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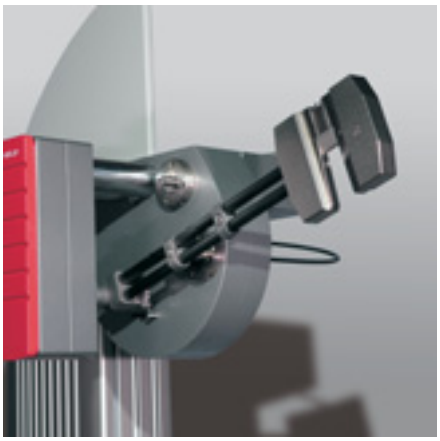
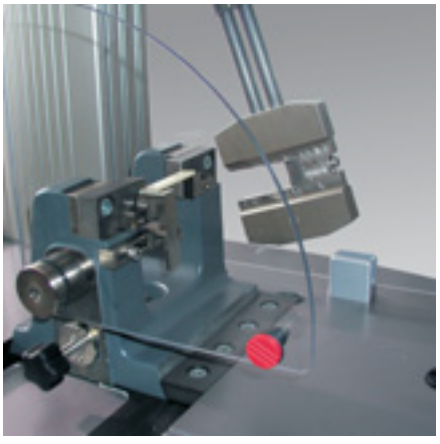
Zwick
Materials Testing

Pendulum Impact Testers
HIT5.5P





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Intelligent Testing

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1. The latest Pendulum Impact Tester from Zwick is a HIT

Important Characteristics

As a leading producer of mechanical testing products, The Zwick Roell Group's HIT pendulum impact tester is a powerful instrument for plastic manufacturers and processors.

The main characteristics of the HIT pendulum impact tester are its accuracy, dependability and ergonomic design. Advanced manufacturing technology enables improved accuracy specifications and brings the following innovations and benefits to users in both R+D and quality assurance:

- Pendulum coding
  The HIT5.5P automatically recognizes the pendulum being used and evaluates the test values in the correct range and corresponding to the relevant standard. It ensures that different pendulum sizes or test procedures are correctly used, and ensures that troublesome, error prone handling of individual weights is eliminated.

- Virtually vibration free
  A new world innovation is the use of double carbon rods for the pendulum. This gives a high stiffness in the direction of impact and a strong concentration of the mass at the impact point. Compared to single-rod, metal construction pendulums to date, and compound type pendulums the energy loss due to resonant oscillations is considerably reduced. The high stiffness gives the pendulums an excellent dynamic characteristic and prevents excessive forces in the pendulum rod during operation and if Izod specimens are only partially broken.

- Pendulum change without tools
  Each pendulum is equipped with a quick change unit. Changing of pendulums can be carried out quickly without special tools. There are no screws which can be easily lost. This is important because a missing screw will change the pendulum energy.

- Low wear disc brake
  The optional disc brake allows the smooth stopping of the pendulum arms.

- Ergonomic design
  All important operating elements such as keyboard, brake, release lever and display are all at one level within easy reach of the operator.

Fig 1: Pendulum Impact Tester HIT5.5P

- Modern electronics
  The new control electronics contains a high resolution digital encoder for the precise measurement of the impact angle. For integration into laboratory management systems and PC connection, both an RS232- and USB-upstream-interface are included.

- High performance PC-Software *testXpert*® II (Option) offers evaluations to DIN, ISO and ASTM. Reports and data archiving are done in the normal formats of the Windows®-World.

Application Range and Standards

The Pendulum Impact Tester HIT5.5P can be used for the determination of impact resistance on plastics and other materials. The impact tester can be equipped with accessories for Charpy, Izod, Dynstat, and impact tensile according to the following standards:

Method	DIN	ISO	ASTM
Charpy	50115	179-1	D6110
Izod		180	D256 (notched) D4812 (without notch)
Impact tensile		8256 A 8256 B	D1822 (spec. in head)
Dynstat	53435		

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2. The HIT5.5P – everything a Pendulum Impact Tester needs

Instrument models

The Pendulum Impact Tester HIT5.5P is available in two models:

- **The Stand-Alone-Model especially for Plastics processors**
  This model is the ideal choice when there is no need to store the test data. The results are calculated by the Pendulum Impact Tester and can be selectively displayed as impact energy, or in absorbed energy, or in % of the pendulum´s nominal energy. A clear, large display allows secure reading of the results even at greater distances (see Fig. 1, below).

