HYDRAULIC PRESS BRAKES

I.T.S

TECHNICAL MANUEL
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1 - GENERAL INTRODUCTION

This document is designed to facilitate the handling, placing operations and connection to the electricity and compressed air supply networks of your ITS or ITPS hydraulic press brake (Figure 1.1).

This publication covers the following models:

- ITS 50/12
- ITS 50/20
- ITS 80/25
- ITS 103
- ITS 125/30

List of available versions:

On ITS 50/12
Type 412 rear thrust block with:

- X axis
- X axis + R1, R2

On ITS 50/20, 80/25, 103, 125/30
Type 600 rear thrust block with:

- X axis
- X + R1; R2
- X axis + R1, R2 + Z1, Z2
## TABLE OF MACHINE CHARACTERISTICS

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<th>UNITES</th>
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<th>50/20</th>
<th>80/25</th>
<th>103</th>
<th>125/3</th>
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<td>2400</td>
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<td>WEIGHT</td>
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<td>3300</td>
<td>4600</td>
<td>6000</td>
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</table>

As AMADA PROMECAM's policy is one of continuous development, all specifications are subject to change without notice.
2 - SAFETY

2.1 - CONFORMITY

Press brakes are shipped from the factory with basic safety equipment including:

- A double foot pedal \((\text{close/open})\).
- A switch-operated mode selector.
- Lateral protection
- Back protection
- Self-supervising electrical and hydraulic circuits
- Optional: equipment for a second operator.

2.2 - SAFETY INSTRUCTIONS FOR PRESS BRAKES

Do not use, adjust or undertake any action on the machine without first having read the instructions.

Observe all safety instructions when using this press.

Do not place hands between tools.

Do not place hands between tools to adjust the back gauge.

Do not operate press if side or rear safety panels are not in place.

Do not remain between the protective pieces and the danger area.

Before any operation make sure that:

- all protective devices are in place
- the operating cycle is correct for the work to be done
- nothing is interfering in-between the tools
- there is open access to the various parts of the machine
- the floor around the machine is free of grease, oil or water.

Make sure that gloves are worn during operation.
2.3 - RULES FOR SAFE OPERATION

Use pliers or any other tooling to help bend small dimension or small width parts. Never place your fingers near the punches.

Remove your hands from the part to be bent after the latter has been pinched between the tools. Otherwise this might result in serious injuries.

Make sure that the operator removes the punches and the tooling in compliance with the procedure described in this manual. Make sure that the motor is stopped at that moment.
Never place your hand between the part and the rear gate while operating your machine.

Never place any part of your body between the die and the punch during a bending operation.

Never try to support the end of the workpiece by supporting it on both sides of the beam.
Take care of sudden rising of the beam. Make sure that the part is bent slowly if it is large.

Make sure that the tools are used within the prescribed safety pressures. The tools might break into pieces and be scattered if the safety pressure is exceeded.

If two operators are to work on the machine, make sure that use of the pedal is limited to the main operator and that the pedals are actuated only after receiving a sign from the other operator; the same caution should be taken for dual control operation.
3 - INSTALLATION REQUIREMENTS

3.1 - ELECTRICAL CONNECTION

The proper operation of an electrical system depends on the quality of the power supply, it should be stable and free of disturbances.

Installation should be planned and carried out so as to meet currently applicable regulations.

3.1.1 - GENERAL MAINS CHARACTERISTICS

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Three-phase current (depending on mains)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>-10% to +10% in stable rating</td>
</tr>
<tr>
<td></td>
<td>-20% to +20% transient rating (20 ms)</td>
</tr>
<tr>
<td>Peaks</td>
<td>50% of nominal value during maximum of 5 ms</td>
</tr>
<tr>
<td>Harmonics</td>
<td>5% maximum</td>
</tr>
<tr>
<td>Frequency</td>
<td>50/60 Hz (depending on mains)</td>
</tr>
<tr>
<td>Electrical power supply</td>
<td>Specialized line to be exclusively reserved for the system from the general LOW VOLTAGE board. The whole system is powered by a single 3-phase cable with earth (possibly also with neutral)</td>
</tr>
</tbody>
</table>

3.1.2 - EARTH

In pursuance with applicable standards any equipment which is not provided with double installation requires an earthing connector. This is also required at operational level and for floor earth drainage of electrical noise interferences.

- The cross section of the earthing conductor must be sufficient. For maximum security earthing distribution should be made in a STAR CONFIGURATION beginning from the power board terminal. As in any other electrical installation the quality of the ground connection should be verified periodically by an approved organization.

- The earthing resistance measured at the bar closest to the earth terminal should be less than 6 ohms.

- The earthing conductor (green and yellow), is reserved exclusively for the system. It is connected directly to the earthing bar.
3.1.3 - INTERFERENCES RELATED TO MAINS AND ENVIRONMENT

**IMPORTANT**

DO NOT UNDER ANY CIRCUMSTANCES WELD A PIECE TO THE MACHINE. YOU COULD DAMAGE THE MECHANICAL, ELECTRICAL AND ELECTRONIC COMPONENTS.

The distribution network introduces some interferences (micro-powercuts, frequency drifts, harmonics, interferences etc...). These might be detrimental to the correct operation of the system.

So, some electronic components might therefore be submitted to abnormal or excessive voltages and currents causing their damage beyond repair.

It may be necessary to provide for some adapter elements without galvanic connection to mains (voltage stabilizer, rectifier, converter, transformer, insulation transformer etc...). If required the quality of this electrical power supply should be checked by an approved organization and analysis of the results should determine the required equipment type.

The following interference must be considered as disturbing for any electronic system:

**Electrostatic discharges**

These are very critical in an environment with relatively low ambient humidity: people or moving assemblies often create a discharge of several thousand volts by touching a door handle or a metal upright or, even worse, the chassis. Therefore, it is necessary to provide for an antistatic environment (anti-static carpet for example).

**Transient on mains power supply**

Transient are electrical noise pulses propagated along the mains leads which may affect system operation. Their origin may be internal: motor, lift, refrigerator, air conditioning unit, fluorescent tube or any other machine generating mains noise; or external: stormy weather, neighbouring plant...

Transient specifications accepted by the system are 50% of the nominal voltage for a maximum duration of 5 ms.

**Stormy weather**

The charges accumulated in stormy conditions result in transient on the mains or on the connecting cables.

**Magnetic fields**

A variable magnetic field induces a voltage into a closed circuit creating considerable interference. Cathode ray tubes are sensitive to magnetic fields. Their sensitivity is materialized by faulty chromatics of the image or of its geometry. These are therefore fitted with a protective shielding.

**Medium- or high-frequency electro-magnetic radiation**

This interference type may be the origin of a large number of problems in the systems (operational amplifiers, DP memory). Generally, the magnitude of such disturbances depends of the radiation duration and intensity. They may be due to RADAR installations (near airports for instance) or to radio frequency transmitters (military, civil, Police, Stations, FM...) or even to defective or badly filtered discharge tubes. Walkie-talkies can produce the same effect when used near input channels. The reference value to be taken into consideration corresponds to an 0.2 to 0.5 V/M field in a frequency range of 10 KHz to 1 GHZ.
3.1.4 - CHARACTERISTICS OF THE MACHINE POWER SUPPLY CABLE

<table>
<thead>
<tr>
<th>MODELS (in tons)</th>
<th>POWER CABLE (section in mm² for a line ≤ 20 meters)</th>
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</thead>
<tbody>
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<td>50</td>
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<tr>
<td>80/100</td>
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</tr>
<tr>
<td>125</td>
<td>6</td>
</tr>
</tbody>
</table>

We recommend the installation of a circuit protector or breaker at the head of the line.

Cable may be led in from the floor (fig 3.2) or on an aerial line (fig 3.1).

The power cable should, in no event, pass through the control box or channel located on its front.

The main switch located in the electrical cabinet is designed to receive up to three safety padlocks. We advise that you immediately install a lock so as to prevent untimely power-up.

3.1.5 - CHECKING THE POWER SUPPLY VOLTAGE

Check your mains voltage. This value should be specified to the AMADA agent who will connect and start your machine.
3.2 - PNEUMATIC SYSTEM

Pneumatic installation is required if your machine is fitted with the "all or nothing" traverse motion.

- Network pressure: 6 bars + 1
- Maximum rate
- Flow: 5 liters/minute under 6 bars

COMPRESSED AIR SUPPLY DIAGRAM

For reference:

Your machine is fitted with a "filter - pressure valve - lubricator" conditioning assembly (if the "all or nothing" traverse motion system is installed).

Periodic control

You should check the levels in the filter and lubricator elements regularly.

Top up when unpressurized using one of the following lubricants:

<table>
<thead>
<tr>
<th>TYPE OF OIL</th>
<th>VISCOSITY RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP ENERGOL HLP10</td>
<td>Class ISO VG 10</td>
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<tr>
<td>ESSO Spinesso 10</td>
<td>ISO 3448</td>
</tr>
<tr>
<td>SHELL TELLUS C10</td>
<td></td>
</tr>
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</table>
4 - SITE AND ENVIRONMENTAL PREPARATION

Press brakes installation requires a stable, rigid ground surface.

Flooring in the work area should be a 50 mm thick concrete slab, with a plane surface (*maximum tolerance 2 mm per meter*). For the installation conditions please consult our technical department.

Access to the press should be provided on all four sides:
- At the back leave a space of approximately 1 meter for maintenance operations and adjustments.
- On at least one of the sides provide for a space slightly above the maximum bending length, so that lateral withdrawal removal of some parts is allowed on the whole press brake length (*dimension A, Figure 1*).

