WANCE Testing Machine

WANCE

®

High frequency resonant testing machine

WANCE

®

Shenzhen WANCE Testing Machine Co., Ltd.
Bldg.3, Yinjin Technology Industrial Park,
Fengjing South Road, Guangming, Shenzhen 518107, China

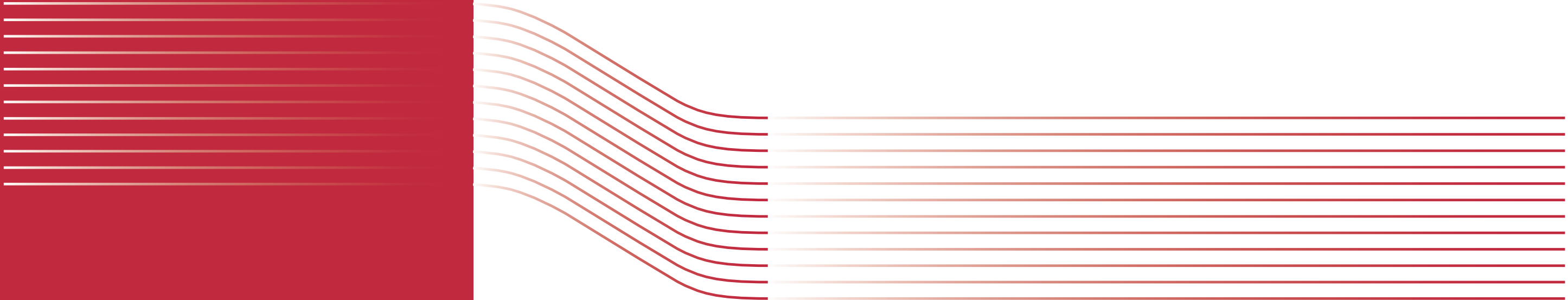T / +86-755-23057280
Email / sales@wance.net.cn

www.wance.net

WANCE ®

Contents

WANCE
Testing Machine

HFT504
50kN

HFT105
100kN

HFT255
250kN

HFT505
500kN

The HFT series fully digital high-frequency resonant testing machines are primarily used in quality control (QC), quality assurance (QA), and research & development (R&D) fields. They are designed to test various technical parameters related to fatigue fracture resistance in metallic materials, composite materials, and other specimens. When equipped with appropriate fixtures and accessories, they can perform tests such as S-N curves, KIC, JIC, CTOD, and more.

These machines are particularly suitable for evaluating the fatigue characteristics or fatigue life of various components (e.g., plates, gears, crankshafts, threads, bolts, screws, studs, chains, connecting rods, compact tension specimens, valves, etc.) and structural parts (e.g., operating joints, connectors, and helical motion pairs) under alternating loads. They can also conduct pre-crack and crack propagation tests.

The HFT series is capable of performing the following types of fatigue tests:

Symmetrical and asymmetrical fatigue tests

Uniaxial tension-tension or compression-compression fatigue tests

Programmed (block spectrum) fatigue tests

Waveform composite (modulated) control fatigue tests

Three-point, four-point, and eight-point bending tests

Torsion tests

Quasi-static fracture toughness and plane-strain fracture toughness tests

Additionally, the machines can be used for fracture mechanics research on CT and SEB specimens.

When configured with specialized environmental chambers, they can perform fatigue tests under complex conditions, including high/low temperatures, corrosive environments, and high/low pressure.
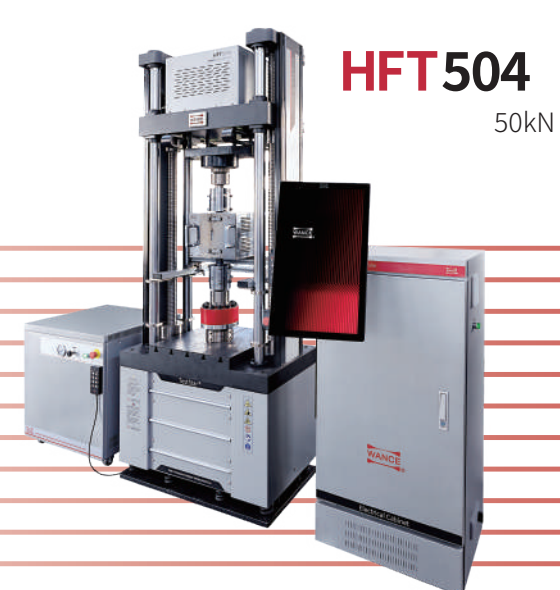
Naming rules

The serial number is composed of three capital English letters: H, F, and T. These three letters are derived from the first letters of the key words in its English name and are used to indicate the series of the equipment.

Working principle

Dynamic loading

The electromagnetic excitation system composed of electromagnets and armatures generates the corresponding excitation force according to the required dynamic force. Through frequency sweeping, its frequency is made consistent with the inherent frequency of the main unit. At this point, the system forms resonance, and in the resonant state, an amplitude-sinusoidal inertial force, i.e., dynamic force, is generated.
The controlled static force and the dynamic force act repeatedly on the tested sample, and the fatigue test begins after reaching the set conditions.

Static loading

The HFT series testing machine is developed based on the principle of mechanical resonance. It starts by using a servo motor to apply the required static force to the sample.
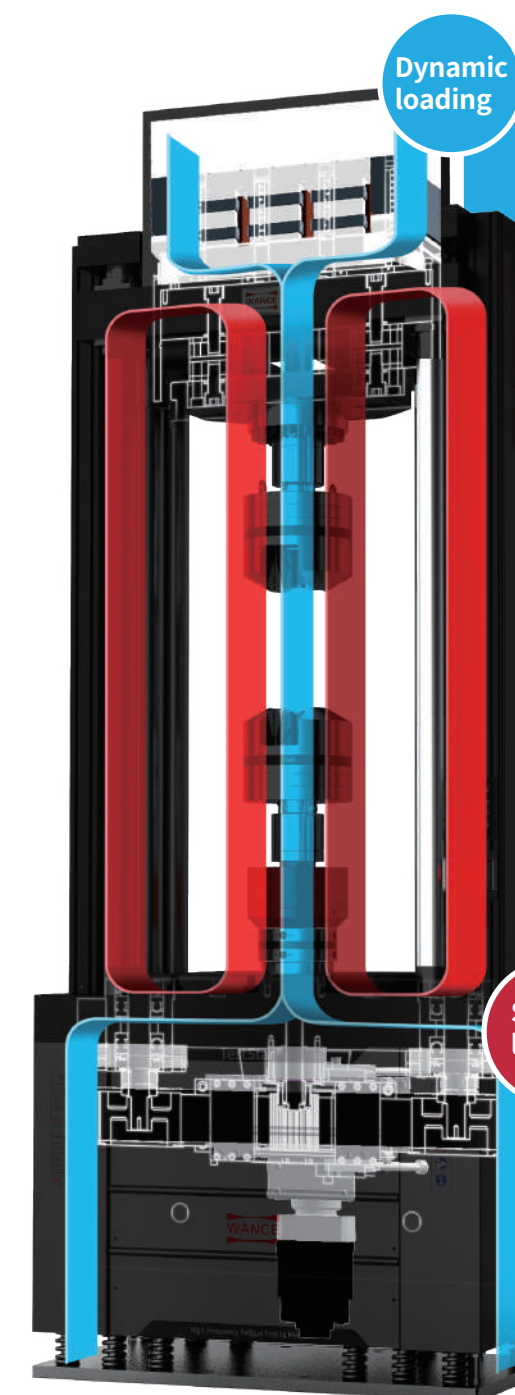
Model number

HFT: high frequency fatigue testing machine

255: 250kN
It is expressed by three Arabic numerals in scientific notation, representing the maximum test force of the equipment, with the unit being N, which stands for Newton.

