine direction
Tensile Strength (MD)	≥50 MPa	
Tensile Strength (TD)	≥100 MPa	
Elongation at Break (MD)	≥90%	
Elongation at Break (TD)	≥40%	
Surface Tension	≥38 mN/m	No corona treatment required
Density	1.34 g/cm ³	
Printing Compatibility	Gravure and flexographic	200–300 m/min; max 10 colours

Table 1.3 — PVC Cast Grade: Shrinkage vs. Temperature (TD 56–60%, MD 4.5–5% Grade)

Temperature (°C)	TD Shrinkage (%)	MD Shrinkage (%)
65	5.0	0.5
70	28.9	3.5
75	44.9	4.5
80	50.9	4.5
85	52.9	5.0
90	54.9	5.0
95	56.9	5.9
100	57.0	5.0

Note: Shrinkage measured by immersion in water bath at the stated temperature for 10 seconds. Data represents the Ti-Cast grade; values for other PVC grades will differ. Confirm shrinkage curve with the supplier for each grade.

Selection Guidance: PVC is appropriate where standard container geometry and a wide processing window are the primary specification drivers and sustainability requirements have not been specified. Given that PVC pricing is now broadly comparable to PETG in the South African market, cost alone is no longer a reliable differentiator. PVC is not suitable for applications involving PET bottle recycling streams, or where brand owner sustainability policies restrict its use.

SECTION 2 — PETG SHRINK LABEL FILM

PETG (polyethylene terephthalate glycol) is the reference-standard material for premium shrink sleeve applications. It is specified primarily where high transverse shrink performance, optical clarity and conformance to complex container geometry are required.

2.1 Technical Advantages

PETG achieves high shrink percentages in the transverse direction, making it well-suited to shaped bottles, curved shoulders and full-body sleeve formats. Optical clarity and gloss are excellent, producing a premium shelf result. Reverse-print colour quality is sharp and vibrant when the correct ink system and surface treatment are in place.

PETG has good mechanical integrity through the converting process, handling printing, slitting, seaming and application reliably when correctly specified for the application.

2.2 Limitations and Constraints

The elevated shrink force that enables conformance to complex shapes can cause distortion on lightweight or thin-walled containers if shrink tunnel parameters are not precisely controlled. PETG has a narrower processing window than PVC and requires tighter control of tunnel temperature, dwell time and steam or hot-air delivery.

PETG is not equivalent to bottle-grade PET. PETG sleeves that are not removed prior to PET bottle recycling can reduce the intrinsic viscosity of the recycled resin stream. This is a material consideration for applications where container recyclability is a specification requirement.

2.3 Seaming — PETG

PETG is solvent-seamed but demands more precise process control than PVC. THF (tetrahydrofuran) is the primary seaming solvent for PETG, exploiting the material's permanently amorphous structure. In South African practice, THF is commonly used in combination with 1,3-Dioxolane. Some formulations incorporate xylene or toluene for specific bond or drying characteristics. Dedicated PET/PETG seaming solvent blends are available from specialist solvent suppliers and are formulated for particular film grades, speeds and seaming equipment. The solvent must be matched to the specific film grade supplied; mismatched or incompatible solvents cause surface attack, haze or inadequate bond formation.

Correct seaming requires controlled solvent volume, accurate overlap (typically 4–8 mm), correct nip pressure, sufficient drying time and stable web tension. The seam must withstand both the tension of sleeve application and the elevated shrink force applied in the tunnel.

Seam testing must always be conducted after shrinking, not only before. A seam that appears acceptable prior to heat exposure may fail once the sleeve contracts under load. Pre-shrink seam approval alone is insufficient.

Table 2.1 — PETG Sealing Failure Modes

Failure Mode	Primary Cause	Consequence
Seam splitting	Insufficient solvent volume or nip pressure	Sleeve opens during shrinking
Tunnel seam cracking	Marginal seam strength under elevated shrink force	Seam failure after heat exposure in tunnel
Curling	Uneven solvent penetration across the overlap zone	Impaired sleeve presentation and applicator feeding
Blocking	Incomplete solvent evaporation before rewinding	Sleeves adhere in roll or pack
Seam distortion	Excess solvent softening the film in the overlap area	Visible seam line or wrinkle on the finished sleeve

2.4 Storage — PETG

PETG requires more controlled storage conditions than PVC. Temperature variation affects dimensional stability: elevated storage temperatures can cause premature shrinkage, uneven lay-flat and tension changes that manifest as processing problems throughout the converting sequence. Storage temperature should be maintained between 15°C and 25°C, with 30°C as the maximum. PETG should not be stored under uninsulated roof sheeting or adjacent to sun-exposed warehouse openings. Allow 24–48 hours acclimatisation before conversion or application.

