

# USER'S MANUAL

## HYDRAULIC PRESS BRAKE

**MODEL APH**

*No part of this User's Manual may be reproduced or transmitted by any without Prior permission of Baykal Makine Sanayi ve Ticaret A.Ş.*

**EDITION NO** : APH  
**DATE OF ISSUE** : July-2005

**SECTION** :  
**PAGE** : 1

**MACHINE TYPE DESCRIPTION****APH XXXXX-XX**

	STANDARD	SUPPLY VOLTAGE	CONTROLLER	HYDRAULIC BLOCK	ACCESSORIES
APH	X	X	X	X	XXX
	C – CE S – STAND.	1 – 220 2 – 230 3 – 240 4 – 400 5 – 415 6 – 440 7 – 480 8 – 600 9 – 220/400	1 -- ELGO 8822	1 – FISSLER AKAS 2 – SICK LIGHT GUARD 3 – REER 4 – LAZER SAFE	

**NOTE:**

In order to **SEE THE TYPE OF YOUR MACHINE**, please see the electric circuit diagram in **APPENDIX C**. It is written in the left bottom side of the diagram.

# **! ATTENTION**

**PUMP ROTATION MUST BE IN  
ARROW DIRECTION,  
OTHERWISE  
THE PUMP WILL BE DAMAGED**

*CHECK THE MOTOR ROTATION BY PUSHING **THE "GREEN "**  
**START**, AND IMMEDIATELY AFTER, **THE (RED) STOP** BUTTONS ON  
THE ELECTRICAL PANEL. THE MOTOR MUST BE ROTATING IN THE  
DIRECTION OF "ARROW". IF IT IS ROTATING IN THE REVERSE  
DIRECTION, CHANGE ANY TWO PHASES IN THE ELECTRICAL  
SUPPLY POINT.*

## INFORMATION AND WARNING LABELS

DESIGNATION PLATE	
Manufacturer	BAYKAL Mak. San. Tic. A.Ş.
	Bursa / TÜRKİYE
Machine	Hydraulic Press Brake
Type	APH
Model	
Serial No	
Capacity	ton
Bending length	mm
Main voltage	V/Hz/Ph
Motor Power	kW
System Pressure	bar
Min stroke	mm
Max stroke	mm
Machine weight	kg
Top tool weight	kg
Bottom tool weight	kg
Length	mm
Width	mm

**DESIGNATION PLATE**

G: 42 kg/mm <sup>2</sup>																																																																																																																																																																																																																																																																																																																															
<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>14</td><td>16</td><td>18</td><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td>30</td><td>32</td><td>34</td><td>36</td><td>38</td><td>40</td><td>42</td><td>44</td><td>46</td><td>48</td><td>50</td><td>52</td><td>54</td><td>56</td><td>58</td><td>60</td><td>62</td><td>64</td><td>66</td><td>68</td><td>70</td><td>72</td><td>74</td><td>76</td><td>78</td><td>80</td><td>82</td><td>84</td><td>86</td><td>88</td><td>90</td><td>92</td><td>94</td><td>96</td><td>98</td><td>100</td><td>102</td><td>104</td><td>106</td><td>108</td><td>110</td><td>112</td><td>114</td><td>116</td><td>118</td><td>120</td><td>122</td><td>124</td><td>126</td><td>128</td><td>130</td><td>132</td><td>134</td><td>136</td><td>138</td><td>140</td><td>142</td><td>144</td><td>146</td><td>148</td><td>150</td><td>152</td><td>154</td><td>156</td><td>158</td><td>160</td><td>162</td><td>164</td><td>166</td><td>168</td><td>170</td><td>172</td><td>174</td><td>176</td><td>178</td><td>180</td><td>182</td><td>184</td><td>186</td><td>188</td><td>190</td><td>192</td><td>194</td><td>196</td><td>198</td><td>200</td></tr> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>14</td><td>16</td><td>18</td><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td>30</td><td>32</td><td>34</td><td>36</td><td>38</td><td>40</td><td>42</td><td>44</td><td>46</td><td>48</td><td>50</td><td>52</td><td>54</td><td>56</td><td>58</td><td>60</td><td>62</td><td>64</td><td>66</td><td>68</td><td>70</td><td>72</td><td>74</td><td>76</td><td>78</td><td>80</td><td>82</td><td>84</td><td>86</td><td>88</td><td>90</td><td>92</td><td>94</td><td>96</td><td>98</td><td>100</td><td>102</td><td>104</td><td>106</td><td>108</td><td>110</td><td>112</td><td>114</td><td>116</td><td>118</td><td>120</td><td>122</td><td>124</td><td>126</td><td>128</td><td>130</td><td>132</td><td>134</td><td>136</td><td>138</td><td>140</td><td>142</td><td>144</td><td>146</td><td>148</td><td>150</td><td>152</td><td>154</td><td>156</td><td>158</td><td>160</td><td>162</td><td>164</td><td>166</td><td>168</td><td>170</td><td>172</td><td>174</td><td>176</td><td>178</td><td>180</td><td>182</td><td>184</td><td>186</td><td>188</td><td>190</td><td>192</td><td>194</td><td>196</td><td>198</td><td>200</td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>14</td><td>16</td><td>18</td><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td>30</td><td>32</td><td>34</td><td>36</td><td>38</td><td>40</td><td>42</td><td>44</td><td>46</td><td>48</td><td>50</td><td>52</td><td>54</td><td>56</td><td>58</td><td>60</td><td>62</td><td>64</td><td>66</td><td>68</td><td>70</td><td>72</td><td>74</td><td>76</td><td>78</td><td>80</td><td>82</td><td>84</td><td>86</td><td>88</td><td>90</td><td>92</td><td>94</td><td>96</td><td>98</td><td>100</td><td>102</td><td>104</td><td>106</td><td>108</td><td>110</td><td>112</td><td>114</td><td>116</td><td>118</td><td>120</td><td>122</td><td>124</td><td>126</td><td>128</td><td>130</td><td>132</td><td>134</td><td>136</td><td>138</td><td>140</td><td>142</td><td>144</td><td>146</td><td>148</td><td>150</td><td>152</td><td>154</td><td>156</td><td>158</td><td>160</td><td>162</td><td>164</td><td>166</td><td>168</td><td>170</td><td>172</td><td>174</td><td>176</td><td>178</td><td>180</td><td>182</td><td>184</td><td>186</td><td>188</td><td>190</td><td>192</td><td>194</td><td>196</td><td>198</td><td>200</td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200
1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200																																																																																																																																																																																																																						
1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200																																																																																																																																																																																																																						
1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200																																																																																																																																																																																																																						
<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>14</td><td>16</td><td>18</td><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td>30</td><td>32</td><td>34</td><td>36</td><td>38</td><td>40</td><td>42</td><td>44</td><td>46</td><td>48</td><td>50</td><td>52</td><td>54</td><td>56</td><td>58</td><td>60</td><td>62</td><td>64</td><td>66</td><td>68</td><td>70</td><td>72</td><td>74</td><td>76</td><td>78</td><td>80</td><td>82</td><td>84</td><td>86</td><td>88</td><td>90</td><td>92</td><td>94</td><td>96</td><td>98</td><td>100</td><td>102</td><td>104</td><td>106</td><td>108</td><td>110</td><td>112</td><td>114</td><td>116</td><td>118</td><td>120</td><td>122</td><td>124</td><td>126</td><td>128</td><td>130</td><td>132</td><td>134</td><td>136</td><td>138</td><td>140</td><td>142</td><td>144</td><td>146</td><td>148</td><td>150</td><td>152</td><td>154</td><td>156</td><td>158</td><td>160</td><td>162</td><td>164</td><td>166</td><td>168</td><td>170</td><td>172</td><td>174</td><td>176</td><td>178</td><td>180</td><td>182</td><td>184</td><td>186</td><td>188</td><td>190</td><td>192</td><td>194</td><td>196</td><td>198</td><td>200</td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>14</td><td>16</td><td>18</td><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td>30</td><td>32</td><td>34</td><td>36</td><td>38</td><td>40</td><td>42</td><td>44</td><td>46</td><td>48</td><td>50</td><td>52</td><td>54</td><td>56</td><td>58</td><td>60</td><td>62</td><td>64</td><td>66</td><td>68</td><td>70</td><td>72</td><td>74</td><td>76</td><td>78</td><td>80</td><td>82</td><td>84</td><td>86</td><td>88</td><td>90</td><td>92</td><td>94</td><td>96</td><td>98</td><td>100</td><td>102</td><td>104</td><td>106</td><td>108</td><td>110</td><td>112</td><td>114</td><td>116</td><td>118</td><td>120</td><td>122</td><td>124</td><td>126</td><td>128</td><td>130</td><td>132</td><td>134</td><td>136</td><td>138</td><td>140</td><td>142</td><td>144</td><td>146</td><td>148</td><td>150</td><td>152</td><td>154</td><td>156</td><td>158</td><td>160</td><td>162</td><td>164</td><td>166</td><td>168</td><td>170</td><td>172</td><td>174</td><td>176</td><td>178</td><td>180</td><td>182</td><td>184</td><td>186</td><td>188</td><td>190</td><td>192</td><td>194</td><td>196</td><td>198</td><td>200</td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200																																																																																																										
1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200																																																																																																																																																																																																																						
1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200																																																																																																																																																																																																																						

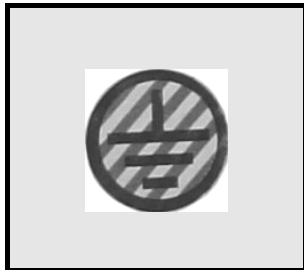
**BENDING TABLE**



**CE CONFIRMATION**



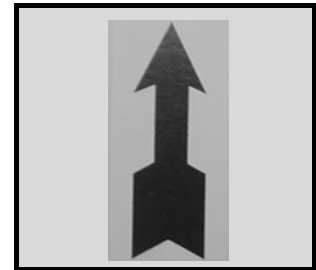
**DANGER:  
ELECTRIC SHOCK**



**GROUND**



**LUBRICATION  
POINT**



**PUMP ROTATION**



**HANDS MAY BE  
JAMMED  
BETWEEN TOOLS**



**WHEN BENDING, HANDS  
MAY BE JAMMED BETWEEN  
TOP TOOL AND SHEET**



**WHEN BENDING, SHEET  
MAY CRASH SOME PARTS  
OF BODY**

# *C O N T E N T S:*

- 1. GENERAL MACHINE INFORMATION**
  - 1.1. Registered trademark
  - 1.2. Machine type
  - 1.3. Serial number
  - 1.4. Year of manufacturer
  - 1.5. Address of the manufacturer
  - 1.6. Address of the authorized dealer
- 2. IMPORTANT INFORMATION**
  - 2.1. Safety features of your Press Brake
  - 2.2. Important safety information & instructions
  - 2.3. Noise Measurement
  - 2.4. Stop Time Control
- 3. OVERALL DIMENSIONS and DRAWING**
- 4. LIFTING & TRANSPORTATION**
- 5. UNPACKING & INSTALLATION**
- 6. OPERATING AND MAINTENANCE INSTRUCTIONS**
  - 6.1. Technical data
  - 6.2. Description of Press brake applications
  - 6.3. Prohibited uses of the Press brake
  - 6.4. Incorrect uses of the Press brake
  - 6.5. Using The Press Brake
    - 6.5.1. *Requirements for the initial test and examination.*
    - 6.5.2. *Electrical connections*
    - 6.5.3. *Operating the Machine.*
    - 6.5.4. *Centering the Bottom tool*
    - 6.5.5. *Top beam parallelism adjustment*
    - 6.5.6. *Backgauge parallelism adjustment*
    - 6.5.7. *Changing Bending Tools*
    - 6.5.8. *Wedge Adjustment*
    - 6.5.9. *Manually Adjustable Crowning System (Optional)*
    - 6.5.10. *Check-list of the finished product*
    - 6.5.11. *Instructions for the press brake supervisor after machine set up*
  - 6.6. Maintenance and inspection
    - 6.6.1. *Type and frequency of inspections*
    - 6.6.2. *Hydraulic System:*
    - 6.6.3. *Changing oil:*
    - 6.6.4. *Changing the filter:*
    - 6.6.5. *Instructions to rescue persons jammed between press brake tools:*
    - 6.6.6. *Stop time measurement:*
  - 6.7. Conditions of storage, re-utilization and scrapping
    - 6.7.1. *Storage*
    - 6.7.2. *Reutilization after storage*
    - 6.7.3. *Scrapping*
- 7. LUBRICATION POINT**

- 8. TROUBLESHOOTING**
- 9. BENDING CHART**
- 10. FOLDING FACILITIES**
- 11. PRINCIPLES OF PRESS BRAKE BENDING TECHNOLOGY**
- APPENDIX**
  - A. SPARE PARTS LIST**
  - B. HYDRAULIC CIRCUIT DIAGRAM**
  - C. ELECTRIC CIRCUIT DIAGRAM**
- ADDITIONAL MANUALS**
  - A. *ELGO P8822 Operating Manuel***
  - B. *AKAS Laser guard User Manuel***
  - C. *Wila Centrally Adjustable Crowning System (CVB/D)(Optional)***

**1. GENERAL MACHINE INFORMATION**

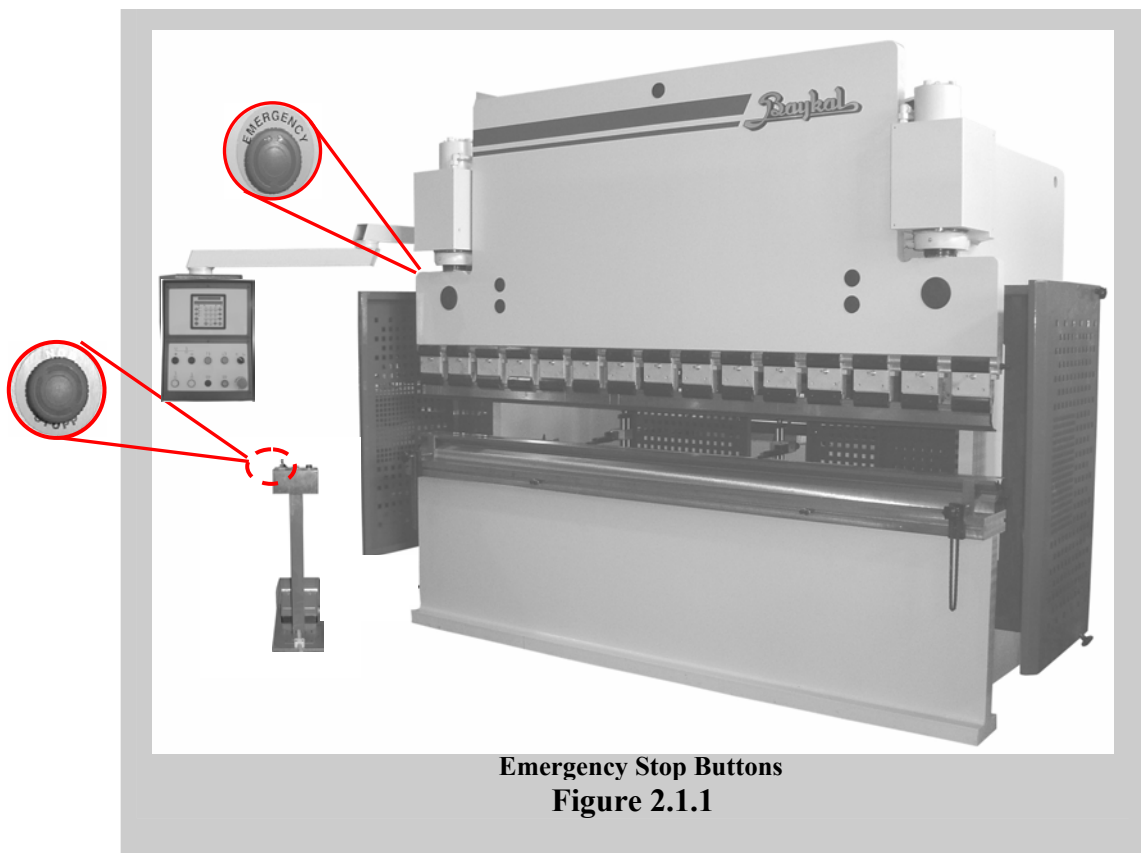
1.1.	Registered trademark	: BAYKAL
1.2.	Machine type	: APH
1.3.	Serial number	:
1.4.	Year of manufacture	:
1.5.	Address of manufacturer:	<b>BAYKAL MAKİNE SAN. TİC. A.Ş.</b>  Organize Sanayi Bölgesi Yeşil Cad. No:24 <b>BURSA - TURKEY</b>
1.6.	Address of the authorized dealer:	

## **2. IMPORTANT INFORMATION**

### **2.1. Safety features of your press brake**

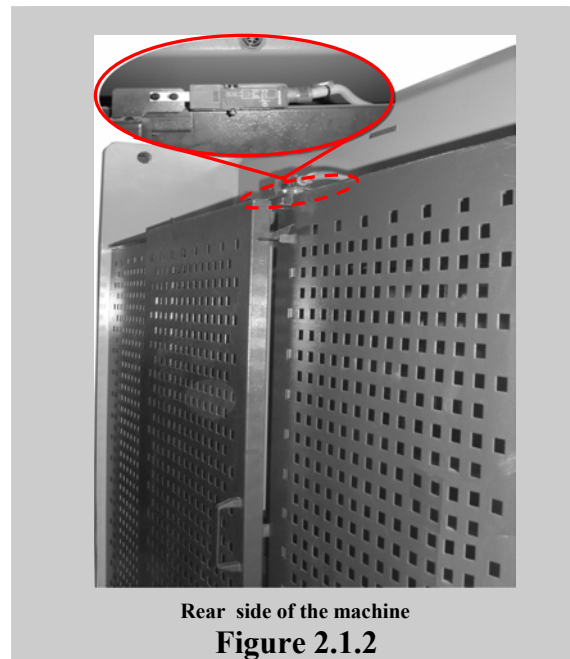
The electrical and hydraulic circuits of your press brake are designed to allow operation with maximum safety. The following precautions are available on the machine for enhanced safety.

- Emergency stop buttons (engaging type) are available on the control unit, on the pedal control stand and on the electrical cabinet cover (see **Figure 2.1.1**).

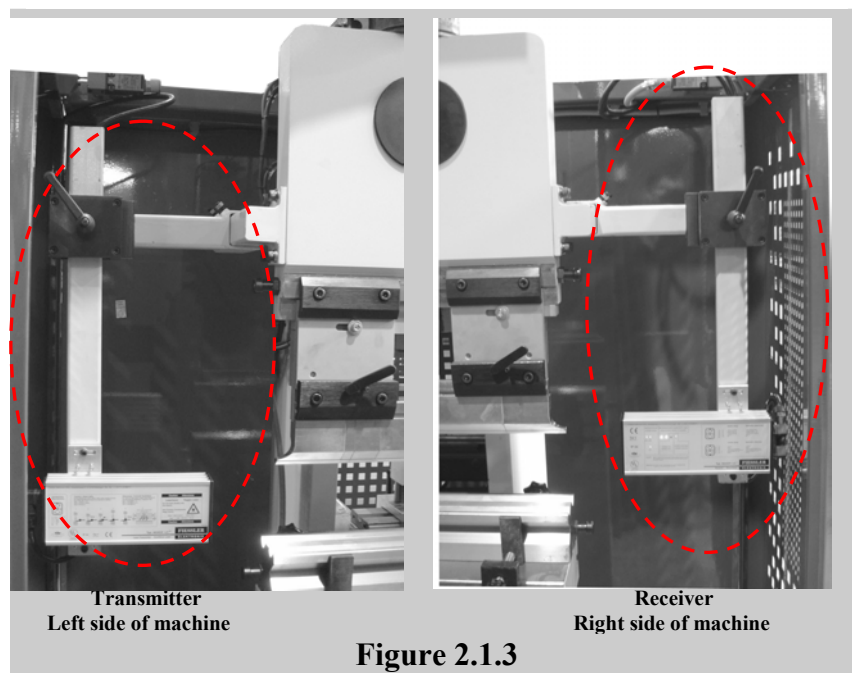


- Electro-switch operated fence (See **Figure 2.1.2**) at the rear of the machine is fitted. If any of these fences are opened when the beam is downstroking at fast speed, the beam will retract automatically. If any of the fences are left open before any operation, the operating modes of the machine are rendered non-functional.





- **Fisler AKAS Laser guard (See Figure 2.1.3)** mounted on the beam in front of the machine protects operator from accidental contact with tooling when the beam is in action. If anything access area between two devices (transmitter and receiver) before the top beam reaches the muting point, the beam will stop and retract automatically.



- In case of a power supply failure during operation, the beam will stop at a standstill. When power supply is recovered, it is Not possible to start the machine without resetting.
- The cylinders are covered by fixed cover plates.

## 2.2. Important safety information & instructions

1. The machine must NOT be operated before reading this User's Manual. Operate the machine only if it is in a perfect condition and in accordance with the work regulations of your factory and operating instructions of this manual.

2. **TRANSPORTATION!** The lifting points are shown in the Lifting Diagram attached. The dimensions and the weight of the machine are given in section 6.1.1. of this manual.

3. **INSTALLATION!** The press brake is delivered in complete assembled execution. It must be leveled and firmly stationed on the floor where it is to be used, according to the Installation Diagram attached. Indoor installation and a dry working environment without danger of fire and explosion is necessary.

! • ***The permissible floor load, where the machine is to be installed, must be accounted for.***

4. The machine must be operated only by authorized and trained personnel. Operation by unauthorized and untrained personnel in a way that does not comply with the instructions and regulations may lead to dangerous situations and is strictly FORBIDDEN.

5. The press brake is designed such that it MUST be operated only by one operator. Using the machine with more than one operator is forbidden.

6. In case of any emergency, push the emergency stop buttons and follow the emergency rules of your factory.

7. The following instructions must be born in mind and be adhered to for safe operation and maintenance of your press brake :

! • ***This press brake is designed for bending only within the meaning of section 6.2 of this manual regarding press brake applications. Prohibited uses of the machine are dealt with in section 6.3 of this manual.***

! • ***DO NOT insert or extend your hands or arms in between bending tools, under any circumstances, while the machine is in an operational mode.***

! • *Check the machine daily for recognizable external damages and defects.*

! • *Operate the machine only if all protective devices and guardings are mounted and effective.*

! • *Take notice of the warning labels on the machine and do not remove them.*

! • *In case of malfunction immediately shut down and secure the machine. All troubles must be eliminated before re-starting.*

! • *Avoid any operation which may endanger other persons and immediately shut down the machine when a danger is noticed.*

! • *Shut off the machine completely before any repair work is carried out.*

! • *DO NOT let yourself be locked in the interior space of the machine.*

! • *The safe distance of the two-hand control of this machine is 130 mm. Make sure that this safe distance is kept at all times.*

! • *DO NOT bridge the safety limit switches of the side and rear protective fences.*

! • *DO NOT use front support arms for intermediate storage of workpieces*

! • *During the bending process the workpiece may leap up. Therefore, the material must be handled carefully.*

! • *All connecting bolts on the machine must be checked periodically and be re-tightened if necessary.*

! • *When changing oil and replacing filter, the illustrations in Section 6. 6 of this manual must be referred to. Make sure that dirty filters are disposed separately.*

! • *The operating temperature range of the oil is : (10 °C - 65 °C )*

**!** *Any fire in the electric control system must be put out by using a CO<sup>2</sup> fire extinguisher.*

**!** *Any burning oil must be put out by using a CO<sup>2</sup> or powder extinguisher.*

**!** *All regulations concerning surface facilities designed for the use of water polluting liquids must be observed in operation and maintenance of this press brake.*

**!** *All environmental regulations effective must be observed in use of this press brake.*

**8.** In the operation of the press brake no special personal safety equipment is necessary. It is however recommended to use working gloves when handling the workpieces.

