



**August 2015**

**ECOsine® active Harmonic Filters**

Packaging Instructions Cabinet Filter Types (V1)

**SCHAFNER**  
energy efficiency and reliability







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Revision: 01 (August 2015)

The most current edition of these instructions (PDF format) can be obtained from your contact of the Schaffner sales or service organization.

Other technical documentation of our products is also available in the download area of our website [www.schaffner.com](http://www.schaffner.com)

Document name:  
Packaging Instructions Cabinet Filter Types Rev01.pdf

### Version history

Revision	Date	Description
01	August 2015	Initial version

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# **1 General Safety Instructions**

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## 1.1 Intended use

The ECOsine® active harmonic filter is used for active compensation of reactive power and harmonic content and for load balancing.

Please ensure that no compensation systems, which are not detuned, are connected to the same grid. Otherwise interactions between ECOsine® active and these compensation systems may occur.



### **DANGER**

Dangerous voltage

**Risk of death due to short circuits and electric shock if the active filter is opened improperly. The discharge time of the intermediate circuit after disconnecting from the mains can be more than 5 minutes.**

All interventions involving opening the device cover or removing or installing the connection cable may only be performed by qualified personnel.



### **WARNING**

High-frequency interferences

**In a residential environment, high-frequency interferences could occur, which necessitate interference suppression.**

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#### **Note**

Please note that there are additional manuals for some product variants. For the latest versions of these manuals go to [www.schaffner.com](http://www.schaffner.com)

It particularly applies to types FN3420-100/120-400-3-GL, please observe the special EMC-Filter Manual for these types (ECOsine EMC Filters for Applications with GL)




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## 1.2 Personnel qualification

Installation of the ECOsine® active filter, inspections for proper operation, and certain troubleshooting measures may only be performed by qualified personnel. All other measures may be performed by people who have read these instructions.

## 1.3 Environmental conditions / Exclusion of warranty

This document classifies groups of environmental parameters and their severities to which ECOsine® active harmonic filters are subjected when mounted for stationary use at weather protected locations under use conditions, including periods of erection work, down time, maintenance and repair. The lifetime of electronic equipment is depending on the environmental conditions they are exposed to. Especially in harsh environments lifetime is reduced due to the corrosiveness of the atmospheric environment. Generally corrosion in micro or power electronics depends on several variants such as the package type, materials involved, assembly processes, moisture, inorganic and organic contaminants, atmospheric pollutants, temperature, thermal stress and electrical bias. To increase the lifetime Schaffner provides all ECOsine® active filters with the ability to work within pollution degree 2 (PD2) and does use coated PCB's according to IEC61721-3-3. Schaffner standard PCB construction complies with class 3C2. Please carefully read the provided information and check if your application fulfills the required specifications as **Schaffner expressly points out that the manufacturer's warranty shall lapse with immediate effect if ECOsine® active harmonic filters are transported, stored, installed or operated outside their published specifications.**

<b>Important</b> 	<p>ECOsine® active harmonic filters (AHF) listed below are IP20 or IP54 devices to be installed in an environment in compliance with the requirements named in this document.</p> <p>All AHF must be installed in a clean, dry location, e.g. in sufficiently ventilated or air conditioned electric cabinets or closed electric rooms. Contaminants such as oils, liquids, corrosive vapors, abrasive debris, dust and aggressive gases must be kept out of the filter enclosure.</p> <p><b>WARNING: Conductive dust may cause damage to ECOsine® active harmonic filters. Ensure that installation site of ECOsine® active is free of conductive dust.</b></p>
<b>Products</b>	<p>FN3420 series, 3-wire filters, models 30...300A          FN3430 series, 4-wire filters, models 30...300A</p>
<b>Overvoltage class (EN50178)</b>	<p>ECOsine® active are designed according to EN 50178 overvoltage class III</p>

