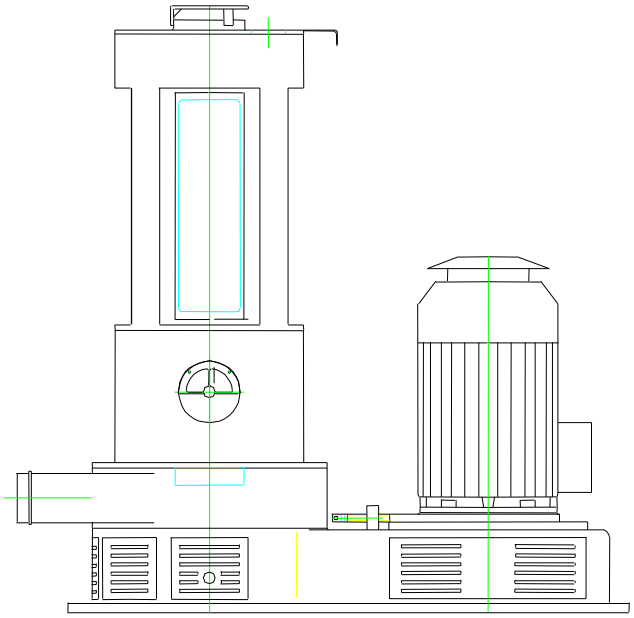
FP SPOMAX S.A.

DEHULLER / PEARLER DOO
USER'S MANUAL



1.0 Contents

2.0 Introduction

The user and operator are obliged to make themselves familiar demonstrably with the present Operating Instructions before starting the work. The Instructions contain important information on work safety, assembly, operation, maintenance, and they have to be considered for integral part of the equipment. A trouble-free operation, safe work with the machine and its service life depend to a great extent on its correct and thorough maintenance.
If you do not understand some information in the Instructions address the machine producer. We recommend you to fill in the data on machine purchase, make a copy of the Instructions and the original copy should be kept thoroughly for the case of loss or damage.
While working you should especially keep the safety instructions to avoid the danger of injury of yourself or other persons.

3.0 Technical Characteristics

Application in any other way and for other purpose then that given in this part is contrary to the machine purpose and is prohibited!
Any changes, made by the user upon this machine, and / or application of the machine in another way and for other purpose then given in the present Instructions for use, relieve the producer from responsibility for consequential damages or injury!

3.1 Utilization - Purpose

The DEHULLER DOO machine is utilized to process barley for production of peeled barley of all sizes and for peeling of peas. It can also be used to process other types of cereals, such as wheat, rye, rice and sorgo.
The machine cannot be used independently; it is component part of a technology line.
Utilization for other materials must be consulted with the producer and must be specified in purchase contract.

3.2 Description of Function Principle

The peeling-hulling machine DEHULLER DOO is a machine working on the principle of dry abrasion of surface husk layers of grain.

3.3 Main Technical Data

The DEHULLER DOO machine is produced in one size. As far as not otherwise specified, it is delivered in basic execution II (2) with jacket (screen) mesh size ≠1,2 x 20 (wheat, barley etc.) or with jacket (screen) mesh size Ø 3 (peas). Other execution possibilities, i.e., mutual position of inlet, outlet and exhaust socket by 90°, are demonstrated on Fig. 1 and designated with Roman numeral.
According to the type of grain processed, DEHULLER DOO is equipped with the following set of grinding wheels:

No 1 – set of grinding wheels for wheat, rye, rice
No 2 – set of grinding wheels for barley, peas, sorgo
No 1 – without grinding wheels

MAIN TECHNICAL PARAMETERS - DEHULLER DOO

Table 1

Description	Unit	Value
Asynchronous three-phase motor, short, form IM 3011, 1460 rpm	kW	22
Rated current at 400 V	A	40
Vertical shaft revolutions	min^{-1}	2053 *
Amount of air aspirated by fan	$m^3.min^{-1}$	15-25
Pressure loss	Pa	147-196
Max. machine capacity at husking of barley for production of peel barley at first run	$t.h^{-1}$	2,5 **
Dynamic factor μ	-	1,5
Frequency	Hz	34,2
Noise level	dB (A)	80
Weight	kg	1060

**/ Capacity of the machine specified while using grinding wheels CARBORUNDUM C 48, grain size F 20 P

MAIN TECHNOLOGICAL PARAMETERS OF DEHULLER DOO 3
(informative values)

Table 2

Peeling	Capacity $t.h^{-1}$
Standard peeling of cereals	1,6 to 1,8
High powered peeling of cereals	0,8 to 1,2
Husking of peas	1,5 to 1,7
Peeling of barley for production of peeled barley processing in the first run	1,4 to 2,5

1.0 Execution

a) All cast pieces (except of impeller of fan and ring from the box with outlets socket) are cast from gray iron 422420. Impeller of fan is made of cast steel. Ring from the outlet socket box is from aluminum alloy 424331. Fan impeller and pulley for V-belts are balanced dynamically. Grinding wheels CARBORUNDUM are made of material C 48 and tested. Sense of rotation of working shaft is arbitrary.

b) Surface treatment is executed for temperate climate conditions (WT) with low corrosion aggressivity. Application for other atmospheric conditions must be specified in purchase contract. Estimated service life of the coating is 5 years. After that time the producer recommends to check up and repair coatings damaged, if any. Innovation of coatings inside the machine is not considered. As far as the customer does not specify color execution of the machine, it will be defined by coating system of the producer.

Designation

a) The DEHULLER DOO machine is provided with basic machine shield and shield of air conduct machinery parameters above the basic shield.
b) The shield designating earthing (earth terminal) is situated at the basic frame at the side of the electromotor (see Figs. 2 and 7). Pictogram AA/B1 – at the working cylinder body (A). Pictogram AA/B28 and AA/B15 at working cylinder jackets (B+C). Pictogram A3/B24 at the terminal board guard of electromotor (D). Location of shields and pictograms see Fig. 7.

Note: pictogram designation according to ISO 11684.

Basic data for project planning

a) Way of execution of the DEHULLER DOO machine – see Fig. 1, basic machine dimensions see Fig. 2, ground area layout see Fig. 3, other technical data see Tables 1 and 2. Built-up area see Fig. 2.
b) Around the machine, a space at least 600 mm must be provided. Above the machine at least 1000 mm for handling with grinding wheels.
c) Project layout of the machine must be executed so that a sufficient and continuous filling of machine is guaranteed (bin must be located above the machine). Feeding and discharge ways and exhaust plant must be connected to the machine so that the machine vibrations are not transferred at these parts (apply silon or rubber hoses, respectively).
d) To guarantee a safe operation and fulfill the machine function, connect DEHULLER DOO to a separator, guaranteeing exhausted air amount.
   As to keeping the purity of exterior atmosphere, the separating equipment must fulfill the following parameters:
   - Separating ability of grain about 100 μm must be higher than 98%
   - Separating ability of grain between 100 - 20 μm must be higher than 90%

Air conduct machinery data are specified in Table 1.

