

Bar Clamp Catalogue







PROVIDING QUALITY PRODUCTS AND INNOVATIVE SOLUTIONS TO THE POWER ELECTRONIC INDUSTRY SINCE 1975



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ICONOPOWER was established in 1975, and for nearly four decades we have been providing quality products and innovative solutions to the Power Electronics Industry worldwide.

Our commitment to quality can be found in every aspect of our business. Our design, engineering, product and process development, as well as our manufacturing team are available to provide a clamp to your exact specifications. Beginning with ICONOPOWER's strong customer service response program, quotes, orders and inventories are computerized so our customer's needs are met quickly and accurately.

Our skilled draftsmen and engineers work together to perfect the details of each clamp. Our state-of-the-art SolidWorks CAD system is utilized in the development, design and test simulation of our clamping products. Throughout the manufacturing process, various inspections, including statistical process control, are performed on 100% of our clamp products to ensure quality.

ICONOPOWER is one of the largest stocking distributors of other associated products such as power semiconductors, heat sinks, power resistors, current, voltage and temperature sensors, as well as low voltage distribution components.

We also design and manufacture a full range of power semiconductor based assemblies for heavy industrial power conversion and control applications, all made to ISO 9001 manufacturing standards.





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Introduction:

This document will assist you through the selection of bar type clamps used with disc or 'puck' style diodes and SCR's. Our standard clamps have a bolt center range of 54mm to 180mm and the clamping pressure / force range of 5kN to 90kN at voltages up to 2500V AC. Different bolt centers, higher pressure ratings and voltages are available as specials.

Please contact your local Sales agent or factory for more information on custom clamp offerings.

Before Selecting a clamp:

The following clamp selection document will aid in selection of an appropriate clamp to suite the project. The clamp selection begins by knowing the device parameters intended to be used and the dimensions of the cooling medium used to maintain proper operating temperature for the device. Most manufacturers provide the information required via data sheets. If you are unsure of the required pressure rating, please contact your local sales agent or factory for assistance.

What is a Semiconductor Clamp?

A semiconductor clamp is a clamping mechanism used to provide even pressure for the proper operation of the semiconductor device in a certain range. It should maintain the pressure for a prolonged period of time and temperature range. Clamps can be used with a variety of heat sinks and bus bars to provide and maintain adequate surface contact area for greater electrical and thermal conductivity.



Clamp selection terminologies and descriptions:

To understand the clamp selection process, the following is a review of some of the terminologies and abbreviations used. A sample example is shown within the guide to select the correct clamp required for a specific project.

1. Max Cell Diameter:

This is the diameter of the largest portion of the device. Most semiconductor devices are designed with a flange and that is larger than the actual ceramic body. This diameter would be the one used in choosing the correct bolt center spacing.

2. Bolt Centers:

This is the center to center bolt spacing of a clamp. Although the clamp bolt spacing is a factor for the manufacturer's design, Iconopower has taken into consideration the standard semiconductor package sizes and their common kN ratings, thus providing a cost effective and quicker solution. (Eg: IC102 series indicates 102mm bolt centre spacing).

3. Clamping force/pressure:

This clamping pressure is specified by the semiconductor manufacturer for each specific device. This value is indicated on the device datasheet. If the pressure applied to the device is insufficient, there is a decrease in current carrying capabilities of the device primarily due to a large increase in operating temperature of the device. These factors can also create hot spots on the silicon wafer chip causing premature failure of the semiconductor. Subsequently, too much pressure can physically damage the device internally. The specifications are normally expressed in kN (kilo Newton), kgf (kilogram force) or PSI (pounds per square inch).

4. Clamping distance / 'Z' Dimension:

This is the sum of the maximum dimension of the parts that need to be clamped. A simple example would be, if there is a 1" thick device with double sided cooling using two 1" thick heat sink webs, the clamping distance would be 1" + 1" + 1" = 3". All Iconopower clamp designs have a table associated with each range, providing information of clamp distances available as a standard. This area is identified as 'Z' dimension and the range would be denoted as Z max and Z min.

Refer to Fig. 1 Clamp Dimensions on page 4.





Fig. 2 Device Dimensions



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Clamp Selection Example:

In this example, the following information will be considered:

1. Max Cell Diameter	=	75mm
2. Required Clamping Pressure	=	22kN
3. Device thickness	=	1.09in
4. Heat Sink web thickness	=	1.00in
5. Device requires double sided cooling	=	Yes



DIAGRAM 1



Part number Selection Process

1. Looking at * **DIAGRAM 1**, we can note that for the device used in this example, IC89 series could be used but as there is only 1mm difference, IC102 series would be the best choice for this certain device. Part number – <u>IC102</u>

2. Since double sided cooling is required, we require two heat sinks with the device in between. The choice of clamp configuration depends on the equipment design, direction and overall height of the clamp but for this example, a 'C' style clamp can be used. The 'C' style uses clamping bars on both sides of the clamp. Part number – IC102<u>C</u>

3. The next step is to determine the clamping pressure. As per the data sheet of the device, the clamping pressure should be in the range of 19kN to 24kN. Now looking at Table 1, we can note that IC102 clamp is offered at 22kN as a standard and that the force sits near the higher limit of the range, which is preferred, so 22kN is chosen as the force. Part number – IC102C22

4. The last step is to determine the clamping distance, the 'Z' dimension. This distance can be calculated by adding the thickness of all the parts used between the clamp. In this case, the clamping distance would be 3.09'' (1'' + 1.09'' + 1''). This distance is denoted by alphabets and the list is included with each series. For this clamp, the 'Z' is 3.09'', so clamp used will have 'Z' of 3.00'' to 3.25''. - Part number – IC102C22L

A review of this part number tells us the following information above:





Basic Design Differences Between Typical North American and ICONOPOWER Designed Clamps are:

- 1. The Mechanism that applies the pressure.
- 2. The Mechanism that indicates the desired pressure has been reached.
- 3. The insulator material that provides electrical isolation.

