LANGRY®

Concrete Test Hammer

Operating Instructions

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PREFACE

Your choice of the products made by Jinan Langrui Detection Technology Co., Ltd. (LANGRY) is greatly appreciated. We are committed to deliver you excellent products and satisfied sales services. Please carefully read the instructions prior to use.

1. The instructions are prepared to provide the correct and complete descriptions of related products and data. However, we do not guarantee that there are no errors or omissions. Therefore, we will not bear responsibilities for any resulting consequences.
2. LANGRY keeps the right of updating the instructions without prior notice.
3. LANGRY bears no responsibilities for possible losses from data deviation or incorrect testing conclusion arising from instrument failure and other errors.
4. When the instrument is put into operation, it means that you have carefully read and had full picture of all terms in the instructions, and you have fully agreed to all the terms in the instructions.
5. LANGRY will not bear responsibilities for all the signed agreements violating the statement during the sales and services process not involving LANGRY.

Contents

1 Safety

1.1 General Information

1.1.1 Basic information

The concrete test hammer is designed according to state-of-the-art technology and the recognized safety regulations. Please read through these operating instructions carefully before initial startup. They contain important information about safety, use and maintenance of the concrete test hammer.

1.1.2 Designated Use

The concrete test hammer is a mechanical device used for performing rapid, non-destructive quality testing on materials in accordance with the customer's specifications; in most cases, however, the material involved is concrete. The device is to be used exclusively on the surfaces to be tested and on the testing anvil.

1.2 Liability

Our “General Terms and Conditions of Sale and Delivery”apply in all cases. Warranty and liability claims arising from personal injury and damage to property cannot be upheld if they are due to one or more of the following causes:

-Failure to use the concrete test hammer in accordance with its designated use.

-Incorrect performance check, operation and maintenance of the concrete test hammer.

-Failure to adhere to the sections of the operating instructions dealing with the performance check, operation and maintenance of the concrete test hammer.

-Unauthorized structural modifications to the concrete test hammer.

-Serious damage resulting from the effects of foreign bodies, accidents, vandalism and force majeure.

1.3 Safety Regulations

1.3.1 General Information

-Perform the prescribed maintenance work on schedule.

-Carry out a performance check once the maintenance work has been completed.

-Handle and dispose of lubricants and cleaning agents responsibly.

1.3.2 Unauthorized Operators

The concrete test hammer is not allowed to be operated by children and anyone under the influence of alcohol, drugs or pharmaceutical preparations.

Anyone who is not familiar with the operating instructions must be supervised when using the concrete test hammer.

1.3.3 Safety Icons

The following icons are used in conjunction with all important safety notes in these operating instructions.

Danger!

This note indicates a risk of serious or fatal injury should certain rules of behavior be disregarded.

Warning!

This note warns you about the risk of material damage, financial loss and legal penalties (e.g. loss of warranty rights, liability cases, etc.)

This denotes important information.

1.4 Standards and Regulations Applied

-ISO/DIS 8045 International
-EN 12504-2 Europe
-ENV 206 Europe
-BS 1881, part 202 Great Britain
-DIN 1048, part 2 Germany
-ASTM C 805 USA
-ASTM D 5873(Rock) USA
-NFP 18-417 France
-B 15-225 Belgium
-JGJ/T 23-2011 China
GB/T50315-2011 China

2 Measuring

2.1 Measuring Principle

The device measures the rebound value R. There is a specific relationship between this value and the hardness and strength of the concrete.

The following factors must be taken into account when ascertaining rebound values R:

-Impact direction: horizontal, vertically upwards or downwards.

-Age of the concrete.

-Size and shape of the comparison sample (cube, cylinder).

Models RH225-A/HT225-N can be used for testing:

-Concrete items 100 mm or more in thickness.

-Concrete with a maximum particle size≤32mm.

Models RH75-A can be used for testing:

-Items with small dimensions (e.g. thin- walled items with a thickness from 50 to 100mm).

If necessary, clamp the items to be tested prior to measurement in order to prevent the material deflecting.

- Items made from artificial stone which are sensitive to impacts.