**9.** General maintenance of the press brake can be carried out by universal tools and equipment while the machine is at a standstill.

**10.** The manufacturer is free of any responsibility in case of any unapproved modifications made on the machine and /or any replacement of the original safety and protective devices by unoriginal ones.

**11.** The machine is to be serviced and/or be repaired only by the authorized personnel of BAYKAL or its appointed representatives.

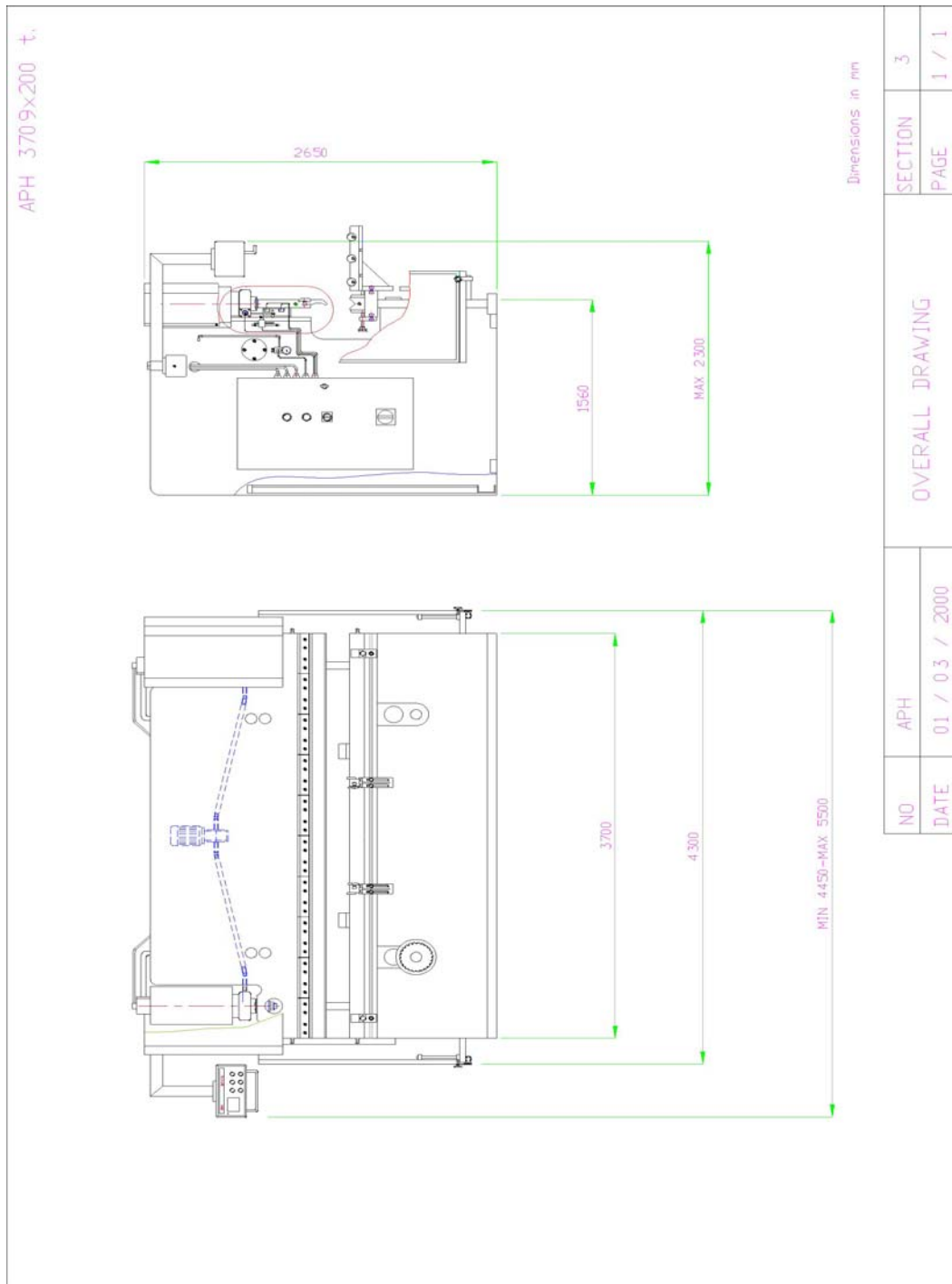
### **2.3. Noise measurement**

The sound pressure level of the press brake at operator's working position is under 70 Db (A).

### **2.4. Stop time control**

The stopping time of this press brake is 80 ms and the corresponding minimum safety distance from the two-hand control is 130 mm.

**3. OVERALL DRAWING AND DIMENSIONS**



**Figure 3.1**

## 4. LIFTING & TRANSPORTATION

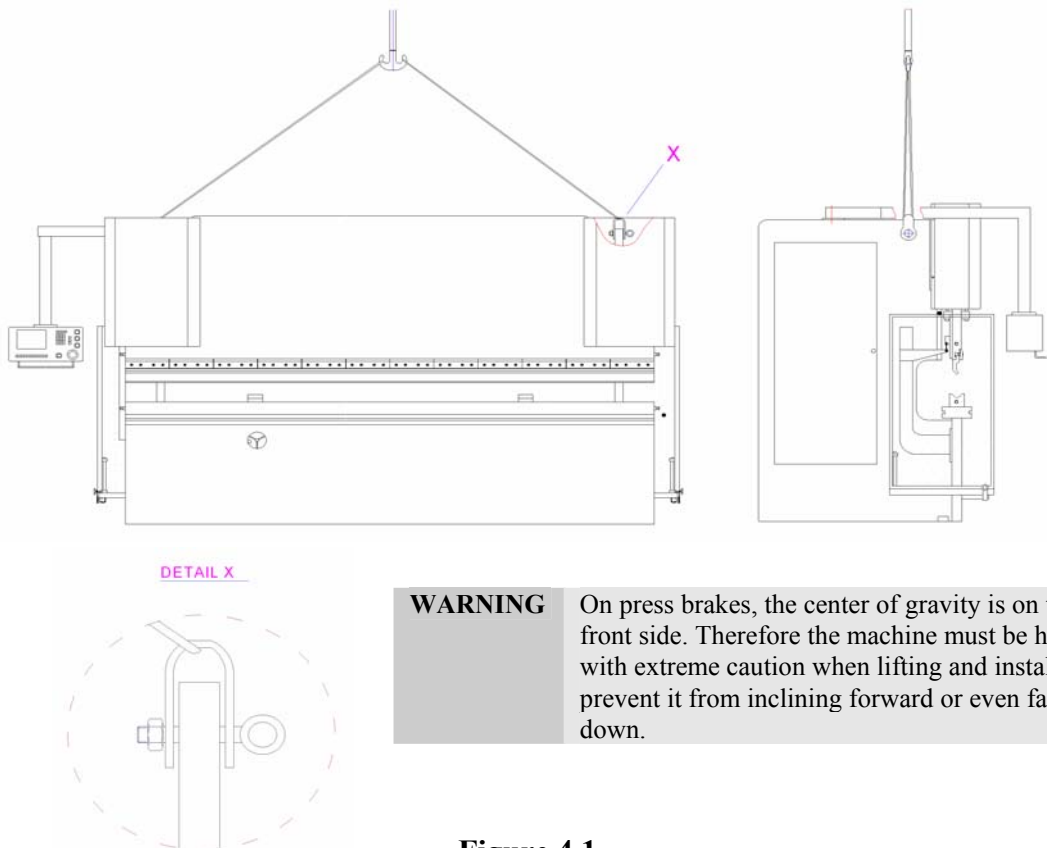
The following points should be taken into account :

- The lifting points are illustrated in **Figure 4.1**. The dimensions and the weight of the machine are given in section 6.1.1. of this manual.
- Make sure that the lifting rope or chain is of sufficient capacity for the lifting operation.

**!** *On press brakes the centre of gravity is on the front side. Therefore, the machine must be handled with extreme caution when lifting and installing to prevent it from inclining forward, or even falling down.*

**!** *Make sure that the machine is not subjected to impact during loading or unloading.*

**!** *The crane to lift the machine must be controlled by a single operator.*



**Figure 4.1**

## 5. UNPACKING & INSTALLATION

The press brake is packed inside a nylon cover, and is bolted on wooden crates.



Prior to installation, dispose nylon and wooden crate separately and safely in accordance with environmental regulations.

After unpacking, check the machine visually against any damage during transport.

Install the machine in an indoor area which is free from humidity and excessive dust.



Make sure that the machine is installed in accordance with the work and maintenance space indicated in the enclosed Installation Diagram to enable the operator to visualize the work area without obstruction. Therefore, the hazardous situations regarding the operator, other persons, or materials due to incorrect installation will be reduced.

It is important to leave a work space by both sides of the machine, which is not less than the tool length. Otherwise, put a reminder that the tool change can only be executed from the front of the machine.

Floor conditions for installation: Flat and concrete surface (BS 25).

Station the machine on the floor by anchorage bolts or steel expansion inserts as illustrated in the Installation Diagram.

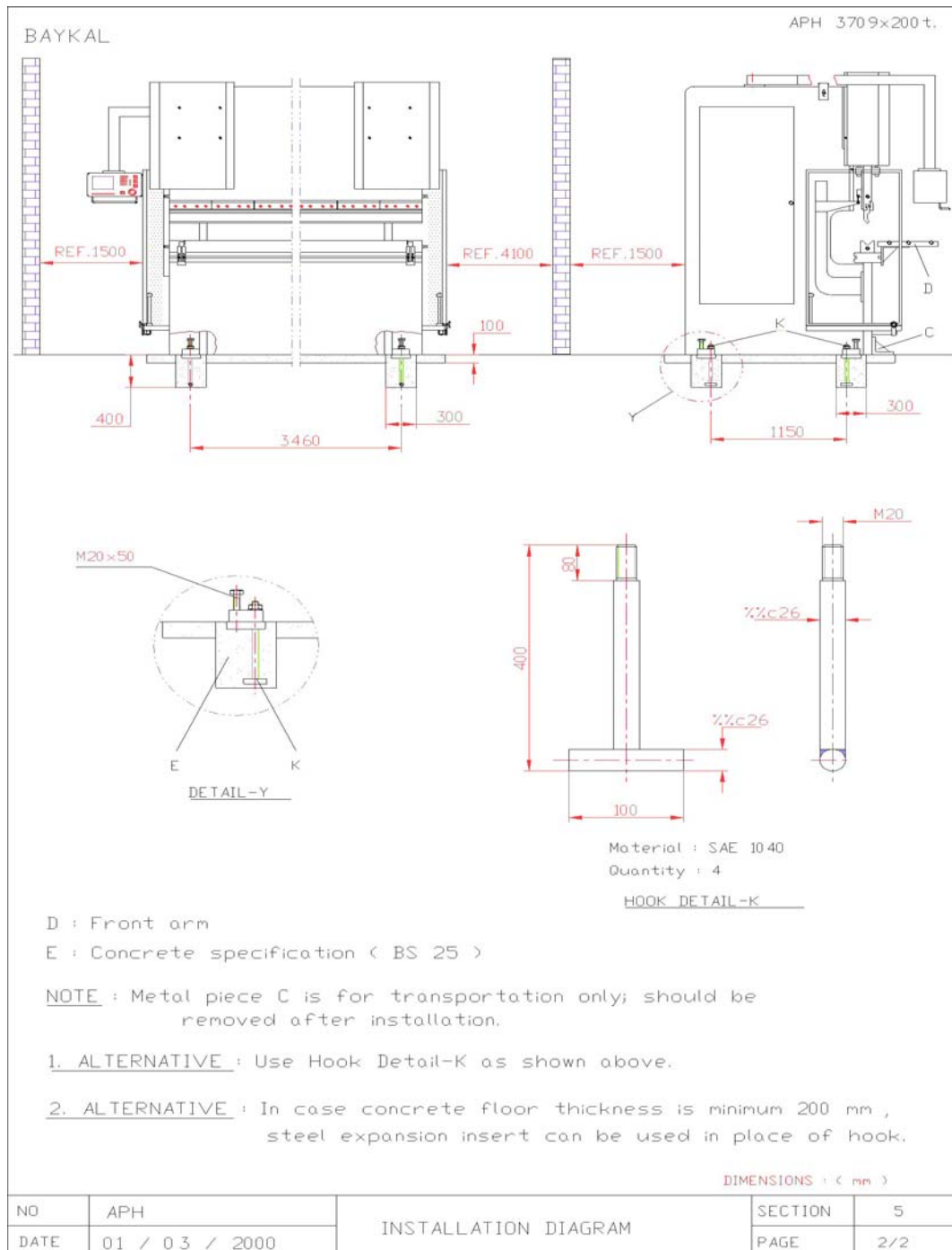
Remove the steel supports (Part "C " in the Installation Diagram), and store away for future use.

Level the machine by using a water level.

Mount the front support arms (Part " D" ) as illustrated in the Installation Diagram.

As the top and bottom tools are already fitted, the machine is now ready to connect to an electric supply.





**Figure 5.1**

## 6. OPERATING AND MAINTENANCE INSTRUCTIONS

### 6.1. Technical Data

#### 6.1.1. Specification:

1.	Bending length	mm
2.	Bending capacity -St.42	mm
3.	Bending force	tons
4.	Length	mm
5.	Width	mm
6.	Height	mm
7.	Weight	kg
8.	Approach speed	mm / sec
9.	Bending speed	mm / sec
10.	Return speed	mm / sec
11.	Total Stroke	mm
	-Piston Stroke	mm
	-Adjustment Stroke	mm
12.	Pump flow rate	cm <sup>3</sup> / rev.
13.	Oil tank volume	lt.
14.	Back-gauge range	mm
15.	Main motor, 3 phase 380 V 50Hz	kw

#### 6.1.2. Standard Equipment:

#	Electric motor: 380 V 50 Hz 3phase
#	Standard top and bottom tools
#	Foot-pedal control system
#	Pendant control unit
#	Wedge system top tooling
#	750 mm. power back-gauge
#	Gearbox drive for cylinder stroke
#	Oil tank level indicator
#	Side and rear fence guarding
#	Hand screw clamps and chains for alignment and rotation of bottom die.

**6.1.3. List of parts subject to rapid wear:**

No	Part name	Size specification	Qty.
1.	Bottom tool	-	1
2.	Top tool	-	1
3.	Piston seal		2
4.	Rod seal		2
5.	Scraper		2
6.	O-ring ( cylinder )		2

**6.1.4. List of bearings and special parts:**

No	Part name	Part no. / description	Qty.	Location on machine
1.	Axial bearing		2	Top beam
2.	Radial bearing		2	Power back-gauge

## 6.2. Description of press brake applications

Your press brake is designed and constructed for press bending of flat metal materials up to \_\_\_\_\_ mm. length through use of hydraulic pressure power of maximum \_\_\_\_\_ tons which is adjustable. At maximum tonnage, the material thickness that can be formed is \_\_\_\_\_ mm. in case of 42 kgs / mm<sup>2</sup> steel-plate, which is the most common material processed on press brake.

The APH press brake is a downstroking type meaning that the bending force is applied by a down-acting top beam, which is actuated by two hydraulic cylinders. The lower beam is stationary. A set of top and bottom tools must be used for bending. For an indication of folding facilities and the type of tooling recommended, please see section 10. Further information on the principles of press brake bending technology is given in section 11.

### **6.3. Prohibited uses of the press brake**

The press brake should not be used in the following circumstances:



If there is ANYTHING OTHER THAN THE WORKPIECE, inserted, extended, put or placed in the working area between top and bottom bending tools.



When any of the protective devices or guardings of the machine are NOT mounted or NOT functioning.



**For operations involving :**

Cutting, punching, slitting, breaking crushing, drilling, imprinting processes.



For bending operations involving non- flat metals (at origin).  
e.g. rods, bars, tubes, pipes.



*The manufacturer does not accept responsibility for personal safety and for damage to the machine if the machine is used in prohibited ways.*

#### 6.4. Incorrect uses of the press brake

During normal operation of the press brake, the following incorrect uses must be avoided. The likely consequences of such incorrect uses are also explained below :

**Incorrect use ( 1 ) :** Top tool not centered on the bottom tool " V "

**Consequence :**

- No bending at desired angle.
- Oil leakage in cylinder.
- Damage to tooling, breaking of tooling with possible injury to operator.
- Breaking of stud connecting piston to beam.

**Incorrect use ( 2 ) :** Bending flame-cut material.

**Consequence :**

- Damage to tools, spread of chips from workpiece with possible injury to operator.

**Incorrect use ( 3 ) :** During machine operation or adjustment, foreign substances (e.g. nuts, bolts, wrenches and similar tools) lying in between bending tools.

**Consequence :**

- Damage to bending tools, foreign substances breaking out with possible injury to operator.

## **6.5. Using the press brake**

### **6.5.1. Requirements for the initial test and examination**

- Check the machine visually against any transport damage.
- Clean the oil tank.
- Fill the oil tank up to the level indicator with one of the oil types recommended in the Lubrication Diagram. (See section 7.)
- Check that the side and rear guards are functioning mechanically in proper.
- Check that the top tool is rigidly fixed in its place.
- Check that the bottom tool is properly placed with respect to the top tool.
- Make sure that the cables are not damaged.
- Check the components and terminal ends inside the electrical cabinet against any loosening.
- Make sure that switches and buttons are not damaged.
- Carry out the electrical connections according to section 6.5.2. and then proceed with initial testing and start-up according to instructions in section 6.5.1. and 6.5.3.
- Check by means of a test-run that :
  - a. All switches and buttons are fulfilling their functions. (In particular, emergency, buttons, safety and limit switches).
  - b. There is no oil leakage in cylinders, valves, pipes and hoses.

### 6.5.2. Electrical connections

**!** *All electrical connections, however simple, must be carried out by qualified electricians.*

Machine must be placed as close as possible to an electricity supply point. In cases where this is not possible, it is recommended to bring an auxiliary supply duct alongside the machine. Electrics should be connected by supply cable with correct diameter

**!** ***EARTHING** connection is strictly necessary.*

Voltage and power requirements are labeled on the machine. First class components are used in the electrical cabinet, and all electric wires are numbered according to electric circuit diagram, and conform to established standards. Cartridge fuses are used in the control circuit.

As the **PEDAL** control connections are already made in the factory, your machine is now ready for initial start-up.

**!** *The machine must be first started-up and be put into Service by authorized and qualified personnel.*

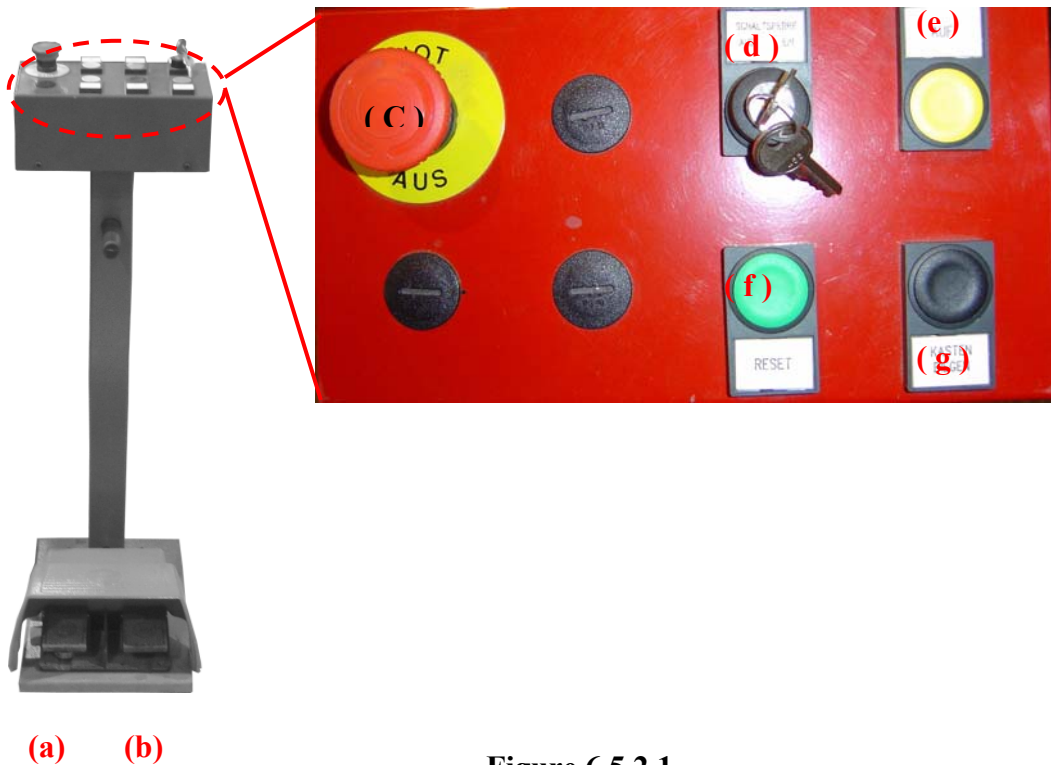
### **WARNING:**

#### *Motor / pump rotation!*

**!** Check the motor/ pump rotation by pushing motor-start button, and immediately after, motor-stop button on the Control pendant. The motor must be rotating in the direction of "arrow" marked. If it is rotating in the reverse direction change any two phases in the electricity supply point.



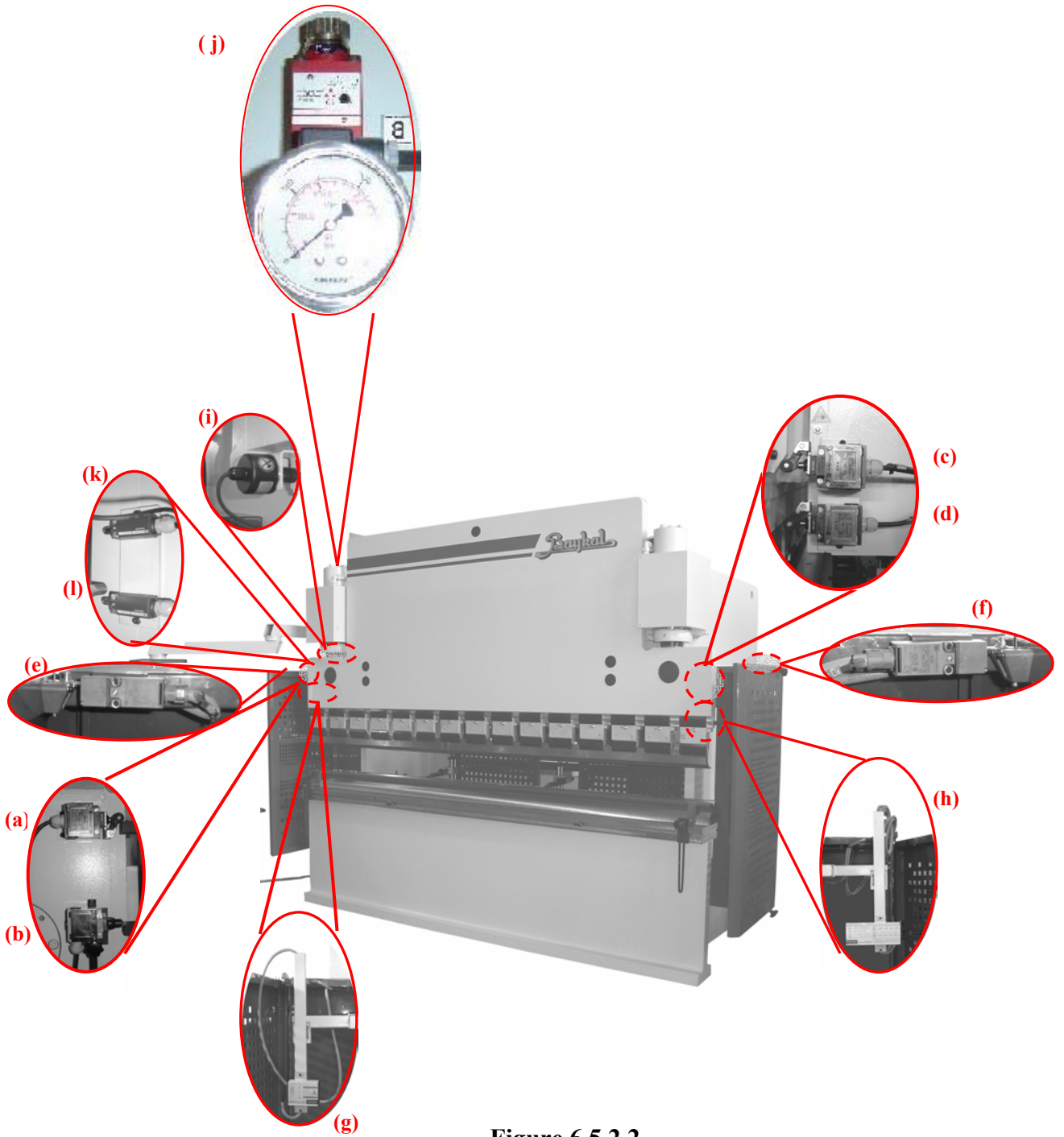
**A. Pedal Connections**



**Figure 6.5.2.1**

Mark	Label (Electr.Diag)	Designation	Description
(a)	10S5	Left pedal	When left pedal is pressed, Beam goes downwards
(b)	10S5A	Right pedal	When left pedal is pressed, Beam goes upwards
(c)	10S2	Emergency stop button	In case of emergency, when this button is pressed, the main pump and other active components of machine stop.
(d)		Operation ON/OFF	It switches on/off pedal operation
(e)	10S6	Up	When Up button is pressed, Beam goes up in the Inching Mode
(f)		Reset	In order to restart the machine after light barrier is activated on the machine, the reset button must be pressed.
(g)		Box Bending	When bending box or box type products, this button must be pressed. Thus you activate the box bending function of the laser safety system and laser beams configuration between the transmitter and the receiver is changed. Finally laser beams will <b>NOT be interrupted</b> because of box sides.

