LIST OF CONTENTS:

1. RELATED DOCUMENTS

The following documents are non-public and can be provided to customer upon request and subject to nondisclosure agreement.

1.1. ISO 2859-1 "Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection";
1.2. RETAL Material approval procedure (MAP);
1.3. Commission Regulation (EU) No. 10/2011.

2. SCOPE

This specification applies to the monolayer preforms made of polyethylene terephthalate and produced at the Retal production sites in EU region.

3. TERMINOLOGY

3.1. **Monolayer preform** – preform consisting of one layer of PET.

3.2. **Multi-layer preform** – preform consisting of an inner layer of gas barrier materials, providing a gas barrier properties for a blown bottle, covered by an injection moulded outside and inside layers of PET.

3.3. **Barrier** – materials helping to block carbon dioxide release from the bottle (passive barrier) and oxygen ingress into the bottle (active barrier) to ensure the required shelf life for the contents.

Barrier properties can be ensured adding:

- barrier additives: these are additives that can be added in liquid form or as a Master Batch;

- coating: this can be applied both internally and externally;

- multilayer: an intermediate layer with a barrier.

3.4. **Additives** – materials providing standard PET resin with specifically required properties such as colour, barriers to oxygen and CO_2, absorption of UV and IR light, scavenging of acetaldehyde and of oxygen, antistatic, light reflection or scattering, reduce friction and other properties.

3.5. **PET resin** – polyethylene terephthalate, commonly abbreviated also as PETE.

3.6. **rPET resin** – recycled PET resin in flake or pellet form, created from post-consumer beverage bottles.

3.7. **IV** – Intrinsic Viscosity – is a measure of a solute's contribution to the viscosity of a solution. IV is dependent upon the length of PET polymer chains. The longer the chains, stiffer the material and higher the Intrinsic Viscosity. Bottle grade PET is of IV 0.74-0.86 dL/g.

3.8. **AA** – acetaldehyde – by-product resulting from PET degradation.–Acetaldehyde can change the taste and flavour of foods packaged in PET, particularly mineral water.

3.9. **Bottle processing** – stretch blow moulding process, during which the preforms are heated (typically using infrared heaters) above their glass transition temperature, then blown using high-pressure air into bottles using metal blow moulds. The preform is always stretched with a core rod as part of the process.

3.10. **Trial** – a test of the performance, qualities, or suitability of preform.

3.11. **Production lot** – number of items of the same type (preform ID) and composition, manufactured under uniform conditions at the essentially the same time, and accompanied by one certificate of analysis.

3.12. **Shelf life** – is the recommended maximum time for which PET preforms can be stored, during which the defined PET preforms quality remains acceptable under normal (or specified) conditions of storage. The important criteria, which will affect the PET preforms performance and shelf life, are the storage conditions.

4. PREFORM DESCRIPTION

4.1. Monolayer preforms has 3 basic elements (Figure 1, indicating also more detailed elements of basic ones). In Figure 1, a typical preform is depicted. The preform consists of a neck portion (1), a gate portion (3) and a body portion (2) extending between the neck portion and the gate portion.

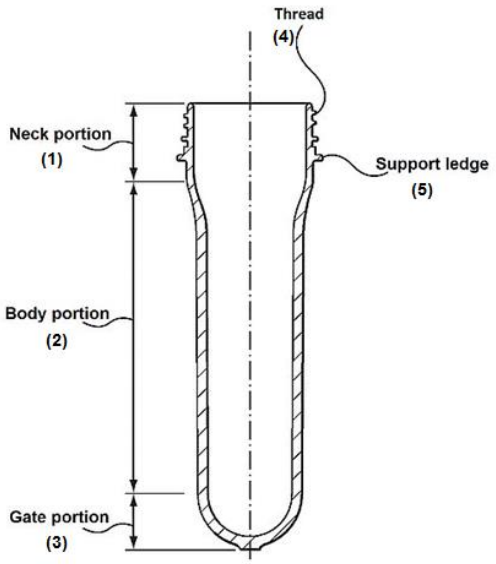


Figure 1. Monolayer preform

4.2. Preform has several additional structural features that fulfil one or more functions. Within the neck portion, there is a thread provided (4). The purpose for the thread is to mate with a complementary thread of a closure device (not depicted) to cap the final-shaped container that is produced from the preform, such as to contain a substance (such as a beverage or the like) contained within a final-shaped container produced from the preform (when such a final-shaped container is blow-moulded and eventually filled with the substance).

