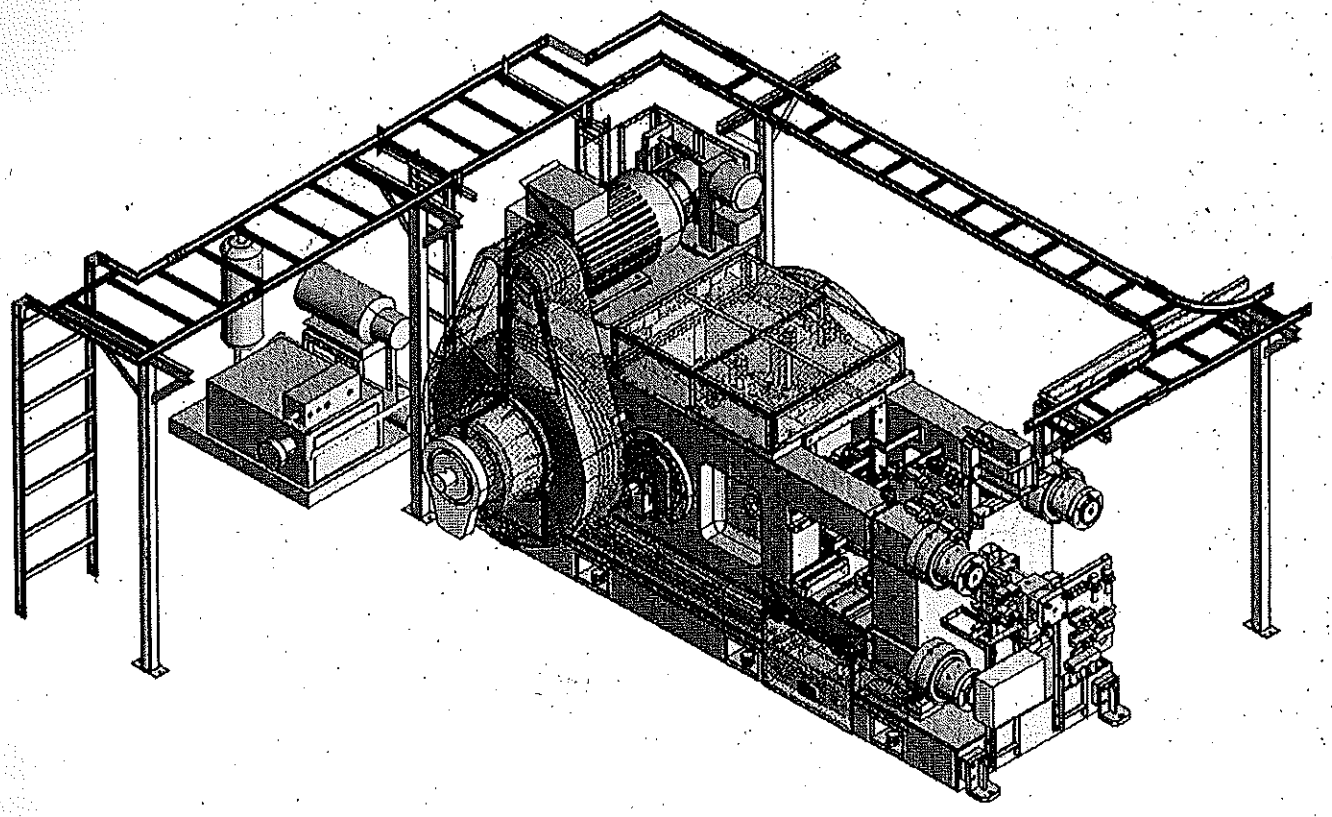
Main Press #243

I. OUTLINE & INSTALLATION

This section provides a general description of the press plus cautionary points relating to its installation. Also please refer to this section if the press is moved to a new location or sold to a new owner.

1. Description

The THP500 is a compact horizontal forging press that provides adequate frame strength to assure a high quality forged product. In addition to a kickout mechanism that ejects the forging from the die, the compact THP500 employs a highly responsive hydraulic drive system and proprietary hydraulic power cylinders. The unique frame design of the THP500 press simplifies and speeds up the job changeover operation



2. Specifications

Model THP500

Forming Step	1 (exclude cutting station)
Kickout Stroke: First Stroke	24 mm
Second Stroke	50 mm
Kickout Power	150 kN
Open Height	625 mm
Closed Height	425mm
Die (W x L)	500x490 mm
Punch (W x L)	250x350 mm
Dieset Replacement	
Frame Opening Dimensions (H x W)	570x475 mm
Ram Stroke	200 mm
Forging Force	5,000 kN
(nominal forging power at 1.3mm before TDC)	
Cycling Time	6.5 sec.
Crank Speed	60 rpm
Main Motor	37-8 kW-P
Machine Weight	28 tons

1-3 Specifications of the press

P C H − 4 0 0 S U 400TON Withdrawal type powder compacting press

No.	Item	Unit	Rating (summary)
1	Maximum pressing capacity	ton	400
2	Maximum ejection capacity	ton	220
3	Die float stop capacity	ton	200
4	Upper ram stroke	mm	220
5	Upper ram adjusting stroke	mm	110
6	Max. powder filling depth	mm	150
7	Max. pressure stroke	mm	50
8	Max. ejection stroke	mm	100
9	Upper punch hold down stroke	mm	125
10	Under fill / overfill stroke	mm	7.5
11	Moveable core stroke	mm	150
12	Compacting capacity (piece/minute)		6- - 12
13	Motor for main drive	kw	45 (4P) Inverter control
14	Hydraulic unit	kw	15 (4P)
15	Upper ram adjustment motor	kw	0.75 (4P)
16	Filling adjusting motor	kw	3.7 (4P)
17	Ejection motor	kw	0.4 (4P)
18	Die surface adjusting motor	kw	0.4 (4P)
19	Lubricator motor	kw	0.75 (4P)
20	Motor	w	90
21	Grease		Auto greaser
22	Tool holder		Customer to make
23	Tool holder clamp	1. Fixed plate by hyd. clamp 2. Upper punch plate by cylinder Upper punch plate of tool holder is raised to reach upper ram.	
24	Cylinder capacity (1) Upper punch hold down	Cylinder dia. ϕ180 × Rod dia ϕ100 (Descend area 254 c㎡) (Ascend dia 175 c㎡)	
	(2) Fill cylinder	Cylinder dia ϕ244 × 2 (Area 467 c㎡ × 934 c㎡)	
	(3) Balance cylinder	Cylinder ϕ140 × 2 (Area = 153 c㎡) (Ascend area 175 c㎡)	
	(4) Under fill / Overfill	Cylinder dia ϕ244 × Rod dia ϕ60 × 2 (Ascend area 467 c㎡ × 2 = 934 c㎡) (Descend area 439 c㎡ × 2 = 878 c㎡)	
	(5) Core cylinder	Cylinder dia ϕ160 × Rod dia. ϕ50 (Descend area 181 c㎡) (Ascend dia 201 c㎡)	
	(6) Hyd. Cylinder for die pulling down	Cylinder dia ϕ80 × 2 (Cylinder area 50 c㎡ × 2 = 100 c㎡ Max. hyd. force 1140 Psi (7.8 MPA)	
25	Tonnage indicator	Hyd. loadcell with upper / lower limit contact	

26	Clutch brake		Air combination type
27	Timing controller		Maker : NSD VS-6E EX
28	Flywheel		Disc brake
29	Cycle counter	pcs	2 (magnetic)
30	Powder feeder	Motor driven feeder (swing lever type)	
31	Hopper	Equipped with mixing device	
32	Feeder		Customer to make
33	Table		Customer to make
34	Air operation		Central control system
35	Hydraulic operation		Central control system
36	Electric operation		Central control system
37	Primary voltage		AC 480V 60 HZ
38	Operation voltage		AC 110V 60 HZ
39	Tools		Provided

#1 Furnace

To Aichi Steel Works, Ltd.

