INOVAN

SNAP DOMES

YOUR SOLUTION DEVELOPER

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Introduction

INOVAN GmbH & Co KG has been gaining experience in the production of metal snap domes for more than thirty years.

INOVAN's initial activitiy in this field has been the development of a snap dome for keyboard application in 1975. A snap dome with a diameter of 12.2 mm has been developed, that even today is still widely used in many applications.

Snap domes are used in keyboards, micro switches, push button switches, touch panels in terminals, flexible keyboards and many other applications.

Along with the increasing extension of communication technology, such as mobile phones, handheld-computers, etc., goes the miniaturisation of electronic components. Therefore the demand of snap domes with a diameter of less than 6 mm is also increasing.

Generally, snap domes can be produced with all available spring materials, but high-grade steel X10CrNi 18 8 (1.4310) proved to be the most suitable in regard to stress and electrical characteristics combined with an electroplated surface.

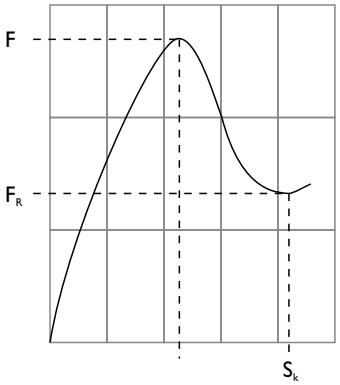
A constant force-deflection-diagram during the total lifetime of the snap dome, also under the condition of varying temperatures, is considered to be one of the significant advantages of such snap domes. Therefore a constant tactile switching characteristic is guaranteed, creating a defined tactile feeling for the user.

Upon request we will develop in cooperation with you an individual customer specific solution for your application.

Please feel free to contact us - we will be glad to help you.

Definitions

Force-deflection-diagram of a typical snap dome



F = maximum actuation force

The force necessary to actuate the snap dome.

F_R = return force (contact force)

The force applied to the counter contact by the snap dome. As a rule the return force should always be > 0,3N, because otherwise there is a risk of a two state switching characteristic.

S_K = spring travel

The distance the snap dome travels from the beginning of the actuation up to contacting the counter contact.

ΔF (Delta F)

ΔF is mainly responsible for a good tactile feeling. This value is the difference between F and F_R . The target for a typical Delta F is 0.3 to 0.5 x F.

As an alternative to ΔF the Click Ratio (C_R) is a well-known term for the tactile feeling. Usually the unit for the Click Ratio also known as snap is percent (%).

Formula to calculate the Click Ratio:

$$C_R = \frac{F(g) - F_R(g)}{F(g)} \times 100$$

Material

Maximum material performance is the basic requirement for a constantly high level of quality for the snap domes.

INOVAN uses high grade steel X10 Cr Ni 18 8 (Material - No. 1.4310) for the production of its snap domes.

The raw material deliveries from our selected suppliers are continuously checked by strict quality controls.

The raw material is precisely specified by INOVAN regarding the alloy composition, grain size, surface quality, tensile strength, strip dimensions and

Electroplating

In our in-house electroplating department the required surfaces are deposited to the raw material with state-of-the-art electroplating lines, which are working in a reel-to-reel process.

Our snap domes can be purchased with the following contact surfaces:

- 0,2 µm Au
- 0,2 µm Ni
- 1 µm Ag
- no plating
- Sn alloys on terminals and solder contacts for customer specific products

Upon customer request we are able to vary the surface thickness.

Toolings

All toolings are designed at INOVAN's engineering department and manufactured in our in-house tool shop.

The toolings are designed in a modular technology to achieve a higher flexibility in producing different variants of snap domes as well as being more efficient in tool maintenance.

In principle all cutting-, bending- and stamping elements are built from carbide metal. The inclusion of sensors for tooling protection goes without saying. All stamping and bending operations in our toolings are adjustable.

Last, but not least, adjustable stamping elements are absolutely vital in order to be able to produce samples with different actuation force, spring travel and tactility.