Preferably perform measurements at temperatures between 10 °C and 50 °C only

Models RH20-A can be used for testing:

- Masonry mortar

2.2 Measuring Procedure

The items (in brackets) are illustrated in Fig. 2.4, Perform a few test impacts with the concrete test hammer on a smooth, hard surface before taking any measurements which you are going to evaluate.

• Use a grindstone to smoothen the test surface.（When using RH20-A: the depth of grinding off the surface mortar should be 5mm-10mm, and should not be less than 5mm）

Fig. 2.1 Preparing the test surface.

Warning!
The impact plunger (1) generates a recoil when it deploys. Always hold the concrete test hammer in both hands!

- Position the concrete test hammer perpendicular to the test surface.
- Deploy the impact plunger (1) by pushing the concrete test hammer towards the test surface until the push-button springs out.

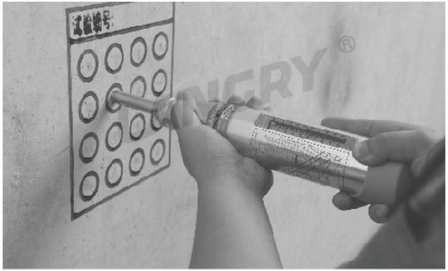

Fig. 2.2 Deploying the impact plunger

Danger!
Always hold the concrete test hammer in both hands, perpendicular to the test surface, before you trigger the impact!

Each test surface should be tested with at least 8-10 impacts.
The individual impact points must be spaced at least 20 mm apart.

· Position the concrete test hammer perpendicular to and against the test surface. Push the concrete test hammer against the test surface at moderate speed until the impact is triggered (a high beep acknowledges registration).

· Repeat this procedure for the whole measurement series.

· If you are using models RH225-A/HT225-N, RH75-A and RH20-A, press the push-button (6) to lock the impact plunger (1) after every impact. Then read off and note down the rebound value R indicated by the pointer assembly (5) on the scale (19).

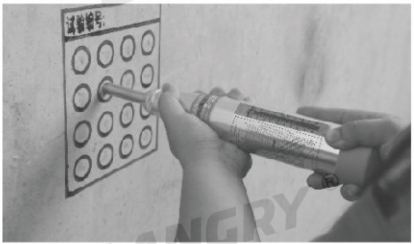

Fig. 2.3 Performing the test

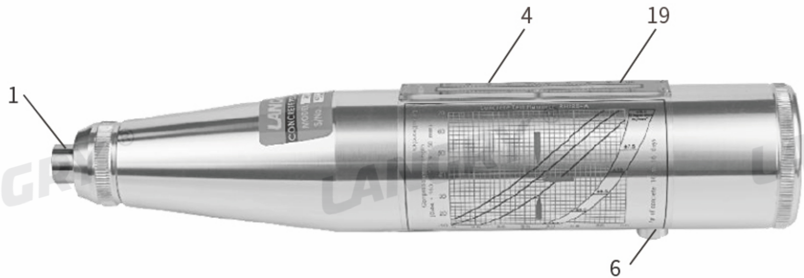

Fig. 2.4 Reading the test result from the scale (19) on RH225-A/HT225-N, RH75-A and RH20-A

2.3 Outputting and Evaluating Data

2.3.1 Output

Models RH225-A/HT225-N, RH75-A and RH20-A

After every impact, the rebound value R is displayed by the pointer assembly (5) on the scale of the device.

2.3.2 Evaluation

Take the average of the 8-10 rebound values R which you have measured.

Do not include values which are too high or too low (the lowest and highest values) in your calculation of the average value.

- Determine which conversion curve is appropriate for the selected body shape (see Fig. 2.5 to Fig.2.10).
- Then, using the average rebound value Rm and the selected conversion curve, read off the average compressive strength.

Note the impact direction!

The average compressive strength is subject to a dispersion (±4.5 N/mm^2 to ±8 N/mm^2).

2.3.3 Median Value

In chapter 7 of the Standard EN 12504-2:2001 "Test Results", the median value is specified instead of the classic mean value.

When applying this method, all measured values must be considered (no outliers allowed).
The median value must be determined as follows:

- The measured values are placed in a row according to the size.
- For an odd number of impacts, the value placed in the middle of the row, is to be taken as the median value.
- For an even number of impacts, the mean value of the two values, placed in the middle of the row, is the median value.
- If more than 20% of the values are spaced more than 6 units apart, the measuring series must be rejected as mentioned in the standard.