<b>Storage environmental specifications</b> <b>(IEC 60721-3-1, EN50178)</b>	Climate conditions for storage class 1K3: <ul style="list-style-type: none"><li>• Temperature range: -25°C to +55°C</li><li>• Relative humidity: &lt; 95%, no condensation</li><li>• Atmospheric pressure: 70KPa to 106KPa</li></ul>																																												
<b>Transportation environmental specifications</b> <b>(IEC 60721-3-2, EN50178)</b>	Climate conditions for transport class 2K3: <ul style="list-style-type: none"><li>• Temperature range: -25°C to +70°C</li><li>• Relative humidity: &lt; 95%, no condensation</li><li>• Atmospheric pressure: 70KPa to 106KPa</li></ul>																																												
<b>Operation environmental specifications</b> <b>(IEC 60721-3-3, EN50178)</b>	Climate conditions for operation class 3K3: <ul style="list-style-type: none"><li>• Temperature range: 0°C to +40°C</li><li>• Relative humidity: &lt; 95%, no condensation</li><li>• Atmospheric pressure: 70KPa to 106KPa</li></ul>																																												
<b>Degree of pollution</b> <b>(IEC 61010, EN50178)</b>	Pollution conditions for operation class PD2																																												
<b>Corrosive levels</b> <b>(IEC 60721-3-3)</b>	<div>Corrosive levels for storage, transport and operation Class 3C2<sup>(3)</sup>:<ul style="list-style-type: none"><li>• Applies to locations with normal levels of contaminants, experienced in urban areas with industrial activities</li><li>• Levels:</li></ul></div> <table><tr><th>Environmental parameter</th><th>Units<sup>(1)</sup></th><th colspan="2">Class 3C2<sup>(2)</sup></th></tr><tr><td></td><td></td><th>Mean value</th><th>Max value</th></tr><tr><td>Sea salt</td><td></td><td colspan="2">Salt mist</td></tr><tr><td>Sulphur dioxide</td><td>ppm cm<sup>3</sup>/m<sup>3</sup></td><td>0.3 0.11</td><td>1.0 0.37</td></tr><tr><td>Hydrogen sulphide</td><td>ppm cm<sup>3</sup>/m<sup>3</sup></td><td>0.1 0.071</td><td>0.5 0.36</td></tr><tr><td>Chlorine</td><td>ppm cm<sup>3</sup>/m<sup>3</sup></td><td>0.1 0.034</td><td>0.3 0.1</td></tr><tr><td>Hydrogen chloride</td><td>ppm cm<sup>3</sup>/m<sup>3</sup></td><td>0.1 0.066</td><td>0.5 0.33</td></tr><tr><td>Hydrogen fluoride</td><td>ppm cm<sup>3</sup>/m<sup>3</sup></td><td>0.01 0.012</td><td>0.03 0.036</td></tr><tr><td>Ammonia</td><td>ppm cm<sup>3</sup>/m<sup>3</sup></td><td>1.0 1.4</td><td>3.0 4.2</td></tr><tr><td>Ozone</td><td>ppm cm<sup>3</sup>/m<sup>3</sup></td><td>0.05 0.025</td><td>0.1 0.05</td></tr><tr><td>Nitrogen oxides</td><td>ppm cm<sup>3</sup>/m<sup>3</sup></td><td>0.5 0.26</td><td>1.0 0.52</td></tr></table> <div><p><sup>(1)</sup>The values given in cm3/m3 have been calculated from the values given in mg/m3 and refer to a temperature of 20 °C and a pressure of 101,3 kPa. The table uses rounded values.</p><p><sup>(2)</sup>Mean values are expected long-term values. Maximum values are limit or peak values, occurring over a period of time of not more than 30 min per day.</p><p><sup>(3)</sup>IEC 60721-3-3 is only applied to the coated PCB covered areas and not the entire device. The unprotected areas, such as connections, terminations and exposed magnetics, may not survive these exposure levels over time.</p></div>	Environmental parameter	Units <sup>(1)</sup>	Class 3C2 <sup>(2)</sup>				Mean value	Max value	Sea salt		Salt mist		Sulphur dioxide	ppm cm <sup>3</sup> /m <sup>3</sup>	0.3 0.11	1.0 0.37	Hydrogen sulphide	ppm cm <sup>3</sup> /m <sup>3</sup>	0.1 0.071	0.5 0.36	Chlorine	ppm cm <sup>3</sup> /m <sup>3</sup>	0.1 0.034	0.3 0.1	Hydrogen chloride	ppm cm <sup>3</sup> /m <sup>3</sup>	0.1 0.066	0.5 0.33	Hydrogen fluoride	ppm cm <sup>3</sup> /m <sup>3</sup>	0.01 0.012	0.03 0.036	Ammonia	ppm cm <sup>3</sup> /m <sup>3</sup>	1.0 1.4	3.0 4.2	Ozone	ppm cm <sup>3</sup> /m <sup>3</sup>	0.05 0.025	0.1 0.05	Nitrogen oxides	ppm cm <sup>3</sup> /m <sup>3</sup>	0.5 0.26	1.0 0.52
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## 2 Introduction

## 2.1 Principle of operation

The ac mains current, which is drawn by a non-linear load, is measured by ECOsine® active either directly or indirectly via external current transformers. The harmonic content and reactive power components are detected and processed in a digital control structure. The active filter continually generates a compensating current that offsets the harmonic content and reactive current in the load, so the ac mains only has to provide the minimum fundamental in phase current.

