

OPERATOR'S MANUAL

- I. Installation Manual
- II. Operation Manual
- III. Maintenance Manual

HYDRAULIC
SWING-BEAM
GUILLOTINE SHEAR

C 13 - 3100

MVD INAN

Takım Tezgahları Sanayi A.Ş.

IMPORTANT:

This protocol must be returned back to MVD INAN, being signed within 1 week after commissioning of the machine. This is the document forming the basis for the start of guarantee period.

Machine Type:

Series Number:

Design based on standard: prEN 13985:2001, CEI/IEC 60204-1997+A1:1999

Customer

The following checks must be carried out by the customer or a qualified service engineer before the machine is commissioned.

1. Installation and levelling
2. Oil level
3. Electrical connections, correct voltage and fuses
4. Hydraulic system
5. Test Run
6. Functional test

The undersigned declares that he /she has received the operator's manual and CE declaration together with the machine. Furthermore, he/she shall ensure that the machine operating personnel reads and understands all of the instructions with regard to the use of the machine and its safety related aspects and the procedures in this manual is strictly adhered to.

Remarks: _____

Signature:

Date:

Customer: _____ Agent or MVD INAN Service Engineer

Name: _____ Name: _____

Position: _____

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INTRODUCTION

This operator's manual is designed to give supportive and corrective instructions to the operating and maintenance personnel concerning commissioning, operation and maintenance of the machine. It is separated into 3 parts : I. Installation Manual, II. Operation Manual, III. Maintenance Manual.

Unless it is permitted by written instruction of the manufacturer, any operation or adjustment, which is not in line with this operator's manual, will be on customer's own risk and manufacturer will have the right to end the guarantee period.

If any further technical information is required, our service department will be pleased to provide you on request.

For information or for spare parts and service please send your fax to:

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I. INSTALLATION MANUAL

I.1 Lifting and carrying

Machine, which is loaded and sent safely, when received by customer, must be unpacked and checked to see if there is anything damaged or missing. Steel ropes must be used to hang the machine from the 4 lifting extensions on both columns of the machine (See figure-1). It is the customer's responsibility to lift, carry and place the machine safely and suitably regarding regulations.

The machine must be well cleaned and the rust preventive coating on the metal surfaces must be cleared of by appropriate chemicals, kerosene or petrol. It is suggested to coat these surfaces with a thin layer of machine oil. See also Operation's manual section II.3.3.

I.2 Foundation

The foundation upon which the machine is to be installed should be concrete and must be levelled and flat. Sufficient space should be left around the machine in order to allow inspection and maintenance operations in addition to safe handling of work pieces and cutting tools.

During bending operations, the force exerted must be absorbed by the concrete foundation. The foundation must also bear the machine weight and to keep the machine fixed during any earthquake shake. See Figure1 as reference.

| |
|---|
| <p>Attention: It is a must for customer to fix the machine by anchor bolts to the ground and also to make the ground connection from the earth connection built into switchgear cabinet to the ground line of the factory.</p> |
|---|

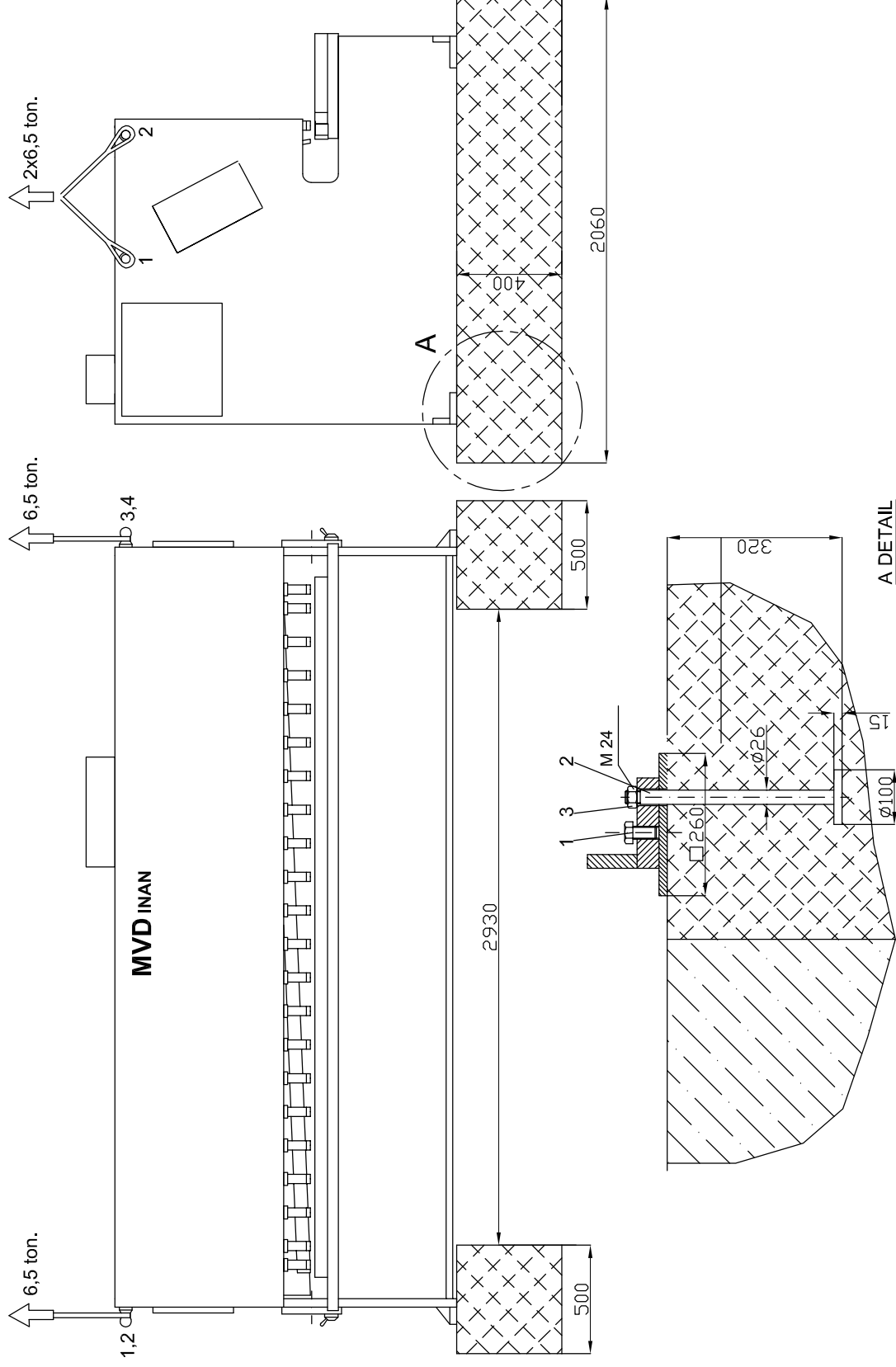
I.3 Levelling

While placing the machine on the foundation prepared, 20 mm. thick iron plates must be supplied under each corner of the machine and the machine must be levelled both lengthwise and crosswise. The levelling of the machine is maintained by the 4 bolts(1) in fig. 1 on the foot of the machine and fixing is maintained by the nuts(3) on the studs(2) in fig.1. A water level must be placed on the lower table and levelling must be made within acceptable inclines as follows:

