



360° PROJECTS BY INOVAN

SNAP DOMES



SNAP DOMES

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360° PROJECTS BY INOVAN //--

THINK. THINKING IT THROUGH. THINKING IT THROUGH RIGHT FROM THE START.
THERE REALLY ARE DIFFERENCES //--

During implementation at the latest. When things take longer, become more expensive or turn out to be much more difficult than expected. So, by all means it is a kind of art: the art of thinking it through right from the start. It has a lot to do with years of experience, deeper understanding and overall implementation expertise.

These are success factors that are expressed in each one of our snap domes. It doesn't matter whether you choose a model from our standard range or we develop a specified snap dome for you.

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THINKING IT THROUGH RIGHT FROM THE START

SNAP DOMES

INTRODUCTION

FOR OVER 30 YEARS WE THINK SNAP DOMES THROUGH RIGHT FROM THE START. //--



INOVAN GmbH & Co KG has been gaining experience in the production of metal snap domes for more than thirty years. INOVAN's initial activity 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 miniaturisation of components, the demand for snap domes with a diameter of less than 6 mm is also rising. Furthermore the snap domes are used more and more in applications of the automotive industry including all considerable OEMs.

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 //--

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 to contacting the counter contact.

ΔF (Delta F)

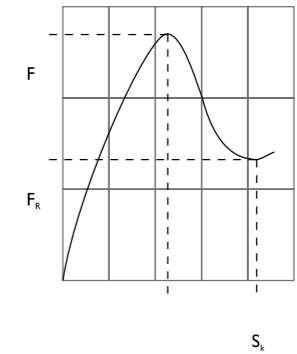
ΔF is mainly responsible for a good tactile feeling. This value is the difference between F and F_R. The target for a typical Delta F is 0.3 to 0.5 x F.

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

Formula to calculate the Snap:

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

Force-deflection-diagram of a typical snap dome



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 and strip dimensions.

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 highperformance Bruderer punching machines of the newest generation in the range of 250 to 500 kN

GENERAL PRODUCT SPECIFICATIONS //--

Material	I.4310
Operating temperature	-40°C to 85°C
Storage temperature	-40°C to 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 //--



VERSION	CHARACTERISTIC
- 00	contact surface 0.2µm Au, piece parts
- 01	contact surface 0.2µm Ni, piece parts
- 02	contact surface 0.2µm Au, on reel
- 03	contact surface 0.2µm 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, ISO 14001 and ISO 50001.

to DIN 42115 before its delivery to the customer. The testing frequency is usually 3 to 5 Hz.



Our certified management systems express our intransigence concerning quality and environment.

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

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

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

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



All INOVAN snap domes are RoHS compliant.

PACKAGING //--

The standard delivery for INOVAN snap domes is as strip on plastic reels (min. 30,000 pcs.) or single parts in PE bags in cardboard boxes (min. 5,000 pcs.). Please refer also to table under "product code".

Upon customer request a delivery as single parts in 13" SMT reel packaging for use in automatic pick-and-place systems is possible. For SMT solderable snap domes this type of packaging is obligatory.

SIMULATION OF SNAP DOMES

INOVAN

Project: Snap dome Customer: INOVAN
 Drawing: 40186200 Customer-No:

INOVAN Snap dome-computing

Material			
X10CrNi 18 8 I.4310	E Modulus of elasticity T Material Thickness	194,000 0.092	N/mm ² 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

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.

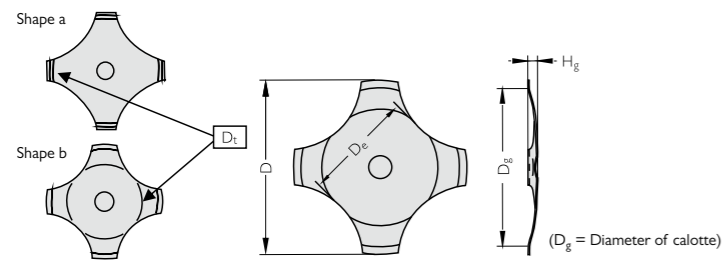
This enables us to define the geometry of new snap domes and to calculate their corresponding life time. This data is transferred directly to the CAD-software, which is used in the engineering department to design the tooling components.

3D-SIMULATION //--

Furthermore we are able to generate FEM simulations in our 3D CAD system to visually illustrate tension within the dome when actuated. This helps us to identify and improve possible weak points already at the developing stages of a dome.

