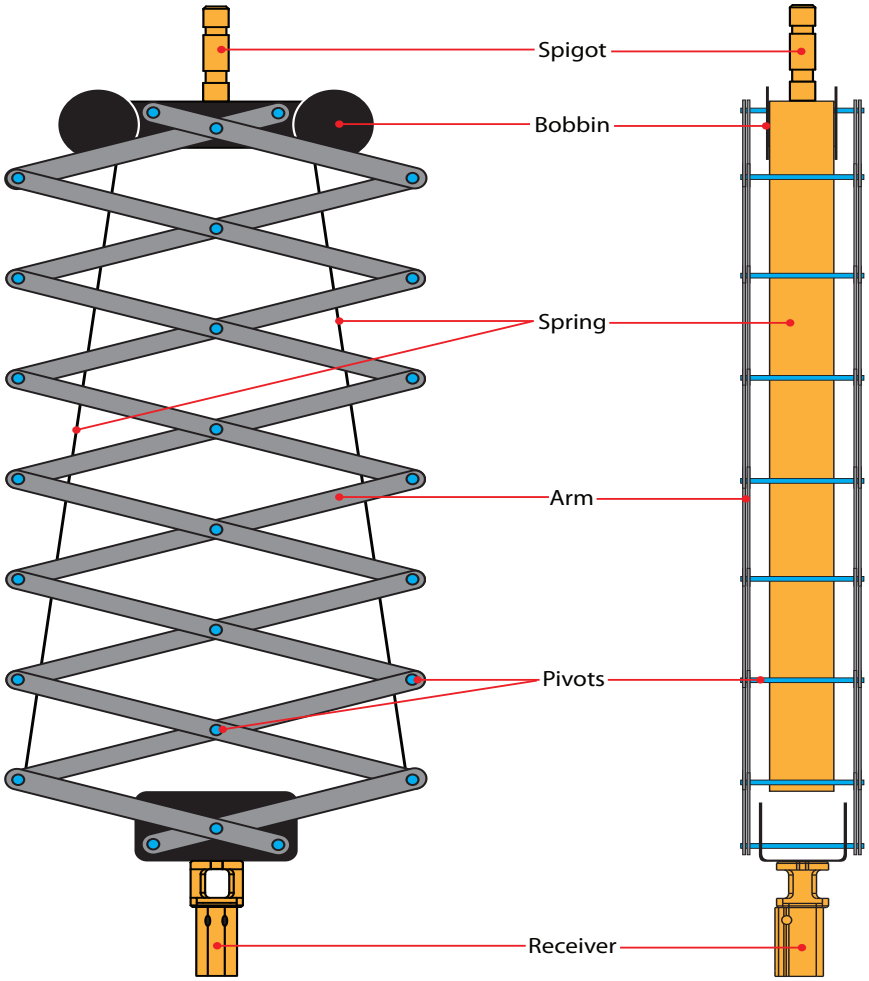
DOUGHTY

Operating Manual

www.doughty-engineering.co.uk

Pantographs

A pantograph is a mechanical device that enables a load to be suspended by the means of balancing the load with two or more constant tension springs. Once balanced the load can be positioned at any height within the range of the Pantograph by simply raising or lowering the load by hand.



