LANGRY®

Concrete Test Hammer

Operating Instructions

PREFACE

Thank you for choosing the product of Langry Technology Pte. Ltd. We are dedicated to providing you with top-notch products and responsive after-sales services. Please read this manual carefully before using the instrument.

1. This manual is developed to accurately and comprehensively describe the relevant contents and data of the instrument. However, it is possible that errors or omissions may occur. Therefore, we will not be responsible for any consequences arising from such errors or omissions.
2. Langry Technology Pte. Ltd. reserves the right to revise this manual from time to time without prior notice.
3. Langry Technology Pte. Ltd. shall not be liable for any possible losses caused by any data error or wrong test conclusion due to this instrument and its faults.
4. By using this instrument, it will be assumed that you have thoroughly read, comprehended and totally agreed to all clauses in this manual.
5. Langry Technology Pte. Ltd. shall not be liable for any agreements that contradict this statement in the sales and service processes in which Langry Technology Pte. Ltd. is not directly involved.

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
GB/T9138-2015 China
JJG 817-2011 China
JGJ/T 294-2013 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 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

RH-450A Concrete Test Hammer can be used to test concrete structures or components with compressive strength ranging from C50 to C100. RH-550A Concrete Test Hammer can be used to test concrete structures or components with compressive strength ranging from C60 to C80. Note: For concrete structures or components with strength grades of C60-C80 in engineering structures, it is recommended to use the RH550-A Concrete Test Hammer as a priority.

2.2 Measuring Procedure

The items (in brackets) are illustrated in Fig. 3.2, 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.

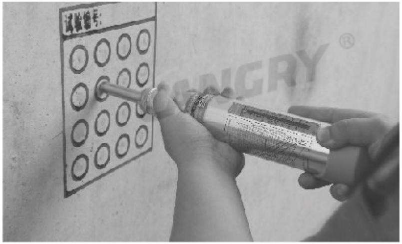

Fig. 2.2 Deploying the impact plunger

Danger!

Always hold the concrete test hammer in both hands, perpendicular to the test surface, before you trigger the impact!RH225-A ,RH75-A and RH20-A Each test surface should be tested with at least 8-10 impacts.

The individual impact points must be spaced at least 20 mm apart. RH450-A and RH550-A Each test surface should be tested with at least 16 impacts.The individual impact points must be spaced at least 30 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, RH75-A, RH20-A, RH450-Aand RH550-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).

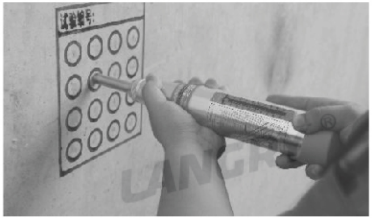

Fig. 2.3 Performing the test

Fig. 2.4 Reading the test result from the scale (19) on RH225-A, RH75-A, RH20-A, RH450-Aand RH550-A

2.3 Outputting and Evaluating Data

2.3.1 Output

Models RH225-A, RH75-A, RH20-A, RH450-Aand RH550-A

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

2.3.2 Common Regulations

These apply to RH450-A and RH550-A.

2.3.2.1 The concrete compressive strength of components can be tested either individually or in batches.

2.3.2.2 Only components that meet the following conditions can be considered as components in the same batch when tested in batches.

1 The grade of design compressive strength of concrete is the same.

2 Concrete raw materials, mixing ratios, molding process, curing conditions and age are basically the same.

3 The types of components are the same.

4 The state is the same during the construction phase.

2.3.2.3 Components tested by batch

The number of samplings shall not be less than 30% of the total number of components in the same batch and the number of components shall not be less than 10. Sampling components should be randomly selected and make the selected components representative. When the number of components in the inspection lot exceeds 50, the number of sampling components can be adjusted according to the current Chinese standard Technical Standard for Inspection of Building Structure (GB/T50344). But the total number of sampling components should not be less than 10, and the concrete compressive strength of the inspection lot should be estimated according to the current Chinese standard Technical Standard for Inspection of Building Structure (GB/T50344).