2.5 Film Properties — YMR286H Reference Data

The following property data is drawn from the Termoencogible Internacional PETG Shrink Film technical data sheet for product code YMR286H. This grade is a rigid PETG shrink film oriented in the transverse direction, recommended for steam shrink tunnels and achieving high TD shrinkage at low heating temperatures (85°C/10 sec). Values should be confirmed against the specific product data sheet for each consignment. Note that PETG density may vary between grades and suppliers; YMR286H has a measured density of 1.32 g/cm³.

Table 2.2 — PETG Shrink Film YMR286H: Film Properties

Property	Unit	Dir.	Typical Value	Tolerance	Testing Method
Thickness	µm	—	40 / 45 / 50	±3%	ASTM D374
Material Yield (40 µm)	m²/kg	—	18.9	≤18.9	—
Material Yield (45 µm)	m²/kg	—	16.8	≤16.8	—
Material Yield (50 µm)	m²/kg	—	15.15	≤15.15	—
Tensile Strength	MPa	MD	60	≥45	ASTM D882 (v=100 mm/min)
Tensile Strength	MPa	TD	340	≥180	ASTM D882 (v=100 mm/min)
E-Modulus	MPa	MD	1600	≥1600	ASTM D882
E-Modulus	MPa	TD	4600	≥4000	ASTM D882
Elongation at Break	%	MD	470	≥300	ASTM D882
Elongation at Break	%	TD	40	≥30	ASTM D882
Heat Shrinkage	%	MD	-2	≤3	ASTM D1204; 85°C/10 sec, water
Heat Shrinkage	%	TD	71	70–78	ASTM D1204; 85°C/10 sec, water
C.O.F. (static)	µs	—	0.385	≤0.60	ASTM D1894E
C.O.F. (kinetic)	µk	—	0.35	≤0.55	ASTM D1894E
Haze	%	—	4.97	≤7.0	ASTM D1003
Gloss (45°)	—	—	110	≥100	ASTM D2457
Surface Tension (Dyne)	mN/m	—	40	≥38	ASTM D2578
Density	g/cm³	—	1.32	≤1.32	ASTM D792

Note: Heat shrinkage measured at 85°C for 10 seconds in a water bath (ASTM D1204). TD shrinkage of 71% (typical) confirms suitability for full-body and complex-geometry sleeve applications. The idealised shrinkage curve shows minimal MD shrinkage across the full temperature range, rising sharply in the transverse direction above 65°C.

Selection Guidance: PETG is appropriate for premium applications, complex container geometries, high transverse shrink requirements and full-body sleeve formats where shelf presentation is a primary specification criterion. Seaming process control must be rigorous, and seam performance must be validated after shrinking.

SECTION 3 — CPET SHRINK LABEL FILM

cPET (Crystallizable PET, also referred to as Crystallized PET) is a heat-shrinkable film based on polyethylene terephthalate, engineered specifically to deliver the shrink performance of PETG while remaining fully compatible with the standard PET bottle recycling stream. It is produced via specialised extrusion and orientation processes to achieve high transverse-direction shrinkage. Unlike PETG, which is kept permanently amorphous through glycol modification, cPET crystallizes under heat — a property that allows it to integrate into the PET recycling process without degrading recycled PET quality or yield.

3.1 Technical Performance

cPET delivers shrink performance that is technically comparable to PETG in the parameters most relevant to shrink sleeve label applications:

Transverse-direction (TD) shrinkage: Typically 60–80%, with some grades achieving $\geq 75\%$. This is sufficient for full-body sleeves, complex bottle geometries and high-conformance applications.

Machine-direction (MD) shrinkage: Typically $\leq 3\%$, often near zero. Low MD shrinkage is essential for dimensional stability through printing, seaming and application.

Optical properties: Excellent clarity, gloss and printability, providing a shelf result comparable to PETG. Reverse-print quality is strong when appropriate ink and primer systems are used.

Mechanical properties: Good tensile strength in the transverse direction with adequate elongation. Density is approximately 1.32 g/cm^3 , comparable to standard PET bottle resin.

Conformability: Suitable for irregularly shaped containers, contoured bottles and full-body sleeve formats requiring high circumferential coverage.

3.2 Recyclability — The Primary Differentiator vs PETG

The principal advantage of cPET over PETG is compatibility with the PET bottle recycling stream. This distinction is increasingly significant for brand owners with published sustainability commitments or operating in markets where extended producer responsibility (EPR) legislation applies.

PETG in recycling: PETG has a lower melting point (approximately 230°C versus approximately 260°C for standard PET) and causes contamination in the PET recycling process, leading to haze, brittleness or processing failures in the recycled resin. It must be separated from PET bottle flake, a step that is often inefficient and results in PET yield losses.

cPET in recycling: cPET crystallizes during the recycling process, allowing it to be processed with PET bottle flake without degrading rPET quality or yield. It enables all-PET packaging designed for bottle-to-bottle recycling. Certain cPET solutions using washable ink systems have received APR (Association of Plastic Recyclers) recognition as meeting critical guidance for PET recyclability.