**B. Front Connections**



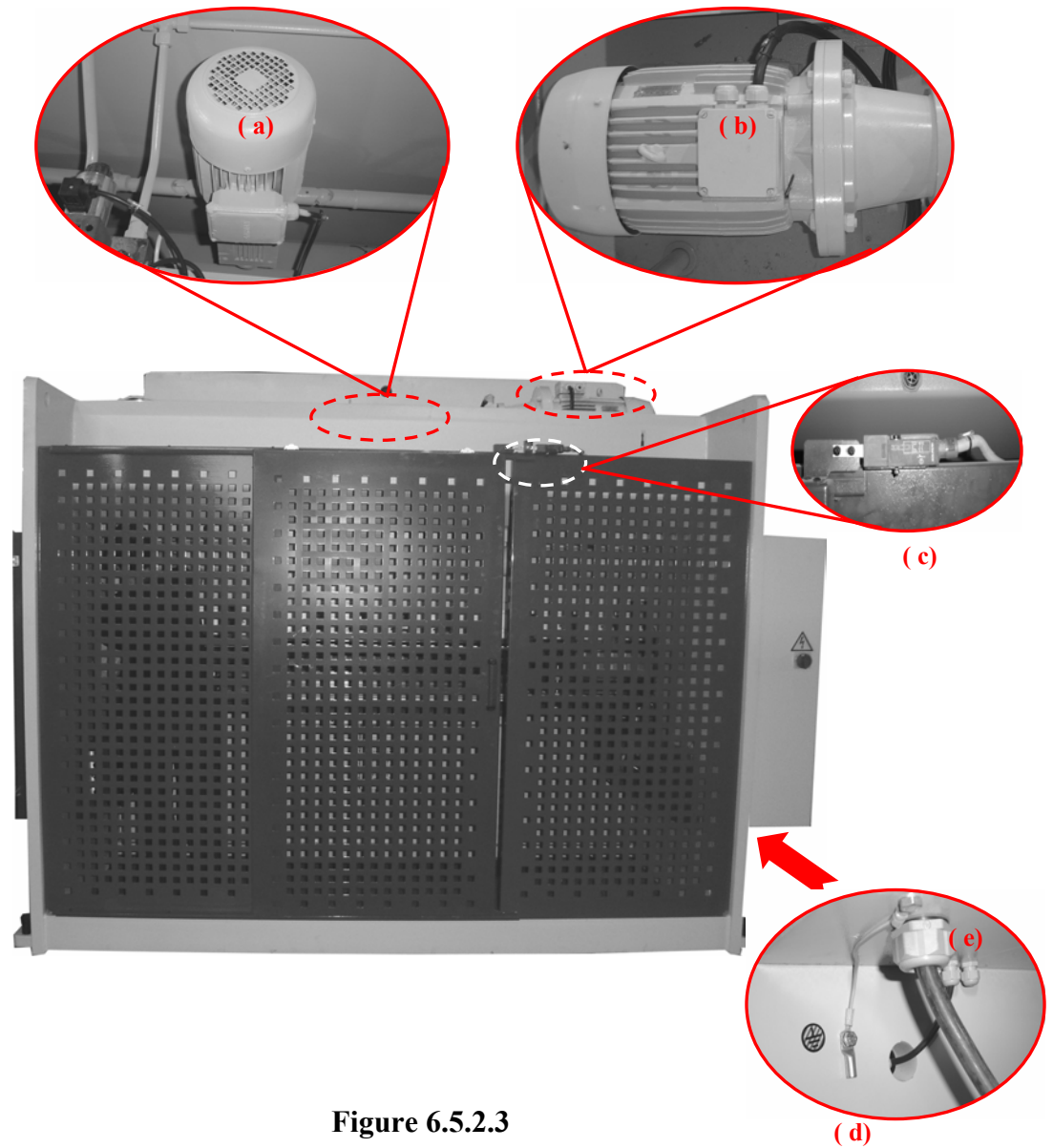
**Figure 6.5.2.2**

Mark	Label	Designation	Description
<i>EDITION NO : APH</i>			<i>SECTION :</i>
<i>DATE OF ISSUE : July-2005</i>			<i>PAGE : 26</i>

## ***BAYKAL***

	<b>(Electr.Diag)</b>		
<b>(a)</b>	<b>11S1</b>	<b>UDP</b>	Upper dead point of Y axis. After Bending process is completed, if you press right foot pedal, beam goes upper dead point.
<b>(b)</b>	<b>11S4</b>	<b>Upper limit</b>	After each bending cycle in order to save time the beam goes to Upper limit instead of UDP (It can be adjusted).
<b>(c)</b>	<b>11S3</b>	<b>Mute switch</b>	The beam stops at this position. Because There is no slowdown switch, Beam stops hardly.
<b>(d)</b>	<b>11S2</b>	<b>Slowdown switch</b>	This switch reduces beam speed while the beam is traveling down fast in Working mode 2
<b>(e)</b>	<b>13S4</b>	<b>Side guard safety switch (Left side)</b>	Safety switch and connection. This is used for additional safety. When the side guard (door) is opened, it sends a interrupt signal to the Controller and thus pump stop.
<b>(f)</b>	<b>13S3</b>	<b>Side guard safety switch (Right side)</b>	Safety switch and connection. This is used for additional safety. When the side guard (door) is opened, it sends a interrupt signal to the Controller and thus pump stop.
<b>(g)</b>	<b>-</b>	<b>Transmitter</b>	AKAS laser guard transmitter and electrical connections. <b>See the electric circuit diagram.</b>
<b>(h)</b>	<b>-</b>	<b>Receiver</b>	AKAS laser guard receiver and electrical connections. <b>See the electric circuit diagram.</b>
<b>(i)</b>	<b>5B2</b>	<b>Reducer encoder</b>	It computes bending angle.
<b>(j)</b>	<b>11S5</b>	<b>Pressure switch</b>	It adjusts bending pressure
<b>(k)</b>	<b>4S6</b>	<b>Limit switch</b>	Reducer maximum limit
<b>(l)</b>	<b>4S5</b>	<b>Limit switch</b>	Reducer minimum limit

**C. Back side connections**



**Figure 6.5.2.3**

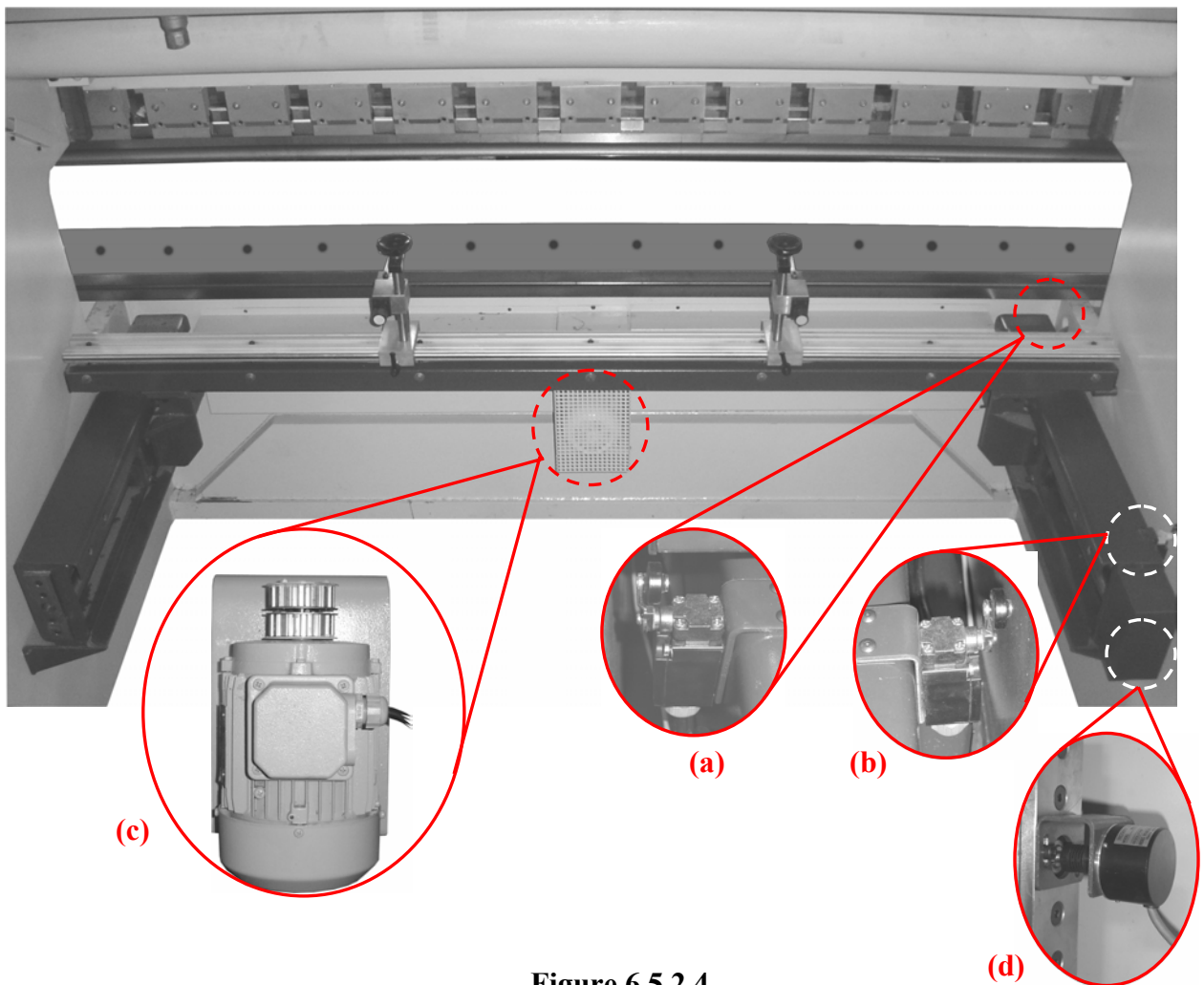
Mark	Label (Electr.Diag)	Designation	Description
------	------------------------	-------------	-------------

*EDITION NO* : *APH*  
*DATE OF ISSUE* : *July-2005*

*SECTION* :  
*PAGE* : 28

(a)	2M2	<b>Reducer motor and connection</b>	This motor rotates Reducer axis to adjust bending angle.
(b)	1M3	<b>Main motor (Pump) and connection</b>	Main motor or pump supplies hydraulic pressure for hydraulic circuit.
(c)	13S2	<b>Safety Switch</b>	Back door safety switch. When this door is opened, main pump of the machine will stops.
(d)	-	<b>Ground connection</b>	Ground connection for the electric circuit. <b>Do not</b> forget connecting this point to the ground.
(e)	-	<b>Main Power connection</b>	Main power connection for the machine. Connect the power cable to the nearest electricity supply point.

**D. Backgauge connections**

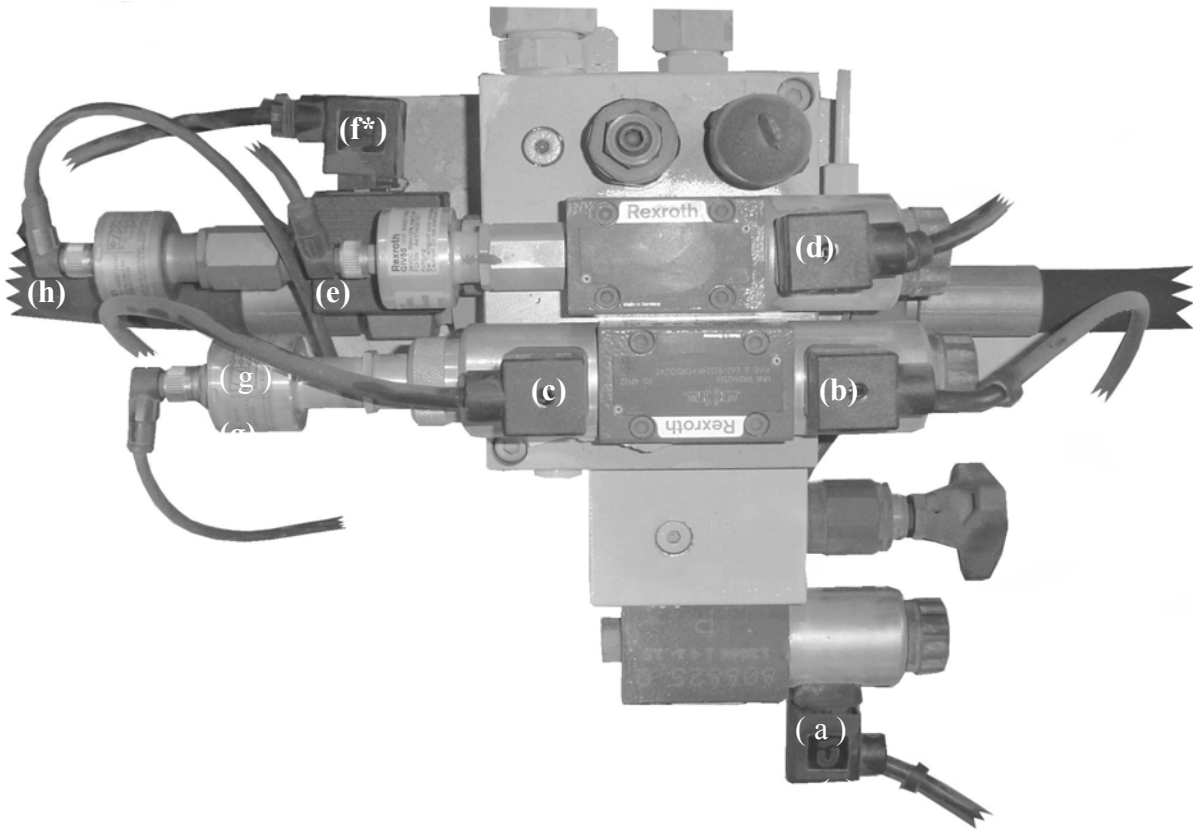


**Figure 6.5.2.4**

Mark	Label (Electr.Diag)	Designation	Description
(a)	5S4	X- Limit switch	Limit position of X axis movement in the

			negative direction
(b)	5S3	X+ Limit switch	Limit position of X axis movement in the positive direction
(c)	5M1	Motor	It provides X axis movement
(d)	5B1	Encoder	X axis encoder connection. Encoder supplies feedback of the axis position

**E. Valve Connections**

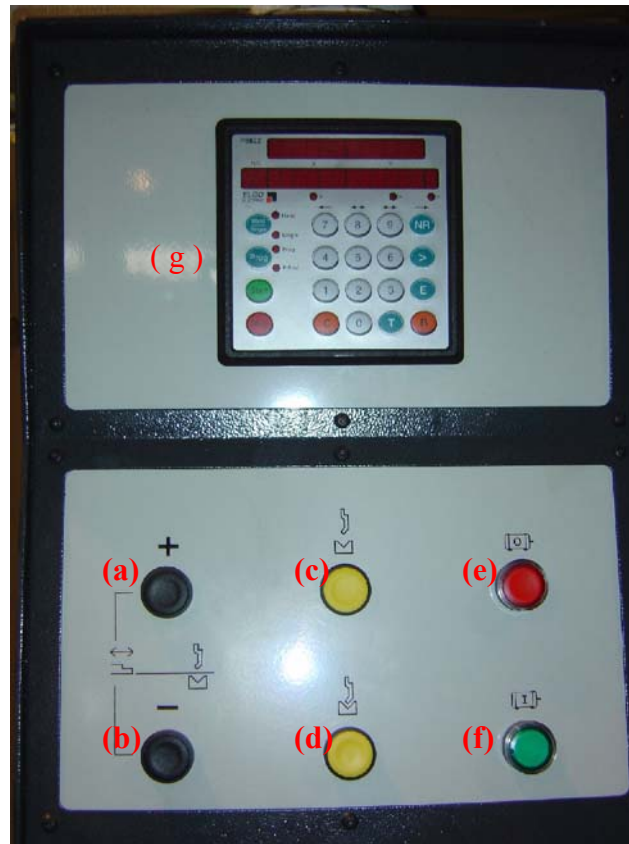


**Figure 6.5.2.5**

## ***BAYKAL***

<b>Mark</b>	<b>Label (Electr.Diag)</b>	<b>Designation</b>	<b>Description</b>
<b>(a)</b>	<b>Y13</b>	<b>Pressure safety valve</b>	Additional safety for directional valves
<b>(b)</b>	<b>Y11A</b>	<b>Directional valve</b>	It controls downward movement of Y axis
<b>(c)</b>	<b>Y11B</b>	<b>Directional valve</b>	It controls upward movement of Y axis
<b>(d)</b>	<b>Y12</b>	<b>Safety valve</b>	Safety valve of directional valves
<b>(e)</b>	<b>S12</b>	<b>Sensor</b>	It checks position of Directional valve
<b>(f)</b>	<b>Y75</b>	<b>Poppet</b>	It changes amount of hydraulic oil flowed in order to adjust beam speed
<b>(g)</b>	<b>S11AB</b>	<b>Sensor</b>	It checks position of Pressure safety valve
<b>(h)</b>	<b>S75</b>	<b>Poppet Sensor</b>	It checks position of poppet valve

**F. Control Panel:**

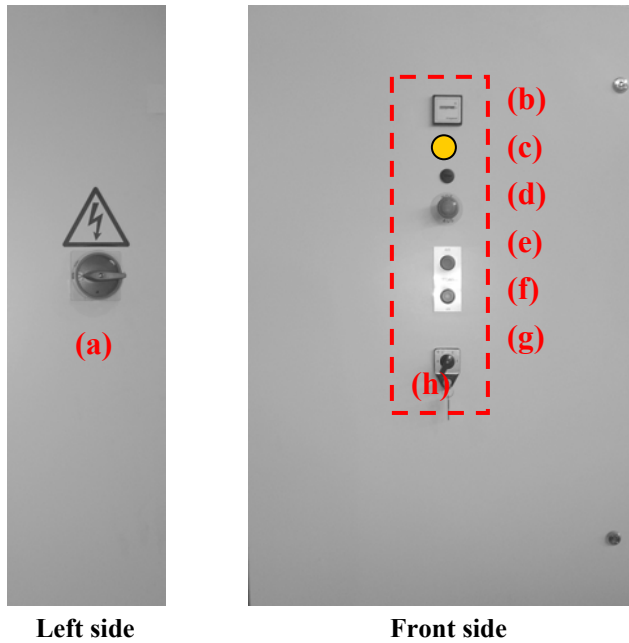


**Figure 6.5.2.6**

Mark	Label (Electr.Diag)	Designation	Description
(a)	5S2	Backgauge backward	When this button is pressed, the backgauge moves backward
(b)	5S1	Backgauge forward	When this button is pressed, the backgauge moves forward
(c)	4S4	Beam reducer up	When this button is pressed, the reducer goes upwards to adjust bending angle
(d)	4S3	Beam reducer down	When this button is pressed, the reducer goes downwards to adjust bending angle
(e)	4S1	Pump stop	This button stops the main motor (pump which supplies hydraulic pressure) and lights up its lamp
(f)	4S2	Pump start	This button starts the main motor (pump which supplies hydraulic pressure) and lights up its lamp
(g)	-	P8822	Controller

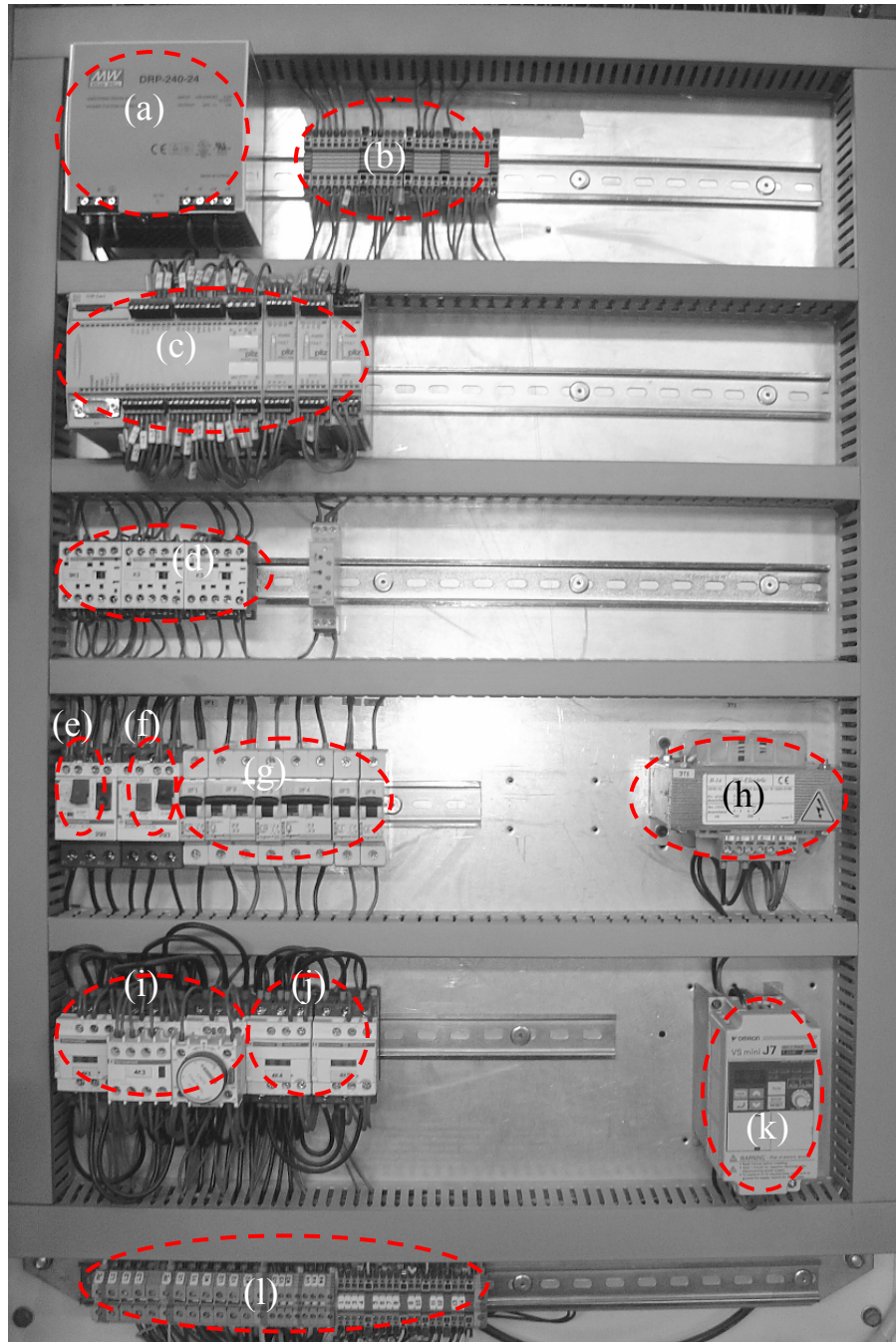


**G. Electrical Cabinet**



**Figure 6.5.2.7**

Mark	Label (Electr.Diag)	Designation	Description
(a)	2Q1	<b>Main Switch</b>	Switches on and off the machine
(b)	4H4	<b>Hour meter</b>	It displays current working time of the machine.
(c)	4H1	<b>Yellow Light</b>	This Light is “ON” if the <b>Mode Selector Switch (g)</b> is on the Position 2 and 3. On the both of them Positions is AKAS Laser System active.
(d)	10S1	<b>Emergency stop button</b>	In case of emergency, when this button is pressed, all movements are stopped.
(e)	9S2	<b>Supply on and its lamp</b>	When this button is pressed, Main control is <b>ON</b> and its lamp lights up.
(f)	9S1	<b>Supply off and its lamp</b>	When this button is pressed, Main control is <b>OFF</b> and its lamp lights up.
(g)	13S1	<b>Mode Selector Switch</b>	Machine working mode can be selected using this switch.
(h)	-	<b>Switch</b>	Mode selector switch enable / disable



