Customer object specification

KRONES Cap Specifications

TD10023417 EN 02

KRONES

Table of Contents

Table of Contents

1 General information

1.1 Basic information

The indicated dimensions and tolerances are the minimum requirements necessary for the configuration of the different machines. Deviations of this specification must be reported in advance to .

This concerns the following parameters:
1. Shape/geometry and dimensional accuracy
2. Physical properties

The specification is to be understood as a supplement and as a clarification of a cap drawing. If the weight, tolerances and other requirements listed in the specification are exceeded, the warranty specifications may be restricted.

Sample caps:

Parts that depend on the caps can only be designed in conjunction with the original sample material. The sample material (small quantity, approx. 20 pieces) shall be provided by the customer in an early phase, however at the latest when the order is placed. This is especially the case when there are different cap suppliers (each supplier shall provide sample material).

Test caps:

Directly after placing the order, sufficient test caps (larger quantity) must be sent to . The exact number will be specified. These caps are part of the final test. If no original caps are available, offers no guarantee that the capper and the related assemblies (i.e. cap disinfection system, sorters, etc.) will function properly.

Despite the adherence to all the points indicated here, the cap manufacturer is not released from the obligation to ensure the processability of all caps under operating conditions at the customer's plant.

All statements in this specification correspond to our current state of knowledge. This way they do not have the meaning to assure specific properties of the products or their suitability with a certain operation purpose. We therefore recommend clarifying questions with.

1.2 Delivery and storage of caps

The caps must be stored dust-free, must not be touched by human hands and must not fall to the floor. Any contaminated caps may not be used.

Caps must be delivered carefully packaged – preferably on pallets. The packaging must not be damaged and must ensure that the caps are protected reliably against climatic influences – especially against air humidity variations. Fibreboard containers with inserted plastic bags, which are sealed with shrink or stretch film, are usually suitable for this purpose. Wooden pallets are not allowed in the aseptic clean room.

The caps must be stored so that no deformations can occur (observe individual stacking height of cap manufacturers). For caps which were stored for longer than 12 months, processing problems can occur that lead to reduced performance. Direct UV radiation foreign odours and temperature fluctuations during storage should be avoided. Otherwise, the harmlessness with regard to odour and taste, as well as the sealing and opening behaviour may be impaired.

It is not permissible to store the caps outdoors.

Before processing, the caps must be stored at least 24 hours at the machine or under identical ambient conditions.

1.2.1 Plastic caps

The caps must be stored originally packed. The storage place should have constant temperatures and should be cool and dry (guide values: 18 °C [min. 10 °C, max. 30 °C] and 50 % relative humidity). There must be no heat sources (e.g. radiators) in the immediate vicinity of the pallet parking space.

1.2.2 Caps made of natural materials

Storage of natural corks

The storage room should be well ventilated and free of substances with strong odours, e.g. fuel and lubricants. Here the storage temperature should not drop below 5 °C and a humidity of 50 – 70 % should be maintained. Before processing, natural corks must be stored at a temperature between 20 – 25 °C for 36 – 48 hours. It is not advisable to store natural corks for more than three months.

Storage of synthetic corks

Synthetic corks must be stored in a closed package up until their planned use. Synthetic corks should be stored in a clean, dry place separate from natural cork products. When the filling cycle is ended, all remaining caps should be removed from the cork vibration hopper and packaged in plastic bags. All opened bags with caps should be closed again and stored at the place intended for this purpose. Extreme storage temperatures for synthetic corks should be avoided (guide value: 18 °C and 50 % relative humidity).

The stock of synthetic corks should be used up within eight months after the production date. This date is located on the accompanying label on each packing carton of synthetic corks. Always use up corks first which were stored first. Stocks which were kept for longer than eight months should be checked again for the coating effectiveness.

1.2.3 General processing information

The processing temperature of caps must not significantly differ (max. temperature difference 10 °C) from the guide temperature (see data sheet of cap manufacturer). The table below serves as an aid for orientation.

The fault and reject quota can increase with greater temperature deviations. Deviations from the recommended temperature range must be discussed and checked individually, also see Chapter 1.2.1: 1.2.1 [▷ 5] on this topic.

In addition, specifications on the pressure stability (specifications as a result of internal container pressure) for plastic caps from the customer and/or manufacturer are required.

Typical processing temperatures for conventional filling		
Temperature of cap during capping	Minimum	Maximum
	18 °C	28 °C

1.2.4 Special features for aseptic caps

A laboratory examination is generally required to determine whether disinfection is possible. Coordination with regard to a laboratory examination must take place with KRONES.

The following information for caps with an injection-moulded liner must also be provided by the cap manufacturer for the selection of a suitable coupling system (hysteresis or magnetic coupling, servo technology).

The initial germ content of each cap must be less than 25 colony-forming units for high-acid applications and less than 10 colony-forming units for low-acid applications.

Properties of caps for aseptic with dry disinfection	Requirements
Properties of caps for aseptic with wet disinfection	**Requirements**
Cap	Gastight against penetration of H_2O_2 during the disinfection (> 1 bar gauge pressure), no diaphragm, H_2O_2-resistant
Thermal stress during the production process	No deformation at a reaction time of < 25 sec and T = 70 °C
Cap	No 2-piece flat caps (see Chap. 3.1.2: 3.1.2 [▶ 13]) or sport caps with inserted sealing film and no multi-piece caps with gaps or hollow spaces.
Thermal stress during the production process	No deformation with a reaction time of < 2 min and T = 40 °C

Depending on the cap-specific properties, caps can be classified as no longer processable after longer machine downtimes and longer dwell times in the cap disinfection system and must therefore be rejected.

1.3 Notes on processing and error tracking

It is imperative for processing the caps that they are fault-free, undamaged and without deformations. The limit dimensions are specified in the respective chapters. In addition, the caps must be of a single type and without contaminants. A batch identification is absolutely essential so that every error can be traced back to its origin.

With plastic caps, the mould number, the tool number and the manufacturer's code must also be inserted.

1.4 Labelability of caps

General notes on labelling caps:

If caps are to be labelled, they must generally be glueable; roughen the surface if necessary, e.g. with flaming units.

For caps that are to be labelled, gluing tests must be carried out by KRONES to make quantifiable statements on the processability.

2 CROWNS

2.1 Pry-off and twist-off

Specifications of crowns according to DIN 6099 serve for the general definition of crowns. This standard is for crowns with a seal (D) made of elastic material. The crown according to this standard is adapted to the dimensions of the neck finish for crowns according to DIN EN 14634 or DIN EN 14635 (originally DIN 6049-1).

The crown need not correspond to the visual representation (see Fig.: Crown according to DIN 6099); only the specified dimensions must be complied with.

2.1.1 Cap dimensions

	Twist-off & Pry-off Type F	Twist-off & Pry-off Type H
Inner diameter d1	26.75 + 0.15 mm	26.5 + 0.1 mm
Height h	6 ± 0.15 mm	6.5 + 0.1 mm
Outer diameter d2	32.1 ± 0.2 mm	32.0 + 0.2 mm
Radius r	165 ± 25 mm	150 mm
Metal thickness at mirror	0.235 ± 0.02 mm	
Number of serrations	21	

Other dimensions of crowns than described in the above table must be tested by for processability.