Washable ink and primer systems are formulated to detach from the film during the hot-wash stage of PET recycling, preventing ink contamination of the recycled stream. This is the recommended ink approach for cPET applications where PET recyclability is a stated requirement. Standard ink systems may not detach during hot-wash and partially negate the recyclability advantage; ink and primer selection must be confirmed with both the ink supplier and the film supplier.

3.3 Limitations and Considerations

cPET is a more recently established product category than PETG or PVC. Availability is more limited, which can affect pricing, lead times and stockholding. A price premium relative to PETG is common in many markets, though this is partially offset by recycling advantages and potential regulatory and brand positioning benefits.

Not all cPET grades are technically equivalent. Performance depends on the manufacturer, extrusion process and formulation. Any change of supplier or grade requires full revalidation of the sealing process, ink system, shrink tunnel settings and final pack performance. Shrink curves and optimal tunnel temperatures vary by grade and must be confirmed with the supplier.

3.4 Seaming — cPET

cPET seaming is technically comparable to PETG and can be run on the same seaming equipment with the same general process approach. Suppliers describe cPET as printing and seaming like PETG, with no major process changes required for most grades. Recommended solvents include 1,3-Dioxolane, THF, or blends of the two (THF + 1,3-Dioxolane). The 1,4-Dioxane + 1,3-Dioxolane combination is also used with certain grades. The specific solvent and ratio must be confirmed and validated for the film grade and seaming machine in use.

Correct seaming requires controlled solvent volume, accurate overlap (typically 4–8 mm), correct nip pressure, sufficient drying time and stable web tension. The seam must be evaluated after shrinking — a seam that appears acceptable before the tunnel may fail once the sleeve contracts under shrink force. Where cPET is paired with washable ink systems for PET recycling compatibility, the seaming solvent must also be confirmed as compatible with the washable ink and primer system in use.

Table 3.1 — cPET Sealing Failure Modes

Failure Mode	Primary Cause	Consequence
Inconsistent seam quality	Film grade variation or incorrect solvent formulation or ratio	Variable sleeve performance across production batches
Seam haze	Surface attack from solvent incompatibility	Visual defect at seam line
Edge lift	Insufficient solvent volume or nip pressure	Sleeve opens during application
Seam cracking	Marginal seam strength under shrink tunnel force	Failure in shrink tunnel
Dimensional instability	Incorrect web tension or insufficient drying time	Poor applicator performance and sleeve distortion

3.5 Storage — cPET

Storage requirements for cPET are equivalent to those for PETG: 15–25°C, maximum 30°C, stable relative humidity (45–60% RH), rolls sealed in original packaging and protected from direct sunlight and heat sources. Storage effects on shrink consistency and seam performance are grade-dependent. The supplier's shelf-life recommendation must be observed. Printed cPET rolls using washable ink systems should be stored with care to avoid any mechanical disturbance of the ink layer before the intended recycling wash stage.

Selection Guidance: cPET is the appropriate choice where PETG-equivalent shrink performance is required and PET bottle recyclability is a specified requirement. It provides high TD shrink (typically 60–80%), excellent clarity and full-body sleeve capability with a substantially better recyclability profile than PETG, provided washable ink systems are used. Seaming parameters and shrink tunnel settings must be validated for the specific grade.

SECTION 4 — POLYOLEFIN SHRINK LABEL FILM

Polyolefin shrink films are based on PE, PP or modified polyolefin structures. They are increasingly specified in applications where sustainability credentials, chlorine-free composition and lower material density are defined requirements. They represent the most technically demanding of the four film types in terms of sealing and process control.

4.1 Technical Advantages

Polyolefin films are chlorine-free, providing a more favourable environmental profile than PVC. Lower density compared to PVC and PETG results in reduced material weight per sleeve. The films are flexible and exhibit good puncture and tear resistance, which is advantageous on squeezable or lightweight containers.

Subject to ink system, adhesive type, film density and sleeve separation behaviour, polyolefin sleeves may be more compatible with PE or PP container recycling streams than PVC or PETG sleeves on equivalent containers.

Polyolefin films have a density below that of water. PP-based grades typically measure 0.90–0.91 g/cm³, and PE-based grades 0.91–0.97 g/cm³. By contrast, all other common shrink film types — PVC (approximately 1.38 g/cm³), PETG (approximately 1.27 g/cm³) and cPET (approximately 1.32 g/cm³) — have densities substantially above 1.0 g/cm³ and sink in water. This density difference has direct practical relevance to the recyclability of polyolefin sleeves on PET containers, as described in Section 4.2.

