

PHI HYDRAULIC PRESSES

ASBESTOS TESTING
BENCH
BONDING
BRIQUETTING
COMPRESSION MOLDING
CUSTOM DESIGNED
CREDIT CARD LAMINATING
ELECTRICALLY HEATED
ENCAPSULATION
FIBERGLASS
FORGING
FORMING

FOUR POST
HEATING
HIGH PRESSURE
HOT & COLD
HOT PLATE
LABORATORY
LAMINATING
METAL WORKING
MULTILAYER LAMINATING
PARTICLE BOARD
PLASTIC MOLDING

PLASTIC & RUBBER
PLYWOOD
PRINTED CIRCUIT BOARD
POST GUIDED
RUBBER MOLDING
RUBBER PRINTING PLATE
STEAM HEATED
TESTING
TRANSFER MOLDING
TRIMMING
VULCANIZING

PHI

MANUAL COMPRESSION PRESSES 20, 30 & 50 TON CAPACITY

For over a quarter century, PHI manual compression presses have been the unquestioned industry standard. Today, almost 15,000 of these compact, efficient presses are in industrial and laboratory service around the world.

Highly versatile, PHI manual compression presses are ideal for short run plastic and rubber molding, batch testing, materials development and evaluation, briquetting, adhesive bonding, printed circuit board laminating and numerous other laboratory and light production applications.

Regardless of model or capacity, each PHI press is designed and ruggedly constructed for years of heavy duty service. The finest hydraulic, electrical and mechanical components, controls and safety devices are used, and all components are conveniently located for ready access for operation and maintenance. Featuring flexible "building block" design and construction, the many standard and optional features available on PHI manual compression presses allow you to easily and economically tailor your press to meet your individual testing or production requirements.

PROVEN DESIGN FEATURES

UNITIZED FRAME—In PHI manual compression presses, the heavy duty frame columns are wide, solid steel plates structurally joined to the solid steel bolsters. Bolsters are ground, and the frame is carefully aligned to insure accurate platen parallelism. The moving bolster is fully guided. This remarkably strong, rigid design affords minimal deflection, assures accurate mold mating and uniform pressure application under all operating conditions.

TWO-STAGE HYDRAULIC PUMP—The PHI patented, manual high/low pressure pump is the most efficient and reliable ever developed. It automatically converts from low pressure/high volume to high pressure/low volume for ease of operation and accurate control throughout the range from O lbs. to full press capacity, with optional low pressure instrumentation.



Model PW-220H

DUMP/DECOMPRESSION VALVE—The two-stage PHI decompression and dump valve enables the operator to adjust pressure to laboratory accuracy. The two-stage design permits precisely bleeding off pressure as required, in the event of pressure overshoot. In addition, the valve provides gradual decompression and fast or slow press opening.

	20 TON (CAPACITY	30 TON (CAPACITY	50 TON CAPACITY		
Specifications	P-21 SERIES	PW-22 SERIES	Q-23 SERIES	Q-24 SERIES	B-23 SERIES	B-24 SERIES	
Platen Size (inches)	8 × 8	12½ × 9½	12½ × 12½	18½ × 12½	12½ × 12½	181/2 × 121/2	
Watts per Platen	800	1500	2000	3000	2000	3000	
Ram Diameter (inches)	4	4	5	5	61/2	61/2	
Ram Stroke (inches)	4	4	4	4	6	6	
Daylight (inches)	4 or 8	4 or 8	4 or 8	4 or 8	6 or 10	6 or 10	
Control Range (tons)	3 to 20	3 to 20	3 to 30	3 to 30	5 to 50	5 to 50	
MANUAL MODELS							
Height (inches)	32	35	38	39	41	44	
Base Dimensions (inches)	15 × 9½	19 × 12	19 × 14	25 × 14	19 × 14	25 × 161/2	
Weight (lbs.)	298	465	704	965	930	1,219	
MOTORIZED MODELS							
Height (inches)	50	52	52	52	53	55	
Base Dimensions (inches)	22 × 16	26 × 19	26 × 19	31 × 19	26 × 19	31 × 22	
Weight (lbs.)	418	590	839	1,115	1,065	1,379	