**Inside the electrical cabinet**

<b>Mark</b>	<b>Label (Electr.Diag)</b>	<b>Designation</b>	<b>Description</b>
(a)	2G1	<b>Power Supply</b>	It provides required DC power
(b)	-	<b>X2 terminal</b>	Connection points
(c)	-	<b>Pilz Safety PLC</b>	It provides to work the machine safely.
(d)	-	<b>Control relays</b>	They are interface between valves and control unit
(e)	2Q2	<b>Main motor protection relay</b>	It protects Main motor against overflow current
(f)	2Q3	<b>Reducer motor protection relay</b>	It protects Reducer motor against overflow current
(g)	-	<b>Control fuses</b>	They control the current flowing through the corresponding elements
(h)	3T1	<b>Transformer</b>	It supplies voltage of servo motors
(i)	4K1-4K2-4K3	<b>Y/<math>\Delta</math> relays</b>	They change main motor connection form Y to $\Delta$ and activates all machine controls.
(j)	4K4-4K5	<b>Reducer control relays</b>	They are interface between reducer motor and control unit
(k)	-	<b>Motor Driver</b>	It drives the motor for X axis movement
(l)	-	<b>X1 terminal</b>	Connection points

**6.5.3. Operating the machine:**

**6.5.3.1. Start-up:**



*The machine must be first started-up and be put into service by authorized and qualified personnel.*

1. Check the emergency stop buttons. If they are engaged, release them. (Pull and release)
2. Switch on the main switch (See **Figure 6.5.3.1**)



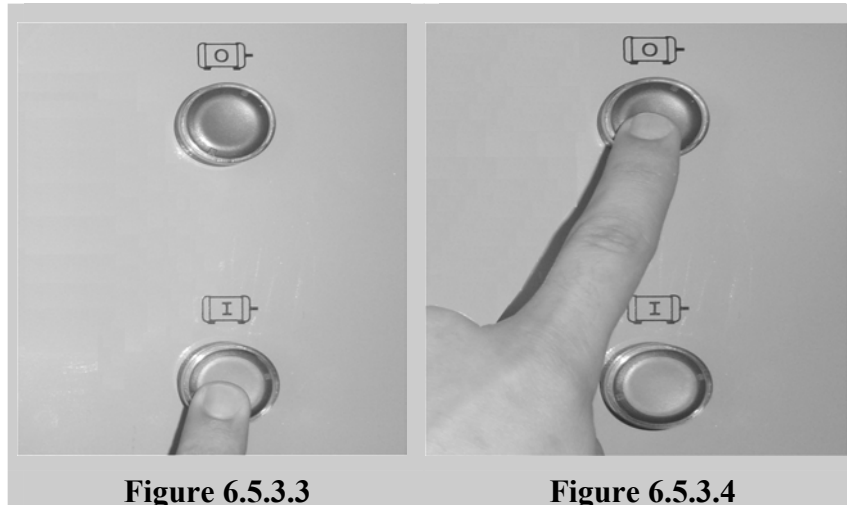
**Figure 6.5.3.1**

3. Press the Main Voltage On button on the electrical cabinet (See **Figure 6.5.3.2**)



**Figure 6.5.3.2**

4. Press the start button on the control panel or on the electrical panel cover (See **Figure 6.5.3.3**).



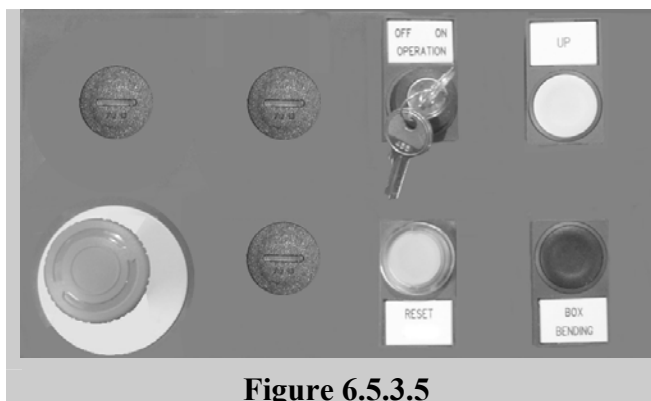
**Figure 6.5.3.3**

**Figure 6.5.3.4**



If you start up the machine at first time after the machine is delivered, you should check the pump rotation. Check the motor rotation by pushing motor **start** button on the control panel or on the cabinet cover (**Figure 6.5.3.3**), and immediately after, motor **stop** button on the control panel (**Figure 6.5.3.4**). The motor must be rotating in the direction of " **arrow** " marked. If it is rotating in the reverse direction change any two phases in the electricity supply point.

5. Turn the **operation ON/OFF** switch on pedal control pendant to the position **ON** (See **Figure 6.5.3.5**). Thus the pedal control circuitry will be activated.



**Figure 6.5.3.5**

6. Now you should select working mode of your machine. There are two operational modes, which can be selected by the working mode selector switch on the electrical cabinet cover. **Mode 1** is used for adjustment applications, **Mode 2** are used for bending operations.

- 1- Turn the mode selector switch to the position **1**. When the **Left Pedal** on the foot-pedal control stand is pressed continuously, the top beam will travel down in a controlled slow speed, and will stop immediately when pedal is released. Pressing pedal

again, this controlled down-travel of the beam will continue. To have the beam move up again at controlled speed, the **Right** foot or **Up** button should be pressed continuously. Releasing this foot pedal, the beam travel will stop. The "stepping" mode is used for tooling adjustments.

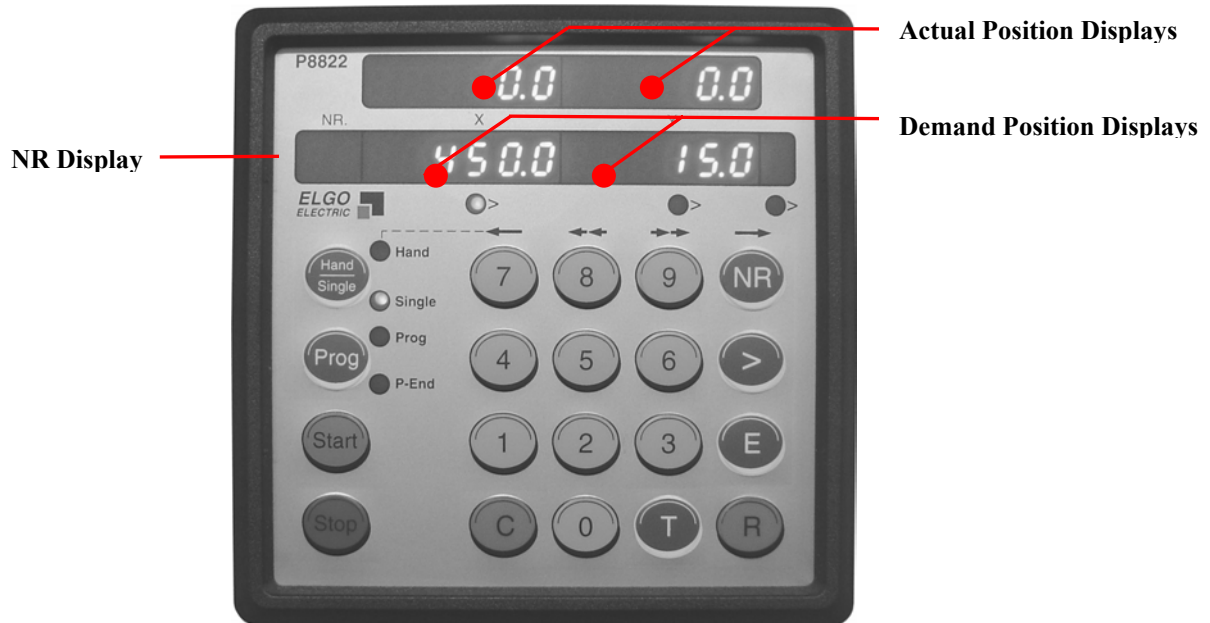
- 2- Turn the mode selector switch to the position **2**. When the left foot switch is pressed, the beam will travel down in fast speed. When the Beam touches slowdown switch, its velocity reduces. Because the beam moves in slow speed you feed the sheet to the machine anytime. The **pressure switch** determines when the down travel is stopped. After completion of the bending operation, the beam will begin its upward travel in fast speed. If the left foot switch is released at anytime, the beam will return at fast speed until it is in contact with the top point switch.
- 3- Turn the mode selector switch to the position **2** in order to perform bending operation. Top beam travel of the machine is in two speeds. When the **Left pedal** on the pedal control stand is pressed continuously, the top beam will travel down in fast speed, and will stop at the mute point. Before mute point, when the pedal is released, the beam retracts immediately to the top point. After the beam stops at mute point, feed the sheet to machine in front of machine. Then, press the **Left Pedal** again. The beam will begin its downward movement in slow speed. The **pressure switch** determines where the down travel is stopped. After completion of the bending operation, the beam will begin its upward travel in fast speed. When buttons are released after mute point, the beam will stop. **Whenever you press the Right Pedal, the beam will return at fast speed until it is in contact with top point switch.**







**Figure 6.5.3.6**



### 6.5.3.2 Operating modes of the machine

Set bending angle and bending width using digital controller. How to make these settings are explained below.



**Figure 6.5.3.7**

Key	Function
<b>Actual Position Displays</b>	Shows current X and Y axes value.
<b>Demand Position Displays</b>	X and Y axes entries
<b>NR Display</b>	Shows NR value
<b>Hand-Single</b>	Hand or Single mode selection key
<b>Prog</b>	Program mode selection key
<b>Start</b>	It executes X and Y axes according to values entered
<b>Stop</b>	Stops execution
	Steps the program through, line by line
	Steps through field by field (rolls over from line to line as well) Single Selects single run mode
	Ends programming (cursor light must be in "last" window)
	Cancels existing value

	Resets the program to beginning
	Selects Registers

P8822 digital controller has 3 working modes.

- 1- Manual mode
- 2- Single mode
- 3- Program mode

These modes are explained in details below.

## 1. Manual Mode

This mode is used for adjustment process. You can determine angle values according to the tool you are using and also move the backgauge for adjustment applications. To work with manual mode;

1. Press Hand/Single key two times (See **Figure 6.5.3.8**) on the P8822. The small led on the controller (Hand led) will light up. Thus you will switch to manual mode.



**Figure 6.5.3.8**



**Figure 6.5.3.9**

2. Press cursor key (See **Figure 6.5.3.9**) to select the axis in which you make adjustments.
3. Use the numeric keys 7, 8, 9 and NR (See **Figure 6.5.3.10**) to move the axis.

**Note:** When making the X axis move manually, you must start the main pump.

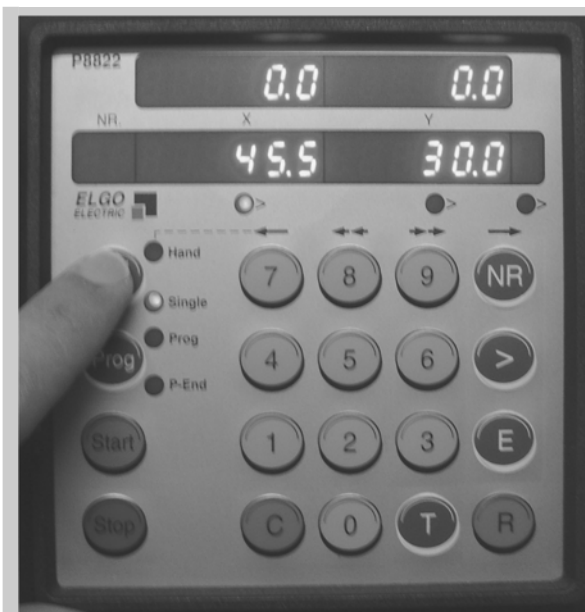


**Figure 6.5.3.10**

## 2. Single Mode

When controller is in single mode, you can bend sheet metals by entering bending width value (X value) and bending angle value (Y value). If you want to make another bent, you should enter new X and Y values. To select single mode;

1. Press Hand/Single key once (See **Figure 6.5.3.11**) on the controller. The related led (Single led) will light up.

**Figure 6.5.3.11****Figure 6.5.3.12**

2. Enter the bending width (See **Figure 6.5.3.12**) in X axis window (X value) using numerical keys.
3. Press cursor key (See **Figure 6.5.3.13**) to select Y axis window (Y value).

4. Enter the bending angle (See Figure 6.5.3.14) in Y axis window (Y value) using numerical keys.

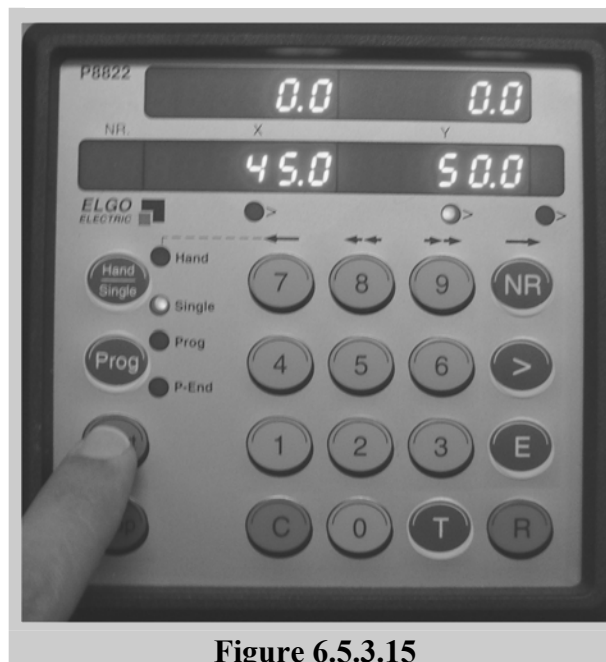


**Figure 6.5.3.13**



**Figure 6.5.3.14**

5. Press start key on the controller. (See Figure 6.5.3.15) Thus the back gauge will move to its final position and the motor with reducer behind the top beam will adjust the angle value.



**Figure 6.5.3.15**

**Note:** Y value is in millimeters. Because of using different types of tools and limitations in Elgo controller, it is impossible to design angle scale in degree. Therefore the user should design a millimeter scale for angle according to different types of tools.

### 3. Program mode

When you select the program mode in the controller, you can bend sheet metals according to the program you write before. To work with program, first you should select program mode;

1. Press Prog key on the controller (See **Figure 6.5.3.16**). The small led (Prog. Led) will light up. A new program can be selected by means of Register R40. The values of digits in register R40 are 0 to 99 i.e. value "0" is the number 1 program.



**Figure 6.5.3.16**



**Figure 6.5.3.17**

2. In this step, you should select program number. To select program number, press R key (See **Figure 6.5.3.17**) on the controller. (If you are editing a program, press T key to resets windows to zero.) NR window begins flashing.
3. Enter 40 (See **Figure 6.5.3.18**) using numerical keys and press Cursor key (See **Figure 6.5.3.19**). You will see existing program number in X widow.



**Figure 6.5.3.18**



**Figure 6.5.3.19**

4. Enter any program number (up to 99) (See Figure 6.5.3.20) for example 1 using numerical keys and press E key (See Figure 6.5.3.21).



**Figure 6.5.3.20**



**Figure 6.5.3.21**

5. You will see zero on NR window (now program line number) and X, Y demand value windows (See Figure 6.5.3.22). Now you are ready to write a program. Do not forget that you are writing 10th program in this example.



**Figure 6.5.3.22**



**Figure 6.5.3.23**

6. Press NR key on the controller (See **Figure 6.5.3.23**) to select program line. After pressing NR key, NR window will show 01. Now you can edit your program.
7. Enter the bending width (See **Figure 6.5.3.24**) in X axis window (X value) using numerical keys.
8. Press cursor key (See **Figure 6.5.3.25**) to select Y axis window (Y value).

**Note:** In order to **delete** existing x or y value, pres C key on the controller.



**Figure 6.5.3.24**



**Figure 6.5.3.25**

9. Enter the bending angle (See Figure 6.5.3.26) in Y axis window (Y value) using numerical keys.

10. Press Cursor key again (See Figure 6.5.3.27) to go to the second line in the program. NR window will show 02. Now you are in the second line in your program.



**Figure 6.5.3.26**



**Figure 6.5.3.27**

11. Repeat the procedure above to program successive lines. You can program 20 lines in a program as a default.

12. At the end of your program, press E key (See Figure 6.5.3.28). You will see zero on NR window (now program line number) and X,Y demand value windows (See Figure 6.5.3.29).



**Figure 6.5.3.28**



**Figure 6.5.3.29**

#### 4. Editing a program

1. In order to make any changes in a existing program, press Prog key on the controller (If you are already in program mode, press T key to set all windows to zero). All windows will show zero (See Figure 6.5.3.30).



**Figure 6.5.3.30**



**Figure 6.5.3.31**

- By pressing NR key sequentially, select the program line you want to change (See Figure 6.5.3.31).



**Figure 6.5.3.32**



**Figure 6.5.3.33**

- Press cursor key to select axis value you want to change. If you want to change X axis value do not need to press cursor key.
- Press C key to delete existing value (See Figure 6.5.3.32). Write new value and press cursor key. The changes you have made will be saved to memory after pressing Cursor key. Press T key to the beginning of the program (See Figure 6.5.3.35)



**Figure 6.5.3.34**



**Figure 6.5.3.35**



## 5. Working with programs

1. If you write programs before (up to 99), first you select the program you want to run (execute). Press Prog. Key (See Figure 6.5.3.36) and then press R key (See Figure 6.5.3.37)
2. Write 40 by using numerical keys in NR window.



**Figure 6.5.3.36**



**Figure 6.5.3.37**

3. Press Cursor key (See Figure 6.5.3.38). Now you are ready to select the program. 0 shows program 1. Write the program number you have created before.
4. Press E key (See Figure 6.5.3.39). Now you should see the beginning of your program. NR will show the line number of your program.



**Figure 6.5.3.38**



**Figure 6.5.3.39**

5. Press **NR** key to select the beginning line you start to execute (See **Figure 6.5.3.40**).

6. Press **Start** key on the controller (See **Figure 6.5.3.38**). The controller will sets the backgauge and angle.



**Figure 6.5.3.40**



**Figure 6.5.3.41**

### 6.5.3.3 Bending

1. If you are using pedal mode (mode 2), keep the left foot switch pressed on the pedal control (See **Figure 6.5.3.42**). The top beam will travel down and stop at mute point.

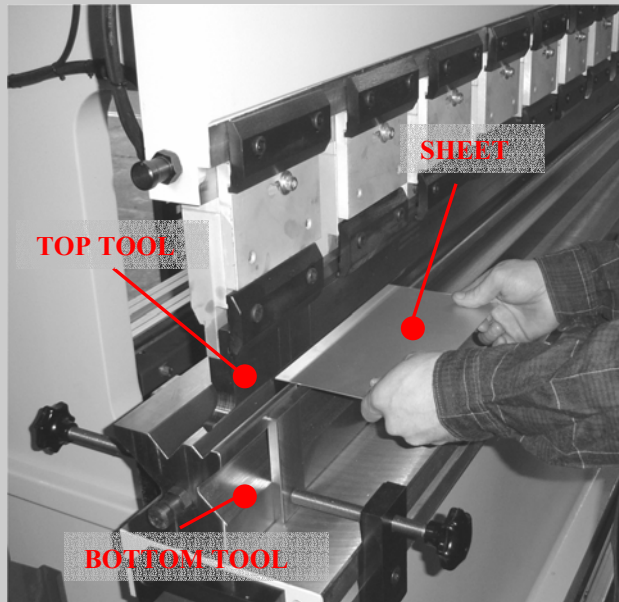
! Before pressing the foot switch, please wait for the controller to finish the positioning the back gauge and angle adjustment.



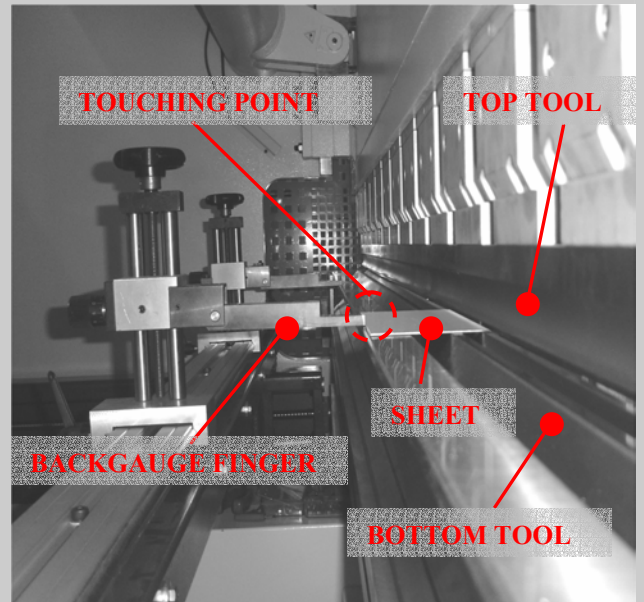
**Figure 6.5.3.42**

**NOTE:** If you release foot pedal, the beam retract automatically to the top point.

2. Place the sheet metal (or plate) between two tools (See **Figure 6.5.3.43.a**) and be sure that the far end of the sheet touches the backgauge finger.



**Figure 6.5.3.43.a**



**Figure 6.5.3.43.b**



While the beam is travelling down, **DO NOT** insert anything between tools. In such cases, the beam stops its movement. Because your machine is equipped with **Laser safety system** for machine and the operator safety, the movement is interrupted.

