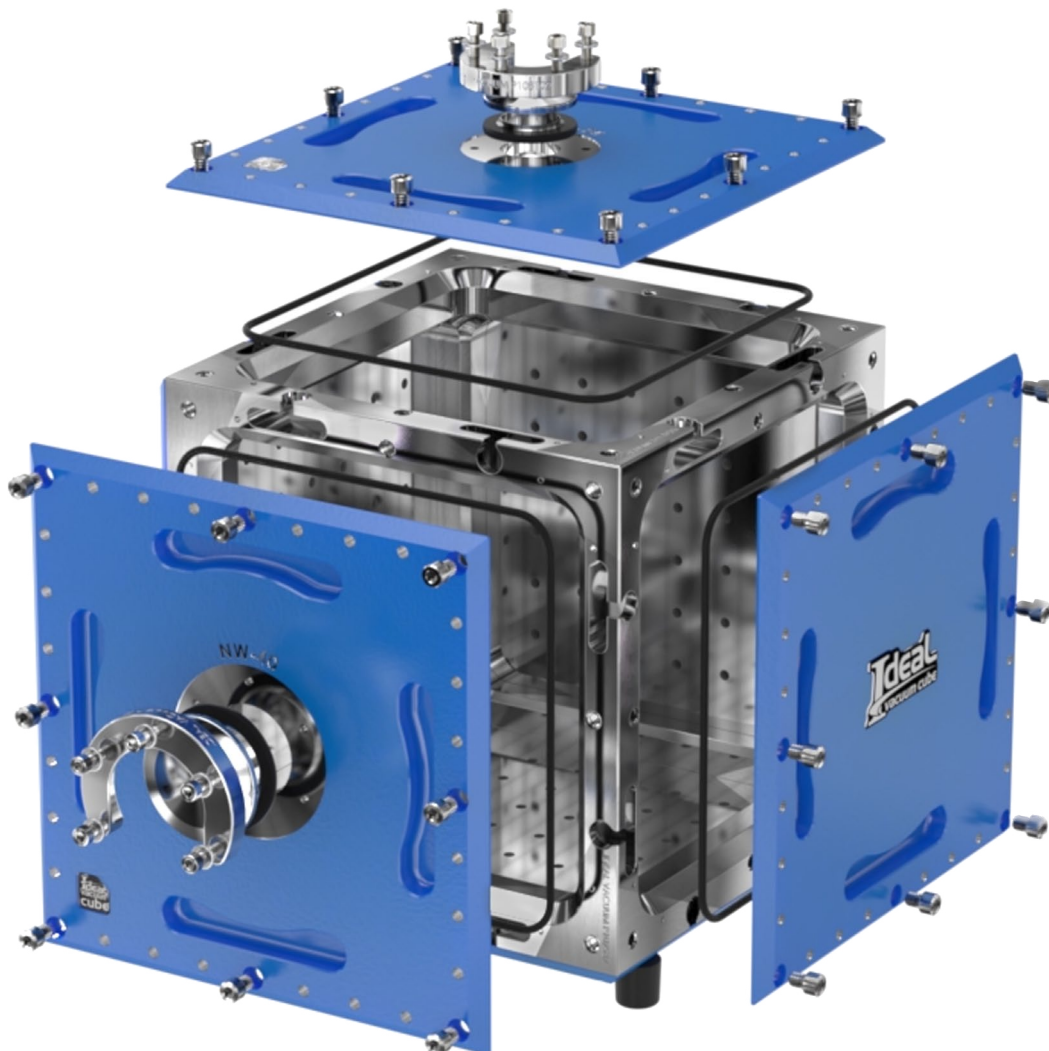




OUR PRODUCTS DEVELOP TOMORROW'S TECHNOLOGIES™

# CUBE PLATE INSTALLATION

for all Ideal Vacuum Cubes and Cube Plates



## WARRANTY

Ideal Vacuum warrants, to the original purchaser, this product to be free from defects in workmanship and materials, for a period of one (1) year from the original delivery date. The liability of Ideal Vacuum, under this warranty, is limited to servicing, adjusting, repairing or replacing any unit or component part which, at Ideal Vacuum's sole discretion, is determined to have failed during normal, intended use. This warranty does not cover improper installation, process related damage, product used in any way other than defined in this manual, or any misuse, abuse, negligence, accident, or customer modification to the product. Prior to returning any product, we require that you contact us by phone or email to determine if the issue can be resolved quickly. A technical support representative will try to resolve the problem. If we cannot resolve the issue quickly, we will issue an RMA number and provide product return instructions.

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## CUSTOMER SERVICE AND SUPPORT

If you have any questions concerning the installation or operation of this equipment, or if you need warranty or repair service, please contact us. Customer Service and Technical Support is available weekdays, from 8am-5pm, Mountain Time.

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**Cover Image:** 9x9 Ideal Modular Vacuum Cube, exploded view, with blank, KF-25 and KF-40 ported Cube plates

# SAFETY

## IMPORTANT SAFETY INFORMATION

Thank you for purchasing this equipment from Ideal Vacuum Products. We want you to operate it safely.

- **Read this manual before installing or operating this equipment. Failure to follow the warnings and instructions may result in serious injury or equipment damage.**
- **Keep this manual in a safe location for future reference.**
- **This equipment should only be installed and operated by trained, qualified personnel, wearing appropriate protective equipment.**
- **Follow all codes that regulate the installation and operation of this equipment.**

## WARNING SYMBOLS AND DEFINITIONS



This is the universal safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



Indicates an imminently hazardous situation that, if not avoided, will result in death or severe injury.