OPTIONS AVAILABLE:

- Double acting (up or down acting) ram
- High pressure readout gages
- Low pressure readout gages
- Solid state temperature controllers and indicators
- Solid state, adjustable timers
- Intermediate platen for increased productivity
- Steam heated steel platens
- Aluminum platens
- Plain (non-heated) steel platens
- Stainless steel—high temperature platens
- Rapid platen heating rates
- T-slot platens
- Peripheral platen insulation
- Centerless ground conductive platen heaters
- Floor standing bases

PRECISION PRESSES 1 TO 30 TON CAPACITY

Standard air actuated presses that incorporate PHI's specialized platen designs and advanced Pneumatic/Air over Oil systems into a precision four post press, intended for applications requiring accurate control of pressure, temperature and parallelism.

FORCE

Standard models with capacity rated from 2000 lbs. to 60,000 lbs.

DIE SPACE

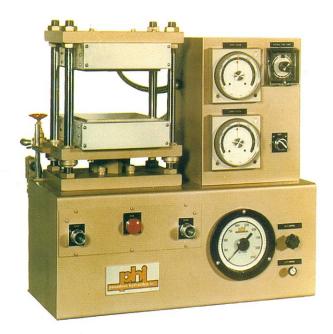
Standard models with die space, or platen size, from $8" \times 8"$ to $18" \times 18"$.

PHI design is based on a building block concept that allows customers to select, for a given capacity and die space, the platen design most suitable to their application.

No matter which platen design is selected, parallelism of .001"/ft. of span will be achieved utilizing surface ground plates, guided on ball bushings, and chrome plated strain rods with fine threads for optimum parallelism alignment.

TEMPERATURE CONTROL

PHI Precision Presses are designed to operate with a variety of platens, steam or electrically heated, with or without cooling, depending on your application. As different applications call for different temperature ranges, heat rise, temperature uniformity and heating modes; we at PHI have designed a complete line of platens ranging from standard industrial platens to



Model TS-21

exotic high temperature platens for laboratory applications. No matter what your application, proven PHI platens are the answer.

All PHI platens utilize special thermocouples, one for each platen, and time proportioning temperature controllers to prevent over-shoot and to provide uniform, predictable heating.

MODEL	TS-21	AS-21	GS-21	RA-22	DA-22	CA-23	CA-24	HA-24	JA-25	QA-25
Capacity (lbs)	2000	3000	5000	4000	7000	9000	9000	16000	22000	60000
Platen Size (in. x in.)	8x8	8x8	8x8	12x9	12x9	12x12	18x12	18x12	18x18	18x18
Stroke and Daylight (in.)®	5	6	6	6	6	6	6	6	8	8
Ram Area (sq. in.)	24	36	36	50	50	113	113	113	154	154
Ram Equiv. Diameter (in.)	5.5	6.8	6.8	8.0	8.0	12.0	12.0	12.0	14.0	14.0
Operating Pressure (psi)	85	85	140	80	150	80	80	150	150	390
Air Supply (psi)	90	90	90	90	90	90	90	90	90	90
Air Booster	No .	No	Yes	No	Yes	No	No	Yes	Yes	Yes
	PNEUMATIC			AIR OVER OIL HYDRAULICS						
Dimensions (LxWxH—in.)	32x16x32	32x18x34	32x30x34	40x24x42	40x32x56	40x22x56	47x24x58	47x30x58	47x30x68	47x30x68
Weight (lbs) ²	250	275	350	625	725	1075	1425	1675	2800	3100
Initial Air Consumption (scfm)	6	9	75	12	66	30	30	95	110	200
Closing Speed (ipm)	60	60	60	60	60	60	60	60	60	60

OPTIONS AVAILABLE:

Notes: ®With Platens installed ®With "U" type platens installed (typical)

We at PHI are aware that special applications may require special features in a press, above of what is offered in the standard Precision Presses. For these special applications we have developed features such as nickel alloy platens for temperatures up to 1200°F, special heaters for heat rise up to 50°F/Min., ¼% accuracy temperature controllers, controlled platen cooling and many others. We solicit your special applications.

