INSPECTION REPORT

KOMATSU LTD.

Inspection Section.

Press Manufacturing Dept. of AWazu Plant.

KOMATSU-PRESS

INSPECTION REPORT

Customer	SIMPSON STRONG-TIE COMPANY, INC.

Serial No.	190M248
Type	E2M200
Machine No.	10051

JAN. 25. 1988

Press Inspection Section
Industrial Machinery Department

AWAZU PLANT
KOMATSU, LTD

株式会社小松製作所
粟津工場　プレス製造部
プレス検査部　検査第二課

Manager	Forman	Inspecter
T. Nagahara	M. Kitano	H. Takabatake

1. Confirmation of the main dimensions

Good ○
Conditionery good △
Bad ×

Unit: mm(inch)

No	Inspection Item	Standard Value	Allowance	Measured Value	Judgement
1	Capacity ton (US TON)	200 (220)	0 ~+10%	200 (220)	○
2	Slide stroke mm (inch)	110 (4.3)	0 ~+ 1%	110 (4.3)	○
3	Die height (from bolster upper face to slide lower face at stroke down and adjust up) mm (inch)	450 (17.71)	±0.1	450 (17.71)	○
4	Slide adjustment mm (inch)	100 (3.94)	0 ~ +1	100 (3.94)	○
5	Number of slide stroke (continuous) s.p.m.	60 ~ 150	0 ~+10%	62 ~ 150	○
6	Bolster dimensions (LR X FR X T) mm (inch)	1850×1100×180 (72.83×43.30 ×7.09)	-2 ~ +10	1849×1100×180 (72.80×43.30 ×7.09)	○
7	Slide dimensions (LR X FR) mm (inch)	1850× 900 (72.83× 35.43)	-2 ~ +10	1852× 900 (72.91× 35.43)	○
8	Distance between uprights mm (inch)	2060 (81.10)	±4	2058 (81.02)	○
9	Balancer capacity (allowable upper die weight including weight of adapter plate at air pressure of (3.8 kg/cm² 54 psi)) ton (US TON)	1.5 (1.7)	——	1.5 (1.7)	○
10	Air pressure (guaranteed value) kg/cm² (psi)	5.0 (71)	——	5.0 (71)	○

2. Electric motor and pump

(1) MOTOR

No	U S E	MAKER AND TYPE	S P E C
1	For flywhel driving	Hitachi YTFO-KK	50 HP (37 Kw), 4P, 440V, 60 Hz Rating CONT, 60 A, 1675 rpm
2	For lubrication	YASUKAWA FELQ-8T	1 HP (0.75Kw), 4P, 440V, 60 Hz Rating CONT, 1.55 A, 1730 rpm
3	For slide adjustment	TOSHIBA IKC-ECKBA1	1 HP (0.75 Kw), 6P, 440V, 60 Hz Rating 30min, 1.8 A, 1120 rpm

(2) Pump

No	U S E	MAKER AND TYPE	S P E C
1	For lubrication	NIPPON GEROTOR CO LTD TOP2MY750	Discharge pressure 249 psi Discharge volume 14.4 l /min Revolution 1800 rpm

3. Inspection of the press accuracy

(1) Accuracy table based on JIS B6402 Class 1

Unit : mm

No.	Item	Allowance
1	Straightness of the bolster upper face and the slide lower face. (Measurement shall be made in right to left and front to rear directions)	$0.015 + \frac{0.04}{1000} \times L1$ *
2	Parallelism between the slide lower face and the bolster upper face. (Measurement shall be made the two positions for the upper and lower limits of slide adjustment)	Lower dead point $0.030 + \frac{0.08}{1000} \times L2$ *
3	Squareness between the slide vertical movement and the bolster upper face. (Measurement shall be made at the lower half of the slide stroke length in the left to right and front to rear directions)	$0.020 + \frac{0.01}{100} \times L3$ *
4	Overall clearance of top and bottom jointed parts. (The pressure to be applied shall be approximately 5% of the nominal capacity with balancer mechanism)	$0.8 + \frac{8\sqrt{P}}{100}$ *

* Remarks :

L1 , L2 , L3 indicate the measured length

P is nominal capacity of the press

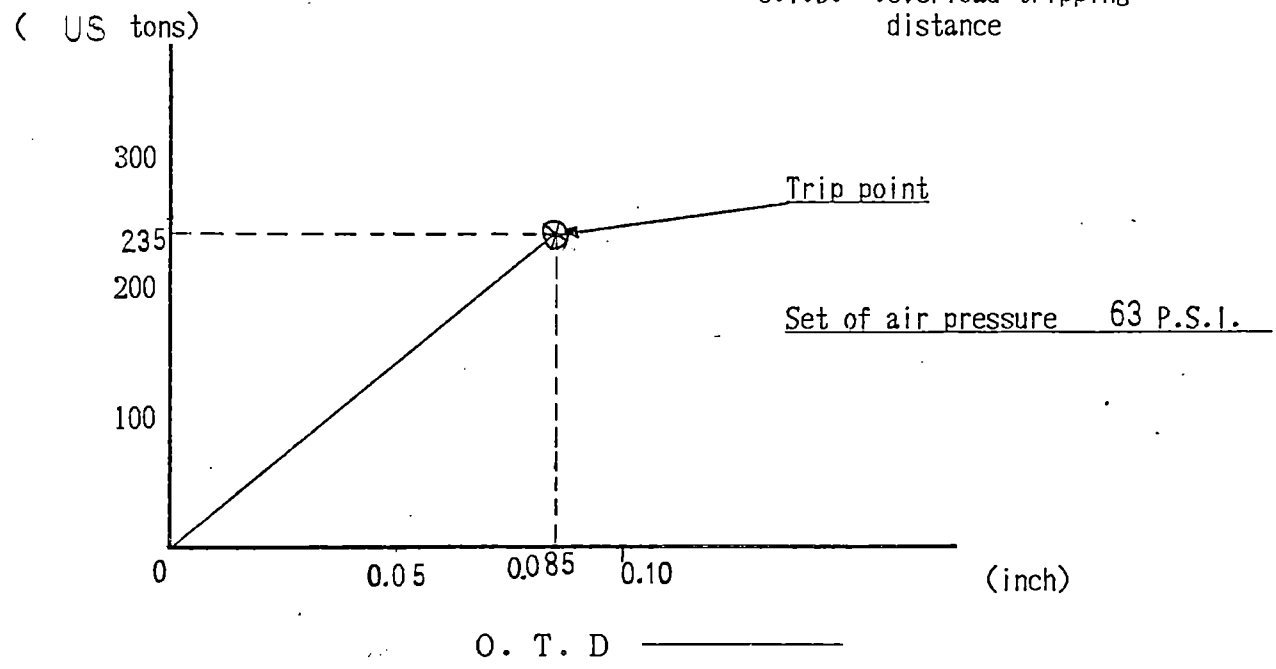
4. Measured table of accuracy

Unit : mm (inch)

Item of inspection	Measured point	Measured direction	Measured length	Allowance	Measured value	Judgement
Straightnss	Upper face of bolster	LR	1650 (64.96)	0.081 (0.003)	0.040 (0.002)	○
		FR	900 (35.43)		0.030 (0.001)	
Parallelism	Stroke lower dead point	LR	1650 (64.96)	0.162 (0.006)	0.020 (0.001)	○
		FR	800 (31.50)		0.130 (0.005)	
Squareness	The lower half of the slide stroke length	LR	110 (4.33)	0.031 (0.001)	0.030 (0.001)	○
		FR			0.020 (0.0008)	
Overall clearance	Each point (designed value)	L	——	1.931 (0.760)	0.73 (0.029)	○
		R	——		0.77 (0.030)	

5. Load-O. T. D. Curve

O.T.D. :Overload tripping distance



6. Measurement of Motors ampare

Use	Output (Hp)	Current on Starting (A)	Current on running (A)	Note
Flywheel driving	50	360	80	
Lubrication	1.0	1.6	0.7	Oil pressure 143 PSI
Slide adjustment	1.0	3.0	0.7	Air pressure 54 PSI
Die stroke adjustment	—	—	—	

7. Trial running test

. Running condition

Continuous 60 ~ 150 S.P.M

. Air pressure

for clutch, brake

71 P.S.I

. for Balancer

54 P.S.I

. Oil Pressure Of lubrication

143 P.S.I

Meased point / Hour	Outer case Of Main motor	Outer case of gear box	Room temp	Note
0	(66.2) 19	(50.0) 10	(55.4) 13	
1	(68.0) 20	(73.4) 23	(55.4) 13	
2	(69.8) 21	(77) 25	(55.4) 13	
3	(69.8) 21	(82.4) 28	(55.4) 13	
4	(69.8) 21	(82.4) 28	(55.4) 13	

Unit;(° F)
° C

TO:MESSRS. SIMPSON STRONG-TIE COMPANY, INC.

MACHINE MANUAL

TYPE	E2M200 (190M248)
MACHINE NO.	10051
DATE OF MANUFACTURE	JAN. 1988

KOMATSU,LTD.

JAPAN

M.Higashi	H.Ishimoto
I.Doi	K.Murayama

KOMATSU LTD.

0104-60001

	INSPECTION SHEET	

INSPECTION ITEMS

1. Inspection of the appearance
2. Inspection of accuracy
3. Inspection of the function
   (1) Lubricating line
   (2) Electric device
   (3) Slide adjusting device
   (4) Overload protector
   (5) Clutch brake
4. All kinds of operation
5. Running test

NOTE: SPECIFICATIONS AND ACCURACY ARE SHOWN ON PAGE A101-1, A101-2 IN THIS MACHINE MANUAL.

C1S60
OBS
OBS25
OBI
OBW
OBW250
OBA
MKN
UKR
E2P
OBS-2
OBS25-2
OBI-2
OBW-2
L1C
OBA-2
OBS-21

E2P-2
E2Q
E2M

RESULT of above-mentioned inspection items.

Inspector

Press Technical Center.
Press Manufacturing Plant
AWAZU PLANT
KOMATSU, LTD.

	FOREWORD	0101

This MACHINE MANUAL is written by KOMATSU having rich experience in design and construction of presses for operational safety and high production of this press throughout its longest possible service life. Correct operation and careful inspection and servicing are essential for the operator's safety of the press.

This manual is edited in the following six parts for our user or operator to be well familiarized with the safety functions, correct operations and servicing of the press.

PART A "SPECIFICATIONS" ---	Instructions mainly on specifications and working capacity
PART B "ACCESSORIES" ------	Instruction mainly on specifications and operation of special auxiliary devices
PART C "SAFETY" ----------	Instructions mainly on operational safety
PART D "INSTALLATION" -----	Instructions mainly on installation and test operation
PART E "OPERATION" --------	Instructions mainly on operation for press operator
PART F "MAINTENANCE" ------	Instructions mainly on inspection and servicing

Correct operation and maintenance care add to the life of the equipment and productive reliability.

THIS MACHINE MANUAL SHOULD CAREFULLY BE READ AND KEPT.

OBA-2
OBS
OBS25
OBI
OBW
OBW250
OBA
MKN
UKR
E2P
OBS-2
OBS25-2
OBI-2
OBW-2
L1C
OBS-21
E2P-2
E2Q
E2M

A

3

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CONTENTS

	CONTENTS	0201-3

	CONTENTS	0201-4

2. PRESS SPECIFICATIONS

2.1 PRESS TYPE

2 POINT, PLUNGER GUIDED, ECCENTRIC GEAR DRIVE, SINGLEGEAR REDUCTION, STRAIGHT SIDE PRESS, TOTALLY ENCLOSED, FLUSH MOUNT.

2.2 PERFORMANCE AND MAJOR DIMENSIONS

PRESS MODEL		E 2 M 2 0 0			
TYPE		NS	NL	WS	WL
RATED CAPACITY	TON (US TON)	200 (220)			
RATING POINT ABOVE B.D.C	MM (INCH)	7.0 (0.28)	6.5 (0.26)	7.0 (0.28)	6.5 (0.26)
SLIDE STROKE	MM (INCH)	110 (4.3)	150 (5.9)	110 (4.3)	150 (5.9)
SPEED	SPM	60 to 150	40 to 100	60 to 150	40 to 100
DIE HEIGHT	MM (INCH)	450 (17.7)			
SLIDE ADJUSTMENT	MM (INCH)	100 (3.9)			
DIMENSION OF SLIDE (L to R × F to B)	MM (INCH)	1500 × 900 (59.1 × 35.4)		1850 × 900 (72.8 × 35.4)	
DIMENSION OF BOLSTER (L to R × F to B)	MM (INCH)	1500 × 1100 (59.1 × 43.3)		1850 × 1100 (72.8 × 43.3)	
BOLSTER THICKNESS	MM (INCH)	180 (7.1)			
COUNTER BALANCE CAPACITY	TON (US TON)	1.5 (1.7)			
MAIN MOTOR	KW(HP)	37 (50)			
ELECTRIC POWER SOURCE	V × Hz	440V ~~460 / 230V~~ 60Hz			
AIR PRESSURE	kg/cm² (PSI)	5 (71)			
ENERGY CAPACITY	T-M/SPM (UST-INCH)	0.8/60-150 (34.7)	0.8/40-100 (34.7)	0.8/60-150 (34.7)	0.8/40-100 (34.7)

Customer's utility and environment conditions

Electrical power supply : 60Hz 440v ±10%
Power supply capacity : 58kVA
Environment temperature : 0℃ to 40℃
Humidity : 45 to 95%
Air pressure required : 5kg/cm² (71PSI)
Max. permissible pressure: 7kg/cm² (99.5PSI)

SPECIFICATIONS	2. LIMIT ON WORKING CAPACITY	A201-1

2.1. Limit on capacity

For a working operation under tonnage near the rated capacity, the slide should be operated below a point of the rated capacity above bottom dead center. If the load exceeding the rated capacity should be imposed on a press, the press could come to an emergency stop for protection of press by means of a hydraulic overload protector or overload detecting device (mechanical). If an overload should be imposed on above a point of the rated capacity, the press would be damaged.

OBS
OBS25
OBW
OBW250
OBA
OBA-2
OBS-2
OBS25-2
OBI-2
OBW-2
OBS-21
E2P-2
E2Q
E2M

The maximum working load should be allowed for the rated capacity taking into consideration variations in blank thickness and material hardness, lack of stability of die lubrication with oil. Particularly in a blanking operation, the working load should be kept below 70% of the rated capacity.

Note: (1) In a press not equipped with an overload protector, the pressworking contents should be checked to be sure they do not exceed the specified capacity.

2.2. Allowable stroke capacity

The allowable tonnage of a mechanical press varies with a position of the slide in stroke, or a distance of the slide from the bottom dead center. On a press of the same type, the allowable tonnage varies with the stroke length.

(A)

The working load should be used within a range of the allowable stroke capacity curves (Fig.A-1). If the working load is used beyond the range, there will be a possibility of the press drive mechanism, clutch, etc. to be damaged.

2.3. Allowable eccentric load capacity

Fundamentally speaking, it is important to avoid on eccentric load. If an eccentric load should be given, the slide would not be parallel with the bolster face, causing an ill-effect to the working accuracy. Where an eccentric load cannot be avoided by any means, the load should be used below an allowable eccentric load capacity curve from a viewpoint of the mechanical strength of a press.

2.4. Number of slide stroke at intermittent operation(S.P.M)

This press uses a wet type clutch-brake, eliminating such a marked fading phenomenon that a clutch slips due to increase in temperature in an intermittent operation, in comparison with a dry type. In order to keep the lube oil in good functioning condition, the clutch-brake should be used below the specified slide speed(intermittent).

If the clutch-brake is operated beyond the specified slide speed, the clutch and brake will run out of timing, causing excessive wear of linings.

2.5. Allowable working torque

The allowable working capacity per cycle of press operation is limited by the energy held by the rotating flywheel and the main electric motor output power. Therefore, a press should be operated below an allowable working torque curve. Particularly on a press under the specifications with a variable speed, the allowable working torque range is smaller because of the motor characteristics than that of a press under the specification with a constant speed, even with to same motor. If a press is operated beyond the allowable working torque range, the motor will be overloaded causing the slide to slow down, and the press will be stopped by a thermal switch.

E2M

2.6 Precautions for working capacity

(1) There is a possibility of the main electric motor to be unable to start due to a thermal switch actuated where the temperature of the lubricating oil is very low (0°C or below). This is not a defect but must be prevented by keeping to working environment at a proper ambient temperature and using the lubricating oil as recommended by KOMATSU.

(2) On the occasion of operation for many hours under very low temperature of the lubricating oil, there is a possibility that stroke-capacity and working torque are lower than allowable value. In this case, the oil must be warmed. If necessary, KOMATSU can offer the heating device (optional).

(3) The press must not be stopped at any position from just before the upper die touching the work to the bottom dead center, since if the press is stopped at such position, the clutch slips and can not be engaged completely so that the press slide may not be operated.

(4) Such component parts as a clutch operating air pressure switch, hydraulic overload protector air regulator, main electric motor thermal switch, etc. have been set at their respective proper values.

Do not change these settings, otherwise, there would be a possibility of the device parts to be broken.

(5) When operating the machine with the loading point far from the center of the machine, change the location of loading point by referring to the allowable eccentric load curve, Fig. A-2, even though the actual load is evenly divided at the center of the machine. If the machine must be used under conditions exceeding the restrictions shown by the allowable eccentric load curve, an adapter plate of sufficient thickness must be placed under the slide bottom face. This is to prevent breakage of slide or adapter.

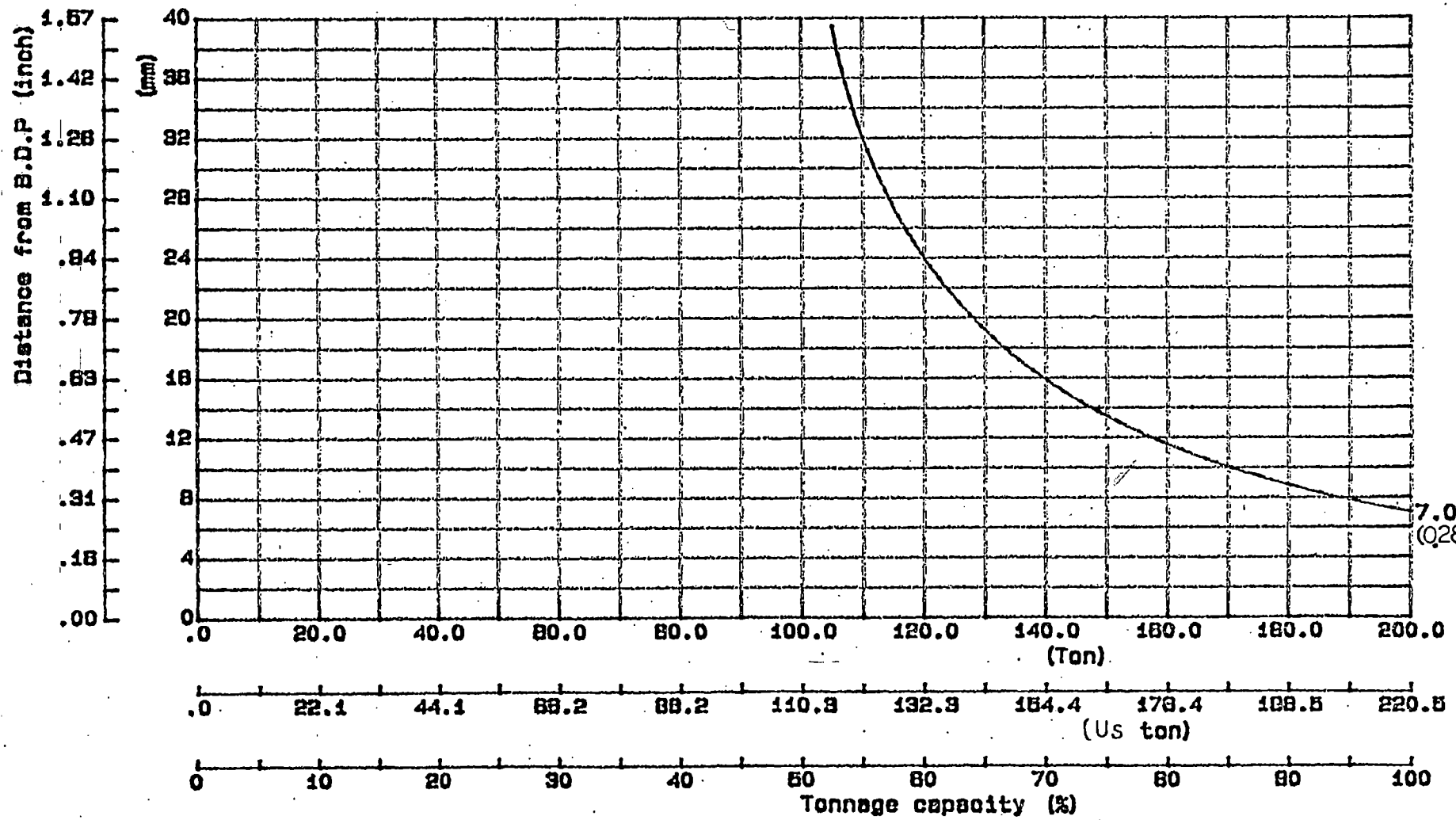
Note (1) Use lubricants a shown in the table of commercial lubricants (page F801) when ambient temperature is below minus 0 degrees C.

(6) Precaution when handling a concentrated load

The machine has been designed so that the load equivalent to "press capacity" will be evenly distributed over two-thirds of the length of the bolster. therefore, when handling materials which impose a concentrated load on the center of the bolster, the load has to be reduced to less than "press capacity". To do this, consult Komatsu.

Allowable stroke capacity curve

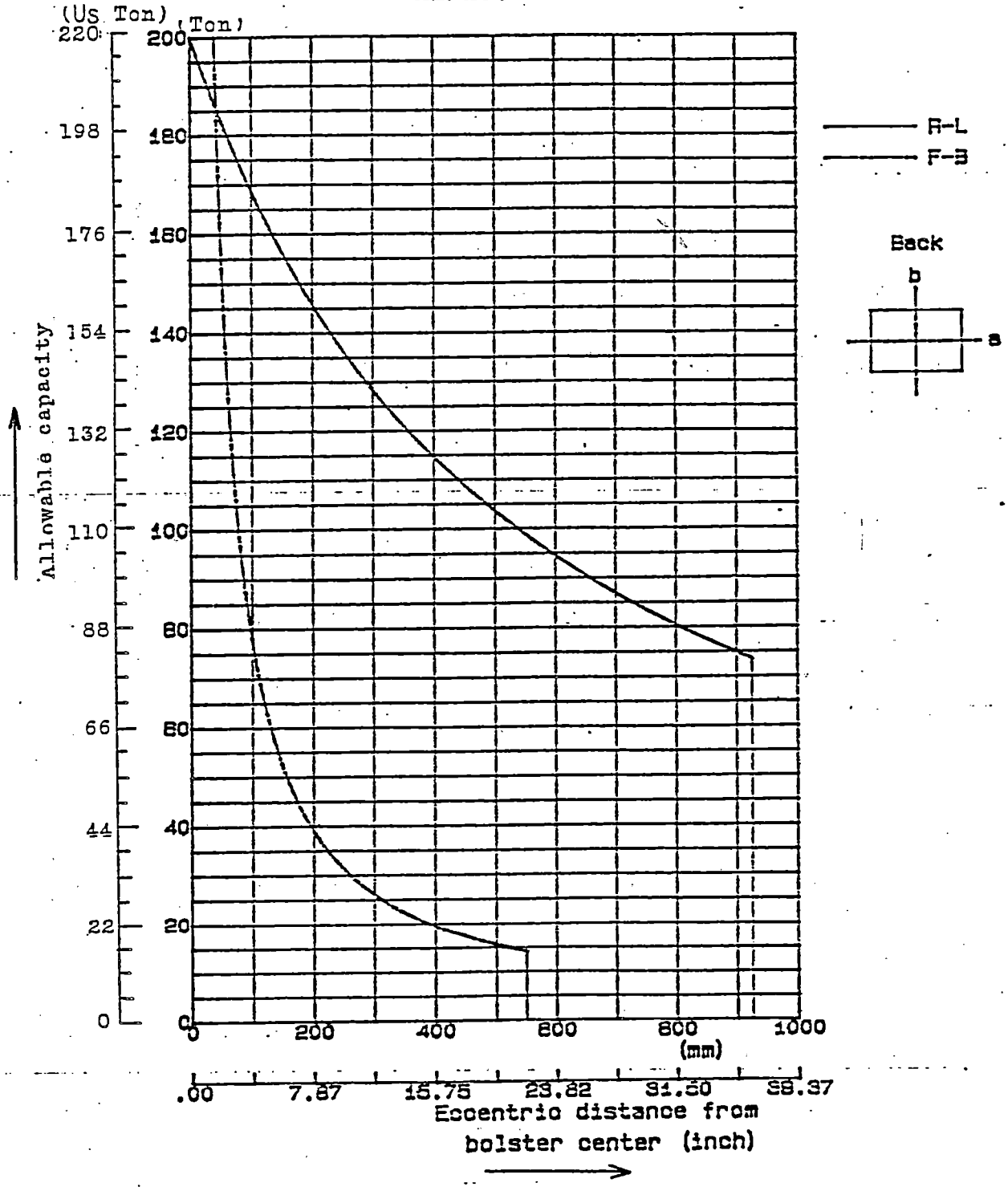
E2H200(S)



SPECIFICATIONS	LIMIT ON WORKING CAPACITY	A202-2

Fig. A - 2 Allowable eccentric loading capacity curve

E2M200W

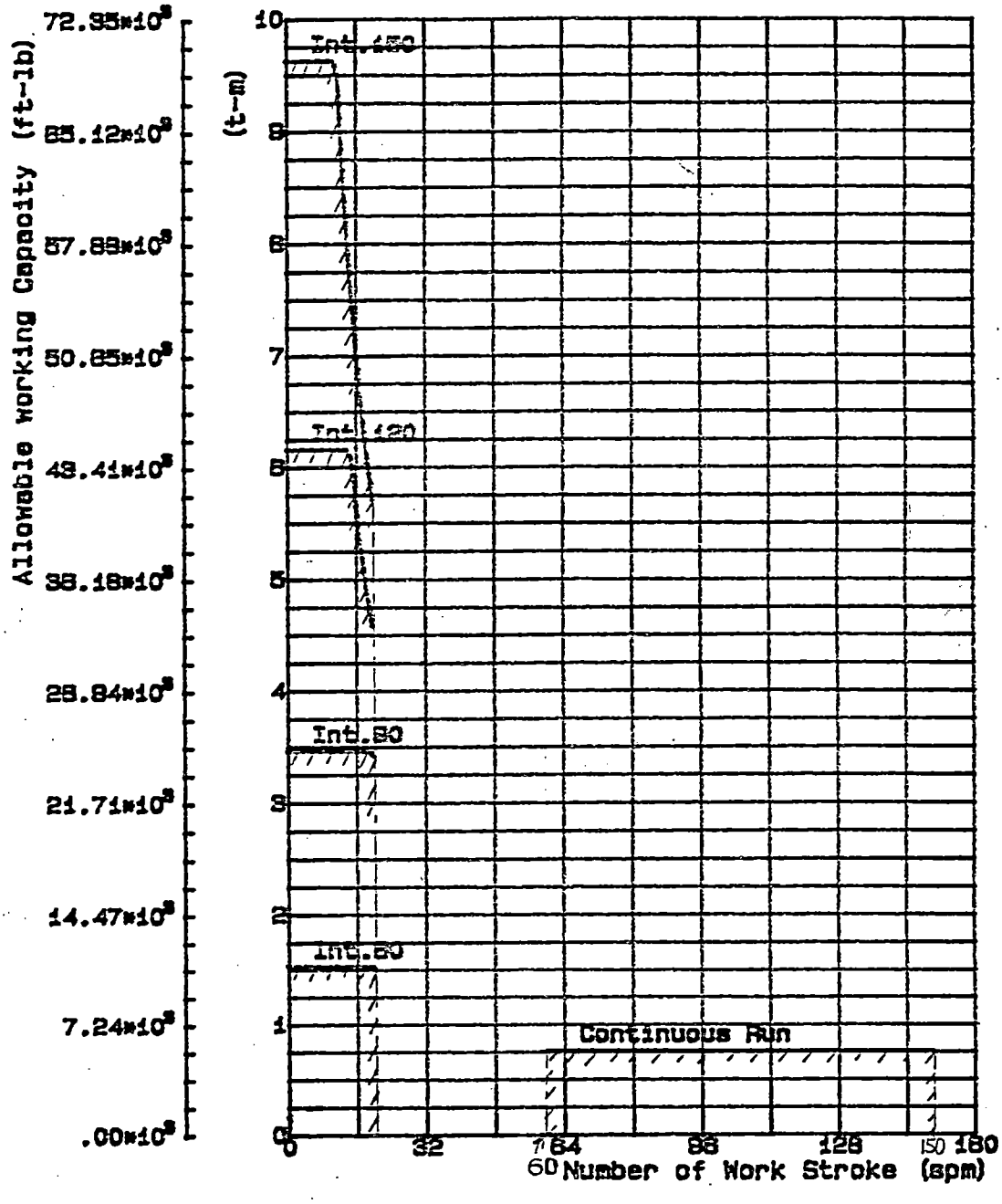


Note : 1. Above curves "R-L" and "F-B" are available for the loads on the center-lines "a" and "b" respectively.

2. Above curves are made from a viewpoint of mechanical strength of the machine, and the accuracies (especially the parallelism between lower surface of the slide and upper surface of the bolster) are not taken into account. Therefore, please take care in using the curves.

Fig. A - 2 Allowable Work Load Capacity

E2M200(S)

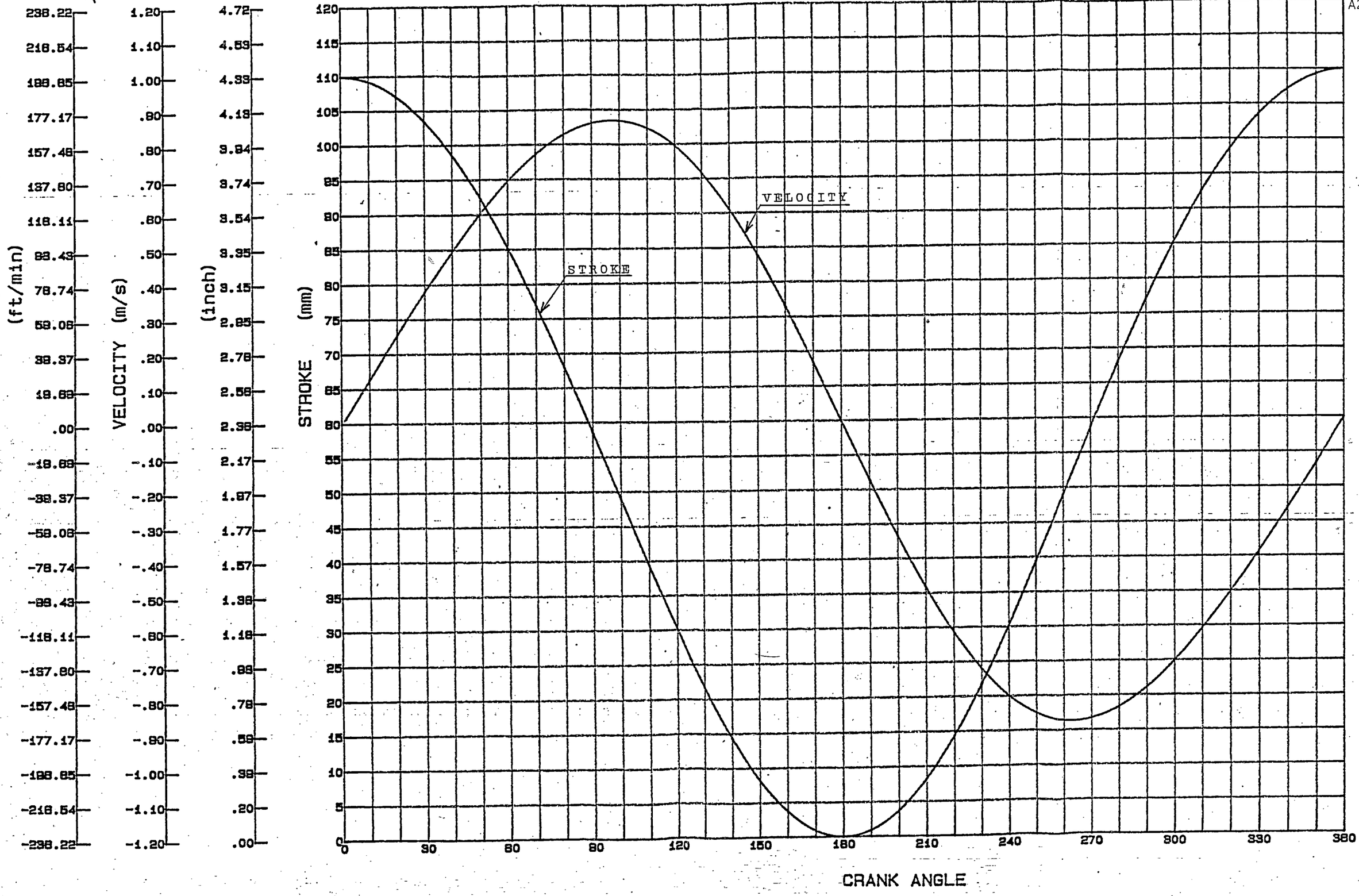


Note: "Int. 150" shows "Intermittent Run at 150 spm"

MOTION DIAGRAM

E2M200(S) -110-150 MM SPM 4CS-10492

A202-4



3.1 MAIN BODY STANDARD EQUIPMENT

The following equipment is normally provided as standard units.

1) Electric motors

Power source frequency 60 Hz

a	Main motor (VS)	E2M200 37kw (50HP) 4P	440V	1unit
b	Motor for slide adjustment driving	E2M200 0.75kw (1HP) 6P		1unit
c	Motor for lube oil pump	0.75kw (1HP) 4P		1unit

2) Electrical equipment

a. Main electric control box 1set

Installed on the right rear upright

b. Control panel 1set

Installed on the right front upright

c. Dual run operation button panel 1pc.

Portable panel with stand, (equipped with dual run buttons, 1 emergency stop button, 1 continuous stop button), and 3 meters of cable.

A receptacle is provided in the right front upright.

d. Emergency stop buttons 5pcs.

Emergency stop button is installed in each upright, and the dual-run push button panel.

Mushroom type push lock, twist reset type.

e. Production counter 1pc.

Provided in the control panel with a 6-figure reset.

f. Valve for the clutch-brake 1pc.

ROSS dual valves (on D.C. 24 V) for the clutch-brake.

g. Pressure switches 4pcs.

Pressure switches for the clutch-brake, counter balance, lube oil pressure, and overload protector.

h. Spotlight receptacle 1pc.

110V, 100W capacity, installed in the right front upright.

i. Electronic type digital rotary switch 1pc.

(8 switches provided as spares)

This is an electronic version of the conventional rotary switch and is installed in the right rear upright. (The quantity of spare switches is decreased accordingly of optional devices are required.

j. Crank angle indicator 1set

This indicator gives a digital and analog indication of the crank angle and is installed in the right front upright.

k. Anti-repeat circuit. 1set

l. OK monitor 1set

This monitor is installed in the right front upright for easy trouble shooting.

m. Wiring in the press body 1set

n. Maintenance counter (Without reset), 7 figures 1pc.

Installed inside the electric control box

3) Principal equipment: Accessories

a. Clutch-brake 1set

Wet, 1-speed combination type

b. Moterized slide adjustment (electrical) 1set

Adjusting speed: E2M200 46mm/min (1.8inch/min)
(at 60 Hz)

c. Die height indicator 1set

Digital indicator with a minimum unit of 0.01inch:

The upper and lower limit switches are set in the indicator.

d. Hydraulic overload protector 1set

This device is installed on the slide

Overload Protector valve is installed in the left upright.

acrylic resin plate. 1set

The die area guard is moved by hand. If the guard is raised, press operation is stopped by means of the interlock function of a limit switch provided at the foot of the guard.

f.

g. Air counter balance cylinder 1set

h. Ladder 1set

Aluminum ladder,

i. Safety block (with safety plug) 1pc.

The height is equal to the stroke length minus 0.4inch (10mm).

Installed in the right front bed.

j. Lube oil pump unit 1set

The driving system circulation oil lubricating pump and pressure gauge are built into the left rear upright.

k. Pneumatic control panel 1set

Pressure reducing valves, for the clutch-brake, and counter balancer are built into the left front upright.

l. Air line receptacle 1set

Built into the left front upright.

m. Service tools 1set

n. Piping in the press body 1set

3.2 OPTIONAL EQUIPMENT FOR THE PRESS MAIN BODY

1) Flywheel brake (air pressure type) 1set

Interlocked with the main motor (depressing the main motor stop button actuates the brake.)

The target time for the flywheel stop is approx. 30 seconds.

2) Main motor reversing unit 1set

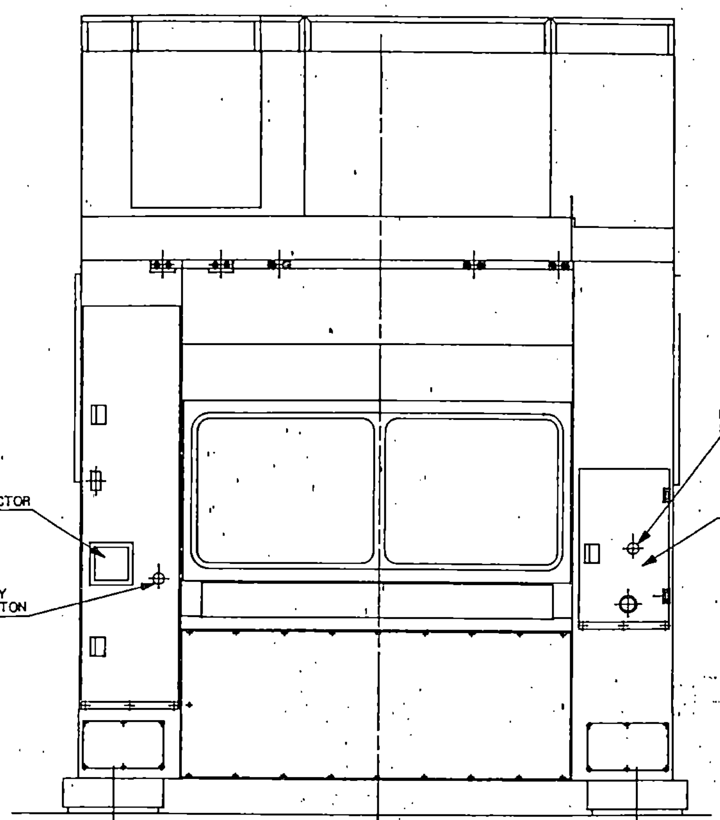
A lamp on the control panel indicates when the flywheel comes to a standstill under the varying speed specifications. This should be confirmed visually, in the case of constant speed specifications.

3) Flush mount foot, provision for anti viblation device 1set

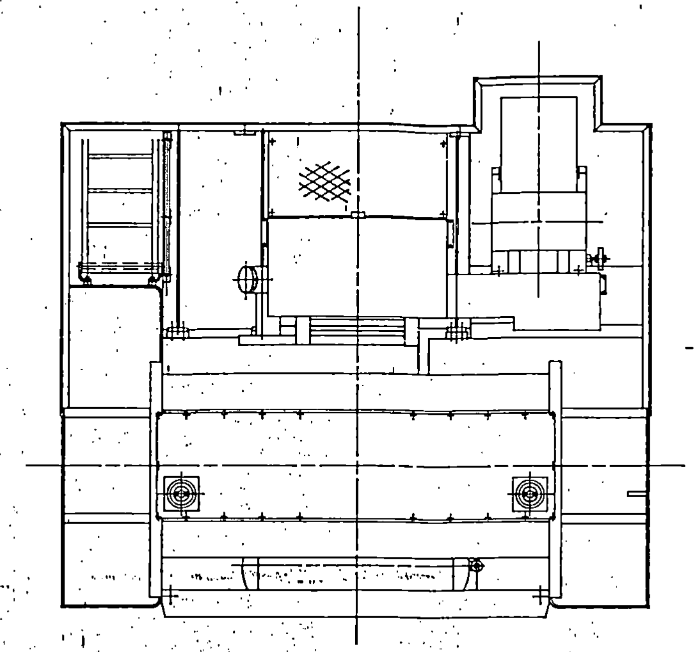
GENERAL TOLERANCE SHALL CONFORM TO KES 04.052.0

A401 — 1

( ) DIMENSIONS:mm

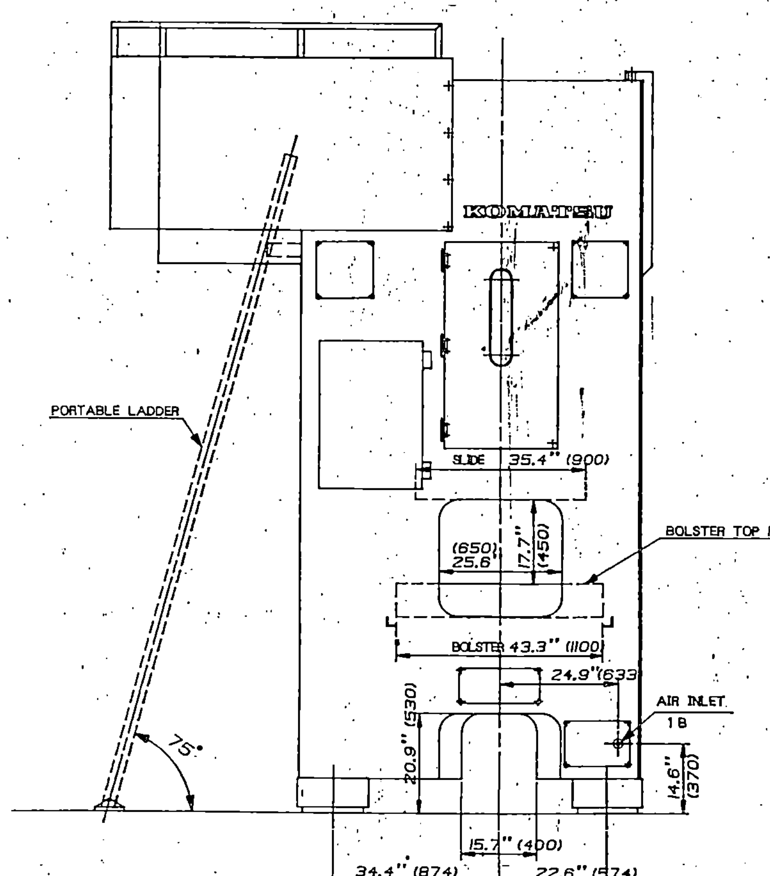


REAR SIDE VIEW

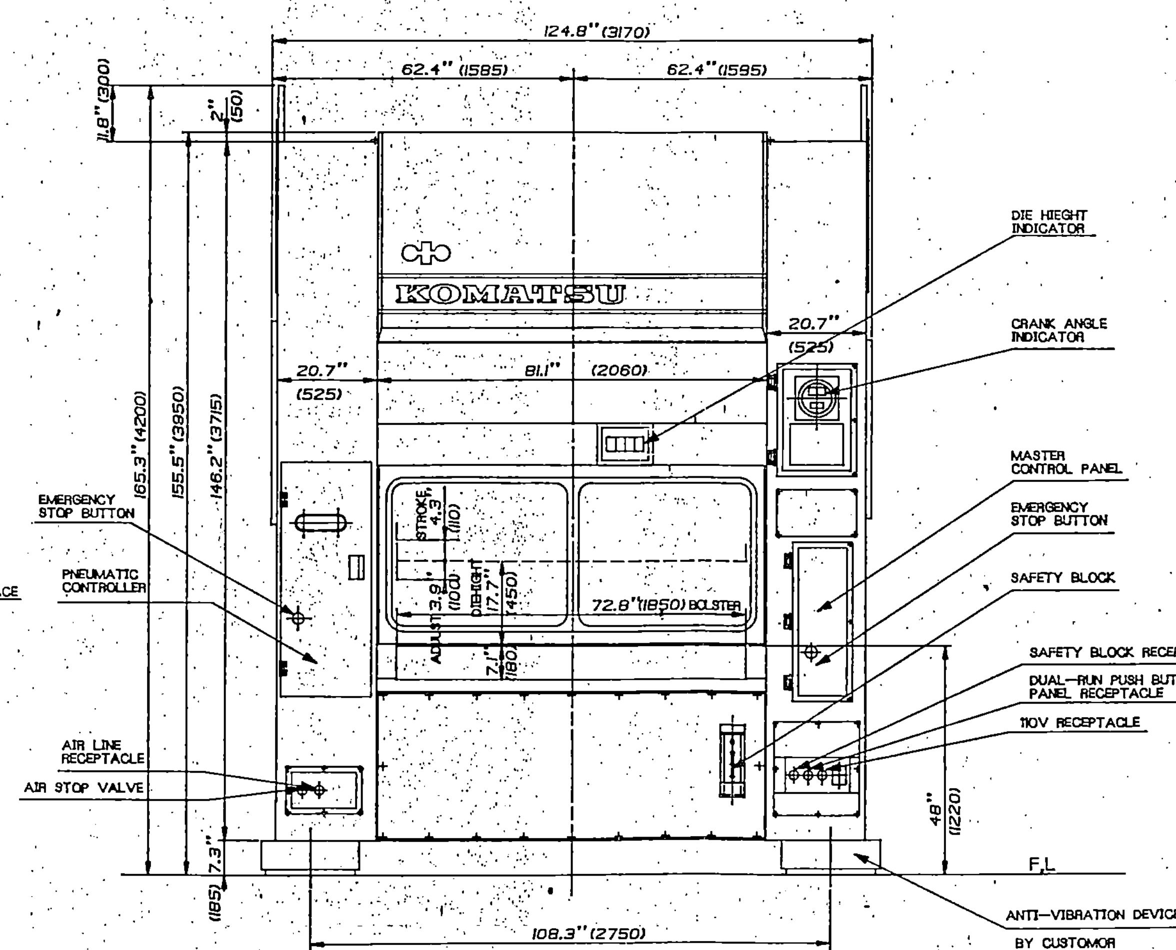


TOP VIEW

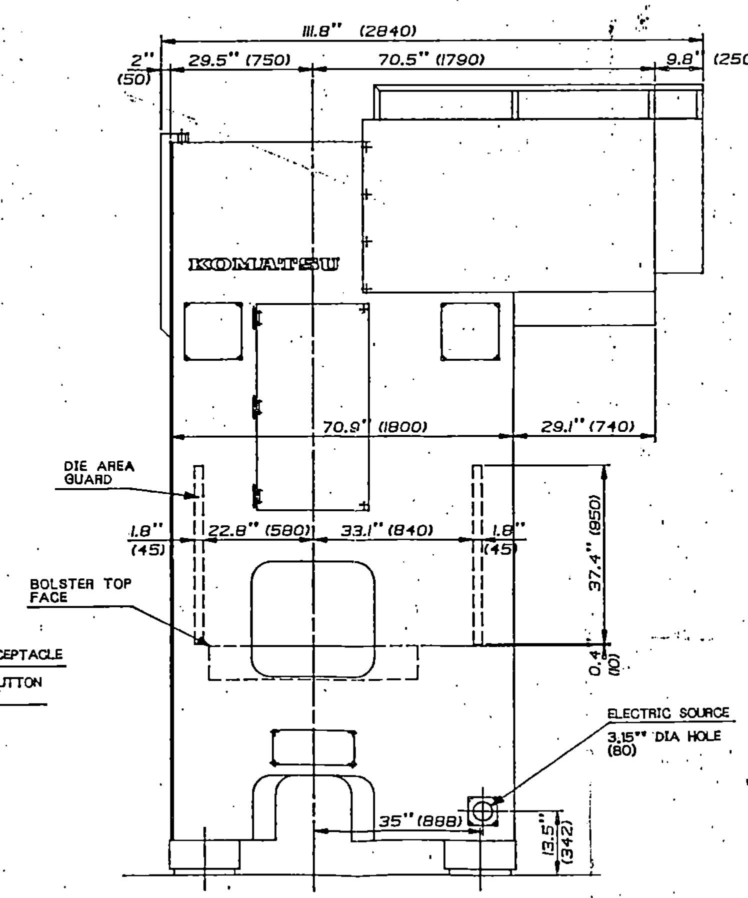
PRESS SPECIFICATIONS	
PRESS MODEL	E2M·200WS
RATED CAPACITY TON (US TON)	200 (220)
RATING POINT ABOVE B.D.C mm (in)	7.0 (0.28)
SLIDE STROKE mm (in)	110 (4.3)
SPEED spm	60 to 150
DIE HEIGHT mm (in)	450 (17.7)
SLIDE ADJUSTMENT mm (in)	100 (3.94)
DIMENSION OF SLIDE (L to R X F to B) mm (in)	1850 X 900 (72.8) (35.4)
DIMENSION OF BOLSTER (L to R X F to B) mm (in)	1850 X 1100 (72.8) (43.3)
BOLSTER THICKNESS mm (in)	180 (7.1)
SIDE OPENING mm (in)	650 (25.6)
COUNTER BALANCE CAPACITY TON (US TON)	1.5 (1.7)
MAIN MOTOR KW (HP)	37 (50)
ELECTRIC POWER SOURCE V X Hz	440V 60Hz
AIR PRESSURE kg/cm² (PSI)	5 (71)
ENERGY CAPACITY T-m/spm (UST-inch)	0.8/60~150 (34.7)



LEFT SIDE VIEW



FRONT SIDE VIEW



RIGHT SIDE VIEW

TO:MESSRS. SIMPSON MANUFACTURIG CO., INC.
E2M 200WS

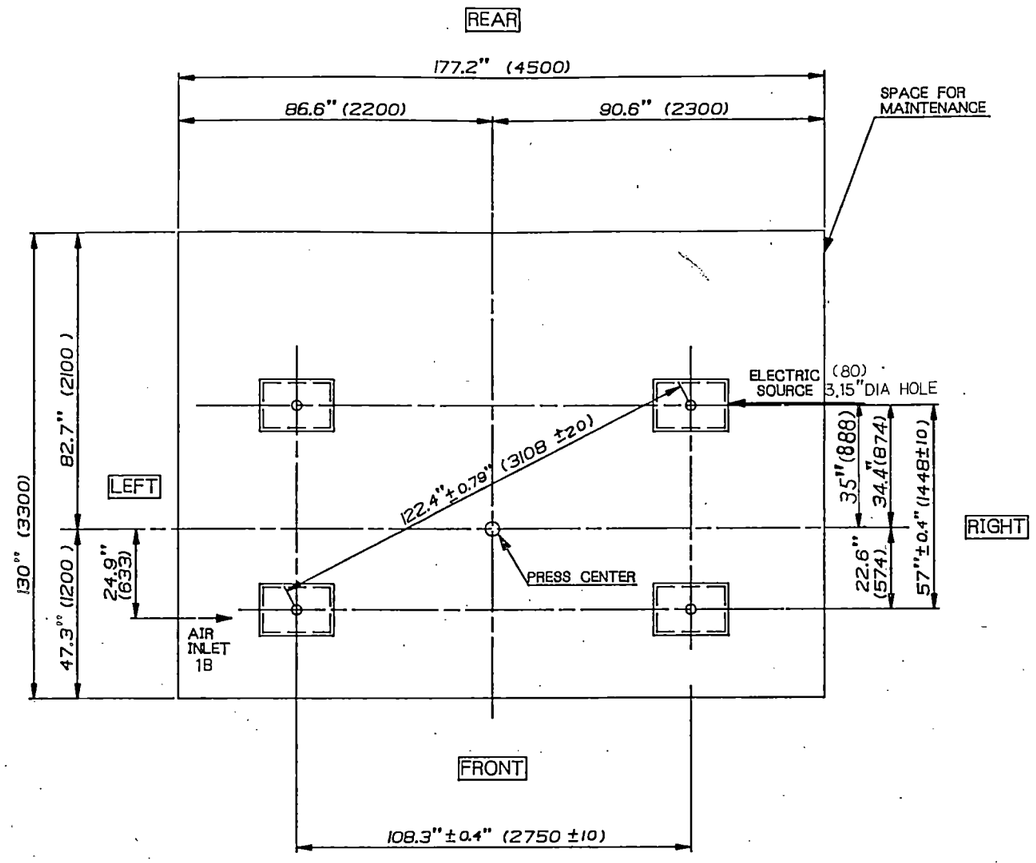
3rd ANGLE P.	PORTION	HEAT TREATMENT	CASE DEPTH	MATERIAL	190M248	1
PRODUCTION NO. 190M248	APPROVE	CHECK	DESIGN	DRAW	NET WEIGHT kg	PRODUCTION NO. / ADDRESS	Q'TY
					SCALE 1:20	DATE 87.2.1	
PART NAME GENERAL VIEW	SIZE	PART NO. 92-1 403297					

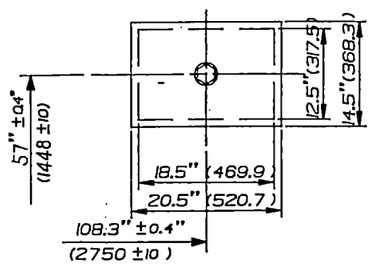
GENERAL TOLERANCE SHALL CONFORM TO KES 04.052.0

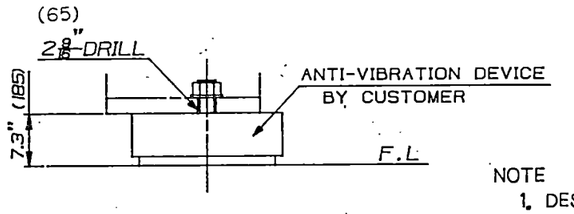
REVISION						
⚠1 ×	· ·			⚠2 ×	· ·	
⚠3 ×	· ·			⚠4 ×	· ·	

A401 — 2

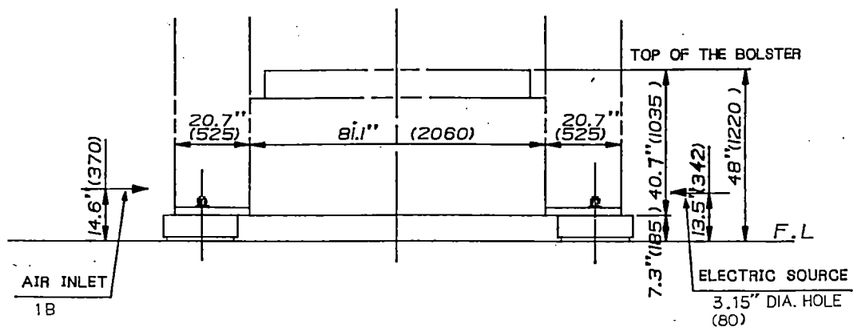
DIMENSION : inch (mm)







DETAILS OF INSTALLATION
(1:15)



NOTE

1. DESIGN, PROCUREMENT OF MATERIAL, AND WORKS OF THE FOUNDATION SHALL BE ACCOMPLISHED BY CUSTOMER.
2. PIPING AND WIRING WORKS OUTSIDE THE MACHINE SHALL BE ACCOMPLISHED BY CUSTOMER.
3. DIFFERENCE IN HEIGHT AMONG LEVEL PLATES SHOULD BE WITHIN 0.08inch, AND HORIZONTALITY OF A LEVEL PLATE SHOULD BE WITHIN 0.006inch PER LENGTH OF 39.37inch.
4. WHEN DESIGNING THIS FOUNDATION, DYNAMIC FORCE (APPROX 60% OF THE MACHINE WEIGHT) SHOULD BE ADDED TO THE MACHINE WEIGHT.
5. TOTAL WEIGHT OF THE MACHINE (EXCEPT DIES) IS 32 TON.