File No. N4134

Delivery Specification

Equipment name: Hearth rotary type sintering furnace

Type: 142-G-22AS

Manufacturer's serial No.: KTS-014832

Prepared: July 10, 2001
△ 1 Revised: July 19, 2001
△ 2 Revised: November 12, 2001

Industrial Furnace Equipment Dept.
Metal Heat Treatment Equipment Group

Approved	Checked		Prepared	
	E	M	E	M
H. Hashimoto	N. mitani	H. Hashimoto	N. mitani	K. Kushigawa

KOYO THERMO SYSTEMS CO., LTD.

General Specifications

Equipment name: Hearth rotary type sintering furnace
Type: 142-G-22AS
Layout drawing No.: J-10-3152B

1. Scope of manufacture

1.1 Equipment body

Hearth rotary type sintering furnace: 142-G-22AS	1 unit
Storage:	1 set
Loading unit:	1 set
Unloading unit:	1 set
Flow panel:	1 panel
Atmosphere gas control unit: S-3CF-IR, infrared CO_2 analyzer	1 set
Control panel / switchboard	1 panel
* Secondary wiring and piping work materials are included.	
Endothermic furnace atmosphere generator: HYEN-4000MT	1 unit
Infrared CO_2 analyzer: S-2CG-IR	1 set

1.2 Scope of our work

1.2.1 Export packing

1.2.2 Domestic transportation (bare ex truck in specified warehouse at Kobe Port)

1.2.3 Inspection platform shall be constructed.

1.2.4 Exhaust hood shall constructed, mounted on the furnace proper and fixed with flange.

1.2.5 Measurement of temperature distribution
We will measure the temperature distribution in your plant. Prepare a recorder for temperature distribution measurement for yourself. We will prepare thermocouple for temperature distribution measurement for ourselves.

1.2.6 Supervisor: Louisville Forge and Gear Works, Inc., Kentucky, USA
- Guidance on unpacking and installation work: 1 person x 15 days
- Guidance on assembly, furnace building, coating and secondary work: 3 persons x 40 days
- Test run and adjustment: 1 person x 40 days

※ We will perform cold adjustment, hot adjustment, delivery inspection, explanations about the operating method and witnessing test of products after completion of delivery and assembly of the equipment at your plant. Your free supply of electricity, gas, air and water required for test run and adjustment is requested.

※ If delay should take place from the work, construction and test run schedules due to a reason or situation on your side, we will ask you to pay the expenses for the supervisor for the extended period separately.

1.3 Scope of other works (To be subject to separate agreement)

1.3.1 Unpacking work

1.3.2 Installation and assembly work

1.3.3 Coating work

1.3.4 Furnace building work

1.3.5 Electrical wiring work

Primary side electric work

Your company is requested to make connection to the breaker input terminal in the equipment control panel.

Secondary side electric work (Control panel, switchboard, operation panel and current check panel shall be installed aside the furnace proper.)

Wiring work from switchboard to transformer box

Wiring work from control panel to switchboard

Wiring work from control panel to operation panel

Wiring work from control panel to terminal box

Wiring work from furnace proper CT to current check panel

Furnace proper wiring work

1.3.6 Piping work

Primary side piping work.

Your company is requested to connect compressed air, N_2 gas, natural gas, cooling water and wastewater to the connection port of each fluid on the endothermic furnace atmosphere generator.

Secondary side piping work (Flow panel and hydraulic unit shall be installed aside the furnace proper.)

Each piping from flow panel to furnace proper

Hydraulic piping from hydraulic unit to furnace proper

Gas piping from atmosphere gas control unit to furnace proper

1.4 Scope of work to be done by your company

1.4.1 Foundation work, pit work and pit cover work

1.4.2 Foreign freight forwarder, sea transportation, shipping

1.4.3 Local transportation

1.4.4 Exhauster and exhaust duct work

2. Items out of scope of manufacture

In addition to the scope of work specified above, the following items shall be out of scope of manufacture by us.

2.1	Zero gas cylinder and standard gas cylinder	2.2	Compressed air supply unit
2.3	Transfer unit	2.4	Initial power receiving equipment
2.5	Pit cover, safety fence and workbench	2.6	Gas leak alarm units
2.7	Drain system	2.8	Plant cranes and hoists
2.9	Cooling water cooling equipment	2.10	Jig and basket
2.11	Gas supply units	2.12	Other items not specified in the Estimate

3. Coating color (As specified by your company. Specify colors according to the Munsell color numbers.)

3.1 Equipment body: Heat-resistant solver
Including units related with loading

3.2 Control panel outside surface: Munsell 7.5BG6/1.5
inside surface: Munsell 2.5Y8/2

3.3 Purchase parts: Maker standard colors

3.4 Piping: Full coating

Electricity	Munsell 2.5YR6/14,	Cooling water	Munsell 2.5G4/4
Air	Munsell N9.5,		
Endothermic furnace atmosphere		Munsell 2.5Y8/12	
Natural gas	Munsell 2.5Y8/12		
N_2 gas	Munsell 10RP8/5,	Hydraulic oil	Munsell 2.5Y8/12

3.5 Covers: Munsell 2.5Y8/12, Expansion unit Munsell N1.5
Handrail Munsell 7.5YR7.5/16

* Rubber part, plastic part, resins, plated area and stainless steel portion shall not be coated.

4. Utility conditions

4.1 Power supply: 3-phase 3-wire type 480 VAC±10%, 60Hz (Body)
3-phase 3-wire type 220 VAC±10%, 60Hz (furnace atmosphere generator)
Grounding Install the equipment in accordance with the installation standard applicable to the district where the equipment is to be installed, and make connection to our grounding terminal.

4.2 N_2 gas: For safety, for heater terminal purge, purity... 99.9% up
supply pressure 0.4 to 0.7 MPa

4.3 Natural gas: For combustion, for denaturation
supply pressure 0.025 MPa

4.4 Natural gas: Enriched (combustion furnace, denaturation furnace)
supply pressure 0.025 MPa, Δ2

4.5 Atmosphere gas: Endothermic type furnace atmosphere... 70 to 90 m^3/h
supply pressure 3.5 kPa

4.6 Compressed air: Dry air
supply pressure... 0.5 MPa

4.7 Cooling water: Water quality (soft water)/supply temperature... Max. 32℃
supply pressure... 0.2 to 0.3 MPa

5. Applicable laws and standards

5.1 Industrial Safety and Health Law

5.2 Japanese Industrial Standard

5.3 Electrical Facility Engineering Standard

5.4 Our Electrical Design Standard

5.5 Your "Sintering Furnace Required Specifications" (Specification No. SSF-010410)

5.6 UL Standard

5.7 OSHA Standard

6. Guarantee

6.1 Guarantee period

If trouble should take place within one year after end of acceptance inspection due to a reason attributable to our incomplete design or manufacture, we will make a repair or replace the applicable part free of charge.

