

규격서

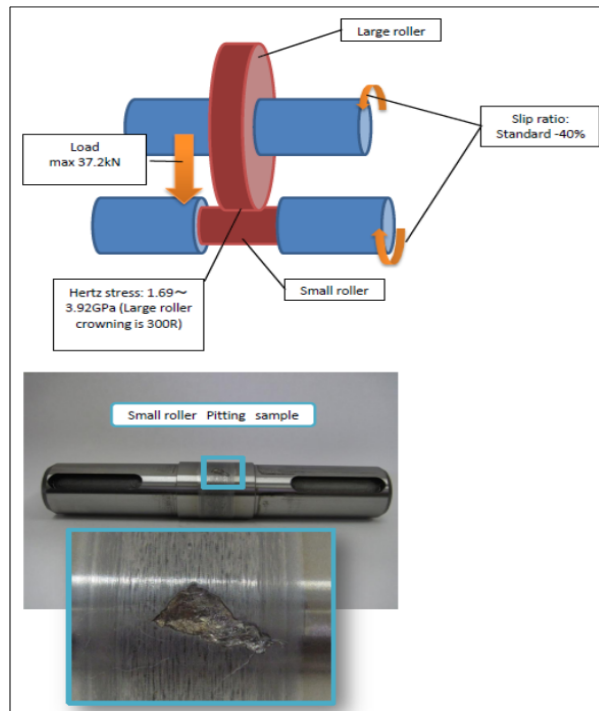
COMMODITY DESCRIPTION

세부품명번호 Item No.	품목 및 규격 Description	단 위 Unit	수 량 Quantity
피로시험기 (Fatigue testers) 4111460801	접촉피로시험기 Roller Pitting Testing Machine	대	1

A. Principles and characterisc of a roller pitting testing machine

□ Introduction for the roller pitting testing machine.

The purpose of a roller pitting testing machine is to investigate the effect on pitting fatigue strength and its mechanism. A conventional friction test machine which is a typical equipment in the field of tribology is helpful but limited to measure a friction coefficient. Instead the roller pitting testing machine can conduct a testing with load conditions and slip effect which is observed on gear surfaces particularly. There are many investigation to indicate that shot peening is a valid means to improve the bending strength of gear teeth, but there are only a limited number of studies on its effect on pitting fatigue. The bending stress can be easily predicted analytically. However the pitting mechanism happening with a certain loading condition with real slipping motion (or dynamic freiction) is difficult to analyze since the dynamic friction involves the nonlinear analytics. For these reasons, the construction of database for the fatigue life with a various surface conditions could be obtained by use of roller pitting machine practically.



< Pitting cause by contact fatigue and slip motion >

□ Characteristics

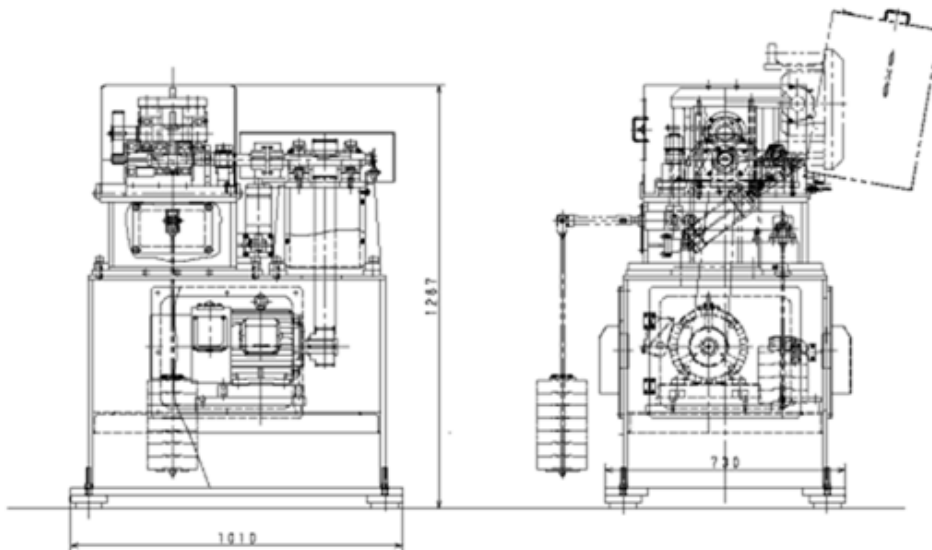
The technology for surface treatment of machinery, (i.e. shot peening of carburized spur gear) is essential role in the manufacturing industry. In general, the equipment for tribology does not limit the purpose of the investigation. However the expected equipment will be utilized in the field of car manufacturing industry. For this reason, the expected equipment(Roller Pitting Testing Machine) must have the compatability with the equipment which is generally used in the surface treatment research of car OEMs. For this reason the Seshine RP-201 compatible equipment is needed .