3.4 Testing

a) The following issues are checked in the production plant:
1. Correct execution according to drawings documentation
2. Smooth running without obvious impacts for the period of 30 minutes
3. Vibration with vibrometer VIB 10 – maximum effective value of vibration speed $V_{ef} = 10$ $mm.s^{-1}$ (only in the case if the machine is equipped with grinding wheels No. 1 or No. 2)

- Lubricant in the bearings during the machine assembly

b) After assembly, the following issues are checked during operation:

- Tightening of fastening screws
- Connection and function of aspiration equipment
- Smooth running without material and with material
- Check up of machine function according to 5.1

c) Check up during operation:
- Machine output and function
- Aspiration function (visual check)
- Tightness to spilling (visual check)

3.5 Detailed description

The DEHULLER DOO machine consists of the following main parts:

a) Basic frame with covered holes
b) Electromotor with tightening plate and pulley
c) Fan box with lower bearing and exhaust air branch
d) Outlet socket box, controller and venting hole
e) Working roll (chamber) with screen and inlet inclined wall
f) Machine head with hollow shaft guard and bearing
g) Hollow shaft with grinding wheels, aspiration rings, pulley and fan impeller

a) Basic frame with covered holes

The basic frame is structural part of the machine. Bearing surface of the frame consists from a shaft with holes for anchor screws. Vertical walls are equipped with relief assembly holes, covered with sheet guards. Frame top consists from a circular shaft with holes for screws for connection of fan box, foot for tightening screws and guide rails with longitudinal holes for connection of cast iron plate under the electromotor. Inside the frame are pulleys for V-belts. One pulley is set to vertical machine shaft, the other at the electromotor shaft. Both are protected with screws and pads and interconnected with V-belts. V-belts are checked or replaced when the machine stands, without disassembly of the machine, through assembly holes in vertical walls of the basic frame, the iron sheet guards unscrewed.

b) Electromotor with cast iron plate and pulley

The electromotor for machine driving is a flange motor with vertical shaft on which a pulley is set and protected.
A cast iron plate is screwed to the electromotor. V-belts are tightened using tightening bolts, situated in the basic frame foots.

c) Fan box with lower bearing and exhaust air branch

The fan box is circular, equipped up and down with circular bearing surface with holes for screws. Exhaust air socket is situated at the fan box periphery. In the middle of the box bottom is a bushing for radial antifriction ball bearing and the respective distance and carrier rings. The bushing is above covered with screwed guard with shaft sealing; below it is packed with felt ring. The bearing can be refilled with grease via lubrication head, which is situated at the guard of basic frame assembly holes.
Inside the fan box, a fan impeller with radial blades is fixed upon vertical shaft. Axial position of the impeller is ensured using flexible retaining ring.

d) Outlet socket box, controller and venting hole

The outlet socket box has cylindrical shape. It rests with circular flange upon bearing surface of the fan box and is connected with screws with the fan box. Circular hole in the lower box part matches with the exterior diameter of the fan suction hole. The upper box part includes a hole of diameter corresponding to the size of the cylindrical perforated jacket. The perforation includes cylindrical working room of the machine, ended with inclined gradient surface. This surface is both bottom of the working room and bottom of the outlet socket, which is used to draw off the peeled grain outside the machine. Controller of the grain flow is mounted to external part of the outlet socket. The closing body of the controller, connected fixedly with the pivot, is swiveled using control lever with indicator. A scale is fixed under the control lever.

The sidewall against the outlet includes a riser with circular aerating hole. To the hole is screwed a lid with semi-circular hole with semi-circular closure, turned with the head with grooved edge.

e) Working roll with screen and inclined inlet wall

The working roll (chamber) is upright, down with a flange, fixed with screws to the outlet socket box. The internal chamber room is connected with the room of the outlet socket box. The chamber consists of two cylindrical surfaces. The lower cylindrical surface represents approximately 4/5 of total chamber height and is reinforced with four vertical U-shape stiffeners. The two opposite vertical cylinder walls among the stiffeners are full; the other two have assembly holes, covered with rounded sheets, along their whole width and height. The upper cylindrical surface is connected with its external diameter to the external diameter of the stiffeners of the lower cylindrical surface. Inside the upper roller is an inclined inlet surface at 1/3 its periphery.

The inside chamber part consists of welded cylindrical jacket made of a longitudinally perforated sheet.

Both lower and upper jacket edges are equipped with welded rings. The lower ring matches to recess in the upper part of the outlet socket box and is protected with a stop against shift; the upper ring matches into the hole of the upper chamber part. At the upper jacket ring is welded a triangle stop, leaning against the sidewall of the inclined inlet surface. Thus, the perforated jacket is ensured against shift.

For peeling of peas, the jacket is welded to the external diameter of the rings and consists of a perforated with circular holes. It is ensured identically against the jacket shift.

f) Machine head with hollow shaft guard and bearing

The machine head is shifted from above into the working roll (chamber) socket. Inside the head there is a bearing, a thrust ring and a bushing for the bearing. The hole in the head, into which the hollow shaft hole opens, is protected with a guard, leaning upon three distance feet, screwed to the head. This creates a covered inlet room for the air entering into the shaft hollow. The machine head also includes a square inlet hole with movable sliding gate. The sliding gate is protected with a stop against complete removal.

The head is fixed to the working roll with three screws and pads. Its centering is obtained by a stepwise tightening of the three screws with safety nuts that are situated at the periphery of the working roll upper cylindrical surface.

g) Hollow shaft with grinding wheels, aspiration rings, pulley and fan impeller

The hollow shaft is a steel pipe to whose lower end is set a pivot, treated for setting and fastening of fan impeller, GUFERO shaft packing, bearing, distance rings and V-belt pulley. The shaft passes vertically through the whole machine. In its upper cylindrical end are grooves with splines. Radial holes are bored in specified pipe heights. The lowest holes open to the room of the outlet socket box. The other ones must be exactly in the height of the aspiration rings.
On the shaft is first set an aspiration ring, which bears against the shoulder. Above the ring is grinding wheel, then again a ring etc. Above the last upper ring is a conical grinding wheel; above the grinding wheel is a distance bushing, which is axially secured with a lock ring. The aspiration rings and grinding wheels are ensured on the shaft with two splines, which are let into the shaft against each other in the length of the shoulder until the upper edge of the distance bushing and are fixed with three let-in screws.
The aspiration rings consist of two annular fronts faces made of steel sheet. The front faces are connected with distance bolts and in small distance from their external end they include a circular groove into which a low sheet band with vertical perforation is inserted. In their interior ends, the front faces are provided with two opposite grooves for splines.
The grinding wheels are of various grain sizes, cylindrical shape and with metal liner, with two opposite grooves for splines. The first wheel from above has the shape of truncated cone.

4 Safety Instructions

4.1 Basic Principles of Work Safety

Work Safety

- The operators must be older then 18 years, reliable, able mentally and physically for this work and clearly trained for machine operation. They must clearly be familiar with the present Instructions. In case the safety regulations, valid in the place of machine erection and operation, required fulfilling stronger criteria compared to those specified in the present Instructions, the machine owner must ensure that these safety regulations are maintained and must instruct clearly the workers engaged in the operation and maintenance!
- The user must not make any construction treatments and repairs of the equipment (machine) without prior agreement of the producer!
- The user is allowed to apply the equipment (machine) only in accordance with description in the present Operating Instructions and for the purpose specified in the present Operating Instructions.
- The machine operating staff must be particular in keeping common order and cleanliness at the workplace and especially in checking and cleaning of all functional elements.

