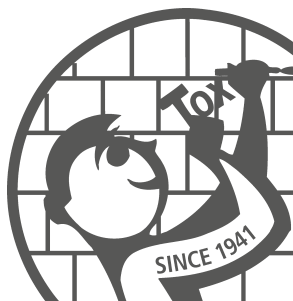




# Wall plug guide

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Essentials  
Tips & tricks



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## Content

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■ TOX-Dübel-Technik - a company with tradition	4
■ Wall plug essentials	5
■ Determining the building material	6
■ Choosing the right drill	10
■ Drill hole cleaning	11
■ Correct installation	12
■ How a wall plug works	13
■ Types of wall plugs and fixings	14
■ Tips & tricks	18
■ Video guides	21
■ Technical hotline	22

### Imprint:

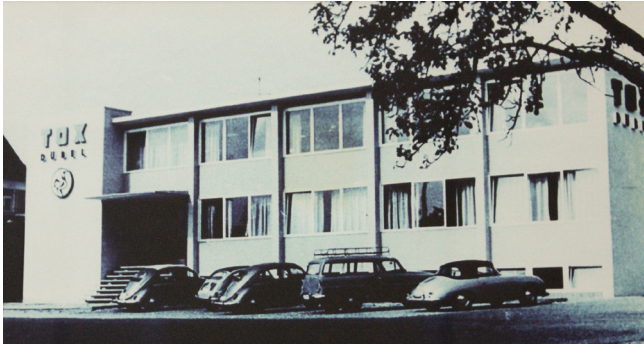
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## A company with tradition

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Since 1941, TOX-Dübel-Technik has been offering its customers innovative products and expert solutions in the field of fixing technology, making it the most experienced wall-plug manufacturer in Germany. With fresh ideas, the medium-sized family-owned company makes a lasting contribution to the market success of its customers and, with its 100 employees, produces exclusively in Germany.

The comprehensive range - from cavity wall plugs, heavy-duty anchors, sanitary and frame wall plugs to insulation fixings - focuses consistently on the needs of customers and end users in order to offer the right solution for every fixing problem.

In 1973, TOX became internationally renowned with the invention of the red TRI wall plug, the original all-purpose wall plug – often copied but never matched.

TOX stands for "Professional Quality". This applies both to the products and the innovative sales concepts with integrated wall-plug finder.

## Wall plug essentials

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A wall plug is a component used in fixing technology for materials into which a screw cannot be screwed directly. In the case of the screw wall plug, a connection is made by means of a screw, whereas the wooden wall plug, comparable to a nail, forms the connection itself.

Before the first screw wall plugs were used, holes were left in walls during construction or were hammered in with a chisel at a later stage. A piece of wood was plastered or bound with mortar in these holes. A screw was then able to be screwed into this piece of wood. An alternative to this method was to hammer a split piece of wood into a drill hole. This piece of wood could be expanded and further pressed with the screwed-in screw.

The first industrially produced expansion wall plug was manufactured in England in 1910. This wall plug was made of a hemp string and a glue made of animal blood.

In 1926, the first industrially produced expansion wall plug with pressed hemp string was delivered to Germany.

Today's wall plugs are made of plastic, metal or both. They are available in many designs for the most diverse types of walls, ceilings and floors.

The correct wall plug depends on the respective building material and the load to be installed! The following points must be taken into account:

- Which building material was used?
- What is the proper way of drilling?
- Where is the correct assembly carried out?
- How does a wall plug work?

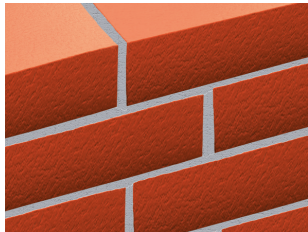
The following small user guide should make it easier for you to answer these points.

# Determining the building material

The type and condition of the building material to be anchored in are decisive factors when selecting the appropriate fixing system. The most commonly used building materials are:



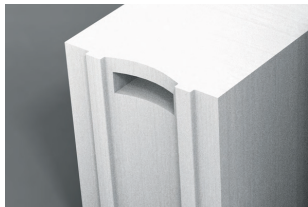
**Concrete:**  
Artificial stone consisting of cement, aggregate (gravel, sand) and gauging water.