E2M—200W

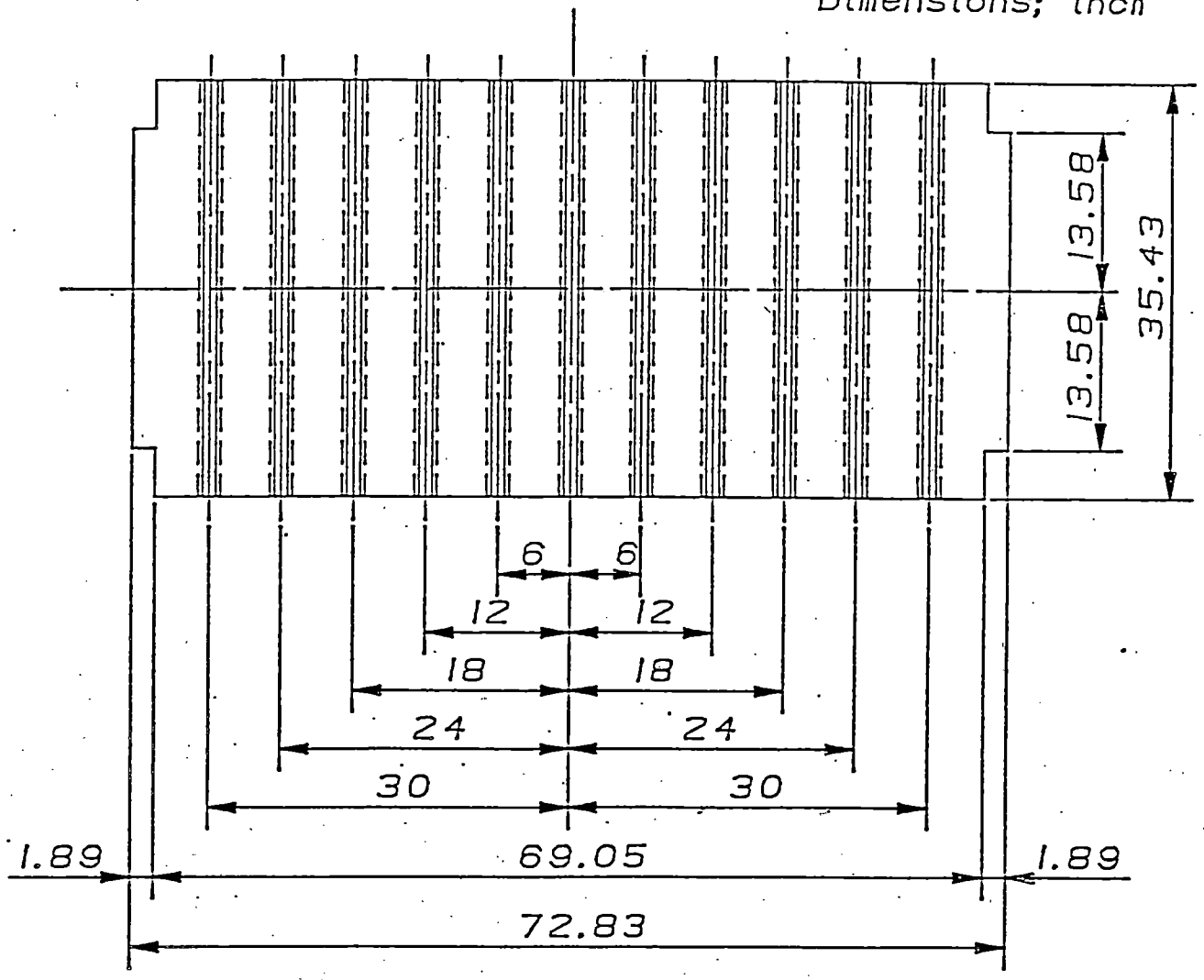
3rd ANGLE P.	PORTION	HEAT TREATMENT	CASE DEPTH	MATERIAL	190M250
PRODUCTION NO. 190M250	APPROVE	CHECK	DESIGN	DRAW	NET WEIGHT kg / PRODUCTION NO. / ADDRESS / Q'TY
					SCALE 1:30 / DATE 87·5·20
PART NAME FOUNDATION DRAWING	SIZE 2	PART NO. 02-2-405605			

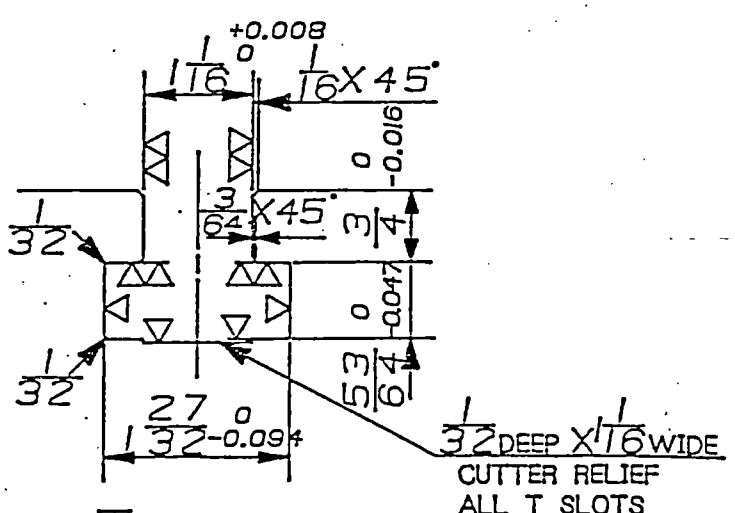
KOMATSU LTD.

AM24600 5020,1,2,3(ECL)

	SLIDE BOTTOM FACE E2M-200W	A401-3

Dimensions; inch



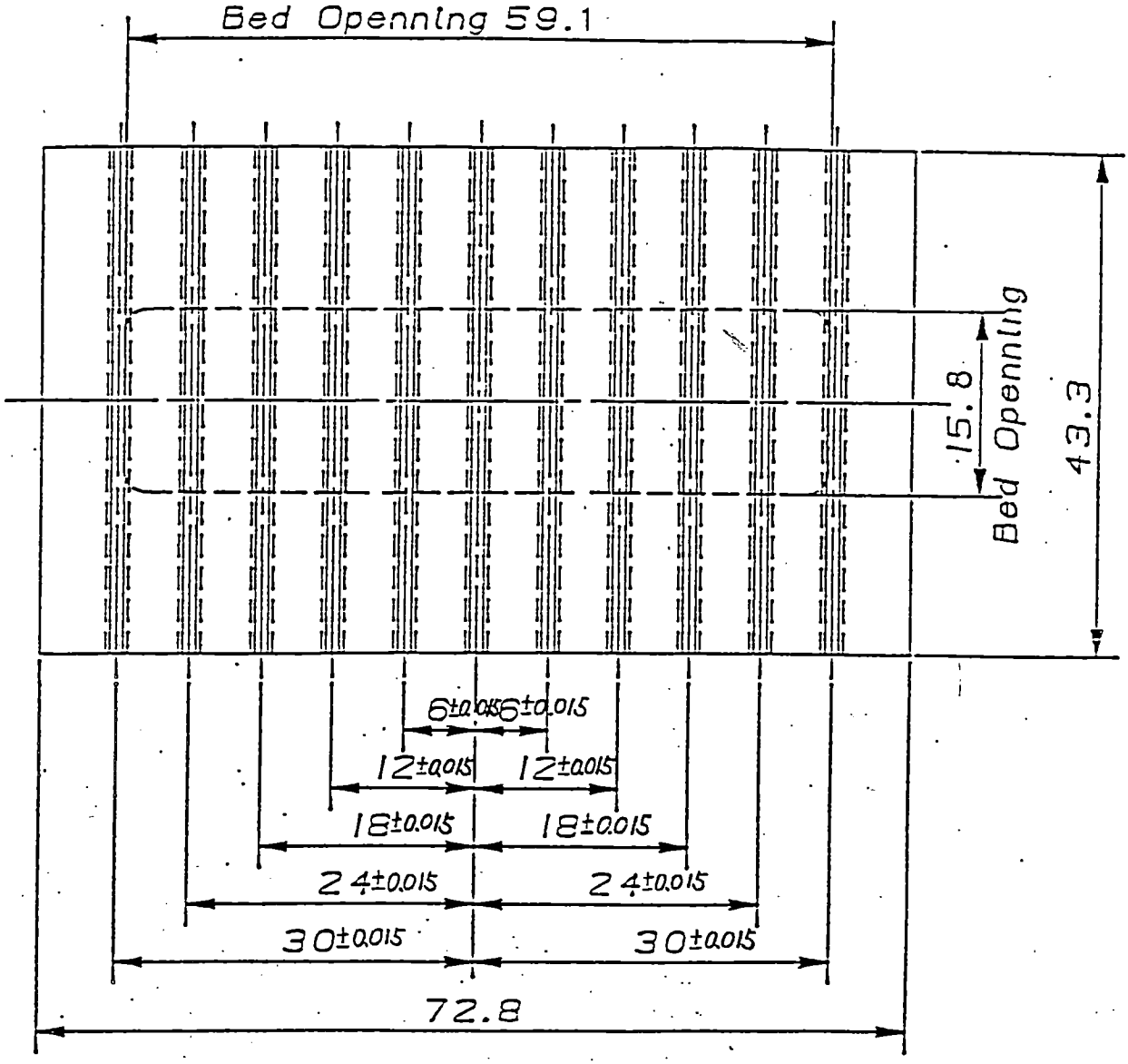


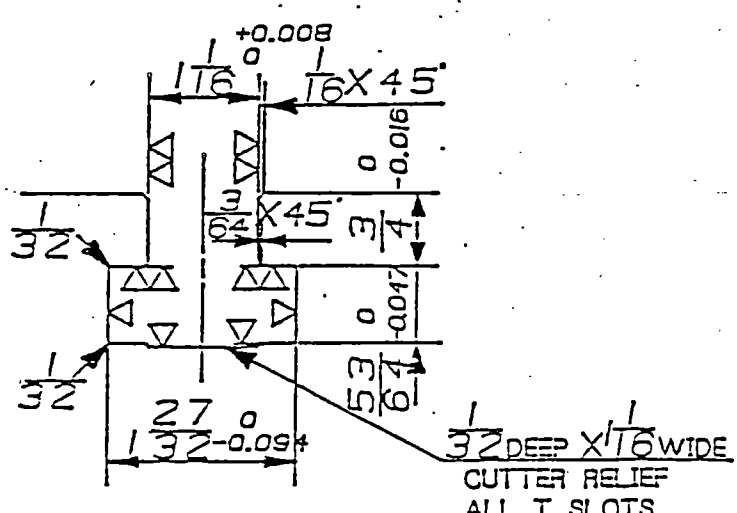
T-SLOT
SCALE 1/2

E2M 200W

	BOLSTER TOP FACE E2M-200W	A401-4

Dimensions; inch





T-SLOT

SCALE 1/2

E2M 200W

AM2ZE01850

ACCESSORIES	OVERLOAD PROTECTOR VALVE	B106-1

SERVICE INFORMATION
FOR
SR V SERIES OVERLOAD VALVE

ACCESSORIES	OVERLOAD PROTECTOR VALVE	B106-2

1. General

V series overload valve is an air-balance type overload valve. The valve portion is a differential pressure seat type, and is lap-finished to provide a structual perfect leakage-proof. The two-stage snap-action method provides high response.

2. Performance

o Rated pressure = 5688 PSI

Type	Relief Dia. (inch)	Pre-load Pressure (PSI)	Set pressure (PSI)	Balance air pressure (PSI)
SR23VMB	0.9055	$Pp=213.3P_B+71.1$	$Ph=61P_B+113.8$	$P_B=28.44$

3. Lubrication and Operation oil

Lubrication oil for lubricator, and operation oil for pump should be JIS K2213 turbine oil #90 to 140 (Operation oil for general hydraulic application).

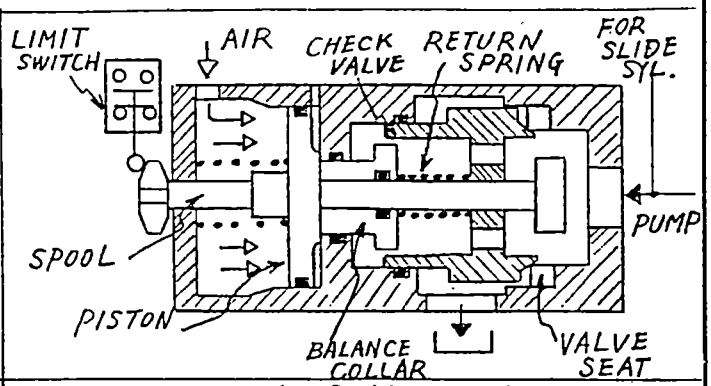
Mobil	Mobil D.T.E. Oillight Medium
Esso-Standard	Telesso 43, Telesso 47
Shell	Tellus 27, Tellus 29
Maruzen	Swalube RO-150, Swalube RO-200
Idemitsu	DAPHNE hydraulic field 32
Nippon Oil	Hi-land oil 90, Hi-land oil 140

ACCESSORIES	OVERLOAD PROTECTOR VALVE	B106-3

4. Operation

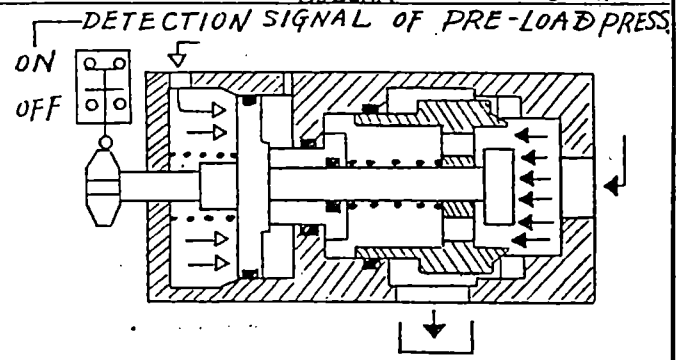
The figure A shows the position before press operation starts. As soon as balance collar is supplied and piston and spool returns to the original position, the check valve is pressed to the valve seat by the force of return spring. The passage to the tank is cut off.

Fig. (A)



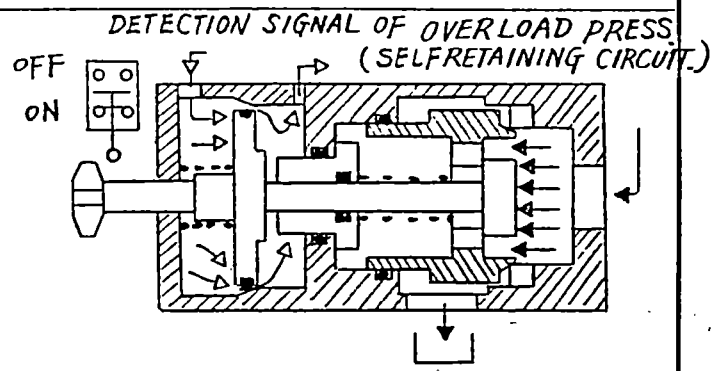
The figure B shows the completion of preparation of press operation, or the position of operation. In this position, the set hydraulic pressure is supplied for pump, and the balance collar and spool move to the left, the detection signal of pre-load pressure becomes on.

Fig. (B)



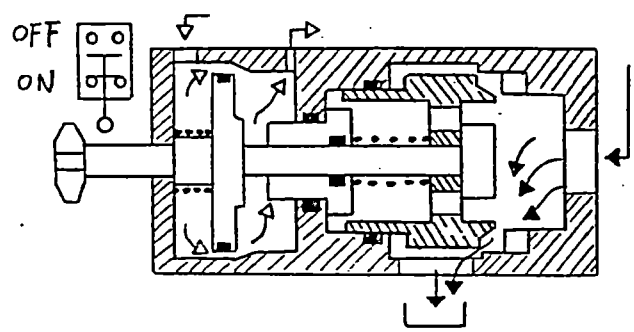
When the hydraulic pressure on the slide side becomes higher than the set pressure and the spool moves to the left, the balance air applied to the piston exhausts to the atmosphere. Then, the spool is out of balance, and the dectction signal of overload pressure becomes on.

Fig. (C)



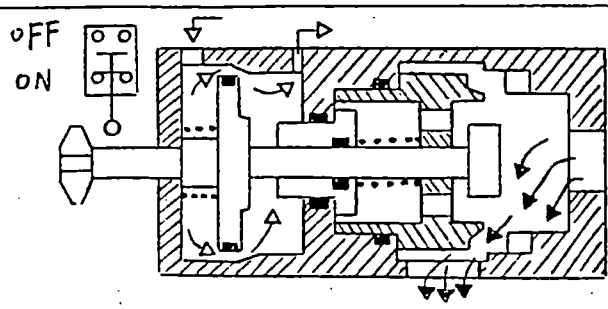
Just after the balance air exhausts to the atmosphere, both the spool and the check valve move to the left in a moment, so that the hydraulic pressure is just about releasing to the tank.

Fig. (D)



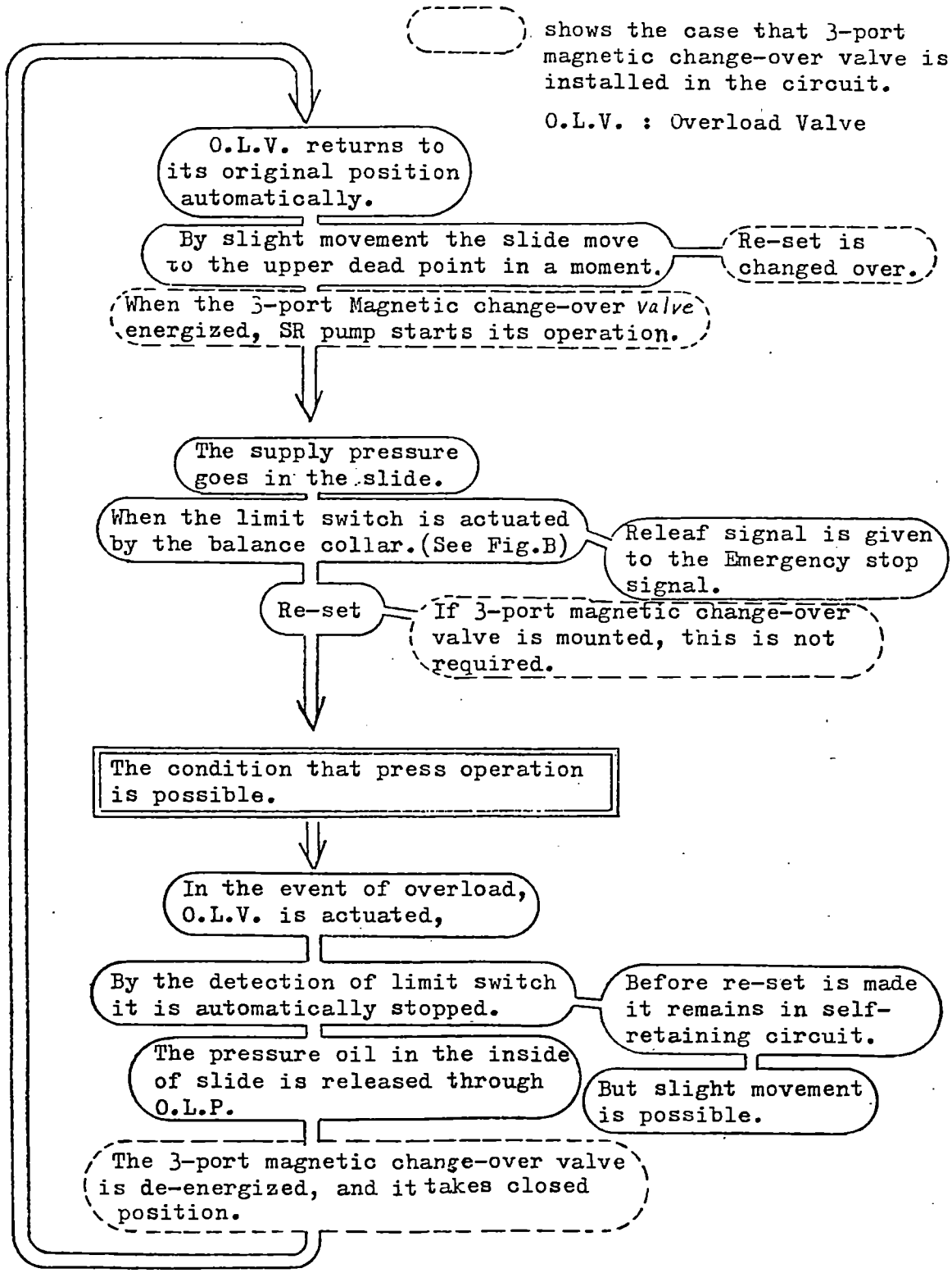
The figure E shows the position that the check valve opens perfectly and the hydraulic pressure on the slide side is releasing to the tank. The responsiveness from Fig. B to Fig. E is instantaneous, takinng 5/1000 sec. Upon completion of releaf, the piston of Fig. A by the foroe of piston return spring.

Fig. (E)



5. Electric Wiring

The operation order of the limit switch (or 3-port magnetic change-over valve), being shown in the general circuit diagram.



ACCESSORIES	OVERLOAD PROTECTOR VALVE	B 106-5

6-1. Installation

6-1-1. This valve can be installed in any position. Use Hex-head nut bolt (material: SCM3) for mounting, and tighten them firmly. (Never forget to use spring washers.)

6-1-2. In case that manifold is used, the surface rughness should be 6.3-S or more.

6-2. Piping

6-2-1. Before piping all pipe should be cleaned perfectly by air jet, so that no dust or rust will not enter the overload valve.

6-2-2. In connecting with taper threads portion, be careful that no seal tape is put inside.

6-2-3. As "dust" and "drain" in the supply air will spoil the sliding portion, and decrease the function and durability, and cause malfunction, use air filter and lubricator in the piping.

6-2-4. Apply a suction strainer (80 to 120 meshes) to the suction pipe of pump without fail.

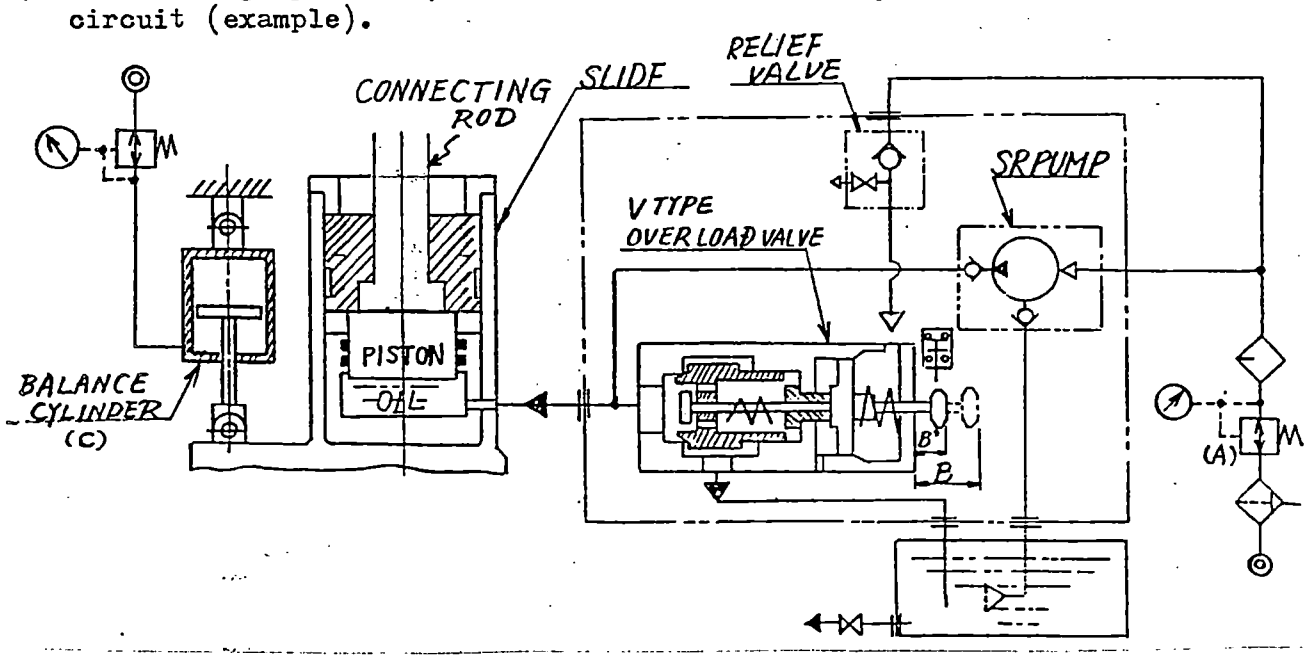
6-2-5. The length of suction pipe for pump should be in less than 50 cm (19.69 inch) from the oil level.

6-2-6. Two releaf ports are provided. The one not used should be plugged.

6-2-7. In regard to the pipe from the relief port to the tank inside, the pipe end should be cut slantly, or connected with an elbow or a "T" fitting to flow the pressure oil against the tank wall, so that the flow pressure is weaken, preventing the oil from expanding rapidly in the tank.

6-2-8. The port for balance air and the limit switch can change its position by 90 degree step.

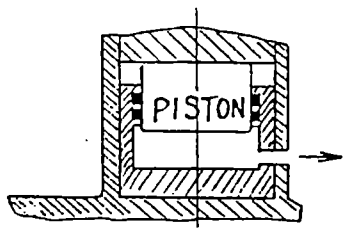
7. In starting operation, an explanation is given by using a general circuit (example).



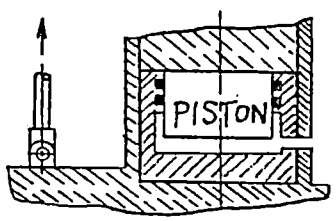
7-1. Air exhaust

When supplying the slide cylinder with oil initially, if air is contained, a proper pressure is not obtained. Consequently, take air out perfectly as indicated below, so that it can be made simply and with sure without oil leakage.

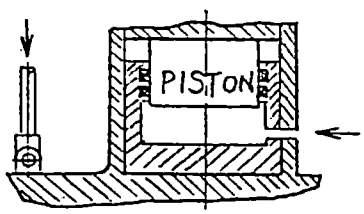
7-1-1. After the overload valve returns to its original position, the oil is supplied in the slide oylinder from SR pump. Then, reduce the balance air pressure to nil by the reducing valve (A), and function the overload valve to discharge the slide oil.



7-1-2. While pulling out the limit switch dog manually (B), raise the air pressure inside balance cylinder (C) to make it in over-balance condition. Then, lift up the slide body.



7-1-3. Return the limit switch saddle to its original position (B'), and reduce gradually the air pressure in the balance cylinder (C), thus operating SR pump to supply oil.



Repeat this operation explained in Items 7-1-1 to 7-1-3 two or three times, and perfect air exhaust is available.

Malfunotion and Trouble-shooting

o The pump does not work.	o Make certain if the connection of air parts is perfect, or if pressured air of 2 kgf/cm2 or more is provided.(28.44 PSI)
o Even though pump can work, no hydraulic pressure is available.	o Make sure if there is sufficient oil in the tank.
o Hydraulic pressure increases, but the pump does not stop.	o Check if the overload valve returns to the original position.
o After overload, the spool of valve does not return to its original position.	o The "O" rings in the overload valve or in the pump may be spoiled. Or the check valve portion is damaged by the flaws caused by the foreign particles (Overhaul is required.)
o The overload valve functions properly, but the press operation is not available.	o Adjust the limit switch portion of overload valve. Check if the function of contact portion is perfect.
o While the press stops the overload valve works.	o Check if the relief valve, which is installed in the balance air port portion of overload valve is closed without fail.
	o Pull once the cam dog (The cam in the switch portion) (At this time, open the relief valve. After pulling cam dog, close it again.)

資料番号 SR-121

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	±0.1	▽▽▽▽	[illegible]
[illegible]	±0.2	▽▽▽	[illegible]
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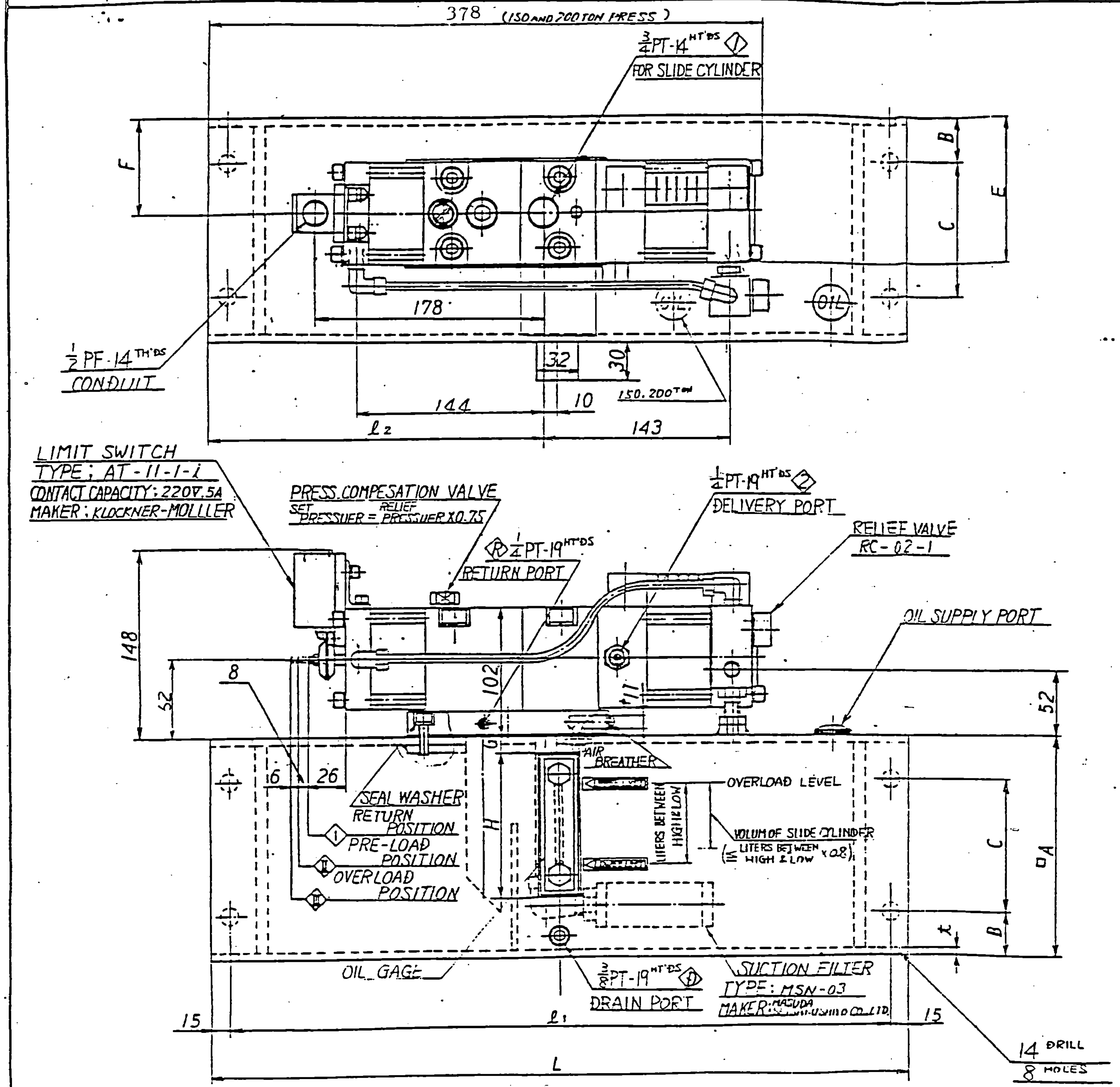
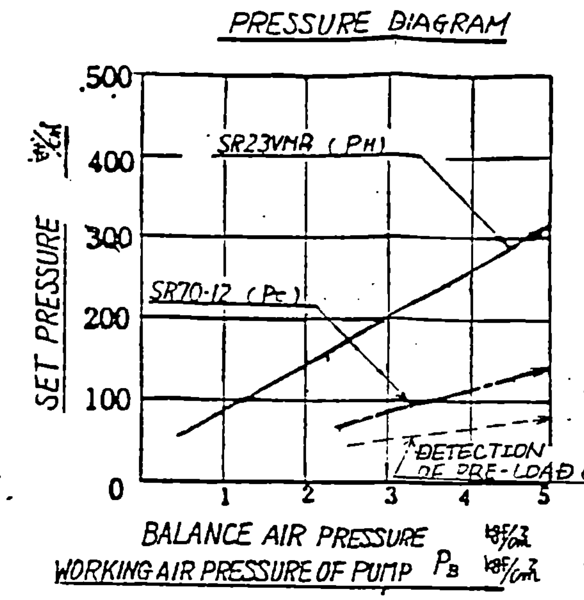
[illegible]	±0.5	▽	[illegible]
[illegible]	±0.8		

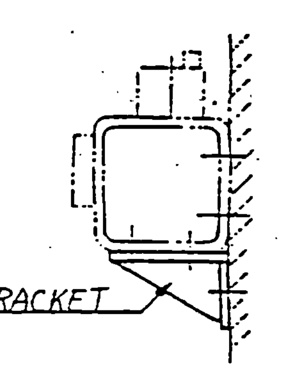




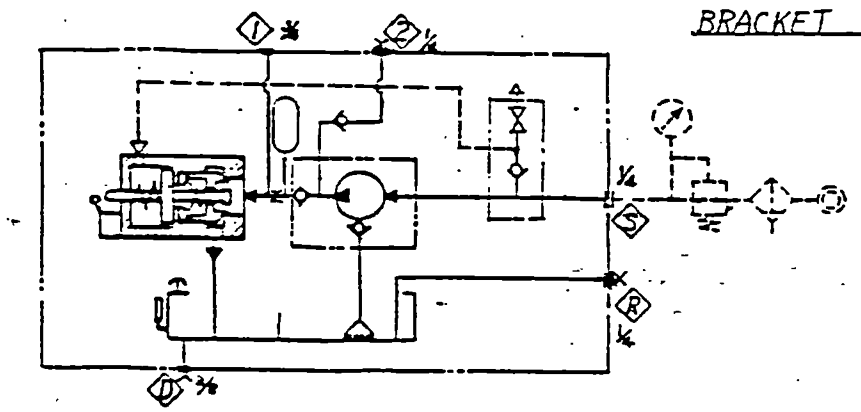
- MAX. BALANCE AIR PRESSURE : 5 kgf/cm²
- WORKING AIR PRESSURE RANGE OF PUMP: 2~6 kgf/cm²
- ORIFICE DIA : φ23 mm
- RELIEF PRESSURE P_H : 265 kgf/cm²
- SETTING BALANCE AIR PRESSURE P_B : 4.2 kgf/cm²
- DELIVERY OIL PRESSURE P_C : 115 kgf/cm²
- DETECTION OF PRE-LOAD PRESSURE P_P : ____ kgf/cm²
- AMBINT TEMPERATURE : 5-60°C
- OIL: FLUID RECOMMENDATION
- TANK COLOR : MUNSEL 7.5BG-4.5/1

TYPE	SET PRESS. P_H kgf/cm²	PRE-LOAD PRESS. P_P kgf/cm²
SR23VMB	$P_B = P_H - 8/61$	$P_P = 15P_B + 5$

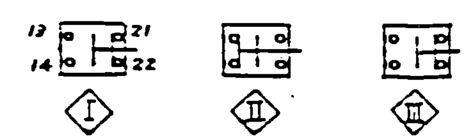
FITTING METHOD



CIRCUIT DIAGRAM



CONTACT POSITION



TYPE	TANK CAPACITY	LITERS BETWEEN HIGH & LOW	L	ℓ1	ℓ2	A	B	C	x	E	F	G	H	PRESS CAPACITY (VOLUM OF SLIDE CYLINDER (ℓ))
SR23VMB-70-12Y/C-H52	12 ℓ	4.7 ℓ	540	510	260	175	35	105	6	163	75	13	114	300 . 400 . 500 TON (1.7) (3.0) (3.7)
SR23VMB-70-12Y/C-H53	5.3 ℓ	1.7 ℓ	370	340	205	150	30	90	4.5	143	55	14	94	150 . 200 TON (0.9) (1.1)
SR23VMB-70-12Y/C-H54	5.5ℓ	2.1 ℓ	500	470	240	125	30	65	4.5	138	50	3	94	E2G

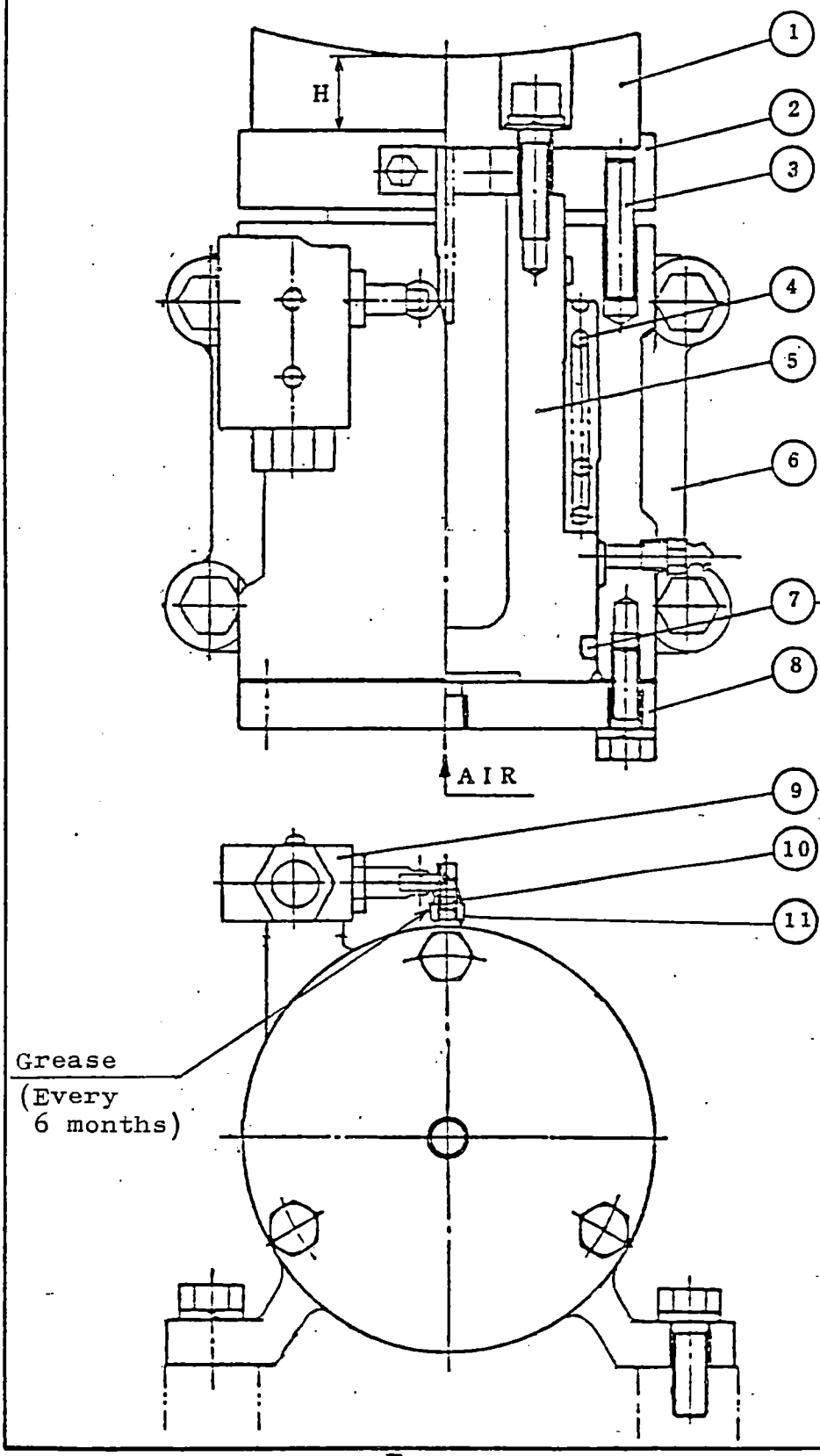
訂正記号 REV. MARK	原 因 および 訂 正 REVISION	訂正日 DATE	承 認 APVD.			
				MATERIAL	—	NAME SR23VMB-70-12Y/C
				SCALE	~	O.L.V. TANK UNIT ASS'Y
						DWG. NO.
				DATE	MAY. 21. '83	
				DESIGN	S. YOKOYAMA	

24

ACCESSORIES	FLYWHEEL BRAKE (OPTIONAL)	B107

Flywheel Brake

1. If the dimension H become less than 18mm (0.709"), facing (1) should be changed to new one.
2. Grease every 6 months.



(1) Facing
(2) Plate
(3) Pin
(4) Spring
(5) Piston
(6) Cylinder
(7) O-Ring
(8) Cover
(9) Limit Switch
(10) Cam
(11) Fitting

(7) KES-D07000-05090
(D-Ring Type)

E2P-2

ACCESSORIES	4. PORTABLE PUSHBUTTON PANEL	B502

For the sake of operator's safety, control circuit of "Portable Pushbutton" are electrically interlocked not to be operated if any safety device (Photo electric safety device or safety guard) is not used. (Except "B" spec. and "INCHING" operation)

(1) Type : Portable

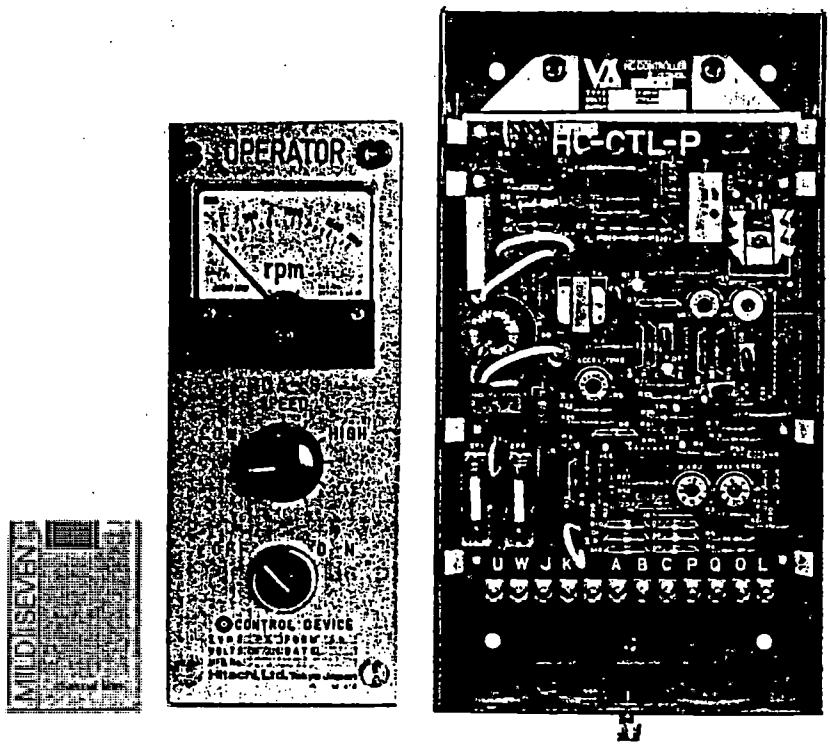
(2) Components :
1) Pushbuttons
"RUN-INCH" buttons, "Emergency Stop" button, "Top Stop" button, "Continuous Set Up" button.
2) Stand
3) Cable $2mm^2$ ($0.0031\ in^2$) x 12 X 3m(118.1 in)
4) Plug
5) Receptacle

(3) Operation :
1) Put the plug into the receptacle
2) When the press is operated, both RUN buttons should be depressed concurrently.

HITACHI HC MOTOR CONTROL DEVICE

CTL-P

INSTRUCTION MANUAL



FOREWORD

Thank you for your recent selection of "HITACHI HC MOTOR". You are kindly requested to thoroughly read this instruction manual for correctly handling this "HITACHI HC MOTOR" so that it fully exhibits its performance and functions for an extended period of time.

CONTENTS

1. UNPACKING

Carefully handle the package at the occasion of unpacking, and do not apply impact or vibration to the product. After unpacking, check for damage to components which might have occurred during shipment, and carry out the following checks.

1-1 Controller (CTL-P)

Check if the voltage indicated in the name plate is matched with the available power supply voltage. (The standard product is of 200V, 50/60Hz or 220V, 60Hz). If serial numbers of the operator and of the HC motor to be combined with the controller are indicated in the name plate, check if the combination is as indicated.

1-2 Operator (OPE-A)

Check if the voltage is good. (The standard product is of 200V, 50/60Hz or 220V, 60Hz.) Check if the speed range covers the range specified in your order specification.

2. STANDARD SPECIFICATION AND CHARACTERISTICS

Table 2-1 Standard Specification

Power supply		200V/220V 50,60Hz/60Hz	
Speed control range		Up to 3.7kW	5.5kW and up
		50Hz 100 ∿ 1200rpm 60Hz 120 ∿ 1500rpm	50Hz 100 ∿ 1350rpm** ∿(1375rpm) 60Hz 120 ∿ 1650rpm ∿(1675rpm)
Ambient temperature		-10°C ∿ 50°C	
Controller output		80V, 5A DC	
Controller input resistance		10kΩ or higher	
*Speed regulation		2% or less (adjustable in the range of 2 ∿ 10%)	
Max. excitable voltage regulating range		0V ∿ 80V	
Acceleration/deceleration time		Adjustable to 30 sec max.	
Influence of power supply	Voltage	±1%/±10% Speed fluctuation/voltage fluctuation	
	Frequency	±1%/±10% Speed fluctuation/frequency fluctuation	

$$* \text{ Speed regulation} = \frac{\text{Running speed with 5\% load torque} - \text{Running speed with 100\% load torque}}{\text{Rated maximum running speed}}$$

** Revolution in ( ) indicates the maximum revolution of 18.5 ∿ 55kW $HC\text{-}D_2$ type.

The specification of combination of a standard HC motor with a control device is as shown in Table 2-1. The characteristics of the standard specification is shown by speed-torque curves in Fig. 2-1. The shadowed area is the range that permits continuous use. Running at 100 rpm or less at 50Hz and running at 120 rpm or less at 60Hz are permitted for a short period at the time of starting or for test.

The HC motor transmits the torque of the drive motor, and it is of constant torque characteristics. The minimum torque is 5% of the rated torque of the drive motor. Thoroughly examine the minimum torque also at the occasion of capacity selection. Pay particular attention to the maximum revolution. If the HC motor is run at a revolution that is beyond the rated revolution, the exciting current rapidly increases even with a light load, and coils and bearings will be burnt.

Positively make adjustment of maximum revolution (refer to page 15) before use.

If there is a possibility where an excessive voltage which is higher than the maximum revolution setting is impressed during running with external signals other than signals from the operator, limit the exciting voltage to the rated exciting voltage indicated in the name plate by making use of the maximum torque regulating (exciting voltage limiting) function of CTL-P.

It is possible to produce a torque that is equivalent to 150% of drive motor's torque or the maximum torque as the starting torque of the HC motor. For driving a load of large inertia moment, the drive motor speed may be reduced and "roar" may be produced if starting is made in the state where setting is made at high speed. Therefore, gradually increase the speed setting.

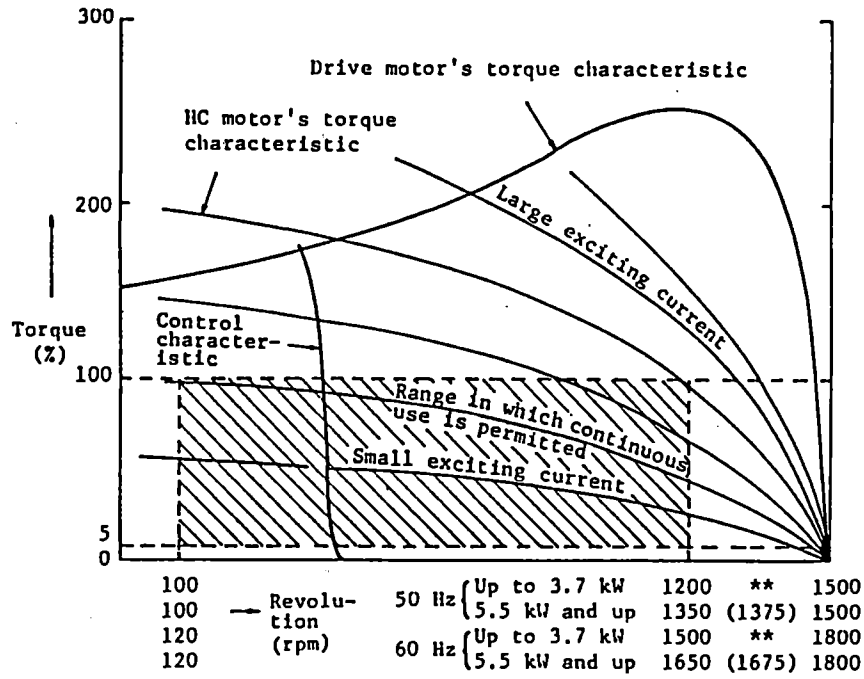


Fig. 2-1 Characteristics Curves of Standard Specification

3. PRINCIPLE OF CONTROL

The principle of speed control is shown in Fig. 3-1. Speed set voltage E_S (DC power is supplied from the controller) set by the variable resistor for speed setting mounted on the operator and voltage E_{FB} (proportional to revolution), which is detected, rectified and smoothed by PG (generator for speed detection), are compared in the controller, and the difference between them ($E_S - E_{FB}$) is amplified and a current is fed to the HC exciting coil. Accordingly, when the load increases and the revolution drops, the HC exciting current increases, the torque increases and drop of the speed is restricted. On the other hand, when the revolution increases because of a load decrease, the HC exciting current decreases, which will be followed by a torque decrease, and the revolution increase is restricted. In other words, automatic control is made to hold the revolution (output shaft revolution) of the HC motor by regulating the HC exciting current.

The control circuit controls thyristor's firing angle through phase control. When the deviation signal ($E_S - E_{FB}$) increases, thyristor's continuity angle increases and HC exciting current increases.

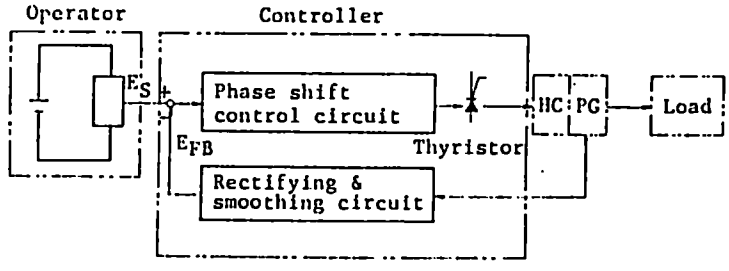
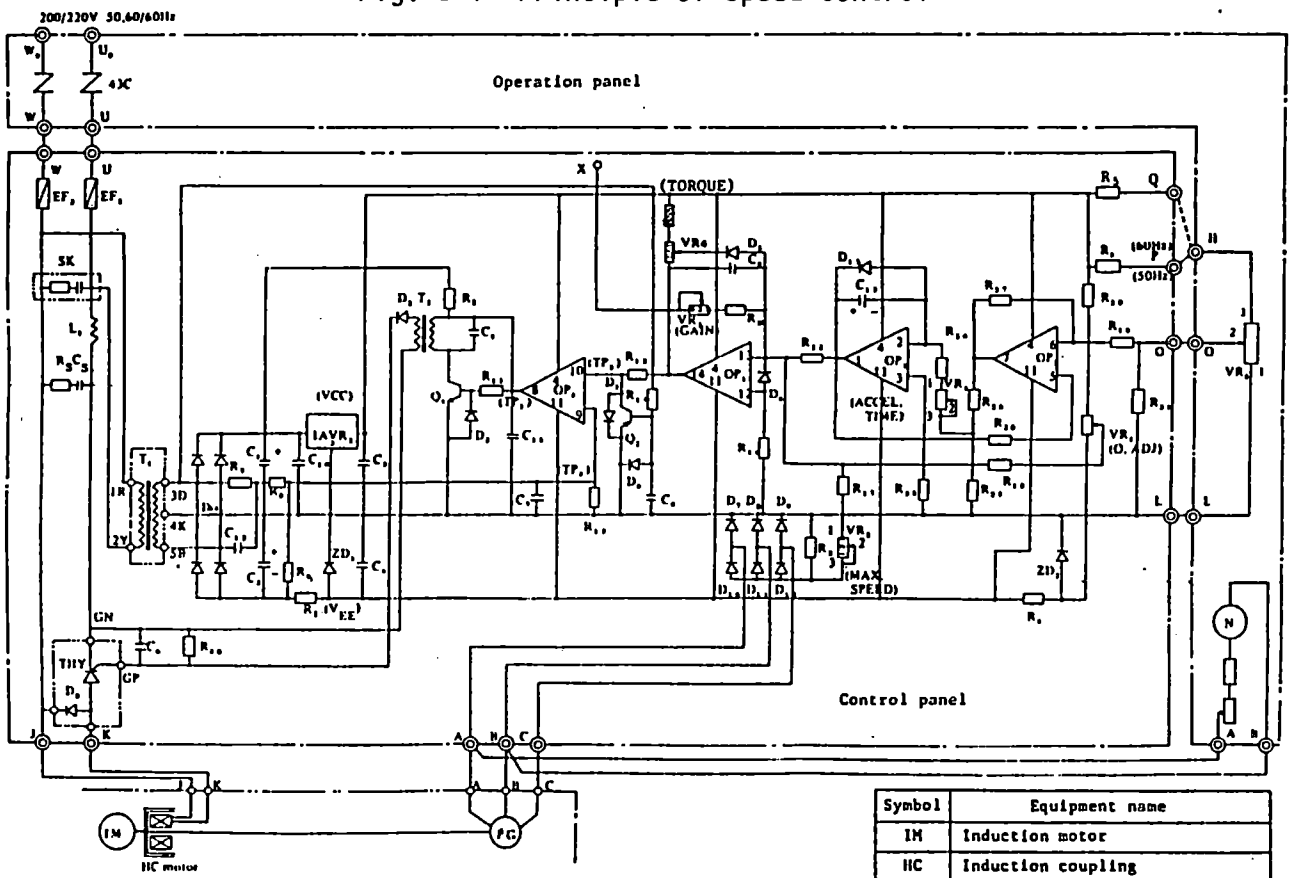


Fig. 3-1 Principle of Speed Control



(Note)

1. Symbols in ( ) are check terminals.
2. Connect internal wiring #H from operator to controller to terminal P if the frequency is 50Hz, or to terminal Q if the frequency is 60Hz.
3. The voltage between A-B (voltage generated by PG) is 20V, 400Hz at 1,000 rpm, and both voltage and frequency are proportional to the revolution.
4. The rated voltage of the controller is 200/220V. If the power supply voltage is different from it, use a transformer and regulate it the rated voltage of the controller. Select the capacity of the transformer as follows as matched with the capacity of the HC motor.

HC motor capacity	Transformer capacity
0.4~0.75kW	500VA
1.5~55kW	1kVA

Symbol	Equipment name
IM	Induction motor
HC	Induction coupling
PG	Generator for speed detection
EF	Cartridge fuse
C	Capacitor
D	Diode
ZD	Zenor diode
R	Fixed resistor
VR	Variable resistor
Q	Transistor
T	Transformer
L	Choke coil
THY	Thyristor
N	Speed indicator
43	Changeover switch

Fig. 3-2 Schematic Diagram

CTL-P also has the function to limit the maximum torque of the HC motor. It is made by limiting the width of thyristor's phase shift control, and maximum exciting voltage of CTL-P, that is, maximum torque of the HC motor, can be regulated by matching this width of phase shift control with the load condition.

CTL-P also has shockless start and stop function. In the case where shockless start and stop of one HC motor is made individually, the acceleration/deceleration time can be set out of the range of 30 seconds at maximum. However, it is not possible to make simultaneous acceleration/deceleration of multiple HC motors. Use application control device LAD-B in such a case.

A schematic diagram is shown in Fig. 3-2.

Variable resistors indicated in Fig. 3-2 are used for the following purposes.

VR1 : Zero level adjustment of speed
VR2 : Maximum speed adjustment
VR3 : Gain adjustment
VR4 : Maximum torque adjustment
VR5 : Acceleration/deceleration time adjustment

For making speed adjustment with a speed setting signal impressed from the exterior, impress a signal of 10V DC at maximum (in the polarity of O+) between terminals O and L of the controllor.