※ As to utility required for the work (electricity, gas, etc.), we would request you to supply us with them free of charge.

6.2 Conditions out of scope of guarantee

6.2.1 Trouble, breakage or damage due to wrong operating method other than those specified in the Instruction Manual and others

6.2.2 Trouble, breakage or damage due to undue repair or modification not approved by us

6.2.3 Trouble, breakage or damage due to fire hazard, earthquake, typhoon, flood, thunderbolt and other natural disasters and accidents

6.2.4 Trouble, breakage or damage due to use of power supply, operating conditions and running conditions other than specified (abnormal voltage, different frequency or ambient temperature and humidity, abnormal water pressure, etc.)

6.2.5 Nonconformance of the portion concerned or related nonconformance due to repair, modification or relocation of the equipment by persons other than our service engineer or other service engineers specially admitted by us

6.2.6 Trouble, breakage or damage due to drop, fall-down and others caused during transportation after delivery

6.2.7 Trouble, breakage or damage due to incomplete or wrong periodic inspections specified by laws and us, other inspections, adjustments or cleaning

6.2.8 Trouble, breakage or damage due to defect after lapse of the guarantee period

6.2.9 Trouble, breakage or damage of products whose contents cannot be checked on the product machine nameplate

6.2.10 Trouble, breakage or damage of products installed in a country other than specified in the contract

6.2.11 Consumable parts

Recording paper, thermocouple, lubricating oils, contacts, fuse, O-ring, V-belt, lamps, work tray, jig, basket, etc.

6.2.12 Trouble due to gas, melt and refuse arising from works

6.2.13 Other troubles judged not attributable to our responsibility

※ Damages with related facilities and secondary loss such as loss of profit during the inoperable period shall be excluded from the scope of guarantee.

※ Even during the guarantee period, deformation of the heat affected portion shall be acceptable, if deformation is of the degree to withstand use.

7. Conditions of acceptance inspection

7.1 Acceptance inspection shall be complete when receiving is accepted by your company after the safety and product tests in witness of your company.

1. Equipment specifications

1.1 Name: Hearth rotary type sintering furnace

1.2 Type: 142-G-22AS

1.3 Method: Electric resistance heating
Hydraulic pressure indexing method

1.4 Use application: Sintering of powder moldings

1.5 Heating capacity: Normal temperature 1,150°C
Max. temperature 1,200°C

1.6 Throughput: Connecting rod 600 pcs/h, 438 kg/h, @ 0.73 kg/piece
※ Treatment of outer races is not included.

a) Number of hearths

Zone	Number of hearths	Number of work loading hearth
		Connecting rod
Preheating zone No. 1	14	14
Preheating zone No. 2	11	11
Preheating zone No. 3	11	11
Sintering zone No. 1	12	12
Sintering zone No. 2	11	11
Sintering zone No. 3	12	12
Taking-out zone	9	1 + (1)
	80	72 + (1)

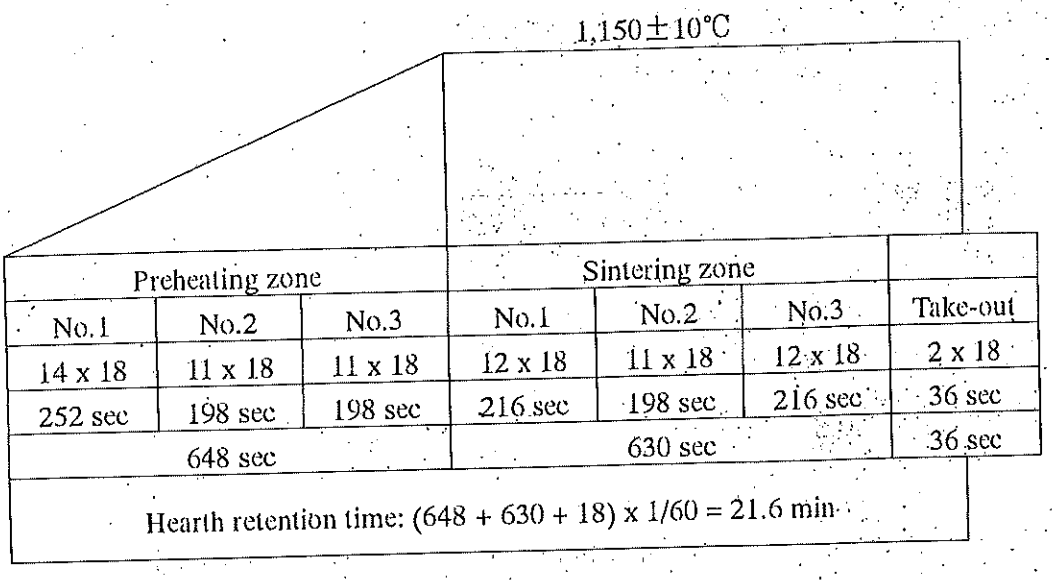
(Note) The zone in the parentheses is an effective station but is excluded from the heating effective time, since the works are taken out upon completion of move.

b) Tact time

	Charge cycle	Discharge cycle	Dividing angle
Connecting rod	3 cps/18 sec	1 pc/6 sec	4.5°

(Note) The tact time of the discharge cycle is 18 sec with 3 pieces of works discharged completely. (The discharge time from the hearth plate is negligibly different depending on the work position.)

1.7 Heating cycle (Connecting rod)



Preheating zone			Sintering zone			
No.1	No.2	No.3	No.1	No.2	No.3	Take-out
14 x 18	11 x 18	11 x 18	12 x 18	11 x 18	12 x 18	2 x 18
252 sec	198 sec	198 sec	216 sec	198 sec	216 sec	36 sec
648 sec			630 sec			36 sec

Hearth retention time: (648 + 630 + 18) x 1/60 = 21.6 min

1.8 Furnace effective dimensions

1. Preheating zone	No. 1	(Width) 600 x (Height) 50 x 14 hearths	
2. Preheating zone	No. 2	(Width) 600 x (Height) 50 x 11 hearths	
3. Preheating zone	No. 3	(Width) 600 x (Height) 50 x 11 hearths	
4. Sintering zone	No. 1	(Width) 600 x (Height) 50 x 12 hearths	
5. Sintering zone	No. 2	(Width) 600 x (Height) 50 x 11 hearths	
6. Sintering zone	No. 3	(Width) 600 x (Height) 50 x 12 hearths	Total: 71
7. Taking-out zone		(Width) 600 x (Height) 50 x 2 hearths	Total: 73

No. of effective hearths: 72

1.9 Facility capacity

Electric capacity: 510 kVA

(Electric power) Heater circuit: 460 kVA (480 V)

