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1. Automobile engine-related measuring machine

Crankshaft

Crankshaft balance measuring and correction machine
This machine measures the imbalance quantity and direction (angle) by using electric micrometer and corrects the balance automatically.
The cleaning is done inside this machine before the measurement and after correcting the balance.

Crankshaft total measuring machine
This machine measures each part of crankshaft and marks the parts.
This in-line machine measures Journal, Pin diameter, Pin stroke, Circularity of Pin/Journal (radial difference comparison method) and the Pin position distance, and result makes the specified making on each work piece based on the measurement.
Crankshaft

Crankshaft gear checker
This machine measures the O.B.D., run out and dent for balance shaft gear of crankshaft. The measurement is made by engaging the work piece with the master gear.

Crankshaft shape measuring machine
This machine measures circularity, cylindricity, concentricity, pin stroke, pin phase, straightness and taper angle of each outer diameter of the crank shaft, and longitudinal length. It is possible to print out the shape data such as roundness and cylindricity.
Crankshaft measuring machine

This machine is an automatic equipment which measures the dimensions of the crankshaft, and determines the classification of the work piece. Also, is possible to mark the rank for each axis.

Camshaft measuring machine

This machine measures the outer diameter of the journal portion of camshaft, the maximum and minimum diameter of cam portion. The flexible head with long displacement enable you to measure various dimensions.
Cam shaft

Cam shape measuring machine
This machine measures the shape (profile) of cam portion of Camshaft. It is also equipped with chatter measurement function. It can print out shape data.

Cylinder Block

Cylinder block crank hole diameter measuring machine
This machine measures the crank-hole diameter of cylinder block by using an electric micrometer and automatically makes a judgement by a specified method. It makes temperature correction by measured machine temperature and work temperature. In addition, it performs the mastering if machine temperature changes more than 2°C.
Cylinder Block bore hole measuring machine
This machine measures the bore diameter of cylinder block by an electric micrometer and automatically makes a judgement by a specified method.
It measures machine temperature and work temperature to make temperature correction.
In addition, when machine temperature has changed more than 2°C, the mastering measurement is made. The correction signal for honing sizing is provided as an output.
It outputs the correction signal for honing sizing.

Cylinder block crank hole diameter deburring measurement and marking machine
This machine performs deburring of crank hole after the boring process of cylinder block is finished. Next, it measures each bore’s size by an electric micrometer and marks ranking after making OK/NG judgement.
**Piston**

**Piston measurement machine**
This automatic machine measures the piston's outer diameter, inner diameter, weight and the ring groove diameter of pin hole. It marks the rank of outer and inner diameters and convey (unload the parts) to a predetermined position. This machine discriminates the model by image processing system.

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**Cylinder Head**

**Cylinder head measuring machine**
This machine measures the lifter hole inner diameter, seat hole inner diameter and guide hole inner diameter of intake and exhaust cylinder head by an electric micrometer, and makes a judgement OK or NG.
Connecting Rod measuring machine

This machine measures the large end, small end and weight of the connecting rod, then it marks ranking based on these results. It can support carrying out chute setup by rank, and also transport by a robot.
Turbine wheel / compressor wheel balance measuring and correcting machine

This machine measures the imbalance of the turbo turbine wheel and the compressor wheel. Correction processing is also possible based on the calculation.
Engine assembly

**Cylinder head ASSY tappet selection machine**

This machine measures the predetermined size of the camshaft, and the cylinder head Assy being assembled. According to the size calculation, select the tappet with proper thickness to make proper clearance between camshaft and tappet when assembling.

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**Cylinder head ASSY Clearance Checker**

This machine checks if the clearance between cam and tappet under the condition that the selected tappet, the camshaft and the cylinder head have been assembled.
CVT Pulley measuring machine

This machine measures the groove dimensions of the CVT PULLEY on fixed side and sliding side, OBD diameter, inside and outside diameter, splitting groove degree by using an electric micrometer and a digital scale. And then it displays the measurement result on the measuring control unit screen and also judges whether it's OK or NG.
Torque Converter

Torque converter measuring machine

This machine is an automatic machine that can measure the check items of torque converter as below. And the multiple use of the work is possible if you exchange the setup simply.
List of the check items: the hole position, HUB height, standards BOSS end face height, HUB, BODY outside dimension, measurement of each type of RING GEAR, large and small SPLINE rotation TORQUE.

AT Housing

AT Housing

This unit measures inner and outer diameter, groove bottom diameter and deflection of A/T housing by using electric micrometer, and judges whether the product is OK or NG.
Transmission shim selection machine

This machine measures how high two parts are positioning before assembly so that the proper preload is applied to the bearing of the drive shaft of the transmission. It is a measuring instrument that selects a shim with appropriate thickness for assembly by calculation.

CVT sheave alignment measuring machine

This machine measures the mutual positioning of the CVT when assembling the CVT sheave in the rear case by an electric micrometer. Next, it makes a judgement and displays the result by the control unit. From the result it calculates the alignment dimensions needed for assembly.
3. Automobile differential related measuring machine

**Carrier**

**Carrier alignment measuring machine**

This machine automatically measures the hole size of the carrier and the distance from the hole to the end face. This information is needed when the shim is selected for differential assembly and carried out to the post-process after writing the information on it by ID.

