



# **OPERATING INSTRUCTIONS FOR CLEGG IMPACT SOIL TESTER "4.5 Kg Standard Hammer" Model Type CIST/882**

- 1. Machine to be operated by trained personnel.**
- 2. Instructions to be read before use.**

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# Impact Soil Tester



Clegg Tester

## Clegg Impact Soil Testers

4.5 Kg Clegg Impact Soil Testers:-

'Classic' CIST/882 Models & Data logging CIST/883

For accurate Compaction Control Testing During Trench Reinstatement. The 4.5Kg Clegg Impact Soil Tester types CIST/882 and CIST/883 provide an easy means for measuring soil compaction and strength during trench re-instatement.

The 'Classic' CIST/882 model shown on the left has a detachable readout unit that the user holds in one hand. The 4.5 Kg hammer is dropped 5 times at each location and the results used to establish the in-situ soil stiffness.

The data logging CIST/883 model shown below provides time & date data logging of up to 10,000 x 5-drop tests. Data download to PC is by Bluetooth. The data then opens immediately into standard MS Excel™ spreadsheets. During testing the Clegg readout unit is clamped to the guide tube so the user doesn't have to hold the readout whilst testing, making it easy to use.

Described in the Design Manual for Roads and Bridges (DMRB) the Tester provides a compact instrument for monitoring the quality of reinstatements in-situ while work proceeds, avoiding the need for later re-excavation.

Product code	Description	
905-000021	4.5kg Model 882 Clegg Impact Soil Tester	® ®
905-000022	4.5kg Model 883 Clegg Impact Soil Tester	® ®
045-000217	Wooden Box to Suit	

Hy-Ram Engineering Co Ltd has a policy of continuous improvement in product quality and design. Hy-Ram Engineering Co Ltd therefore reserves the right to change the specification of its models at any time, without prior notice.

## **Important!**

This manual forms a part of the product to which it relates. It should be kept for the life of the product. Any amendments issued by Hy-Ram Engineering Co Ltd should be incorporated in the text. The manual should be passed to any subsequent holder or user of this product.

## **General Description.**

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## **HEALTH AND SAFETY CONSIDERATIONS HANDLING PRECAUTIONS**

The Clegg Impact Soil Tester requires careful handling at all times during preparation and use to ensure safe working and freedom from accidents. A few common-sense precautions should always be observed. Use extreme care when lifting and handling the Tester. Keep the feet clear of the hammer when it is being loaded into the guide tube and when it is released during testing and operation of the equipment. Ensure it is properly and safely packed in a suitable transit case when transported.

Hiram offers the information in this manual in good faith as a guide to suggested operation and procedure. Actual operation of the instrument or reporting and interpretation of the test results are the sole responsibility of the user. Liability is not accepted for any inaccuracies or negligent statements this manual may contain or for any defects in the equipment.

### **Introduction**

The Clegg Impact Soil Tester provides a simple means of testing the design and construction of pavement overlays, subgrades and earthworks and for confirming uniform compaction over wide areas. It is also a valuable tool in checking compaction levels during trench reinstatement after pipe or cable laying.

A significant number of utility reinstatements suffer from settlement that is usually a symptom of poor workmanship.

The Clegg Impact Soil tester can be utilised to identify poorly compacted areas. Defective work can be detected and remedied as it arises, thereby avoiding ineffective compacting or rolling.

The Tester has a hand-held readout meter that displays a digital reading known as an Impact Value that is related to the stiffness of the material being tested. The Impact Values give an indication of soil strength and show good correlation with results from CBR tests. Data from the Clegg Impact Soil Tester can therefore be used in a similar manner to results from CBR tests performed in the laboratory and in the field.

## Construction

The Clegg Impact Soil Tester consists of these principal parts:

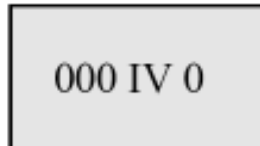
1. Drop-Hammer with built-in impact sensor
2. Guide Tube with integral base plate & carrying handle
3. Meter with digital display
4. Calibration Ring + carry case.