		Output	Number of heaters
Preheating zone	No. 1	75 kW	13
Preheating zone	No. 2	64 kW	11
Preheating zone	No. 3	64 kW	11
Sintering zone	No. 1	75 kW	13
Sintering zone	No. 2	52 kW	9
Sintering zone	No. 3	64 kW	11
	Total)	394 kW	68 pieces

Motive power circuit: 50 kVA (480 V)

(Endothermic type gas volume) Total: 70 to 90 m^3/h

Preheating zone	No. 1	15 m^3/h
Preheating zone	No. 2	9 m^3/h
Preheating zone	No. 3	10 m^3/h
Sintering zone	No. 1	10 m^3/h
Sintering zone	No. 2	10 m^3/h
Sintering zone	No. 3	10 m^3/h
Taking-out zone		10 m^3/h

(Natural gas volume) Total: 2.2 m^3/h

For flame curtain	2.0 m^3/h
For pilot burner	0.2 m^3/h

(Natural gas volume) Total: 2.0 m^3/h

For enrichment	2.0 m^3/h

(Cooling water volume) Total: 4.3 m^3/h

Loading water-cooled arm	0.5 m^3/h
Unloading water-cooled arm	0.5 m^3/h
Hydraulic unit	1.5 m^3/h
Furnace front storage	0.3 m^3/h
For photoelectric switch cooling	0.3 m^3/h
Inner periphery side heater terminal cover 0.2 m^3/h x 6 =	1.2 m^3/h

(N_2 gas volume) Total: 32 m^3/h

For heater terminal purge	30 m^3/h
For phototube protection	2.0 m^3/h

1.10 Shell dimensions: Shell outside diameter ϕ5,080
Shell center diameter ϕ3,440
Shell inside diameter ϕ1,900

1.11 Working height: FL + 1,100 mm (Pit depth: 600 mm)

1.12 Piping connection

		Supply pressure	Bore diameter
	1. Endothermic type furnace atmosphere	3.5 kPa	50 A x 1 place (Flow panel)
	2. Natural gas	0.025 MPa	15 A x 1 place (Flow panel)
Δ2	3. Natural gas	0.025 MPa	25 A x 1 place (For flame curtain)
	4. N_2 gas	0.4 to 0.7 MPa	25 A (Flow panel), 15 A (Photoelectric), 1 place each
	5. High-pressure air	0.4 to 0.6 MPa	25 A (Flow panel), 15 A (Photoelectric), 1 place each
	6. Cooling water	0.1 to 0.2 MPa	15 A x 2 places (Loading and unloading)
	7. Cooling water	0.1 to 0.2 MPa	20 A x 1 place (Hydraulic unit)
	8. Cooling water	0.1 to 0.2 MPa	25 A x 1 places (Heater cover, storage, photoelectric)
	9. Drainage	Natural flow	50 A x 1 place, 25 A x 1 place, 20 A x 2 places

2. Outline of equipment

This equipment is designed to automatically supply powder moldings, have them sintered in the furnace and automatically discharge them.

2.1 Hearth drive unit

The hearths are supported with two lines of support rollers with move of the hearths in the longitudinal direction controlled with side rollers.

The hearth dividing is performed according to the method to feed the feed pins under the hearth with a hydraulic cylinder.

All hearth lock, hearth pusher and pusher lock are driven by hydraulic cylinders.

2.2 Sintering furnace

The main body consists of doughnut type hearth, outer wall, inner wall and ceiling arch. The electric heating element is SIC electric heating element and consists of SiC furnace plate, firebrick and others. The charge port and the discharge port are provided with a manual type door.

There are 3 preheating zones and 3 sintering zones, total 6 zones. Each zone is equipped with a furnace atmosphere introduction tube and a thermocouple.

The intermediate zone is equipped with a unit to detect residual works resulting form incomplete discharge of works by means of laser. Works left over after discharge are to be raked out of the inspection plug manually.

The equipment is designed to ensure energy saving as much as possible with MICROTHERM adopted as the ceiling, outer periphery and inner periphery insulating material.

2.3 Material handling units

The storage is provided to receive treated works from the molding press and transfer them to the loading unit. The loading unit receives the moldings and arranges them in order in the specified position on the furnace hearth to the rotation of the hearth.

The unloading unit is to rake treated works complete in sintering out of the specified position on the hearth.

The units are driven in combination of the hydraulic cylinder and the AC servomotor.

KOYO THERMO SYSTEM CO., LTD.

Specification

Equipment name: Endothermic furnace atmosphere generator
Type: HYEN-400MT
Sketch drawing No.: J-30-2270A

1. Generator specifications

1.1 Method: Electric resistance heating

1.2 Use application: Denaturation of atmosphere gas (endothermic type gas)

1.3 Denaturation temperature: 1,050℃

1.4 Denaturation capacity: Maximum ... 113.6 (56.8 x 2) m^3/h
Minimum ... 18.9 m^3/h

1.5 Facility electric energy:

	Total	Electric heating element	Operation circuit
220 V	72 kVA	6.6 kW	2 kW

1.6 Gas consumption: Natural gas ... 23.0 m^3/h

1.7 Cooling water consumption: 2.2 to 2.4 m^3/h

1.8 Piping specifications:

	Natural gas	Endothermic gas	Cooling water	Drainage
Connection bore dia.:	34Ax2	32Ax2	15Ax2	50Ax1
△2 Supply pressure:	Natural gas		0.025 MPa	
	Drainage	Natural flow		
	Cooling water	0.1 to 0.2 MPa		
Generated pressure:	Endothermic gas	3.5 kPa		

1.9 Temperature control system: PID-phase control system

1.10 Error detection: If an error should take place, the error is indicated and an alarm is issued.

Furnace over-heating: When the over-heat preventive gauge reaches a temperature higher than the preset level, an alarm is issued and the heater circuit is shut off.

Thermal error (motor protection): Denaturation is stopped with the root blower stopped and an alarm issued.

Reduction of raw material gas pressure: An alarm is issued and denaturation is stopped when the natural gas pressure is reduced.

3. Parts List

3.1 Sintering furnace

We will assemble the heating chamber during the local work.

Shell sheet metal:	SS400 material	1 set
Hearth sheet metal:	SS400 + SUS material	1 set
Insulating material:	Outer periphery side 370 mm, Inner periphery side 320 mm	1 set
	Ceiling Ceramic fiber laminated to 300 mm, Ceramic pin fixing type	
	* MICROTHERM is adopted as the ceiling, outer periphery and inner periphery insulating material to improve the insulation performance.	
Heater:	ϕ 1-3/4" x 68", inner/outer periphery resistance value change type Including alumina sleeve, heat-resistant clamp and aluminum strap	68 pieces
Hearth plate:	SiC (Drawing No. J-34-5203).	1 set
	Inspection platform and safety fence	1 set
Charge unit:	Manual open/close type door, door hood and curtain burner	1 set
Discharge unit:	Manual open/close type door, door hood and curtain burner	1 set

Dimensions of the opening are as follows with operation and deformation of the loading unit and the unloading unit taken into consideration.