Crosswise levelling : about 0.1 mm/m. (machine depth)

Lengthwise levelling : about 0.2 mm/m. (machine length)

Anchor bolts are not included as a part of machine and can be supplied at extra price.



I.4 Filling the oil tank

Fill the oil tank up to 3-4 cm. below the top cover of the tank, with one of the below mentioned oil. The trouble free functioning of the hydraulic system is very much dependant on the quality and condition (cleanliness and purity) of the hydraulic oil which is used. The oil must possess the following minimum properties:

Viscosity at 40 °C : 46 cSt

Viscosity index : approx. 105

Examples : Shell Tellus 46, BP Energol HLP 46, Esso Nuto H 46 , Aral oil 46, Mobil DTE 25

I.5 Electrical main supply connection

The machine's electrical connection is ready for use. Only the 3 phases of supply voltage has to be connected to the main switch on the cabinet. The earth connection must be made to the earth terminal. For the main supply, shielded cable must be used and the shield must be fixed to the metal gland at the entrance of the cabinet.

Electrical connections are to be made by properly qualified personnel and in accordance with the applicable standards. The cross-section of the connection cable must suit the total power required as mentioned on the machine plate.

The rotation of motor is limited to one direction. When all electrical connections are made, safety conditions are maintained and the start button is pressed, if the motor does not rotate, just interchange the main switch connections of two phases and it will rotate. See also section I.6.

I.6 Starting up the machine

The shop and machine main switches are turned on, emergency stop buttons are freed and then the reset button is pressed. The power light on the machines electrical cabinet shall then come on. (If not, control the main supply circuit and light beams at the rear). When start button is pressed, the motor will rotate. If the power light does not come on, then there is some problem due to the safeguarding system established and the machine won't work. In this case, the light beams and switch of safety bar underneath upper beam is checked to see it is closed. Then the safety "reset" button is pressed again. If there is still problem, MVD INAN or the Agent must be contacted.

ATTENTION

- Do not operate the machine before reading the “operator’s manual”.
- The machine must be fixed to the concrete floor as described in section I.2.
- Before starting the machine, be sure the tank is full of oil.
- Input voltage will be 380-400 volts and current will be 50 Hz.
- The cable of mains supply will be 4 x 6 mm². R, S, T for the phases and GND for the ground (Earth) line of the building.
- For the safe of the pump, the rotation of motor is limited to be in one direction only. So if the motor does not start, two of the phases (R, S, T) must be in interchanged from the connection of the main electricity switch on the cabinet.
- The electricity cabinet shall be kept close when operating.
- Operations such as welding, grinding must not be carried on or by the machine.
- Do not make any readjustment on the set positions of the hydraulic valves.
- The machine shall be operated only by the responsible who read and comply with operator’s manual.
- Inform the agent or manufacturer for any problem occur.

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II. OPERATION MANUAL

II.1 PRODUCT INFORMATION

II.1.1 General features

1. Swing beam type movement of the upper beam,
2. Rigid and robust structure due to completely welded steel construction of side housing, table and tank.
3. Most precise machining of the constructions carried on CNC machining centre,
4. Parallel operation of hydraulic cylinders,
5. Compact and mono block hydraulic system,
6. Pressure relief valves to eliminate the risk of access pressure rise,
7. High strength hold-down system with pressure adjustment,
8. Illumination of blades,
9. Cutting length adjustment,
10. Highly wear resistant and tough blades, made of imported European steel with 2 cutting edges of upper blades and 4 cutting edges in lower ones,
11. Position switch for different modes of operation,
12. Light beams at the rear side,
13. Emergency stop and reset facilities,
14. Motorised back gauge and position controller with $\pm 0,1$ mm. positioning accuracy.

II.1.2 Technical features

| | |
|-------------------------|---------------|
| Model | : C 13 - 3100 |
| Blade Length | : 3100 mm |
| Cutting Thickness(max): | 13 mm |
| Rake Angle | : 2,1 degrees |
| Cuts per minute | : 10/14 |
| Pump Pressure (max) | : 300 bar |
| Tank | : 230 lt |
| Motor | : 22 kW |
| Overall Length | : 4400 mm |
| Overall Depth | : 3150 mm |
| Overall Height | : 2400 mm |
| Approximate Weight | : 11 ton |

II.1.3 Remarks

1. The hydraulic pump must never be run without oil, since it will be damaged. The oil level must always be checked before starting the motor.
2. Any adjustment on hydraulic valves may only be permitted by manufacturer's notice.
3. Electrical and mechanical connections, which are not made properly by qualified personnel, will be at customer's risk.
4. The customer will make sure that there is a minimum of 500 lux local lighting or daylight at the blades area.

II.2. SAFETY

II.2.1 Instructions

- The capacity of the machine must not be exceeded.
- Only one piece of sheet must be cut at each cutting stroke.
- Only properly qualified personnel may operate the machine.
- Before starting the machine all area around the machine must be cleared of obstacles which may cause falling, tripping or slipping hazards.
- Operation manual of digital position control unit must be well understood and referred by the operators. Refer to Appendix D.
- Operator must be sure there is no one behind, within or on the machine while operating.
- Safety is maintained by fixed guards at the front part of the tools area and at the side gaps. At the rear part, 3 light beams maintain control for entrance to the work area.
- The limit switches at top and bottom points prevent excessive and continuous pressure rise, which also prevents temperature rise of the oil.
- Adjustment mode for adjustment of blade gap after grinding.
- Operators should take care of the control panel and foot pedal cable not to be damaged during handling of material or due to any misuse or falling objects.
- Electrical cabinet shall be kept close during operation. Anyone except the properly qualified maintenance personnel is not allowed to open it anytime.
- It is forbidden to hold naked flame against the machine, or to carry on welding or grinding of the work pieces on or around the machine.
- The operators should wear according to the related regulations. (ie. durable clothing, which does not hang loose, as well as industrial shoes with steel toecaps, industrial gloves etc.)
- During the maintenance and repair work, the main switch shall be turned off to the "0" position and locked by a padlock for safety reasons.
- In case it is needed emergency stop buttons are available on the foot pedal stand and on control panel.