These parts fit together into a lightweight portable assembly that can be carried easily. The specially instrumented 4.5 kg compaction hammer operates within the vertical guide tube. When the hammer is released from a fixed height, it falls through the tube and strikes the surface beneath the guide tube, decelerating at a rate determined by the bearing strength and stiffness of the material within the region of impact. The output from a precision accelerometer mounted on the hammer is coupled by the flexible connecting cable to the digital readout meter. This registers the peak deceleration of the hammer on impact. The value attained after the fourth drop is recorded as the Impact Value (or, IV) for the material being tested.

### The Digital Readout Meter

The meter is supplied as a detachable hand-held unit, powered from an internal battery. It is switched on merely by pressing and holding on the button on the front of the meter. No initial setting up is needed nor are zero adjustments required. The meter employs a liquid crystal display that presents the following information:

- i. Initial display at 'switch-on':



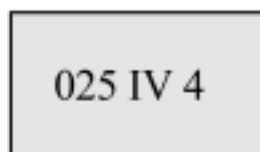
The three left-hand digits are the Impact Value. The letters 'IV' Stand for Impact Value. The right hand digit is the number of drops made since switch-on incrementing from 0 through to 5.

### Information note:

**The on/off button is kept pressed during testing. As soon as the button is released the digital readout meter switches off.**

The Digital Readout Meter (continued)

- ii. A typical Display after the fourth hammer drop might be:



This indicates an Impact Value of 25 after the 4th drop.

### **Correlation with CBR Values**

The fourth reading of Impact Value can be converted to 'Equivalent % CBR' using the relationship below.

$$\text{Equivalent \% CBR} = (0.24(\text{IV}) + 1)^2$$

Example: 25 IV =  $((0.24 \times 25) + 1)^2$  % CBR

$$25 \text{ IV} = 49\% \text{ CBR approximately.}$$

### **Site Test Procedure. CIST/882 and CIST/882/TREND Models**

In order to obtain a reliable reading of Impact Value it is necessary to carry out five test drops at each location. The procedure described below should be followed, regardless of the material being tested.

- i. Choose a test position where the guide tube can stand upright without assistance. If necessary remove excessive loose surface material (scuffing with the side of the shoe or boot is usually adequate) and ensure that the tube is not standing over a stone larger than any other stones visible at the surface.
- ii. Check that the guide tube is reasonably vertical and steady. Stand with both feet on the base flange, or rest one foot on the flange whilst steadying the tube with the side of the leg. Remove the locking pin that retains the hammer inside the tube and unclip the meter readout unit. Press the button on the readout and check the display shows zero IV and zero drop count. If necessary, release and repress the push button until the required zero readings are obtained and then keep the button depressed throughout the remainder of the test.
- iii. Without moving the guide tube or releasing the meter button, repeat the procedure in ii above for a further four drops to give a total of five readings at the test position.
- iv. Assess the set of 5 readings. The first two or three drops effectively take up the surface irregularities and loose material immediately beneath the hammer. The readings thereafter should get progressively higher. The third, fourth and fifth readings should level out and register the stiffness of the compacted layer under test.
- v. The fourth reading is the critical reading; it represents the degree of compaction being measured.
- vi. If any of the readings is more than 2 IV lower than a previous reading or if the fifth reading is greater than the fourth reading by more than 2 IV, then the measurements are generally not reliable and the test should be abandoned at that location. The table of allowable IV limits during the 5 drop test are shown in Table A on page 6. If the IV values fall outside these limits a repeat test should be carried out around 300 mm away from the position of the abandoned test location.
- vii. The CIST/882/TREND model automatically monitors the trend in readings throughout the 5 drop test and will inform the operator of a suspect reinstatement if the readings fall outside those described in the paragraph above. The display will show 'ABORT !' in this situation and the test should be stopped and then repeated around 300 mm away.