4. DIMENSIONS AND STRUCTURE

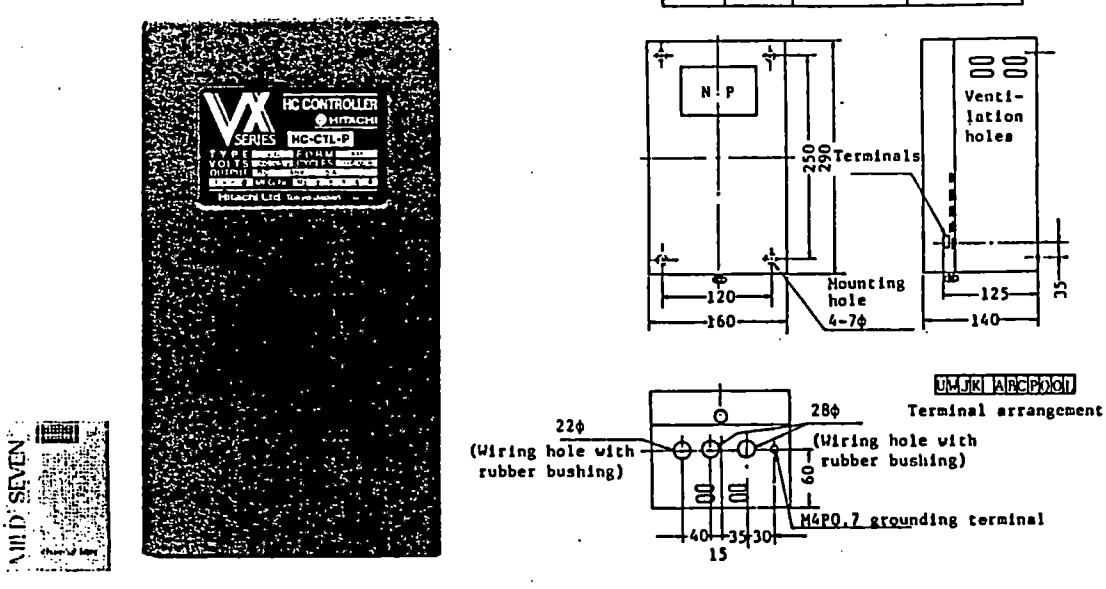
4-1 Controller

Dimensions of a controller of enclosed type are shown in Fig. 4-1, and dimensions of a controller of open type taken out of the cabinet are shown in Fig. 4-2. The interior of the controller is composed of a printed circuit board and a chassis. Arrangement of devices on the printed circuit board is shown in Fig. 4-3, and arrangement of devices on the chassis is shown in Fig. 4-4 (indicates the state where the printed circuit board is removed).

104
95
(40)

4-2 Operator

Dimensions of an operator of wall-mount type are shown in Fig. 4-5, and dimensions of an operator of flush-mount type are shown in Fig. 4-6. In the case where the operator is used as mounted on the wall, fit the cover to the case as shown in Fig. 4-7 at occasions of installation, wiring, adjustment, maintenance and/or inspection.
The arrangement of devices in the operator is shown in Fig. 4-8.
The operator may used as a flush-mount type operator when its case is removed.
In this case, remove terminals (two 5-pole terminals) only from the case with the wiring remaining unchanged, and mount them to the cover as shown in Fig. 4-9.



Note) The controller may be used as open type (shown in Fig. 4-2) when the case of wall-mount enclosed type controller is removed. 5A glass cartridge fuses (2 pcs) are provided.

Fig. 4-1 Wall-mount Enclosed Type Controller

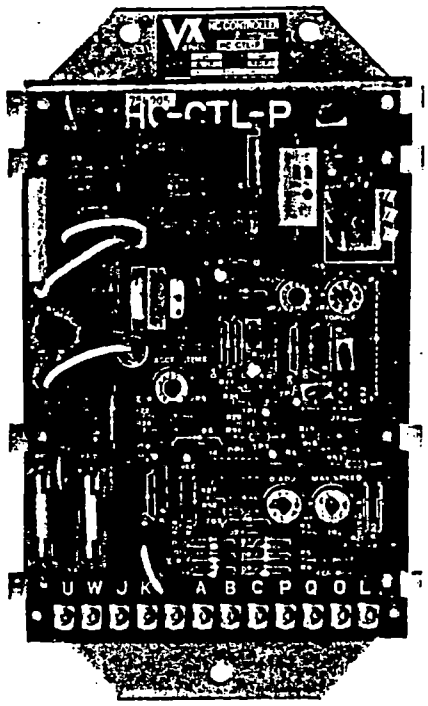
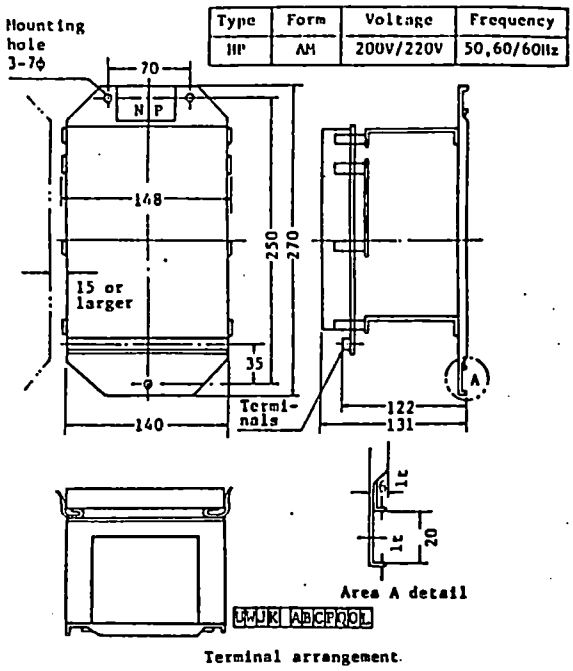


Fig. 4-2 Wall-mount Open Type Controller

CTL-P (wall-mount open type)

Type	Form	Voltage	Frequency
HP	AH	200V/220V	50,60/60Hz



Terminal arrangement

Note) A controller of enclosed type (shown in Fig.4-1) less case. In the case where multiple wall-mount open type controllers are mounted side by side, provide a separation of 15 mm at minimum. 5A glass cartridge fuses (5 pcs) are provided.

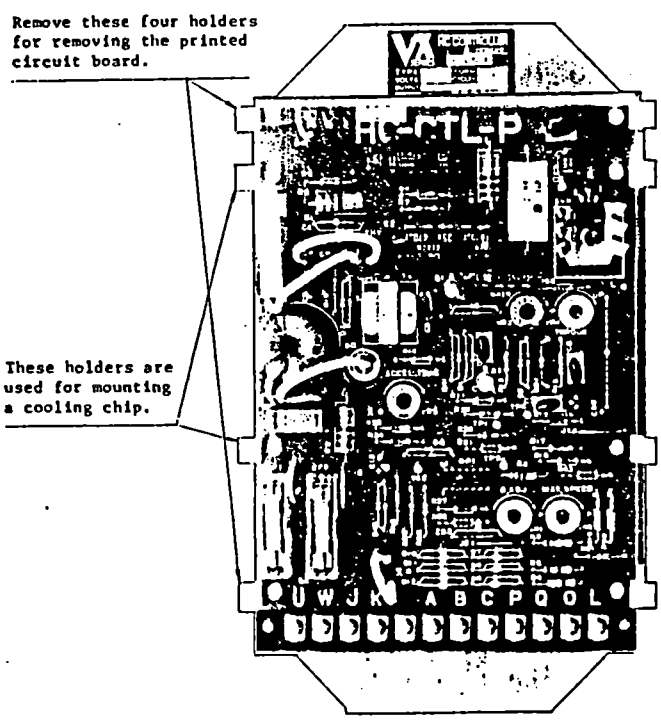


Fig. 4-3 Arrangement of Devices on Printed Circuit Board

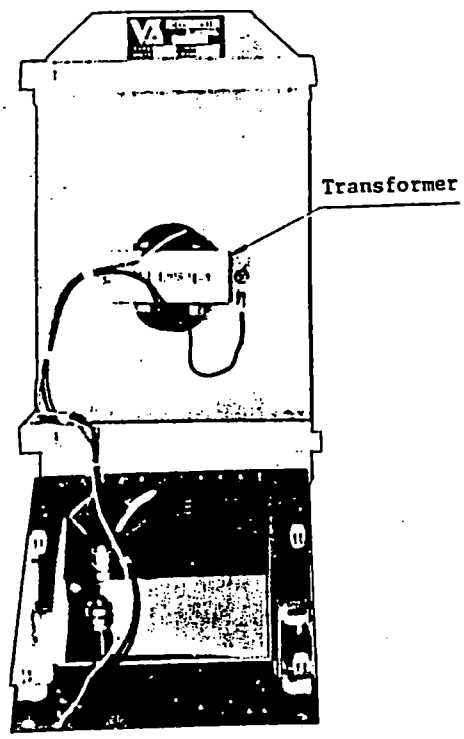


Fig. 4-4 Arrangement of Devices on Chassis

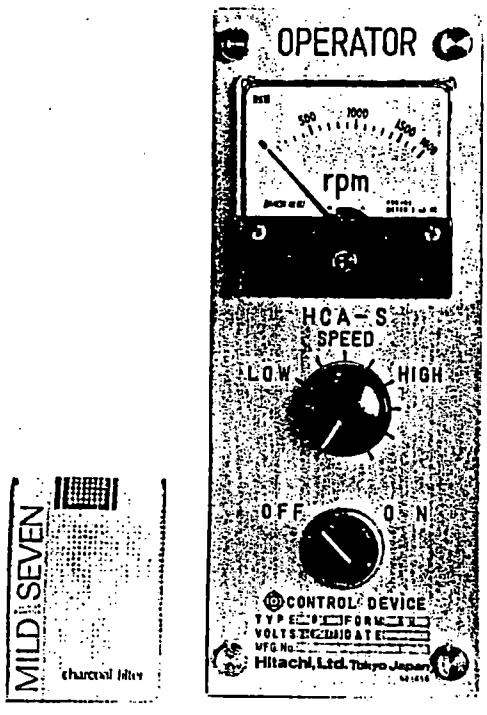
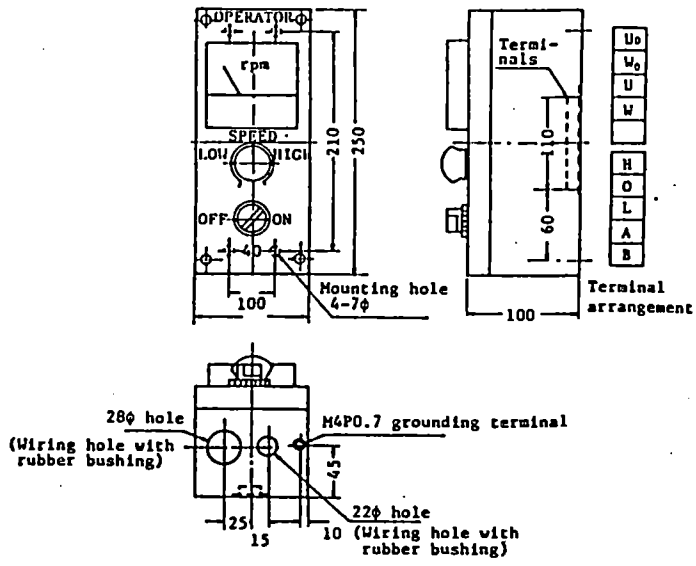


Fig. 4-5 Wall-mount Type Operator

HC operator (wall-mount type)

Type	Form	Voltage	Frequency
HD	AH	200V/220V	50,60/60Hz



Note) It may be used as flush-mount type (shown in Fig. 4-6) with the case removed.

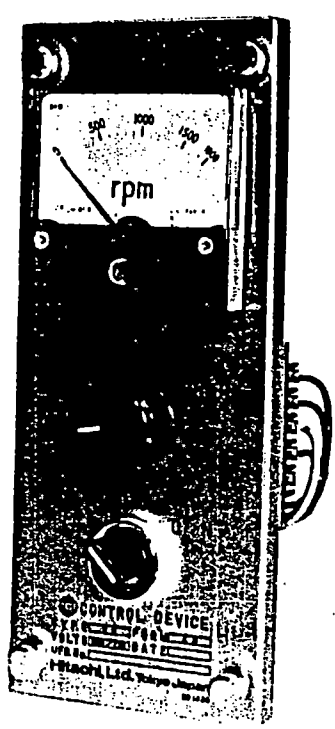
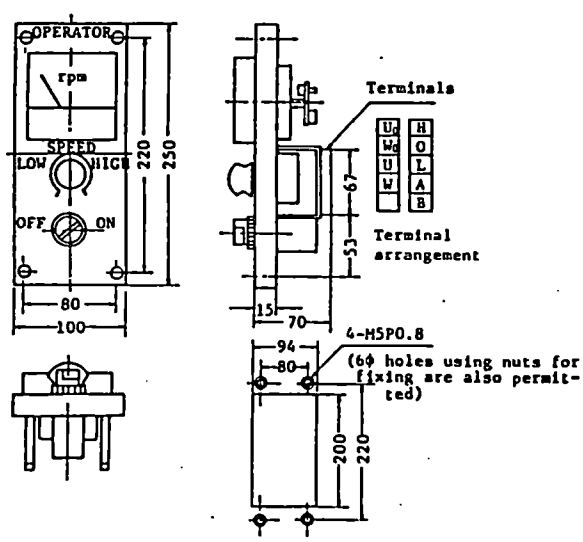


Fig. 4-6 Flush-mount Type Operator

HC operator (flush type)

Type	Form	Voltage	Frequency
HD	AH	200V/220V	50,60/60Hz



Note) An operator of flush-mount type is an operator of wall-mount type (shown in Fig. 4-5) less case.

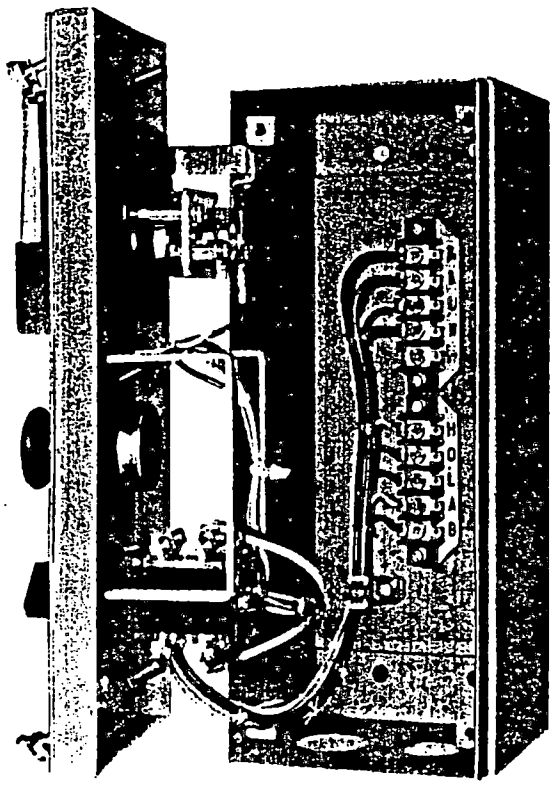


Fig. 4-7 Fitting Cover to Case

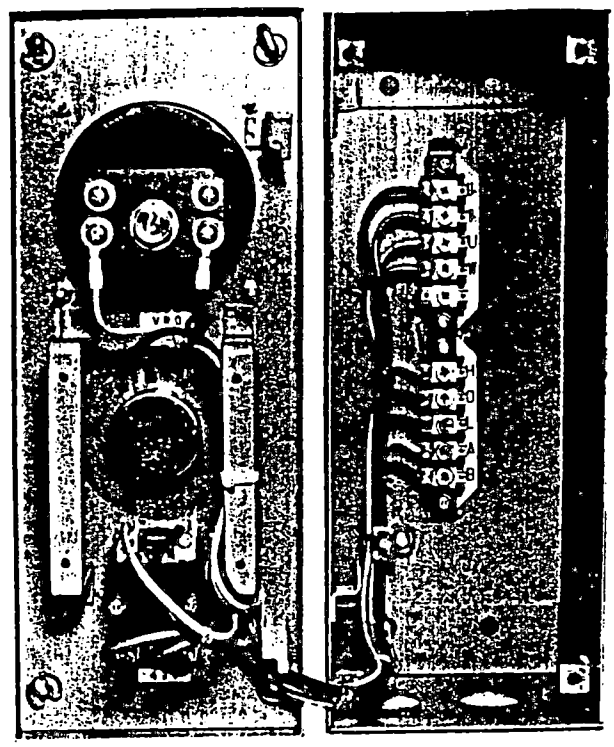


Fig. 4-8 Arrangement of Devices in Operator

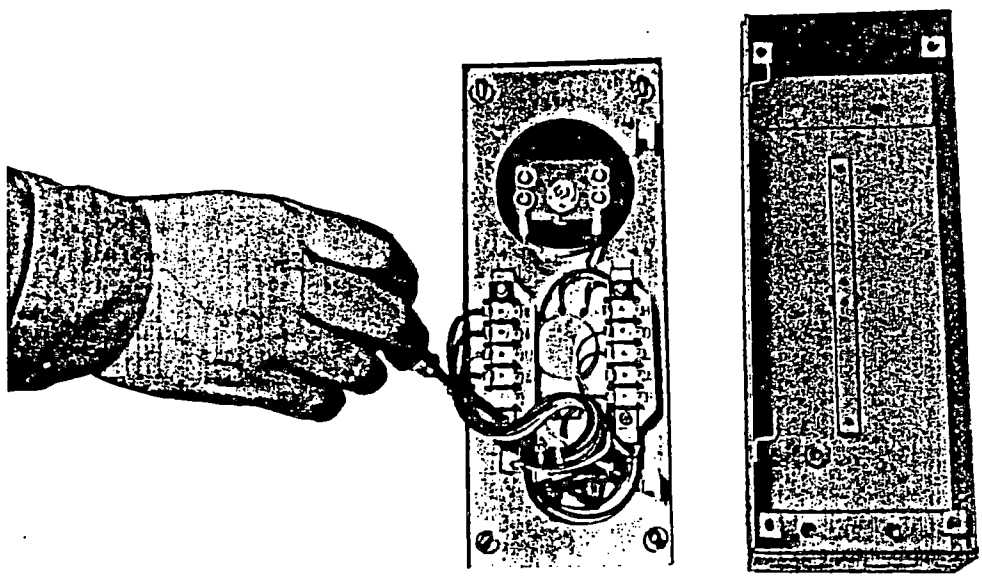
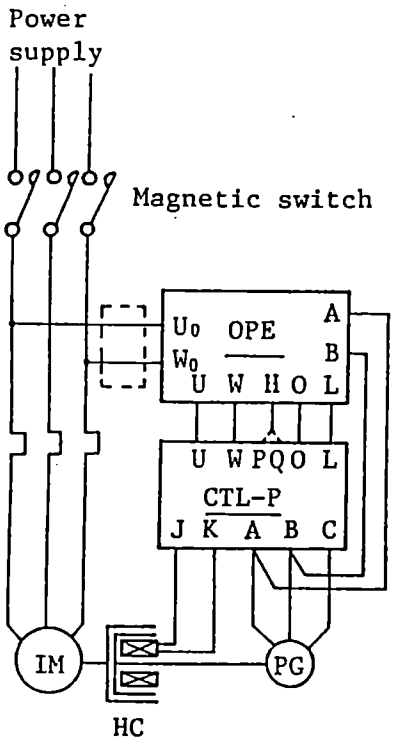


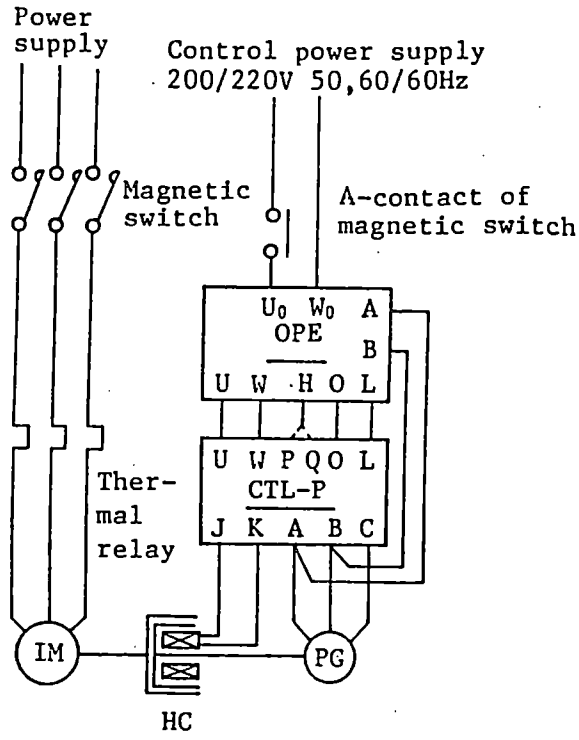
Fig. 4-9 Converting Operator to Flush-mount Type

5. INSTALLATION AND WIRING

Both controller and operator are of wall-mount type. Install them with their longitudinal directions located in vertical direction.
Install them in a place that is free from dust, moisture and gas.
Carry out wiring in accordance with the total connection diagram after installation of controller and operator. As a standard HC motor control device (controller and operator) does not include start/stop circuit for the drive motor, it is necessary to prepare it elsewhere.
A total connection diagram is shown in Fig. 5-1. Exercise care so that the power for the control circuit is ON unless the drive motor is started.
If power is impressed to the control circuit while the drive motor is not running, excessive current flows to the exciting coil of the HC motor and the exciting coil may be burnt. In order to prevent occurrence of such a problem, obtain the power for the controller from the load side of the magnetic switch for drive motor. If the power supply voltage for the drive motor is other than 200/220V 50, 60/60Hz, use a transformer so that a voltage of 200/220 50, 60/60Hz is supplied to the controller. If the power for the controller cannot be obtained from the load side of the magnetic switch, connect auxiliary a-contact of the magnetic switch to the power supply for the controller.
Select the size of the cable to the drive motor and of the grounding wire in accordance with "HITACHI HC MOTOR INSTRUCTION MANUAL". Use standard cables for wiring to the controller and operator.
In the case where standard controller and operator are used and particularly in the case where the controller is used as open type and is installed in a separate controller, install it as spaced apart from strong-current parts and cables, and do not locate the cable together with cables for strong current.
The separation between the HC motor and the control device should not exceed 50 m.



(1) Case where power is obtained from load side of magnetic s switch



(2) Case where power is not obtained from load side of magnetic switch

Note) 1. Of wires connected from operator (OPE) to controller (CTL), connect the wire from terminal H to temrinal P if the frequency is 50 Hz, or connect it ti terminal Q if the frequency is 60 Hz.

2. [--------] indicates the place where a transformer is to be inserted in the case where the power supply voltage is other than 200/220V 50,60/60 Hz.

Fig. 5-1 Total Connection Diagram

6. ADJUSTMENT AND RUNNING

6-1 Adjustment

Although the HC control device has been adjusted at shop prior to shipment, there are cases where the reading of the speed indicator is deviated to a minor extent or where zero speed and maximum speed of the speed setting variable resistor are deviated depending on the combination with the HC motor. There may also be a case where hunting occurs. Carry out adjustment in the following manner if high accuracy is required.

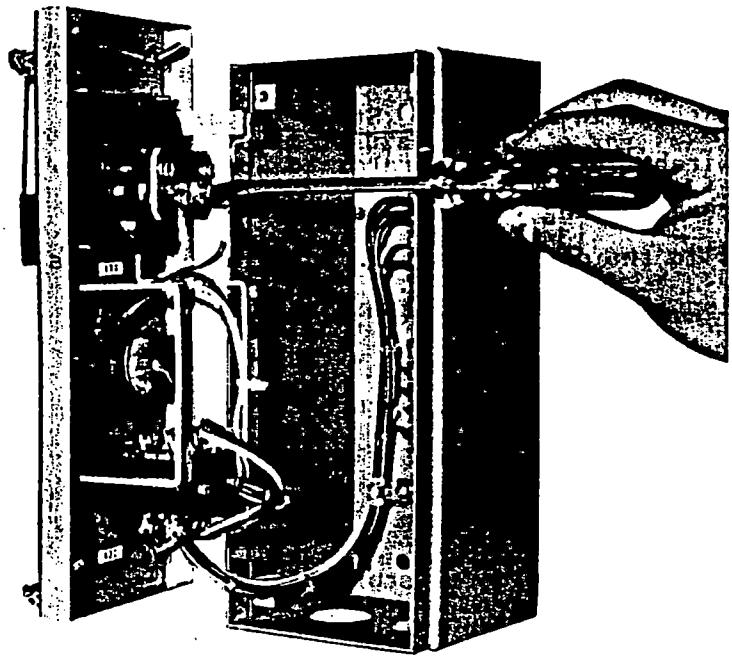


Fig. 6-1 Adjusting Speed Indicator

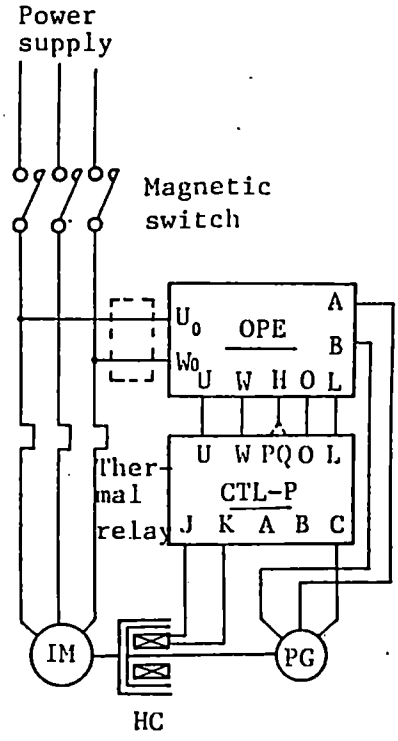


Fig. 6-2 Connection Diagram for Adjusting Revolution Counter

(1) Adjustment of Speed Indicator

Open the cover of the operator and adjust indication of the speed indicator by turning the variable resistor in the interior clockwise or counterclockwise using a standard (-) tip screwdriver, as shown in Fig. 6-1. Measure the speed of the HC motor using a standard speed indicator for adjusting the indication. Match the indication of the speed indicator on the operator with the measured value in the vicinity of 1,000 rpm.

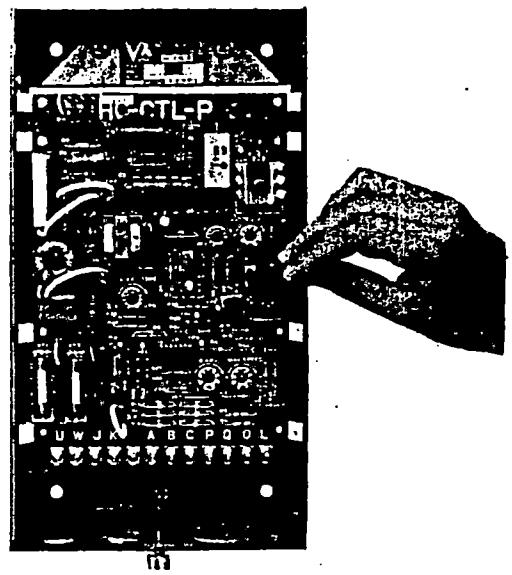


Fig. 6-3 Adjusting Gain

If no standard speed indicator is available, make adjustment in the following manner in unloaded state disconnected from the load. Of wiring between controller and HC motor, disconnect wires from terminals A and B of the controller and connect them to terminals A and B of the operator as shown in Fig. 6-2. Start the drive motor. Turn changeover switch 43C on the operator to "ON" position and then fully turn the speed setting variable resistor clockwise. Turn the variable resistor in the operator mentioned earlier in this state and set the indication at 1,500 rpm if the power is of 50Hz or 1,800 rpm if the power is of 60Hz. Lock the variable resistor on completion of adjustment, and change wiring connection back to what is shown in the total connection diagram (Fig. 5-1).

(2) Zero Adjustment

Make zero adjustment by turning variable resistor VR_1 for minimum speed adjustment mounted in the controller in the state where the HC motor is coupled with the load and the load is reduced to the minimum. Set variable resistor VR_0 for speed setting in a position that is slightly (about 1/2 graduation of ten equally divided graduations) before the position reached by fully turning it counter-clockwise and turn VR_1 in the controller clockwise using a standard (-) tip screwdriver. Stop and lock VR_1 at the point at which the HC motor begins to rotate.

(3) Maximum Speed Adjustment

Make maximum speed adjustment by variable resistor VR_2 for maximum speed adjustment. VR_2 is set at about 1,200 rpm at 50Hz at shop prior to shipment. If the power supply frequency is 60Hz or if the HC motor is 5.5kW and up even when the power supply frequency is 50Hz, the maximum speed varies. Turn VR_2 so that the recolution of the HC motor reaches the maximum speed when variable resistor VR_0 for speed setting in the operator is fully turned clockwise in the state where the specified load is applied to the HC motor. The speed of the HC motor increases when VR_2 is turned clockwise.

(4) Gain Adjustment

The gain can be adjusted by variable resistor VR_3 mounted in the controller. Adjustment can be made by around 2 ∿ 10% for reducing the speed regulation. Setting is made at about 5% at shop. If hunting occurs in this state, slightly reduce the gain. Gain adjustment is shown in Fig. 6-3.

112
103
(98)

(5) Maximum Torque Adjustment and Exciting Voltage Limit Adjustment

Make wiring connection as shown in Fig. 6-4. Fully turn VR_0 clockwise. Fully turn variable resistor VR_4 for torque setting counterclockwise. The current of IM is less than the rated current. When VR_4 is slowly turned clockwise while observing the ammeter of IM, the swing of the ammeter increases accordingly. Turn VR_4 so that the desired current value (torque value) is obtained. If it is not necessary to limit the torque, set VR_4 in the position reached by fully turning it clockwise.

For limiting the exciting voltage, connect a DC voltmeter between terminals J and K shown in Fig. 6-4, and turn VR_4 in the sequence identical to that for maximum torque adjustment, so that the voltmeter reading is the target exciting voltage (a value that does not exceed the value indicated in the rating name plate).

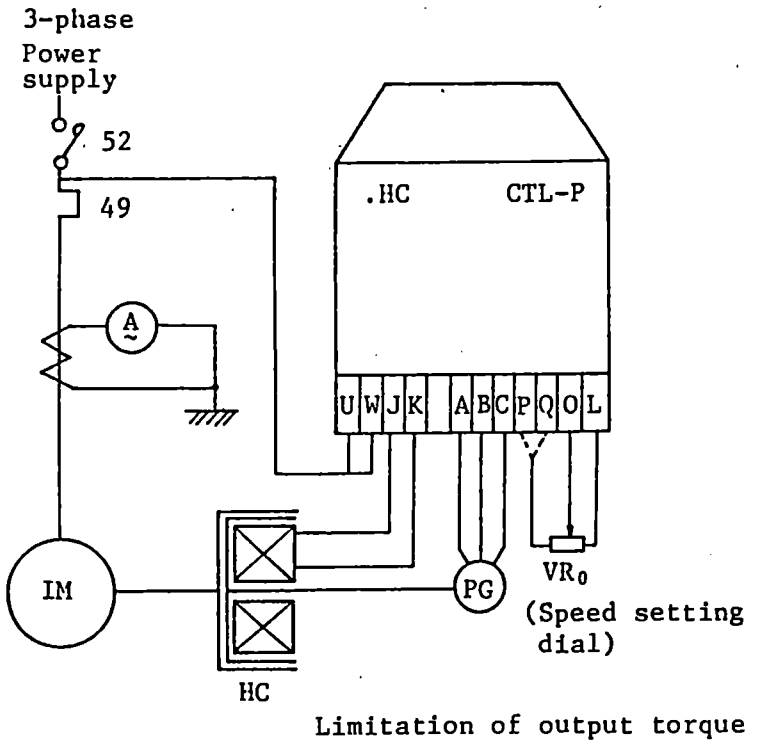
(6) Acceleration/Deceleration Time Adjustment

Setting of acceleration/deceleration time can be made by VR_5 when it is wanted to perform shockless acceleration/deceleration. Acceleration and deceleration are of about the same time. Adjustment can be made to 30 seconds at maximum. The time increases when VR_5 is turned clockwise. Keep VR_5 in the position reached by fully turning counterclockwise when it is not necessary to make acceleration/deceleration shockless.

(7) Checks to be made after Adjustment

On completion of adjustment described above, measure the voltage between terminals J and K while the motor is running, and assure that it does not exceed the exciting voltage indicated in the name plate on the motor. If a voltage that is higher than the value indicated in the name plate is continuously impressed, the exciting coil or bearings may be burnt.

113
104
(#9)



Limitation of output torque of HC motor can be made by setting the maximum level of current value of IM motor.

Fig. 6-4 Method for Adjusting Maximum Torque

6-2 Start and Stop

First of all, start the drive motor. When its speed reaches the rated revolution, turn changeover switch 43C on the operator to "ON" position. Power is supplied to the HC controller as a result and it is possible to change the revolution of the HC motor by variable resistor VR_0 for speed setting. For stopping the load only, turn changeover switch 43C to "OFF" position. The HC motor is de-energized and comes to a stop. Completely turn the changeover switch to "OFF" position at this time. When the drive motor is stopped, the HC motor is also de-energized. The running speed of the HC motor is indicated by the speed indicator on the operator. If speed adjustment is required, turn variable resistor VR_0 while observing this speed indicator.

114
105
(150)

For stopping the HC motor, do not open the circuit between terminals, J, K of the controller and the exciting coil of the HC motor. Be sure to open the circuit along the power line to terminals U, W of the controller. Run the HC motor in the rated speed range. If the HC motor is run at a high speed or low speed outside of the rated speed range, the exciting coil and drum of the HC motor are overheated and an accident may occur. Depending in the load there are cases where the HC motor is not stabilized but hunting occurs. Stability can be obtained in such a case if the speed regulation is increased. Please send an inquiry to us if the situation does not allow increase of speed regulation.
Reversing of the HC motor can be made only by reversing the drive motor, and it is not necessary to change wiring of the controller.

7. MAINTENANCE AND INSPECTION

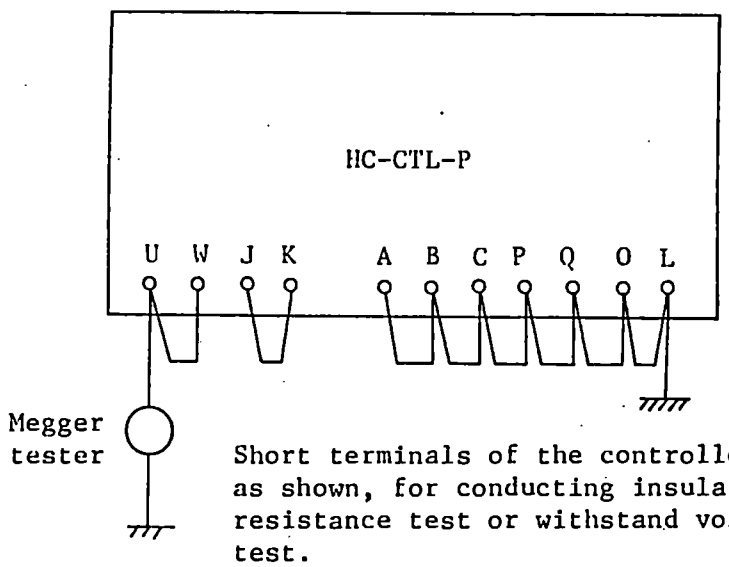


Fig. 7-1 Connection for Insulation Resistance Test and Withstand Voltage Test

(1) Short terminals of the controller as shown in Fig. 7-1, for conducting insulation resistance test of the controller.

(2) Pay sufficient attention to open circuit and poor connection of wiring, and always keep terminals firmly tightened.

(3) Exercise care, if temperature rise of any device becomes abnormally high.

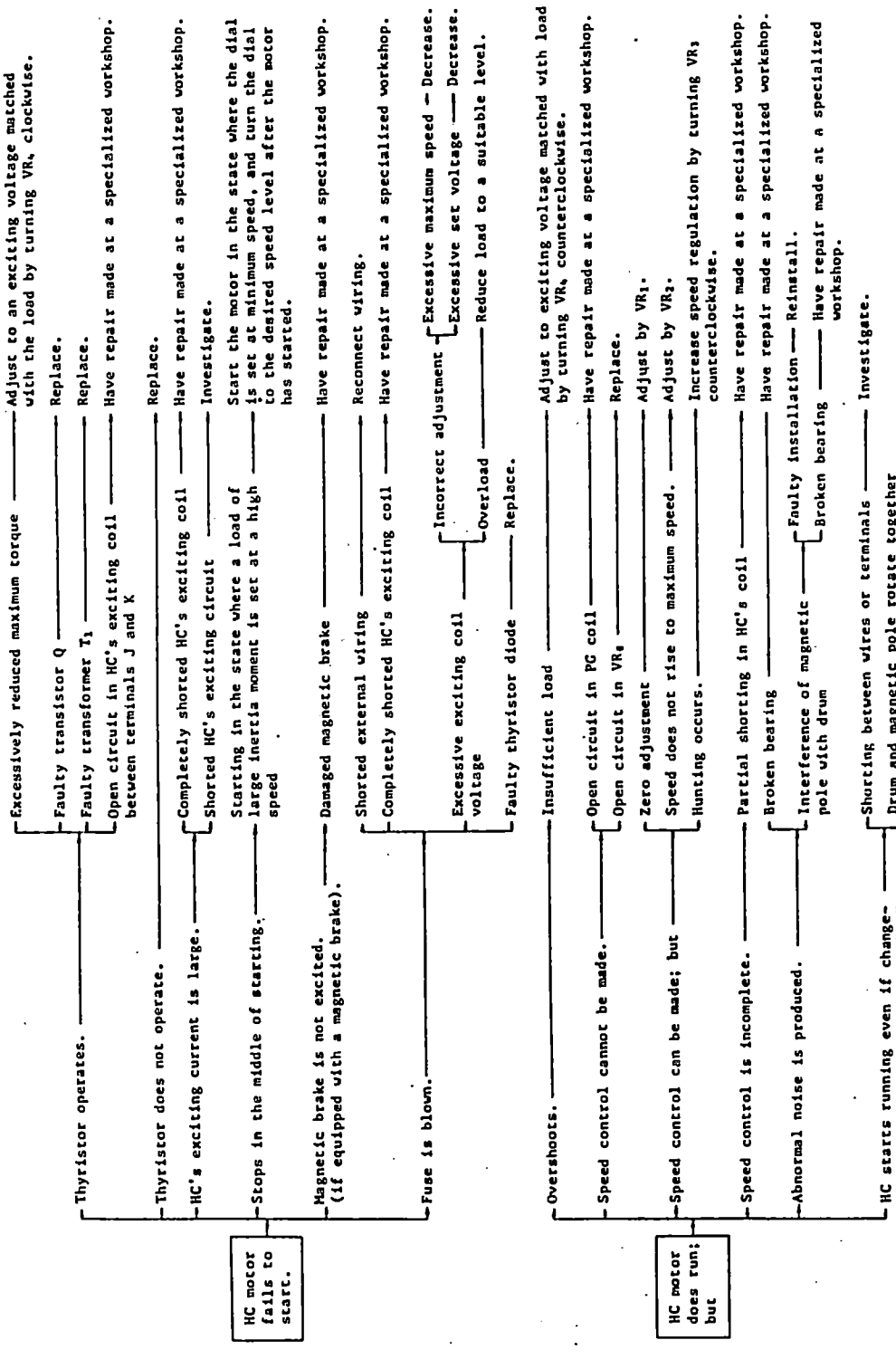
(4) Always keep the controller and operator clean without dust.

(5) If any failure occurs to the HC control device, refer to "TROUBLE-SHOOTING" (page 19).

115
106
550

☐ TROUBLESHOOTING (Refer to schematic diagram.)

In the case where the changeover switch on the operator is turned to "ON" position in the state where the drive motor is normally running:



8. INFORMATION REQUIRED FOR INQUIRY

Please give the following information to your dealer on occurrence of a failure to the product, for placement of an order for spare parts or for any inquiry regarding the product.

(1) TYPE, FORM
(2) VOLTS
(3) MFG, NO.

If the description on the name plate can be hardly read, please inform the readable items together with a simple sketch of the required part.

117
108
(53)

SOLID STATE CONTROLLER

I. Specifications

1. Voltage

(1) Input	AC100V	
(2) Input signal	DC24V	
(3) Output	DC24V	
(4) Control	DC5V (Digital)	DC±12V(Analogue)

2. Control system

(1) Hard	Wired logic + Read only memory
(2) Circuit	Mutual comparison at 2 circuit
(3) Check	Check by operator's at stop

E2P-2
E2M

3. Operation

(1) Stroke selector	INCH, SINGLE, CONT. OPTION

4. Run

(1) Anti-tie down	Without timer	
	Option = with timer (0.5 sec.)	
(2) Continuous set up	Option (3 sec.)	
(3) Input at push button	4 input (2A, 2B)	

5. Stroke angle

(1) Angle signal	$0 \sim 360^{\circ}$ BCD code (Absolute)
(2) Angle setting	DIP Switch

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6. Indicate

(1) Roulette panel	Digital indicate	0～360°	Every 1°
	Roulette indicate	0～360°	Every 15°
	Stopping time	0～999 ms	
(2) Input indicate	LED All (24 pcs.) indicate		
(3) Circuit condition indicate	LED 4		
(4) Fault indicate	LED 4		

7. Fault detector

(1) Motion detector	Detector space	Every 10°
	Detector time	Propotion at stroke number
	Setting	RPM × 80%
(2) Detecting synchro for broken wiring	When the synchro control circuit or the wiring in any phase is broken	
(3) Over run	When the running angle exceeds 15°	
(4) Run push button	Refer to item 8.	
(5) Operating selector	"	
(6) Control circuit for solenoid valve	"	

8. Checking and troubleshooting the controller internal circuit

The following checks must be made by the operator before operation.

(1) Run circuit	Check, Always monitor
(2) Operation selector switch circuit	Check, Always monitor
(3) Run push button circuit	Check, Always monitor

(4)	Overrun detector circuit	Check
(5)	Motion detector circuit	Check
(6)	Angle signal (BCD code)	Check, Always monitor
(7)	Setting angle signal	Check
(8)	Voltage of solenoid coil	Check, Always monitor
(9)	Light guard	Check

9. Output signal

(1)	Clutch.brake	DC24V × 2
(2)	Integrating counter	" × 1
(3)	Accumulation counter	" × 1
(4)	Running	" × 2
(5)	Ready to start	" × 2
(6)	Light guard effective	" × 1
(7)	" ineffective	" × 1
(8)	Overrun	" × 1
(9)	Flywheel stop	" × 1
(10)	Position of upper dead point	Contact 100V, 2A
(11)	Emergency stop	"

II. Preparation and adjustment when installing the controller or replacing the board.

1. Before operation

(1) Setting the stop angle

Set the DIP (dual in-line package) switches on the display and driver board (LOC-4) in the following manner.

① Setting the angle for backup (second brake control)

Set the angle to 355° (DS1 = 3, DS2 = 5, and DS3 = 5).

Note: Instruction for setting the angle for installing the second brake will be given separately.

② Setting the stop angle

Set DS4, DS5, and DS6 and DS7, DS8, and DS9 at angles between 300° and 350°.

Use DS4 - DS6 when the top dead center stop selector switch is off, or when there is no switch.

Use DS4 - DS6 when the top dead center stop selector switch is on.

(2) Confirming an optional stroke (when replacing the board)

When there is an optional stroke in addition to the "INCH", "SINGLE" and "CONT." operation strokes, make sure that the present ROM (read-only memory) is correct.

2. Preparation for operation

After checking the wiring to the controller, turn the power switch on and check the monitor lamps (LED) for the following conditions.

(1) Control mode switches

Of lamps No.21 to 24, only the lamp for the intended stroke lights. The other lamps are off.

(2) Operation push button switches

Lamps No.14, 15, and 17 light. Lamps No.16, 18, 19, and 20 are off.

(3) Machine conditions

Lamps No.10 - 13 are off.

(4) Light guard operation

① When the light guard is off:

Lamps No.6 and 8 light.

Lamps No.7 and 9 are off.

② When the light guard is on:

Lamps No.7 and 9 light.

Lamps No.6 and 8 are off.

(5) Output from the light guard

① When the light guard is off:

Lamps No.1, 2, 3, and 4 may either light or be off.

② When the light guard is on:

Lamps No.1, 2, 3, and 4 light.

(6) Stand-by point selector

Lamp No.5 may either be on or off.

(7) Indication of fault

Lamps No.25 - 28 are off.

(8) Circuit conditions

① When the control selector switch is in "INCH" position, lamps No.29 and 30 may be either on or off. Lamps No.31 and 32 are off.

② When the control selector switch is in any position other than "INCH", lamps No.29 and 30 light. Lamps No.31 and 32 are off.

3. Stroke angle adjustment

Start the main motor and bring the slide to the top or bottom dead center by "INCH". Then, use the DIP switches (DSW1 thru DSW3) on the S/D board (LOC-6) so that the digital angle indicates 0° (upper dead point) when the slide is at top dead center or 180° (Lower dead point) when the slide is at bottom dead center.

DSW3 --- gives a large angular variation

DSW2 --- gives a medium angular variation

DSW1 --- gives a small angular variation

4. Stop position adjustment

(1) Setting the maximum number of the slide strokes

Set the number of slide strokes per minute at the maximum rated value and turn VR1 on the output board (LOC-5) clockwise to turn off the LED (LA1) on the right side of VR1. Then, turn VR1 counterclockwise to turn the LED on. Next, turn VR1 counterclockwise by one scale mark and fix VR1 in position.

(2) Setting the slide stop position at the maximum number of the slide strokes

Set the number of slide strokes per minute at the maximum rated value and set the operating control selector switch in SINGLE position. Then, operate the press and check where the slide stops. If the slide stops at an angle out of the range of 330° to 15°, change the set angles of DIP switches DS4 - DS6 and DS7 - DA9 on the board (LOC-4).

(Example)

If the slide stops at a position of 260° even though the DIP switches have been set at 200°:

360° - 260° (stop position) = 100°

200° (setting angle) + 100° = 300°

Then, reset the DIP switches to 300°.

Operate and stop the press again and see if the slide stops at an angle between 330° and 15°. The angle need not be 0°. (refer to Item 5. in Page 9)

2/17

(3) Setting the slide stop position at the minimum number of slide strokes

Normally, the minimum number of slide strokes is set to 1/2 of the maximum number of slide strokes. If the minimum number of strokes is less than 1/2 of the maximum number of strokes, the slide may not stop within $\pm 3^{\circ}$ of the preset position.

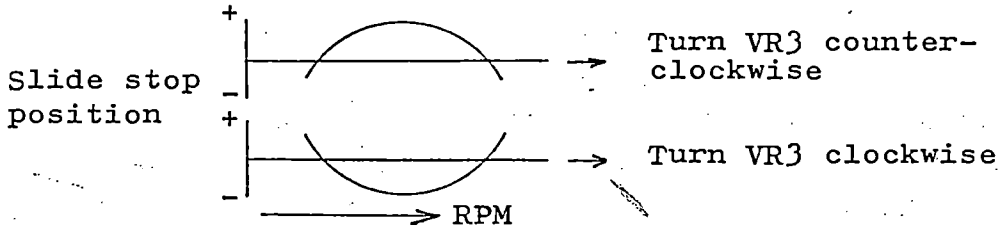
Set the number of slide strokes to the minimum applicable number of strokes. Then, operate the press under SINGLE operational control and see if the slide stops at the same position as when stopped at the maximum number of strokes. If the stop position angle is larger than that for operation at the maximum number of strokes, turn VR2 clockwise. If smaller, turn VR2 counter-clockwise. After adjustment, the slide will stop at the position angle preset for operation of the maximum number of slide strokes.

(4) Checking the stop position in the whole range of slide strokes

See if the slide always stops within $\pm 3^{\circ}$ of each preset angle in the whole range of slide strokes divided into the minimum, maximum, and medium numbers of strokes.

(5) When the slide stops at various positions

(When the stop position angles are not within $\pm 3^{\circ}$ of the preset values)



5. Correcting the stop position at top dead center

If the slide stop position at top dead center is not 0°, correct the position angle with the DIP switch (DS4 - 6 or DS7 - 9).

(Example)

At the max. number of slide strokes : 343°

At the min. number of slide strokes : 338°

$360^{\circ} - 343^{\circ} = 17^{\circ}$

Therefore, add 7° to the preset position angle with DS4 - 6 or DS7 - 9.

6. Adjusting the motion detector

Operate the press at the maximum number of slide strokes under continuous operational control and turn VR4 on board LOC-5 clockwise little by little to actuate the motion detector. Then, stop the press. Set the detector to 80% of the value indicated by VR4. Thereby, the motion detector will actuate at 80% of any optional number of slide strokes.

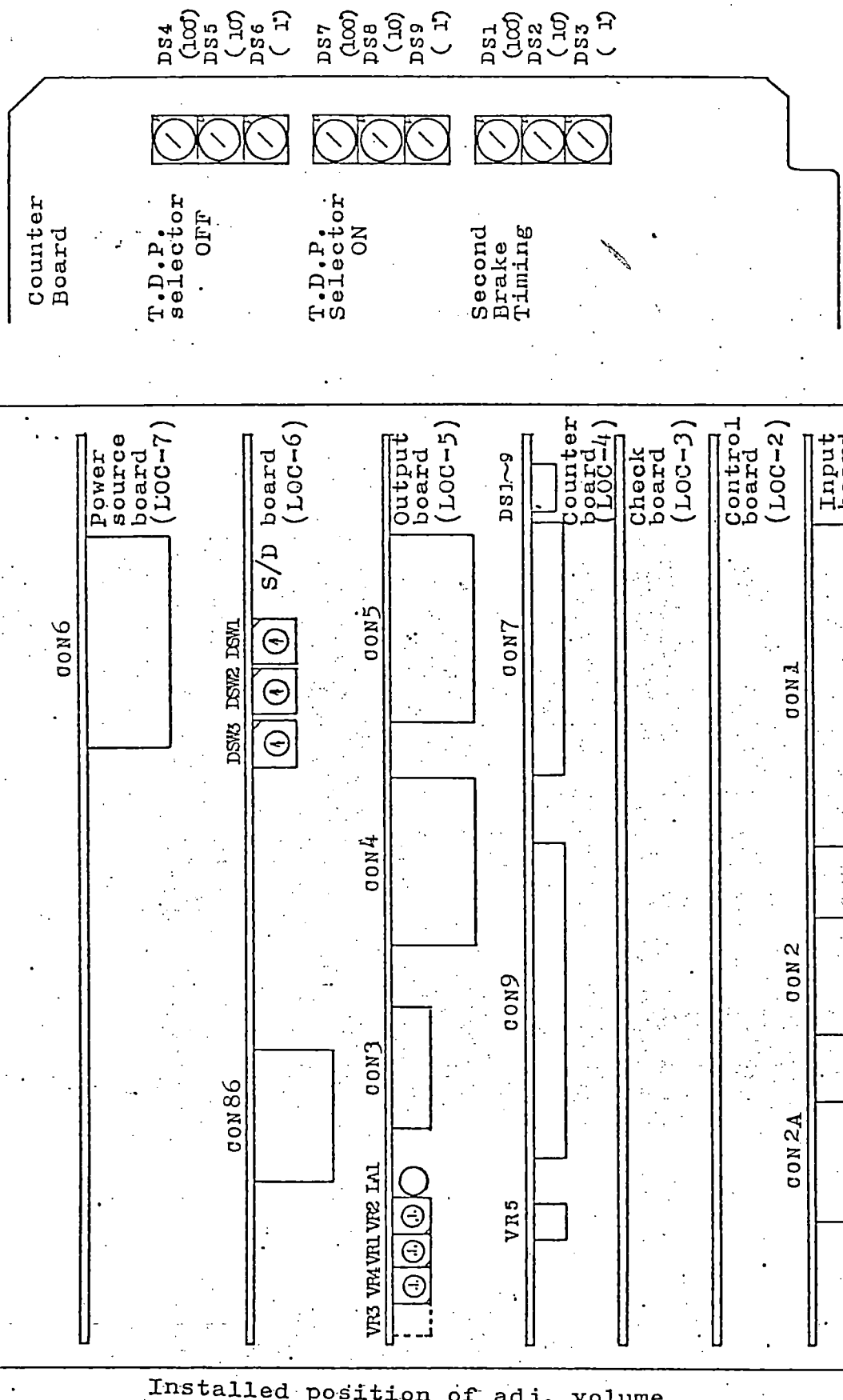
7. Starting compensation switches

Starting compensation switches are used to compensate for a delay in the electric starting signal or the beginning of the slide movement. The periods of compensating time are indicated below.

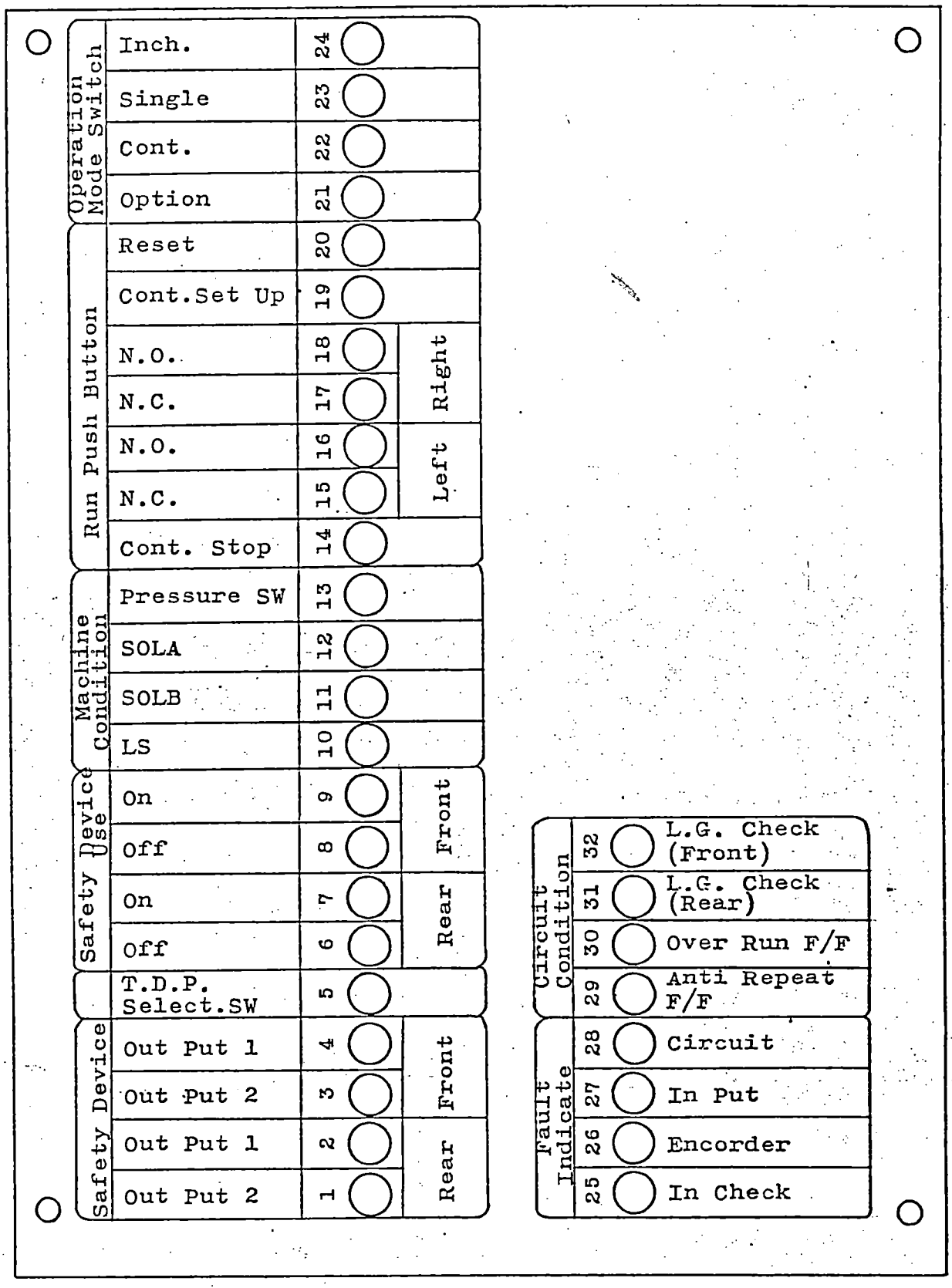
Switch operating pattern	SW1	SW2	Period of compensation, ms
1	OFF	OFF	Approx. 200
2	OFF	ON	" 400
3	ON	OFF	" 600
4	ON	ON	" 800

The starting compensating time should be short enough to avoid switch operating patterns 4,3, and 2 and to avoid actuating the motion detector when the press is started.

10. Installed of Adjustment Volume



Installed position of adj. volume
(Top view of digital control device)


Operation Mode Switch
Inch. 24
Single 23
Cont. 22
Option 21
Run Push Button
Reset 20
Cont.Set Up 19
N.O. 18
N.C. 17
N.O. 16
N.C. 15
Right
Left
Cont. Stop 14
Machine Condition
Pressure SW 13
SOLA 12
SOLB 11
LS 10
Safety Device Use
On 9
Off 8
On 7
Off 6
Front
Rear
T.D.P. Select.SW 5
Safety Device
Out Put 1 4
Out Put 2 3
Out Put 1 2
Out Put 2 1
Front
Rear
Circuit Condition
L.G. Check (Front) 32
L.G. Check (Rear) 31
Over Run F/F 30
Anti Repeat F/F 29
Fault Indicate
Circuit 28
In Put 27
Encorder 26
In Check 25

SAFETY	1. SAFETY PRECAUTIONS	C101-1

The following matters should be observed to prevent injury or a fatal accident on operators.