X: load cell is lower seated
S: load cell is upper seated

Number of drive stations, 1,2,3……

Gripping method
Y: hydraulic, L: manual screw

G: the machine is placed separately from the computer. Network interface communication and emergency stop extension cables need to be supplied (maximum 30 meters)
N: not separately, G: separately

HFT 255-X 3 Y G

A B C

A B C scientific notation: $A.B \times 10^C$

For example: 255 is $2.5 \times 10^5 = 2500000N$

WANCE
Testing
Machine

04 / Tel +86-755-23057280

WANCE
Testing
Machine

05 / www.wance.net

Features

Frame

High-stiffness 4-column frame

4-column, 2 ball screw to form high-stiffness frame.
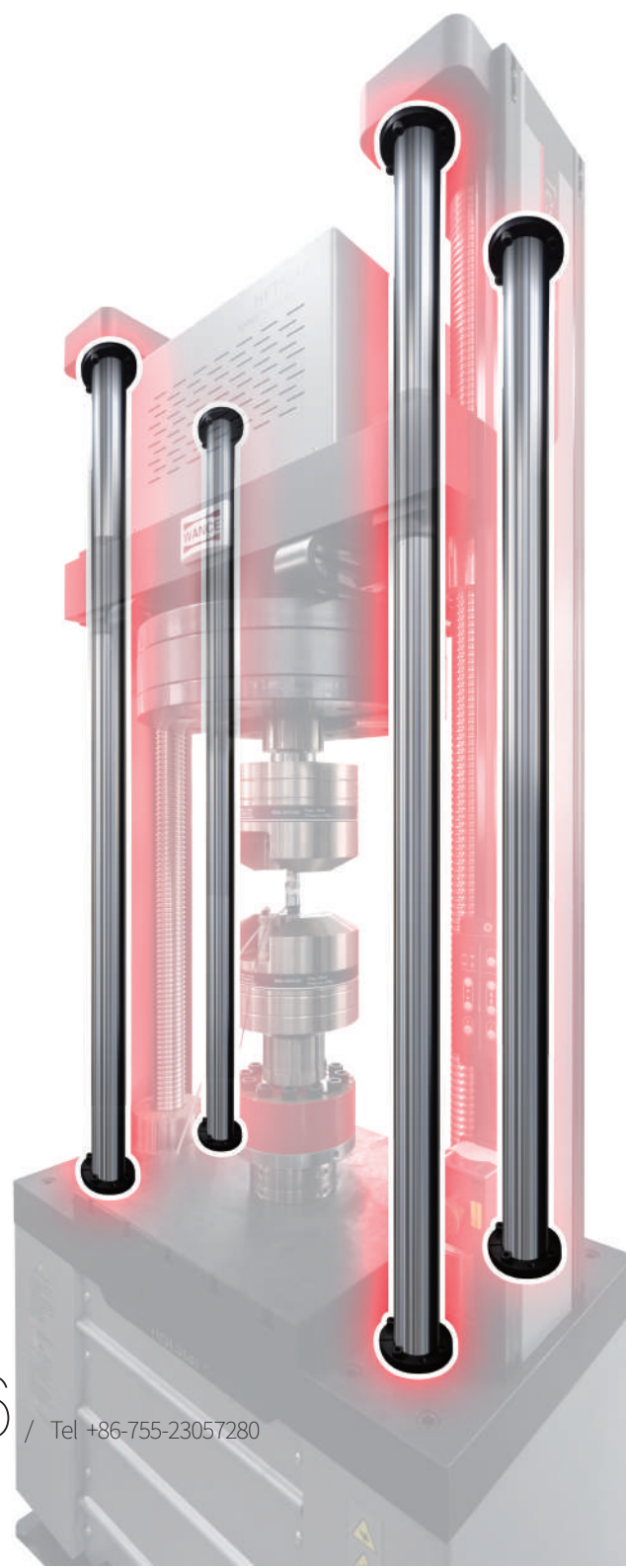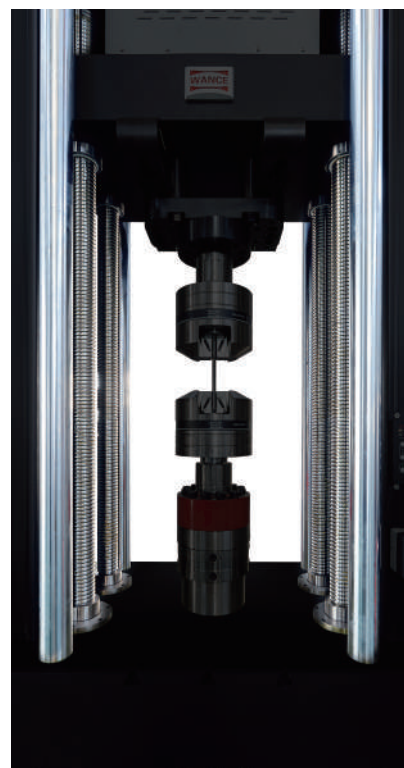
Frame

Ergonomic design

The height of the test machine's operating table is ergonomic.

HFT504: 800mm
HFT105: 900mm
▼ **HFT255:** 1000mm

Manual grip operation height

Hydraulic grip operation height

HFT504: 500mm
HFT105: 600mm
HFT255: 700mm

Platform height
HFT504: 725mm
HFT105: 960mm
HFT255: 1050mm

Features

Frame

Remote control handset

The function keys and indicator lights are simple and clear, enabling convenient operation.

Frame

Two types of gripping

Hydraulic and manual screw gripping, quick and reliable.

