

# Pendulum Impact Testing Machine



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## Application:

- Impact on metals, Charpy, both non-instrumented and instrumented
- Servo motor driven pendulum can stop at any position, realizing different angle/energy impact test for R&D use
- Equipped with cooling system, I can perform low temperature test down to -180

## Standards

ASTM E23, ASTM E1820, ASTM E2298,  
ISO 148, EN10045, ISO 148, EN10045, ISO 14556, JIS Z 2242, GOST 9454-78

## Significance of instrumentation impact test

Compared with traditional pendulum impact testing machine, instrumented type is more useful for accurate analysis of material property during crack, facilitating the engineers to understand the most fragile part of materials when developing new materials.

In addition to providing an measure of total absorbed energy (Wt), instrumented testing enables the determination of characteristic force, energy, and displacement parameters, such as the pre-maximum force energy (Wm); the post maximum force energy; the general yield force (Fgy); the force at brittle fracture initiation (Fbf); the arrest force (Fa). Wance is the leading R&D and manufacturing of instrumented impact testing system in China, and has experienced experts for force transducer design. Combined with our high speed data sampling system, Wance provides the full complement of solutions for laboratory, ranging from 0.1J for engineering plastic to 100,000J for steel DWTT test.

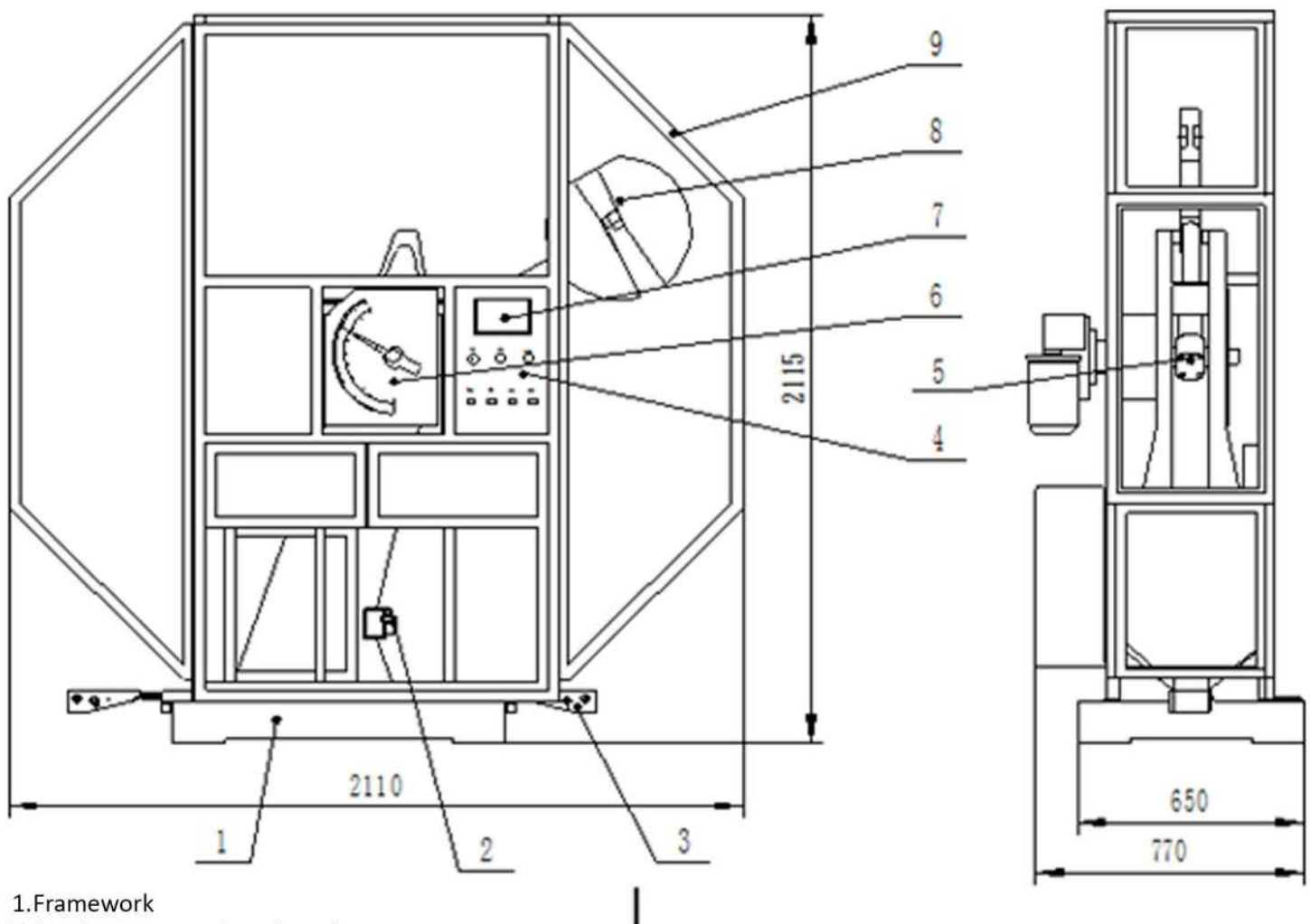