Hole gauge with which the dimensional accuracy of the crowns can be checked simply:

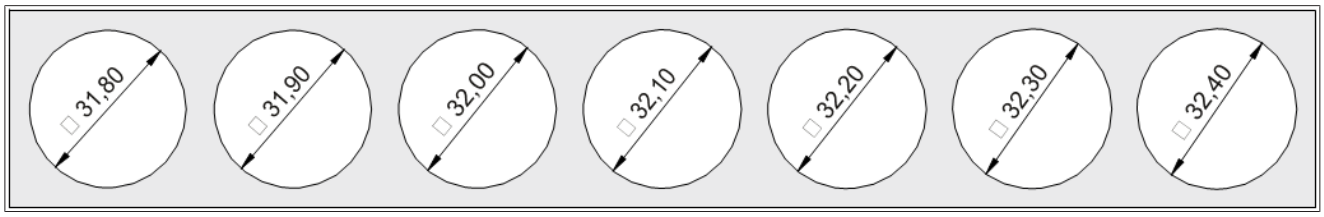


Fig. 1: Hole gauge for outer diameter 32.10 ± 0.2

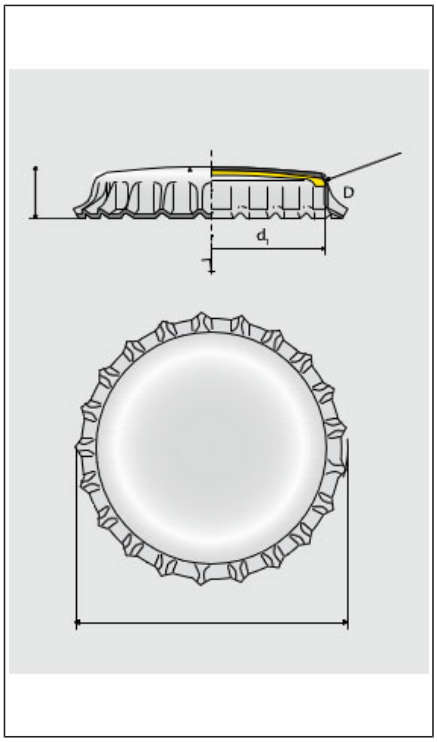


Fig. 2: Crown according to DIN 6099

Fig. 3: CROWNS

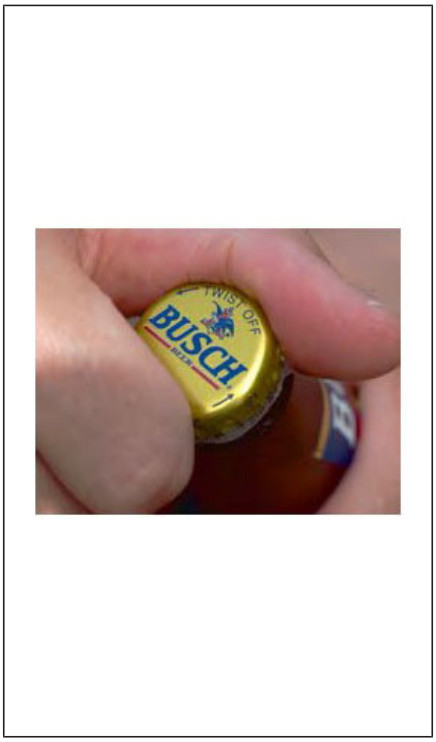


Fig. 4: Twist-off crowns

2.1.2 Neck finishes (pry-off and twist-off caps)

The neck finishes for various crowns are shown with dimensions in the following illustrations.

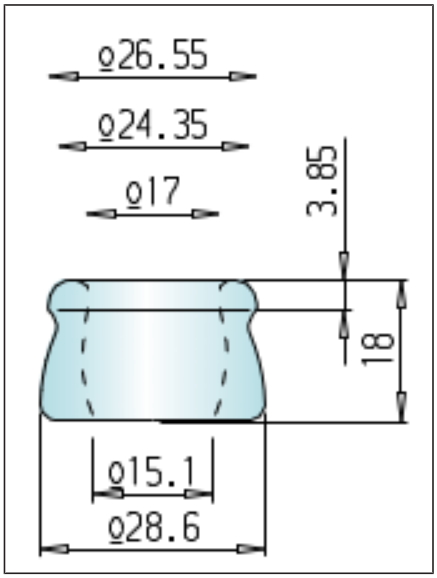


Fig. 5: Standard neck finish

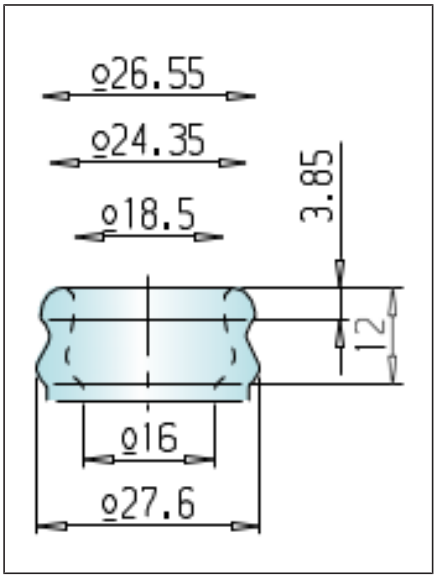


Fig. 6: Low neck finish

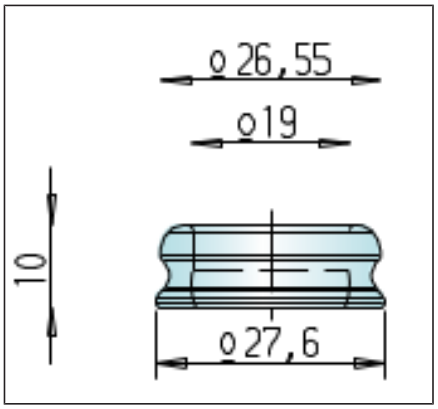


Fig. 7: Special neck finish

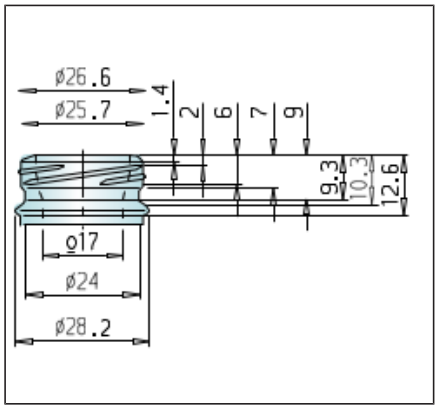


Fig. 8: Twist-off neck finish

2.2 Pull-off cap

The pull-off cap is available in two variants. Once with a plastic and once with a metal ring. Both variants are processed with a crowner for standard crowns according to DIN 6099 with individually adapted capping heads.

2.2.1 Pull-off cap with plastic ring (maxi-crown cap)

The pull-off cap with a plastic ring is a three-piece cap. It consists of a cap (of semi-hard aluminium), a seal insert (of LDPE) and a ring (of HDPE).

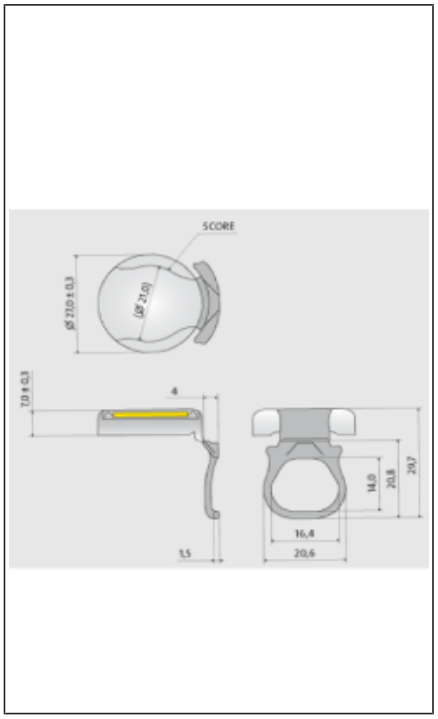


Fig. 9: Dimensions of a maxi-crown cap

Fig. 10: Maxi-crown cap

The capping heads, cap sorter and cap feed unit are designed by the cap manufacturer. The dimensions and tolerances must be requested individually from the respective cap manufacturer.