II.2.2 Safety Equipments

II.2.2.1 Control cabinet and electrical switchgear cabinet

This switchgear cabinet carries main switch, pedal cable connection and main supply entrance gland. The control cabinet carries power light, reset button, start button, stop button, emergency stop button, position controller, mode selector switch and also a key to lock the control facilities.

Attention: The operation manual of position control unit in Appendix D must be completely read and understood by the operating personnel before starting the machine.

II.2.2.2 Fixed guards

In the front and at both sides there are guards fixed by bolts. These guards won't let operators hand to reach to blades and hold-down cylinders. The distance of these guards are determined according to the standard.

Attention: The fixed guards and other covers around shall never be taken out at operation stage. As this area is the most dangerous part of the machine, any operator shall strictly be responsible for this.

II.2.2.3 Light Beams

Light beams are AOPD (active opto-electronic protective device), which form an optical curtain at the rear side. It is operative if the red indicator lights are on. If there is any obstacle in between sender and receiver units or if they are misaligned, the red light will be off and the machine will show an emergency stop characteristics.

The distance of the light beams from the back gauge is 1 m. and the reference distance from blades can be find on the machine plate. It is strictly forbidden to change the distance lower than the mentioned value. In case there is any deficiency in the stopping behaviour of the system, MVD INAN or the Agent must be contacted immediately.

ATTENTION! Light beams sense the passing of people. It does not sense if there is anyone already inside the machine area. It is full responsibility of the operator to check if there is anyone behind or within machine before he resets and starts the machine.

II.2.2.4 Safety switch and lock bar

Safety switch and the lock bar are placed underneath the down stroking upper beam. The lock bar is pulled out of the housing and the switch pressing on the bar is freed to off position, and the machine acts like at stop position. Then the bar must be pushed into the housing on the side column, so that it also maintains a safety means to stop the gravity fall of the beam. But, note that the bar is not designed to bear the weight of the beam not to stop the cylinder force.

II.2.2.5 Foot pedal

Cutting operations are performed by pressing the foot pedal. When the pedal is pressed the beam moves down. When it is left free, the beam either stops or moves up according to the mode of the position switch.

2.2.6 Adjustment of cut length

The cut length is adjusted by the use of a time relay or a potentiometer placed on the control panel. The system is time based. When the time set by relay or potentiometer is reached the beam automatically stops. Then when the pedal is left free it may move up according to the mode position switch.

2.2.7 Pressure relief valves

Hydraulic system is equipped with several pressure relief valves, which limit the maximum operating pressures at different lines of the system and maintain safe working condition.

II.2.2.8 Emergency stop button

It is used for emergency stops and for stopping at the end of operating the machine. It is designed to stop all movements and controls immediately. To restart, its head must be rotated to free. When the reset button is pressed, the white power light will come on and the start button may then be pressed.

II.2.2.9 Reset buttons

This button is to turn off the reset light. Reset light checks the safety system. In case of any interruption or fault of the safe guarding system, the system locks the operating system, until the safety related fault is cleared and the reset button is pressed. Note that the fault may be due to light beams, safety lock bar switch or emergency stops.

II.2.3 Liability

MVD INAN hydraulic guillotine shears are designed and produced to cut plate materials. The operator manuals of the machine and back gauge position controller unit must be the primary basis for using the machine. MVD INAN has no liability for any damage or its consequences, which is incurred due to the incompetent use of the machine.

II.3 OPERATION

The shop and machine main switches are turned on and the reset button is pressed. The power light on the machines electrical cabinet shall then come on (if not, control the main supply circuit, light beams alignment and safety bar switch). Pressing start button, the motor will start rotating. If the power light does not come in any case, observe other safety related components and relays, or contact MVD INAN or the agent.

II.3.1 Modes of position switch

There are two modes, which can be selected from position switch. First mode is for blade gap adjustment (see section II.3.2) after grinding of the blades and second mode is for cutting operation at desired length. In the first mode beam moves down as the pedal is pressed and stops when the pedal is left free. For return, position switch is turned to 2nd position, pedal is pressed and left free.

In mode 2, the upper beam moves down when the pedal is pressed and returns when it is left free. The beam stroke is limited basically by the machine construction, but also by upper and lower limit switches. The switch positions are adjusted before delivery and user will not need readjustment. See also section II.2.6, where the stroke may also be adjusted through a time relay or a potentiometer placed on the control panel.

II.3.2 Adjustment of Blade Gap

Before starting to cut, the blade gap is adjusted by rotating the arm on the side column of the machine. The scale and arrow must show the thickness to be cut. During the adjustment, the fixing handles on both sides are loosened at first and then tightened strongly after adjustment.

The scale around the gap adjustment arm is prepared according to mild steel (St 37-42). When the sheet material is harder, the gap needs to be increased, or when the sheet material is softer, the gap needs to be decreased. Figure 2 gives supportive information on determination of the gap according to the section of the sheet metal. Note that, excessive opening of the gap with respect to the sheet thickness, may cause the sheet metal to go in between the upper and lower blades and may damage the beam or the table. It is suggested to adjust the gap from the scale at ± 1 mm. thickness tolerance.

Do not forget to readjust the scale after grinding of blades. For several grindings, only the adjustment of the scale will be enough, but when the thickness of blades $t_b < 15$ mm, 1 mm. thick sheet metal may be placed behind the blades or the lower blade support needs readjustment. (See Figure 3).

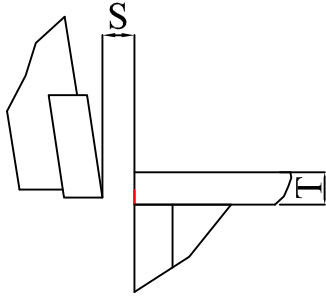
After grinding and fixing the blades, upper beam must be lowered in the 1st mode of position switch and machine must be stopped completely. At this point feeler gauges must be used to adjust blade gap to 0,1 mm. and then the scale must be set to 1 mm. It is suggested to check this gap to be precise throughout the whole length. Deviations may cause collision and breaking of the blades. Note also that, there are mechanical limitations for maximum and minimum gaps, so after setting the scale, these limits should be readjusted to prevent collision of upper and lower blades.