Indicates an imminently hazardous situation that, if not avoided, could result in death or severe injury.



Indicates a potentially hazardous situation that, if not avoided, could result in moderate or minor injury. It may also be used to alert against unsafe practices.



Indicates an potentially hazardous situation that, if not avoided, could result in equipment or property damage.



Indicates helpful tips and recommendations, as well as information for efficient, trouble-free operation.

Internationally recognized safety symbols may be used with safety warnings to specify the type of hazard or a safety protocol to follow. For example:



Indicates an electric shock hazard



Indicates safety glasses are required

# 1. INTRODUCTION

The Ideal Vacuum Cube™ is a modular high-vacuum chamber system, conceived to enable creativity and design flexibility in vacuum chamber system construction. Cubes can be stacked together into various shapes and configurations, with interchangeable plates offering a variety of features for connections, windows, and feedthroughs. Cube plates are configured with multiple 1/4"-20 threaded mounting holes for adding both internal and external accessories to a Cube system.

The core of an Ideal Vacuum Cube modular chamber system is the Cube frame (Figure 1). Machined from a single billet of 6061-T6 aluminum alloy and reinforced with stainless steel threaded inserts, a Cube frame accepts a single Vacuum Cube Plate on each side (6 sides).

Configuring and building an Ideal Vacuum Cube chamber is a simple process. Once the desired plates have been selected, they can be mounted quickly onto the Cube frame. Single or multiple plates can be swapped easily when reconfiguration is needed. Plates are mounted to the Cube frame and sealed using our patented Taper-Seal™ design, which helps protect vacuum sealing surfaces and O-ring seals from damage or contamination.



Figure 1 - The Cube frame

This manual provides instructions for how to properly mount a Cube plate onto a Cube frame and how to correctly remove and replace a Cube plate when reconfiguring a Cube system.

The entire lineup of Ideal Vacuum [Cube chambers, plates and accessories](#) is available on the [Ideal Vacuum](#) website. Figure 2 shows just a few of the available standard plate configurations. Custom plates are available for unique requirements.

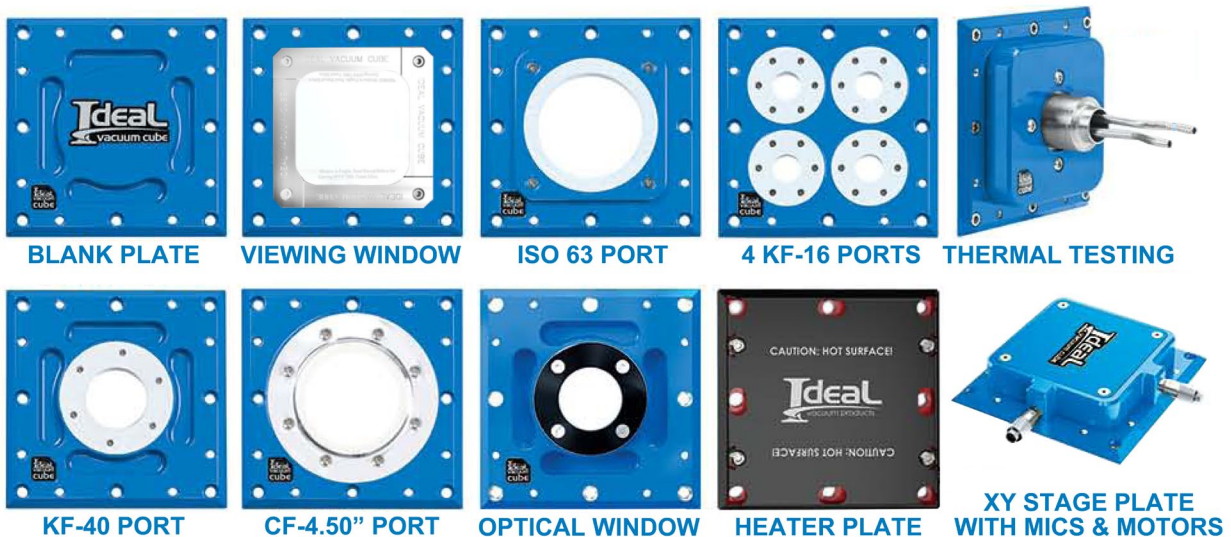


Figure 2 - Some of the available Cube plate options



## 2. PLATE REMOVAL

If you are reconfiguring the Cube chamber with a new plate, or are performing service (e.g., for cleaning or to replace an O-ring), the existing plate will first need to be removed (dismounted) from the Cube frame.

A 3/16” hex key wrench is used to remove an existing Cube plate from a Cube frame. We offer a Cube plate maintenance toolkit ([P1010554](#)) which includes a 3/16” hex wrench and an O-ring removal tool. A complete Cube essential service tool kit ([P1010558](#)) is also available.

**CAUTION**



Always wear protective equipment, including safety glasses and gloves when working with any vacuum system or component.

**WARNING**

Before performing any maintenance or service, the Cube chamber must be brought up to ambient atmosphere.

**NOTICE**

Prepare and use a clean, soft surface when performing any maintenance or service on an Ideal Vacuum Cube. Be careful, use clean tools and recommended cleaning agents.