In our competitors design, there is a solid centre pivot point, and spring bars are placed on top of this point. As the bolts are tightened, the spring bars bend and the amount of deflection is equal to the pressure being applied to pivot point. The problem with this design is that it forces the bolts to bend inward as the clamping pressure goes up and can cause failure of insulation which causes a short circuit in the system through the clamp and possibilities of bolt cross threading. The pressure indicator system in these clamps can also go out of tolerance very easily.

In our clamp design, the centre pivot point compresses the Disc washers and the supporting bar remains rigid thus the clamping mechanism remains very parallel (including the bolts) as pressure is applied. Furthermore, because the Disc washers are cup-shaped:



and lubricated, they slide within each other and self-centre. This keeps the pressure even and flat. Disc Washers are used in extreme applications mainly due to their ability to maintain required pressure over a wide temperature range, over an extended period of time.



Clamp Design Comparison

V.E.P. Clamp





Wakefield Clamp



Pic 2

ICONOPOWER Clamp



Pic 3



This design also means that you do not need any special tools for installation and is extremely cost effective. Lastly, the quality of insulating material is a large factor in the longevity of a clamp. Some insulation materials have been shown to deteriorate over time and become brittle causing electrical system failure.

If you would like further explanation on any of the above parts, please contact your local Sales Agent or factory.



Wakefield Clamp



V.E.P. Clamp



ICONOPOWER Clamp

Pic 5







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Effects of Insufficient Clamp Force

The following shows the effect under pressure has, as it relates to the thermal resistance between the device pole face and the heat sink.



In the case of Disc type SCR or Diode, a reduction in clamping pressure, increases thermal resistance and forward voltage drop. If the pressure applied by clamping pressure is greater than specified, it can cause internal physical damage to the device and cause premature failure.



Iconopower's standard clamps are available in mainly three styles, 'C', 'D' and 'F'. The 'C' style is the most common style as it uses bars on both sides of the device and can be used in most equipment. The 'D' style is used mainly for single side cooling projects and also where the bottom heat sink is threaded. The 'F' style uses fully threaded rods which gives a larger range of 'Z' dimension. These styles are provided as standard clamps, and can be configured in different arrangements on request.



bottom bar using 'Loc-tite'.

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Iconopower's standard line of clamps is listed below in Table 1. Clamps are categorized by Bolt Centers and kN rating. If the project requires different size or kN rating, please contact Iconopower for further information.

Clamp Series	Max Cell Diameter	Styles Available		Clamping Pressure (Force)											
(mm)	(mm)								(kN)						
54	42	C, D, F	5	9											
65	54	C, D, F		9											
70	55	C, D, F	5	9	15										
79	65	C, D, F	5	9	15										
89	75	C, D, F		9	15	22									
102	86	C, D, F			15	22		30							
118	103	C, F				22			32		40				
132	112	C, F					28		32	38		45			
140	120	C, F								38		45	50		
146	126	C, F								38		45	50		
180	155	C, F												80	90

Table 1

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Other Clamp Manufacturer's Series Part Number Cross Reference

Wakefield Series Part Number	Value Engineered Products (V.E.P.) Series Part Number	ICONOPOWER Series Part Numbe
130	VE1272 VE2270	IC54 Series
	VE2500 VE3000	IC70 Series
	VE2350 VE5350	IC79 Series
139	VE3500 VE5500	IC89 Series
143	VE3501 / VE3510 VE5501 / VE5510	IC102 Series
144	VE3500 / VE6501 VE7500 / VE7501 VE3510 / VE7510 VE9546	IC118 Series
145	VE9555	IC140 Series



Conversion Chart / Table

The newton (abbreviation and symbol: N) is the unit of force in metric system (SI), named after Isaac Newton. The newton is equal to the amount of force needed to accelerate a one kilogram mass at a rate of one meter per second squared.

1 newton (N) = 0.001 kilonewton (kN) = 0.224808943 pounds force (lbf) = 0.101971621 kilogram-force (kgf)

Our Stand	dard	Pound-Force	Kilogram-Force
Clamp	os kN	Ratings <u>Ibs.</u>	kgf
5kN	=	1124.045	509.8581
9kN	=	2023.280	917.7446
15kN	=	3372.134	1529574
22kN	=	4945.797	2243.376
28kN	=	6294.650	2855.205
30kN	=	6744.268	3059.149
32kN	=	7193.886	3263.092
38kN	=	8542.740	3874.922
40kN	=	8992.358	4078.865
45kN	=	10116.40	4588.723
50kN	=	11240.45	5098.581
80kN	=	17984.72	8157.730
90kN	=	20232.80	9177.446



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If you are unsure of what is the best clamp for your application, please fill in as much of the information below and fax or email it to us for assistance.

<u>Clam</u>	p Selector Form	Ĺ		
Company Information	Date			
Name	Telephone			
Company Name	Fax			
Address	Email			
Device Information				
SCR or Diode	Heatsink Type			
Device Manufacturer	Heatsink Manaufacturer			
Part # used and Manufacturer	Annual Usage			
Clamp Information				
Style				F]
	"Z" Dimension	in	mm	
	Bolt Centres	in	mm	
	Mounting Force	lbs	kN	
	Device Height	in	mm	
	Flange dimension	in	mm	
	Clamp Style Preferered			
Notes				0

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on to a clear acetate for a transparency to overlay directly

be photocopied

clamp chart tool should

This

force

to determine clamping

on to the contact area of the Diode or SCR pucks

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Step by Step Assembly Procedures for ICONOPOWER Bar Clamps

Clamps are used with semiconductor devices which require a specific force for best electrical connection and best possible heat transfer from the semiconductor to the heat sink. The force for these semiconductors typically range from 5kN – 90kN (19mm to 100mm mounting surface diameter) depending on the actual device. The actual value for a given device should be found in the device data sheets. This documentation outlines the proper procedure for installation of our clamps.

Clamp Construction Information

The two bolt clamp system utilizes spring type washers to achieve the required clamping force for the device. This force is achieved when the spring washers are compressed to a specific point, whereby the indicator washer is able to rotate freely. This type of pre-calibrated pressure indicator system eliminates the need for any special tools.