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PHI HYDRAULIC COMPRESSION PRESSES

for high quality, high production plastic and rubber molding, bonding and laminating.

"BUILDING-BLOCK" DESIGN AND CONSTRUCTION

To most efficiently and economically meet the increasingly varied operating and production needs of the plastic, rubber and electronic industries, PHI has developed a versatile, standardized "building-block" system for the design and construction of its compression presses.

The basic "building-blocks" include a wide range of standard frames, platens, heating systems, hydraulic power supplies and electric cycle controls. Utilizing these basic "building-blocks" in various combinations, PHI can quickly and inexpensively supply compression presses with capacities, controls, features and capabilities tailored to your specific needs.

With this proven, pre-engineered "building-block" technique, press users now have the opportunity to select presses with "special" capabilities at realistic, economical "standard" prices. Lead time is greatly reduced, and deliveries of most presses can be made in a few weeks.

Whether Strain Rod or Unitized Frame, all PHI compression presses are carefully engineered and ruggedly built for years of heavy duty service. Only the finest hydraulic, electrical and mechanical components, controls and safety devices are used. Components are conveniently located to afford maximum accessibility for ease of operation, inspection and maintenance.



Special compression press, 75 ton capacity, provides precise pressure control utilizing PHI's advanced control instrumentation. Press includes 3 pressure control ranges, electrically heated platens, microprocessor based temperature programmer, operational load cell and a digital temperature and pressure data logger/multipoint recorder with full alarm capabilities.



Compression press, 50 ton capacity, designed to operate per requirements of ASTM standard D 1928, Procedure C, for preparation of compression molded polyethylene test samples. Microprocessor based temperature programmer allows programming of heating and cooling cycles. Special platen design, utilizing proportional control valves and separate temperature controllers for heating and cooling, allow press to follow exact and programmable cooling rate under controlled pressure.

UNITIZED COMPRESSION PRESSES

In PHI unitized frame construction, the frame columns are heavy duty steel plates structurally joined to the solid steel bolsters. Bolsters are ground, and the frame is precisely aligned to insure accurate platen parallelism. The moving bolster is fully guided. This strong, rigid design affords minimal deflection, assures accurate mold mating and uniform pressure application under all operating conditions.

PHI compression presses are available in capacities from 20 to 1000 tons. With the wide flexibility afforded by our "building-block" design and construction, unitized frame compression presses can be supplied with the specific capacity, platen size, daylight, controls and operating features necessary to most efficiently and economically meet your individual production requirements.

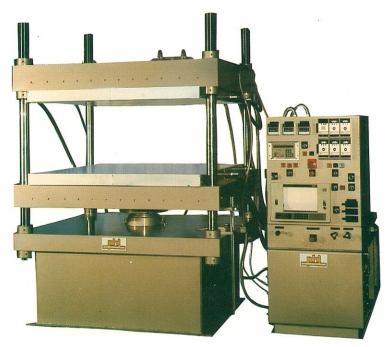


Model Shown Above: 100 ton rubber bonding press with bump cycle for automatic mold outgassing

STRAIN ROD COMPRESSION PRESSES

PHI strain rod compression presses feature extra large strain rods and solid steel bolsters for maximum strength and rigidity. The heavy duty strain rods are ground and finely threaded to provide precise platen alignment, parallelism and exceptionally accurate bolster guidance. The bolsters are ground for precision platen mating, and the moving bolster is guided by four large lubricated bushings. This superior design provides unmatched accuracy in alignment and parallelism of platens ±.001 inches per foot of span — for more uniform pressure and accurate mold mating.

PHI compression presses are available in capacities from 20 to 1000 tons. Due to the extreme versatility inherent in our "building-block" design and construction, strain rod frame compression presses can easily and economically be supplied with the precise capacity, platen size and type, operating characteristics and time, temperature and pressure controls you require.