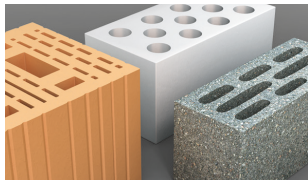
**Solid brick (with dense structure) / clay brick / clinker:**  
Is a composite material of stones and mortar. The stones used predominantly have no cavities and have a high pressure resistance. Less than 15% of their area is perforated.



**Sand-lime solid brick:**  
Is an artificially produced stone made from a mixture of lime, sand and water. Sand-lime solid bricks have a high pressure resistance and are suitable for interior and exterior walls.

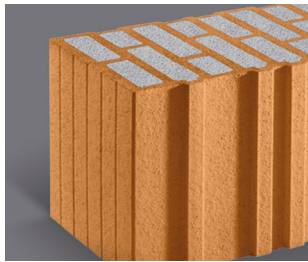


**Porous concrete (solid brick with porous structure):**  
Have a low pressure resistance and many pores. For optimum fixing, it is best to use special wall plugs such as the **Ytox** porous concrete wall plug or the **Apollo** and **Tetrafix XL** frame wall plug.



**Perforated brick with dense structure:**  
Are made of the same pressure-resistant material as solid brick with a dense structure, but have cavities.

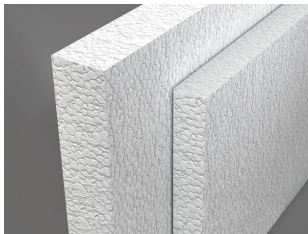
# Determining the building material



**Perforated brick with porous structure (Poroton):**  
Due to their cavities and pores in the building material, these bricks have a low pressure resistance which means wall plugs must be selected carefully. Wall plugs such as **Fassad** or **Bizeps** or fixings like the **Liquix** injection system would be suitable.



**Wall boards, plasterboard, gypsum fibre board:**  
Thin-walled boards with low strength. Cavity wall plugs are used here and are positively connected behind the board. The **Spiral** plasterboard plug can be used for lightweight fixings and a maximum board thickness of 12.5mm. **Acrobat** should be used for higher loads and a board thickness up to 30mm.



**Insulation boards (polystyrene boards, polyurethane rigid-foam boards etc.):**  
Have a low pressure resistance and many pores. Insulation wall plugs such as the **Thermo** and **Thermo Plus** with a large external thread are ideally suited for lightweight fixings in these boards.



If your building material has not been mentioned, such as clay, please contact our technical hotline.

**Note:** Non-load-bearing layers such as plaster or wall cladding must not be used as the anchoring base and must be taken into account when selecting the wall plug (e.g. wall plug length).

# Determining the building material

## TOX practical tip

The building materials are easy to recognise when the shell is still visible. As soon as the wall is plastered, however, it is much harder to identify the building material through observation alone. In this case, a test drilling at the edge with a small drill diameter can help to show what is hidden under the surface.



### Concrete

Produces a very fine, white to grey drilling dust.



### Solid brick (brick masonry)

Provides the unmistakable red drilling dust.



### Porous concrete

Produces light grey, coarse-grained drilling dust.



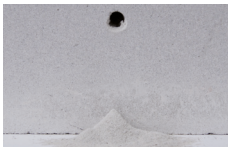
### Perforated brick

Cavities noticeable during drilling; dust is light red/orange.



### Plasterboard

Cavity behind the boards; dust is white and fine.



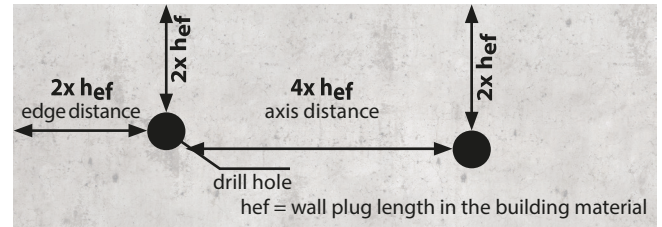
### Sand-lime brick

Dust is white and fine-grained, almost sandy.

If a test drilling is not desirable or possible, the use of an all-purpose wall plug is an alternative option. We recommend our red all-purpose wall plug **Tri**.

# Determining the building material

To ensure that the loads applied are held securely by the wall plug and that the wall plug does not chip or crack, wall plugs must be installed at sufficient distances from the edges of the building material, edge distances - and at certain distances from each other (axis distances). For steel and chemical anchors, these distances are usually regulated in the relevant approvals.



## TOX practical tip

If the wall plug does not hold, this may be due to the following:

### Anchoring base broken

Causes: Too high loads, low building material strength, incorrect wall plug or too small axis or edge distances.