2.3.2.4 The number and arrangement of testing zones shall be in accordance with the following regulations:

1 The number of testing zones for each component shall not be less than 10;

2 The distance between two adjacent testing zones should be controlled within 2m, and the distance between the testing zone and the edge of the component should not be less than 100mm. The area of the testing zone should be 200x200mm;

3 The testing zones must be selected to ensure that the concrete test hammer is in a horizontal direction to detect the concrete casting side, and can be located on two symmetrical measurable surfaces of the component, or on one measurable surface. The testing zones should be evenly distributed, and must be arranged at important and weak parts of the component, and embedded parts should be avoided;

4 The testing surface should be the original concrete surface, which should be clean and plain without loose layers, laitance, oil stains, coatings, honey combs, and pockmarks. If necessary, loose layers and debris should be removed, and there should be no residual powder or debris;

5 The component testing zones should be numbered, and if necessary, a schematic diagram of the testing zone arrangement and appearance quality should be described.

2.3.3 Evaluation

These apply to RH225-A,RH75-A and RH20-A.

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).

These apply to RH450-A and RH550-A.

To calculate the average rebound values of a testing zone, the 3 maximum and 3 minimum values should be excluded from the 16 rebound values in the testing zone, and the remaining 10 rebound values should be calculated according to the following formula:

$$R = \frac{1}{10}\sum_{i=1}^{10} R_i$$

In the formula,

R - the average rebound value of the testing zone, accurate to 0.1;

R_i - the rebound value of the ith testing point.

Select the appropriate conversion curve (as shown in Figure 2.6 and Figure 2.7).

When the testing conditions significantly differ from the applicable conditions of the conversion curve, the value of concrete compressive strength in the testing zone should not be directly converted based on the conversion curve. But a dedicated conversion curve can be established or corrected using drill core or concrete sample cured under the same condition. The number of the concrete samples cured under the same condition or drill core samples should not be less than 6. During the calculation, the correction of the converted value of the concrete compressive strength in the testing zone and the correction value of the concrete compressive strength in the testing zone should comply with the following regulations:

1. The correction value should be calculated according to the following formula:

$$\Delta_{tot}=\frac{1}{n}\sum_{i=1}^{n} f_{cor.i}-\frac{1}{n}\sum_{i=1}^{n} f_{cu,i}^{c}$$

Or

$$\Delta_{tot}=\frac{1}{n}\sum_{i=1}^{n} f_{cu.i}-\frac{1}{n}\sum_{i=1}^{n} f_{cu,i}^{c}$$

In the two formulas,

Δ_{tot} - the correction value for concrete compressive strength (MPa) in the testing zone, accurate to 0.1 MPa;

$f_{cor.i}$ - the compressive strength of the ith drill core sample;

$f_{cu.i}$ - the compressive strength of the ith concrete sample cured under the same condition;

$f_{cu,i}^{c}$ - conversion value of concrete compressive strength corresponding to the rebound value of the ith concrete sample cured under the same condition or drill core sample;

n - the number of drill core samples or concrete samples cured under the same condition.

2. The correction of the conversion value of concrete compressive strength in the testing zone should be calculated according to the following formula:

$$f_{cu,i1}^{c} = f_{cu,i0}^{c} + \Delta_{tot}$$

In the formula,

$f_{cu,i0}^{c}$- the conversion value of concrete compressive strength (MPa) before correction of the ith testing zone, accurate to 0.1 MPa;

$f_{cu,i1}^{c}$ - the conversion value of concrete compressive strength (MPa) after correction of the ith testing zone, accurate to 0.1 MPa.

The average value and standard deviation of the concrete compressive strength of the structure or component in the testing zones can be calculated based on the conversion value of concrete compressive strength in each testing zone. When the number of testing zones is 10 or more, the standard deviation of the concrete compressive strength should be calculated. The average value and standard deviation should be calculated according to the following formulas:

$$m_{f_{cu}^{c}} = \frac{1}{n}\sum_{i=1}^{n} f_{cu,i}^{c}$$

$$s_{f_{cu}^c} = \sqrt{\frac{\sum_{i=1}^{n}\left(f_{cu,i}^c\right)^2 - n\left(m_{f_{cu}^c}\right)^2}{n-1}}$$

In the two formulas,

$m_{f_{cu}^c}$ - the average value of the conversion value of concrete compressive strength (MPa) in the testing zone, accurate to 0.1 MPa;

$s_{f_{cu}^c}$ - the standard deviation of the conversion value of concrete compressive strength (MPa) in the testing zone, accurate to 0.01 MPa;

n - for a single test component, take the number of testing zones for one component; for batch testing of components, take the sum of the number of testing zones for the sampled components.

$$f_{cu,e} = f_{cu,min}$$

Estimated concrete compressive strength of the structure or component should be determined by the following formula:

