SCREW CAM CLAMP

(Double Eye Type / Twist Cam style)

SWC-S

Operation Manual

This operation manual explain the basic usage and handling of clamps. Please do not fail to carefully read this instruction manual before use and never fail to follow each attention of usage for the proper handling of clamps.

SUPERTOOL

On the Proper Handling of Lifting Clamps with Super Tool's Mark

We are thankful to you for your selection and purchase of our Lifting Clamps with Super Tool's mark on them. Our Lifting Clamps with Super Tool's mark on them (hereinafter to be called "Lifting Clamp" or "Clamp") is energy-saving lifting tools designed and developed for transportation of steel materials and other steel products.

Proper use of Lifting Clamps demanded
You are kindly asked to operate the Lifting Clamps after careful reading and understanding of this instruction manual for the purpose of enhancing safety and efficiency at work.

Prime efficiency and economy
The sophisticated functions, reasonableness and wide applications of the finely and carefully designed Lifting Clamps ensure prime efficiency and economy.

Special considerations on safety
We conduct a pulling test with a load three times (or twice) the rated capacity and a manufacturing number is marked on each product, thus directing a special attention to the safety.

Cautions for safety operation
Please do not fail to carefully read this instruction manual before use of the Lifting Clamps. Mistaken use of the Lifting Clamps (hereinafter to be called "Clamps") may cause troubles such as the dropping of load. Never fail to carefully read this manual for proper operation before use. Education of "crane safety regulations," "operation manual for lifting clamps," "in-house operation standards," etc. should be given before actual operation not only to business owners who have purchased the Clamps but also to their operators to ensure that actual operators have acquired enough knowledge of clamps, safety information, and precautions.
As according to the "Lifting clamp safety council," we have divided cautions in general into "Dangers" and "Cautions," which are used in this instruction manual.

◇**DANGER:** Indicates mistaken handling may cause a potentially hazardous situation which, if not avoided, could result in death or serious injury.
△**CAUTION:** Indicates mistaken handling may cause a potentially hazardous situation which, if not avoided, could result in medium damage or slight injury, or could result in property damage.

Even though only mentioned in the Cautions, not complying them still may lead to a serious disaster. So, do not fail to pay attention both to dangers and cautions which are of great importance in operating the Clamps properly.

Meanings of Signs

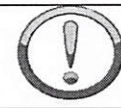
The signs of ◇ and △ indicate that attention should be given to the marks indicative of dangers and cautions respectively. The signs figuratively show the contents of danger or caution.

The sign of  indicates prohibited actions.

The sign of  indicates that an action is enforced or instructed to be executed.

* After reading of this manual, please keep it at a convenient place to which any user can gain easy access for reference.

1. About handling in general

◇Dangers	
• Any person who is not well-informed about instruction manual, tags, and signs of cautions is not eligible for use of the Lifting Clamps. • Any person who is not legally qualified is never to operate a crane and a lifting clamp. (Clauses 221 and 222, Crane Safety Regulations) • While lifting or turning the load, do not enter the area where the lifted load threatens to drop off or fall over. (Clause 28 and 29, Crane Safety Regulations) • Do not use this lifting clamp for other purposes than lifting work.	
• Never fail to execute a before-use and periodical inspection. (Clauses 217 and 220, Crane Safety Regulations)	

2. About checking before operation

◇Dangers	
• Do not use a clamp other than applicable to the operation method. • Do not use an abnormal clamp with deformation, cracks, operational trouble, abrasion, etc. • If the load is under the following conditions, do not use the clamp. (fragile material, high-hardness material, low-hardness or extremely low-hardness material, and members with the gripping part tapered more than 8°)	
• Please check on the clamp main unit the type, basically applicable load, opening diameter, and indication of periodical inspections executed. • The load to be lifted shall be within the allowable range of the basically applicable load of the clamp. • The thickness of the load shall be within the allowable clamping range.	

△Cautions	
• Do not use the clamp for the load under the following conditions. (A load to be lifted is more than 150℃, is less than minus 20℃ in temperature, and acidic or alkaline chemicals.)	
• The sling to be used for the clamp shall be an appropriate one for the lifting operation.	

3. About the method of use and lifting operation

◇Dangers	
• Do not use the Clamp, lifting at one point. (excluding special products or custom ordered products) • Do not use the Clamp in the following way of lifting: (overlapped loads, padded load, engrafted lifting, concurrent lifting, and side gripping) • Do not use the Clamp for pulling out from among steel sheet pilings and not lift pulled-out steel sheets vertically. • Do not use the Clamp when strong wind threatens to cause any danger. • Do not use the Clamp for a hydraulic excavator.	
• Install two or more Clamps in a balanced way to keep the balance of load. • The lifting angle of the Clamp and the dividing angle should be kept within the allowable angles according to types. • A load should be inserted to the innermost end of the Clamp opening. • When you use the Clamp with a locking system, never fail to use the Clamp with the locking system on.	
△Cautions	
• If oil, paint, scales, rust, etc. are on the gripping pad, do not use the Clamp. • Do not drop the Clamp to the ground or drag along the ground.	

4. About the operation of a crane

◇Dangers	
• Never lift the load weighing more than rated capacity. • Do not operate the crane in such a way as to give an impact to the load or the Clamp. • Do not allow a person to stand on the load. Never use the Clamp for the purpose of carrying him. • Do not lift by the earth lifting. • In the course of lifting the load, do not release the lock of the Clamp. • Avoid unintended contact to the load or an adjacent member by the Clamp, which has been removed from the load.	

• When you wind up the wire by the crane and notice the load is applied at the lifting ring, stop the operation temporarily for safety checking (depth of the load into the Clamp opening; status of locking). • Stop the operation of the crane just before the load reaches the ground, and check the following matters: (Inclination and falling over of the load and security at and around the landing area of the load)	
△Cautions	
• Do not operate the crane in such a way as to drag the load along the ground. • Do not leave the crane (or winder, etc.) unattended operating position while keeping the load to be lifted with the Clamp.	
• Hoisting and lowering operation by the crane should be made slowly and carefully.	