2.2.2 Pull-off cap with metal ring (ring-crown cap)

For the pull-off cap with a metal ring, the cap is manufactured from tin (matt or bare) or from tin-free steel with a thickness of 0.17 mm. The ring is manufactured from a tin coil.

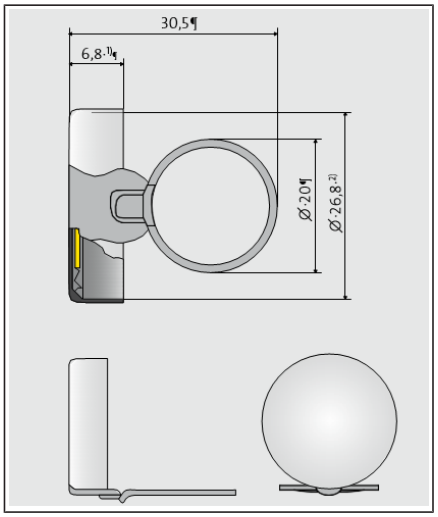


Fig. 11: Dimensions of a ring-crown cap

Fig. 12: Ring-crown cap

Panel data:

Thickness: 0.17 ± 0.01

Hardness: 2 – 2.5

Normal dimension:

6.7 – 7.0 (1)

26.7 – 27 (2)

2.3 Neck finishes (maxi and ring-crown cap)

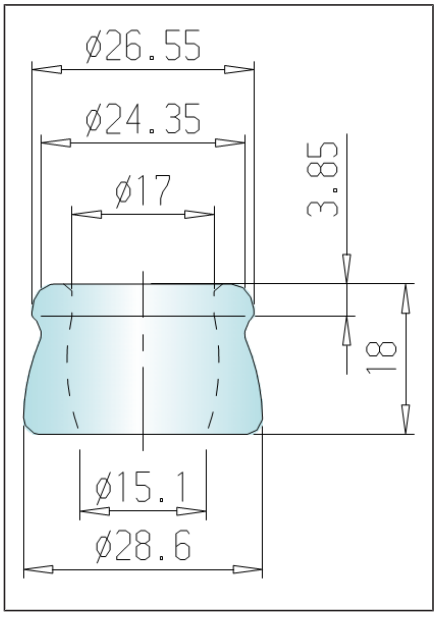


Fig. 13: Standard neck finish

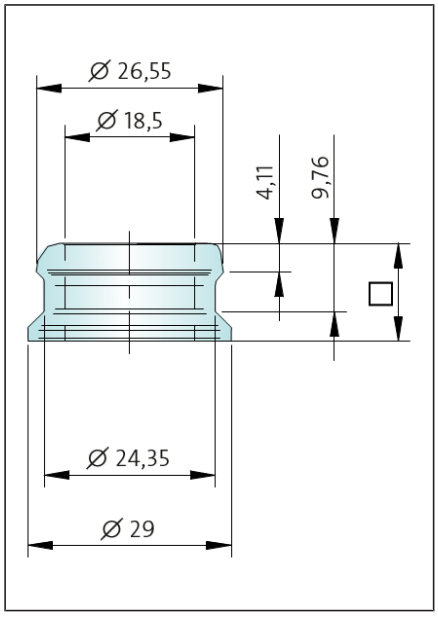


Fig. 14: PET neck finish

3 Screw caps

3.1 Plastic

3.1.1 Tolerance specifications for plastic caps

Due to the different friction values and dimensional accuracy, the manufacturers involved in the order case must be named for KRONES. The corresponding cap data must be provided for each cap manufacturer. For example, this data contains processing parameters (application torque, head pressure, etc.), the colour palette and the dimensioned cap drawing.

The data sheet listed in the appendix serves as an aid (see Chapter 8.1: 8.1 [▷ 26]). It forms the basis for the design of a capping head during order processing.

The series spread of the caps must not exceed the following limit values also under the influence of different sterilising agents as indicated in the following tables:

Outer geometry, shaping and weight distribution

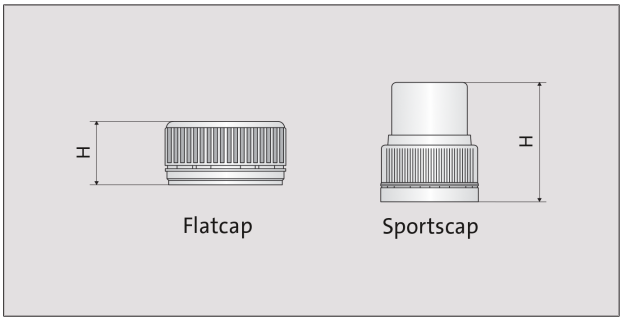


Fig. 15:

1. Cap height H:
   - Standard screw caps including doming (flat cap)
   - H_{max} = H + 0.3 mm
   - H_{min} = H - 0.3 mm
   - Push-pull and spring cover (sports cap)
   - H_{max} = H + 0.4 mm
   - H_{min} = H - 0.4 mm

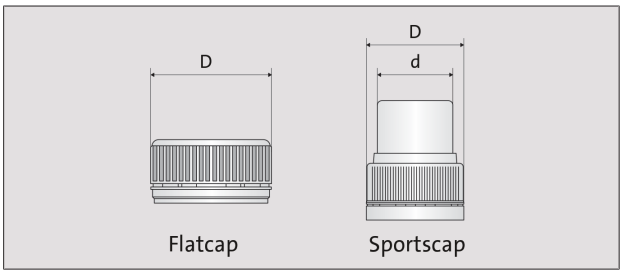


Fig. 16:

2. Cap diameter D, d
   - D_{max} = D + 0.15 mm
   - D_{min} = D - 0.15 mm

Push-pull and spring cover (sports cap):
   - d_{max} = d + 0.2 mm
   - d_{min}= d - 0.2 mm

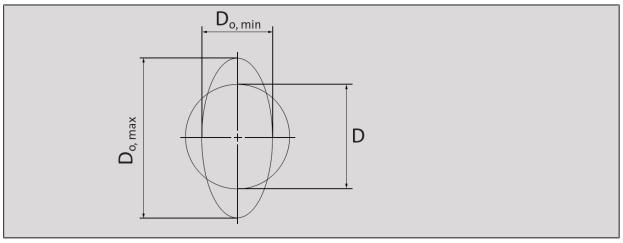


Fig. 17:

3. Ovality ΔD
(max. outer diameter – min. outer diameter)
   - $\Delta D = D_{o,\,max} - D_{o,\,min} < 3$ mm

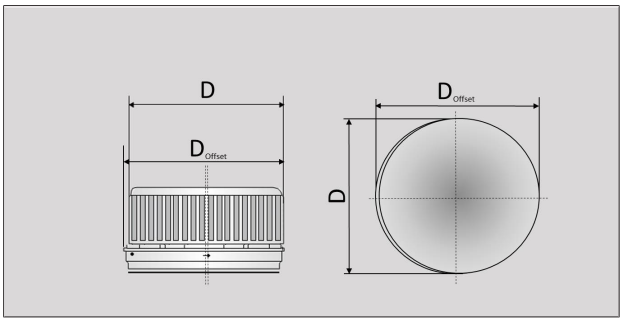


Fig. 18:

4. Diameter offset
   - Quality assurance belt - body
   - D_{Offset} – D < 0.1 mm

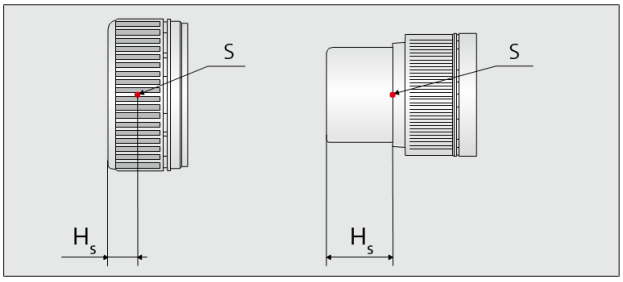


Fig. 19:

5. Centre of gravity H_S from cap to cap
   - $H_{S,max} = H_S + 0.15$ mm
   - $H_{S,min} = H_S - 0.15$ mm

Visual inspection

1. Protruding extension A

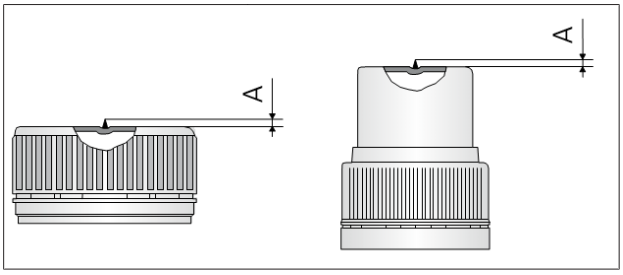


Fig. 20:

A ≤ 0 !