4.2 Recyclability — Float-Sink Density Separation

The density of polyolefin below 1.0 g/cm^3 — the density of water — provides a recyclability advantage that is distinct in mechanism from the chemical compatibility that characterises cPET in the PET recycling stream.

In PET bottle recycling, the processing sequence includes a grinding or flaking stage in which both the PET bottle and any applied shrink sleeves are reduced to flake. A water-based float-sink separation step then separates materials by density. PET bottle resin (density approximately 1.38 g/cm^3), PVC (approximately 1.38 g/cm^3), PETG (approximately 1.27 g/cm^3) and cPET (approximately 1.32 g/cm^3) all have densities above 1.0 g/cm^3 and sink together with the PET bottle flake. Density-based separation is therefore not effective for those film types when applied to PET containers.

Polyolefin is the exception. Polyolefin flake — with a density below 1.0 g/cm^3 — floats to the surface of the water bath. The floating fraction is physically skimmed or scooped from the surface without the need for additional chemical or optical sortation equipment. When a polyolefin shrink sleeve is applied to a PET bottle and the combination enters the recycling process, the ground polyolefin flake separates from the PET flake by floating to the surface, and is removed before the PET flake continues through the rest of the recycling process.

The practical consequence is that polyolefin shrink sleeves on PET containers do not contaminate the rPET stream. This positions polyolefin as physically compatible with standard PET bottle recycling infrastructure at the float-sink stage. The mechanism is recognised in recycling guidelines for PET packaging, where polyolefin sleeves are generally identified as separable from PET bottle flake based on float-sink density separation.

This is a mechanistically distinct recyclability advantage from that offered by cPET. cPET achieves compatibility with the PET recycling process through crystallization under heat. Polyolefin achieves sleeve separation through a purely physical, density-driven mechanism at the float-sink stage, independent of heat-induced material changes.

The float-sink advantage is most pronounced for polyolefin sleeves applied to PET containers, where the density differential between sleeve flake and container flake is large. For PE or PP containers — where the container material may have a density close to that of the polyolefin sleeve — the density differential is reduced and float-sink separation may be less effective. The specific combination of sleeve material, container substrate and local recycling infrastructure should be confirmed with the relevant recycler.

4.3 Limitations and Constraints

Polyolefin does not solvent-seal effectively under standard conditions. The chemical resistance of polyolefin prevents effective solvent-based bonding. Surface energy is typically in the range of 29–35 mN/m, which is below the threshold required for reliable solvent adhesion. Standard PVC or PETG solvent-seaming equipment and processes cannot be applied to polyolefin without modification.

Transverse shrink percentages achievable with some polyolefin grades are lower than those available from PETG, which limits suitability for complex container geometries requiring high shrink. The processing window in the shrink tunnel can be narrower, requiring tighter control of temperature and dwell time.

Surface treatment is essential. Polyolefin requires corona or plasma treatment to achieve adequate ink adhesion and reliable solvent seaming performance. Treatment level must be actively managed, as it decays over time and with poor storage conditions. Loss of treatment is a primary cause of seam failure on stored polyolefin rolls.

4.4 Sealing — Polyolefin

Polyolefin sealing requires more careful solvent or process selection than PVC or PETG, but solvent-based seaming is achievable in practice. Several methods are used in the South African market:

Solvent seaming with THF/1,3-Dioxolane blends: The most common approach in the South African market. Polyolefin is seamed using a THF and 1,3-Dioxolane blend, typically at an 80:20 or 70:30 ratio (THF:Dioxolane) depending on the specific film grade and seaming equipment. This approach can be run on standard solvent-seaming equipment when properly configured, but the solvent formulation must be validated for each film grade.

α -Pinene: Alpha-pinene is also used as a seaming solvent for polyolefin films. It is a terpene-based solvent with a lower environmental and toxicological profile than THF. Seam strength and production speed must be validated for the specific film and equipment combination.

Heat sealing: Controlled heat and pressure are applied to the overlapped film to create a welded bond. No solvent handling is required. Precise temperature control is necessary — insufficient heat produces a weak bond; excessive heat distorts the sleeve.

The seaming solvent and ratio must be validated for each polyolefin film grade and seaming machine configuration. Do not assume that a formulation proven on one grade will transfer directly to another. The sealing method must be formally confirmed in production trials before commercial commitment.

Table 4.1 — Polyolefin Sealing Failure Modes

Failure Mode	Primary Cause	Consequence
Weak seal	Low surface energy or incorrect heat or pressure setting	Seam opens during application or in shrink tunnel
Seal zone distortion	Excessive heat at the weld interface	Sleeve warps or curls at the seam
Adhesive failure	Incorrect adhesive selection or inadequate cure	Seam opens under tunnel shrink conditions
Thick or prominent seam	Excessive adhesive application or heavy heat weld	Visible seam on the finished pack
Poor print adhesion at seam	Insufficient or decayed corona treatment	Ink detaches during forming or shrinking
Seam shrink mismatch	Seam zone behaviour differs from the film body	Wrinkle or fish-mouth deformation at seam after shrinking

4.5 Storage — Polyolefin

Polyolefin storage requires management of a risk that does not apply to the other three film types: surface treatment decay. Corona treatment level diminishes over time, and degraded treatment can result in failure during printing or adhesive seaming even when the film appears visually acceptable. Standard commercial guidance is to use within 3–6 months of treatment, subject to supplier recommendation.