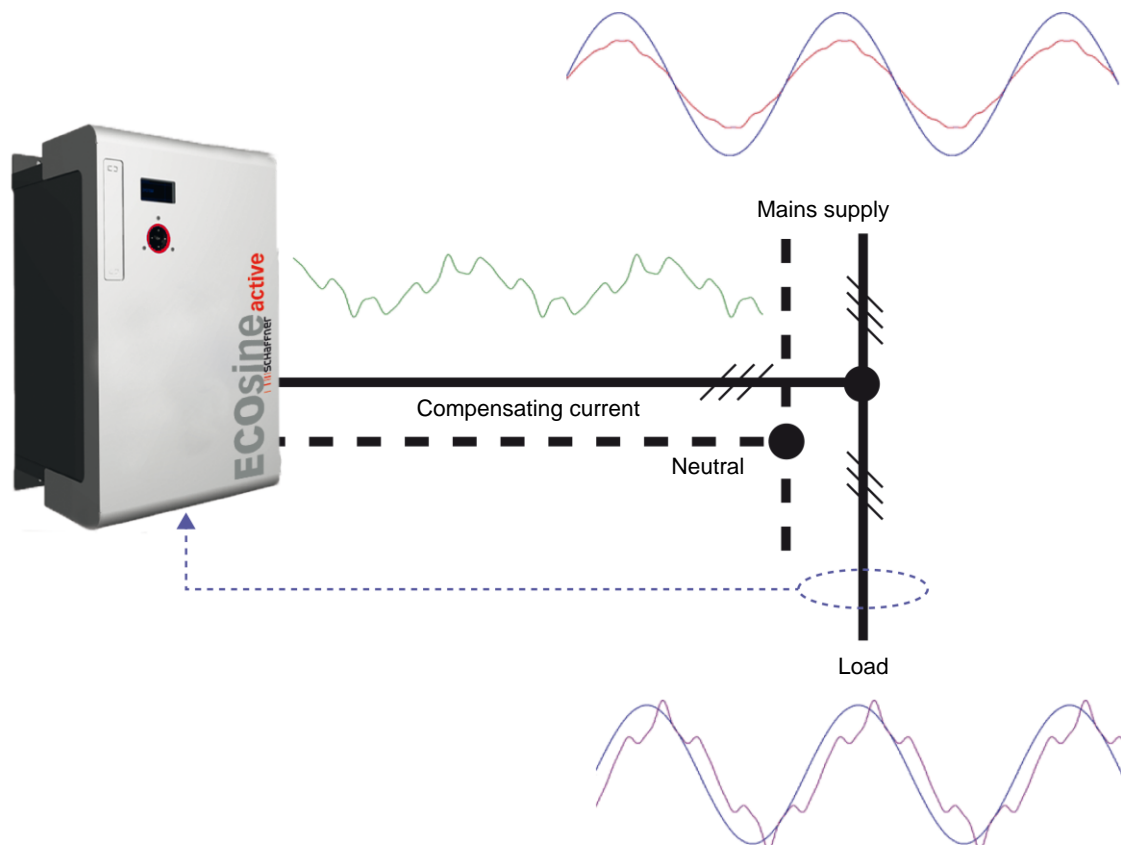


Fig. 1: Principle of operation of the ECOsine® active filter

The active filter instantly adapts to all changes in the load and the systems harmonic content spectrum, in order to be able to optimally respond at any time.