4.3. The neck portion also comprises a support ledge (5). The support ledge performs multiple functions including, but not limited to, coupling with various handling devices and structures during injection moulding and blow moulding stages of production of the preform (for example, coupling with guiding rails) and the final – shaped container from the preform (for example, coupling with the blow-moulding equipment to provide sealing, etc.).

4.4. Body and gate portions – a generally tubular preform body portion and an integral preform bottom structure – gate portion – closing a lowermost end of the preform during stretch blow moulding forms a generally tubular bottle body portion and an integral bottle bottom structure closing a lowermost end of the bottle body portion.

4.5. Preform design is combination of preform length, weight and wall thickness to obtain stretch ratios needed for blow moulding of bottles. Main dimensions of preform listed in Table 1 and Figure 2.

Table 1. Abbreviation description

Diameter	*D1/DUS*	*Diameter under support ledge*
	D3/BD	*Base Diameter*
Thickness	*S1/WT*	*Wall Thickness*
	S3/WTB	*Wall thickness at Bottom*
Length	*H/TL*	*Total Length*
Gate		*Gate*

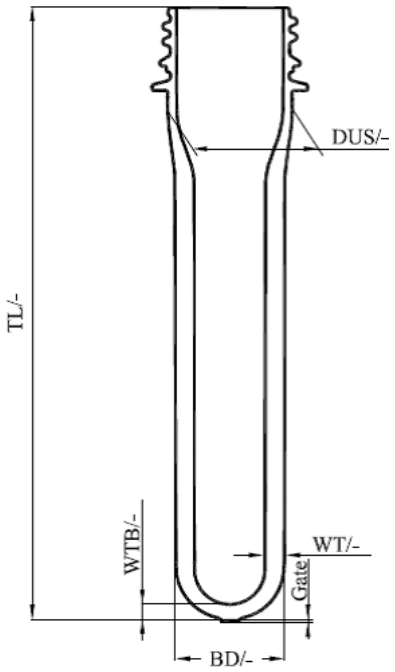


Figure 2. Preform dimensions

4.6. The area between thread and support ledge, among other, can contain the embossed logo of preform manufacturer (Please note, that the word “RETAL” and the stylized globe (logo) and the word “RETAL” are trademarks of RETAL Industries Limited, used under license by respective closure manufacturer), mould number, and cavity number (example of engraving place is shown in Figure 3).

Figure 1. Example of engraving

5. RAW MATERIALS, COLORANTS AND ADDITIVES

5.1. Only raw materials, colorants and additives approved for a direct contact with food can be used for production of preforms according to Commission Regulation (EU) No. 10/2011.

5.2. They must be approved for use in RETAL, according to MAP (Material Approval Procedure) or internal rules and procedures, which are in use at the manufacturer’s site.

5.3. The exclusions of these rules can be agreed upon with the customer, if it is requested.

6. INSPECTION AND ACCEPTANCE QUALITY LIMIT (AQL)

6.1. Every single delivered production lot of preforms has passed inspection at producer to ensure conformity to all known to us safety and quality standards as indicated in the table below (Table 2). However, customers are encouraged to perform their own inspections of incoming goods. The production lots of preforms can be accepted/rejected by a customer according to the rules laid down in this specification.