Please see chapter on characteristics for other specifications.

<table>
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<tr>
<th>MACHINE</th>
<th>A</th>
<th>B</th>
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<td>50/20</td>
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<td>80/25</td>
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<td>3000</td>
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<td>125/30</td>
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5 - INSTALLATION

5.1 - INSTRUCTIONS PRIOR TO HANDLING AND INSTALLATION

5.1.1 - PREPARATION OF THE INSTALLATION FLOOR

Once the location is prepared, carefully sweep the area to be occupied by the press.

5.1.2 - FORBIDDEN OPERATIONS

In no case should handling accessories (slings, hooks, straps, etc.) be attached to the following components:

- Upper beam
- Lower beam
- Electrical cabinet
- NC Cabinet
- Bending Depth control (ITS)
- Pressure limiter (ITS)
- Mechanical protectors on:
  - Goose neck
  - back of machine
  - Hooding
  - Back gauge

Please see section 5.3.2 to identify the areas recommended for floor support.

IMPORTANT

CERTAIN PARTS OF THE MACHINE (ESPECIALLY ITS NUMERICAL CONTROL IF FITTED) ARE NOT DESIGNED TO WITHSTAND THE WEIGHT OF A MAN WITHOUT DEFORMATION. THEY ARE INDICATED BY A TAG AS ILLUSTRATED ON FIG. 5.1

Figure 5.1
5.2 - HANDLING

5.2.1 - BASIC PRINCIPLES

The lifting efforts should only be applied at the slinging points provided for this purpose (Fig. 5.2).

**LOAD DISTRIBUTION RELATED TO SLING ANGLE**

| Example A | (45° angle) 50% of load weight on each sling arm.
| Example B | (90° angle) 75% of load weight on each sling arm.

**DO NOT EXCEED AN ANGLE OF 90°.**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>CENTRE OF GRAVITY</th>
<th>E</th>
<th>WEIGHT IN KG</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>Y</td>
<td>Z</td>
</tr>
<tr>
<td>50/12</td>
<td>810</td>
<td>670</td>
<td>525</td>
</tr>
<tr>
<td>50/20</td>
<td>915</td>
<td>670</td>
<td>710</td>
</tr>
<tr>
<td>80/25</td>
<td>1005</td>
<td>670</td>
<td>700</td>
</tr>
<tr>
<td>103</td>
<td>1120</td>
<td>670</td>
<td>770</td>
</tr>
<tr>
<td>125/30</td>
<td>1140</td>
<td>670</td>
<td>770</td>
</tr>
</tbody>
</table>

Add approximately 500 Kg if your machine is fitted with a numerically controlled back gauge.
5.2.2. - Handling Accessories

The handling operations are to be performed as follows:

a) Use lifting means such as travelling bridges or cranes. Use the slinging point (40 mm diameter holes on each upright). These holes can directly receive the shackles where the lifting slings will be secured.

b) If no appropriate lifting equipment is available the press may be moved on small tractors (Fig 5.3).

In this case carefully comply with the allowed bearing points:

![Diagram showing allowed and forbidden areas](image)

**IMPORTANT**

ANY HANDLING OR SELECTION OF BEARING/ANCHORING POINT OTHER THAN THOSE SHOWN ON THE ABOVE DIAGRAMS ARE FORBIDDEN. ANY INCIDENT RESULTING FROM NON-COMPLIANCE WITH SUCH INSTRUCTIONS MAY RESULT IN SUSPENSION OF THE GUARANTEE.
6 - LEVELLING OF THE MACHINE

Carefully follow the procedure given below to level your machine correctly.

Provide two 150 X 150 X 5 mild steel shims.

![Diagram](image)

According to the date on which the machines are manufactured, screws refs. 1 can be located either inside or outside the frame.

With the machine laid directly on the floor, test its horizontality with a spirit level placed successively in N1 and N2.

A 2 mm per metre level fault (*in N1 and N2*) is acceptable.

**IMPORTANT**

THE MACHINE SHOULD NEVER REST ON OTHER SUPPORTS THAN C1, C2, C3. SCREWS REF 1 SHOULD NEVER BE USED TO CORRECT THE LEVEL. THEIR ONLY TASK IS TO ENSURE THE TRANSVERSE STABILITY OF THE MACHINE. FOR SPECIAL INSTALLATION CONDITIONS REFER TO OUR TECHNICAL DEPARTMENT.
Commissioning of the machine is ensured by our Technical Department.

For commissioning, prepare some sheet metal plates for testing: 200 mm wide strips, length depending on your machine capacity.

Select sheet metal nature and thicknesses generally used for your production requirements.

**IMPORTANT**

AS WE ENSURE INITIAL START UP OF THE MACHINE, ANY USE OF THE MACHINE BEFORE ARRIVAL OF OUR TECHNICIANS WILL RESULT IN THE SUSPENSION OF OUR WARRANTY. THIS SUSPENSION WOULD BE LIFTED ONLY ONCE THE MACHINE HAS BEEN TESTED AND, IF NEED BE, REPAIRED AT THE CUSTOMER'S EXPENSE.
So as to ensure long life for the electronic and hydraulic components, the minimum and maximum temperatures to be observed are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Mini</th>
<th>Maxi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temp.</td>
<td>-10°C</td>
<td>+50°C</td>
</tr>
<tr>
<td>Cabinet use ambient temp.</td>
<td>+5°C</td>
<td>+50°C</td>
</tr>
<tr>
<td>Oil temp.</td>
<td>+5°C</td>
<td>+80°C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>20%</td>
<td>75%</td>
</tr>
</tbody>
</table>

For temperatures below 5°C the electronic cabinet must be left ON so that components and circuit can remain at a normal temperature.
9 - TECHNICAL DESCRIPTION

9 - 1 MECHANICAL STRUCTURE

made of:

1) A welded frame including
   - 2 uprights items 1, 1',
   - 1 sole item 2,
   - 1 table item 3,
   - 1 front plate item 4.

2) Movable mechanical elements:
   - 1 upper beam item 5,
   - 1 lower beam item 6,
   - 1 front support item 7.
9 - 2 MECHANICAL CONNECTIONS

9 - 2 - 1 UPPER BEAM

The upper beam is supported by ball and socket joints resting on each of the uprights. Transverse adjustment is made using eight push-pull mechanisms that also serve to adjust table linearity.

9 - 2 - 2 FRONT SUPPORT

The front support rests on the uprights via ball and socket joints for 80/25, 103 and 125/30 machines, and via jacks for 50/12 and 50/20 machines.

9 - 2 - 3 JACKS

The number of jackscrews is:
- 1 on 50/12 and 50/20 machines
- 2 on 80/25 and 103 machines
- 3 on 125/30 machines.

Their functions are to:
- transmit the force needed for bending to the lower beam
- separate the front plate and the front support
- provide lateral guidance for the lower portion of the lower beam.

The jack(s) rest on the front plate and front support via ball and socket joints.

9 - 2 - 4 UPPER GUIDE

The upper guide is designed:
- to separate the front plate and the front support.
- to provide lateral guidance to the upper portion of the lower table.
- to provide the lowermost endstop for the lower table.

9 - 2 - 5 LATERAL GUIDANCE

- it ensures strict parallelism of the lower beam stroke
- to provide a reaction to offset loads.

Lateral guidance is provided:
- by 8 bearings on 50/20 machines,
- by 8 sectors on 80/25, 103 and 125/30.

9 - 2 - 6 TRANSVERSE GUIDANCE

It provides:
- correspondence between the functional axes of the punches and dies along the lower beam stroke.
9 - 3  Y AXIS MECHANISM

The end-of-bending level is obtained by actuating the hydraulic valve (hydraulic back gauge) which discharges the pump system when bending is completed.

9 - 3 - 1 MANUAL CONTROL

Manual control is done by means of a crank with a graduated vernier on which each division represents a 0.02 mm penetration of tools.

9 - 3 - 2 MOTOR-ACTUATED CONTROL

Control of this valve can be motor-driven. The motorization consists of a compact assembly attached to the left upright, instead of the manual control.

The D.C. motor (item 1) transmits the rotational motion from the pinions (items 2 and 3) to the screw (item 4). The spacer (item 5) locks the nut (item 6) in place so that it will not turn. The control rod (item 7) is pushed by the nut.

Movement of the valve control rod is controlled by the encoder (item 8), which is coupled to the motor.

The knob (item 9) is used to manually adjust the end-of-bending level.
9-4  SPEED SEQUENCE

Your press brake is factory-fitted with a speed change device* which changes speeds during closing. This device consists of a safety element and must be adjusted as a function of the height of the die and the thickness of the worksheet to be bent. There must be a maximum clearance of 6 mm between the tip of the punch and the worksheet.

An adjusting cam fitted with a locking knob can be accessed through the door located on the lower right cover of your machine. This door is key-locking. Raising of the cam determines a lower sequence level and vice-versa.

* The approach and working speeds are listed in the table of general characteristics. The adjustment must be made in relation to the height of the tools used and the thickness of the worksheet.
10 - REAR GAUGE ASSEMBLIES

10 - 1 DESCRIPTION

Mechanical part of the back gauge assembly.

The mechanical part of the back gauge unit is made up of a compact assembly attached to the lower beam on the press. A DC motor (item 4) is attached to the rear of the compact assembly, and transmits movement via notched belts (item 5) to one (model 412) or two (model 600) ball screws.

The rotation of the ball screws moves the mobile crosspiece.

A group of casings (item 9) protect the mechanisms in the rear gauge assembly unit and provide operator safety.

Two proximity detectors (items 6 and 7) front and rear stop the movement at the end of the strokes.