To remove a Cube plate, start by loosening one corner bolt. Then, loosen the bolt opposite from it. Continue to loosen bolts using a “star” or “cross” pattern (similar to removing the lug nuts on a car). Unscrew bolts gradually (about a 1/2 turn at a time) and take several “passes” around the plate until all bolts are free.

Figure 3 shows the loosening bolt order for 6x6 and 9x9 plates. Reverse the order in [Figures 9 and 10](#) for 6x12 and 12x12 plates.

Once all bolts are free, the plate should easily separate from the frame. If necessary, use an O-ring removal tool ([Figure 5](#)), or a flat plastic putty knife to separate the plate from the frame. Do not use a metal tool as it could damage the sealing surface.

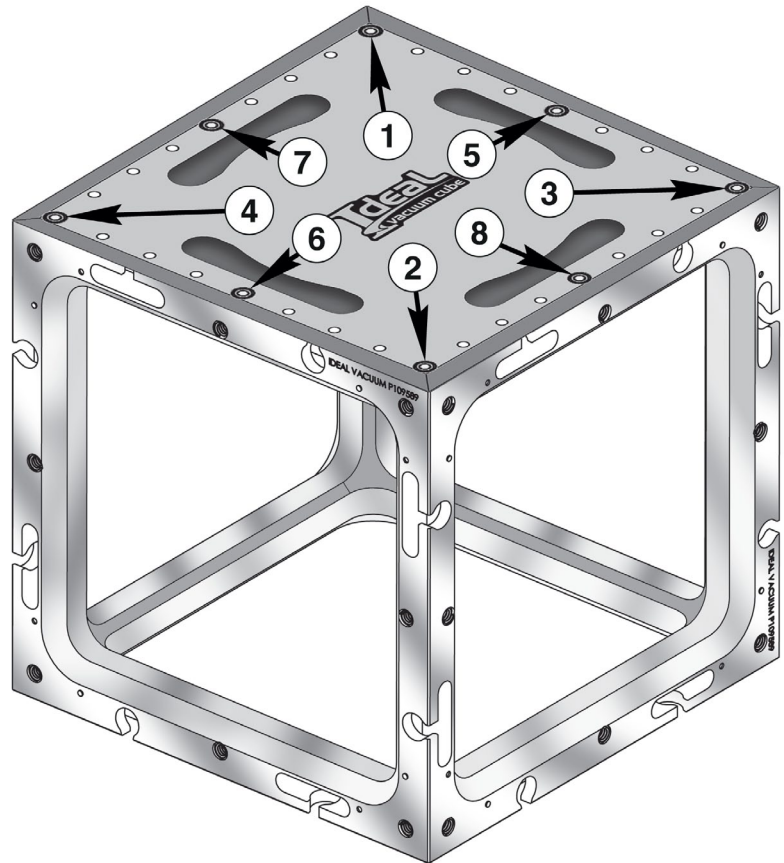


Figure 3 - Bolt loosening order (6x6 and 9x9 plates)

### 3. CLEANING AND O-RING REPLACEMENT

Once the plate has been dismantled from the Cube frame, place it face down on a soft surface to keep from scratching the powdercoating. On the underside of each Cube plate is an O-ring set in a tapered O-ring groove.

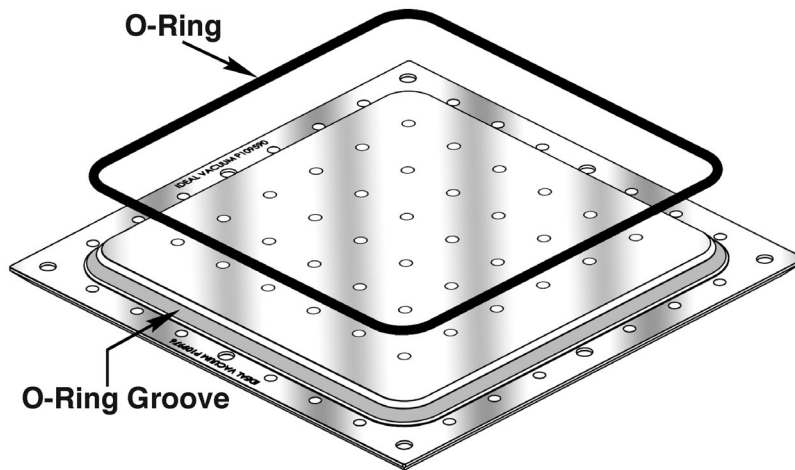


Figure 4 - Back of a Cube plate

1. Carefully remove the O-ring from its groove. Use only a plastic O-ring/seal removal tool (Figure 5, [P1010547](#)). Avoid the use of metal tools which could damage the groove or O-ring.



Figure 5 - Remove the O-ring from the groove

2. Clean the O-ring and the O-ring groove with isopropyl alcohol (IPA). O-rings can be re-used many times, but should be replaced if nicked, torn, permanently deformed, no longer round or otherwise damaged. Replacement plate O-rings are available for all plate sizes (Table 1).