The bolt insulator material has been specifically designed to ensure excellent dielectric performance, mechanical compression strength, and stable high temperature performance.

Clamping Procedures

This type of clamp has a preloaded cup shaped spring system, which ensures perpendicular clamping force when used properly.



Pic 1



The release of an indicator washer(s) on the top of the loader bar indicates the achievement of the correct mounting force.



Indicator washer Pic 2

DO NOT LOOSEN OR TIGHTEN THE NYLON LOCKNUT AND BOLT MECHANISM WITH THE SPRING WASHER ASSEMBLIES. DOING SO WILL PUT THE CLAMP OUT OF CALIBRATION.



Pic 3

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Heat sink preparation and Clamp installation procedure.

The following serves as a general guideline for preparation of heat sink and installation of our Clamp.

- 1) Verify the part number of the device and check the Heat Sink against Quality Assurance documents.
- 2) The Contact surface that mates with the device (Shown in Red Circle in Pic 4) must have it's plating removed in order to ensure proper electrical and thermal conduction. You can remove this plating by using a very soft 3M Scotch-Brite pad or very fine steel wool. Any residue must be cleaned by compressed air or a vacuum.



Pic 4



3) The contact surface of the heat sinks must be cleaned with Isopropyl Alcohol, and then a thin coat of electrical joint compound applied and the surplus removed. In order to avoid contamination of electrical joint compound, avoid using your finger to apply the compound.









4) The two contact surfaces of the semiconductor should be cleaned with isoprosyl alcohol and then covered with a thin coating of an approved Electrical Joint Compound and any surplus removed.





5) Locate the semiconductor device on one of the two heat sinks centrally by using the provided centering pin after checking to ensure that height of centring pin is 1/16th " (1.5mm) or less, and the polarity of the device. The semiconductor should then be rotated with a slight downward force to spread the compound evenly over the pole face of the device.











6) The two contact surfaces of the semiconductor should be covered with a thin coating of an approved Electrical Joint Compound and any surplus removed. Place top heatsink on device, ensuring the centring pin drop into device.



CENTRING PIN Pic 10

Rotate heatsink 90 ° back & fourth twice to squeeze out excess thermal compound.



Pic 11

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DO NOT LOOSEN OR TIGHTEN THE NYLON LOCKNUT AND BOLT MECHANISM WITH THE SPRING WASHER ASSEMBLIES. DOING SO WILL PUT THE CLAMP OUT OF CALIBRATION.



Pic 12



Pic 13

ALWAYS INSERT WASHER INSIDE THE CUP WITH ROUND SIDE UP.

Orientation of the washer shown as it sits inside the insulator cup

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7a) For all clamps above 42kN, it is highly recommended that non-conductive anti-seize compound is used between the insulator washer and the bolt head before installing.





7b) For all clamps above 22kN, it is highly recommended that anti-seize compound is used on the bolt threads before installing.





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Insert bolt assembly into clamp.



Pic 16

Slide in bottom bar and centre.

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Assemble the clamp connecting the heat sinks; hand tighten the bolts alternatively with a socket until the bolt makes contact with the metal washer in the Insulator Cup.



Pic 18

HAND TIGHTENING SHOULD BE ALL THAT IS NECESSARY AT THIS POINT. It is important to make sure the bolts are threaded evenly. You can check this by making sure the same amount of threads appear on each side of the bottom bar.



Pic 19



8) Check that the top bar is parallel with the heat sink and make sure that it is centrally located, (Not at an angle to the channel in the heat sink).



Pic 20

9) Check the parallel alignment of the heat sinks. Ensure centring pins are aligned and properly seated.



Loosen and re-align if necessary.

Pic 21

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10) Tighten both bolts by exactly ¼ turn, then proceed to tighten bolts by 1/8th of a turn, checking the pressure indicator washer(s) each time until one or both the indicating washer(s) just turns free.

IMPORTANT

IF THE INDICATOR WASHER IS PARTLY FREE TO ROTATE, TIGHTEN ONLY WHAT IS NECESSARY (LESS THAN 1/8TH TURN) TO RELEASE THE WASHER TO A FREE SPINNING STATE BEFORE PROCEDDING TO THE NEXT STEP.





On clamps with two sets of spring washers/indicators:

If one side releases before the other continue to turn the unreleased side by $1/16^{th}$ until it releases. If it does not release within 5 x $1/16^{th}$ turns, remove clamp completely. Allow the clamp spring washers to relax for $\frac{1}{2}$ hour before starting over.

11) Tighten the bolt opposite to the side that last released 1/8th of a turn. DO NOT OVER TIGHTEN DEVICE.





Pic 24





Bar Clamp Selector Guide



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IC54 Series

Style 'C'









Style 'F'







<u>IC</u>	<u>54</u>	<u>x</u>	<u>xx</u>
	Bolt Centre	Style	Force
" A "	=	2.75 [69.85]	
" A1 "	=	2.95 [74.89]	
" B "	=	2.13 [54.00]	
" C "	=	0.63 [15.88]	
" C1 "	=	0.83 [21.04]	
" ח "	_	1 65 [42 00]	
U	-	1.05 [42.00]	
"н"	=	0.50 [12.70]	

Part #'s	" Z " min	" Z " max	" G " (ref)	
			5kN	9kN
IC54 x xx B	0.75 [19.05]	1.00 [25.40]	0.59 [14.98]	0.47 [11.93]
IC54 x xx C	1.00 [25.40]	1.25 [31.75]	0.59 [14.98]	0.67 [17.01]
IC54 x xx D	1.25 [31.75]	1.50 [38.10]	0.78 [19.81]	0.75 [19.05]
IC54 x xx E	1.50 [38.10]	1.75 [44.45]	0.86 [21.84]	0.87 [22.09]
IC54 x xx F	1.75 [44.45]	2.00 [50.80]	0.98 [24.89]	1.06 [26.92]
IC54 x xx G	2.00 [50.80]	2.25 [57.15]	1.18 [29.97]	1.14 [28.95]
IC54 x xx H	2.25 [57.15]	2.50 [63.50]	1.26 [32.00]	1.26 [32.00]
IC54 x xx J	2.50 [63.50]	2.75 [69.85]	1.37 [34.79]	1.46 [37.08]
IC54 x xx K	2.75 [69.85]	3.00 [76.20]	1.57 [39.87]	1.46 [37.08]

Force [kN]	"E"	" F " (ref)	Bolt Type
5	0.34 [8.64]	1.26 [32.00]	M6
9	0.34 [8.64]	1.38 [35.05]	M6

* All dimensions are in Inches [Millimeters].