- **The PC-Model especially for Plastics manufacturers and processors**
  The PC-Model with RS232 or USB interface is the perfect choice if test results are to be stored and/or subsequently processed. The testing software *testXpert*® II takes the test data and prepares it graphically and statistically. If an electronic vernier caliper is connected to the PC, the cross-sectional area of the specimen can be measured, transferred to the PC and the impact toughness determined. Also possible is the data link to laboratory information systems.

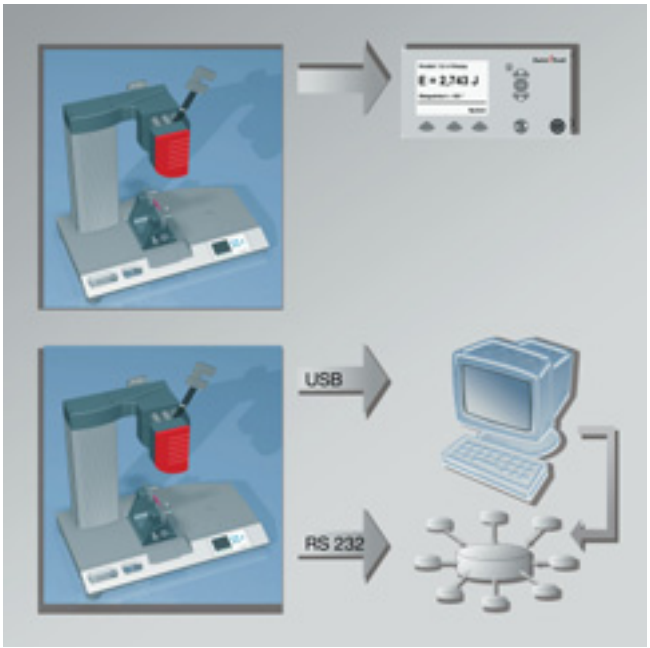

Fig. 1: HIT5.5P-Models: Stand-Alone- and PC-Model

Low vibration instrument design

The design of the perfect low vibration Pendulum Impact Tester, begins in the pendulum and the supports which are closest to the specimen. For this reason we use high performance carbon materials in the HIT5.5P. This significantly increases the stiffness of the pendulum and brings the distribution of its mass very close to the ideal pendulum, and makes the instrument, as well as the results, more dependable and stable over the long-term (Fig. 2).

Fig. 2: Low vibration carbon pendulum rod

The ratio of pendulum to frame mass is extremely high, (>115) and enables it to measure 80 % of consumed energy with high accuracy according to ISO 13802.

A unique feature of the HIT5.5P is the dovetail base plate guide which secures the Charpy, Izod, and tensile impact specimen vises over the entire depth of the support. Whilst enabling the tester to be quickly setup for each type of test, it also guarantees a perfect connection between the support and the frame of the impact tester (Fig. 3).

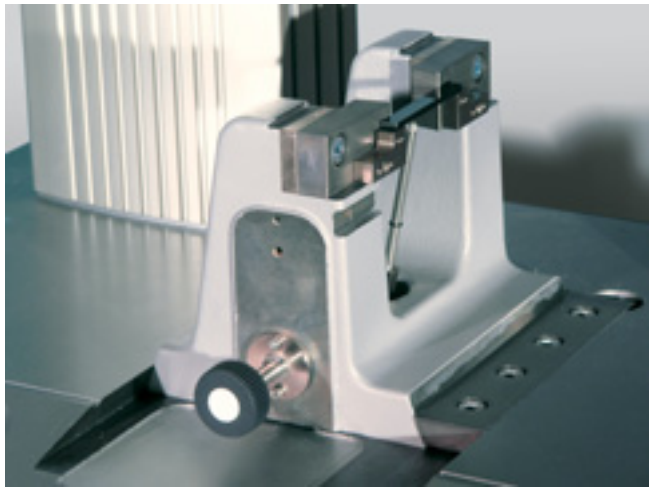

Fig. 3: Instrument base and gripping wedge of the impact support

The heavy frame is made from cast iron to eliminate vibrations, and three heavy duty leveling feet ensure that the tester remains perfectly leveled.