Any protrusion or injection threads are impermissible

Caps not completely produced (caps with an incomplete geometry)

impermissible

Casting flags, lugs, casting flags or lugs which extend beyond the geometry of the cap (from dividing plane of the mould) and other protruding, unspecified extensions

impermissible

Strength and stability values

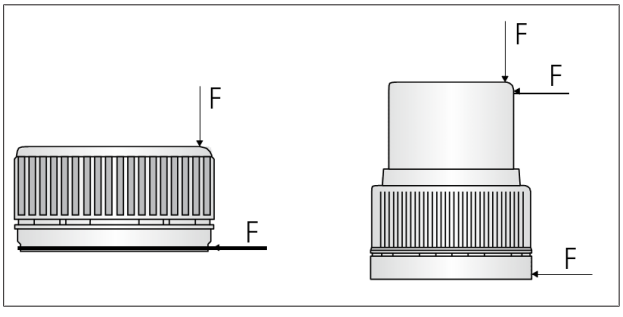


Fig. 21:

Body and pilferproof ring must have the same stability and strength values as the samples delivered to !

3.1.2 Flat cap

Flat cap – one-piece

- Without liner:

These flat caps are manufactured from one piece and mainly seal off inside and/or outside on the neck finish.

- With insert:

As without liner, but with additional insert. The insert does not serve as a seal, but for adsorption of the oxygen in the head space of the bottle.

Fig. 22: Flat cap – one-piece without liner

Fig. 23: Flat cap – one-piece with liner

Flat cap – multi-piece

- With liner or gasket:

A gasket in the form of an aluminium sealing or plastic disc is inserted or a liner injected in these flat caps. Sealing is carried out on the neck finish. Depending on the material composition of the liner material, difficulties can result when processing with servo technology (opening value fluctuations/pull-up deviations). A suitable composition must be clarified with the cap manufacturer and .

Fig. 24: Flat cap – multi-piece with liner or gasket

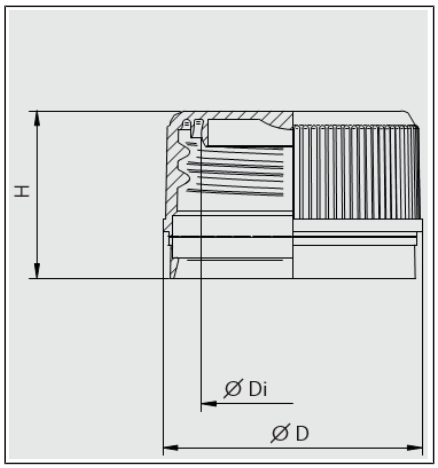


Fig. 25: Flat cap

3.1.3 Sports cap

Basically, for all sports caps axial pressure (max. head pressure 220 N) must be exerted on the cap during the capping process. Specifications on the force attach area (shoulder area/dust cap or closure) are required from the manufacturer for the design of the respective cap retainer. In addition, the maximum pressure forces must be specified for these areas.

The maximum height of the cap type is generally limited to 42 mm. must be consulted if the cap height is exceeded.

This cap type is primarily limited to non-carbonated beverages (CO_2 content up to approximately 2 g/l, in exceptional cases 6 g/l).

Sports cap – push-pull

Main characteristic: Pulling and/or twisting of the cap closing mechanism for opening

Principally all diaphragms, struts and two-piece press-in bodies in the area of the sealing surface must be avoided for aseptic applications. In individual cases, always check the sterilisability for applications with cap sterilisation.

Fig. 26:

Sports cap – snap-off

Main characteristic: Hinged mechanism for opening

The type of capping system (gripper/cap retainer) is dependent on the geometric properties of the cap. For example, with protruding hinges, a gripper system is required instead of a cap retainer. It is only possible to change the various capping systems within a machine with great technical effort and is very cost-intensive.

The reason for this is that

- due to their design (control mechanism), gripper systems have higher purchase and operating costs than retainer systems.
- the performance range for gripper systems tends to be smaller than for retainer systems.

Properties of the caps when using cap retainers:

- No protrusion of a rigid hinge in the closed state over the tooth root diameter.
- A flexible hinge that protrudes beyond the tooth root diameter requires checking for processability at KRONES.
- The moving part of the cap must not exceed the tooth root diameter.
- The cap must be locked with a catch or locking device.

Example of snap-off sports caps with details

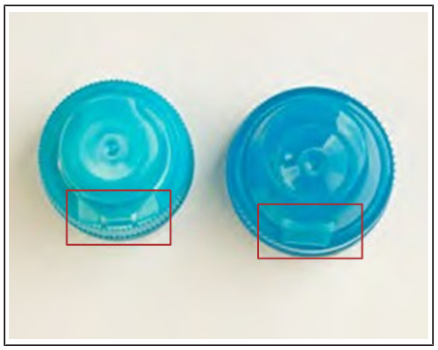


Fig. 27: Flexible hinge, does not protrude beyond the tooth root diameter.

Fig. 28: Web folded inward, flexible hinge

Fig. 29: Flexible hinge

Fig. 30: Head pressure on shoulder

Properties of the caps when using gripper systems:

- All caps which do not fulfil the above properties for cap retainers must be processed with a gripper system.

Example of snap-off sports caps with details

Fig. 31: Rigid web

Fig. 32: Circumferential overhang of cap over tooth root

Fig. 33: Overhang of dog

Fig. 34: No cap lock

3.1.3.3 Neck finishes for plastic screw caps

Neck finishes for plastic screw caps are frequently adapted customer-specific. Drawings of the neck finishes or sample parts are required for the machine design. The general functionality of the cap-neck finish combination is the responsibility of the cap manufacturer.

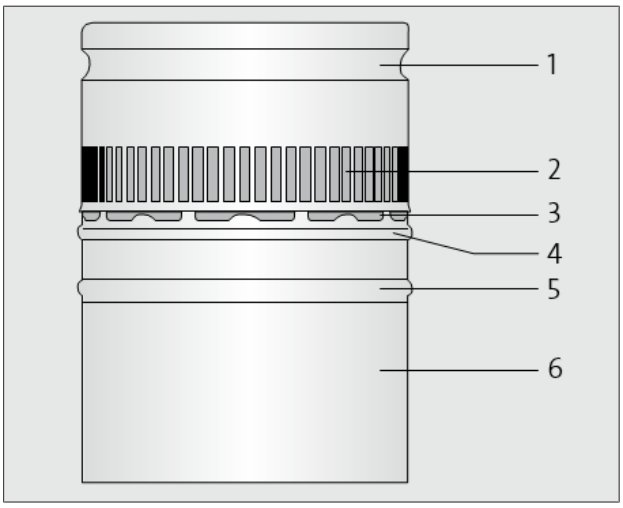
For the combination of various neck finish types (single-threaded, double-threaded, triple-threaded caps or 1810 and 1881 neck finishes, etc.) on one machine, must be consulted regarding the feasibility or the selection of the suitable machine type (capper).

