VSS s.r.o.

Kosice Slovakia

Cap-Frame Eccentric Press SMERAL

Type LE160C

TECHNICAL PASSPORT-OPERATING INSTRUCTIONS MANUAL (ENGLISH)

Závody ťažkého strojárstva
kombinát
Kombinátny podnik KOŠICE

Č S S R

O P E R A T I N G M A N U A L

ECCENTRIC PRESS LE 160 C

C O N T E N T S

1. INTRODUCTION

We are presenting you a documentation to the supplied press where you may find technical data, instructions for how to set the press in run, instructions for operation and maintenance.

The documentation is completed with detailed description of the press, list of common and special accessories, specification of electric outfit, list of spare parts and instructions for their ordering, press accuracy certificate, electric outfit wiring diagram, air distribution diagram, lubrication chart and the like.

With its content it is meant for technologists, technicians, formen, instructors, workers of maintenance and repair workshops and for operators.

Operating instructions are divided into several sections of the documentation. The documentation would not complete its mission if the aforementioned persons are not acquainted with its content.

We hope the instructions will serve you as a guide for a proper utilization of the supplied press. While keeping to instructions we assure you of the press accuracy, power output and dependability.

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2. PRESS GENERAL DATA

Press design	mechanic single-frame eccentric press
Type	LE 160 C
Production year	
Production number	
Total length	2 310 mm
width	1 270 mm
height	2 585 mm
Total weight (netto)	9 760 kg
Power supply voltage	
Frequency	
Total power input	11 kW
Press suitable for ambience	
Operating air pressure	0.4 - 0.6 MPa
Total air consumption with engaged clutch	28 dm^3
Manufacturer	**Závody ťažkého strojárstva kombinát Kombinátny podnik KOŠICE**

2.1. Press technical data - LE 160 C

2.1. Press technical data - LE 160 C

Nominal forming force	1 600 kN
Gap	355 mm
Stroke adjustable in range of	20 - 120 mm
Max. distance of ram from table	450 mm
Ram adjustability - downwards	100 mm
Table plate thickness	100 mm
Table plate surface	995 x 700 mm
Table plate hole	Ø 290 H 8 mm
Number of strokes, continuous run	50 min^{-1}
Number of effective strokes	30 min^{-1}
Clamping hole of ram	Ø 50 H 8 x 85 mm
Clamping face of table	1 000 x 720 mm
Clamping face of ram	750 x 380 mm
Passage hole in table	480 x 300/Ø 390 mm
Electromotor power output	11 kW
Flywheel dimensions	Ø 1 230 x 305 mm
Flywheel revolutions	180 min^{-1}

2.2 List of common accessories

Common accessories are supplied along with the press and are included in the price of the press.

1. Upper ejector of the press ram
2. Table plate
3. Bar for turning the flywheel and for stroke readjusting
4. Ram safety insert (2 Pcs)
5. Wrench 19 for ram readjustment
6. Various wrenches 50, 46, 36, 30, 20, 17, 14, 12, 10, 8, 6, 5; 8x10, 14x17, 19x24
7. Hand lever grease gun 300 cm^3 with 16/500 hose
8. Tin box
9. Anchoring equipment, screws, plates, foundation frame
10. 6x1x4000 Silamide hose
11. Links - connectors
12. Electric material for interconnection of electric box with the press
    CYKY 7x4 mm^2, CMSM 24x1 mm^2 cables
    Armoured packing
    Sleeves - various
13. Various screws, nuts, washers
14. Technical passport with the Operating Manual

2.3. Clamping possibilities

Dimensions and form of clamping surfaces are obvious from Figures No. 1, 2, 3.

Chart A represents table clamping surface Fig. 3
Chart B represents table plate clamping surface Fig. 2
Chart C represents ram clamping surface Fig. 2

Clamping

Stroke height is adjustable. Stroke adjustment is made by rotating the eccentric bushing of the eccentric shaft. The sum of adjustable eccentricities determines the stroke height.

For calculation of clamping the distance of the stroke path center is to be taken for the initial point. The distance of the stroke path center (from the press table surface) is to be calculated from the given technical data when the half of the maximum stroke is substracted from the maximum distance of the ram from the table. Whichever stroke adjustment and correct alignment mean that the ram moves half of the stroke over and half of the stroke under the stroke center. Maximum clamping can be achieved when the half of the maximum stroke is substracted from the distance of the stroke path center. (Distance between the table and ram in the bottom dead center will be minimal.)

Minimum clamping may be achieved in case of minimum stroke when the half of the minimum stroke is substracted from the distance of the stroke center.

(Distance between the table and ram in the bottom dead center will be maximal.) Further reduction of clamping may be achieved by readjustment of the ram downwards at the given stroke. The value of readjustment is substracted from the given clamping. While working with table plate the thickness of the table plate is to be consequently substracted.

Elastic working space gap

The size of the elastic working space gap in dependence on load is given in the diagram, Fig. No. 4.

F = press loading - kN
A = working space gap including production clearance
B = elactic press frame gap

2.4. Forming possibilities and press size determination

The LE presses are heavy-duty machines designed for lot production of pressings including shallow drawings. They are commonly applied for shearing, cutting and bending of workpieces made of ferrous and non-ferrous metals in cold and hot state.

The LE 160 C eccentric press features a maximum forming force of 1 600 kN which corresponds to a cutting surface of about 4 000 mm^2 with a material strength of 392 MPa.

The maximum force of the press is applicable at max. 30° before the bottom dead center, with the stroke mean value H_{str} = 70 mm.

The course of the forming force for various crank positions and various strokes is given in the diagram, Fig. No. 5. It is to be taken into consideration that even if the press is not overloaded by a force exceeding 1 600 kN the drive of the eccentric shaft may be overloaded by higher torque and the electric motor by higher power take-off. If the press durability is not to be effected it is necessary to keep to the both former conditions. The press must not be overloaded:

1. neither by a force exceeding the nominal force,
2. nor by a torque.

While forming by individual strokes 20 strokes per min. may be used. Forming with higher number of individual strokes may result in increased thermal and mechanical stress and wear of clutch, brake and slide valves, and finally in fast drop of life of the press as well as it may also endanger the personnel while operating the press. From this reason it is recommended to the maximum extent for application of repeated strokes or constant run but only in case that the total work required for forming does not exceed 50 % of nominal work.

The nominal effective press work is considered for individual strokes and is given by the product of the nominal press force and the distance of the ram at bottom dead center with the crank position at 30° and stroke center

$$H_{str} = 70 \text{ mm.}$$

Then

$$A_m = F_m \cdot h_{nom}$$

where

$$h_{nom} = \frac{H_{str.}}{2} - \frac{H_{str.}}{2} \cdot \cos 30^{\circ}$$

$$h_{nom} = 35 - 35 \cdot \cos 30^{\circ}$$

$$h_{nom} = 35(1 - 0.866)$$

$$= 35 \cdot 0.134 = 4.7 \text{ mm}$$

$$A_m = 1\ 600\ 000 \cdot \frac{4.7}{1000} = 7\ 520 \text{ J}$$

The press drive is designed for the given values, therefore the work required for forming must not exceed the nominal press work, in the contrary case the flywheel revolutions drops what may result in arrest of the press in the press tool. While determining the work and force required for certain operation it is important to understand that the values cannot be defined precisely by a common calculation.

There are many factors (press tool blunting, incorrect clearance, unsuitable edge rounding - off, deviations in depth and material strength, its temperature and the like) increasing the real force and may not be included in calculation with sufficient accuracy.

If the press is not to be overloaded and consequently its life is not to be decreased, it is important to increase the values given by calculation by at least 30 %. These values are thereafter directive for press size determination.

For instance F = 900 kN has been found by calculation as a required force, and if it is necessary to operate with maximum stroke H = 120 mm, the pressing may start at a maximum of 30° before bottom dead center which corresponds to a distance of 8 mm.

This position corresponds to a point where the tangential force as a product with the radius $\frac{H}{2}$ yields the torque which is still permissible for the crank shaft.

With increasing distance of the ram from the bottom dead center i. e. with increasing α, but with equal radius $\frac{H}{2}$ the effective force drops. If the angle must be increased for any reasons and the force F must remain unchanged, the ram stroke (radius $\frac{H}{2}$) must be decreased so that the torque does not exceed the permissible value.

For rough orientation there is a diagram, Fig. No. 5, for stroke determination with respect to the required force F and thickness of the plate to be sheared or length of drawing. It is supposed that the distance of the ram from the bottom dead center must minimally be equal like the strength of the plate to be sheared, or the length of the yield.

For instance a plate 10 mm in thickness is to be sheared and a shearing force of 1 000 kN is required, then it is necessary to choose a minimum stroke H = 80 mm or even less. Especially while drawing one must not forget to check the required forming work.

3. PRESS DESCRIPTION

Mechanic single frame eccentric press, LE series features following functional units, Fig. No. 6

1. Frame
2. Ram
3. Eccentric shaft and countershaft
4. Clutch - brake
5. Unit drive
6. Covers
7. Lubrication
8. Air distribution
9. Electric outfit
10. Control board

Kinematic diagram of the press is shown in Fig. No. 7.