Table 2. Preform characteristics

№	Product characteristics	Values required	Method of verification
1.	Visual appearance	Defect types and classification on severity	RTMP 1.1. Visual
2.	Colour	Within agreed reference No streaking of colorant Has to be evenly coloured	RTMP 1.2. Visual/spectrophotometry
3.	Dimensions verification with go-no-go gauge	According to technical data sheet	RTMP 1.3. Go-No-Go
4.	Dimension measurements of length, diameter, wall thickness	According to technical data sheet	RTMP 1.4. Callipers, magnetic thickness gauge, height gauge
5.	Weight	According to technical data sheet	RTMP 1.5. Weight
6.	Acetaldehyde content	15 ppm (general) up to <1 ppm on customer requirements.	RTMP 2.1. Grounded method/Non-grounded method
7.	IV drop	0,03 drop from resin IV	RTMP 2.2. IV solvent method/Melt method

Note: For recommendations/support on proper adjustment/settings for bottles blowing process please refer to RETAL experts.

6.2. The sampling for quality control of preforms compliance with the requirements of the current specification is carried out in accordance with ISO 2859 according to a normal, single sampling, inspection plan at the general level of inspection II and values of acceptance quality limit (AQL) as shown in Table 3.

6.3.

Table 3. Preform defects list

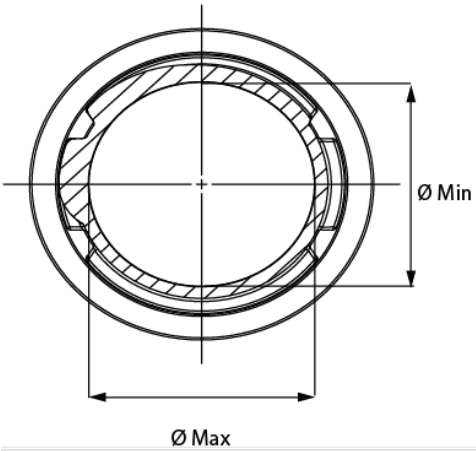
ID Defect	Preform defect definitions	Picture
1	2	3
Unacceptable defects are defined as defects that may cause damage to the health of the final user. No A.Q.L. can be assigned to these non-conformities		
Unacceptable defects		
RPD-1	**Odour** – no off odours	
RPD-2	**Finish damage/ finish moulding defects** – damage to the finish or to the top sealing surface of the preform that would adversely affect the sealing integrity to the package	
RPD-3	**Short shots**	
RPD-4	**Neck ovality**, which may cause damage to the machinery or lead to production problems and generally reduce the effectiveness of production line. The range in neck finish internal diameter as measured around its internal circumference is +/-0.13 mm. [Max diameter] – [Min diameter] tolerances is +/-0.13 mm	
RPD-5	**Preform colour do not comply** with approved standard for all Lot.	

Table 3. Preform defects list

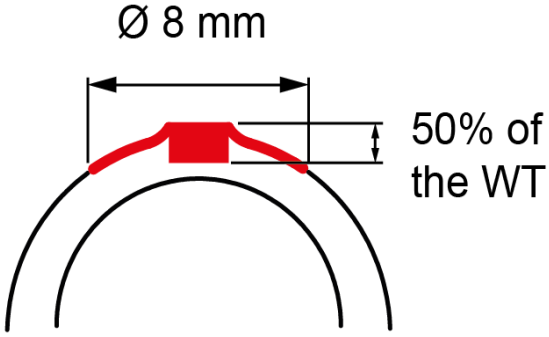
1	2	3
RPD-6	**Label** non-conformity – wrong or missing label	
RPD-7	**Incorrect or mixed preforms** in container	
Critical defects are those defects, obvious or hidden, which seriously affect the functionality of the container and/or the quality of the product		
Critical – AQL level 0.0015%		
RPD-8	**Cracks, holes** – any hole, pinhole, or other hole anywhere in the preform that would cause product leakage and/ or spoilage.	
RPD-9	**Crystallization around the injection point** – crystallinity in gate area to be within a 8 mm diameter centred on gate preform base diameter less than 35 mm	