1. This press is provided with the following devices and components as safety measures is its operation.
   Do not remove, modify or change their control circuits to prevent their functional deterioration.
   1) Over run ditector
   2) Motion ditector
   3) Dual valve
   4) Pressure switch for clutch and balancer
   5) Safety control circuit (non-contact control device)
   6) Safety block
   7) Protective grille

2. Do not operate the press with any portion of operator's body within a dangerous area such as under the slide in a die, etc. Dies should be designed in conformity with the "Technical guidance for safety standard of dies".

3. Do not change or adjust a die or service the press while the flywheel is in motion. When making such an operation, be sure to move the control power switch key to OFF and take the key out of the switch.

4. Before operation of the press, confirm the notched position for selector switch with key "OPERATION".

5. Do not make any modification on safety device and control circuit provided for the press.

6. Be sure to make such correct "OPERATION" "ADJUSTMENT" and the "PERIODICAL INSPECTION AND SERVICING" as described in this machine manual. (Refer to F101)

OBS-21
OBS
OBS-2
OBS25-2
OBS25
OBA-2
OBW-2
EM

7. Do not operate the press, if the driving mechanism, a safety device or a safety control circuit is out of order. Carry out servicing correctly according to the"trouble shooting guide"in this machine manual. KOMATSU genuine parts should be used as replacement parts.

8. Do not operate the press with the main control box door left open. After making sure the door screwed, operate the press.

9. Do not operate the press with the rotary cam drive unit, flywheel, etc., remaining uncovered.

10. Do not operate the press beyond the specified data or working capacity given in this machine manual.

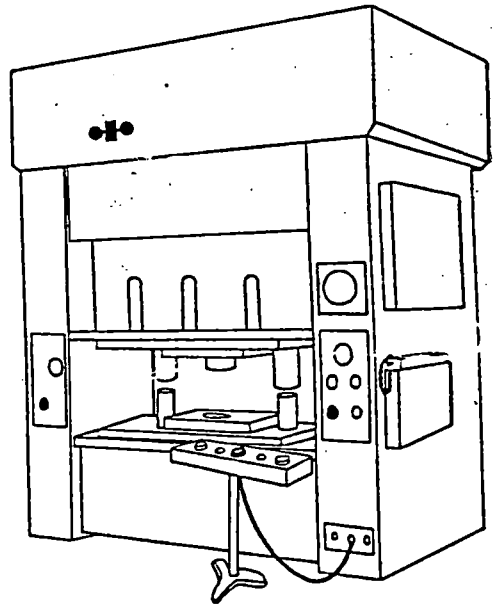
11. "INCH" control should be operated in die spotting works only. Do not operate the press under ordinary press works in "INCH" operation.

SAFETY	1. SAFETY PRECAUTIONS	C101-3

KOMATSU is always studying operational safety for presses. Please contact KOMATSU for inquiry about the latest information on our press technology and techniques.

OBS-21
OBS
OBS-2
BS25
BS25-2
OBA-2
OBW-2

SAFETY HANDBOOK



KOMATSU LTD.

TOKYO, JAPAN

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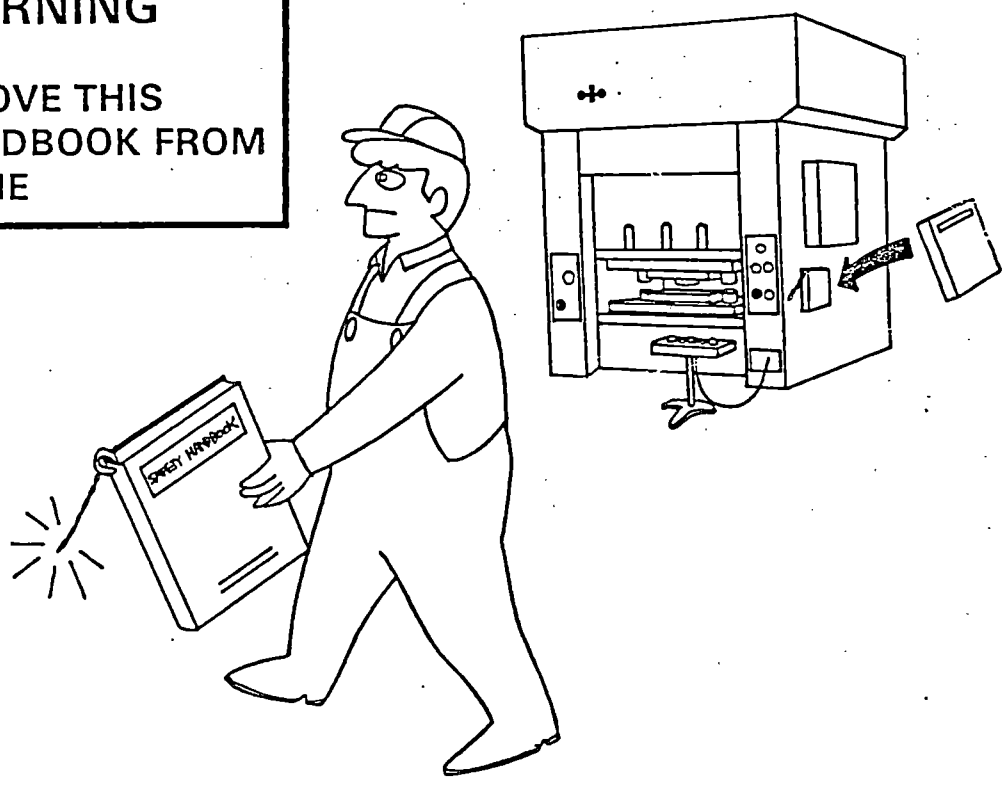
WARNING

NEVER REMOVE THIS SAFETY HANDBOOK FROM THE MACHINE



This press is designed and constructed in conformity with the regulations based on the U.S. OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA). 1910.217 (b), as we interpret it.

Where this press is modified, or some of the original equipment are removed from the press without KOMATSU's consent, or the press is operated beyond the limits of the specifications prescribed by KOMATSU, or where its operation, adjustment, inspection or servicing is not correctly carried out as indicated in the Machine Manual, KOMATSU will not assume responsibility for any troubles or accidents due to any of the above matters.

SAFETY HANDBOOK

Preface

KOMATSU considers that the safety operation of the press is just as important as its productivity, therefore, this handbook is made as a guide for those who operate, service, and supervise the operation of the press. KOMATSU does not intend this safety handbook to be a safety code. Our purpose is to alert press operators, die setters, and press user management to the importance of establishing safe operating and maintenance procedure.

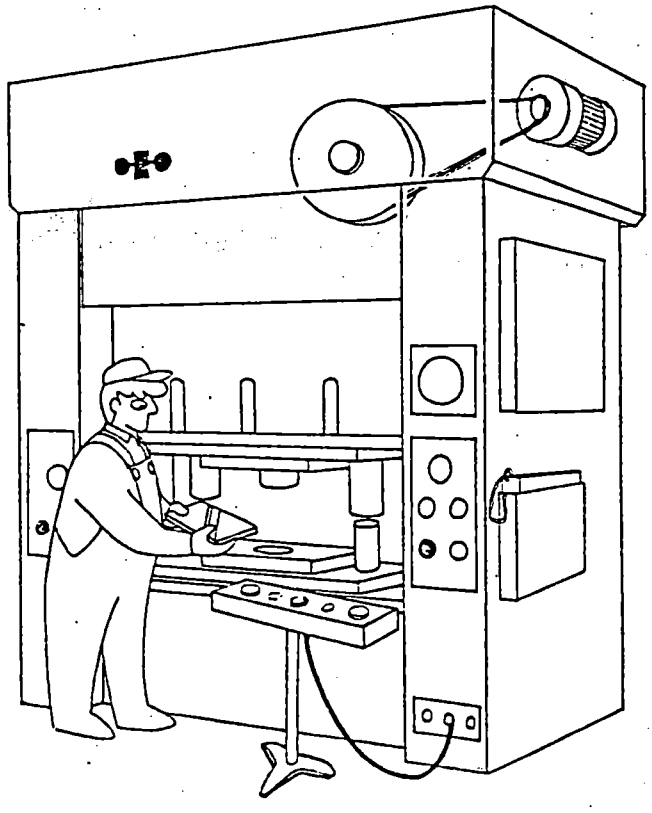
Press owner, operators, die setters and maintenance personnel should recognize the fact that press safety operation is a vital part of their jobs. No matter what job activity is involved, prevention of accidents should be their ultimate purpose.

This handbook is applied to both the type, stationary and inclinable.

You should make every effort to keep your presses safe for production.

Press workers should always observe the "Golden Rule" which is:

"NEVER PLACE YOUR HANDS OR ANY PART OF YOUR BODY INTO THE DIE AREA UNLESS MAIN DRIVE MOTOR IS TURNED OFF, FLYWHEEL HAS STOPPED TURNING, AND SLIDE OR DIE IS BLOCKED."



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1. Safety Operation

(1) Safety Guide for Press Operation

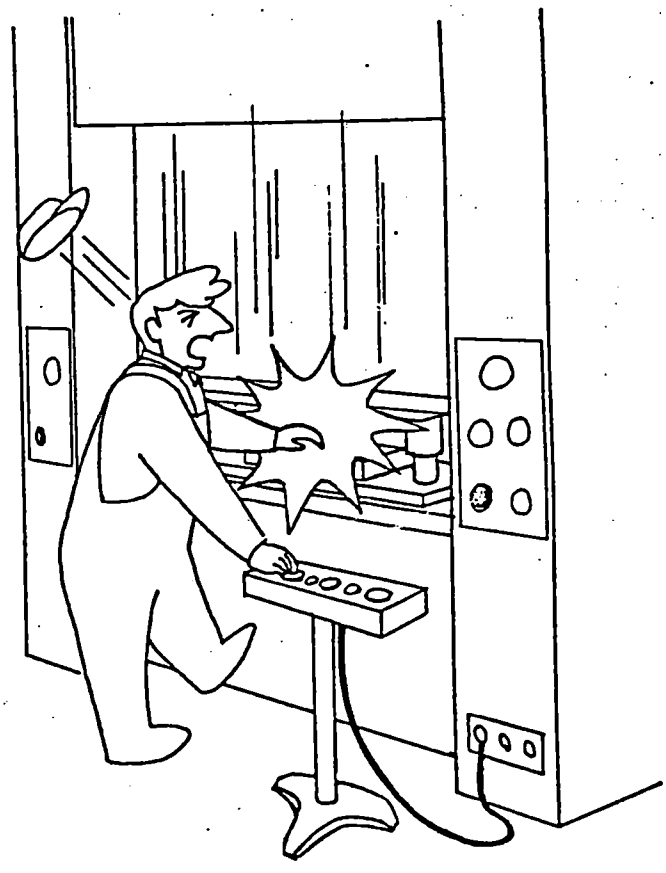
Many operators place their hands into the die area to increase their rate of production. Some operators, also, retain their hold on the unfinished end until it passes into the danger area when feeding stock.
There are some persons who use their hands, instead of a pick, to remove scrap material or finished part which has stuck in the die. However,

To place your hand in the die area is very dangerous!

Each item listed below is related to the operator's safety. It is for your benefit that those procedures be observed.

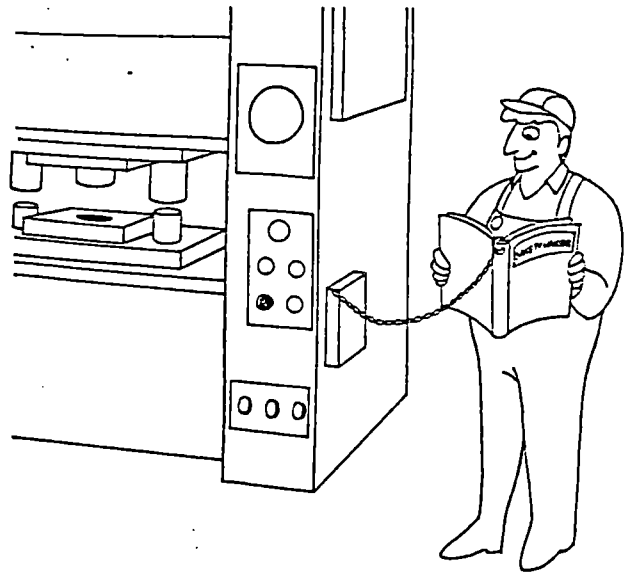
WARNING

NEVER PLACE YOUR HANDS OR ANY PART OF YOUR BODY UNDER THE SLIDE OR WITHIN THE DIE AREA.



WARNING

NEVER OPERATE, SERVICE OR ADJUST THE PRESS, OR INSTALL DIE, WITHOUT PROPER INSTRUCTIONS AND WITHOUT FIRST READING AND UNDERSTANDING THE INSTRUCTIONS IN THE SAFETY HANDBOOK AND MACHINE MANUAL.



Press drive motor must be stopped, flywheel stopped and safety blocks properly inserted before probing die (with tools) to release the part which is stuck.

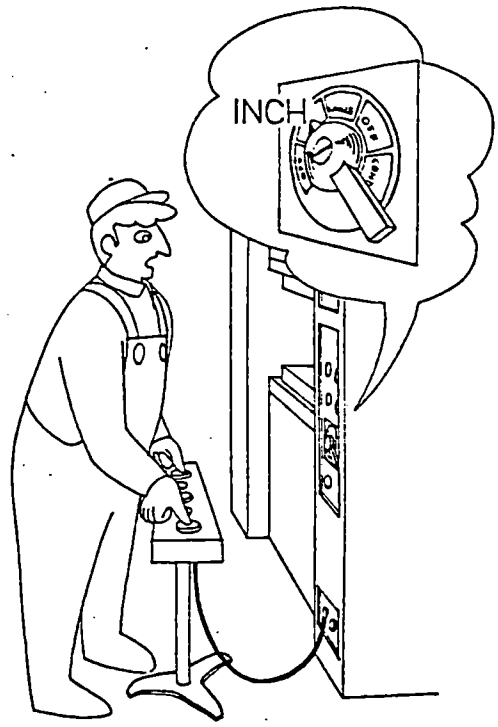
> ***SAFETY BLOCK:** A safety block, used to block the slide, is defined in the **ANSI B11.1-1971** "American National Standard Safety Requirements For The Construction, Care, and Use of Mechanical Power Presses" as "—a prop that, when inserted between the upper and lower dies or between the bolster plate and the face of the slide, prevents the slide from falling of its own deadweight."

KOMATSU press is provided the interlock method, which automatically opens the press electrical circuit when safety block is in use.

Whenever workers are required to reach into the point of operation or other related hazard areas to adjust, repair or set dies, the employer shall provide and enforce the use of die safety blocks (**OSHA** regulation . Note that the use of, and the physical dimensions of a die safety block are entirely dependent upon the tooling (dies) installed in the press machine.

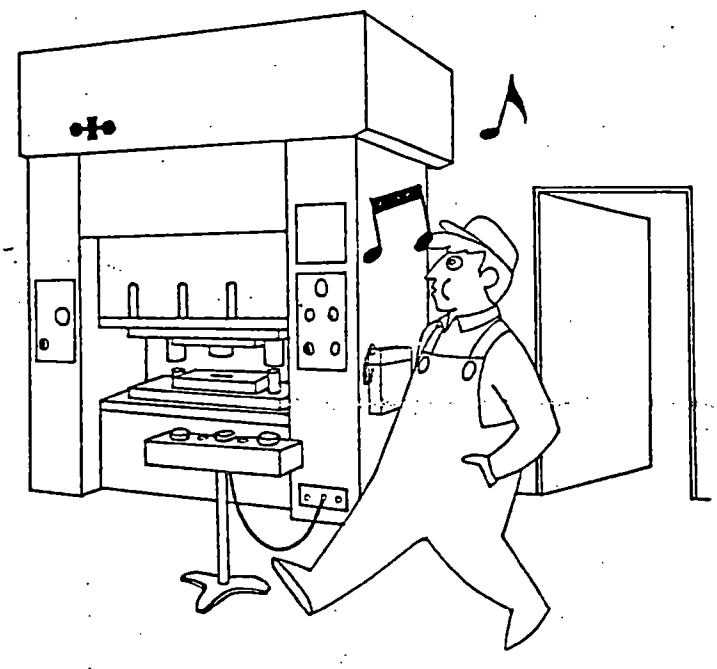
WARNING

NEVER RUN PRODUCTION ON A PRESS WITH STROKING SELECTOR SET IN THE INCH MODE. INCHING IS A FUNCTION TO BE USED BY THE DIE SETTER FOR SET-UP OF DIES AND TOOLING, OR, FOR MECHANIC'S USE WHEN CONTROLLED INTERMITTENT MOTION OF THE SLIDE IS REQUIRED.



Whenever press has been inoperative or left unattended, even for a brief moment, the setting of all selector switches should be checked before starting the machine.

At the beginning of each shift and after every break, cycle the press several times and observe carefully to be sure that clutch/brake and controls are functioning properly. Also check for proper operation of other press parts, dies and auxiliary equipment.



WARNING

AT THE BEGINNING OF EACH SHIFT AND AFTER EVERY BREAK, MAKE SURE THE SLIDE IS AT TOP POSITION BY CHECKING THE CRANK ANGLE INDICATOR.

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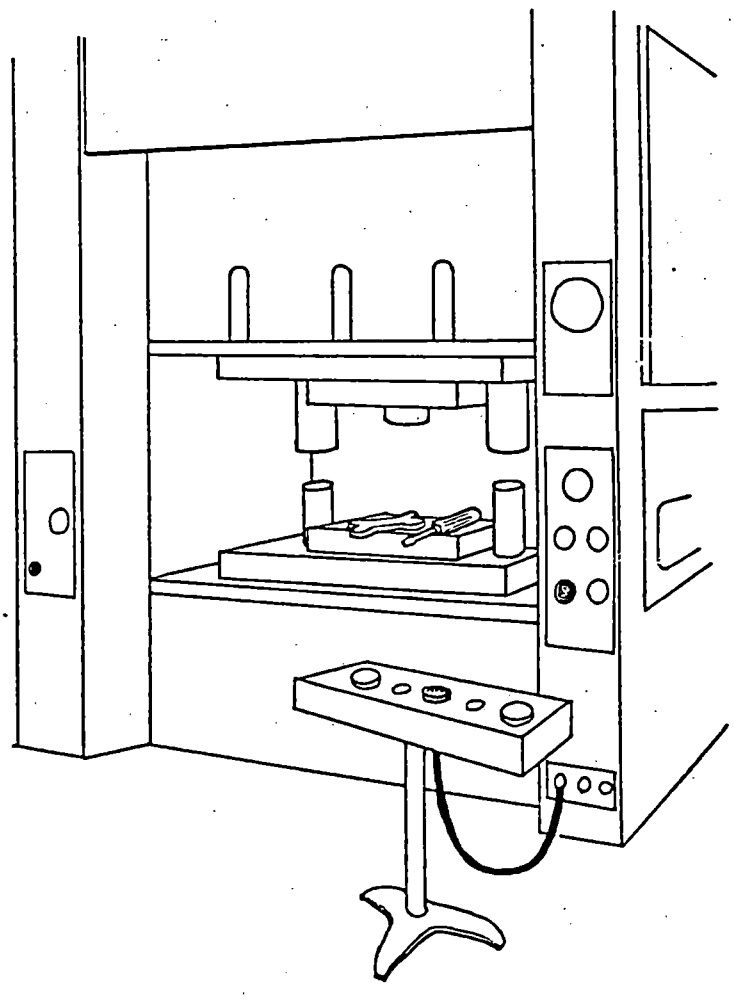
If manual loading or unloading of parts into and out of the die is required, use always the necessary tools such as safety tongs, vacuum lifters, pliers or other mechanical devices.

Fingers are precious! Keep all of them by keeping them clear of danger areas.

Before starting press at the beginning of a shift, or after a break, check the following items:

- Make certain that safety blocks have not been left between the dies, or between slide and bolster.
- Be sure that no tools, nuts, bolts, clamps or bars were left lying on the press. (Check die area, slide, bolster and overhead area.)
- Check visually for workpiece or other obstruction left in the dies.
- Check all control selector switches to make certain they are set for the desired mode of operation.



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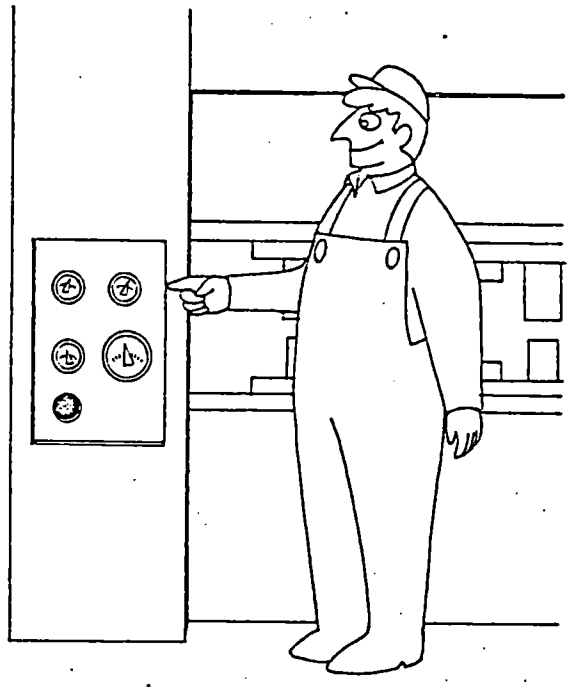
Check clutch air pressure gauge and counterbalance gauge for proper air pressure setting.



Both pushbutton switches should be checked periodically for proper and correct operation. The concurrent depression of two pushbuttons is required to place the slide in motion in INCH, SINGLE STROKE or CONTINUOUS mode.

WARNING

BOTH PUSHBUTTON SWITCHES MUST BE OPERATIVE AND ACTUATED BY THE USE OF BOTH HANDS.

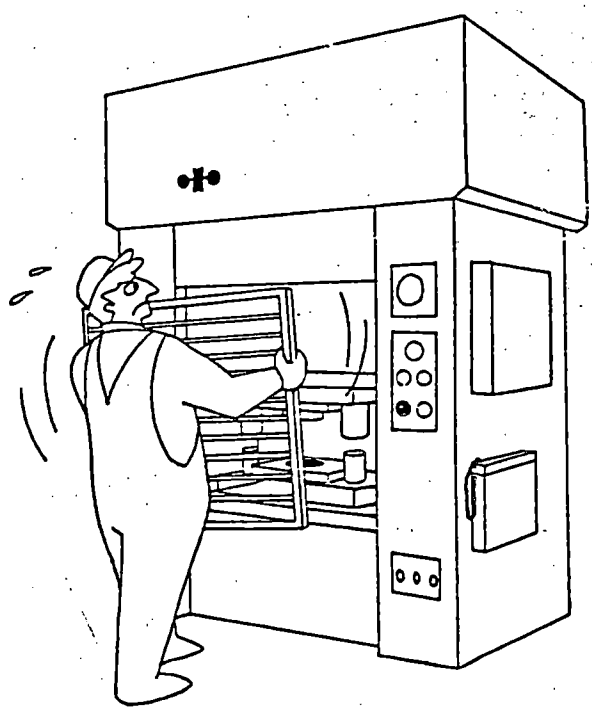
WARNING

NEVER ATTEMPT TO PULL A PART OR SCRAP OUT OF THE DIE WITH YOUR HANDS. IF A PART STICKS IN THE DIE, STOP THE PRESS IMMEDIATELY.

It is the user's responsibility to provide all guards, safety devices, or tools. When determining how the power press is to be used, safeguarding the point of operation is of extreme importance. Die guards must be installed and every opening through which an operator can insert even a finger into the die area must be eliminated.

WARNING

NEVER REMOVE ANY POINT OF OPERATION GUARDS OR DEVICES.



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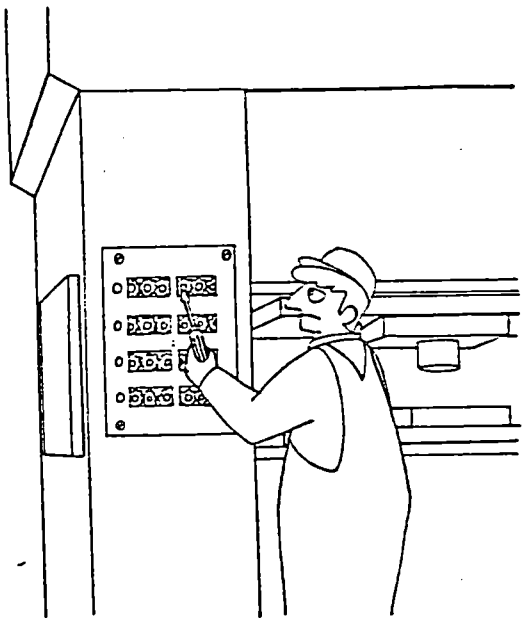
Rotary cam limit switches are used for the control of press operation and they are already adjusted accurately in KOMATSU factory, therefore, do not change the cam positions except in case of adjustment by a responsible person.

WARNING

NEVER ADJUST OR RESET ROTARY CAM LIMIT SWITCHES EXCEPT BY A RESPONSIBLE PERSON.



Check reservoir oil level daily. Oil should appear near the level mark when pump is not running. With pump in operation, oil level may be lowered, but must always be above the low level mark.

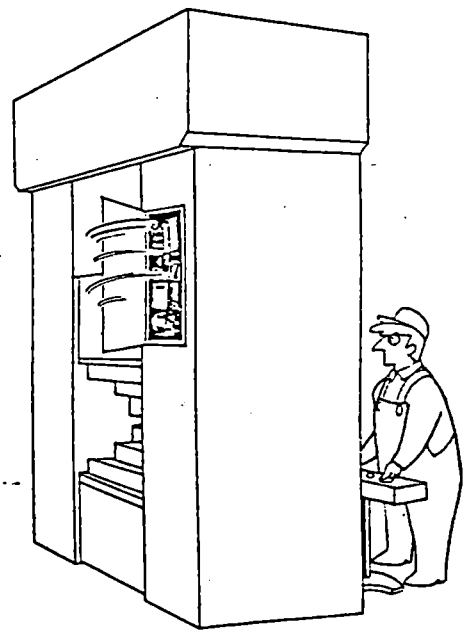
WARNING

NEVER ADD GREASE OR OIL WHILE PRESS IS RUNNING

Voltage which could be fatal to human life is present inside most press electrical control panels. If necessary to gain access to the inside of a control enclosure, you must first make certain that incoming power has been disconnected.

WARNING

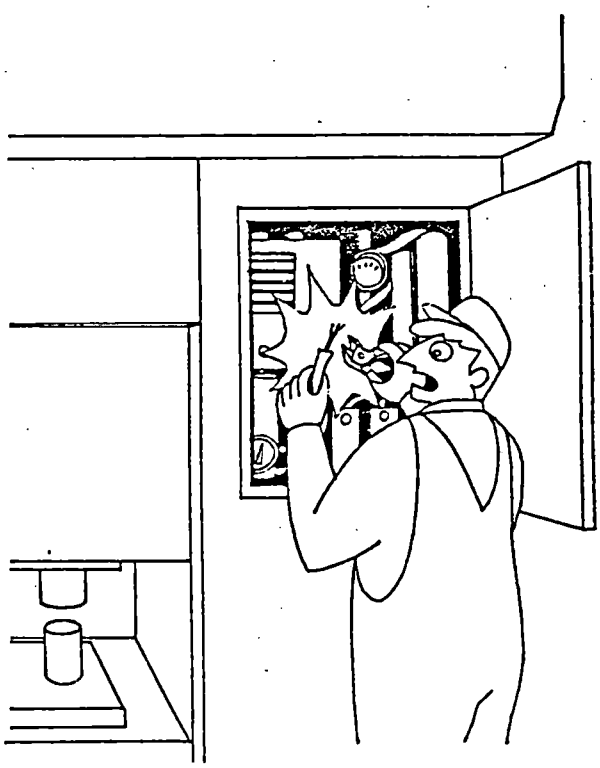
NEVER OPERATE THE PRESS WITH THE DOOR OF THE CONTROL PANEL OPEN.



You should not attempt to modify or rework the press electrical control system.

WARNING

NEVER MODIFY ANY CONTROL CIRCUITS.



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Check slide height to be certain slide is not set too low for the dies in use at that time. Setting slide too low will increase, considerably, the load applied to the press.

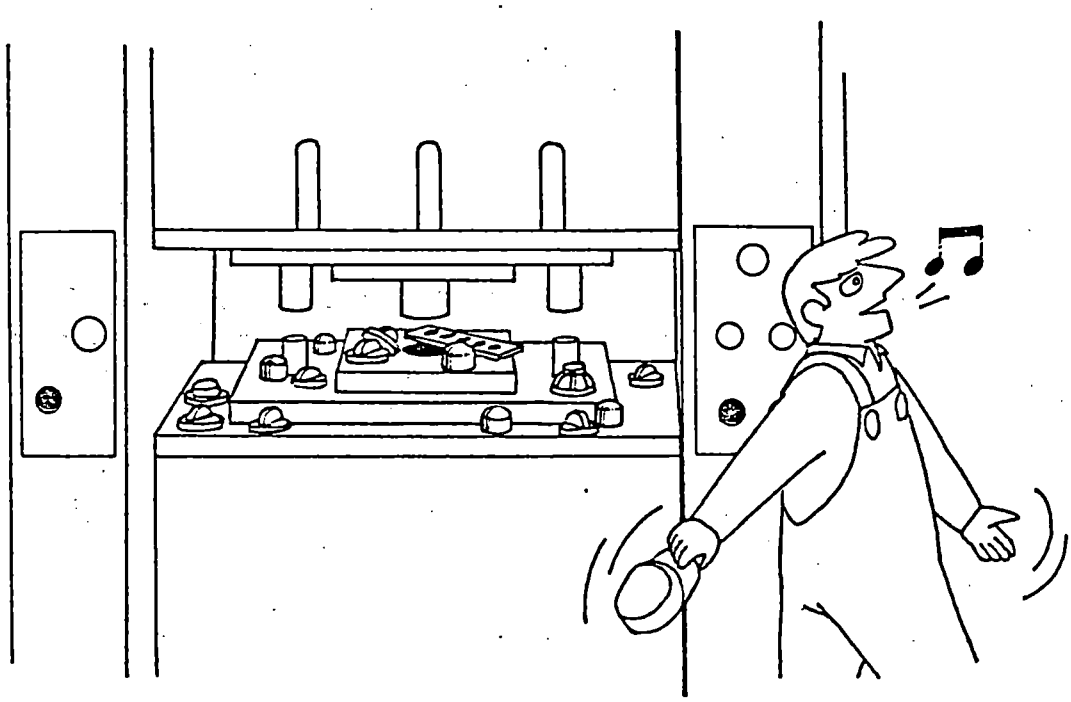
When changing setting of press controls for a different mode of operation, make certain selector switches are set correctly—then test cycle the machine to be sure it operates as expected. Locking type selector switches should be adjusted by authorized persons only and keys removed after setting to prevent unauthorized change.

Always exhaust air pressure from the die cushion, if used, before attempting to remove a jammed part from the die.

Shut off power to the press when it is not in use. Lock the control circuit switch and main switch in the OFF position to prevent unauthorized use of the press and unintentional start.

WARNING

NEVER STACK PARTS ON THE BOLSTER PLATE OR NEAR THE DIE AREA OF A PRESS. PARTS STACKED TOO HIGH COULD CREATE A PINCH POINT AND THE SLIDE OR DIE COULD BE SERIOUSLY DAMAGED IF THEY SHOULD HAPPEN TO STRIKE THIS STACK OF PARTS



(2) Safety Guide for Die Setter

Die setters as well as press operators are normally more closely associated with the actual use of presses than anyone else. It is this reason that you should develop a sense of personal safety awareness and understand that by working safely you will be the first to benefit.

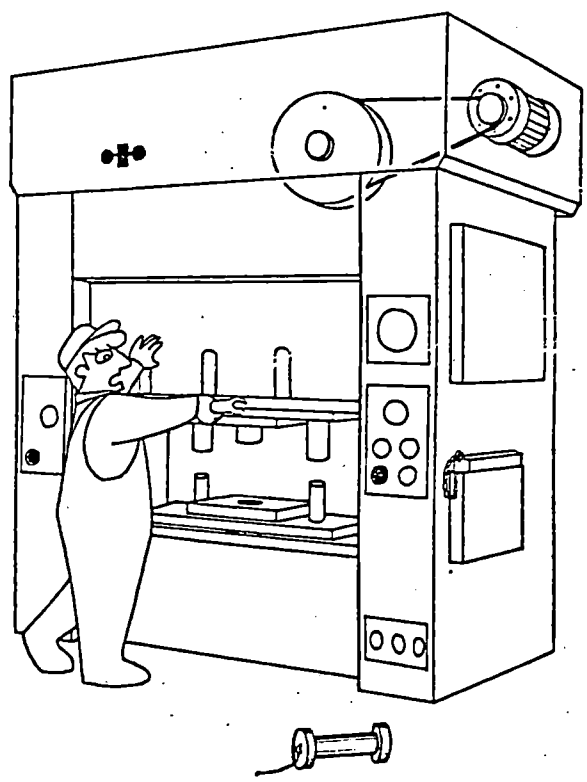
It is not only important that dies be installed correctly in the proper size press, but also, the process must be accomplished in a safe manner. The job of setting dies is not completed until die guards, and other necessary point of operation safety devices, are properly installed and tested.

The following precautions are offered as a guide in the development of safe die setting procedures.

Do not place your hands or any part of your body under the slide or within the die area unless main drive motor is turned OFF, flywheel has stopped turning, and slide is blocked. Check visually to make certain flywheel has stopped.

WARNING

NEVER INSTALL, ADJUST, OR REMOVE DIES, OR SERVICE THE PRESS WITH THE FLY-WHEEL IN MOTION OR MOTOR ON.



WARNING

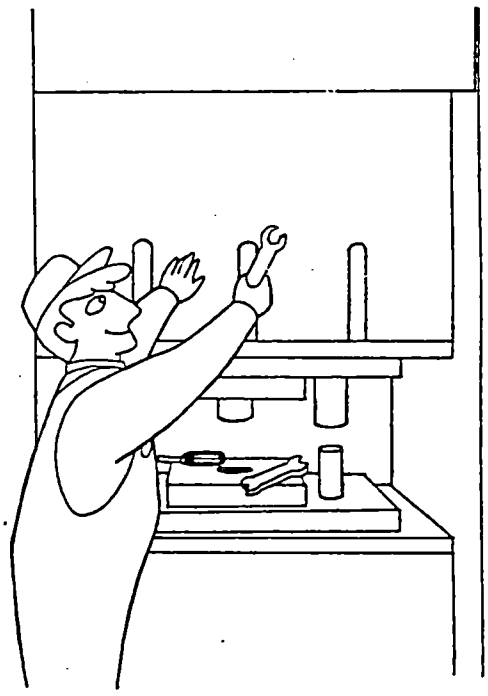
NEVER ATTEMPT TO INSTALL, ADJUST OR REMOVE DIES WITHOUT PROPER INSTRUCTIONS AND WITHOUT FIRST READING AND UNDERSTANDING THE INSTRUCTIONS IN THE SAFETY HANDBOOK, AND MACHINE MANUAL.

When a die set is being installed in a press, the stroke should be down, the drive motor shut off, flywheel stopped, and the slide adjustment positioned high enough to properly clear the die set.

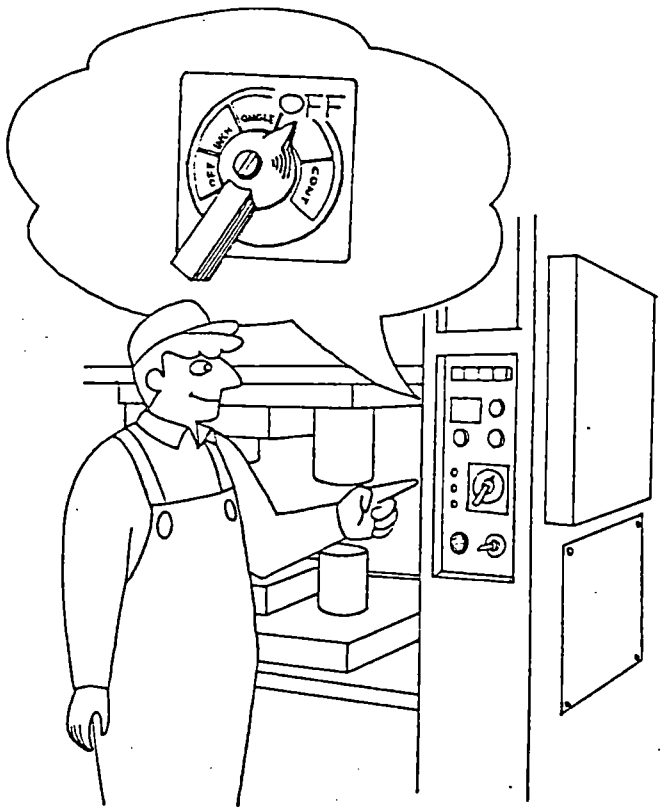
After dies are installed, perform all necessary adjustments before cycling the press. Be sure the slide height setting is correct.

Clean bolster plate, slide face and dies before installing the die set. Misalignment caused by dirt, chips of metal or other foreign materials could result in injury to operator or damage to press and dies. If die cushion is used, check pressure pin holes in bolster plate to be sure there is no excessive play.

Check die area, slide, bolster and overhead area to be certain that no tools, nuts, bolts, clamps or bars were left—before cycling press.



The main electrical panel switch should be kept in the **OFF** position to prevent unauthorized use of the press and unintentional start.



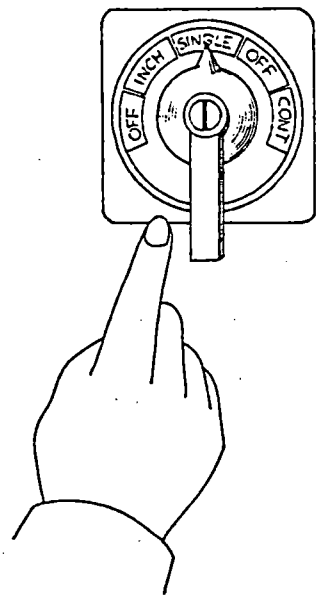
WARNING

NEVER INSTALL UPPER DIES EXCEEDING THE WEIGHT STIPULATED IN THE MACHINE MANUAL.

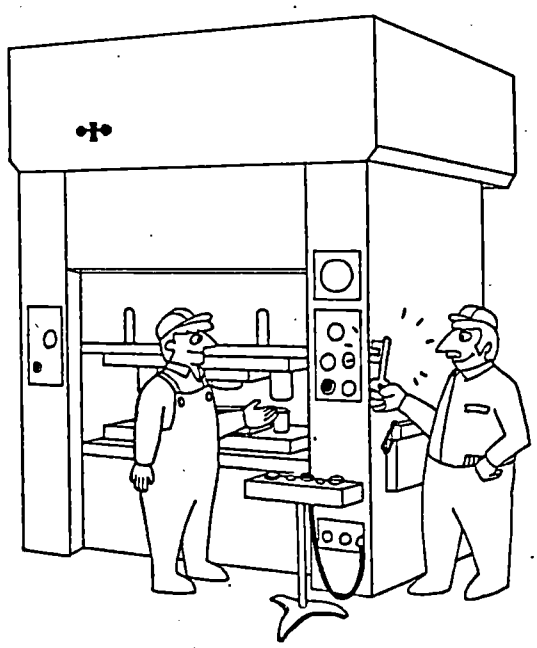
If manual loading or unloading of parts into and out of the die is required, make certain that the necessary tools *(safety tongs, vacuum lifters, pliers or other mechanical devices)* are provided for the operator. The tools must be in good condition.

Even though main drive motor is turned off, never install dies or work under the slide if press flywheel is still turning. Check visually to make certain flywheel has stopped.

Whenever press has been inoperative or left unattended, even for a brief moment, the setting of all selector switches should be checked before starting the machine.



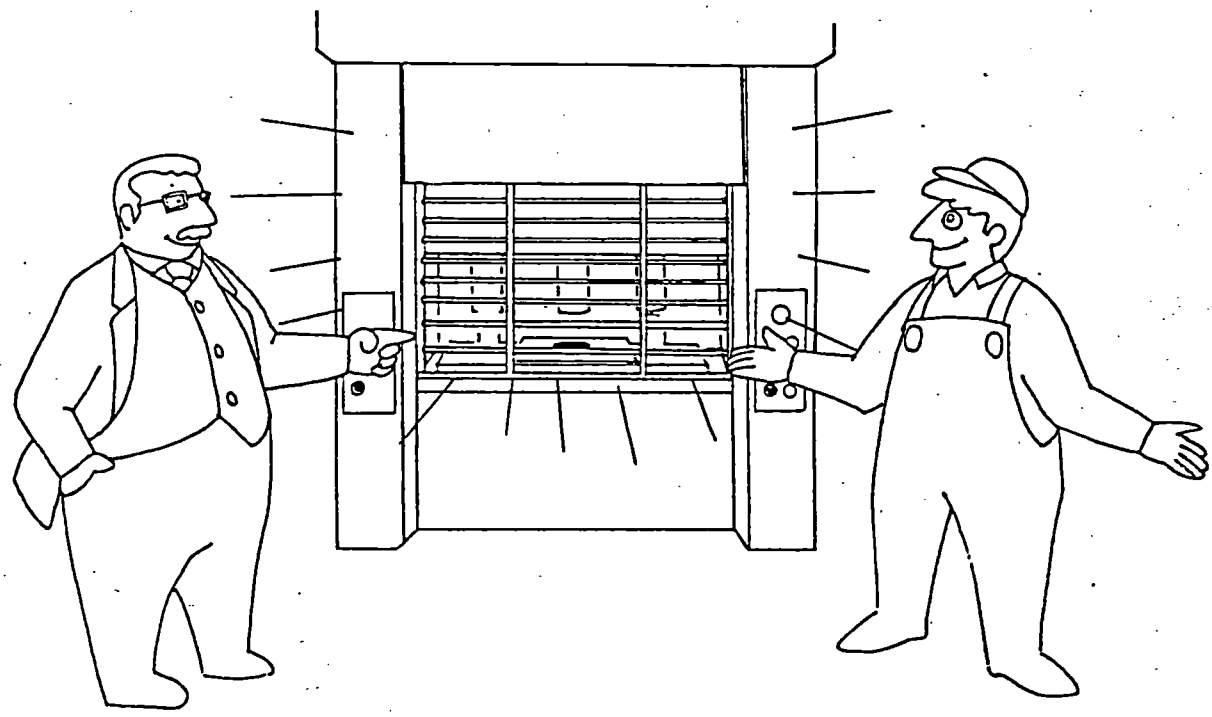
When changing setting of press controls for a different mode of operation, make certain selector switches are set correctly—then test cycle the machine to be sure it operates as expected. Locking type selector switches should be adjusted by authorized persons only and the keys removed after setting to prevent unauthorized change.



2. Management's Responsibilities

It is the responsibilities of an employer to provide all guards, safety devices, or tools so that employees can work with or operate the press safely.

KOMATSU cannot know what day to day use will be made of a press. In fact, it would be difficult to comprehend the magnitude of potential applications. It is the press user who determines which dies are going to be installed, the type of material to be used, the method of loading and unloading the workpieces, and the type of die guards that will be used for the job. It is for this reason that point of operation guards are *not* furnished as a part of the original press package. It becomes the responsibility of the user management to make certain that point of operation guards and other necessary safety devices are installed which will make it impossible for press operators to place their hands, or any other part of their bodies, under the slide or into any other hazardous area of the machine. The guards must be installed and tested before releasing machine for production.

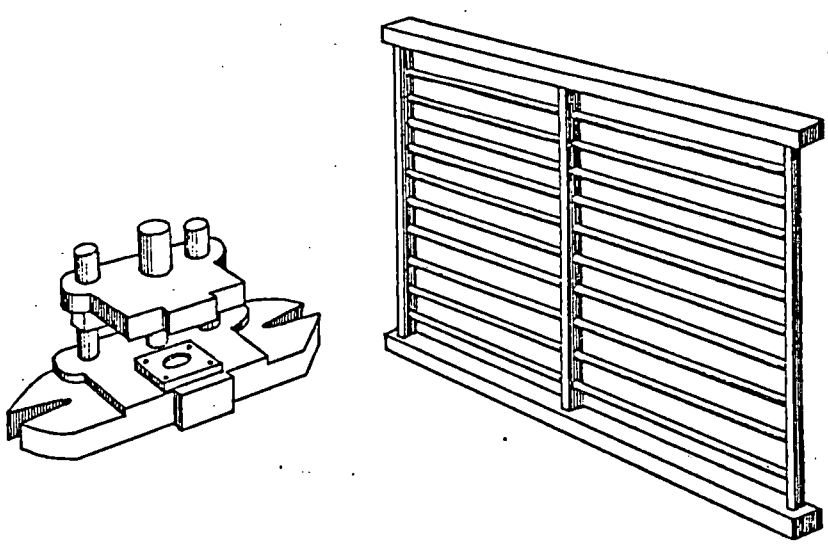


Make certain press operators and die setters are properly trained.

Set up a program of daily, weekly and monthly press inspections. Make a check list and follow through to make certain the job is being done correctly.

Establish a definite preventive maintenance program with check lists for each press. Keep a historical record of all press maintenance work, repairs and adjustments.

Make frequent evaluation checks of all press safety guards and devices—especially during actual production runs. Correct any unsafe practices or situations immediately.



Provide a clean, safe, uncluttered work area around each press.

Provide safety blocks of the correct size.

Make certain that all mechanical presses and associated equipment are properly connected to earth ground. Grounding should be in accordance with the National Electrical Safety Code and consistent with sound local practices.

Never overload the presses.

3. Warning Signs

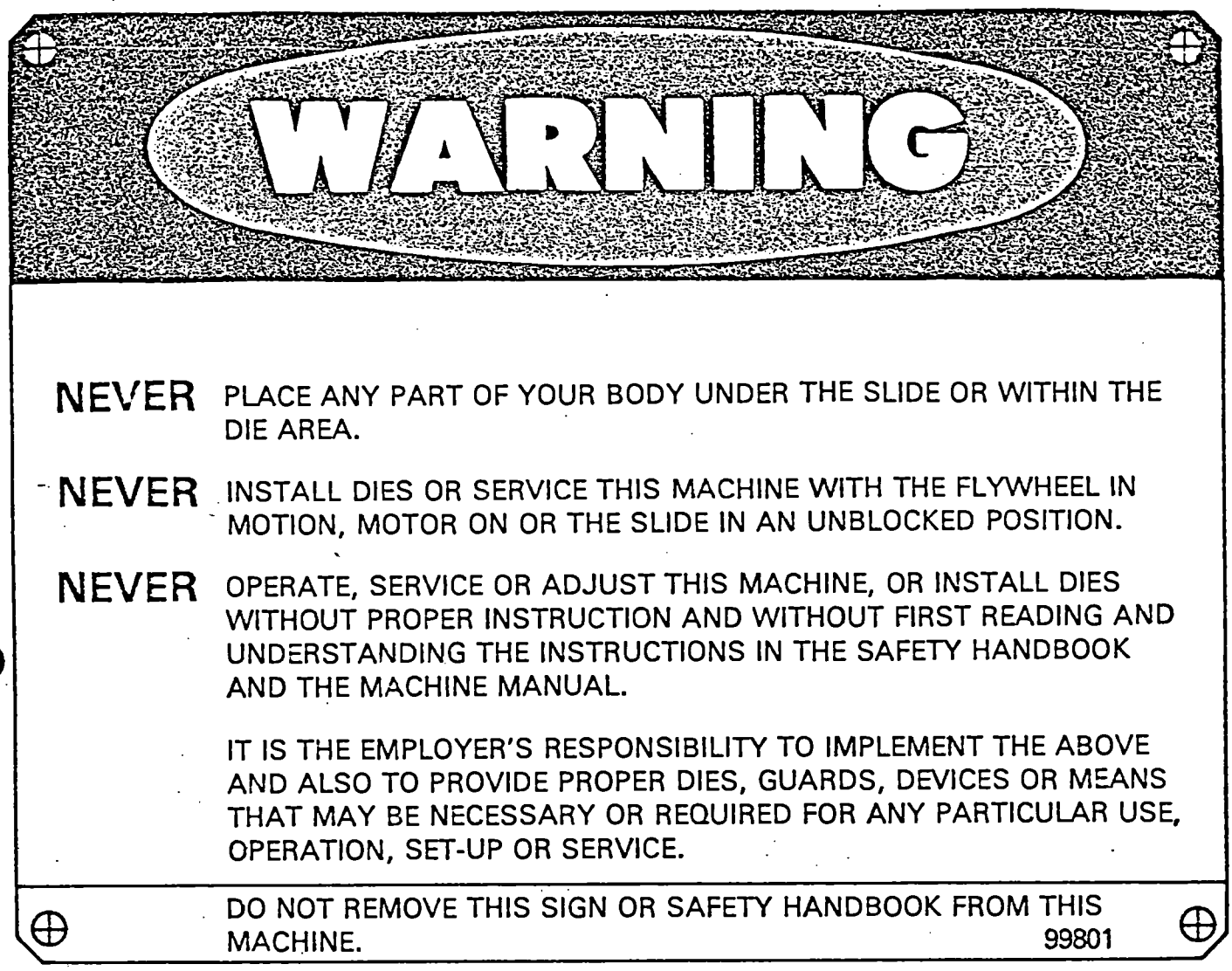
Warning signs are placed at strategic points on the machine for most effective use. It is, therefore, most important that they NOT be removed, covered, hidden or defaced. To be useful, they must be easily seen.

Press users are advised that signs warning of hidden or latent dangers are important to the safety of all personnel and must not be removed. In case the signs are defaced or damaged, they should be replaced immediately by ordering new ones. The SAFETY HANDBOOK and MACHINE MANUAL must also be left with the press in order that all persons associated with operation and maintenance of the equipment will have a ready reference.

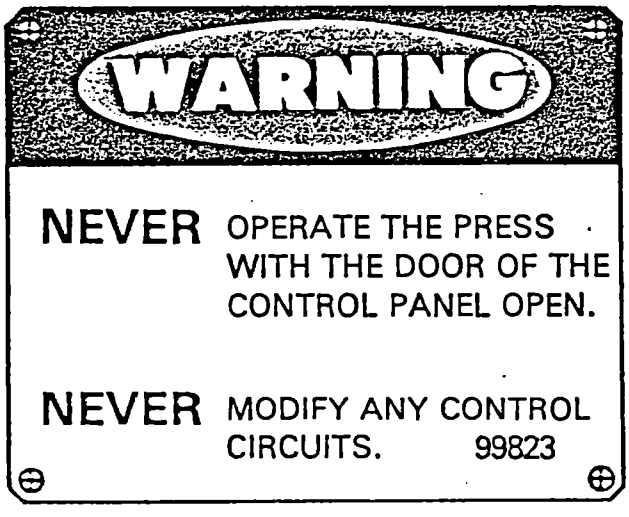
The note is a reminder that the press must be equipped with guards and other safety devices which will completely protect the operator from hazardous areas. All safety equipment must be installed before releasing press for production. It is the employer's responsibility to furnish these guards and safety devices, and to make certain that they are properly installed. It is also employer's responsibility to carefully observe the machine while in use and to correct any unsafe situations or misuse of equipment.

WARNING

NEVER REMOVE THE WARNING PLATE FROM THE MACHINE.

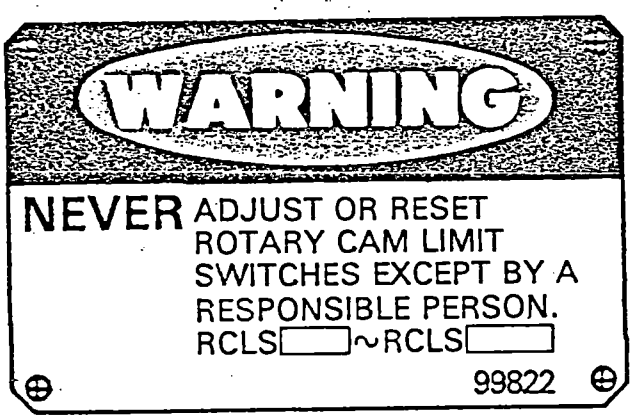


The machine on which the sign is placed	Location where the sign is placed
All models	The front of the Press

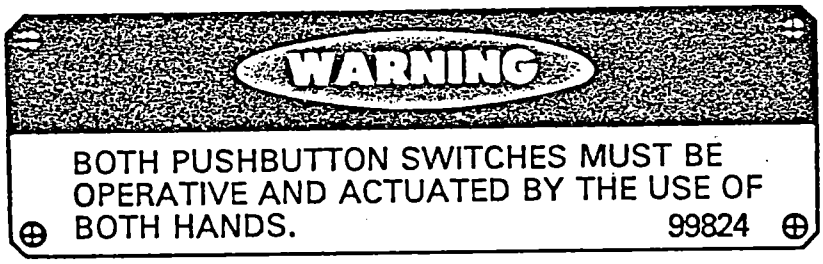


The machine on which the sign is placed	Location where the sign is placed
All models	On the door of electrical control panel.

The machine on which the sign is placed	Location where the sign is placed
All models	Various press components such as flywheel, gears, sprocket, chains, cams and other moving parts.

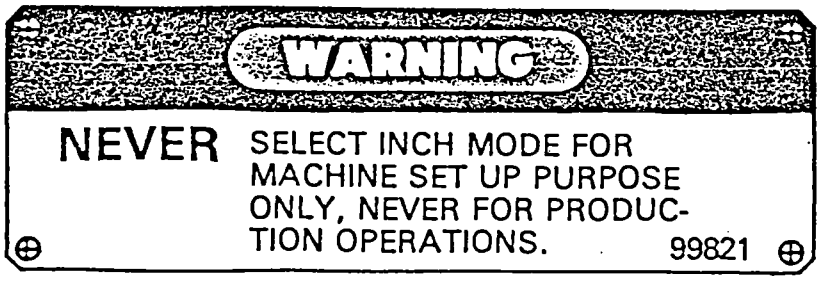


The machine on which the sign is placed	Location where the sign is placed
All models	Rotary cam box

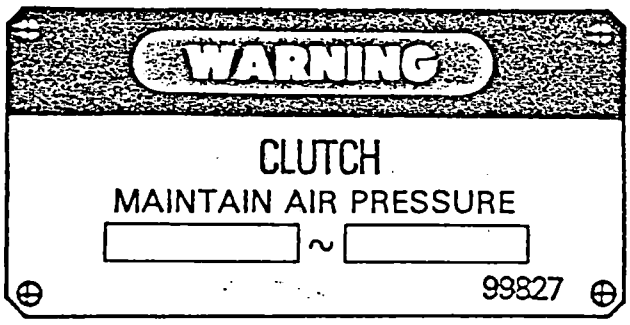


The machine on which the sign is placed	Location where the sign is placed
All models	Pushbutton panel

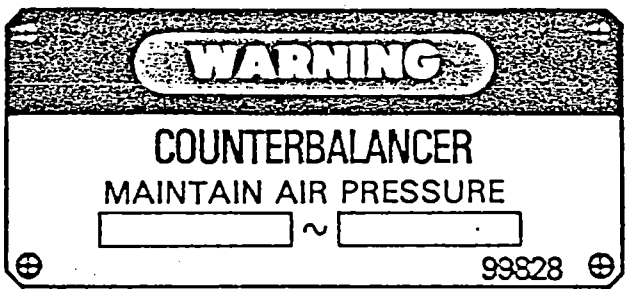
The machine on which the sign is placed	Location where the sign is placed
The machine that any point of operation guards or devices are installed	Near the point of operation guards or devices



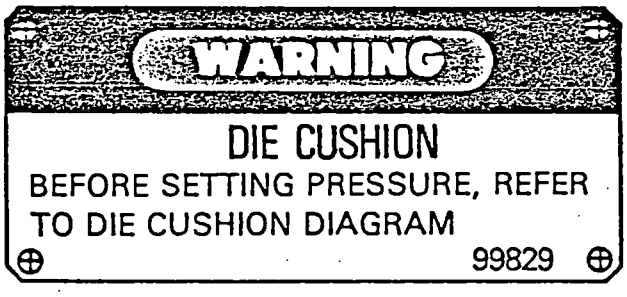
The machine on which the sign is placed	Location where the sign is placed
All models	Stroking selector



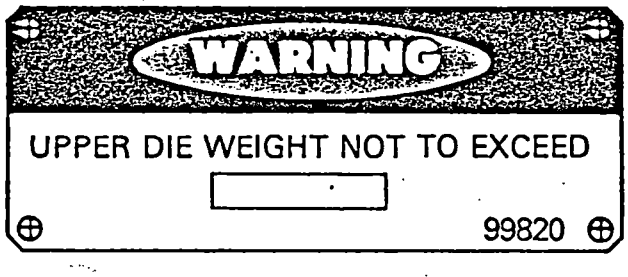
The machine on which the sign is placed	Location where the sign is placed
All models	Near the regulator



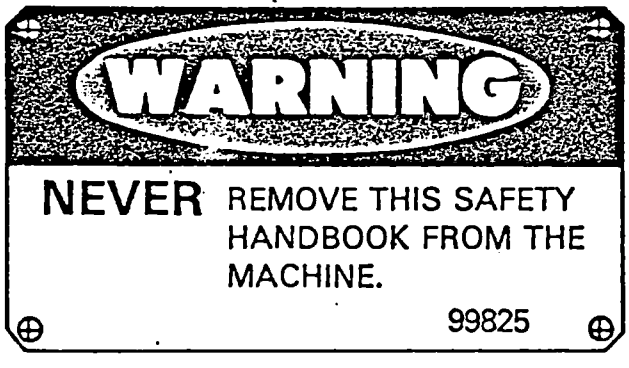
The machine on which the sign is placed	Location where the sign is placed
All models	Near the regulator



The machine on which the sign is placed	Location where the sign is placed
The machine that die cushion is installed	Near the regulator



The machine on which the sign is placed	Location where the sign is placed
All models	The front of Slide



The machine on which the sign is placed	Location where the sign is placed
All models	On the box for SAFETY HANDBOOK

4. Protective Equipments for the Machine

This press is provided with the protective equipment listed below:

(1) Overload protector or Overload detector
Do not operate the press beyond the capacity prescribed by the specifications. If overload should be imposed on the press for some reason, the press would be stopped by means of this equipment.