* Modifications available on request.

* Our standard is Metric but imperial can be accomodated.

* "Ref" dimensions due to compression of springs.

<u>×</u> "z"





Style 'C'





Style 'D'











<u>IC</u>	<u>65</u>	<u>×</u>	<u>×</u>	<u>×</u>				
	Bolt Centre	Style	Force	" Z "				
"A"	=	3.25 [82.55]				-1		1
					Part #'s	" Z " min	" Z " max	" G " (ref)
" A1 "	=	3.39 [86.04]						9kN
					IC65 x x B	0.75 [19.05]	1.00 [25.40]	0.59 [14.98]
"В"	=	2.56 [65.00]			IC65 x x C	1.00 [25.40]	1.25 [31.75]	0.71 [18.03]
					IC65 x x D	1.25 [31.75]	1.50 [38.10]	0.83 [21.08]
" C "	=	0.63 [15.88]			IC65 x x E	1.50 [38.10]	1.75 [44.45]	0.95 [24.13]
					IC65 x x F	1.75 [44.45]	2.00 [50.80]	1.06 [26.92]
" C1 "	=	0.83 [21.04]			IC65 x x G	2.00 [50.80]	2.25 [57.15]	1.18 [29.97]
					IC65 x x H	2.25 [57.15]	2.50 [63.50]	1.30 [33.02]
" D "	=	2.12 [54.00]			IC65 x x J	2.50 [63.50]	2.75 [69.85]	1.46 [27.08]
					IC65 x x K	2.75 [69.85]	3.00 [76.20]	1.46 [27.08]
"н"	=	0.50 [12.70]						· · · ·

Force [kN]	"E"	" F " (ref)	Bolt Type
9	0.34 [8.62]	1.38 [34.93]	M6

* All dimensions are in Inches [Millimeters].

* Modifications available on request.

* Our standard is Metric but imperial can be accomodated.

* "Ref" dimensions due to compression of springs.

IC70 Series

Style 'C'





5kN & 9kN





15kN

Style 'D'







Style 'F'



5kN & 9kN









<u>IC</u>	<u>70</u>	<u>x</u>	<u>xx</u>	<u>x</u>

Bolt Centre	Style	Force	" Z "
Dur Centre	JUVIC	IUICE	~

" A "	=	3.75 [95.25]
"В"	=	2.76 [70.00]
" C "	=	1.00 [25.40]
" D "	=	2.20 [56.00]
"Н"	=	0.38 [9.53]

Force [kN]	"E"	" F " (ref)	Bolt Type
5	0.48 [12.19]	1.29 [32.74]	M8
9	0.48 [12.19]	1.60 [40.55]	M8
15	0.48 [12.19]	1.78 [45.30]	M8

* All dimensions are in	Inches [Millimeters].
-------------------------	-----------------------

- * Modifications available on request.
- * Our standard is Metric but imperial can be accomodated.
- * "Ref" dimensions due to compression of springs.

Part #'s	" Z " min	" Z " max	" G " (ref)		
			5kN	9kN	15kN
IC70 x xx D	1.25 [31.75]	1.50 [38.10]	0.80 [20.32]	0.81 [20.57]	1.01 [25.65]
IC70 x xx E	1.50 [38.10]	1.75 [44.45]	0.92 [23.36]	0.92 [23.36]	1.13 [28.70]
IC70 x xx F	1.75 [44.45]	2.00 [50.80]	1.03 [26.16]	1.04 [26.41]	1.29 [32.76]
IC70 x xx G	2.00 [50.80]	2.25 [57.15]	1.11 [28.19]	1,16 [29,46]	1.41 [35.81]
IC70 x xx H	2.25 [57.15]	2.50 [63.50]	1.31 [33.27]	1.32 [33.52]	1.52 [38.60]
	2 50 [63 50]	2 75 [69 85]	1 /3 [36 32]	1 44 [36 57]	1 60 [40 64]
	2.75 [69.85]	3.00 [76.20]	1.51 [38.35]	1.51 [38.35]	1.72 [43.68]
1670	2.00 [76 20]	2 25 [92 55]	1 70 [42 40]	1 (7 [42 44]	1.04[46.72]
	3.00 [76.20]	3.25 [82.55]	1.70 [43.18]	1.67 [42.41]	1.84 [46.73]
	3.50 [88.90]	3 75 [95 25]	1 90 [48 26]	1.79 [43.46]	2 07 [52 57]
	3.50 [00.50]	5.75 [55.25]	1.50 [40.20]		2.07 [32.37]
IC/U x xx P	3.75 [95.25]	4.00 [101.60]	2.02 [51.30]	2.03 [51.56]	2.19 [55.62]
IC70 x xx Q	4.00 [101.60]	4.25 [107.95]	2.10 [53.34]	2.18 [55.37]	2.31 [58.67]
IC70 x xx R	4.25 [107.95]	4.50 [114.30	2.22 [56.38]	2.22 [56.38]	2.43 [61.72]
IC70 x xx S	4.50 [114.30	4.75 [120.65]	2.33 [59.18]	2.38 [60.45]	2.55 [64.77]

IC79 Series

Style 'C'





5kN & 9kN





15kN

Style 'D'







Style 'F'



5kN & 9kN









15kN

" H "

RODS LOCTITE INTO THE BOTTOM BAR [ALL THE WAY]