The main part of the press consists of a frame that comprises ram guiding, bearing bushing and other units. The drive from the electric motor (1) located in the rear part of the frame is transferred by a set of V-belts (2) to a flywheel (3) seating on the countershaft (4). Clutch and brake are located in the flywheel. While pressing the clutch, the brake is released and the motion is transferred from the flywheel to the countershaft and from there through gears (5) to the eccentric shaft (6).

The brake is functionally connected with the clutch. The rotary motion of the eccentric shaft is converted by a connecting rod (8) to a straightline motion of the ram. The ram moves in four guidings, out of which two are adjustable. The distance between the ram and press table is changeable by screwing-in of a ball screw (9) into the connecting rod.

The stroke size is changeable by rotating of the eccentric bushing (10) in the eccentric shaft.

For rough works, works in hot state it is necessary to increase the clearances in the workshop beyond given values. The clearance depends on settled temperature of the ram.

3.1. Foundation works and press seating in foundation

Press seating in the user's factory is made against special order.

a) building instructions for foundation works:

The foundation must be made of compressed concrete according to the included foundation plan, drawing No. 1 - 21- 9002 - 012. Outer dimensions are to be given by the building company of the user with respect to the soil bearing capacity in the place where the press is intended to be installed. The frame, plate for foundation bolts and hook nails must be set in concrete of the foundation.

The accessories for the foundation pit is supplied by the manufacturer. The press may be installed on the hardened concrete only to avoid subsequent settling.

b) instructions for correct seating of the press in the foundation and its fixing:

Before installing the press onto the foundation the anchoring screws must be inserted into the holes of the foundation. The foundation is to be fitted up with steel washers whereupon the frame is to be resting and by means of some other washers is to be levelled. Washers and nuts are

fitted on the foundation bolts and slightly tightened. Thereafter the press is set in thin concrete from under. After hardening the nuts of anchoring screws are tightened and the press is checked for balancing.

3.2. Operation and maintenance

The leader of the respective section is responsible for the condition of the press and must be familiar with it and independently solve its problems in operation. The press care, repair or even transport are to be given in hands of experts thoroughly acquainted with the press.

It is very important to be fully acquainted with the press operation still before starting it. Increased attention is to be paid specially to correct press lubrication and maintenance. Pay attention to instructions for press operation and maintenance. To respect them means accurate run, long life and to avoid accidents.

Instructions for correct handling with the press

1. Correct press seating in the foundation and correct press adjustment condition the production accuracy.
2. Press alignement is to be made by experts familiar with the press operation.
3. Press tool and other objects are not to be put on guiding and functional surfaces of the press.
4. Before each shift the press is to be cleaned and made free of dust.

5. Do not clean the press with compressed air which drives the impurities inbetween the press moving parts what may result in fast wear of the press and its premature putting out of operation.

6. Do not underestimate the checking of the grease distribution and the press lubrication itself. Lubrication ensures long life of the press.

7. Do not neglect the checking of the functional units - clutch, brake, sliding valve, cam, to avoid accidents.

8. Do not overload the press beyond the permissible limit. Higher load means fast damage of the press.

9. Check the ram guiding for clearance, herewith to increase the life of your press tools.

10. Regularily once in a month to check the tightening of all screws of the press which may get loose from time to time due to shocks.

For general survey over the press condition it is recommended to keep a log look of the press. It is to contain all service checks, results of these regular checks, records on occured faults, their reasons and way of their removal.

4. PRESS MAIN PARTS DESCRIPTION

4.1. Press frame (Fig. No. 8)

Press frame (1) is a case - like iron casting. For fixing it to the foundation it is fitted with footings and holes which fit on the foundation bolts (2). The table (11) is fitted up with an overfall and two T-shaped clamping grooves. These grooves may be used directly for gripping the press tool but as a rule it is used for fixing the table plate. The table plate (10) is fitted with the same grooves. Their arrangement and size of openings in the table plate is obvious from the clamping possibilities, Figures 1, 2, 3. The circular opening in the plate is adapted for the use of air blankholder. Under the table there is enough space for a store of overfall pressings. On both sides of the press there are boxes with terminals and air distribution system.

In the frame front part there is a guiding of the ram (6) which is further guided in adjustable bars (12). For adjustment of correct clearance between the adjustable bars and the ram the adjustable screws (5) located on sides of the guiding are used. The values of clearance are given in the testing certificate. The guiding and guiding bars must be kept clean and well greased. Insufficient greasing may result in seizure of the ram.

In the lower part of the guiding there are consoles (8) with adjustable screws that hit the ruler of the upper ejector. Before each change of the stroke size these adjustable screws must be screwed out and thereafter adjusted. If the operation does not require the upper ejector it is recom-

needed to screw out the adjustable screws to avoid their damage in case of eventual change of the stroke size.

In holes (7) of the frame middle part there are antifriction bearing of the countershaft. In side walls of the frame front part there are holes (9) covered with lids. The holes are to facilitate the suspension of the press for transport, see Fig. Pic. 9.

The frame upper part contains bronze bushings, front (4) and rear ones (3) for eccentric shaft seating.

Clearance in slide fits

Production clearances in eccentric shaft slide fits are as follows:

in the front bearing	0.14 - 0.16 mm
in the rear bearing	0.10 - 0.11 mm

Excessive clearances in these fits result in increased noisiness and wear of gears.

Production clearance in bearings of the connecting rod in the eccentric bushing represents 0.06 mm. Excessive clearance results in knocking in the bottom dead center of the ram. In case of increased given clearances approximately by a double it is recommended to exchange the bronze bushings.

The accuracy of the ram run is checked with guiding rods adjusted to a total clearance of 0.05 mm. For common operation the rods are adjusted to a mean clearance of 0.1 mm. As per the nature and accuracy required for the respective operation the adjustment ranges from 0.07 to 0.15 mm.

For rough works, works in hot state the clea-

rances must be increased beyond these values. The clearance depends on the settled temperature of the ram.

4.2. Ram (Fig. No. 10)

Rotary motion of the eccentric shaft is converted by means of the connecting rod (1) to a straight-line motion of the ram (2). The connecting rod contains a screwed-in ball screw (6) which is made safe against release by an insert (3) and two tightening screws. This solution facilitates to change the distance between the table and ram according to the height of the press tool to be applied. For ram readjustment both screws of the insert (3) must first be loosened. The crank is fitted onto the square of the worm shaft (4) whose rotation sets the worm ring (5) in motion and the latter transfers the motion onto the ball screw. The clockwise rotation increases the distance between the ram and table. While rotating anticlockwise the ram falls. After the required distance it is set, the screws of the insert (3) are firmly tightened. The screwing-out of the ball screw must not exceed the corresponding maximum ram readjustment. The ram is suspended in the sphere of the ball insert (7). The ball insert is in a flange (4) screwed onto the ram. The pressure of the ball screw while pressing is transferred onto a pressure disk (2). The clearance inbetween the ball screw, pressure disk and ball insert is to be approximately 0.05 mm. If it is increased to a maximum of 0.25 mm due to wear, the clearance must be resettled to the initial value of 0.05 mm by replacement of the washer or by grinding off the lower surface of the ball

insert in the ram flange.

Under the pressure disk in the ram cavity there is a safety insert (10) protecting the press against damage due to excessive load. It gets sheared while overloading the press excessively. The replacement of the sheared insert is carried out through the hole (13) in the ram. In the traverse cavity of the ram there is a ruler (9) of the upper ejector.The upper ejector works so that the ruler is lifted in the cavity into the upper position by a broach passing through vertical opening in the press tool clamping pin. After the stroke and while the ram returns to the upper position (dead position), the projecting ends of the ruler hit the adjustable screws (15) screwed-in in consoles (16) in the lower part of the ram guiding (17).

The ram ends its motion in upper position and the ruler leaning against the adjustable screws drives the broach out from the shank and releases the pressing from the press tool upper part. Before an operation with a new press tool, when changing the stroke and when changing the distance between the ram and table one may not forget to adjust the adjustable screws of the ejector.

Faulty adjustment of ejector screws may result in drop of the ram, bending of ejector screws or break of consoles of ejector screws.

In the ram lower surface there is an opening for fitting in the clamping pin of the press tool. The clamping pin is gripped by a gripping jaw (11) and holding screw (12).

To fix the press tools there are grooves in the lower surface of the ram. Their arrangement is shown

in the table of clamping possibilities, Figures No. 1, 2, 3.

Attention!

The press construction does not permit an eccentric ram loading. In each case it is necessary to guarantee the parallelity of the ram seating face, shifting plate and pressure disk to avoid eccentric load of the safety insert. While pressing the side forces must be eliminated. The specific pressure onto ram side guiding must not exceed a pressure of 2.5 MPa.

Eventual defects and the way of their removal

Defects	Cause	Removal
Hard ram run	Small clearance in guiding.	To loosen the guiding rods (18) and screws (19), to adjust the clearance according to testing certificate.
	Insufficient greasing.	To check lubrication and to renew oil inlet.
	Seizure of guiding surfaces.	Guiding surfaces to be scraped.
Ram jumps in dead centers.	Clearance in ball seating.	To tighten the screws of the ram flange (14), to adjust the clearance in the seating.
Connecting rod head gets hot.	Insufficient lubrication, seizure of bushing.	To renew lubrication, to scrape the bushing.
Eccentric bushing for stroke readjustment seizes in the eccentric shaft.	Pressure corrosion arising in case of insufficient tightening of eccentric bushing into eccentric ring.	To scrape the bushing of the eccentric shaft. To phosphate the eccentric bushing. "MOLYKO" lubrication may be applied with advantage.
Bending of ball screw, cracking of connecting rod	a) maximum ram readjustment exceeded b) press eccentrically loaded	Replacement of spare parts.