Positioning of the sheet is regulated by the two slide runners (item 10) that are adjustable over the entire length of the slide guide plate (item 1). Each slide runner is fitted with stop finger articulated upward.

An encoder (item 8) coupled to the motor (item 4) generates counting and resetting signals.

Motor driver on stop fingers:

The mobile fingers are motor driven to provide programmed and automatic vertical movement for the stay following a predetermined sequence over the entire length of the stroke (150 mm).

Via a belt, a DC motor transmits movement to a threaded bolt (master bolt) which moves the stop finger. The end of the lower stroke is controlled by a proximity detector used to realign the assembly.
10 - 2 REAR GAUGE ASSEMBLY MECHANISM ON MODEL 412

1 - Slide guide plates
2 - Guide spindles
3 - Ball screw
4 - Motor
5 - Transmission system
6 - Inductive sensors
7 - Detector
8 - Encoder
9 - Casing
10 - Slide
10 - 3 REAR GAUGE ASSEMBLY MECHANISM ON MODEL 600

1 - Slide guideplate
2 - Guide spindles
3 - Ball screw
4 - Motor
5 - Transmission system
6 - Inductive limit switches
7 - Adjustment sensor (ITPS only)
8 - Encoder
9 - Casing
10 - Slides
**X AXIS**

<table>
<thead>
<tr>
<th>GAUGE</th>
<th>STROKE (in mm)</th>
<th>SPEED (in mm/sec)</th>
<th>POSITIONING ACCURACY (in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ITS</td>
<td>ITPS</td>
</tr>
<tr>
<td>412</td>
<td>400</td>
<td>160</td>
<td>200</td>
</tr>
<tr>
<td>620</td>
<td>600</td>
<td>± 5</td>
<td>± 5</td>
</tr>
<tr>
<td>625</td>
<td>600</td>
<td>± 5</td>
<td>± 5</td>
</tr>
<tr>
<td>630</td>
<td>600</td>
<td>± 5</td>
<td>± 5</td>
</tr>
</tbody>
</table>

**R1 AXIS, motor-driven R2**

<table>
<thead>
<tr>
<th>GAUGE</th>
<th>STROKE (in mm)</th>
<th>SPEED (in mm/sec)</th>
<th>POSITIONING ACCURACY (in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ITS</td>
<td>ITPS</td>
</tr>
<tr>
<td>412</td>
<td>130</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>620</td>
<td>± 10</td>
<td>± 5</td>
<td>± 5</td>
</tr>
<tr>
<td>625</td>
<td>± 10</td>
<td>± 5</td>
<td>± 5</td>
</tr>
<tr>
<td>630</td>
<td>± 10</td>
<td>± 5</td>
<td>± 5</td>
</tr>
</tbody>
</table>

* This value is also applicable to axes R1 and R2 in the manual version.

**Z AXIS**

<table>
<thead>
<tr>
<th>GAUGE</th>
<th>STROKE (in mm)</th>
<th>SPEED (in mm/s)</th>
<th>DISTANCE BETWEEN FINGERS</th>
<th>ACCURACY (in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ITS</td>
<td>ITPS</td>
<td>Max.</td>
</tr>
<tr>
<td>412</td>
<td>510</td>
<td>(manual)</td>
<td>(manual)</td>
<td>105</td>
</tr>
<tr>
<td>620</td>
<td>895</td>
<td>± 150</td>
<td>± 170</td>
<td>105</td>
</tr>
<tr>
<td>625</td>
<td>1395</td>
<td>± 5</td>
<td>± 10</td>
<td>105</td>
</tr>
<tr>
<td>630</td>
<td>1815</td>
<td>± 5</td>
<td>± 10</td>
<td></td>
</tr>
</tbody>
</table>
11 - LOCATION OF CONTROL DEVICES

11 - 1 ON THE ELECTRICAL CABINET

A: Machine identification tag
B: Bending chart
C: Approval plate
D: Master switch
E: ON indicator light
F: Motor start-up control
G: Green motor start-up indicator light
H: Cycle selection
I: Plotting stop control
J: Coining selection (Hydraulic back gauge time delay deletion)
K: Control with or without numerical control
L: Automatic pressure holding control
M: Hour meter
N: Fan
O: Radius bending selection
11 - 2 START-UP

- Turn master switch (D); the white indicator light (E) lights up.
- Turn motor starting key (F); the green indicator light (G) lights up.

If the machine has numerical control:

- Put switch (K) on numerical control position.
- The numerical control lights up and makes a sound modulation.
- The numerical control is then ready to be reset.

11 - 3 DESCRIPTION OF CYCLES

THE OPENING PEDAL OVERRIDES IN ALL CASES.

Above the mute level, the opening pedal must be held down in order to open.

Below the mute level, the opening pedal must be released. In this case, the press is open to B.D.C. as set.

CYCLE 1 : adjustment

- Means of control: pedal
- Cycle selector (H) on position 1
- On all travel: working (operating) speed
- Stoppage at mute level if the selection was made on selector (I)

CYCLE 2 :

- Means of control: pedal
- Cycle selector (H) on position 2

BREAKDOWN OF CYCLE

- Closure at approach speed up to mute level.
- May or may not stop at sequence level (selection made by switch (I))
- Closure at working speed.
- Automatic pressure holding or pressure holding by pedal, according to selection made on selector (L).
- Automatic decompression.
- Opening at high-speed down B.D.C. as set.

RELEASE OF THE PEDAL DURING THE CLOSURE PHASE CAUSES THE BEAM TO STOP IN WHATEVER POSITION IT IS FOUND.
CYCLE 3:
- Means of control two-hand control + pedal.
- Cycle selector (H) on position 3.

BREAKDOWN OF CYCLE
- Closure at approach speed up to mute level, by means of two-hand control panel
- Mandatory stoppage at sequence level
- Release of two-hand control
- Closure at working speed above mute level, by means of pedal
- Automatic pressure holding or pressure holding by means of pedal, according to selection made on (L)
- Automatic decompression
- Opening at high-speed up to B.D.C. as set.

RELEASE OF THE CONTROL MEANS DURING THE CLOSING PHASE CAUSES THE BEAM TO STOP IN WHATEVER POSITION IT IS FOUND.

CYCLE 4:
- Means of control: two-hand control panel
- Cycle selector (H) on position 4.

BREAKDOWN OF CYCLE
- This cycle is exactly like cycle 2; the only difference is in the selection of the means of control.
11 - 4  ON NC CONTROL PANEL (OPTION)

Function keys:

- KEY: X  Programing of axes, items 1, 2 and 3 (white)
- KEY: Y  REAR GAUGE BLOCK, item 1 (white)
- KEY: AUX  TOOL PENETRATION (2) (white)
- KEY: AUX  AUXILIARY AXIS, item 3 (white)
- KEY: REAR GAUGE BLOCK WITHDRAWAL TIME DELAY (4) (white)
- KEY: AUXILIARY FUNCTION PROGRAMMING (5) (blue)
- KEY: FAST MOVEMENT OF AXES IN MANUAL MODE (6) (blue)
- KEY: FORWARD, REVERSE, UP, DOWN CONTROL IN LOW-SPEED MANUAL MODE (7 and 8) (blue)
- KEY: PROGRAM CALL (9) (yellow)
- KEY: PROGRAM STEP CALL (10) (yellow)
- KEY: ACCESS TO AXIS SETTING AND CALIBRATION VALUE PLUS EMERGENCY STOPPAGE (11) (red)
- KEY: DIRECT STORAGE OF CURRENT POSITION OF AXES IN MEMORY (setting) (12) (yellow)
- KEY: ACCESS TO INCH OR MM CONVERSION (this operation lights up the corresponding LED) (27 and 13) (yellow)
- KEY:   [NR]   NUMBER FOR RECALLING A PROGRAM STORED IN EXTERNAL MEMORY (14) (yellow)

- KEY:   [←]   TRANSFER FROM NUMERICAL CONTROL MEMORY TO EXTERNAL MEMORY (16) (yellow)

- KEY:   [→]   TRANSFER FROM EXTERNAL MEMORY TO NUMERICAL CONTROL MEMORY (yellow)

- KEY:   [♀]   DATA CANCELLATION (25)

- KEY:   [+]   CORRECTION OF DATA ON X AND Y AXES (26)

- KEY:   [−]   CORRECTION OF DATA ON X AND Y AXES (26)

- KEY:   [●]   WRITE OF DIMENSIONS, WITH DECIMALS, ON X AND Y AXES (comma decimal function) (26)

- KEY:   [START]   STARTS ACTIVITY EXECUTION (resetting, program start) (31)

- KEY:   [□]   OPERATION IN AUTOMATIC MODE (28)

- KEY:   [♀]   DATA READ AND PROGRAMMING and program recall (29) (WRITE MODE)

- KEY:   [♀]   MANUAL CONTROL OF MOVEMENT AXES (30)

NOTE:
Use of certain keys is associated with the intervention of a sound warning which indicates that a cycle is being executed, that an operation has been completed, or that an operation is being carried out under abnormal conditions.
11.5 - USE OF THE LIGHT GUARD

UK safety standards
- Guard only
- Single break
- Double break

ELEMENT FOR SELECTION OF THE CYCLE AND CONTROL MODE
- GUARD CONDITION INDICATOR LIGHTS

- GUARD CONTROL BOX

- CYCLE SELECTOR

(Locate on numerical control panel - ITPS)

1. Manual (slow speed)
2. Normal
3. Single/double break
4. 2 hand operation (not used in the UK)
11.5.1 Guard Mode Only

The guard has a safety function only

The control box selector is set to "guard only"

The cycle selector is set to "1" or "2"

1st example

EVERYTHING OK - The bending cycle can start

2nd example

OR

REQUIRES RESET

The cycle can only start after guard reset
RESET PROCEDURE

- Press pushbutton "GUARD RESET"

- Interrupt the guard once or twice.

a) "Guard Reset" remains on:

- The beam has not reached the bottom dead point
  Fully press the "opening" pedal to teach the bottom dead point.

