Local Solutions For Individual Customers Worldwide

ACT Clamp
Anti-corrosion Technology

STAUFF ACT Clamp
Anti-Corrosion Technology
Product Catalogue

2012 Winner of the NACE International Corrosion Innovation of the Year Award
The Issue: Pipework Corrosion

Stainless Steel Pipework

Stainless steel pipework on offshore oil and gas platforms is used over a wide range of temperature, flow and pressure conditions, e.g. for process instrumentation and sensing, as well as for chemical inhibition, hydraulic or utility lines.

The typical tubing material selected for these particular applications is 316 Stainless Steel.

In all major offshore oil and gas regions – including the Gulf of Mexico, the North Sea, the Gulf of Guinea and the China Sea – corrosion of 316 Stainless Steel pipework can be observed, and has been a researched and well documented problem as well as a costly and time consuming issue with regard to maintenance processes for many years.

Pitting Corrosion

One of the most prevalent forms of localised corrosion is pitting corrosion: Under certain specific conditions – particularly involving chlorides (such as sodium chloride in seawater) and exacerbated by elevated temperatures – small pits can form in a Stainless Steel surface.

Dependent upon both the environment and the Stainless Steel itself, these pits may continue to grow and eventually lead to perforation of tubing walls and leaks, while the majority of the surface may still be totally unaffected.

Pitting corrosion is often quite easy to recognise: Small individual pits and – in later stages – sometimes deeper and connected pits can be observed by visual inspection with the unaided eye.

Crevice Corrosion

Another dominant type is crevice corrosion, which is a lot more difficult to observe: It usually tends to occur in shielded areas such as crevices, formed under gaskets, washers, fastener heads, insulating material, surface deposits, disbonded coatings, threads and lap joints.

Pipe clamps made of plastic in particular have also been prone to inducing crevice corrosion in the past, because the plastic deforms around the tubing and creates even tighter crevices.

Crevice corrosion is always initiated by changes in the local chemistry within the shielded area, usually associated with a stagnant solution on the micro-environmental level:

- Trapped seawater becomes stagnant
- Depletion of inhibitor and oxygen
- A shift to acid conditions
- Build-up of aggressive ion species (such as sodium chloride in seawater)
- Accelerated corrosion process

Crevice corrosion can have serious and adverse consequences eventually leading to perforation of tubing walls and the escape of highly flammable fluids and chemicals.

Material Selection

Hence, the selection of proper materials and the use of robust design and safe construction practices are mandatory, even if crevices are sometimes difficult or even impossible to avoid in tubing installations when using regular types of tubing supports and clamps.

And this is where the STAUFF ACT Clamp comes into play ...

Corrosion Facts

Corrosion in general is a naturally occurring phenomenon commonly defined as the deterioration of a substance (usually a metal) or its properties because of a reaction with its environment. Like other natural hazards, corrosion can cause not only expensive but also dangerous damage to almost everything from automobiles, home appliances and drinking water systems to pipelines, bridges and public buildings.

Figures provided by the U.S. National Climatic Data Center underline that major weather related disasters the U.S. incurred total losses of averaging USD 17 billion annually (1980 – 2001). According to U.S. corrosion studies, the estimated direct cost of metallic corrosion in general was USD 276 billion on an annual basis in 1998. This represented 3.1% of the U.S. Gross Domestic Product.

Direct corrosion costs associated with the domestic oil and gas production activities in the U.S. were determined to be about USD 1.4 billion annually, with USD 0.6 billion attributed to surface piping and facility costs, USD 0.5 billion to downhole tubing, and USD 0.3 billion to capital expenditures related to corrosion.

The U.S. refineries represent approximately 23% of the world’s petroleum production in 1996 supplying more than 18 million barrels of refined petroleum products per day, with a total corrosion related direct cost of USD 3.7 billion. Maintenance expenses make up USD 1.8 billion of this total, vessel expenses are USD 1.4 billion and fouling costs are approximately USD 0.5 billion annually.