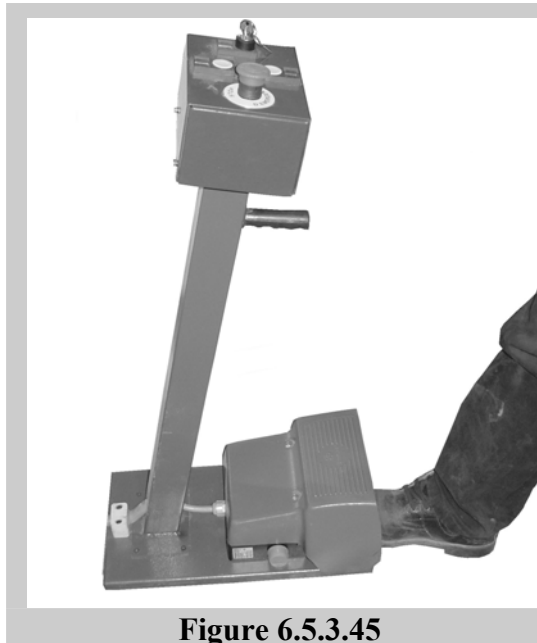


**Figure 6.5.3.44**



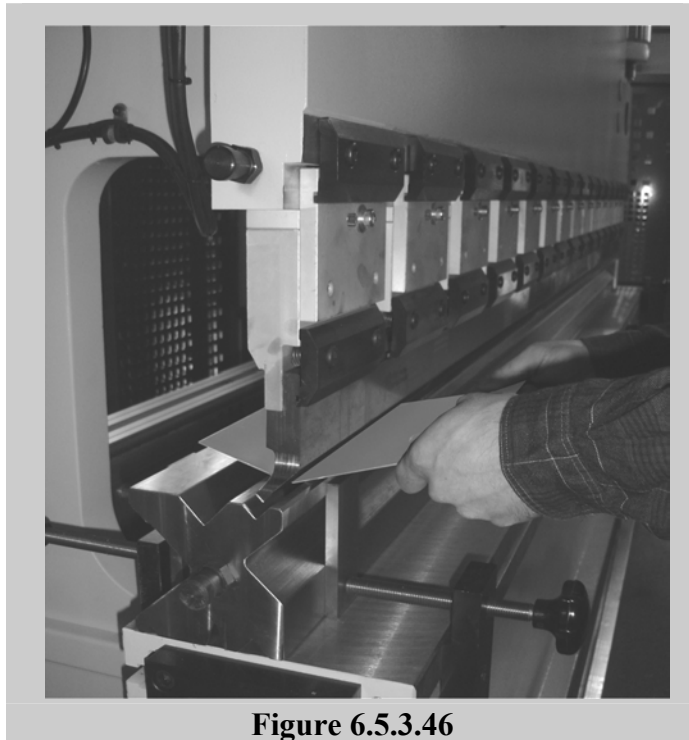
**After the mute point, some safety devices will be NOT ACTIVE except emergency stop buttons, back door safety switch and side doors safety switches.**

**3. Release the left foot pedal and press it again (see Figure 6.5.3.45)**



**Figure 6.5.3.45**

**And complete the bending (see Figure 6.5.3.46)**



**Figure 6.5.3.46**

**!!! Warning: Your hands can be jammed between the top tool and the sheet.**



Prior to despatch the machine has been tested according to its capacity ; adjustments for parallelism have been made; and the bottom tool has been centered with respect to the top tool.

So long as the original parallelism of the machine remains intact, bending operations can be carried out in the modes 1, 2, 3 by selecting the appropriate "V" groove on the bottom tool according to material thickness used.

### **Remember:**



6. When the foot-pedal is released during fast speed before mute point, the beam will retract automatically.
7. When the foot-pedal is released during slow bending speed, the beam will stop at standstill. Pressing the foot-pedal again, the beam will continue to travel down.
8. At any standstill position of the beam, the button on the pedal control stand or the right foot switch retracts the beam up to the top dead-point.



*Always switch off the main switch to "0" when inside the danger zone of the press brake.*

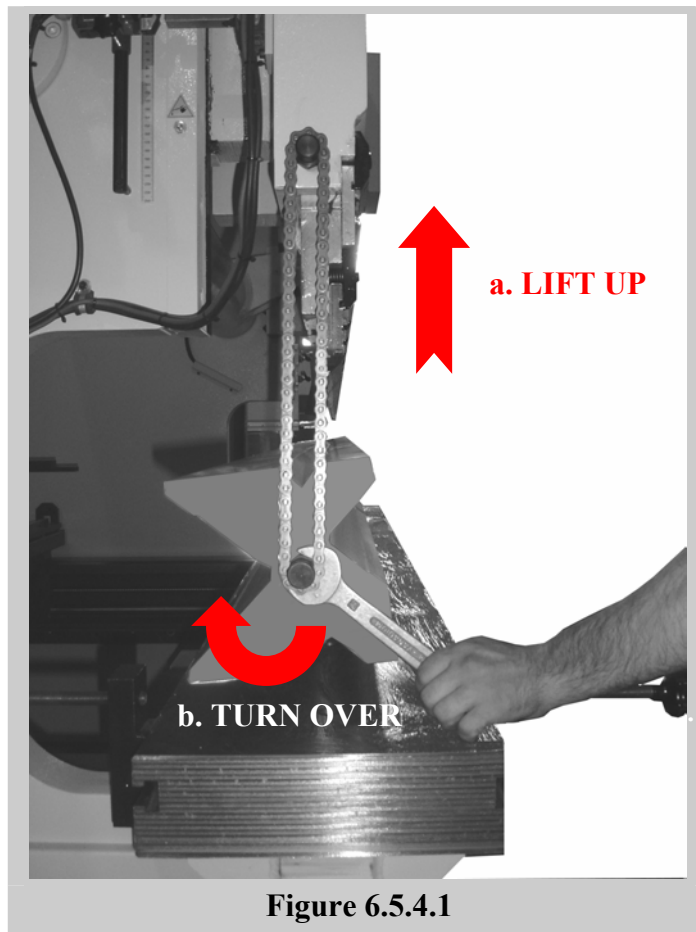
### 6.5.4. Centering the bottom tool

Make sure that mode selector switch on electrical cabinet cover is in **position 1 (mode 1)** during the following procedures.



Top tool is fixed on the top beam by means of holders and bolts. It can be reversed if necessary. To align top tool with appropriate "V" groove on the bottom tool, proceed as follows:

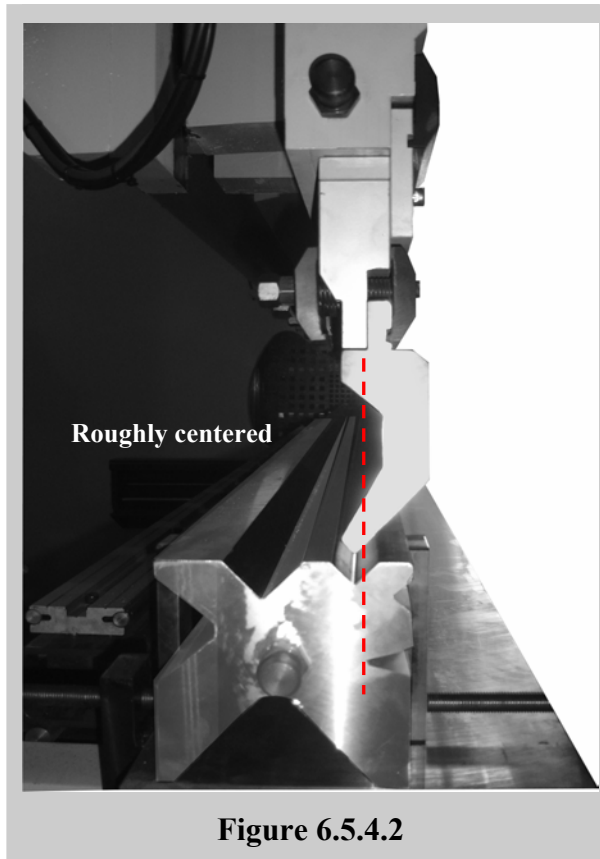
1. Lift up the bottom tool from the both sides by means of top beam power using the chains (See **Figure 6.5.4.1.a**) provided on both sides of the machine.



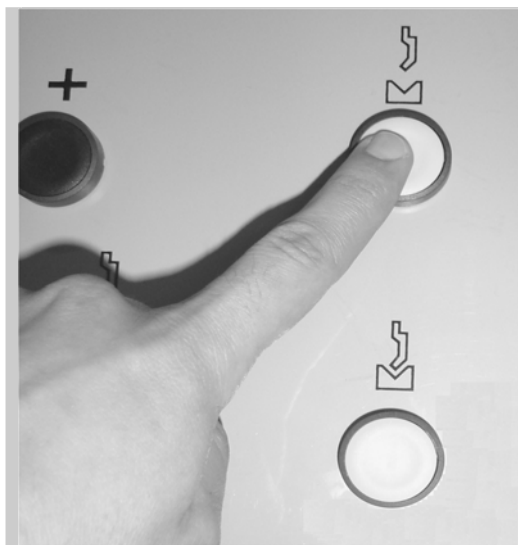
**Figure 6.5.4.1**

2. Select the desired vee by turning over the tool using wrench (See **Figure 6.5.4.1.b**).

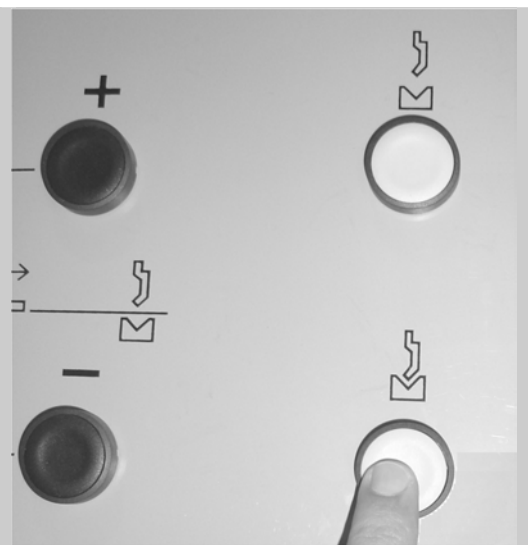
3. Place back the bottom tool by roughly centering it on the table (See **Figure 6.5.4.2**).



4. Use pushbuttons **reducer up** (see **Figure 6.5.4.3.a**) and **reducer down** (see **Figure 6.5.4.3.b**) on the control panel to coin the top tool in the vee to be used. (When using the above pushbuttons it is possible to work with side fences open, in which case the beam will be inactive).

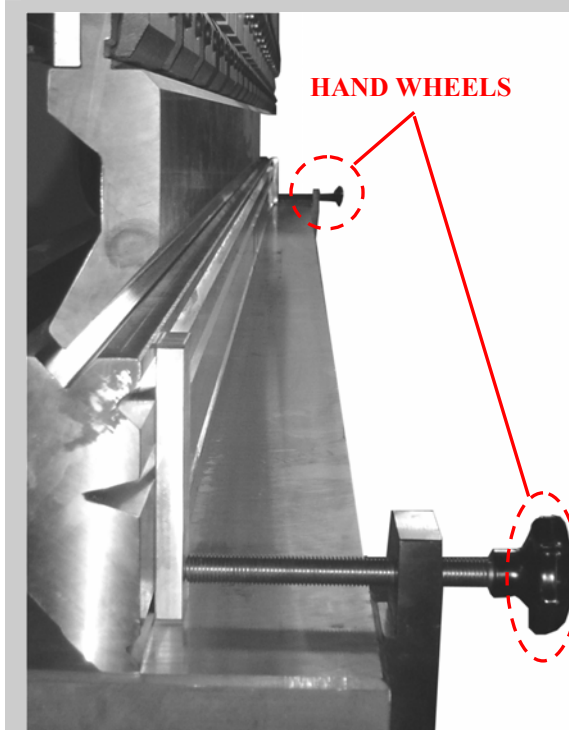


**Figure 6.5.4.3.a**



**Figure 6.5.4.3.b**

5. Use hand wheels to align the bottom tool as much as needed for exact centering (see Figure 6.5.4.4 and Figure 6.5.4.5)



**Figure 6.5.4.4**



**Figure 6.5.4.5**

**IMPORTANT:** As soon the punch is in contact with the "V" release pushbutton **reducer down**. Otherwise, the reducer or the sliding shafts may be damaged.

Stop the machine after alignment, and use the hand screw clamps to fix the bottom tool in this location.

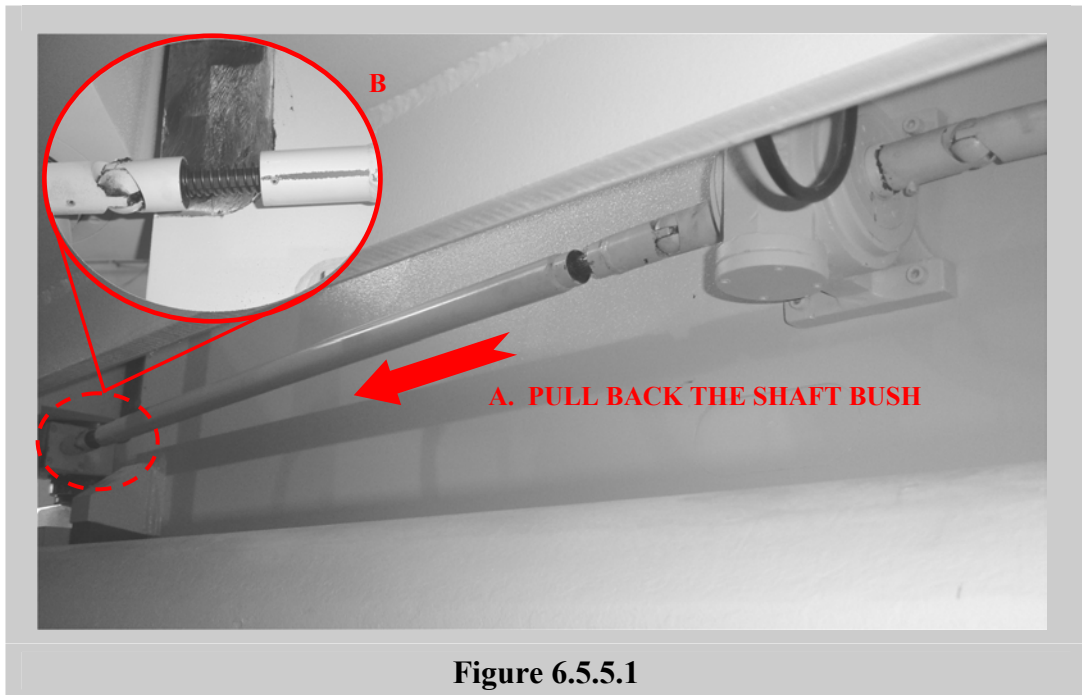


### 6.5.5. Top beam parallelism adjustment

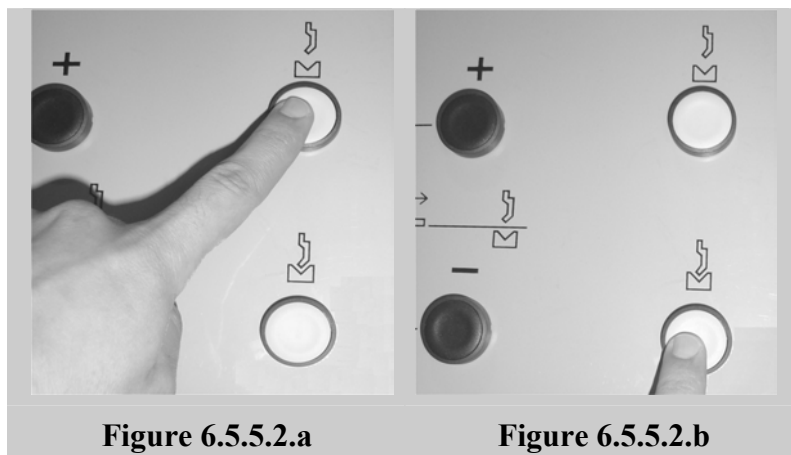
If, for any reason, the factory-set parallelism is lost, the following actions should be taken:

- Turn the mode selector switch on the electrical cabinet cover to **position 1 (Inching mode)**

1. Pull back the bush of the splined shaft (see fig a) and remove it. The spring in the shaft-the piston screw connection point allows the shaft bush move back (see **Figure 6.5.5.1**).



2. To re-establish parallelism; use pushbutton **reducer up** (see **Figure 6.5.5.2.a**) on the control panel to descend left hand side of the top beam and pushbutton **reducer down** (see **Figure 6.5.5.2.b**) on the control panel to ascend it. In this case the piston on the right hand side is stationary



3. Continue with this alignment until you can verify that both sides of the top beam have the same level.

4. When parallelism is achieved, put the bush of splined shaft back into its original position.

The piston on the left hand side can travel safely within a range of 2mm. To avoid beam deflection and any damage to the machine, this limit should not be exceeded.

**! *NO ADJUSTMENT FOR PARALLELISM SHOULD BE DONE WHILE TOP BEAM IS UNDER HYDRAULIC PRESSURE.***

### 6.5.6. Backgauge parallelism adjustment

If, for any reason, the factory-set parallelism is lost, the following actions should be taken:

Two types of parallelism adjustment should be made;

1. Backgauge profile parallelism.
2. Guiding profile parallelism.

#### 1. Backgauge profile parallelism:

Backgauge profile parallelism should be adjusted in the Y direction (See Figure ). Both ends of the backgauge profile must be parallel to the bottom tool table.

- Tighten or loosen the both bolts (See Figure 6.5.6.1.a and Figure 6.5.6.1.b) to satisfy the parallelism.

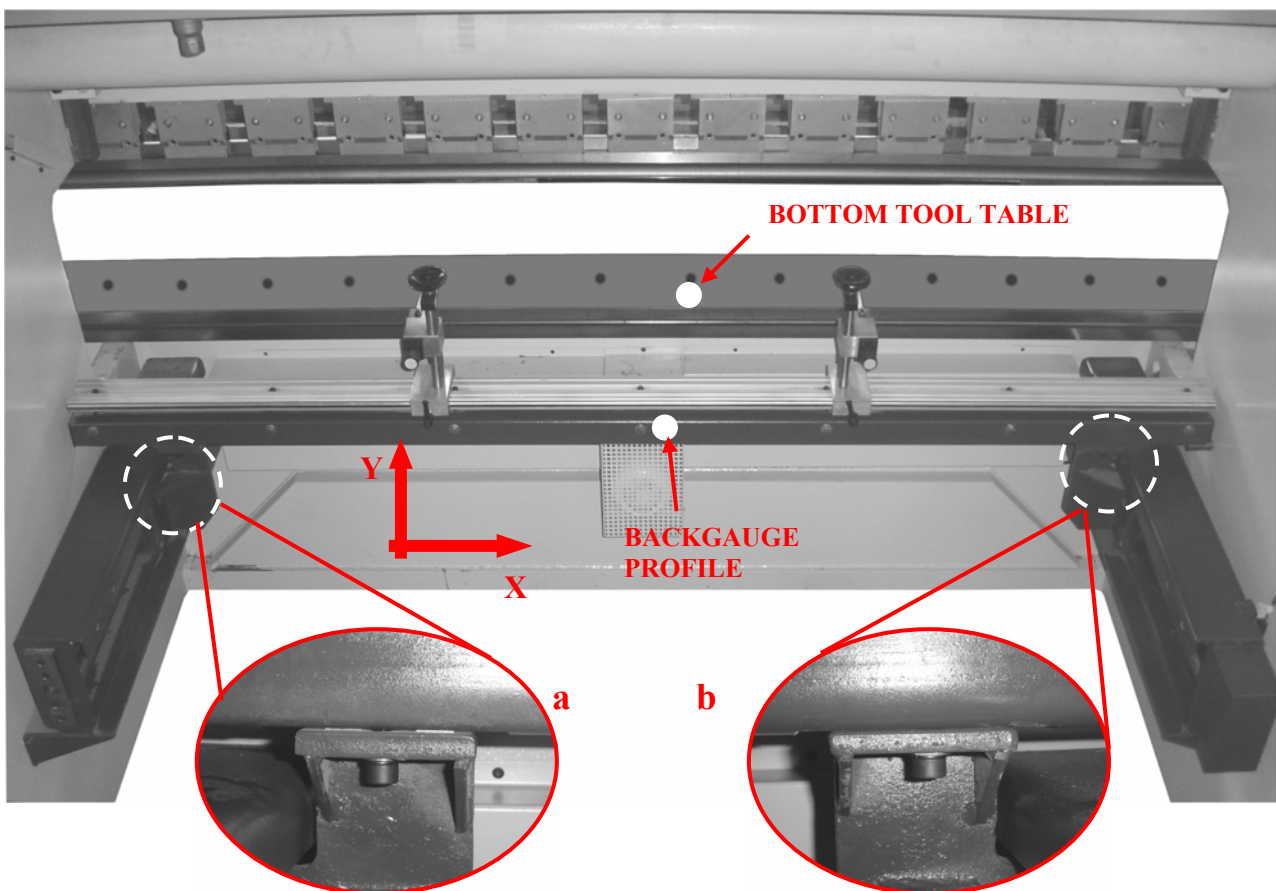


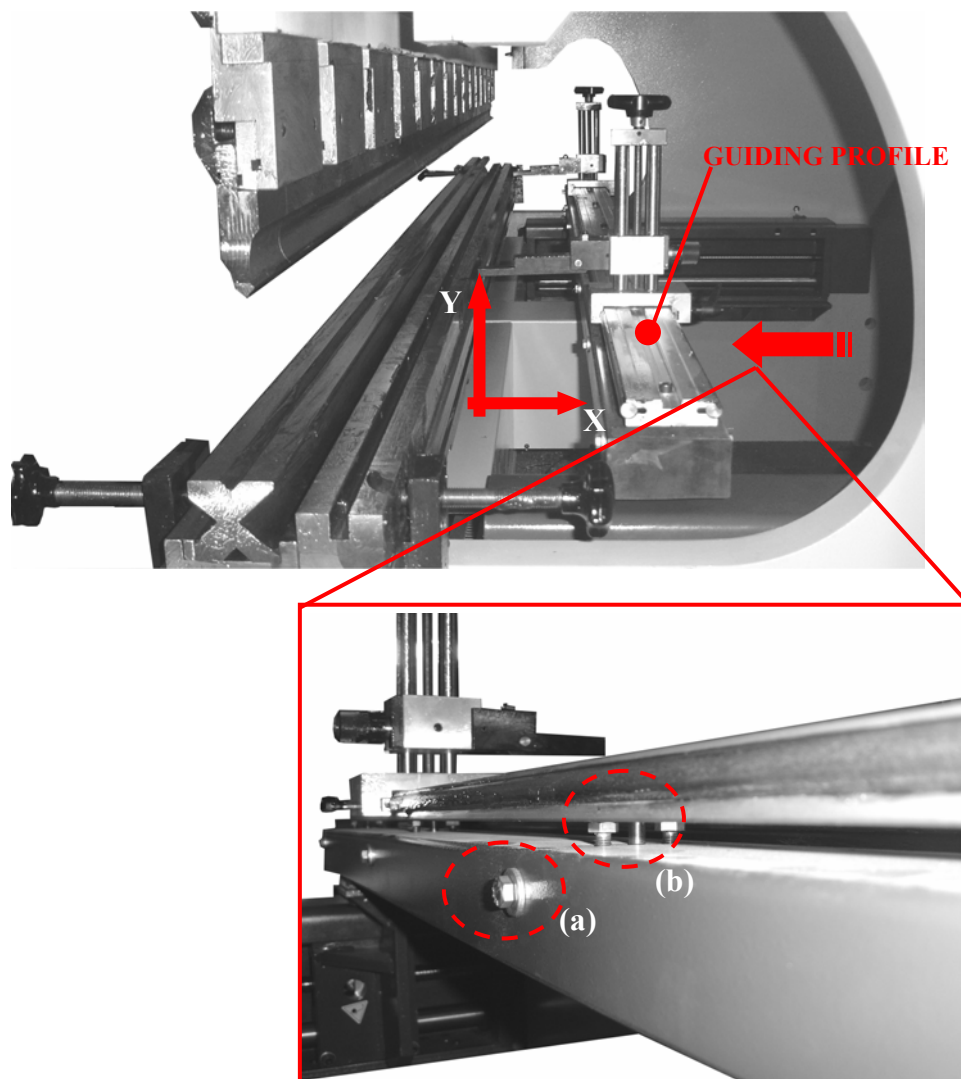
Figure 6.5.6.1

**2. Guiding profile parallelism:**

Guiding profile parallelism should be adjusted in the X and Y direction (See **Figure 6.5.6.2**).