Charge unit: 220W x 260H
Take-out unit: 140W x 240H

Transformer:	Preheating zone 75 kVA, 52 kVA, 64 kVA with overheat preventive function	1 set
	Sintering zone 75 kVA, 52 kVA, 64 kVA with overheat preventive function	1 set
Heat-resistant cable:	LKGB200 150 and 100 Including wire cable rack	1 set
Current transformer:	150/5 A, 15 VA	68 pieces
Current check panel		1 panel
Partition curtain:	Nextel™	8 sets
Furnace atmosphere introduction tube:	Drawing No. J-D2-0401	8 sets
Sampling tube:	Side face	3 sets
Compensating lead wire:	RX-11	600 m
Sand seal:	Outer periphery side Rotary type	1 set
	Inner periphery side Same as above	1 set
Thermocouple:	R 1-pair type, magnetic protective tube	7 pieces
	R 2-pair type, magnetic protective tube	6 pieces
Switchboard		1 panel
Control panel		1 panel
Sequencer:	A2USHCPU-S1 (MITSUBISHI ELECTRIC CORP.)	1 set
Temperature recorder:	SRF212, 12 chopper bars, 180-mm chart (YAMATAKE)	1 unit
Humidity recorder:	SDC31 (YAMATAKE)	6 sets
Over-heat preventive gauge:	SDC20 (YAMATAKE)	6 sets
Laser type photoelectric switch:	KL®44A, 100VAC (TAKENAKA DENSHI)	1 set

3.2 Hearth drive unit

Hydraulic unit:	For furnace and transfer, 400L	(TOYOOKI KOGYO)	1 set
Hydraulic cylinder:	HC-125x250 T4552 (Hearth pusher)	(TOYOOKI KOGYO)	1 set
	HC-63x75-0170 (Hearth lock)	(TOYOOKI KOGYO)	1 set
	HC-50x75C179 (Pusher lock)	(TOYOOKI KOGYO)	1 set
Hydraulic manifold, solenoid valve, etc.		(TOYOOKI KOGYO)	1 set
LM guide:	HSR55B2SS+540	(THK)	1 set
Limit switch:	WLG2-LD	(OMRON)	6 sets

3.3 Furnace front storage

Hydraulic cylinder:	HC1-40x250-2731 (Pusher)	(TOYOOKI KOGYO)	1 set
	HC1-40x280-TC (Workbench)	(TOYOOKI KOGYO)	1 set
	HC-40x408474 (Stopper)	(TOYOOKI KOGYO)	1 set
Proximity switch:	TL-XP10	(OMRON)	3 sets
	TL-XY5	(OMRON)	3 sets
Limit switch:	WLG2-LD	(OMRON)	1 set

3.4 Loading unit

AC servomotor:	SGMG-20A2BAS	(YASUKAWA ELECTRIC MFG.)	1 set
Servo pack:	SGDB-20AM	(YASUKAWA ELECTRIC MFG.)	1 set
Noise filter:	LF320, LF330		1 each
Digital operator:	JUSP-0P02A-1		2 sets
PG cable			2 sets
M cable			2 sets
Hydraulic cylinder:	HC140x780-LBC (Extraction slider)	(TOYOOKI KOGYO)	1 set
	HC1-80x30-LBA (Loading)	(TOYOOKI KOGYO)	1 set
	HC-AAX3-30x50 (Stopper)	(TOYOOKI KOGYO)	1 set
Hydraulic manifold, solenoid valve,		(TOYOOKI KOGYO)	1 set
Limit switch:	WLG2-LD	(OMRON)	7 sets
Cable bearer:	TK095, R = 200	(TSUBAKIMOTO CHAIN)	1 set
Hydraulic oil hose:	Pressure proof... 7 MPa	(BRIDGESTONE)	1 set
Timing pulley:	120S 8M, 30S	(MITSUBOSHI BELT)	1 set
Timing belt:	800S 8M 1280	(MITSUBOSHI BELT)	1 set
Proximity switch:	TL-XP10	(OMRON)	2 sets
Flow switch:	FSS-J-20A		1 set
Pressure switch:	L404F204, 0 to 350 kPa	(YAMATAKE)	1 set

3.5 Unloading unit

AC servomotor:	SGMG-30A2BAS	(YASUKAWA ELECTRIC MFG.)	1 set
Servo pack:	SGDB-30AM	(YASUKAWA ELECTRIC MFG.)	1 set
Hydraulic cylinder:	HC-AAX3-30x50 (Stopper)	(TOYOOKI KOGYO)	1 set
Hydraulic manifold, solenoid valve,		(TOYOOKI KOGYO)	1 set
Photoelectric switch:			1 set
Proximity switch:	E2E-X7D1	(OMRON)	2 sets
Flow switch:	FSS-J-20A		1 set
Pressure switch:	L404F204, 0 to 350 kPa	(YAMATAKE)	1 set
Limit switch:	WLG2-LD	(OMRON)	1 set
Cable bearer:	TK095, R = 200	(TSUBAKIMOTO CHAIN)	1 set
Hydraulic oil hose:	Pressure proof... 7 MPa	(BRIDGESTONE)	1 set

3.6 Flow panel

Flowmeter:	R-105-RK, 0.3 to 28 m^3/h		(TOKYO KEISO)	1 set
	R-105-RK, 0.2 to 20 m^3/h		(TOKYO KEISO)	6 sets
Enriched gas flowmeter:	P-200, 0.05 to 0.5 m^3/h		(TOKYO KEISO)	6 sets
Reducing valve:	Air	G-32A-1	(ITO KOKI)	1 set
	N_2 gas	C-10A-1, G-32A-1	(ITO KOKI)	1 each
	Natural gas	C-10A-2	(ITO KOKI)	1 set
Emergency shut-off valve: 208LT-1S-3			(Eclipse)	1 set
Pressure switch: Endothermic type furnace atmosphere, natural gas, cooling water			(YAMATAKE)	1 set
Solenoid valve: VNA and others			(CKD)	1 set
Pressure gauge: 0 to 10 kPa			(DAIITI KEIKI)	1 set
Flexible tube:	Furnace atmosphere	50Ax500L		1 set
	Enriched gas	15Ax500L	(TOFULE)	1 set
Ball valve: 10-FCTB and others			(KITZ)	1 set
Curtain burner: Drawing No. J-72-836B				2 sets
Gas injector: 10HG-66			(DAIDO NETSU)	2 sets
Pilot burner: DFR-2			(DAIDO NETSU)	2 sets

3.7 Atmosphere gas control unit

Type: S-3CF-IR

Furnace to be measured: Hearth rotary type sintering furnace

Unit specifications: Recording and control ... 3 points;
preheating zone No. 2, sintering zone No. 1 and sintering zone No. 3

Outline of unit:

This unit measures atmosphere CO_2 concentration in the sintering furnace with an infrared CO_2 analyzer and controls the CO_2 concentration to the preset value.

The atmosphere gas is controlled according to the method to control the volume of enriched gas by controlling the opening amount of the motor valve.

The control unit switches sampling from 3 points at the interval of 1 minute, takes the output from the analyzer into the analog memory, and the outputs the data to the controller and the recorder.