Rolls should be stored at 15–25°C, away from UV exposure and direct sunlight. Static management is important — low relative humidity accelerates static build-up on polyolefin film surfaces. Surface treatment level should be confirmed by dyne testing before printing or seaming on rolls that have been in storage for an extended period.

4.6 Film Properties — YBR606H(f) Reference Data

The following property data is drawn from the Termoencogible Internacional Polyolefin Shrink Label Film technical data sheet for product code YBR606H(f). This is a floatable functional film with low density ($0.92 \pm 0.02 \text{ g/cm}^3$), enabling physical flotation separation from PET bottles during the recycling process. One surface is corona treated for printing. The film is oriented in the transverse direction with high shrinkage and is recommended for use in steam and hot-air shrink tunnels. Values should be confirmed against the specific product data sheet for each consignment.

Table 4.1 — Polyolefin Shrink Label Film YBR606H(f): Film Properties

Property	Unit	Dir.	Typical Value	Tolerance	Testing Method
Thickness	µm	—	50	±5%	ASTM D374
Thickness Tolerance	%	—	±5	—	ASTM D374
Material Yield (50 µm)	m ² /kg	—	21.74	—	—
Tensile Strength	MPa	MD	16.7	—	ASTM D882 (v=100 mm/min)
Tensile Strength	MPa	TD	60.3	—	ASTM D882 (v=100 mm/min)
E-Modulus	MPa	MD	433	—	ASTM D882
E-Modulus	MPa	TD	661.6	—	ASTM D882
Elongation at Break	%	MD	243	—	ASTM D882
Elongation at Break	%	TD	40.2	—	ASTM D882
Heat Shrinkage	%	MD	2	—	ASTM D1204; 95°C/10 sec, water
Heat Shrinkage	%	TD	65	—	ASTM D1204; 95°C/10 sec, water
C.O.F. (static / kinetic)	µs/µk	—	0.466 / 0.433	—	ASTM D1894E
Haze	%	—	5.1	—	ASTM D1003
Gloss (45°)	—	—	90.6	—	ASTM D2457
Density	g/cm ³	—	0.92 ± 0.02	—	ASTM D792

Note: Heat shrinkage measured at 95°C for 10 seconds in a water bath (ASTM D1204) — a higher activation temperature than the PETG grade (85°C). TD shrinkage of 65% confirms suitability for full-body sleeve applications. Density of 0.92 g/cm³ is below 1.0 g/cm³, enabling float-sink separation from PET bottle flake (density ≈1.38 g/cm³) in the water-based recycling stage. Unit correlation: MPa = kg/mm² × 9.8; psi = kg/mm² × 1422.

Selection Guidance: Polyolefin is appropriate where sustainability is a formally defined specification requirement. Its density below 1.0 g/cm³ provides a float-sink recyclability advantage on PET containers: ground polyolefin sleeve flake floats in the water-based separation step and is physically removed without contaminating the rPET stream. Solvent seaming is achievable in the South African market using validated THF/1,3-Dioxolane blends or α-Pinene, but the correct ratio and process parameters must be confirmed for the specific film grade and equipment. Polyolefin is the most heat-sensitive of the four films and requires strict adherence to the 30°C maximum storage temperature. Shrink tunnel parameters and container compatibility must be validated in trials before commercial commitment.

SECTION 5 — SEALING PARAMETERS AND FAILURE MODES

Sealing performance is a primary determinant of sleeve quality in production. Correct film selection may be negated by inadequate sealing process control. The following parameters apply regardless of film type and must be established and maintained for each film and sleeve format.

5.1 Seaming Process Overview

Shrink sleeve seaming converts a flat, slit, printed film roll into a continuous tube by bonding the two longitudinal edges together. The dominant method for PVC, PETG and cPET is solvent seaming (also referred to as solvent welding), in which solvent chemically softens the polymer surfaces at the overlap zone to form a strong, low-visibility bond. The process is carried out on dedicated seaming machines after printing and slitting.