II.3.3 Back gauge adjustment

Back gauge system is controlled by position controller (See appendix D), which is placed on the control panel. The calibration and resetting is completed before delivery. The calibration may be made at the minimum position where the back gauge touches the front limit switch. At this point pressing the stop button of the controller will reset the position to the datum value in controller parameters.

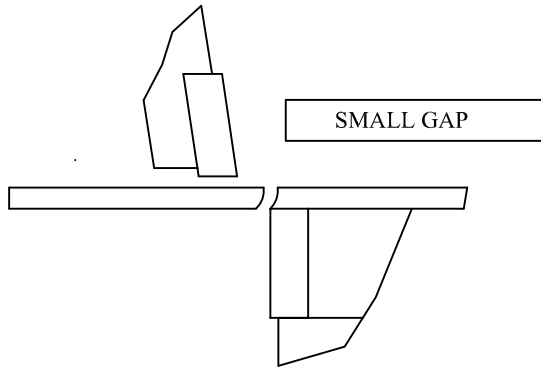
For any problem, the manual of the position controller must be referred. (App.D)

ADJUSTMENT OF BLADE GAP

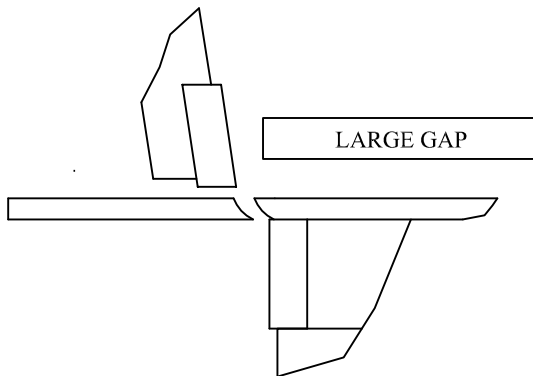


The indicator fit around the arm on the left side of the machine is prepared for blade gap adjustment of mild steel St 37- St 42. For harder materials gap may be increased, and for softer materials it may be decreased.

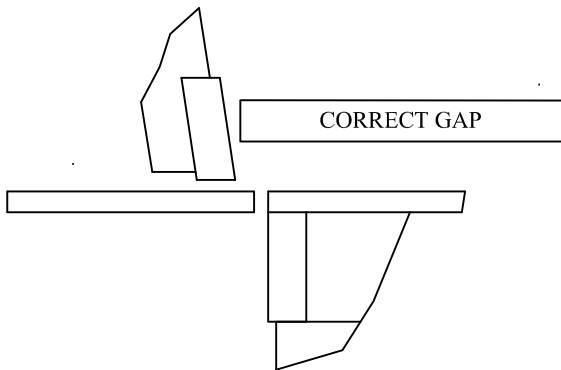
$$S=0.10 \times T \quad (\text{St 37 - St 42})$$



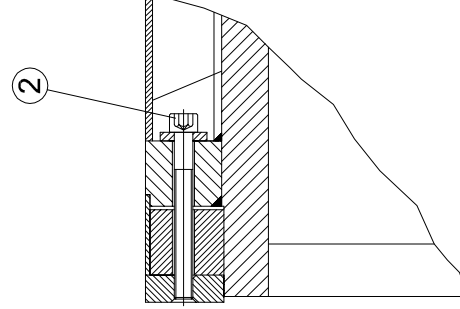
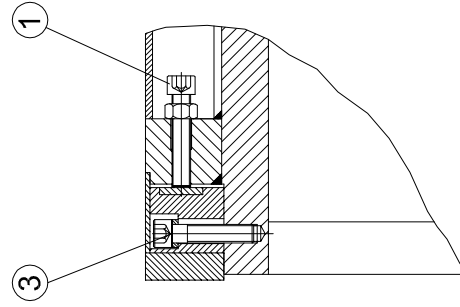
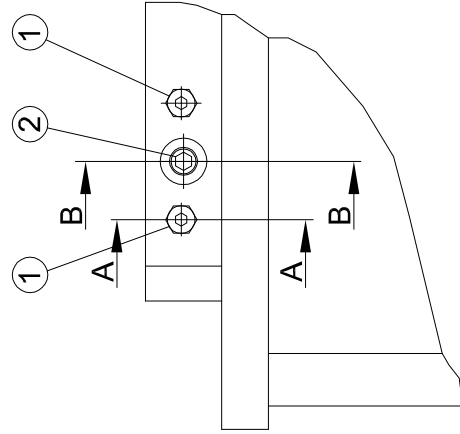
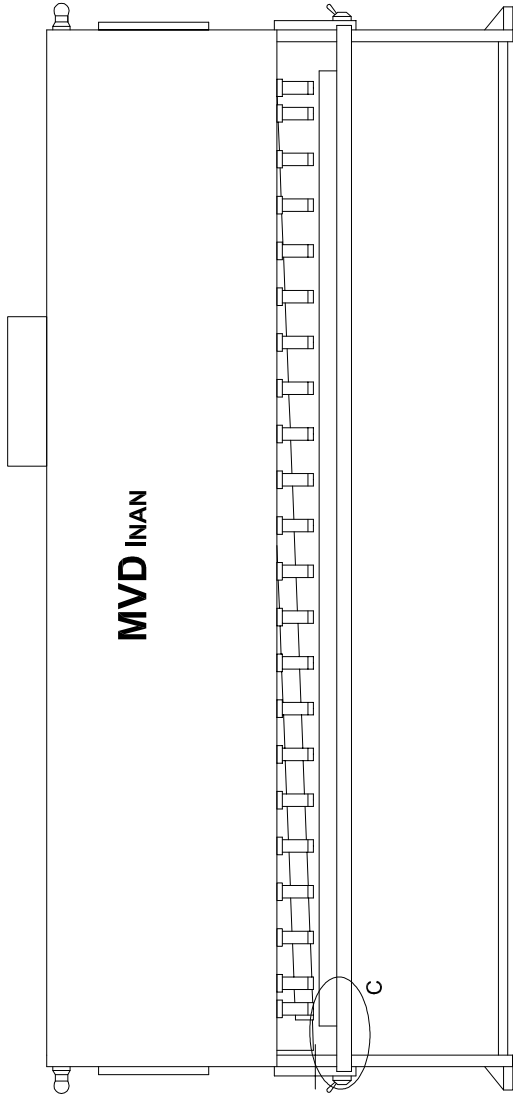
INCREASE THE BLADE GAP.