4.2.1. Shear safety pin replacement (Fig. No. 11)

In case of exceeding the press nominal pressure the shear safety pin breaks.

1. After replacement to keep the safety pin permanently resistant and to avoid further damage of the press it is necessary to clean the seating surfaces and the ram. The crushed shear safety pin that remained inbetween the seating surfaces does not guarantee a good seating of the replaced, new shear fagety pin. Eventual damage of the seating surface (projection around the scratch) must be smoothed. When neglecting these instructions the shear safety pin breaks even at a lower pressure.

2. In the lid covering the cavity for the shear safety pin there is a bent plate fixed to push the shear safety pin to the rear wall and hence to provide its centricity. In case of crashing, this plate often distorts. It must therefore be rebent and hence the shear safety pin must be pushed for centricity. If the shear safety pin remains loose, it may cause a shift to eccentric loading and the shear safety pin breaks even at low pressure. If the seating surface is damaged too much it can be repaired by new machining with washer. The bent holding plate must not be replaced by any fix holding screw, cube and the like. Violent deformation of the crashed shear safety pin in this fix coupling might endanger the safety of the press operator.

3. The shear safety pin is made of quality grey cast iron with a minimum strength of 245 MPa. The prescribed hardness of machined surfaces is to represent 170 - 230 HB. The shape of the shear safety pin as

shown in Fig. 11 corresponds to the load (as given in compulsory evaluation) 20 % higher than the press nominal pressure. In favour of security this spare part must not undergo any changes in shape or material without prior assent of the design and construction department.

3.0. For production of safety inserts, quality 42 2425, there must be an ATEST issued according to 42 1241.19.

3.1. Chemical composition "Se" narrowed in range of 0,87 - 0.93.

3.2. Tensile strength of separately cast bars according to ČSN 42 2425, minimum strength 250 MPa.

3.3. Casting hardness 170 - 200 HB is to be measured after grinding of the upper front face "H" and the measured value is to be stamped in a place marked with "N".

4. Melt number and text: "LE 160"; pouring in the casting in a place marked with "T" not to be damaged!

5. Dimension of knecking-down "K" to be chosen and made in dependence on stamped value of hardness given in "N" according to the diagram:
in dimension figures Ø 180 $^{+0.1}$ and in radii R 1 no casting defects are permitted.

4.2.2. Ram stroke adjustment (Fig. No. 10)

Connecting rod head is lined with bronze bushing (20). The connecting rod is fitted onto the eccentric bushing (21) which may be rotated to change the stroke size.

The scale with different stroke sizes is stamped in the front wall of the eccentric bushing (21). On the side facing to the frame the eccentric bushing is fitted with saw teeth engaging in the same teeth of the eccentric ring (22). The eccentric ring is struck onto the eccentric shaft (25). Teeth engagement of the bushing and the ring works with the aid of a washer (23) with double-part nut (24). The nut is made safe against release by means of safety screws. While changing the stroke (with motor in still stand) first the safety nuts (24) are to be loosened and screwed out by appr. 15 mm. The eccentric bushing is shifted forwards to disconnect the engagement between the bushing and ring teeth.

To fit a bar of Ø 25 mm into radial openings of the eccentric bushing circumference and while turning the bushing the stroke is being adjusted. After stroke adjustment the bushing is to be fitted towards the frame with paying attention that the saw teeth mutually engage. The nuts are to be tightened and made safe by tightening the screws.

Before next operation the screws of the upper ejector and control system, whose drive are derived from eccentric shaft (see next section of control system), are to be adjusted.

4.3. Control system (Fig. No. 12, 13)

For press control there is a program switch VH 1 F 05 or an another one in use. The program switch adjustment (1) according to the diagram of developed shape of cams (upper part of Fig. No. 12) is given by following requirements:

1. Initial position corresponds to the ram top dead center. The ram is set in motion by pressing of push-buttons (individual strokes - two-hand starting).
   Push-buttons are kept pressed till position B.

2. In position B contacts SA1.2, SA1.3 take over the function of push-buttons, before position B the ram stops. The adjustment of this position must correspond to the standard of ČSN 21 0711, section V., articles 20 and 21.
   The press main shaft may rotate by a full revolution only if the clutch is controlled by starting equipment during the stroke. This control time must be long enough so as according to the adjusted stroke size reliably to avoid accidents by additional reach in the press working space. If the clutch is operated for a short time, the press stroke must be interrupted.

3. Behind position C, under the effect of switched-off contacts SA1.4, SA1.5 the press cannot be set in motion by neither repeated pressing nor by constant keeping of push-buttons pressed to keep it in uninterrupted run. The switching-off of contacts SA1.4, SA1.5 follows immediately after the contacts SA1.2, SA1.3, position B, are on.
   The new starting may follow only after the contacts in position E are on, at the end of revolution of the eccentric shaft, close before the initial position A. This adjustment corresponds to ČSN 21 0711, section V, article 28.

4. Position D means the beginning of the clutch disengagement and of braking. As a rule it is required that the ram stops in the top dead center after the stroke is completed. After the use of

upper ejector in the press ram the stop is required behind the top dead center. The stop position of the top dead center varies due to following effects:

In case of each change of operation accompanied with a change of press tools and ram stroke readjustment, inertial forces and position of eccentricity change as well. Herewith the position, where the press stops, also changes.

For all these cases it is necessary to adjust the press run i. e. the stop in the top position by setting-up the program switch. Therefore at the output shaft the program switch is fitted up with an adjustable clutch (3), by means of which the press stop may be corrected. The adjustment is made by turning the cam (4) whose end is adapted for turning it by a screwdriver.
To read the position, where the press stops, there is the program switch provided with an angular scale (5) and indicator (6).

How to operate the program switch

The program switch is located on the press right side when viewing it from the front side. The drive is derived from the eccentric shaft, gear ration 1 : 1, through link chain (2).

The cams are accessible after removal of lid. For each contact there are two cams according to the preceding description. Two and two contacts are connected in series, so that after failure the press ram cannot be set in motion. The fifth contact SA1.6 controlled by cam is connected in the circuit of run-out control.

The cam release is performed by turning the clamping plates. Therefore the plates are fitted with a slot. Total removal and resetting of new cam segments are possible by slight levering of released clamping plates. The clamping is carried out by repeated turning. The operation is executed under dead current. The cam correct position is set by the manufacturer and the resetting is to be carried out in case of breakdown or replacement.

Program switch cams are set by the manufacturer of the press according to the switching diagram and the program switch is sealed.
The program switch cam readjustment by the user is not permitted unless the guarantee period of the press expires.

4.4. Clutch - brake (Fig. No. 14)

The press is fitted up with friction multi-plate clutch and brake with a membrane pressure space. The clutch sets the eccentric shaft in motion and the brake brakes it so that they must properly be maintained and each their defect immediately removed.

The clutch is controlled by compressed air whose pressure must guarantee soft clutch engagement and eliminate its sliping. The required air pressure is controlled by a pressure switch which stops the air inlet into the control circuit while the air pressure drops and hence stops the air inlet with insufficient pressure into the clutch cylinder.

The clutch is fitted in the flywheel (1), which seats in two antifriction bearings (3,28) on bushing (2).

The bearings are kept apart by a distance bushing (4). The flywheel is protected against axial shift by a lid (5). On clutch shaft (6) there is a disc (7) fitted in groove. The disc is connected by means of screws (8) and pins (9) with the middle clutch plate (10) fitted with riveted lining (20). The middle clutch plate (10) with its friction surface leans upon bearing clutch plate (11) fixed to the flywheel by screws (12) and distance bushings (13). Inbetween the distance bushings (13) and bearing clutch plate (11) there are washers (17). The other friction surface is in contact with the pressed clutch plate (14) guided in distance bushings (13). The clutch plate is made in one unit with a piston (15) which is located in the pressure space of the flywheel and sealed with a membrane (16). The air inlet is conducted through the clutch axis into branches (18) and through under the lid (19) under membrane(16).

After clutch engagement the valve lets the compressed air through the air inlet in the clutch axis into branches and further into the space under the membrane. It bends under the air pressure and shifts the piston and the pressed clutch plate which presses the middle clutch plate with lining onto the bearing clutch plate. Through friction the flywheel links with the clutch shaft which also starts to rotate. The clutch shaft pinion transfers the torque onto the toothed wheel wedged on eccentric shaft. The ram completes a stroke.

The clutch disengagement is performed by an automatic cam which through an end switch disconnects the compressed air inlet into the clutch. Piston and clutch plates resume their initial positions and the clutch shaft is braked by the brake whereas the fly-

wheel remains in motion.

The brake along with the clutch is also arranged in the flywheel. The friction lining (21) is also riveted onto the middle clutch plate (10). The friction lining (21) with its frontface is in contact with a fix clutch plate (22) fastened in bushing (2) and its rear part is in contact with a shifting clutch plate (23). Under the clutch plate there are adjusting washers (27). The shifting clutch plate (23) is pushed to the fix clutch plate (22) by brake springs (24). Functionally the brake is interconnected with the clutch through forcing-off screw (25) and axial bearing (26).