The follow-on toolings are being operated on high-performance Bruderer punching machines of the newest generation in the range of 250 to 500 kN

General product specifications

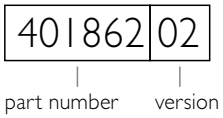
Material	1.4310
Operating temperature	upon request
Storage temperature	- 40°C - 105°C
Contact resistance(no plating)	< 100 Ω *
Contact resistance (Ni)	< 1 Ω *
Contact resistance (Au)	< 100 mΩ *
Mechanical life time (LD)	depending on product (see table)

* The above mentioned values are standard values, which are depending very much on the actual assembly situation in the final product.

The values mentioned in the tables are valid for the normal applications for snap domes.
Requirements for product testing need to be clarified in advance.
Technical changes reserved.

Product code

Example:



Version:	Characteristic:
00	contact surface 0.2ym Au, piece parts
01	contact surface 0.2ym Ni, piece parts
02	contact surface 0.2ym Au, on reel
03	contact surface 0.2ym Ni, on reel

Remark:
Parts without plating, with Ag and with non adhesive domes upon request.

Quality Management

INOVAN is certified according to TS 16949:2002 and ISO 14001.

During the production of snap domes the force-deflection-diagrams are cyclically recorded and documented in our CAQ-system.

A complete traceability of every production lot back to the incoming inspection of the raw material can be guaranteed.

Every production lot of snap domes has to pass a life time inspection according to DIN 42115 before its delivery to the customer. The testing frequency is usually 3 to 5 Hz.

Depending on the actual final purpose and the assembly situation of the snap dome, agreements regarding customer specific test methods can be met.

With each delivery we provide the force-deflection-diagram, the inspection report and the report of the plating thickness in case of electroplated snap domes.

Packaging

The standard delivery for INOVAN snap domes is as strip on plastic reels or single parts in PE bags in cardboard boxes. Please refer also to table under "product code".

Upon customer request a delivery as single parts in SMD reel packaging for use in automatic SMD shooters is also possible.

Computing of snap domes

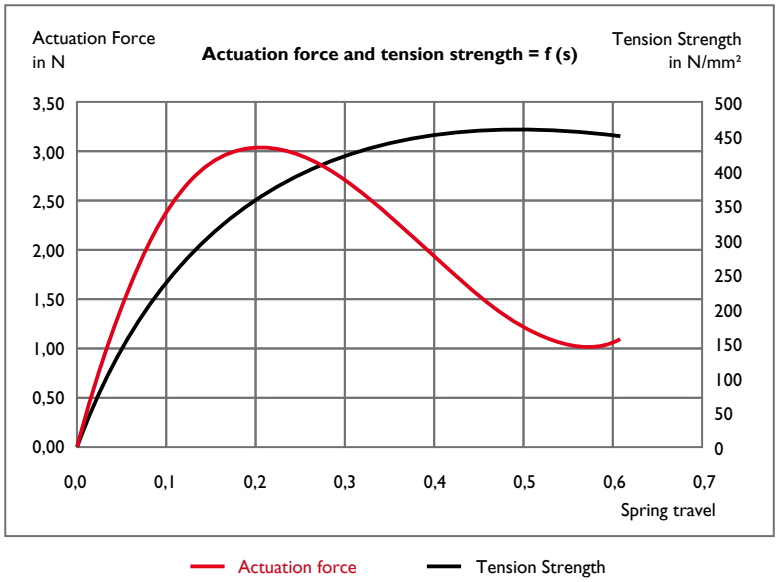
INOVAN

Project: snap dome
drawing: 40186200

Customer: INOVAN
Customer-No.

INOVAN snap dome-computing REV. 15.03.1997

	Material		
X10CrNi 18 8 1.4310	E Modulus of elasticity T Material Thickness	194.000 0,092	N/mm² mm
Dt Ho	Diameter of calotte Height of calotte	7,800 0,211	mm mm
Dg Hg	Diameter spring legs Height spring legs	7,800 0,211	mm mm
S	Spring Travel	0,600	mm
Rt	Radius of calotte	36,148	mm

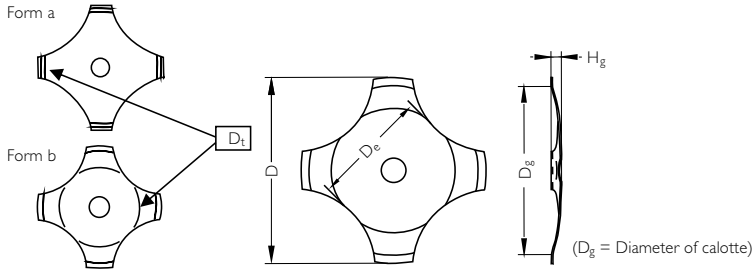


To compute snap domes INOVAN is working with a specially developed software program, which is frequently updated with empirically determined data of newly produced parts.