5. About maintenance, storage and alternation

◇Dangers	
• Never alter the Clamp and its accessories. • Do not apply welding load or heating to the Clamp and its accessories. • Do not use any other parts than our company's genuine parts. • Store at a different place Clamps requiring repairing so that they are not used mistakenly.	
• A person with specialized knowledge designated by the business owner is to conduct maintenance and repairing work. • When any abnormality with the Clamp is found, do not use it and immediately repair or dispose. • Remove, if any, paint or mud sticking to the moving parts of the Clamp, cams, and pads.	
△Cautions	
• Conduct maintenance and repairing without any load attached. • Conduct maintenance and repairing after posting a sign indicating that you're on the maintenance work. • Never fail to lubricate oil on the rotating part of the Clamp (around the pins), guide grooves, sliding parts, etc. • Be sure to store Clamps inside a room.	

■Warning for use

1. **Be sure to select proper model clamp for use.**
   Pay special attentions to keep the lifting direction (rope angle).
2. Confirm the weight of the load. Do not exceed limited lifting load shown on clamp. (Never overload.)
3. Before lifting the load, confirm followings:
   (a) Proper capacity of clamp.
   (b) No abnormal movements of clamp or loosening of any bolts.
   (c) No oil or other foreign matters on the surface of the cam and pad.
4. **Never clamp the load beyond the clamp range.**
5. When installing a clamp, insert a lifting load completely until it comes in contact with the deepest of the mouth of main body.
6. **Depends on the model or capacity of the clamp, the cam teeth may not bite a load sufficiently when the load is a hard or light weight material (Less than 1/5 of capacity or less than 1/4 of maximum clamp range). Confirm the condition of clamp for safety.**
7. Confirm that the safety lock is completely engaged in case it is equipped.
8. Confirm that the load is well balanced. Determine the clamp position or the center of gravity of the rope properly. It is very important to determine the horizontal center of gravity.
9. When lifting at 2 points, be sure to use two wire ropes, and make the length of each to be equal. (Fig. A)

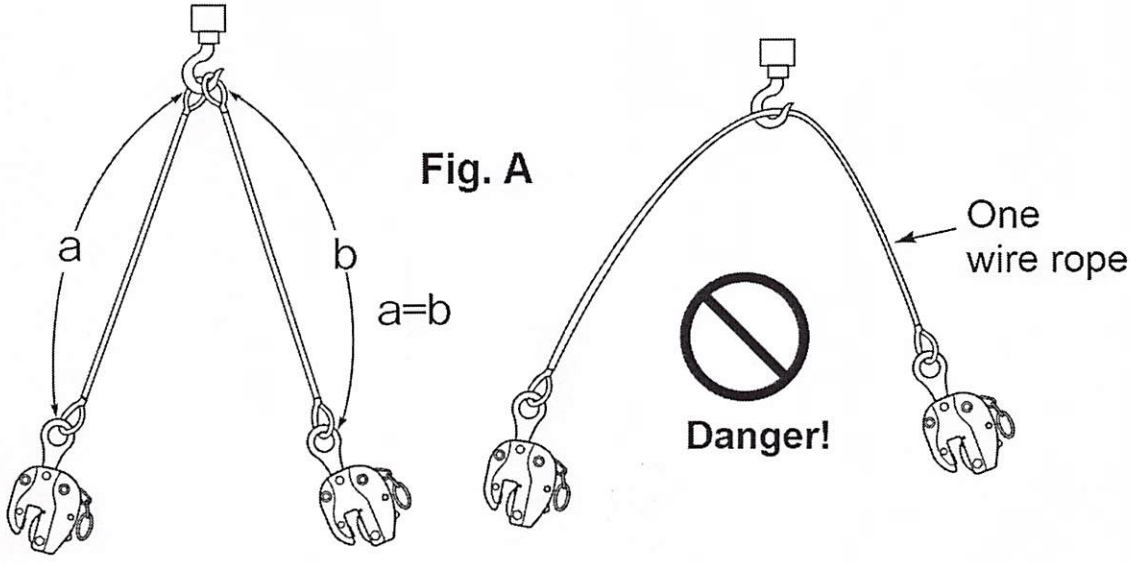


Fig. A

10. When lifting at 2 points, keep the lifting angle within 60°. (Fig. B) (Follow the standards if lifting Angle Is specified within 60° depends on the item.) If the load is long, operate with balanced lifting.

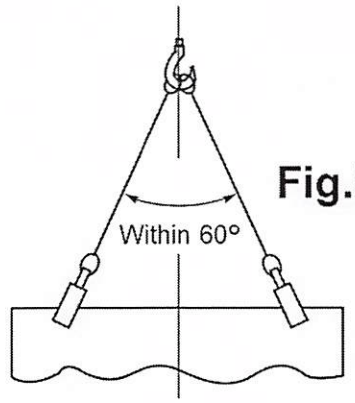
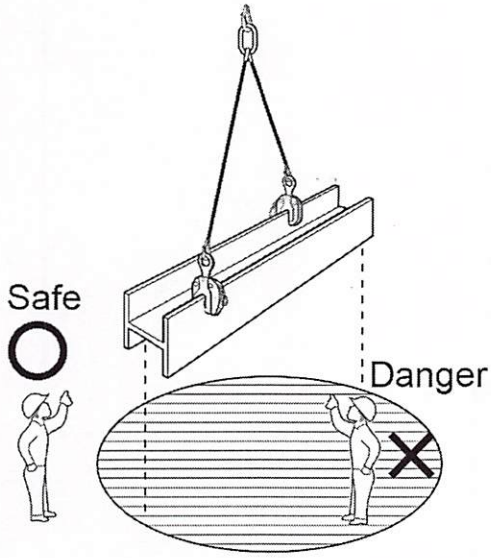


Fig.B

11. Never lift two or more steel plates or steel materials at a time.
12. When lifting, the load may move to an unexpected direction when the load is lifted off the ground. Confirm the center of gravity and the clamping position for safety. Beware of the dangerous period until the clamp with the load becomes completely balanced after lifting.
13. When changing directions of the load or any similar operations, do not ent.er in the range that the load is moving. (Fig. C)