After clutch engagement the axial shift of membrane and piston is transferred through axial bearing and forcing-off screw onto the shift clutch plate which negotiates the brake springs and releases the middle clutch plate and hence the clutch shaft. In case of clutch disengagement the shifting clutch plate with the force of brake springs is pushed to the friction surface and the brake stops the clutch shaft.

During the press operation regular attention must be paid to the function and adjustment of the clutch and brake. In one shift service once in a month, in two shifts service twice in a month it is necessary to check the clearance between the pressed clutch plate (14) and flywheel (1), whose nominal value with engaged brake represents 3 mm. If it drops under 2 mm the clutch must be readjusted by means of washers (17 and 27) to avoid seating of pressed clutch plate (14) onto the flywheel (1). The seating may result in drop of brake braking effect and endanger the operator. Further on the lining wear must also

be checked. In case of new lining, with engaged clutch the stroke of pressed clutch plate represents approximately 3 mm. If the stroke of pressed clutch plate increases beyond 5 mm it is also necessary to readjust the clutch-brake system by means of adjusting washers (17 and 27).
By removing or adding of washers the clutch plates are accordingly adjusted so that with the engaged brake the clearance between the pressed clutch plate and the flywheel represents 3 mm and the clearance between the clutch plates and friction lining of the clutch represents approximately 1 mm.

After clutch engagement the friction lining of the brake represents a two-sided clearance of about 1 mm. While adjusting it is always necessary to check the lining for thickness to avoid wear until rivets. The minimum lining thickness represents approximately 5 mm. So much worn lining must be replaced.

In two shifts service it is necessary to check the membrane twice in a year and in one shift service once in a year. If it is defective (worn-off), it must be replaced. If grease entered between friction surfaces, it must thoroughly be degreased.

Worn-off, oil stained and incorrectly adjusted lining and clutch plates may result in delayed clutch engagement or its slipping.

In these cases the brake may operate in delay, too and the ram may overrun the top dead center and eventually endanger the operator.

The brake is to be adjusted in dependence on the control system. The braking force may to a certain extent be adjusted by the prestress of brake springs.

4.5. Eccentric shaft and countershaft (Fig. No. 15)

The eccentric shaft (12) is seated in bronze bushings (1, 2). The shaft is provided with a wedged-on tooth wheel (3) which fits in the pinion of the countershaft (4). The countershaft is in antifriction bearings (5) and (11) which are located in the frame (9). The shaft is made safe against axial shift by means of lids (6). The end of the countershaft is provided with an overhung flywheel with clutch and brake.

The rear end of the eccentric shaft is provided with a fastened drive of the control system and lubricating device (8).

Eventual defects and their removal

Defect	Cause	Removal
Slide bearings of eccentric shaft are getting too much warm	Likely seizure	To check the inlet of grease, to scratch bushings, to grind the shaft in the place of seating
Noisiness of toothed wheels	Big clearance in bushings of eccentric shaft	New bushings
Axial clearance of countershaft	Release of lid	To tighten screws of lid (6) along the brake side

4.6. Unit drive (Fig. No. 16)

The press is driven by an electric motor (3) which is fitted into the cavity of the frame rear part. It is located in the horizontal plate of console (4). Grooves in the vertical plate of console facilitate the shift of console vertically after the screws (5) are released. The console is to be lifted or lowered by means of screws (6). In case of motor dismantling the screws (5) are removed and the motor along with the console are taken out. The electric motor shaft is provided with a wedged-on pulley (2) which drives the press flywheel (7) by means of V-belts (1).

The V-belts must properly be tight. The properly tight V-belts feature an elastic vibration. V-belts too much loose start transversally vibrating and may jump out from the wedge groove and slip. V-belts too much tight substantially decrease their life.

After a few weeks operation the new V-belts slightly elongate and their length settles. It is necessary to tighten them again. When tightening the screws (5) must be released and the console with the motor are to be lowered. After the adjustment is over, it is important to tighten the screws (5). It is recommended to check once in a week, if the fastening screws of the electric motor and console are tight enough.

4.7. Covers

To increase the safety of the personnel the press is equipped with covers. All rotating parts are covered. Motor pulley, V-belts drive and flywheel are under cover. Cover of the flywheel has a groove to enable to turn the flywheel by hand. Separate cover of the eccentric shaft toothed wheel is provided with an opening right half when viewing it from the front. After the cover is opened the oil tank filling neck is easily accessible.

The ram front wall is covered by a cover. When changing the distance between the table and ram the cover must be removed. The press operation without covers is dangerous and therefore it is not permitted to operate the press without covers to be mounted and closed.

4.8. Lubrication

The main greasing points are connected with the central pressure lubrication. The remaining points are to be greased manually by means of grease gun and oil can.

For central lubrication a greasing device ON 12 6522 is applied. The transported quantity is regulated from 0.00 to 0.09 dm^3 per stroke of the device piston. Before regulation it is necessary to remove the hand crank and device lid. While screwing--in the regulating screw into the piston and while screwing it out the piston stroke increases and decreases respectively and hence the lubricant quantity supplied by respective pairs of outlets.

The grease gun must at least once in 6 mounths be dismentled and cleaned by kerosene. While remounting it is necessary to care of the pistons so that they are located according to respective numbering because of being fitted with respective opening in the body of the device.

The oil tank is situated under the toothed wheel cover along the press right side when viewing it from the front. The oil is to be poured in always through a fine screen which is fitted in the filling opening. Oil level indicator is located in the tank wall, it indicates the minimum oil level in the tank. The effective tank capacity represents approximately 7 liters. Under the oil level indicator there is an outlet provided with a plug.

For press lubrication an oil with higher viscosity is recommended to diminish the spontane leakage from the seating to a minimum and simultaneously to guarantee the creation of a continuous

lubricating film even in case of high specific pressure in bearings. After a stand still of the press longer than 5 hours the press must thoroughly be greased by turning the hand crank of the grease gun. The survey of greasing points, applied lubrication and kind of recommended lubricant are given in following sections (Lubrication plan).

Lubricant consumption for central lubrication depends on how the grease gun is operated and on number of strokes, max. 30 min^{-1}. Lubrication conditions are checked by oil outlet from greasing points 1 - 2 - 3 - 12. This dependence is shown in the diagram of "Lubricant consumption", Fig. No. 17. The lower scale shows the number of strokes (f) in a minute and the vertical one the quantity of consumed oil (C) $cm^3 . h^{-1}$.

The line (1) shows the lubricant consumption with the complete stroke of the grease gun. This lubrication is applied when the press is in running-in period i. e. approximately 200 operating hours with 20 strokes per minute.

The line (2) shows the lubricant consumption for the following period of about 200 operating hours. For this consumption the piston stroke drops to 1/3.

For further operation the lubricant consumption is set up from 1/2 to 2/5 of the initial quantity (line 3 - 4). While applying gradual reduction it is necessary during operation to check the temperature of the grease points. In case of temperature increase it is necessary to raise again the stroke of the respective piston to avoid seizure.

Correct lubrication with valuable and suitable lubricants is the guarantee of the topmost output, it eliminates breakdowns, extends the press life. The recommended lubricants may be ordered always in the same quality.

4.8.1. Lubrication plan (Fig. No. 18)

Unit	Grease point	Lubrication applied	Lubricant applied	Instructions
Frame 2,3,1 2,3,1 4	11 left rear bar 10 left ram guiding 7 right front bar 6 right ram guiding 12 front bearing of eccentric shaft 5 rear bearing of eccentric shaft	Grease gun ON 12 C	Durable oil K 12 CSN 65 6650	Tank capacity 7 l To check the oil level, to be refilled if necessary. Before starting the press is to be greased by hand through crank of the grease gun.
Ram 9	8 connecting rod 13 thread of ball bar 14 disk of ball bar 15 bearing of readjustment 21 gearbox	Manual by oil can.	Durable oil K 12. ČSN 65 6650.	To be greased before each shift.
Grease gun Eccentric shaft	22 toothed wheels	Manual by brush.	Lubricant OPR TPD-42-402-61	To be refilled once in 3 mounths. To be put on tooth profile once in 6 mounths. After 6-8 mounths the teeth are to be cleaned and thoroughly greased.

Unit	Grease point	Lubrication applied	Lubricant applied	Instructions
Ram	23 Seating of eccentric shaft	Manual by grease gun	Grease PH 2 ČSN 65 6918	To be greased before each shift.
Countershaft	24 Front bearing 25 Rear bearing 26 Flywheel bearing			To be greased after 400 operating hours. Once in a year to be dismounted, washed in petrol and after dryind to be filled with clean grease till half of the ring.
Air inlet	27 Bearings	While dismantling only		Once in a year.
Electric motor	28 Bearings			
Ram	29 Bearings of readjustment			
Program switch	Bearings			
Air distribution	30 Valve 3VEE 25 DA	Oil distributor	Bearing oil J2 ČSN 65 6610	Oil level to be checked daily and if necessary to be refilled.