- If the operator finds out malfunction or damage, which could harm the working safety or machine operation and which the operator alone is not able to remove, he / she must not put the machine into operation.
- Remove, disassembly or lift off the guards only after complete machine stoppage and having checked the off-condition of the machine.
- Rotating machine part has an arbitrary sense of rotation.
- The machine owner is obliged to provide visibly located tables “No Admittance to Unauthorized Persons”.
- Keep clean the safety labels, symbols and signs. Were they damaged or illegible, the user is obliged to renew them in accordance with the original execution.

It is prohibited

- To put into operation and utilize the equipment if dismounted or damaged or if safety devices (guards) inactivated or if the machine head is not secured with screws.
- To touch moving machine parts.
- To work with the machine if the working room for operation (workplace) is not lighted sufficiently.
- To make maintenance, cleaning and repairs in running, when it is not protected against incidental start.
- To inactivate safety, protective and security equipment.

Fire Protection

- The machine is not provided with fire extinguishers. Thus, the user is obliged to provide the premise, where the machine is installed, with suitable fire extinguishers of approved types, in corresponding amount, situated at visible places, protected against damaged and misuse, with regular checks. The operators must be familiar with their application in accordance with fire regulations.
- All places in which the machines run hot during operation (electric gearbox, bearings, etc.) must be cleaned regularly from deposited inflammable dust and other impurities so that the layer thickness does never exceed 1 mm. These surfaces also must not be polluted with working raw material.
- Before putting into operation, the operator is obliged to check up visually if supply electric cables are undamaged. All parts of the electric equipment must be stiff, fixed reliably and must not influence unfavorably other devices for the whole service life.

Working Hygiene

- As the machine cannot be used independently (it works in a line or this line can work at parallel work of several lines) and with regard to its location, during the project preparation, the user is obliged to pay the necessary attention to machine location with regards to noise emission and dustiness. Before putting into operation, the user is obliged to ask the respective Occupational Hygiene Station to authorize operation of the whole equipment (line). If highest permissible values of noise emission and dustiness are exceeded, compensatory measures to decrease the noise emission and dustiness level will follow for the workers (exposition time, personal protective equipment, etc.).

- While using acid and alkaline disinfectants, it is necessary to dispose them in accordance with instructions of the producer and the operators must apply personal protective equipment.

Electrical Installation

- The electrical installation must be executed in accordance with requirements of the relative valid regulations and standards as well as the attendant regulations with regards to data specified in Table 1.
- The works on electrical installation in the sense of proper standard may only be done by a person having the respective electrotechnical qualifications in accordance with Decree CUBP and CBU No. 50/1978, instructed with the equipment in the necessary extent:
  §4 – informed workers - operators
  §6 – workers for an independent work (maintenance workers)
- All electrical installation must be executed, maintained and inspected in accordance with valid regulations and standards.. The user is obliged to ensure regular inspections of the electrical installation in the periods of time..
- Before starting the testing operation tests and initial inspection of the electrical supply must be executed.
- Only the worker having corresponding electrotechnical qualification is allowed to connect the electrical installation to the mains. Having connected, he / she must check up correct functions of the electrical installation, including the function of protections and safety cutting-off.

It is prohibited to utilize the machine in other way and to other purpose than those specified in the present Instructions!!!

4.2 Warning on Possible Risks of Injury and Material Damages Occurring in the Course of Utilization of the Equipment (Machine) concerning:

- ***Installation and assembly*** – danger of injury and damage during the handling with a heavy load
  The machine is an integral part of the technology line. The main switch of the line and the safety switch do not belong to delivery volume. The main switch must be able of locking in off-position. The devices for emergency stop must be situated at each control station of the operator of the technological line. ***Putting into operation*** – First, it is necessary to test the machine at no-load operation for max. 10 minutes. Only than is the machine ready for working load. Check up electrical wiring due to possible electrical accident.
- ***Utilization*** – During the machine running it is prohibited to remove tops or protective guards of machine basic frame. RISK OF INJURY!!
- ***Handling*** – Possible fall of part of equipment during the handling (for example, with hoisting device), possibility of is damage or depreciation – way of handling see Fig. 5)
- ***Adjustment, maintenance, service and repairs*** – Only professional worker, familiar with the operating instruction, is allowed to adjust and maintain the equipment, keep it in cleanliness, maintain the bearing (bearings) and replace

lubricants in time (possible occurrence of damages), as well as check up and replace, if necessary, packing pieces – possible occurrence of leakage and release of raw material from the machine at the floor, possible fall and injury. Any maintenance, service and repair are allowed only at machine standstill. In such a case, the machine must be switched off safely, protected against an incidental start – main switch locked in the off-position – and marked with a sufficiently distinctive table **„DO NOT SWITCH ON – THE MACHINE IS BEING REPAIRED!!“**

- Before any maintenance in the machine working room, the operator must check up that there is no danger of injury.
- ***Disassembling and liquidation*** – Before liquidation of metallic or non-metallic parts (for example, to junk) clean the parts properly to avoid transfer of infection. Lubricants and greases used must be stored in specified container, protected against release of these matters into environment.
- ***Fire protection*** – Electrical installation must not be extinguished with water! Have available powder extinguisher, snow extinguisher or halene extinguisher; machine attendance must be familiar with their application. If there is water extinguisher or foam extinguisher available, it is possible to apply it only when electrical current is switched off!!!
- ***Occupational hygiene*** – The machine attendance must keep hygienical regulations valid for the relevant type of operation.
- ***Noise level*** – If the machine exceeds in given place the noise level allowed, the owner is obliged to take the necessary measures to ensure safety and health of the operators.
- ***Dustiness*** – The machine must be cleaned and maintained regularly – important places are, for example, bearings and drive).
- ***Vibrations*** – The machine must be settled so that all possible vibrations are transferred into its foundation (floor, frame, ...). Vibrations must not be transferred to other machines or buildings.
- ***Danger of explosion*** – The machine is intended for explosion-free operation. The machine is no source of explosion.
- ***Location of warning signs, picture information and symbols, if necessary*** – All dangerous places must be marked with warning symbols. The owner is obliged to keep clean these signs and renew them, if necessary.

While operating the machine, the owner is obliged to keep valid laws, regulations, decrees and directions, to provide the attendance with personal protective equipment in sufficient extent and regularly, at least once a year, to organize demonstrably training and testing of machine operators, targeted to operating safety of the machine (the line).

5 Preparation and Operation

5.1 Instructions and Working Process for the Operators

The way of operation depends on machine position in the working line. The machine must be connected suitably into the technological line with regard to the link to ways before and behind this machine (the connection is solved in the electrical project).