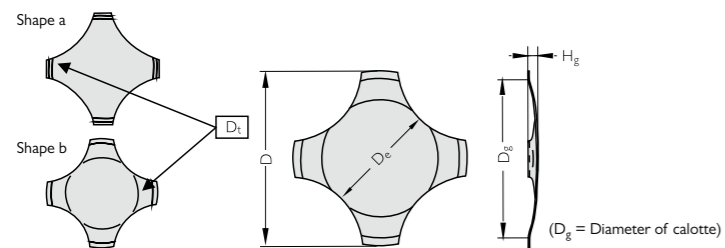
SNAP DOMES WITH 4 LEGS WITH DIMPLE //--

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 K	a
402035	6.0	3.50	2.20	0.31	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	0.75	0.35	6.00	7.40	0.50	1 Mio	a
401856	8.0	3.00	1.35	0.34	6.00	7.60	0.50	1 Mio	a
401864	8.0	3.50	1.60	0.36	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	0.57	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
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	0.50	8.00	11.80	0.77	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	1.20	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	0.61	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



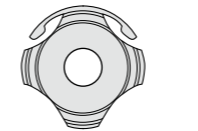
SNAP DOMES SMD //--

PART NO.	D (mm)	F (N)	F _R (N)	S _K (mm)	D _e (mm)	D _g (mm)	H _g (mm)	LIFETIME	SHAPE
402210	8.20	3.00	1.30	0.35	6.00	7.40	0.48	1 Mio	—
402252	8.20	4.00						upon request	
40xxxx	12.00	4.00						upon request	



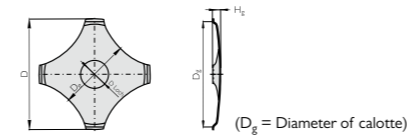
SNAP DOMES SMD WITH LED HOLE //--

PART NO.	D (mm)	F (N)	F _R (N)	S _K (mm)	D _e (mm)	D _g (mm)	H _g (mm)	D hole	LIFETIME	SHAPE
402353	8.20	3.00			upon request			2.60	upon request	
402354	8.20	4.00			upon request			2.60	upon request	



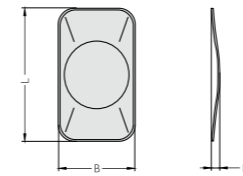
SNAP DOMES WITH 4 LEGS WITH LED HOLE //--

PART NO.	D (mm)	F (N)	F _R (N)	S _K (mm)	D _e (mm)	D _g (mm)	H _g (mm)	D hole	LIFETIME	SHAPE
40174707	12.2	3.00	0.90	0.55	8.00	11.60	0.66	3.10	1 Mio	a
402272	12.2	3.50	1.20	0.56	—	—	0.67	1.50	1 Mio	a



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	4.00	1.80	ΔF ≥ 0.30	0.23	0.22	300 K

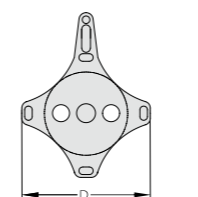


REMARK

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

SNAP DOME WITH OPEN-CLOSE FUNCTION //--

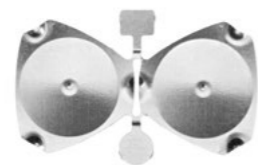
PART NO.	D (mm)	F (N)	F _R (N)	S _R (mm)
401646	13.60	3.00	1.2	0.6



CUSTOMER SPECIFIC SPECIAL DESIGNS // --



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



Snap dome for SMD-assembly



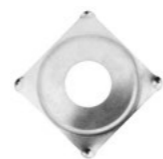
Snap dome with contact rivet for doorbell switch



Snap dome with additional frame to increase spring travel



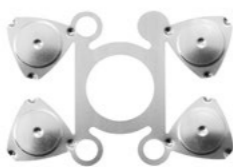
Snap dome with multiple contact positions for joystick applications



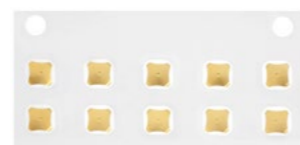
Square snap dome for LED lighting



Snap domes for assembly on PCBs



Snap dome array for car window switch



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



LET US THINK YOUR PROJECT THROUGH
RIGHT FROM THE START.
PLEASE CONTACT US.

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