- Press GUARD RESET - The indicator light comes off. The green indicator light of the guard is on
  The bending cycle can start.

CYCLE SEQUENCING

Press the "closing" pedal
2 situations may occur:

a) There is no interruption of guard during the approach phase:

The press brake closes down to the mute level. Once this level is reached, the amber indicator light of the guard comes on, and the green indicator goes off.

From that moment the light guard is inoperative, (since the press brake is in the safety area), and the "GUARD OFF" warning light will come on.

The bending sequence can then take place. After bending the press brake is brought down to the bottom dead point.

Once the press brake has reached the bottom dead point, everything is O.K. and the next cycle can start: Interrupt the guard once, the machine is then reset (green light is on).

b) If the guard is interrupted during the approach stroke: the cycle is stopped, the ram falls away and a reset of the guard is necessary, (see guard reset).
11.5.2. - "SINGLE BREAK" MODE

(The guard has a safety function and a control function)

Switch the control to selector to position: "SINGLE BREAK"

Switch the cycle selector to position: CYCLE 3

1st example

![Diagram 1st example]

EVERYTHING OK - The bending cycle can start

2nd example

![Diagram 2nd example]

RESET - The cycle can start only after reset

In this case proceed in the same way as described in paragraph "GUARD ONLY" i.e., by positioning the press brake at the bottom dead point.
CYCLE SEQUENCE
Interrupt the guard once. The green indicator light comes on. The press brake closes fast and stops at the mute level.

a) During this phase, if the guard is interrupted, the closing stroke stops and the ram falls away. A reset is necessary, (see reset).

b) If there is no interruption of the guard during the approach stroke, the cycle is completed by pressing the "closing" pedal above the mute point.

Once the press brake has reached the bottom dead point, everything is OK and the next cycle can start: interrupt the guard once.

11.5.3. DOUBLE BREAK MODE
(The guard has a safety function and a control function)

- Switch the Control box selector to position 2: "DOUBLE BREAK"

- Switch the Cycle selector to position 3: CYCLE 3

1st example

2nd example
In this case proceed as described in paragraph "GUARD ONLY" i.e., by positioning the press brake at the bottom dead point.

I.T.S - LOCATION OF CONTROL DEVICES
CYCLE SEQUENCE
Same operation as in "SINGLE BREAK" mode except that the guard has to be interrupted twice before initiation of the press brake.

WARNING
During the first cycle, one SINGLE guard interruption initiates the machine cycle.

11. 5. 4 - IMPORTANT
1) In the "SINGLE BREAK" and "DOUBLE BREAK" cycles, once the cycle is completed if no other operation is performed and after 30 seconds", the "GUARD RESET" push button comes on.

The selector switch must be positioned back to "GUARD ONLY"; press "GUARD RESET", set the selector to the required cycle 1 or 2, and interrupt the guard once.

* The timing relay KA 21 inside the electrical panel is set to 30 seconds, which is assumed to be the normal component cycle time. This should be adjusted for greater or lesser cycle times so that if the machine is not initiated within this period, the controls will revert back to normal means of initiation.

This is a safety feature and should be adjusted by a competent person.

2) The mute position ("GUARD OFF"), should be set at a point just above the material thickness which is being processed. Under no circumstances can it be set at more than 6mm above material thickness.

3) The distance bars fixed to the front of the machine are to prevent any person walking through the light curtain and Auto initiation occurring. They should be maintained in their present condition and should not be removed under any circumstances.
12 - MB NUMERICAL CONTROL (OPTION)

12 - 1 DESCRIPTION

The MB numerical control is a very simple option, ideal for increasing the productivity of a Promecam AMADA press brake.

The MB numerical control manages 1, 2 or 3 axes (X, Y, R or Z). There are 4 different versions.

A self-diagnostic program, linked to the appearance of numbered error messages, facilitates usage and maintenance of the numerical control.

12 - 2 GENERAL CHARACTERISTICS OF THE MB NUMERICAL CONTROL

- The numerical control unit accepts up to 81 program steps.
- 380/220 V supply voltage, three-phase, 50/60 Hz current.
- Power consumed, according to case of usage, either 300 or 500 W.
- Display of 1 to 30 program steps.
- Alphanumeric display.
- Values shown on display.
- Memory capacity: 9 programs. The number of bends stored in memory can include up to 81 steps.
- Operating mode: manual or automatic.
- Programming mode.
- Data recording format: X axis: 999.9 mm; Y axis: 99.99 mm; AUX axis: 999.9 mm
- Automatic conversion of data stored in inches or millimeters.
- Visual and sound signal in case of operating errors.
- Automatic recalibration.
- Programming of up to 8 machine functions.
- Backup of programs in external memory.
- Unlimited duration of memories.
- Incremental positions sensors.
12 - 3 MANAGEMENT OF AXES

There are 4 versions of the MB computerized numerical control (CNC).

1) 1-axis MB CNC:
   - management of X axis

2) 2-axis MB CNC:
   - management of X and Y axes

3) 3-axis MB CNC:
   - management of X, Y and R axes

4) 4-axis MB CNC:
   - management of X, Y and Z axes

* There is an all-or-nothing pneumatic R option, which positions the stop finger 15 mm apart.
12 - 4 OPERATING DIAGRAM

Control panel

Power control plate

Encoder

Encoder

Start cycle switch on depth control, referred to as "hydraulic gauge block"

380 or 220 V power supply
12 - 5 CHARACTERISTICS OF COMMAND AND CONTROL PANELBOARDS

The logic unit consists of six boards, the functions of which are listed below.

12 - 5 - 1 E5 POWER SUPPLY BOARD (AL3)

Receives the power supplies coming from the "AU" (emergency stop) power supply board. These power supplies are filtered and stabilized on this board in order to obtain constant voltages for operation of the entire positioning assembly.

Stabilized voltages:

+ 5V - power supply of integrated circuits
+ 12V - 12V - power supply of circuits with special technical characteristics requiring these voltages for their operation
- 30V - 12V - supply voltages for ER 3400 memories.

12 - 5 - 2 E4 MOTOR BOARDS (Mot)

The E4 motor board has three independent circuits whose function is to control the speed and direction of each motor.

12 - 5 - 3 E3 MICROPROCESSOR BOARD (Mu)

The E3 microprocessor board controls all the functions of the equipment. These functions are microprocessor-controlled by means of a software program stored in the memories of this board. The microprocessor board can interact with a group of logic circuits through the input and output buses.

12 - 5 - 4 E2 INTERMEDIATE BOARD (Int)

A series of integrated circuits are located on the intermediate board; these circuits receive the square wave signals, phase shifted among themselves by 90°, produced by the incremental sensors (X-Y axes), and transformed on output into pulses that are counted by the microprocessor.

In addition, other types of integrated circuits receive instructions from the microprocessor; they are decoded to select the ER 3400 memories, which contain all the data from the work program. A system of integrated circuits decodes signals for machine functions; other logic circuits transmit the motor speed command to the motor board.
12 - 5 - 5 E1 FRONT PANEL BOARD

The front panel of the command and control unit consists of:

- a keyboard numbered from 0 to 9 for entering data.
- operating push-buttons for selecting the type of machine operation.
- a group of function keys to store data and other special instructions.
- digital and alpha-numeric displays used to display the data entered and to execute other operations.
- a locking socket, onto which is mounted the removable memory for transfer of data.
- a sound signal.

12 - 5 - 6 E6 BASIC BOARD

All the boards above are attached by means of connectors to the basic board, which connects them to each other.

CONTROL BOARD CHARACTERISTICS (power cabinet)

The boards listed below are control boards.

12 - 5 - 7 E8 SETTING BOARD (CMT)

The E8 setting board includes control circuits with double-thyrister triggers (SCR) and an analog stabilization circuit for the current loop.

12 - 5 - 8 E10 CONSTANT-CURRENT REGULATOR BOARD

The E10 constant-current regulator board has a control circuit with thyristors (SC) and a current loop detector.

12 - 5 - 9 E9 REGULATOR BOARD (APP3)

12 - 5 - 10 E7 POWER SUPPLY BOARD (AU)

The E7 power supply board has a hexa-phase Graetz bridge, a +9 V stabilized circuit and integrated circuits for stabilization at +12 V.
13 - BENDING TECHNIQUES

There are two basic bending techniques:

- Air bending

Usually used because it requires relatively low forces.

- Coining:
Requires forces equal to 4 or 5 times that of air bending; nevertheless makes it possible to obtain a remarkable angular accuracy by die stamping the inside radius, which cancels the elasticity of the metal.

13 - 1 AIR BENDING

During bending, the worksheet maintains part of its elasticity. It is therefore necessary to execute a more closed angle than the angle required, in order to compensate for the opening due to this phenomenon. The computer integrates all the parameters required for air bending. Our standard air bending tools are designed in light of this. The bending chart on the electric cabinet of the press shows the forces required and the inside radii obtained as a function of the other characteristics (thickness and quality of worksheet, die opening, etc.).

a) Partial air bending: The deformation of the worksheet is interrupted before the worksheet is brought to the penetration limit in the die. The worksheet is in contact with the tools at three points, A, B and C, as shown in the figure below. The practical result of this special feature is that it maintains the quality of the bending: Die = 8 to 10 times \( t \) (for angles \( \geq 135^\circ \), it is preferable to use die = 10 to 12 times \( t \)).