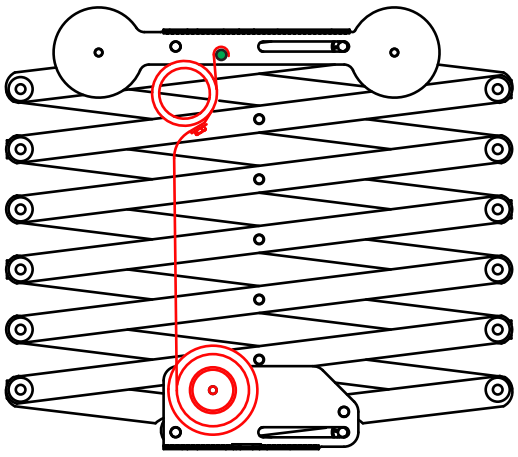
Part No.	Springs	SWL	Max Length	Weight
G1660	2	12 Kg	2.20m	6.80 Kg
G1662	2	12 Kg	3.00m	9.60 Kg
G1664	2	12 Kg	4.00m	13.00 Kg
G1666	2	12 Kg	5.00m	16.40 Kg
G1670	3	20 Kg	2.20m	7.50 Kg
G1672	3	20 Kg	3.00m	10.30 Kg
G1674	3	20 Kg	4.00m	13.60 Kg
G1676	3	20 Kg	5.00m	17.00 Kg
G1680	4	27 Kg	2.20m	7.50 Kg
G1682	4	27 Kg	3.00m	10.30 Kg
G1684	4	27 Kg	4.00m	10.40 Kg
G1686	4	27 Kg	5.00m	17.00 Kg
G1694	5	36 Kg	4.00m	10.40 Kg
G1696	5	36 Kg	5.00m	17.00 Kg

Installation

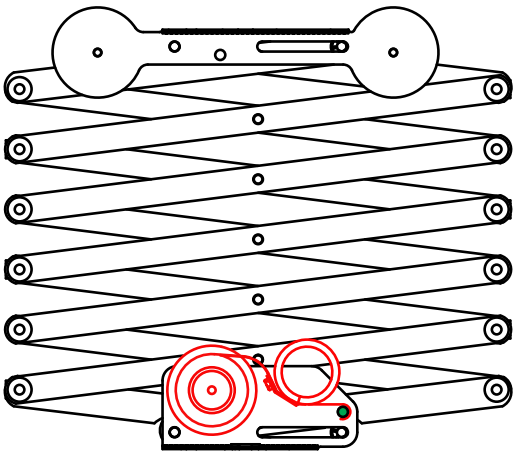
- Installation should only be carried out by a competent person familiar with this type of equipment.
- Ensure that the suspension fittings are suitable for the application and are securely attached at the top and bottom of the pantograph.
- Ensure that the two outer springs are set to the maximum. The spring hook has to be properly seated around the bottom pivot each side. The 3 spring pantograph has the option of disengaging the third spring and securing it to a parking bar on the bottom bracket, to give a working load range of 2 to 11 Kg. (see illustration below)
- Note that for the 4 and 5 spring pantographs, all the central springs are factory fitted. On no account attempt to alter the installation of these central springs.
- Attach the pantograph to the required suspension point, and secure safely. A safety bond should be used with all installations taking care to ensure that the wire rope has a minimum of slack.
- Before applying any load to the pantograph ensure that the load is not greater than the SWL stated on the pantograph.
- All loads should be fitted with a secondary safety device. ie. a safety bond
- Adjust the two outer springs to higher pivot rungs as necessary to balance the load enabling stable positioning throughout the movement of the pantograph.

  NOTE: When a spring hook is attached to an intermediate pivot, the pantograph will not close completely.

3rd Spring in use attached to top chassis



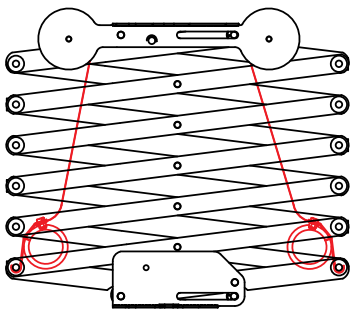
3rd Spring stowed attached to pin provided



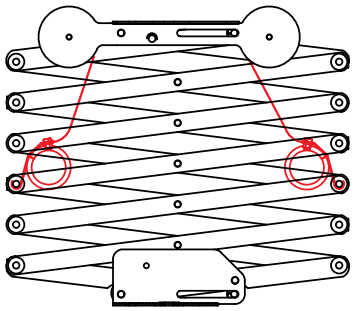
The 3rd Spring can either be “in use” or “stowed”
Never leave the 3rd spring loose as it may jam the mechanism