Putting into running:

Inlet slide gate, air shutter and controller closing body are shut. Start electromotor and as far as it has operating revolutions, the inlet gate opens and the grain flow starts

to run into the machine. The grain falls to conical surface of the first grinding wheel, the wheel's centrifugal force throws the grain to perforated jacket, it drops lower into the space among grinding wheels and perforated jacket. Through shocks and abrasion of the wheels abrasive, of the jacket and of each other the parts of its surface get loose. When the working roll is filled with grain, the controller body opens so that the falling grain is peeled in required quality.
Shifting the controller closing body changes through-flow profile of outlet, thus the amount of grain leaving the working roll. During pealing check the grain from time to time if it is peeled sufficiently and open or close the controller, if necessary. The more closed is the controller, the longer the grain is exposed to peeling and, thus, the more peeled it is.
The fan aspirates the air through the hole in the upper head part into the shaft hollow. The air flows into aspiration rings through the shaft holes. From aspiration rings, the air penetrates into the layer of falling grain and pulls down ground particles of the grain husk. Than, the air penetrated through perforated jacket into the space between the jacket and the working roll. From there, the air blended with husks and dust goes to the outlet socket box; the air is aspirated with the fan and is forced into the exhaust socket. The air with husks and dust is conveyed through aspiration piping to separating equipment (filter, cyclone).
The air flowing through falling layer of grain in the working roll decreases the velocity of grain fall, thus increasing the peeling intensity. The more the air flows through the grain layer, the more intensive the peeling is.
The grain layer is the most blown if the ventilation hole is closed. Upon opening the ventilation hole, the fan starts the aspirate the air directly into the outlet socket box. This way, the air flowing through the grain is changed and, consequently, the peeling intensity decreases.
The excess air leaves through the hollow shaft holes, opening into the outlet socket box, while equalizing the overpressure.
Before stopping the machine first close the inlet slide gate. Let running the machine until it is emptied completely. Than, switch off the electromotor and the machine stops.
Machine equipment with breakdown STOP button, enabling the operator to stop the machine (due to defect, breakdown, injury, fire, etc.) and restart is solved in the electrical project.

5.2 Written Instructions for Operating Workers

The owner must elaborate detailed instructions for operating workers (operating personnel) to ensure common operation of the machine. These instructions must be fixed upon a well visible place immediately close to the machine. They must be in accordance with the present Instructions and with the regulations valid in the place of operation.
The operator is obliged to keep the book of repairs and maintenance for this equipment (machine).

5.3 Technical Requirements on the Product Processed

The machine is planned, designed, and produced for utilization in the plants producing all sizes of peeled barley and peeled peas.

5.4 Working Conditions, Working Environment

- DEHULLER DOO is not intended for exterior location.
- Temperature of ambient –10 to +50 °C
- The machine cannot be applied separately, it works in a line
- To prevent dust formation, connect the machine to separating equipment. Such equipment is not component part of delivery.

5.5 Control Elements and Figure Symbols

Notice: The user is obliged to keep legible the pictograms and to renew them, if necessary.

Demonstration of pictograms and their location see Fig. 7 of the present Instructions.

5.6 Adjustment and Maintenance

At least twice a month it is necessary to:

a) Check up the machine and bearings on leakage and replace non-functional pieces, if necessary.
b) Check up machine lubrication according to lubrication plan.
c) Check up tightening of screwed joints, V-belts and function of control bodies on the machine.
d) Monitor condition of wearing pieces.

Note: Keep checking temperature of the bearings; the temperature of bearing bodies surface must not exceed 60 °C. Higher temperature is evidence of bearing malfunction.

- How to remove the machine head (see Fig. 4)
Loosen and unscrew three hexagonal head screws (1). Loosen three screws with safety nut (36), which center the machine head (2) in the working roll socket (4). Get the head by mounting screws with eyes and remove from the working roll socket. Guard (3) of the hollow shaft must not be dismantled.

- How to set on the machine head (see Fig. 4)
Get the machine head (2) by mounting screws with eyes, set with bearing bushing (14) to splines (37) of shaft (9) and sinking slowly, shift the head (2) into working roll socket (4). Fasten the machine head (2) with three screws (1). By stepwise tightening the screws with safety nut (36), center the head (2) in the working roll socket (4).

- How to replace grinding wheels (see Fig. 4)
Remove the machine head. Use tongs to open and remove lock ring (5). Lift and remove distance bushing (6). Unscrew fastening screws of guard sheets (7) and remove both guard sheets. Remove perforated jacket (8). Stepwise, remove the grinding wheels (12a through 12g) and aspiration rings (13a through 13g) from

vertical shaft (9). While dismantling, mark position and location at the shaft of the particular grinding wheels (12) and aspiration rings (13).

Set grinding wheels (12) in opposite way:

Slide the aspiration ring (13g) upon the shaft (9) till it sits down at the shoulder above the guard ring (18). Slide grinding wheel (12g), aspiration ring (13f), grinding wheel (12f) and so on, until conical grinding wheel (12a) is on. While doing that, take care that the aspiration rings (13) and grinding wheels (12) fit on to each other, especially, that the holes in the shaft were always in the level of the aspiration rings (13).
Take up the clearance between the grinding wheels (12) and the shaft (9) using aluminum foils thick 0,03 mm, if the grinding wheels are not provided with inside metal bushing. Take care to keep alignment of grinding wheel and shaft! Their producer in accordance with PL standard must balance new grinding wheels statically!
Slide distance bushing (6) behind the grinding wheel (12a) and secure it with safety ring (5), which must match exactly into the shaft groove (9) while leaning on the distance bushing.
With regard to tolerance of grinding wheel width the distance bushing may cover the groove for safety ring or there may occur clearance between the groove and the distance bushing. In such a case, shorten the distance bushing length and remove the clearance using distance pads, respectively. Having set the safety ring into the groove, slide the perforated jacket (8). Take care that it sits down correctly down at the shoulder in the upper part of outlet socket box (20). Shift the jacket (8) so that the stop (10) leans on the inlet inclined wall side (11) inside the working roll socket (4). Then, fasten the guard sheets (7) with screws to the outside of the working roll. Put on the machine head.

While assembling, put the rotary machine parts, that means, the shaft, the grinding wheels, the aspiration rings and the fan impeller exactly on their original places. This way you prevent from balance impairment, oscillations and shocks during further operation.

- How to replace the bearings in the machine head (see Fig. 4)

Remove the machine head. Loosen two screws (16) and remove thrust ring (17). Remove the bushing (14) with the bearing, remove the safety ring (15) and draw off the bearing from the bushing (14). Put on the bearing in opposite way.

- How to replace the fan impeller (see Fig.4)

Dismantle the upper machine part. Loosen the screws connecting the working roll (4) with the outlet socket box (20) and fan box (21). Remove the working roll (4). Loosen and remove the cover ring (18) and the ring (19) and remove the outlet socket box (20). Use the tongs to open and remove the safety ring (22). Remove the fan impeller (23). For assembly proceed in opposite way. The cover ring (18) must be installed into the same place upon the shaft (9). The space between the inside of the ring (18) and the ring (19) should be 2+0,5 mm. For putting the grinding wheels and setting the machine head proceed according to the above-mentioned sections.