# Pendulum Impact Testing Machine

In addition to providing an measure of total absorbed energy ( $W_t$ ), instrumented testing enables the determination of characteristic force, energy, and displacement parameters, such as the pre-maximum force energy ( $W_m$ ); the post maximum force energy; the general yield force ( $F_{gy}$ ); the force at brittle fracture initiation ( $F_{bf}$ ); the arrest force ( $F_a$ ).

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## Machine structure

The basic model consists of a heavy steel base on which the specimen holder (anvil) and a heavy-duty cast steel upright are mounted.



- 1.Framework
- 2.Specimen supports and anvils
- 3.Specimen collection device
- 4.Control panel
- 5.Pendulum
- 6.Analogue display
- 7.Touch screen
- 8.Striker
- 9.Protection shield

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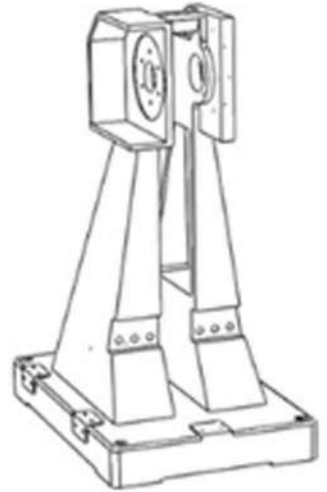
# Pendulum Impact Testing Machine

## Framework

The framework is processed with one body casting. Front and rear columns are symmetric with single beam support axis, with high stiffness and precision.

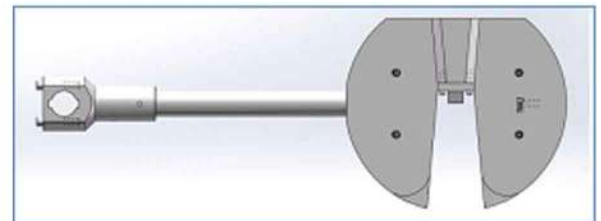
The framework is made from ductile cast iron with high strength and stiffness, and with good capability of vibration absorbing.

The seat mass is 822kg, 15 times than 750J pendulum mass (54.65), fully complying with standards that seat mass must be 12 times than pendulum mass.

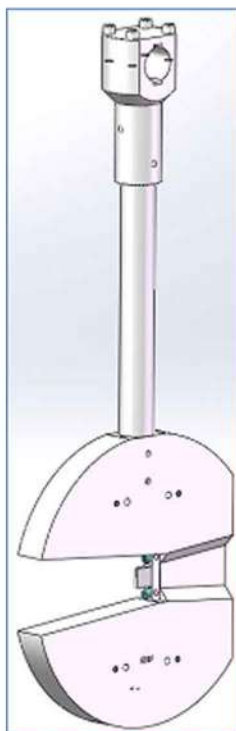


## Pendulum

Pendulum is designed with 3D CAD software, greatly ensuring the striking center accuracy and pendulum moment precision. High strength pendulum rod highly reduces vibration after impact.