Main Features

Construction based on STAUFF Clamps

- Constructed according to DIN 3015, Parts 1 and 3 (Standard Series and Twin Series)
- Covering the most commonly used Metric and Imperial pipe diameters from 6 mm to 25.4 mm (1/4 inch to 1 inch)
- Tried and tested industry standard for many years
- Can be used in combination with existing mounting hardware – available ex stock from STAUFF in several Stainless Steel qualities
- Installation time reduction and long term cost savings due to extended service intervals (compared to alternative clamp designs)

Independent Testing and Approval

- Salt spray tests according to ASTM B117 applied in controlled laboratory environments
- Field tested on a rig in the Dutch sector of the North Sea
- Tests results independently assessed by Sheffield Hallam University’s Materials and Engineering Research Institute (Centre for Corrosion Technology)
- Fully detailed reports available on request

Material selection and design

- Material and design in compliance with Norwegian offshore standard Norsok Z-CR-010
- Clamp body made of flame-retardant PPV0 plastic material – tested and V0 classified according to UL 94
- Geometrically designed rubber strips made of ACE anti-corrosion elastomer material avoid the accumulation of seawater between clamp body and pipe
- Drainage channels aid the dispersal of water
- High UV stability of the clamp body material – resistant against seawater, rain and oil
- To be used in sub-sea and top-side environments – alleviating the requirement for two products

Design

STAUFF ACT Clamps are an innovatively designed solution for the installation of instrumentation pipework where anti-corrosion properties are of paramount importance (e.g. in the fields of offshore oil and gas exploration and processing).

The design – based on the tried and tested STAUFF Clamps according to DIN 3015 – offers installation time reduction and long term cost savings due to extended service intervals.

The STAUFF ACT clamp body design is available for the Standard Series (DIN 3015, Part 3) to cover the most commonly used Metric and Imperial pipe diameters from 6 mm to 25.4 mm (1/4 inch to 1 inch).

Development

Throughout their development, STAUFF ACT Clamps have been subject to stringent testing at the STAUFF in-house laboratories located in Werdohl, Germany.

In order to ensure credibility of the product, the development process has also involved independent testing.

Sheffield Hallam University

To achieve this, the services of the Centre for Corrosion Technology at Sheffield Hallam University’s Materials and Engineering Research Institute have been utilized, applying advanced techniques with equipment such as high resolution surface metrology and form measurement systems.

In a controlled laboratory environment, continuous hot salt spray tests according to ASTM B117 have been applied for periods of 2000 hours to various clamp configurations holding 316L Stainless Steel tubing.

In addition to that, independent field test samples – located on an oil rig in the Dutch sector of the North Sea – have also been assessed at the Sheffield Hallam University facilities.

Both independent tests have recorded positive results in favour of the anti-corrosion attributes of the STAUFF ACT Clamp. Fully detailed test reports are available upon request.

Conformity

Using flame-retardant PPV0 plastic material for the clamp body and ACE anti-corrosion elastomer material for the rubber strips, STAUFF ACT Clamps have been constructed in compliance with the Norwegian offshore standard Norsok Z-CR-010.

Norsok Organisation

Norsok is a Norwegian industry initiative to add value, reduce cost and lead time and remove unnecessary activities in offshore field developments and operations.

The Norsok standards are developed by the Norwegian petroleum industry and are jointly issued by the Norwegian Oil Industry Association (OLF) and the Federation of Norwegian Engineering Industries (TBL). They are administered by the Norwegian Technology Standards Institution (NTS).

The purpose of the Norsok industry standards is to replace the individual oil company specifications for use in existing and future petroleum industry developments, subject to the individual company’s review and application.

The Norsok standard Z-CR-010 (Section 8: Functional and Technical Requirements related to Electrical, Instrumentation and Telecommunication Equipment) states the following with regards to design and material selection:

“Tubing clamps shall be made of non-corrosive material, Stainless Steel AISI 316 or flame-retardant plastic. Galvanic corrosion between tubing and tubing support system shall be avoided.

The tubing clamp shall – when installed – not allow for water / sea water to be accumulated between tubing clamp and tubing, this is to avoid crevice corrosion.”
# Standard Series DIN 3015, Part 1 Clamp Components

## Clamp Bodies • Type ACT

![Image of integrated rubber strips made of anti-corrosion elastomer]

### Order Codes

<table>
<thead>
<tr>
<th>Clamp Body</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>2</em>12,7*ACT</td>
<td>STAUFF Group 1A</td>
<td>Clamp Body 06,4A*ACT (1)</td>
</tr>
</tbody>
</table>

One clamp body is consisting of two clamp halves, each with two integrated rubber strips per pipe support.

- STAUFF Group
- Exact outside diameter Ø D1 (mm)
- Material code (see below) ACT

### Material Properties

Flame Retardant Polypropylene (PPV0)

- with Integrated Rubber Strips made of Anti-Corrosion Elastomer (ACE)

Material code: ACT

### Additional Sizes and Outside Diameters

Optional sizes are available upon request. Please consult STAUFF for further information.