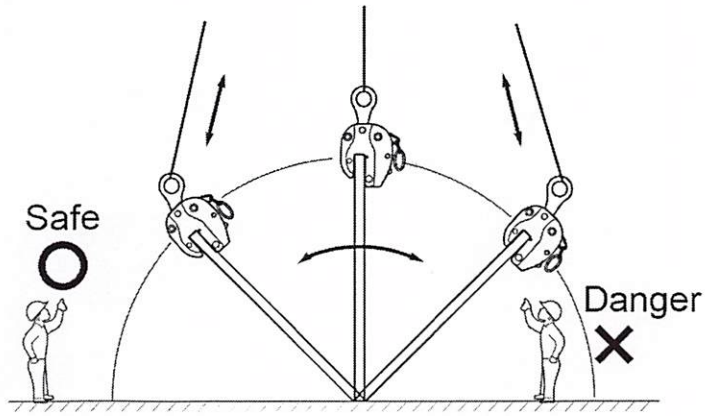


Fig. C

14. Keep momentarily inverting angle of a steel plate within max. 30°. (Fig. D)

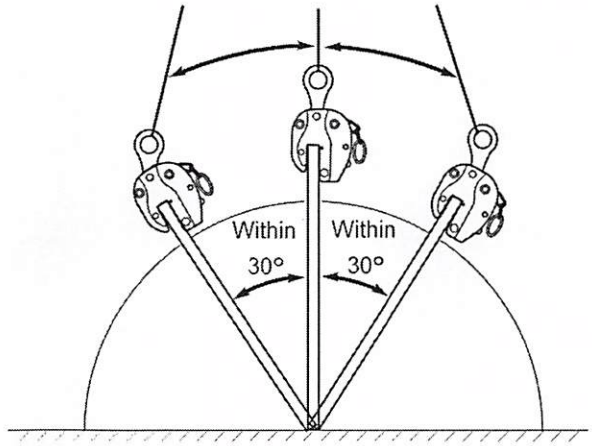


Fig. D

15. **The surface of the load must always be clean and free of scale, coatings or other foreign matters that can reduce friction significantly against safe operation.**
16. **When lifting, special attention must be given to prevent the rope from loosening by its unintended contact with any other objects.**
17. When lifting again after the load is put on, reconfirm the clamp condition.
18. Do not use clamp for the load heated or in a corrosion liquid because safety factor and durability will be reduced in such conditions.
19. Do not alter clamp by welding or cutting by gas.
20. Do not weld electrically a load while being lifted by clamp.
21. Conduct daily maintenance and lubrication.

■Maintenance and Inspection

Ⅰ. Maintenance

Daily maintenance is important for efficient and safe operation even under the severe use condition and for such purposes, please comply with the followings.

(1) Make the use conditions explicit and control.
(2) Keep clamps in-house and do not leave them outside.
(3) Check the followings to maintain clamps in a good condition.
  (a) Operating condition.
  (b) Any abrasion, damage, or clogging at teeth of cam and pad.
  (c) Deformation of main body, jaw opening in particular.
(4) If a hazardous lifting clamp is found during use or inspection, clearly indicate the parts to be repaired and distinguish it from conforming products and immediately repair it.
(5) Perform inspection and maintenance once a week by referring to "Inspection Standards". Lubricate sliding sections periodically. (However, remove the oil at teeth of cam and pad.)

Ⅱ. Periodic Inspection

Perform periodic inspection in accordance with the periodic inspection and maintenance standards. Functions and life of clamps may differ in a great degree as they are used in varieties of fields under different conditions of use. Therefore, preparation and practice of effective handling/inspection standards manual by users themselves is recommended. We ask you to establish complete maintenance and control for the assurance of safety in reference to the inspection standards of "Super" clamp. Clamp is designed for easy replacement of parts and therefore, do not fail to replace defective parts. Also, keeping spare parts at all times is recommended. For your preparation of the standards, pay special attention to the followings.

(1) Operation and maintenance standards
  (a) Preparation of application criteria (Load shape and operating methods).
  (b) Through understanding and compliance of cautions on handling.
  (c) Maintenance and storage.
  (d) Rules of inspection and check at site.

(2) Standards on periodic inspection
  (A) Establishing dates of periodic inspection.
  (B) Establishing inspection and maintenance methods.
    (a) Inspecting period
    (b) Person in charge for the inspection.
    (c) Inspection site.
    (d) Tools and devices for inspection.
    (e) Establishment of permissible limit of use.
    (f) Designation of maintenance and repair methods.

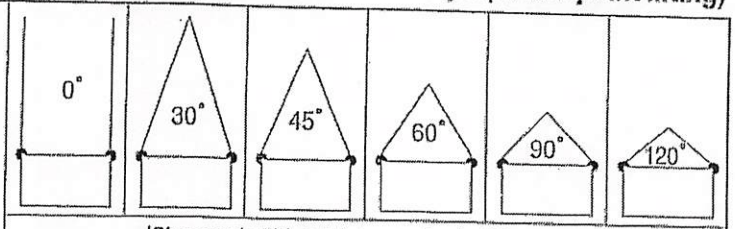
<u>Please feel free to consult custom-made clamp by advising us the following.</u>

(1) Material and weight of loads.
(2) Shape and size of the loads.
(3) How to handle (application, grip position).
(4) Clamp capacity (grip range, rated capacity)
(5) Conditions of a site to be used.
(6) Other requests/inquiries.

LIFTING ANGLE AND SAFE LOAD OF WIRE ROPE

The maximum allowable load ((safe load)) of wire rope also varies with the lifting angle. Therefore, select a wire rope of proper diameter in consideration of the lifting angle.
((The breakage load specified in table below refers to No.4. 6×24A class of JIS G3525.))

Correlation between Lifting Angle and Safe Load of Wire Rope (in two-point lifting)