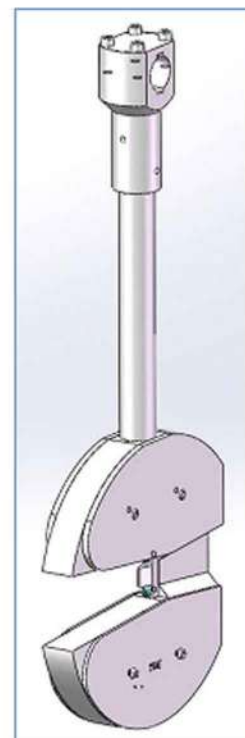
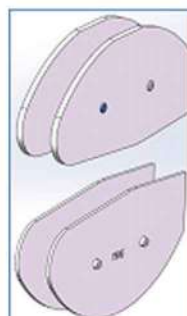
Striking head is combined design. 300J plus two counter weights becomes 450J, and 600J plus two counter weights becomes 750J. It is convenient to perform different energy tests with frequent changing pendulums.



**600J Pendulum**

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## Counter Weights

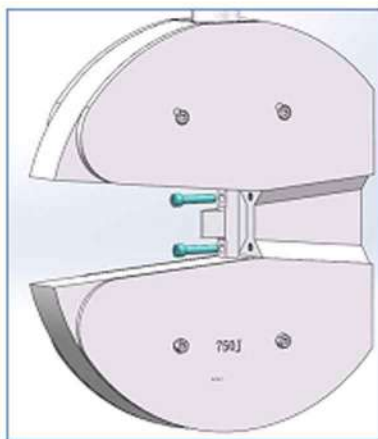


**750J Pendulum**

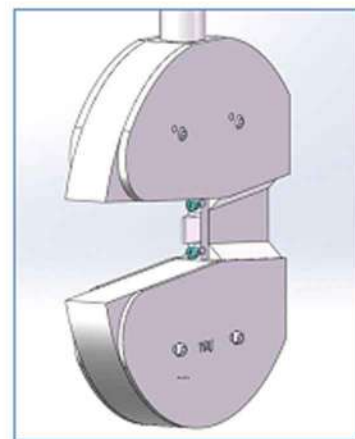
# Pendulum Impact Testing Machine

## Machine structure

Striking knife is tightened by wedge block, simple to change. Striking knife is available with R2 and R8, fully complying with ASTM, JIS, DIN, GB, ISO, EN and other standards.



**Change striker knife**



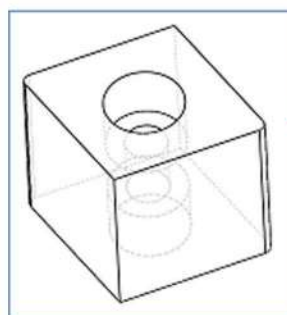
Striking knife is made of anti-wearing high speed tool steel with hardening treatment, and hardness is larger than HRC60, with high strength, ductility and abrasion resistance.

## Supports and anvils

Anvil shape is rhombus and can be used in any direction, meaning the using life is 4 times than traditional anvil. The anvil material is high speed tooling steel CW6Mo5Cr4V2 after hardening treatment, and the hardness is larger than HRC60, with high strength, ductility and abrasion resistance.

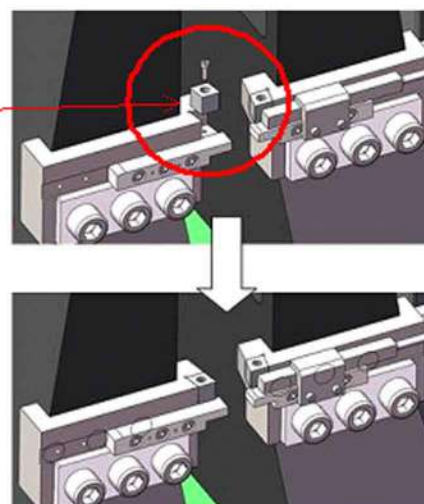
It is very simple to change anvils with inner hexagon spanner. The anvil is machined by special process with high precision and good interchangeability.

Anvil is exchangeable and can be used four times by changing mount directions, greatly improving the servicing life and saving cost.