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An optional table, especially designed for the HIT Pendulum Impact Tester enables the optimum low vibration mounting conditions. Dependable test results can be then achieved independently of the local conditions. Large-area leveling elements and positioning stops secure a firm foothold of the pendulum impact tester. With Izod tests, the specimen remains can fall directly from the support into a container, so that they can be disposed of efficiently.

Any table, which is stable in transverse directions, can be used.

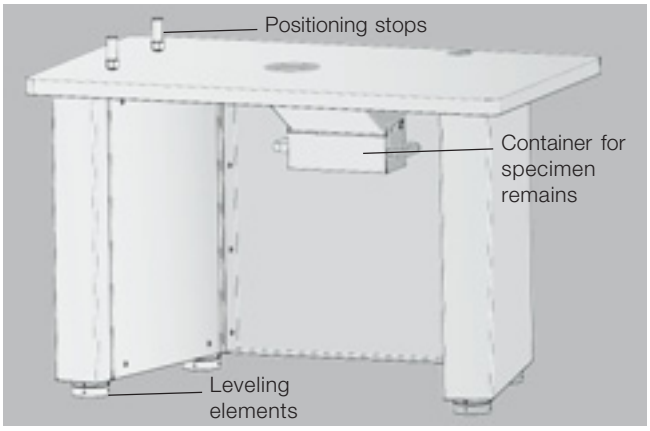

Fig. 1: HIT5.5P-Instrument table

Pendulum identification

Just as a certified weight has its mass engraved, each Zwick pendulum carries its own data in its electronic identity tag (Fig. 2). This tag identifies the test standard, pendulum energy, and release angle. This eliminates erroneous measurements. The precise design and construction ensures that the test results exceed the requirements of the international standards. This allows the interchanging of pendulums from one HIT instrument to another.

Fig. 2: Electronic identity tag

Modern instrument electronics

The electronics contains all important functions: the calculation and display of the impact energy, the correction of windage, which conforms to Standard, and the control of the vertical position in the impact direction. The connection of a PC, except with the Stand-Alone version, is via an USB interface. There is also a serial interface for connection to already existing LIMS Systems.

The HIT5.5 includes a self-identifying power supply and it can be connected to supply voltages from 100 V to 240 V.

Simple, intuitive operation, distinguishes the HIT5.5P electronics: The individual steps are subdivided logically from the set-up to the definition of the test. The menu leads quickly from set-up to test mode. The set-up includes:

- Determination of friction and windage to Standard and input of local rate of acceleration due to gravity.
- Monitoring of the time of swing of the pendulum.

The test mode displays:

- The absorbed impact energy in Joule or in ft-lbf and % of the impact energy used.

A connected PC calculates the impact resistance. The RS232 port on the PC can be used for the connection of a digital measuring instrument.

Fig. 3: Clear, easily understandable operating panel

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Ergonomics

Packed with outstanding ergonomic features, The HIT5.5P offers significant advantages to testing laboratories. The machine controls are placed close together and at the same level helping to simplify operation and reduce operator fatigue.

Specimen vises can be replaced simply by loosening the fixing screws, removing the first vise, and inserting the next one. Its exact positioning is achieved via stops in the baseplate.

The pendulum is easily changed by means of a quick release mechanism eliminating the need for tools.

Fig. 1: Pendulum quick release for fast changing of pendulums

The optional safety protection system contains an integrated receptacle on the left side of the machine for catching most of the broken specimen remains, and can be emptied when the protection device is swivelled out.

The electronics has a simple and easy to use keyboard, with a large and clear display designed to reduce fatigue even when testing large batches. The operation and structured menu system enables the machine to be setup and operated quickly and easily.

Accessories

Operator protection

The Pendulum Impact Tester HIT5.5P can be equipped with modular protection devices (Fig. 2). Certain legal safety standards allow working without protection only up to a pendulum energy of 4 Joules. Above this value operator protection is required.

The protection device on the left, (Fig. 2, left), can be used when protection is deemed necessary. The protection device contains an integrated receptacle for catching the specimen remains. If the protection device is swiveled out, the specimen remains can be easily and quickly removed.

If left and right protection screens are used, (Fig. 2, middle), the instrument corresponds to CE-requirements for impact energies > 4 J and DIN 51233 (Materials Testing Machines – technical safety accords).

A plastic protection screen is available for the Charpy support which protects the operator from flying debris (Fig. 2, right).