Plate Size	6x6	6x12	9x9	12x12
O-Ring Part #	<a href="#">P107295</a>	<a href="#">P108339</a>	<a href="#">P1010490</a>	<a href="#">P108428</a>

Table 1 - Replacement plate O-rings

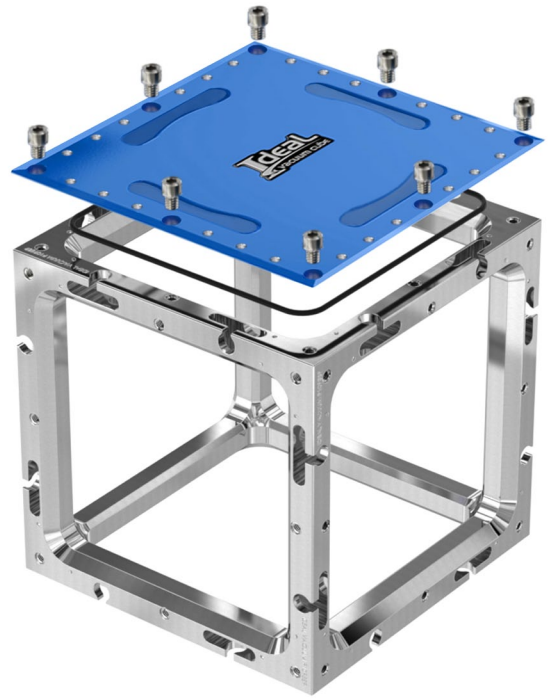
## 4. PLATE MOUNTING

The plate mounting procedure is similar for all Cube plates. All plates are mounted using 1/4"-20 x 5/16" long socket head bolts, which take a 3/16" hex key wrench.

### NOTICE

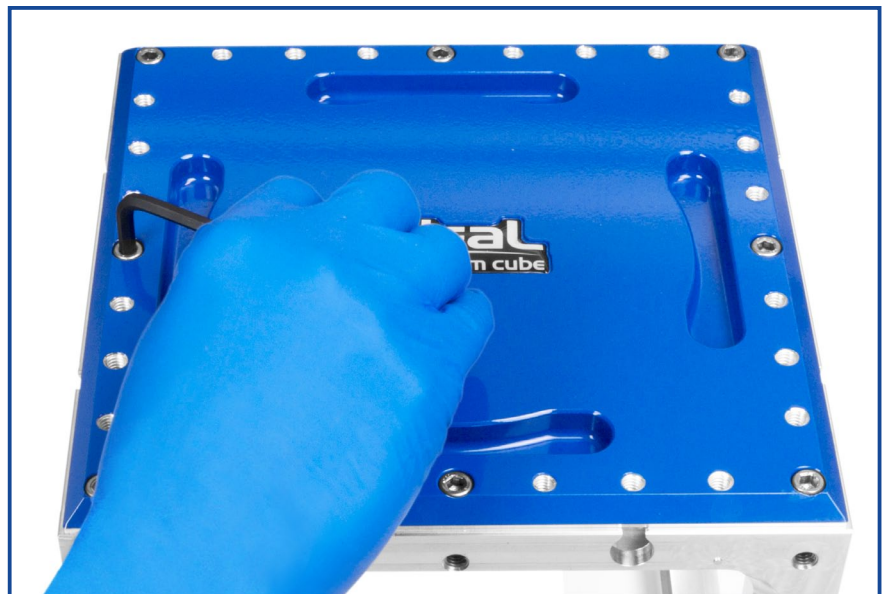
**Maximum plate bolt torque is 70 in-lb. Do not exceed recommended torque. Over-tightening of bolts DOES NOT produce a more leak-proof seal.**

1. Before mounting a plate onto the Cube frame, clean the plate, O-ring, O-ring groove and the tapered sealing surface of the Cube with IPA.
2. Install the O-ring by pushing it into the plate groove with your fingers. If the O-ring pops out of the groove, run it through your hands to create friction to warm and slightly stretch it to fit better. For the best vacuum performance, be sure the installed O-ring has minimal twist. Do not use vacuum grease.
3. Position and gently place the Cube plate onto the Cube frame (Figure 6).
4. Insert 1/4"-20 x 5/16" long bolts into each of the plate bolt holes (Figure 6).



*Figure 6 - Fit the plate onto the frame*

5. Use a 3/16" hex wrench to begin tightening the plate bolts (Figure 7).
6. Start by tightening one center bolt. Tighten the bolt opposite from it until the plate is drawn to and sits flush against the Cube.



*Figure 7 - Begin tightening the bolts*



- Begin to tighten all the plate bolts gradually (about a 1/2 turn at a time). Use the tightening pattern shown in Figure 8, 9 or 10, corresponding to your plate size. Take several “passes” around the plate until all bolts are snug.