Hydraulic gripping

Manual screw gripping

Features
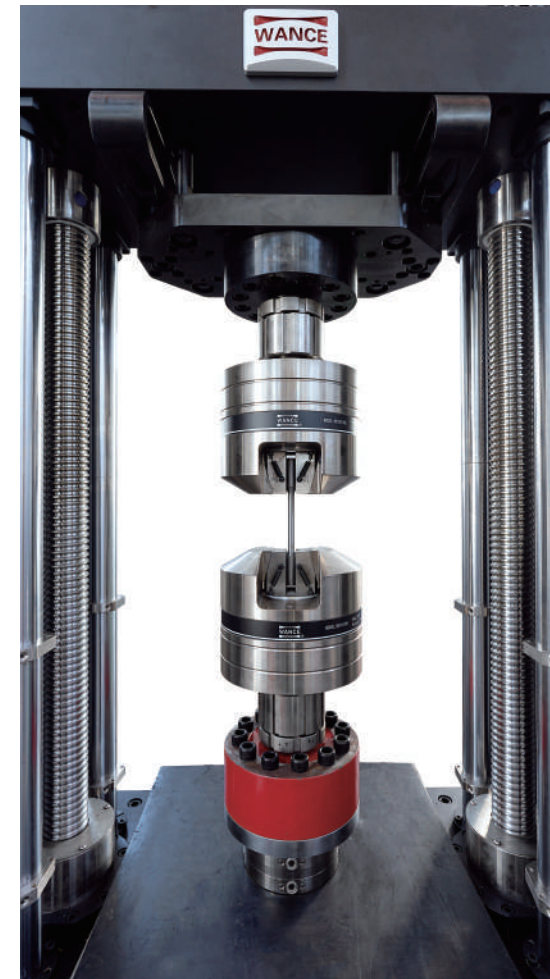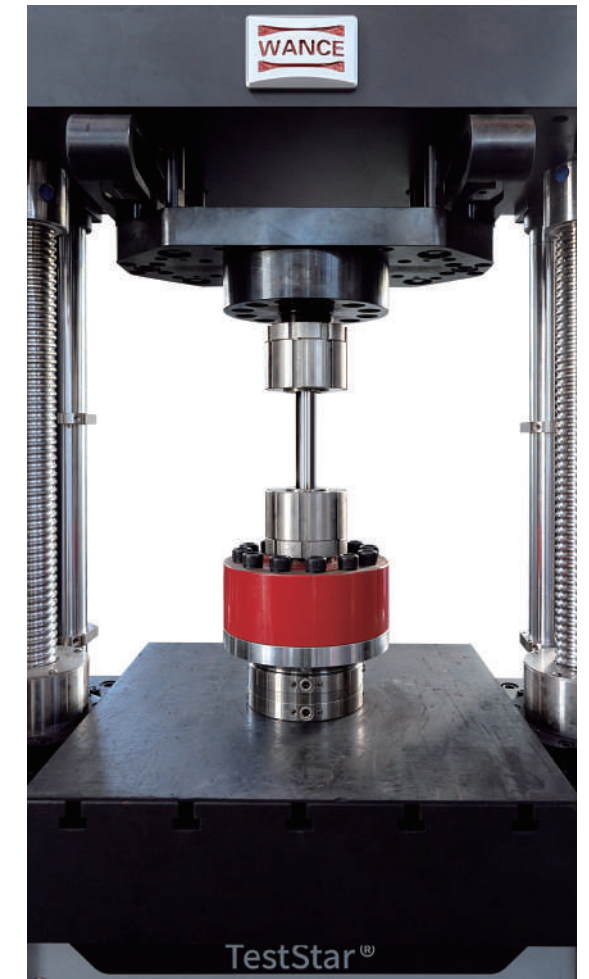
Frame
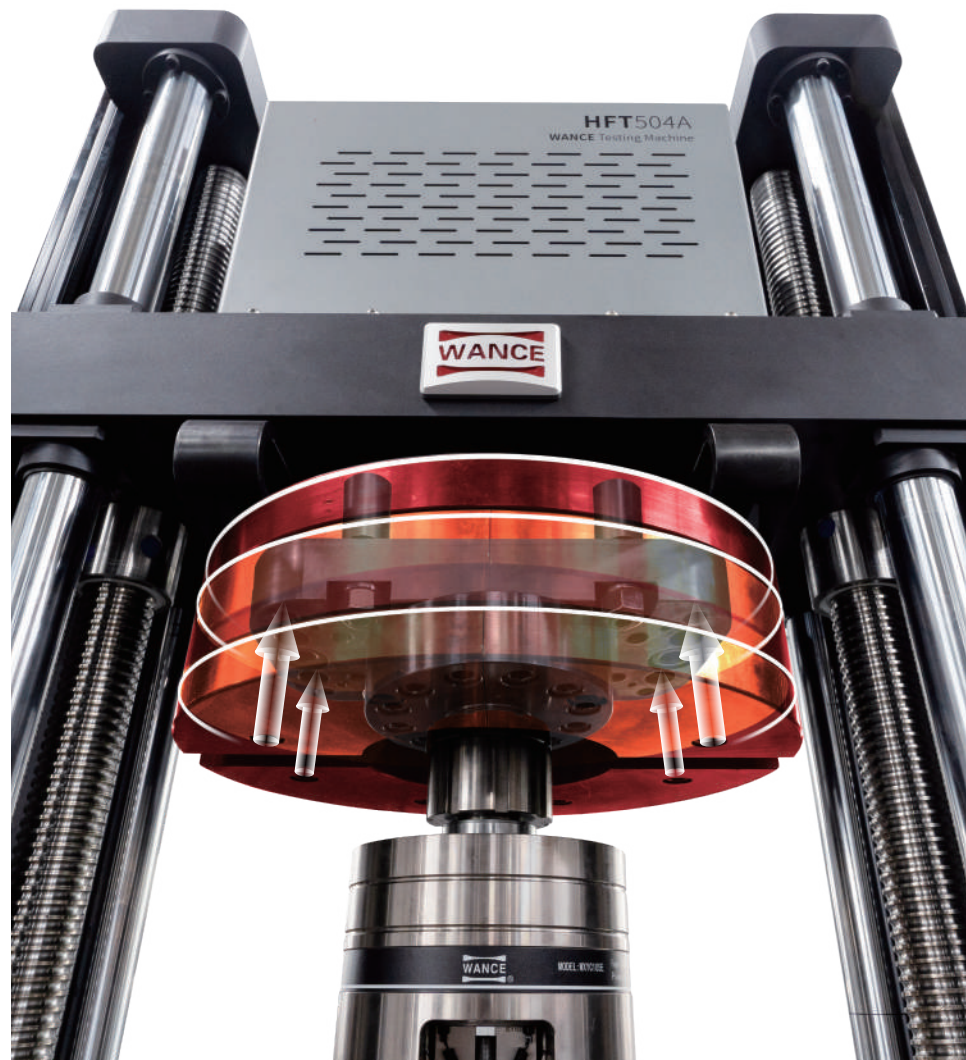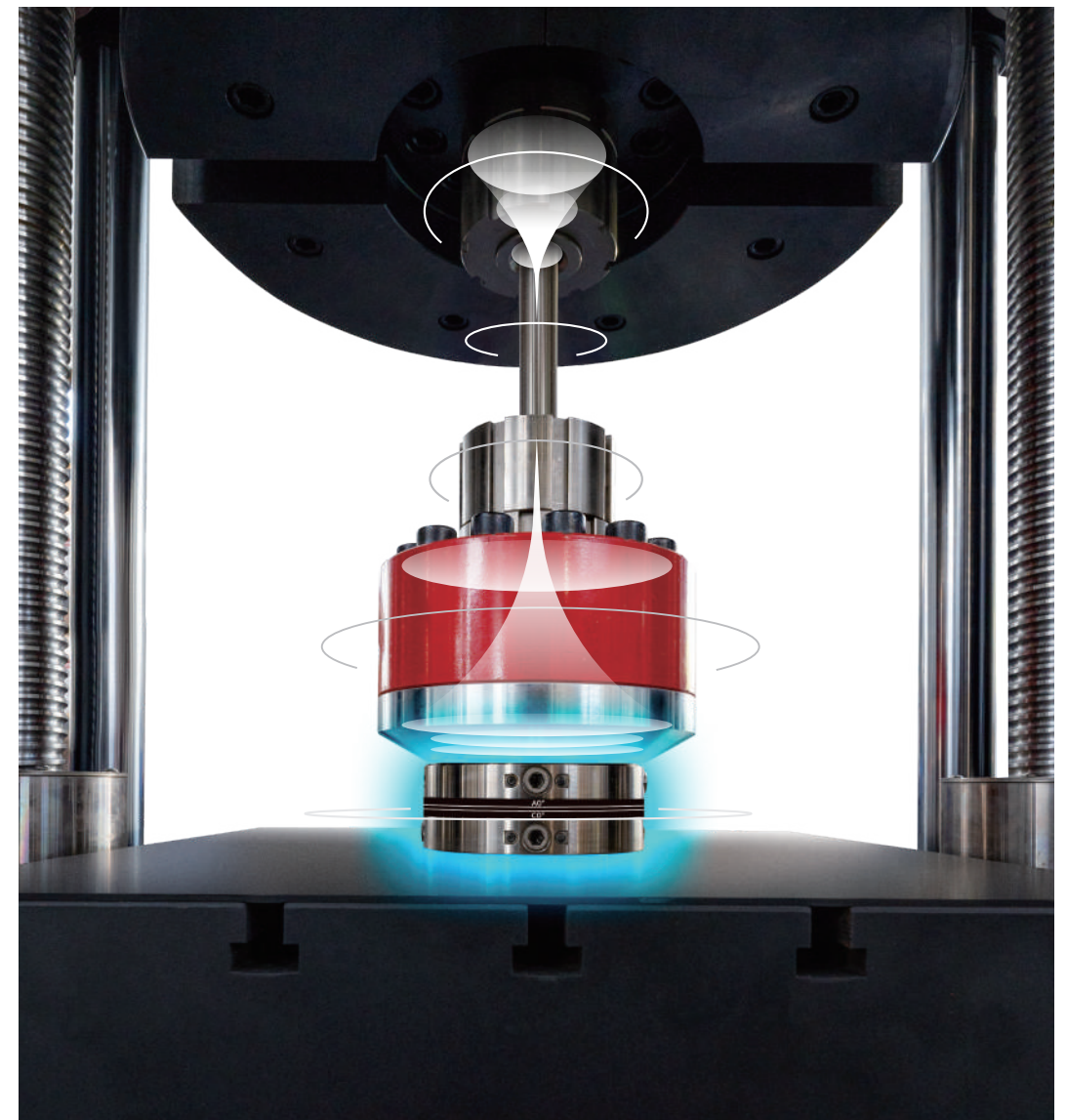
Multi-control testing frequency