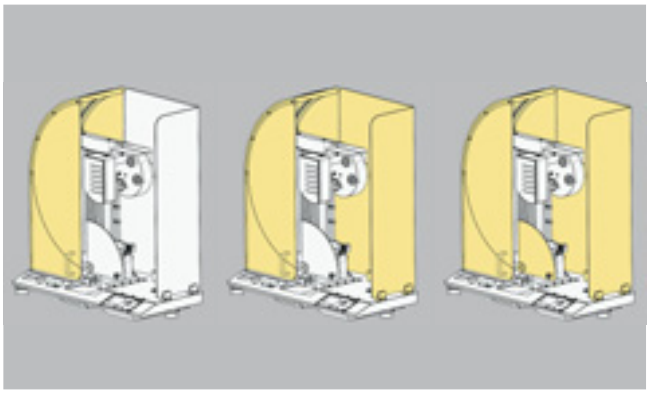

Fig. 2: Modular protection devices

PC-Software *testXpert*® II

A choice of Master and Standard Test Programs are available for the HIT5.5P. Master Test Programs have the most comprehensive range of options and flexibility to control test parameters and process results, and are perfectly suited to research and development needs.

Standard Test Programs are focused on individual DIN, ISO or ASTM Standards, and are designed primarily for use in quality control laboratories.

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Charpy-tools
The Charpy vise consists of a heavy cast iron body. Test specific accessories such as supports and abutments, can be selected according to the specimen to be tested (Fig. 1).

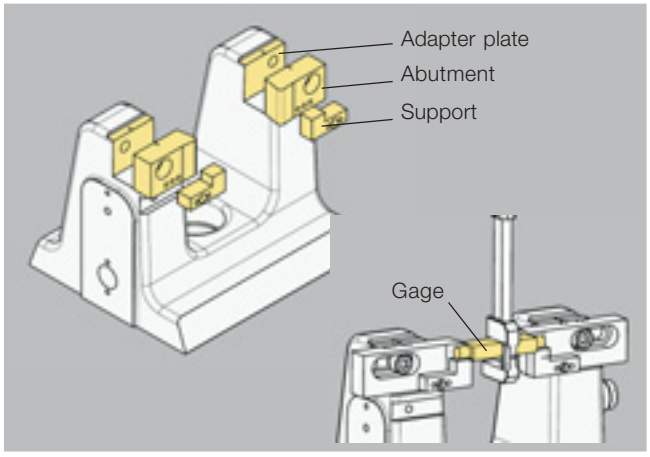

Fig. 1: Charpy clamping device with accessories

All important parts, such as the abutments, are manufactured on Zwick CNC machines and 100 % quality controlled to ensure radii and general tolerances are met. Zwick does not offer single-piece abutments which may have low dimensional accuracy.

When mounting the abutments, a gage provided ensures their position in relation to the fin. Since abutments have higher wear than supports, they are designed so that they can be easily and inexpensively exchanged, independently of the supports or adapter plates.

Quick change adapter platens ensure proper adaptation to the specimen width in the impact direction. The specimen is aligned in the correct position by individual supports and adapter plates. The quick change adapter plates are used to adapt the testing machine to different specimen widths, whilst the supports are precisely positioned using set pins and adapt to the specimen thickness.

An optional swivel protective shield can be used with the clamping device, and a positioning aid helps to position the specimen correctly using either the notch, or the front edge of the specimen.

The advantages:
- Quick changing of the clamping device
- The abutments are precision-made by CNC machine and individually inspected for 100% accuracy

Izod-tools
There are two types of specimen vise which can be chosen: The manual device clamps the specimen with a fine threaded adjustment spindle which ensures that the optimum gripping force is applied whether on sensitive, soft or hard specimen.

If a high through-put is to be achieved, or if temperature conditioned specimen are to be tested, then the pneumatic clamping device would be the best. Quick clamping via a switch on the clamping device itself, reduces the time between taking the specimen from the temperature unit and the performance of the test to a minimum.