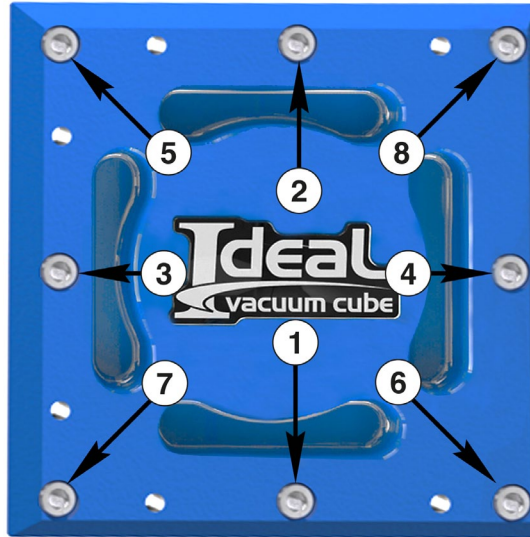


Figure 8 - 6x6 and 9x9 bolt tightening pattern

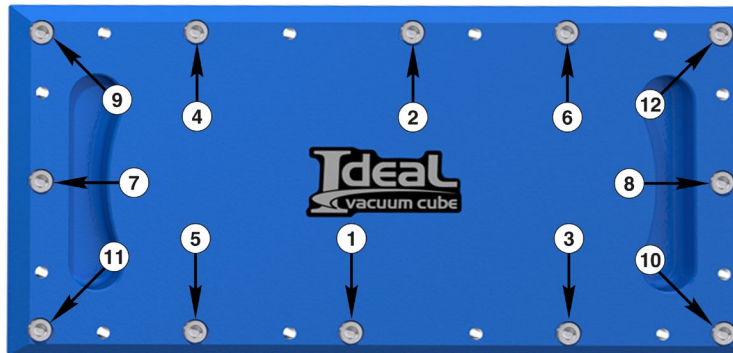


Figure 9 - 6x12 bolt tightening pattern

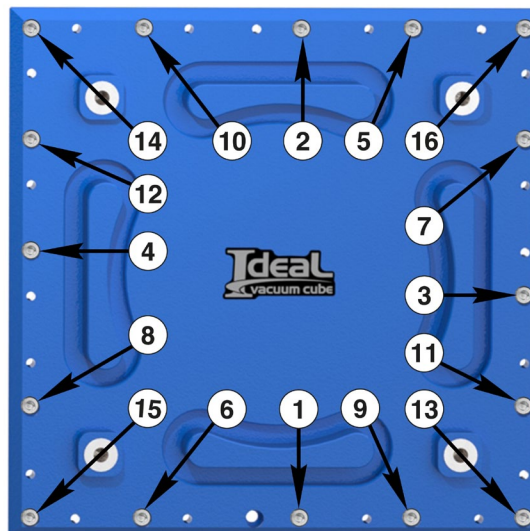
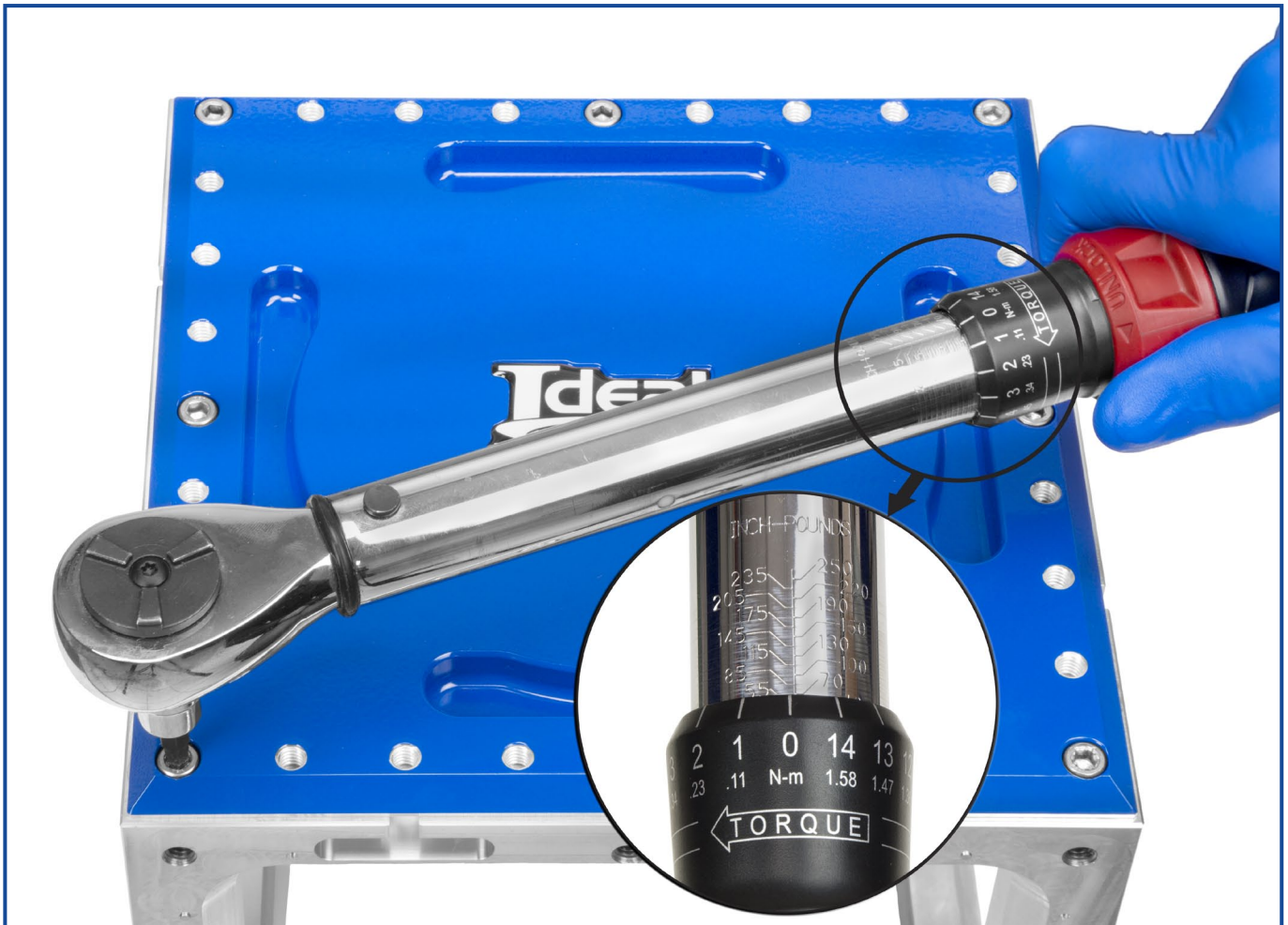