### Mounting Hardware

STAUFF is in the position to offer a complete range of mounting hardware meeting the demands of customers for the most various industrial applications.

Typical installation scenarios include:

- **Installation on Weld Plates**
  - Single, Double and Group Weld Plates available
- **Installation on Mounting / Channel Rails**
  - Adaptors for various rail types available
- **Multi-Level (Stacking) Installation**
  - Using Stacking Bolts and Safety Locking Plates

### Spacing and Positioning of STAUFF Clamps

In order to conform with the Norwegian Offshore standard Norsok Z-CR-010, correct spacing of pipe and tube clamps has to be observed.

The following recommendations are made:

- Instrument tubing should be supported to field trays with tubing clamps approximately every 600 mm (1.97 ft) for tubing sizes less than 25 mm (.98 in) outside diameter. Tubing sizes above 25 mm (.98 in) outside diameter shall as a minimum have support every 1500 mm (4.92 ft).
- Please also note the following information on the installation of STAUFF Clamps next to pipe bends, fittings and/or valves:
- Pipe bends should be supported by STAUFF Clamps positioned as close to the bends as possible.
- If fittings and/or valves are incorporated in the pipeline system, it is recommended that support is provided by STAUFF Clamps located directly next to these components to protect them from vibrations.

### Typical Installation of STAUFF Clamps (Standard Series)

![Image of clamp installation]

To ensure the full anti-corrosion performance of STAUFF ACT Clamps, it is highly recommended to use Stainless Steel mounting hardware only. STAUFF is in the position to offer all required mounting hardware ex stock in several Stainless Steel qualities, including:

- **Stainless Steel V4A**
  - 1.4401 / 1.4571 (AISI 316 / 316 Ti)
  - STAUFF Material Code: W5

Alternative materials and surface finishings are available upon request. Consult STAUFF for further information.

### Spacing A as recommended in the Norsok Z-CR-010 standard

<table>
<thead>
<tr>
<th>Diameter</th>
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<tr>
<td>&lt;25</td>
<td>600</td>
</tr>
<tr>
<td>&gt;25</td>
<td>1500</td>
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</tbody>
</table>

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**www.stauff.com/act**
Clamp Assemblies

1. **Type of Installation**
   Please select the type of installation (e.g. Weld Plates, Rail Nuts, etc.) and add the corresponding Code to position 1 of the order code for your clamp assembly.

   - Without Installation Equipment
     Code: none

2. **Group Size & Diameter**
   Please select the required group size and diameter and add the corresponding Code to position 2 of the order code for your clamp assembly.

<table>
<thead>
<tr>
<th>Group Size STAUFF DIN</th>
<th>Outside Diameter (mm)</th>
<th>Code</th>
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</thead>
<tbody>
<tr>
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<td>8</td>
<td>106A ACT</td>
</tr>
<tr>
<td>8.4 1/4</td>
<td>106.4A ACT</td>
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</tr>
<tr>
<td>8.5 3/8</td>
<td>106.5A ACT</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>110A ACT</td>
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<td>112A ACT</td>
<td></td>
</tr>
<tr>
<td>13/2</td>
<td>212.7 ACT</td>
<td></td>
</tr>
<tr>
<td>13/4</td>
<td>213.7 ACT</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>218 ACT</td>
<td></td>
</tr>
<tr>
<td>3A 3</td>
<td>318 ACT</td>
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<tr>
<td>320 ACT</td>
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<td></td>
</tr>
<tr>
<td>321.3 ACT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>325.4 ACT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   Additional outside diameters are available upon request. Please consult STAUFF for further information.

3. **Clamp Body Design & Material**
   Please select the design and material of your clamp body and add the corresponding Code to position 3 of the order code for your clamp assembly.

   - **Type ACT (Anti-Corrosion Technology)**
     Flame Retardant Polypropylene (PPV0) with Integrated Rubber Strips made of Anti-Corrosion Elastomer (ACE)
     Code: ACT

4. **Mounting & Fitting Combination**
   Please select the mounting and fitting combination (e.g. bolts, screws, cover plates, etc.) and add the corresponding Code to position 4 of the order code for your clamp assembly.

   - Installation with Cover Plate and Bolts
     Cover Plate DP with Hexagon Head Bolts AS
     Code: DP-AS
   - Installation with Locking Plate and Bolts
     Safety Locking Plate SIG with Stacking Bolts AF
     Code: SIG-AF
   - Installation with Bolts only
     Socket Cap Screws IS with Washers
     Code: IS

5. **Thread Type**
   Please select the required thread type and add the corresponding Code to position 5 of the order code for your clamp assembly.