1. When the number of testing zones for the structure or component is less than 10, it should be calculated using the following formula:

$$f_{cu,e} = m_{f_{cu}^c} - 1.645 s_{f_{cu}^c}$$

2. When the number of testing zones for the structure or component is not less than 10 or when the test is conducted in batches, it shall be calculated according to the following formula:

For structures or components that are tested in batches, when the standard deviation of concrete compressive strength for that batch of components occurs in one of the following situations, all components in that batch should be tested as individual components:

1. The average value (mfccu) of the converted compressive strength of concrete for that batch of components is not more than 50MPa, and the standard deviation (sfccu) is more than 5.50MPa;

2. When the average value (mfccu) of the converted compressive strength of the concrete in this batch of components is more than 50MPa, and the standard deviation (sfccu) is more than 6. 50MPa.

2.3.4 Median Value

These apply to RH225-A,RH75-A and RH20-A.

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

These apply to RH225-A,RH75-A and RH20-A.

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

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

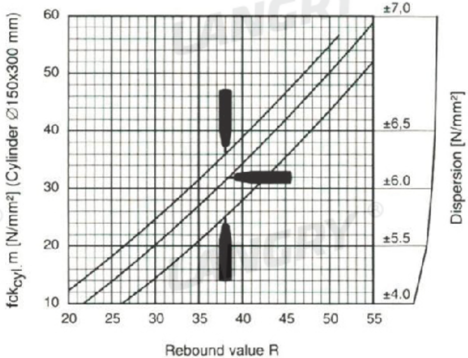

Fig. 2.5 Model RH225-A: Conversion curves based on the average compressive strength of a cylinder and the rebound value of R

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

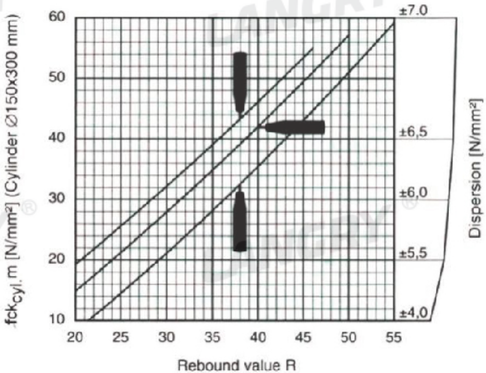

Fig 2.6 Model RH75-A: Conversion curves based on the average pressure resistance of a cylinder and the rebound value R

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

Concrete pressure resistance of a cube after 14 - 56 days

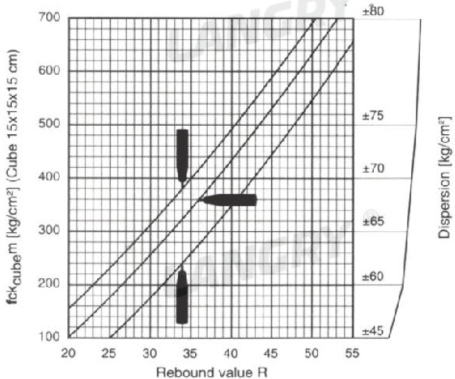

Fig. 2.7 Model RH225-A: Conversion curves based on the average compressive strength of a cube and the rebound value of R

$fck_{cube.}m$: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

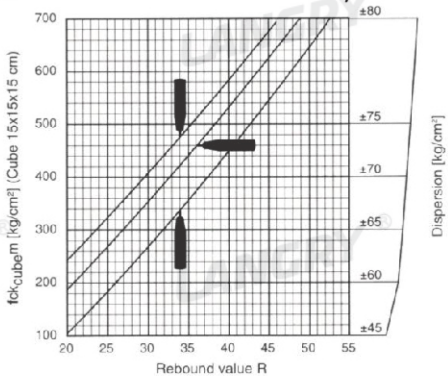

Fig 2.8 Model RH75-A: Conversion curves based on the average compressive strength of a cube and the rebound value R

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

Concrete pressure resistance of a cylinder after 14 - 56 days

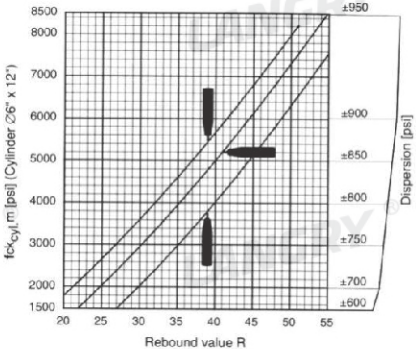

Fig. 2.9 Model RH225-A: Conversion curves based on the average compressive strength of a cylinder and the rebound value of R