Model Shown Above: 100 ton laminating press, with $60^{\prime\prime}\times60^{\prime\prime}$ electrically heated platens and programmable cycle controls

PH SPECIAL PURPOSE COMPRESSION PRESSES



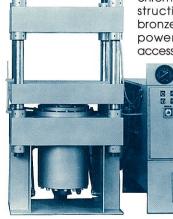
MOLDING PRESS

The 150 ton down acting press shown was designed for fully automatic operation. Low height of lower bolster allows interface with shuttle mechanism (not shown) for fast mold loading and positioning.



COMPRESSION MOLDING PRESS

300 ton up acting, power return, molding press with chrome plated four post construction and lubricated bronze bushings. Separate power unit for maximum accessibility.







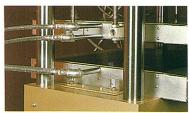
STEAM/ELECTRIC LAMINATING PRESS

This 75 ton press was designed for laboratory applications where exact pressure and temperature controls are required to establish optimum process parameters.

Major features are:

- Combination steam/ electric heating
- Precise control and operation in three pressure ranges
- Auxiliary ram mounted air pistons for ultra low pressure control

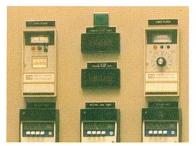
OPTIONS AVAILABLE:



Counterbalance

Included is a four-point counterbalance system for each intermediate platen.

The counterbalance system eliminates the effect of platen weight on pressure in each opening.



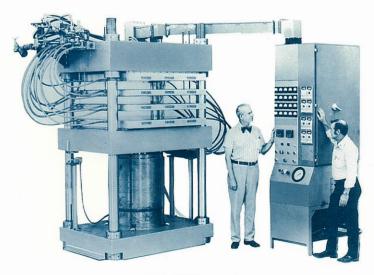
Digital Display of pressure

LED digital display gauges provide accurate setting and readout of pressure.



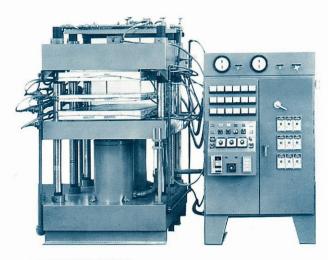
Digital Display of Platen Position

A linear variable displacement transducer (LVDT) is used to sense distance between the top platens. Actual displacement is displayed on a digital readout gauge.



HIGH TEMPERATURE PRESS

Major characteristics of this electrically heated press are a 22" diameter ram, used to minimize platen deflection, and a two stage cooling system for uniform cool down from the 1000°F operating temperature.



LAMINATING PRESS

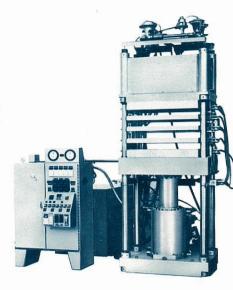
This multiple opening, electrically heated Laminating Press is suitable for operation up to 600°F. Three zone temperature control on each platen insure a temperature uniformity of $\pm 10^{\circ}$ F at 550°F over the 26" \times 56" platen working area.

Controls are provided for manual, automatic and programmed mode of operation.



CREDIT CARD LAMINATING PRESS

A production rate of 13,000 standard size credit cards per hour can be achieved using this 200 Ton Laminating Press. Designed specifically for the high production of credit cards the 11 steel platens, $30'' \times 24''$, are cored for steam heating to achieve a fast heat-up rate and a temperature uniformity of $\pm 5^{\circ}$ F.



COMPUTER OPERATED HYDRAULIC PRESS

The press, equipped with five steam heated 42" × 30" platens capable of maintaining temperature uniformity of plus or minus 3°F, has a 300 ton capacity.

Heavy top weldment insures that deflection is limited to .0015".

Time, temperature, and pressure variables are under computer control.



Microprocessor Based Program Controller

Programmed cycling is achieved using a setpoint programmer that allows programming of temperature and pressure as function of time.



Temperature and Pressure Recorder

A 24 point strip chart recorder with one point per platen to record platen temperature and two points to record low and high pressure.



Provision for Additional Platens

This provision insures that as production requirements increase the press capacity can be expanded accordingly.