2.4 Conversion Curves

2.4.1 Derivation of the conversion Curves

The conversion curves (Fig. 2.5 to Fig. 2.11) for the concrete test hammer are based on measurements taken on many sample cubes. The rebound value R of the sample cubes were measured using the concrete test hammer. Then the compressive strength was ascertained on a pressure testing machine. In each test, at least 10 test hammer impacts were performed on one side of the test cube which was lightly clamped on the press.

2.4.2 Validity of the Conversion Curves

-Standard concrete made from Portland or bleat furnace slag cement with sand

gravel (maximum particle size dia. ≤ 32 mm).
-Smooth, dry surface.
-Age: 14-56 days.

Empirical values:

The conversion curve is practically independent of the:
-Cement content of the concrete.
-Particle graduation.
-Diameter of the largest particle in the fine gravel mixture, providing the diameter of the maximum particle is ≤ 32 mm.
-Water/cement ratio.

Conversion Curves, Concrete Test Hammer Model RH225-A /HT225-N

Concrete pressure resistance of *a* cylinder after 14 - 56 days

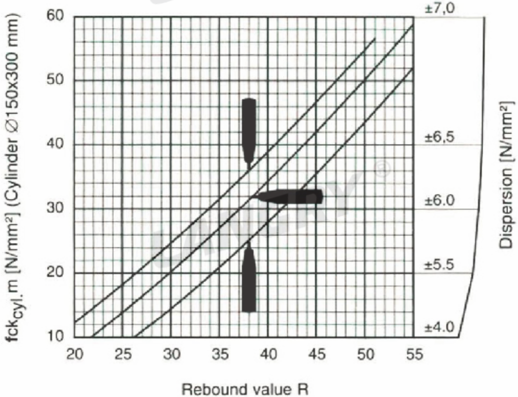

Fig. 2.5 Model RH225-A: Conversion curves based on the average compressive strength of a cylinder and the rebound value of R

$fck_{cyl.}m$: Average pressure resistance of a cylinder (probable value)

The concrete test hammers shown in Fig. 2.5 and Fig. 2.6 indicates the impact direction.

Conversion Curves, Concrete Test Hammer Model RH75-A

Concrete pressure resistance of a cylinder after 14 - 56 days

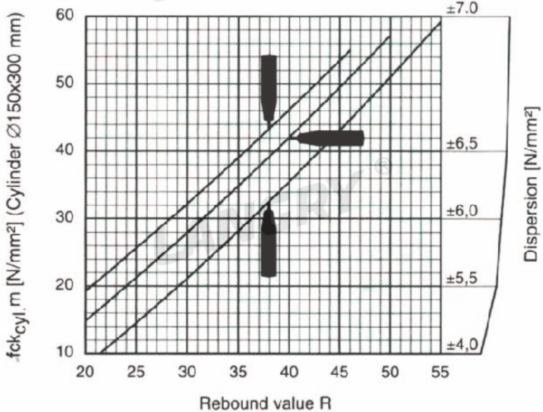

Fig 2.6 Model RH75-A: Conversion curves based on the average pressure resistance of a cylinder and the rebound value R

Limits of Dispersion

fck$_{cyl.}$: The max. and min. values are set to 80% of all test results are included.

Conversion Curves, Concrete Test Hammer Model RH225-A/HT225-N

Concrete pressure resistance of a cube after 14 - 56 days

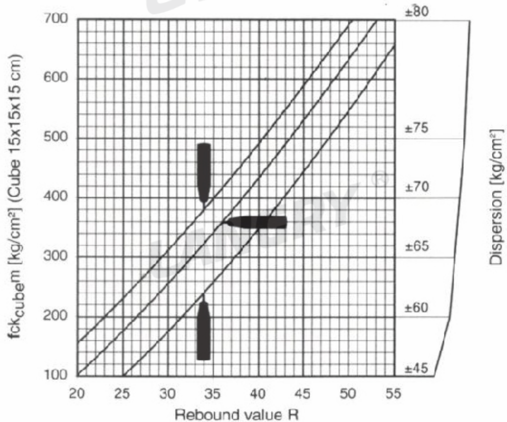

Fig. 2.7 Model RH225-A: Conversion curves based on the average compressive strength of a cube and the rebound value of R

$fck_{cube.}m$:Average pressure resistance of a cube (probable value)

The concrete test hammers shown in Fig. 2.7 and Fig. 2.8 indicates the impact direction.