Comparison of our and foreign lubricants

ČSSR	Durable oil K 12	Bearing oil J2	Grease PH 2	OP (OPR) TPD-42-402-61
U.S.S.R.	Maslo Cilindrovoje 11	Maslo Industrial-voje IS 20	-	-
G. D. R.	Getriebeöl GL 125	Schmiereöl R 12	Heisslager-fett HSSF	-
POLAND	Transol 80	Olej Maszynowy 16	Smar do GO-Racych lozysk SLG 3	-
HUNGARY	Transol II	GT - 15 Gépolaj	-	-
MOBIL	DTE Oil BB	Vactra Oil LIGHT	Mobil Grease BRB 3	-
SHELL	Vitrea Oil 71	Vitrea Oil 21	Alvania Greasa R 2	-
BP	Energol CS 200	Energol HP - 10	Energreasa RBB 3	-
ESSO	Teresso 85	Teresso 43	Essoleum D	-
RAJNER				KG - 10
KLÜBER				GRAFLOSCON CF - 2

4.9. Electromagnetic valve (Fig. No. 21)

The LE 160 C press is fitted up with 3 VEE 25 DC double three-way valve. The electromagnetic valve is provided with a remote control by push-buttons and foot switch. Upon a given impulse it is to let in or let out the compressed air from the control cylinder of the clutch-brake system. Herewith the press ram is set in motion and on the contrary.

The valve consists of valve body provided with two pairs of seats whose rate of flow is controlled by closing elements interconnected with tie rods. From one side the body is covered with flange carrying two electromagnets controlling each pair of seats separately and from the other side closed with plugs through which tie rods pass. In separate box on the lower end of the body there are a pair of indicating scanners located and an orifice plate controlled by tie rods for control of valve dynamic function.

The air pressure let in to kneck "P" reaches through auxiliary run off the seats whose rate of flow is controlled by electromagnet cores. After the coils are under current the electromagnet cores are reset to an active position, herewith the passage into the space above the control pistons is opened. Pistons move in the body guiding and by means of tie rods they reset the closing discs into the open position, whereas the pistons close the exhaust passage. This position provides an open passage from the pressure source to clutch--brake. After disconnection of current on coils the cores return to their initial position, close the bypass passage but they connect at the same time

the space above the control pistons and atmosphere. The pressure present in space under pistons resets them in standstill and herewith the exhaust seats are opened. Pistons motion under effect of prestressed springs are followed also by closing discs that close down the compressed air inlet from the source. This position provides an open passage from the device to atmosphere. The extended tie rods are lead out into a space beyond the valve where they control the orifice plate.

When the valve is broken (red lamp is on) the control is blocked. After the master switch is switched off and the defect removed the control circuit resumes its function.

4.10. Air distribution (Fig. No. 22)

The motion of clutch and brake is provided by compressed air. In the piping there are air cleaner (1), reducing valve (2), pressure gauge (3), pressure switch (4), oil sprayer (5), fan (6) with outlet cock (9) and electromagnetic valve (7). From the valve the air is lead into the body of air inlet (8) which is fitted on the clutch rotating cylinder.

The proper press operation and safety require an air overpressure of min. 0.4 MPa. The pressure switch disconnects the current for the electric control circuit when the pressure of the inlet air drops to 0.37 MPa. While working with lower pressure the electric motor would be overloaded with faulty function of clutch and brake what would result in disconnection of thermal relay or burn out of fuses.

The inlet air pressure is set up by reducing valve, the correct setting is to be checked on the pressure gauge. Setting - see individual sections of air distribution deviced as given in the first paragraph.

How to care for air distribution

1. Daily to check or refill the oil level in the oil sprayer.
2. At least twice in a week to drain off the condensed water from the fan through cock (9) which also represents an outlet of compressed air in case of repair of the air distribution.

3. At least once in a week to check all screwings for tightness to avoid loss of compressed air.

4. 10. 1. Air cleaner (Fig. No. 23)

The air cleaner is designed to clean the air let into the inlet piping. Cylinder filter (2) made of wire screen fits in the body of the cleaner (1). The cleaner is closed by closing screw (3) and sealing which fastens the filter inside the cavity of the cleaner.

The flowing air passes through screen which retains impurities and course dust particles. The cleaner screen must once in a month be removed and made free from settled impurities.

Rights for fitting another cleaner than that given in Fig. No. 23 are reserved.

4.10.2. Reducing valve (Fig. No. 24)

(Throttle 0.5 MPa with branch 3/4" B 330827 - KOVOLIS Hedvikov)

The reducing valve is designed for automatic maintenance of preset pressure in the piping. The preset pressure is indicated by the pressure gauge in the piping behind the reducing valve.

The compressed air is let into the valve body (in sense of arrow) to the valve (1) which is under constant pressure of a spring (2). Through pressing the spring (6) by a screw (7) which is made safe by a screw (8) the membrane (4) is bent downwards by piston (5), herewith the piston (3) leaves its initial position and the valve (1) is pressed at the same time. Thus the valve (1) is pushed out from its seat and the compressed air may flow into the space behind the valve.

As soon as the pressure behind the valve raises and with an effect upon piston (3) negotiates the force of spring (6), it returns to its initial position and the valve (1) sits back in its seat. The rate of flow through reducing valve resumes as soon as the pressure drops in the space behind the valve (1), because the air pressure cannot negotiate the force of spring (6) anymore.

By means of the reducing valve the air pressure is automatically kept at a preset value as it is required by the correct function of the press.

The reducing valve is set up from 0.46 to 0.5 MPa according to conditions in the air distri-

bution system (higher supply - lower pressure).

4.10.3. Pressure switch (Fig. No. 25)

TSV - 6E adjustability DM: 0.05 - 0.4 MPa
TI: 0.06 - 0.4 MPa

to adjust DM = lower limit = 0.36 MPa
TI = pressure interval = 0.1 MPa

The pressure switch disconnects the electric control circuit in following cases:

1. Air pressure drops to a level which could not guarantee sufficient clamping of clutch plates.
2. Air pressure is insufficient for braking of the press.

If the air pressure is not enough big, the press cannot be started. (Pressure switch SP 1 blocks the control, yellow lamp HL 5 is on.)

The supplied press is set up in the factory of the manufacturer for given functional pressures. During transport or when setting the press in operation some damage may occur, due to shocks the function of the pressure switch may change. Thereafter it does not work properly. Because of safety it must be rechecked and eventually reset.

If the press works in humid ambience, it is recommended to inspect the device once in two years, sometimes to unscrew the outer screw (1) and to drain off the condensed water.

The correct function of the pressure switch is to be checked at least once in a week.

4.10.4. Oil sprayer (Fig. No. 26)

Forced-feed lubricator OP - 16

For the right function of the press it is important for the operating surfaces of the air controlled mechanismus to be covered during operation with a slight oil film to facilitate the motion and to protect the inner surfaces against corrosive effects of water contained in the compressed air in a form of water vapours.

The oil droplets in the oil sprayer are sprayed by the flowing air forming an oil mist carried by air to operating surfaces.

The oil quantity may be set up by a regulating screw located accessibly on a topmost point of the forced-feed lubricator. By turning the regulating screw clockwise the oil quantity drops and when turning it anticlockwise it increases. The circular sight hole enables to check the function of the forced-feed lubricator.

The oil quantity in the forced-feed lubricator can easily be checked by translucent body which serves as an oil tank. The forced-feed lubricator content represents approximately 250 cm^3. The forced-feed lubricator is to be filled with pure engine oil J-2 made free of impurities.

Air leakage due to damage of sealings may derange the functioning of the oil sprayer.

4.10.5. Air inlet (Fig. No. 27)

The compressed air is lead to the clutch from electromagnetic valve. As the pressure space of the clutch is rotating along with the flywheel, the air inlet is designed so as to enable the connection of a fix pipe to the rotating clutch.

The air inlet is through body (1) screwed to the body of branching (4) fitted with inlet opening (16) and exhaust opening (9). Inbetween the air inlet body and body of branching there is a rubber membrane (6) with an opening in the middle and supported by a hole insert (5). Further in the air inlet body there is a connector (2) seated in bearings (10) and sealed by a ring (12). The outer end of the connector is provided with a thread of G 3/4" for connection of inlet piping.

While letting the compressed air in the air flows through the hole in the rubber membrane. Due to throttling there is an overpressure before membrane and underpressure behind membrane. Herewith the membrane is pushed to the body of branching, covers the exhaust opening (9) and the air reaches the clutch.

While stopping, the compressed air inlet through valve is disconnected, the air leaves the clutch and the overpressure resets the membrane. Herewith the exhaust opening is uncovered and the air pressure in the clutch drops immediatly and the clutch is out of function.

The radial run-out of the air inlet body of max. 0,4 mm and axial run-out of max. 0,2 mm are neither at a cost of functioning, nor at a cost of press power output.

4.11. Starting and press control

1. Press drive starting (Fig. No. 28)

To switch on the switch QS1 in position I. If the power supply is present, the white control light HL1 on the distribution box is on. By pressing the push-button SB3 (START) on the distribution box the motor starts. After starting is completed, green control light HL2 lights on on the distribution box. The motor is switched off by pressing the push-button SB2 (STOP) on the distribution box or by pressing the push-button SB1 (CENTRAL STOP) on the press.