Figure 10 - 12x12 bolt tightening pattern

## NOTICE

Ideal Vacuum Cube components are machined to very precise tolerances so that plates will sit very flat against the Cube and create a consistent seal. Over-tightening fasteners will not improve the vacuum performance. Once the plate is in contact with the frame it can go no further. Over-tightening could cause damage to the bolts or threaded frame inserts.

8. Finish tightening the bolts using a torque wrench set to **70 in-lb.** maximum (Figure 11).
9. Continue around the tightening pattern until all bolts have been properly torqued.



*Figure 11 - Torque bolts to 70 in-lb.*

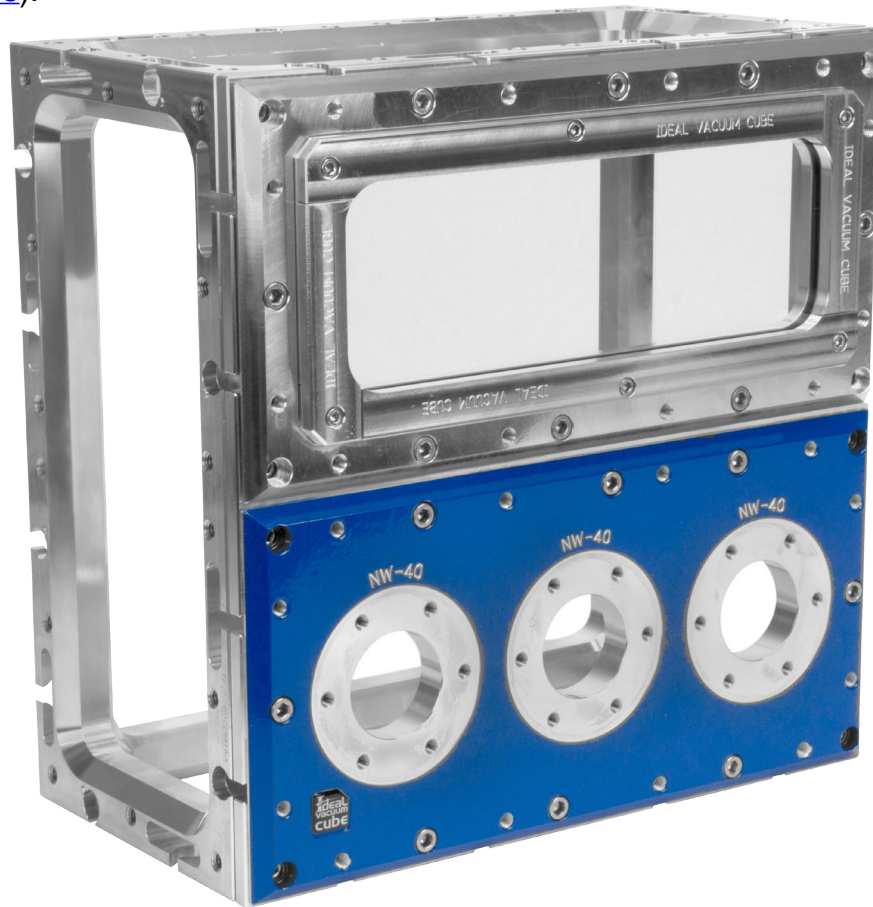
## 5. PLATE ADAPTERS

Ideal Vacuum Cube plate adapters add even more versatility to our modular Cube chamber systems. These specialized plates, made from solid 6061-T6 aluminum, allow two or more smaller plates, or even smaller Cubes, to be mounted to the side of a Cube frame.

Cube plate adapters are available in three configurations:

- 6x12 plate adapter for mounting two 6x6 plates ([P108167](#))
- 12x12 plate adapter for mounting two 6x12 plates ([P108718](#))
- 12x12 plate adapter for mounting four 6x6 plates ([P108476](#))

Figure 12 shows one possible configuration. In this example, a 6x12 viewing window plate ([P108695](#)) and a 6x12 multiple port (triple KF-40, [P108218](#)) plate are mounted to a 12x12 plate adapter ([P108718](#)).



*Figure 12 - Cube frame with plate adapter, viewing window and triple KF-40 plates*

The number of mounting bolts used to mount a plate adapter is less than for other Cube plates, but similar “star” bolt tightening patterns are used and plate adapters incorporate the same patented Taper-Seal™ technology.

Plate adapters include the Cube frame-to-plate sealing O-ring and are mounted using the same bolts (1/4”-20 x 5/16” long socket head bolts) as other Cube plates.

## 5.1 PLATE ADAPTER MOUNTING

Plate adapters have either eight or twelve countersunk through holes located in the corners and on the sides. These holes are used to mount the plate adapter onto the Cube frame (Figure 13). The open slots in the plate adapter sides are used for [Cube coupling](#).