The following steps apply to all solvent-seamed film types:

- Slitting: The printed roll is slit to the exact lay-flat width required for the sleeve circumference, including the seam overlap allowance. Cut edge quality is critical — square, clean edges with no bevelling are required for consistent seam strength and appearance.
- Solvent application: A controlled volume of solvent is applied to one edge of the film as it unwinds on the seaming machine. Application methods include needle, wick and gravure wheel systems, depending on the machine design and solvent viscosity. Solvent volume must be matched to web speed to avoid weak bonds (under-application) or blocking, embrittlement and seam whitening (over-application).
- Forming and overlap: The film is folded and the solvent-treated edge is overlapped with the opposite edge under controlled nip pressure to form the tube. The overlap width is typically 4–8 mm, as detailed in Section 5.3.
- Curing and drying: The seam sets as the solvent evaporates. Inspection — often automated — checks seam strength, appearance and for defects including whitening, embrittlement and internal welding. A curing period of 24–48 hours is sometimes recommended before full seam strength testing, particularly for PETG and cPET.
- Finishing: Perforations (for tamper-evidence or easy opening), rewinding into finished rolls or cutting into individual sleeves as required.

Seaming machines range from entry-level units to high-speed servo-controlled systems (such as the Karlville K-series and equivalent machines from other manufacturers). Film thickness, additives, print inks and surface treatments all influence seam results — process parameters established on one film or ink system should always be revalidated when any of these variables change. Solvent handling requires appropriate environmental and safety controls for volatile organic compounds (VOCs).

5.2 Seam Overlap

The seam overlap width is typically 4–8 mm, determined by film type, sleeve diameter and applicator design. The lower end of this range applies to thinner gauge films and smaller sleeve diameters. The upper end applies to larger diameters and to polyolefin grades where greater bonding area is required. Insufficient overlap produces weak seams; excessive overlap creates a visible seam line and may affect shrink uniformity.

5.3 Solvent Volume

For solvent-seamed films (PVC, PETG, cPET), solvent application volume must be consistent and precisely controlled. Under-application results in poor bond formation, edge lift and sleeve opening. Over-application causes blocking, curling, brittleness and retained odour. For cPET, the THF/1,3-Dioxolane ratio must be established and validated for the specific film grade in use.

5.4 Nip Pressure

Nip pressure must be sufficient to consolidate the bonded overlap without distorting the film. Inadequate pressure produces uneven seam width, incomplete bonding and inconsistent sleeve diameter. Excessive pressure may damage the film at the seam zone or cause distortion visible in the finished sleeve.

5.5 Drying Time and Curing

For solvent-seamed films, adequate solvent flash-off must occur before rewinding or cutting. Insufficient drying time produces blocking between reel layers, retained solvent odour and compromised seam integrity. Drying time requirements depend on the solvent system, solvent application method, ambient temperature, relative humidity and production speed.

For PETG and cPET specifically, a curing period of 24–48 hours is sometimes recommended before full seam strength testing is conducted. Seam strength measured immediately after seaming may not reflect the bond quality that will be present during application and shrinking. Final seam approval should be based on testing conducted after the appropriate curing period and after shrink tunnel exposure.

5.6 Web Tension

Incorrect web tension during seaming produces curling, loss of lay-flat, telescoping rolls and applicator feeding problems. Web tension must be controlled throughout seaming and rewinding to ensure roll geometry and sleeve dimensions are consistent.

5.7 Seam Position

The seam is normally positioned at the rear of the pack, away from primary graphics, away from barcode areas where practicable, and away from high-shrink stress zones where possible. Seam placement is agreed during pre-production and must be maintained in production.

5.8 Shrink Tunnel Verification

Seam integrity must be assessed after exposure to the shrink tunnel, not only prior to it. A seam that meets acceptance criteria before heat exposure may fail once the sleeve shrinks under load. Final seam approval must be based on results from a post-shrink evaluation conducted under production tunnel conditions.

Shrink tunnel parameters requiring control include: steam pressure, hot-air temperature, dwell time, conveyor speed, container temperature, container wall rigidity, seam position and wrinkle formation.

5.9 Sealing Method Comparison by Film Type

Film Type	Standard Sealing Method	Process Complexity	Seam Strength	Primary Risk Factor
PVC	Solvent seaming	Low	Good	Solvent volume control
PETG	Solvent seaming	Medium	Good — with controlled parameters	Seam cracking under elevated shrink force
cPET	Solvent seaming — THF + 1,3-Dioxolane (same chemistry as PETG)	Medium	Grade-dependent	Validate ratio and parameters per grade; do not assume direct transfer from PETG process
Polyolefin	Heat, adhesive or ultrasonic	High	Method-dependent	Weak seal or visible seam line

SECTION 6 — STORAGE REQUIREMENTS

Shrink film is a technically sensitive packaging material. It is susceptible to heat, mechanical stress and humidity. Storage conditions that would be acceptable for standard plastic films can cause dimensional, mechanical and surface changes in shrink film that affect every stage of the converting and application process.

Premature shrinkage, roll blocking, loss of lay-flat, seaming problems, print registration errors, telescoping and inconsistent sleeve diameter are potential consequences of inadequate storage practice. These defects typically become apparent at the point of use.