Conversion Curves, Concrete Test Hammer Model RH75-A

Concrete pressure resistance of a cube after 14 - 56 days

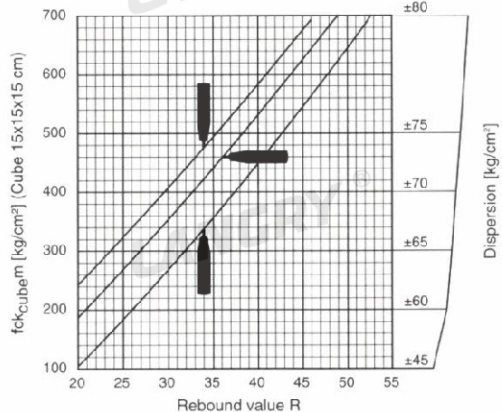

Fig 2.8 Model RH75-A: Conversion curves based on the average compressive strength of a cube and the rebound value R

Limits ofDispersion

$fck_{cube.}$:The max. and min. values are set to 80% of all test results are included.

Conversion Curves, Concrete Test Hammer Model RH225-A/HT225-N

Concrete pressure resistance of a cylinder after 14 - 56 days

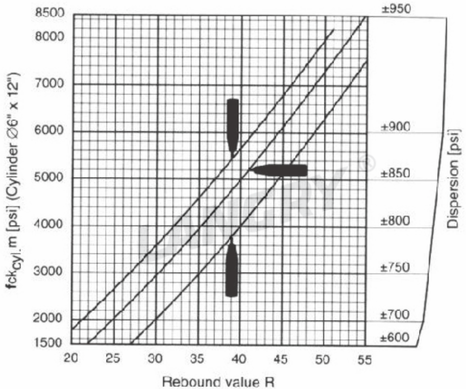

Fig. 2.9 Model RH225-A: Conversion curves based on the average compressive strength of a cylinder and the rebound value of R

fck$_{cyl.}$m:Average pressure resistance of a cylinder (probable value) The concrete test hammers shown in Fig. 2.9 - Fig. 2.10 indicates the impact direction.

☞ The concrete test hammers shown in Fig. 2.9-2.10 indicates the impact direction.

Conversion Curves, Concrete Test Hammer Model RH75-A

Concrete pressure resistance of a cylinder after 14 - 56 days

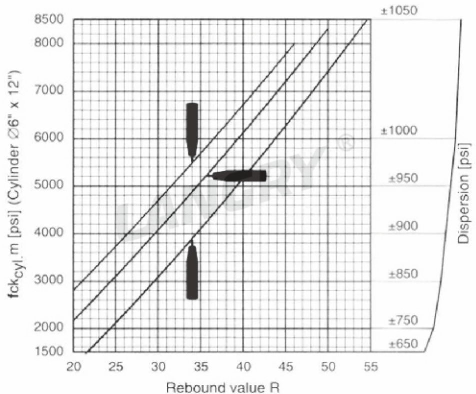

Fig 2.10 Model RH75-A: Conversion curves based on the average compressive strength of a cylinder and the rebound value R

Limits of Dispersion

$fck_{cube.}$:The max. and min. values are set to 80% of all test results are included.