Operation

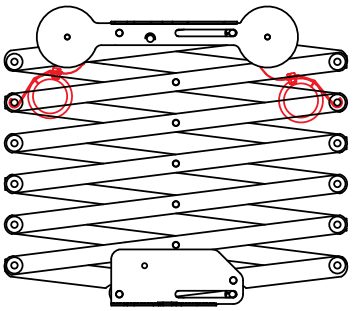
- Operation should only be carried out by a competent person familiar with this type of equipment.
- Only attach and unattach loads with the pantograph closed do not attempt and pull the pantograph to floor level and attach / detach a load.
- The pantograph is balanced to the load by adjusting the position of the spring hooks on the pivot rungs. (see illustration below)



Maximum Load



Medium Load



Light Load

For optimum performance set springs on similar rungs either side of the pantograph.

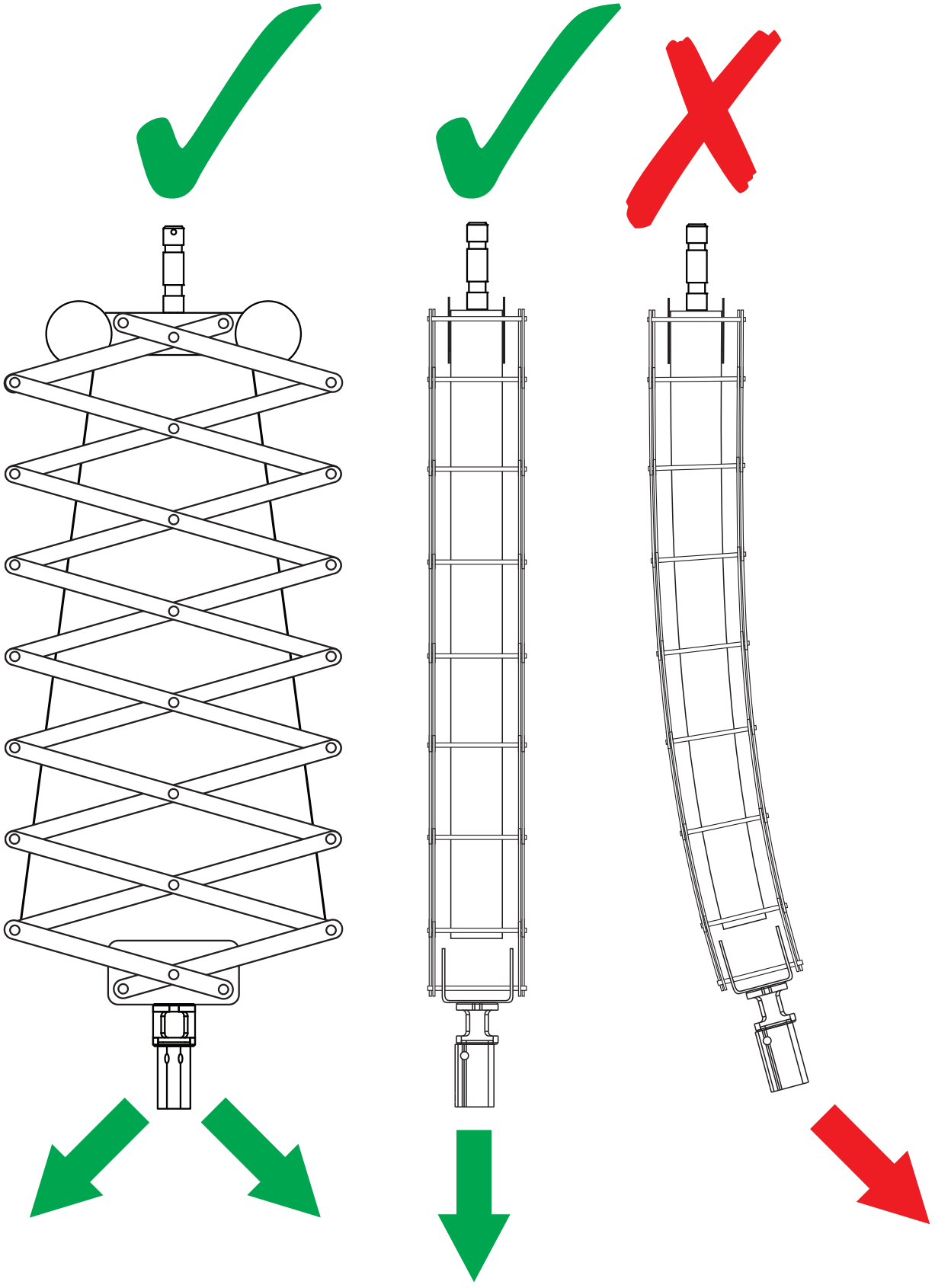
- With the pantograph balanced the load can be positioned within the range of the pantograph's vertical movement by hand.
- The pantograph should hold the load at any chosen height once balanced. Should the load creep up or down simply adjust one of the springs by one rung.
- When positioning the pantograph care must be taken not to push / pull the pantograph out of vertical alignment.
- Should any of the springs become twisted do not under any circumstances attempt to rectify the spring. The pantograph must be decommissioned and returned for repair.