This enables us to define the geometry of new snap domes and to calculate their corresponding life time. This data is transferred directly to the CAD-software, which is used in the engineering department to design the tooling components.

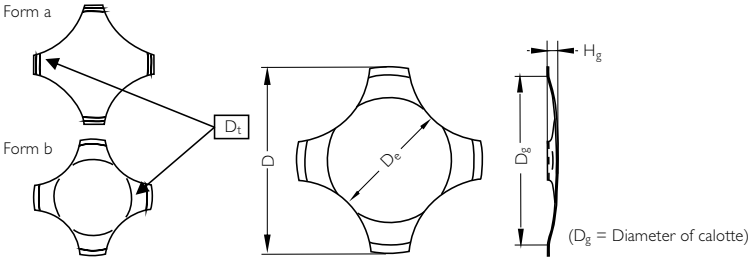
Snap domes with 4 legs with dimple

part no.	D (mm)	F (N)	F_R (N)	S_K (mm)	D_e (mm)	D_g (mm)	H_g (mm)	lifetime	shape
401883	6.0	1.70	0.70	0.32	4.10	5.60	0.40	300 K	a
402009	6.0	2.00	0.60	0.32	4.10	5.60	0.40	100	a
402035	6.0	3.50	2.20	0.32	4.10	5.60	0.40	20 K	a
401855	8.0	1.50	0.60	0.32	6.00	7.40	0.40	1 Mio	a
401749	8.0	2.00	0.80	0.35	6.00	7.40	0.50	1 Mio	a
401856	8.0	3.00	1.30	0.37	6.00	7.40	0.50	1 Mio	a
401864	8.0	3.50	1.60	0.38	6.00	7.40	0.55	50 K	a
401921	8.0	4.00	1.80	0.38	6.00	7.40	0.55	50 K	a
402038	10.0	3.00	1.70	0.40	8.00	9.60	0.55	1 Mio	a
401862	12.0	3.00	1.00	0.60	7.80	11.00	0.90	1 Mio	b
401854	12.2	1.50	0.60	0.50	8.00	11.80	0.70	1 Mio	b
401748	12.2	2.00	0.70	0.55	8.00	11.50	0.90	1 Mio	a
402128	12.2	2.30	0.80	0.55	8.00	11.50	0.90	1 Mio	a
402214	12.2	2.80	0.90	0.60	7.50	11,80	0,69	1 Mio	b
401747	12.2	3.00	0.90	0.60	8.00	11.60	0.90	1 Mio	a
401835	12.2	3.00	2.00	0.55	8.00	11.80	0.80	1 Mio	a
401844	12.2	3.30	0.90	0.60	8.00	11.80	0.90	1 Mio	a
401853	12.2	4.00	2.00	0.65	8.00	11.80	0.90	1 Mio	b
402126	18.0	8.00	3.00	0.95	11.00	16.75	1.35	150 K	b



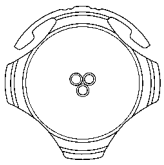
Snap domes with 4 legs without dimple

part no.	D (mm)	F (N)	F_R (N)	S_K (mm)	D_e (mm)	D_g (mm)	H_g (mm)	lifetime	shape
402031	6.0	1.70	0.90	0.25	4.10	5.40	0.31	300 K	a
401888	8.0	2.00	1.05	0.35	6.00	7.30	0.43	1 Mio	a
402256	8,0	2,80	0,90	0,42	6.00	7.30	0.50	1 Mio	a
402257	8,0	3,40	1,10	0,45	6.00	7.30	0.52	1 Mio	a
402259	10,0	2,80	1,30	0,39	8.00	9.60	0.47	1 Mio	a
401783	12.2	2.80	1.00	0.60	7.20	11.50	0.70	1 Mio	b
402021	12.2	3.50	1.20	0.60	7.80	11.10	0.70	1 Mio	b
401878	12.2	4.00	1.20	0.65	7.80	11.10	0.70	50 K	b
402118	18.0	8.00	3.00	0.95	11.0	17.40	1.15	150 K	b