To change testing frequency by adjusting counter-weight.

Frame

Alignment fixture

Alignment fixture ensures high center alignment.

WANCE
Testing
Machine

10 / Tel +86-755-23057280

WANCE
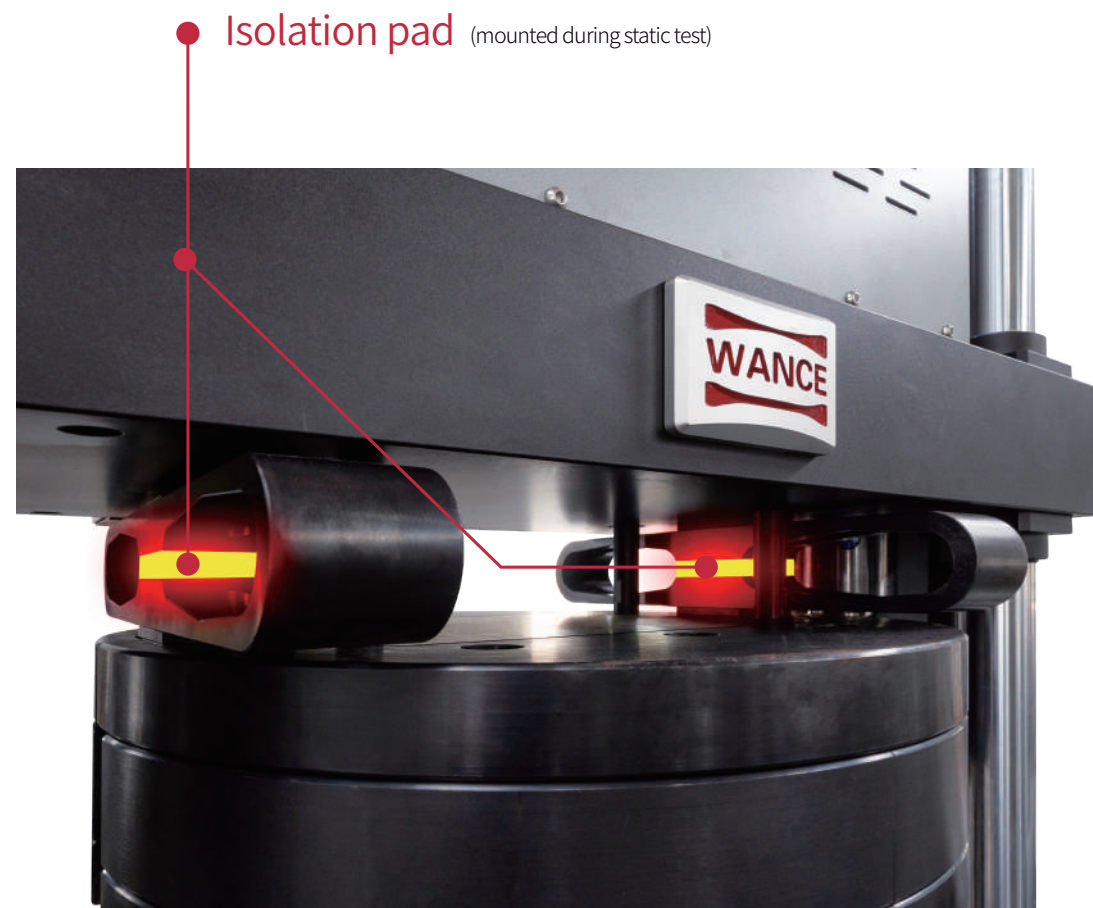Testing
Machine

11 / www.wance.net

Features

Frame

Static and dynamic test combination

The static load is applied by driving the ball screw with a motor, while the dynamic load is achieved through electromagnetic resonance. This eliminates the interference between the dynamic and static loads. By combining the dynamic test function with the static test function, it is possible to achieve dual functionality for both dynamic and static tests.

Isolation pad (mounted during static test)

Frame

High-efficiency

High test frequency and short testing time.
The energy consumption of electromagnetic resonance is low (about 3% of servohydraulic fatigue testing machines).

Energy consumption

100% Servohydraulic fatigue testing machine

3% High frequency resonant testing machine

Testing time

100% Servohydraulic fatigue testing machine

10-30% High frequency resonant testing machine

Other features

▶ The servo motor enables fast and precise control of the average test force.
▶ Pulse width modulation enhances control stability.
▶ Equipped with various accessories, it can be widely applied to all types of specimens and tests.
▶ Protection functions: overload protection, mechanical limit protection, exciter overcurrent protection, fracture protection, frequency drop protection, load upper and lower limit protection, etc.
▶ Large and adjustable magnetic gap, allowing a wide range of specimen adaptation.
▶ Coils can be switched into different combinations via a changeover switch.
▶ Worktable with T-slots for convenient expansion of accessory configurations.