Table 3. Preform defects list

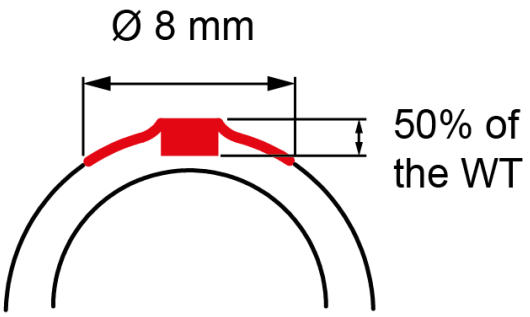
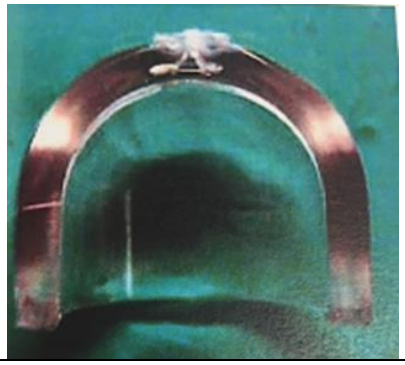
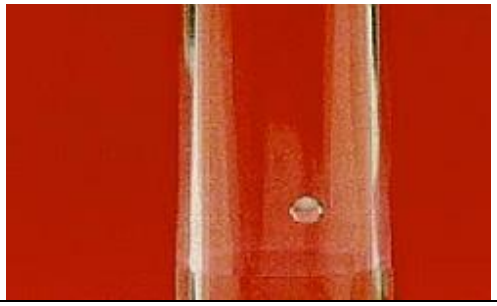
1	2	3
RPD-10	**Crystallization in the preform bottom** – when exceed 50% of the thickness in the injection point	
RPD-11	**Gate void** – a hollow blister appearing as a conical cavity in the preform wall just below the gate vestige. Sometimes associated with a pinhole in the gate.	
RPD-12	**Unmelts** – any unmelts in excess of 1 mm of diameter.	
RPD-13	**Air bubbles** – any air bubble in excess of 1 mm of diameter.	

Table 3. Preform defects list

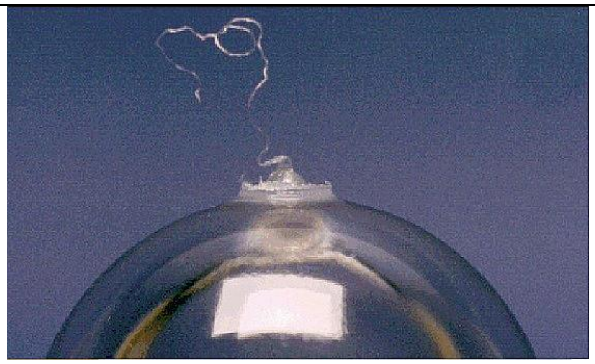
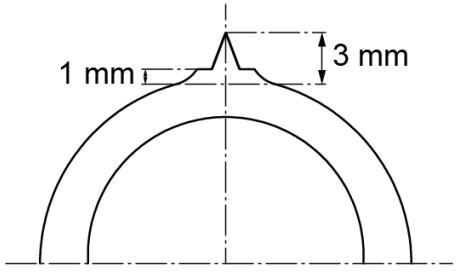
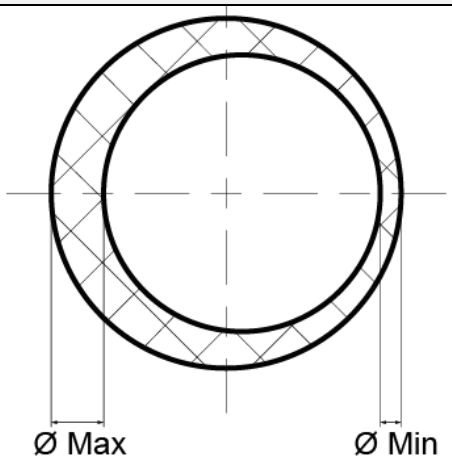
1	2	3
RPD-14	**Internal gate sink** – an internal gate depression directly below gate nub	
Major defects are defects that cause waste, losses and/or reductions in the efficiency of bottling lines and negatively affect the functionality of the container		
Major Defects – AQL level 0.065%		
RPD-16	**The dimensional characteristics** of the preforms do not conform to the drawing	
RPD-17	**Weight outside the standard limit** – see tolerances in the technical data sheet of preform	
RPD-18	**Stringing** – length over 3 mm	
RPD-19	**Long gate nub** – length over 3 mm	