DECREASE THE BLADE GAP



DO NOT MAKE ANY EXTRA
ADJUSTMENT



II.3.4 Ending the operation

Motor stop button is pressed, control lock key is turned off and the key is removed. Main switch is turned off to "0" position. It shall be locked by a padlock when machine is not operated and also when it is maintained.

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III. MAINTENANCE MANUAL

Maintenance may only be carried by properly qualified maintenance personnel or by a service technician of MVD INAN or the Agent. The machine is designed to carry out maintenance and lubrication safely.

Attention: During the maintenance and repair work, the main switch shall be turned off to the "0" position and locked by a padlock for safety reasons. Also the lock bar shall be placed into the side column for mechanical safety. See II.2.2.4.

III.1 Lubrication

Back gauge slide ways and screws must be cleaned and lubricated by oil everyday. Roller bearings must be greased once a week. (See Figure 4) The swing beam axis must be greased once a month inside for roller bearing and once a week outside for frictional bearings. During continuous use and heavy work conditions, it is suggested to lubricate them more frequently.

Attention: The cylinder joints of the machine will never be lubricated.

III.2 Mechanical system maintenance

Everyday, the tightness of upper and lower blade bolts must be checked (See Figure 3). Every week the blade clearance between the blades must be assured to correspond to the scale (The clearance will be 10% of the sheet thickness for mild steel).

Additionally, tightness of all bolts and nuts on the machine must be checked regularly every 15 days and also when there is any irregularity on the operating behaviour.

Any other adjustment and problem may be referred to MVD INAN or the agent.

III.3 Hydraulic system maintenance

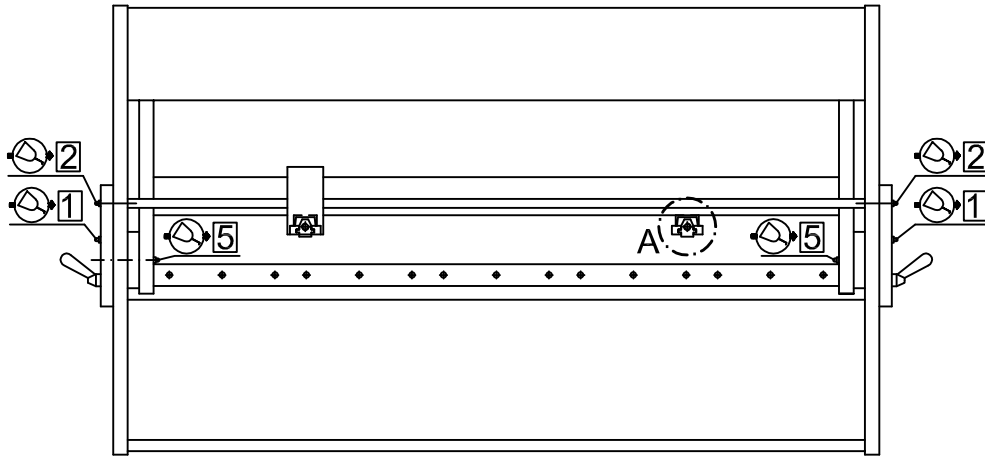
Level of oil in the tank must be checked daily. It must be 3-5 cm. below the top cover.

The oil must be clean. So, it must be checked that the filter works properly. If filter is dirty, the manometer at the top of the filter will reach the red region. In such case the filtering element in the filter body has to be replaced. The quality and cleanliness of the oil is of primary concern in hydraulic systems. Improper and dirty oil will shorten the life of the system and will cause unexpected problems.

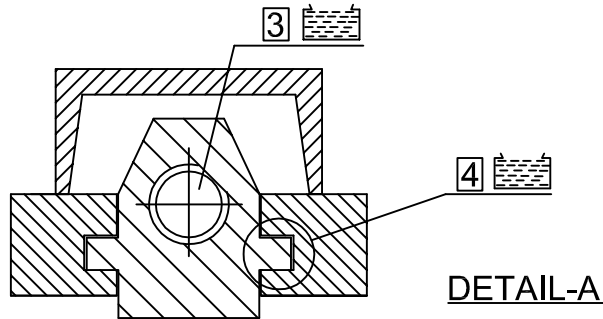
After 2000 operating hours or 1 year, whichever is earlier, drain off the oil from the tap at the bottom of the tank. It is suggested to use a flexible hose to connect this point to an empty oil tank or place the tank hole underneath the tap.

To refill the machine's oil tank, the cap at the top surface must be removed. The filtering element must be in place to protect fall of materials other than oil. Oil may either be pumped by a manual pumping device or poured directly into the tank. The oil



LUBRICATION POINTS.








BACK VIEW OF THE MACHINE.



DETAIL-A

| | | | |
|---|--------------------|---|---------------------------|
|  | Grease to be used. |  | Oil to be used. |
| | SHELL ALVANIA R3 | | SHELL ROTELLA 30 or 40 |
| | MOBIL LUX EP-3 | | MOBIL ENGINE OIL 30 or 40 |

LUBRICATION CHART.

| LUBRICATION POINT | SYMBOL | LUBRICATION FREQUENCY |
|-------------------|---|-----------------------|
| 1 |  | Once a week. |
| 2 |  | Once a week. |
| 3 |  | Everyday |
| 4 |  | Everyday |
| 5 |  | Once in a month. |

mentioned in section I.4 must be used. During this process maintenance personnel shall supply a ladder or platform and place it safely.

Attention: Wear protective clothing while changing the oil.

In addition to change of oil, the element of the filter shown in the hydraulic diagram shall also be replaced every year. Other hydraulic elements may be ordered regarding the drawings in Appendix B: Hydraulic System

Appendix A: Explanatory Wordlist

Hydraulic swing-beam guillotine shear: Machine designed to transmit energy to the moving beam by hydraulic means principally for the purpose of shearing of sheet metal between blades along straight lines.

Beam: Main reciprocating machine member, which holds upper blade.

Table: Stationary table which holds lower blade.

Upper blades: Blades with cutting edge less than 90°.