WANCE
Testing
Machine

12 / Tel +86-755-23057280

WANCE
Testing
Machine

13 / www.wance.net

Controller

▶ DSP fully digital closed-loop control with multi-channel acquisition and high-speed data transmission capabilities.

▶ Accurately analyzes and captures the system's resonant frequency via FFT transformation to ensure smooth vibration initiation.

▶ Operates at a sampling and control frequency of 10kHz to ensure accurate and reliable data.

▶ Employs PID control algorithm leveraging DSP's hardware PWM for precise excitation power control, ensuring stable dynamic loading.

▶ Phase discrimination and frequency locking functions: Utilizes DSP's high-speed capture to lock phase of feedback load, ensuring resonant phase synchronization.

▶ Capable of collecting various test data: Frequency, mean values, cycle data, power supply voltage, operating current/voltage, etc.

▶ Automatically adjusts voltage output based on pulse width to maintain optimal pulse duration for high-precision control.

▶ Features adjustable control parameters: PID tuning, start frequency/pulse width/time adjustment, voltage/current limit regulation.

▶ Operates in a two-tier master-slave configuration between PC and controller. The slave DSP controller manages real-time phase-locking and PWM output during resonance.

▶ Controller functions independently; equipment operation continues even if PC malfunctions.

▶ Separate power supplies for host and controller ensure strong isolation and anti-interference capabilities.

▶ Locking-type connectors ensure durability and reliability, with logically arranged interfaces for easy plug-and-play operation.

▶ Dual emergency stop buttons enhance operator and equipment safety.

Features

Electrical Cabinet

WANCE
®

Software

▶ Programmed in C language for high efficiency and speed.

▶ Dynamic and static loads can be set separately or simultaneously during testing.

▶ Real-time display of static force, cyclic force, displacement, voltage, frequency, cycle, pulse width, deformation and other data.

▶ Detects and displays fault code information for immediate awareness of test status.

▶ Real-time monitoring, waveform display, data graph processing and saving, test report storage and printing.

▶ Intelligent online diagnostic function monitors the entire test process, provides timely alarms to ensure test safety.

▶ Supports test plan editing for quick adaptation to new test methods.

▶ Provides standard test plans for common test methods, easy to learn and operate.

▶ Automatically stores test process and raw data.

▶ Enables data (data continuity) for interrupted tests due to power outages or other factors, ensuring complete data retention.

▶ Test data can be imported into various office software such as Microsoft Office and WPS Office.

▶ Online monitoring of frequency, force values, limits, displacement and other parameters.

▶ Emergency stop in case of anomalies to protect equipment.

▶ Multiple curve types can be switched at any time.

▶ Supports arbitrary zooming, panning and traversing of test curves. Automatically adjusts coordinate system during testing to maintain optimal curve display.

▶ Supports real-time printing of test reports and curves.

▶ Supports remote control via computer.

Software
TestCenter
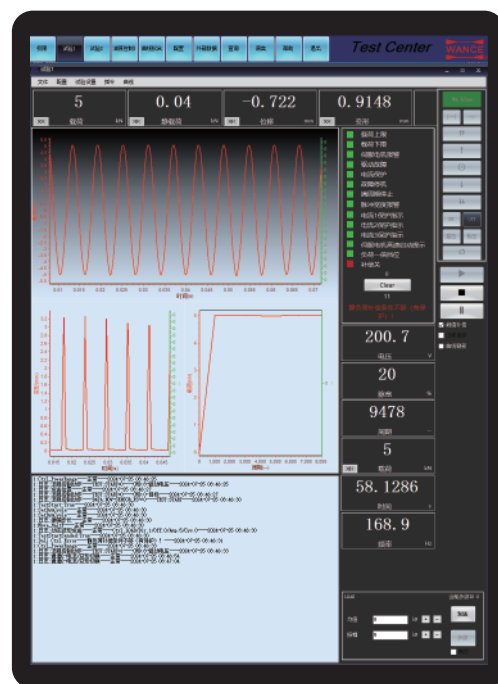
Software interface

WANCE
Testing
Machine

Hydraulic grip

25kN　100kN　250kN　500kN　1000kN　2500kN

Model	25kN	100kN	250kN	500kN	1000kN	2500kN
Vee jaws for round specimen（mm)	Φ5~Φ10 Φ10~Φ15	Φ5~Φ10 Φ10~Φ15 Φ15~Φ20	Φ10~Φ20 Φ20~Φ30	Φ10~Φ20 Φ20~Φ30 Φ30~Φ40	Φ20~Φ30 Φ30~Φ40 Φ40~Φ50	Φ30~Φ40 Φ40~Φ50 Φ50~Φ60
Flat jaws for flat specimen (mm)	0~8	0~8 8~15	0~10,10~20 20~30	0~10,10~20 20~30,30~40	0~15	0~20
Flat jaw (width x height) (mm)	30×38	50×65	50×90	80×90	130×130	160×150
Outside diameter (mm)	Φ126	Φ210	Φ270	Φ340	Φ444	Φ580
Height(mm)(excluding piston rod)	163	175	232	287	414	514
Single weight(kg)	9	39	85	162	410	900
Pressure(MPa)	21	21	21	21	21	42

Manual grip

For 50kN & 100kN machine:
Standard thread: M32x1.5;
Other threaded end specimen: made to order

Fracture extensometer (COD gauge)

Model: EX00503F, EX01204F
Gauge length: 5mm, 12mm
Extension: 3mm, 4mm

Features
▶ Extensometer can follow to fracture.
▶ Accuracy complies with ASTM.
▶ 350Ω full-bridge design, compatible with all testing systems.
▶ Class 0.5 according to ASTM E1820, ISO 12135, ISO9513.
▶ Easy installation with clamping force provided by measuring arms (elastomers).
▶ Suitable for high-frequency testing (up to 100Hz).