Table 3. Preform defects list

1	2	3
RPD-20	**Wall thickness variation (concentricity) –** any wall thickness not within specified tolerances (if specified) that affects line performance but not bottle properties. The value is measured on an orthogonal section of the preform body at 5 mm from the body/bottom split line.	
RPD-21	**Flash not on finish** – mould line/parting line mismatch or any external body flash over 0.2 mm:	
RPD-22	**Moisture marks**	

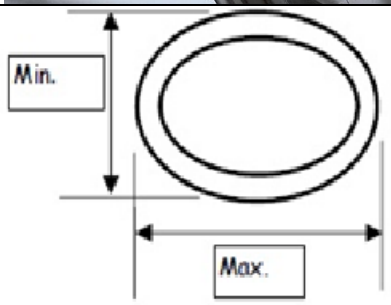
1	2	3
RPD-23	**Haze, crystallinity** in the side wall	
RPD-24	**Splay marks**	
RPD-25	**Preform body ovalization** more than 0.2 mm expressed as difference between [max diameter] – [min. diameter].	
RPD-26	**Burn marks**	

Table 3. Preform defects list

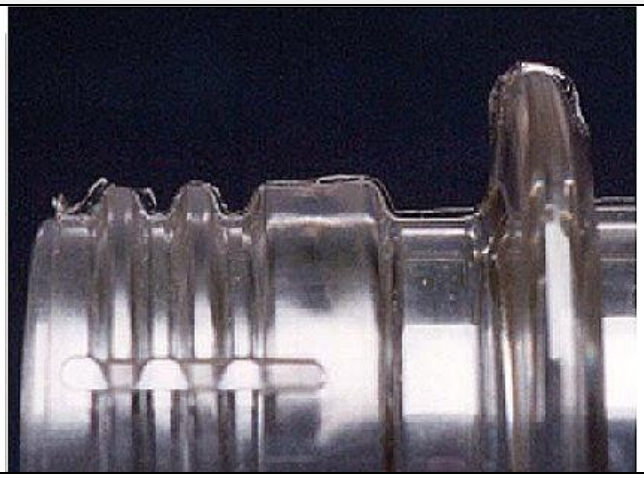
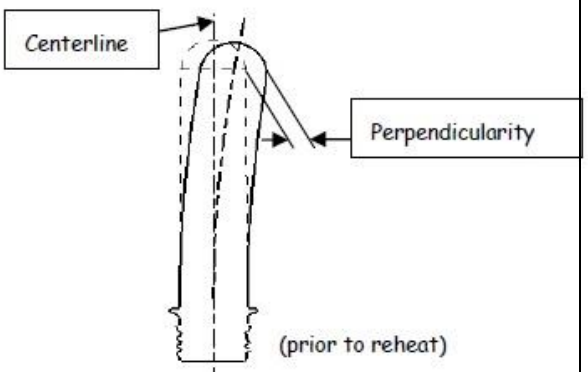
1	2	3
RPD-27	**Flash** on the finish more than 0.125 mm	
RPD-28	**Colour deviation** – visible colour deviation from approved between client and Retal colour standard	
RPD-29	**Preform axial deviation**: Preform length (<120 mm) – greater than 1.2 mm. Preform length (>120 mm) – greater than 1.75 mm	
RPD-30	**Degradation** – thermal degradation yellow preforms	