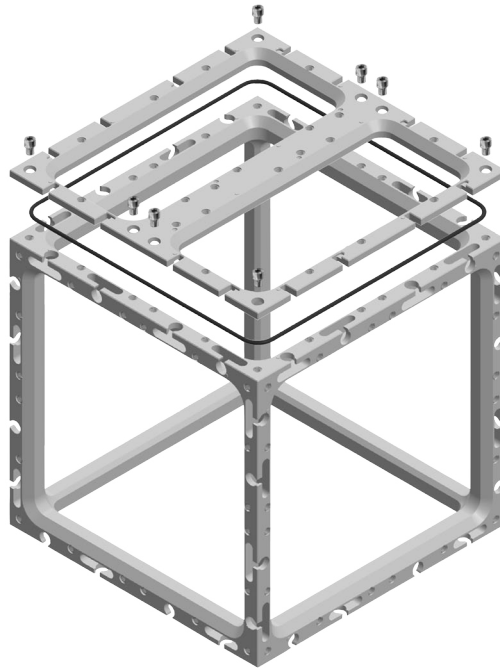


Figure 13 - Mounting a plate adapter

To mount a plate adapter, begin by cleaning it with IPA and install the sealing O-ring. Use the plate adapter tightening order shown in Figure 14 or 15.

6x12 plate adapter use eight mounting bolts.

Both 12x12 plate adapters ([P108718](#) and [P108476](#)) require 12 bolts and have the same mounting hole positions.

Bolt torque is the same as for all Cube plate bolts: **70 in-lb. maximum.**

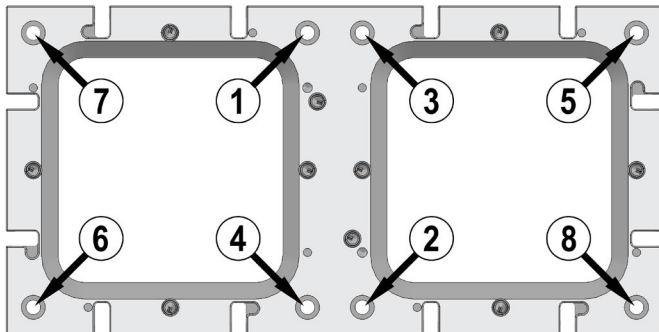


Figure 14 - 6x12 plate adapter tightening order

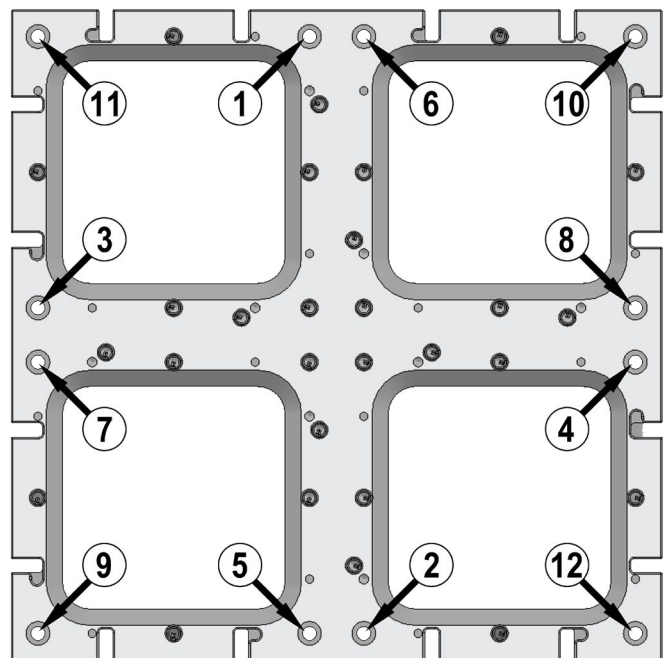


Figure 15 - 12x12 plate adapter tightening order



## 5.2 MOUNTING ONTO PLATE ADAPTERS

Plate adapters have stainless steel threaded inserts in all bolt mounting locations, except for the countersunk through holes used to mount the adapter plate to the Cube frame. The threaded inserts accept 1/4"-20 x 5/16" long socket head plate mounting bolts. The elimination of corner plate mounting bolts does not cause a reduction in the ultimate vacuum capability of the Cube chamber system.

### NOTICE

**Use only 1/4"-20 x 5/16" long socket head bolts. Longer bolts can cause damage to the plate adapter threaded inserts, the adapter plate and the Cube frame. Torque all bolts to 70 in-lb. maximum.**

Once the plate adapter is mounted onto the Cube frame, install one Cube plate on to it at a time. All plates installed onto a plate adapter use similar "star" tightening patterns as other Cube plates, but without corner mounting bolts. All mounting bolts are torqued to **70 in-lb.**

Figures 16, 17 and 18 show the tightening order for installing Cube plates onto plate adapters.