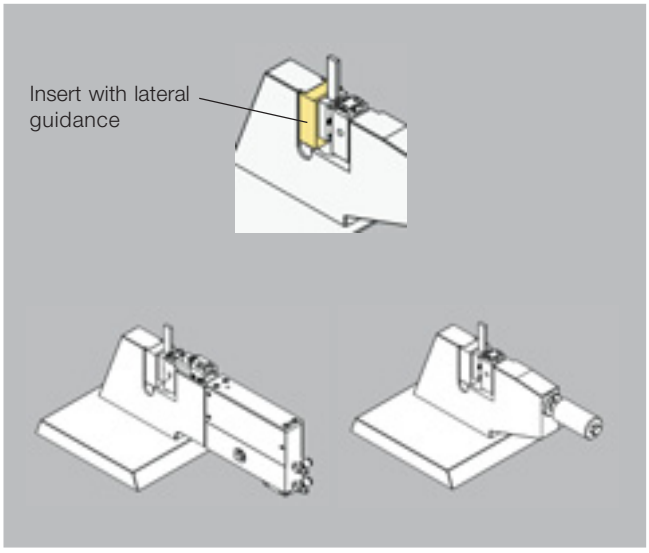

Fig. 2: Izod clamping device: manual and pneumatic clamping

Both clamping devices are equipped with a centering unit which ensures that the specimen notch is positioned at the correct height in the clamping device.

The position of the sample relative to its width in the impact direction is performed by the quick-change inserts which have integrated lateral guides.

The advantages:
- Quick centering and gripping of the specimen
- Fine adjustment of specimen clamping force
- Quick testing with the pneumatic clamping device

Tensile-impact tools
In order to accurately align the tensile impact specimen in the impact tester it is necessary to use a gage and template. This allows one end of the test specimen to be clamped in the yoke, and perfectly aligned at the same time.

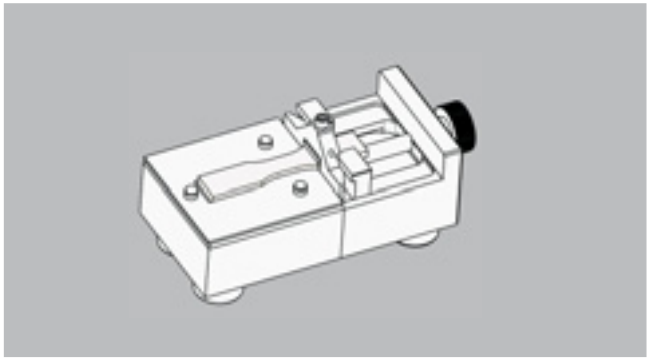

Fig. 1: Clamping gage for the tensile impact test

For ISO and ASTM specimens corresponding templates can be selected.

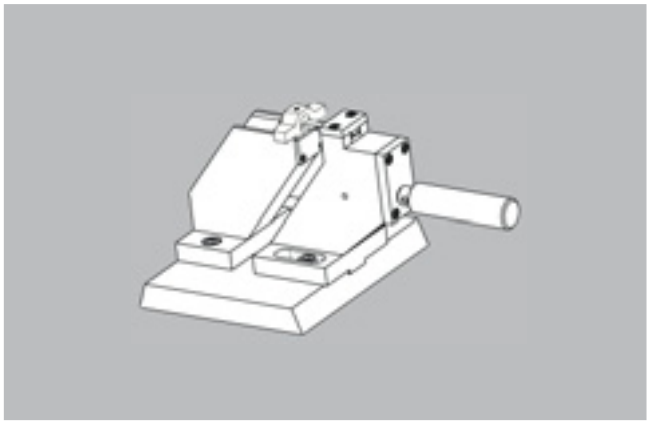

Fig. 2: Clamping device for tensile impact tests, Method A

ISO 8256, Method A
For this test method one specimen shoulder is gripped in the yoke. The other end is secured in a vise attached to the impact tester. The pendulum strikes the yoke and hence the free end of the specimen in order to carry out the tensile impact test.

Yokes with masses of 15, 30, and 60 g are available.

ISO 8256 Method B and ASTM D 1822
With this method, one specimen end is gripped in the pendulum. The end of the specimen carries a yoke and hangs free.

During the test, the free end with the yoke hits against the vise.

The same vise, and the 15 g yoke can be used for both Standards.

The pendulums are individually constructed to ISO 8256 Method B or ASTM D 1822.

The advantage:
- Rapid configuration changes between the three different test methods.

Dynstat vise
The HIT5.5P can also be equipped for Dynstat tests to DIN 51230.

A Dynstat vise and three pendulums between 0.5 J and 2 J cover the Dynstat applications areas.