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**Exchangeable anvil**



# Pendulum Impact Testing Machine

## Energy display system

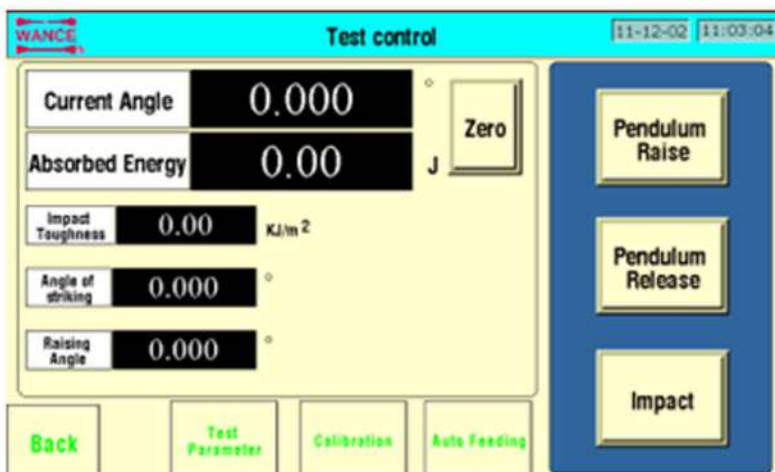
Three types of energy display are available:

- Analogue display: simple and direct to read impact energy
- Wide view touch screen
- Computer with test software

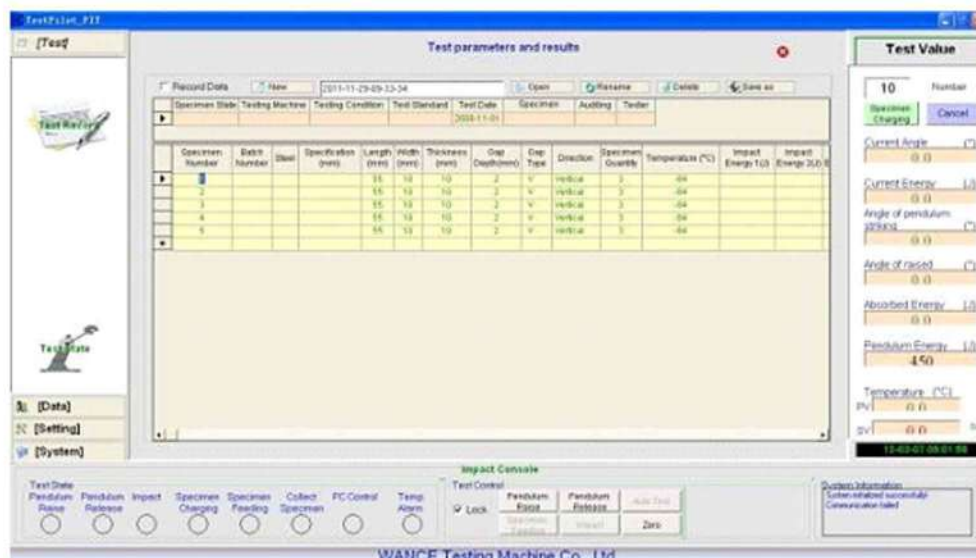
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## Analogue display



## Wide view touch screen display



## Professional test software

# Pendulum Impact Testing Machine

## Instrumented impact system – IIS105

Instrumented impact system consists of striking knife with force transducer, data sampling card, signal conditioner and professional test software. Instantaneous force signal from transducer assembled on the striker is transferred to and enlarged by high speed signal conditioner. Enlarged signal is A/D converted by high speed data sampling card, then transferred to computer for storage and analysis. After calculating and analyzing original force vs.

displacement curve, more characteristic parameters could be determined, furthermore specimen deformation and fracture property could be precisely judged