<u>IC</u>	<u>79</u>	<u>x</u>	<u>xx</u>	<u>x</u>

Bolt Centre	Style	Force	" Z "

"A"	=	4.11 [104.39]
"В"	=	3.11 [79.00]
" C "	=	1.00 [25.40]
" D "	=	2.56 [65.00]
"н"	=	0.50 [12.70]

Force [kN]	Force [kN] " E "		Bolt Type	
5	0.48 [12.19]	1.66 [42.14]	M8	
9	0.48 [12.19]	1.72 [43.72]	M8	
15	0.48 [12.19]	1.91 [48.48]	M8	

Part #'s	" Z " min	" Z " max	" G " (ref)		
			5kN	9kN	15kN
IC79 x xx D	1.25 [31.75]	1.50 [38.10]	0.78 [19.81]	0.81 [20.57]	1.01 [25.65]
IC79 x xx E	1.50 [38.10]	1.75 [44.45]	0.90 [22.86]	0.92 [23.36]	1.13 [28.70]
IC79 x xx F	1.75 [44.45]	2.00 [50.80]	1.02 [25.90]	1.04 [26.41]	1.29 [32.76]
IC79 x xx G	2.00 [50.80]	2.25 [57.15]	1.14 [28.95]	1.16 [29.46]	1.41 [35.81]
IC79 x xx H	2.25 [57.15]	2.50 [63.50]	1.25 [31.75]	1.32 [33.52]	1.52 [38.60]
IC79 x xx J	2.50 [63.50]	2.75 [69.85]	1.37 [34.79]	1.44 [36.57]	1.60 [40.64]
IC79 x xx K	2.75 [69.85]	3.00 [76.20]	1.45 [36.83]	1.51 [38.35]	1.72 [43.68]
IC79 x xx L	3.00 [76.20]	3.25 [82.55]	1.64 [41.65]	1.67 [42.41]	1.84 [46.73]
	3.25 [82.55]	3.50 [88.90]	1.73 [43.94]	1.79 [45.46]	1.96 [49.78]
	3 50 [88 90]	3 75 [95 25]	1 85 [46 99]	1 91 [/8 51]	2 07 [52 57]
	2 75 [05 25]	4.00[101.60]	1.05 [40.55]	2 02 [51 56]	2.07 [52.57]
	5.75 [95.25]	4.00 [101.80]	1.90 [49.78]	2.03 [31.30]	2.19[55.02]
1C79 x xx Q	4.00 [101.60]	4.25 [107.95]	2.08 [52.83]	2.18 [55.37]	2.31 [58.67]
IC79 x xx R	4.25 [107.95]	4.50 [114.30	2.20 [55.88]	2.22 [56.38]	2.43 [61.72]
IC79 x xx S	4.50 [114.30	4.75 [120.65]	2.32 [58.92]	2.38 [60.45]	2.55 [64.77]

* All dimensions are in Inches [Millimeters].

* Modifications available on request.

* Our standard is Metric but imperial can be accomodated.

* "Ref" dimensions due to compression of springs.

IC89 Series







9kN & 15kN











9kN & 15kN





22kN



Style 'F'





9kN & 15kN





22kN

22kN

<u>IC</u>	<u>89</u>	<u>x</u>	<u>xx</u>	<u>x</u>
	Bolt Centre	Style	Force	" Z "

Part #'s	" Z " min	" Z " max		" G " (ref)	
			9kN	15kN	22kN
IC89 x xx D	1.25 [31.75]	1.50 [38.10]	0.77 [19.55]	1.03 [26.16]	0.97 [24.63]
IC89 x xx E	1.50 [38.10]	1.75 [44.45]	0.88 [22.35]	1.15 [29.21]	1.09 [27.68]
IC89 x xx F	1.75 [44.45]	2.00 [50.80]	1.00 [25.40]	1.27 [32.25]	1.21 [30.73]
IC89 x xx G	2.00 [50.80]	2.25 [57.15]	1.12 [28.44]	1.37 [34.79]	1.32 [33.52]
IC89 x xx H	2.25 [57.15]	2.50 [63.50]	1.24 [31.49]	1.50 [38.10]	1.44 [36.57]
IC89 x xx J	2.50 [63.50]	2.75 [69.85]	1.36 [35.54]	1.62 [42.14]	1.56 [39.62]
IC89 x xx K	2.75 [69.85]	3.00 [76.20]	1.47 [37.33]	1.70 [43.18]	1.64 [41.65]
IC89 x xx L	3.00 [76.20]	3.25 [82.55]	1.59 [40.38]	1.86 [47.24]	1.80 [45.72]
IC89 x xx M	3.25 [82.55]	3.50 [88.90]	1.71 [43.43]	1.98 [50.29]	1.91 [48.51]
IC89 x xx N	3.50 [88.90]	3.75 [95.25]	1.79 [45.46]	2.10 [53.34]	2.03 [51.56]
IC89 x xx P	3.75 [95.25]	4.00 [101.60]	1.95 [49.53]	2.21 [56.13]	2.15 [54.61]
IC89 x xx Q	4.00 [101.60]	4.25 [107.95]	2.07 [52.57]	2.33 [59.18]	2.27 [57.65]
IC89 x xx R	4.25 [107.95]	4.50 [114.30	2.18 [55.37]	2.45 [62.23]	2.39 [60.70]
IC89 x xx S	4.50 [114.30	4.75 [120.65]	2.30 [58.42]	2.57 [65.27]	2.51 [63.75]

"A"	=	4.44 [112.78]
"В"	=	3.50 [89.00]
" C "	=	1.00 [25.40]
" D "	=	2.95 [75.00]
"Н"	=	0.50 [12.70]

Force [kN]	"E"	" F " (ref)	Bolt Type
9	0.48 [12.19]	1.60 [40.55]	M8
15	0.48 [12.19]	1.41 [35.79]	M8
22	0.48 [12.19]	1.47 [37.37]	M8

* All dimensions are in Inches [Millimeters].

* Modifications available on request.

* Our standard is Metric but imperial can be accomodated.