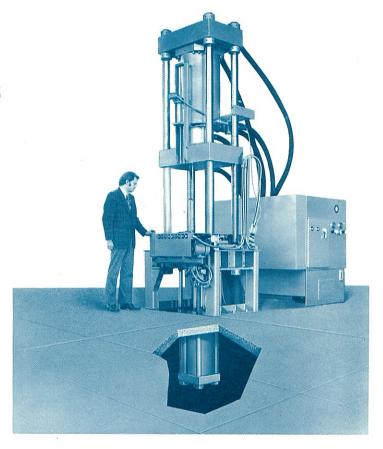
FORGING AND METAL WORKING PRESSES

This special 300-ton automatic metal forging press was designed to implement a new forging process application.

Press was designed to form metal couplings at high speeds with a down-acting cylinder coupled with a second stage high speed up-acting piercing operation. PHI also designed a rotary 3-position indexing table to facilitate loading, unloading, and forming.

Press features:

- 161/2" diameter forming cylinder
- 300 ton forming capacity
- 0-300 ipm forming closing speed
- 48" daylight
- 29" × 25" die area
- Rotary indexing table
- 12" diameter piercing cylinder
- 150 ton piercing capacity
- 0-400 ipm piercing speed
- Self-contained hydraulic system
- Manual-automatic cycle controls

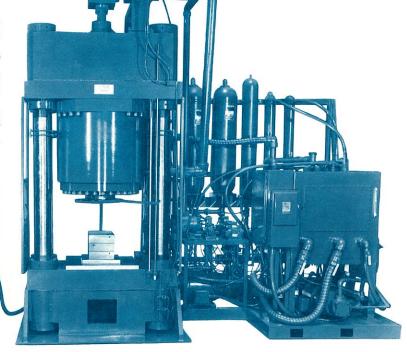


POWDER METAL COMPACTING PRESS

This special press features a maximum capacity of 1200 tons on a 32" diameter, down acting cylinder.

The hydraulic system includes a series of accumulators to obtain the high operating speed required in this proprietary metal powder compacting process.

The pressure profile during compacting can be programmed on the microprocessor based press controller. A RS232 port is provided for computer interface.



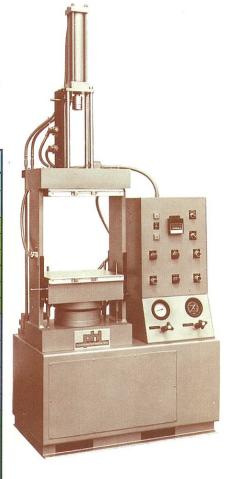


TRANSFER MOLDING AND ENCAPSULATION PRESSES

For Prototype and Low Volume Production

These transfer presses are of simple, rugged, unitized frame design with columns fabricated from wide steel plate. Intended for use in laboratories or production departments for low volume molding of thermosetting resins or elastomers. Options available include lower or higher transfer force, T-slotted platens and plungers in a variety of sizes.

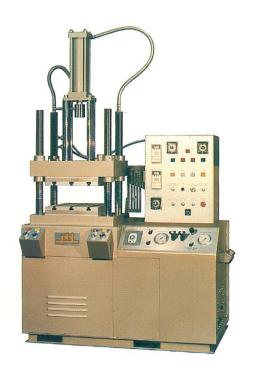
ordingers in a variety of sizes.							
MODEL	EP210	EPW220	EQ230	EQ240	EB230	EB240	
Platen Size (in.)	8×8	12.5×9.5	12.5×12.5	18.5×12.5	12.5×12.5	18.5×12.5	
Platen Total Heating (KW)	1.6	3	4	6	4	6	
Clamp Force (tons)	20	20	30	30	50	50	
Fast Close (ipm)	73	73	78	78	56	56	
Slow Close (ipm)	18	18	12	12	7	7	
Ram Dia. (in.)	4	4	5	5	6.5	6.5	
Ram Stroke (in.)	6	6	6	6	8	8	
Daylight (in.)	8	8	8	8	10	10	
Transfer Force (tons)	5	5	8	8	12.5	12.5	
Approach Speed (ipm)	185	185	190	190	140	140	
Transfer Speed (ipm)	0-45	0-45	0-31	0-31	0-18	0-18	
Stroke (in.)	10	10	12	12	14	14	
Motor (HP)	1.5	1.5	3	3	3	3	
Weight (lbs.)	975	1100	1900	2075	2570	2630	
Height (in.)	83	86	94	95	98	99	
Floor Space (in. × in.)	36×19	36×19	55×21	55×21	55×21	55×21	