- How to replace lower bearing (see Fig. 4)

Dismantle the machine according to the above-mentioned sections. Remove the guards of cylindrical part of the basic frame (24). Through the assembly holes of the frame (24) loosen the screws (25) and remove the lock washer (26) of the V-belt pulley (27) upon the vertical shaft (9). Loosen the fastening screws (28) of the tensioning plate (29) under the electromotor and turn the tensioning screws (30) to loosen V-belts. Loosen the screws (34) and remove the guard of the bearing (35) with the shaft sealing. Remove the vertical shaft (9) with the bearing and the thrust rings (31) and (32). The V-belt pulley (27) and the distance ring (33) fall with gravity at the base, to which the machine is screwed down. Remove the thrust rings (31) and (32) and the bearing from the shaft (9). For assembly proceed in opposite way.

- How to replace V-belts (see Fig. 4)

Loosen the screws (28), which fasten the basic plate under the electromotor (29) to the basic frame (24). Loosen the tensioning screws (30) and shift the electromotor towards the working roll. This way, the belts slacken. Remove safety guards of the basic frame holes (24). Dismount the loosen belts and remove them through the assembly holes in the basic frame (24). Through the basic frame hole, set new belts into V-belt pulleys grooves, tension the belts with tensioning screws (30) and secure position of the electromotor with screws (28). Screw down the safety guards of the holes to their original place!

Possible defects of the equipment and their remedy, aids, spare parts

Description of defect	Possible cause	Remedy	Spare part
Dustiness	Separator equipment is not operational	Switch on or connect the separator	-
	The guard of working roll does not close properly	Repair and ensure with screws	-
Machine stands	Machine drive does not turn	Check up power supply and belt drive	-
	Motor runs, machine stands	Check up belt drive	17
Spilling	Grain appears in the separator	Check up the screen – replace damage screen	26 to 30
Machine output decreases	Worn grinding wheels (average operation time of grinding wheels for barley is approx. 1500 hrs)	Replace the grinding wheels	22 23

5.7 Cleaning and Sanitation

Before cleaning the machine inside, switch off safely the machine and protect it against an incidental starting. The maintenance worker must apply protective gloves

and protection of eyes. Dismount chamber top, remove the screen and clean the machine inside using brush or scraper. Clean once in 6 months.
Cleaning of exterior surfaces using brush once a week.

6.0 Machine Installation, Handling before Assembly, Assembly

6.1 Machine Installation

The room and space for machine installation must be conform to valid safety and hygienical regulations. While planning the machine foundation, consider the dynamic stress (dynamic effect $\mu = 1,5$). Provide sufficient space around the machine to enable the operators to check up the machine and disassembly and repairs, if necessary. Anchor properly the machine to its foundation.

6.2 Handling before Assembly

Handling: see Fig.5

The DEHULLER DOO machine is delivered built-up at the package bottom.
Use mechanical transport and hoisting means with minimum carrying capacity 1200 kg for transport to the work location. The machine frame is provided with four lifting eyes for transfer to the machine placing.

6.3 Assembly

The machine assembly should proceed according to assembly procedure, elaborated by assembling organization. The assembly process is always elaborated again for particular conditions of the place of installation and operation. Therefore, the assembly process is not part of the present Instructions.

The assembly proceeds according to project documentation of the construction, design of machine and technological equipment and electrical scheme.

The machine must be connected to the earthing network of the plant and must be protected against dangerous contact voltage.

Assembly of Machine:

a) Install the DEHULLER DOO machine upon a sufficiently rigid foundation to prevent from transfer of vibrations from the machine into the floor (dynamic factor $\mu = 1,5$).
b) Prior to start assembling, draw and cut holes for machine fastening. Ground area arrangements of fastening dimensions see Fig. 3.
c) The assembled machine is transported to the place of installation (see 5.2. Handling). Anchor the machine to the floor using 10 screws M20. Length and type of screws are specified according to projection layout.
d) Provide the product supply into the machine so that free space (at least 1000 mm) is available above the machine inlet for machine dismantling due to repairs.

e) To ensure a safe operation and to prevent dustiness, connect the machine to an exhausting device (filter, separator). The exhausting device must be sized with regard to capacity and pressure loss of the peeling-hulling machine ventilator.
f) Finally, connect the machine to feed and discharge ways.

Assembly of electrical part:
Connect the electromotor so that motors of the previous devices (line) are blocked. Example of the wiring diagram see Figure 6.

6.4 Putting into Operation and Test Running

Before start check up if the machine inside is clean and that foreign objects do not prevent from machine function. Further, check all screw joints if they are tight, mainly those of guards, drive, bearing and packing.

The machine operator must be older than 18, reliable, able mentally and physically, trained and introduced by a qualified worker.
Record on training and verification of knowledge of regulations and way of operation must be made and signed by the trainer and the operator.
The owner must verify the knowledge of the operators at least once a year and make signed records.
Having terminated the machine assembly, the assembling organization will test running (no-load running and running with product) under the presence of operators, maintenance workers and other representatives of the owner and participation of the producer, if necessary.
Extent of the tests is specified in chapter 3.4b.

The owner must inform the producer in time about the term of test operation start and enable him to participate during the test operation.

The condition of participation in the test operation must be included into business contract!!

Operating staff action

a) Preparation for operation

- Check if all base screws of the basic frame are tightened correctly.
- Check if the head guard is fastened (3 screws) to the machine head.
- Check up tensioning of belts and perforated jacket inside the chamber.
- Check up fastening of protective sheets of the working roll body and all guards at the basic frame.
- Check if supply cables to the drive of the DEHULLER DOO machine are in good order.

b) Start
- Before each start close the inlet slide gate, controller body and semi-circular air closure.

- Check the function of separator.
- Check up if the discharge way is in operation and free.

c) Operation

- Start DEHULLER DOO. Having obtained the operating revolutions, close the inlet slide gate. Capacity of the feeding way must correspond to shield capacity of DEHULLER DOO.
- Continue in accordance with 5.1.
- Monitor the function and smooth operation of DEHULLER DOO.

Machine attendance consists in check rounds at least once a shift.

d) Termination of operation

- Switch off the feeding way.
- When the machine is empty, switch off DEHULLER DOO.
- Switch off the separator.

Lubrication Plan

Lubrication of the bearings through lubricating nipple using lubricating grease PM-LV2-3 (substitution for example ESSO - BEACON EP2, SHELL – ALVANIA EP2). Once for 12 months disassemble the bearing bodies, clean the bearings and refill with lubricating grease until ¾ bearing chamber volume.
Lubrication plan – see Fig. 4.
Lubrication of electromotor – according to instructions of the electromotor producer

Lubrication place	Lubricant	Amount	Interval	Supplier
No.1 (Bearing of the head)	Grease LV2-3	25 g	2000 hrs	-
No.2 (Bearing of the fan box)	Grease LV2-3	35 g	3000 hrs	

7.0 Delivery and Service

7.1 Accessories

No accessories extra are supplied with the machine.