* "Ref" dimensions due to compression of springs.

IC102 Series

Style 'C'



15kN & 22kN





30kN

Style 'D'





15kN & 22kN







Style 'F'





15kN & 22kN





30kN

<u>IC</u>	<u>102</u>	<u>x</u>	<u>xx</u>	<u>x</u>
	Bolt Centre	Style	Force	" Z "

"A"	=	5.00 [127.00]
"В"	=	4.01 [102.00]
" C "	=	1.00 [25.40]
" D "	=	3.42 [87.00]
"н"	=	0.75 [19.05]

Force [kN]	"E"	" F " (ref)	Bolt Type
15	0.48 [12.19]	1.41 [35.79]	M8
22	0.48 [12.19]	1.91 [48.48]	M8
30	0.48 [12.19]	1.41 [35.79]	M8

* All dimensions are in Inch	hes [Millimeters]
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* Modifications available on request.

* Our standard is Metric but imperial can be accomodated.

* "Ref" dimensions due to compression of springs.

Part #'s	" Z " min	" Z " max	" G " (ref)		
			15kN	22kN	30kN
IC102 x xx D	1.25 [31.75]	1.50 [38.10]	1.03 [26.16]	1.09 [27.68]	0.97 [24.63]
IC102 x xx E	1.50 [38.10]	1.75 [44.45]	1.15 [29.21]	1.21 [30.73]	1.08 [27.43]
IC102 x xx F	1.75 [44.45]	2.00 [50.80]	1.27 [32.25]	1.32 [33.52]	1.20 [30.48]
IC102 x xx G	2.00 [50.80]	2.25 [57.15]	1.39 [35.30]	1.44 [36.57]	1.32 [33.52]
IC102 x xx H	2.25 [57.15]	2.50 [63.50]	1.50 [38.10]	1.56 [39.62]	1.48 [37.59]
IC102 x xx J	2.50 [63.50]	2.75 [69.85]	1.62 [41.14]	1.64 [41.65]	1.60 [40.64]
IC102 x xx K	2.75 [69.85]	3.00 [76.20]	1.70 [43.18]	1.80 [45.72]	1.74 [43.43]
IC102 x xx L	3.00 [76.20]	3.25 [82.55]	1.86 [47.24]	1.91 [48.51]	1.83 [46.48]
IC102 x xx M	3.25 [82.55]	3.50 [88.90]	1.95 [49.53]	2.03 [51.56]	1.95 [49.53]
IC102 x xx N	3.50 [88.90]	3.75 [95.25]	2.10 [53.34]	2.15 [54.61]	2.07 [52.57]
IC102 x xx P	3.75 [95.25]	4.00 [101.60]	2.21 [56.13]	2.27 [57.65]	2.19 [55.62]
IC102 x xx Q	4.00 [101.60]	4.25 [107.95]	2.33 [59.18]	2.39 [60.70]	2.30 [58.42]
IC102 x xx R	4.25 [107.95]	4.50 [114.30	2.45 [62.23]	2.51 [63.75]	2.42 [61.46]
IC102 x xx S	4.50 [114.30	4.75 [120.65]	2.57 [65.27]	2.62 [66.54]	2.54 [64.51]

IC118 Series









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32kN

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40kN









Style 'C'

<u>IC</u>	<u>118</u>	<u>×</u>	<u>xx</u>	<u>x</u>
	Bolt Centre	Style	Force	"Z"

"A"	=	5.70 [144.78]
" A1 "	=	6.07 [154.11]
" B "	=	4.64 [118.00]
" C "	=	1.00 [25.40]
" C1 "	=	1.42 [36.00]
" D "	=	4.05 [103.00]
"Н"	=	0.75 [19.05]

Force [kN]	"E"	" F " (ref)	Bolt Type
22	0.48 [12.19]	2.28 [57.99]	M8
32	0.48 [12.19]	1.91 [48.48]	M8
40	0.65 [16.56]	2.77 [70.41]	M10

* All dimensions are in Inches [Millimeters].

* Modifications available on request.

* Our standard is Metric but imperial can be accomodated.

Tel: 613-744-3670

Fax: 613-744-8452

* "Ref" dimensions due to compression of springs.

Part #'s	" Z " min	" Z " max	" G " (ref)		
			22kN	32kN	40kN
IC118 x xx D	1.25 [31.75]	1.50 [38.10]	0.98 [24.89]	1.12 [28.44]	1.16 [29.46]
IC118 x xx E	1.50 [38.10]	1.75 [44.45]	1.10 [27.94]	1.20 [30.48]	1.28 [32.51]
IC118 x xx F	1.75 [44.45]	2.00 [50.80]	1.26 [32.00]	1.36 [34.54]	1.40 [35.56]
IC118 x xx G	2.00 [50.80]	2.25 [57.15]	1.38 [35.05]	1.48 [37.59]	1.52 [38.60]
IC118 x xx H	2.25 [57.15]	2.50 [63.50]	1.50 [38.10]	1.60 [40.64]	1.64 [41.65]
IC118 x xx J	2.50 [63.50]	2.75 [69.85]	1.61 [40.89]	1.71 [43.43]	1.76 [44.70]
IC118 x xx K	2.75 [69.85]	3.00 [76.20]	1.73 [43.94]	1.83 [46.48]	1.87 [47.49]
IC118 x xx L	3.00 [76.20]	3.25 [82.55]	1.85 [46.99]	1.95 [49.53]	1.99 [50.54]
IC118 x xx M	3.25 [82.55]	3.50 [88.90]	1.97 [50.03]	2.07 [52.57]	2.11 [53.59]
IC118 x xx N	3.50 [88.90]	3.75 [95.25]	2.09 [53.08]	2.19 [55.62]	2.23 [56.64]
IC118 x xx P	3.75 [95.25]	4.00 [101.60]	2.21 [56.13]	2.30 [58.42]	2.35 [59.69]
IC118 x xx Q	4.00 [101.60]	4.25 [107.95]	2.32 [58.92]	2.42 [61.46]	2.46 [62.48]
IC118 x xx R	4.25 [107.95]	4.50 [114.30	2.44 [61.97]	2.54 [64.51]	2.58 [65.53]
IC118 x xx S	4.50 [114.30	4.75 [120.65]	2.56 [65.02]	2.66 [67.56]	2.70 [68.58]