The bolts B (See **fig**) along the backgauge profile are used to adjust parallelism in Y direction and the bolts A are used in X direction. Guiding profile must be parallel to the bottom tool so that bending process can be achieved in right dimensions.

- Tighten or loosen the both bolts (See **Figure 6.5.6.2.a** and **Figure 6.5.6.2.b**) along the back gauge profile to satisfy the parallelism.



**Figure 6.5.6.2**

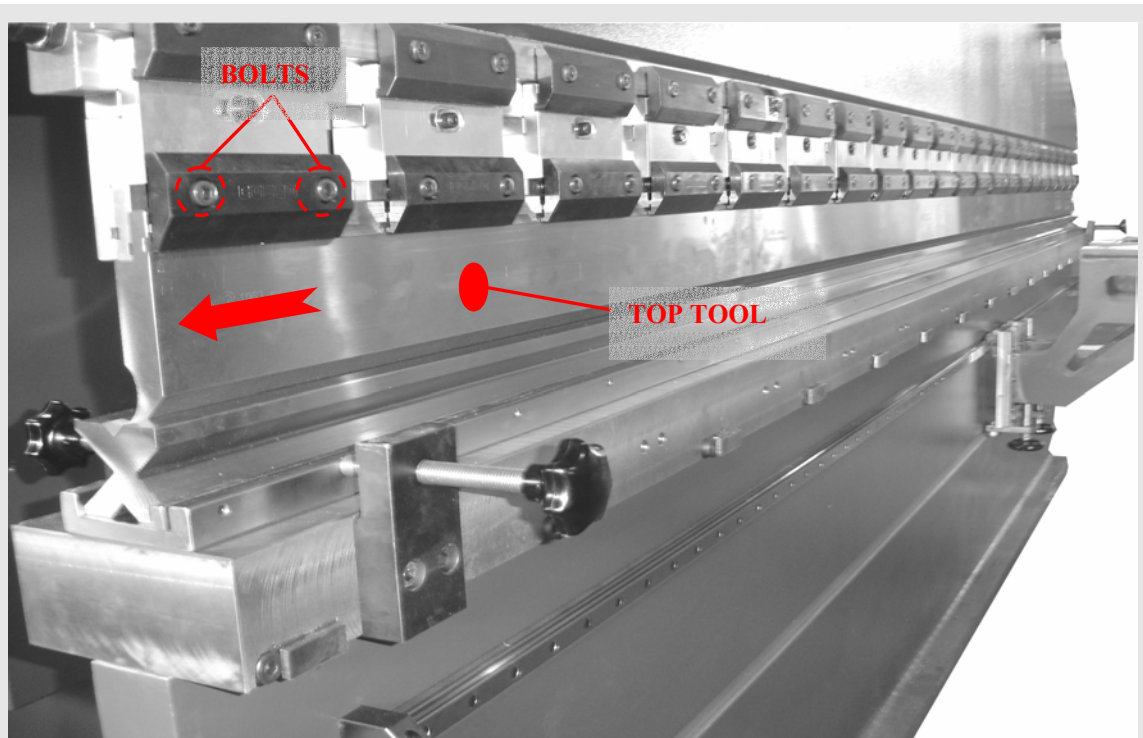
### 6.5.7. Changing Bending Tools

In hydraulic press brakes, two different mechanic clamping (For the top tool) and (tree for the bottom tool) systems are used. These systems and tool changing are explained below.

#### Type 1.

##### a. Changing the top tool:

The top tool is fixed in its place as seen in **Figure 6.5.7.1** below.



**Figure 6.5.7.1**

! There is danger of top tool falling free if the tool fixing bolts are let loose excessively and also danger of top tool and adaptors assembly falling free if the adaptors fixing bolts are let loose. **CHECK** the bolts against any loosening periodically.

1. Drop top beam on low pressure such that there is a clearance of approximately (1 mm) between top and bottom tools.

2. After stopping the main motor and switching off the main switch, let the top tool sit on the bottom tool "vee" slowly by loosening up the bolts (See **Figure 6.5.7.1**)

3. Pull out the top tool manually by the left side of the machine. Stock it using appropriate lifting equipment.

**NOTE :**

You should loosen the all bolts along the beam so that you can pull out the top tool.

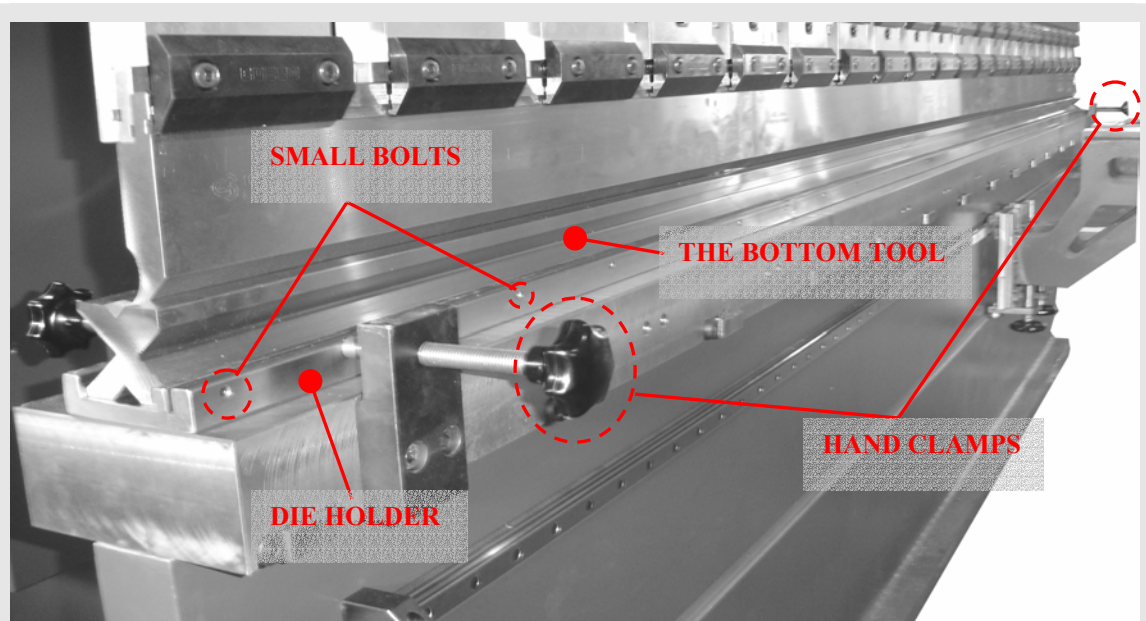
3. Place the new top tool from any side.

5. Tighten up the all bolts to fix the top tool.

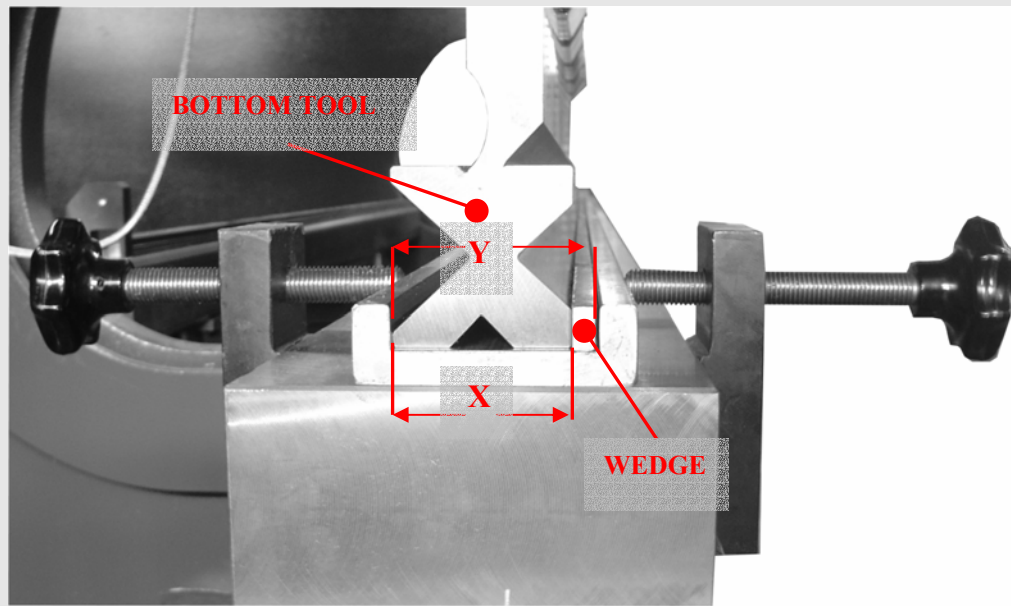
**b. Changing the bottom tool:**

To replace the existing bottom tool with a new one :

1. Loosen up the small bolts (See **Figure 6.5.7.2**) along the die holder.



**Figure 6.5.7.2**



**Figure 6.5.7.3**

2. Pull out the wedge (See **Figure 6.5.7.3**) from any side.
3. Pull out the tool to any side, and stock it by appropriate lifting equipment.
4. Put on the new tool on die holder by means of lifting equipment. Place the new bottom tool from any side.
5. Place the wedge in its place.

**NOTE 1:** If the X value (width of the bottom tool) is larger than width of the removed tool, you should change the wedge also.

7. Tighten up the small bolts along the die holder.

**NOTE 2:** If the X value (width of the bottom tool) is greater than width of the inner width (Y) of the die holder, you should change the die holder also.

**In order to change the die holder;**

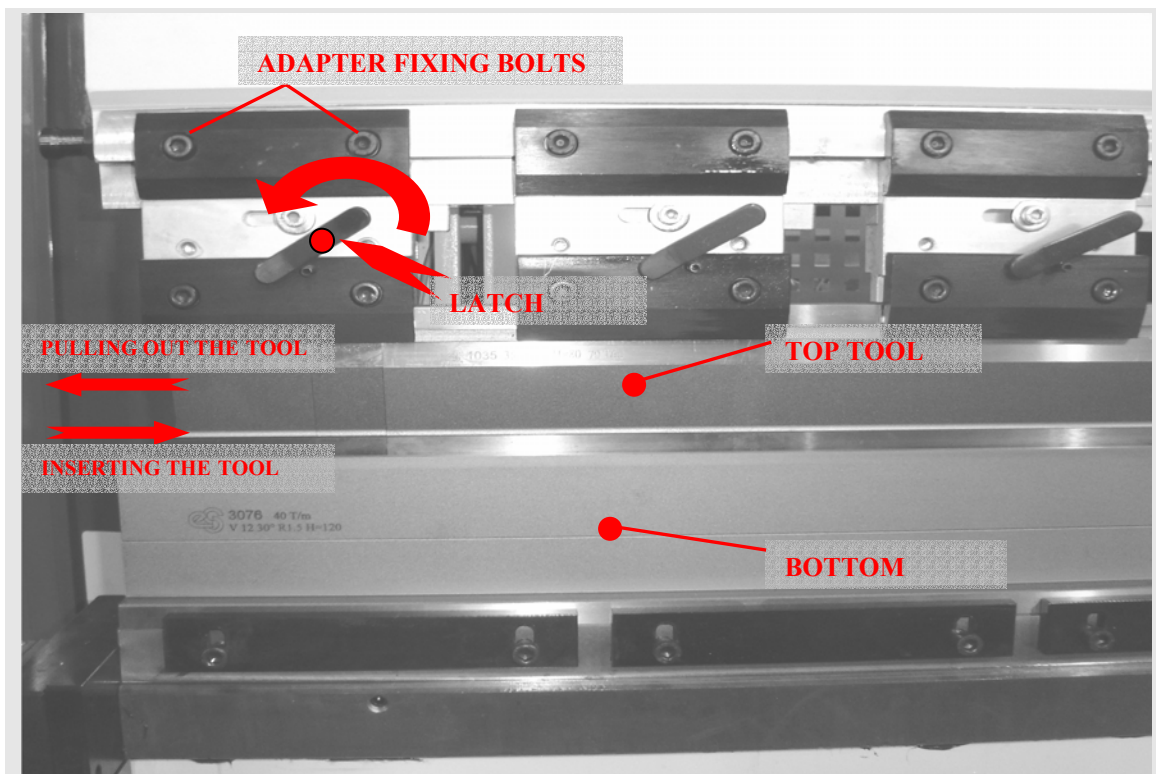
After removing the bottom tool,

1. Loosen up the hand screws in both sides of the machine.
2. Change the die holder with a new one.
3. Tighten up the hand screws.

**Type 2.**

**a. Changing the top tool:**

The top tool is fixed in its place as seen in **Figure 6.5.7.4** below.



**Figure 6.5.7.4**

! There is danger of top tool falling free if the tool fixing bolts are let loose excessively and also danger of top tool and adaptors assembly falling free if the adaptors fixing bolts are let loose. **CHECK** the bolts against any loosening periodically.



1. Drop top beam on low pressure such that there is a clearance of approximately (1 mm) between top and bottom tools.
2. After stopping the main motor and switching off the main switch, let the top tool sit on the bottom tool "vee" slowly by releasing the latch in the direction (See Figure 6.5.7.4)
3. Pull out the top tool manually by the left side of the machine. Stock it using appropriate lifting equipment. (If the tool is a sectional type, by hand)

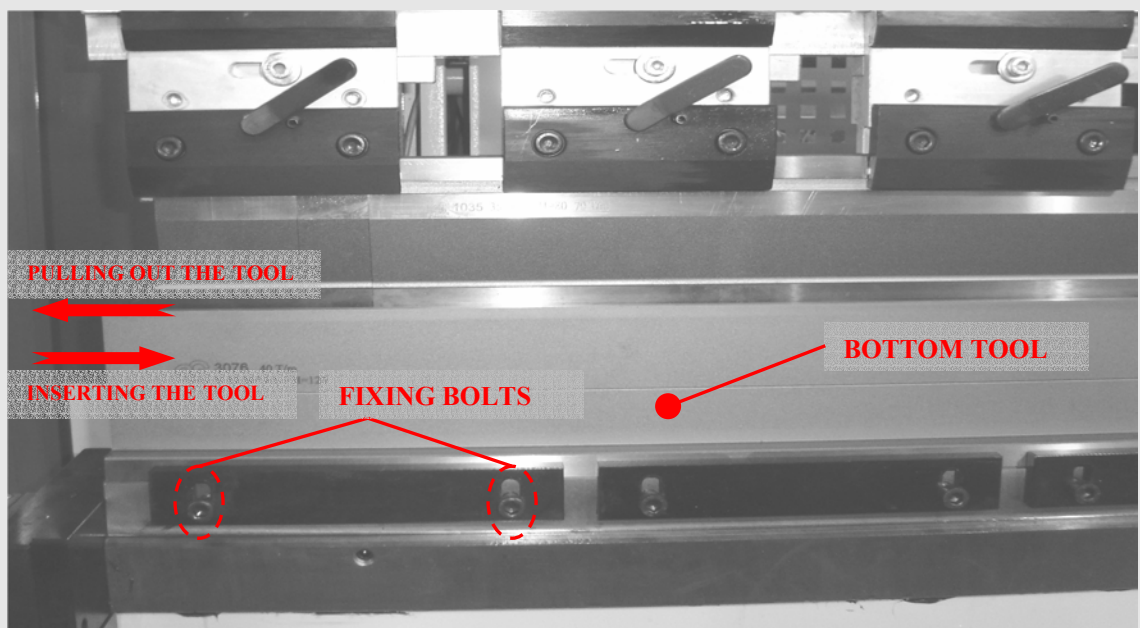
**NOTE :** You should release all latches along the beam so that you can pull out the top tool. (If the tool is not sectional type)

4. Place the new top tool from any side.
5. Tighten up all latches to fix the top tool.

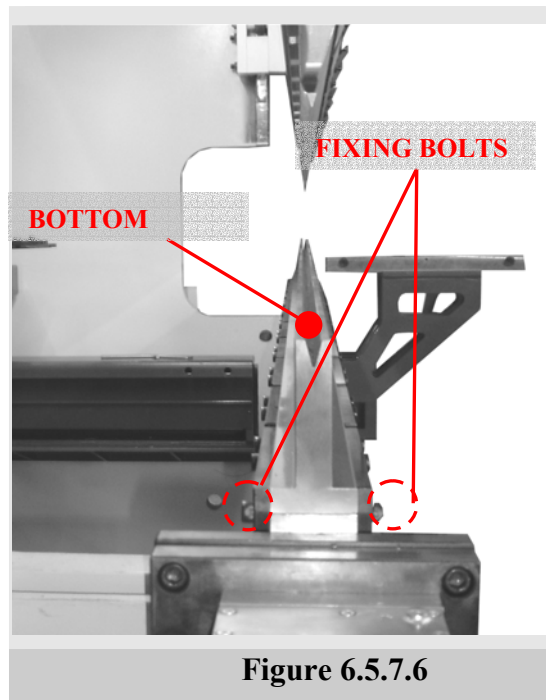
**b. Changing the bottom tool:**

To replace the existing bottom tool with a new one :

1. Loosen up the fixing bolts (See Figure 6.5.7.5 and Figure 6.5.7.6)



**Figure 6.5.7.5**



2. Pull out the bottom tool (See Figure 6.5.7.5) from any side.

3. Put on the new tool on the bed by means of lifting equipment (If you use sectional type of tools, by hand). Place the new bottom tool from any side.

4. Tighten up the fixing bolts along the bed.

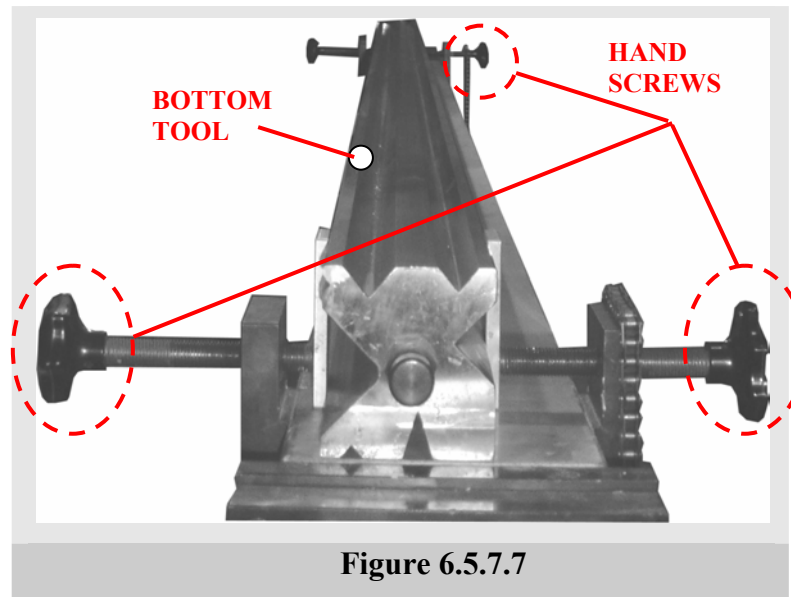
### **Type 3.**

#### **Changing the bottom tool:**

The bottom tool is fixed in its place as seen in **Figure 6.5.7.7** below.

In order to change the bottom tool, proceed the followings;

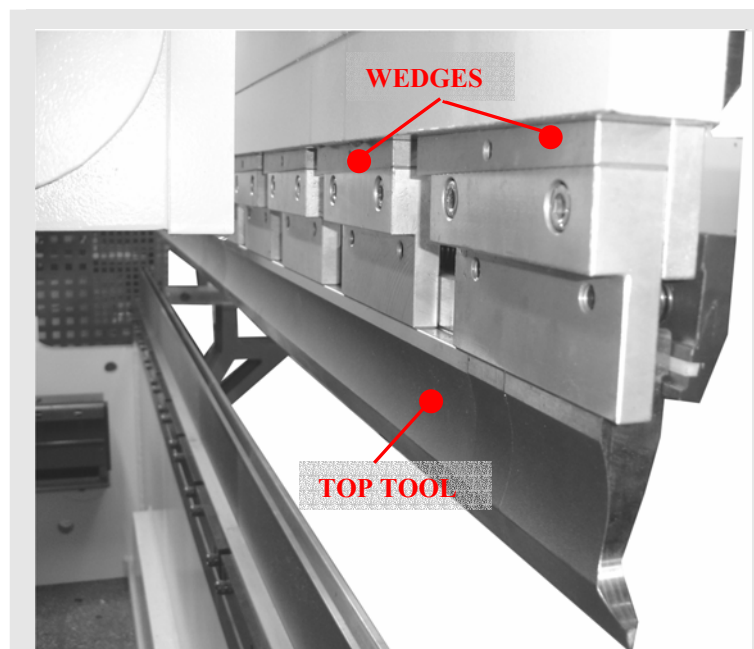
1. Loosen up the hand screws in both sides of the machine.
2. Remove the bottom tool using lifting equipment.
3. Put on the new tool on the bed by means of a lifting equipment
4. Tighten up the hand screws



**Figure 6.5.7.7**

### **6.5.8. Wedge Adjustment**

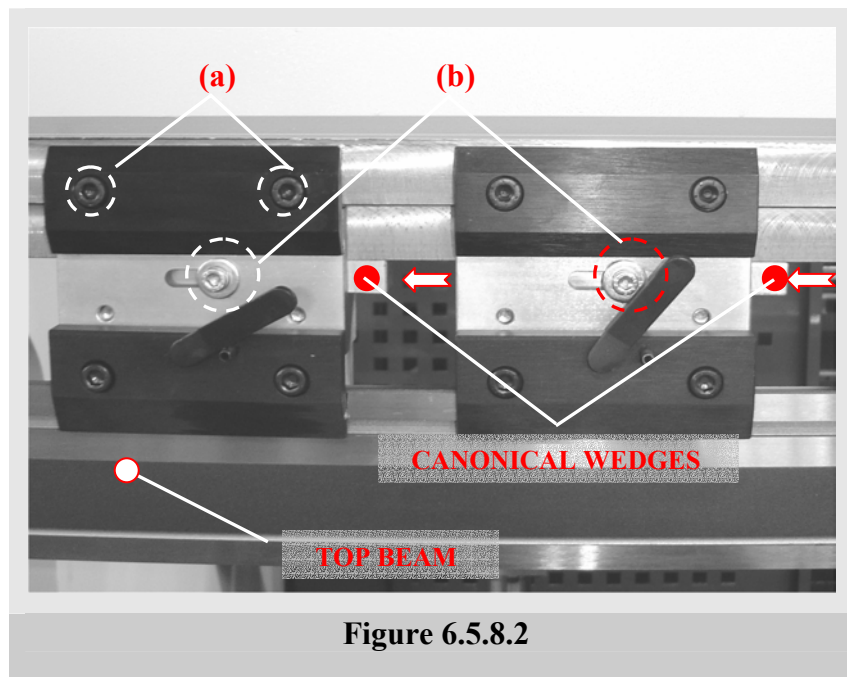
After long periods of usage it is natural that the top and bottom tools will be subject to some material deformation. Such deformations will make it difficult to obtain identical angles over the full bending length. If deformation is excessive, the tools require re-machining, in cases where deformation is not that serious, conical wedges in tile tooling system are utilized to offset angle differences (**Figure 6.5.8.1**)