## 2.2    About these instructions

The following symbols, terms and designations are used in these operating and installation instructions:





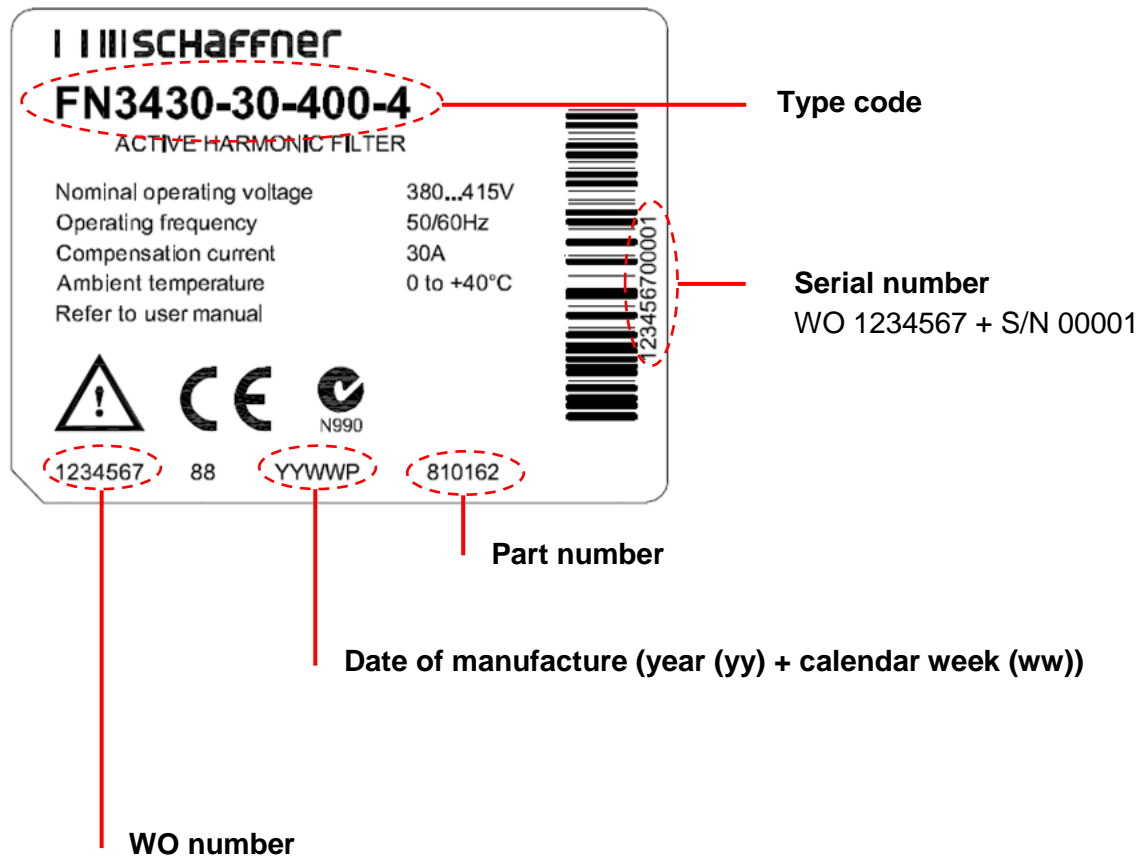
Description	
<b>NOTICE</b>	Notice Follow these instructions to avoid damages to the unit.
 <b>CAUTION</b>	Caution Follow these instructions to avoid damages to the unit or injuries of personnel.
 <b>WARNING</b>	Warning Follow these instructions to avoid situations which may cause severe or deadly injuries.
 <b>DANGER</b>	Danger Follow these instructions to avoid situations which may cause severe or deadly injuries.
 <b>DANGER</b>	Dangerous voltage Follow these instructions to avoid situations which cause severe or deadly injuries due to dangerous electrical voltage.
<b>NOTE</b> <b>Note text</b>	Note Please observe these notes..
⇒ <b>1.</b> <b>2.</b>	Operation steps Complete the operation described (multiple steps are numbered, arrow indicates a single step).

Table 1: Use of symbols, terms, and designations

## 2.3 Type plate



# 2.4 Type code

The type designations of all ECOsine® active have the following structure:  
 FN34TT-AAA-VVV-W-CC

Variable	Description
TT	Type: 20 – 3-wire device 30 – 4-wire device
AAA	Rated current
VVV	Rated voltage
W	Number of compensated conductors
CC	Certificates and variants (optional)

Table 2: Type code



## **3 Welcome**

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## 3.1 About this manual

This manual is meant to provide comprehensive information on how to unpack the cabinet types of ECOSine® active harmonic filters. The issues discussed in this guide cover the basic opening and closing processes. The guide will familiarize you with the required tasks.

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## 3.2 Who should read this guide

The primary audience for this book is anyone interested in or responsible for unpacking of ECOsine® active harmonic filters. To fully understand the guide, only very basic technical knowledge is required.