> **WARNING**
>
> ADJUSTMENT OF THE OVERLOAD PROTECTOR OR OVERLOAD DETECTOR TO BE MADE BY RESPONSIBLE PERSON ONLY.

(2) Main Motor Thermal Relay
Do not operate the press beyond the specified working energy. If overload should be imposed on the press for some reason, or if overload should occur in the main motor for any other reason, the overcurrent would be detected causing the main motor to stop running.

(3) Pressure Switch
If the air pressure should drop below the specified minimum air pressure because of any abnormality in the air, the press would be placed in an emergency stop by the pressure switch for safety of operator as well as for prevention of damages of the press.
In starting the press, the press operation or slide adjustment cannot be carried out until the air pressure reaches the specified level.

> **WARNING**
>
> ADJUSTMENT OF THE PRESSURE SWITCH TO BE MADE BY RESPONSIBLE PERSON ONLY.

(4) Dual valve for clutch
Dual valve is provided for the clutch. If one of the solenoid valves is out of order, the machine is impossible to re-start.

(5) Brake monitor (Over-run detector)
Brake monitor is provided to detect the stopping position of the press. If the stopping position exceeds 15° of crank angle, it is indicated by a lamp.

(6) Control system
Important parts such as relays and limit switches in the press operating circuit are doubled. Consequently, if one of these relays is out of order, the press will be stopped to prevent restarting of the slide.

(7) Two hand control
The two hand control is provided for con current use in actuation of the press.

(8) Two RUN pushbuttons
Use the two **RUN** pushbuttons in a safe position as stipulated in **OSHA 1910, 217,** (C), (3), (Vii), (C). (proper distance from cut edge from die.)

WARNING

BOTH PUSHBUTTON SWITCHES MUST BE OPERATIVE AND ACTUATED BY THE USE OF BOTH HANDS.

5. Use of Mechanical Press

The importance of using mechanical presses in a thoughtful and intelligent manner must be recognized—safety of press operators and die setters is involved, as well as total useful life of the machine.

The mechanical press works by releasing a large energy accumulated in the flywheel in a very short interval of time.
Therefore, the press is designed and constructed to withstand such a severe operation. An erroneous operation may cause an instantaneous breakage, damage or trouble. Even if this erroneous operation does not directly lead to breakage or troubles, it will have ill-effects on the machine life. Thus, the press must only be operated after full understanding of the following items.

(1) Overload

Overload is one of the most significant items to be avoided among erroneous press operations. Not only overloading the press, but double-striking of a part, forming of an unannealed part, incorrect slide adjustment, etc. must be avoided at all times.
An overload protector installed in the press can protect any overload, if it should occur in the press.

(2) Snap-thru-shock

In a punching or piercing operation where no preventive means of snap-thru-shock is provided with the die, the press must be operated under load equal to 50% or below of the press capacity.

(3) Allowable load-stroke relationship

In this press, the revolution of the clutch shaft is converted into a linear movement of the slide.

The clutch transmitting torque is constant irrespective of a crank angle, but the allowable slide pressing force is varied by a crank angle.
The relationship is indicated on the allowable load-stroke diagram and must be observed strictly in operating the press.
If not observed, the press driving parts like the clutch, gears, etc. may be damaged or broken.
The allowable load-stroke diagram is applied to the work in the center of slide.

(4) Allowable eccentric load-distance relationship
The eccentric load in the front to back and the left to right direction with respect to the press center is limited in addition to the allowable load described in the preceding paragraph (3). The allowable eccentric load-relationship is shown on the specifications which must also be observed.

(5) Working energy
Working energy of the press is determined by the capacities of main motor and flywheel. Its value is stated in the specifications. Operation of the press beyond the specified working energy causes the motor to be damaged.

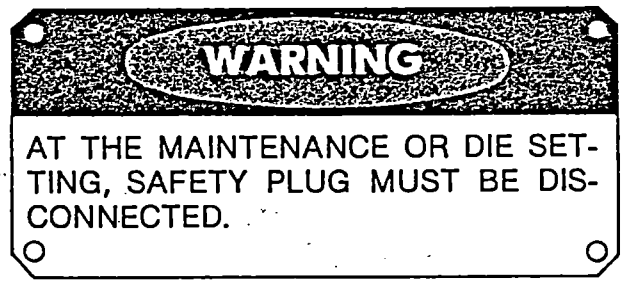
(6) Number of "SINGLE" strokes
The number of "SINGLE" strokes is determined by the capacity of clutch-brake and its value is indicated in the specifications. Operation of the press beyond this specified number of "SINGLE" strokes causes the clutch-brake linings to wear excessively and the oil deterioration to be accelerated.

(7) Press foundation
The right foundation is indispensable for minimal vibrations to be transmitted to the base, prevention of overturning of the press in an earthquake and for maintaining the machine accuracy. The press must be erected on the correct foundation, observing precautions in the specifications.

6. Additional Articles.

(1) Warning Signs

The machine on which the sign is placed	Location where the sign is placed
Portable control device only	Near the Run buttons



The machine on which the sign is placed	Location where the sign is placed
All models	Near the safety plug

2.1. Overrun detector

If the slide should overrun without stopping at a preset position in a "SINGLE" operation or when a "CONTINUOUS" operation is stopped, overrun detector will be actuated to bring the slide to an emergency stop and simultaneously to cause an "OVERRUN" indicator lamp(green)on the operator's panel to come on.

2.2. Motion detector

This device is used to prevent a possible double-stroke of the slide caused by a malfunctioning angle detector and wire cutting.

2.3. Dual valve

A life time-lubricated, trouble-free and high reliability dual valve is used to prevent a possible double-stroke of the slide.

2.4. Pressure switch for clutch and balancer

Do not change an air pressure setting.

Do not disconnect or short-circuit this pressure switch, unless absolutely necessary.

2.5. Safety control circuits

(1) Self-checking circuit

Control circuit for clutch & brake which is designed as double-circuits has a function to detect a disorder according with a comparison between two signals. In the parts consisting of single-circuit, checked-circuit or mode disorder detecting circuit has a function above. They are checked automatically when the electric power is connected and after the slide stroke stopps. Therefore, it is possible to operate the press safety.

E2M

(2) Main motor interlock

This interlock serves to make the main motor possible to start after the electric power of the coil for clutch & brake is turned off.

(3) Main switch

The main switch is of an auto-breaker type, which will automatically break off, if a short circuit troubles occur. The switch is interlocked to the main control box door.

2.6. Key lock (Selector switch "CONTROL CIRCUIT OFF-ON")

This key lock is used to breake off the control circuit and to prevent unexpected descent of the slide, when die is changed or adjusted.

Move the selector switch to "OFF" and certainly take the key out of the switch in die changing or die adjusting.

In this condition, starting of the main motor and operation of the press are not in motion.

2.7 Protective grille

This device made by acryl is used to protect workers from a dangerous positon.
This is fixed on the front and the rear of the press.

2.8 Safety block

To prevent unexpected descent of the slide in die changing or adjusting, this device is consisted of the plug to break off the control circuit and the block to support the slide.

Certainly take the safety plug out of the receptacle and set the block between upper and lower die when die is changed or adjusted.

When the safety plug is pulled out, starting of the main motor and operation of the press are not in motion.

1.1 Girder type installation

Accuracy of various parts

- The horizontalness of the level plate above the girders shall be within 0.05mm (0.002") per 1000mm(39.370")
- The difference in height between level plates shall be within 2mm(0.079").
- The height from the floor to the level plate shall be within ±2mm (0.079") of the drawing dimension.
- The dimension of the diagonal line of the hole for mounting the press on the girder shall be within ±3mm(0.118") of the drawing dimension.

In the case of a girder type press, if the installation position of the press is not in line with the center of the girder, the amount of deflection of the girders will be different when the press is placed on them. It is thus necessary to make adjustment by previously inserting shims below the mounting part.

1.2 Non-girder type installation

a) The accuracy of the level plate when placed on the foundation shall be the same as 1.1 above.

b) Fix the level plate to the foundation by pouring mortar under it.

c) After the mortar has set, place the press on the level plate and if necessary insert shims between the press and the level plate.

d) The horizontalness of the bed shall be within 0.05mm(0.002") per 1000mm(39.370").

The horizontalness will vary depending upon the strength of the foundation. Accordingly, periodically check the horizontalness to ensure that correct operating conditions are maintained.

E2M

2.1 Oil supply (Use the same type No. oil of the same maker.)

2.1.1 Gear box oil bath

Remove the cover from the top of the clutch and pour in clean oil up to the center level of the oil level gauge.

There are two gauges. One is on the platform and the other is in the left uplight.

Check the both gauges.

Oil type: Mobil DTE Light Oil (refer to Oil type B on page F801)

Oil quantity: ℓ (Oil quantites for various machines are shown in the table below. These quantities may vary slightly depending upon the machine specifications.)

Model	150	200	300
Oil quantity liters (gallons)	110 (29)	110 (29)	250 (66)

2.1.2 Slide adjuster (Point)

Pour in clean oil up to the center through the oil supply plug of the point.

Oil type: Mobil DTE Light Oil (refer to Oil type B on page F801)

Oil quantity: ℓ

Model	150	200	300
Oil quantity liters (gallons)	1.5×2^S (0.42×2^S)	1.7×2^S (0.48×2^S)	2.5×2^S (0.7×2^S)

2.1.3 Overload protector

Pour in clean oil up to the upper level of the oil level gauge of the protector pump unit attached to the slide.

Oil quantity ; 5ℓ (1.3gal)

2.1.4 Gib adjustment

Gibs are used as guides for the slide to make a smooth vertical movement and therfore, they are precision-finished to high accuracy. Special lubrication- free gibs and used to eliminate the need for gib lubrication.

The lubrication—free gib may cause a accumulation of the solid powder lubricant (black) on the slide liner at the bottom end of the gib because of scraping by the moving slide. Since there is plenty of solid lubricant in the gib, no harm is caused by the scraping of the powder. The blackening of the gib and the mating slide surface during operation is not an abnormality.

Be sure to operate the press with no load. Although the lubrication-free gears do not need to be oiled, they will perform better if they are. Thus, it is recommended to oil them once a month.

How to add oil: On the top of the slide liner there are four holes covered with plugs. Using a lubricator, slowly add oil through the holes.

Recommendation oil: Oil type B
(Refer to List of commercially available lubricants on page F801)

Interval of oil: once/month

Quantity of oil: approx. 30 cc

2.2 Connection of the shop air line

The shop main air line should be connected to a stop valve (applicable piping opening size: 1B and over) on the lower side of the pneumatic and hydraulic piping unit within the length of 5m(16.4ft).

A drain filter with a transparent bowl is provided in the unit to filter the shop air. Periodically the bowl must be drained to remove water. If the water is early accumulated in the tank, any preventive action such as installation of an auto-drain filter in the shop air line should be taken immediately. The required air pressure is 5kg/cm² (71.1psi).

Model			150	200	300
Air consumption per minute (ℓ/spm)			→	1.7	2.6
Air tank capacity	Clutch		30 L (8 GAL)		
	Balancer		→	80L(21GAL)	190L(50GAL)
	Die Cushion	1P.2Cylin			
		2p.2Cylin			

Note: Air consumption per minute indicates the air consumption in clutch only in an intermittent operation.

2.3 Connection of electric power line

When connection is made to the power line, move the power switch key on the operator's-panel to OFF position. Connection should be made to the primary line of magnet starter(M1) on the main control board.(When the main switch is added to the primary line, connection should be made to the primary line of that main switch.) . Specification of wire and electric parts to be used to this machine should be decided according to voltage, motor-power and a table below. Voltage and motor-power to this machine are mentioned on page A101 "SPECIFICATION AND ACCURACY". To prevent electrical trouble, be sure to connect the earth cable to the earth terminal in the main control board. Before connection, check the direction of flywheel rotation.

OBS-21
OBS-2
OBS25-2
OBS
OBI
OBW
OBW250
MKN
UKR
E2P
L1C
E2M

Motor output [KW]/[HP]	Cable size [mm², minimum] Power cable (Earth cable)		Conventional current [A]		Fuse capacity [A] Direct (人-△start)		Press loading capacity [KVA]
	200~250V	251~500V	*1. 200~250V	*2. 251~500V	200~250V	251~500V	
2.2/ 3	3.5(3.5)		10	5.8	30(30)	20(20)	4
3.7/ 5			16.1	9.2	50(50)	30(30)	6
5.5/7.5	5.5(5.5)	3.5(3.5)	24	14	75(75)	40(40)	9
7.5/ 10	8(5.5)		32	18	100(75)	50(40)	12
11/ 15	14(14)	5.5(5.5)	45	25	150(100)	75(75)	17
15/ 20	22(14)	8(5.5)	61	34	200(125)	100(75)	25
18.5/ 25		14(14)	78	41	200(150)		30
22/ 30	30(22)		90	52	300(200)	150(100)	35
30/ 40	50(22)		120	65	400(250)	200(125)	48
37/ 50	60(22)	22(14)	148	84	400(300)	200(150)	58
45/ 60	80(38)	30(22)	165	100	500(400)	250(200)	71
55/ 75	125(38)	38(22)	204	121	600(400)	300(200)	86
75/100	250(60)	60(22)	282	163	800(600)	400(300)	125

Note: 1. *1 These current values indicate in case of 200 [volt]. Therefore, in case that used voltage to the machine is E volt , the current is $(\frac{200}{E})$ times as much as the conventional current.

2. *2 These current values indicate in case of 380 [volt]. Therefore, in case that used voltage to the machine is E volt , the current is $(\frac{380}{E})$ times as much as the conventional current.

3. The peack value of starting current is 6.5 to 8 times as much as the ~~ranventional~~ current and the starting time is approx. 10 to 15 seconds.

OBS-21
OBS-2
OBS25-2
OBS
OBI
OBW
OBW250
MKN
UKR
E2P
L1E
E2M

INSTALLATION	3. CHECK AT TEST OPERATION (BEFORE SHIPPING OUT OF THE FACTORY)	D301-1

Before shipping a press out of the factory, the press is subjected to be inspected in its test operation with respect to the following item. For inspection before daily operation, refer to PART F101 MAINTENANCE.

Notice: (1) It is not applicable to model MKN, UKR, OKN mechanical press serieses.

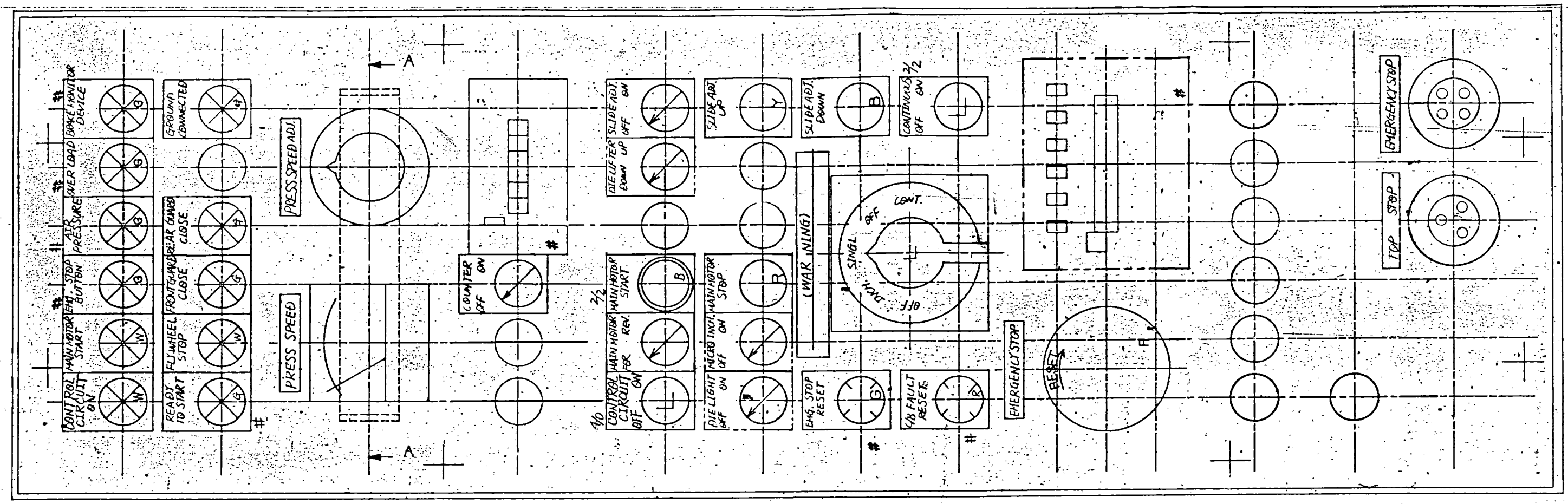
	No.	Check item	Standard	Checked
Checks in First stage	1.	Ambient temperature	0 to 40°C (32° to 102°F) (refer to page A2C1 para. 2.6)	
	2.	Oil level in gear box	Up to the level marking on the level gauge	
	3.			
	4.	Flywheel to see if it can be rotated manually		
	5.	V-belt tension	If should sag by one finger when pushed	
	6.	Size of the power and earth cables	Refer to Para. 2. 3	
After connection of air line	7.	Clutch and balancer pressure ranges	Pointer should be in white zone of dial of pressure gauge	
	8.	Drain filter for excessive water accumulation		
	9.	Air leakage		
	10.	Air tank for drained condition	Loosen an exhaust handle	
	11.	Interval of operation after air pump is stopped (1)	20 sec. minimum	

INSTALLATION	3. CHECK AT TEST OPERATION (BEFORE SHIPPING OUT OF THE FACTORY)	D301-2

* OBS25 is useless auto-breaker.

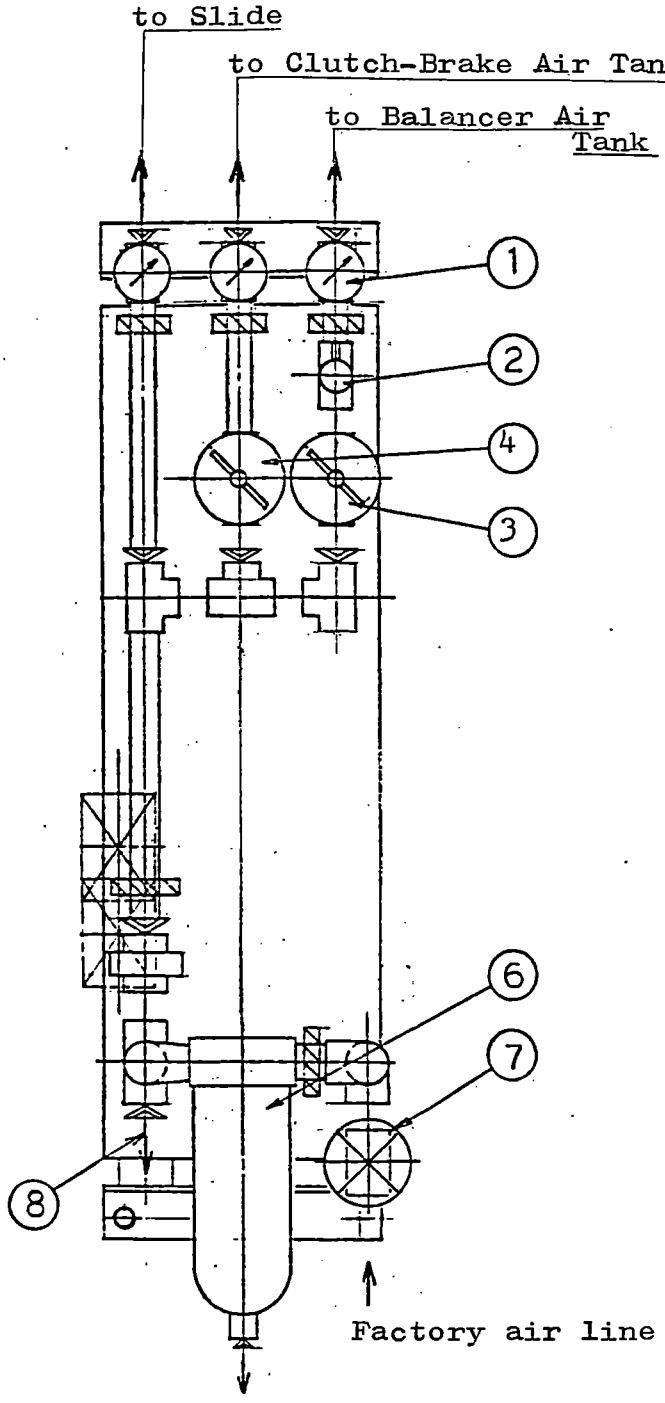
After power line on	12.	"Ready to start" indicator lamp when * Power supply auto-breaker on, power switch on and operation selector switch in "Inch" position. (After resetting emergency stop reset button)	Indicator lamp (green) should come on	
	13.	Clutch valve and clutch when RUN pushbuttons are depressed or released concurrently with operation selector switch in "Inch" position	Clutch valve is actuated and clutch is lightly engaged or disengaged	
	14.	Gibs for lubricated condition		
	15.	Oil supply line and hydraulic piping for oil leakage		
After main motor is started	16.	Direction of flywheel rotation	In arrow direction shown name plate on rim of the flywheel	
	17.	Motor indicator lamp	The lamp(white) should come on	
Press operational control	18.	Operate the press is "Inch" operation to check abnormal sound and inching performance		
	19.	In "Single" operation, make certain the slide stops up to around lower dead point when operation button is released and thereafter, the slide automatically moves	Check to "SINGLE" operation	
	20.	In "Single" operation, make certain the slide stops at the top dead point even when operation button is kept down	Check to "Anti repeat"	

Press operational control	21.	The range of stopped positions at the top dead point	within $\pm 5^{\circ}$ within $\pm 15^{\circ}$ (from 150 to 300 rpm)	
	22.	Make certain slide stops at the top dead point by depressing to "Continuous stroke off" push-button		
	23.	Make certain slide stops at once by depressing to "Emergency stop" button	Check the stopping function	
	24.	Beeing provided with photodectric safety device (light guard) make certain slide stops immediately by shieling the light when the slide is coming down		-
Slide adjustment	25.	Make certain the slide adjustment device moves lightly by a ratchet handle	Manual-operated type	
	26.	Make certain the slide goes up or down with "Slide adjustment" switch key in ON position	Electrical type	
	27.	Make certain all operating controls are not operated with "Slide adjustment" switch key in ON position	Electrical type	
	28.	Make certain slide automatically stops at upper and lower limit of adjustment	Electrical type	
	29.	Make certain the indicated value of slide adjustment and adjustment obtained conform to the specification		


A
PRESS SPEED ADJ.
PRESS SPEED
COUNTER ON OFF
DIE CUSHION UP DOWN
SLIDE ADJ. ON OFF
SLIDE ADJ. UP
SLIDE ADJ. DOWN
CONTINUOUS ON OFF
(WARNING)
CONT.
SINGL
OFF
EMERGENCY STOP
STOP
RESET
MAIN MOTOR START
MAIN MOTOR REV.
MAIN MOTOR STOP
MICRO INCH. MAIN MOTOR ON OFF
DIE LIGHT ON OFF
EMG. STOP RESET
V-BELT FAULT RESET
CONTROL CIRCUIT FOR ON OFF
CONTROL CIRCUIT ON
READY TO START
FLYWHEEL STOP
FRONT GUARD CLOSE
REAR GUARD CLOSE
AIR PRESSURE
OVER LOAD
BRAKE MONITOR DEVICE
GROUND CONNECTED
MAIN MOTOR START
STOP BUTTON
2/2
4/6

1.2 Air-hydraulic operating panel

The panel is located in left-front of the machine as standard.



① Pressure gauge
② Exhaust valve
③ Regulator valve : for Balancer
④ Regulator valve : for Clutch & Brake
⑥ Drain filter
⑦ Stop valve
⑧ to Automatic air line (optional)

2.1 Press stroking selector mode

A Key-lock press stroking selector is provided for the described press operation. The selector positions are "OFF", "INCH", "SINGLE", "OFF" and "CONT.". These positions control the "RUN" buttons and select the circuit for proper sequence of press operation.

OFF -------- The slide cannot be in motion even by depressing the "RUN" buttons.

INCH ------- The slide is in motion only 1 cycle, even if the "RUN" buttons are kept depressing concurrently. If the buttons are released, the slide stops at once.
"INCH" is a function used by the die setter for setup of dies and tooling, but is not intended for use during production operations by the operator. Reverse Motion; The slide stop stroke angle about 145° and about 330°. If the buttons are released, the slide stops at once.

SINGLE ----- "SINGLE" stands for "SINGLE STROKE". "SINGLE" permits the slide to make one complete cycle and then to stop at top dead point when both "RUN" buttons are depressed concurrently during the die closing portion of the stroke. Release of all "RUN" buttons are required by "ANTI REPEAT", before another stroke can be initiated.

CONT. ------ (1) Within 3 second after depress the set up button, depress the "RUN" buttons, and the slide will start and continuously repeat its upward and downward strokes.

(2) To stop the "CONT." operation, depress the "TOP STOP" button. The slide will stop at the top dead point.

OBI
OBI-2
OBS-2
OBW-2
OBS25-2

2.2. Preparations and checks prior to press operation

(1) Air pressure setting

The air pressure for clutch, balancer, etc. should be set to the specified valve through a regulator in the pneumatic and hydraulic piping unit. For the air pressure setting for balancer and die cushion(optional), refer to the pressure diagram attached to the press frame side.

(2) Connection to power supply

Turn on the auto-breaker and move the power switch key to "ON" position. Simultaneously, the gibs and balancer lubricating oil pump will start running.

(3) Check the lighting of lamp "READY TO START"

"READY TO START" lamp comes on, when the selector switch is moved to "INCH". But it is necessary to depress the "FAULT TO RESET" push button (optional), if it is equipped with. Lighting of lamp "READY TO START" means that the slide can be in motion by depressing "RUN" push buttons.

(4) Functional check of dual solenoid valve for clutch and brake

To make a functional check of the valve, clutch and brake, move the operation selector switch key to "INCH" position, then, check them for their functional conditions by the "CLUTCH VALVE" lamp by alternately depressing and releasing "RUN" buttons concurrently.

If this lamp comes on, you should check and repair the valve. Then depress the "CONTROL RESET" button.

(5) Main motor starting

Depressing the "MAIN MOTOR START" button causes the motor to run. At the same time, the "MOTOR START" indicator lamp'white) comes on.

For starting a variable speed motor, proceed as follows:

1) Turn the "PRESS SPEED ADJUSTMENT" knob counterclockwise as for as go.
2) Depress the "MAIN MOTOR START" button, and the main motor will run and the "MAIN MOTOR START" lamp will come on.
3) Turn the "PRESS SPEED ADJUSTMENT" knob slowly clockwise while reading a "PRESS SPEED" meter to set the slide speed at a required rpm.

When starting the main motor, check for V belt slippage noises, and abnormal motor noises.

(6) Check the "INCH" operation

Turn the stroking selector switch key to "INCH" position and alternately depress and release the "RUN" buttons until the slide reaches the top dead point while confirming the Inching performance.

Further more, also confirm the Inching performance normally functioning by checking the following items No.1), 2).

1) If the press slide once stops, the press can not be continuously operated until both "RUN" buttons are completely released.
2) The press slide shall stop even if both "RUN" buttons are kept depressing.

(7) Checking the "SINGLE" operation

Move the selector switch key to "SINGLE" position, and make sure the lighting of lamp "READY TO START" and then depress the "RUN" buttons concurrently to start the slide. Then, make certain the slide stops at once by releasing the "RUN" buttons up to about 180° in crank angle or it stops at the top dead point even when the "RUN" buttons are kept down (anti-repeat circuit function).

Repeat the above procedure for "SINGLE STROKE" operation about 10 cycles to make certain there occur no variations in the position where the slide stops at the top dead point (variations in the position where the slide stops should be within $\pm 5^{\circ}$ at a slide speed below 150 rpm, or within $\pm 15^{\circ}$ at a slide speed from 150 to 300 rpm).

(8) Checking the emergency stopping function

Make certain the slide stops at once by depressing the "EMERGENCY STOP" button in a "CONT." operation. After emergency stop, unlock the "EMERGENCY STOP" button.

In this case, must move the slide to the top dead point by "INCH" operation.

2.3. Emergency stop during operation

In any of the cases during operation, the slide comes to an emergency stop.

(1) When selector switch "Slide adjustment OFF-ON" is moved to "ON" (ON electrical slide adjustment)

(2) When the detecting device is actuated with the slide overloaded.

(3) When the detecting device is actuated with the clutch air pressure dropped.

(4) When the detecting device is actuated with the balancer air pressure dropped. (only when there is a pressure switch for balancer)

(5) When a safety device is actuated.

(6) When the overrun detector is actuated.

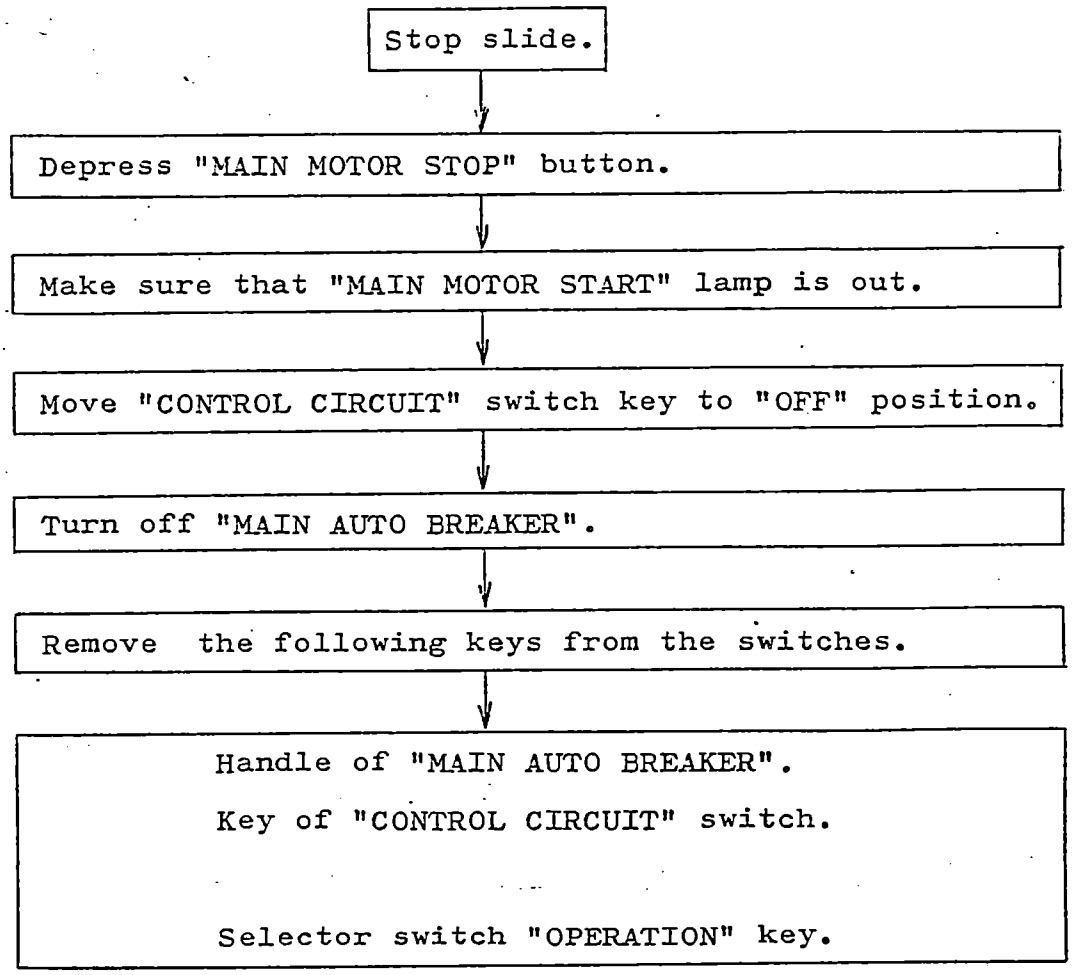
(7) When the other optional interlocked circuit for emergency stop is actuated.

When the slide comes to an emergency stop in any of the above cases, remove the cause and depress the push button "FAULT TO RESET" (optional), then proceed to the normal press operation.

Except for above (5), bring the slide to the top dead point (about $330^{\circ} \sim 15^{\circ}$ in crank angle) under "INCH" operation, and then proceed to the normal press operation.

2.3a Stoppage of operation

To place the press at rest after an operation is completed as scheduled or for any other reason, proceed as follows:



3.1. Die height adjustment (Electrical adjustment)

In an electrical adjustment, if the balancer air pressure is too high, the slide adjusting motor will be overloaded, resulting in a motor failure. Before electrical die height adjustment, be sure to make sure that the balancer air pressure has been set as indicated on the balancer diagram. For the die height adjustment, proceed as follows:

(1) Move the "Slide Adjustment" selector switch to "ON" position.

(2) While the "Slide Adjustment Up" or "Slide Adjustment Down" push button is kept down, the slide adjusting motor runs, causing the slide to go up or down.

(3) The amount of adjustment is indicated by a figure on a die height indicating digital counter on the front of the slide.

The directory readable unit is 0.01".(0.254mm) A figure to be indicated is distance from the bolster top face to the slide underside.

(4) The upper and lower limit switch is set in the digital counter, causing the slide adjusting motor to stop automatically at the amount of adjustment beyond the specified range.

(5) After adjustment, move the "Slide Adjustment" selector switch to "OFF" position.

3.2. Angle detector adjustment

The working angle adjustment of angle detector is made in the following manner.

(1) Move the operation selector switch key into "OFF" position and remove a key.

(2) The working angular range is set by means of six rotary switches (six rotary switches used in one angular setting) and one snap switch.

(3) Three rotary switches at the left side are used to indicate the working starting angle and the others are used to indicate the working finishing angle. The snap switch at the right end is set at "ON" if the signal is ON at the crank angle 0° and "OFF" if the signal is OFF then. But, if the working starting angle is bigger than the working finishing angle, change them with each other.

(4) For example, when it is necessary to obtain the signal from 200° to 240°, set rotary switches at ⌜2⌟ ⌜0⌟ ⌜0⌟ ⌜2⌟ ⌜4⌟ ⌜0⌟ from the left end and the snap switch at "OFF".
And when it is necessary to obtain the signal from 300° to 60°, set rotary switches at ⌜0⌟ ⌜6⌟ ⌜0⌟ ⌜3⌟ ⌜0⌟ ⌜0⌟ from the left end and the snap switche at "ON".
But take notice of the following matter.
If the working angle is set above 360°, there is no output of the signal.

Notes:

1) Output method		Relay contact
2) Max. load electric power (cos ϕ=1)		2000VA, 150W/circuit
3) Max. load voltage		250VAC/circuit
4) Max. load current		8A/circuit
5) Contact life	Electrically	8A, 250VAC (cos ϕ=1) more than 100,000 operations
		5A, 30VDC (cos ϕ=1) more than 200,000 operations
		3.5A, 250VAC (cos ϕ=0.4) more than 150,000 operations
	Mechanically	more than 10,000,000 operations (ISO operations/min.)

3.3. Air pressure adjustment

Air pressure adjustment for the clutch and brake, balancer and die cushion(optional) is made through a regulator arranged on the front side of an pneumatic and hydraulic piping unit. The air pressure adjustment should be made in the following manner.

Raising the air pressure

(1) Loosen a locknut in the regulator.

(2) Turn the pressure adjusting knob clockwise until the specified pressure is obtained, while looking at the pressure gauge pointer.

(3) If specified pressure is obtained, surely rock the pressure adjusting knob by Rock Nut.

Lowering the air pressure

(1) Loosen a locknut in the regulator.

(2) Turn the pressure adjusting knob counter clockwise to a scale division below the specified pressure.

(3) Loosen an exhaust handle to let air out until the air pressure is lowered below the specified value. Then, tighten to handle positively.

(4) Turn the pressure adjusting knob clockwise until the specified pressure is obtained, while looking at the pressure gauge pointer.

(5) When the specified pressure is obtained, lock the knob positively.

Exhausting the air pressure

Close the stop valve and loosen and exhaust valve to let air out.

3.4 Restoring the hydraulic overload protector to its original (not actuated) condition(refer to F201. MAINTENANCE.)

When the overload protector is actuated to cause the press to come to an emergency stop, restore the protector to its original condition in the following manner.

When the slide stopped after passing through the bottom dead center:

(1) Depress the Push Button "Fault to reset" (Indicator lamp will come on.)

(2) Move the operation selector switch key to "INCH" position and let the slide move to the top dead point under an "INCHING" operational control.

(3) Remove the cause of overload.

Thus, the press can be placed continuously in operation.

When the slide stopped before the bottom dead center:

(1) Depress the Push Button "Fault to reset" (Indicator lamp will come on.)

(2) Move the operation selector switch key to "INCHING" position and let the slide move to the top dead point under an "INCHING" operational control. In this case, if the slide stopping position is less than the oil relief (1) of the hydraulic overload protector, and if the slide seems to be unable to pass through the bottom dead point, raise the adjustment by means of the slide adjustment mechanism before the slide movement under an inching operational control. If the slide seems to be unable to pass through the bottom dead point even when the adjustment is raised to the upper limit, change the phase R and T with each other

to run the main motor in the reverse direction and let the slide move to the top dead point under an "INCH" control.

If the overrun protector for the main motor (optional) is attached to the machine, inch the slide to top dead center im the reverse direction.

(3) Remove the cause of overload.

Thus, the press can be placed continuously in operation.

1.1. Servicing cares before operation

Before starting operation of the press daily, or when the press is out of operation for more than 2 or 3 hours because of some changes in operational details etc., be sure to check the following items before starting to operation.

No.	Check item	Procedure
1	Air pressure for its proper setting	Clutch ... See if the pressure is within the specified range of a pressure gauge Balancer . Refer to its graph and instruction plate Die cushion(optional) ... Refer to its graph and instruction plate
2	Flywheel for rotating condition	Check V-belt for slip and abnormal sound and motor for humming sound
3	"Single" operational control	Make certain the slide stops at once when both RUN-INCH buttons are release during the die closing portion of the stroke
4	Antirepeat function	Make certain the slide stops at the top dead point even with the push-buttons kept down under "INCH" and "SINGLE" operational control
5	Variations in position where the slide stops at the top dead point	Within $\pm 5^{\circ}$ (at 150 rpm max.) Within $\pm 15^{\circ}$ (at 300 rpm max.)
6	Emergency stop	Depress the red emergency stop button to make certain the slide stops at once
7	Abnormal sound during operation	Check clutch-brake and solenoid valve at work for abnormal sound. Check the driving mechanism in gear box for abnormal sound
8	Die installed condition	Check die shank bolts for tightness

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1.2 Periodic servicing

For better machine performance, the user's own servicing (Daily, Weekly, Monthly, Every 3-month, Every 6-month and annual servicing) is severely recommended.
If necessary, KOMATSU renders a inspection and servicing upon user's request.

	No.	Check Item	Procedure
Weekly	1	Check for air or oil leakage from piping parts and rubber hoses	Pipe couplings and connecting parts particullary.
	2	Check for oil quantity of lubricators.	1. Refer to lubricant standard on page F401-4. 2. Setting of lubricant quantity is as the following. a) Devices which need a lubrication every stroke (for automatical device, etc.) One drop by three or five strokes b) Devices except for a (for die clamper, etc.) Two or three drops by one stroke
	3	Check slide gib surfaces	for damage and alien substances adhering to the surfaces
	4	Check suction filter for lube pump	Turn a handle of the filter about four or five rounds and check oil pressure for normal level (If necessary, drain through the plug on the bottom)
	5	Check air auto-drain filter for normal function	Disassemble and clean
	6	Check electrical cables	Cable leading to the slide, cables for portable push-button panel (standard and optional), foot switch(optional), etc. for damage. Receptacles for tightness

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	No.	Check Item	Procedure
Weekly	7	Check oil level of oil bathes	Gear box, slide adjuster, over load protector, die cushion(optional), etc.
Monthly	1	Drain moisture from all air tanks	Open a exhaust valve
	2	Make functional check of relays	Check relays for beating sound, looseness etc., contacts for rough surfaces, and moving parts for smooth movement
	3	Check indicator lamps for normal functions	"Control circuit on" lamp(Green).. Main switch "ON" and Key switch "Control Circuit""ON" "Main motor start" lamp(White) ... Main motor switch "ON"
	4	Grease to driving parts of slide adjustment	Grease chain couplings, chains and gears
	5	Check safety block	1. Check whether the press stops when safety block is pulled out during operation. 2. Check whether main motors stops coincidently
Every 3 months	1	Check couplings of motion detecting encorder	Remove a cover of the encorder and check for damage and looseness
	2	Check crank angle indicated by roullete panel	Check the position where the slide stops to make certain it coincides with indicating angle

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	No.	Check Item	Procedure
Every 6 months	1	Check for oil or air leakage	Retighten piping joints
	2	Check bolts for tightness	Retighten flywheel mounting bolts, gib bolts, top cover bolts, etc.
	3	Check V-belts	Refer to Para.4.2.(page F401)
	4	Check oil level of oil bath	Check on a level gauge on left side
	5	Grease flywheel brake (optional)	Grease 3~4 time by grease pump
		and check for wear of the facing	Replace the facing with 17mm thickness left
	6	Check lubricated conditions	Check them with pipes which are lubricated through stop valves loosend
	7	Make functional check of limit switches	Check the position where limit switches work to make certain it coincides with setting position Higher and lower limit of slide adjusting. Over load protector, higher and lower limit of stroke adjusting of die cushion
	8	Check plunger	Check lubricated condition Check sliding surfaces for wear damage
	9	Check balancer rod	Check for wear damage
	10	Check pressure switches	Check setting pressure for normal level
	11	Check pressure gauges	Check whether the pointers return to 0 point
	12	Check rubber hoses and cables for damage	For senility and damage
	13	Check couplings of motion detecting encorder	Remove a cover of the encorder and check for damage and looseness

	No.	Check Item	Procedure
Every 6 months	14	Check cables for portable push-button panel and cables leading to the slide	Check electric wire connecting parts of plug sockets for normal function
	15	Check press appearance	Check bolts and nuts of moving parts (slide, die cushion), limit switches, etc. for looseness
	16	Check operation selector button and emergency stop button	Make functional check Check contacts
	17	Check magnet switches and connecting points of relays for clutch & brake operating circuit for damage	Check for senility and roughness (Replace relays for clutch & brake operating circuit within a year)
	18	Check screws and bolts of wire connecting parts for looseness	Retighten
	19	Check oil invasion of terminal boxes	
	20	Clean oil filters (Clean the oil filter of lube pump outlet monthly for the first three months and replace every year)	Air blowing and washing lube pump inlet
	21	Check devices which don't always work	Over load protector, etc.
	22	Check bolts of upright gib	
	23	Grease slide adjusting screws	Coat grease, by grease nipple of plunger at lower
	24	Grease gear coupling for PTO shaft	

	No.	Check Item	Procedure
Annual (user's own periodic inspection)	1	Check solenoid valve	Check coil terminals for looseness Check coil for foul condition, humming sound, discolored condition, etc.
	2	Disassemble and check clutch	Check for clutch disc stroke (Check for wear exceeding wear limit on brake and clutch side) Check O-rings in sliding portions, springs, linings, for scores, scratches, deformation, etc.
	3	Clean air tank	Drain moisture and remove rust from the tank
	4	Make functional check of air relief valves	
	5	Drain and refill oil bath with new oil	Refer to Para.4.1.(page F401)
	6	Measure insulation resistance	Resistance should be 5MΩ min. in motor circuit and 2MΩ min. in operational circuit
	7	Check accuracy	Check gib clearances, slide parallelism, squareness
	8	Measure stopping time of the press (value of TS)	Measure time with a TS meter and at approximately 90° position of crankshaft rotation
	9	Check couplings of motion detecting encorder	Remove a cover of the encorder and check for looseness and damage

1. MAINTENANCE

(1) Temperature Rise

For an usual motor, it is all right even if the temperature of the internal coil rises up to the limit of the temperature shown in Table 1 above the ambient temperature. If the temperature of the motor rises abnormally under a normal load, it is necessary to check the motor. (Refer to the diagnostic table for the HC motor and the control device.)

Table 1 Temperature Rise Limit (Unit °C)

	E Type Insulation		B Type Insulation		F Type Insulation		H Type Insulation	
	Thermometer Method	Resistance Method	Thermometer Method	Resistance Method	Thermometer Method	Resistance Method	Thermometer Method	Resistance Method
Totally closed type	70	75	75	80	90	100	110	125
Open type	65	75	70	80	85	100	105	125

(2) Inspection

Remove dust from such places as the vent of the motor section, metal nets and indented surfaces of the HC section and like. At the time of periodic inspection, check the insulation resistance of the coil by using 500V mega and check whether the value is more than 1MΩ or not.

When measuring the insulation resistance, be sure that the control panel and the operation panels are disconnected.

(3) Handling of Sealed Bearings

High performance and durable grease is used. So in usual cases, it is not at all necessary to replace the grease. However, if the ambient temperature is very high, the humidity is very high, dust is too much, in such a place the life of grease will become very short. However, for the replacement of bearing or grease, contact the nearest service station.

(4) Grease Replacement Method

In the case of grease replacement type HC motor, they are so designed that grease can be supplied during operation or when the motor is not operating. And this is done by the grease nipple which is supplied with the motor. The type of grease to be used and the amount of grease to be supplied are mentioned on the name plate. So carry out greasing according to the contents of the name plate.

(5) Bearings are consumable goods. Their life varies depending on the condition of grease, condition of operation, surrounding conditions, etc. In a usual case, change them once in two years. In the case of the replacement of bearings, use the size and clearance of bearing as mentioned on the name plate. If any special bearings are used, their details would be mentioned on the name plate.

(6) If the motor is not to be used for a long time, carry out disassembling and store it in a place of no dust.

2. DISASSEMBLY AND ASSEMBLY

In an HC motor, the drum and magnetic pole, and yoke are facing each other with a small gap. If undesired particles enter into this gap, or if resin particles stick to this gap, speed control becomes impossible. Since the magnetic poles becomes a strong magnet, iron particles easily stick to it. So take care of it.

Disassemble the motor once in a year and clean it properly.

<Precautions for disassembly>

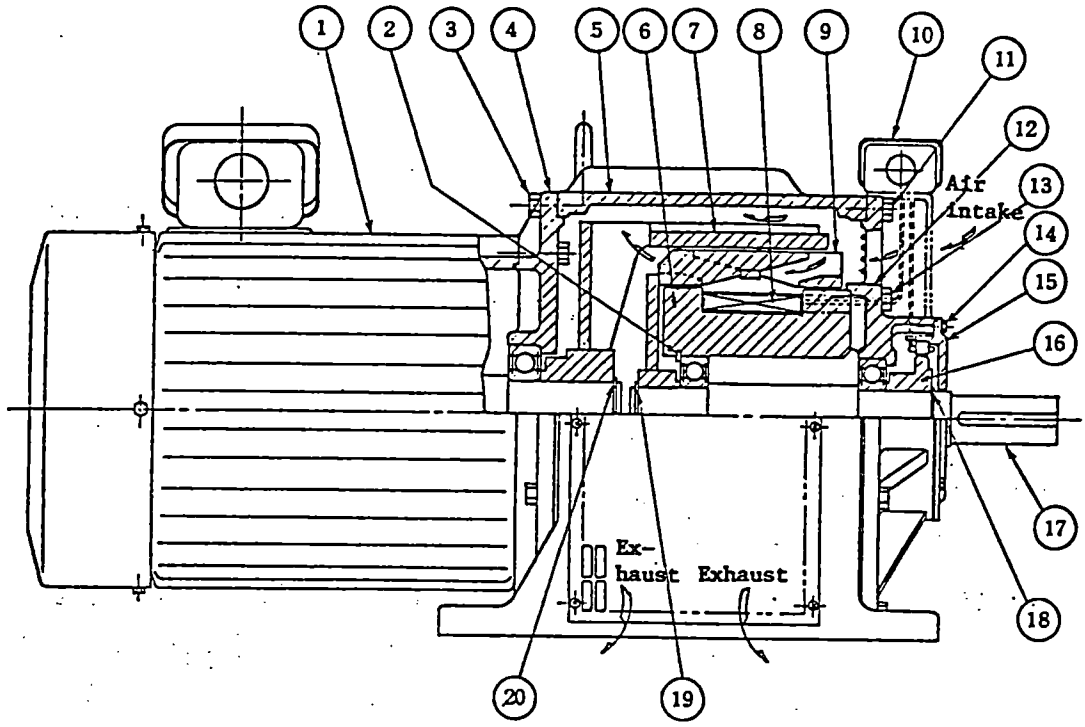
If iron particles are present at the place of disassembly, they may stick to the motor. Their removal becomes very difficult and moreover, they cause abnormal sound after assembly. Ultimately this leads to big troubles. So carry out disassembly in a place of no dust, moisture and place a clean piece of paper, etc. at the place of assembly.

(1) Structure of HC Motor

The HC motor is mainly composed of a drum ⑦, magnetic pole ⑨, yoke ⑥ and excitation coil ⑧. The drum is overhung on the driving motor ① shaft and it rotates in the same speed of the motor.

The magnetic pole is in reciprocity with the drum through the gap and it rotates in the same speed of the output shaft. The excitation coil is fixed on the yoke and moreover, fitted on the bracket (12). Direct current is supplied to the excitation coil.

Moreover, a speed detecting generator (PG) is built-in inside the HC motor. Its specifications are, 3-pole 400Hz at 1000 rpm and generated line voltage of 20V.



Item No.	Name	Item No.	Name
1	Driving motor	11	Bracket (HC) fitting bolt
2	C type stop ring (for internal diameter)	12	Bracket (HC)
3	Bracket (IM) fitting bolt	13	Yoke fitting bolt
4	Bracket (IM)	14	PG fitting bolt
5	Housing	15	PG (speed detecting generator) stater
6	Yoke	16	PG rotor
7	Drum	17	Output shaft
8	Excitation coil	18	C type stop ring (for PG)
9	Magnetic pole	19	" (for magnetic pole)
10	Terminal box	20	" (for drum)

Fig. 1 Structural Drawing of HC Motor

(2) Sequence of Disassembly

1. Remove the fitting bolt ③ of the bracket (IM) ④ and them remove the driving motor ① from the housing ⑤, which is attached to the drum ⑦.
2. For removing the drum ⑦, remove the C type stop ring ⑳ and then remove it from the shaft of the driving motor by using the thread hole (meant for this purpose) on the drum.
3. The driving motor is of the same structure as that of the totally enclosed cage type motor.
4. Disconnect three lines A, B, C of the terminal box and then push them through the hole of the rubber bush situated at the lower part of the terminal box.
   (Only in the case of 0.4kW, detach two lines J and K and there is no rubber bush.)
5. Remove the PG stater ⑮ by removing the fitting bolts ⑭ of PG.
6. Remove the PG rotor ⑯ from the output shaft by removing the C type stop ring ⑱.
7. If the fitting bolt ⑪ of the bracket (HC) is removed, the magnetic pole ⑨, yoke ⑥, excitation coil ⑧, bracket (HC) ⑫ and output shaft ⑰ can be removed as a single unit.

≪Precautions≫

Do not remove the yoke fitting bolt ⑬, unless it is required due to the damage of the excitation coil ⑧ or yoke ⑥ or bracket (HC).

8. For removing the magnetic pole ⑨, remove the C type stop ring ⑲ and then remove the magnetic pole from the output shaft ⑰ by utilizing the thread hole (which is meant for this purpose).
9. Remove the output shaft ⑰ from the yoke by removing the C type stop ring (for inner diameter). The bearings and output shaft ⑰ can be removed as a single unit.

(3) Sequence of Assembly

Assembly is carried out in the reverse sequence of disassembly.

Note 1: Apply grease to sheet surface of each bracket (contact surface of the outer race) prior to the insertion of bearings.

Each bracket
- Bracket of the-driving motor on the reverse side of loading
- Bracket of the driving motor on the loading side
- Yoke of HC section
- Bracket of HC section on the loading side

} In total 4 places

Note 2: Be sure that no dust or undesired particles are sticking to the mating surfaces of housing, bracket, and other joints, during assembly.
Moreover, after the completion of assembly, check whether the gap between the drum and magnetic pole is uniform.
Better safety can be achieved, if the gap is found to be uniform.

3. TROUBLE-SHOOTING AND QUICK COUNTERMEASURES

If above mentioned precautions are taken and the motor is serviced from time to time, a satisfactory operation of the motor can be derived. However, even after taking all precautions, troubles may appear and immediate countermeasures become necessary.

HC motor is composed of a driving motor, a speed changing HC section and a speed detector PG. Moreover, the HC section is composed of a control device. If any one of these components gets damaged, the motor can not be operated. So in the case of any trouble, it is necessary to check properly the actually damaged component.

Typical troubles and their countermeasures are given in the table attached below for a ready reference. If this table is found to be insufficient, request a repair workshop (having sufficient testing equipments) or the local agent or the nearest service station.