![Diagram of Partial Air Bending]

NOTE:

If a special angle is required, tools can be made at the bending angle, which brings us to the technique referred to as "air bending in die bottom".

b) Air bending in die bottom: to make 90° bends. In this case, the worksheet goes down to the bottom of the die and rests against its sides. This leads to an increase in the force required.

NOTE:

This type of bending generally applies to worksheets greater than 2 mm thick.
13 - 2 COINING

This type of bending is comparable to stamping. The punch tip, when at the bottom of the die, breaks the elasticity of the worksheet, which then takes on the exact form of the punch.

In practice:
- for 90° bends
  - width of die: 5 to 6 times thickness
  - angle die: 90°
  - angle punch: 90°

- NOTE:

Very strong forces must be used. These may go as high as 4 to 5 times the forces shown on the air bending chart. This type of bending generally applies to worksheets up to 2 mm thick.

EXAMPLE OF TOOLING SELECTION

a) For ≤ 90° bending
- thin metal sheet (400 N/mm²)
- 1.5 mm thick
- 12/60° die
- 60° punch, 0.8 mm radius

b) For ≥ 90° bending
- 150°, for example
- thin metal sheet (400 N/mm²)
- 1 mm thick
- 12/60° die
- 60° punch, 0.8 mm radius
PUNCHING TECHNIQUE

The gooseneck or special assemblies on the machine can be used to carry out punching, notching, etc. operations. Nevertheless, certain rules should be observed in order to avoid accidents involving the press and so that operations can be carried out correctly.

The force used for punching must be limited to the values listed in the chart below.

We recommend that you symmetrically step punches on the axis of the press. By placing the units at several different levels, the punching capacity will be multiplied by the number of levels. The instantaneous force should in no case exceed the values listed in the chart.

Insofar as possible, punch grinding should be progressive.

FOR ALL PROBLEMS CONCERNING PUNCHING AND BENDING, WE RECOMMEND THAT YOU CALL THE TECHNICIANS IN OUR SALES ENGINEERING DEPARTMENT.

The values in the chart are understood to be for punches symmetrically distributed in relation to the axis of the beams.
13 - 4 MOUNTING TOOLS

We strongly recommend that the order of assembly be kept to, for reasons of facility and safety.

1) Die or vee (V)
2) Punch or counter-vee (CV)

13 - 4 - 1 MOUNTING DIES

The dies are slid on the resting plane of the lower beam and locked home in place by the front plates. The rear plates are the vertical reference surface and must never be unlocked.

For dies with two vees, loosen their lock screws before making the punches.

13 - 4 - 2 ASSEMBLY OF FILLER BLOCK

Caution: When assembling a feeder bush, make sure that the flat brackets (slick brackets section) are at the back of the resting plane of the lower beam. These brackets must in no case be unlocked.
**13 - 4 - 3 Assembly of Punches (Punches without Safety Grooves)**

- Set cycle selector on position 1.
- Press closing pedal.
- Hold down closing pedal to adjust stoppage level of lower beam (sequence or mute) using the hydraulic gauge control (vernier wheel or knob, depending on machine type. See section 9.3).
- The stoppage level must correspond to the height dimension of the punch-die assembly.

- Keeping the closing pedal pushed down, unlock the low gauge assembly by half a turn, then tighten it back.

- Release closing pedal.
- Press down opening pedal. This action makes the lower beam go down by a few millimeters. The clearance thus obtained makes it possible to slide in the punches, which then lie in die bottom.
- Slightly screw in the force limiter control (pressure regulator) until the moving beam rises.
- Completely disengage bending depth control (clockwise direction), to tool contact.
- Turn two more times.
- Tighten force limiter control (clockwise direction) until required force is obtained on pressure gauge (black scale).

**CAUTION**

The maximum permissible force depends on the type of tool used; refer to the tool list.
13 - 4 - 5 DISMOUNTING TOOLS

Tools must be assembled in the following order:

a) Dismounting of punches
b) Dismounting of dies

- Set cycle selector to position 1.
- Press down closing pedal. Without releasing pedal, use the hydraulic gauge assembly control to adjust level of lower beam, so that punch and dies are in contact, then loosen and tighten the low gauge block control.
- Press down opening pedal. The clearance obtained between the tools makes it possible to slide in the punches through one of the ends of the beam.

* STORAGE OF TOOLS:

- To protect the working edges of your tools, we advise that you store them in a special box near the press and set them on wooden slats or soft materials.
- In case of dismounting adjustable intermediate sets for special reasons, replace these parts in order and in their respective locations.
- Dismount dies.

13 - 4 - 6 TOOL ADJUSTMENT

After turning on your press:
- Set press on cycle 1 (H switch)
- Set plot stoppage (I) switch to 1.
- Press down closing pedal. The lower beam rises to the sequence level initially set.

Check distance between punch tip and worksheet.

Actuate opening pedal to bring down beam.

Set adjusting cam so that there is a maximum of 6 mm between the punch and the worksheet (Fig. 1).

Bringing the cam back up brings about a higher sequence level.
### LIST OF STANDARD PROMECAM AMADA TOOLS

The height of the die-punch assembly can be corrected in relation to the filler block selected. See section 7.3.1 for the various assemblies.

*Crushing tools.

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PUNCHES

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14 - USE WITHOUT NUMERICAL CONTROL

14 - 1 PRELIMINARY OPERATIONS

Before carrying out any bending operations, it is necessary to define:

The bending technique:

- air bending
or
- coining (see section 13)

14 - 2 IMPORTANT RECOMMENDATIONS

In order to avoid any accident during bending operations, it is imperative that the instructions below be followed:

a. Never run the pump when there is no oil in the tank.

b. Never use the pressure regulator on the bending depth setting.

c. Do not exceed the maximum permissible force for tools.

d. After usage, completely loosen the pressure regulator and the hydraulic gauge control.

14 - 3 TURNING ON AND OFF

See section 11.2.

14 - 4 MUTE LEVEL SETTING (SEE SECTION 13.4.6)
14 - 5 PRESSURE REGULATOR SETTING

The regulator control makes it possible to set the required force.

This operation is carried out by actuating the regulator control.

The force is checked on the pressure gauge.

The pressure gauge has two graduated scales, continuously giving the following information:

- The force in tonnes, given by the small side of the needle, on the black scale,
- The minimum bending length in order to not damage the tool, given by the large side of the needle, on the red scale.

CAUTION

NEVER USE THIS CONTROL TO SET THE AIR BENDING DEPTH (NO ACCURACY SETTING FOR END-OF-BENDING DIMENSION)

Adjusting Force as a Function of Bending Length

This setting consists in limiting the force of the press in relation to the permissible unit load of 1.2 tons per centimetre of bending length.

This setting must be made before carrying out any bending operation (no matter what technique is used), with a view to preventing any deterioration of bending tools or of their supporting forces.
- Completely loosen the pressure regulator control; put into contact with tool (die bottom); use pressure gauge to check that the pressure is not rising.

- Tighten regulator control to the force required for bending (clockwise direction).

- Press pedal and turn hydraulic gauge control in clockwise direction until the tools come into contact.

When using vees larger than 40 mm, insert a worksheet between the tools (to protect tool).

- Tighten pressure regulator control (in clockwise direction) until the length corresponding to the part to be bent is displayed on the red scale of the pressure gauge.

The bending force is therefore limited to the condition of 1.2 t/cm.

NOTE:

- For short bending lengths, the pressure regulator must be set below 20% of the nominal force of the press brake.

- Likely to make approach and working speeds drop.

- When the setting has been made, the pressure regulator must not be used during bending operations, except to compensate for the spring back of the material when setting the bending angle.

**14 - 6 HYDRAULIC GAUGE BLOCK CONTROL SETTING**

This control is used to set the bending depth (or penetration height of the punch into the die), by stopping the moving beam from rising at the selected point of stoppage.

This stoppage point is set by turning the moving vernier.

This is accurate to a few hundredths of a millimeter, even during bending.

To increase the height of the stoppage point, turn the vernier in the clockwise direction.

To decrease this height, turn the vernier in the counter-clockwise direction (see section 9.3).
After making the final setting, tighten the locking screw to lock the assembly in place.

NOTE 1: If too closed of a bend is obtained during settings, release the control pedal and turn the hydraulic gauge block control in the clockwise direction.

NOTE 2: In the case of blow bending, if the bend is too closed, turn the hydraulic gauge assembly control in the clockwise direction. In this case a bend that is more closed than the angle of the tool indicates that the force is too low.

NOTE 3: If there are several variations in angles over the entire length of the bend, check that the tools (the die and the punch) are in good condition. Adjust the intermediate sets.
15 - USE OF NUMERICAL CONTROL
(TYPE MB)

15 - 1 PRELIMINARY OPERATIONS

- Start-up: refer to section 11.2.

- The type of numerical control and the date of the software program are displayed for a few seconds (24). This display is followed by another, indicating the number of startups.

- The flashing entry START appears on the alphanumeric display device (item 31).

- One of the indicator lights up (inches or millimeters).

- Various segments appear on the displays (17 and 18).

- After this first operating phase, which takes place in a very brief time, the microprocessor is ready to carry out a first origin setting operation (X, Y, R or Z).

- Press the flashing START key (31) to start the origin setting.

- When resetting is completed (beep), go into write mode by pressing the key (29).

  Display the adjustment values; hold down the key (11) for more than 2 seconds.

- The adjustment values are then displayed and can be modified. Check that they indeed correspond to the values shown on the inspection sheet that comes with your machine.