Fig. 3: Dynstat vise

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3. Instrument Specification

The following points should be checked before a Pendulum Impact Tester is specified in detail:

- To be used with or without a PC
- Standards to be used
- Test methods and specimen to be used

The specification assistance on the next pages should help you to configure your instrument to meet your testing requirements. Naturally, we will be happy to assist you if you have questions.

For a quick orientation we marked the •item numbers with a red dot.

Selection of the basic unit

	PC-Model	Stand-Alone-Model
	To be used with PC	To be used without PC
Max. impact energy	5.5 J (4,06 ft lbf)	5.5 J (4,06 ft lbf)
Interfaces	RS232, USB upstream	none
Height x Width x Depth (w/o shield)	920 x 870 x 500 mm	920 x 870 x 500 mm
Weight without accessories	approx. 137 kg	approx. 137 kg
Line voltage	100 to 240 V, 50/60 Hz, 70 W	100 to 240 V, 50/60 Hz, 70 W
Test results, numeric	Impact work [%], Impact work abs. Impact strength	Impact work [%], Impact work abs.,
Units	SI, metric, imperial	J, ft lbf, %
Control functions	Friction correction Vertical position of pendulum Time of swing Display of instrument´s data	Friction correction Vertical position of pendulum Time of swing Display of instrument´s data
Item number	•PI-5.5COMC	•PI-5.5STAC

Pendulum release units for various standards

Two cable release units are available. The cable release unit is suitable for general purpose testing, and the pneumatic version is recommended for high specimen throughput and when using pendulums about 5 Joules.

In order to achieve the different impact speeds for ISO and ASTM tests, 2 starting angle mechanisms are available. They release the pendulum at the corresponding starting angle. To run tests according to both groups of standards, please specify both item numbers.

Pneumatic release unit	Cable release unit	Starting angle according to DIN/ISO-Standards	Starting angle according to ISO/ASTM-Standards
		DIN 53435, ISO 179, ISO 8256	ISO 180, ASTM D6110, ASTM D256, ASTM D4812, ASTM D1822
•PI-ACRELSE.001	•PI-ACRELSE.002	•PI-ACSTART.001	•PI-ACSTART.002

HIT5.5P – Installation, operator protection, pendulum brake

These items are optional.

			
Instrument table	**Protection left**	**Protection left and right**	**Pendulum brake**
Low vibration mounting table with specimen container, 1200 mm (47.3") wide, 710 mm (28") deep	Swivable with specimen remains container, not required for energies ≤ 4 J	Swivable left with remains container, fixed to the right. Operating area freely accessable CE- and DIN 51233-conform	Specimen disc brake, manually operated
•PI-ACTABLE.002	•PI-AC5.5PR.001	•PI-AC5.5PR.002	•PI-ACBRAKE.001

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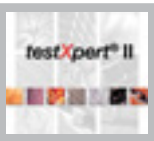
HIT 5.5P - PC-Software *testXpert*® II
testXpert® II comprises Master and Standard Test Programs (see special product information) for the optional use with the PC-Model.

Essential characteristics of Standard Test Programs:
- Acceptance of impact characteristics.
- Test curve: impact characteristics over time and number of specimen.
- Statistical evaluations.

Essential characteristics of the Master Test Program:
- Acceptance of impact characteristics.
- Test curve: impact characteristics over time, number of specimen and temperature.
- Statistical evaluations, free set-up of report, export of data.



Standard Test Programs				**Master Test Program**
according to following Standards				for pendulum impact tests
DIN 53435	ISO 179-1	ASTM D6110	DIN 50115	on plastics and metals
(Dynstat)	ISO 180	ASTM D256		
	ISO 8256	ASTM D4812		
		ASTM D1822		
•269055.01	•269055.02	•269055.03	•269055.06	•269055.00

HIT5.5P – Tests to Charpy: pendulums, pendulum-set
ISO 179 recommends using a pendulum in a narrowly limited range. The consequence is that pendulums must be changed quite often.

In order to meet this demand, the HIT-Pendulum Impact Testers have a pendulum quick-change unit. The changing of a pendulum is performed within seconds and, thanks to pendulum identification, without any further inputs.

Important: With the HIT5.5P it is not necessary to fix or remove additional pendulum masses to change the pendulum energy.