### Component split

Causes: Insufficient component dimension, axis or edge distances were not observed.


### Wall plug pulled out

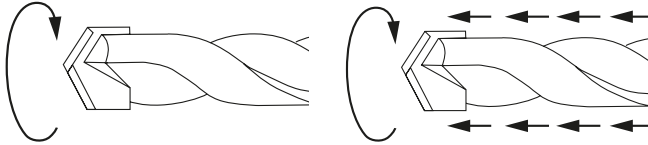
Causes: Frictional and adhesive bond have failed due to high load or incorrect installation (e.g. drill hole too large or unevenly drilled).

### Steel fracture

Causes: The screw strength is too low for the load.

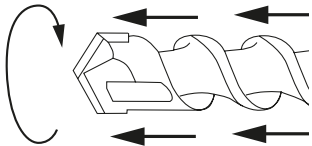
# Choosing the right drill

In order to achieve optimum load-bearing values, drills must be used which have the **test mark of the Prüfgemeinschaft Mauerbohrer**.  In addition, the drill hole must be thoroughly cleaned after drilling. The following drilling methods are used for a wide variety of building materials:



## Rotary drilling:

Removes the material through a rotating spiral blade. Does not destroy building material. Drilling into porous concrete, perforated brick and wall boards with a normal drill and without impact to prevent webs in the building material from breaking out or the drill hole becoming too large, e.g. suitable for boards with a porous structure (porous or pumice concrete) or perforated brick.



## Hammer drilling:

The hammer drill functions with less, but at the same time, considerably stronger impacts. The hammer mill does the main work. Drill with hammer drill with hard impacts and high drilling progress, for drilling that requires a high quality. Suitable for substrates made of solid brick with a dense structure, e.g. for concrete or natural stone, etc.

## Impact drilling:

Material is crushed by the impact and transported out of the drill hole with the helix. Drill with an impact drill with light impacts for substrates made of solid stone with a dense structure (solid brick or sand-lime solid brick) and rather soft materials. The drill is propelled forward by the machine making many light impacts.

## TOX practical tip

### Hearing protection

Working with power tools can become loud, despite the prescribed noise limit. Therefore, suitable hearing protection is essential when working with the devices on a regular basis.

There are three types of noise protection in the workplace:

- Earplugs
- Ear muffs (similar to headphones)
- Earmoulds (individually manufactured hearing protection plugs made of acrylic or silicone)

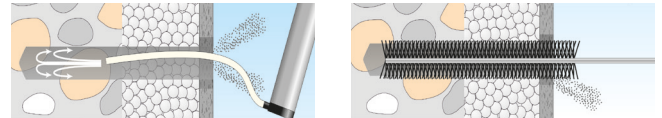
# Drill hole cleaning

**Optimum drill hole cleaning** is an important factor when installing a wall plug, as drilling dust in the building material can reduce the holding forces of a wall plug by more than 50%.

Drilling dust acts like a sliding layer in friction-locked wall plugs, e.g. the **Barracuda** expansion wall plug. Wall plugs can slip out of the drill hole. In the case of adhesive-locking wall plugs such as the **Liquix** compound mortar, the drilling dust acts as a separating layer and prevents a firm connection between compound mortar and anchoring base. To ensure a fixing is secure, especially for products approved by building authorities, drill hole cleaning is specified in the respective approval.

## Optimum cleaning:

Optimum drill hole cleaning consists of blowing and brushing, e.g. with the **Taifun** air blower and the **Brush** cleaning brush.



## TOX practical tip

### How deep must the drilling be?

As a general rule, the depth of the drill hole must be greater than the anchoring depth. In particular with plastic wall plugs, space is needed to accommodate the screw, which must always consider of the tip of the wall plug.

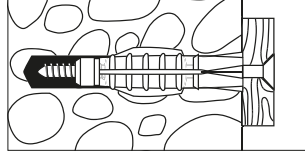


# Correct installation

A distinction is made between three types of installation for wall plugs:

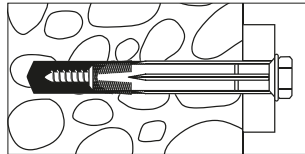
## Flush installation:

The wall plug is flush with the anchoring base. The attachment is installed on the wall plug. The screw is screwed through the attachment into the wall plug.