- Follow the procedure in section 15.4 to change the resetting values.
15 - 2 OPERATION

15 - 2 - 1 MANUAL MODE

- Press the \[\text{\texttt{\textasciicircum}}\] key (30) to go into manual mode.

- Select the mm or inch unit by holding down \[\text{\texttt{\textasciicircum} \text{\texttt{\textasciicircum}}}\] (13) for 2 seconds.

- By pressing the \[\text{\texttt{X}} \text{\texttt{Y}} \text{\texttt{AUX}}\] (1, 2 or 3) keys, the alphanumeric display (24) shows the entry MANUAL X, MANUAL Y or A = nn.n.

a) MANUAL X:

- Pressing the \[\text{\texttt{+}}\] key (7) makes the X axis move away from the bending axis.

- Pressing the \[\text{\texttt{-}}\] key (8) makes the X axis move closer to the bending axis.

b) MANUAL Y:

- Pressing the \[\text{\texttt{+}}\] key (7) makes the distance between the punches and dies increase (pedal up, engaged).

- Pressing the \[\text{\texttt{-}}\] key (8) makes the distance between the punches and dies decrease (pedal up, engaged).

A short impulse on (7) or (8) results in a movement of 0.01 mm.

NOTE:

Simultaneous pressing of (7) or (8) and (6) results in high-speed rotation of the motor of the axes in question (X or Y).
c) \( A = nn.n \)

- Pressing the \( + \) key (7) makes the rear gauge stop fingers rise or separate (as per R or Z configuration of gauge assembly).

- Pressing the \( - \) key (8) makes the rear gauge stop fingers descend or come closer to each other.

When the values X, Y, R or Z have been reached in accordance with the procedure below, the operator can carry out the bending operation.
15 - 2 - 2 Programming

- Go into programming mode by pressing \( \text{[P]} \) (29). All the display windows are empty, except for 19 (bend number) and 20 (program number set to 1).

- The indicator lights (27) light up in accordance with the last selection made (inches or millimeters).

- Select the program number (from 1 to 9) then press key \( \text{[P]} \) (9).

The amount of available memory is displayed (maximum of 81 steps). The program number selected is displayed on (20). The number of the first non-programmed bend is displayed on (19).

1 - Entering X-axis Value

- Enter the dimension on the numeric key-pad (26).

- Press \( \text{[X]} \) key (1); the value appears on the display (18).

2 - Entering Y-axis Value

- Enter the dimension on the numeric key-pad (26).

- Press \( \text{[Y]} \) key (2); the value appears on the display (17).

- A sound signal indicates and confirms that it has been stored in memory.

3 - Entering AUX-axis Value

- Enter the dimension on the numeric key-pad (26).

- Press \( \text{[AUX]} \) key (3); the value appears on the display (24).

4 - Release of Part

- Between two successive bends, it may prove necessary to provide a withdrawal on the X axis, or simply a waiting time for this axis, before positioning a new part.

- After a bend has been made, the rear gauge assembly is locked for a time that can be programmed from 0 to 9 seconds.

- Program this time on numeric key-pad (26).

- Press \( \text{[\rightarrow]} \) key (4).

- The withdrawal time is then entered in memory.

- Programming of a withdrawal time validates this value on the selected bend(s).

- To cancel the withdrawal time programming, simultaneously press the \( \text{[\%]} \) key (25) and the \( \text{[\rightarrow]} \) key (4).
5 - Changing the Rear Gauge Block Withdrawal Value (In Programming Mode)

- Use the key (11) to call up the calibration values.

- Hold down (4) for two seconds to read the withdrawal values.

- Enter the selected dimension on the numeric key-pad (26) (0 to 600) and press (4).

For example:

- Gauge assembly value (X) = 100
- Required withdrawal = 50
- Enter 50 on the key-pad (26)
- The maximum withdrawal value must not exceed the capacity of the gauge assembly, i.e. 600 mm.

- Press the (4) key (4) to validate.

- The gauge assembly moves back to 150 mm, awaits the program time "t" before positioning itself for the next bend.

6 - Machine Function

- Key (5) is used to confirm an external all or nothing function (for example, a solenoid).

- This function can be associated to making the selected bend, within a given program.

- Type the number of the function on the numeric key-pad (26) (from 1 to 6).

- Then press the key (5).

To cancel a machine function, type 0 on the numeric key-pad (26) and press (5).

7 - Programming of Next Bend

- Press the key (10); program the bend according to the same procedure used for bend number 1.
15 - 2 - 3 - Running a Program

- Press the \[\text{\(\square\)}\] key (29) to go into programming mode. Type the number of the program you wish to use on the key-pad (25), then press the \[\text{P}\] key (9).

- Press \[\text{N}\] (10) to display 1 in window 19.

- Press \[\text{G}\] (28) to go into run mode.

- The START indicator light (31) lights up.
- Press START. The axes are positioned for bend number 1.
- Make the bend (see cycle selection heading in section 11.3).
- Each time the press starts to open, the axes are positioned for the next bend.

15 - 2 - 4 Correction of a Bend within a Program

Corrections may be made to the following parameters:

- Back position value (X).
- Penetration value (Y).
- Gauge assembly withdrawal value.
- Gauge assembly withdrawal delay.
- Machine function (auxiliary axis).

In all cases, press \[\text{\(\square\) \(\square\)}\] (29) to go into programming mode.

1 - Back Positioning or Penetration Value

- Select the correction sign on the key-pad (26): <10 mm on X axis.
- Type in the correction value on the key-pad (26): <10 mm on the Y axis.

- Type \[\text{X}\] (1) or \[\text{Y}\] (2), according to the axis selected.

2 - Gauge Assembly Withdrawal Delay

The gauge assembly withdrawal delay consists of reprogramming with new value(s), according to the procedure described in 15.2.2.
Warning: Only one withdrawal value per part can be selected for \(n\) bends.

3 - Machine Functions (See 15.2.6)

4 - Deleting a Bend

- Enter the number of the bend to be deleted on the key-pad.
- Press \[\text{N}\] key (10) and hold down; press the \[\text{\(\div\)}\] key (25).

- WAIT appears on the alpha-numeric display (24).
- Release the keys.
- A sound signal indicates cancellation.
- The numbering of the bends is automatically changed.
15 - 2 - 5 DELETION OF A PROGRAM

- Enter the number of the program to be deleted on the numeric key-pad (26).
- Then press the \[P\] key (9), then holding it down press the \[\%\] key (25).
- WAIT appears on the alpha-numeric display device (24).
- Release the keys.

A sound signal indicates cancellation of the program.

15 - 2 - 6 TRANSFER OF PROGRAM INTO EXTERNAL MEMORY

External memory capacity = 2 programs with a total of 45 bends. One of the programs can contain up to 30 bends.

- To transfer data from a program into an external memory, insert the external memory into the base (32).
- With the numeric control in \[-\rightarrow\] mode (29), retrieve the program (type in its number).
  - Press the \[P\] (9).
- Assign it a number (which is to be engraved on the housing of the memory, for example 1234).
- Then press \[NR\] key (14).
- Press 1 or 2 on the numeric key-pad (26), according to the memory space available,
  - then press the \[\rightarrow\] key (16)
- The following message appears on the alpha-numeric display device (24):

  Write symbol \(W\) \(EXT\) \(1\) program number

  transfer into external memory

- A beep indicates the end of transfer.
- Unplug the EPROMs from the memory and store them for future usage.

NOTE:

Caution: Watch out for possible program losses caused by overwriting in the external memory.
15 - 2 - 7 TRANSFER OF A PROGRAM FROM EXTERNAL MEMORY INTO INTERNAL MEMORY

- Find an available programme number or make one available for a transfer into external memory, as explained in the preceding section.
- Press the \[P\] key (9) to make sure that there are enough bends available.
- Type 1 or 2 on key-pad (26), according to area of external memory to be transferred.
- Press the \[(\rightarrow\leftarrow)\] key (15) to make transfer.

The following message appears on the alpha-numeric display (24):

Write symbol \[W\]  S 1234 program name

number of program selected

NOTE:

If there is a programming error (incorrect recording of data, entry error, omission, etc.), the word ERROR, followed by a number, appears on the alpha-numeric display device. This number is a means of identifying the type of error (see section 15.5). Correct the faulty parameter.

15 - 3 USE IN TEACHING MODE

- Press the \[O\] key (30).
- Position the axes as described in section 15.2.1.
- When the axes are positioned, press \[(\rightarrow\leftarrow)\] (29).
- Press the \[N\] key (10) to confirm the first available bend.
- Press \[(\rightarrow\leftarrow)\] (12), then simultaneously press \[X\] (1) or \[Y\] (2) or \[AUX\] (3).

The value of X, Y or AUX will be stored in memory.

LEARNING USING MECHANICAL CONTROL WHEEL ON Y AXIS

- Press the \[(\rightarrow\leftarrow)\] key (29). At this time, the Y axis motor is in electrical "free wheel" mode.
- Operate handle by hand to obtain depth of bending desired.
- To store the Y axis dimension in memory, simultaneously press \[(\rightarrow\leftarrow)\] (12) and \[Y\] (2).
15 - 4 SELF-DIAGNOSTIC

The self-diagnostic is a software programme that checks the operating status of certain components in the MB numerical control.

15 - 4 - 1 INSTRUCTIONS FOR USE

To go into diagnostic mode:

- Press any key on the key-pad (1 to 16) before powering up.
- Turn on by holding down key until end of sound signal.
- The alpha-numeric display device (24) displays the DIAGNOSTIC message.
- After a few moments, the LED TEST message appears on the alpha-numeric display (24).
- This is the first check.
- To run the test, press the key (YES).
- To go to the next test before the preceding one is completed, press the key (NO).