6.1 General Storage Requirements — All Film Types

- Store indoors at 15–25°C; 45–60% relative humidity; maximum 30°C
- Keep rolls in original packaging until required for production
- Protect from direct sunlight, heat sources, solvents and strong odours
- Implement FIFO stock rotation
- Allow 24–48 hours acclimatisation in the production environment before printing, seaming or application
- Protect roll edges from impact — edge damage causes web breaks and tracking problems in production
- Avoid excessive roll stacking — weight on lower rolls increases blocking risk
- Allow roll temperature to stabilise inside its packaging before unwrapping when moving from cooler to warmer environments

6.2 Film-Specific Storage Risk Profiles

PVC: Primary risk is heat-related dimensional loss. Prolonged storage at elevated temperature can result in premature shrinkage of lay-flat width, creating sleeve diameter and application problems.

PETG: Temperature variation causes dimensional instability. Elevated storage temperatures produce shrinkage, uneven lay-flat and tension changes that propagate through all subsequent converting operations. PETG must not be stored under uninsulated roof sheeting or adjacent to sun-exposed warehouse openings.

cPET: Store as per PETG: 15–25°C, maximum 30°C, stable humidity, original packaging. Shrink consistency and seam strength effects are grade-dependent; follow the supplier's specific recommendation. Printed rolls using washable ink systems should be handled carefully to avoid ink disturbance before the recycling wash stage.

Polyolefin: Polyolefin is the most heat-susceptible of the four films — more so than PVC, PETG or cPET. The 30°C maximum storage temperature is a firm upper limit for polyolefin and should not be exceeded. In addition, polyolefin is subject to corona treatment decay. A roll that is dimensionally and visually sound may produce ink adhesion or solvent seaming failures if the surface treatment level has declined. Dyne level must be confirmed before printing or seaming on stored rolls.

6.3 Storage Comparison by Film Type

Film Type	Storage Sensitivity	Primary Storage Risk	Recommended Conditions
PVC	Lower than other films	Blocking and dimensional loss under sustained heat; slightly more tolerant than PETG, cPET and Polyolefin	15–25°C, dry, away from heat sources
PETG	High	Dimensional instability; seam performance degradation	15–25°C, stable temperature, original packaging
cPET	High	Dimensional instability under warm storage (grade-dependent)	15–25°C, maximum 30°C, original packaging; follow supplier guidance
Polyolefin	High (most heat-susceptible of the four)	Premature shrinkage above 30°C; surface treatment decay; static accumulation	15–25°C, dry, UV protected, static controlled

6.4 Storage After Printing

Printed shrink film requires more careful handling than unprinted film. Ink systems, coatings and residual solvents introduce additional risks during storage of printed rolls.

- Ensure ink is fully cured or dried before rewinding
- Apply controlled, consistent rewind tension
- Do not store printed rolls in elevated temperature areas
- Protect from dust, moisture and solvent vapour
- Keep printed rolls in wrapped condition until required
- Observe the ink supplier's and film supplier's recommended storage period for printed stock

Table 6.1 — Post-Printing Storage Failure Modes

Failure Mode	Primary Cause	Consequence
Ink offset	Ink not fully cured prior to rewinding	Print transfers to the adjacent film layer on the roll
Roll blocking	Retained heat, roll pressure or residual solvent	Roll fails to unwind cleanly
Weak seam at printed zone	Ink or coating present in the seam bonding area	Inadequate adhesion at seam line
Curling	Uneven drying or inconsistent rewind tension	Poor web tracking and sleeve formation
Retained solvent odour	Insufficient evaporation time before rewind	Compliance or customer complaint on finished pack

6.5 Storage After Seaming

Seamed reels and cut sleeves require specific storage controls because residual solvent, adhesive or heat can continue to affect the film and seam following production.

Solvent-seamed films (PVC, PETG, cPET): Sufficient solvent flash-off time must be allowed before packing into cartons. Seamed stock should be stored in ventilated conditions, away from heat, with carton stacking weight minimised. Blocking, seam brittleness and residual odour should be checked before dispatch.

Adhesive or heat-seamed films (Polyolefin): Adhesive must be allowed to cool and cure fully before packing. Rolls should not be subjected to elevated temperatures or heavy stacking pressure after seaming. Adhesive bond strength should be confirmed after any period of warm storage. Adhesive formulation must be verified not to soften under expected warehouse temperature conditions.

6.6 Acclimatisation Before Use

Transfer of film from a cooler storage environment to a warmer production area introduces temperature-related dimensional movement and the risk of condensation on roll surfaces. These effects influence web tension, lay-flat width, print registration, seaming overlap and sleeve dimensions.