DO NOT PUSH THE PANTOGRAPH OUT OF VERTICAL FREE HANGING ALIGNMENT.

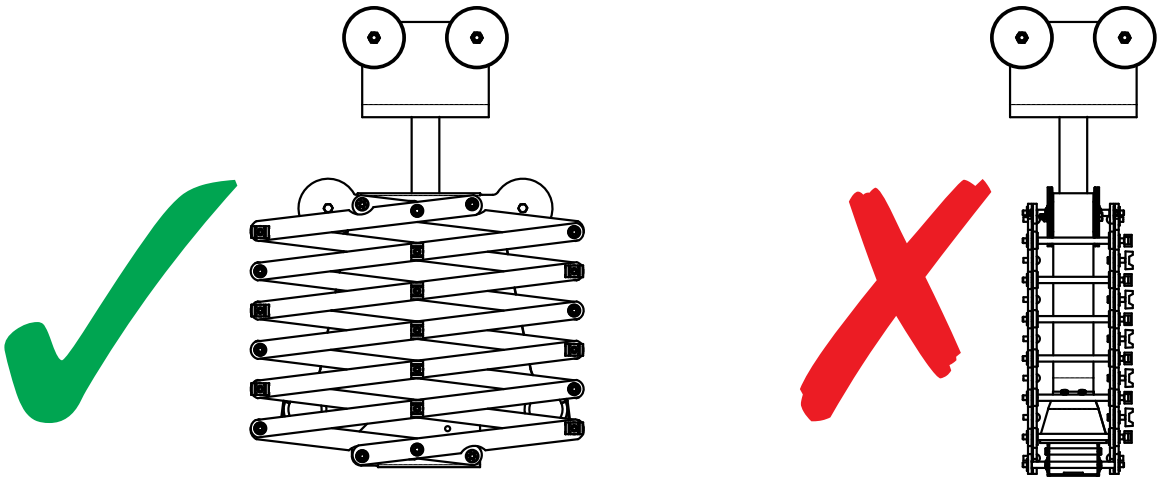
Although the Pantograph is classed as lifting equipment, it is not designed for lifting persons.