(Horizontal impact) Conversion Curves, Concrete Test Hammer Model RH**20-**A

Concrete pressure resistance after 28 days

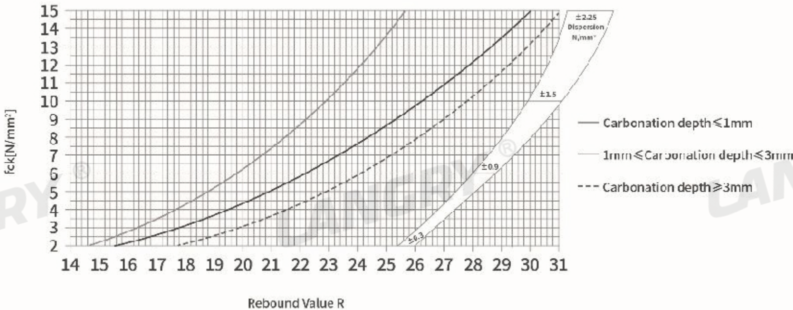

Fig 2.11 Model RH20-A: Conversion curves based on the average compressive strength and the rebound value R

2.5 Factors Affecting the Values

2.5.1 Direction of impact

The measured rebound value R is dependent on the impact direction.

2.5.2 Shape coefficient

The compressive strength measured in a pressure testing machine depends on the shape and size of the sample.

The samples prescribed for use in the Particular country must be taken into account when converting the rebound value R into Compressive strength. In the conversion curves on Fig 2.5 to Fig 2.10, the Values for compressive strength are specified for cylinders (Ø 150 × 300 mm or Ø 6" × 12") and for cubes (length of side 15cm). The following shape coefficients are familiar from the literature:

Cube	150mm	200mm	300mm
Shape Coefficient	**1.00** 1.25	0.95 1.19	0.85 1.06

Cylinder	Ø150×300mm Ø6" × 12"	Ø100×200mm	Ø200×200mm
Shape Coefficient	0.80 **1.00**	0.85 1.06	0.95 1.19

Drill core	Ø50×56mm	Ø100×100mm	Ø150×150mm
Shape Coefficient	1.04 1.30	1.02 1.28	1.00 1.25

Example:

A cube with a length of side of 200 mm is used for the determination of the compressive strength with the pressure testing machine. In this case the strength values shown in the conversion curves in Fig. 2. 9 and Fig. 2.10 (for cylinders ϕ6" × 12") must be multiplied by the shape coefficient of 1.19.

2.5.3 Time coefficient

The age of the concrete and its carbonate penetration depth can significantly increase the measured rebound values R. It is possible to obtain accurate values for the effective strength by removing the hard, carbonate-impregnated surface layer using a manual grinding machine over a surface area of about Ø120 mm and performing the measurement on the non-carbonate-impregnated concrete. The time coefficient, i.e. the amount of the increased rebound values R, can be obtained by taking additional measurements on the carbonate-impregnated surface.

$$\text{Time coeff. } Zf = \frac{Rm\ carb}{Rm\ n.c.} \Rightarrow Rm\ n.c = \frac{Rm\ carb}{Zf.}$$

$R_{m\ carb.}$:Average rebound value R, measured on carbonate-impregnated concrete surface.

$R_{m\ n.c.}$:Average rebound value R, measured on non-carbonate-impregnated concrete surface (Factor on the base of the Chinese standard JGJ/T23-2001, see our special info leaflet).

2.5.4 Special Cases

Experience has shown that deviations from the normal conversion curves occur under the following circumstances:

-Artificial stone products with an unusual concrete composition and small dimensions. It is recommended that a separate series of tests should be performed for each product in order to determine the relationship between the rebound value R and the compressive strength.

-Aggregates made from low strength, lightweight or cleavable stone (e.g. pumice, brick rubble, gneiss) result in a strength value lower than shown on the conversion curve.

-Gravel with extremely smooth, polished surfaces and a spherical shape results in values for compressive strength which are lower than those ascertained by the rebound measurements.

-A strong, dry mixed concrete (i.e. with low sand content) which has not been placed adequately processed may contain lumps of gravel which are not visible from the surface. These affect the strength of the concrete without however influencing the rebound values R.

-The concrete test hammer gives inadequate rebound values R on concrete from which the form has just been removed, which is wet or which has hardened under water. The concrete must be dried before the test.

-Very high values for compressive strength (> 70 N/mm^2) can be achieved by adding pulverized fuel ash or silica fume. However, these strengths cannot reliably be ascertained using the rebound value R measured by the concrete test hammer.

2.5.5 Conversion Curves for Special Cases

The recommended course in special cases is to prepare a separate conversion curve.