D Wire rope dia (mm)	σ Breakage load (tons)	W Sale load (on one rope) W=σ/S (safety factor S=6) (tons)	
			(Changes in lifting efficiency due to lifting angle.%)
			100% | 96% | 92% | 86% | 70% | 50%
			Max.allowable load (safe load) on two wire ropes (tons)
8	3.21	0.54	1.08 | 1.04 | 0.99 | 0.93 | 0.76 | 0.54
9	4.06	0.68	1.36 | 1.31 | 1.25 | 1.17 | 0.95 | 0.68
10	5.02	0.84	1.68 | 1.61 | 1.55 | 1.44 | 1.18 | 0.84
11.2	6.29	1.05	2.1 | 2.02 | 1.93 | 1.81 | 1.47 | 1.05
12.5	7.84	1.31	2.62 | 2.52 | 2.41 | 2.25 | 1.83 | 1.31
14	9.83	1.64	3.28 | 3.15 | 3.02 | 2.82 | 2.3 | 1.64
16	12.8	2.13	4.26 | 4.09 | 3.92 | 3.66 | 2.98 | 2.13
18	16.2	2.7	5.4 | 5.18 | 4.97 | 4.64 | 3.78 | 2.7
20	20.1	3.35	6.7 | 6.43 | 6.16 | 5.76 | 4.69 | 3.35
22.4	25.2	4.2	8.4 | 8.06 | 7.73 | 7.22 | 5.88 | 4.2
25	31.3	5.22	10.44 | 10.02 | 9.6 | 8.98 | 7.31 | 5.22
28	39.3	6.55	13.1 | 12.58 | 12.05 | 11.27 | 9.17 | 6.55
30	45.1	7.52	15.04 | 14.44 | 13.84 | 12.93 | 10.53 | 7.52
31.5	49.8	8.3	16.6 | 15.94 | 15.27 | 14.28 | 11.62 | 8.3
33.5	56.3	9.38	18.76 | 18.01 | 17.26 | 16.13 | 13.13 | 9.38
35.5	63.2	10.53	21.06 | 20.22 | 19.38 | 18.11 | 14.74 | 10.53

Note For four-point lifting, multiply the corresponding figure in the table by 2 to find the maximum allowable load(safeload).

Simplified calculation method of wire rope diameter and safe load(one-point lifting)

1) $D=\sqrt{W\times C}$

2) $W=\frac{D^2}{C}$

Where D : wire rope diameter(mm)
W : safe load(tons)
C : constant=120
(safety factor S=6)

★To find the diameter of wire rope for 3 tons :

① $D=\sqrt{W\times C}$

$D=\sqrt{3\times 120}=\sqrt{360}=19\rightarrow 20mm$

★To find the service load (safe load) on 25mm diameter wire rope:

② $W=\frac{D^2}{C}$

$W=\frac{25^2}{120}=\frac{625}{120}=5.2\rightarrow 5.2ton$

Screw Cam Clamp

(Double Eye Type / Twist Cam Style)

SWC-S

■ Applications

Best suited for lifting up, lateral pulling or turning-over steel plates and beams for the industries as in civil engineering, construction, ship building, steel and can manufacturing industries. Also best suited for lifting down chain block or hoist as a jig or pulling steel materials.

■ Features

1. Shackle attaching part is on 2 places, so the selection can be made according to operation condition.
2. The screw is placed on top (operator's side) when used in horizontal pulling, so the tightening operation can be done easily.
3. When tightening the screw, the round cam bite harder into the work piece while turning around, which ensures great clamping force. Also, round cam has phosphorescent (glow-in-the dark) paint for easy recognition of adequate tightening.
4. The built-in spring make strong grip and prevent the loose of the screw.
5. The cam will tilt in accordance with the weight of the load, which make strong clamping.
6. Round cam is designed to always return to the original position by spring mechanism.
7. Robust with superb durability. Main body is made of die-forged special alloy with the optimum heat treatment.

■ Specifications

Part No.	Rated Capacity (ton)	Clamping Range (mm)	Net weight (kg)
SWC 0.5S	0.5	0~25	1.9
SWC 1S	1	0~40	3.6
SWC 2S	2	0~40	5.8

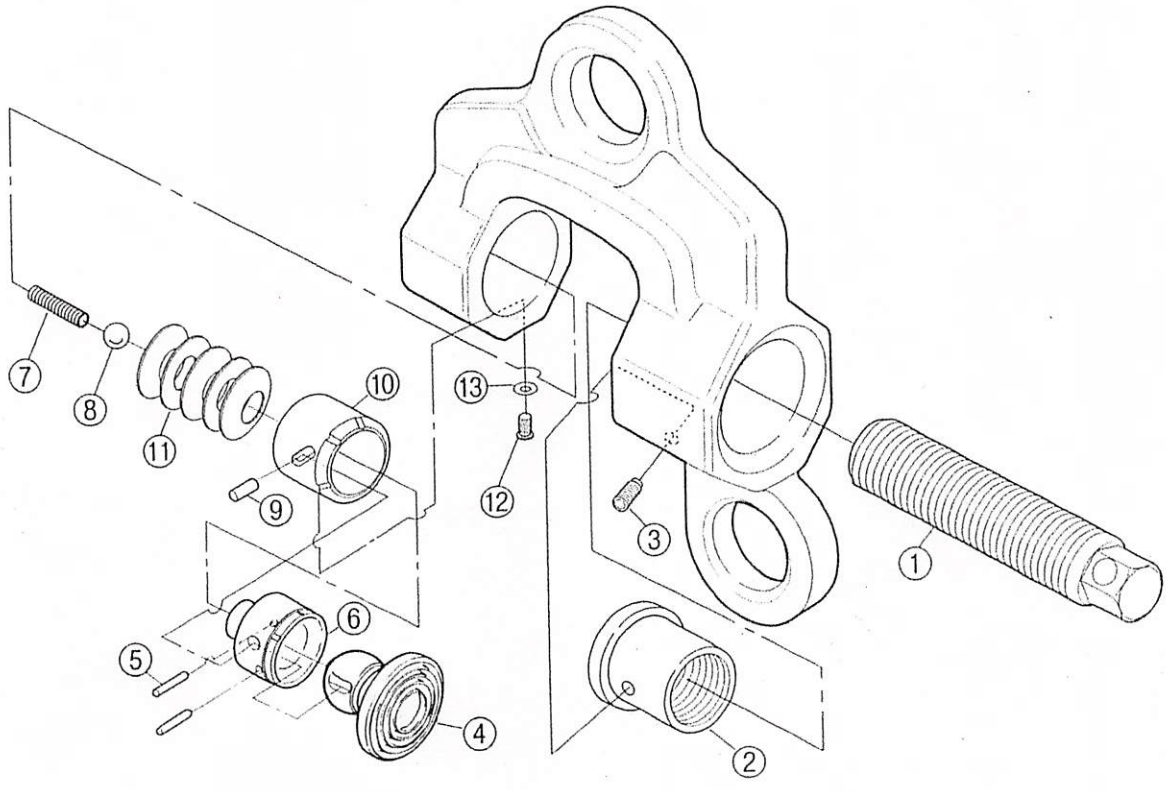
REPLACEMENT PARTS AND FITINGS

Model: SWC-S

PARTS NO.	ITEM NAME			QTY.
	SET	DETAIL	ITEM No.	
1	SCREW	SCREW	SWCR	1
2	SLEEVE	SLEEVE	SWCB	1
3		HEX. HOLE HEAD SCREW		1
4	CAM	CIRCULAR CAM	SWT	1
5		STOPPER PIN		2
6		CAM HOLDER		1
7		SPRING		1
8		STEEL BALL		1
9		GUIDE PIN		1
10		COLLAR		1
11		DISC SPRING		5
12		HEX. SOCKET HEAD SCREW		1
13		SPRING WASHER		1