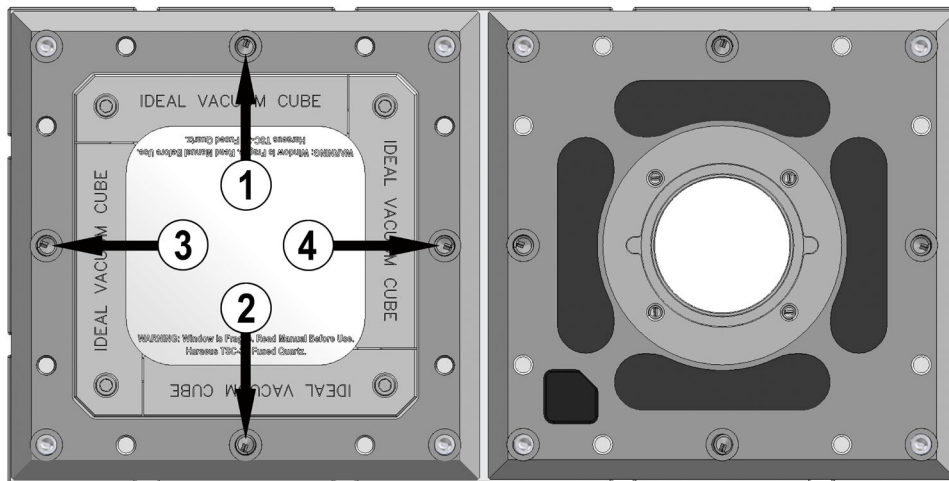


Figure 16 - Tightening order for 6x6 plates mounted onto a 6x12 plate adapter

### NOTE

**12x12 plate adapters can accept either two 6x12 Cube plates ([P108718](#)) or four 6x6 plates ([P108476](#)). 12x12 plate adapters cannot accept combinations of two different plate sizes (e.g. one 6x12 and two 6x6 plates).**

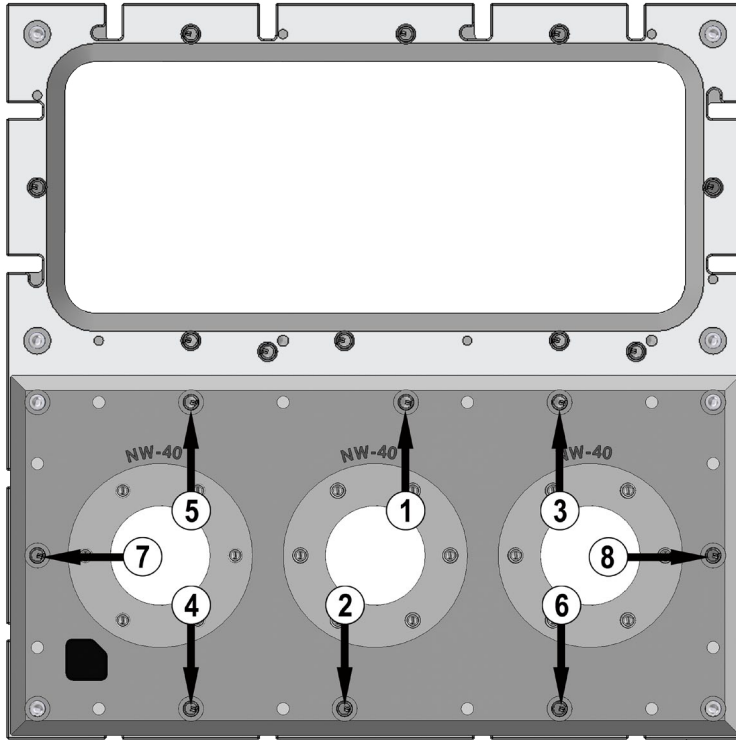


Figure 17 - Tightening order for 6x12 plates mounted onto a 12x12 plate adapter

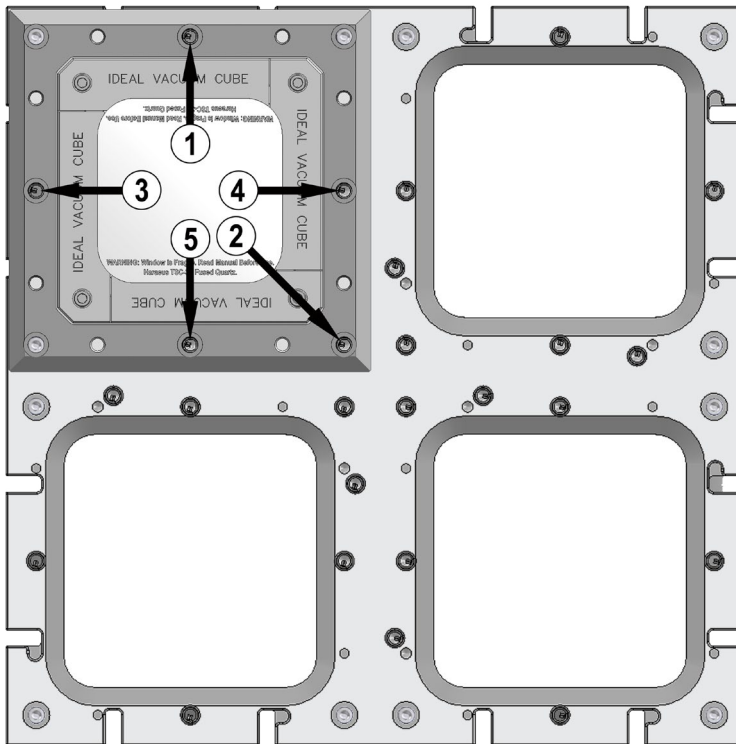


Figure 18 - Tightening order for 6x6 plates mounted onto a 12x12 plate adapter

**NOTE**

Please contact the Ideal Customer Support Team to assist you with any issue regarding Ideal Vacuum Cube plates. We are here to help. [Customer Service](#) and [Technical Support](#) is available weekdays, from 8am-5pm, MST.



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