3.2 Roll-on caps

Roll-on caps are available in a number of variations. Depending on the height and diameter differences, these different variations require different capping heads. The required number of capping heads cannot be specified until after the cap samples have been checked.

Aluminium is primarily used as a material for this type of cap. The various sub-chapters provide an overview of frequently used cap types with their respective dimensions and tolerances.

The following figure shows the schematic structure of an aluminium cap with the general designation of the individual cap sections.



Schematic structure of an aluminium cap
1. Bead
2. Toothing
3. Web row
4. Safety flange
5. Support flange
6. Edge strip

Fig. 35:

In the figure below the parts of a capping head with their various functions are shown for a standard aluminium cap. They are required for the roll-on process.

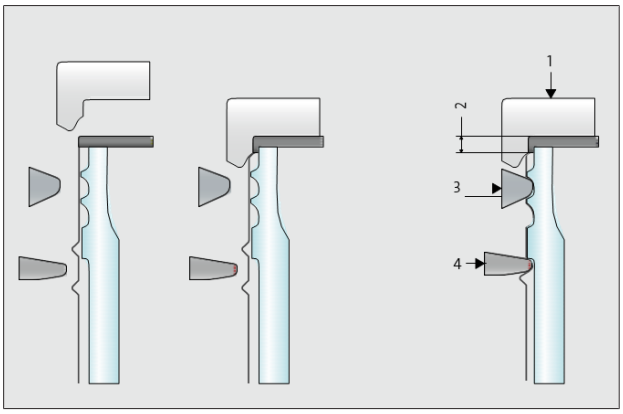


Fig. 36:

Parts of a capping head with their various functions

1. Head pressure plunger
2. Drawing depth
3. Lateral forces on thread roller
4. Lateral forces on crimping roller

3.2.1 Definition of terms as basis for capping head design

In the following, the terms required for filling out the data sheet listed in the appendix (see Chap. 8.2: 8.2 [▷ 27]) are described in detail. This data sheet forms the basis for the design of a capping head during order processing. The cap manufacturer must provide the required data.

- Head force:

Force for pressing the cap onto the neck finish, depending on the seal and the cap material

- Plunger, drawing depth, drawing diameter, pre-centring:

The drawing depth and the drawing diameter determine to a large degree the inner pressure strength of the cap. For carbonated beverages, a certain drawing depth is necessary to ensure sealing between the bottle and cap.

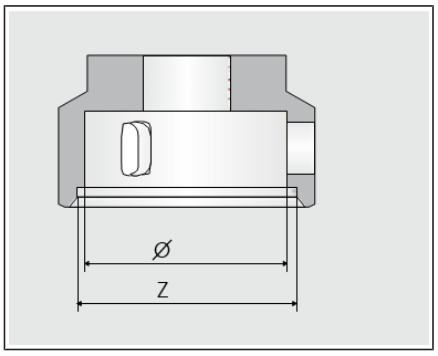


Fig. 37: Plunger dia. = drawing diameter Z = pre-centring

Fig. 38: Deep-drawn gastight cap

Fig. 39: Gastight cap

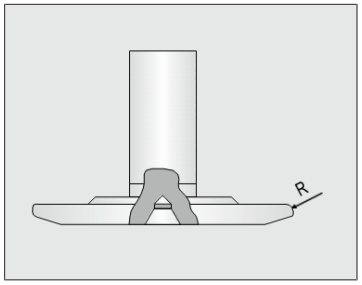


Fig. 40: R = Radius

- Thread rollers, lateral force, radius:

Force that is necessary to form the thread correctly (deep) with the thread rollers. Excessive lateral pressure can, among other things, lead to cutting in of the cap and to damage to the bottle.

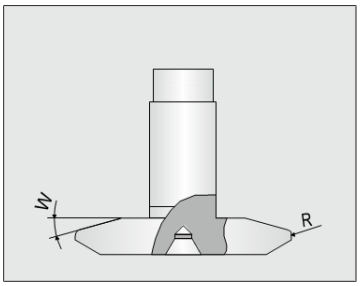


Fig. 41: R = Radius W = Angle

- Crimping rollers, lateral force, radius, angle:

Force that is necessary to correctly crimp the tear-off ring with the crimping rollers. Excessive lateral pressure can, among other things, lead to damage to the bottle. Normally in the range from 100 to 160 N.

3.2.2 Roll-on pilfer-proof (ROPP)

With ROPP caps, there are three different heights available – Standard (Std), High (H) and Extra-high (EH) – which must be coordinated with the matching neck finishes. Certain diameter-height combinations common in the industry have been specified (see Chapter 8.3.1: Roll-on pilfer-proof (ROPP) [▷ 28]). These differ in the height of the arrangement of the crimping (i.e. crimping roller position on capping head) with the same neck finish diameter. A separate capping head is required for each cap variant.

Fig. 42: ROPP caps

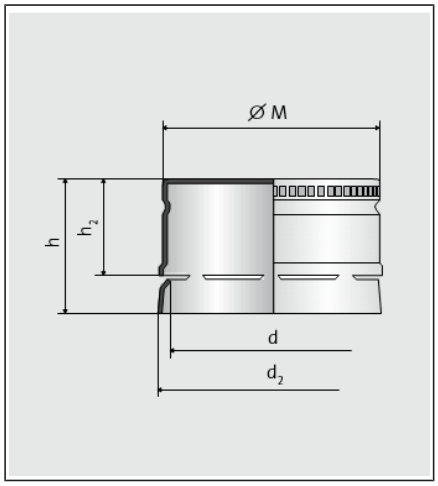


Fig. 43: Technical drawing of a ROPP cap

Fig. 44:

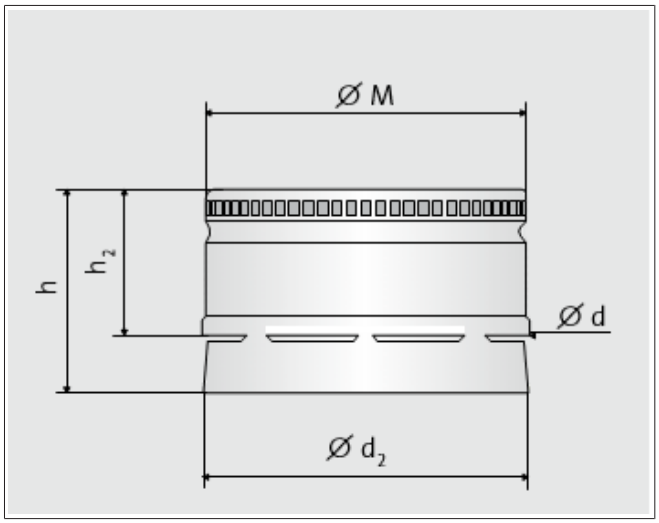


Fig. 45: Neck finish for "Standard" height characteristic with a diameter of 28 mm according to DIN 6094-7

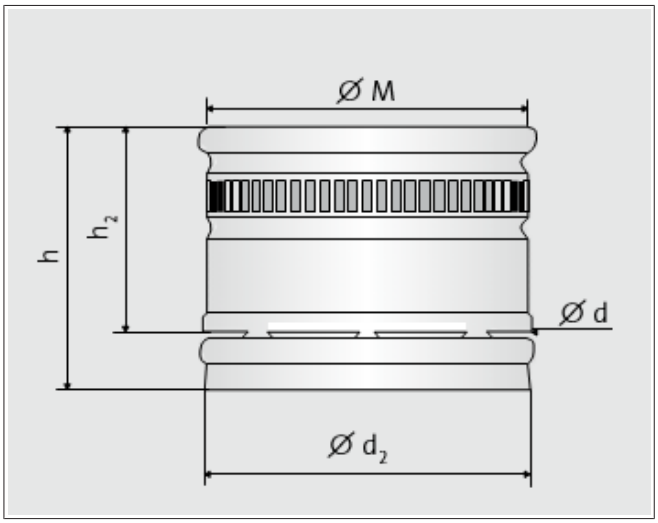


Fig. 46: Neck finish for "High" height characteristic with a diameter of 28 mm according to DIN 6094-7.