7.2 Spare parts

List of spare parts is specified for an everyday 16-hrs machine operation and the spare parts are delivered on an extra order. The spare parts are not included in the machine price (except of the spare parts for one-year operation).
Numbers of positions correspond to Fig. 4
List of spare parts

Item	Name	Fig.1 Pos.	Drawing Number	Number of pieces for operation of			Weight (kg)
				1 year	3 years	5 years	
1.	Tube shaft	9	1168-03.0050	-	1	2	55,50
2.	Air ring	13	1168-03.0040	-	7	14	2,10
3.	Bushing	14	1168-04.0040	-	1	1	3,50
4.	Ring	17	1168-04.0006	-	1	1	1,26
5.	Distance bushing	6	1168-03.0013	-	1	1	5,50
6.	Cover ring	18	1168-02.0052	-	1	1	2,00
7.	Ring	19	1168-02.0051	-	1	1	0,07
8.	Packing body	35	1168-01.0074	-	1	1	4,20
9.	Packing splice	-	1168-01.0057	-	1	1	0,35
10.	Impeller	23	1168-02.0001	-	1	2	20,40
11.	Thrust ring	31	1168-01.0070	-	1	1	2,00
12.	Thrust ring	32	1168-01.0071	-	1	1	2,15
13.	Distance ring	33	1168-01.0072	-	1	1	1,35
14.	Controller valve	-	1168-02.0046	-	-	1	0,65
15.	Controller lever	-	1168-02.0048	-	-	1	0,10
16.							
17.	V-belt C-2240	-	Catalogue BARUM	-	5	10	0,70
18.	Lower bearing 6316/C3	-		-	1	1	3,60
19.	Upper bearing 6022	-		-	1	1	2,00
20.	GUFERO G-120x160x15	-		-	1	2	0,17
21.							
22.	Grinding wheels set No. 2	12	1168-03.0047	1	2	3	58,30
23.	Grinding wheels set No. 1	12	1168-03.0042	1	2	3	58,30
24.	Separate grinding wheels (to be discussed with machine producer)	-	-	-	As needed	As needed	-
25.							

26.	Jacket (screen) 1,2 x 20	8	1168-02.0008	1	1	2	6,00
27.	Jacket (screen) 1 x 20	8	1168-43.0022	-	As needed	As needed	-
28.	Jacket (screen) ∅ 3 - peas	8	1168-43.0003	1	1	2	9,35
29.	Jacket (screen) ∅ 3,2	8	1168-43.0008	-	As needed	As needed	9,10
30.	Jacket (screen) ∅ 2,5	8	1168-43.0020	-	As needed	As needed	8,90
31.							
32.							
33.	Spring (for grinding wheels)	-	1168-03.0002	-	2	2	0,45
34.							
35.							

Notice:

1. Spare parts for 1-year operation are integral part of the machine delivery.
2. Order the spare parts from the department of spare parts sale of the producer.
3. Having installed the replace screen No. 26 through 30 into the machine, ensure the screen with new stop, which is spot-welded, or apply the original ones from the old screen and weld them on.
4. The spare parts are determined for an everyday 16-hrs operation and are delivered on a special order. The spare parts are not included in the machine price (except of the spare parts for 1-year operation).

7.3 Orders

The following technical data are necessary for order specification:

a) Number of pieces
b) Machine name and type (see 3.3)
c) Art of processed material
d) As far as the customer requires other jacket (screen) than that specified in the machine basic execution, he / she must specify the size and way of perforation including permeable surface in %.

Service

The producer ensures the service.

7.4 Guarantee Conditions

The guarantee conditions are clearly limited in the business contract; therefore, they are not part of the Operating Instructions.

7.5 Reclamation

The reclamations are subject to valid regulations, laws, directions and conditions agreed upon in the business contract.

7.6 Storage

The machine must be stored at dry places, protected against damage and penetration of dust and water, in covered space under the temperature –10 °C to +50 °C.

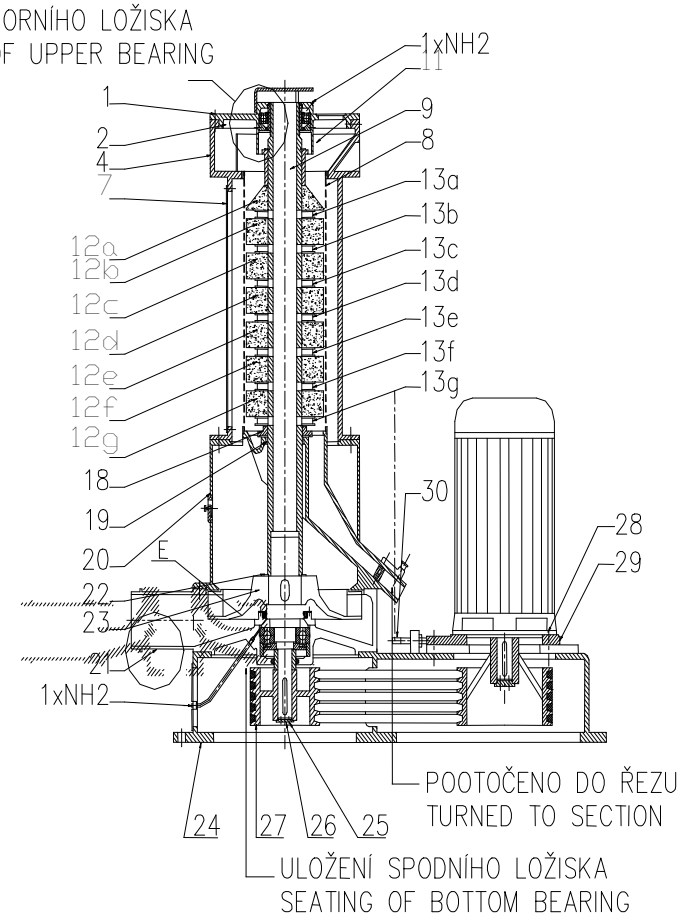
7.7 Disposal

Common materials are utilized for production of the machine. Upon termination of the machine service life, the user is obliged to dispose them in common way using specified organizations. Metal materials should be used as secondary raw material; lubricants and oils should be recycled; electrical insulation waste should be disposed at a landfill according to the Law on Wastes No. 125/97 and Decree MZ 338/97 on details of wastes treatment.

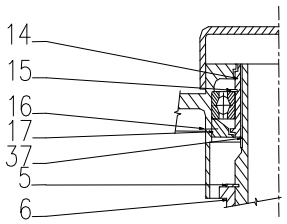
8.0 Figure Enclosure

Fig.1 – Machine execution - DEHULLER DOO
Fig.2 – Main machine dimensions – DEHULLER DOO
Fig.3 – Ground area layout - DEHULLER DOO 3
Fig.4 – Maintenance and adjustment – lubrication plan – spare parts – DEHULLER DOO
Fig.5 - Handling – DEHULLER DOO
Fig.6 – Example of wiring diagram - DEHULLER DOO
Fig.7 –Control elements and figure symbols

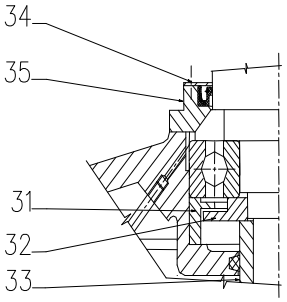
ULOŽENÍ HORNÍHO LOŽISKA
SEATING OF UPPER BEARING