15 - 4 - 2 CHECKING PHASE

The following checks are made:

- LED test
- FM test
- MEN test
- EXT test
- MAN test
- KEY test

1 - LED Test:

- The LED test checks the operation of the displays by lighting up the various segments, and of the LEDs related to the control keys, items 28, 29, 30 and 31.

2 - FM Test:

- The FM test checks the operation of the machine functions on 1 to 9, through sound signals (8 or 9 are software functions).

3 - MEN Test:

- The MEN test checks the operation of the two ER 3400 memories and initializes them.
- The alpha-numeric display (24) displays the message PASSED 1 and PASSED 2 and INIZ MEM.
4 - EXT Test:
- The EXT test checks the operation the change of steps, the ends of travel, the encoders and the X, Y and AUX axes.
- This test is carried out by lighting up the various segments on the display (17, 18, 19, 20, 21 and 22).

5 - MAN Test:
- The MAN test checks the operation of the motors in manual mode.
  - Simultaneously press one of the keys X Y or AUX (1, 2 or 3) and the key + or - (7 or 8) (slow-speed).
  - Simultaneously press the ▲ key (6) and one of the + or - keys (7 or 8) (high-speed); only the keys that define the axis must be held down when checking the motors. Operation stops when they are released.
- When running the motors, the displays related to the program and to the steps display the increments per turn (19, 20 and 24).
- To continue the self-diagnostic after the end of the test, simply press the N key (10).

6 - KEY Test:
- The KEY test checks the operation of the function control keys and the key-pad keys.
- When one of the keys are pressed down, the alpha-numeric display (24) displays the key required.

7 - Exit from DIAGNOSTIC mode
- At the end of the test, you can go back to the beginning of the diagnostic. It is possible to again run the MB numeric control; to do this, simultaneously press + (7), M (5) and AUX (3). After the beep, the numeric control is operational and requests a START.

8 - Return to Beginning of DIAGNOSTIC Mode
- At the end of the KEY test, you can go back to the beginning of the DIAGNOSTIC mode by simultaneously pressing X (1) M (5) and P (9).
15-5 ERROR MESSAGES

- ERROR 00 - The position resetting has not been made correctly (see 16.1).
- ERROR 10 - The position resetting program does not contain the data required.
- ERROR 11 - The program only contains one step, hence impossible to increment step.
- ERROR 12 - It is not possible to access the next step if the step in progress is not completed.
- ERROR 13 - It is not possible to enter adjustment data in inches.
- ERROR 14 - The number of axes is not correct. START to restart the operation along three axes (see 16.1).
- ERROR 20 - It is not possible to write this data first into a completely empty step.
- ERROR 21 - Value greater than permissible maximum.
- ERROR 22 - Value lower than permissible minimum.
- ERROR 23 - The algebraic sum of successive corrections is greater than the maximum permissible value.
- ERROR 24 - The data containing the + or - sign is not permissible in this case.
- ERROR 25 - The data contains a comma, while a whole number value is permissible in this case.
- ERROR 26 - The required program is not between 1 and 9 inclusive.
- ERROR 27 - The required step is not between 1 and 30 inclusive.
- ERROR 28 - It is not possible to request a step in the adjustment program.
- ERROR 29 - It is not possible to write this value into the adjustment program.
- ERROR 30 - There is no machine function greater than 8.
- ERROR 40 - The external memory is not correctly placed in its housing.
- ERROR 41 - The external memory does contain any data. The external memory is deleted.
- ERROR 42 - It is not possible to read or write the adjustment program into or from the external memory.
- ERROR 43 - The data written on the alphanumeric display is not correct.
- **ERROR 44** - It is not possible to transfer an empty program into the external memory.

- **ERROR 45** - The external memory does not have enough space to continue the program that you wish to transfer.

- **ERROR 46** - The internal memory does not have enough space to hold the program that you wish to read from the external memory.

- **ERROR 47** - It is not possible to transfer a program with a bend which is not completely defined into the external memory.

- **ERROR 50** - It is not possible to run the adjustment program in automatic mode.

- **ERROR 51** - The last program is not completely written.

- **ERROR 52** - Program not runnable because it is completely empty.

- **ERROR 53** - Withdrawal impossible because greater than maximum dimension for X.

- **ERROR 60** - Dimension of data displayed greater than maximum permissible value.

- **ERROR 78** - Impossible to delete a step that does not exist.

- **ERROR 80** - Memory needs to be initialized. Control code missing (see 16.1 and run MEM test (see 15.4.3)).

- **ERROR 81** - Internal memory 1 not operating correctly, sampled in self-diagnostic mode (see 16.1).

- **ERROR 82** - Internal memory 2 not operating correctly, sampled in self-diagnostic mode (see 16.1).

- **ERROR 91** - Faulty operation of X axis motor in automatic mode. Positioning control not executed.

- **ERROR 92** - Faulty operation of Y axis motor in automatic mode. Positioning control not executed.

- **ERROR 93** - Faulty operation of AUX axis motor in automatic mode. Positioning control not executed.

- **ERROR 95** - The X axis has a dimension lower than 0 (see 15.1).

- **ERROR 96** - The position resetting has not been made. It is impossible to going to manual or automatic mode (see 16.1).
## 15-6 Trouble-Shooting

<table>
<thead>
<tr>
<th>Failures</th>
<th>Possible Causes and Corrective Actions</th>
<th>Error n°</th>
</tr>
</thead>
</table>
| Total blockage of one or several motors                                  | - For X and Y axes D.C. motors: possible fault on CMT board, or deterioration of transformer secondary supply fuses  
- For motors: possible fault on APP 3, RCC or MOT boards.                | 91, 92   |
| Incorrect operation of one or several motors.                            | - For D.C. motors: faulty connection of armatures.  
- Probable fault on intermediate boards (speed control, direction of running)  
- See trouble shooting table.                                            | 91, 92   |
| Faults that show up as incorrect counting in axes movement. The values indicated do not correspond to the actual values. | - Check entry of position resetting.  
- Probable fault on microprocessor board.  
- Probable fault on encoder of axis concerned.  
- Probable fault on intermediate board.                                  |          |
| Incorrect counting on one of axes (see diagnostic mode).                 | - No supply voltages for memories (-30 V* and -12 V*) being looked for an emergency stop (power) and AL3 (numerical control unit) boards.  
- Probable fault on intermediate board.                                  | 80       |
| Faults involving storage in memory of data and involving external memory*.| - Memory storage general failure: the data is not stored in memory, neither in internal nor external memory.  
- Probable fault on intermediate board.                                  |          |

* It is possible to use the external memory along with a voltmeter to check the -30 V and -12 V voltages.
<table>
<thead>
<tr>
<th>FAILURES</th>
<th>POSSIBLE CAUSES AND CORRECTIVE ACTIONS</th>
<th>Error n°</th>
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</thead>
<tbody>
<tr>
<td>Failure involving external memory.</td>
<td>- A particular external memory is not working correctly (memory damaged or deteriorated).</td>
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<td>- No external memory is operating correctly.</td>
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<td>- On the external memory base: between the foot of the base, there may be dust or grease, for example, which isolates the contact, or the contacts on the base are not correctly clamped onto the memory pins.</td>
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<td>45</td>
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<tr>
<td>Failures due to incorrect operation of particular display or keys.</td>
<td>- Probably a faulty component (alpha-numeric or numeric display) O.</td>
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<td>- Probable fault on display decoding circuit on front panel board.</td>
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<td>A particular display or segment is not attained.</td>
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<tr>
<td>One or several keys do not respond to commands.</td>
<td>- Faulty key→KEY test.</td>
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<td></td>
<td>- Probable fault at decoding level (see troubleshooting table when an operating error has been made).</td>
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<tr>
<td>General blockage of equipment.</td>
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<tr>
<td>General blockage with total extinction of displays and LEDs.</td>
<td>- No +5 V power supply available on AL3 or AU (emergency stop) boards.</td>
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</tr>
<tr>
<td>General blockage with steady light-up of displays and no reaction to key commands.</td>
<td>- Temporary unavailability of supply voltage: in this case, it is advisable to turn off and turn the equipment back on.</td>
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<td>- Much disturbance on electric line, affecting equipment.</td>
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<td>- The microprocessor is probably damaged.</td>
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<tr>
<td>Fault involving one or several machines.</td>
<td>- Probable failure on interface circuit on intermediate board.</td>
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<td></td>
<td>IMPORTANT: Fit the machine function relay with diodes set in parallel on the coil.</td>
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</table>
16 - NUMERICAL CONTROL CUSTOMIZATION

The numerical control customization operation configures the numerical control in relation to the number of axes used.

In case of the ERROR 00 or ERROR 80 message, it is advisable to check that this configuration is correct.

16 - 1 METHOD OF ACCESS

- Press the "() (28) and "(30) keys, and hold them down while you turn on the numerical control.

- Do not release the keys before hearing two successive sound signals.

- No display is visible on the screen.

16 - 2 KEY VALUES

- Along X axis: number of axes installed:
  1 = X
  2 = X + Y
  3 = X + Y + R or Z
  4 = X + R or Z

- Along Y axis:
  1 the Y count decreases when the press is closed
  2 reverse counting (not used).

- Along AUX axis:
  1 adjustment on FC- (R axis)
  2 adjustment on FC+ (Z axis)

- Along -- t: Multiplication factor
  1 on R axis
  2 on Z axis

- Along M: End-of-travel value
  200 on R axis
  60 on Z axis

Along : Number of parts between two position resets of AUX axis. It is recommended that this value be set to zero.
16 - 3 METHOD OF CHECKING

- After carrying out procedure 16.1, press \( X \) (1), then \( Y \) (2), then \( AUX \) (3) then \( \rightarrow \) (4), then \( M \) (5), then \( \wedge \wedge \) (6). The respective values can be read on the alpha-numeric display (24).