   - Metric ISO thread
     Code: M
   - Unified coarse (UNC) thread
     Code: U
   All threaded parts are available with Metric ISO thread or unified coarse (UNC) thread.

6. **Material & Surface Finishing**
   Please select the required material & surface finishing of the mounting hardware and add the corresponding Code to position 6 of the order code for your clamp assembly.

   - **Type ACT (Anti-Corrosion Technology)**
     Metal parts made of Stainless Steel V4A
     Code: W5

   Alternative materials and surface finishings are available upon request. Consult STAUFF for further information.

7. **Assembling & Kitting**
   If required, please select an additional assembling and kitting option and add the corresponding Code to the last position of the order code for your clamp assembly.

   - Components supplied separately
     Code: none (standard option)
   - Components assembled
     Code: #A (special option)
   - Components packed in kits
     Code: #K (special option)

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**Dimensions of Clamp Assemblies**

<table>
<thead>
<tr>
<th>Group</th>
<th>Dimensions (mm)</th>
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</thead>
<tbody>
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<td>106A ACT</td>
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<td>8</td>
<td>106.4A ACT</td>
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<td>112A ACT</td>
<td></td>
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<td>325.4 ACT</td>
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</table>

**Weights of Clamp Assemblies**

<table>
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<tr>
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<th>Dimensions (mm)</th>
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<td>106A ACT</td>
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<tr>
<td>8.4 Group Size 1</td>
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<tr>
<td>8.5 Group Size 1</td>
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<td>10 Group Size 1</td>
<td>110A ACT</td>
<td></td>
</tr>
<tr>
<td>12 Group Size 1</td>
<td>112A ACT</td>
<td></td>
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<td>13/2 Group Size 1</td>
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<td>13/4 Group Size 1</td>
<td>213.7 ACT</td>
<td></td>
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<td>18 Group Size 1</td>
<td>218 ACT</td>
<td></td>
</tr>
<tr>
<td>3A Group Size 3</td>
<td>318 ACT</td>
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<tr>
<td>320 ACT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>321.3 ACT</td>
<td></td>
<td></td>
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<tr>
<td>325.4 ACT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dimensions and weights for clamp assemblies including Weld Plate SP, Cover Plate DP and Hexagon Head Bolts AS.
Clamp Components

<table>
<thead>
<tr>
<th>Group Size</th>
<th>Outside Diameters ØD1 / ØD2 (mm)</th>
<th>Ordering Code</th>
<th>Dimensions (in)</th>
</tr>
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<tbody>
<tr>
<td>STAUFF DIN</td>
<td>(2 Clamp Halves) ØD2 W L1 L2 H Width</td>
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</tr>
<tr>
<td>ØD1 ØD2</td>
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<td>ØD2</td>
<td>W</td>
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<tr>
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<td>1/2</td>
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<td>87</td>
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<td>320/20 ACT (1130029749)</td>
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<td>67</td>
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<td>28.4</td>
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</tbody>
</table>

Clamp Bodies • Type ACT

<table>
<thead>
<tr>
<th>Order Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clamp Body</td>
</tr>
</tbody>
</table>

One clamp body is consisting of two clamp halves, each one with two integrated rubber strips per pipe support.

1st Part of STAUFF Group

Exact outside diameters Ø D1 / Ø D2 (mm) 12,7 / 12,7

Material code (see below) ACT

Standard packaging unit is 25 clamp bodies per bag.

Material Code:

- **W5**
- **Stainless Steel V4A**
- **1.4401 / 1.4571 (AISI 316 / 316 Ti)**
- **STAUFF Material Code: W**

Alternative materials and surface finishings are available upon request. Consult STAUFF for further information.

**Order Codes**

- **W**

STAUFF is in the position to offer a complete range of mounting hardware meeting the demands of customers for the most various industrial applications.

Typical installation scenarios include:

- **Installation on Weld Plates**
  - Single and Group Weld Plates available
- **Installation on Mounting / Channel Rails**
  - Adaptors for various rail types available
- **Multi-Level (Stacking) Installation**
  - Using Stacking Bolts and Safety Locking Plates

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In order to conform with the Norwegian Offshore standard Norsok Z-CR-010, correct spacing of pipe and tube clamps has to be observed.