Infrared CO_2 analyzer:	ZRH	(FUJI ELECTRIC)	1 unit
Recorder:	SRF206	(YAMATAKE)	1 unit
Controller:	SDC31	(YAMATAKE)	3 units
Control panel			1 panel
Sequencer:	AnS-CPU	(Mitsubishi Electric)	1 set
Control motor			3 sets
Gas sampling equipment:	Gas filter, suction pump		3 sets
Solenoid valve			5 sets

* Procure and furnish the zero gas cylinder and the standard gas cylinder at the site.

H.C.

21. MACHINE SPECIFICATIONS

21. 1 Main Specifications

(1) Machine Specifications

Items	Specifications	Remarks
Main Body	Straight-side frame	
Press Capacity	67.4 ~ 674.4 klbf	※1
Press Shut Height	4.72 inch	
Stroke Length	0.97 inch	
Maximum Slide Lowering Speed	1.5 inch/sec.	
Number of Stroke	40 min^{-1}	※2
Maximum Slide Rising Speed	1.97 inch/sec.	
Dimension between Uprights (Inner Dimension))	25.6 inch	
Bolster Dimensions (W×D)	22.83 × 11.81 inch	
Slide Dimensions (W×D)	22.8 × 11.81 inch	
Die Dimensions	3.74 × 11.02 × 4.72 inch	
Noise	85 dB (A) or less (Measured at the place 39.37 inch away from the machine front)	
Maximum Hydraulic Pressure	3,087 psi at 674.4 klbf	
Oil Tank Capacity	184.94 gal	
Height from Floor Level to Bolster Top	47.24 inch	
Press Total Height	108.27 inch	+0%, –5%

NOTE:

※1. This is pressure gauge value.
※2. Including feeder (When stroke is 0.19inch)
※3. The slide lowering and rising speed is indicated by the number of stroke.
※4. The above values are for operation at 60Hz.
※5. The above are all calculated values.

(2) Transfer Unit Specifications

Feed Stroke	7.48 inch (Fixed)
Clamp Stroke	One side maximum 3.15 inch (1.18 inch during production)
Clamp Offset Stroke	1.97 inch
Feed Bar Inner Dimensions (at Maximum Unclamp)	11.81 inch (5.91 inch from center of the machine)
Feed Height (above the floor level)	49.02 inch
Number of Process	Molding – 1 process Idling – 2 processes
Number of Stroke	40 min^{-1}
Feed Bar	2 pcs (Iron) - Detachable type
Safety Device – Miss clamp Detection (Finger and sensors are provided by Asai)	Installation and wiring are done by Asai.
Safety Device – Over Torque Device	When the feed bar is interrupted by an obstacle, over-torque is detected. The detecting torque is set 20% above the torque required for normal feed.
Lubrication System	Forced lubricant circulation system
Driving System	AC Servo motor driving Feed – 4.7 HP Clamp – 1.3 HP

(3) Possible Operation (Connecting rod cold coining)

Cold Forging	Shear working (Using the shock absorber)	×
	Bending	×
	Drawing	×
	Cold forging	○
	Strain modification	△
	Others ( )	—
Hot and Warm Forging	Warm forging	×
	Hot forging	×

○: Main operation
△: Possible operation
×: Impossible operation

21. 2 Standard Devices Specifications

	Name		Specifications
Pump	Main pump	Type	Piston pump (Pump discharge variable)
		Discharge	84.54 gal/min.
	Pump for cooler circulation	Type	Geared pump (Pump discharge invariable)
		Discharge	39.63 gal/min.
	Pump for drive section lubrication	Type	Geared pump (Pump discharge invariable)
		Discharge	0.16 gal/min.
Motor	Main pump's motor		Totally-enclosed fancooled type High-efficiency type 75 HP-6P, 480V × 60Hz
	Motor for cooler circulation		Totally-enclosed fancooled type 7.5 HP-4P, 480V × 60Hz
	Motor for drive section lubrication		Totally-enclosed fancooled type 0.5 HP-6P, 480V × 60Hz
Position Controller	Slide position controller	Quantity	1 set
		Display digit	4 digits
		Minimum display	3.93 × 10^{-3} inch
		Setting position	Production upper limit

21. 3 Special Devices Specifications

Device	Quantity	Remarks
Oil purifier	1 set	
Sequencer programming unit	1 set	Mitsubishi A series
Sound isolation cover for hydraulic unit	1 set	Aiming 85 db (A) or less at the place 39.37 inch away from the machine front, 59.1 inch above the floor

※:Change the die in manual.

21. 4 Standard Accessories

Name	Quantity	Remarks
Control Panel	1 set	
Operation Panel	1 set	
Hydraulic Unit	1 set	
Pressure Gauge	1 set	
Limit Switch	1 set	
Tool	1 set	
Pressure Switch	1 pce	For pressure holding detection
Earth Leakage Breaker	1 set	For main circuit
Circuit Protector and Breaker	1 set	For auxiliary circuit
Oil Cooler (Cooling Water)	1 set	
Oil Cleaner	1 set	With clogging detector
Oil Gauge	1 pce	Attached to the oil tank
Oil Temperature Gauge	1 pce	Attaching to the control panel
Gib Lubrication	1 set	Forced lubricant circulation system

21. 5 Standard Safety Device

Name	Q'ty	Type	Remarks
Emergency stop button	4 pcs		Installed at the main operation panel and front safety door. (Install safety guards by the customer) Independent Stand for Emergency stop (short-circuited between ES04 and ES05 upon delivery)
Safety cover	1 set	Manual open-close	Installed at the front of the machine. Interlocked with the safety plug in the front box.

21. 6 Outline of The Equipment

Power Supply	3-phases, 480V ±6%
Power Capacity	60 Hz 100kVA 480V
Ambient Temperature	33.8～104° F
Humidity	Under 95%
Cooling Water Flow Rate for Hydraulic Fluid	(Piping size 1B IN.OUT) 26.42 gal/min
Cooling Water Pressure for Hydraulic Fluid	28.4～71 psi
Cooling Water Temperature for Hydraulic Fluid	86° F
Hydraulic Fluid Amount	211.36 gal (Piping capacity 26.42 gal)
Lubrication Oil Amount (Gib Lubrication)	15.85 gal

21. 7 Drive Section Lubrication System

The machine is lubricated by the lubricant circulation system. The lubricant is fed to the slide sliding section and transfer feeder axes by the hydraulic pump, and it is collected on the oil pan and returned to the oil tank of the lubrication unit.
The distributing valves used in this system are connected with the main pipe through the pistons directly and the pistons are activated one by one.
Accordingly, any of the pistons is blocked, the lubrication system stops and the press stops due to count error of the cycle switch.
The number of the cycle count of the distributing valves is set by the flow-regulating valve.