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IC132 Series







Style 'F'



28KN, 32kN, 38kN, 45kN

28KN, 32kN, 38kN. 45kN

IC	132	х	XX	х
		—	_	-

Don centre Style Porce Z	Bolt Centre	Style	Force	" Z "
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						"G		
		Part #'s	" Z " min	"Z" max		" (ret)		
6.50 [165.02]					28kN	32kN	38kN	45kN
		IC132 x xx D	1.25 [31.75]	1.50 [38.10]	0.95 [24.13]	1.15 [29.21]	1.16 [29.46]	1.18 [29.97]
5.20 [132.00]		IC132 x xx E	1.50 [38.10]	1.75 [44.45]	1.07 [27.17]	1.27 [32.25]	1.28 [32.51]	1.40 [33.02]
		IC132 x xx F	1.75 [44.45]	2.00 [50.80]	1.19 [30.22]	1.38 [35.05]	1.40 [35.56]	1.42 [36.06]
1.00 [25.40]		IC132 x xx G	2.00 [50.80]	2.25 [57.15]	1.31 [33.27]	1.50 [38.10]	1.52 [38.60]	1.54 [39.11]
		IC132 x xx H	2.25 [57.15]	2.50 [63.50]	1.42 [36.06]	1.62 [41.14]	1.64 [41.65]	1.65 [41.91]
1.42 [36.00]		IC132 x xx J	2.50 [63.50]	2.75 [69.85]	1.54 [39.11]	1.74 [44.19]	1.76 [44.70]	1.77 [44.95]
		IC132 x xx K	2.75 [69.85]	3.00 [76.20]	1.66 [42.16]	1.86 [47.24]	1.87 [47.49]	1.89 [48.00]
4.41 [112.00]		IC132 x xx L	3.00 [76.20]	3.25 [82.55]	1.78 [45.21]	1.98 [50.29]	1.99 [50.54]	2.01 [51.05]
		IC132 x xx M	3.25 [82.55]	3.50 [88.90]	1.90 [48.26]	2.09 [53.08]	2.11 [53.59]	2.13 [54.10]
1.00 [25.40]		IC132 x xx N	3.50 [88.90]	3.75 [95.25]	2.01 [51.05]	2.21 [56.13]	2.23 [56.64]	2.24 [56.89]
		IC132 x xx P	3.75 [95.25]	4.00 [101.60]	2.13 [54.10]	2.33 [59.18]	2.35 [59.69]	2.36 [59.94]
		IC132 x xx Q	4.00 [101.60]	4.25 [107.95]	2.25 [57.15]	2.45 [62.23]	2.46 [62.48]	2.48 [62.99]
" F " (ref)	Bolt Type	IC132 x xx R	4.25 [107.95]	4.50 [114.30	2.37 [60.19]	2.57 [65.27]	2.58 [65.53]	2.60 [66.04]
		IC132 x xx S	4.50 [114.30	4.75 [120.65]	2.49 [63.24]	2.68 [68.07]	2.70 [68.58]	2.72 [69.08]

Force [kN]	"E"	" F " (ref)	Bolt Type
28	0.65 [16.56]	2.71 [68.83]	M10
32	0.65 [16.56]	2.71 [68.83]	M10
38	0.65 [16.56]	2.77 [70.41]	M10
45	0.65 [16.56]	2.73 [71.99]	M10

* All dimensions are in Inches [Millimeters].

* Modifications available on request.

" A "

"B"

" C "

" C1 "

" D "

"Н"

=

=

=

=

=

=

* Our standard is Metric but imperial can be accomodated.

* "Ref" dimensions due to compression of springs.

IC140 Series





Style 'F'



38kN, 45kN, 50kN

38kN, 45kN, 50kN

<u>IC 140 x xx x</u>

Bolt Centre Style Force "Z"

" A "	=	6.80 [172.72]
"B"	=	5.51 [140.00]
" C "	=	1.00 [25.40]
" C1 "	=	1.42 [36.00]
" D "	=	4.72 [120.00]
"н"	=	1.00 [25.40]

Part #'s	" Z " min	" Z " max	" G " (ref)		
			38kN	45kN	50kN
IC140 x xx F	1.75 [44.45]	2.00 [50.80]	1.40 [35.56]	1.50 [38.10]	1.43 [36.32]
IC140 x xx G	2.00 [50.80]	2.25 [57.15]	1.52 [38.60]	1.61 [40.89]	1.55 [39.37]
IC140 x xx H	2.25 [57.15]	2.50 [63.50]	1.64 [41.65]	1.73 [43.94]	1.67 [42.41]
IC140 x xx J	2.50 [63.50]	2.75 [69.85]	1.76 [44.70]	1.85 [46.99]	1.79 [45.46]
IC140 x xx K	2.75 [69.85]	3.00 [76.20]	1.87 [47.49]	1.97 [50.03]	1.91 [48.51]
IC140 x xx L	3.00 [76.20]	3.25 [82.55]	1.99 [50.54]	2.09 [53.08]	2.02 [51.30]
IC140 x xx M	3.25 [82.55]	3.50 [88.90]	2.11 [53.59]	2.21 [56.13]	2.14 [54.35]
IC140 x xx N	3.50 [88.90]	3.75 [95.25]	2.23 [56.64]	2.32 [58.92]	2.26 [57.40]
IC140 x xx P	3.75 [95.25]	4.00 [101.60]	2.35 [59.69]	2.44 [61.97]	2.38 [60.45]
IC140 x xx Q	4.00 [101.60]	4.25 [107.95]	2.46 [62.48]	2.56 [65.02]	2.50 [63.50]
IC140 x xx R	4.25 [107.95]	4.50 [114.30	2.58 [65.53]	2.68 [68.07]	2.62 [66.54]
IC140 x xx S	4.50 [114.30	4.75 [120.65]	2.70 [68.58]	2.80 [71.12]	2.73 [69.34]

Force [kN]	"E"	" F " (ref)	Bolt Type
38	0.65 [16.56]	2.77 [70.34]	M10
45	0.65 [16.56]	2.83 [71.99]	M10
50	0.65 [16.56]	2.90 [73.57]	M10

* All dimensions are in Inches [Millimeters].