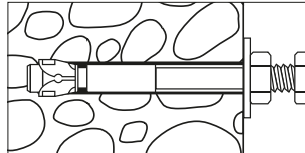
## Through installation:

Here, the expansion part of the wall plug is inserted through the attachment into the anchoring base. Therefore, the wall plug head is against the attachment. The wall plug length also limits the thickness of the attachment.



## Spaced installation:

This is used for attachments that need to be fixed at a specific distance from the anchoring base. For this type of installation, metal wall plugs with internal threads are usually used to hold threaded rods with locking nuts. Spaced installation is used, for example, to compensate for unevenness, for ceiling suspensions or, with the **THERMO Proof** for bridging insulation.



## General safety instructions:

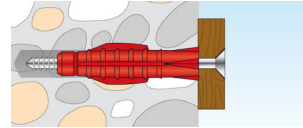
- The anchoring depth of the wall plug must be observed.
- The drilling process and drill hole cleaning must be adapted to the building material.
- For heavy-duty fixings: Dimensioning in compliance with the approval.
- The recommended loads apply only to installation in the building material and not to installation in joints.
- Approved wall plugs must be used for fixings where safety is of importance.

## General note:

Fixings must be installed and dimensioned in accordance with applicable rules and regulations. In case of doubt, please contact our **technical hotline** at +49 (0) 07576 / 9295-123 or [technik@tox.de](mailto:technik@tox.de).

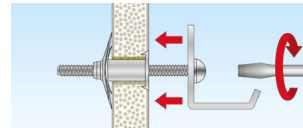
# How a wall plug works

To ensure that the different forces acting on the wall plug can be safely transmitted into the substrate, various support mechanisms are used.



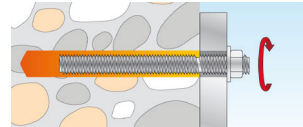
## Friction lock:

In this case, the expansion part of the wall plug is pressed against the wall of the drill hole in the building material.



## Form lock:

Here, the wall plug geometry adapts to the shape of the substrate or the drill hole.



## Adhesive lock:

In this case, the wall plug is connected to the substrate with a mortar.

## TOX practical tip

### Selecting the correct wall plug and screw length

The following applies to the correct length of drill hole, wall plug and screw:

- Drill hole depth = wall plug length + min. 10mm
- Screw length = wall plug length + thickness of attachment + 5mm (must protrude from the tip of the wall plug)
- Drill Ø = wall plug Ø

This does not apply to the **Ytox**, **Dual Force** and **Impact** wall plugs. Please refer to the information on the packaging.

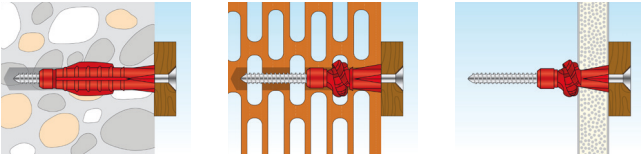
### How do I select the correct wall plug diameter?

To ensure that a fixing holds properly, it is not only the correct wall plug length that matters, but also its size. In principle, the wall plug diameter corresponds to the diameter of the drill hole. The diameter of the screw is normally 2-3mm less. **The optimum approach:** Define the correct screw size (diameter) based on the attachment, then add 2-3mm for the correct wall plug and drill diameter. Of course, factors such as building material, correct length and location (inside or outside) must also be taken into account.

# Types of wall plugs and fixings

## All-purpose wall plugs:

Due to its function with expansion or knotting, the all-purpose wall plug is suitable for almost all building materials. The wall plugs **knot behind** the building material or **expand** in solid building materials like an expansion wall plug. Rotation locks prevent the wall plugs from rotating in the building materials. The most common all-purpose wall plugs include the **Tri**, **Trika** or **Deco**.



**Field of application:** Fixing kitchen cabinets, shelves, TV sets, pictures, mailboxes, hanging baskets, curtain rods, towel holders, skirting boards, lamps, cable ducts, lightweight mirror cabinets etc.

**Please always refer to the building material information on the packaging!**



## Heavy-duty wall plug:

Heavy-duty wall plugs are generally defined as wall plugs made of steel which anchor in the material by expanding. In addition to the mechanical heavy-duty wall plugs, there are heavy-duty wall plugs where a steel element is "glued" into the drill hole with the help of a mortar. Mechanical heavy-duty wall plugs include, for example, the **S-Fix** bolt anchor, the **Dual Force** heavy-duty anchor or the **Impact** single-hit anchor. The expansion of the heavy-duty anchor in the component results in a so-called frictional lock.