**Figure 6.5.8.1**

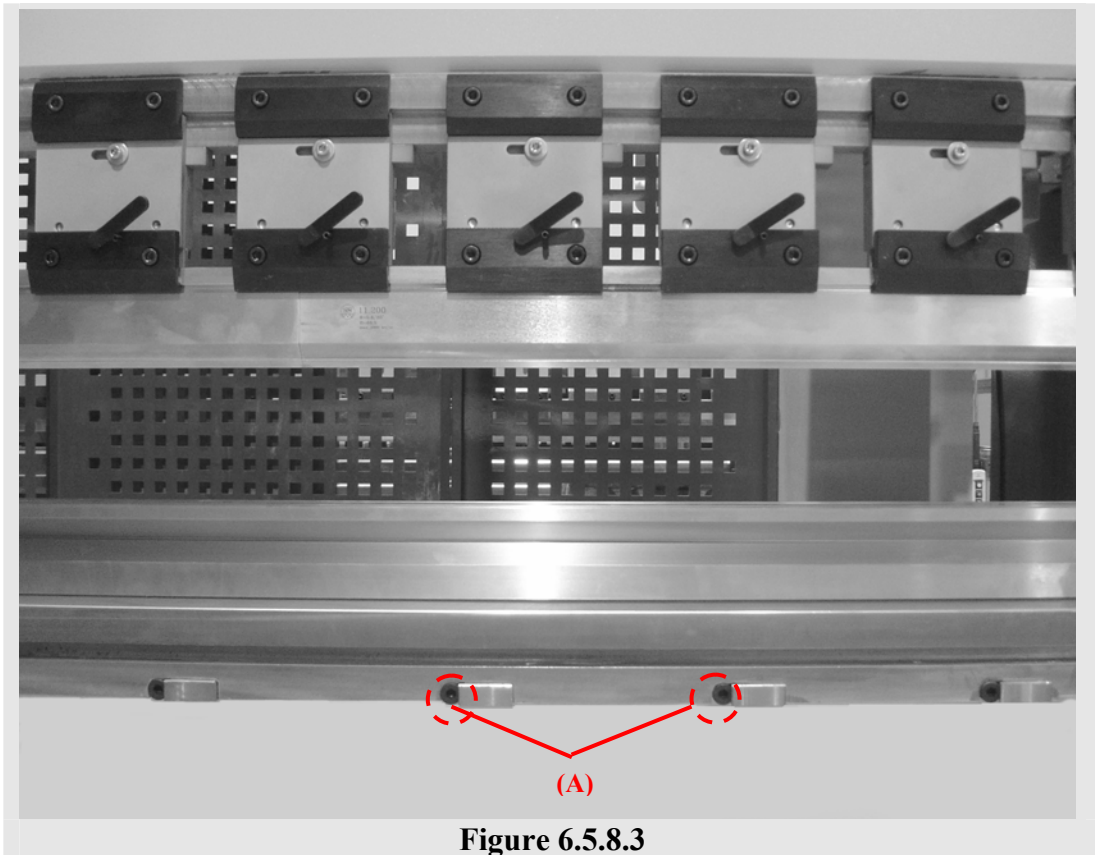
**Wedges are adjusted as follows:**

1. Identify the section on the top tool where bending angle shows a difference.
2. Slightly loosen the cover plate(s) fixing bolts (See **Figure 6.5.8.2.a and b**) with approximate amount of  $y = 0.5$  mm.
3. Push the conical wedges in the direction of the arrow to the extent of tool deformation. (See **Figure 6.5.8.2**)

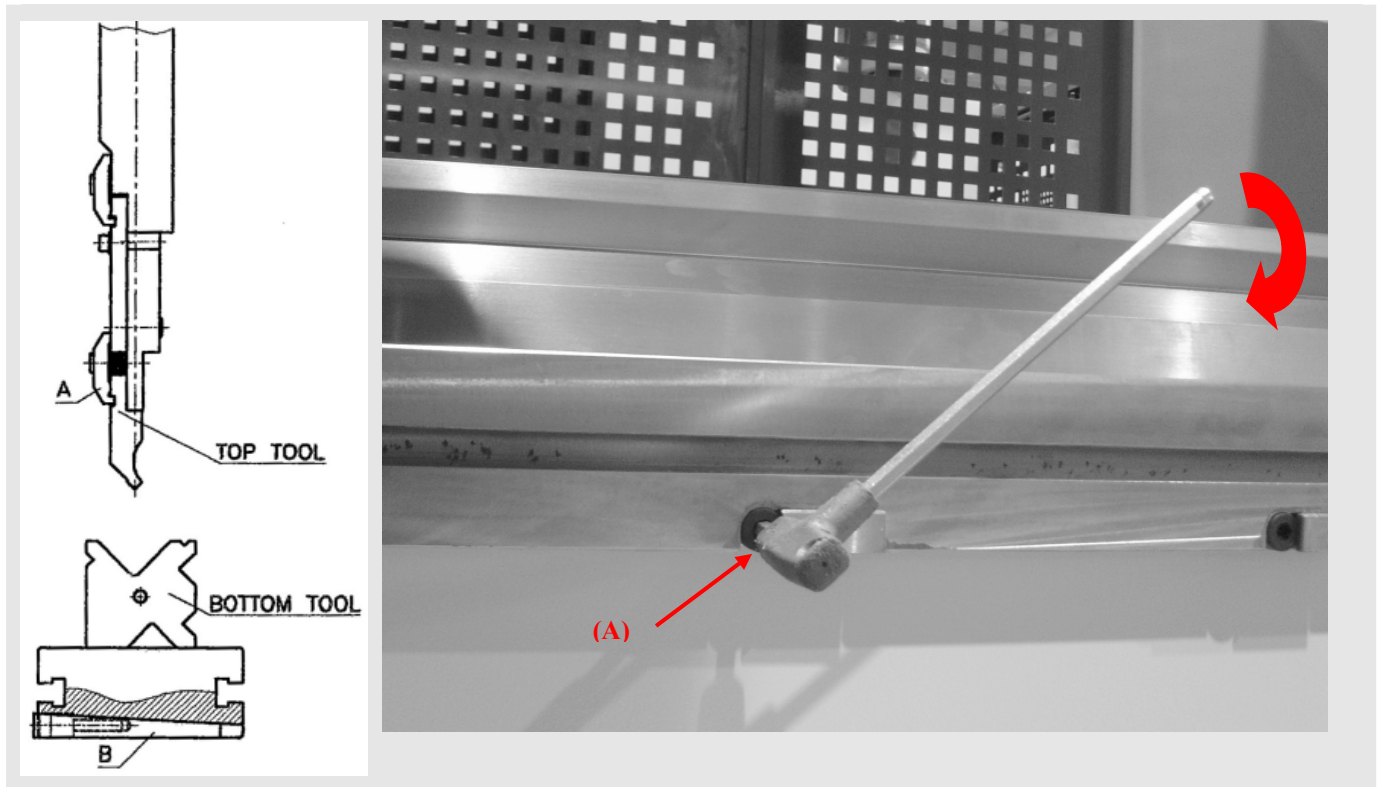


4. Re-tighten the bolts (**a and b**) to fix the cover plate(s).
5. The same wedge adjustment should be carried out on the other sections of top tool where angle differences are noticed.

**\* Wedge Adjustment (Work Table)**



**Figure 6.5.8.3**



**Figure 6.5.8.4**

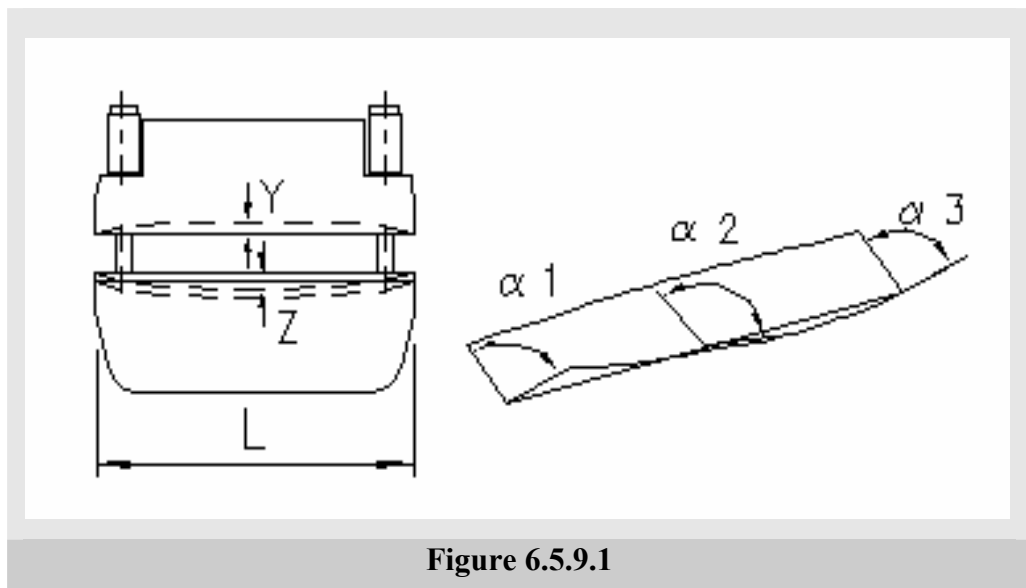
1. Identify the location the work table where the bending angle is different.
2. Pull forward the conical wedges (B) by means of (A) bolts to the extent of deformation. The deformed section of work table is thus pushed up.
3. The same adjustment should be done on other sections of work table where angle differences are noticed.

*\* If the machine is not equipped with **Wila crowning device***

### 6.5.9. Manually Adjustable Crowning System (Optional)

When the hydraulic cylinders of the press brake are mounted at either end, the centre is not supported. This leads to the curvature which a crowning table can even out.

A press brake deflects slightly during bending (concave sagging). This causes the top tool to penetrate less deeply into the lower tool in certain areas because the distance between the upper and lower beam of the press brake increase by elastic deformation (**See Figure 6.5.9.1 as indicated by Y and Z in the diagram**). Without the correct amount of bed deflection compensation by crowning (convex correction to amount of sagging) it would mean that the upper and lower tools would not remain parallel during bending. The result would be that the angle of the bent product would vary over the bending length as shown in the above drawing,  $\alpha 1$ ,  $\alpha 2$ ,  $\alpha 3$ .



**Figure 6.5.9.1**

Common conventional crowning methods are:

- Local shimming of the bottom tools with paper or brass strips to build up the bottom tool in those areas where there is concave sagging.
- Machining a convex crown into the lower beam, tool holder or tool.
- Making localized convex corrections by hand at various points throughout the upper or lower beam by adjustable holders.

These methods of crowning are, however, very labor-intensive, not very flexible, difficult to repeat, and result in a significant loss of production time. These problems can be eliminated by the manually operated anti-deflection device developed by **Wila**.

The **Wila** crowning devices (See **Figure 6.5.9.2**) compensate the deflection of the press brake quickly and accurately. Manual models (as shown in **Figure 6.5.6.2**) are adjusted simply by turning a hand crank; the built-in numerical read-out provides a bench-mark for repeatability.



**Figure 6.5.9.2**

The first time you set up your new ModuCrown device, you can use these fine-tuning "push/pull" screws to compensate for small inaccuracies in the brake's bed (See **Figure 6.5.9.3**). After that, the ModuCrown operates from a single point for effortless compensation.



**Figure 6.5.9.3**



For **detailed and technical information** about **Wila manually adjustable crowning system**, please see related manual in **ADDITIONAL MANUALS**.

### 6.5.10. Check- list of the finished product

Prior to despatch, your press brake has been checked with respect to the following safety and operational functions, and verified **O.K.** :

✓	Safety guards
✓	Electric circuit diagram
✓	Hydraulic circuit diagram
✓	Top beam speed
✓	Sound level
✓	Information and warning labels
✓	Rigid fixation of top tool
✓	Rigid fixation of bottom tool
✓	Oil leakage
✓	Switches and buttons
✓	Functional operation of machine
✓	Anti-rust lubrication
✓	Accuracy of bending angle
✓	Material bending at full-capacity

### **6.5.11. Instructions for the press brake supervisor after machine set up**

- All machine adjustment as specified in section 6 must be executed before the machine is delivered to its operator.
- Check that the User's Manual of the machine is by the machine and make sure that it is kept by the machine all the time.
- Read User's Manual thoroughly.
- Make sure that only qualified and authorized personal operate the machine.
- All personnel in charge of set-up, operation, service, and maintenance must be identified clearly.
- Clearly specify the responsibilities of the machine operator, and make sure that a third person is not involved in giving instructions to the operator against the regulations.
- Make sure that all personnel in training to operate the press brake is under supervision of an experienced press brake specialist.
- Take all the necessary precautions for the machine to be operated only in normal working condition. Machine should be disabled for operation in case of breakdown or repair.

## 6.6. Maintenance & Inspection



*General maintenance and cleaning of the press brake requires careful attention. Therefore the machine must be shut-off before starting any maintenance work.*

### 6.6.1. Type and frequency of inspections

	<b>Inspection</b>	<b>Period</b>	<b>Responsibility</b>
•	Lubrication	See: Lubrication Diagram	Operator
•	Oil leakage in cylinders	Daily	Operator
•	Lubrication of tooling	Daily	Operator
•	Guards against any physical damage	Daily	Operator
•	Oil leakage in pipes, hoses and hydraulic elements	Weekly	Operator
•	Hydraulic fluid level	Weekly	Operator
•	Cylinder connecting bolts against loosening	Weekly	Operator
•	Reducer connecting bolts against loosening	Weekly	Operator
•	Safety & limit switches against loosening, damage	Weekly	Operator
•	Slide adjusting bolts	Weekly	Operator
•	Stop time control	Every 6 months	Approved Body
•	Terminal connections of the electrical installation	Annually	Electrician
•	Safety doors and emergency-stop function	Weekly	Electrician

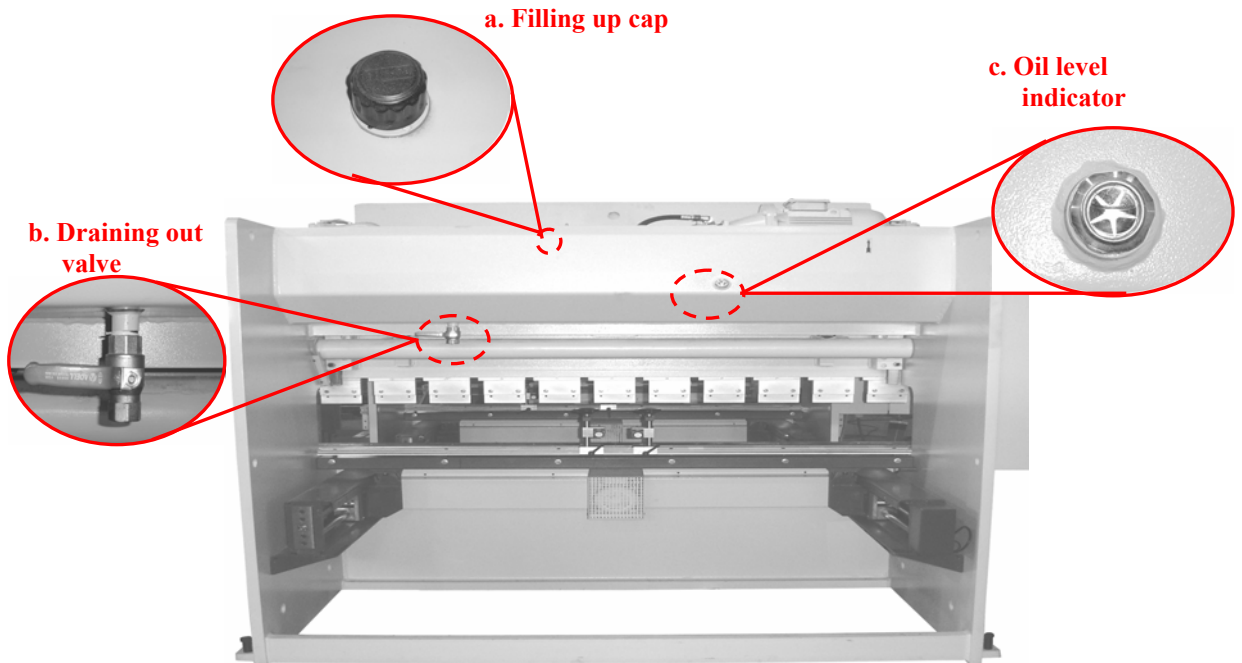
- Foot-pedal control system      Every 6 months      Electrician

### 6.6.2. Hydraulic System:

All precautions must be taken to keep the hydraulic system clean at all circumstances.

### 6.6.3. Changing oil:

Oil must be changed after first 200 working hours of use, and then every 1000 working hours.



**Figure 6.6.3.1**

1. Remove the oil tank cap (Filling up point in Figure 6.6.3.1).
2. Open the valve under the oil tank to drain out the old oil completely (Draining off point in **Figure 6.6.3.1**). **Note:** Insert a **discharge hose** to the valve cock to drain out old oil from oil tank to any tank.
3. Using a pump or a proper equipment, fill in new oil from the filling up point seen in **Figure 6.6.3.1.a**  
Oil level must be seen in the middle of the oil indicator. Observe the oil level from this indicator. Always keep the oil in same level.

**!** When changing oil, keep the oil tank clean.

## 6.6.4. Changing the filter:

### a. Changing return filter

The return filter element must be changed after first 200 hours of use, and then every 1000 working hours (See **Figure 6.6.4.1**). Return filter is placed at the top of machine. In order to change return filter element;

- a. Remove the bolts (See **Figure 6.6.4.2**)



Return filter  
Figure 6.6.4.1

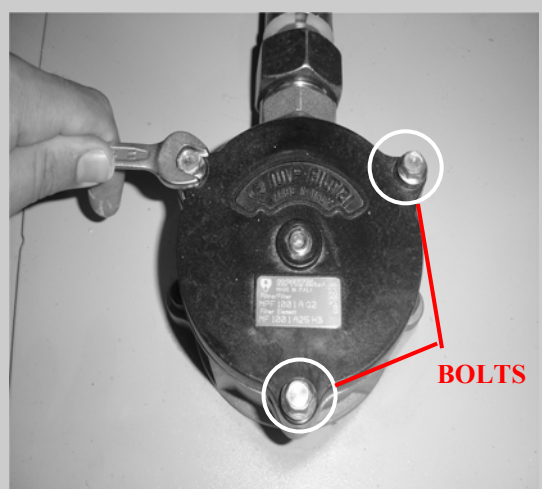
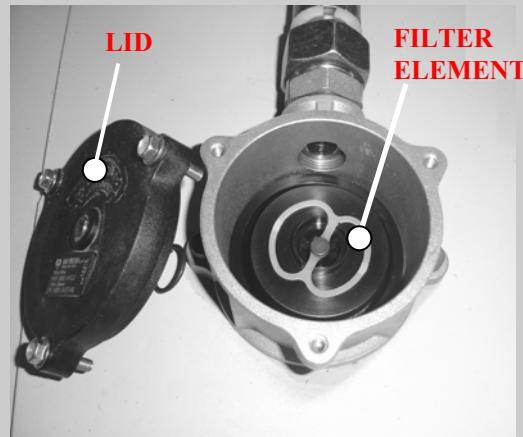


Figure 6.6.4.2

- b. Take out the lid (See Figure 6.6.4.3)
- c. Replace the filter element (See Figure 6.6.4.4)
- d. Refix lid and bolts



**Figure 6.6.4.3**

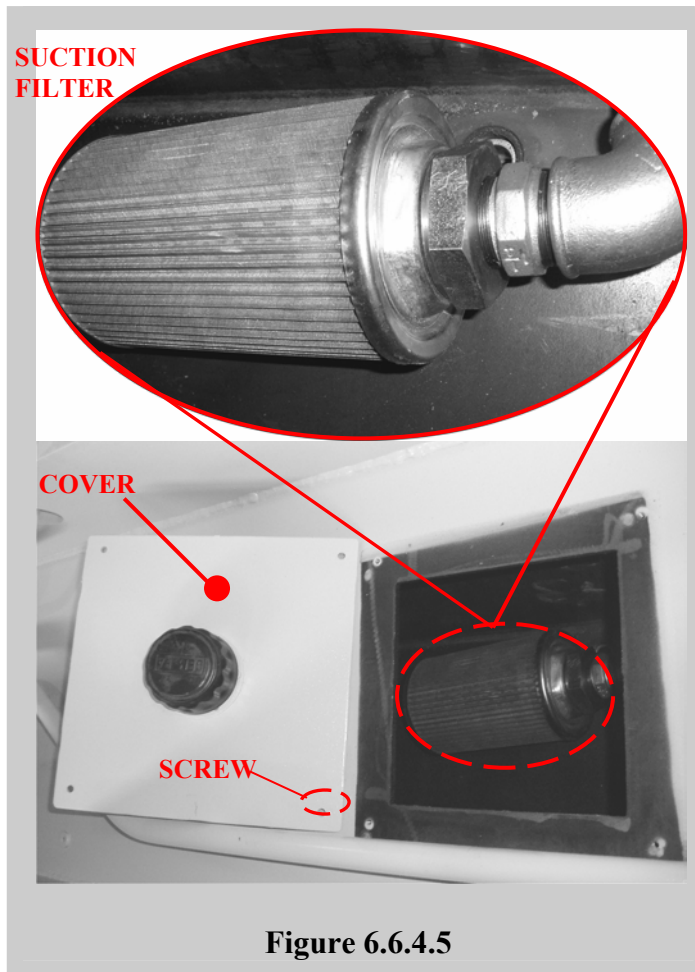


**Figure 6.6.4.4**

**a. Changing suction filter**

The suction filter must be changed after first 200 hours of use, and then every 1000 working hours (See Figure 6.6.4.5). Suction filter is fixed into the main pump pipe in the oil tank at the top of machine. In order to change suction filter;

- 1- Remove the bolts



**Figure 6.6.4.5**

1. Remove the cover on the oil tank after loosening and pulling out the screws.
2. Remove the old filter from its place inside oil tank by turning in CW.
3. Fix the new filter into its place by turning in CCW.

**RETURN FILTERS LIST**

The filters listed below, which are produced by different companies, can be used.

<b>APH/APHS 40-200 TON</b>		
<b>MANUFACTURER</b>	<b>TYPE</b>	<b>FILTER ELEMENT</b>
MP (Italy)	MPF-100 1AG2D	MPF-100 1A25HB
HYDAC (Germany)	RFM ECO/N 165 BD20W 1.1	0165 R 020 BN 3 HC
GEN-FA (Turkey)	GYD 11-25	GYE 10-25

<b>APH/APHS 240 TON</b>		
<b>MANUFACTURER</b>	<b>TYPE</b>	<b>FILTER ELEMENT</b>
MP (Italy)	MPF-100 3AG3D	MPF-100 3A25HB
GEN-FA (Turkey)	GYD 21-25	GYE 20-25

<b>APH/APHS 300 TON</b>		
<b>MANUFACTURER</b>	<b>TYPE</b>	<b>FILTER ELEMENT</b>
MP (Italy)	MPF-180 1AG1D	MPF-180 1A25HB
UCC (USA)	MFA 33 01.34	MFR 33 00
GEN-FA (Turkey)	GYD 41-25	GYE 40-25

**6.6.5. Instructions to rescue persons jammed between press brake tools:**

By pushing on button 10S6, the top beam will move up to its upper dead point at any position.

**6.6.6. Stop time measurement:**

The stop-time measurement device must be connected between clamps 10 and 11 and X1.