2. Ram starting

The press is provided with following ways of operations and starting:

a) individual strokes by two hands
b) individual strokes by foot (foot-switch)
c) adjustment by two hands
d) constant running by foot (foot-switch)
e) constant running by two hands
f) repeated strokes by foot (foot-switch)
g) repeated strokes by single hand

a) Individual strokes by two hands

Switch SA2-1-8 in distribution box to be set to possition of "Individual strokes by two hands". The ram to be started by push-button START (SB4, SB5) on the press control board.

The push-buttons must be pressed in a time sequence of max. 0.5 s and must be kept pressed until the ram passes the lower position. If the push-buttons are released earlier the ram stops. If the press tool contains already the material, it must be taken out and by repressing of starting push-buttons the ram completes the stroke. If even by repressing of push-buttons the ram does not complete the stroke, it is necessary to apply "c" regime.

b) Individual strokes by foot

Switch SA2.1-8 in distribution box to be set to position of "Individual strokes by foot". The ram is set in run by pressing the fcot switch SQ6. The remaining operations as in description of "a".

c) Adjustment by two hands

Switch SA2.1-8 in distribution box to be set to position of "Adjustment by two hands". For adjustment the energy of the flywheel only is to be utilized. The motor must be switched off, green control light HL2 in distribution box is off. The ram moves only when the push-buttons SB4, 5 are pressed.

d) Constant running by foot

Switch SA2.1-8 in distribution box to be set to position of "Constant running by foot". The ram is to be set in run by pressing the foot switch. After the ram is set in run the foot switch must be released before the ram reaches the lower posi-

tion, otherwise it completes only one stroke. The ram is to be stopped by pressing the foot switch which is kept pressed until the ram stops in the upper position.

e) Constant running by two hands

Switch SA2.1-8 in distribution box to be set to position of "Constant running by two hands". The ram is to be set in run by pressing the push-buttons "START" SB4, SB5. After the ram is set in run the push-buttons SB4, SB5 must be released before the ram reaches the lower position, otherwise it completes only one stroke. The ram is to be stopped by pressing the push-buttons SB4, SB5 and keeping it pressed until the ram stops in the upper position.

f) Repeated strokes by foot

Switch SA2.1-8 in distribution box to be set to position of "Repeated strokes by foot". The ram is to be set in run by pressing the foot switch. The ram repeats the strokes until the foot switch is kept pressed.

g) Repeated strokes by single hand

Switch SA2.1-8 in distribution box to be set to position of "Repeated strokes by single hand". The ram is to be set in run by pressing the push--button "START" SB4. The ram repeats the strokes until the foot switch is kept pressed.

ATTENTION:

In regime of "Individual strokes" (control by two hands and by foot) the running-out is checked. The overrunning of the run-out critical angle is signalled by pilot light HL3 (yellow). Disconnecting contacts of contactor KM9 are blocking the press control. The press can be reset in run only after the breakdown is removed while the ram is readjusted in initial position. The ram readjustment in initial position is made by following regimes: "Constant running", "Repeated strokes", or "Adjustment".

4.12. Press electric outfit

The electric outfit is designed for:

a) press drive
b) press electropneumatic control
c) lights

It is located in:

a) separate distribution box, Fig. No. 28
b) press, Fig. No. 29

The press functional diagram is shown in drawing No. 3-21-9C01-0C5. To follow the functions according to the diagram, tables are required:

- symbols applied in the electric diagram
- electric diagram of the regime switch.

Function description:

1. Press drive

The press is driven by an asynchrouons three--phase electromotor (MA1) with a short-circuit armature.

The electromotor is to be started by a switch Y/D.
The time to switch the automatic switch Y/D from Y over to D is set up by time relay (KT120 + 30 seconds) in the factory of the manufacturer. The electromotor protection against short circuit is provided by fuses FU1. The electromotor protection against overload is provided by overcurrent relay FA1. The value of electromotor current may be observed in the amperemeter PA1.

2. Press electropneumatic control

The electromagnetic control is to serve the clutch-brake control. In the clutch-brake inlet there is an electropneumatic valve YV1-2 located. The electromagnets are controlled by contactors KM6, KM7 which along with contactors KM4, KM5, program switch SA1-2-6, switch SA2.1-8 and push--buttons SB4, SB5, SB6 form a unit of devices for each way of operation and ram control. The air pressure required for the press operation is checked by pressure switch SP1 which blocks the press operation if the air pressure does not reach the set value.

3. Press lights

Upon customer's special request the press may be supplied with a socket for a hand lamp for 24 V. The socket power is supplied through safety protection transformer. The common workmanship is provided with this socket hole blinded.

Press intake and interconnection of distribution box with frame

1. Press intake

When determining the cross section it is necessary to take into consideration extremly long starting of electromotor due to high inertia mass. The intake must have a cross section so that the voltage drop does not effect the motor driving moment.

2. Interconnection of distribution box with frame

The interconnection of distribution box with frame is made by multistrand cable, type CYKY and CMSM 5. The application of multistrand cables is given in a table on page 63 .

The values given in the table are valid for an arrangement of press and distribution box according to foundation plan.

4.13. Applied symbols

Machine	Distribution box	Functions
	C1 + 9	Suppression capacitors
	FU1	Electromotor fuses
	FU4	Fuses of primary winding TC1
	FU6	Fuse of secondary winding TC1-220
	FU7, 8, 9	Fuses of secondary winding TC1 - 20, 24, 29
	FU13	Fuses of primary winding TC2 . ZP
	FU14	Fuses of secondary winding TC2 . ZP
	HL 1	Control light, white - press under current
	HL2	Control light, green - motor switched over to D
	HL 3	Control light, yellow - for running out
	HL4	Control light, red - for valve
	HL5	Control light, yellow - for air pressure
	KA10	Auxiliary relay - for valve
	KM1, 2, 3	Contactors of automatic switch Y/D
	KM4 - 7	Press control contactors
	KM9	Circuit contactor - for running out
	KT1	Time relay of automatic switch Y/D
	KT2	Time relay of simultaneity principle
MA1		Electromotor of press drive
	PA1	Amperemeter for measuring the MA1
	PC1	Electromagnetic stroke counter ZP
	QS1	Press master switch
	R1-3	Resistances
SA1.2-6		Press program switch
	SA2.1 - 1D	Regime switch
SB1		Push-button "CENTRAL STOP"
	SB2	Push-button "STOP"
	SB3	Push-button, motor "START"
SB4, 5		Push-button "START"

Machine	Distribution box	Functions
SP 1		Air distribution pressure switch
SQ6		Foot switch
	TC1	Transformer for supply of control circuit and circuits of 20, 24, 29 V
	TC2	Safety transformer of lights - ZP
	US1	DC regulated power supply 24 V
	XT1, XT2	Terminal of distribution box
XT5		Terminal of press
	XS3	Socket of foot switch
	XS4	Socket of lights - ZP
YV1 - 2		Electromagnetic valve

ZP - Special accessories

4.14. Switching diagram of the press cam switch - LE 160 C

Press regime	Way of control	Control elements	Switch contacts SA2.1	2	3	4	5	6	7	8	9	10
Individual strokes	two hands	push-button START, SB4, SB5		X	X					X	X	
Individual strokes	foot	foot switch SQ6		X		X				X		
Adjustment	two hands	push-button START SB5	X						X			X
Constant running	foot	foot switch SQ6		X		X		X				
Constant running	two hands	push-button START, SB4, SB5		X	X			X			X	
Repeated strokes	foot	foot switch SQ6		X		X			X			
Repeated strokes	one hand	push-button START SB5		X	X		X		X			

X - contact switched on

4.15. Specification of electric outfit devices

Symbol	Device	Type
C1, 2, 3	Capacitor M 25	TC 253 M25 250 Vst
C5 + 8	Capacitor M1	TC 252 M1 250 Vst
C9	Capacitor 2M	TC 487 2M 1000 V =
FU1	Fuse 35A, slow	2420 - 35 T
FU4, 6	Fuse 6A, slow	2410 - 6 T
FU7, 8, 9, 11, 12	Fuse 4A, normal	2410 - 4
FA1	Overcurrent relay	R 100 - 15A, 50 (60) Hz
HL1	Control light - white	T6E 24 Vst, 2W
HL2	Control light - green	T6E 24 Vst, 2W
HL3	Control light - yellow	T6E 24 Vst, 2W
HL4	Control light- red	T6E 24 Vst, 2W
HL5	Control light - yellow	T6E 24 Vst + trafo 220/24V, 2VA
KA10	Auxiliary relay, 3 switching contacts	R 15 - 3P, 24 V =
KM 4, 5, 6, 9, 7	Contactor, 3 main contacts 16 A 4 auxiliary contacts 6A 2/2	K16E, 220 V, 50/60 Hz
KM2, 3	Contactor, 3 main contacts 40 A 4 auxiliary contacts 6A 2/2	V 40E, 220 V, 50/60 Hz
KM1	Contactor, 3 main contacts 25 A 4 auxiliary contacts 6A 2/2	K 25E, 220 V, 50/60 Hz