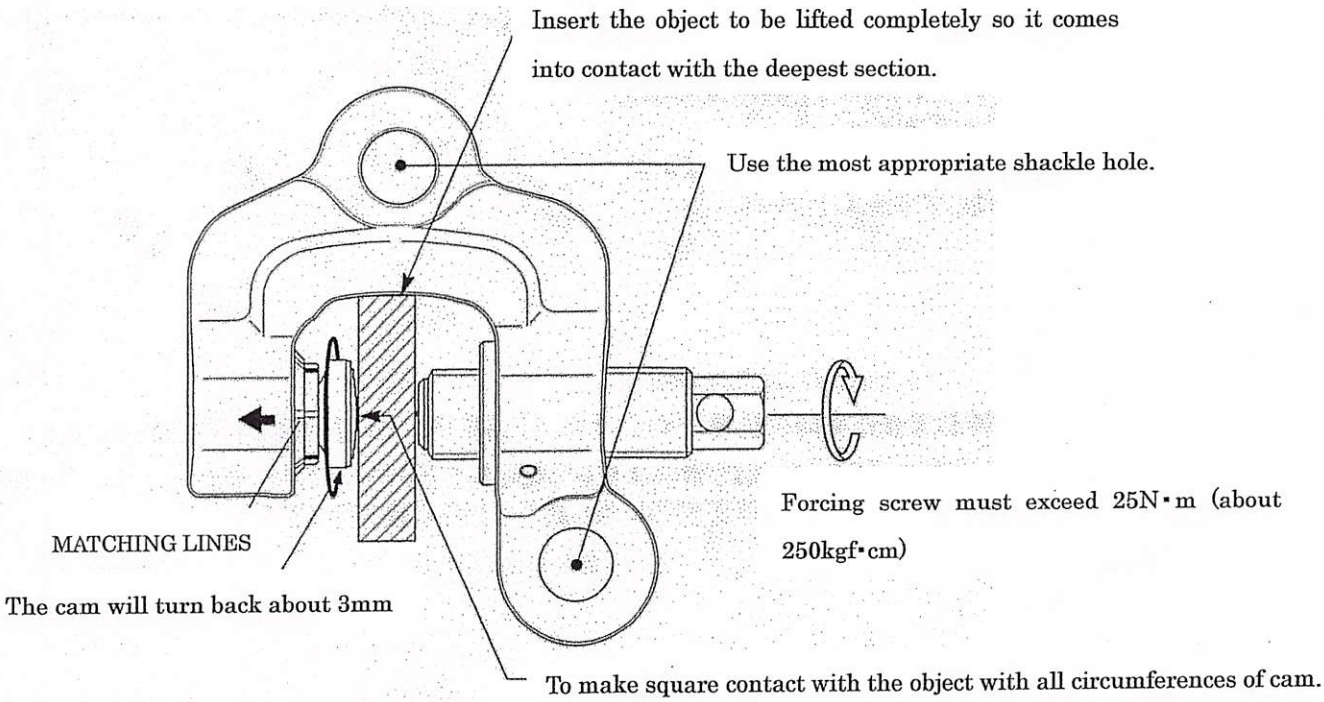
Attention

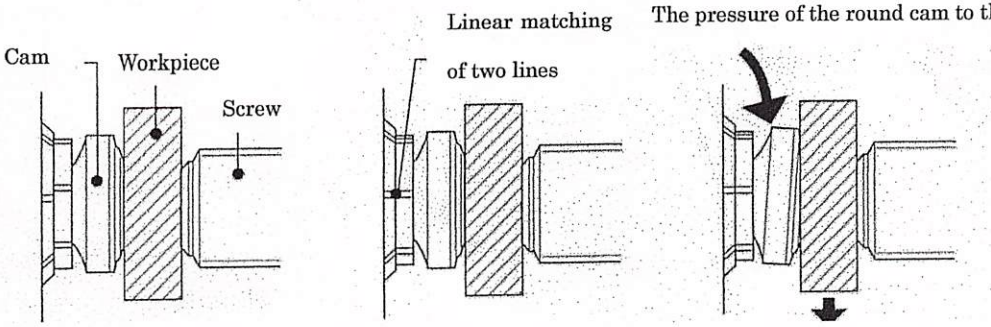
1) When ordering, specify the CAPA (TON) with ITEM NO.
   (For instance, the screw for SWC1S is SWCR1S)
2) Periodic lubrication is regularly required on to cam holder and screw.



OPERATION METHOD

1) The forcing screw will tighten when turned clockwise, and will loosen when turned counterclockwise.
2) When setting the clamp, insert the object to be lifted completely into the jaw opening until it comes into contact with the deepest end section. Next turn the handle and tighten the forcing screw firmly with all circumferences of cam by square contact with the object.
3) The cam will turn back about 3mm after coming into contact with the steel plate when tightening the forcing screw. Continue to tighten the forcing screw until it stops where MATCHING-LINEs fit each other on one line.
   Confirming the matching-line meets each other, the tightening of the forcing screw must exceed 25N・m (about 250Kgf. Cm).
4) Determine which shackle hole (wire rope hole) to use from the method of use and from the shape of the object to be lifted. Never use 2 shackle holes at the same time.
   Never use the two shackle holes at the same time.
5) When hoisting or during other operations, special attention must be given to prevent the handle from coming into contact with the wire rope or other objects. When the handle comes into contact with something, there is a possibility that the forcing screw will turn and loosen.