Table 3. Preform defects list

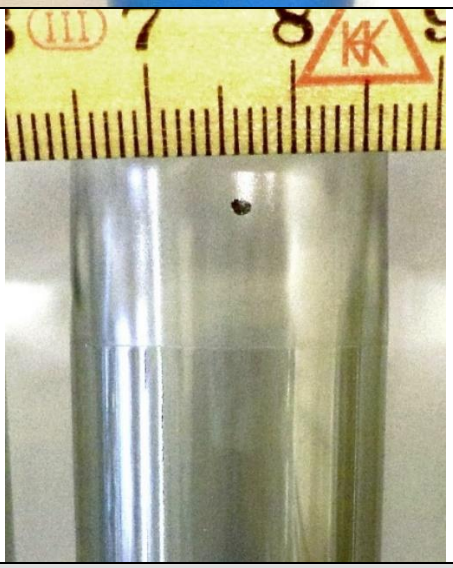
1	2	3
Minor defects are those non-conformities, essentially of an aesthetic nature, that do not cause interruptions in production and do not significantly damage the functionality of the container.		
Minor Defects – AQL-1%		
RPD-31	**Peeling in the injection point** – when length is more than 10 mm measured from the injection point.	
RPD-32	**Embedded contamination (for virgin material)** – material or inclusion not capable of getting loose and into, or in contact with, the beverage. Non-metal, non-glass, or defined contamination is not allowed if any one particle is greater than 0.8 mm in size or more than four particles of any size visible to the unaided eye, observing a nearby small object without a magnifying glass or a microscope, the usual distance is 20-25 cm. At this close range, 0.05 mm can be seen clearly.	
RPD-33	**Colour deviation** – colour streaks	

Table 3. Preform defects list

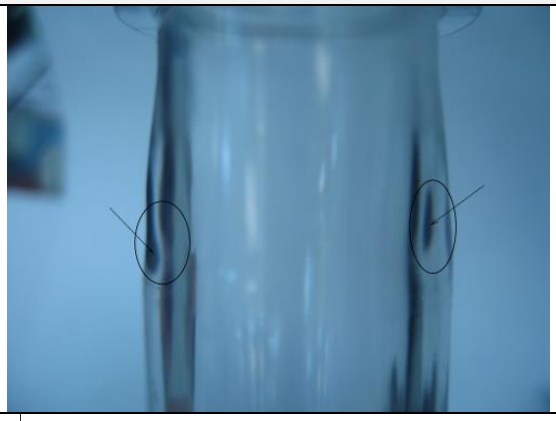
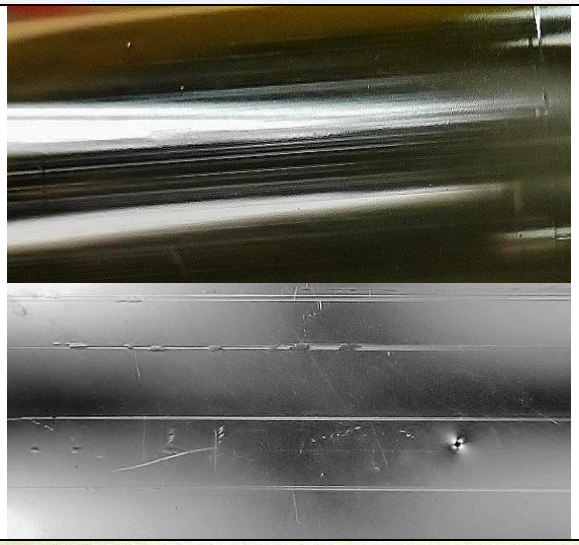
1	2	3
RPD-34	**Sink marks**	
RPD-35	**Parting line indentation** more than 0.05 mm	
RPD-36	**Gate dimpling –** orange peel	

Table 3. Preform defects list

1	2	3
RPD-37	**Scratches on preforms body** – visible scratches which has an impact to blown bottle aesthetic appearance.	
RPD-38	**Long gate nub** more than 2 mm	
RPD-39	**Colour residues**	

7. INSPECTION OF CONSIGNMENT

7.1. Each delivery is a subject to visual inspection by the customer to determine the integrity of the packaging and labelling compliance;

7.2. To control the integrity and labelling of the shipping container, the following number of samples (shown in Table 4), should be selected from the delivery:

Table 4. Sampling algorithm

Quantity of shipping containers per lot, pcs	Quantity of shipping containers to be inspected, pcs
Up to and including 15	All pieces
16-200	15