In accordance with BS7905 part 1 The loading details are shown in the below table

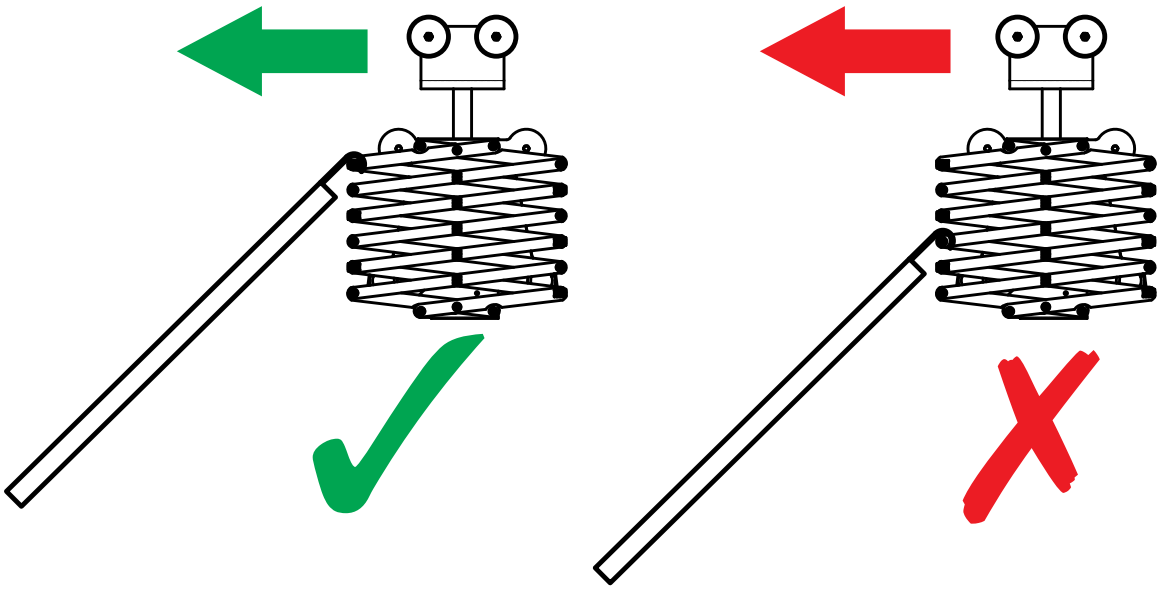
2 Spring Pantograph	loads between 3Kg and 12Kg
3 Spring Pantograph	loads between 2Kg and 19Kg
4 Spring Pantograph	loads between 9Kg and 26Kg
5 Spring Pantograph	loads between 17Kg and 36Kg



THE PANTOGRAPH MUST HANG VERTICALLY AND BE STRAIGHT WHEN LOADED.
UNBALANCED/OFFSET LOADS CAN ONLY BE USED AS SHOWN.
ALLOWING THE PANTOGRAPH TO BEND CAN DAMAGE THE PANTOGRAPH SPRINGS.



If the Pantograph is mounted on a Barrel Trolley the Pantograph Arms must be aligned with the trolley as shown



If the Barrel Trolley has a brake, only draw the trolley slowly along the runway by the brake
If the Trolley does not have a brake the Pantograph may be drawn slowly along the runway by the top rung only. Do not draw the pantograph by the lower rungs.
Always draw the Pantograph slowly and smoothly.

Safety Precautions

- Ensure only qualified (i.e. Doughty trained) personnel handle the pantograph
- Ensure that the setting of springs is restricted to trained and authorised persons only.
- Be aware that the principle risks are
  1. The uncontrolled release of a spring.
  2. Entrapment of fingers during adjustment.
- Ensure that any pantograph is subject to regular inspections and maintain written records of usage.
- Be sure that these instructions are fully understood before operating any pantographs.
- Always close pantograph before removing load.
- Always ensure attachments are fully secured and safety bonds are in place.
- Never place any objects between the arms.

Upon Installation record the following:

1. Serial number and type of pantograph.
2. Place and date installed.
3. Name and title of installer and organisation.
4. Estimate of the number of operations each week.

Fully extend the pantograph and examine the springs to ensure that there are no cracks at the edge of any spring. (If cracks are observed, they will grow gradually over many cycles, and the spring will get progressively weaker. The spring should be replaced.)