## Specifications

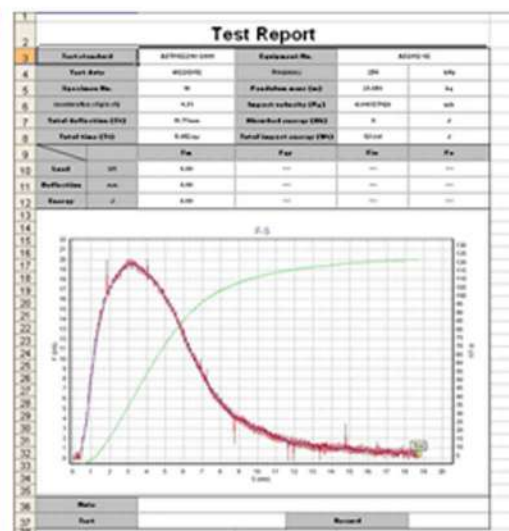
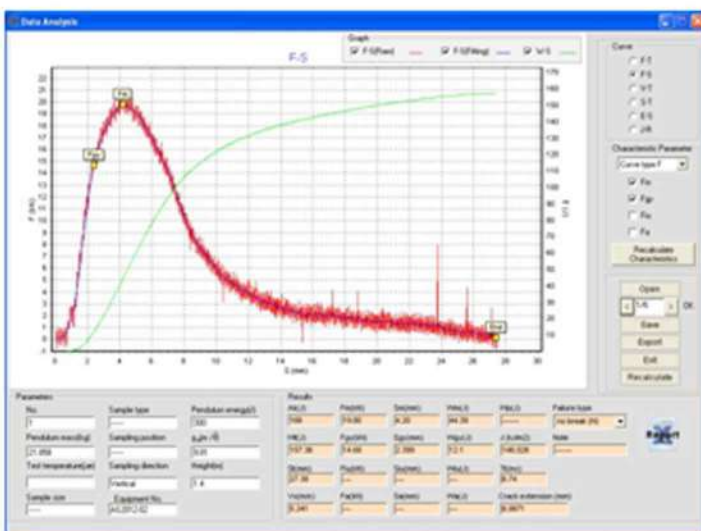
|                            |                        |
|----------------------------|------------------------|
| Model                      | PIT452G PIT752H        |
| Force transducer           | 30kN, 50kN             |
| A/D sampling resolution    | 16bits                 |
| Maximum sampling frequency | 1.25MHz                |
| Frequency band width       | 500kHz                 |
| Power supply               | AC220V±10%, 50Hz, 100W |

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## Wide view touch screen display

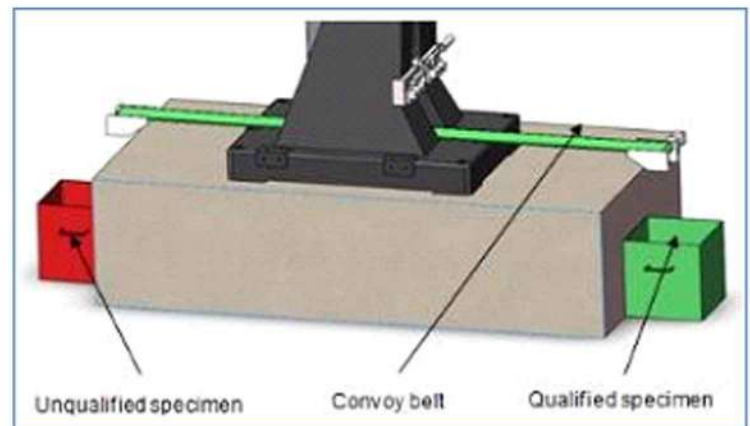
- Automatic curve fitting of force vs. displacements
- Automatically determine  $F_{gy}$ ,  $F_m$ ,  $F_{iu}$ ,  $F_a$ , and other characteristic parameter, further determine after calculation  $S_{gy}$ ,  $S_m$ ,  $S_{iu}$ ,  $S_a$ ,  $S_t$ ,  $W_m$ ,  $W_{iu}$ ,  $W_a$ ,  $W_t$  and others.
- Fully automatic data processing permits to get test results and report after each test immediately.
- Curve and raw data can be exported