ix. On completion of the test, move the guide tube to one side and observe the indentation made by the drop hammer. The stronger the material, the shallower the indentation. Typical indentation values on fine fill range from 20 mm at 10 IV to 2 mm at road base with 30 IV. Values outside of these usually indicate a problem. If the indentation is greater than 20 mm deep with fine fill or 2mm deep for coarse or dry materials, the test at that location has failed regardless of the IV recorded.

x. Possible reasons for this type of failure may be due to excess moisture, poor quality material or insufficient compaction.

### Drop Counter on the Readout Display

On all Clegg Hammer readout models the number of drops from switch-on, indicated by the right hand digit on display, increments from 0 to 5 and thereafter recycles from 1 through 5. After observing the five readings of Impact Value at one location, release the press button on the meter. Install the guide tube at its next location and switch the meter on again to re-commence measurements.

The CIST/882/TREND model will re-display the critical 4th drop reading when the operator keeps the front panel button pressed after the 5th drop. The drop number '4' will momentarily flash on and off to highlight the reading being displayed is the 4th drop value.

### Typical Impact Values

The lower and upper limits of permissible Impact Values are depicted in Table A, where IV readings A-E are the values obtained on the first to fifth drops respectively.

The critical 4th drop value D in Table A can be used providing the other limits in the table are not exceeded. The CIST/882/TREND Clegg model has these limit checks built into the readout electronics and the display will show ABORT ! if the limits are exceeded. The CIST/882/TREND model automatically re-displays the 4th drop reading if the operator keeps the front panel button pressed after the 5th hammer drop.

(See also Pages 9 for an indication of target Impact Values from site tests).

**TABLE A**

	Drop No.	IV Reading	Permissible Lower limit	IV Reading Upper limit
	1	A	-	No Upper Limit set for 1 <sup>st</sup> 4 drops
	2	B	A-2	
	3	C	B-2	
Critical Impact Value	4	<b>D</b>	C-2	
	5	E	D-2	

## **Trench Reinstatement**

It is important to note there will be variations in strength along a trench or within a patch and it is necessary to take sufficient readings to determine average strength as well as locating soft spots. In a typical one metre square patch at least three readings are required: one in the centre; and two in the corners. If good agreement is not reached then check the remaining two corners. In short trenches a reading should be taken at longer intervals - say up to five metres, depending on overall length. The longer the trench, then the greater the number of readings that will be needed to achieve a representative average.

Usually it is found that good materials properly compacted, will give consistent readings. Inconsistent readings generally indicate some problem, requiring further investigation.

## **Testing the Clegg Impact Soil Tester**

The operation of the Tester should be checked regularly; at least at monthly intervals, depending on frequency of use. The Tester must be checked on a hard solid surface and always with the test ring in place, the functional check always being conducted, or repeated, on the same selected surface to eliminate the possible influence of different surfaces on the reading obtained.

- a. Make a total of 20 consecutive drops onto the test ring and observe the Impact Values.
- b. Discard the highest and lowest values and study the remaining 18 or so values. These should all be within  $\pm 3$  IV of the value shown on the test ring.
- c. The scatter of the remaining 18 or so test values should be evenly spread around the ring value.
- d. If the Tester fails to satisfy the above functional check criteria, it should be returned to the manufacturer for maintenance or repair, except that:
- e. If the result of the test was repeatable, but indicated a 'test value' that was consistently different from the ring value (all confirmed by the use of a second Clegg Impact Soil Tester at the same location), then the actual test value should be substituted for the official ring value in all subsequent functional checks carried out on the Tester in that location.
- f. The new test value from the above may be marked on the test ring but the original ring value should remain for use during functional checks in the field or when otherwise conducted away from the specific test location.
- g. For all functional checks conducted away from this designated location, the test ring should be placed in the middle of a length of carriageway or kerbing, or on the surface of the carriageway (road) itself, at least 500 mm away from any edge or joint. Functional checks should never be carried out on any footway surface, regardless of surface material, or on unmade ground.