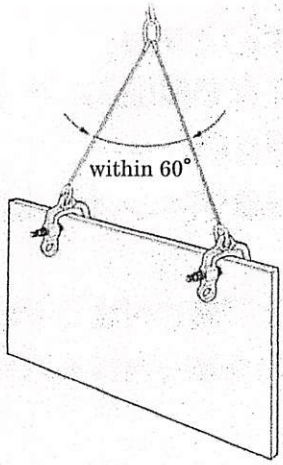


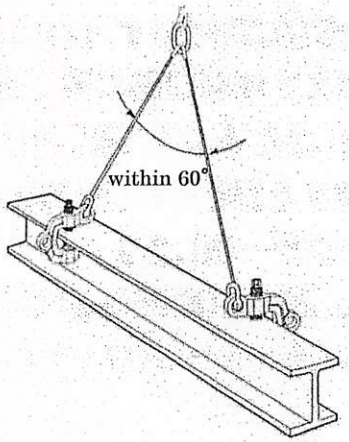


Before tightening the screw | After tightening | When under a load

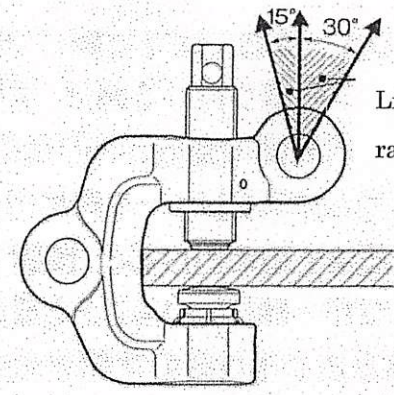
2. Method of Use

② When lifting at 2 points, keep the lifting angle within 60°

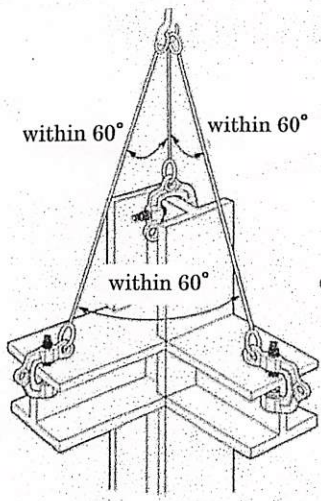


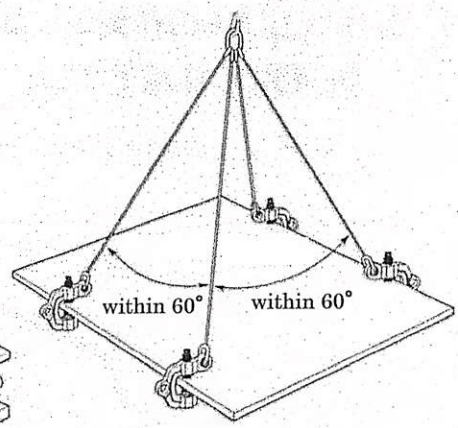


① When lifting horizontally, the direction of wire rope should be within the following

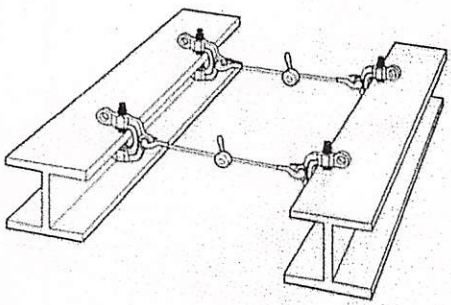


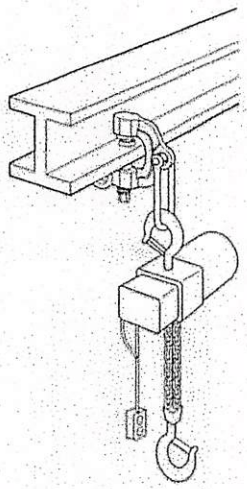
③ Always lift at 3 points with complicated shaped objects.
(When lifting steel plates horizontally, always lift at 4 points.)

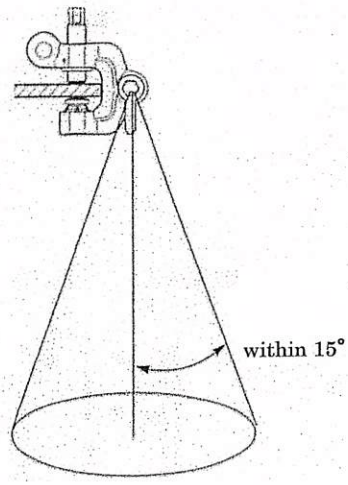




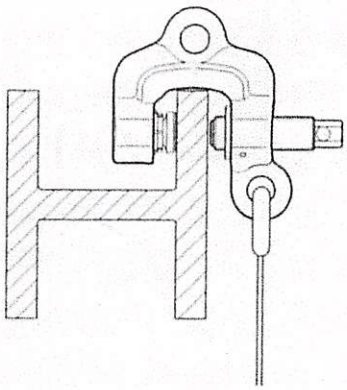
④ Used for positioning steel structure for welding, for pulling and for hanging.
(When the clamps are used continuously over a long period of time, check the clamping force regularly at short intervals.)



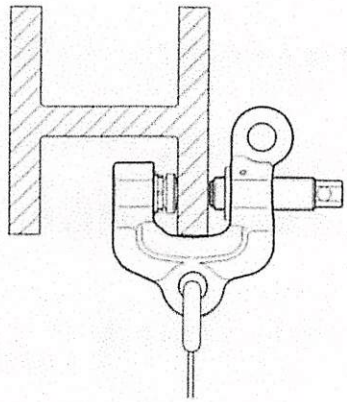


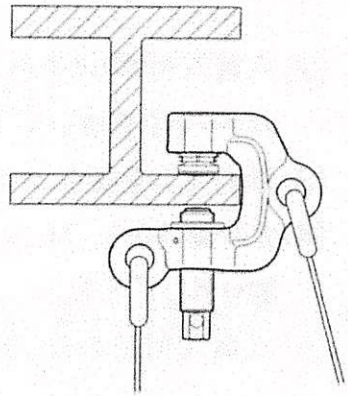


※Load direction for hanging hoist and chain block should be within 15°
The shackle and chain must not interfere with each other.