---

## 3.3 Personnel qualification

Any maintenance actions on ECosine® active harmonic filter has to be performed only by skilled electricians who additionally must be familiar with the instructions in the **Installation and Operation Manual** as well as this **Maintenance and Wear Parts Manual**.



### Caution

Unpacking tasks should only be performed by trained and skilled personnel to avoid damages to the unit or injuries of personnel.

---

### Note!

### Warning

Check whether the product has been damaged or not during transportation. If the product is not correct, or it has been damaged, contact your local Schaffner sales partner or Schaffner representative

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## 3.4 Get help

Schaffner believes in the value of service and partnering. We do offer help with a lot of topics. In order to provide the most successful help Schaffner does operate a service organization and worldwide service centers. We do also closely collaborate with a growing network of qualified and authorized sales and service partners to maintain our high service quality on a global approach.

---

## 3.5 Get training

Do you need training? Schaffner can offer a training course comprised of lecture and hands-on workshops designed to introduce you to the fundamental concepts of power quality, ECOsine® harmonic filters and filter maintenance.

We also offer customized training courses designed to meet your specific needs. Please contact your local Schaffner sales organization or Schaffner representative to discuss how we can help you achieve success in your power quality efforts.

---

## 3.6 Contact us

Schaffner – More than just filters. Schaffner is in the unique position of being able to support the user with problem analyses, engineering advice, testing and measurement support, custom products, and a worldwide customer service organization. Our goal is to ensure that you obtain the level of support you actually need. Toward this objective, we invite you to contact your local Schaffner representative at any time that we may be of service to you. You can find out more about us and your local contact on our corporate website or you may contact us via email:

Corporate URL: [www.schaffner.com](http://www.schaffner.com)  
Corporate E-mail: [info@schaffner.com](mailto:info@schaffner.com)

## **4 Butterfly clasps**



# 4.1 Butterfly clasps opening process




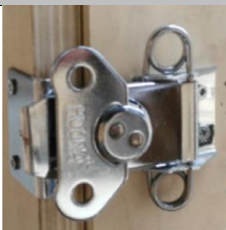

Butterfly Clasp Opening Process		
Locked Clasp		
Lift		
Rotate 180°		
Fold		
Open		

Table 3: Butterfly clasp opening process

# 4.2      Butterfly clasps closing process

Butterfly Clasp Closing Process



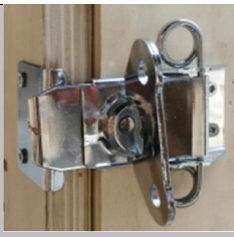


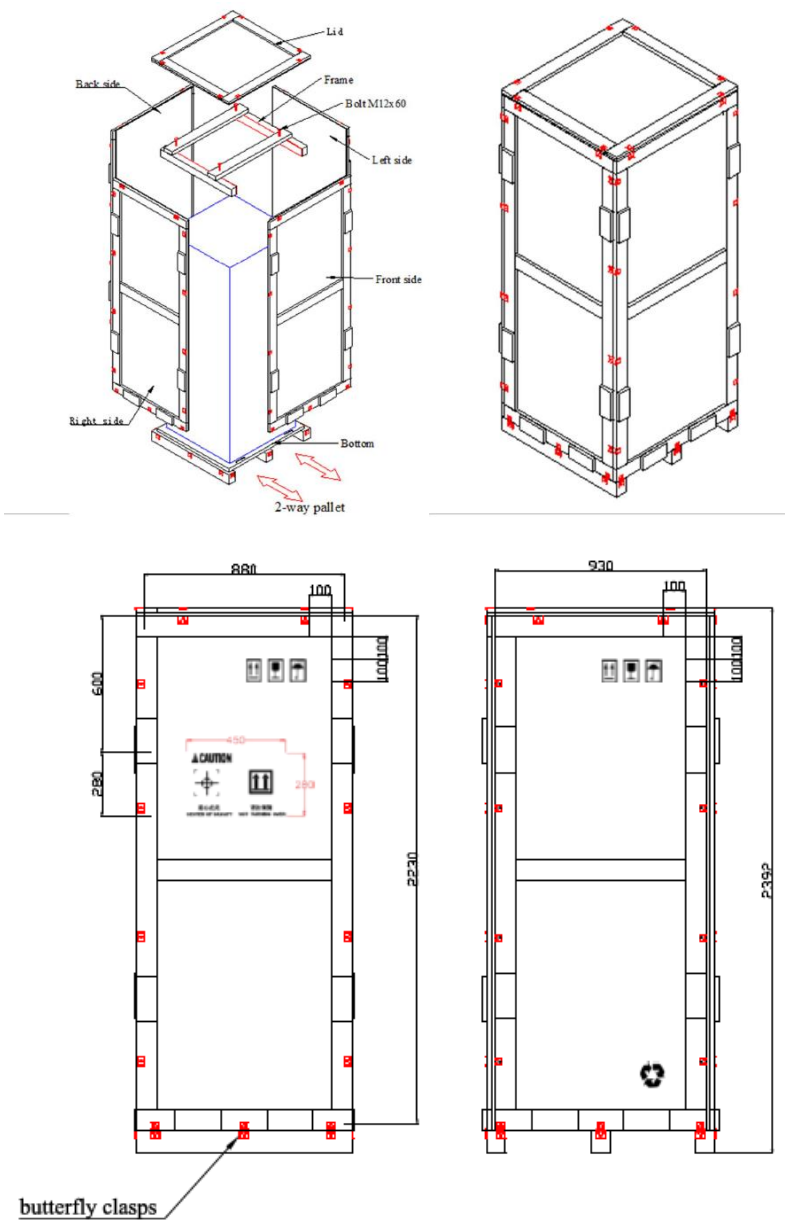
Open Clasp	
Adjust buckle	
Lift	
Rotate 180°	
Closed	