**THE HAMMER MUST NEVER BE DROPPED ON ANY HARD SURFACE AS THIS MAY PERMANENTLY DAMAGE THE ACCELEROMETER.**

## Display Warnings

During normal operations either of the following two displays may appear:

**'BAT FAIL'**            **'STOP NOW'**

A reading of **'BAT FAIL'** means the battery needs to be replaced. The instrument is powered by a 9V PP3 Alkaline Battery (Duracell, Ever Ready Gold Seal, or similar). Battery replacement should be carried out within a clean and dry environment. See procedure on Battery Replacement.

**'STOP NOW'** will be displayed when the test material is too hard. The maximum IV reading is 100 IV for CIST/882 and CIST/882/TREND models.

Using the Tester on such materials may damage the accelerometer, as mentioned previously. This is likely to happen if the hammer is dropped on a paved surfaced but can also happen when the hammer falls directly on top of a large stone. If this occurs, repeat the test nearby. If the display warning persists, stop immediately, then check the operation of the Tester on some softer material. If necessary repeat the operational check, using the test ring.

In the case of the CIST/882/TREND model an additional warning may be displayed during a Clegg test:

### **'ABORT !'**

For the CIST/882/TREND model this message signifies that the trend in IV values have fallen outside the limits shown in Table A on page 6.

## General Care

Although the instrument is robust it should preferably be transported and stored in the special transit and storage case, available as an optional extra. The coaxial cable and connectors should be checked if inconsistent readings occur. The connecting cable has to be light and flexible so as not to impede the free fall of the hammer. As a result the cable is of limited strength. **Never attempt to lift or move the Tester by means of the cable.** This may break the cable connections internally, leading either to an open circuit or short circuit. In some instances, this fault may be revealed by the display indicating **'STOP NOW'**.

Although readings may be taken in wet conditions, the readout unit is not fully waterproof and should be kept as dry as possible. If moisture does infiltrate the unit, the display may malfunction. If this occurs, remove the back cover and allow the circuitry to dry out in a dry area.

Check the base of the hammer after each set of readings to ensure that it is clean. If material builds up on the hammer it could lead to an uneven indentation and a false reading. A change in impact sound may also be detected. During each hammer drop the experienced user will be able to hear if the hammer has dropped cleanly. A low reading may result if it has rubbed against the inside of the guide tube on the way down. Provided the other readings are considered satisfactory, the fourth reading can be taken as valid; otherwise, repeat the test.



## Target Impact Values

The Target Impact Values in Table B represents a balance between compacted density and stiffness. The target value is to be regarded as the lowest value acceptable on the fourth drop under average condition.

**TABLE B**

REINSTATEMENT LEVEL	FOURTH DROP IMPACT VALUE		
	Target Value	Typical Range	Highest Likely
Trench Bed	7	7 - 8	30
Top of Fine Fill	10	10 - 17	-
Top of Back Fill	18*	17# - 27	-
Top of Sub-base	22	24 - 27	-
Top of Road Base	30	32 - 34	38

\*Minimum IV for re-used materials

#Minimum IV for imported materials

Compaction must always be carried out in full accordance with the reinstatement specification and must not be stopped when the target Impact Value has been achieved.

The impact values shown under the headings 'Typical Range' and 'Highest Likely' in Table B are to be taken as approximate guidelines.

It is most important that all reinstatement materials achieve their full potential and hence long-term performance. Under average conditions the target values will normally be exceeded by a few units. Under ideal conditions significantly higher values can be achieved. However granular materials in road base and sub-base can result in falsely high readings if the material is poorly graded or compacted dry.