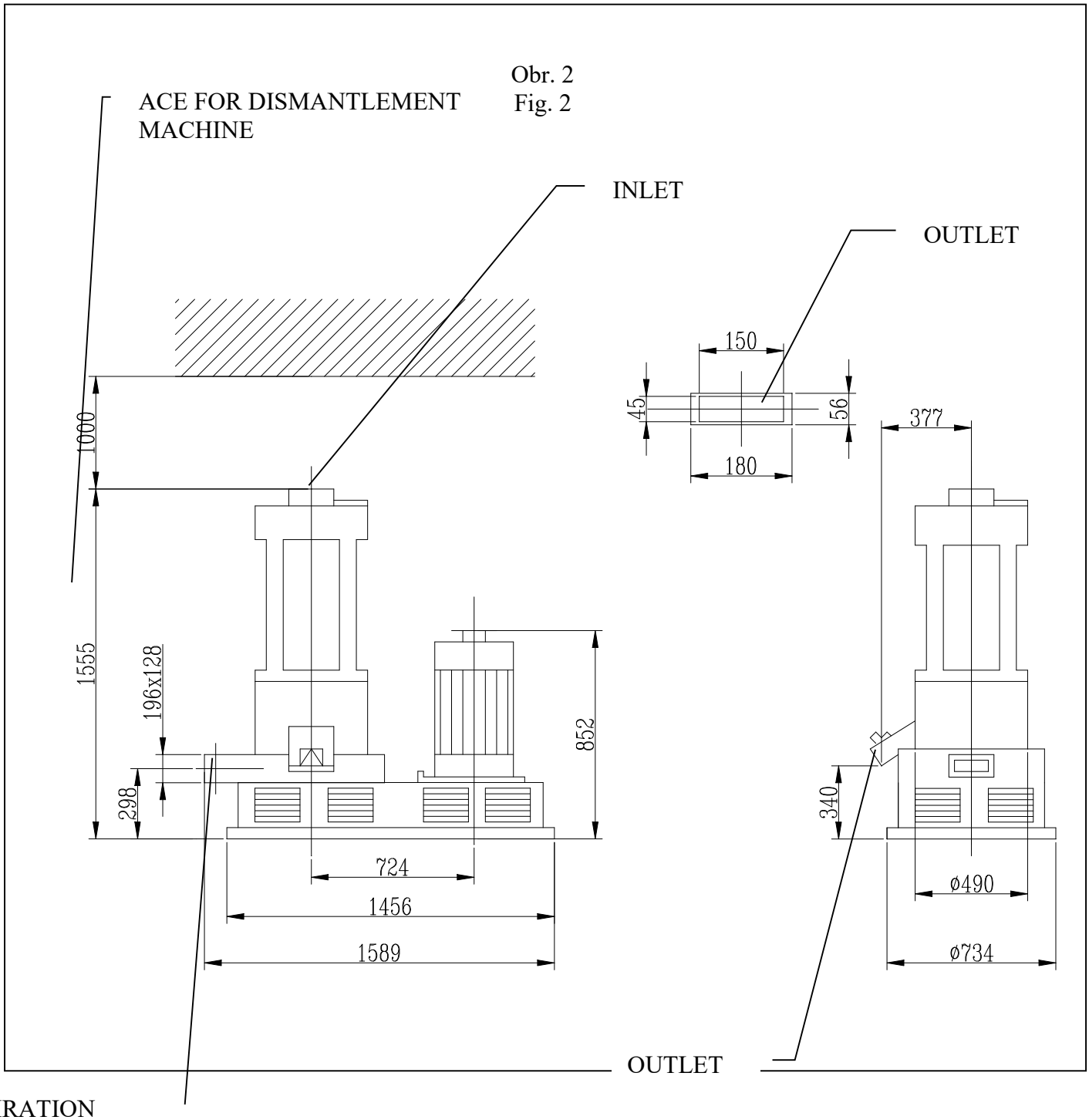
ULOŽENÍ HORNÍHO LOŽISKA
SEATING OF UPPER BEARING



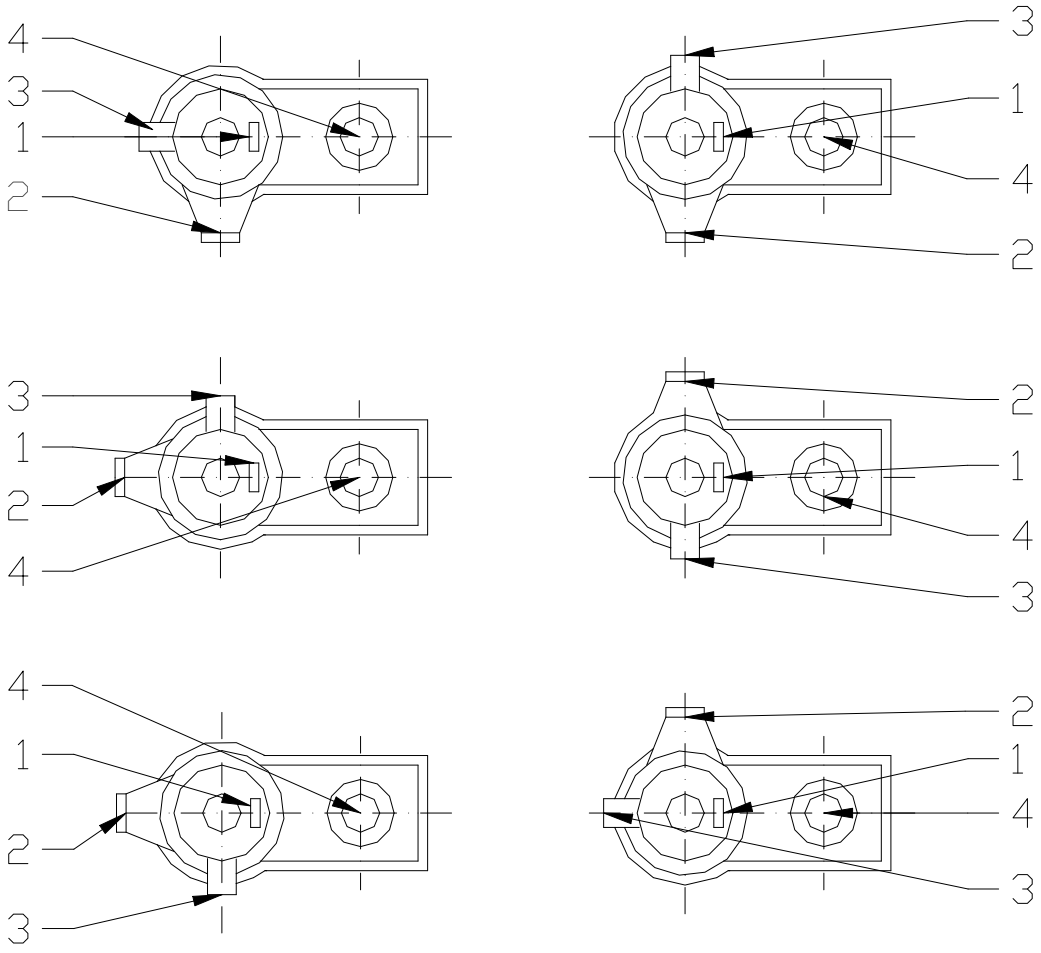
ULOŽENÍ SPODNÍHO LOŽISKA
SEATING OF BOTTOM BEARING