WANCE
Testing
Machine
18 / Tel +86-755-23057280

WANCE
Testing
Machine
19 / www.wance.net
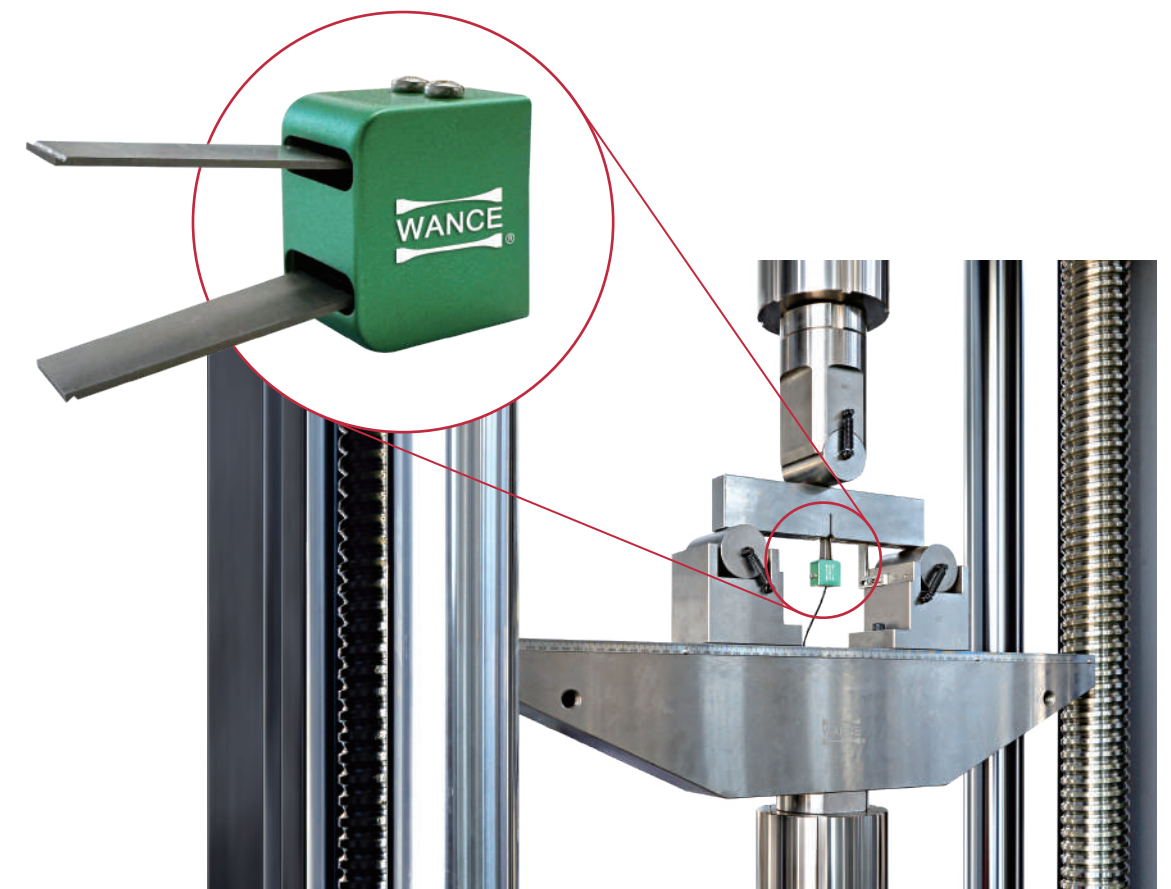
CT fixture (Compact tensile fixture)
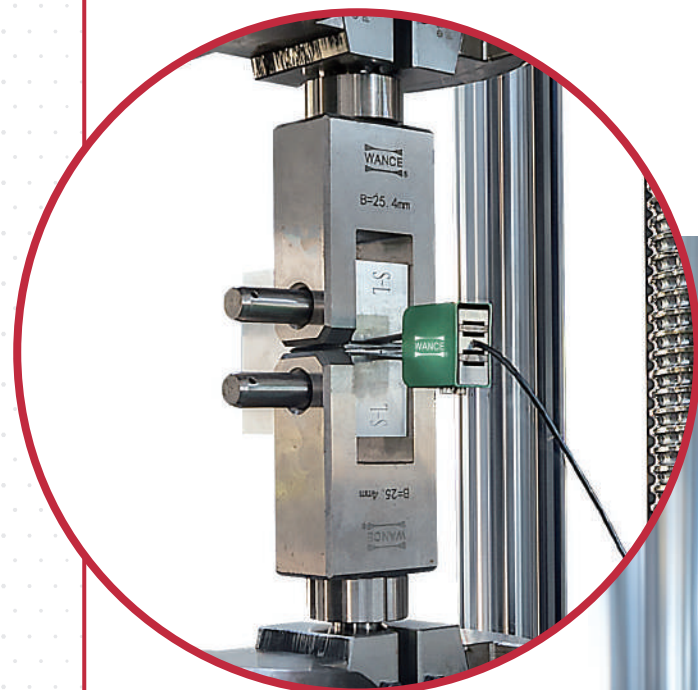
①Model 1：
B=6.35mm W=25mm d=6mm
②Model 2：
B=12.7mm W=50.8mm d=12.2mm
③Model 3：
B=25.4mm W=50.8mm d=12.2mm
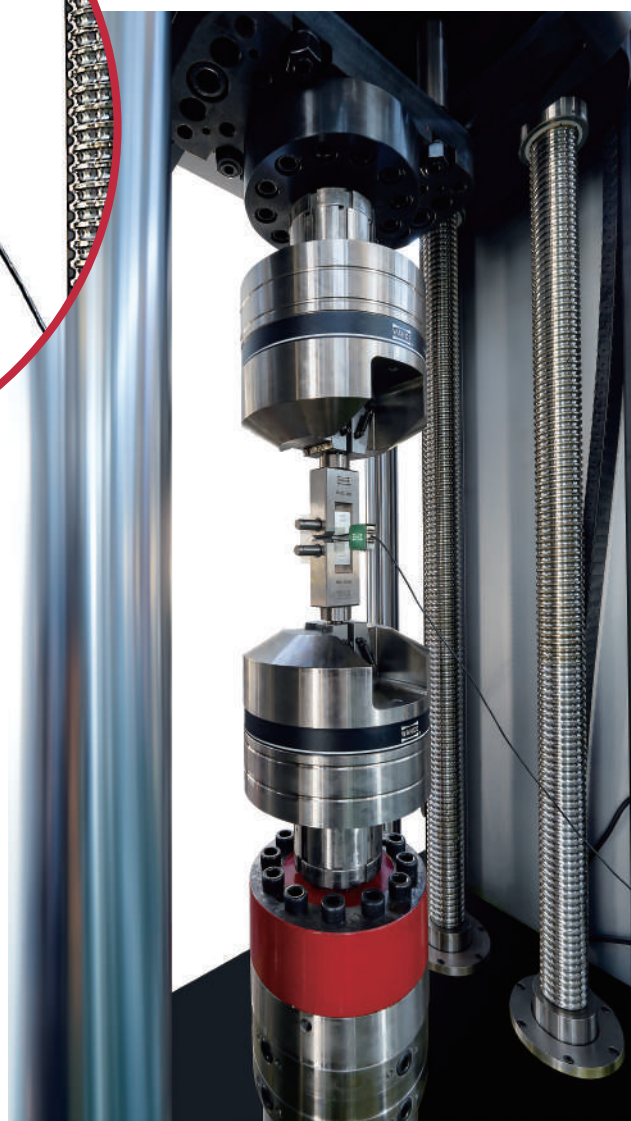
SEB fixture (Bending fixture)

Model：
①Force: 100kN
②Span L=40-300mm
③Support roller length: 46mm
④Support roller diameter
D=10mm,15mm, 20mm

WANCE
Testing
Machine

20 / Tel +86-755-23057280

WANCE
Testing
Machine

21 / www.wance.net

High temperature funace (with rail)