・ Clamp the sample in a pressure testing machine and apply a preload of about 40kN vertically to the direction in which the concrete had been poured in.

・ Measure the rebound hardness by applying as many test impacts as possible to the sides.

The only way to achieve a meaningful result is to measure the rebound values R and the compressive Strength of several samples.

Concrete is a very inhomogeneous material. Sample made from the same batch of concrete and stored together can reveal discrepancies of ±15% when tested in the pressure testing machine.

- Discard the lowest and highest values and calculate the average R_m.
- Determine the compressive strength of the sample using the pressure testing machine and ascertain the average value fckm, The pair of values R_m / fckm applies to a certain range of the measured rebound value R.

It is necessary to test samples of differing qualities and/or ages in order to prepare a new conversion curve for the entire range of rebound values from R=20 to R=55.

- Determine the curve with the pairs of values R_m / fckm (e.g. EXCEL in the RGP function).

3 Maintenance

3.1 Performance Check

If possible, carry out the performance check every time before you use the device, however at least every 1000 impacts or every 3 months.

- Place the testing anvil on a hard, smooth surface (e.g. stone floor).

- Clean the contact surfaces of the anvil and the impact plunger.
- Perform about 10 impacts with the concrete test hammer and check the result against the calibration value specified on the testing anvil.

Fig. 3.1 Performance check of the concrete test Hammer (model RH225-A/HT225-N shown)

Proceed as described in “Maintenance Procedure”if the values are not within the tolerance range specified on the testing anvil.

3.2 Cleaning After Use

- Deploy the impact plunger (1) as described in, "'Measuring Procedure”.
- Wipe the impact plunger (1) and housing (3) using a clean cloth.

Warning!

Never immerse the device in water or wash it under a running tap! Do not use either abrasives or solvents for cleaning!

3.3 Maintenance

We recommend that the concrete test hammer should be checked for wear after 2 years at most and be cleaned. Do this as described below.

The concrete test hammer can either be sent to a service center authorized by the vendor or else it can be maintained by the operator according to the following description.

The items (in brackets) are illustrated in Fig 3.2, “Lengthways section through the concrete test hammer”.

3.3.1 Stripping Down

Warning!

Never strip down, adjust or clean the pointer and guide rod(4) (SEE Fig. 3.2), otherwise the pointer friction may change. Special tools would be required to readjust it.

- Position the concrete test hammer perpendicular to the surface

Danger!

The impact plunger (1) generates a recoil when it deploys. Therefore always hold the concrete test hammer with both hands! Always direct the impact plunger (1) against a hard surface!

- Deploy the impact plunger (1) by pushing the concrete test hammer towards the surface until the pushbutton (6) springs out.
- Unscrew the cap (9) and remove the two-part ring (10).
- Unscrew the cover (11) and remove the compression spring (12).
- Press the pawl (13) and pull the system vertically up And out of the housing (3).
- Lightly strike the impact plunger (1) with the hammer mass (14) to release the impact plunger (1) from the hammer guide bar (7).The buffer spring (15) comes free.
- Pull the hammer mass (14) off the hammer guide bar together with the impact

spring (16) and sleeve (17).

- Remove the felt washer (18) from the cap (9).

3.3.2 Cleaning

- Immerse all parts except for the housing (3) in kerosene and clean them using a brush.
- Use a round brush (copper bristles) to clean the hole in the impact plunger (1) and in the hammer mass (14) thoroughly.
- Let the fluid drip off the parts and then rub them dry with a clean, dry cloth.
- Use a clean, dry cloth to clean the inside and outside of the housing (3).

3.3.3 Assembly

- Before assembling the hammer guide bar (7), lubricate it slightly with a low viscosity oil (one or two drops is ample; viscosity ISO 22, e.g. Shell Tellus Oil 22).
- Insert a new felt washer (18) into the cap (9).
- Apply a small amount of grease to the screw head of the screw (20).
- Slide the hammer guide bar (7) through the hammer mass (14).
- Insert the buffer spring (15) into the hole in the impact plunger (1).
- Slide the hammer guide bar (7) into the hole in the impact plunger (1) and push it further in until noticeable resistance is encountered.