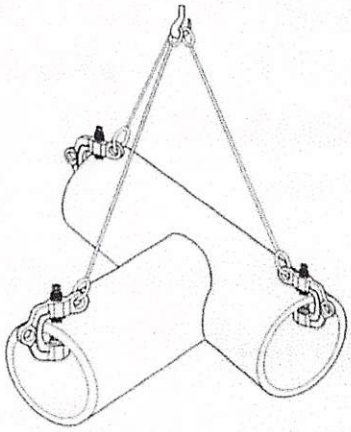
When using H shaped steel, a chain must not interfere with a work.

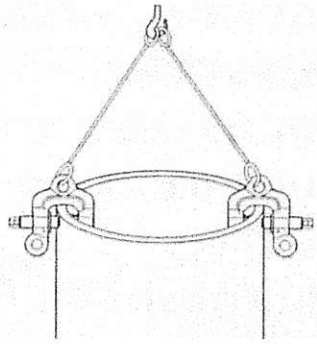




Never use to the falling direction and also never use 2 shackle holes at the same time.

⑤ The clamps can also be used for lifting pipe shaped objects and for turning over objects.

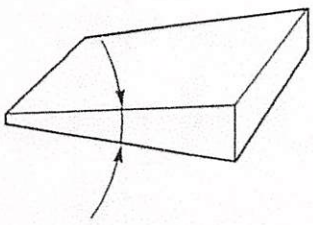




(Cylinder with inner dia. over 600mm)

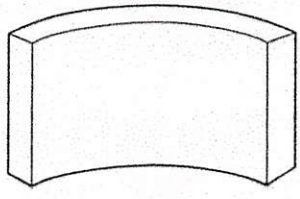
⑤ The clamps cannot be used on the following shaped structures.

※Wedge shapes over 8°

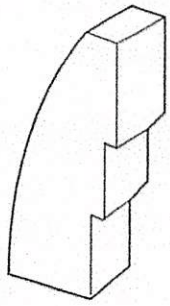


Round bars

Curve shapes with radius under 100mm

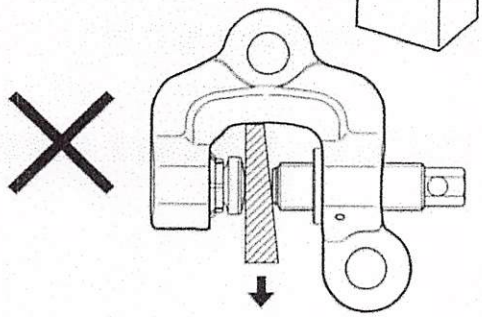


Object with uneven surfaces (no flat surface for clamping)



Cylinders with inner dia. under 600mm

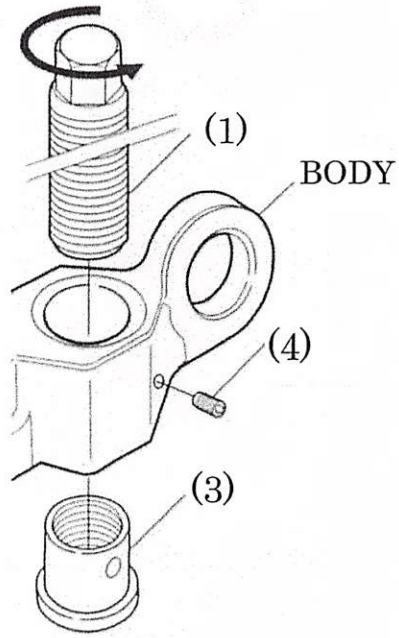
※Lift with care when clamped the tapered side even if the wedge shapes under 8°



3. Disassembling and Assembling of Parts

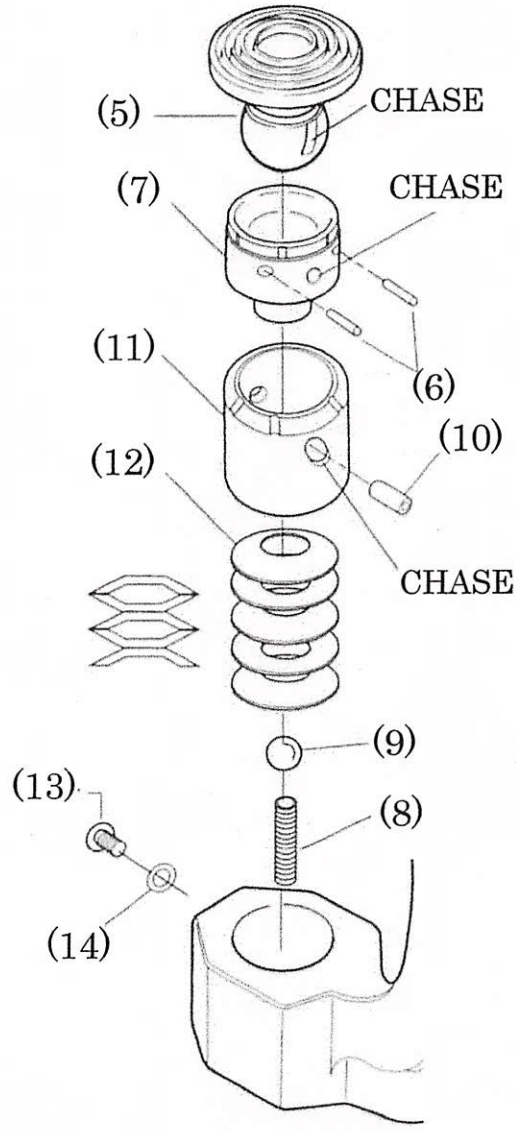
Disassembling (screw side)
Turn screw (1) anticlockwise to remove. Handle and screw cannot be apart.
Loosen hex. Screw (4) and remove (3).

Disassembling (cam side)
Loosen hex. Screw (13) and remove (5), (7), and (11).
Pull out (10) and remove (11).
Pull out (6) and remove (5).



Assembling (screw side)
Fit and match the hole of (3) into the body hole of (4). Screw (4) and fix (3).
Turn (1) into the internal screw of body finally after all assembling of both screw and cam sides.

Assembling (cam side)
Set (5) into (7) and fix them with (6).
Set (11) over (7) by matching all chases of (5), (7), and (11) in one line. Insert (10) to fix them all.
Fix 5pcs of disc spring as shown
Set and fix 5 pieces of (12) as per fig.
Set (9) and (12) to the bottom part of (7).
Set partly assemble combination of (5), (7), and (11) to the body and fix them by (13).