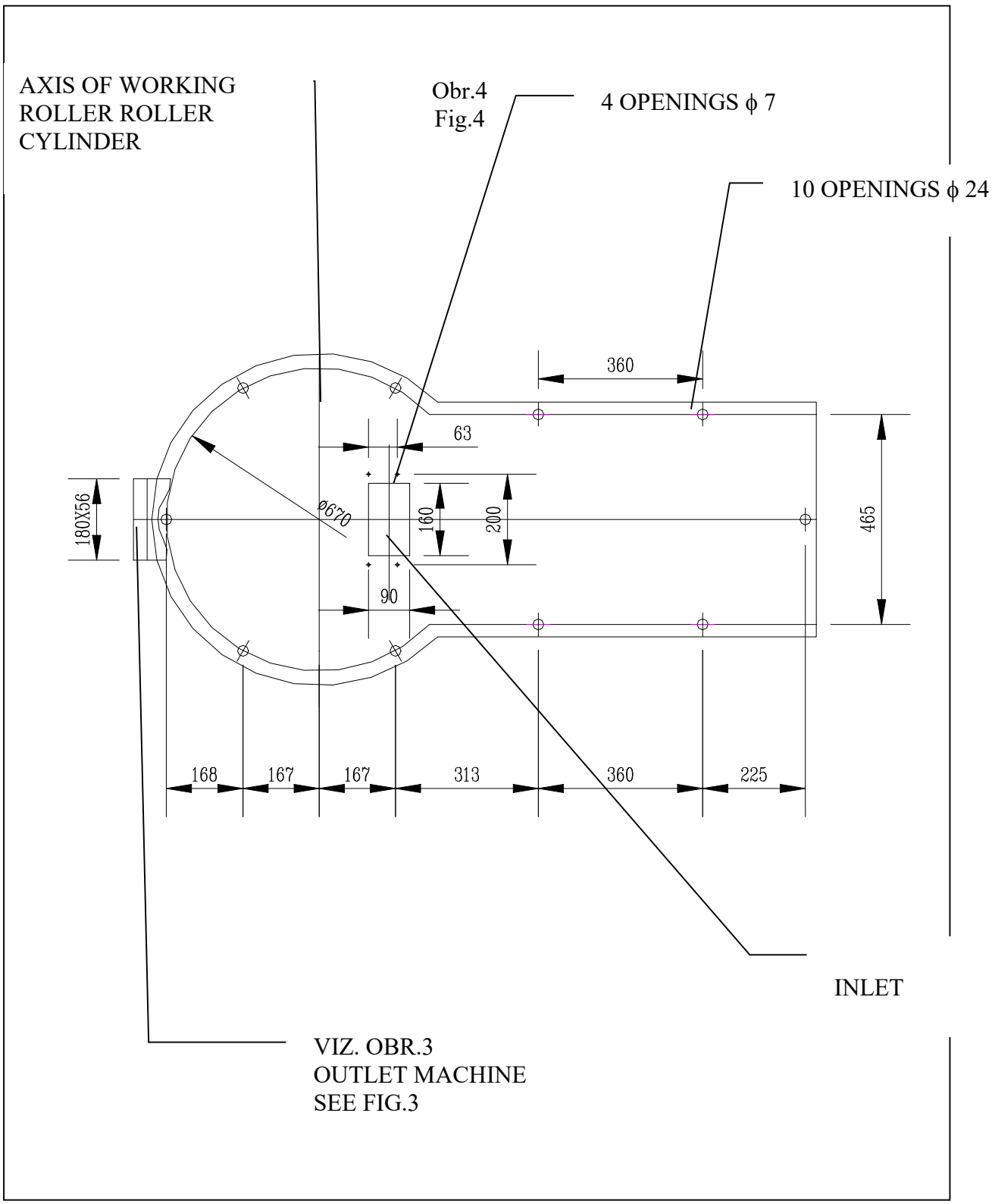
Obr. 2
Fig. 2


ACE FOR DISMANTLEMENT MACHINE
INLET
OUTLET
150
45
56
180
377
1000
1555
196x128
298
852
724
1456
1589
340
ø490
ø734
OUTLET
ASPIRATION SOCKET

Obr. 3
Fig. 3



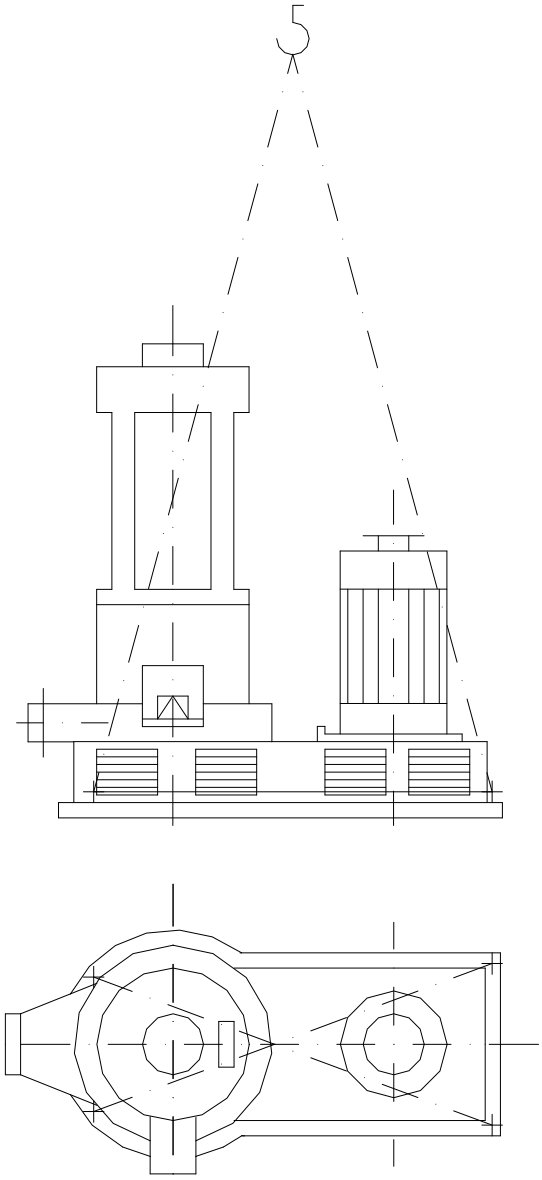
LEGENDA: 1 -;inlet of grain
LEGEND 2 -; aspiration socket
3 - outlet of grain
4 - elektric motor


AXIS OF WORKING
ROLLER ROLLER
CYLINDER
Obr.4
Fig.4
4 OPENINGS ϕ 7
10 OPENINGS ϕ 24
360
63
180X56
ø670
160
200
465
90
168
167
167
313
360
225
INLET
VIZ. OBR.3
OUTLET MACHINE
SEE FIG.3

Obr. 5
Fig. 5

MODE OF BINDING DEVICES CLAMPING FOR TRANSFER MACHINE

Total weight : 980 kg



Obr. 6

Fig. 6

ELECTROINSTALATION SCHEMA

Electroinstalation will be provided as part of project. Recommended circuit is delineated on the schema.

LEGENDA: FU 1-FU3 - fuses
LEGEND KM 1 - air-break contactor
FA 1 - overload protection
M -; electric motor
SB 1, SB 2 –T6; button T6 A+ contact group