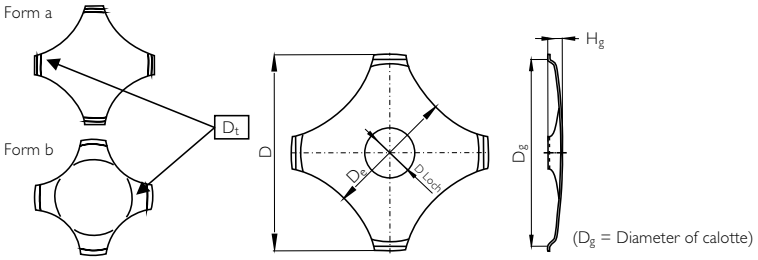
Snap domes SMD

part no.	D (mm)	F (N)	F_R (N)	S_K (mm)	D_e (mm)	D_g (mm)	H_g (mm)	lifetime	shape
402210	8.2	3.00	1.30	0.38	6.00	7.40	0.50	1 Mio	---



Snap domes with 4 legs with LED hole

part no.	D (mm)	F (N)	F_R (N)	S_K (mm)	D_e (mm)	D_g (mm)	H_g (mm)	D Loch	lifetime	shape
40174707	12.2	3.00	0.90	0.55	8.00	11.60	0.90	3.10	1 Mio	a



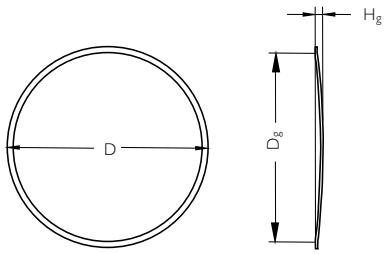
Snap domes round without dimple

part no.	D (mm)	F (N)	F_R (N)	S_K (mm)	D_e (mm)	D_g (mm)	H_g (mm)	lifetime	shape
402020	4.10	2.70	ΔF ≥ 0.60	0.18	---	3.70	0.24	1 Mio	---
402032	5.00	1.70	0.60	0.20	---	4.50	0.18	1 Mio	---
402111	5.00	1.60	0.90	0.18	---	4.80	0.24	1 Mio	---
---	6.00	upon request							
---	8.00	upon request							

Remarks:

Part number 402032: The contact point is specified -0.05 to -0.07mm below the plain.

Part number 402020: Only strip on reels available.



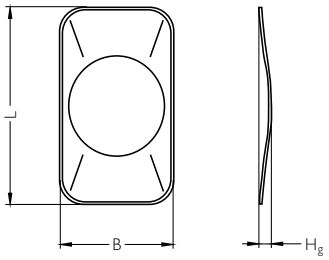
Snap domes rectangular without dimple

part no.	B (mm)	L (mm)	F (N)	F_R (N)	S_K (mm)	H_g (mm)	lifetime
402036	2.30	3.00	1.8	ΔF ≥ 0.30	0.23	0.22	300 K

Remark:

Part number 402036: The contact point is specified -0.06mm below the plain.

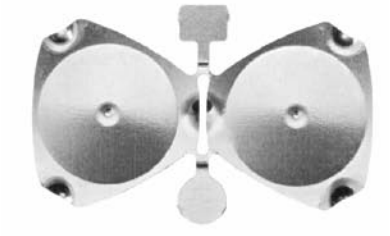
Only strip on reels available.



Customer specific
Special designs

Snap dome with open-close function

Snap dome with contact rivet for power application 30 A in car window switch

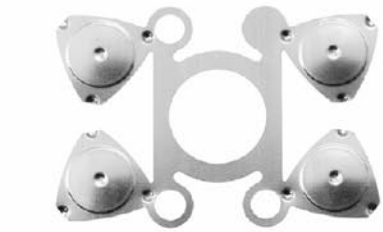


Snap dome for SMD-assembly

Snap dome with contact rivet for door bell switch

Snap dome with additional frame to increase spring travel

Snap dome with multiple contact positions for joystick applications



Snap dome array for car window switch

Snap domes for assembly on PCBs

Snap dome with contact rivets for power application 700 A

Self-adhesive dome arrays on carrier foil with and without spacer foil to stick on PCBs for panels, flexible keyboards, etc.

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