■CAUTION:

- Use within the maximum capacity.
- Use within the clamp range.
- Do not use in any objects other than steel materials.
- Do not use for a hard (30 HRC or higher) load.
- It cannot be used for a load with a taper down direction.
- Do not apply shock to the load or lifting clamps.
- Do not lift more than one plate simultaneously.
- Before using the product, be sure to check for clogging and wear of the teeth of the circular cam, the screw and any other parts.
- Do not modify. Heating, processing, etc. can significantly reduce the quality (strength).

■OTHER:

- Inquiries for Repair Parts and Repair.

If repair parts or repairs are required, stop using this clamp and contact your distributor.

■DAILY INSPECTION:

Conduct daily checks and maintenance to prevent the loss of safety and efficiency.

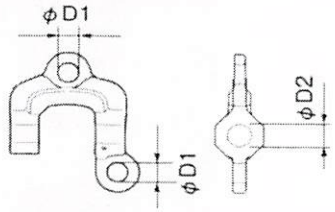
1. Check that there are no scratches or cracks in the body, circular cam, or wire rope holes.
2. Check the operation and lubrication condition of each part is good.
3. Check for wear, defects, and clogging of the teeth of the circular cam and the screw.
4. Refer to other inspection standards.

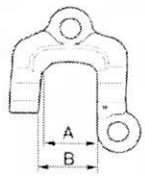
■ INSPECTION STANDARDS

<table>
<tr><th>Category</th><th>Inspecting Method</th><th>Limit of use</th><th>Counter-measures</th></tr>
<tr><td>Body</td><td>● Visually check or use color dyes to find cracks

● Check wear or deformation of shackle and screw hole

● Measure the jaw opening (by measuring device)</td><td>● When a crack is found.

● When hole diameter, even one part of circumference, exceeds the size of the table below
 

<table><tr><td>Max. capacity (ton)</td><td>0.5</td><td>1</td><td>2</td></tr><tr><td>D1 (mm)</td><td>23</td><td>27.5</td><td>34.5</td></tr><tr><td>D2 (mm)</td><td>34.5</td><td>42.5</td><td>44.5</td></tr></table>
● When the difference of "A" and "B" exceed 5%
 

● When the displacement of the center of the forcing screw and cam exceed 2 mm.</td><td>Dispose</td></tr>
<tr><td>Screw</td><td>●Visually check or use color dyes to find cracks.

●Visually check the forcing screw for bends or damage.

●Visually check the forcing screw for wear or damage.

●Visually check and measure the amount of wear on the top parts.

●Visually check or use color dyes to find crack or flow at the teeth bottom.

●Visually check for broken teeth</td><td>●When a crack is found.

●When the movement is not smooth, or when the displacement of the screw center exceed 2mm.

●When thread part on circumference exceeds the size

<table><tr><td>Capacity (ton)</td><td>0.5</td><td>1</td><td>2</td></tr><tr><td>Diameter (mm)</td><td>23.3</td><td>29.3</td><td>29.3</td></tr></table>
●When the width of wear exceeds 0.5mm.
 
●When the crack or flow is found.
 
●When the broken teeth is found.
  </td><td>Replace</td></tr>
<tr><td>Sleeve</td><td>●Visually check or use color dyes to crack or flow

●Inspect the wear on the top (by measuring device)

●Visually check for the condition of attachment</td><td>●When visually confirmed.

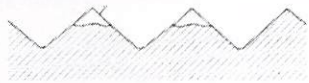
●Whenthe backlash exceeds 2mm between the screws and sleeves.

●When the hex. socket head disconnects or loosen.</td><td>Replace</td></tr>
</table>

<table>
<tr><td>Circular Cam</td><td>●Visually check and measure the amount of wear.

●Visually check or use color dyes to find cracks or flows at the bottom cam teeth.

●Visually check for broken cam teeth

●Inspect each section for wear.
(by measuring device)</td><td>●When the amount of wear exceeds 0.5mm
 
●When the crack or flow is found.
 
●When the broken tooth is found
 
●When the clearance between circular cam and cam holder exceeds 0.5mm</td><td>Replace</td></tr>
<tr><td>Cam Holder</td><td>●Inspect each section for wear.
(by measuring device)</td><td>●When the clearance between the body, cam holder and cam becomes large, and exceeds 0.5mm</td><td>Replace</td></tr>
<tr><td>Collar</td><td>●Inspect each section for wear.
(by measuring device)

●Visually check for the condition of attachment</td><td>●When the clearance between collar, body, and cam holder become large, and exceeds 0.3mm.

●When extreme low head hexagon bolt with hole disconnect or loosen.</td><td>Replace</td></tr>
<tr><td>Guide Pin</td><td>●Inspect each section for wear and distortion
(by measuring device)

●Visually check and measure the forcing screw for bends, or deformation.</td><td>●When the clearance of chase hole exceeds 0.1mm
When distortion exceeds 0.1mm.

●When the clearance of the forcing screw for bends, or deformation exceeds 0.1mm</td><td>Replace</td></tr>
<tr><td>Stopper Pin</td><td>●Measure each section for wear.

●Visually check and measure the forcing screw for bends, or deformation.</td><td>●When the clearance of chase hole exceeds 0.2mm

●When distortion exceeds 0.2mm.

●When the circular cam is not smooth.</td><td>Replace</td></tr>
<tr><td>Steel ball</td><td>●Inspect each section for wear or deformation</td><td>●When ball diameter exceeds the size in the table below at least.
<table><tr><td>Capacity (ton)</td><td>0.5</td><td>1</td><td>2</td></tr><tr><td>Diameter (mm)</td><td>4.8</td><td>6.8</td><td>6.8</td></tr></table>●When the circular cam is not smooth.</td><td>Replace</td></tr>
<tr><td>Spring</td><td>●Check if cam returns automatically to original position when moved by hands.

●Visually check the clearance of spring</td><td>●When no repulsive power from deformation and not return to original position.

●When the spring becomes 5% shorter than its original length or when the clearance between the coils becomes small.</td><td>Replace</td></tr>
<tr><td>Disc Spring</td><td>●Check proper repulsive power when cam pushed</td><td>●When normal repulsive power lost from deformation and lack of movement of circular cam.</td><td>Replace</td></tr>
</table>

Oct, 2018