Consistent failure to achieve the minimum target values will usually indicate poor compaction, poor material quality control or excessive layer thickness. Further more compaction may improve the value but very often it will be necessary to re-excavate down the last layer at which acceptable Impact Values were obtained. An inherent limitation in most methods of strength and stiffness assessment is that the measurement relates mainly to materials within 200-250 mm of the surface being tested. It is therefore not possible to monitor the state of compaction of the lower layers of the completed reinstatement directly from the road base. However where acceptable levels at road base level have been recorded, this usually indicates adequate compaction at depth, subject to the usual site observations and correct laying procedures. Thick layers can disguise poor compaction at depth. Therefore periodic checking on top of the fine fill, back fill, subbase and road base or at appropriate increments of up to 200 mm, whichever is the smaller, is recommended during the re-instatement operation.

## **Conclusions**

The CIST has already demonstrated its effectiveness by a recognisable improvement in re-instatement standards, achieved wherever the instrument has been introduced. Major changes in re-instatement practices have taken place and become legal requirements throughout the UK for all utility operations. It must be stressed that the Clegg Impact Soil Tester is neither foolproof nor infallible. The full potential of the instrument can only be achieved with the assistance of a confident and experienced operator.

## **Optional Accessories**

Additional items of equipment are available from Hiram as optional accessories. A list of spare parts is also given on Page 11. The optional accessories are as follows:

- i. Transit and storage case. This is a hinged wooden case with specially contoured interior supports, designed for the safe carriage and storage of the Clegg Impact Soil Tester. Fitted with carrying handle and toggle latches, enabling the case to be locked. Type CIST/WTS/00
- ii. An extra connecting cable is recommended as a stand-by against accidental damage to the cable supplies with the Tester. Cable type CIST/BNC/99.

## **SERVICING & RECALIBRATION**

Information in this section related to first-line servicing and re-calibration procedures that can be carried out by suitably qualified personnel equipped with the test instruments specified below. Before undertaking any of the following processes, ensure that a new battery has been fitted.

### **'BAT FAIL' Indicator**

The circuit of the Clegg Impact Soil Tester will operate satisfactorily at battery voltage levels down to 7V. Below this level the warning **'BAT FAIL'** will appear on the display.

### **Battery Replacement**

Use a 9 volt PP3 Alkaline Battery. Suitable types are Duracell, Ever Ready Gold Seal, RS Components Part No. 591-792 or similar. Battery replacement should be carried out within a clean and dry environment.

To replace the battery, locate the Battery Holder, Lift and withdraw the tray. Replace the Battery in the tray, taking care to observe correct polarity, then push the tray back in to the holder until it clicks shut.

Check the operation of the Tester after battery replacement using the test ring, as described on Page 7. "Testing the Clegg Impact Soil Tester".

### **'STOP NOW' Indicator**

This warning appears on the display if the impact deceleration is too high due for example, when dropping the hammer on too hard a surface. The maximum IV reading is 100 IV for CIST/882 and CIST/882/TREND models.

## **Calibration**

Calibration should be carried out at 12 months intervals using a Clegg Calibrator type FG05. The FG05 Calibrator is an electronic calibration unit that injects synthesised pulse waveforms of known characteristics that closely mimic those of the actual hammer into the Clegg Impact Soil Tester Readout Unit. The FG05 Calibrator tests the Readout unit across its whole range. Contact Hynam for this calibration service (see page 15 in this manual for contact details). Warranty is void if unapproved calibration attempted.

A simple procedure for checking the basic operation of the Clegg Impact Soil Tester, using the test ring supplied with the instrument, is described on Page 7. If this simple test routine gives an inconsistent and significantly different value of IV on the meter from the value indicated on the ring, the instrument, together with its connecting cable and test ring should be returned to Hynam for a complete test and re-calibration using the FG05 Calibrator described above. The Clegg Impact Soil Tester should be carefully packed and accompanied by an order with sender's name, address, telephone/telex/fax number and contact name and address for return. A brief description of the fault should also be included.