Symbol	Device	Type
KT1	Time relay, 2 switching contacts 1,5A	TX 11 ZR, 1+100s, 220V, 50-60 Hz
KT2	Time relay, 1 connecting contact 1A	P2 HZ , 0.5s/220V, 50 Hz
MA1	Asynchronous three-phase motor	F 160 MO4, 11 kW, 1150 rpm, 50 Hz (12.6 kW, 1735 rpm, 60 Hz)
PA 1	Amperemeter	FP 80 0-25/50A,50(60) Hz
QS 1	Three-pole cylinder switch (it can be locked)	S 63 VZ 01 PO, 500 Vst
R 1 + 3	Film resistor	TR 214, 47 OHM, 6 W
SA1.2 - 6	Program switch - contacts 6 A	VH 1F 05
SA2.1 - 10	Cam switch - contacts 16 A	NUK 16 752/3300
SB 1	Control push-button - red 1 disconnecting contact 6A	T6H 0/1
SB2	Control push-button - red 1 disconnecting contact 6A	T6A 0/1
SB3	Control push-button - green 1 disconnecting contact 6A	T6A 2/0
SB4, 5	Control push-button - green 1 disconneting contact 6A 1 conneting contact 6A	T6H 2/2
SP1	Pressure switch - switching pressure 0.46 MPa switching-off pressure 0.36 MPa	TS V6E
SQ6	End switch - 1 connecting contact 6A 1 disconnecting contact 6A	2 KS6 FK11

Symbol	Device	Type
TC1	Transformer, primary winding 0-220, 380, 415, 440, 500, 550 V secondary winding 0-186, 220, 265 V - 400 VA 0-20, 24, 29 V - 100 VA	JNC 05 IP 00 50-60 Hz 500 VA
US 1	Regulated power supply 24 V = 1 A	ZRC 3.2
XT1, 2, 5	Terminal	6035 - 20,10
XS 3	Seven-pole socket	ZM 7 PO
YV1 - 2	Two-way electromagnetic valve 220V	3 VEE 25 DC 50 Hz (60 Hz)

SPECIAL ACCESSORIES

FU 13	Fuse 2A, normal	2410 - 2
FU 14	Fuse 6A, normal	2410 - 6
FC 1	Electromagnetic stroke counter	Z - F - 593 220 Vst
TC 2	Safety transformer, primary winding: 0-220, 380, 415, 440, 500 V secondary winding: 0-24 V - 125 A	JBCT 0125 50-60 Hz IP 00
XS 4	Socket	5515 - 7790

Symbol	Device	Type

SPECIFICATION OF SPARE PARTS US 1, type ZRC 3.2

R 1	Trimmer	TP 011 680 OHM
C 1	Electric capacitor	TE 986, 500 M
C 2	Electric capacitor	TE 154, 20 M
C 3	Electric capacitor	TE 986, 20 M
XT	Terminal, 12 poles	6310 - 10
I 01	Integrated circuit	MA 7824
VD 1+4	Diode	KY 708
VD 5	Diode	KY 130/80

Devices for 50 and 60 Hz are given in bracket, the remaining devices are identical for both frequencies.

The manufacturer reserves the rights for change of type of devices and for minor deviations in their arrangement.

4.16. Data of devices for various voltages

Symbol	Device	3 x 220 V	3 x 380 V	3 x 415 V	3 x 440 V	3 x 500 V
FA 1	Overcurrent relay	R 101-23 A	R 100-15 A	R 100-15 A	R 100-15 A	R 100-15 A
FU 1	Fusible cut-out	2420 - 63 T 63 A - slow	2420 - 35 T 35 A - slow	2420 - 35 T 35 A - slow	2420 - 35 T 35 A - slow	2420 - 35 T 35 A - slow
MA 1	Asynchronous three-phase motor with short-circuit armature starting Y/D	127/220 V	220/380 V	239/415 V	254/440 V	288/500 V
PA 1	Amperemeter	FP 80 0-60/120 A	FP 80 0-25/50 A	FP 80 0-25/50 A	FP 80 0-25/50 A	FP 80 0-25/50 A

4.17. Table of cable interconnection between the press and distribution box

1. Main circuit

Lead No.	Feeding system	Cable	Cable length (m)	Number (Pcs)
Black 8, 9, 10 14, 15, 16	3 x 220 V	7 x CYA 6 mm^2	4	2
	3 x 380 Vst 415 Vst 440 Vst 500 Vst	7 x CYA 4 mm^2	4	1

2. Control circuit

Lead No.	Cable	Cable length (m)	Number (Pcs)
21, 23, 24, 52, 53, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 68, 69, 73, 75, 76, 81, 91, 92, 94, 96, 97, 98, 99	CMSM 37x1 mm^2	4	1

4.18. Labour security, electric current protection

The press is provided with all safety measures prescribed by standards:

Electric outfit is performed according to valid regulations ČSN - ESČ.

The electromotor is protected by fuses and thermal relay. Part of the electric outfit is located in the distribution box beyond press. The press security is guaranteed by the standard ČSN 21 0711 "Safety regulations for eccentric and crank presses". All dangerous spaces, rotating and moving parts in reach of operating or maintenance staff are protected by covers and colour paints according to ČSN 01 8010.

The ram motion in any position can be stopped and simultaneously the electromotor can be switched off by push-button "CENTRAL STOP" SB1 (breakdown switch). The press is fitted up with electric protection against repeated stroke.

The press nominal force must not be exceeded. In the ram there is a shear safety pin which crashes in case the nominal pressure is exceeded by approximately 20 %.

4.18.1. Noisiness

The press is a source of disturbing noise which may vary in level according to the kind of technological operations. Technological operations as bending, pressing, forging, deep drawing are as a rule less noisy. Much noise is caused by shearing

tools, especially by those of parallel grinding. When using a tool without special modifications the noise level while shearing ranges between 112 and 115 dB (AI).
In these cases it is necessary to use either specially modified tools provided with different vibration dampers or substitutes for personnel protection as for instance individual aids, implementations of working breaks and the like.

4.19. Labour security - check and maintenance

From the point of view of labour security and life of press it is necessary daily to check:

1.	Oil level in lubricating tank	at rest	service man
2.	Function of lubricating devices	at rest	service man
3.	Function of oil sprayer	in run	service man
4.	Condition of brake	at rest	service man
5.	Brake adjustment	at rest and in run	service man
6.	Function of air inlet	at rest and in run	service man
7.	Function and condition of valve	at rest and in run	service man
8.	Fastening, condition and drive of control system	at rest and in run	service man

At least once to check:

1.	Pressure switch adjustment	in run	service man
2.	Reducing valves adjustment	in run	service man
3.	Air cleaner	at rest	service man
4.	Fan drainage	in run	servise man
5.	Condition of electric box	in run at rest	service man
6.	Keeping to lubrication plan	in run	foreman
7.	Keeping to checks and adjustment	in run	foreman

At least once in a month:

1. Condition of clutch	in run at rest	service man
2. Condition of driving mechanism	in run at rest	service man
3. Condition of seating	in run at rest	service man
4. Condition of security pin for overloading	in run at rest	service man

For each change of press operation it is necessary to adjust:

1. Control system	in run at rest	adjuster
2. Upper ejector	in run at rest	adjuster

All defects of press and its equipment which are reported to the foreman must be entered in the log book of defects. The report is to contain when and how the defect was removed.

Records on press are to contain important breakdowns, especially those ones which caused accidents, and other reconstructions and changes. It is necessary to inform the manufacturer of the press on repeated breakdowns, significant improvements, eventual reconstruction of the same.

4.20. Press transport and assembly in user's factory, guarantees

After the press is tested in the factory of the manufacturer the press is ready for packing. All easily damageable parts are protected against damage. Surfaces and parts of the press exposed to atmospheric effects are protected with protective paint or preserved. Slide surfaces of the frame and other parts are for transport protected against shocks.

Packing of the press

The packing of the press must correspond to conditions of transport to the user's factory. For supplies within the country of the manufacturer the press is transported loose under canvas, the remaining parts are located in boxes while the packing is carried out according to regulations given by Foreign Trade Corporation and Transport Department. Boxes with the press and its parts are marked with the center of gravity, points for suspension of ropes, dimensions and number of boxes. The completeness of the supply is checked according to the part list of the product and export production ordes.

Transport

The supply is marked with the addressee and address of supplier, number of order, type of machine, production number, brutto and netto weight. Dimensions of supply must correspond to transport possibilities to the user's factory.

Storing

For damages and defects on the press during its storage before setting it in run, the manufacture does not take responsibility.
Costs for eventual desmantling and press assembly, clearing and the like, which will be necessary before setting the press in run after a storage of more than 3 months, will be borne by the user.
Press installation in the user's factory is performed against special order. Expenditures are accounted for according to valid regulations.
Sequence assembly operations are given by the fitter of the manufacturer.

Guarantees

The supplier takes responsibility for construction, function, use and selection of material, production of the product including parts supplied along with the press for a perion of 12 months from the date of supply of the its last part, but not more than 6 months from the date of its setting in run.

Conditions for acceptance of guarantees and way of removal of defects are precisely given in technical conditions of the press.

The manufacturer provides for the user's acceptance authority all technical informations and aids for acceptance of the press according to technical conditions.

On the ground of the valid notice 135 - 64 § 18, section 6, para 7/d, the user has no rights within the guarantee period to carry out any

disassemblies of the press without prior consent of the manufacturer.

Functinally important units are sealed by the manufacturer. Removal of the seal during the guarantee period without the consent of the manufacturer means loss of rights for claims.

