

# S3i Lifting Shackles

## Materials used

Our lifting shackles are manufactured from two different grades of stainless steel used specifically for different applications. The application and environment will determine which type of shackle should be used.

## Shackles for general lifting applications

S3i PH shackles are made from PH 17/4, a martensitic precipitation/age hardening 17% chromium, 4% nickel stainless steel, offering high strength and hardness together with excellent corrosion resistance. PH shackles are heat treated to between condition H1025 and condition H1075 to achieve the optimum balance of mechanical properties and resistance to corrosion: in this state PH 17/4 closely approaches stainless types 302 and 304 for most corrosion agents.

Because of the critical dependence of the strength/corrosion characteristics on the heat treatment process it is imperative that no attempt is made to anneal S3i PH shackles for whatever reason.

Technical Information Analysis (a typical analysis of PH 17/4)	
Carbon	0.07% max
Manganese	1.00% max
Silicon	1.00% max
Phosphorus	0.04% max
Sulphur	0.03% max
Chromium	15.50 - 17.50%
Nickel	3.00 - 5.00%
Columbium & Tantalum	0.15 - 0.45%
Copper	3.00 - 5.00%
Iron	100%

Mechanical Properties		
Ultimate Tensile Strength	10,900 kg/cm <sup>2</sup> (H1025) to 10,190kg/cm <sup>2</sup> (H1075) Iron	11,810 kg/cm <sup>2</sup> (H1025) to 11,530kg/cm <sup>2</sup> (H1075)
Yield Strength (0.2%)	10,190 kg/cm <sup>2</sup> (H1025) to 8,790kg/cm <sup>2</sup> (H1075)	10,190 kg/cm <sup>2</sup> (H1025) to 8,790kg/cm <sup>2</sup> (H1075)

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## Shackles for lifting applications requiring a higher resistance to corrosion

S3i E Pin shackles (D and Bow) are manufactured from ISO 1.4404 stainless steel and are proof-tested to twice their Working Load Limit (WLL) using equipment calibrated to BS EN 10002-2 and NAMAS NIS 0424.

S3i stainless steel E Type shackles should be used in applications where corrosion resistance is of significant importance. Stainless steels are possible solutions to corrosion problems and are ideally suited to natural (water, city and landscape atmospheric) conditions. S3i stainless steel E Type shackles should NOT be used in general lifting applications where corrosion resistance is not required. For such general lifting applications please refer to the S3i PH range of lifting shackles. Due to the nature of stainless steel and the possibility of work hardening/stress ageing, we strongly recommend that thorough inspection and maintenance is carried out on a regular basis.

S3i stainless steel E Type shackles (D and Bow) are made from EN10088-3 1995 1.4404 stainless steel, a work hardening Austenitic stainless steel.

Because of the critical dependence of the strength characteristics on the mechanical history of the material the shackles should not be used if distorted in any way, it is imperative that no attempt is made to straighten or modify the shape of these shackles for whatever reason.

Stainless steel grade EN10088 1.4404 is an iron-chromium-nickel alloy which is hardenable by cold working. Nickel is the main element varied within the alloys of this class while carbon is kept to low levels. This grade is slightly magnetic in the cold-worked condition, but is essentially non-magnetic in the annealed condition. The austenitic types of stainless steel feature adaptability to cold forming and in general, the highest corrosion resistance. Type 316 (EN10088 1.4404) stainless steel contains molybdenum for better corrosion resistance - particularly to pitting.

### Technical Information Analysis (a typical analysis of EN1008803 1.4404)

Carbon	0.03% max
Chromium	16-18%
Nickel	10-13%
Manganese	2.0% max
Silicon	1.0% max
Sulphur	0.03% max
Phosphorus	0.04% max
Molybdenum	2.0-3.0%
Iron	to 100%

Please refer to EN 10088-3 1995 for chemical analysis and typical mechanical properties of 1.4401 and 1.4404 steel, which are also commonly known as grade 316 and 316L.

# S3i Lifting Shackles

## Testing S3i lifting shackles

All of our lifting shackles are inspected before they are tested and inspected again before they are dispatched. A thorough examination takes place ensuring that:

- The body of the shackle and pin are both compatible.
- All markings are clearly legible.
- The pin is the correct type for the body.
- The threads of the pin and the body are in good order and function correctly.
- The body and pin are not damaged in any way and are free from any dents, cracks, deformation etc.

All load rated shackles are supplied with a WLL and proof load test certificate in accordance with EN10204 3.1b. Each shackle is individually tested to its proof load (2 x WLL).

Each shackle is mechanically engraved with the following details

- Working Load Limit (WLL).
- Batch number specific to the test for that batch of shackles.
- The grade of stainless steel which the shackle is manufactured from.
- CE mark.

The Lifting Operations and Lifting Regulations (LOLER) 1998 specify that the following provisions apply to all shackles used in a lifting application. It is the responsibility of the user to ensure that:

- The equipment is safe and suitable for the intended use.
- The equipment is supplied with a leaflet providing information on its safe use.
- The personnel who use the equipment must be suitably trained.
- The equipment must be maintained in a safe condition.
- Record of conformity, test and examination etc. must be retained.

## Instructions for use

Shackles should be inspected before use to ensure that:

- all markings are legible.
- the threads of the pin and the body are undamaged.
- never use a safety type bolt/pin without using the split cotter pin.
- the body and the pin are not distorted or unduly worn.
- the body and pin are free from nicks, gouges, cracks and corrosion.
- shackles may not be heat treated as this may affect their working load limit.
- never modify, repair or reshape a shackle as this will affect the Working Load Limit.

# S3i Lifting Shackles

## Inspection of the S3i lifting shackle

Before the shackle is first put into use it should be examined for signs of damage.

If it is known, or suspected, that the shackle has been subjected to an excess load or the shackle shows any sign of cracking, splitting or deformation it must be destroyed.

It is required that the shackles are regularly inspected and that the inspection should take place in accordance with the safety standards given in the country of use. This is required because the products in use may be affected by wear, misuse, overloading etc. with a consequence of deformation and alteration of the material structure. Inspection should take place at least every 6 months and even more frequently when the shackles are used in severe operating conditions.