Attached Table: Trouble-shooting and Quick Countermeasures of HC Motor and Control Device

Driving motor section

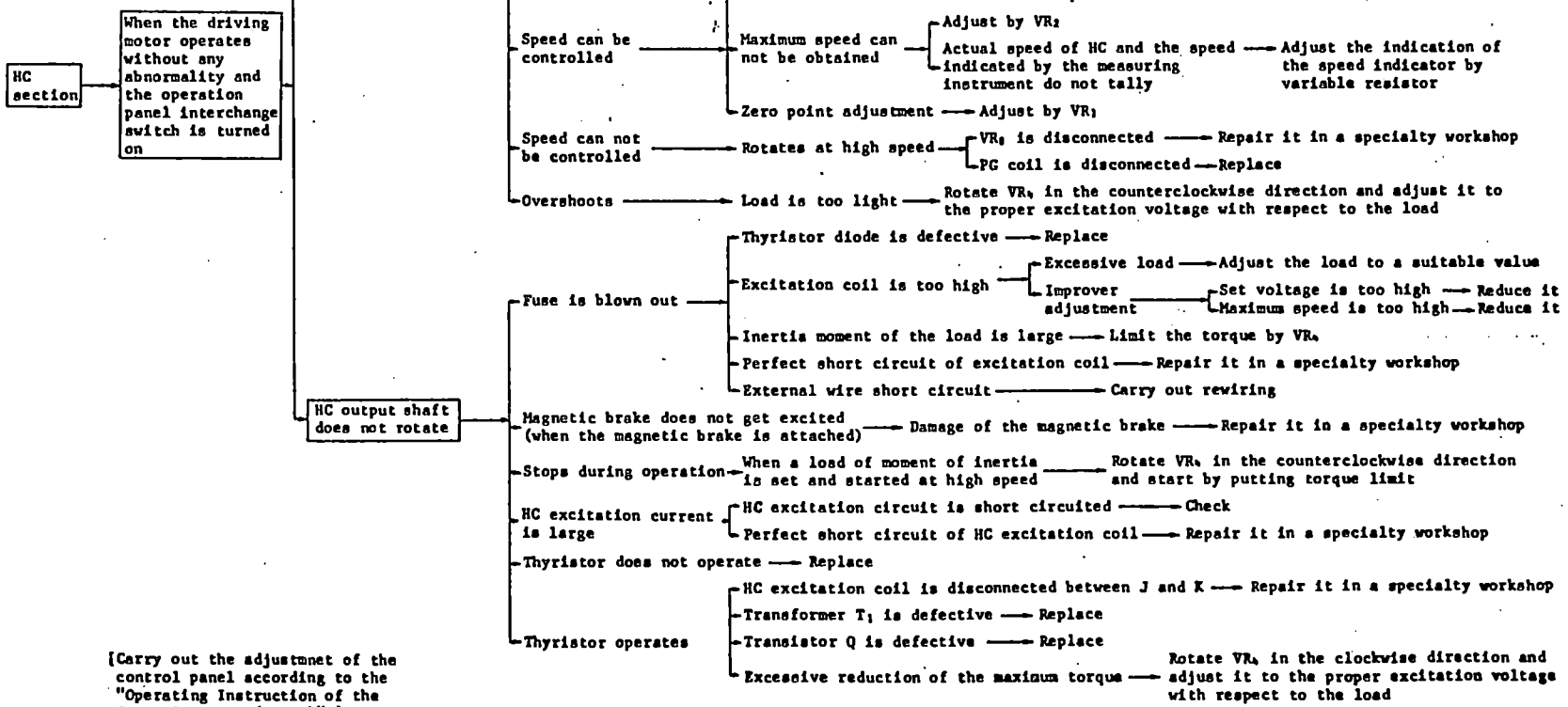
Cause \ Phenomenon		Abnormal Sound	Abnormal Speed	Vibration	Excessive Heat		Thermal Relay Activation	Circuit Breaker Activation	Current Leakage	Decrease of Insulation Resistance	Remedy
					Frame	Bearing					
Wiring	Imperfect grounding								◎		Carry out specified grounding.
	Improper capacity of circuit breaker and switch				Note 3 ○			◎			Change to the specified one.
	Disconnection of wiring		○					○			Repair the wire.
	Improper connection of starter and switch		○		Note 3 ○						Adjust the contact portion.
Surroundings	Less cooling due to dust, etc.				○						Clean properly.
	High ambient temperature				◎	○	◎				Improve ventilation (SS) or contact us.
	High humidity									◎	Contact service station or us.
	Dust, etc. entered					○			○	◎	Take preventive measures.
	Large quantity of water and oil consumption					○			○	◎	Take preventive measures.
	Large external vibration and shock			◎							Take precentive measures.
Power supply	Single phase operation	◎	◎	○	◎		◎	○			Check the contact of circuit breaker, switch, etc.
	High voltage drop	○	○		◎		◎				Check the thickness and length of wires. Consult the power supply company.
	Nonuniform voltage	○		○	○		○				Contact the power supply company.
Load	Excess load		○		◎		◎	○			Reduce the load. Check the bearing of the machine side.
	High starting frequency				◎		○				Reduce the frequency of starting. Consult us or service station.
	Large moment of inertia of the load				◎		○				Consult us or service station.
Bearing abnormality Note 2		◎		◎		◎	○				Repair in a specialty workshop.
Motor coil damage Note 2		○	○		○		◎	◎	○		Repair in a specialty workshop.

Note 1: ◎ indicates a close relationship between the cause and phenomenon.
○ indicates the related thing.

2: In such a case, it is necessary to check the actual cause of trouble and then to remove it.

3: Overheating of circuit breaker, switch and starter.

4: (SS) indicates service station.



[Carry out the adjustmnet of the control panel according to the "Operating Instruction of the Control Device (CTL-P)".]

4. INQUIRY

When contacting us for machine repair or orders of machine parts do not fail to mention the following items.

(1) Type-form
(2) Output (kW)
(3) Manufacturing No.
(4) Date of manufacture

However, if the items can not be understood because of too old name plate, give a simple sketch of the necessary parts.

Unit	Symptom	Cause	How to check	Remedy
1. Lamp "CONTROL CIRCUIT"	Lamp does not come on	1. Main control circuit switch is not "ON" (Optional)	Make a visual check	Connect
		2. Control circuit braker is "OFF"	Check switch in the main control box	Turn "ON" the switch
		3. Power switch key is "OFF" position	Check location of switch key	Move key to "ON" position
		4. Transformer is defective	Make a continuity test	Replace contacts or buttons
		5. Lamp is defective	Make a continuity test	Replace lamp
2. Lamp "MAIN MOTOR"	Lamp does not come on	1. Control circuit lamp is not in light	Refer to control circuit lamp	Refer to control circuit lamp
		2. Lamp is defective	Make a continuity test	Replace lamp
		3. "STOP" and "START" button contacts are defective	Make a continuity test	Replace contacts or buttons
		4. Electromagnetic switch coil is broken off	Make a continuity test	Replace coil
		5. Thermal relay is in action	Check the relay if it has been reset	Reset

Unit	Symptom	Cause	How to check	Remedy
2. Lamp (MAIN MOTOR)	Lamp does not come on	6. Starting circuit is broken off or connected	Make a visual check or continuity check	Connect or repair
	Motor go out because of the thermal relay in action	1. Oil temperature is too low when starting motor	Check to see if temperature is below $-5^{\circ}C(23^{\circ}F)$	Warm
		2. Different type of oil used in oil bath	Check to see if oil in of specified grade oil	If different, replace
		3. Overload in duty	Check to see if r.p.m. are reduced	Examine the cause
		4. Half-engaged condition in clutch	Disassemble clutch	Examine the cause and replace clutch
	Lamp go out during operation	1. Starting circuit is unsatisfactory in contact due to tibration of machine	Check for unusual vibration	Examine the cause
	Lamp does not go out	1. "STOP" button contact is melted	Make a continuity test	Replace
		2. Electromagnetic switch contact is melted or moving parts are defective	Make a visual check	Replace contact or part
3. "EMERGENCY STOP"	Lamp does not come on	1. Lamp is defective	Make a continuity test	Replace lamp

Unit	Symptom	Cause	Check methode	Remedy
	Lamp does not come on	3. Emergency stop button is pushed	Make a visual check	Reset
4. Lamp "AIR PRESSURE"	Lamp does not come on	1. Emergency stop indicator lamp does not come on	Refer to emergency stop indicator lamp	Refer to emergency stop indicator lamp
		2. Lamp is defective	Make a continuity test	Replace lamp
		3. Air pressure PS2, PS3, is "OFF"	Check to see if air pressure exceeds 4.5kg/cm² (64 PSI)	The specified air pressure should be insured
			Check to see if PS is "ON" at the specified pressure	Replace P.S
5. Lamp "OVERRUN"	Lamp does not come on "INCH"	1. Air pressure indicator lamp does not come on	Refer to air pressure indicator	Refer to air pressure indicator lamp
		2. Lamp is defective	Make a continuity test	Replace lamp
		3. The output relay in the non-contact control unit is faulty	If starting is possible by Inch control, it indicates that the relay is at fault	Replace the input-output base board
	Lamp does not come on "SINGLE" "CONTINUOUS"	1. Refer to "INCH" Item 1, 2	Refer to "INCH" Item 1, 2	Refer to "INCH" Item 1, 2

Unit	Symptom	Cause	How to check	Remedy
6. Overrun & motion detectors	Indicator lamp comes on when overrun	1. Unusual clutch air pressure	Check with pressure gauge	Insure the specified pressure
		2. Clutch valve is actuated partly	Refer to Para. pertaining to "Solenoid valve"	
		3. Excessively warn linings	Check disk stroke	Examine the cause and replace clutch

Unit-	Symptom	Cause	Check methode	Remedy
Lamp "FAULT"	Lamp does not come	1. Lamp is defective 2. Electromagnetic switch contact is melted or moving parts are defective	Make a continuity test Check of wiring reset button.	Replace
Lamp "OVERLOAD"	Lamp does not come on	1. Clutch valve lamp is not in light 2. Lamp is defective 3. "OVERLOAD" LS18 is 「OFF」	Refer to clutch valve lamp - Make a continuity test. Make a continuity test	Replace

Unit	Symptom	Cause	How to check	Remedy
7. Solenoid valve	Valve is not actuated	1. Lack of clutch air pressure	Check the air pressure with pressure gauge	Insure the specified pressure
		2. Coil is broken off	Make a continuity test	Replace coil
	Press stops and does not start because the valve is actuated partly	1. One side coil is burnt	same as above	Replace coil
		2. Dust invate to valve spool	Dissolve or visually check	Clean the valve

Major component parts of this press, namely, gears and shafts are subjected to the heat treatment and a grinding operation for improved strength and durability. Main bearings are made of the high tension special alloy and precision finished. Such small parts as bolts and pins are not commercially available ordinary parts, but these conforming to the KOMATSU engineering standards.

The assembly clearance standard, tightening torque standards, shrinkage fit standard, etc. have been established by KOMATSU for the safe and positive performance of each press component.
Consequently, disassembly and reassembly operations of driving units, etc. should be carried out by KOMATSU or KOMATSU authorized service shops.

Hereinafter are described the fundamental knowledge of this press and its major components with respect to this constructions and functions for the purposes of user's correct operation and servicing cares as well as their correct information on any troubles, if any, to KOMATSU.

3.1 Press driving unit (Refer to page F390 construction of the driving unit)

The driving unit of this press is totally built in an integrated rigid frame, lubricated in the oil bath and has enforced circulating supply of oil. Rotation of the flywheel is acheived by the main motor. Energy from the flywheel is transmitted to the driving parts through a wet-type friction clutch. The drive transmitted through the clutch

causes the eccentric drum reamer-bolted together with main gear to rotate through main pinion and gear, which in turn causes the slide to move up and down.

3.2 Clutch and brake (Refer to page F390 construction of clutch and brake)

The clutch-brake is of a wet, multi-disk type and installed in the oil chamber in the upper section of the press. Linings are of the high-durability, special sintered alloy, requiring no replacement through its long service life. Consequently, no special clutch adjusting mechanism is necessary to compensate wear.

Further, this clutch-brake unit is a combination unit of a disk friction type consisting of a spring-releasing type clutch and a spring-loaded type brake. Both clutch and brake are mechanically interlocked with each other and capable of a timing adjustment to prevent their functional overlapping, no rotary connection is required. The air line pressure switch is provided to signal emergency stop, when the air pressure of clutch-brake lowers below the specified operating pressures.

3.3. Slide and hydraulic overload protector (*)

(Refer to Page F390 construction of slide.)

A hydraulic overload protector is installed in the slide to protect the press against overload to be encountered accidentally. The oil relief in the system is 15mm(0.59")

However, overloading with the slide at a point nearer to the upper stroke end may causes damages to the driving unit and slide.

A connection screw and ram are installed independently of each other. Between the screw and holder is provided a proper clearance, making it possible to insure a smooth slide adjustment and keep the overall clearance as well as to insure the movement of the slide in the front to back and left to back directions for readjustment of gibs. For the construction of gibs, refer to Page F401. The overload protector consists mainly of an air pump, a relief valve to relieve the pressure oil at overloaded and a valve to recover the oil pressure to the level before relieving the oil at overload. These parts are installed in the pneumatic and hydraulic piping unit on the frame as one unit.

A pressure switch and valve are factors determing the max. allowable tonnage of press. KOMATSU has set to max. tonnage in a range from 100 to 110% of the press capacity. If this setting is changed, the press may be unable to perform its function as designed, and damage may occure. Do not change the setting for max. allowable tonnage at any time.

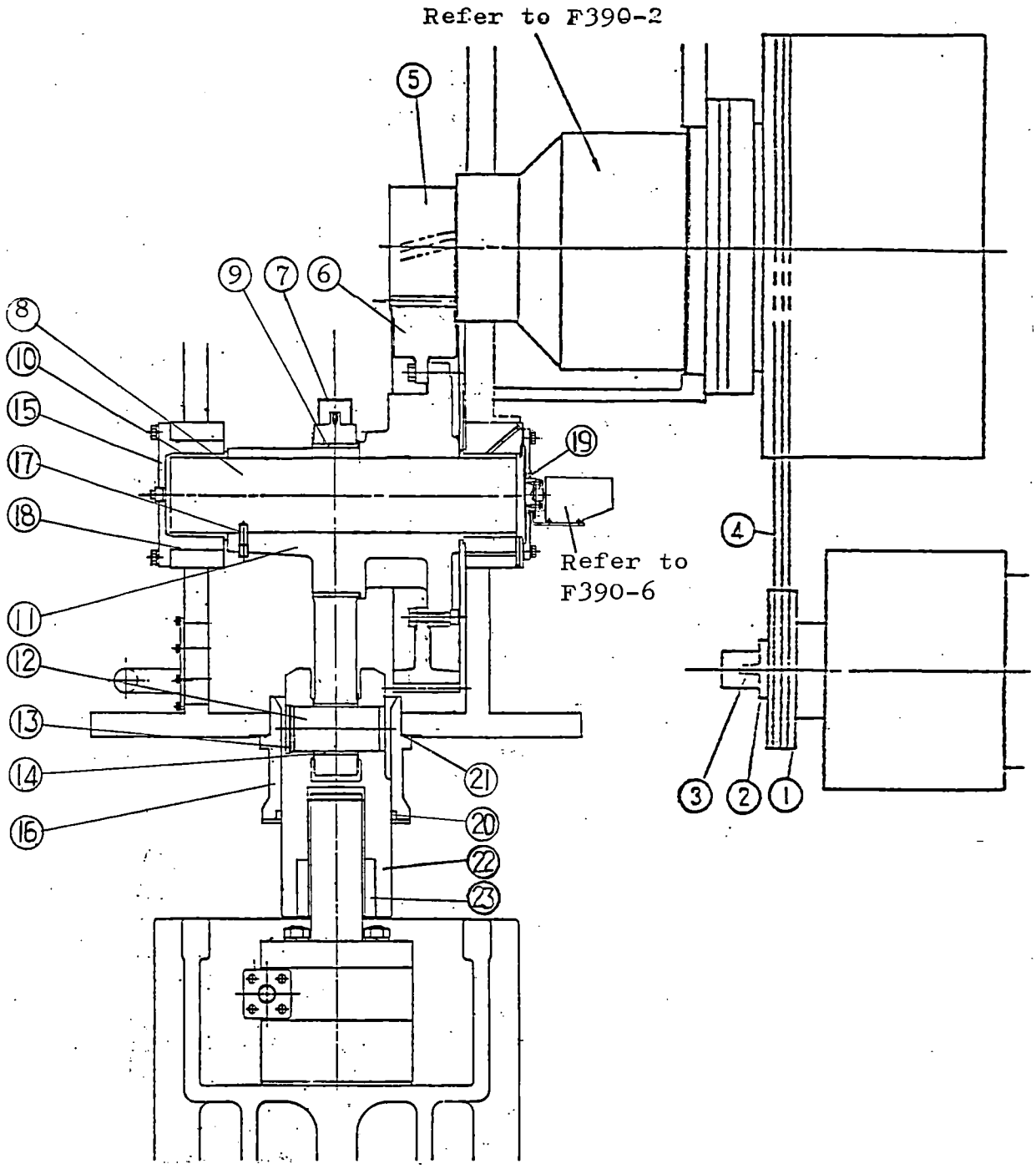
3.4. Balancer(Refer to Page F390 Construction of Balancer)

This balancer device serves to suspend a connection rod, slide and upper die weight and to insure a smooth vertical movement of the slide and take off the overall clearance of the connection. A cylinder is installed in the frame to eliminate hazards due to an accidental rod breakage. A pressure switch is provided to cause the slide to come to an emergency stop it the operating air pressure drops below the specified level.

The air pressure for the balancer should be adjusted through a regulator , referring to the balancer diagram.

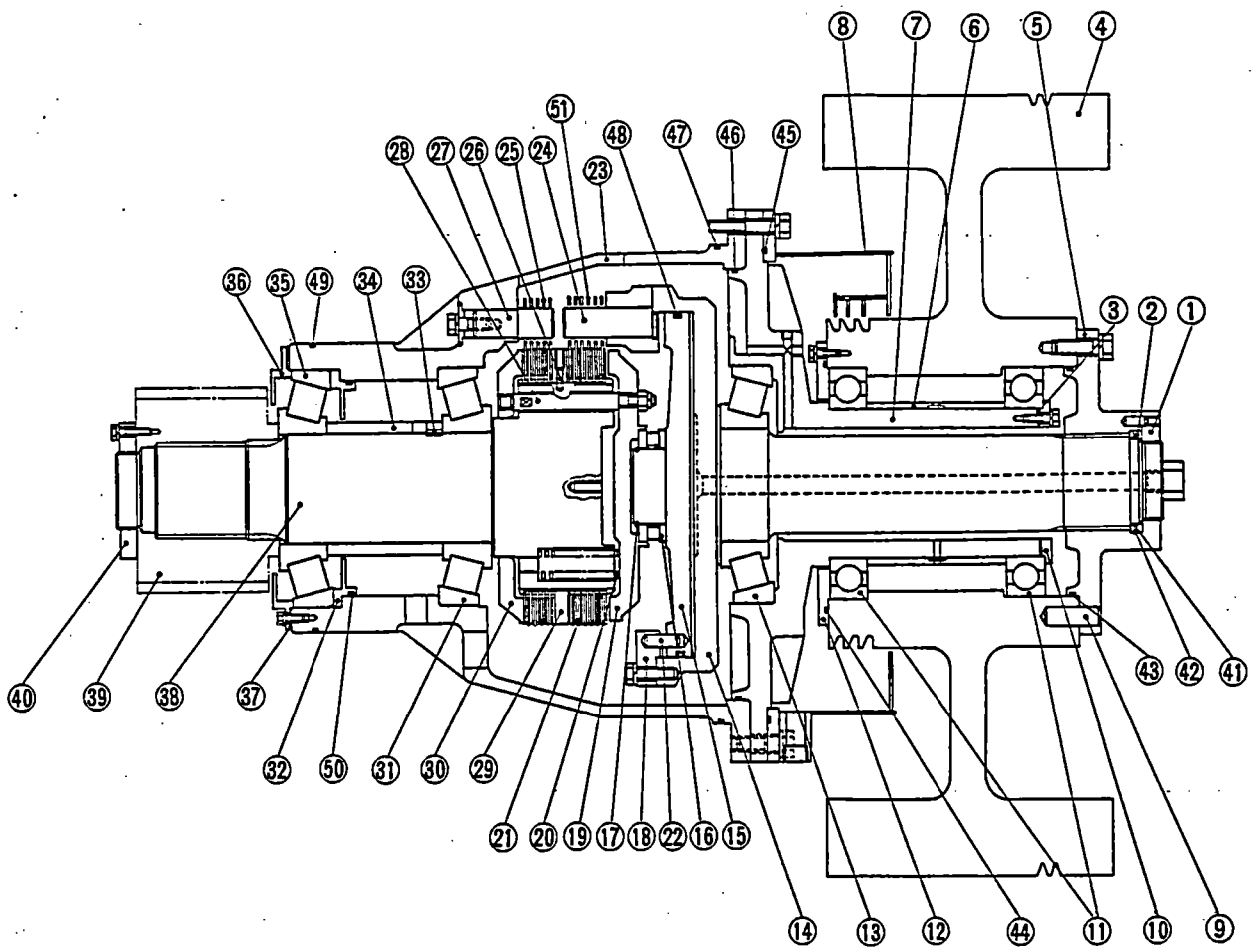
The upper die weight must not exceed the corresponding TABLE of SPECIFICATIONS.

Press Driving Unit Construction



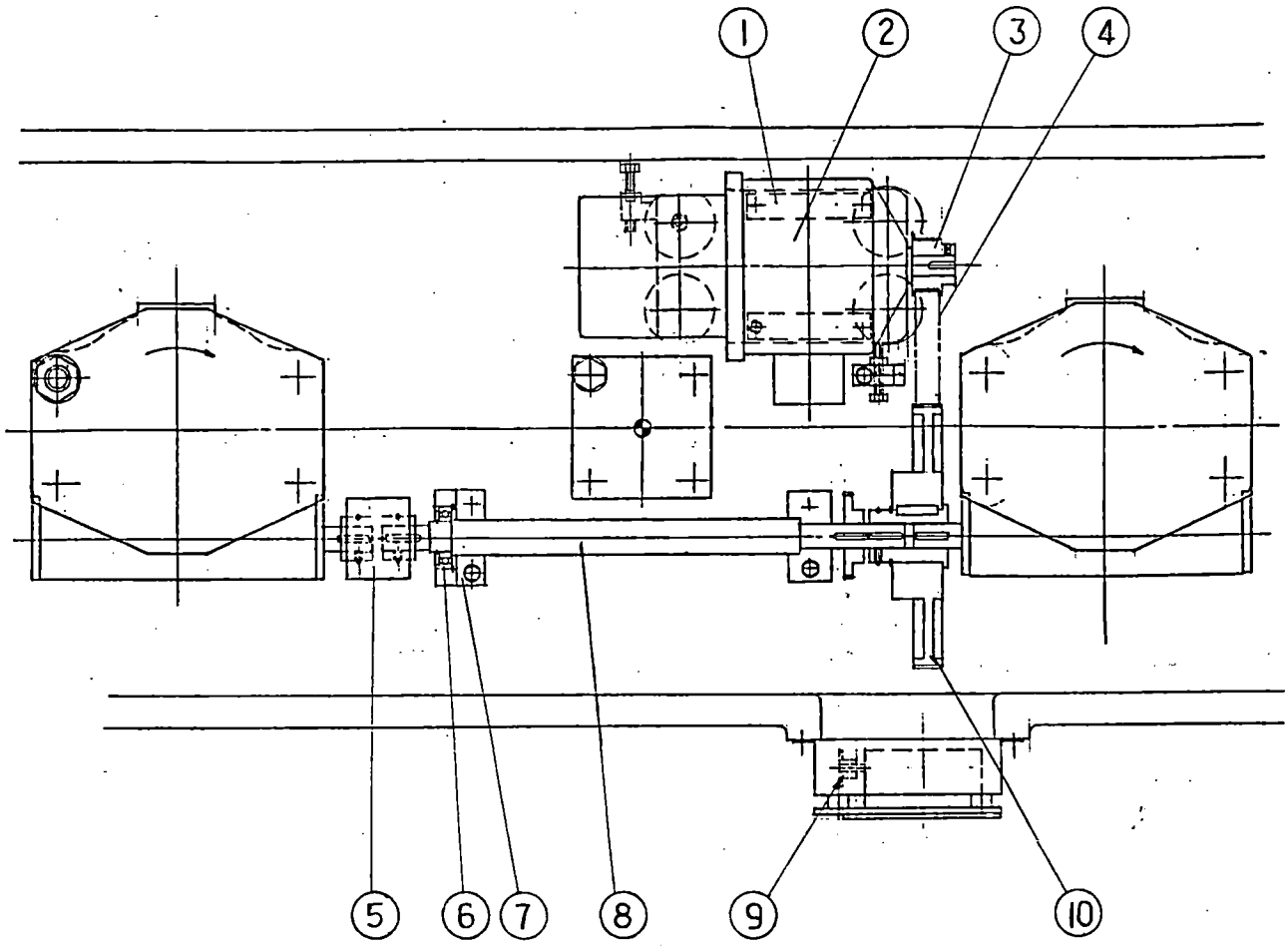
① Pully	⑧ Main Shaft	⑮ Holder	㉒ Plunger
② End Plate	⑨ Bushing	⑯ Plate	㉓ Nut
③ Key	⑩ Bushing	⑰ Pin	
④ V-Belt	⑪ Eccen Drum	⑱ O-Ring	
⑤ Main Pinion	⑫ Wrist Pin	⑲ Oil Seal	
⑥ Main Gear	⑬ Snap Ring	⑳ Y-Packing	
⑦ Conrod	⑭ Bushion	㉑ O-Ring	

Fig. F-2 Clutch-brake construction



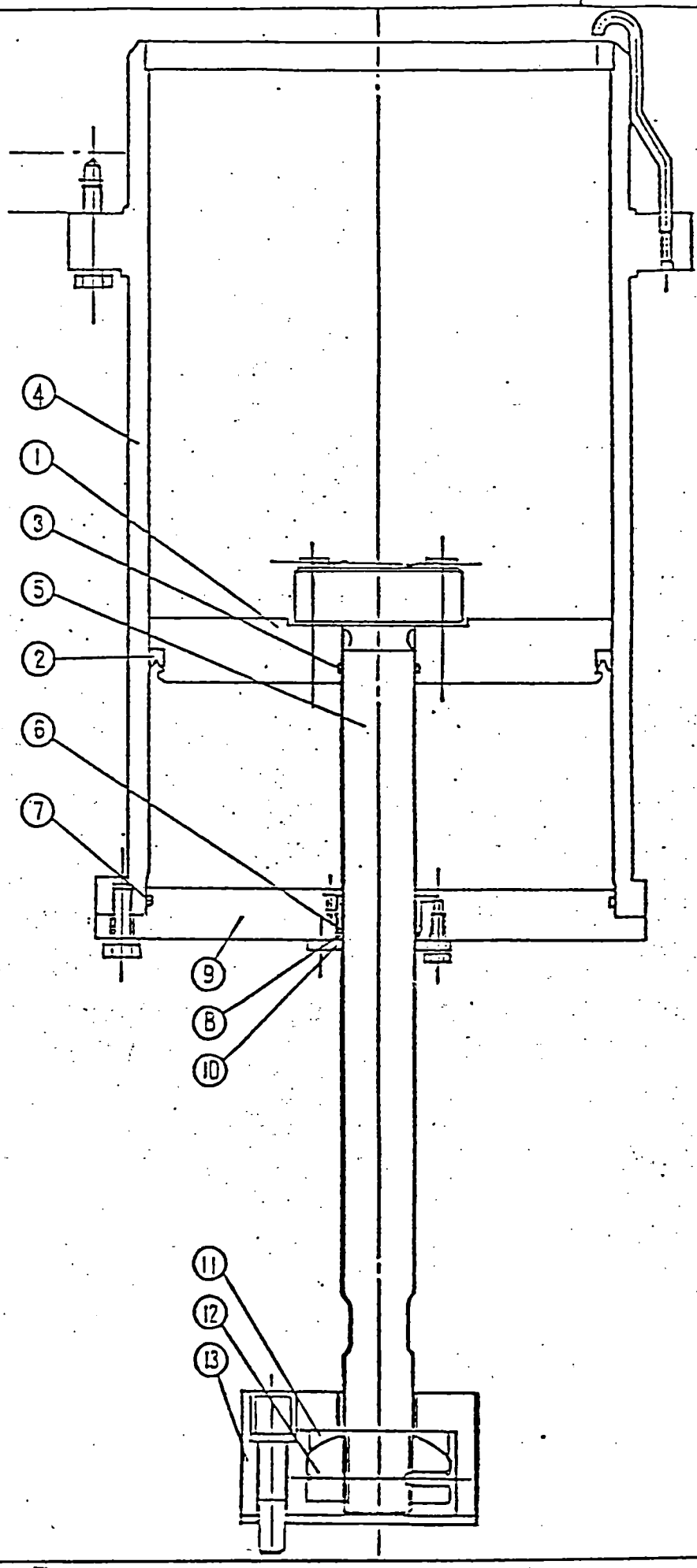
① End-plate	⑭ Shaft	㉗ Pin	㊴ Pinion
② Ring	⑮ Disk	㉘ Bolt	㊵ Nut
③ Shim	⑯ Bearing	㉙ Disk	㊶ O-Ring
④ Fly Wheel	⑰ Snap-Ring	㉚ Disk	㊷ O-Ring
⑤ Supporter	⑱ Holder	㉛ Bearing	㊸ O-Ring
⑥ Collar	⑲ Disk	㉜ Retainer	㊹ O-Ring
⑦ Holder	⑳ Spring	㉝ Key	㊺ O-Ring
⑧ Oil-Case	㉑ Disk	㉞ Collar	㊻ O-Ring
⑨ Pin	㉒ Pin	㉟ Bearing	㊼ O-Ring
⑩ Retainer	㉓ Casing	㊱ Retainer	㊽ O-Ring
⑪ Bearing	㉔ Pin	㊲ Gasket	㊾ O-Ring
⑫ Retainer	㉕ Lining	㊳ Shaft	㊿ O-Ring
⑬ Bearing	㉖ Pin		(51) Lining

Construction of Slide adjustment



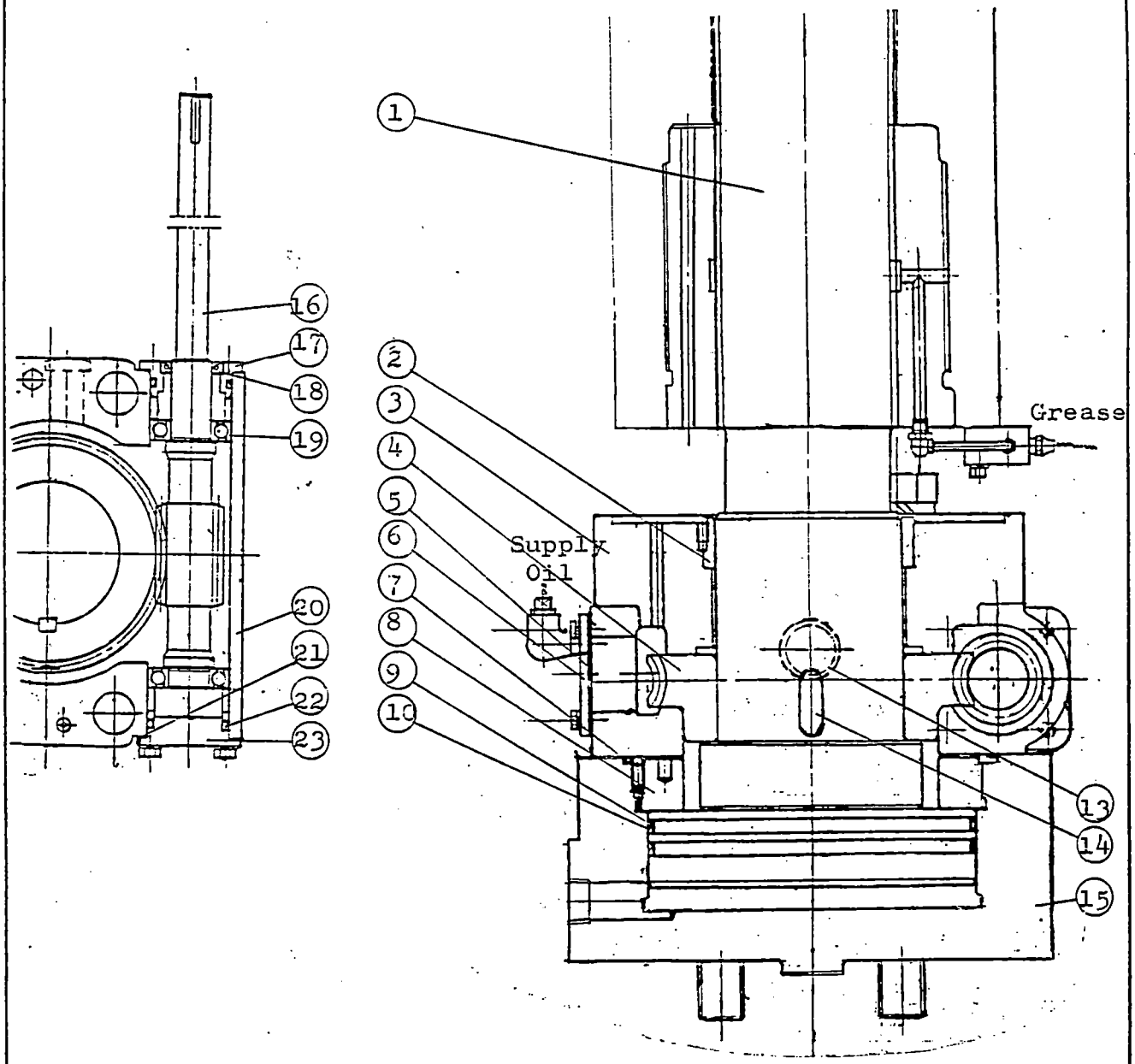
1. Base
2. Motor
3. Pulley
4. Timing belt
5. Coupling
6. Bearing
7. Bracket
8. Shaft
9. Sprocket
10. Pulley

Construction of
Balancer Unit



1. Piston
2. Y-Packing
3. O-Ring
4. Cylinder
5. Rod
6. Bushing
7. O-Ring
8. Y-Packing
9. Cover
10. Retainer
11. Ring
12. Nut
13. Bracket

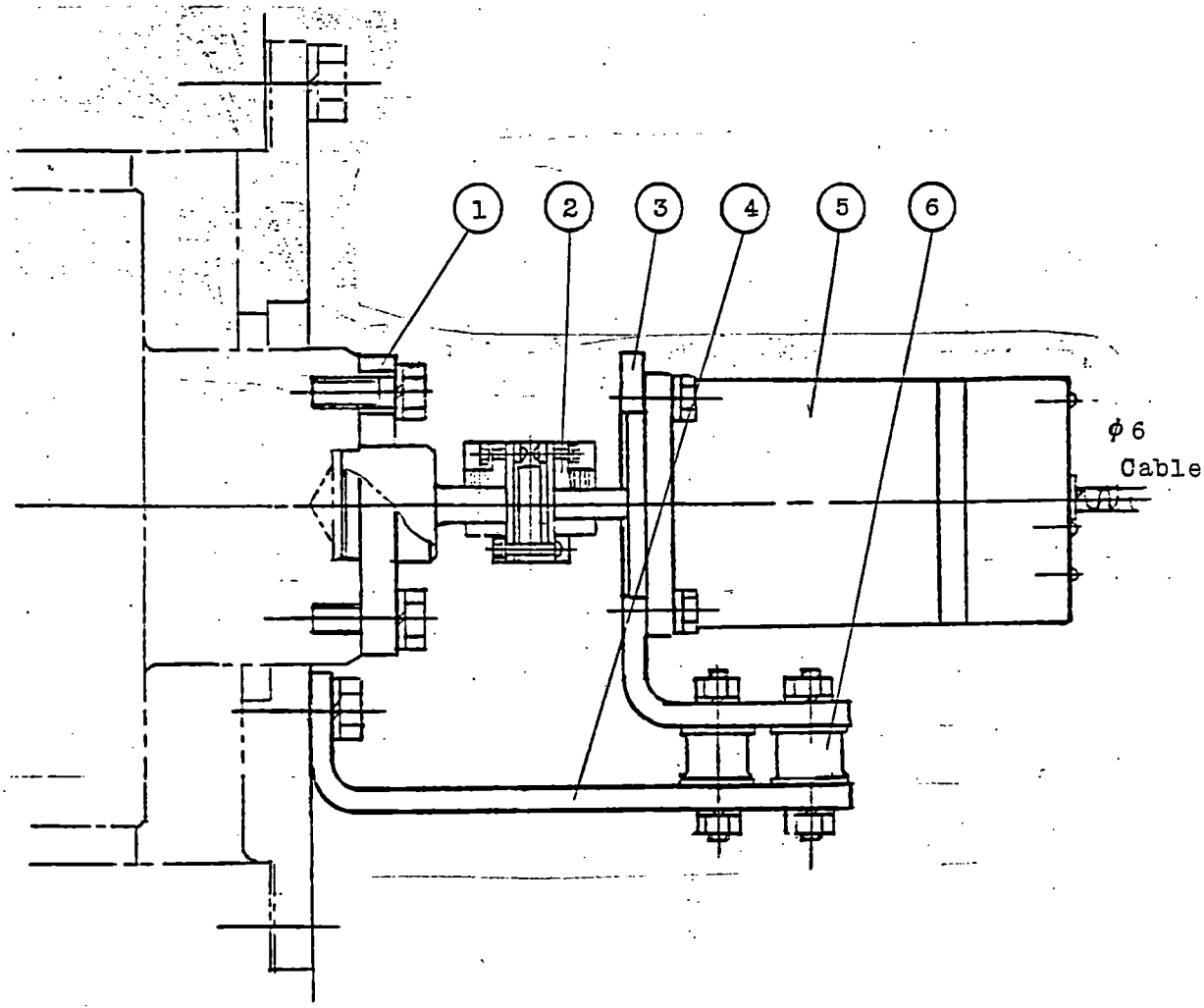
Fig.5 Construction of Point



① Screw	⑨ Back Up Ring	⑰ Holder
② Bushing	⑩ O-Ring	⑱ Oil Seal
③ Holder		⑲ Bearing
④ Warm Wheel		⑳ Case
⑤ Gasket	⑬ Oil Gauge	㉑ Shim
⑥ Cover	⑭ Key	㉒ O-Ring
⑦ O-Ring	⑮ Cylinder	㉓ Holder
⑧ Nut	⑯ Warm Shaft	

(92-2-402249-2)

Fig. 6 Construction of Encorder for Motion Detector



E2D-2
E2M
E2G

1. Shaft
2. Coupling
3. Bracket
4. Bracket
5. Encorder
6. Cushion

4.1. Change of lubricating oil in the gear box

One year after delivery of the press, lubricating oil in the oil bath should be changed with new oil. To do so, connect hose to drain valves and drain to oil in the oil bath by operating a pump. Then, remove a clutch inspection hole cover and fill the oil bath with new oil. If the drained oil is much contaminated, clean the gear box bottom and fill the oil bath with new oil. For the types and the amount of lube oil, refer to page D201.INSTALLATION. For the commercially available lubricants, refer to page F801 commercially available lubricants.

4.2. V-belt replacement

Remove the flywheel cover and loosen all V-belts by turning off the adjusting screws at the motor mount. Then, replace the V-belts with new ones. Do not use the old type of V-belts or new ones lacking in uniformity of the length. Keep in mind that belts may be different in the true dimensions even though they are of the same size. On purchasing V-belts, be sure to check them to see if they are not lacking in uniformity of the length(within 5mm). (within 0.197)

The standard sizes of applicable V-belts are indicated below(When the slide speed(rpm) is changed because of modification, etc., these sizes are not applicable.) Figures in parentheses are these to be used in such a district where the power source is on 50 Hz.

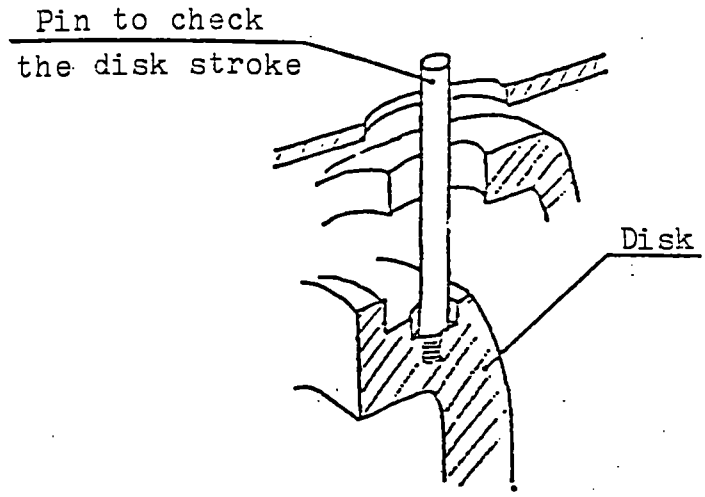
MODEL	E2M150	E2M200	E2M300	E2M400	
SPECIFICATION	5V-1500 ( )	5V-1500 (5V-1600)	5V-1700 (5V-1700)	5V-1800	
SPECIAL					

Proper tension of a V-belt is such that it sags about 15mm (0.59 in) under a thumb push (5 to 8kg) (11.02 to 17.63 lb) applied to the mid-point of the span. Too tight belt tension may shorten the life of V-belt and the main motor. After completion of V-belt tension, attach a straight edge to the flywheel and check parallelism with pulley and V-belt. If the V-belt tension is proper, lock an adjusting screw positively with a locknut.

4.3. Clutch and brake inspection

To check the clutch disk stroke, remove the clutch inspection hole cover on the frame top face. An oblong hole is provided in the clutch casing periphery and a needle indicating a disk stroke is provided therein. To inspect look inside the clutch casing through the oblong hole, using a flash light, two grooves have been drilled on the disk periphery.

It indicate the stroke ends of the clutch and brake linings worn act to the wear limits. When the needle indicates that the lining has worn to the wear limit, the lining should be replaced. If the clutch-brake unit is used with the linings worn beyond the wear limits, there will be a possibility of the slide to go down without stopping at the top dead point.



When checking the stroke, inner clutch pipe joints, band, etc. should also be checked for tightness.

4.4 Disassembly and reassembly of clutch-brake unit

Drain the oil bath, remove the top cover and disconnect piping. Remove the mounting bolts on the casing located behind the flywheel, and the clutch-brake unit can be taken out of place toward the rear of frame. At this time, close the shop air line at a stop valve in the piping unit and open a drain valve to bleed air thoroughly act of the tank. The slide should also be lowered to the bottom dead point for the operational safety. Drain the balancer, too.

Rest the clutch-brake unit on the floor with the flywheel down. Remove the mounting bolts from the casing on the brake side and sling the unit by making use of drilled and topped holes in the clutch shaft ends. Then, the linings and disks connected to the clutch shaft can be removed leaving the

casing on the clutch side.

In the above disassembly operation, pliers for snap rings, round-nut turning tool and a special tool for spring bolts are required. For disassembly and reassembly of the clutch-brake unit, you are requested to ask KOMATSU servicemen, because special techniques and know-how are required for these servicing operations.

4.5. Disassembly and reassembly of the press driving unit

In reassembly of the driving unit, bolt thread fastener and shrinkage fit must be applied in some portions according to instructions by KOMATSU servicemen.

To make an internal check of the driving unit, remove the top cover from the frame. If the unit must be checked to the bottom, drain oil through a drain valve on the frame front side.

In case of the main , jack up the slide, remove a wrist pin access hole cover below the main shaft and take the pin act of place. Then, remove the holder of main shaft and the main shaft from the front side.

4.6. Gib adjustment

Gibs are used as guides for the slide to make a smooth vertical movement and therefore, they are precision-finished to high accuracy.

Clearance adjustment between gibs and the slide can be made easily by means of push and pull-bolts without shims. Those clearance are adjusted accurately in the factory. When their adjustment is required after periodic inspection, etc., proceed as follows:

(1) Slightly loosen front gib mounting bolts and push and pull bolts on the sides.

(2) Turning in push-bolts makes the clearances small. Turning in pull-bolts after loosening push-bolts makes the clearance large.

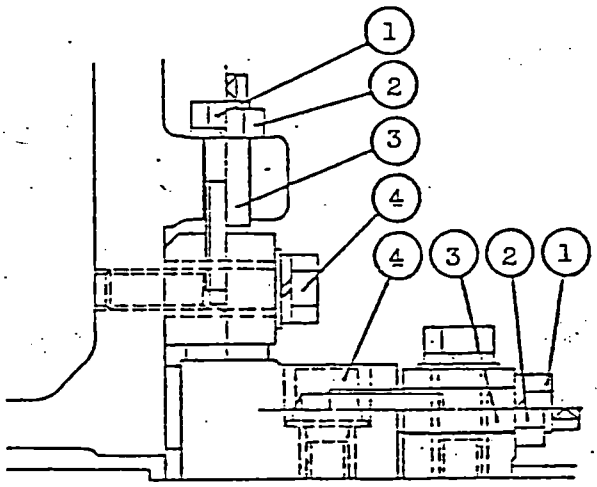
(3) The above adjustment should be carried out, measuring parallelism of the slide underside with the bolster face.

(4) Proper clearances between gibs and the slide are 0.03 to 0.1 mm (0.004 in) on one side and 0.06 to 0.15mm (0.002 in) (0.006 in) across the flats, which should be insured by using a thickness gauge.

(5) After completion of adjustment, tighten mounting bolts, pull and push-bolts and nuts positively.

(6) After operation of the press for about 2 hours, check the gibs for the oil-lubricated or heat-generated conditions, etc.

Gib construction



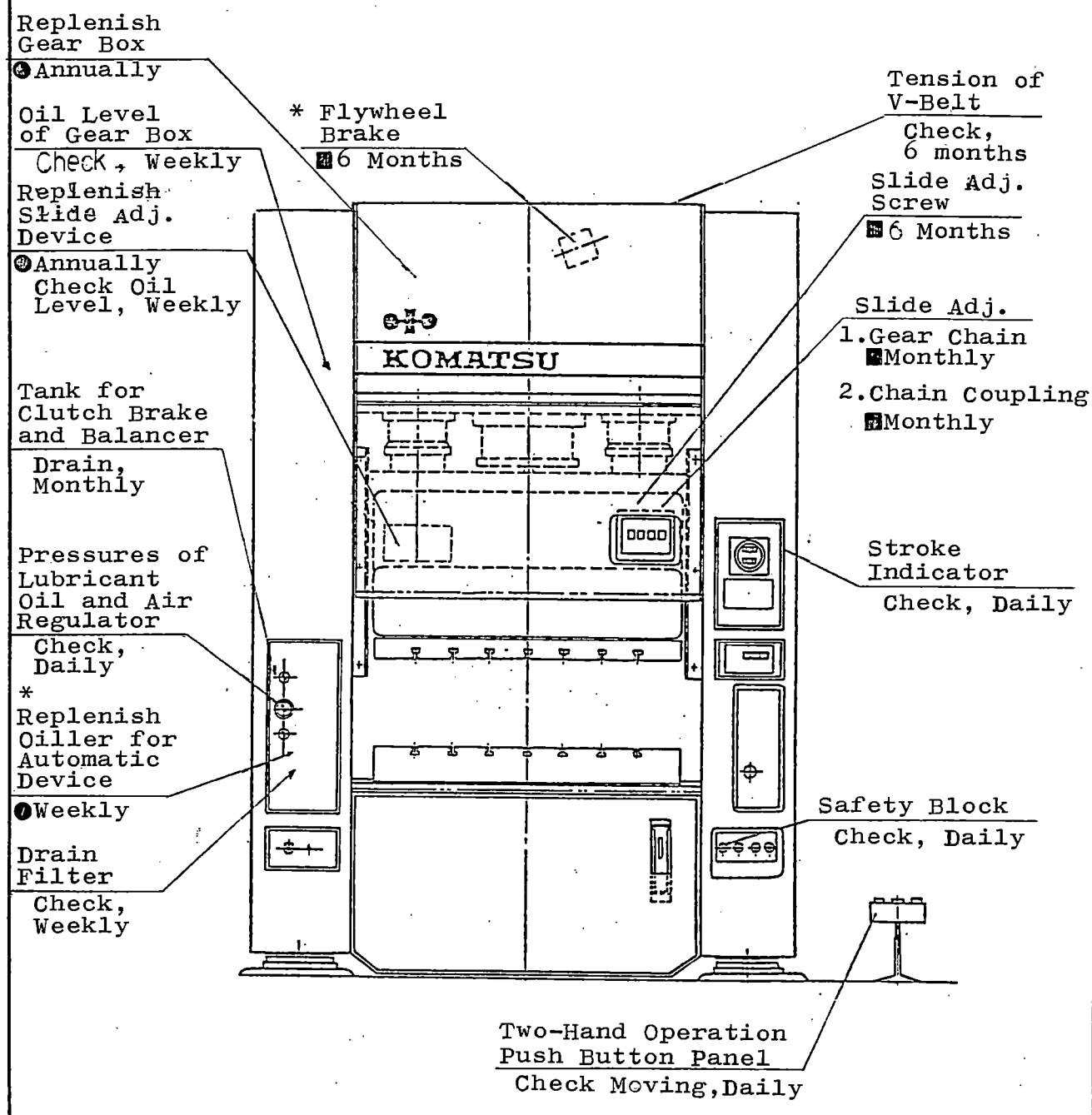
1. Pull Bolt
2. Nut
3. Push Bolt
4. Mounting Bolt

4.7 Servicing and lubricant standard

See detail of this manual servicing cares.

* marks are optional.

Oil Type	
●	Oil type : B (refer to page F801)
▲	Oil type : D (")
■	Oil type : E (")

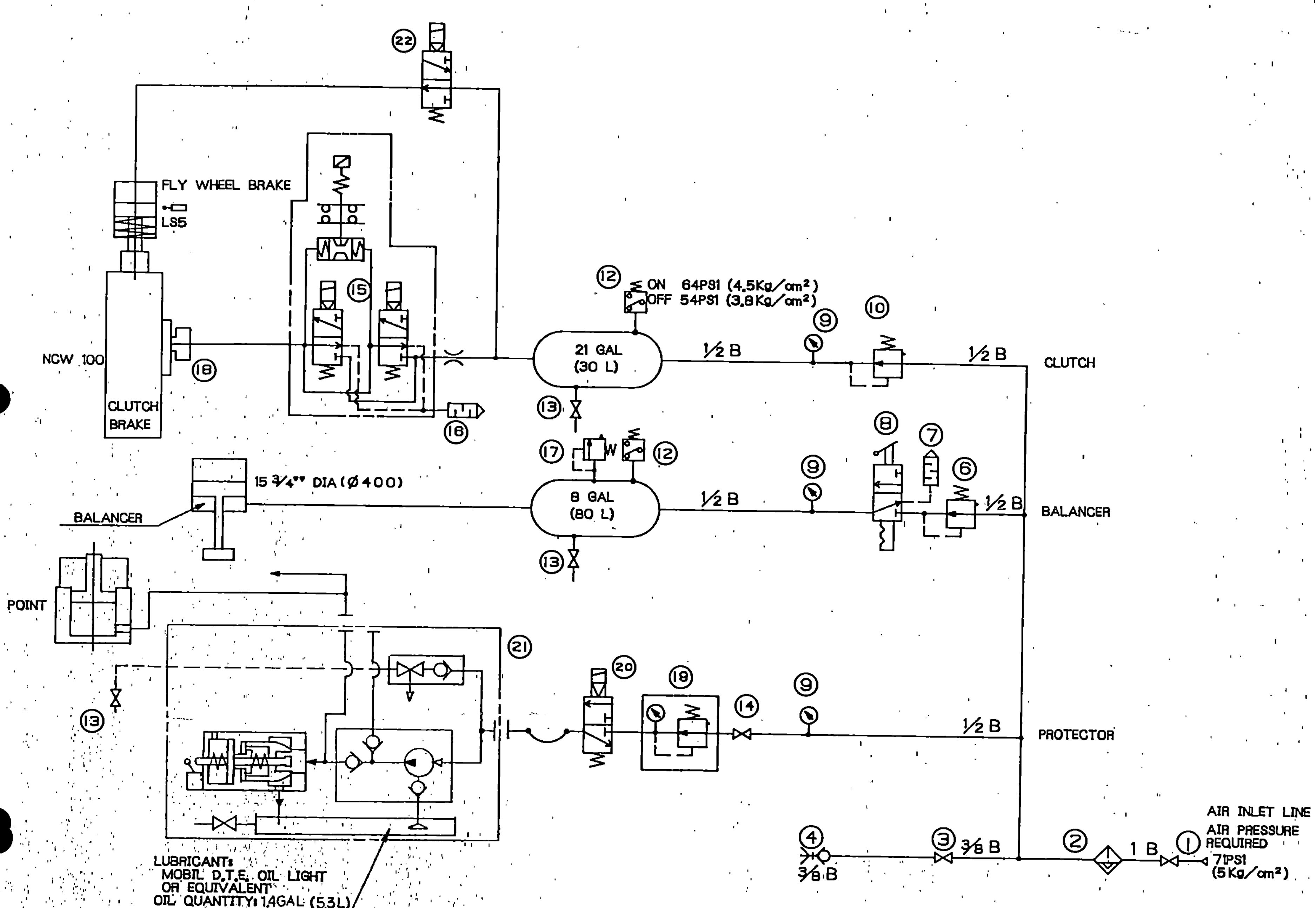


GENERAL TOLERANCE SHALL CONFORM TO KES 04.052.0

REVISION							
△	88·1·5	DELETED HIGH-TORQUE DEVICE	K.M	△	88·1·26	REVISED PROTECTOR VALVE TYPE was R20-265-112/C-M18 Now SR23VMB-70-12Y/C-H53	

F501 - 1

AM2480E060,1



ITEM	PART NAME	Q.TY	MAKER	TYPE	REMARKS	ADDRESS
23						
22	SOLENOID VALVE	1	S M C	VT315-02T	¼ B	
21	PROTECTOR VALVE	1	SR ENG.	SR23VMB-70-12Y/C -H53		
20	SOLENOID VALVE	1	S M C	VT315-02T	¼ B	
19	REGULATOR	1	KONAN	RV2-03-8A	¼ B	
18	ROTARY JOINT	1	SHOWA	RJ-TS-10-R	1 B	
17	SAFETY VALVE	1	KUNKLE	6000-D-1	1/2xDx3/4	
16	MAFFLER	1	S M C	AN900	2 B	
15	SOLENOID VALVE	1	ROSS	J3573D-7002w/EP	1¼ B	DC24V
14	GROVE VALVE	1	KITAZAWA		¼ B	
13	GROVE VALVE	3	KITAZAWA		¼ B	
12	PRESSURE SWITCH	2	SANWA	SPS-8T	⅜ B	
11						
10	REGULATOR	1	KONAN	RV2-04-15A	½ B	
9	GAUGE	3	NAGANO		¼ B	
8	HAND VALVE	1	S M C	VHS400	½ B	
7	MAFFLER	1	S M C	AN400	½ B	
6	REGULATOR	1	KONAN	RV2-04-15A-NR	½ B	
5						
4	COUPLING	1	NITTO	TW-30SF+30PF	⅜ B	
3	GROVE VALVE	1	KITAZAWA		⅜ B	
2	DRAIN FILTER	1	S M C	AF611	1 B	
1	GATE VALVE	1	KITAZAWA		1 B	

E2M 200

PRODUCTION NO.	Q'TY
190M250	1
190M249	1
190M248	1

3rd ANGLE P.

PORTION: HEAT TREATMENT — CASE DEPTH — MATERIAL

PRODUCTION NO. 190M250 190M249 190M248

APPROVE / CHECK / DESIGN / DRAW

NET WEIGHT kg — SCALE : — DATE 87·12·1

PRODUCTION NO. ADDRESS

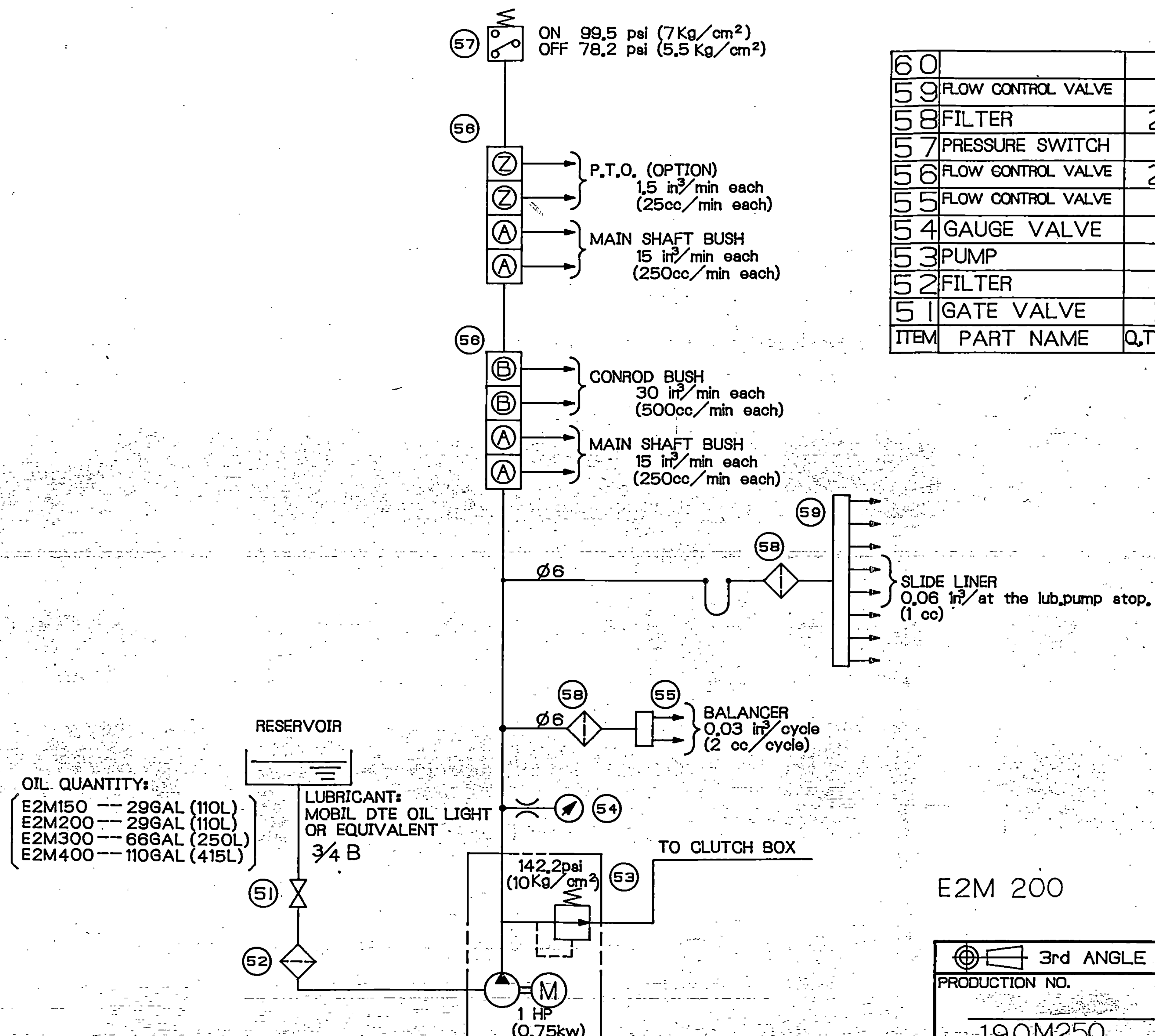
PART NAME: PNEUMATIC DIAGRAM — SIZE 2 — PART NO. 92-2-406145 0 △2

KOMATSU LTD.