Table 4: Butterfly clasp closing process

## **5 AHF Cabinet type package opening process**

# 5.1    General View

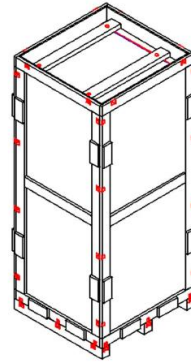


Remark: (cabinet: Height=2145mm)

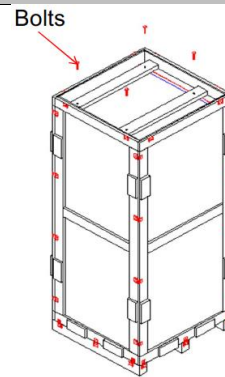
Fig. 2: General view of the cabinet type ECOSine® active filter packaging

## Filter Package Opening Process

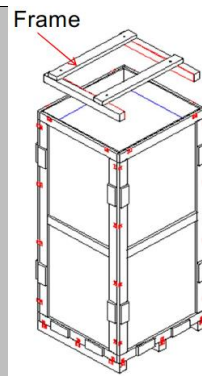
1. Open lid



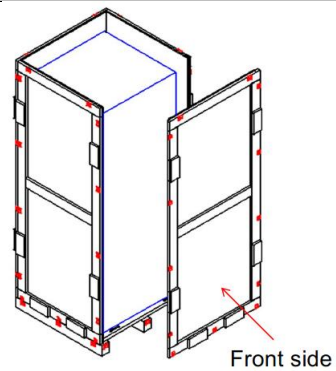
2. Loosen bolts



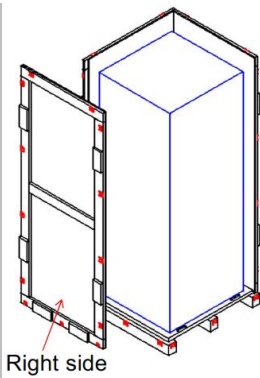
3. Remove frame



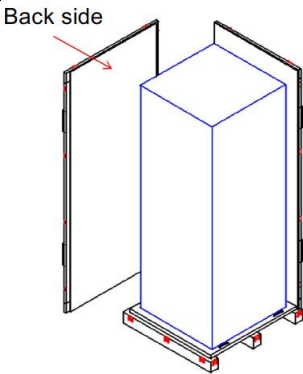
4. Open front panel



5. Open right panel



6. Open back panel  
Attention left side need to  
be fixed or hold



7. Open left panel

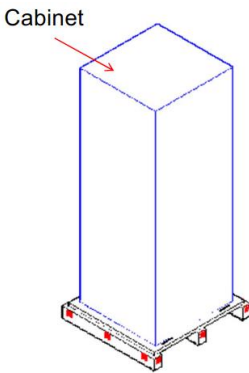


Table 5: Opening Process

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