Lower blades: Blades with 90° cutting edges.

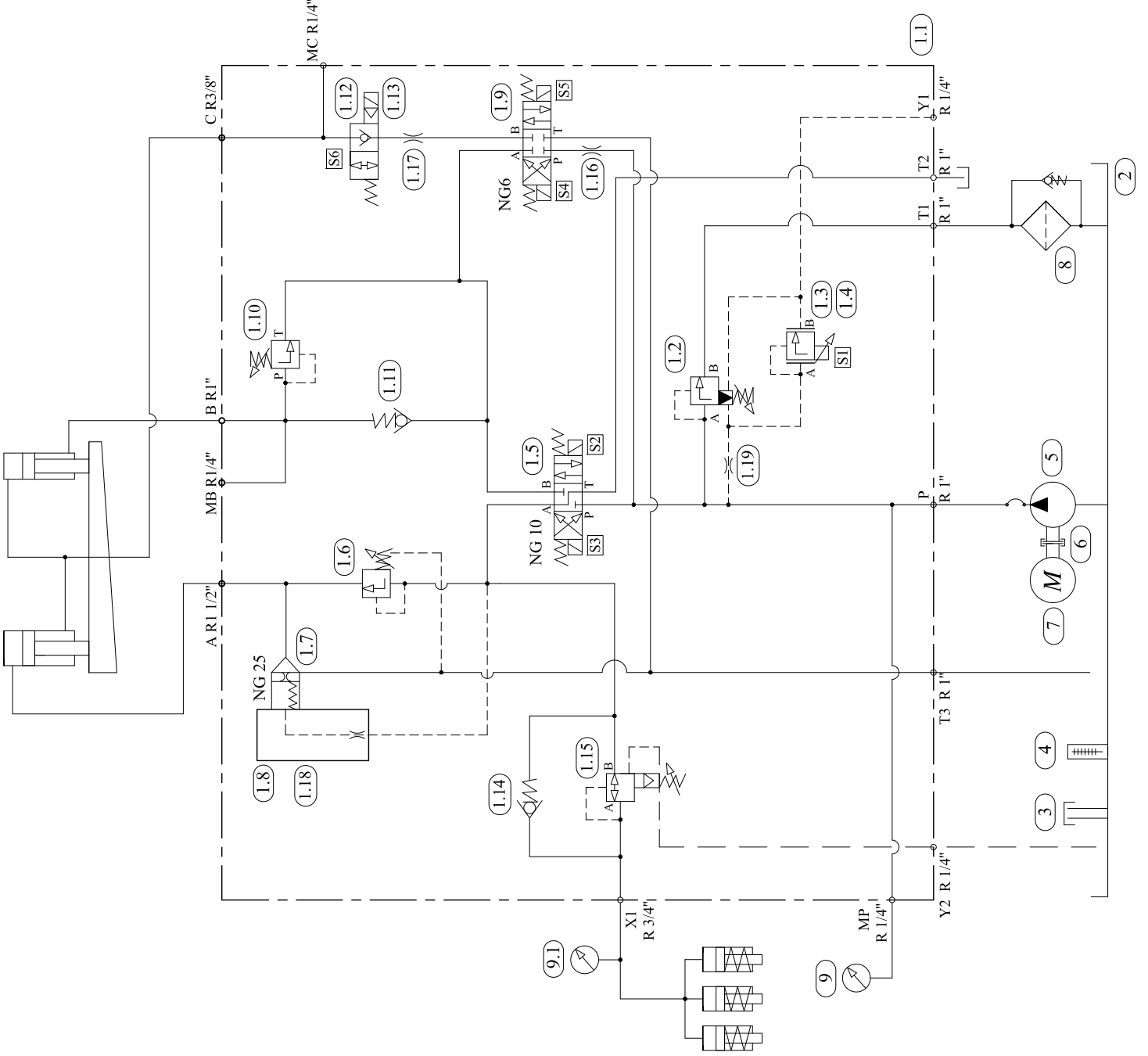
Cut cylinders: Placed one on each column and turns hydraulic pressure to mechanical force and exerts it onto the beam to cut the sheet metal.

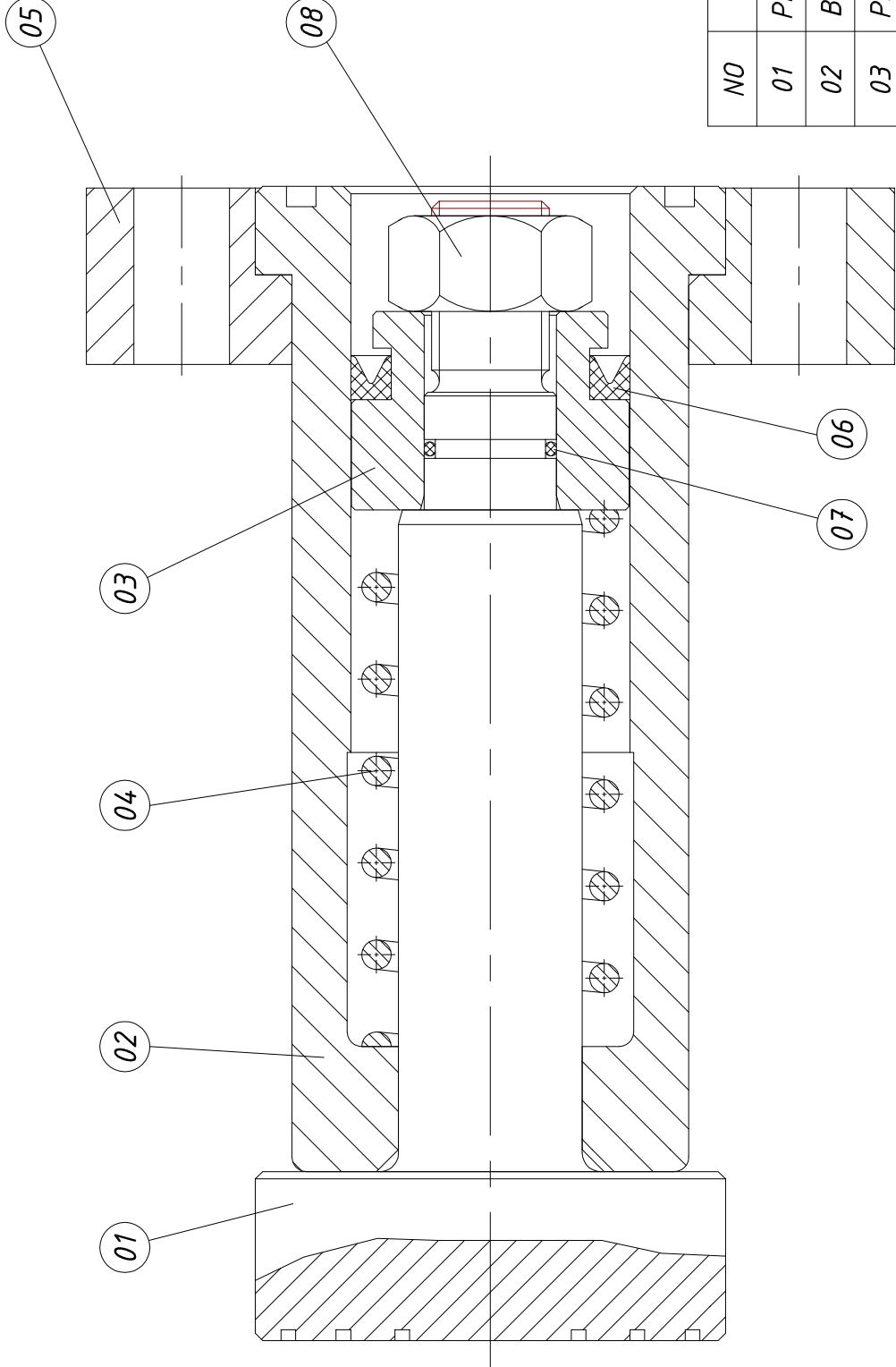
Return cylinders: Cylinders which move the beam up.