Prior to and during installation of the system in the housing (3), make sure that the

hammer mass (14) does not get held by the pawl (13).
Hint: For this purpose press pawl (13) briefly.

- Install the system vertically downwards in the housing (3).
- Insert the compression spring (12) and screw the rear cover (11) into the housing (3).
- Insert the two-part ring (10) into the groove in the sleeve (17) and screw on the cap (9).
- Carry out a performance check.

Send in the device for repair if the maintenance you perform does not result in correct function and achievement of the calibration values specified on the testing anvil.

3.3.4 Concrete Test Hammer Model RH225-A /HT225-N/ RH75-A/RH20-A

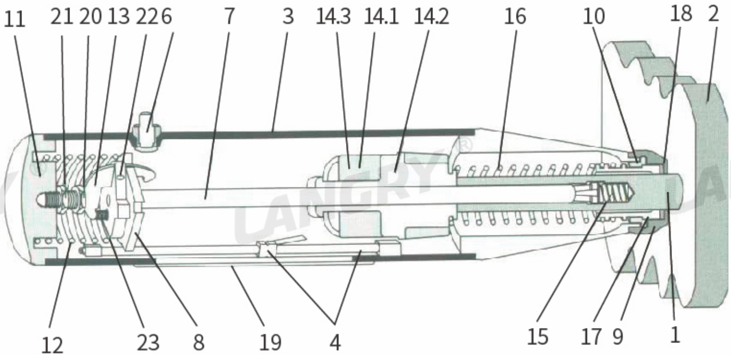

Fig. 3.2 Lengthways section through the concrete test hammer

Key:

1 Impact plunger
2 Test surface
3 Housing
4 Guide rod
5 Pointer assembly
6 Push button, complete
7 Hammer guide bar
8 Guide disk
9 Cap
10 Two-part ring
11 Rear cover
12 Compression spring
13 Pawl
14 Hammer mass:
    14.1 model RH225-A/HT225-N
    14.2 model RH75-A
    14.3model RH20-A
15 Buffer spring
16 Impact spring
17 Guide sleeve
18 Felt washer
19 Plexiglas window
20 Trip screw
21 Locknut
22 Pin
23 Pawl spring

4 Data

4.1Form of Delivery

Concrete test hammer	RH225-A/HT225-N	RH75-A	RH20-A
Total weight	2.67 kg	2.32 kg	2.20kg
Carrying case, W×H × D	340×110×240mm	340×110×240	340×110×240mm
Grindstone	1 pce.	1 pce.	1 pce.

4.2 Accessories

Concrete test hammer	RH225-A/HT225-N	RH75-A	RH20-A
Testing anvil	GZII	GZII	GZII
Carrying case, W× H× D	250x260x290mm	250x260x290 mm	250x260x290mm
Grindstone	1 pce.	1 pce.	1 pce.

4.3 Technical Data

Concrete test	RH225-A/HT225-N	RH75-A	RH20-A
Impact energy	2.207 Nm	0.735 Nm	0.196 Nm
Measuring range	10 to 70 N/mm^2 resistance to pressure	10 to 70 N/mm^2 resistance to pressure	2 to 15 N/mm^2 resistance to pressure

Manufacturer warranty

LANGRY warrants that the tool supplied is free of defects in material and workmanship .This warranty is valid so long as the tool is operated and handled correctly , cleaned and serviced properly and in accordance with the LANGRY Operating Instructions.

The warranty covers the free replacement or repair of damaged parts during the whole service life of this tool. If the parts need to be repaired or protected due to normal wear and tear, they are not covered by the warranty.

Other claims are not covered by the warranty unless there is a different provision under the specific law of the customer's country. In particular, LANGRY shall not be liable for any direct, indirect, incidental or inevitable damage, financial loss or additional expenses caused by or related to the improper use or abuse of this tool. Expressly exclude implied warranties of merchantability and fitness for a particular purpose.

In case of repair or replacement, the tool or relevant parts shall be sent to LANGRY's market organization immediately after the failure is determined.

This constitutes LANGRY's entire obligation with regard to warranty and supersedes all prior or contemporaneous comments and oral or written agreements concerning warranties.

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JINAN LANGRUI DETECTION TECHNOLOGY CO.,LTD

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