Various designs of ROPP caps

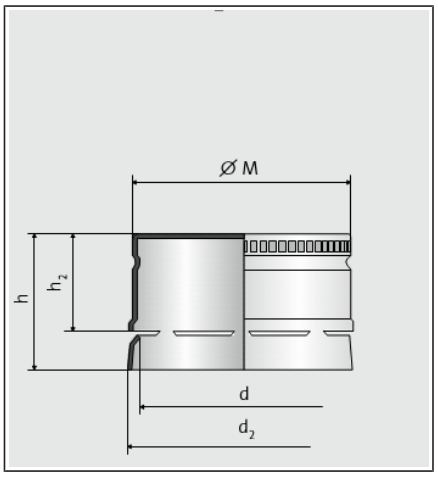


Fig. 47: Standard design

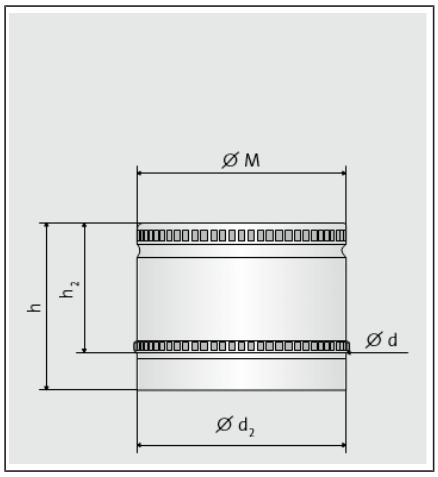


Fig. 48: "High" design

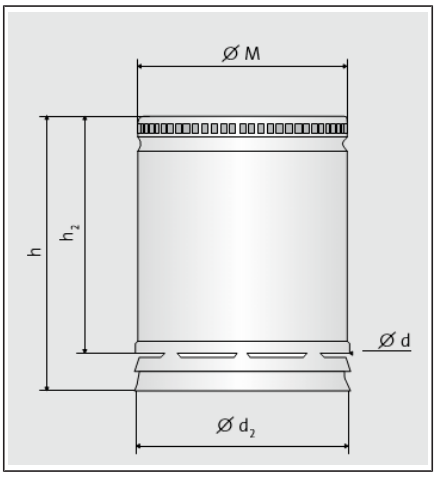


Fig. 49: "Extra-high" design

3.2.3 Stelcap

With Stelcap caps, different heights are available – Standard (Std) and High (H) – which must be co-ordinated with the matching neck finishes and bottle neck shapes. Certain diameter-height combinations common in the industry have been specified (see Chapter 8.3.2: Stelcap [▶ 29]). When processing on a capper, a separate capping head is generally required for each cap diameter variant.

Fig. 50: Stelcap

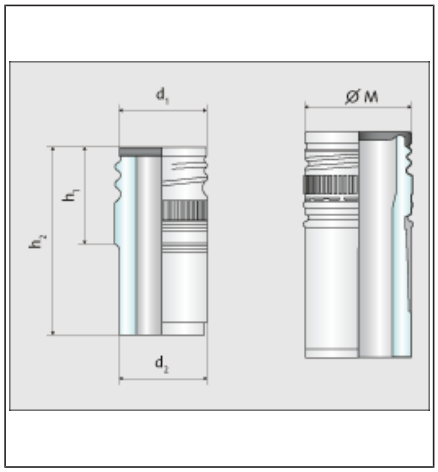


Fig. 51: Technical drawing of a Stelcap cap

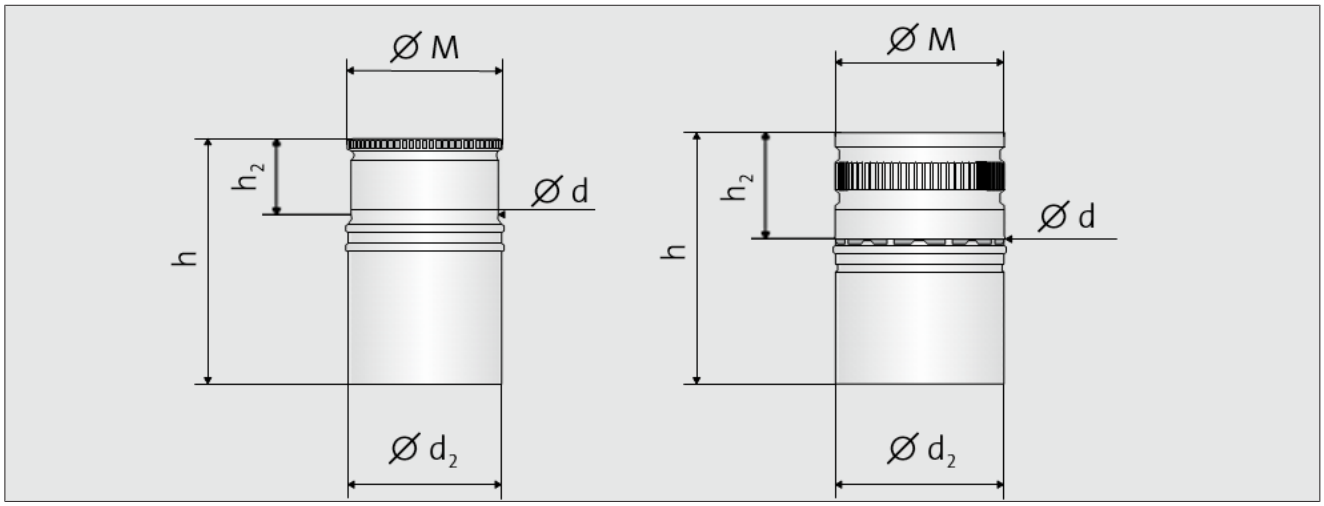


Fig. 52: Stelcap cap – "High" design

3.2.4 Ovality of roll-on caps

Fig. 53: Standard design

If the smallest inner diameter of the cap drops below the outer diameter of the bottle neck finish due to the ovality of the caps provided, a smooth capping process is no longer ensured.

Deviations from optimum ovality

On the left an optimally shaped aluminium cap is shown and on the right a no longer processable aluminium cap.

3.3 Special caps, e.g. Guala

The term special caps refers, for example, to aluminium or plastic caps with pourers and/or other safety components. These caps can be either struck on and/or flanged on. Well-known manufacturers of these caps include Global Closure System or Guala Closures Group. Checking by KRONES is necessary for a statement on processability to be made.

4 Can closure

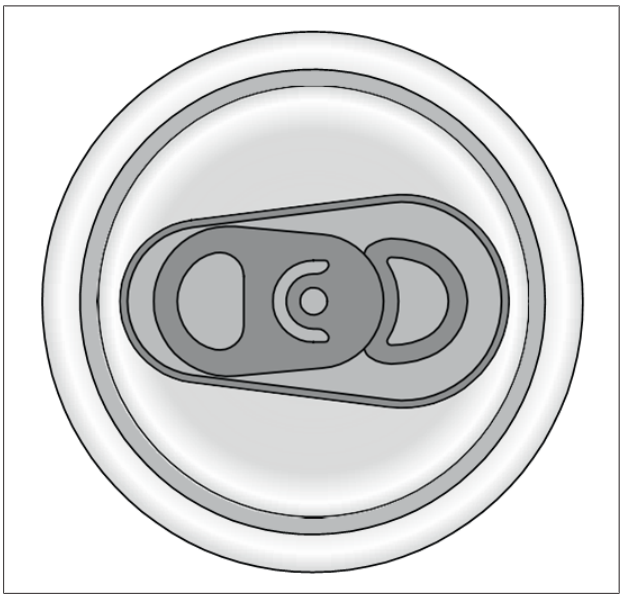


Fig. 54: Standard can closure

This chapter only covers beverage can closures. Information on the type and nominal size of the closure (200, 202, 206) and a drawing of the cap manufacturer as well as cap samples are required for designing the machines.