Back gauge: The gauge against which the plate to be cut is positioned to maintain the cut width all along the cut length. Its position is adjusted by the position controller on the control panel.

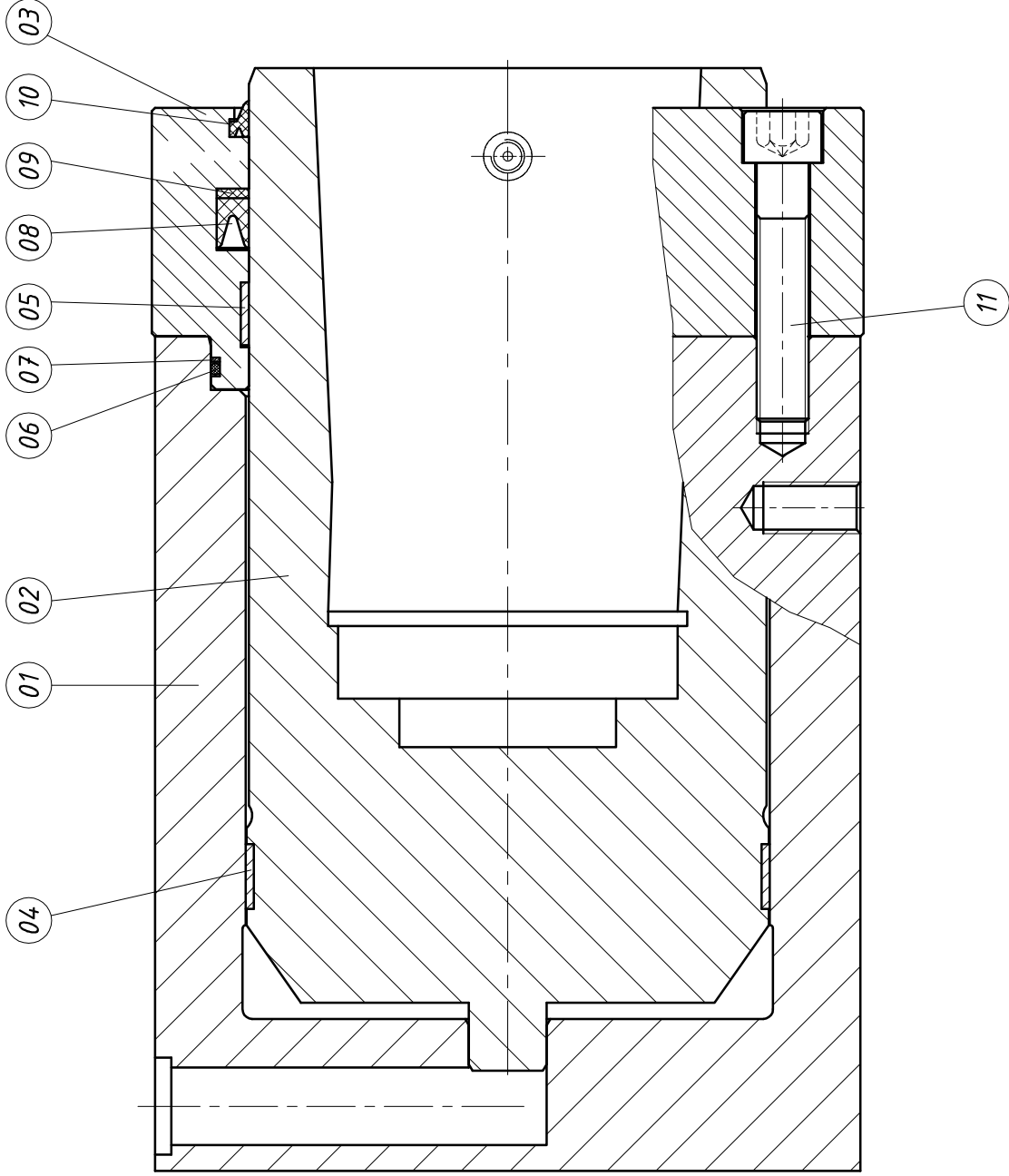
APPENDIX B: Hydraulic System And Equipments