# Pendulum Impact Testing Machine

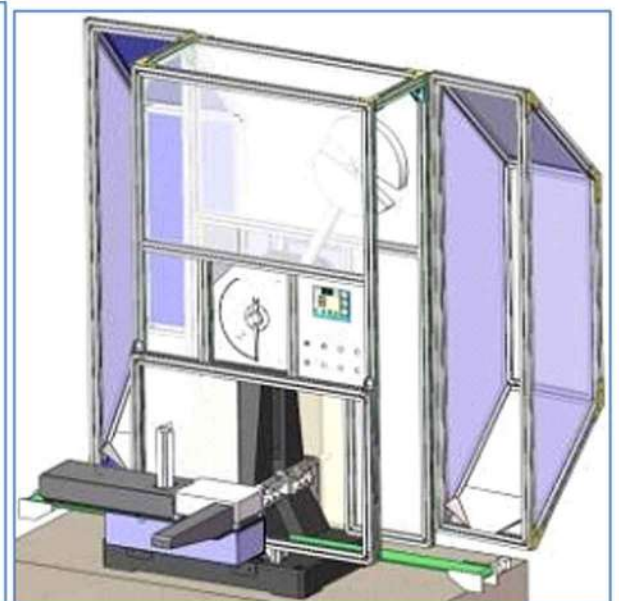
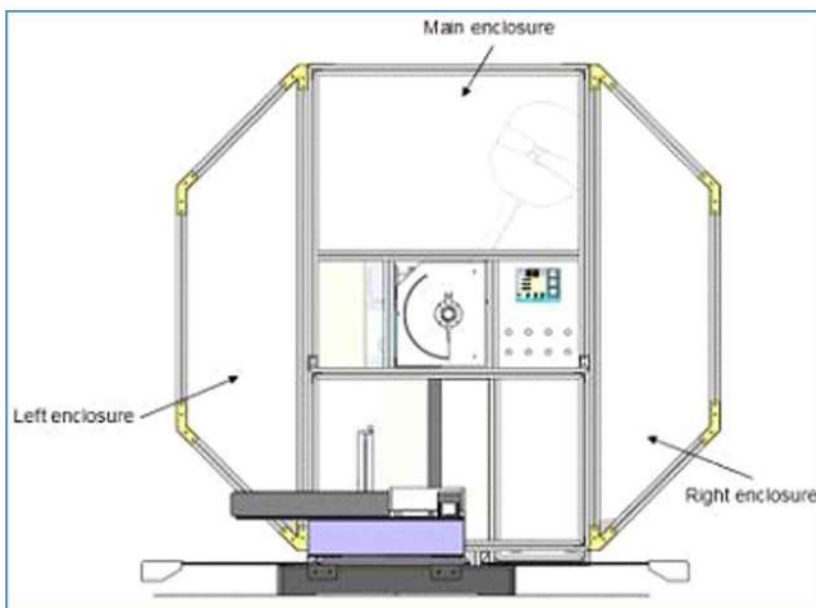
## Specimen collection system

- Motorized device is used for collecting broken specimens after impact, instead of manual cleaning, which fully prevents striker from getting stuck
- Unique specimen filtering function: automatically judge and transport qualified and unqualified specimens to different collecting box



## Safety system

This series of machine has fully closed protection shield to protect operator against specimen splitting during test, and to deny any access to the inside during test. Built-in door interlock further ensures operator safety. The protection shield is constructed with aluminum alloy profile for frame and fiber glass for easy observation. Split-type door design is simple to repair and change pendulum.



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## Specimen collection system

| Name                                                          | Description                     |
|---------------------------------------------------------------|---------------------------------|
| Model No.                                                     | PIT752H                         |
| Maximum impact energy                                         | 300J, 450J, 600J, 750J          |
| Angle resolution                                              | 0.025°                          |
| Distance from the axis of support to the center of percussion | 750mm                           |
| Velocity of striking                                          | 5.24m/s                         |
| Angle of striking                                             | 30°~150°, adjustable            |
| Anvil                                                         | Span                            |
|                                                               | 40mm                            |
|                                                               | Radius of curvature of supports |
| Instrumented striking knife                                   | 1mm                             |
|                                                               | Angle of taper of supports      |
|                                                               | 11°±1°                          |
|                                                               | Radius of striking edge         |
|                                                               | 2mm(R2) or 8mm(R8)              |
| Instrumented striking knife                                   | Angle of striking tip           |
|                                                               | 30°                             |
|                                                               | Thickness of striker            |
|                                                               | 16mm                            |
| Dimension (with protection shield)                            |                                 |
| 1960 x 680 x 2000 mm                                          |                                 |
| Weight                                                        |                                 |
| 800kg                                                         |                                 |
| Power supply                                                  |                                 |
| 220V±10% 50Hz 5A                                              |                                 |