Recommended acclimatisation periods: Small rolls — minimum 24 hours in the production environment; large rolls and pallets — 24 to 48 hours; rolls received from cold storage or under winter conditions — allow additional time as required.

Rolls should not be unwrapped immediately on arrival in a warm production area. The roll should be allowed to reach ambient temperature inside its packaging before unwrapping, to prevent condensation forming on the film surface.

6.7 Shelf Life Reference

Shelf life is dependent on film grade, gauge, surface treatment and storage conditions. The following provides practical guidance only — the film supplier's specific recommendation takes precedence.

Film Type	Primary Shelf Life Risk	Practical Guidance
PVC	Heat ageing; blocking under warm storage conditions	Observe FIFO; avoid storage in areas with fluctuating or elevated temperatures
PETG	Dimensional change and blocking under elevated storage temperatures	Avoid extended storage periods; do not store in uninsulated warehouses
cPET	Dimensional change and seam performance degradation under elevated storage temperatures	Store as PETG; confirm shelf-life requirements with the specific film supplier
Polyolefin	Surface treatment decay — film may appear sound while bonding performance is compromised	Verify dyne level before printing or adhesive seaming on rolls stored beyond 3 months

SECTION 7 — INCOMING MATERIAL AND PRE-USE CHECKS

The following inspection procedure should be applied to all shrink film received into stores, and to any rolls retrieved from storage prior to use. Early identification of out-of-specification material prevents production stoppages and defective sleeve output.

7.1 All Film Types

- Roll edges are undamaged — no dents, cuts or deformation
- No telescoping visible in the roll profile
- No blocking between film layers on the roll
- No strong or unusual odour
- No visible dimensional distortion or premature shrinkage
- No waviness or irregular lay-flat profile
- No condensation on roll surface or inside packaging
- Lay-flat width is within the specified tolerance
- Roll unwind tension is consistent and appropriate
- Film identity, grade, batch number and supplier are confirmed and match the delivery documentation

7.2 Solvent-Seamed Films (PVC, PETG, cPET) — Additional Checks

- Seam does not lift when individual sleeves are flexed by hand
- Seam does not crack under manual flexing
- No residual solvent odour
- No seam whitening or haze at the seam line
- Sleeves open freely without adhesion between layers
- Sleeve internal diameter is consistent along the length of the roll

7.3 Polyolefin Films — Additional Checks

- Verify corona treatment level by dyne testing if the roll is intended for printing or adhesive seaming
- Assess static level — excessive static may indicate low ambient humidity or treatment decay
- If the roll has been pre-seamed, confirm adhesive bond strength is within specification
- Confirm that the film tracks correctly through the applicator before committing to a production run

SECTION 8 — FILM SELECTION SUMMARY

Film selection is determined by a combination of technical, operational and commercial requirements. The following reference summarises the primary selection criteria for each film type.

Film Type	Typical Application	Key Advantage	Primary Constraint	Sealing Method
PVC	High-volume, cost-sensitive; standard container shapes; lines with older shrink tunnel infrastructure	Widest processing window; easiest to seam; price now broadly comparable to PETG	Chlorine content; recycling contamination on PET bottles; declining brand owner acceptance	Solvent seaming — lowest process complexity of the four
PETG	Premium products; complex or contoured container shapes; full-body sleeves; high transverse shrink requirements	Highest shrink performance; excellent optical clarity and print quality	Higher material cost; elevated shrink force on lightweight containers; PET recycling contamination risk	Solvent seaming — requires precise parameter control; post-shrink seam validation essential
cPET	Applications requiring PETG-equivalent shrink performance combined with PET bottle recyclability; full-body sleeves for beverage, cosmetic and pharmaceutical containers	PET-recycling-stream compatible; TD shrink 60–80%; excellent clarity; supports washable ink systems and APR recyclability recognition	Grade- and supplier-specific; washable ink required for full recycling benefit; validate shrink curves and seaming parameters per grade	Solvent seaming — THF + 1,3-Dioxolane (same chemistry as PETG); ratio to be validated per grade
Polyolefin	Sustainability-specified applications; PE or PP container formats; chlorine-free material requirements	Chlorine-free; density below 1.0 g/cm ³ enables physical float-sink separation from PET bottle flake in recycling — ground sleeve flake floats and is skimmed off without contaminating the rPET stream; lower material weight per sleeve	Seaming solvent must be validated per grade (THF/Dioxolane ratio or α -Pinene); most heat-susceptible of the four films; surface treatment must be actively managed	THF/1,3-Dioxolane solvent blends (80:20 or 70:30) or α -Pinene; heat, adhesive or ultrasonic also applicable. Solvent ratio and method must be validated per grade

Film selection decisions should be based on confirmed run lengths, container substrate and geometry, required shrink performance, available line equipment, quality specifications, sustainability requirements and applicable brand owner guidelines. Sealing process validation and storage management are integral to achieving specified film performance in production.