The following recommendations are made:

- Instrument tubing should be supported on field trays with tubing clamps approximately every 600 mm (1.97 ft) for tubing sizes less than 25 mm (.98 in.) outside diameter.
- Tubing sizes above 25 mm (.98 in.) outside diameter shall have a minimum support every 1500 mm (4.92 ft).

Please also note the following information on the installation of STAUFF Clamps next to pipe bends, fittings and/or valves:

- Pipe bends should be supported by STAUFF Clamps positioned as close to the bends as possible.
- If fittings and/or valves are incorporated in the pipeline system, it is recommended that support is provided by STAUFF Clamps located directly next to these components to protect them from vibrations.

To ensure the full anti-corrosion performance of STAUFF ACT Clamps, it is highly recommended to use Stainless Steel mounting hardware only. STAUFF is in the position to offer all required mounting hardware ex stock in several Stainless Steel qualities, including:

- **Stainless Steel V4A**
  - **1.4401 / 1.4571 (AISI 316 / 316 Ti)**
  - **STAUFF Material Code: W**

Alternative materials and surface finishings are available upon request. Consult STAUFF for further information.

Spacing and Positioning of STAUFF Clamps

**Spacing A** as recommended in the Norsok Z-CR-010 standard

- **600 mm (1.97 ft)** for tubing sizes < 25 mm (<.98 in.)
- **1500 mm (4.92 ft)** for tubing sizes > 25 mm (> .98 in.)

Please consult STAUFF for further information.

www.stauff.com/act

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**Type of Installation**

Please select the type of installation (e.g. Weld Plates, Rail Nuts, etc.) and add the corresponding Code to position 1 of the order code for your clamp assembly.

- Without Installation Equipment
  
  Code: none

**Installation on Weld Plate**

- Single Weld Plate
  
  Code: SP

- Group Weld Plate
  
  Code: RAP

**Installation on Mounting / Channel Rail**

- Hexagon Rail Nut
  
  Code: SM

- Channel Rail Adaptor
  
  Code: CRA

**Group Size & Diameter**

Please select the required group size and diameter and add the corresponding Code to position 2 of the order code for your clamp assembly.

<table>
<thead>
<tr>
<th>Group Size</th>
<th>STAUT</th>
<th>DIN</th>
<th>Outside Diameters (mm)</th>
<th>Outside Diameters (in)</th>
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Additional outside diameters and combinations of different outside diameters are available upon request. Please consult STAUFF for further information.

**Clamp Body Design & Material**

Please select the design and material of your clamp body and add the corresponding Code to position 3 of the order code for your clamp assembly.

**Type ACT (Anti-Corrosion Technology)**

Flame Retardant Polypropylene (PPV0) with Integrated Rubber Strips made of Anti-Corrosion Elastomer (ACE)

Code: ACT

**Mounting & Fitting Combination**

Please select the mounting and fitting combination (e.g. bolts, screws, cover plates, etc.) and add the corresponding Code to position 4 of the order code for your clamp assembly.

- Installation with Cover Plate and Bolt
  
  Cover Plate GD with Hexagon Head Bolt AS
  
  Code: GD-AS

- Installation with Cover Plate and Bolt
  
  Cover Plate GD with Socket Cap Screw IS
  
  Code: GD-IS

**Thread Type**

Please select the required thread type and add the corresponding Code to position 5 of the order code for your clamp assembly.

- Metric ISO thread
  
  Code: M

- Unified coarse (UNC) thread
  
  Code: U

All threaded parts are available with Metric ISO thread or unified coarse (UNC) thread.

**Material & Surface Finishing**

Please select the required material & surface finishing of the mounting hardware and add the corresponding Code to position 6 of the order code for your clamp assembly.

To ensure the full anti-corrosion performance of STAUFF ACT Clamps, it is highly recommended that the mounting hardware is manufactured from Stainless Steel:

- Metal parts made of Stainless Steel V4A 1.4401 / 1.4571 (AISI 316 / 316 Ti)
  
  Code: W5

Alternative materials and surface finishings are available upon request. Consult STAUFF for further information.

**Assembling & Kitting**

If required, please select an additional assembling and kitting option and add the corresponding Code to the last position of the order code for your clamp assembly.

- Components supplied separately
  
  Code: none (standard option)

- Components assembled
  
  Code: #A (special option)

- Components packed in kits
  
  Code: #K (special option)

**Dimensions of Clamp Assemblies**

**Weights of Clamp Assemblies**

Dimensions and weights for clamp assemblies including Weld Plate SP, Cover Plate GD and Hexagon Head Bolt AS.

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