GENERAL TOLERANCE SHALL CONFORM TO KES 04.052.0

REVISION	· ·					
△1 ×	· ·			△2 ×	· ·	
△3 ×	· ·			△4 ×	· ·	

F501-2



ITEM	PART NAME	Q.TY	MAKER	TYPE	REMARKS	ADDRESS
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59	FLOW CONTROL VALVE	1	SHOWA	DSA-8-1	DESTER BLOCK	
58	FILTER	2	SHOWA	LFY-01	1/8 B	
57	PRESSURE SWITCH	1	SANWA	SPS-8T	3/8 B	
56	FLOW CONTROL VALVE	2	KOMATSU			
55	FLOW CONTROL VALVE	1	SHOWA	DSA-2-1	DESTER BLOCK	
54	GAUGE VALVE	1	NAGANO	AA15-721-V-10K		
53	PUMP	1	N.O.P	TOP-2MY-750-208HAM-VD-10		
52	FILTER	1	KAMUI	KAF-08-100-P	1 B	
51	GATE VALVE	1	KITAZAWA		3/4 B	

E2M 200

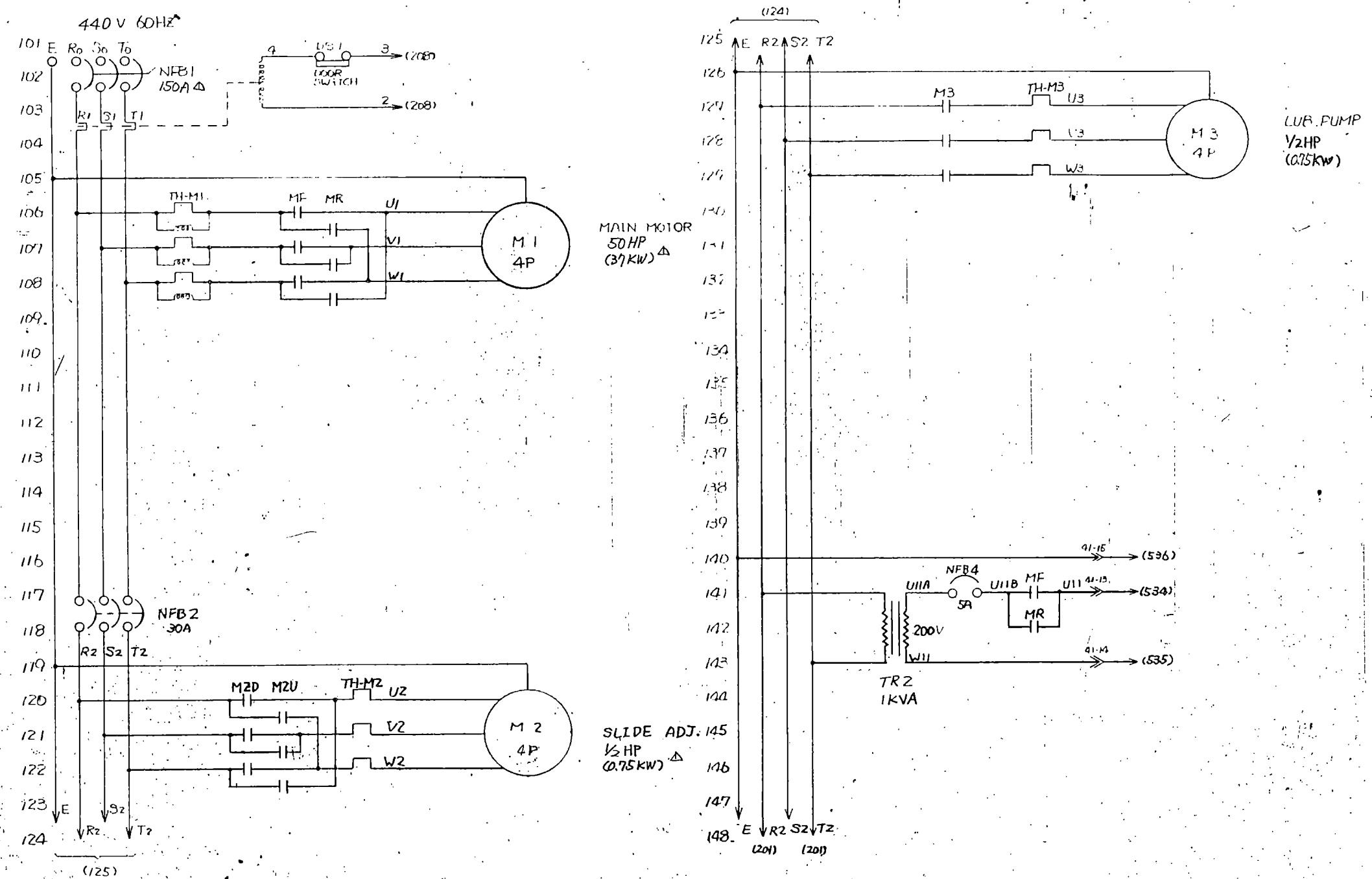
△		
190M250		
△		
190M249		1
△		
190M248		1
△		
PRODUCTION NO. / ADDRESS		Q'TY

3rd ANGLE P. | PORTION | HEAT TREATMENT | CASE DEPTH | MATERIAL

PRODUCTION NO. 190M250

APPROVE | CHECK Taniyin | DESIGN H. Murayama | DRAW | NET WEIGHT kg | SCALE : | DATE 87.12.1

PART NAME LUBRICATING DIAGRAM | SIZE 3 | PART NO. 92-3-413126 △



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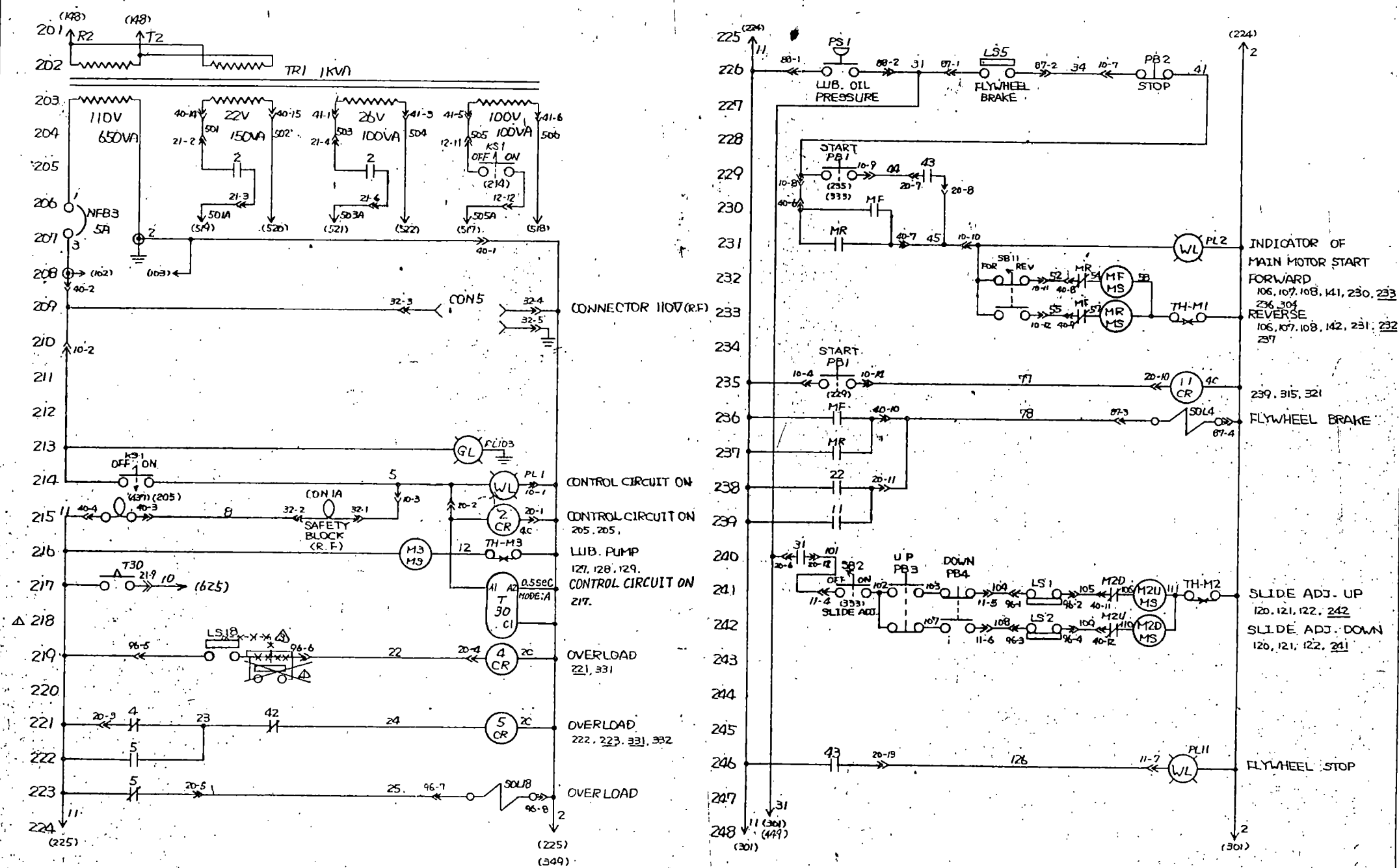
⚠ ×3	87.12.9	ブレーカ容量,モータ容量追記	土井	CIRCUIT DIAGRAM	1248 (76008-11)	M.Higashi	'87. NOV. 26
					929-3-005156 ⚠3	T.Doi	1/7



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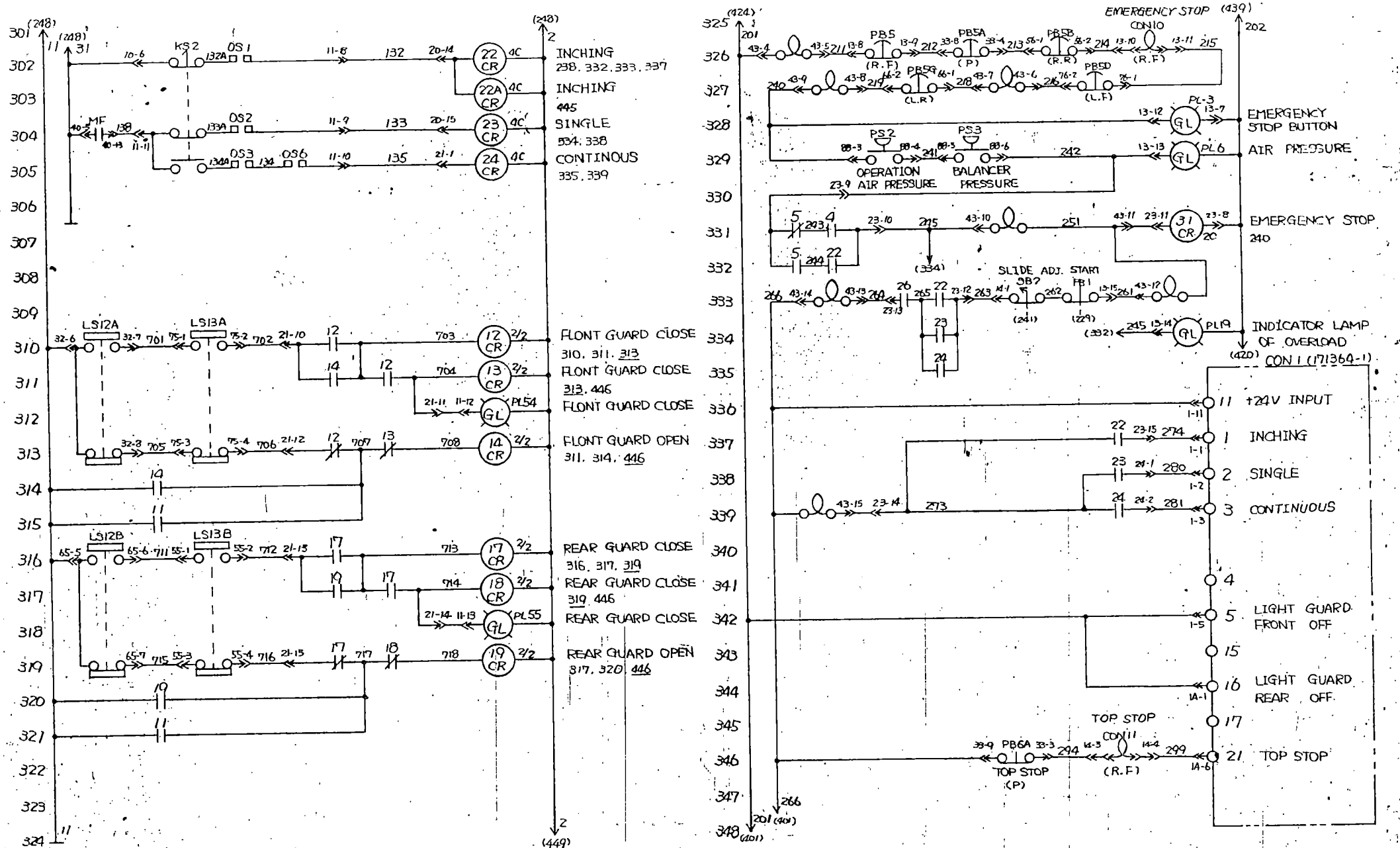
△×1	87·12·9	オーバロードLS変更	土井					



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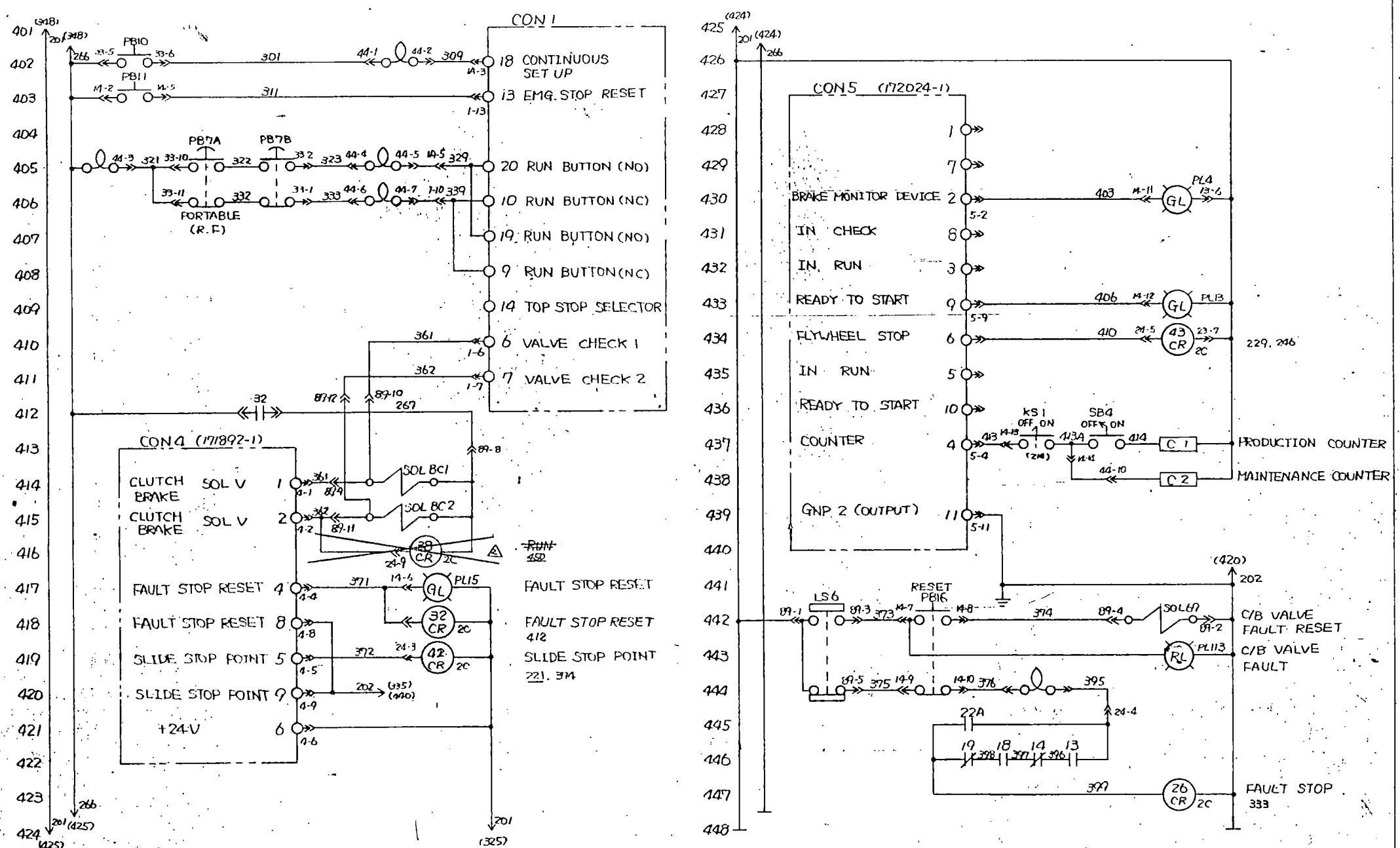

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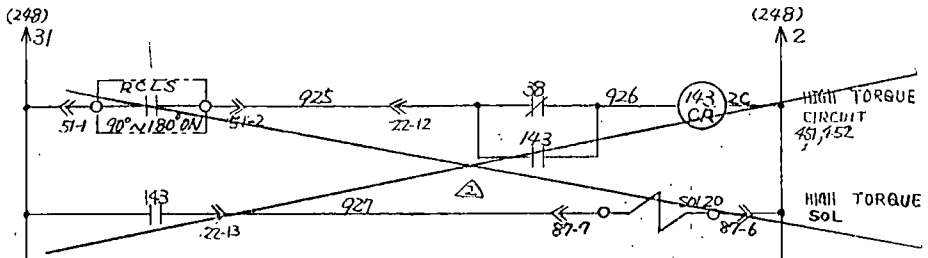
⚠ X 0					DESIGN	DRAW		



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GROUP

PRODUCTION No. [redacted]1248

PART No. 929[redacted]-005156 △3

APPROVE: M.Higashi

CHECK

DESIGN

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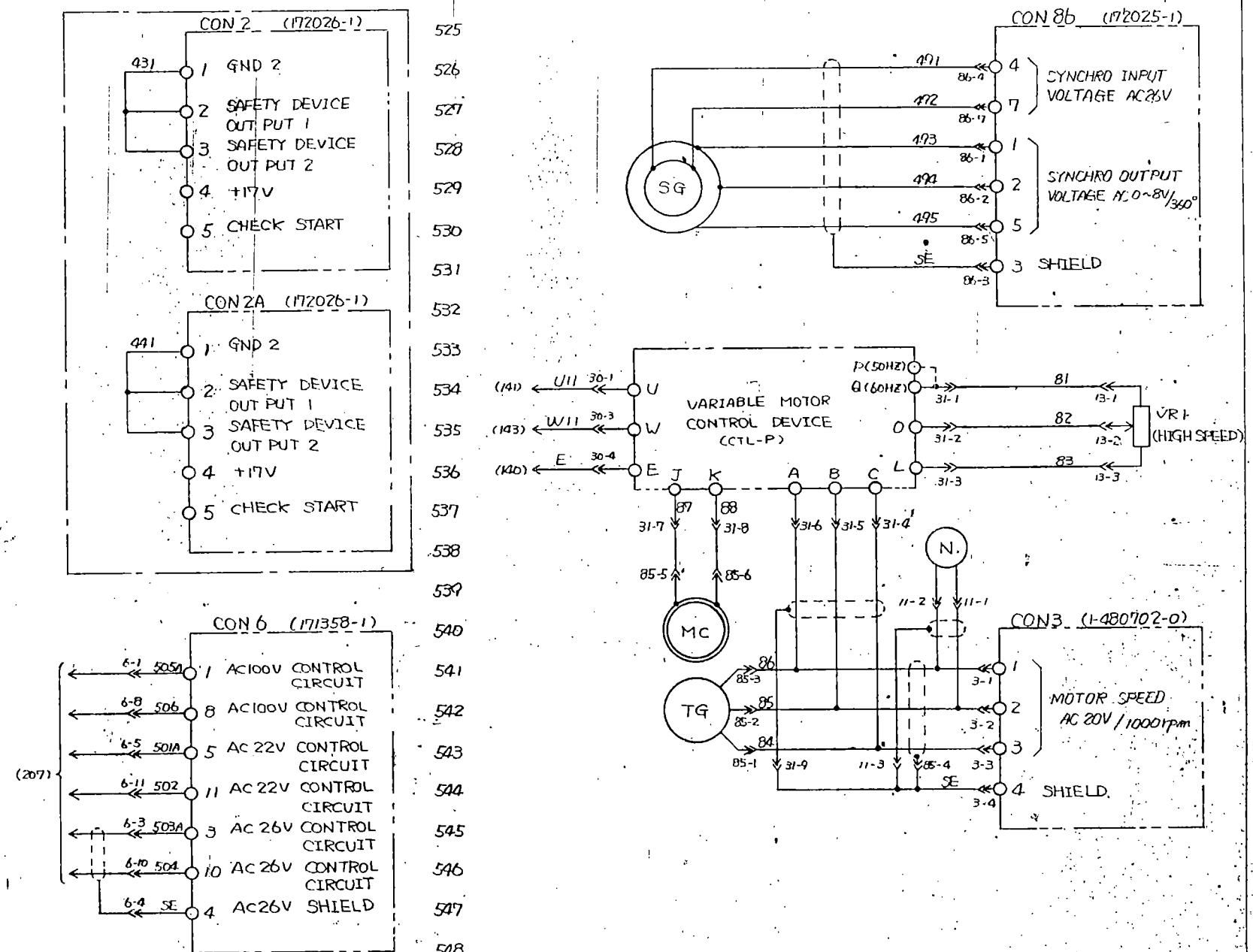
DATE

PAGE 5/7



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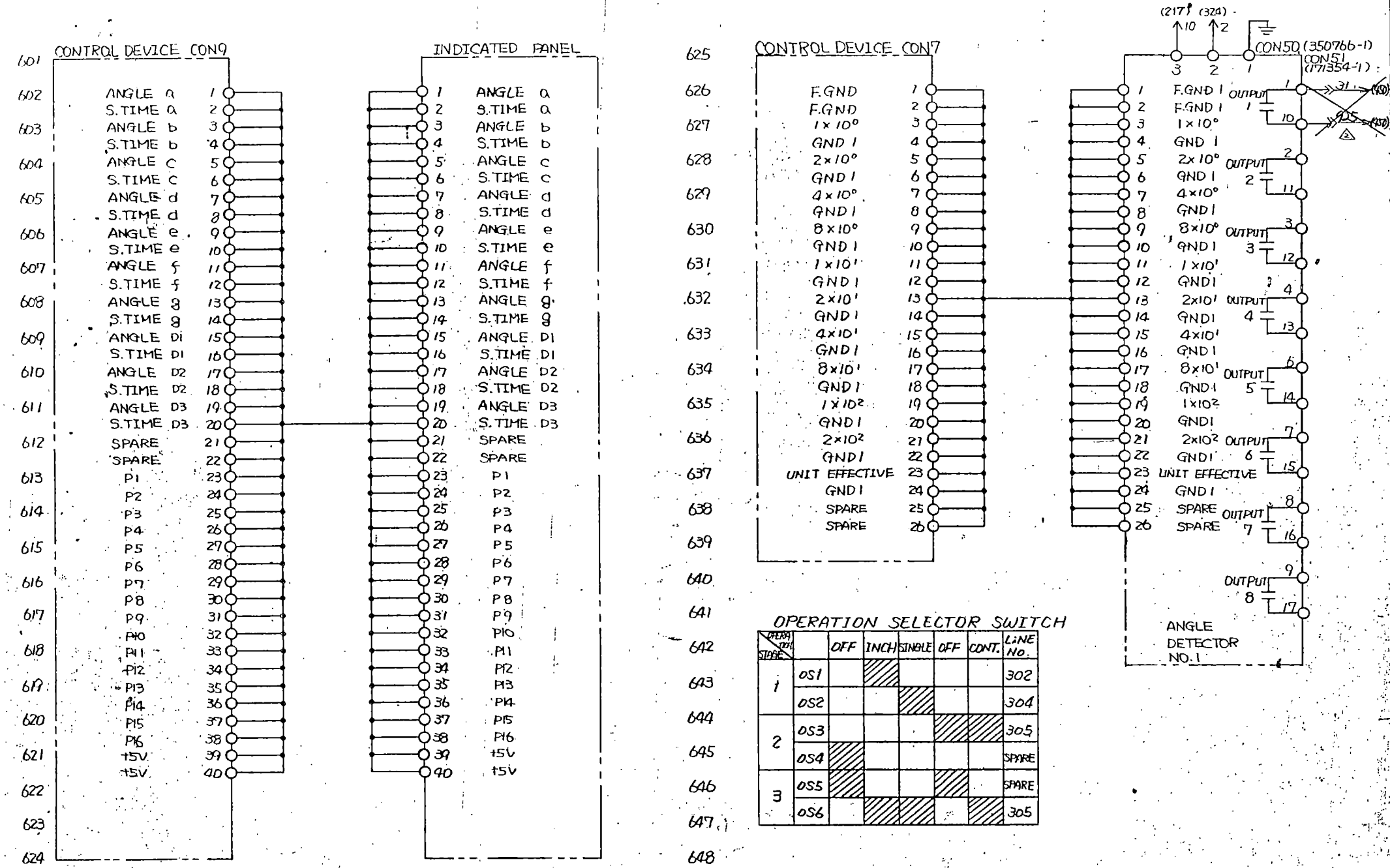
		PART No. 929-3-005156 03	DESIGN	DRAW		



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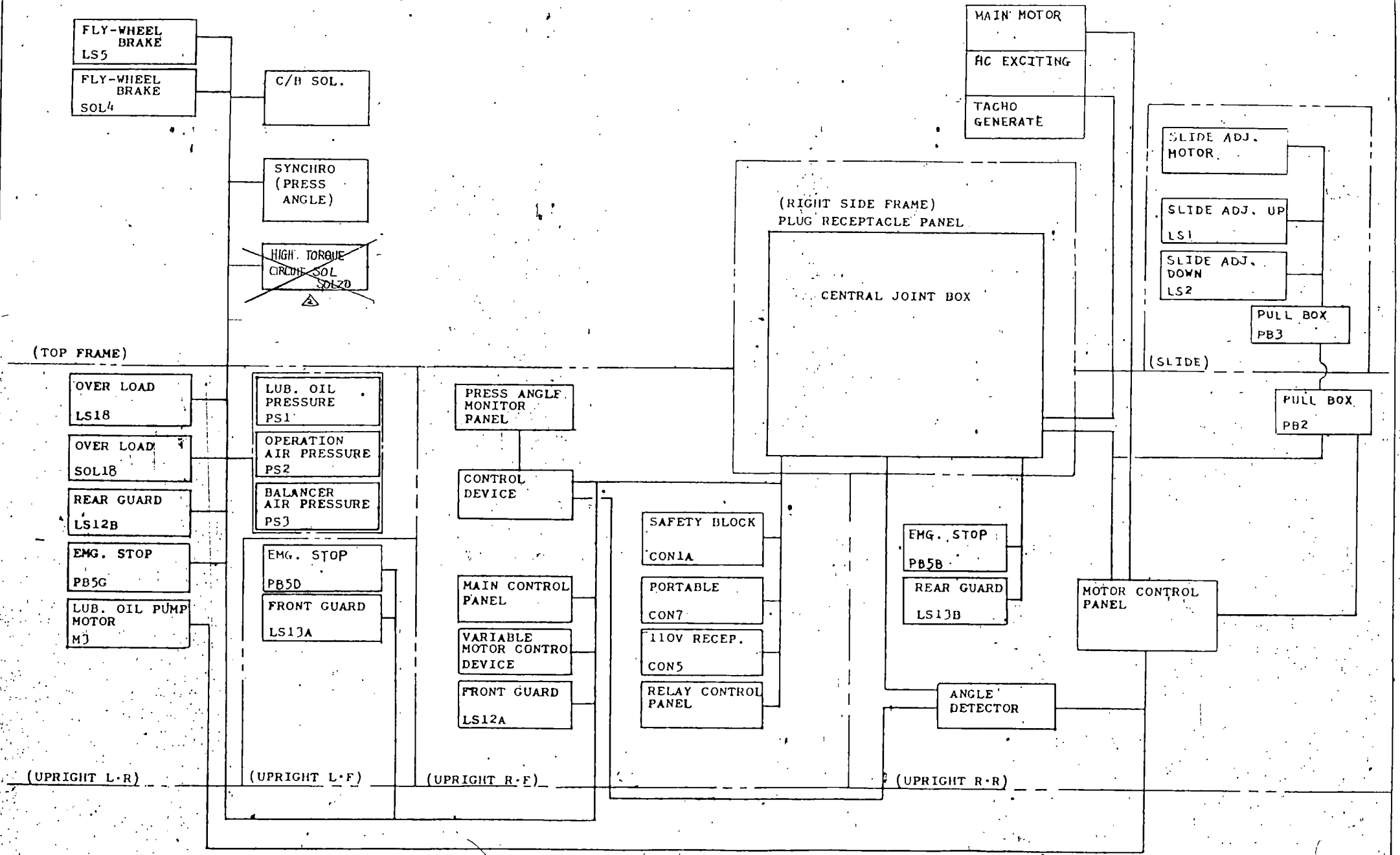

⚠×0				WIRING DIAGRAM (1/6) [redacted]	GROUPE LAYOUT	PRODUCTION No 190M248 (76005-11)	CHECK	DATE '87.NOV.27	PAGE 1/6
⚠×1	88.1.5	High Torque Sol. deleted	Doi			PART No 929-[redacted]005157 ⚠3	DESIGN, DRAW 9.Doi		
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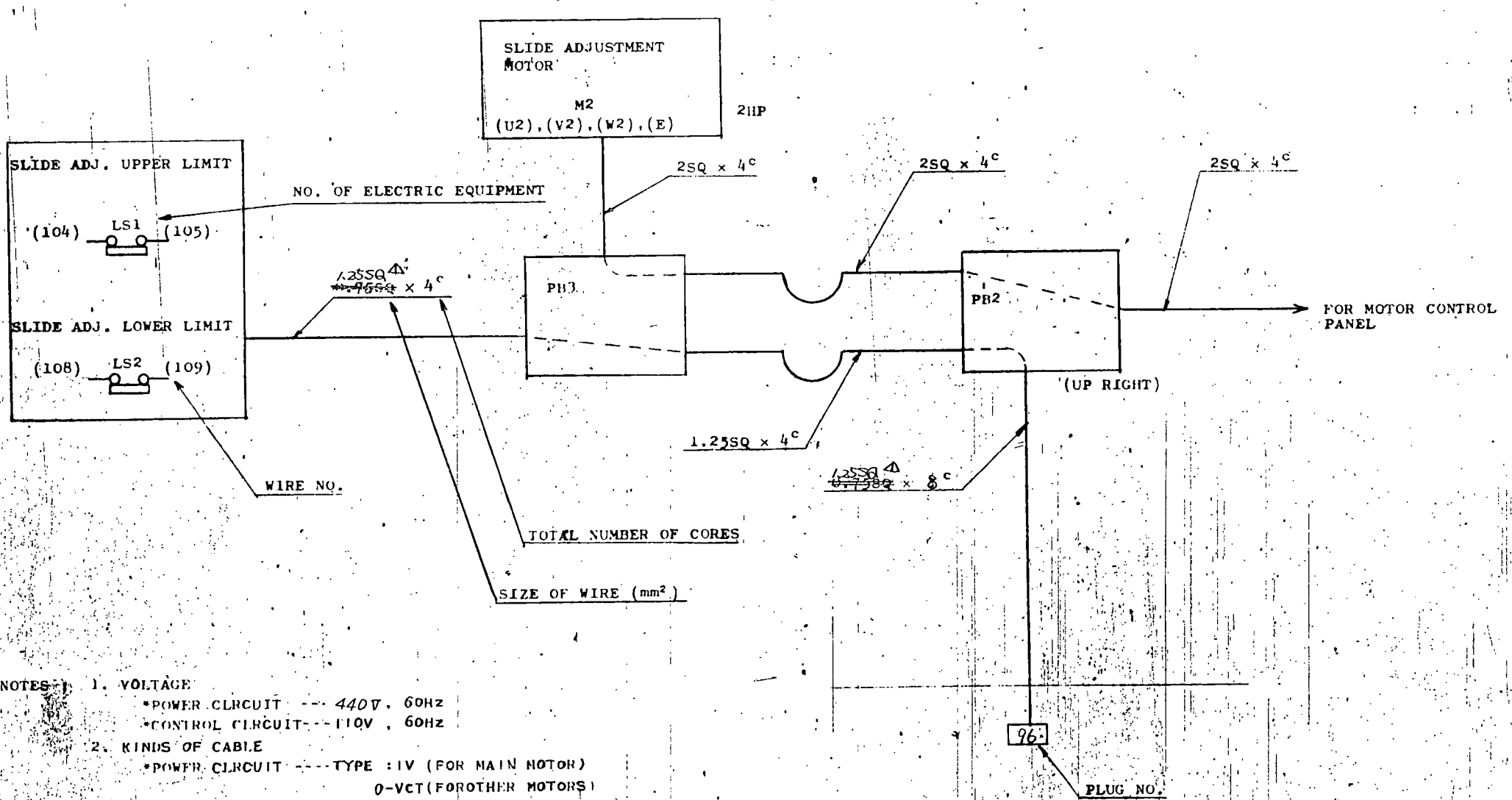
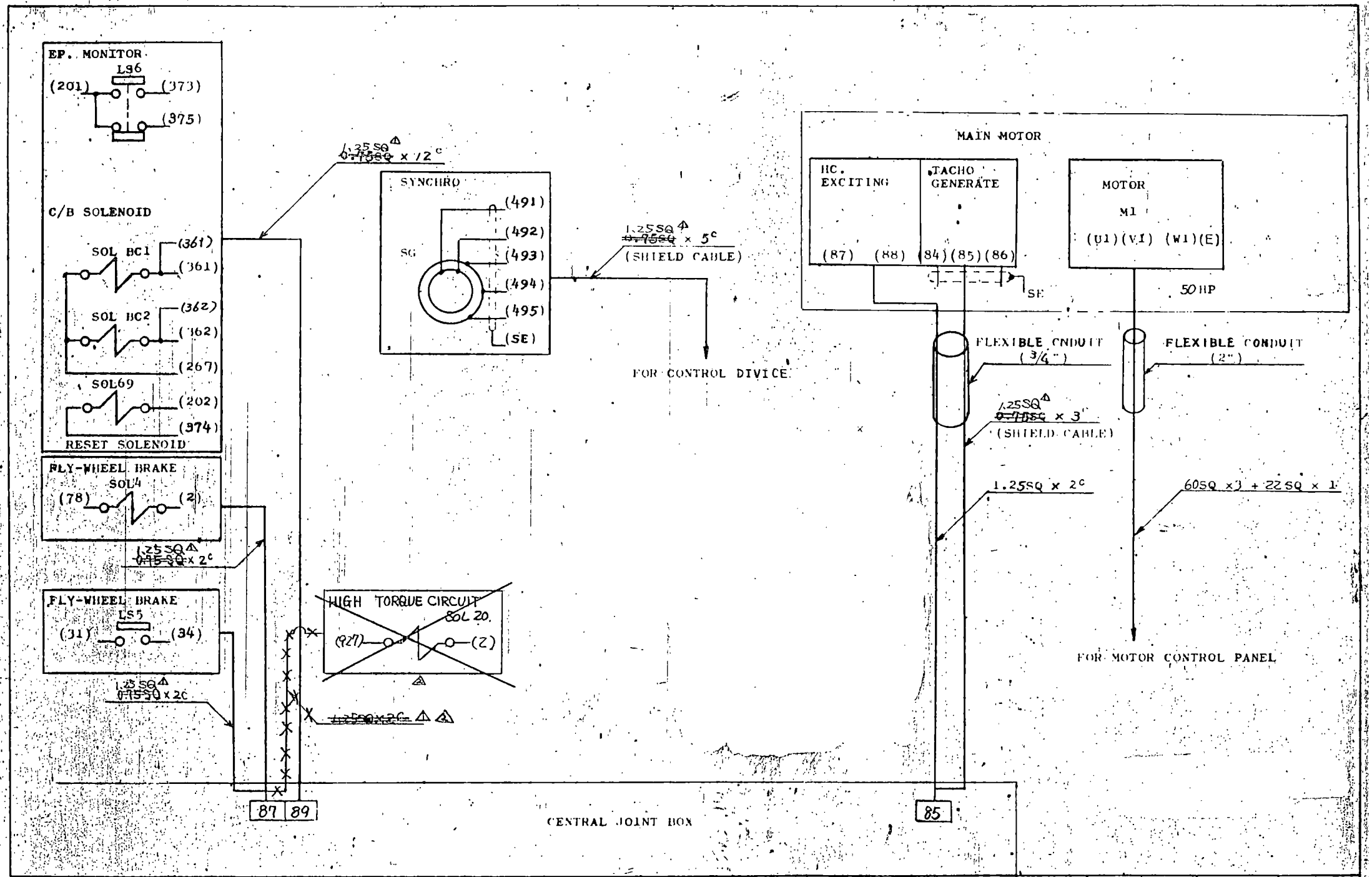
		929-3-003720							



NOTES: 1. VOLTAGE
*POWER CIRCUIT --- 440V, 60Hz
*CONTROL CIRCUIT---110V, 60Hz
2. KINDS OF CABLE
*POWER CIRCUIT ----TYPE :IV (FOR MAIN MOTOR)
0-VCT(FOROTHER MOTORS)
CONTROL CIRCUIT---- TYPE :CVV & 0-VCT
3.COLOR
*TERMINAL BOX ---- INSIDE :2.5Y8/2

⚠×0			WIRING DIAGRAM [redacted]	GROUPE	PRODUCTION No	APPROVE	CHECK	DATE	PAGE
⚠×0				SLIDE	1901248	M.Higashi			2/6
⚠×2	87.12.9	Cable size changed	Doi		929-3-00515 ⚠3	DESIGN	DRAW		



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⚠×2	88·1·5	High Torque Sol. deleted	Doi
⚠×6	87·12·9	cable size changed	Doi

WIRING DIAGRAM [redacted]

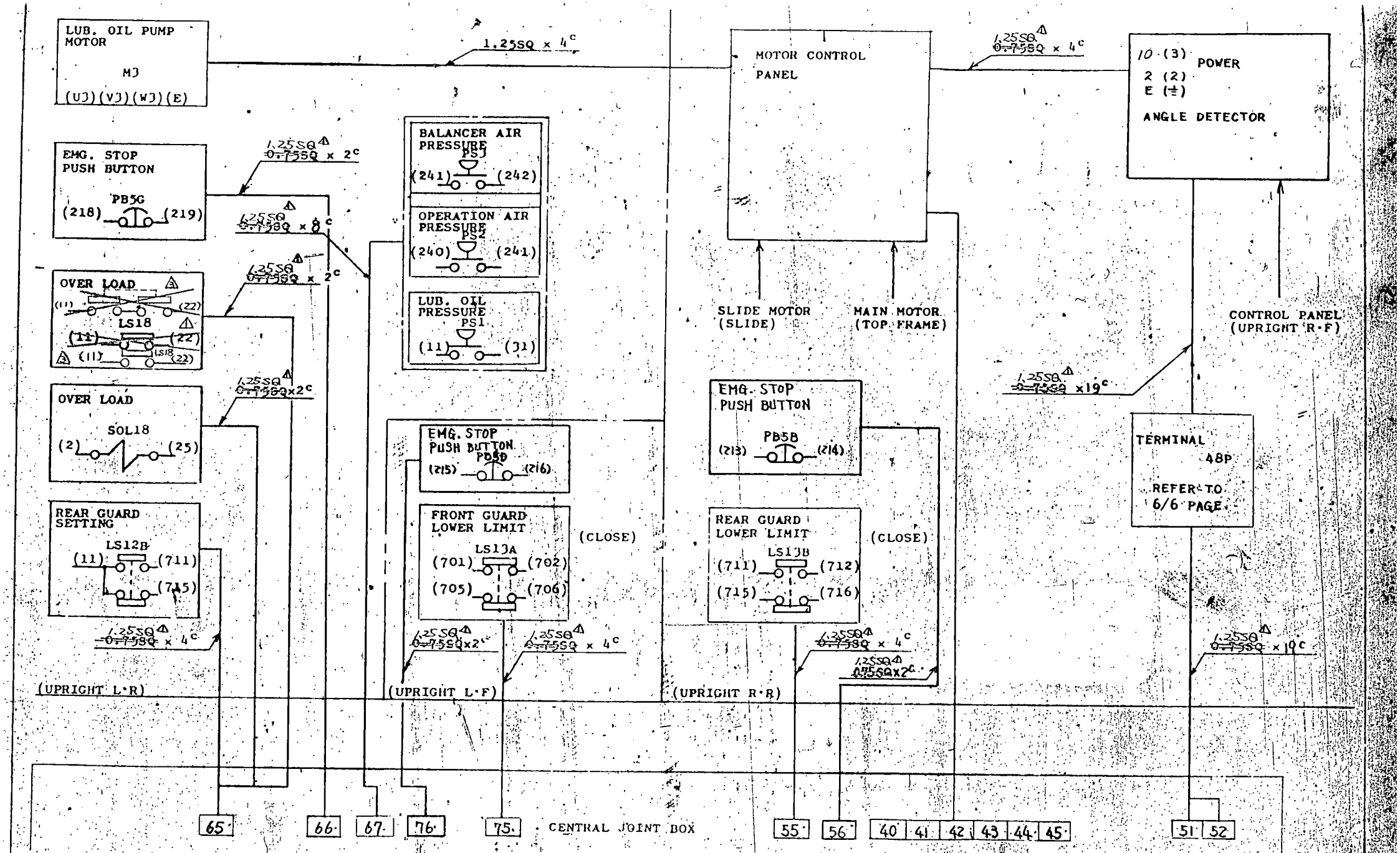
GROUPE: TOP FRAME

PRODUCTION No. [redacted]248

PART 929-3-005157 ⚠

APPROVE	CHECK	DATE	PAGE
M.Higashi			3/6

DESIGN DRAW



△×2	88·1·26	プログラム用LS変更	土井
△×0	・・		
△×13	87·12·9	オーバーロードLS変更,ケーブル変更	土井

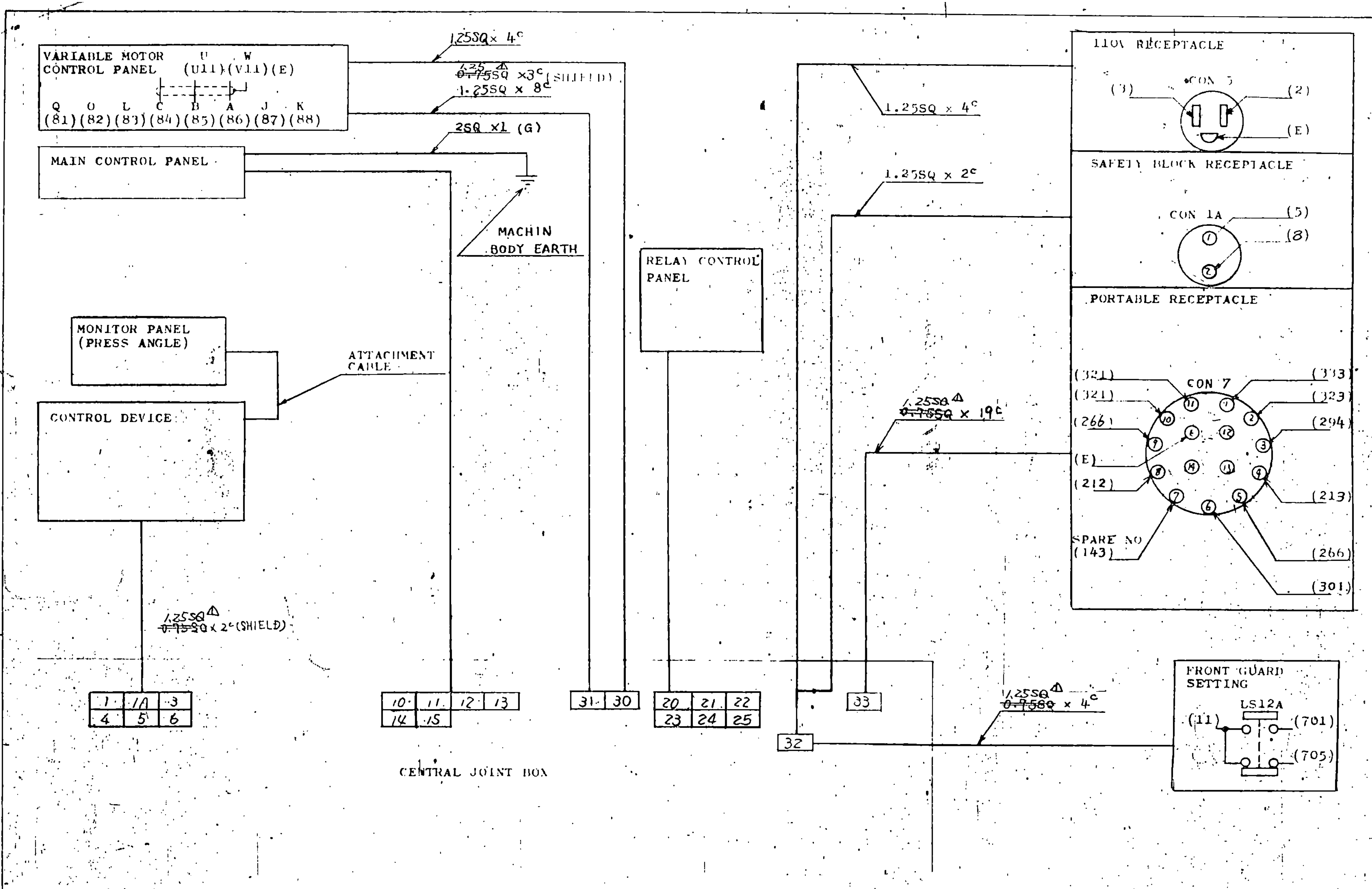
WIRING DIAGRAM (4/6)

GROUPE
UPRIGHT L·R
L·F
R·R

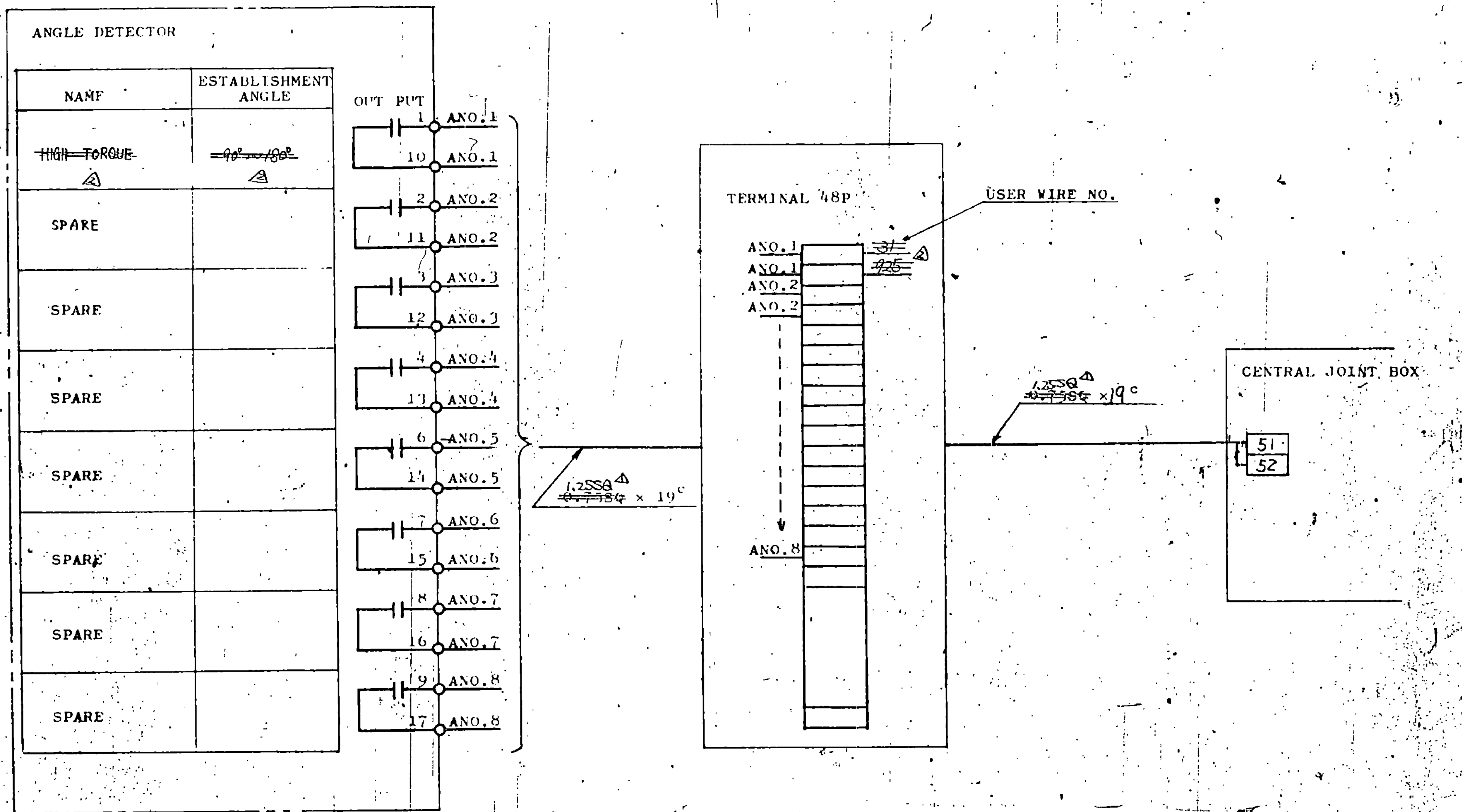
PRODUCTION No
190M248

PART
929-3-005157 △3

APPROVE | CHECK | DESIGN | DRAW | DATE | PAGE
4/6



0 0 4 87·12·9 Cables size changed	WIRING DIAGRAM [redacted]	GROUPE UPRIGHT R·F	PRODUCTION N 1[redacted]1248 PART 929-3-005157/3	APPROVE CHECK M.Higoshi DESIGN DRAW	DATE	PAGE 5/6



△ X0				WIRING DIAGRA[redacted](6/6)	GROUPE: DETAIL OF WIRLING ANGLE DETACTOR	PRODUCTION No. 190M348
△ X3	88·1·5	High Torque SOL. deleted	Doi			PART No. 92[redacted]3-005157 △3
△ X2	87·12·9	Cable size changed	Doi			

APPROVE	CHECK	DATE	PAGE
M.Higashi			6/6
DESIGN	DRAW		

CON. No \ PIN No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
10	2	3	5	11		31	34	41	44	45	52	55		77	
11 AC	85	86	SE	101	104	108	126	132	133	135	138	704	714		E
12	(S) 1	2	3	4	5	6	7	8	9	(S) 10					
13	81	82	83			201	202	211	212	214	215	240	242	245	261
14 DC	263	266	294	299	311	371	373	374	375	376	403	406	413	413A	
15	(S) 11	12	13	14	15	16	17	18	19	(S) 20					

Main Control Panel

CON. No \ PIN No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
20	2	5	11	22	25	31	44	45		77	78	101	126	132	133
21 AC	135	501	501A	503	SE	503A	SE		10	702	704	706	712	714	716
22	(S) 31	32	33	34	35	36	37	38	39	(S) 40					E
23							201	202	242	245	251	263	264	273	274
24 DC	280	281	372	395	410	266	267	371							
25	(S) 41	42	43	44	45	46	47	48	49	(S) 50					

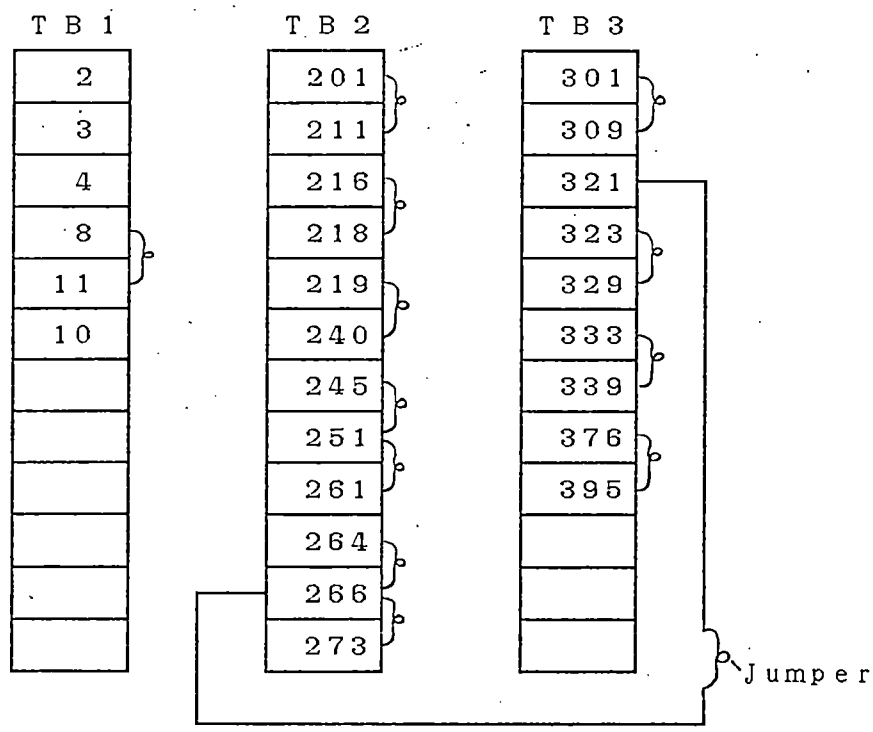
Relay Panel

Note: 1. (S) Marks are Spare No.

CON. No. \ PIN No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
40	2	3	8	11	31	41	45	52	55	78	105	109	138	501	502
41 AC	503	SE	504	SE	505	506	10						U11	W11	E
42	(S) 61	62	63	64	65	66	67	68	69	(S) 70					
43				201	211	216	218	219	240	245	251	261	264	266	273
44 DC	301	309	321	323	329	333	339	376	395	413A					
45	(S) 71	72	73	74	75	76	77	78	79	(S) 80					

Power Panel

Note: 1. (S) Marks are Spare No.