The combination of pendulum identification and the quick-change unit, ensure that errors in pendulum energy due to incorrect use of supplemental masses or the loss of associated fixing screws are eliminated. The HIT5.5P is extremely reliable and easy to use.

Pendulums can be purchased individually or in sets:

Standard	**Impact energy**		**Pendulum**
ISO 179-1	0.5 J		•PI-ACPECHI.001
	1 J		•PI-ACPECHI.002
	2 J		•PI-ACPECHI.003
	4 J		•PI-ACPECHI.004
	5 J		•PI-ACPECHI.005
ASTM D6110	0.5 J	(0.37 ft lbf)	•PI-ACPECHA.101
	1 J	(0.74 ft lbf)	•PI-ACPECHA.102
	2.7 J	(2 ft lbf)	•PI-ACPECHA.103
	5.4 J	(4 ft lbf)	•PI-ACPECHA.104
Pendulum sets			
ISO 179-1	4 J and 5 J		•PI-ACPESET.001
ASTM D6110	2.7 and 5.4 J		•PI-ACPESET.101
	(2 ft lbf and 4 ft lbf)		

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HIT5.5P – Tests to Charpy: clamping vise and accessories

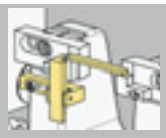
You can optionally purchase a local operator shield in combination with the Charpy clamping device. Choose supports and abutments additionally to the specimen.

The notch alignment unit is required to align the specimen notch with the centre of impact. If the distance from the edge of the notch to one end of the specimen is specified in the test Standard then the side alignment unit should be used for centering the specimen. The attached stop is swivable.

Charpy vise
•PI-AC5.5VI.001

Local operator shield
•PI-AC5.5PR.101

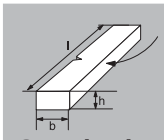
Notch alignment unit
•PI-AC5.5AL.001

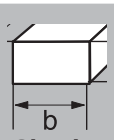


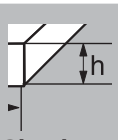
Side alignment unit
•PI-AC5.5AL.002

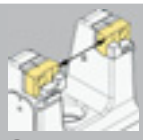
HIT5.5P – Tests to Charpy: adapter plates, supports and abutments

'Size b' in the table means the specimen´s dimension in direction of impact, 'size h' is the dimension in direction of the pendulum´s center of rotation.









Standard	Size b	Adapter plate	Size h	Support	Abutment	Span
ISO 179-1	10 mm	•PI-ACADPLT.001	4 mm	•PI-ACBEARG.002	•PI-ACSUPCH.001	62 mm
	4 mm	•PI-ACADPLT.004	10 mm	•PI-ACBEARG.004	•PI-ACSUPCH.001	62 mm
	15 mm	•PI-ACADPLT.002	3 mm	•PI-ACBEARG.001	•PI-ACSUPCH.002	22...70 mm
	10 mm	•PI-ACADPLT.001	3 mm	•PI-ACBEARG.001	•PI-ACSUPCH.002	22...70 mm
	3 mm	•PI-ACADPLT.005	15 mm	•PI-ACBEARG.005	•PI-ACSUPCH.002	22...70 mm
	3 mm	•PI-ACADPLT.005	10 mm	•PI-ACBEARG.004	•PI-ACSUPCH.002	22...70 mm
ASTM D 6110	12.7 mm/1/2"	•PI-ACADPLT.101	3.17 mm/1/8"	•PI-ACBEARG.101	•PI-ACSUPCH.101	101.6 mm/4"
	12.7 mm/1/2"	•PI-ACADPLT.101	6.35 mm/1/4"	•PI-ACBEARG.102	•PI-ACSUPCH.101	101.6 mm/4"
	12.7 mm/1/2"	•PI-ACADPLT.101	12.7 mm/1/2"	•PI-ACBEARG.103	•PI-ACSUPCH.101	101.6 mm/4"
DIN 50115	4 mm	•PI-ACADPLT.004	3 mm	•PI-ACBEARG.001	•PI-ACSUPCH.002	22...70 mm

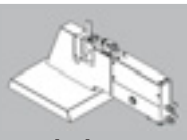
HIT5.5P – Tests to Izod: vises

The clamping force of the Izod vise may directly influence the test results, and two options are available for specimen clamping:

A manual vise using a precision threaded spindle which ensures that the torque is transferred directly to the specimen without friction losses, and a pneumatic vise where the clamping force can be regulated and which is very comfortable to use. The pneumatic-switch for the closing of the jaws is integrated into the Izod-vise.