Note:- The test ring must NOT be used as a means to calibrate the Clegg Impact Soil Tester.

## **Connector Cable Check**

As mentioned on page 8 the connector cable can be damaged if the instrument is lifted or moved by means of the cable and this practice should be strongly discouraged. If, when using the Clegg Impact Soil Tester, the meter does not register impact values when the hammer is dropped, there is a possibility that the connector cable may have developed a fault.

To check this, detach the connector cable from the hammer and the meter. Use a continuity meter to check an unbroken circuit between the inner conductors of the BNC connectors at each end of the cable. Check also continuity between the outer shells of the BNC connectors. Finally check that there is no short circuit path between inner and outer conductors. Should a fault be found in the connector that cannot be repaired locally, see Page 15 for ordering a replacement.

**Spare Parts List** (These are available from Hynam.)

### **ITEM PART NO.**

1. CIST/882 Readout Meter Unit, Complete CIST/882/RU
2. CIST/882/TREND Readout Meter Unit, Complete CIST/882/TREND/RU
3. Hammer with Accelerometer, complete CIST/HAM/4.5
4. Guide Tube CIST/GT/99
5. Connector Cable CIST/BNC/99
6. Fibre Carton CIST/FC/99
7. Battery ALK/PP3
8. Test Ring CIST/CHP/99
9. Securing Pin and chain CIST/SPC/99
10. Meter Unit, Printed Circuit Board CIST/PCB
- 11 Alpha-Numeric Display & Driver CIST/HIT/54
12. Accelerometer CIST/1008
13. Front Panel Overlay CIST/FG/SDI99
14. Switch Assembly CIST/SW/99
15. Operating Handbook CIST/MANSDI
16. Wooden Transit & Storage Case CIST/WTS/07

## **TROUBLE SHOOTING GUIDE**

A list is given below of possible fault conditions that may be encountered during use of the instrument with suggestions for clearing faults.

### **1. Display remains blank:-**

- i. If meter display does not show characters when ON/OFF button is pressed, replace battery.
- ii. If display still remains blank, return the complete instrument for repair.

### **2. Display shows STOP NOW:-**

- i. Disconnect cable from readout and press button. If display shows 000 IV 0 then cable is faulty. Repair or replace cable.
- ii. If display still shows STOP NOW, return the complete instrument for repair.

### **3. Display shows BAT FAIL:-**

- i. Replace the battery with an alkaline or lithium type PP3. (If lower capacity or inferior batteries are used the instrument battery operating time will be reduced).

### **4. Display shows ABORT !:-**

- i. CIST/882/TREND:- IV values exceed limits in Table A, page 6.

### **5. Display remains reading zero:-**

- i. If display shows 000 IV 0, and does not change when hammer is dropped on test ring, replace battery. If fault remains replace the cable.
- ii. If display remains at 000 IV 0, return complete instrument for repair.

### **6. Meter gives low readings:-**

- i. Check that the hammer and the meter unit have the same serial number to ensure that a matched combination is being used.
- ii. Clean inside of guide tube and the barrel and end face of the hammer. Check instrument out with test ring.
- iii. If Meter still gives low readings, replace the battery and check out instrument with test ring.
- iv. If Meter still gives low readings, return complete instrument for repair.

### **7. Meter gives high readings:-**

- i. Check that the hammer and the meter unit have the same serial number to ensure that a matched combination is being used.
- ii. Check that the hammer is not impacting on a stone or other hard object. Move to a new position if necessary.
- iii. If Meter unit still gives high readings, check instrument out with test ring.
- iv. If Meter still gives high readings, return instrument for repair.

## **RETURNING INSTRUMENTS FOR CALIBRATION OR REPAIR**

The Clegg Impact Soil tester is a precision measuring instrument and should be calibrated every 12 months. Hynam carries out a repair and re-calibration service and can arrange collection and delivery back if needed.