7.3. Acceptance criteria for packages:

- No label – AQL level 0%;
- Pallets non-compliant in terms of hygiene and microbiology – AQL level 0%;
- Box/cover damaged (intact liner):
  - If the secondary packaging (cardboard/box cover) is damaged and is not causing any risk to the product and work safety, the primary packaging (inlayer) is homogeneous (without any damage), this is not considered as critical defect and the load can't be rejected;
  - However, if the primary packaging (inlayer) is also damaged, then the damaged boxes must be segregated and returned to the seller;

8. PACKAGING

8.1 Packaging must protect the product from contamination, rain, snow, and mechanical damage.

8.2 Preforms are placed into transparent, food grade and disposable plastic bags, made of polyethylene film, which are laid in octabins made of corrugated cardboard or metal containers;

8.3 The free ends of the plastic bag must be sealed. Top of metal container covered with plastic bag.

Figure 4. Product packaging

8.4 Other methods of packaging, which ensure the integrity of preform quality, can be implemented only if agreed to with a customer in writing.

8.5 Detailed information on packaging used can be provided upon request or given in Packing list;

8.6 Acceptable/tolerable deviation of preforms quantity in one package must not exceed ± 1% if not otherwise agreed to by the seller and the buyer. Claims within this range will be deemed unjustified.

9. MARKING/LABELLING

9.1. Packaging with preforms (containers, octabins) is marked with a label (for example, see Figure 5) on two adjacent sides of the packaging;

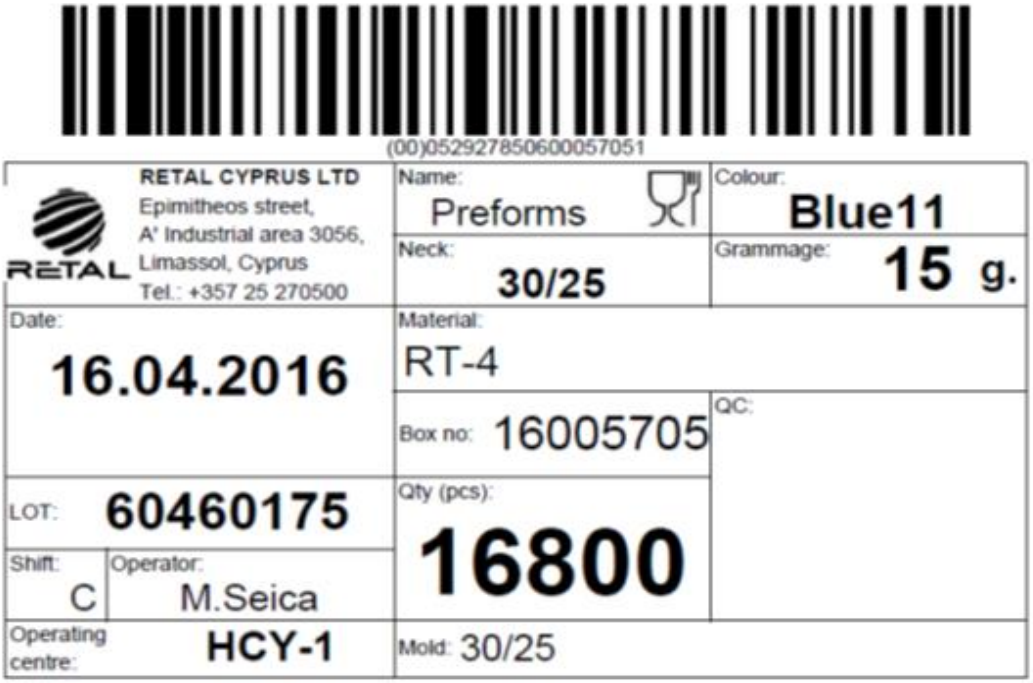


Figure 5. Label sample

9.2. The label contains the following information:

- SSCC barcode;
- Name and address of the manufacturer;
- Food safe symbol (a wine glass and a fork);
- Nominal weight of the single preform, neck finish standard and colour;
- Lot number;
- Box identification (number)
- Date of manufacture;
- Raw material code or name;
- Quantity of preforms in a package;
- Working line identification.