- Watch out for the squared zeros, which are a sign that the memory is polluted.

16 - 4 METHOD OF WRITING

- If a checked value is not in compliance with your machine, as shown in table 16.2:

Enter the correct value on the numeric key-pad, then press the \( X \) (1) or \( Y \) (2) or \( AUX \) (3), etc. key.
17 - PROGRAMMING

17 - 1 PROGRAMMING OF A PART

START waits for the beep

Write mode

1 to 9 selection of a program 1 to 9

the selected program is not blank

back-up

---

1 to 9 n° of program to be stored in memory (4 for example)

assign it a number, to be engraved on memory housing

p

NR

according to memory space available

1 or 2

a beep indicates the end of the transfer; unplug the memory and store it for future usage.

---

I.T.S - PROGRAMMING

17 - 1/18
17-2 PROGRAMMING OF BENDS

Dimension of edge of first bend:

4 0 5

Window (18) indicates 40.5

Penetration value, with 80 being a safety dimension allowing enough passage between P and M for insertion of the worksheet.

80.00

Window (17) indicates

In the case of a 3-axis MB3 numerical control, program the dimension of the R axis or the Z axis, using the AUX key.

Programming of second bend:

3 8

Dimension of edge of second bend:

8 0

Penetration dimension for second bend, with 80 still being a safety value

Press this key twice to go back to first bend.

Window (19) indicates 1

Goes into automatic mode

START positioning of axes
Fig. 4

Fig. 5

Fig. 6
17 - 3 FINDING PINCH DIMENSION

17 - 3 - 1 IN MANUAL MODE

Position of switches on electrical control compartment

resetting, green indicator light is on

Manual mode

Identification of axis; window (24) indicates MANUAL Y

press pedal

the beam rises to the safety dimension

simultaneously press two keys until the worksheet is pinched

Programming mode

storage in memory; the pinching value appears for example

62.37

Y

goes to bend n° 2; window (19) indicates

2

N

window (17) indicates

proceed in the same manner if the program has other bends.
17 - 3 - 2 IN PROGRAMMING MODE

- Press pedal: the apron rises to the safety dimension.
- Turn motorization knob until the worksheet is pinched.
- Storage in memory of pinching value for first bend.
- Goes to bend n° 2.
- Storage in memory of squeezing dimension for bend n° 2.

Fig. 13
17 - 4 FINDING BENDING DEPTH VALUE

Position of switches on electrical control compartment

resetting, green indicator light is on

Return to bend n° 1

Automatic mode

The axes are positioned on bend n° 1
(wait for beep)
17 - 4 - 1 In Manual Mode

- Manual mode
  - Identification of axis; window (24) indicates **MANUAL Y**
  - Press pedal: the apron rises until the worksheet is squeezed

- Simultaneously press these two keys to obtain the angle of the first bend $\alpha - 90^\circ$

- Programming mode
  - Storage in memory of first bend $\alpha - 90^\circ$
  - Window (17) indicates $43.58$ for example

- Release pedal

- Goes to bend n° 2 $2$

- Automatic mode
the axes are positioned on bend n° 2
(wait for beep)

Manual mode

identification of axis; window (24) indicates \textit{MANUAL Y}

the beam rises until the worksheet is pinched

simultaneously press these two keys until
the angle of the second bend $\alpha = -135^\circ$ is obtained

Programming mode

storage in memory of second bend $\alpha = 135^\circ$
window (17) indicates \textit{52,15} for example

release pedal
17 - 4 - 2 **IN PROGRAMMING MODE**

**Programming mode**

- **press pedal**
  - the beam rises until the worksheet is pinched

- **turn motorization knob**
  - until \( \alpha - 90^\circ \) is obtained

- **storage in memory of first bend** \( \alpha - 90^\circ \)

- **release pedal**

**N**

- **goes to 2nd bend**

**Q**

- **goes into automatic mode**

**START**

- **the axes are positioned on the 2nd bend**

**Programming mode**

- **press pedal**
  - the beam rises until the worksheet is pinched

- **turn motorization knob until**
  - the 2nd bend \( \alpha - 135^\circ \) is obtained
Position of switches on electrical control cabinet

resetting, green indicator light is on

Programming mode

return to bend n° 1

goes into automatic mode

the axes are positioned on bend n° 1
wait for end of positioning (beep)

You can now make the first bend.

After making the first bend, the numerical control is automatically placed on next bend. Always wait for the end-of-positioning beep before pressing the pedal again.
18 - ROUTINE MAINTENANCE OPERATIONS

18 - 1 MACHINE MAINTENANCE:

Your press requires a minimum amount of maintenance; maintenance is chiefly limited to draining the hydraulic system.

A) HYDRAULIC SYSTEM - DRAINAGE

The hydraulic system in your press has distributor valves.

- The reliability of these valves depends above all on how clean the oil is.

We would like to remind you of a few basic rules:

- All hydraulic systems are contaminated, even before the system is assembled.
- When operating the system, wear by abrasion generates further contamination.
- The same applies when the system is topped up with new hydraulic fluid assumed to be clean.
- For this reason, it is advisable not to stop up at short intervals, and not to drain the system too often.
- Well-filtered oil deteriorates quite slowly.
- Non-filtered oil increases the amount of pollution and clogs the filters more quickly.

TAKE EXTRA CARE WHEN FILLING. ONLY USE OIL THAT HAS BEEN FILTERED. THIS IS WHAT DETERMINES THE LIFE OF YOUR PRESS BRAKE

DRAINAGE

First drainage: : after 500 hours
Next drainages: : every 1,500 hours

- Make sure that the lower beam is in the bottom position.
- Remove the high-pressure filter element.
- Remove the filling filter element.
- Remove the drain plug and insert a hose in its place.
- Drain tank completely.

FILLING

- Reassemble high-pressure filter (if necessary, change the element).
- Insert drain plug.
- Fill tank with Mobil DTE 25 oil (or any other oil with the exact same characteristics). Refer to the table of machine characteristics to find out how much oil is needed.
- When filling, filter the oil through a filter element of 5 absolute microns.
- Check level, which should be between the minimum and maximum marks on the dipstick.
- Insert filler plug

WARNING

THE PUMP MUST NEVER BE RUN WITHOUT ANY OIL IN IT.
B) TIGHTENING OF PIPES (IF NECESSARY)

The tightening torque applied to the pipe and hose fittings in the factory is sufficient to avoid any risk of them coming loose. Nevertheless, if a leak is detected, we advise you to contact our After-Sales Service before carrying out any operations on your own.

C) PERIOD OIL CHECK

Regularly check the level of the oil (approximately every 200 hours).

NOTE:

Technical characteristics of Mobil DTE 25 oil:
- Viscosity 44 Centistokes at 40°C
- Viscosity 4° Engler at 50°C
- Viscosity index 102
- Pour point -18°C
18 - 2 REAR GAUGE ASSEMBLY MAINTENANCE

- Lubrication:

After dust removal, it is advisable to oil the slides on the rear gauge assembly once a week; to do this, use an oil with a viscosity of 3 to 5 E 50° C, 30/40 Cts. For the ball screw(s), we recommend using Tellus M oil, from Shell.

NOTE:

When working under special conditions, such as dusty, harmful or ill-adapted environments, it is best to remove all impurities and deposits and to carefully clean the parts before lubricating.

Remember that all maintenance operations must be carried out with the machine turned OFF.
18 - 3 ADJUSTABLE INTERMEDIATE SETS

A - Function:

To allow fine setting of the tool line in order to obtain given conditions for minimum angle of phase differences over the length of the bend.

B - Purpose of adjustment:

The adjustment is made to compensate for the differences in penetration between the punch and the die. It is symbolised by the curve of the intermediate sets.

![Adjustment Curve]

The various adjustment curves for a given machine have the same general appearance. The values vary in amplitude, according to:

- the type of material, its mechanical characteristics, expressed by its resistance to breaking under traction.

- the length and thickness of the worksheet to be bent (the design of adjustable intermediate sets can be used with all tools in the Amada range).

- the type of work being performed.

OBSERVATION:

The intermediate curve on Amada machines is adjusted in relation to mean values, verified by the Amada technician when commissioning is done for the customer.
C - Adjustment:

Preparation: on all the intermediate sets making up the tool line (Fig. 18.1):

- Loosen screw (item 6) (6 mm Allen wrench) to free the adjusting corner.
- Slide the corner (item 9) as far down as it will go into the hole, to the right.
- Slightly tighten screw (item 6), then fully tighten tool spacer by means of the two screws (item 8). (key for six socket screw, 8).

Flattening Intermediates:

Use either two identical die + punch lengths, or two special parts to produce the sketch below. These parts will be simultaneously and systematically moved to flatten each pair of intermediates.

Adjust the press to a force of 20 tons.
- Simultaneously flatten the two end intermediate sets, then the next two, and so on. If only one remains in the middle of the press, flatten it with a force of 10 tons.
Adjustment of Dimension E on Dial Gauge

- Select the lowest intermediate, i.e. the one have the shortest E distance.

- Block its tightening corner (item 1), by means of screws, 2.

- Place travel dial indicator on lower beam, putting it in the middle of the intermediate set, and set needle on zero.

Adjust the following intermediates:

- by observing the values indicated in the curves below, which are mean adjusting values,

- or by customizing the adjustments in relation to the conditions of use and the results aimed at.

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