Drawing terminal for Power Panel

BLK	CONNECT. NO. / TYPE / USE		CONNECTOR PIN NO. (1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
S	1001	W.NO.	274	280	281	--	201	361	362	--	--	339	266	--	311	--	--
	ILLR-15	IN	1023-15	1024-1	1024-2	--	1023-7	1089-10	--	--	--	1044-7	1033-5	--	1014-5	--	--
	SOLID STATE	OUT	--	--	--	--	101A-1	--	1089-12	--	--	--	1033-9	--	--	--	--
				DC	DC	DC		DC	DC	DC			DC	DC		DC		
S	1003	W.NO.	86	85	84	SE	--	--	--	--	--	--	--	--	--	--	--
	ILLR-15	IN	1011-2	1011-1	131B-4	1011-3	--	--	--	--	--	--	--	--	--	--	--
	SOLID STATE	OUT	131B-6	131B-5	--	131B-9	--	--	--	--	--	--	--	--	--	--	--
				AC	AC	AC	AC											
S	1004	W.NO.	361	362	--	371	372	201	--	--	202	--	--	--	--	--	--
	ILLR-15	IN	--	1089-11	--	1014-6	1024-3	101A-1	--	--	1005-11	--	--	--	--	--	--
	SOLID STATE	OUT	1089-9	--	--	1024-8	--	1089-1	--	--	1089-2	--	--	--	--	--	--
				DC	DC		DC	DC	DC			DC						
S	1005	W.NO.	--	403	--	413	--	410	--	--	406	--	202	--	--	--	--
	ILLR-15	IN	--	--	--	1014-13	--	1024-5	--	--	1014-12	--	1013-7	--	--	--	--
	SOLID STATE	OUT	--	1014-11	--	--	--	--	--	--	--	--	1004-9	--	--	--	--
				DC		DC		DC			DC		DC				
S	1006	W.NO.	505A	--	503A	SE	501A	--	--	506	--	504	502	--	--	--	--
	ILLR-15	IN	1012-12	--	--	1041-4	1021-3	--	--	--	--	1041-3	--	--	--	--	--
	SOLID STATE	OUT	--	--	1021-6	1021-7	--	--	--	1041-6	--	--	1040-15	--	--	--	--
				AC		AC	AC	AC			AC		AC	AC				
T	1010	W.NO.	2	3	5	11	--	31	34	41	44	45	52	55	--	77	--
	ILLR-15	IN	1020-1	1032-3	1032-1	1065-1	--	1040-5	1087-2	--	1020-7	1020-8	1040-8	1040-9	--	1020-10	--
	IOP-PANEL	OUT	1032-4	1040-2	1020-2	1020-3	--	1067-2	--	1040-6	--	1040-7	--	--	--	--	--
				AC	AC	AC	AC		AC	AC	AC	AC	AC	AC	AC		AC	
T	1011	W.NO.	85	86	SE	101	104	108	126	132	133	135	138	704	714	--	E
	ILLR-15	IN	--	--	--	--	1096-1	--	1020-13	1020-14	--	1021-1	--	--	--	--	120-1
	IOP-PANEL	OUT	1003-2	1003-1	1003-4	1020-12	--	1096-3	--	--	1020-15	--	1040-13	1021-11	1021-14	--	-
				AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC			AC
T	1012	W.NO.	--	--	--	--	--	--	--	--	--	--	505	505A	--	--	--
	ILLR-15	IN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	IOP-PANEL	OUT	--	--	--	--	--	--	--	--	--	--	1041-5	1006-1	--	--	--
													AC	AC			
T	1013	W.NO.	81	82	83	--	--	201	202	211	212	214	215	240	242	245	261
	ILLR-15	IN	--	1031-2	1031-3	--	--	--	1023-8	1043-5	--	1056-2	1076-1	167A-3	1023-9	1023-10	--
	IOP-PANEL	OUT	1031-1	--	--	--	--	1043-4	1005-11	--	1033-8	--	--	1043-9	167A-6	1043-10	1043-12
				DC	DC	DC			DC	DC	DC	DC	DC	DC	DC	DC	DC	DC
T	1014	W.NO.	263	266	294	299	311	371	373	374	375	376	403	406	413	413A	--
	ILLR-15	IN	1023-12	1043-14	--	--	--	--	1089-3	--	1089-5	--	1005-2	--	--	1044-10	--
	IOP-PANEL	OUT	--	1033-5	1033-3	101A-6	1001-13	1004-4	--	1089-4	--	1044-8	--	1005-9	1005-4	--	--
				DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	

BLK	CONNECT. NO. / TYPE / USE		C O N N E C T O R P I N. N O.														
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
S	101A	W.NO.	201	--	309	--	329	299	--	--	--	--	--	--	--	--	--
	ILLR-15	IN	1001-5	--	1044-2	--	--	1014-4	--	--	--	--	--	--	--	--	--
	ISOLID STATE	OUT	1004-6	--	--	--	1044-5	--	--	--	--	--	--	--	--	--	--
			DC		DC		DC	DC									
W	1020	W.NO.	2	5	11	22	25	31	44	45	--	77	78	101	126	132	133
	ILLR-15	IN	1065-4	1010-3	1010-4	--	1065-3	1087-1	--	--	--	--	1040-10	1011-4	--	--	1011-9
	IRELAY-PANEL	OUT	1010-1	—	1040-4	1065-2	--	1040-5	1010-9	1010-10	--	1010-14	--	--	1011-7	1011-8	--
			AC	AC	AC	AC	AC	AC	AC	AC		AC	AC	AC	AC	AC	AC
W	1021	W.NO.	135	501	501A	503	SE	503A	SE	—	10	702	704	706	712	714	716
	ILLR-15	IN	--	--	--	1041-1	1041-2	1006-3	1006-4	--	--	1075-2	1011-12	1075-4	--	1011-13	--
	IRELAY-PANEL	OUT	1011-10	1040-14	1006-5	--	—	--	—	—	1041-7	--	--	--	1055-2	--	1055-4
			AC	AC	AC	AC	AC	AC	AC		AC	AC	AC	AC	AC	AC	AC
W	1022	W.NO.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	E
	ILLR-15	IN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	120-2
	IRELAY-PANEL	OUT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
																	AC
W	1023	W.NO.	--	--	--	--	--	--	201	202	242	245	251	263	264	273	274
	ILLR-15	IN	--	--	--	--	--	--	1043-4	--	--	--	--	--	1043-13	--	--
	IRELAY-PANEL	OUT	--	--	--	--	--	--	1001-5	1013-7	1013-13	1013-14	1043-11	1014-1	--	1043-15	1001-1
									DC	DC	DC	DC	DC	DC	DC	DC	DC
W	1024	W.NO.	280	281	372	395	410	266	267	371	--	--	--	--	--	--	--
	ILLR-15	IN	--	--	--	-	--	1033-9	1089-8	1004-4	--	--	--	--	--	--	--
	IRELAY-PANEL	OUT	1001-2	1001-3	1004-5	1044-9	1005-6	--	--	--	--	--	--	--	--	--	--
			DC	DC	DC	DC	DC	DC	DC	DC							
A	1030	W.NO.	U11	--	W11	E	--	--	--	--	--	--	--	--	--	--	--
	ILLR-15	IN	--	--	--	120-3	--	--	--	--	--	--	--	--	--	--	--
	IHC-CONTROL.POW.	OUT	1041-13	--	1041-14	—	--	--	--	--	--	--	--	--	--	--	--
			AC		AC	AC											
A	1031	W.NO.	81	82	83	--	--	--	--	--	--	--	--	--	--	--	--
	ILLR-15	IN	1013-1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	IHC-CONTROL	OUT	--	1013-2	1013-3	--	--	--	--	--	--	--	--	--	--	--	--
			DC	DC	DC												
A	1032	W.NO.	5	8	3	2	E	11	701	705	--	--	--	--	--	--	--
	ILLR-15	IN	--	--	—	1010-1	120-4	1065-5	--	1075-3	--	--	--	--	--	--	--
	ISAFETY-BLOCK	OUT	1010-3	1040-3	1010-2	1040-1	—	1067-1	1075-1	--	--	--	--	--	--	--	--
			AC	AC	AC	AC	AC	AC	AC	AC							
A	1033	W.NO.	333	323	294	213	266	301	--	212	266	321	321	--	--	--	E
	ILLR-15	IN	1044-6	1044-4	1014-3	--	1014-2	1044-1	--	1013-9	1001-11	1033-11	--	--	--	--	120-5
	IPORTABLE	OUT	--	--	--	1056-1	1001-11	--	--	--	1024-6	1044-3	1033-10	--	--	--	—
			DC	DC	DC	DC	DC	DC		DC	DC	DC	DC				AC

BLK	CONNECT. NO. / TYPE / USE		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
			C O N N E C T O R P I N. N O.														
Y	040	W.NO.	2	3	8	11	31	41	45	52	55	78	105	109	138	501	502
	LLR-15	IN	032- 4	010- 2	032- 2	020- 3	020- 6	010- 8	010-10	--	--	087-4	--	096- 4	011-11	021- 2	006-11
	POWER-PANEL	OUT	078-4	--	--	--	010- 6	--	--	010-11	010-12	020-11	096- 2	--	--	--	--
			AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC	AC
Y	041	W.NO.	503	SE	504	SE	505	506	10	--	--	--	--	--	U11	W11	E
	LLR-15	IN	--	--	--	--	012-11	006- 8	021- 9	--	--	--	--	--	030- 1	030- 3	120-6
	POWER-PANEL	OUT	021- 4	021-5	006-10	006- 4	--	--	--	--	--	--	--	--	--	--	--
			AC	AC	AC	AC	AC	AC	AC						AC	AC	AC
Y	043	W.NO.	--	--	--	201	211	216	218	219	240	245	251	261	264	266	273
	LLR-15	IN	--	--	--	013- 6	--	076- 2	--	066- 2	013-12	013-14	023-11	013-15	--	--	023-14
	POWER-PANEL	OUT	--	--	--	023- 7	013- 8	--	066- 1	--	--	--	--	--	023-13	014- 2	--
						DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC	DC
Y	044	W.NO.	301	309	321	323	329	333	339	376	395	413A	--	--	--	--	--
	LLR-15	IN	--	--	033-10	--	01A- 5	--	--	014-10	024- 4	--	--	--	--	--	--
	POWER-PANEL	OUT	033- 6	01A- 3	--	033- 2	--	033- 1	001-10	--	--	014-14	--	--	--	--	--
			DC	DC	DC	DC	DC	DC	DC	DC	DC	DC					
D	055	W.NO.	711	712	715	716	--	--	--	--	--	--	--	--	--	--	--
	LLR-15	IN	065- 6	021-13	065- 7	021-15	--	--	--	--	--	--	--	--	--	--	--
	GUARD LS(R.R)	OUT	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
			AC	AC	AC	AC											
D	056	W.NO.	213	214	--	--	--	--	--	--	--	--	--	--	--	--	--
	LLR-15	IN	033- 4	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	EMG.STOP	OUT	--	013-10	--	--	--	--	--	--	--	--	--	--	--	--	--
			DC	DC													
F	065	W.NO.	11	22	25	2	11	711	715	--	--	--	--	--	--	--	--
	LLR-15	IN	067- 1	020- 4	--	--	--	--	--	--	--	--	--	--	--	--	--
	OVER LOAD LS	OUT	010- 4	--	020- 5	020-11	032- 6	055- 1	055- 3	--	--	--	--	--	--	--	--
			AC	AC	AC	AC	AC	AC	AC								
F	066	W.NO.	218	219	--	--	--	--	--	--	--	--	--	--	--	--	--
	LLR-15	IN	043- 7	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	EMG.STOP	OUT	--	043- 8	--	--	--	--	--	--	--	--	--	--	--	--	--
			DC	DC													
F	067	W.NO.	11	31	--	--	--	--	--	--	--	--	--	--	--	--	--
	LLR-15	IN	032- 6	010- 6	--	--	--	--	--	--	--	--	--	--	--	--	--
	LUB.PS	OUT	065- 1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
			AC	AC													
H	075	W.NO.	701	702	705	706	--	--	--	--	--	--	--	--	--	--	--
	LLR-15	IN	032- 7	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	GUARD LS(L.F)	OUT	--	021-10	032- 8	021-12	--	--	--	--	--	--	--	--	--	--	--
			AC	AC	AC	AC											
H	076	W.NO.	215	216	--	--	--	--	--	--	--	--	--	--	--	--	--
	LLR-15	IN	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	EMG.STOP	OUT	013-11	043- 6	--	--	--	--	--	--	--	--	--	--	--	--	--
			DC	DC													

BLK	CONNECT. NO. / TYPE / USE		C O N N E C T O R P I N. N O.														
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
K	1085	W.NO.	84	85	86	SE	87	88	--	--	--	--	--	--	--	--	--
	ILLR-15	IN	—	131B-5	131B-6	131B-9	131A-7	--	--	--	--	--	--	--	--	--	--
	IT6	OUT	131B-4 AC	-- AC	-- AC	- AC	-- AC	131A-8 AC	--	--	--	--	--	--	--	--	--
L	1087	W.NO.	31	34	78	2	--	--	--	--	--	--	--	--	--	--	--
	ILLR-15	IN	--	--	--	1040-1	--	--	--	--	--	--	--	--	--	--	--
		OUT	1020-6 AC	1010-7 AC	1040-10 AC	-- AC	--	--	--	--	--	--	--	--	--	--	--
L	1089	W.NO.	201	202	373	374	375	--	--	267	361	361	362	362	--	--	--
	ILLR-15	IN	1004-6	1004-9	--	1014-8	--	--	--	--	1004-1	--	--	1001-7	--	--	--
	IC/B SOL	OUT	-- DC	-- DC	1014-7 DC	-- DC	1014-9 DC	--	--	1024-7 DC	-- DC	1001-6 DC	1004-2 DC	-- DC	--	--	--
N	1096	W.NO.	104	105	108	109	--	--	--	--	--	--	--	--	--	--	--
	ILLR-15	IN	--	1040-11	1011-6	--	--	--	--	--	--	--	--	--	--	--	--
	ISLIDE,OVER LOAD	OUT	1011-5 AC	-- AC	-- AC	1040-12 AC	--	--	--	--	--	--	--	--	--	--	--
A	131A	W.NO.	--	--	--	--	--	--	87	88	--	--	--	--	--	--	--
	ILLR-15	IN	--	--	--	--	--	--	--	1085-6	--	--	--	--	--	--	--
	IHC-CONTROL	OUT	--	--	--	--	--	--	1085-5 AC	-- AC	--	--	--	--	--	--	--
A	131B	W.NO.	--	--	--	84	85	86	--	--	SE	--	--	--	--	--	--
	ILLR-15	IN	--	--	--	1085-1	1003-2	1003-1	--	--	1003-4	--	--	--	--	--	--
	IHC-CONTROL	OUT	--	--	--	1003-3 AC	1085-2 AC	1085-3 AC	--	--	1085-4 AC	--	--	--	--	--	--
F	167A	W.NO.	--	--	240	241	241	242	--	--	--	--	--	--	--	--	--
	ILLR-15	IN	--	--	--	--	167A-4	1013-13	--	--	--	--	--	--	--	--	--
	IAIR,LUB-PS	OUT	--	--	1013-12 DC	167A-5 DC	-- DC	-- DC	--	--	--	--	--	--	--	--	--
^	120 LLR-15 EARTH	W.NO.	E	E	E	E	E	E	—	—	—	—	—	—	—	—	—
		IN	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		OUT	011-15 AC	022-15 AC	030-4 AC	032-5 AC	033-15 AC	041-15 AC	—	—	—	—	—	—	—	—	—

MAINTENANCE	8. LIST OF COMMERCIALLY AVAILABLE LUBRICANTS	F801

Lubricants used in this press should be selected depending on their applications. (Refer to INSTALLATION page D201, 2.1.)

(Refer to ISO, VG indication)

Oil Type		A	B	C	D	E	F
Maker	MOBIL	Mobil D.T.E Oil 11	Mobil D.T.E Oil Light	Mobil Vactra Oil No.2	Mobil Vactra Oil No.4	Mobilux 2	Mobil Rarus 427
	SHELL	Shell Tellus Oil T15	Shell Tellus Oil 32	Shell Tonna Oil T68	Shell Tonna Oil T180	Alvania Grease 2	Shell Corena Oil N100
	ESSO	Nuto H15	Teresso 32	Febis K68	Febis K220	Beacon 2	Neurex DF100

OBS
OBS-2
OBS25-2
OBS25
OBW
OBW-2
OBI
OBI-2
OBA
OBA-2
MSR32
MKN
UKN
E2P
L1C

OBS-21
E2P-2
E21

(A)

195
198

MOTOR CONTROL PANEL

Name of unit or part	Ref. Code	Maker	Q'ty	Type (Model) & Specifications	Parts No.	Remarks
No fuse breaker	NFB1	FUJI	1	SA225K 150A with handle (G-12AK) bracket (H-1) thermal cover T1-23)	919-15-04409	Main switch
Thermal relay	THM1	MITSUBISHI	1	TH-60TAHZSR 54-80A	97272-18670	Main motor (For 440 V)
Magnet contacter	MFMS MRMS	FUJI	2	SC-8	97211-23310	Main motor
Reversible magnet starter	M2U, THM2 M2D	FUJI	1	E2M200 SRCa3938-05R Thermal 1.4-2.2A E2M300 SRCa3938-05R Thermal 5-8A	919-19-04520 919-19-04399	Slide adj. (For 440 V)
Magnet starter	M3, THM3	FUJI	1	SRCa3931-02 Thermal 1.4 - 2.2A	919-19-04902	Lub. pump (For 440 V)
No fuse breaker	NFB2	FUJI	1	SA33 (3P) 30A	919-15-04300	Power circuit
No fuse breaker	NFB3, 4	NIKKO	2	KM-51 5A	97204-51051	Control circuit
Transformer	TR1	CHUO	1	440 /100V (100VA), 22V(150VA), 26V (100VA), 110V (650VA)	92-4-4113290	Control circuit
Transformer	TR2	CHUO	1	440 /200V (1KVA)	92-4-4113280	Variable motor Control device
Counter	C2	LINE	1	MCU-7C, 7-Figures, DC24V	919-20-04527	Accumulation counter

CONTROL PANEL

Name of unit or part	Ref. Code	Maker	Q'ty	Type (Model) & Specifications	Parts No.	Remarks
Key switch	KS1	IZUMI	1	ASHW-2K40-105	919-14-04288	Control circuit
Key switch	KS2	IZUMI	1	ASHW-2K22	919-14-04287	Continuous
Selector switch	SB2, 4, 41,42,11	IZUMI	5	ASHW-211	919-14-04289	Slide adj. Counter etc.
Push button	PB1	IZUMI	1	ABHW-122 (Black)	919-14-04292	Main motor start
Push button	PB2	IZUMI	1	ABHW-111 (Red)	919-14-04291	Main motor stop
Push button	PB3	IZUMI	1	ABHW-111 (Yellow)	919-14-04293	Slide adj. up
Push button	PB4	IZUMI	1	ABHW-111 (Black)	919-14-04290	Slide adj. down
Push button	PB5	FUJI	1	RCa470-V1R1 (Red)	97262-00010	Emergency stop
Push button with lamp	PB11 PL15	IZUMI	1	ALHW-23311 (Green) DC24V	919-14-04294	Emg. stop reset
Push button with lamp	PB16 PL113	IZUMI	1	ALHW-23311 (Red) DC24V	919-14-04298	C/B fault reset
Indicator lamp	PL1,2,11	IZUMI	3	APHW-116 (White)	919-14-04295	Main motor start Control circuit etc.
Indicator lamp	PL54,55 PL103	IZUMI	3	APHW-116 (Green)	919-14-04296	Guard close Ground connected
Indicator lamp	PL3,4,6, 13,19	IZUMI	5	APHW-133 (Green) DC24V	919-14-04297	Ready to start Air pressure etc.
Selector switch	OS	FUJI	1	RC310-1MJ2	97262-93300	Operation selector
Counter	C1	LINE	1	MCR-6PNV DC24V	919-20-04526	Product number
Speed meter	N	CHUO	1	CF-52A	97452-10011	Speed meter
Volume	VR1	NIHON TEIKOKI	1	RA25A1RE-501BK, 3W, 500Ω Plate: 60P Knob : 40N	97731-10100	Speed setting
Receptacle	CON8	NANABOSHI	1	NCS-303-RF & PM & SPM	97681-13210 & 13230 & 13240	Top stop
Receptacle	CON9	NANABOSHI	1	NCS-304-RF & PM & SPM	97681-13310 & 13330 & 13340	Emergency stop
BULB		IZUMI	4	LS-6 6.3V 1W BASE BA 9S113	97553-10110	SPARE
BULB		IZUMI	6	LS-3 30V 1W BASE BA 9S113	919-16-05117	SPARE

RELAY PANEL

Name of unit or part	Ref. Code	Maker	Q'ty	Type (Model) & Specifications	Parts No.	Remarks
Timer	T30	TATEISHI	1	H3BA-FA MODE: A 0.5 Sec.	919-28-04145	
Relay	CR	TATEISHI	2	LY2, 2C, AC110V	97234-31120	
Relay	CR	TATEISHI	8	LY4, 4C, AC110V	97234-33130	
Relay	CR	TATEISHI	5	LY2, 2C, DC24V	97234-31320	Control
Relay	CR	FUJI	6	SRCa50-3,2A2B,AC110V	97231-22210	

RUN PUSH BUTTON PANEL

Name of unit or part	Ref. Code	Maker	Q'ty	Type (Model) & Specifications	Parts No.	Remarks
Plug	CON7	NANABOSHI	1	NT5015-PM-19	97681-23750	Portable
Push button	PB7A PB7B	TOKYO	2	BS1033AK-22B (Black) Special type	97264-00110	Run
Push button	PB 6	FUJI	1	RCa470-B1Y1 (Yellow)	97262-44310	Top stop
Push button	PB 10	IZUMI	1	ABHW-111 (Black)	919-14-04290	Continuous set up
Push button	PB5A	FUJI	1	RCa470-V1R1 (Red)	97262-00010	Emergency stop

OTHERS

Name of unit or part	Ref. Code	Maker	Q'ty	Type (Model) & Specifications	Parts No.	Remarks
Receptacle	CON5	MATSUSHITA	1	WF3002E	97683-10100	110V
Receptacle	CON1A	INOUE	1	SIP-A	97684-10100	Safety block
Receptacle	CON7	NANABOSHI	1	NT-5015-RF	97681-21800	Portable
Limit switch	LS1 LS2	TATEISHI	2	Z-15GW	919-14-04352	Slide adj.
Limit switch	DS1	YAMATAKE	1	BZ-2RW-822T4-J	919-14-04353	Door switch
Limit switch	LS5	YAMATAKE	1	BZ-E6-2RQ8-J	98714-00000	Fly-wheel brake
Limit switch	LS18	KLOCKNER MOELLER	1	AT-11-1i	919-14-04354	Overload
Push button	PB5B, 5D 5G	FUJI	3	RCa470-V1R1 (Red)	97262-00010	Emergency stop
Synchro	SG	NIHON DENKI SEIKI	1	0Y3-17137a	919-20-04464	Crank position detector
R-panel		KOMATSU	1		919-27-04094	Crank angle indicator
A-detector		KOMATSU	1		919-27-04088	Electric degital rotary switch
Solid state control		KOMATSU	1		919-27-04087	Solid state controller
S/D card		NIHON DENKI SEIKI	1		919-20-04465	
HC control		HITACHI	1		97751-10010	Main motor control device
Pack gauge		KOMATSU	2	LUM-420A	97422-10300	Used by load monitor

LIST OF SPARE PARTS

NO.	MODEL NAME
1	LINING FOR CLUTCH & BRAKE
2	SPRING
3	O-RING
4	OIL SEAL
5	Y-PACKING
6	FACING FOR FLY-WHEEL BRAKE
7	V-BELT
8	TIMING BELT
9	BEARING
10	HOSE
11	BACK-UP RING

MAINTENANCE	LIST OF FAST-WEARING AND REPLACEMENT PARTS	G101-2

1.Lining

KOMATSU Part No.	90252-3-1251	90252-3-1241
Part No. (Ref.F390-)	25	51
Q'ty	4	8
Application	Clutch & Brake	

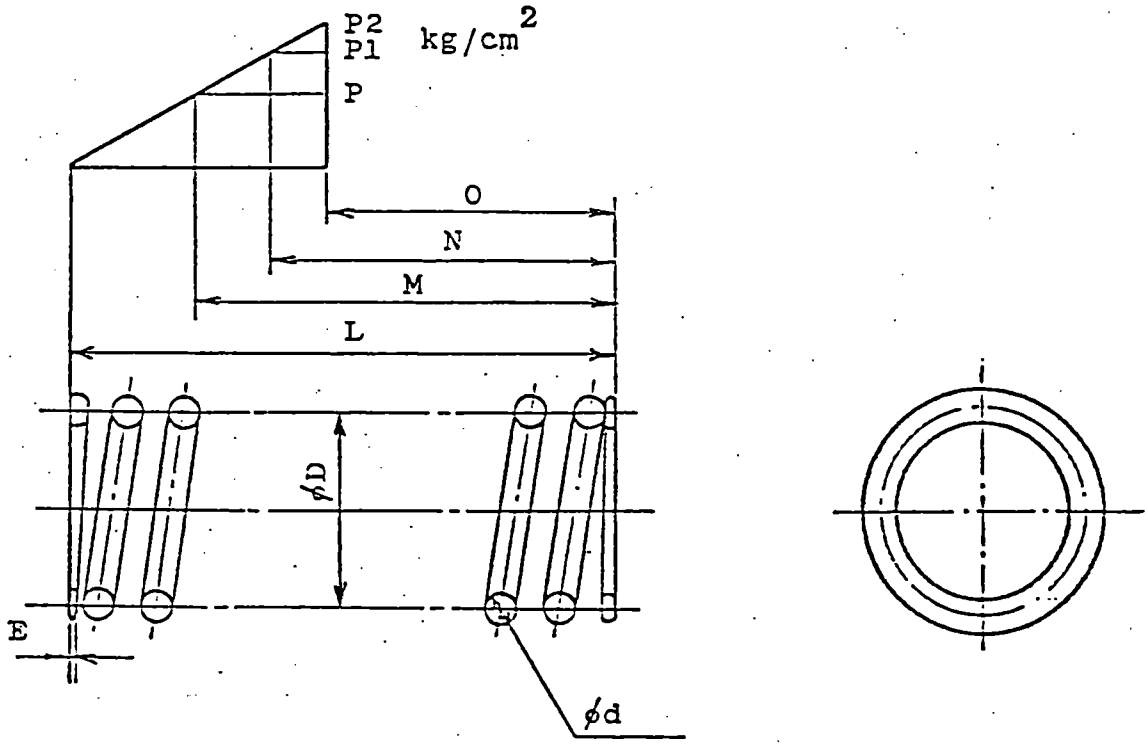
2.Spring

KOMATSU Part No.	90252-4-1280	91-4-0256531
Part No.	(Ref.F390) 20	(Ref.B107) 4
Q'ty	6	1
Application	Clutch & Brake	Flywheel Brake

252
246

MAINTENANCE	LIST OF FAST-WEARING AND REPLACEMENT PARTS	G101-3

Fig. 2. SPRING



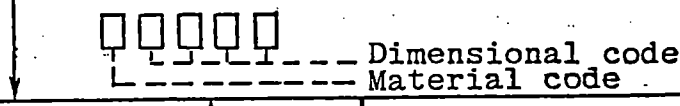
Unit: mm

P/N / Date	907-12000-22					
Diameter : d	6					
Mean coil dia.: D	90					
No.of active coils	6					
Total No. of coils	8					
Direction of turning	RIGHT					
Free length : L	173					
When installed — Load : P	29.1					
When installed — Length: M	75					
Under pressure — Load : P1	35.0					
Under pressure — Length: N	55					
Most closed — Load : P2	38.0					
Most closed — Length: O	45					
End	1.5					
Material	SUP-4					
Q'ty	1					
Application	FLY-WHEEL BRAKE					

MAINTENANCE	LIST OF FAST-WEARING AND REPLACEMENT PARTS	G101-4 1/2

O-RING

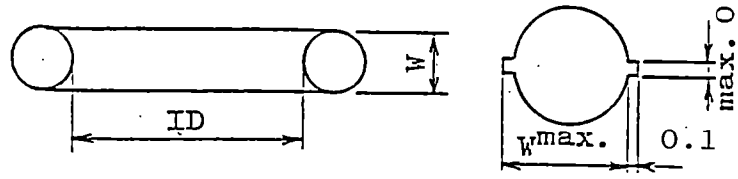
Refer to the following table.



PART NO.	KOMATSU TYPE NO. 07000-	Q'ty	APPLICATION
F390-18	07000-05220	2	Press driving unit
21	07000-05320	2	〃
41	07000-02090	1	Clutch & Brake
42	07000-02105	1	〃
43	07000-05270	1	〃
44	07000-05290	1	〃
46	07000-05475	1	〃
49	07000-05305	1	〃
50	07000-05220	1	〃
3	07000-02055	1	Balancer unit
7	07000-05390	1	〃
7	07000-05240	2	Point
10	07000-15210	2	〃
22	07000-05062	4	〃

MAINTENANCE	LIST OF FAST-WEARING AND REPLACEMENT PARTS	G101-4a

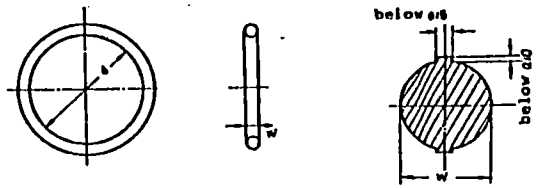
3. O-RING



Unit: mm(inch)

KOMATSU Part No.	PART No.	Dimension		Q'ty	Application
		ID	W		
98360 -05520	F390- 45,47	520 (20.47)	5.7 (0.22)	1	Clutch & Brake
90252- 4-1201	48	399.5(15.73)	8.4 (0.33)	1	"

Table of O-ring dimensions



	*	**
Class code	07000	
Material code	0	1
Material	NBR-1A	NBR-1B
Hardness	JIS $H_S 70 \pm 5^\circ$	JIS $H_S 90 \pm 5^\circ$
Color code	Blue at one point	Blue at two points

Unit: mm

Norminal No.	Norminal Dimensions			W	d		Dimensional code	Designation by JIS B2401
	Size	I. D.	O. D.		Basic dimension	Tolerance		
1	1.5	3	6	1.9 ± 0.07	2.8	±0.12	1003	P3
		4	7		3.8		1004	P4
		5	8		4.8		1005	P5
		6	9		5.8		1006	P6
		7	10		6.8		1007	P7
		8	11		7.8		1008	P8
		9	12		8.8		1009	P9
2	2	10	14	2.4 ±0.07	9.8		2010	P10A
		11	15		10.8		2011	P11
		12	16		11.8		2012	P12
		14	18		13.8		2014	P14
		15	19		14.8		2015	P15
		16	20		15.8		2016	P16
		18	22		17.8		2018	P18
		20	24		19.8	±0.15	2020	P20
		21	25		20.8		2021	P21
3	3	22	28	3.5 ±0.1	21.7		3022	P22A
		25	31		24.7		3025	P25
		28	34		27.7		3028	P28
		30	36		29.7		3030	P30
		32	38		31.7		3032	P32
		35	41		34.7		3035	P35
		38	44		37.7		3038	P38
		40	46		39.7		3040	P40
		42	48		41.7		3042	P42
		45	51		44.7		3045	P45

Norminal No.	Norminal Dimensions			W	d		Dimensional code	Designation by JIS B2401
	Size	I.D.	O.D.		Basic dimension	Tolerance		
2	2	48	54	3.1 ±0.1	47.7	±0.25	3048	P48
		50	56		49.7		3050	P50
	2	55	60		54.4		2055	G55
		60	65		59.4		2060	G60
		65	70		64.4		2065	G65
		70	75		69.4		2070	G70
		75	80		74.4	±0.4	2075	G75
		80	85		79.4		2080	G80
		85	90		84.4		2085	G85
		90	95		89.4		2090	G90
		95	100		94.5		2095	G95
	2.5	100	105		99.4		2100	G100
		105	110		104.4		2105	G105
		110	115		109.4		2110	G110
		115	120		114.4		2115	G115
		120	125		119.4		2120	G120
		125	130		124.4		2125	G125
		130	135		129.4	±0.6	2130	G130
		135	140		134.4		2135	G135
		140	145		139.4		2140	G140
		145	150		144.4		2145	G145
5	5	55	65	5.7 ±0.15	54.6	±0.25	5055	P55
		60	70		59.6		5060	P60
		65	75		64.6		5065	P65
		70	80		69.6		5070	P70
		75	85		74.6		5075	P73

Nominal No.	Nominal Dimensions			W	d		Dimensional code	Designation by JIS B2401
	Size	I.D.	O.D.		Basic dimension	Tolerance		
5	5	80	90	5.7 ±0.15	79.6	±0.4	5080	P80
		85	95		84.6		5085	P85
		90	100		89.6		5090	P90
		95	105		94.6		5095	95
		100	110		99.6		5100	P100
		105	115		104.6		5105	P105
		110	120		109.6		5110	P110
		115	125		114.6		5115	P115
		120	130		119.6		5120	P120
		125	135		124.6		5125	P125
		130	140		129.6	±0.6	5130	P130
		135	145		134.6		5135	P135
		140	150		139.6		5140	P140
		145	155		144.6		5145	P145
		150	160		149.3		5150	G150
		155	165		154.3		5155	G155
		160	170		159.3		5160	G160
		165	175		164.3		5165	G165
		170	180		169.3		5170	G170
		175	185		174.3		5175	G175
		180	190		179.3		5180	G180
		185	195		184.3	±0.8	5185	G185
		190	200		189.3		5190	G190
		195	205		194.3		5195	G195
		200	210		199.3		5200	G200
5	5	210	220	5.7 ±0.15	209.3		5210	G210
		220	230		219.3		5220	G220
		230	240		229.3		5230	G230
		240	250		239.3		5240	G240
		250	260		249.3		5250	G250
		260	270		259.3		5260	G260
		270	280		269.3		5270	G270
		280	290		279.3		5280	G280
		290	300		289.3		5290	G290
		300	310		299.3		5300	G300

Nominal No.	Nominal Dimensions			W	d		Dimensional code	Designation by JIS B2401
	Size	I.D.	O.D.		Basic dimension	Tolerance		
5	5	305	315	5.7 ±0.15	304.4	±0.75	5305	—
		310	320		309.4		5310	—
		315	325		314.4		5315	—
		320	330		319.4		5320	—
		325	335		324.4		5325	—
		330	340		329.4		5330	—
		335	345		334.4		5335	—
		340	350		339.4		5340	—
		345	355		344.4		5345	—
		350	360		349.4		5350	—
		355	365		354.4		5355	—
		360	370		359.4		5360	—
		365	375		364.4		5365	—
		370	380		369.4		5370	—
		375	385		374.4		5375	—
		380	390		379.4		5380	—
		385	395		384.4		5385	—
		390	400		389.4		5390	—
		395	405		394.4		5395	—
		400	410		399.4	±1.0	5400	—
5	5	405	415	5.7 ±0.15	404.4		5405	—
		410	420		409.4		5410	—
		415	425		414.4		5415	—
		420	430		419.4		5420	—
		425	435		424.4		5425	—
		430	440		429.4		5430	—
		435	445		434.4		5435	—
		440	450		439.4		5440	—
		445	455		444.4		5445	—
		450	460		449.4		5450	—
		455	465		454.4		5455	—
		460	470		459.4		5460	—
		465	475		464.4		5465	—
		470	480		469.4		5470	—
		475	485		474.4		5470	—

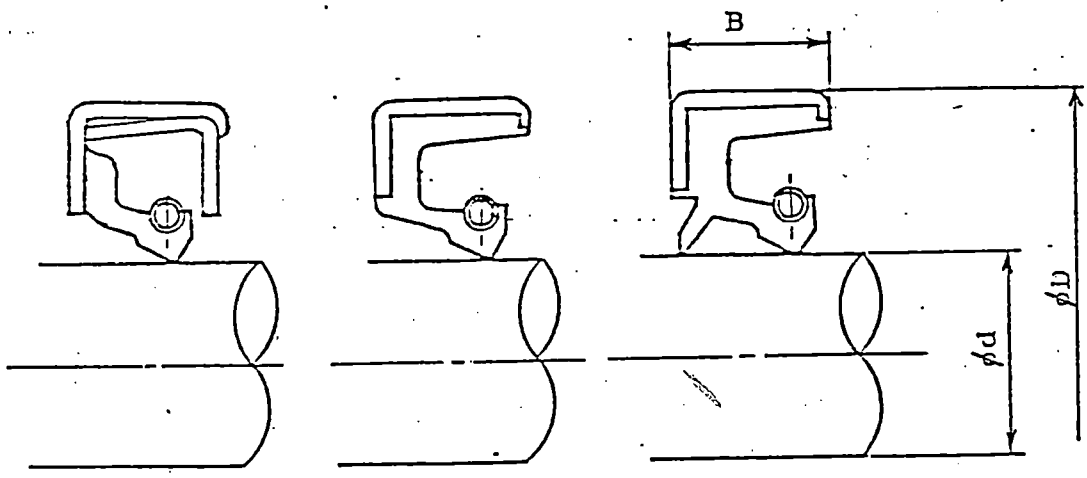
Nominal No.	Nominal Dimensions			W	d		Dimensional code	Designation by JIS B2401
	Size	I.D.	O.D.		Basic dimension	Tolerance		
5	5	480	490	5.7 ±0.15	479.4	±1.0	5480	—
		485	495		484.4		5485	—
		490	500		489.4		5490	—
		495	505		494.4		5495	—
		500	510		499.4		5600	—
6	6	150	162	6.9 ±0.15	149.1	±0.75	6150	—
		155	167		154.1		6155	—
		160	172		159.1		6160	—
		165	177		164.1		6165	—
		170	182		169.1		6170	—
		175	187		174.1		6175	—
		180	192		179.1		6180	—
		185	197		184.1		6185	—
		190	202		189.1		6190	—
		195	207		194.1		6195	—
		200	212		199.1		6200	—
		205	217		204.1		6205	—
		210	222		209.1		6210	—

Nominal No.	Nominal Dimensions			W	d		Dimensional code	Designation by JIS B2401
	Size	I.D.	O.D.		Basic dimension	Tolerance		
6	6	215	227	6.9 ±0.15	214.1	±0.75	6215	—
		220	232		219.1		6220	—
		225	237		224.1		6225	—
		230	242		229.1		6230	—
		235	247		234.1		6235	—
		240	252		239.1		6240	—
		245	257		244.1		6245	—
		250	262		249.1		6250	—
		255	267		254.1		6255	—
		260	272		259.1		6260	—
		265	277		264.1		6265	—
		270	282		269.1		6270	—
		275	287		274.1		6275	—
		280	292		279.1		6280	—
		285	297		284.1		6285	—
		290	302		289.1		6290	—
		295	307		294.1		6295	—
		300	312		299.1		6300	—

Remarks: 1. KOMATSU Type No. consists of the Class, Material and Dimensional codes.

2. This Table has been prepared on the basis of KES D 07000-(1966R) and JIS B2401(1963).

4. Oil-Seal



Typ: 07010 Typ: 07011 Typ: 07012

Unit: mm(inch)

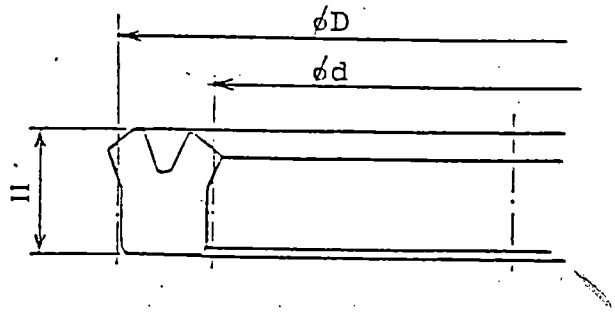
KOMATSU PART No.	Part No.	Dimension d	Dimension D	Dimension B	Q'ty	Application
07011 -00085	F390- 19	85 (3.35)	110 (4.33)	13 (0.51)	1	Press Driving Unit
07011 -00035	18	35 (1.38)	55 (2.17)	11 (0.43)	2	Point

MAINTENANCE	LIST OF FAST-WEARING AND REPLACEMENT PARTS	G101-9

5. Y-PACKING

Type B : Stuffing box mounting

Type C : Piston seal



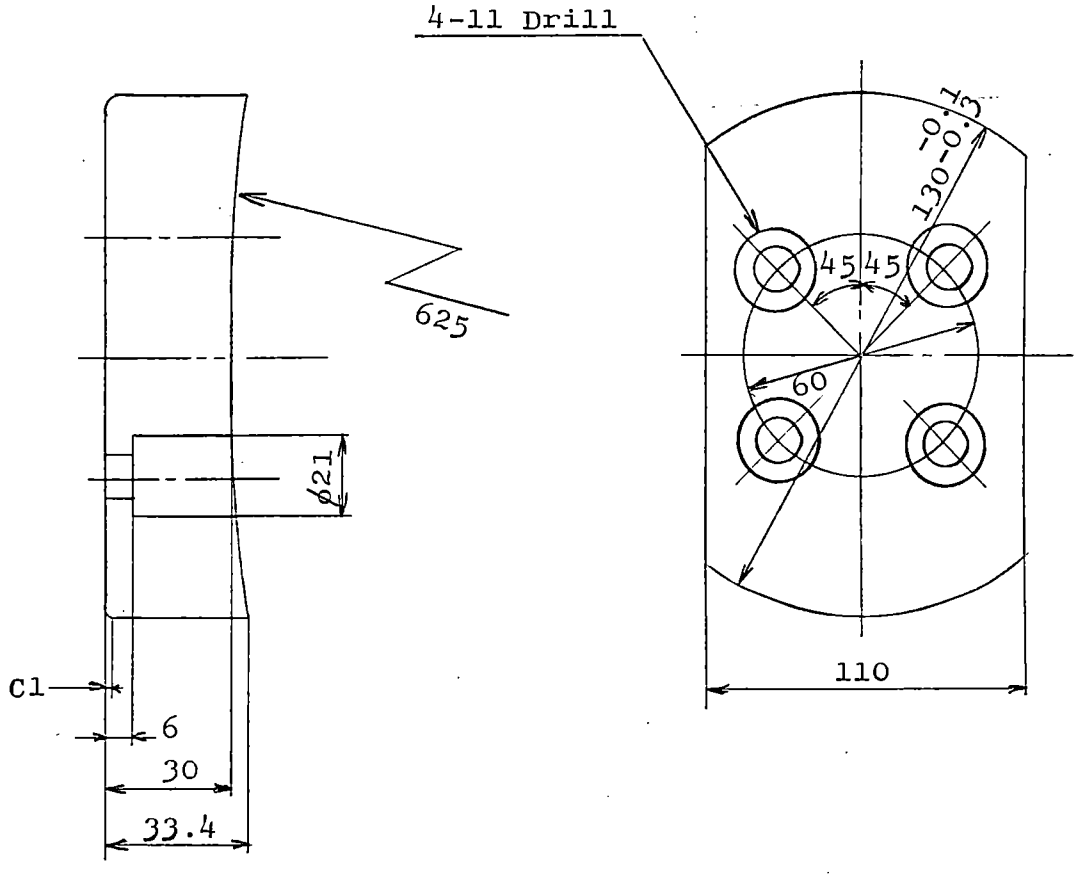
Unit:mm(inch)

KOMATSU Part No.	Part No.	Type	Dimension d	Dimension D	Dimension H	Q'ty	Application
92-4-4001560	F390-20	C	255 (10.04)	280 (11.02)	19 (0.75)	2	Press Driving Unit
07130--00400	2	C	376 (26.61)	399 (15.71)	16 (0.63)	1	Balancer
941-10-73990	8	C	55 (2.17)	65 (2.56)	6 (0.24)	1	〃

Fig. 6 Facing for Fly-wheel brake

Part No.	907-12030-11
Komatsu Part No.	99300-06250
Material	RESIN MOLD
Q'ty	1

E2P-2
E2Q



MAINTENANCE	LIST OF FAST-WEARING AND REPLACEMENT PARTS	G101-11

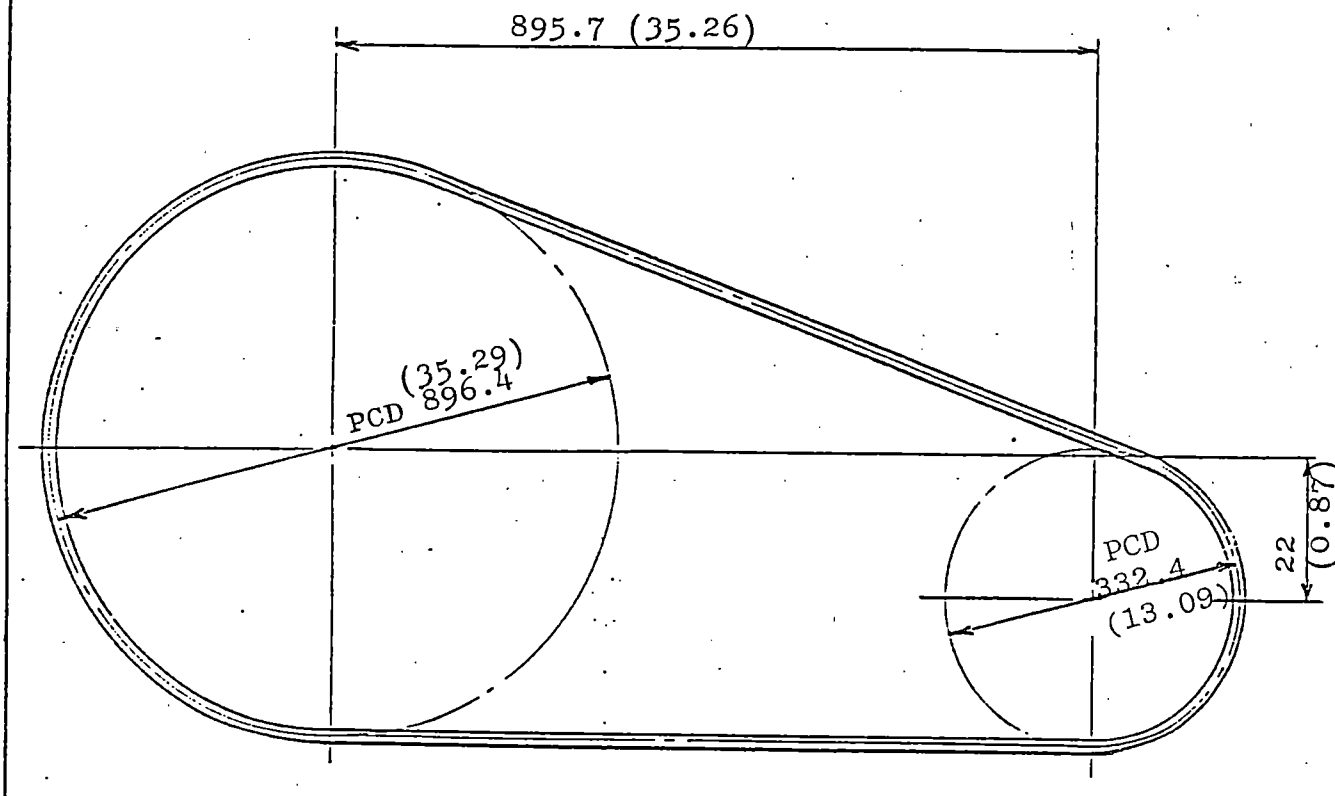
V-BELT

Part No. : 98541-11500

Type No. : 5V-1500

Q'ty : 3

Unit: mm(inch)

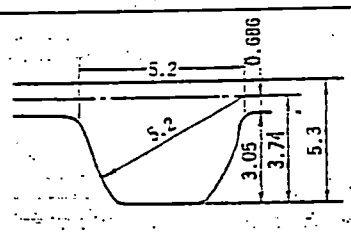
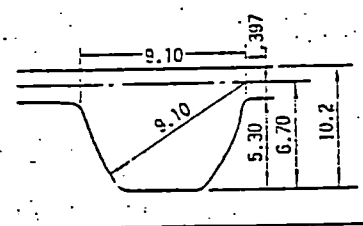


MAINTENANCE	LIST OF FAST-WEARING AND REPLACEMENT PARTS	G101-12

Timing Belt

Maker : MITSUBOSHI

Name : Supper Torque Timing Belt

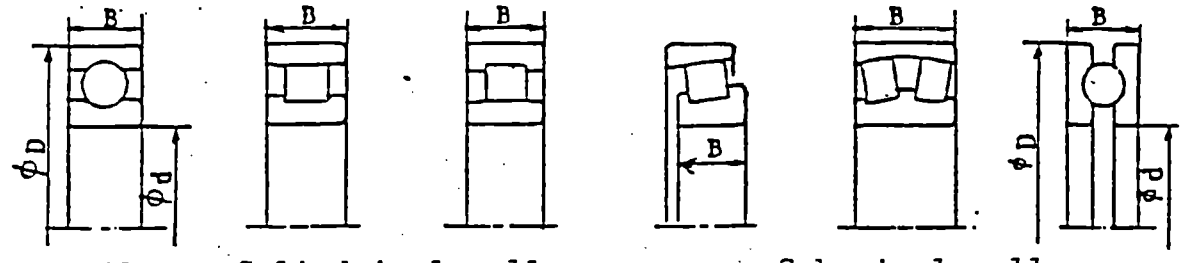
8mm Pitch (S8M)	14mm Pitch(S14M)
8mm	14mm
0.686mm	1.397mm
	
Breadth / Code No. 15mm 150 25mm 250 40mm 400 60mm 600	Breadth / Code No. 40mm 400 60mm 600 80mm 800 100mm 1000 120mm 1200
250 S 8M 2000 Breadth ×10 — Length Supper Torque — Pitch	800 S 14M 3150

	Type				Q'ty	Application
F390-4	250S8M1248				1	Slide A.D.J

MAINTENANCE	LIST OF FAST-WEARING AND REPLACEMENT PARTS	G101-13

BEARING

Type 1. 2. 3. 4. 5. 6.



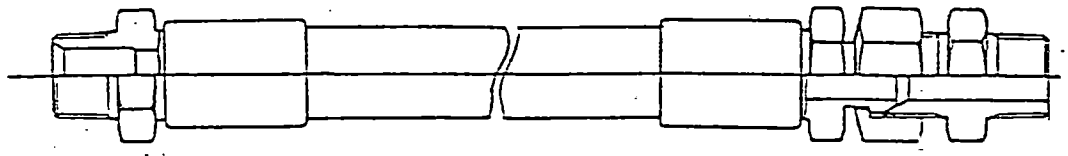
Ball Cylindrical roller Spherical roller

Tapered roller Trust ball

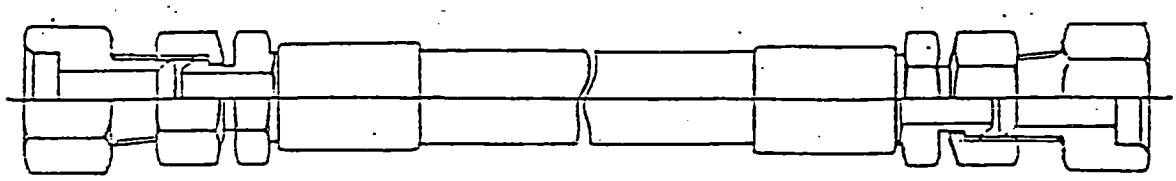
PART NO.	TYPE	BEARING NO.	DIMENSIONS mm(inch) d	D	B	Q'TY	APPLICATION
F390-11	1	6036	180 (7.09)	280 (11.02)	46 (1.81)	2	Clutch&Brake
13,31,35	4	30324	120 (4.72)	260 (10.24)	55 (2.17)	3	↓
16	6	81216	80 (3.15)	115 (4.53)	28 (1.10)	1	↓
6	1	6207	35 (1.38)	72 (2.83)	17 (0.67)	1	Slide A.D.J
19	1	7207	35 (1.38)	72 (2.83)	17 (0.67)	4	Point

10. RUBBER HOSES

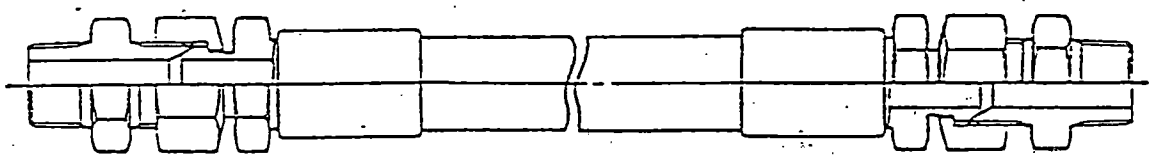
Type : A



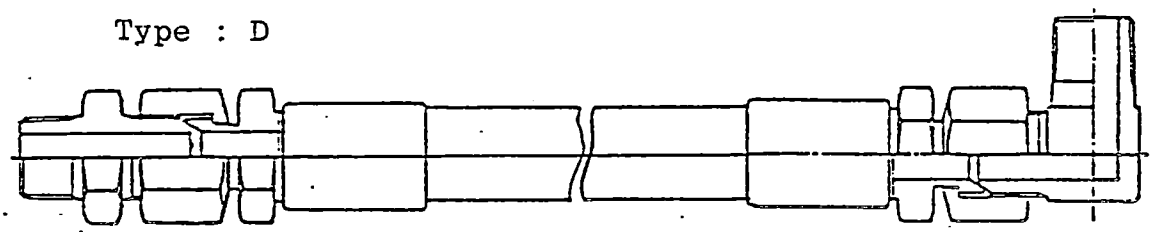
Type : B



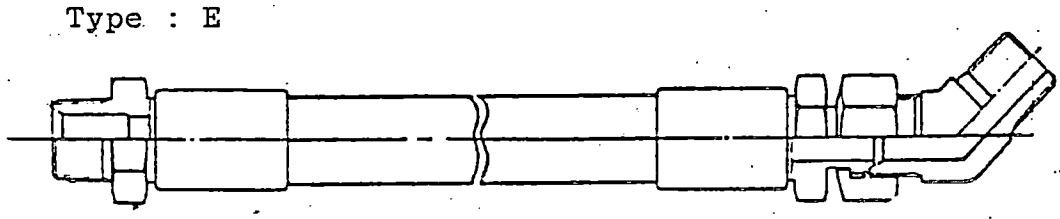
Type : C



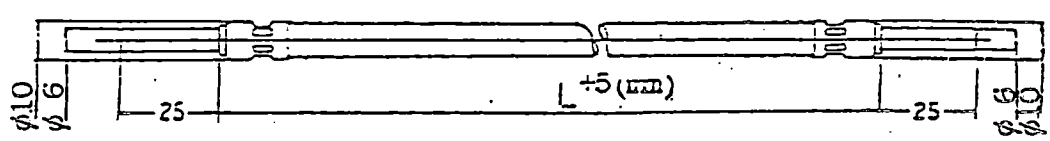
Type : D



Type : E



Type : F



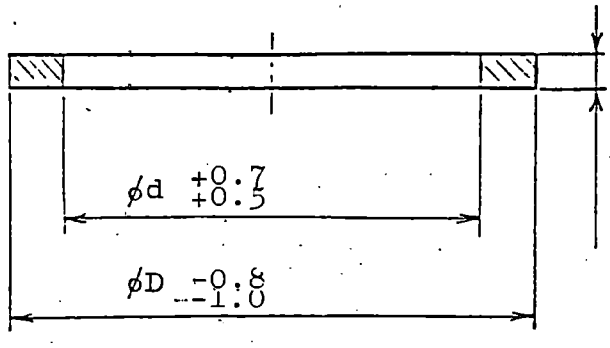
10. LIST OF HOSES

Manufacture : TOGAWA RUBBER

Part No.	Model No.	Type	Q'ty	Application (Position)
	98107-21101	A	1	between points
	98107-25075	D	1	〃
	98107-24115	D	1	to slide

MAINTENANCE	LIST OF FAST-WEARING AND REPLACEMENT PARTS	G101-16

BACK-UP RING

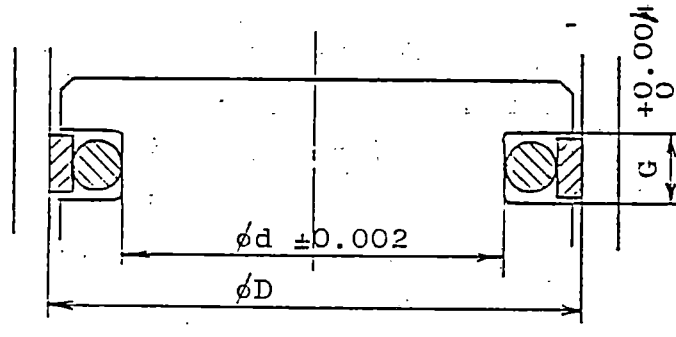


Specification
1. Material
Leather (chrome-tanned)
2. Fluid used
Oil
3. Max. working pressure
350 kg/cm²
4. Working temperature
50 C

Unit: mm(inch)

Part No.	KOMATSU Part No.	Dimensions d	D	t	Q'ty	Application
F390 -9	07001 -05210	210 (8.27)	220 (8.66)	1.9 (0.07)	2	Point

SEAL-RING



Material:

Unit: inch

KOMATSU Part No.	Dimension d	D	G	Q'ty	Application
					Protector valve