For Precision High Production Molding

PHI transfer presses are specially designed for precision, high production molding and encapsulation of semiconductors, integrated circuits, capacitors, resistors and countless other electrical and electronic components. Presses are constructed for rugged, heavy duty service and are fully equipped with precision time, temperature and pressure controls for both manual and semi-automatic operation. Virtually every key operating feature you could want or need has been carefully engineered into the press system, and are standard on all models.

			TRANSFER						
	Capa-	Die Space (inches)		Max.	Max. Day-		Capacit (lbs.		
Model	city (Tons)	L-R	F-B	Stroke (in.)	light (in.)	Dia. (in.)	Low	High	Stroke (in.)
T50	50	211/2	211/2	8	24	8	250 to 6,000	6,000 to 25,000	81/2
T75	75	28	28	12	28	10	250 to 6,000	6,000 to 25,000	121/2
T100	100	28	28	12	28	10	400 to 9,000	9,000 to 39,000	121/2
T125	125	28	28	12	28	111/2	400 to 9,000	9,000 to 39,000	121/2



PHI MULTILAYER PRESSES

For years PHI has been the world's leading manufacturer of Multilayer Laminating Presses. The exacting mechanical accuracy, exceptionally precise controls and advanced operating features of PHI presses have made them first choice of printed circuit board manufacturers the world over.

In these new and advanced models, PHI engineers have incorporated scores of important new features...many immediately obvious...many others not so readily apparent ...until you start production. Each of these new features and improvements has been designed to give you superior

operating performance and to significantly increase the quality and production of your multilayer laminates.

Obviously, the more accurately time, temperature and pressure can be controlled, the more consistent and close to perfection will be the multilayer laminates. In these new PHI presses, these parameters...time, temperature and pressure...can be precisely controlled with exceptional accuracy and repeatability. Press operation is far smoother and quieter, and the array of controlling, monitoring, and readout components include the most advanced, sensitive and reliable instruments available.

ELECTRICALLY HEATED PLATENS



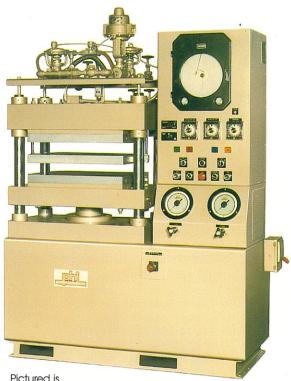
Pictured is Model No. 100R2424-4 Electrically heated platens

Electrically heated presses feature PHI special design platens and digital setpoint temperature controllers with time proportioning and automatic reset for uniform and predictable platen heating.

Heavy duty bolsters, insulated from hot platens, and large diameter ram insure that defelction is kept to a minimum while providing lower hydraulic system pressure resulting in reduced hydraulic maintenance requirements.

Selector switches and timers are provided for either manual or automatic operation.

STEAM HEATED PLATENS



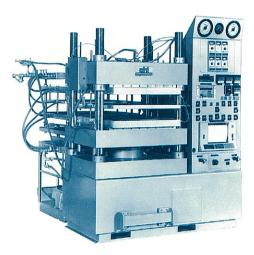
Model No. 75R2418-3 Steam heated platens

Steam heated presses are supplied as standard with steam temperature controller, by-pass valves, steam traps, inlet and outlet manifolds and all components required for a complete system.

Controller includes proportional band adjustment plus automatic reset and will control each platen to within $\pm 4^{\circ}F$ of desired set point in an area one inch in from the platen outer periphery.

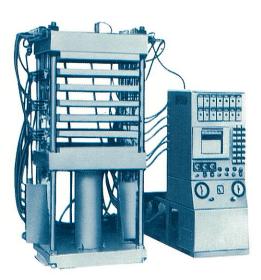
Digital display of platen temperature is included to monitor individual platen temperature or all platen temperatures automatically in a scanning mode, as selected by operator.