B. Constitution

1. Main body

Sketch drawing of the expected main system module is shown in the attached Figure 1. Two gears shown on the left part of the front view are used to alter rotation speed of two rollers and create sliding effect.

Due to weight load variation contact pressure applied to the small roller (driving specimen) varies from 1,060Mpa to 3,920Mpa ($R=300$, low contact pressure Att used). The figure below indicate the way of applying the weight.



<Figure 1. Main body sketch>

2. Lubrication oil unit

Lubrication unit consists from specimen oil tank, fan cooler, heat exchanger, heater's tank unit, and oil heater.

1) Specimen oil tank

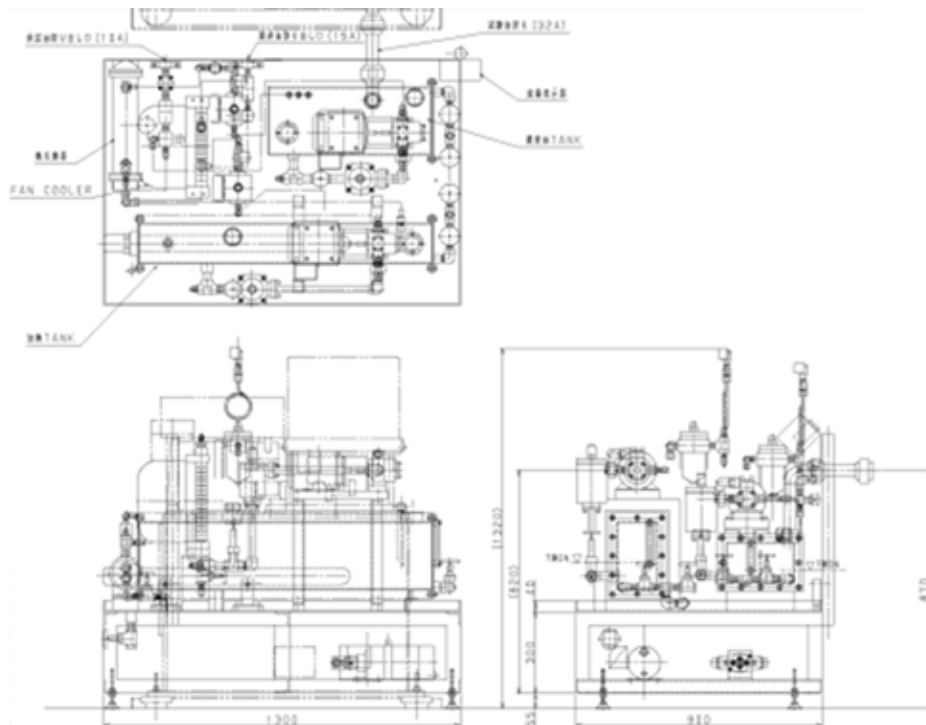
This tank unit contains oil supplied to specimens under test (and to lubricate bearings). The unit is equipped with suction filter pipeline filter with clogging sensors and flow meter used to measure the flow rate of the oil supplied to specimens.

2) Test temperature control.

To prevent specimen oil degradation caused by direct heating, the oil is heated to test temperature indirectly by means of heat exchanger. Cooling is controlled by the fan heater. To raise heating efficiency oil is supplied to test specimens and bearings only after it is heated to oil tank set temperature; during the heating oil is circulating inside closed loop.

3) Heating tank unit

The purpose of this tank is to heat the oil supplied to test specimen using heat exchanger. A plug heater is installed inside the tank.