The specifications of the manufacturers for storage, transport and processing must be complied with.

5 Corks

5.1 Corks/synthetic corks

Corks are available in a number of variations. requires information on materials, lengths and diameters as well as a drawing for the design of the machines.

Fig. 55: Natural corks

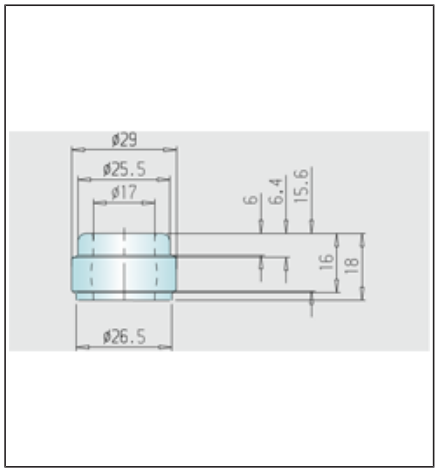


Fig. 56: Neck finish for cork cappers according to DIN 12726

Properties when using corks	Requirements for the cork	
	Natural	Synthetic
Length	± 1 mm	± 0.5 mm
Diameter	± 0.5 mm	± 0.2 mm
Ovality	< 0.7 mm	
Moisture	6.5 % ± 1.5	
Compression diameter of cork clamping jaws during infeed	Generally 15.5 mm	
Guide value for cap distance (from lower edge of cork to product) at 20 °C	15 mm ± 2 mm for a 0.75 l bottle 27 – 30 mm for a 1.5 l bottle	
Processing temperature	15 – 25 °C	
Press-in depth	Upper edge of cork approximately 0.5 - 1.0 mm below upper edge of neck finish	
Extension after capping process	Approx. 2 mm	

A vacuum cork machine is recommended for filling with synthetic cork. The manufacturer of synthetic corks recommends that all filling processes be strictly monitored and all values recorded. Possible data for this purpose are, for example, gas space pressure, chemical analysis, production date, batch number of corks, bottle type and batch number of bottles. Upright storage of the bottles is possible with elastometric and synthetic corks.

6 Swing stopper

With swing stoppers, it must be especially ensured that the closure does not open by itself (ensure self-locking).

Fig. 57: Swing stopper

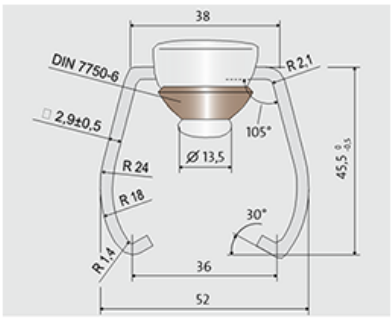


Fig. 58: Dimensions of upper bar of a swing stopper of 13.5 mm diameter (extended length = 145)

7 Special caps

The category of special caps includes all caps not listed in this specification.

Statements on the processability of the caps and a design of the capper can only be carried out for special caps following consultation with KRONES. A drawing of the cap and a cap sample including container are always required for a feasibility study.

8 Appendix

8.1 Required data for order processing of plastic screw caps

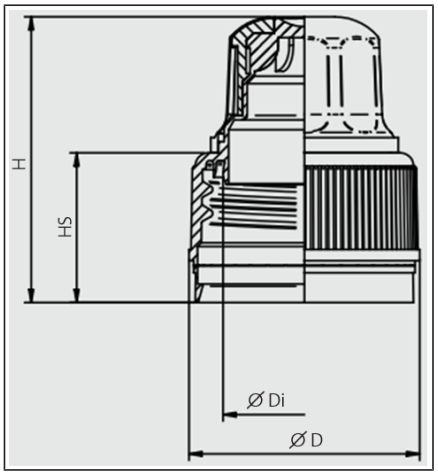


Fig. 59: Push-pull sports cap

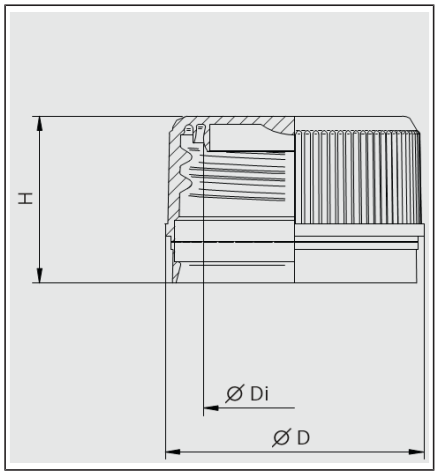


Fig. 60: Flat cap

Exact designation of the cap				
	Dimensions		**Tolerances**	
ØD		mm		mm
ØDi		mm		mm
H		mm		mm
MS		mm		mm
Number of grooves		Pcs.		
Thread pitch		mm/rot.		
Thread length		°		
Weight		Green		Green
Recommended head pressure during cap-ping		N		N
Recommended application torque (static torque)				
Opening value		lbs inch		lbs inch
Opening value after _____ hours		lbs inch		lbs inch
Opening value after _____ hours		lbs inch		lbs inch

8.2 Required data for order processing of aluminium roll-on caps

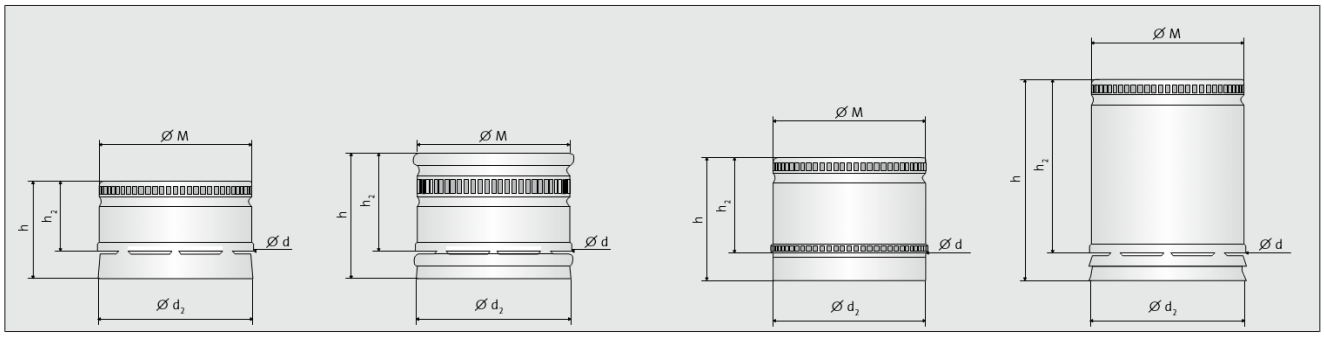


Fig. 61: Technical drawings of aluminium caps

Exact designation of the cap					
		Dimensions		Tolerances	
□M			mm	±	mm
□d			mm	±	mm
□d2			mm	±	mm
h			mm	±	mm
h2			mm	±	mm
Head force		800-1200	☐		N
		1900-2300	☐		
		Other value:			
Product plunger	Drawing depth	1.3	☐		mm
		2.6	☐		
		2.8	☐		
		Other value:			
	Drawing diameter	26	☐		mm
		26.3	☐		
		Other value:			
	Diameter of pre-centring	28.4	☐		mm
		Other value:			
Thread rollers	Lateral force	70-100	☐	(4 thread rollers)	N
		100-140	☐	(2 thread rollers)	
		Other value:			
	Radius	0.8	☐		mm
		0.9	☐		
		Other value:			
Crimping rollers	Lateral force	70-100	☐		N
		100-140	☐		
		Other value:			
	Radius	0.8	☐		MM
		0.9	☐		
		Other value:			
	Angle	0	☐		°
		15-20	☐		
		Other value:			