Inserts are required to fit the Izod-supports to the dimensions of the specimen.

Izod vise, manual
•PI-AC5.5VI.302



Izod vise, pneumatic
•PI-AC5.5VI.301

Notch alignment unit
Contained in both

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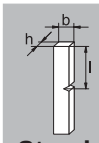
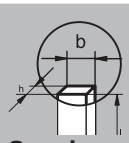
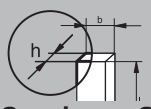
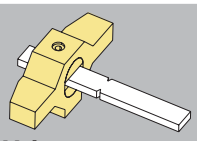
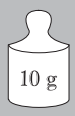
HIT5.5P – Tests according to Izod: inserts and pendulums

Standard	Specimen Size b	Specimen, Size h	Insert	Impact energy, Pendulum	
ISO 180	10 mm	4 mm	•PI-ACINLAY.301	1 J (0.74 ft lbf)	•PI-ACPENIZ.002
	10 mm	3 mm	•PI-ACINLAY.302	2.75 J (2.03 ft lbf)	•PI-ACPENIZ.003
ASTM D 256	12.7 mm/1/2"	3.17 mm/1/8"	•PI-ACINLAY.303	5.5 J (4,06 ft lbf)	•PI-ACPENIZ.004
ASTM D 4812	12.7 mm/1/2"	6.35 mm/1/4"	•PI-ACINLAY.304	(pendulums can be used for all Standards)	
	12.7 mm/1/2"	12.7 mm/1/2"	•PI-ACINLAY.305		

HIT5.5P – Tensile impact testing: tensile impact supports, yokes and pendulums

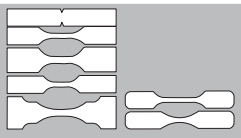


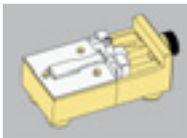



Standard	Tensile Imp. Supp.	Yoke	Mass	Impact energy, Pendulum	
ISO 8256	•PI-AC5.5VI.401	•PI-AC5.5YO.400	15 g	2 J	•PI-ACPETIM.001
Method A		•PI-AC5.5YO.401	30 g	4 J	•PI-ACPETIM.002
ISO 8256	•PI-AC5.5VI.402	•PI-AC5.5YO.410	15 g	2 J	•PI-ACPETIM.012
Method B				4 J	•PI-ACPETIM.013
ASTM D 1822	•PI-AC5.5VI.402	•PI-AC5.5YO.410	15 g	2.7 J	•PI-ACPETIM.014
				5.4 J	•PI-ACPETIM.015

HIT5.5P – Tensile impact testing: clamping units for tests to ISO 8256 and ASTM D 1822

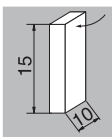
Simplifies a lasting clamping of the specimen in the yoke. For this clamping template and gage are required.

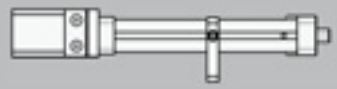





Standard	Specimen type	Clamping template	Clamping gage
ISO 8256	Type 1	•PI-AC5.5TE.401	
Method A	Type 2	•PI-AC5.5TE.402	
	Type 3	•PI-AC5.5TE.403	
	Type 4	•PI-AC5.5TE.404	•PI-AC5.5GA.401
ISO 8256	Type 2	•PI-AC5.5TE.402	(clamping gage can be used for all Standards)
Method B	Type 4	•PI-AC5.5TE.404	
ASTM D 1822	Typ S / 9.53 mm - 0.375"	•PI-AC5.5TE.410	
	Typ L / 9.53 mm - 0.375"	•PI-AC5.5TE.411	
	Typ S / 12.71 mm - 0.5"	•PI-AC5.5TE.412	
	Typ L / 12.71 mm - 0.5"	•PI-AC5.5TE.413	

HIT 5.5P – Dynstat testing: vise and pendulum



Standard	Dynstat vise	Impact energy, Pendulum	
DIN 53435	•PI-AC5.5VI.501	0.2 J	•PI-ACPEDYN.001
		0.5 J	•PI-ACPEDYN.002
		1 J	•PI-ACPEDYN.003
		2 J	•PI-ACPEDYN.004

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