| HAGM 3010 HİDROLİK PARÇA LİSTESİ | | | |
|----------------------------------|---|-----------------|--|
| NO | PARÇA İSMİ | AÇIKLAMA | |
| 1.1 | Hidrolik Blok. (H008133) (HDŞ 2003238) | | |
| 1.2 | Basınç kontrol valfi. (BOSCH REXROTH DB 20 K1-1X/350XY) | Ana basınç. | |
| 1.3 | Oransal emniyet valfi. (BOSCH REXROTH KBPSR AA/CG24K4V) | | |
| 1.4 | Oransal sürücü kart. (BOSCH REXROTH VT SSPA1-9-1XV0/0) | | |
| 1.5 | Yön kontrol valfi. 24V. DC. (BOSCH REXROTH 0810001793) | | |
| 1.6 | Basınç sıralama valfi. (INTEGRATED 1PS-100-P35-S) | | |
| 1.7 | NG 25 Lojik valfi. (BOSCH REXROTH LC 25B10E7X) | | |
| 1.8 | Lojik valf kapağı. (BOSCH REXROTH H007230) | | |
| 1.9 | Yön kontrol valfi. 24V. DC. (BOSCH REXROTH 4WE6 E 6X/EG24N9K4) | | |
| 1.10 | Karşı denge valfi. (BOSCH REXROTH DBDH 10K-1X/100) | Counter balance | |
| 1.11 | Çek valfi. (BOSCH REXR M-SR 15 KE05-1X) | | |
| 1.12 | Popet valfi. (Edi OD150518378000) | | |
| 1.13 | Boblin. (Edi OD021101300C00) | | |
| 1.14 | Çek valfi. (BOSCH REXR M-SR 15 KE05-1X) | | |
| 1.15 | Basınç düşürücü valfi. (BOSCH REX. DR10K4-3X/100YM) | | |
| 1.16 | Ø1,5mm. Orifis | | |
| 1.17 | Ø2mm. Orifis | | |
| 1.18 | Ø1,5mm. Orifis.(BOSCH REXR M-SR 15 KE05-1X) | | |
| 1.19 | Ø0,6mm. Orifis(Edi OD150518378000) | | |
| 2 | Hidrolik tank. (MVD İnan) | | |
| 3 | Tank kapağı. | | |
| 4 | Sıcaklık ve seviye göstergesi. | | |
| 5 | Hidrolik Pompa. (DENISON TB 011) | | |
| 6 | Kaplin. | | |
| 7 | Ana Motor. (GAMAK 11 KW.) | | |
| 8 | Dönüş filtresi.(HYDAC RFM 165 BD A1,0 (.....)) | | |
| 9 | Manometre.(PAKKENS 315 Bar.) | | |
| 9.1 | Manometre.(PAKKENS 315 Bar.) | | |

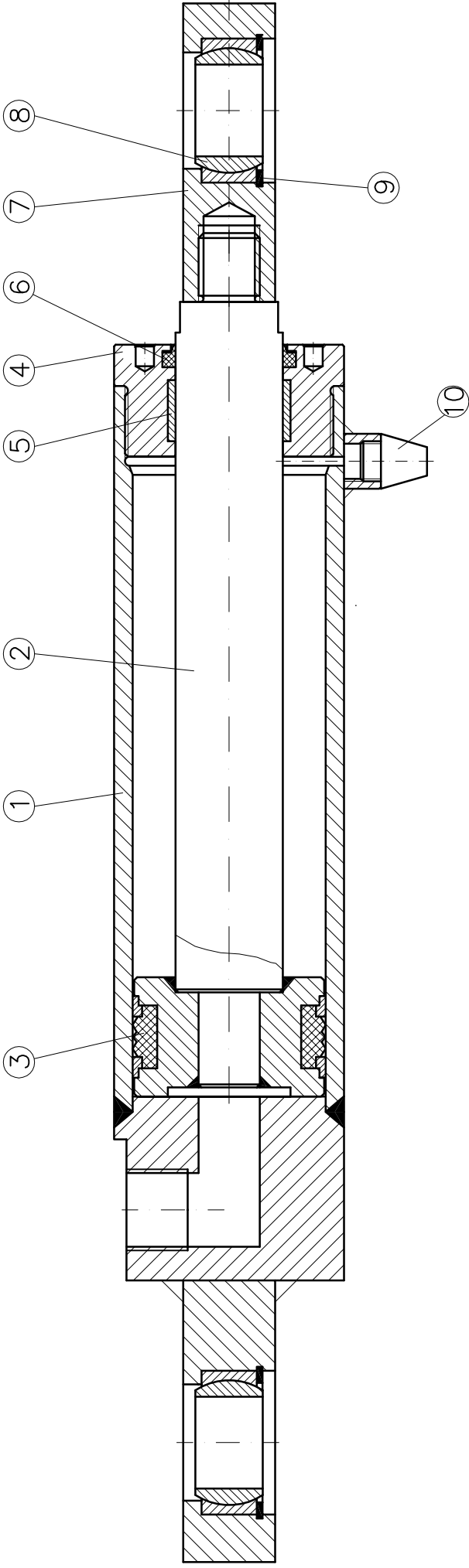




| NO | PARÇA ADI / MARKA KOD |
|----|---|
| 01 | PISTON ARM |
| 02 | BODY |
| 03 | PISTON |
| 04 | SIPRING |
| 05 | FLANGE |
| 06 | NUTRING $\phi(27X36)/6$ PU KASTAŞ K21-027/1 |
| 07 | O-RING $\phi 2X15$ |
| 08 | M16 NUT |



| NO | PART NAME |
|----|--|
| 01 | BLOCK |
| 02 | PISTON |
| 03 | CAP |
| 04 | WEAR BUSAK SHAMBAN 2,5X20 |
| 05 | WEAR BUSAK SHAMBAN 2,5X20 |
| 06 | O-RING $\phi 3,50 \times 177,4$ |
| 07 | SUPPORT RING $\phi(178,1 \times 183,5) / 1,25$ |
| 08 | NUTRING $\phi(160 \times 180) / 15$ PU |
| 09 | SUPPORT RING $\phi(160 \times 180) / 3$ |
| 10 | WIPER KASTAŞ K10-160 |
| 11 | CAP BOLTS M16 L=80 |



| HGM 3013 RETURN CYLINDER | | |
|--------------------------|---------------------|---|
| PART NO | PART NAME | SERIAL NUMBER / REMARKS |
| 1 | Cylinder Block | MVD Standart |
| 2 | Piston arm | MVD Standart |
| 3 | Compakt Piston seal | KASTAŞ (Ø47X63X59)-3,10-20,5 (K18 063-047) |
| 4 | Cap | MVD Standart |
| 5 | Wear | Busak Shamban |
| 6 | Wiper | KASTAŞ (Ø35X43)X(5/7) (K06 -35) |
| 7 | Joint | MVD Standart |
| 8 | Joint bed | ELGES (GE 30 UK 2RS) |
| 9 | Segment | Ø47 |
| 10 | Filter | |

APPENDIX C: Electrical System And Equipments

APPENDIX D: Digital Position Control Unit