8.3 Supplement to roll-on caps

8.3.1 Roll-on pilfer-proof (ROPP)

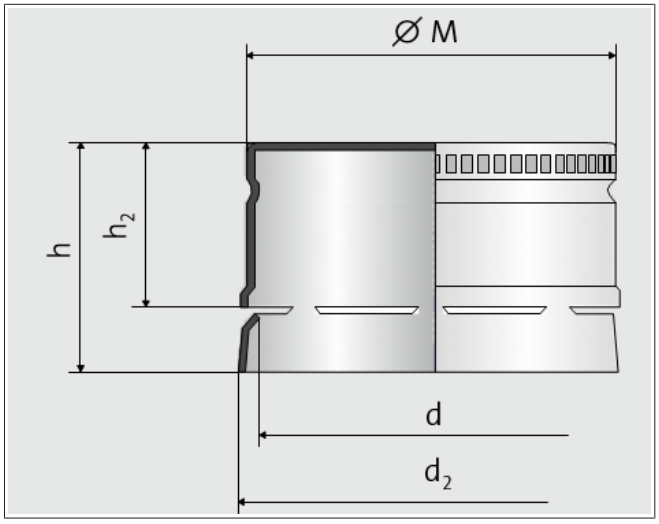


Fig. 62: Technical drawing of a ROPP cap

A selection of frequently used ROPP caps

Type	⌀ M ± 0.3 [mm]	Ø d min. inside [mm]	Ø d2 inside [mm]		h2 [mm]		h [mm]	
			mini	maxi	mini	maxi	mini	maxi
18 Std	18.6	17.8	18.15	18.6	8.2	8.9	12.1	12.6
20 Std	20.6	19.8	20.15	20.7	8.4	8.9	12.2	12.9
22 Std	22.6	21.6	21.9	22.4	10.2	11.05	14.8	15.3
25 Std	25.7	24.6	25.1	25.4	11.8	12.3	16.5	17.0
25 H	25.6	24.6	25.1	25.4	13.8	14.3	18.1	18.6
28 Std	28.3	27.45	27.85	28.4	12.6	13.8	17.9	18.4
28 H	28.4	27.45	27.8	28.4	15.2	16.05	21.5	22.3
30 H	29.6	28.6	29.1	29.6	16.1	16.8	21.3	21.8
30 EH	29.7	28.5	29.1	29.6	28.1	29.0	34.35	34.9
31.5 Std	31.4	30.5	31.0	31.4	12.9	13.4	17.9	18.4
31.5 H	31.5	30.5	31.0	31.4	16.8	18.45	23.9	24.55
35 Std	35.4	34.7	35.15	31.4	12.7	13.2	18.2	18.7
36 Std	36.8	35.5	36.0	36.4	12.9	13.4	17.8	18.3
36 H	36.2	35.6	36.0	36.4	17.9	18.4	23.9	24.4
38 Std	38.4	37.5	37.9	38.1	12.9	13.4	17.85	18.35
41 Std	41.5	40.3	41.2	41.6	12.9	13.4	17.9	18.4

8.3.2 Stelcap

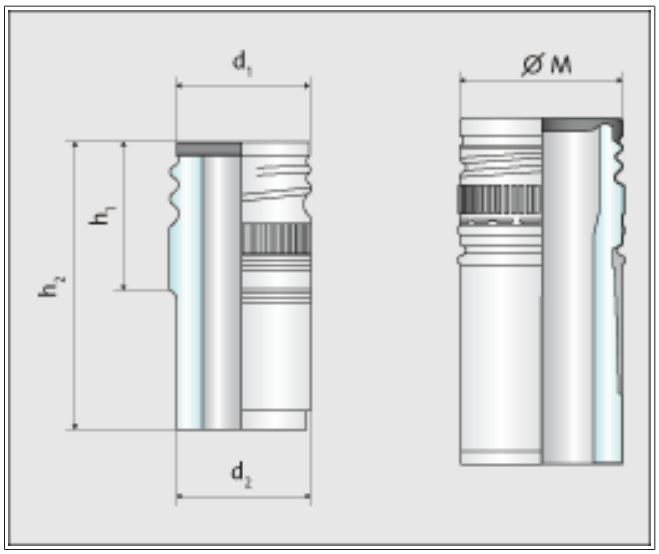


Fig. 63: Technical drawing for Stelcap

A selection of frequently used Stelcap caps:

For use with high design

Type	▯ M ± 0.3 [mm]	Ø d min. inside [mm]	Ø d2 inside [mm]		h2 [mm]		h [mm]	
			mini	maxi	mini	maxi	mini	maxi
22 H 30	22.7	21.6	22.1	22.3	11.7	13.0	29.6	31.1
25 H 33	25.6	24.7	25.1	25.3	12.2	14.0	32.6	33.1
25 H 43	25.6	24.7	25.1	25.3	12.2	13.2	42.6	43.1
28 H 38	28.6	27.4	27.85	28.15	15.7	16.2	37.6	38.1
28 H 44	28.5	27.4	27.85	28.15	15.7	16.2	43.6	44.1
28 H 50	28.4	27.4	27.85	28.15	15.7	16.2	49.6	50.1
30 H 35	29.7	28.6	29.1	29.45	17.7	18.2	34.35	35.2
30 H 44	29.75	28.6	29.15	29.5	17.7	18.2	43.6	44.1
30 H 50	29.75	28.6	29.15	29.5	17.7	18.2	49.6	50.1
30 H 55	29.75	28.6	29.15	29.5	17.7	18.2	54.6	55.1
30 H 60	29.75	28.6	29.15	29.5	17.7	18.2	59.6	60.1
31.5 H 44	31.5	30.5	30.9	31.2	17.7	18.2	43.6	44.1
31.5 H 50	31.4	30.5	30.9	31.2	17.7	18.2	49.6	50.1
31.5 H 55	31.4	30.5	30.9	31.2	17.7	18.2	54.6	55.1
31.5 H 60	31.5	30.5	30.9	31.2	17.7	18.2	59.6	60.1
36 H 52	36.5	35.6	35.95	36.25	17.7	18.2	51.6	52.1

For use with standard design

Type	▯ M ± 0.3 [mm]	Ø d min. inside [mm]	Ø d2 inside [mm]		h2 [mm]		h [mm]	
			mini	maxi	mini	maxi	mini	maxi
18 Std 24	18.8	17.8	18.3	18.5	8.2	8.7	23.7	24.2

For use with caps with injected liner

Type	□ M ± 0.3 [mm]	Ø d min. inside [mm]	Ø d2 inside [mm]		h2 [mm]		h [mm]	
			mini	maxi	mini	maxi	mini	maxi
31.5 Std	31.4	30.5	31.0	31.3	12.9	13.4	17.9	18.4
31.5 H 24	31.4	30.5	31.0	31.3	17.7	18.2	17.9	18.4
31.5 H 44	31.4	30.5	30.9	31.2	17.7	18.2	43.6	44.1
31.5 H 50	31.4	30.5	30.9	31.2	17.7	18.2	49.6	50.1
31.5 H 55	31.4	30.5	30.9	31.2	17.7	18.2	54.6	55.1
31.5 H 60	31.4	30.5	30.9	31.2	17.7	18.2	59.6	60.1