SPECIAL MULTILAYER PRESSES



MANUAL HOT TRANSFER PRESS 150 TON CAPACITY

This 150 ton press with 3 electrically heated platens, $30\%'' \times 30\%''$ is equipped with matching cold press for manual hot transfer front to back. Special features include digital display of platen position, microprocessor controller for programming temperature and pressure, provision for adding two openings at a later date and a recorder/data logger featuring math functions, digital printout and alarm functions.



MULTILAYER LAMINATING PRESS 125 TON CAPACITY

This custom designed PHI unit of 125 ton capacity features 7 electrically heated aluminum, hard anodized, platens $36\frac{1}{2}$ x $30\frac{1}{2}$ suitable for operation up to 400° E

Featured for external or process monitoring is a 24 point strip chart temperature recorder. Recorder monitoring points are connected to the side of control panel to include thermocouple plugs and jacks. Press includes all other standard equipment for precision control of time, temperature and pressure.



STEAM HEATED PRESS 150 TON CAPACITY

This 150 ton capacity press with 6 steam heated platens, $24\frac{1}{2}$ " x $24\frac{1}{2}$ ", includes microprocessor temperature programming and led temperature displays.

Also included is the microsense thickness sensor option and temperature recorder. The electrical control features the 5 Tl programmable controller with solid state input/output system for reliability and diagnostic ease.



MASS LAMINATING PRESS 600 TON CAPACITY

This steam heated press features 8 platens $42^{\prime\prime} \times 30^{\prime\prime}$ and is designed for mass laminating of standard prepreg half sheets. Extra heavy bolsters and large diameter ram insure that laminate thickness is uniform. Loader and unloader (not shown) are available for automatic operation.

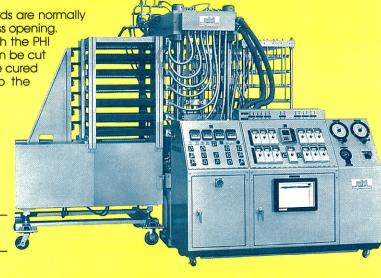


In conventional processing, multilayer boards are normally heated, cured and cooled in the same press opening. Typical cycle time is about 75 minutes. With the PHI hot transfer presses, effective cycle time can be cut to only 30 minutes, because the boards are cured in the hot press, and then transferred to the cooling press.

The need for repetitive hot press cooling, reheating and temperature stabilization is eliminated. Productivity can be increased 250%, and board quality can be improved and maintained.

You Can Increase Productivity 250%

CYCLE FUNCTION	STANDARD ELECTRIC PRESS	TRANSFER PRESS		
Heating Temp. Stabilization	15 min.	0		
Temp. Stabilization	15 min.	0		
Cure	30 min.	30 min.		
Cooling	15 min.	0		
Total Cycle Time	75 min.	30 min.		



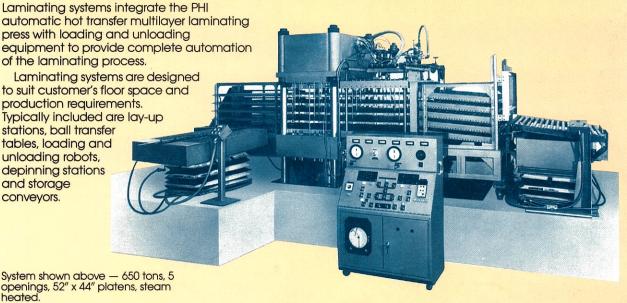
Shown above — 150 ton, 6 opening, 30½" x 30½" platen size, electrically heated platens, Automatic Hot Transfer Press

LAMINATING SYSTEMS

automatic hot transfer multilayer laminating press with loading and unloading equipment to provide complete automation of the laminating process. Laminating systems are designed

production requirements. Typically included are lay-up stations, ball transfer tables, loading and unloading robots, depinning stations and storage conveyors.

System shown above — 650 tons, 5 openings, 52" x 44" platens, steam heated.



REPRESENTED BY:



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