①Temperature range: 200°C~1000°C
②Inside dimension (LxWxH): 62.5x62.5x185mm
③Outside dimension (LxWxH): 300x145x223mm
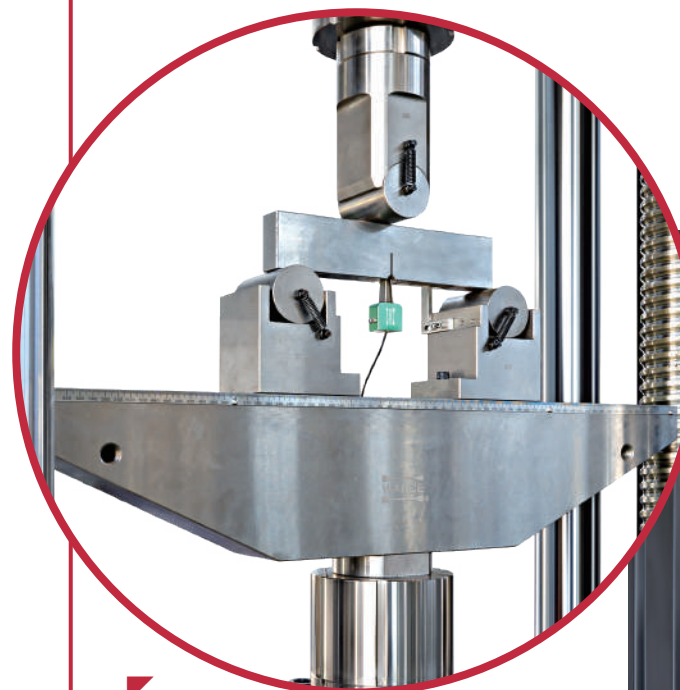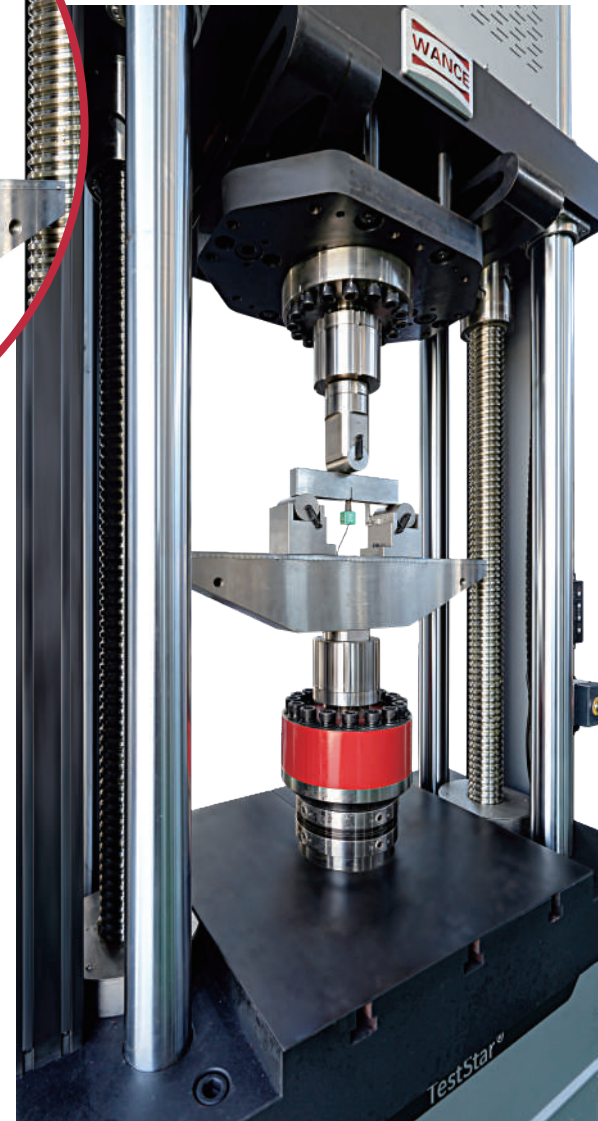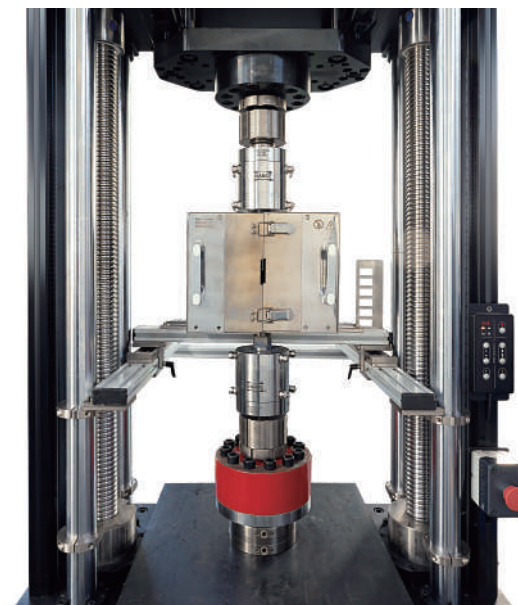④Front open: 25x8mm
⑤Furnace structure: heating is carried out using three silicon carbide heating elements
⑥Heating power: 2.4kW
⑦Uniform temperature length: 60mm

Chamber (with rail)

①Working temperature: -180°C ~ 350°C   ②Temperature fluctuation: ≤±0.5°C
③Inside dimension (LxWxH): 230x230x340mm   ④Outside dimension (LxWxH): 900x380x500mm
⑤Internal material: 304 stainless steel   ⑥Watch window:Electric heating frost prevention observation window
⑦Touch screen display   ⑧Power consumption: 1.6kW

Performance

The performance of this machine meets and is not limited to the relevant provisions of the following standards:

1、ASTM E647 Standard Test Method for Measurement of Fatigue Crack Growth Rates
2、ISO 4965：1979 Axial load fa-tigue testing machines—Dynamic force calibration—Strain gauge technique
3、ISO 204 Metallic materials—Uniaxial creep testing in tension—Method of test
4、ASTM E467-2008 Standard Practice for Verification of Constant Amplitude Dynamic Force in an Axial Fatigue Tes-ting System
5、ASTM E1012-2005 Standard Practice for Verification of Test Frame and Specimen Alignment UnderTensile and Compressive Axial Force Application

Function

The functions of this machine meet and are not limited to the relevant provisions of the following standards:

1、ASTM E399-2017 Standard Test Method for Linear-Elastic Plane-Strain Fracture Toughness KIc of Metallic Materials
2、ISO 6934-4:2020 Steel for prestressing of concrete-Part 4:Strand
3、ISO 10190:2008 specifies the dimensions and mechanical properties of roller and bush chains
4、ISO 15654:2004 Fatigue Test Method for Transmission Precision Roller Chain
5、ISO 15630-3:2019 Steel for the reinforcement and prestressing of concrete - Test methods - Part 3: Prestressing steel
6、ISO 15630-1:2019 Steel for the reinforcement and prestressing of concrete - Test methods - Part 1: Reinforcing bars, wire rod and wire

Note 1: Only the functions and performance that are compatible with the high-frequency fatigue testing machine ordered are met. The satisfaction of functions and performance is related to the selected mainframe, fixtures, and accessories, as well as the test specimens being tested.
Note 2: According to the continuous updates of the standards, WANCE will promptly update its products to ensure timely compliance with the requirements of the latest versions of the standards.