<Figure 2. Lubrication oil unit sketch>

3. Lubrication oil unit

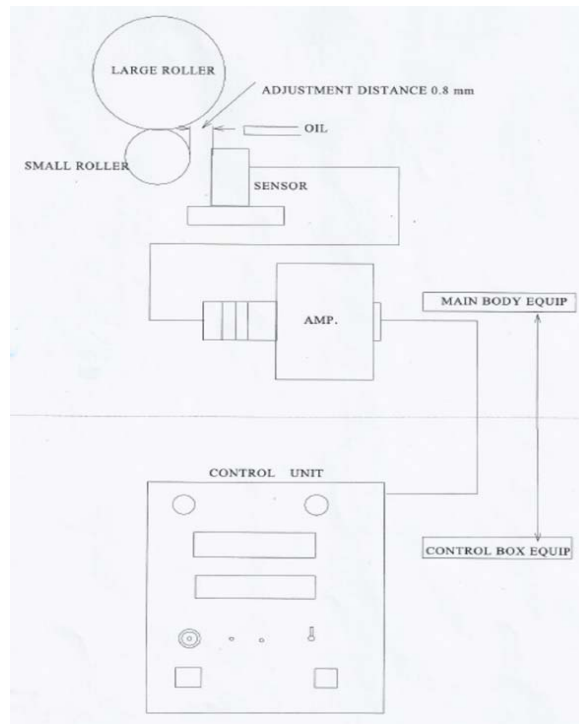
Automatic control panel is shown in the Figure 3.

The following devices are used to control the test equipment: control buttons, lamps showing the cause of automatic emergency stop, touch screen for indication of all test conditions.

4. Pitting detection device

As shown on the Figure 4, pitting detector consists from probe, preamplifier (installed in main unit), processing unit (installed in control panel) and connecting cables.

Preamplifier emits light beam on small roller, detects reflected light, and converts it into electric signal and amplifier the signal. Processing module contains "pitting present" signal generation circuit and pitting size estimation unit.



<Figure 4. Pitting detection device sketch>

5. Constitution of the expected equipment

1) Parts detail

No	Parts	Example of specifications (i.e. maker, type, etc.)
1	Super leveler	東海 RUBBER TK1140H
2	Bearing	NSK NJ408M
3	Main motor	7.5kw 4P INVERTOR MOTOR
4	Pulley	BELT 26H200B
5	Belt	BELT 560H200B
6	Bearing	NSK NJ2309 or equivalence
7	bearing	IKO TAFI-405520
8	Coupling	CR-5016 J iii
9	Pillow unit	PILLOW BLOCK UCP308
10	Pulley(drive shaft)	BELT 18H200B
11	Suction filter	SFN-03 #150
12	Line filter assy	UL-03- EV

13	Filter element	P-VL-03-20U
14	Oil pump	OIL PUMP TOP2MY400-210-HBMRVBVF
15	Air breather	FA-35
16	Heater	2kw
17	Level switch	OLV-5
18	Solenoid valve	KSO-G02-66CA-30
19	Pressure gauge	GC61-174-1MPa
20	Pitting detecting device	KOMATSU
21	Pitting detecting probe	KOMATSU

C. Specification

1. General uses

Contact fatigue of a material is measured by analyzing pitting and other surface damage caused by rotation and sliding of two roller specimens (big roller and small roller) pushed together with high pressure force.

2. Specification for operation

1) Specimens load :

a. Load : 0.75KN ~ 37.2KN

b. Hertz pressure :

In case of roller crowning 300R (values in brackets are for low contact pressure Att)

Standard - for weight = 0N : 1,690 Mpa (1,060 Mpa)

for weight = 350N : 3,920 Mpa (2,150 Mpa)

2) Specimen's rotation speed :

a. Drive motor with inverter : AC200V, 4P, 7.5KW, variable speed

b. Small roller's rotation speed : 500 ~ 2,000 rpm

- c. Sliding factor : standard 40%
- 3) Temperature of oil supplied to specimen :
 - a. Temperature inside oil tank : fixed in the range from room temperature to 80°C
 - b. Specimen's oil heating temperature : from room temperature to 120°C
 - c. Oil flow rate : MAX 5.0 l/min (120°C). *Emergency stop is activated if flow rate is too low.
- 4) Oil heating temperature : Automatic control of specimen's oil temperature
- 5) Automatic pitting detection : Optical and vibration methods
(optical method is used only for oil temperature below 80°C)
- 6) Automatic stop after specified number of revolutions:
Test stops after specified number of revolutions is reached.
- 7) Horizontal load indication :
The moment when load becomes horizontal is indicated by lamp.
- 8) Sound insulation measures :
Soundproof and sound absorbing materials are attached to the cover. Effort to reduce sound level and the weight of cover should be made.

3. Specification for safety

To prevent accidents the test is aborted in the following situations.