**Field of application:** Fixing wooden and steel structures, railings, ladders, cable routes, beams, awnings, canopies, security doors, substructures etc.

**Please always refer to the building material information on the packaging!**



# Types of wall plugs and fixings

## Hook wall plugs:

Wall plugs with a hook or ring screw, e.g. the **Pirat Skippi** cavity hook wall plug, the **Pirat Will & Bill** all-purpose hook wall plugs or the **Pirat Leslie** plasterboard hook wall plug.

**Field of application:** Fixing wall cabinets, wardrobes, shelves, lights, hammocks, washing lines, pictures, hanging flower baskets, etc.

**Please always refer to the building material information on the packaging!**



## Sanitary fixings:

Different fixing systems for installing sanitary systems with optimally matched components, e.g. the **Oase** wash stand fixing, **Piss-Fix** urinal fixing or the **Toilet** standing WC fixing.

**Field of application:** Fixing mirrors, glass panels, washstands, consoles, boilers, urinals, standing WCs, ceramic shelves, washbasins etc.

**Please always refer to the building material information on the packaging!**



## TOX practical tip

### Should I use approved wall plugs?

To answer this, you need to ask yourself the following questions:

- Would there be a danger to life if the fixing failed?
- Can high economic damage be expected if the fixing fails?
- Is approval of the wall plug required in the tender or similar?

If you have answered yes to one or more of the questions, wall plugs approved by the building authorities must be used.



## Types of wall plugs and fixings

### Frame wall plug:

Frame wall plugs consist of a plastic sleeve and a corresponding screw. When the screw is tightened, the plastic sleeve expands and anchors into the drill hole. Frame wall plugs are installed using through installation. These include, for example, the **Attack Metal** metal support fixing, the **Apollo** all-purpose frame wall plug or the **Fassad** frame wall plug.

**Field of application:** For anchoring window frames, door frames, kitchen cabinets, wooden substructures, wardrobes, metal support profiles, sheet metal, cable ducts, substructures, wooden beams etc.

**Please always refer to the building material information on the packaging!**



### Chemical wall plugs / composite mortars:

Composite mortar (= two-component adhesive) is an adhesive that consists of different components (resin and hardener). The hardening reaction is started by mixing the two components. To do this, the composite mortar is pressed out of the cartridge into the cleaned drill hole with the aid of a dispenser gun. The threaded rod or internally threaded sleeve is then screwed in. In hollow stones, a plastic sieve sleeve ensures that the mortar mass does not run too far into the building material and adheres better to the stone. Once dry, the synthetic resin mortar is solid. The **Liquix Pro 1**, for example, is a composite mortar.

**Field of application:** For fixing awnings, canopies, steel constructions, ladders, high shelves, railings etc.

**Please always refer to the building material information on the packaging!**

### TOX practical tip

#### Safe use of composite mortar

The TOX **Liquix Blaster** dispenser gun is recommended for the safest and easiest use of composite mortars. The stable metal design, the non-slip handle and the high transmission ratio of **1:18** require little effort and ensure that the composite mortar can be pressed out more easily than comparable products.

## Types of wall plugs and fixings

### Cavity wall plugs:

Cavity wall plugs are suitable for securely fixing attachments to thinner walls behind which there is a cavity. Cavity wall plugs are suitable for fixing in metal profiles, sheet rock or in the ceiling walls of some old dwellings. Cavity wall plugs include, for example, the **Spiral** plasterboard wall plug, the **Spagat** spring toggle wall plug and the **Acrobat** metal cavity wall plug.

**Field of application:** For fixing pictures, lights, electric switches, signs, curtain rods, spice racks, hanging baskets, mirrors, wardrobes etc.

**Please always refer to the building material information on the packaging!**



### Insulation wall plugs:

There are two types of insulation wall plugs:

#### 1. Fixings in insulation materials:

Lighter elements can be fixed directly in the insulation layer, as the conical thread of the wall plug compresses the insulation layer, thereby creating a strong hold. Thermal bridges are also prevented. These fixing systems include, for example, the **Thermo** and **Thermo Plus**.

**Field of application:** For fixing signs, lamps etc.

#### 2. Fixing insulation materials to house walls:

For fixing pressure-resistant, self-supporting insulation boards, soft insulation materials such as glass wool, rock wool, foils etc. These fixing systems include, for example, the **Husky** or **Keeper** insulation wall plug.