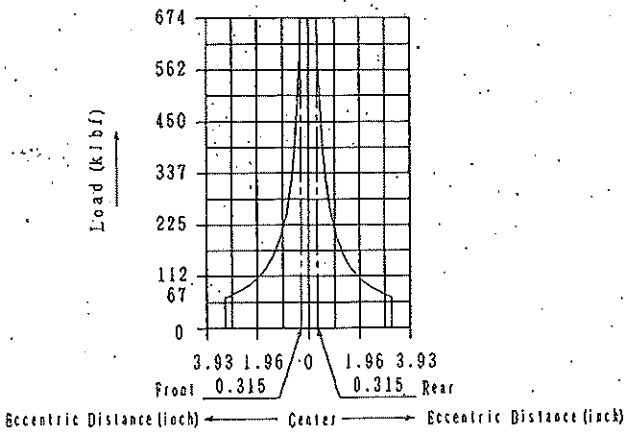
22. OPERATION PERFORMANCE LIMITS

22. 1 Allowable Eccentric Load Graph

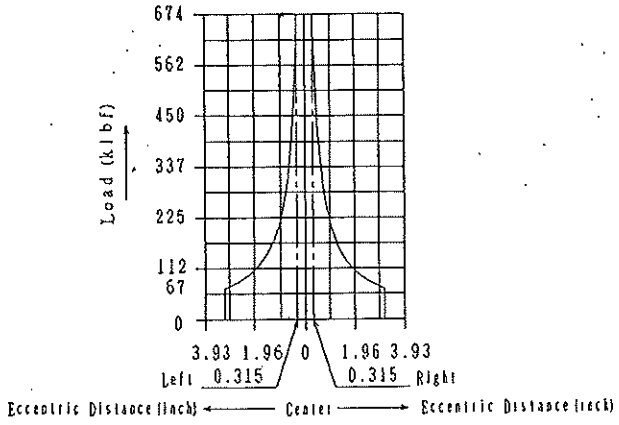
Basically, it is important to avoid the application of an eccentric load to the press. In the case that it becomes necessary, the eccentric load should be within the allowable ranges shown in the graphs below. When performing blanking, the load to be applied to the press should be no more than 60% of the press capacity. When considering variances in breaking through, in the metal's breaking strength (plate thickness, tensile strength), and in die lubrication, 60% or less of the allowable press capacity is considered appropriate. Since, when processing a material with a high tensile strength (silicon steel plate, stainless steel plate, S45C, etc.), breakthrough occurs easily, reducing the load to be applied a further 10%, to 50% of the allowable press capacity and allowable eccentric load is recommended.

Allowable Eccentric Load Graph

- Back and forth direction



- Lateral direction



#1 Main press

SPECIFICATIONS
FOR
C2F-16 HOT FORGING PRESS

2. SPECIFICATIONS

2-1. Specification of Press

Model		C2F-16
Capacity	(6mm above lower dead point)	16 MN
Stroke		260 mm
Number of strokes per minute		60 min^{-1}
Number of working strokes per minute		20 min^{-1}
		10 min^{-1}
Allowable eccentric load		16 MN
Allowable eccentric distance: (Left/Right)		280 mm
	(Front/Back)	50 mm
Die height	(STROKE DOWN ADJ. UP)	707 mm
Die height adjustment		10 mm
Bolster area	LR×FB×THICKNESS	1265× 890× 190 mm
Adapter area	LR×FB×THICKNESS	930×1065× 133 mm
Distance between column		1400 mm
Side Opening		800 mm
Upper knockout	Oil-hydraulic	200 kN× 50 mm
Lower knockout	Mechanical	800 kN× 80 mm
(Lower K.O. timing cylinder)		25 kN× 80 mm
Main motor		440V 60Hz 75kw×12P
Die height ADJ. motor		220V 60Hz 1.5kw×4P
Lubricating oil pump motor		220V 60Hz 0.75kw×4P
Lubricating oil return pump motor		220V 60Hz 0.4kw×4P
Hydraulic power unit		
(Upper KO.)		220V 60Hz 11kw×6P
(Circulation)		220V 60Hz 0.75kw×6P
Grease pump motor		220V 60Hz 0.2kw×4P

Utilities

Electric power source	480V 240KVA
Compressed air	0.5 MPa 600L/min
Cooling water	0.3 MPa 40 L/min

2-2. Major Equipment

1) Load meter (strain gauge type・Overload detector)	1 set
2) Stick liberating device (Oil-hydraulic)	1 set
3) Bearing temperature monitor (6 points)	1 set
4) Clamp device	1 set
Upper clamp (lever type・With forward and backward cylinder)	100 kN
Lower clamp (lever type)	150 kN
5) Die lifter device	1 set
(rail type no roller)	lift 50kN
6) Oil cleaner	1 set
7) Oil collect tank (1000L)	1 set
8) Lubricating oil pump up device	1 set
9) Die lubricating oil collect pan	1 set
10) Dust free unit (in hydraulic power unit)	1 set
11) Brake inspection deck・handrails	1 set
12) Pipe joints from first to secondary pipes	1 set
13) Others	
・Installation plate for Loader	1 set
・Installation plate for Transfer	1 set
・Drive shaft for Transfer	1 set
・Installation plate for Carry device	1 set

2-3. Electrical specifications

2-3-1 panel 1 set

Control panel

Operation panel

Portable operation panel

2-3-2 General specifications

Control power (Voltage) AC120V

DC 24V

(Apply only equipment supplied by KURIMOT)

Panel ambient conditions:

Temperature 0~40℃

(Must be no frozen condition)

Humidity At or less than 90%

(Must be no condensation)