- 1) Full stop : Press emergency stop button in emergency situation to stop the system.
- 2) Motor error : If current in main motor or oil pump motor is higher than the upper limit.
- 3) Oil temperature too high : If oil temperature is higher than the upper limit.
(oil temperature in supply tank, heating tank, specimen and bearings is checked)
- 4) Oil level too low : If oil level low switch in supply or heating tank triggered.
- 5) Flow rate too low : If flow rate in lubrication, heating or supply pipeline is below the limit system is fully stopped.
- 6) Oil filter clogging : When pipeline or suction filter is clogged.
- 7) Pitting detected : When pitting is detected by optical or vibration method.
- 8) Set number of revolutions is reached : Automatic stop after the end of experiment.
- 9) Cover opened : If cover of test chamber or main motor is opened.

10) Oil pressure too low : If pressure in oil pipeline is below the lower limit.

11) PLC error : If controller error occurred.

12) Inverter error : If inverter error occurred.

After automatic stop alarm buzzer sounds and alarm message is displayed on touch screen.

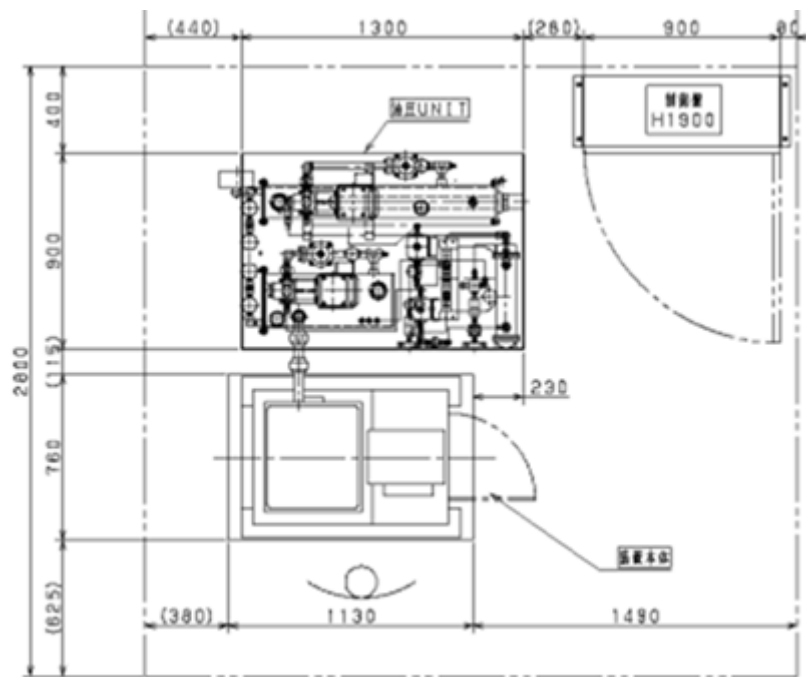
Switch to alarm screen and acknowledge the message.

4. Utility

1) Mains voltage : AC200V \pm 10%, 60Hz.

5. Constitution (Test equipment structure)

Test equipment consists of the following basic parts : main unit (Figure 1), oil unit (Figure 2), automatic control panel (Figure 3). Equipment layout is shown on the Figure 5.



<Figure 5. Expected layout for the equipment>

D. Accessories

1. Consumable parts

1) Main bearing 4EA/set \times 2set

2) Bearing 1EA/set \times 2set

3) Shaft

- a. Driving axis 1EA/set×3set
- b. Engaged axis 1EA/set×3set
- c. Small Gear axis 1EA/set×3set
 - Belt 1EA/set×2set
 - Oil Filter 3EA/set×2set×4set

4) Attached Tools

1	Wrench for loading nut	1
2	Snap ring pliers CS-10	1
3	Ratchet wrench 19x21, 22x24	1
4	Plastic hammer	1
5	Monkey wrench a250	1
6	Hexagonal long wrench set	1set
7	Thickness gauge	1
8	Tool box	1
9	Key	1set

E. Remarks

- ※ Installation should be completed within 5 months
- ※ The brochure containing pictures of the product and specifications should be presented before the contraction.

1. Maintenance

1) Check list for the initial test

- a. Leakage of water and oil: Connection, oil level meter, etc.
- b. Loose bolts and nuts:
- c. Disconnection, short circuit, loose terminals:
- d. Oil level check and supplement: Supplement same trade mark oil
- e. Tension of belt and adjustment:
- f. Grease up and check:

2) Periodic maintenance

- a. Large roller and small roller bearings exchange
 - Ordinary life span is following, at 250 kgf/mm², but change by stress, rotary speed and lubrication. For large roller: 3,000 Hours For small roller: 2,000 Hours
- b. Oil exchange: Life span is 2,000 hours, but shortens at high temperature
Stop by filter choking.
- c. Line filter element: Wash or exchange the element, when automatically
- d. Grease: Grease up interval is 1,000 hours.