## **6.7. Conditions of storage, re-utilization and scrapping**

### **6.7.1. Storage**

In cases where the machine is not be used for a long period of time, the following precautions must be taken:

- Disconnect electrical supply to the machine, and write so on the electric panel as a reminder for future use.
- The storage place of the shear must be indoor with protection against humidity, dust, and danger of fire.
- Lubricate top and bottom tools by an anti-rust lubricant, and then seat the top tool in one of the " V " grooves on the bottom tool.
- Empty the oil the tank.
- Lubricate pistons and all metal surfaces by an anti-rust lubricant
- Lubricate plastic hoses against cracking.
- Lubricate pistons, slides, and all metal surfaces by an an anti-rust lubricant.
- Cover the machine by a nylon cover for protection against dust.

### **6.7.2. Reutilization after storage**

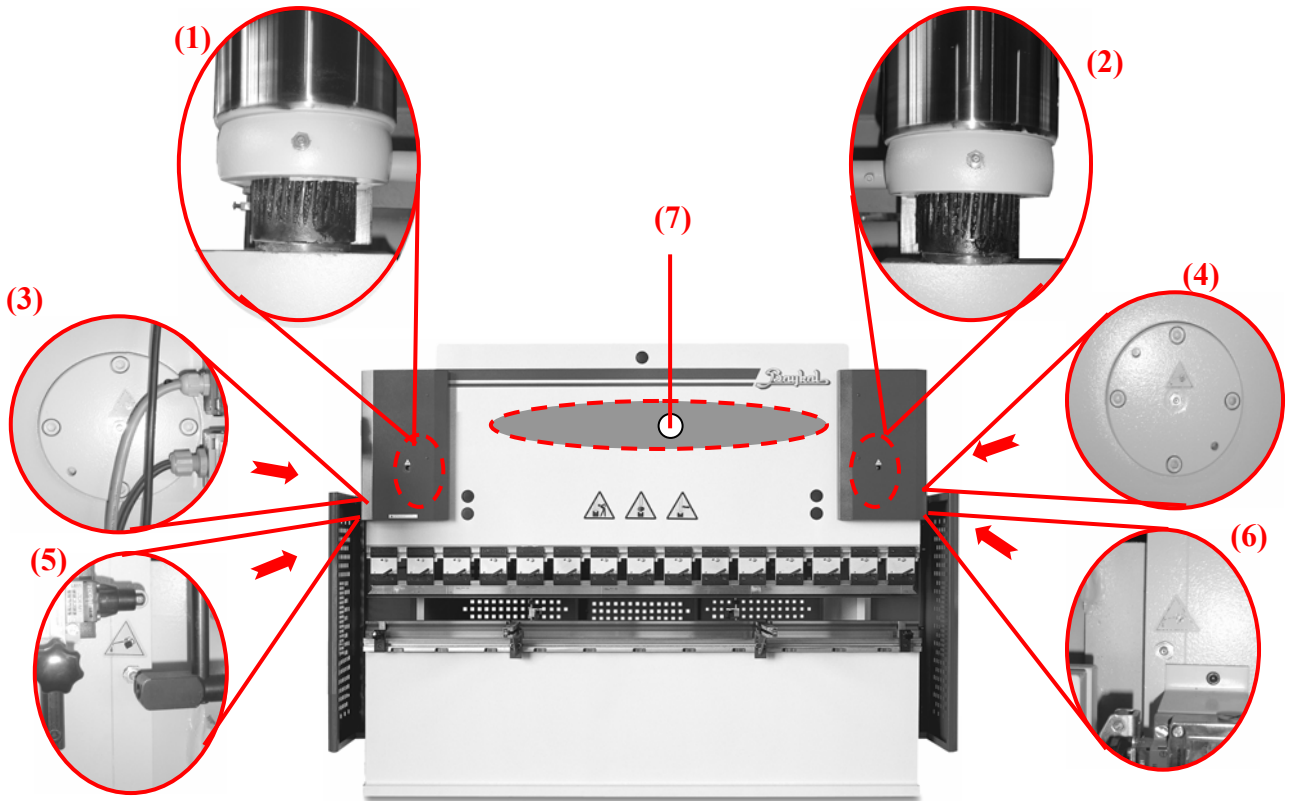
Take the following steps if the press brake is to be reutilized after a long period of storage :

- To use the old machine oil, make sure that the physical and chemical properties of the liquid is intact. This should be verified by an expert body. Otherwise, fill the tank with new oil.
- All electrical components must be checked by a qualified electrician to make sure that all of them are properly functional. Replace the faulty components.
- The machine body and mechanical parts must be checked through by authorized and qualified personnel, and the machine must be prepared for operation according to the operating instructions.

### **6.7.3. Scrapping**

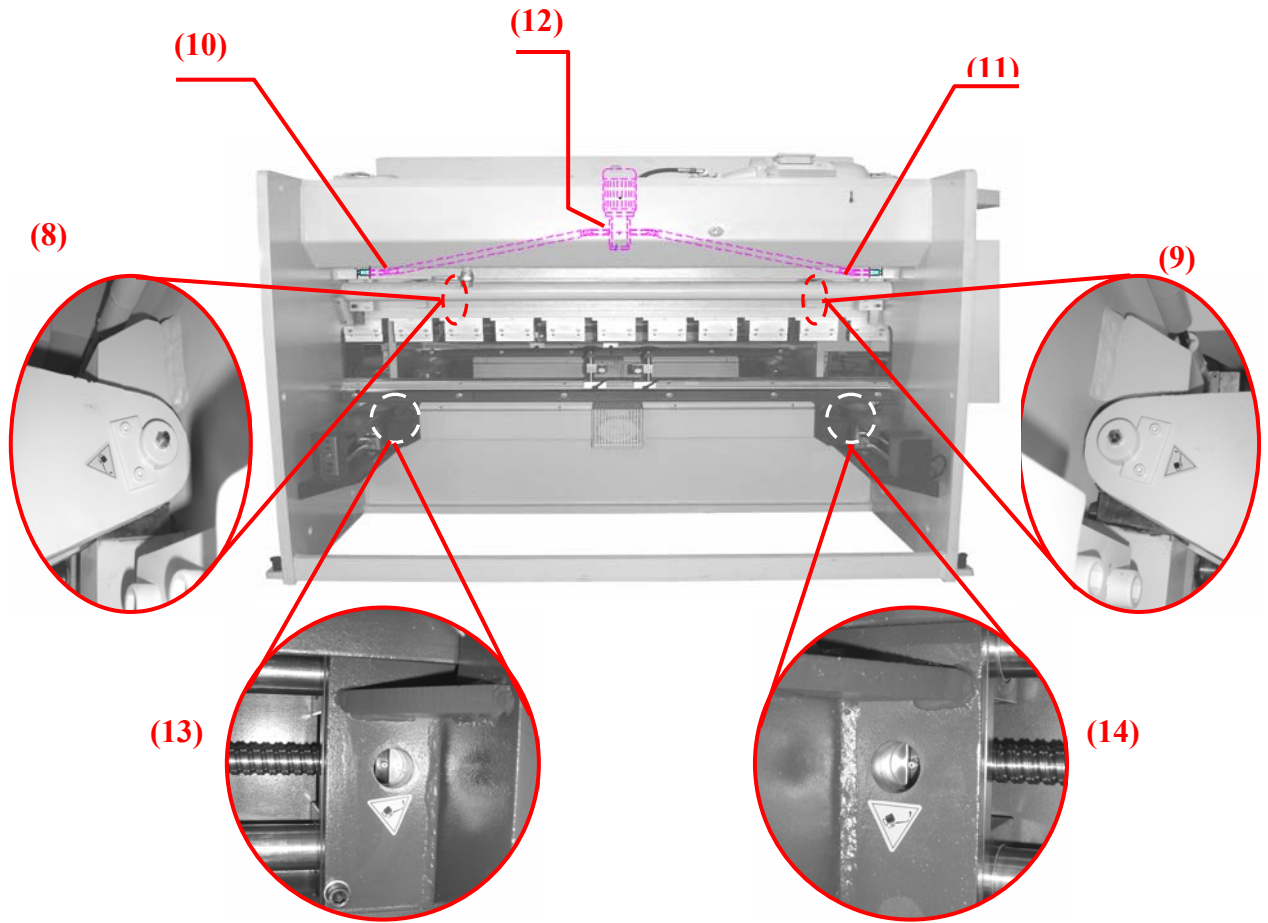
If the press brake has completed its normal operating life, prior to scrapping all the oil in the tank and cylinders should be drained off, and the machine should be dismantled.

**7. LUBRICATION POINTS**



**Figure 7.1**

PLACE OF LUBRICATION	NO	NUMBER OF LUBRICATION SPOTS	OIL TYPE PREFILLED AT FACTORY	EQUIVALENT OIL TYPES	LUBRICATION PERIOD
REDUCER ASSEMBLY	<b>1,2</b>	2	MOLLYKOTTE BR2 PLUS	MORRIS K48EP	2-7 Days
SLIDES	<b>5,6</b>	2	KAP GREASE 2	-	2-7 Days
TORSION BAR SEATS	<b>3,4</b>	2	KAP GREASE 2	-	30-60 Days
OIL TANK	<b>7</b>	1	$t < 10^{\circ}\text{C}$ HLP 32 $t > 10^{\circ}\text{C}$ HLP 46 $t > 30^{\circ}\text{C}$ HLP 60	RANDO OIL 32 / TELLUS 32 RANDO OIL 46 / TELLUS 46 RANDO OIL 68 / TELLUS 68	MUST BE CHANGED AFTER FIRST 200 WORKING HOURS.  NEXT CHANGE AFTER 1000 WORKING HOURS.



**Figure 7.2**

PLACE OF LUBRICATION	NO	NUMBER OF LUBRICATION SPOTS	OIL TYPE PREFILLED AT FACTORY	EQUIVALENT OIL TYPES	LUBRICATION PERIOD
TORSION BAR-BEAM CONNECTION POINTS	<b>8-9</b>	2	KAP GREASE 2	-	30-60 Days
REDUCER SHAFTS	<b>10-11</b>	2	KAP GREASE 2	-	30-60 Days
BACK GAUGE CHAIN		1	KAP GREASE 2	-	60-90 Days
BACK GAUGE TRAVELLING BEARING	<b>13-14</b>	2	KAP GREASE 2	-	2-7 Days
REDUCER	<b>12</b>	1	URSA OIL T.20	MOBILGEAR 0629,630; OMALA OIL 100,200	EVERY 5000 WORKING HOURS

**8. TROUBLESHOOTING**

<b>Problem</b>	<b>Possible causes</b>	<b>Correction</b>
a) Beam descends, but no bending	-Leakage in refill valve -Pressure relief valve is blocked -Failure in pressure relief valve -Failure in directional valve -Spool of directional valve is burnt -Pump failure -Piston seals are torn out -Low voltage	-Clean valve -Clean valve -Change valve -Change valve -Change spool -Change pump -Change seals -Call electrician
b) Beam descends, but does not return	-Pressure relief valve is blocked -Failure in pressure relief valve -Failure in directional valve -Spool of directional valve is burt -Leakage in pipes  -Pump failure -Cylinder seals are damaged  -Failure in pressure switch	-Clean valve -Change valve -Change valve -Change spool -Check and tighten pipe fittings -Change pump -Check and replace seals if necessary -Change pressure switch
c) Oil leaking from cylinders	-Throat seal is damaged -Cylinder o-ring is damaged -Piston seal is torn out	-Change seal -Change o-ring -Change seal
d) Beam does not descend accurately	-Torsion bar conical slides are loose	-Re-set slide clearance
e) Bending angle cannot be set	-Piston screw reducer or main reducers are damaged	-Call service
f) Oil leakage in fittings	-Fittings are loose	-Tighten fittings



**IMPORTANT REMINDER:** In the following cases the material cannot be bent, even though the machine works normally.

- 1 Appropriate "Vee" is not selected: Refeter to bending chart and select the correct vee.
- 2 Material specification is harder than St.42: Bending chart is arranged according to St.42 material specification. If the correct vee is selected, but still the material cannot be formed, then its specification is harder than St.42 In this case, a wider vee must be used.

**9. BENDING CHART**

A bending chart is provided in this file to determine the following with respect to material thickness:

- Selecting the correct vee.
- Bending force required to bend material of 1 meter length.
- Minimum flange that can be bent.
- Inside radius.

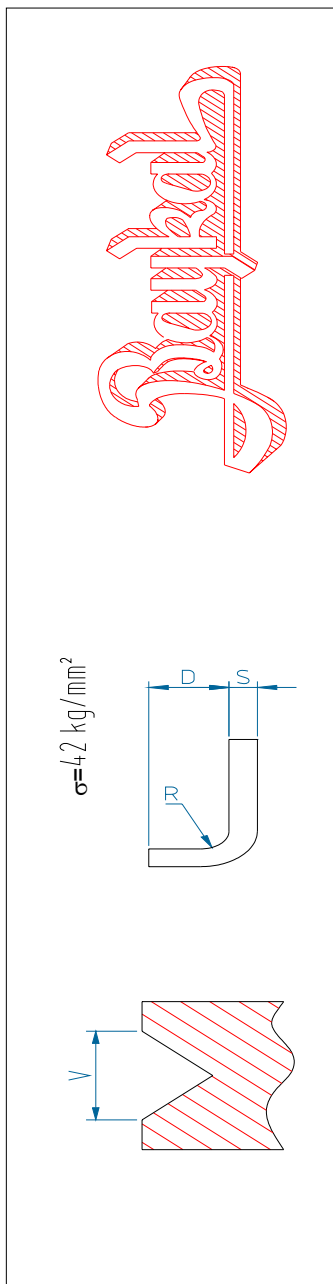
**F (Ton):** Pressure in metric per meter

**R (mm):** Inner radius

**V (mm):** Groove on the die to fit sheet thickness

**S (mm):** Sheet thickness

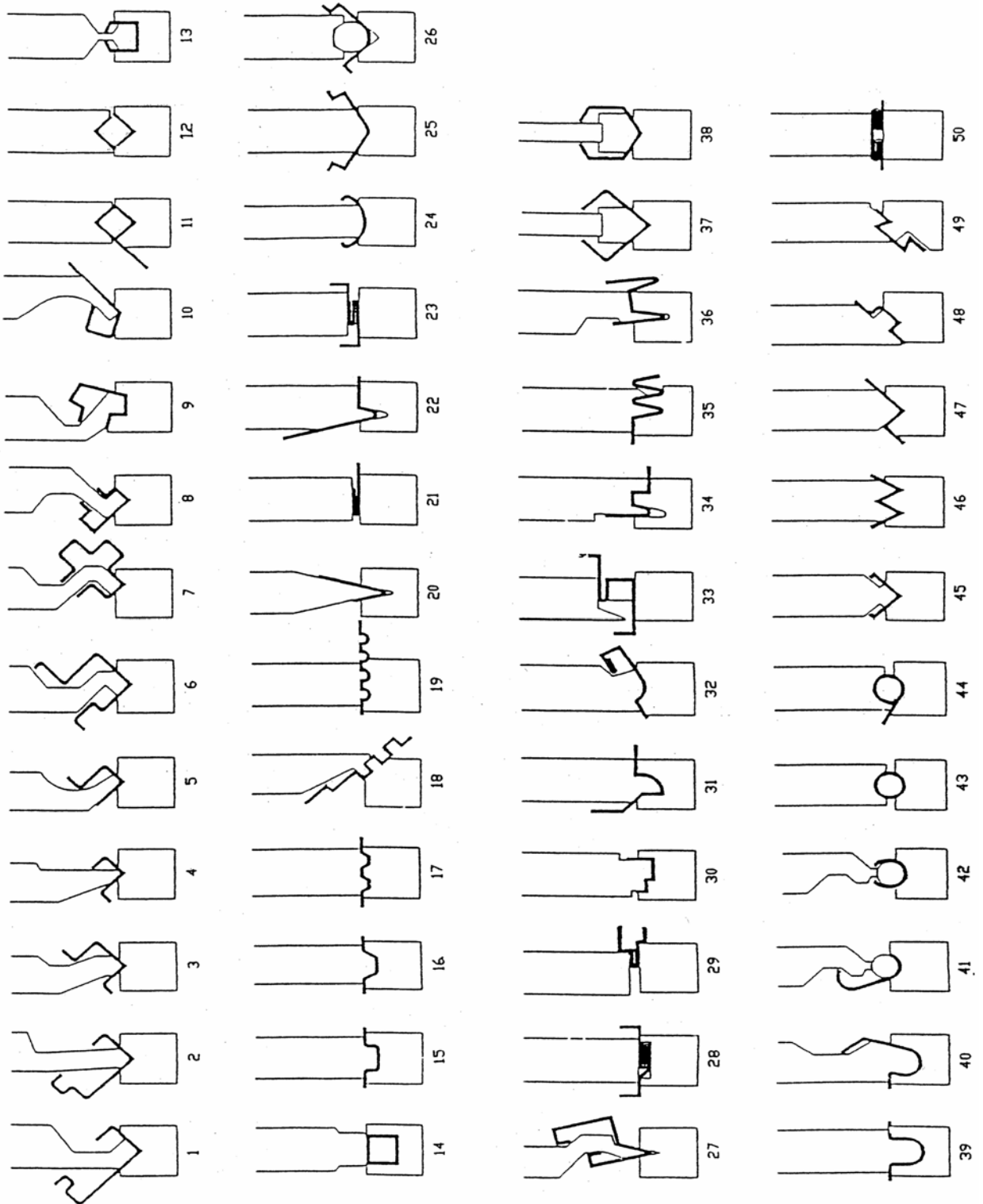
**D (mm):** Minimum width of flange that can be bent



	1	1.2	1.6	2	2.2	2.5	2.8	3	3.5	4	4.5	5	5.5	6	7	8	9	9.5	10	11	12	14	15.5	17	19	21	23	24.5	26	28	30	32
$\epsilon$	3.6	4.8	6	7.3	8.6	9.6	11	12	13.5	15.5	17	18.5	21	23.5	27	30	33	36	39	42	48	53	59	64	71	76	82	88	94	106	111	118
$\sigma$	6	8	10	12	14	16	18	20	23	26	29	32	35	40	45	50	55	60	65	70	80	90	100	110	120	130	140	150	160	180	190	200
0.5	2																															
0.8	7	5																														
1.0	12	8	6																													
1.2	12	9	7																													
1.5	15	12	10	8																												
2.0	23	19	16	14	12	10																										
2.5	27	23																														
3.0	30	25																														
4.0	42	36	32	28	24	21	18																									
5.0	54	47	40	34	30	26	24																									
6.0	61	52	45	40	36	32	29																									
7.0	74	64	57	51	46	42	35	30																								
8.0	88	77	69	62	56	47	41	36	32																							
10	104	94	79	68	59	52	47	43	39	104	94	79	68	59	52	47	43	39														
12	121	103	90	79	71	64	58	54	50	121	103	90	79	71	64	58	54	50														
14	128	113								128	113																					
16	137	123	112	102	94	81	76	71	F																							
18	147	134	123	106	99	93	F																									
20	135	126	118	F																												

**10. FOLDING FACILITIES**

You can see some bending examples according to the different tools below.



## 11. PRINCIPLES OF PRESS BRAKE BENDING TECHNOLOGY

Sheet metal bending is effected by using two basic procedures:

- 1) **Air Bending:** Widely used because of the relatively small tonnage required, but as regards to angular precision, it is subject to the residual elasticity inherent in the material after bending.
- 2) **Coining:** Requires higher tonnage (approximately 3 to 5 times more) than air bending, but through crushing of the inner radius of the bend annulling the elasticity, a very high degree of angular precision is achieved.

### 1. AIR BENDING

There are two methods:

#### a) Air bending with bottoming of the punch

#### Basic Rules:

- $R > S$  (residual elasticity after bending)
- R approx equal to  $V / 10$  ( $R=S$  when  $V=10xS$ )
- R, when equal to S, is called the "natural " radius of the bend.

#### Application:

For 90° degree bends (see tonnage on **bending chart**)

**Vee opening** = 7 to 8 times S (for thicknesses up to 4 mm)  
9 to 10 times S (for thicknesses above 4 mm)

**Vee angle** = 88 to compensate for the residual elasticity.

$V > 30 \text{ mm} \Rightarrow 86^\circ$

$V > 30 \text{ mm} \Rightarrow 88^\circ$

This method of bending applies generally to material thicknesses of 2mm and above (See Figure 11.1 below).

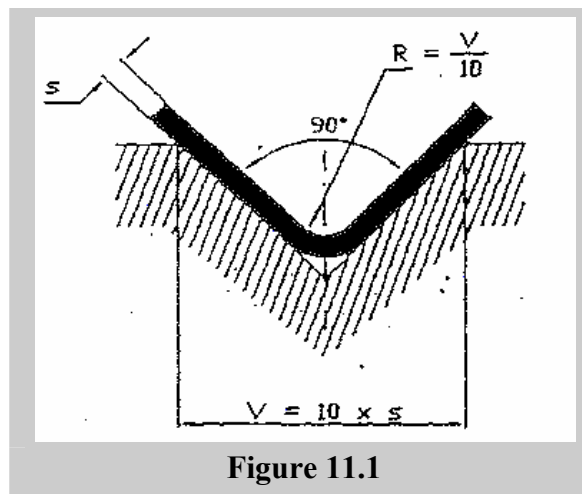


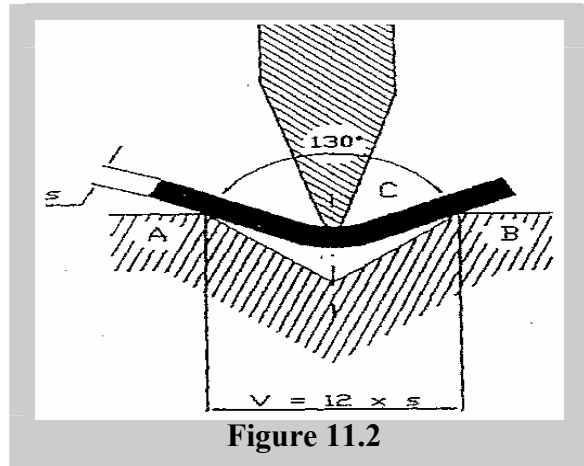
Figure 11.1



**b) Partial Air Bending:**

This method of bending is in fact a limited case of air bending, as the forming of the metal sheet is interrupted before it bottoms in the vee.

The plate is in contact with the tooling along the lines ABC. This method calls for a larger Vee opening (12 to 15 times) to maintain good bending quality. The shape of the punch and of the die is immaterial (**Figure 11.2**)

**Figure 11.2****2.COINING****Basic Rules:**

**R < S** : The nose of the punch penetrates into the natural radius of the coined sheet, breaking the elasticity of the material.

**Application:**

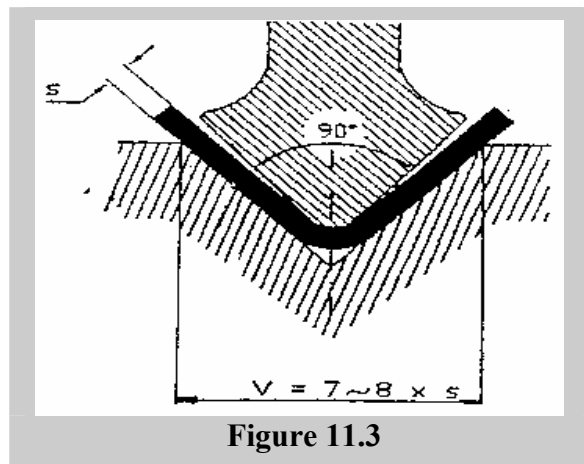
For 90° bends:

**Vee opening** = 7 to 8 times S

**Vee angle** = 90°

**Punch angle** = 90° (This is the only case in which the punch angle has a functional effect)

This method of bending applies generally to materials of thicknesses up and occasionally 3 mm in specific cases. (**See Figure 11.3 below**)

**Figure 11.3**

# **APPENDIX**

## **A. SPARE PART LIST**

## **B. HYDRAULIC CIRCUIT DIAGRAM**

**C. ELECTRIC CIRCUIT DIAGRAM**

## **ADDITIONAL MANUALS**