WANCE
Testing
Machine
22 / Tel +86-755-23057280

WANCE
Testing
Machine
23 / www.wance.net

Technical parameters

	50kN	100kN
Maximum force	50kN	100kN
Maximum mean force	±50kN	±100kN
Maximum cyclic force	±25kN	±50kN
Maximum deformation	4mm (±2mm)	4mm (±2mm)
Frequency range	50～320Hz	50～320Hz
No.of frequency steps	6	6
No. of guide columns	4	4
No.of drive lead-screw	2	2
Lead-screw type	Precise ball screw	Precise ball screw
Drive votage adjustment	Automatic	Automatic
Sampling & control frequency (kHz)	10	10
PC communication port	LAN port	LAN port
Sample clamping mode	Hydraulic clamping or manual screw	Hydraulic clamping or manual screw
Frame stiffness (at 1000mm)	180	380
No. of drive	1	3
Max.frequency at full load	Achievable	Achievable
Alignment under load	Standard type: better than 8%	Standard type: better than 8%
	Precision type: better than 5%	Precision type: better than 5%
Zero shift	±1.0%	±1.0%
Relatvie resolution	0.5%	0.5%
Static test and mean force control	AC drive	AC drive
Zero-point relative error of the force measurement system	±0.5%	±0.5%
Static force accuracy	Standard type: ±1.0% / Precision type: ±0.5%	Standard type: ±1.0% / Precision type: ±0.5%
Static force repeatability	1.0%	1.0%
Static force return accuracy	Standard type: ±1.5% / Precision type: ±1.0%	Standard type: ±1.5% / Precision type: ±1.0%
Cyclic force accuracy	Standard type: ±3.0% / Precision type: ±2.0%	Standard type: ±3.0% / Precision type: ±2.0%
Cyclic force repeatability	Standard type: 3.0% / Precision type: 2.0%	Standard type: 3.0% / Precision type: 2.0%
Peak cyclic force accuracy	Standard type: ±3.0% / Precision type: ±2.0%	Standard type: ±3.0% / Precision type: ±2.0%
Peak cyclic force repeatability	Standard type: 3.0% / Precision type: 2.0%	Standard type: 3.0% / Precision type: 2.0%
Cyclic force indication value variation within 10 min	Standard type: 3.0% / Precision type: 2.0%	Standard type: 3.0% / Precision type: 2.0%
Peak cyclic force indication value variation within 10 min	Standard type: 3.0% / Precision type: 2.0%	Standard type: 3.0% / Precision type: 2.0%
Counter capacity	≥9×10⁹	≥9×10⁹
Loading rate adjustment range(mm/min)	0-550	0-450
Max.displacement rate without load(mm/min)	800	700
Static stress control range (MPa/s)	0～30	0～30
Repeated positioning accuracy(μm)	±8	±8
Motor with braking function	Yes	Yes
Static loading mode	Servo motor	Servo motor
dynamic loading mode	Non-wear electromagnetic drive	Non-wear electromagnetic drive
Noise(dB)	≤90	≤100
Weight (without grips)(kg)	1800	4200
Load frame dimension [WxDxH(mm)]	660x915x2500	685x1130x2820
Control cabinet dimension (with computer)[WxDxH(mm)]	450x800x1200	550x900x1500

Technical parameters

	250kN	500kN	1000kN
Maximum force	250kN	500kN	1000kN
Maximum mean force	±250kN	±500kN	±1000kN
Maximum cyclic force	±125kN	±250kN	±500kN
Maximum deformation	4mm (±2mm)	2mm (±1mm)	2mm (±1mm)
Frequency range	50～285Hz	50～285Hz	50～285Hz
No.of frequency steps	8	8	8
No. of guide columns	4	4	4
No.of drive lead-screw	2	2	2
Lead-screw type	Precise ball screw	Precise ball screw	Precise ball screw
Drive votage adjustment	Automatic	Automatic	Automatic
Sampling & control frequency (kHz)	10	10	10
PC communication port	LAN port	LAN port	LAN port
Sample clamping mode	Hydraulic clamping or manual screw	Hydraulic clamping or manual screw	Hydraulic clamping or manual screw
Frame stiffness (at 1000mm)	380	980	980
No. of drive	3	3	3
Max.frequency at full load	Achievable	Achievable	Achievable
Alignment under load	Standard type: better than 8%	Standard type: better than 8%	Standard type: better than 8%
	Precision type: better than 5%	Precision type: better than 5%	Precision type: better than 5%
Zero shift	±1.0%	±1.0%	±1.0%
Relatvie resolution	0.5%	0.50%	0.50%
Static test and mean force control	AC drive	AC drive	AC drive
Zero-point relative error of the force measurement system	±0.5%	±0.5%	±0.5%
Static force accuracy	Standard type: ±1.0%	Standard type: ±1.0%	Standard type: ±1.0%
	Precision type: ±0.5%	Precision type: ±0.5%	Precision type: ±0.5%
Static force repeatability	1.0%	1.00%	1.00%
Static force return accuracy	Standard type: ±1.5%	Standard type: ±1.5%	Standard type: ±1.5%
	Precision type: ±1.0%	Precision type: ±1.0%	Precision type: ±1.0%
Cyclic force accuracy	Standard type: ±3.0%	Standard type: ±3.0%	Standard type: ±3.0%
	Precision type: ±2.0%	Precision type: ±2.0%	Precision type: ±2.0%
Cyclic force repeatability	Standard type: 3.0%	Standard type: 3.0%	Standard type: 3.0%
	Precision type: 2.0%	Precision type: 2.0%	Precision type: 2.0%
Peak cyclic force accuracy	Standard type: ±3.0%	Standard type: ±3.0%	Standard type: ±3.0%
	Precision type: ±2.0%	Precision type: ±2.0%	Precision type: ±2.0%
Peak cyclic force repeatability	Standard type: 3.0%	Standard type: 3.0%	Standard type: 3.0%
	Precision type: 2.0%	Precision type: 2.0%	Precision type: 2.0%
Cyclic force indication value variation within 10 min	Standard type: 3.0%	Standard type: 3.0%	Standard type: 3.0%
	Precision type: 2.0%	Precision type: 2.0%	Precision type: 2.0%
Peak cyclic force indication value variation within 10 min	Standard type: 3.0%	Standard type: 3.0%	Standard type: 3.0%
	Precision type: 2.0%	Precision type: 2.0%	Precision type: 2.0%
Counter capacity	≥9×10⁹	≥9×10⁹	≥9×10⁹
Loading rate adjustment range(mm/min)	0-550	0-250	0-250
Max.displacement rate without load(mm/min)	880	500	500
Static stress control range (MPa/s)	0～30	0～30	0～30
Repeated positioning accuracy(μm)	±8	±8	±8
Motor with braking function	Yes	Yes	Yes
Static loading mode	Servo motor	Servo motor	Servo motor
dynamic loading mode	Non-wear electromagnetic drive	Non-wear electromagnetic drive	Non-wear electromagnetic drive
Noise(dB)	≤110	≤115	≤115
Weight (without grips)(kg)	4500	10500	20000
Load frame dimension [WxDxH(mm)]	820x1150x3130	1350x1350x3600	1550x1700x4200
Control cabinet dimension (with computer)[WxDxH(mm)]	550x900x1500	550x900x1500	550x900x1500