## Standard configurations:

| Name                                       | Description                    | Model     |           |           |
|--------------------------------------------|--------------------------------|-----------|-----------|-----------|
|                                            |                                | PIT752H-2 | PIT752H-3 | PIT752H-4 |
| Framework                                  | Frame                          | √         | √         | √         |
|                                            | Pendulum lock/release system   | √         | √         | √         |
|                                            | Driving system                 | √         | √         | √         |
|                                            | Dual clutch system             | √         | √         | √         |
|                                            | Angle measurement system       | √         | √         | √         |
|                                            | SIMENS PLC control             | √         | √         | √         |
|                                            | Analogue display               | √         | √         | √         |
|                                            | Touch screen                   | √         | √         | √         |
|                                            | Protection shield              | √         | √         | √         |
|                                            | Other auxiliary parts          | √         | √         | √         |
| Servo motor                                |                                | √         | √         | √         |
| Instrumented impact system (model: IIS105) | Data sampling card             |           |           | √         |
|                                            | Data Conditioner               |           |           | √         |
|                                            | Instrumented test software     |           |           | √         |
| Software                                   |                                |           | √         | √         |
| Accessories                                | Span adjusting device specimen |           |           |           |
|                                            | center alignment device        | √         | √         | √         |
|                                            | inside-hexagonal spanner       |           |           |           |
|                                            | foundation bolts               |           |           |           |
|                                            | wedge-shaped irons             |           |           |           |

## Safety system

| Name                                                       | Description |
|------------------------------------------------------------|-------------|
| Charpy pendulum & specimen support (striking knife: R2/R8) | 300J        |
|                                                            | 450J        |
|                                                            | 600J        |
| Please specify ISO striker or ASTM striker                 | 750J        |

Remark:

- 1) 450J pendulum is assembled by 300J pendulum with two counter weight.
- 2) 750J pendulum is assembled by 600J pendulum with two counter weight.

| Name                                                                                                                                             | Description |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Instrumented Charpy pendulum & specimen support (striking knife with 30kN force transducer: R2/R8)<br>Please specify ISO striker or ASTM striker | 300J        |
|                                                                                                                                                  | 450J        |
|                                                                                                                                                  | 600J        |
|                                                                                                                                                  | 750J        |

## Safety system

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## Optional notch broacher

| Name                 | MODEL   | Specifications                                     |
|----------------------|---------|----------------------------------------------------|
| Notch making machine | NSM201B | V2 and U5 notch<br>Comply with ISO148 and ASTM E23 |

## Optional configurations:

| Name                                 | Model     | Description                                       | Accessories                                                                                     |
|--------------------------------------|-----------|---------------------------------------------------|-------------------------------------------------------------------------------------------------|
| Automatic cooling and feeding system | LTC601A-2 | -60°C~ambient Cooling<br>method: compressor       | Specimen auto-feeding system<br>Low temperature chamber<br>Compressor<br>Air pump               |
|                                      | LTC102B-2 | -100°C~ambient<br>Cooling method: liquid nitrogen | Specimen auto-feeding system<br>Low temperature chamber<br>Liquid nitrogen cylinder<br>Air pump |
|                                      | LTC182B-2 | -180°C~ambient<br>Cooling method: liquid nitrogen |                                                                                                 |
| Manual cooling system                | LTC601A-1 | -60°C~ambient<br>Cooling method: compressor       | Low temperature chamber<br>Compressor                                                           |
|                                      | LTC801A-1 | -80°C~ambient<br>Cooling method: compressor       | Low temperature chamber<br>Compressor                                                           |
|                                      | LTC102B-1 | -100°C~ambient<br>Cooling method: liquid nitrogen | Low temperature chamber<br>Liquid nitrogen cylinder                                             |
|                                      | LTC182B-1 | -180°C~ambient<br>Cooling method: liquid nitrogen |                                                                                                 |

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