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

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

Conversion Curves, Concrete Test Hammer Model RH75-A

Concrete pressure resistance of a cylinder after 14 - 56 days

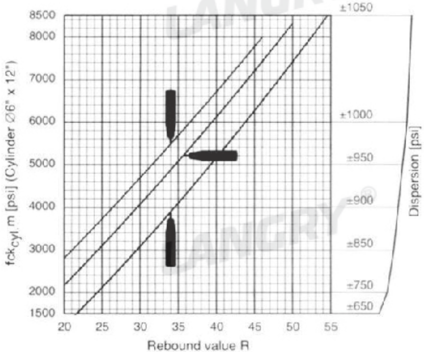

Fig 2.10 Model RH75-A: Conversion curves based on the average compressive strength of a cylinder and the rebound value R

Limits of Dispersion

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

(Horizontal impact) Conversion Curves, Masonry mortar Test Hammer Model RH20-A Masonry mortar pressure resistance after 28 days

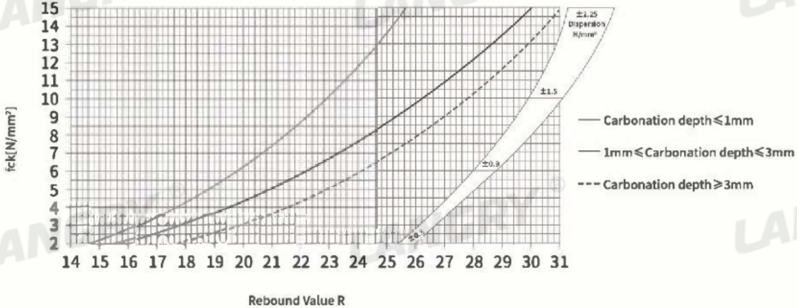

Fig 2.11 Model RH20-A: Conversion curves based on the average compressive strength and the rebound value R

RH450-A, RH550-A measurement curves of compressive strength are detailed in the appendix.

2.5 Factors Affecting the Values

These apply to RH225-A,RH75-A and RH20-A.

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 / **f**ckm 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 / **f**ckm (e.g. EXCEL in the RGP function).

3 Maintenance

3.1 Performance Check

The calibration of the concrete test hammer should refer to local regulations.

Fig. 3.1 Performance check of the concrete test Hammer (model RH225-A 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/RH75-A/RH20-A/RH450-A/RH550-A

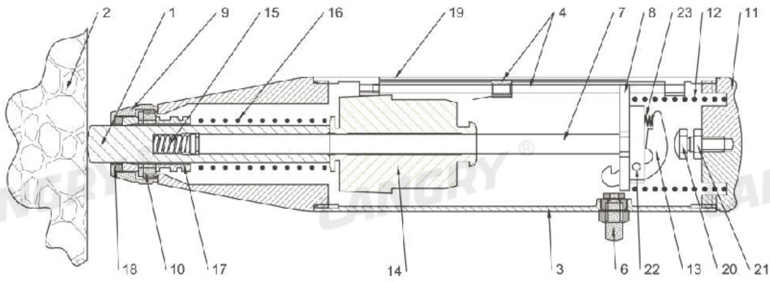

Fig. 3.2 Lengthways section through the concrete test hammer

Key:

1 Impact plunger
2 Test surface
3 Housing
4 Rider
5 Guide rod
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
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

4.1 Form of Delivery

Model	RH225-A	RH75-A	RH20-A	RH450-A	RH550-A
Article number	10010005	10010004	10010003	10010001	10010002
Total weight	2.75 kg	2.10 kg	2.10 kg	4.45 kg	3.90 kg
Carrying case, W×H × D	340×110× 240mm	340×110× 240mm	340×110× 240mm	460×125× 240mm	460×125× 240mm
Grindstone	1 pce.	1 pce.	1 pce.	1 pce.	1 pce.