Other No corrosive gas, salty compound, nor dust

2-3-3 Input/Output with relating equipment

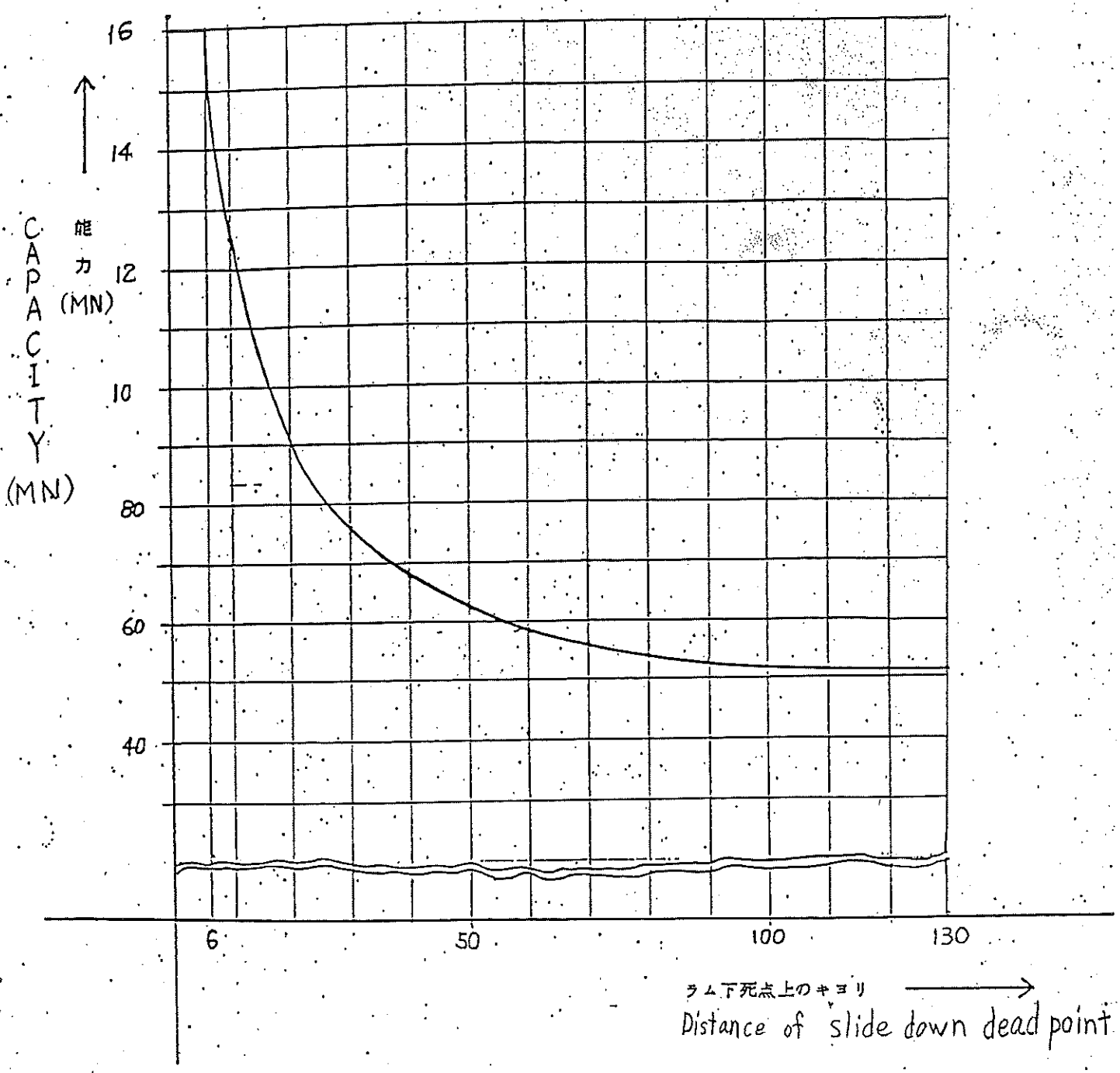
IO to heater 1 set

2-3-4 Specifications for wiring

Wiring distance	Distance between control panel and center of machine	10 M
	Cable length	50 M
Power circuit:	Wiring with cable	1 set
Control circuit:	Wiring with cable and IV cord	1 set
Construction:	Wiring between control panel and the press with rack	
	Wiring in the press with thin cord pipe and flexible tube	
	Regarding terminals, Y-type will be used, exception of terminals for power which will be circle type.	

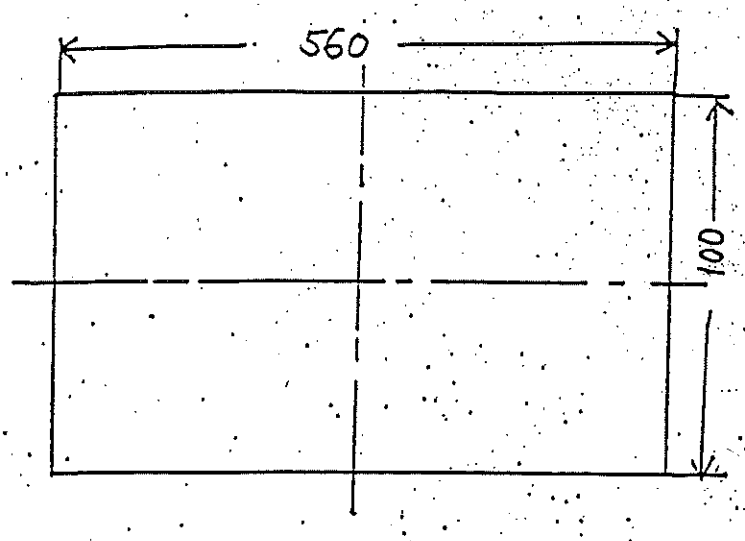
CAPACITY-STROKE DIAGRAM

能力ーストローク線図

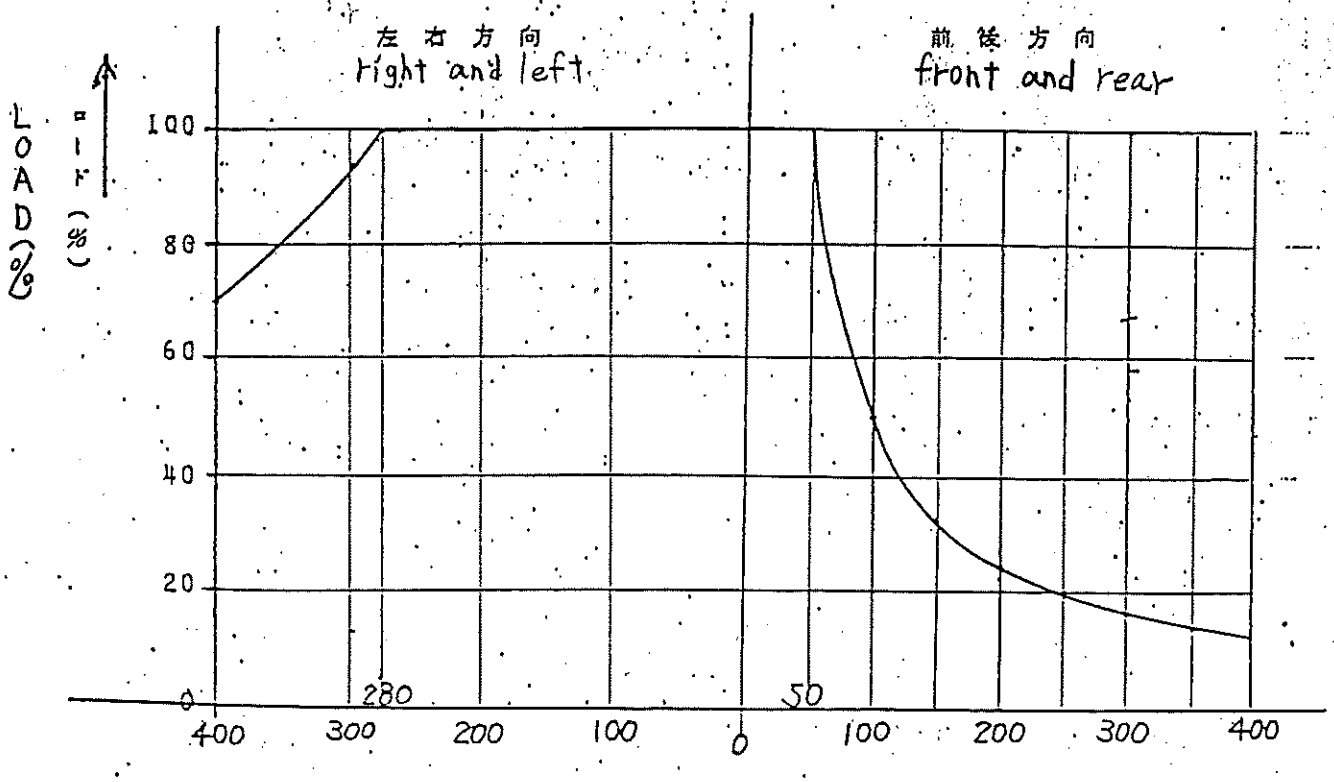


ECCENTRIC LOAD DIAGRAM

許容偏芯荷重線図



(作業者側)
Operaton side



BALANCE CYLINDER CAPACITY DIAGRAM.

バランス・シリンダー能力線図