* Modifications available on request.

* Our standard is Metric but imperial can be accomodated.

* "Ref" dimensions due to compression of springs.

IC146 Series



Style 'C'











38kN, 45kN, 50kN

38kN, 45kN, 50kN

<u>IC 146 x xx x</u>

" Z "

Force

Bolt Centre Style

" A "	=	7.13 [181.10]
"В"	=	5.75 [146.00]
" C "	=	1.00 [25.40]
" C1 "	=	1.42 [36.00]
" D "	=	4.96 [126.00]
"н"	=	1.00 [25.40]

Part #'s	" Z " min	" Z " max		" G " (ref)	
			38kN	45kN	50kN
IC146 x xx F	1.75 [44.45]	2.00 [50.80]	1.40 [35.56]	1.50 [38.10]	1.43 [36.32]
IC146 x xx G	2.00 [50.80]	2.25 [57.15]	1.52 [38.60]	1.61 [40.89]	1.55 [39.37]
IC146 x xx H	2.25 [57.15]	2.50 [63.50]	1.64 [41.65]	1.73 [43.94]	1.67 [42.41]
IC146 x xx J	2.50 [63.50]	2.75 [69.85]	1.76 [44.70]	1.85 [46.99]	1.79 [45.46]
IC146 x xx K	2.75 [69.85]	3.00 [76.20]	1.87 [47.49]	1.97 [50.03]	1.91 [48.51]
IC146 x xx L	3.00 [76.20]	3.25 [82.55]	1.99 [50.54]	2.09 [53.08]	2.02 [51.30]
IC146 x xx M	3.25 [82.55]	3.50 [88.90]	2.11 [53.59]	2.21 [56.13]	2.14 [54.35]
IC146 x xx N	3.50 [88.90]	3.75 [95.25]	2.23 [56.64]	2.32 [58.92]	2.26 [57.40]
IC146 x xx P	3.75 [95.25]	4.00 [101.60]	2.35 [59.69]	2.44 [61.97]	2.38 [60.45]
IC146 x xx Q	4.00 [101.60]	4.25 [107.95]	2.46 [62.48]	2.56 [65.02]	2.50 [63.50]
IC146 x xx R	4.25 [107.95]	4.50 [114.30	2.58 [65.53]	2.68 [68.07]	2.62 [66.54]
IC146 x xx S	4.50 [114.30	4.75 [120.65]	2.70 [68.58]	2.80 [71.12]	2.73 [69.34]

Force [kN]	"E"	" F " (ref)	Bolt Type
38	0.65 [16.56]	2.77 [70.34]	M10
45	0.65 [16.56]	2.83 [71.99]	M10
50	0.65 [16.56]	2.90 [73.57]	M10

* All dimensions are in Inches [Millimeters].

- * Modifications available on request.
- * Our standard is Metric but imperial can be accomodated.

* "Ref" dimensions due to compression of springs.

IC180 Series

Style 'C'













80kN & 90kN

80kN & 90kN

<u>IC</u>	<u>180</u>	<u>×</u>	<u>xx</u>	
	Bolt Centre	Style	Force	
" A "	=	8.51 [216.07]		
"В"	=	7.09 [180.00]		
" C "	=	1.50 [38.10]		
"D"	=	6.29 [160.00]		
-		[]		
" ப "	_	1 50 [28 10]		
п	-	1.30 [30.10]		

			" G "	
Part #'s	" Z " min	" Z " max	(ref)	
			80kN	90kN
IC180 x xx F	1.75 [44.45]	2.00 [50.80]	1.23 [31.24]	1.24 [31.49]
IC180 x xx G	2.00 [50.80]	2.25 [57.15]	1.35 [34.29]	1.36 [34.54]
IC180 x xx H	2.25 [57.15]	2.50 [63.50]	1.47 [37.33]	1.48 [37.59]
IC180 x xx J	2.50 [63.50]	2.75 [69.85]	1.59 [40.38]	1.60 [40.64]
IC180 x xx K	2.75 [69.85]	3.00 [76.20]	1.70 [43.18]	1.72 [43.68]
IC180 x xx L	3.00 [76.20]	3.25 [82.55]	1.82 [46.22]	1.83 [46.48]
IC180 x xx M	3.25 [82.55]	3.50 [88.90]	1.94 [49.27]	1.95 [49.53]
IC180 x xx N	3.50 [88.90]	3.75 [95.25]	2.06 [52.32]	2.07 [52.57]
IC180 x xx P	3.75 [95.25]	4.00 [101.60]	2.18 [55.37]	2.19 [55.62]
IC180 x xx Q	4.00 [101.60]	4.25 [107.95]	2.29 [58.16]	2.31 [58.67]
IC180 x xx R	4.25 [107.95]	4.50 [114.30	2.41 [61.21]	2.43 [61.72]
IC180 x xx S	4.50 [114.30	4.75 [120.65]	2.53 [64.26]	2.54 [64.51]

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Force [kN]	"E"	" F " (ref)	Bolt Type
80	0.65 [16.56]	3.61 [91.66]	M12
90	0.65 [16.56]	3.71 [94.33]	M12 - Class 10.9

* All dimensions are in Inches [Millimeters].

* Modifications available on request.

* Our standard is Metric but imperial can be accomodated.

* "Ref" dimensions due to compression of springs.

<u>X</u>

" Z "

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ICONOPOWER also stocks a large inventory of Capacitors, Semiconductors, Low Voltage Components, Thermal Management, Voltage, current and Heat Sensors, and can provide a turn key Assembly solution.



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