Electrical Cables

Select the correct electrical cable for duty with particular reference to the following:

- Highest likely air temperature
- Plug and socket assemblies required.
- Electrical rating.
- Cable assembly inspection and test records.
- Due date for next testing procedure.
- The cable must be to a suitable rubber insulated ‘trailing flexible’ specification, Recommended cable lengths for pantographs including approximately 2 meter ‘tail’ at the top are listed in the below table:

Nominal Length metres	No. of pivots (or rungs)	Cable metres
2.2	6	4.5m
3	8	5.5m
4	11	7.0m
5	14	8.5m

Fit cable to pantograph only when the pantograph is fully closed.

Take good care to ensure that the cable is secured to each cable saddle by means of the reusable cable ties provided. (Spares are available from Doughty or Doughty agents).

Make sure the cable is not kinked and that cable will not become trapped between arms when the pantograph is operated throughout the working range.

Inspection

To be carried out after any rectification and every 12 months or to an approved timetable.

- Examine records and assess the number of operations since springs were new. If this is more than 4000, then the springs must be renewed by return to Doughty or by an approved Doughty Service Agent.

- Ensure that the attachment fittings are suitable for the application and that they are securely attached a the top and bottom of the pantograph.

- Fully extend the pantograph and examine the springs to ensure that there are no cracks at the edge of any spring. (If cracks are observed, they will grow gradually over many cycles, and the spring will get progressively weaker. The spring should be replaced.)

- Ensure that all components are correctly in place, and that no item is distorted.

  After the pantograph has been passed as satisfactory, written records must be completed to that effect to include an estimate of the number of operations that have been completed by the springs. (This has to be derived from records).

Repair Procedure

Do not attempt to repair any Doughty Pantograph, unless fully trained and authorised in writing by Doughty or suitable responsible repair authority.

Replacement of parts

- New spring assemblies can be supplied separately by Doughty, these will be supplied complete with bobbin and retainer hook.

- Replacement arms are available from Doughty, these are made from carefully chosen high duty material. Only genuine parts should be used as quality of copies cannot be guaranteed.

- Replacement clips are available from Doughty.
  As there are a number of slightly different clips used in different places on the pantograph, it is important to ensure that only the correct clips are used in each place. Details are issued within Doughty repair training scheme.

After the pantograph has been passed as satisfactory, written records shall be completed to that effect to include an estimate of the number of operations that have been completed by the springs.

Pantograph Installation / Inspection Report

Installation

Part No.....**Serial No**.....

Customer..... **Location**.....

Installation Company .....

Installed By .....

Inspection

Inspected by	Date	Estimated Operations	Signed

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DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and EN45014

Manufacturer's Name: Doughty Engineering Limited

Declares that the product:

Product Name: Spring Pantograph

Model Numbers: G1660, G1662, G1664, G1666, G1670, G1672, G1674, G1676

Conforms to the following Product Specifications:

BSEN755-2:1997	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Mechanical properties
BS970	Specification for wrought steels for mechanical and allied engineering purposes
BS1449	Steel plate, sheet and strip. Carbon and carbon-manganese plate, sheet and strip. General specification
BS1490:1988	Specification for aluminium and aluminium alloy ingots and castings for general engineering purposes
BS1706:1990	Method for specifying electroplated coatings of zinc and cadmium on iron and steel
BS7905-1:2001	Lifting equipment for performance, broadcast and similar applications. Specification for the design and manufacture of above stage equipment (excluding trusses and towers)

Supplementary Information:

The product herewith complies with the requirements of the Machinery Directive 98/37/EEC and carries the CE marking accordingly.

Ringwood, March 9, 2004 Nigel D Curtis, Director

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Note: Whilst every effort has been made to ensure that the information contained within this manual is correct, Doughty Engineering does not accept any liability for errors or omissions. Specifications and technical data are intended for guidance purposes only and may vary.