**Please always refer to the building material information on the packaging!**



## Tips & tricks

### How can I fix a 60" flat screen (weight: approx. 40kg) to a plasterboard wall?

To fix heavy objects to plasterboard walls, we recommend our **Acrobat** metal cavity wall plug. If the television is attached to an extendible telescopic arm, the lever effect of the swivel arm additionally increases the tensile force of the television. There is a risk that the plasterboard wall will break.

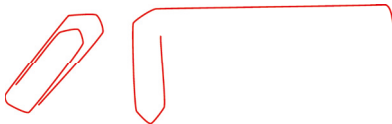
#### Here's a trick:

Gypsum plasterboards are usually mounted on struts every 62.5cm when constructing drywalls. These struts can be found by tapping the walls. The closer the TV is installed to a strut, the better the wall will hold the weight of the TV. A heavy flat screen can be fixed directly on a strut with our **Acrobat** metal cavity wall plug or our **Spagat** or **Spagat Pro** spring toggle wall plug.



### How do I find out the thickness of the gypsum plasterboard in my kitchen ?

Simply carry out a test drilling with a small drill diameter. Bend one end of a wire or, alternatively, a paper clip by approx. 4mm and measure the remaining length from the bend. Then push the wire through the hole and pull it back until there is resistance. You can then measure the length of the wire protruding from the hole. If you subtract this from the total remaining length of the wire (remaining length = length from bend), you will calculate the thickness of your wall boards.



## Tips & tricks

### How do I fix a wall cabinet in a drywall?

The best way to fix objects to drywall is with our cavity wall plug. However, using the **Acrobat** metal cavity wall plug or our **Spagat** or **Spagat Pro** to fix objects, such as a wall cabinet, to or near wall struts, which are usually every 62.5cm in a drywall, will create an even stronger hold. These struts can be found by tapping the walls or using a detection device.



### What do I have to consider if I want to install fixings outdoors?

When fixing outdoors, make sure to use stainless steel components. For heavy loads, we recommend our **S-Fix Pro 1** bolt anchor and our **Liquix Pro 1** composite mortar. For lighter fixings, we recommend our **Tri** and **Trika** all-purpose wall plugs, the **Barracuda** and **Bizeps** expansion wall plugs or our frame and insulation wall plugs.

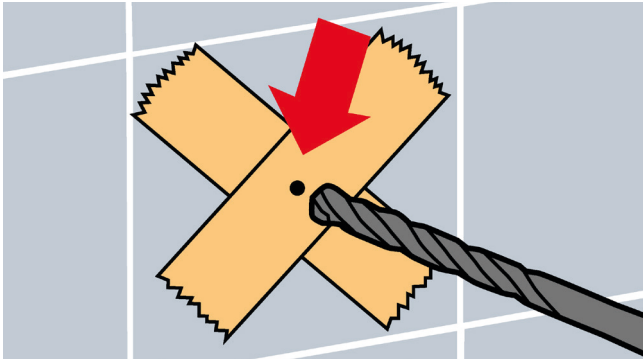


## Tips & tricks

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### What is the correct way to drill into a tile?

Simply stick a piece of masking tape on the spot where the hole is to be drilled. This prevents the drill slipping on the tile and chipping the tile glaze. Then carefully place the drill (tile or masonry drill) and drill the hole at slow speed (without impact).

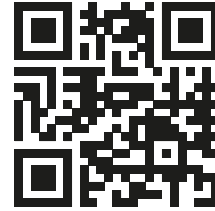


Further tips & tricks and instructions for correct installation can be found online on our website: [www.tox.de](http://www.tox.de)

## Tips & tricks

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### Video guide on YouTube



*toxgermany* - Follow us on



**YouTube**

Our TOX wall plug clips give a clear and understandable explanation of how to use our wall plugs.

# Technical hotline

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## Personalised advice for all fixing problems!

Our technical hotline is available for questions about the basics of wall plugs or general application technology on

**+49 (0) 7576 / 9295-123**

or by email to

**technik@tox.de**

from Monday to Friday, 07:00 - 17:00.



### Note:

Our products are constantly being developed, therefore we reserve the right to make technical changes or changes to the product range. Liability for printing errors and mistakes is excluded.

The declarations of performance (including building authority approvals) of our products can be downloaded from **[www.tox.de/dop](http://www.tox.de/dop)**



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