9.3. Other information on label is allowed if agreed with customer.

10. PREFORM IDENTIFICATION AND TRACEABILITY

10.1. Additional information can be included on label based on customer requirements. In order to be identified, preforms have engraving on outer surface, where cavity number, mould number are indicated, as shown in p. 4.6;

10.2. Preform traceability is achieved via the lot number (p. 3.12), which can be found on the packaging label (p. 9).

11. TRANSPORTATION

11.1. Transportation must be carried out under the best hygienic and technical conditions to ensure proper preservation of packaging, able to prevent dirt, moisture and any possible damage in all covered type of transport. It is not allowed to carry any hazardous goods together with preforms as well as non-food grade goods or other goods that may impact the organoleptic properties of preforms.

12. STORAGE CONDITIONS

12.1. PET preforms must be stored in the original packaging – octabins or metal containers – inside their liner bags, kept sealed and with their original cover, in closed dry well-ventilated warehouse, in conditions, that exclude the impact of aggressive media and foreign smell, in places, protected from moisture and direct sunlight, at a temperature ranging from +5 to +45 ^{o}C and a relative humidity 25 – 80% at least 1 m away from heating systems and heating devices.

12.2. Storage is acceptable stacked 3 high (but no more than 900 kg) for cardboards – palletized octabins in dry area (humidity impacts the cardboard crash resistance);

12.3. Storage is acceptable stacked 4 high for metal containers;

12.4. In case any additional questions regarding storage conditions arise, please consult the producer.

13. USAGE/STRETCH BLOWING

13.1. In accordance with the recommendations set forth in the technical data sheet;

13.2. It is strictly recommended to use preforms in the blowing process at a temperature 15 °C and above for at least 24 hours before blowing, to avoid facing unexpected difficulties and unwanted problems on the bottles obtained. The blowing parameters can be affected by seasonal environment climate changes. Therefore, it is strongly recommended to check and, if necessary, adjust them accordingly.

13.3. Intended for blowing into PET bottles at food industry companies. PET bottles may be used to dispense water, carbonated drinks, non-carbonated drinks (lemonades), fruit or vegetable juices (natural or concentrated), fats and oils, as well as alcoholic drinks.

13.4. Information provided within this specification and technical data sheet is based on empirical tests conducted in laboratories by ourselves and partners and is provided in good faith. However, this information can in no way be considered as a legal commitment or document and we reserve the right to amend or change this document as and when new information becomes available. It is imperative for a customer to check the suitability of our preforms for its intended use. A customer assumes full responsibility for compatibility of its other products/materials, setting/tuning of equipment and our preform. Meeting the requirements indicated above does not absolve the customer from the obligation to set/tune up the blowing equipment as required and needed, and also from carrying out compatibility tests (including industrial trials);

13.5. Technical assistance may be provided by RETAL experts under request.

14. PET PREFORM RETURN BACK TO THE RETAL COMPANIES

Only PET preforms with the defects mentioned in “27 PERFORM SPECIFICATION” chapter 6.3 can be returned to Retal Company.

Defected PET preforms must be segregated and stored in closed dry well-ventilated warehouse, in conditions, that exclude the impact of aggressive media and foreign smell, in places, protected from moisture and direct sunlight, at a temperature ranging from +5 to +45 ^{o}C and a relative humidity 25 – 80% at least 1 m away from heating systems and heating devices.

Defected or returned due to other reasons PET preforms must be returned in the original packaging – octabins or metal containers – inside their liner bags, kept sealed and with their original cover and label.

Annex A. Revisions / Validation of Modifications

Item No.	Date	Revisions / Modification Results (No modifications / paragraphs modified / version modified)	First name, last name of the person responsible
1	2018.03.02	Rev. 1.0	Renata Smataviciene
2	2020.04.29	Rev.2.0	Renata Smataviciene

Prepared:	Owner:	Informed:
Renata Smataviciene	Renata Smataviciene	Quality department Logistic department Sales department