4.2 Testing anvil

Model	RH225-A	RH75-A	RH20-A	RH450-A	RH550-A
Testing anvil	GZII	GZII	GZII	GZ I	GZ I
Article number	10010007	10010007	10010007	10010010	10010010
Carrying case, W× H× D	258x258x 430mm	258x258x 430mm	258x258x 430mm	258×258× 430mm	258×258× 430mm

4.3 Technical Data

Model	RH225-A	RH75-A	RH20-A	RH450-A	RH550-A
Impact energy	2.207 Nm	0.735 Nm	0.196 Nm	4.500 Nm	5.500 Nm
Measuring range	10 to＞100N/mm^2 compressive strength	10-70N/mm^2 compressive strength	2-15N/mm^2 compressive strength	C50-C100 concrete	C60-C80 concrete

Appendix A Conversion Values of Concrete Compressive Strength in the Testing Zones Using the RH450-A Concrete Test Hammer

R	$f_{cu,i}$		R	$f_{cu,i}$		R	$f_{cu,i}$
29.0	20.6		39.0	33.4		49.0	47.9
30.0	21.8		40.0	34.8		50.0	49.4
31.0	23.0		41.0	36.2		51.0	51.0
32.0	24.3		42.0	37.6		52.0	52. 5
33.0	25.5		43.0	39.0		53.0	54.1
34.0	26.8		44.0	40.5		54.0	55.7
35.0	28.1		45.0	41.9		55.0	57.3
36.0	29.4		46.0	43.4		56.0	58. 9
37.0	30.7		47.0	44.9		57.0	60. 6
38.0	32.1		48.0	46.4		58.0	62.2

R	$f_{cu,i}$		R	$f_{cu,i}$		R	$f_{cu,i}$
59.0	63. 9		68.0	79.7		77.0	96.8
60.0	65.6		69.0	81.5		78.0	98.7
61.0	67. 3		70.0	83.4		79.0	100.7
62.0	69.0		71.0	85.2		80.0	102.7
63.0	70.8		72.0	87.1		81.0	104.8
64.0	72. 5		73.0	89.0		82.0	106.8
65.0	74. 3		74.0	90.9		83.0	108. 8
66.0	76. 1		75.0	92.9			
67.0	77.9		76.0	94.8			

Note:

1 Values not listed in the table can be obtained by interpolation, with an accuracy of 0.1 MPa.

2 In the table, R is the representative rebound value in the test area, and $f_{cu,i}$ is the converted value of compressive strength of concrete in the test area.

3 The values in the table are calculated according to the curve formula $f_{cu,i}$=-7.83+0.75R+0.0079R^2.

Appendix B Conversion Values of Concrete Compressive Strength in the Testing Zones Using the RH550-A Concrete Test Hammer

R	$f_{cu,i}$	R	$f_{cu,i}$	R	$f_{cu,i}$	R	$f_{cu,i}$
35.6	60.2	37.6	63.2	39.6	66.1	41.6	69. 1
35.8	60.5	37.8	63.5	39.8	66.4	41.8	69.4
36.0	60.8	38.0	63.8	40.0	66. 7	42.0	69.7
36.2	61.1	38.2	64.1	40.2	67.0	42.2	70.0
36.4	61.4	38.4	64.4	40.4	67. 3	42.4	70.3
36.6	61.7	38.6	64.7	40.6	67.6	42.6	70.6
36.8	62.0	38.8	64.9	40.8	67.9	42.8	70.9
37.0	62.3	39.0	65.2	41.0	68.2	43.0	71.2
37.2	62.6	39.2	65.5	41.2	68.5	43.2	71.5
37.4	62.9	39.4	65.8	41.4	68.8	43.4	71.8

R	$f_{cu,i}$	R	$f_{cu,i}$	R	$f_{cu,i}$	R	$f_{cu,i}$
43.6	72.0	45.0	74.1	46.4	76.1	47.8	78.2
43.8	72.3	45.2	74.4	46.6	76.4	48.0	78.5
44.0	72.6	45.4	74.7	46.8	76.7	48.2	78.8
44.2	72. 9	45.6	75.0	47.0	77.0	48.4	79.1
44.4	73. 2	45.8	75.3	47.2	77.3	48.6	79.3
44.6	73.5	46.0	75.6	47.4	77.6	48.8	79.6
44.8	73.8	46.2	75.9	47.6	77.9	49.0	79.9

Note:

1 Values not listed in the table can be obtained by interpolation, with an accuracy of 0.1 MPa.

2 In the table, R is the representative rebound value in the test area, and $f_{cu,i}$ is the converted value of compressive strength of concrete in the test area.

3 The values in the table are calculated according to the curve formula $f_{cu,i}=2.51246R^{0.889}$.

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.

V1.5

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