**Differential case, Drive pinion**

**Differential case, drive pinion set width measuring machine**

This machine measures the height dimension under the condition that the bearing is assembled to the differential case and drive pinion. This information is needed when the shim is selected for differential assembly and carried out to the post-process after writing the information on it by ID.
**Differential assembly**

**Companion deflection measuring machine**

This machine measures the companion rotating deflection and marks where it occurs maximum. The measurement should be made when the condition that the differential is assembled. This marking is required during the assembly with propeller shaft to be connected.

**Side shim**

**Side shim selection machine**

This machine measures the distance between case mating surface and dif. outer mounting surface, and the distance of UD shaft gear end surface. According to the measured value and ID reading, it selects the dif. side shim and UD shim required for assembling.
4. Automobile axle related measuring machine

Front hub

Front hub run out measuring machine
This machine measures run-out of the brake disk mounting surface related to the bearing axis of the front hub, and marks where the deflection occurs at the most. This marking is used for the connection with brake disk during assembling process.

Brake disk

Brake disk deflection measuring machine
This machine measures the deflection of the brake disk mounting surface related to the bearing axis of the front hub and marks where deflection occurs at the most. This marking is used for connection and assembling with front hub.
Ball Joint

Ball joint ball outer groove diameter measuring machine
This machine measures the inner diameter of the outer ball groove of the ball joint. With measurement result, it indicates which ball should be used properly.

Ball joint ball inner groove diameter measuring machine
This machine measures the inner diameter of the inner ball groove of the ball joint. With measurement result, it indicates which ball should be used properly.
5. Bearing related measuring machine

Inner ring, Outer ring

Bearing ball groove shape measuring machine

This machine measures the shape of each ball groove of inner and outer rings. It calculates the R dimensions of the grooves, PV value (maximum and minimum value of shape graph).

Bearing matching measuring machine

This machine measures the inner ring groove diameter and puts it in the inner ring rotation stocker. Also, the classified ball was prepared in advance, after measurement of outer ring of groove diameter, select the inner ring and a ball to make optimum clearance.
**Inner ring, Outer ring**

**Minimum bearing ball matching measuring machine**

This machine is a minimum sized bearing ball matching assembly. The minimum inner diameter can be handled is $\Phi 1\text{mm}$. It measures the inner and the outer rings of ball grooves, and set up with the optimum clearance on the basis of the calculation.

**Bearing assembly**

**Bearing total measuring machine**

This machine measures the various items of completion bearings. Make discrimination of OK / NG and read automatically the bearing number to make the inspection report.
Needle roller outer diameter inspection machine

This measures the outside diameter of the needle roller and makes judgement. Also it makes correction with the feedback signal from the measurement results.
6. Shaft related machines

Flexible shaft

Flexible shaft measuring machine

This machine measures the outer diameter and longitudinal dimensions of the shaft shape work, and makes the selection.

Drive shaft

Drive shaft measuring machine

This machine measures each outer diameter of the drive shaft gear, the spline outer diameter and the engagement gear by the detector installed an electric micrometer. It also measures the engagement of the drive shaft gear and the master gear.
7. Ball screw measuring machine

Ball screw / lead measuring machine

This machine measures the automatically the lead of ball screw by the use of a laser interference instrument DISTAX.
Changing the measurement jig makes "screw axis single measurement" and "nut assembly measurement" possible.

DISTAX light source
Laser light can be wired the same as the wiring due to the fiber-coupled DISTAX

Meas. screw ball
Probe

DISTAX (2-axis synchronous system)
The connection is very flexible thanks to the fiber optic cable

Screw axis measurement
Nut mounting measurement
Ball screw O.B.D measuring machine

This machine measures the ball screw nut and screw O. B. D. (over ball detector) dimensions by an electric micrometer, and selects the ball properly.
8. Air compressor related measuring machine

Vane

Vane width right angle measuring machine
This machine measures the width and squareness of the vane (taper) and sort based on the width dimension.
This can sort me piece per second at speed and also classify items up to 10 types.

Rotor shaft

Rotor size measuring machine
This machine is a manual to measure the outside diameter, cylindricity, roundness and the width of rotor shaft.
**Cylinder Alignment machine**

This machine adjusts the bearing temporarily assembled with a cylinder in the proper position, based on the data of the shaft measurement. And rotary compressor cylinder, bearings and the shaft can be assembled within the dimension tolerance. After it moved the optimum position, this machine tightens the bolt up by a nut runner.

![Shaft measurement](image)

![Cylinder bearing measurement](image)

**Casing pipe inner diameter, concentricity measuring machine**

This machine uses the internal diameter of 4 points of the casing pipe of the scroll compressor, a straight line connecting the virtual axis of two points of inner diameter as a reference, to measure the misalignment amount between the reference and the object that is the virtual axis of the inner diameter with one place and judges OK/NG.
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