## **Certificate of calibration.**

- This product has been inspected and tested in accordance with the ISO9001 quality control systems and procedures in place at Hyram Engineering Co Ltd.
- This product has been calibrated using equipment traceable to national and international standards.

## **Decommissioning & Disposal Instructions**

*These give the instructions for decommissioning and disposal of the equipment and confirm how it is to be taken out of service safely, in respect of the Essential Health and Safety Requirements.*

- If this tool has reached the end of its useful working life and cannot be refurbished it must be disposed of through a licensed scrap or waste disposal facility. Alternatively, a reverse engineering company could be used to strip the equipment for recycling purposes.
- Disposal is the responsibility of the Customer this can also be achieved by returning the product back to the manufacturer.

## **Warranty Information.**

### **1. Extent of Warranty.**

- (a) Hy-Ram Engineering Co Ltd warrants to the end-user customer that its products will be free from defects in materials and workmanship, for six months after the date of purchase by the end-user customer, subject to providing proof of purchase.
- (b) If Hy-Ram Engineering Co Ltd receives, during the warranty period, notice of a defect in product which is covered by this warranty, Hy-Ram Engineering Co Ltd shall either repair or replace the product, at its option. Any replacement product may be either new or like-new, provided that it has functionality at least equal to that of the product being replaced.
- (c) All warranty work will be carried out by Hy-Ram Engineering Co Ltd unless otherwise agreed. On-site warranty and repair or replacement services are available from authorised Hy-Ram Engineering Co Ltd service facilities world-wide.
- (d) Customers shall prepay shipping charges for products returned to Hy-Ram Engineering Co Ltd for warranty service, and Hy-Ram Engineering Co Ltd will charge for return of the products back to the customer.
- (e) This warranty statement gives the customer specific legal rights. The customer may also have other rights which vary from country to country in the world.

## **Pre-conditions for Warranty Application.**

Hy-Ram Engineering Co Ltd' warranty covers only those defects which arise as a result of normal use of the product, and this warranty shall only apply in the following circumstances:

- (a) All the instructions contained in the operating manual have been complied with
- (b) And none of the following apply:
  - (i) Improper or inadequate maintenance;
  - (ii) Physical abuse;
  - (iii) Unauthorised modification, misuse or any use not in accordance with the operating manual and good industry practice;
  - (iv) Operation outside the products specifications;
  - (v) Improper site preparation or maintenance; and
  - (vi) Faulty pipe or fittings.

## **Limitations of Warranty.**

- (a) Hy-Ram Engineering Co Ltd does not warrant the operation of any product to be uninterrupted or error free.
- (b) Hy-Ram Engineering Co Ltd makes no other warranty of any kind, whether express or implied, with respect to its products. Hy-Ram Engineering Co Ltd specifically disclaims the implied warranties of satisfactory quality and fitness for a particular purpose.
- (c) To the extent that this warranty statement is inconsistent with the law of the locality where the customer uses the product, this warranty statement shall be deemed modified by the minimum necessary to be consistent with such local law.
- (d) To the extent allowed by local law, the remedies provided in this warranty statement are the customer's sole and exclusive remedies.
- (e) This tool has been designed for the range of fittings available at the time of its design and development. Hy-Ram Engineering Co Ltd can accept NO liability for the unit's ability or otherwise to work with new or different fittings that subsequently appear in the market place.

Please complete this information and keep it safely with your proof of purchase receipt.  
You will require it for any warranty claim.

Where purchased .....

Date of purchase .....

Name & address .....

Of purchaser  
.....  
.....

Type of tool .....

Serial number .....

**For Service and repair please contact:**

Hy-Ram Mansfield  
Pelham Street  
Mansfield  
Nottinghamshire  
NG18 2EY  
Tel: 01623 422982  
Fax: 01623 661022