4.21. List of applied gearings, rings, belts and chains

					Position/Fig.
1 Pc	Double-row spherical-roller bearing	222 32	ČSN 02 4705	Eccentric shaft	26/15
1 Pc	Double-row spherical-roller bearing	222 24	ČSN 02 4705	Eccentric shaft	27/15
1 Pc	Single-row ball bearing	6234	ČSN 02 4630	Clutch-brake	20/14
1 Pc	Single-row ball bearing	6032	ČSN 02 4630	Clutch-brake	21/14
1 Pc	Single-direction thrust bearing	51 160	ČSN 02 4730	Clutch-brake	22/14
1 Pc	Single-direction thrust bearing	51 204	ČSN 02 4731	Ram	60/10
1 Pc	Single-direction thrust bearing	51 205	ČSN 02 4731	Ram	61/10
1 Pc	Single-row ball bearing	6000	ČSN 02 4633	Control system	- /12
2 Pcs	Single-row ball bearing	6007	ČSN 02 4630	Air inlet	2/27
1 Pc	Membrane t=3; Ø 845	Drw. No. 3-21-2065-033		Clutch-brake	32/14
1 Pc	Membrane t=3; Ø 195	Drw. No. 3-21-2065-017		Air inlet	16/27
1 Pc	Packing "U" 28x48		ČSN 02 9261.2	Air inlet	13/27
5 Pcs	V-belt 20/12.5x4500			Unit drive	12/16
1 Pc	Chain 1x12.7x3.3 - 121 links		ČSN 02 3311.2	Control system	2/12

4.22. List of special accessories (Fig. No. 30)

Special accessories are to be understood as parts that may be supplied without special modifications.
They are, however, a subject of a separate supply and order.

With LE presses following parts may be supplied:

1. Roller feeder QPD 250/4
2. Light 24 Vst
3. Air blankholder with fastening in the table plate, type QVV
4. Electromagnetic stroke counter
5. Pneumatic tightener for ram readjustment, UV 30
6. Strip lubrication, QFP 250
7. Strip unwinder - winder, QPUM

The press is supplied with:

Date: Signature and rubber stamp

4.22.1. Air blankholder (Fig. No. 31)

These blankholders with movable pistons enable the performance of difficult works with single acting presses. They can also be used for throwing-out of blanks or pressings from the press tool. Their holding force for drawing is developed by compressed air from air distribution or from separate compressor plant.

The most suitable force required for drawing can precisely be adjusted by reducing valve. After the fan incorporated in the compressed air inlet is full, there is almost no further air consumption (losses only due to untightness). If lower blankholder is applied the total forming force is to be reduced by a force developed by the blankholder.

Construction of the blankholders correspond to their applicability for presses with table plate (height L) or without it (height L_1) by exchange of piston rod only. If the production program is to be changed, the blankholder as a whole does not have to be dismantled.

The blankholder is to be fastened to pressings in the table cavity. It consists of two cylinders 1 and 2 tightened together with screws 3. Pistons 4 and 5 are in cylinders 1 and 2 sealed by leather packings 6. The piston rod consists of several parts. The pin of piston rod lower part 7 is fitted with exchangeable pipe 8 in which the pin is shifted with holding plate 10 moving in bushing 11 which seats in table plate 12 or in insert of table 13. The compressed air is let

into the lid of lower cylinder 14 with opening into piston rod 7, flows into upper cylinder 1, lifts pistons 4 and 5 and holding plate 10 connected with them. The resulting load of holding plate 10 must not be eccentric.

If the nature of operations requires an overfall, the blankholder is easily and fast dismantled. By lifting the holding plate 10 the exchangeable pipe 8 is released. Both parts are to be placed in store. After the partial dismantling the opening in chute may be closed by slide valve 16.

The blankholders constitute the press special accessories and hence they are the subject of a separate order.

T E C H N I C A L D A T A

Designation of size Fig. No.	Force at 0.6 MPa in kN	Ø D mm	Z mm	Ø d mm	Ø d_1 mm	L mm	L_1 mm	Air inlet	Weight kg	For press
QVV 360/12	120	360	70	250	480	1195	1095	G 1 1/2"	415	LE 160 LCE 160 LE 160 C
QVV 450/18	180	450	85	280	578	1265	1155	G 1 1/2"	592	LE 250 LE 250 A LCE 250 LE 250 C
QVV 525/25	250	525	75	320	655	1505	1365	G 1 1/2"	950	LCE 400
QVV 525/25 A	250	525	75	320	655	1715	1575	G 1 1/2"	1035	LE 400 LE 400 C

4.22.2. Blankholder accessories (Fig. No. 32)

The operating force of blankholder (1) is regulated. By means of reducing valve (7) the air pressure required for the blankholder is being adjusted. The value of the air pressure is shown by pressure gauge (8).

The blankholder works without air exhaust into atmosphere - no energy losses develop and the own compressed air consumption is excluded. To avoid the return of compressed air into the inlet piping while pressing the blankholder and to avoid herewith the unfavourable air pressure deviation in the piping, there is a pressure vessel incorporated before the blankholder. In case of LE presses the vessel is divided into battery which is located in the press wall.
There are no requirements on increase of working space. Each pressure vessel is fitted up with deaerating valve (6). Each pressure vessel is supplied with revision book.

While working with blankholder, back shocks of air upon reducing valve are taken by non-return valve (3). Unexpected increase of pressure beyond 0.6 MPa is secured by safety valve (5). While using the complete stroke of blankholder the pressure raises in pressure vessels by 0.1 MPa. The blankholder nominal pressure is achieved when the reducing valve is set up to 0.6 MPa.

The air flowing into the blankholder takes along the oil mist developed in the oil sprayer (2) and it lubricates packings and cylinder slide surfaces. The oil consumption (J2) is negligeable.

4.22.3. Pneumatic tightener for ram adjustment (Fig. No. 33)

The readjustment of distance between the table and ram may be performed by pneumatic tightener, type UV 30 or PU 30. The tightener is portable and one piece may be used for more pieces of the same type.

The tightener (1) consists of pneumatic motor, impulse mechanism, control mechanism, exchangeable reducing clutch (2). The size of the clutch determines the possibility of use of tightener for ram adjustment of LE 160 or LE 250 presses.

The suspension (3) facilitates to suspend the tightener in operating position. While readjusting and after releasing screws (13) of insert (8) the tightener with the reducing clutch is fitted in the square of screw (9) so that the suspension pin (3) is at the same time shifted in the opening of the piston rod (10).

The air is let into the tightener by hose (4) connected with self-closing valve (5) in branch Te (6) which is incorporated in the press inlet piping. If the tightener is to be used for more presses, it is necessary to increase accordingly the number of self-closing valves.

The change of sense of rotation and of torque is made possible by a shifting mechanism controlled by push-button (7). Starting is controlled by lever (14). The motion of screw (9) is transferred by screw wheel upon ball screw (12). After the readjustment of distance it is necessary to take the tightener and to tighten the screw (13) of insert (8).

The press must not work with fitted tightener

The readjustment in extreme positions of ram (appr. 5 before extreme position) is made by hand to avoid damage of the press mechanism due to big forces of tightener.

In concern of reliable operation and long life of tightener it is necessary to maintain the air pressure in the range of 0.4 - 0.6 MPa. Supply of dry air prevents or substantially decreases the corrosion. When interrupting the operation it is necessary to place the tightener to a dry place.

Impulse mechanism is lubricated through opening in the square pin by grease V 1 ČSN 656922 after 8 hours of operation.
Blade motor is to be lubricated by oil ON - ČSN 65 6680.
If the oil sprayer is not in the inlet piping, the given oil is to be poured into the connecting branch and the tightener may be started whereby the oil sprays all over the mechanism.

This sort of lubrication must be repeated after each 4 hours of operation and before each setting in operation.

4.23. Press testing run

After completion of each press it is adjusted and run in by the manufacturer at least 4 hours from which one and a half hour switching of individual strokes must be in operation using 20 strokes/min.

Testing run with gradually increasing load up to the nominal pressure is performed in next 4 hours.

While testing, all parts of the press are checked for strength and rigidity in operating conditions, further on the temperature of clutch lining, brake, slide surface and correct functioning of all functional and security equipment of the press are checked.

The press is checked also for accuracy and quality of machined surfaces for which a testing protocol as a part of the technical passport is issued.

Before starting the press in the user's factory it is necessary to remove the preservants from all functional and protected surfaces. Consequently the oil level in tanks and oil sprayer is to be checked and the press must be greased. In case of central lubrication the crank of the oil pump is to be rotated and hence checked for function.

The screw tightness of motor and bearing cases is to be checked. Afterwards it is necessary to check the air distribution, its adjustment and to check the electric outfit.

After the preceding checks are completed the press testing run may begin. During this check the correct and reliable function of all functional units are verified, the temperature of bearings and other slide surfaces is being checked. The temperatures of slide fits are to be settled at temperatures below 60° C, temperature of brake lining max. 150° C, temperature of clutch lining max. 130° C.

The press testing under operating load is carried out in the factory of the manufacturer only against special order of the customer.

4.24. Instructions for how to order the spare parts

When ordering spare parts it is necessary to provide:

1. type of the press
2. production year
3. production number
4. number of spares (in pieces)
5. name of spare
6. unit of the press
7. drawing number or standard

List of spare parts is in the included catalogue of spare parts (Page 84).

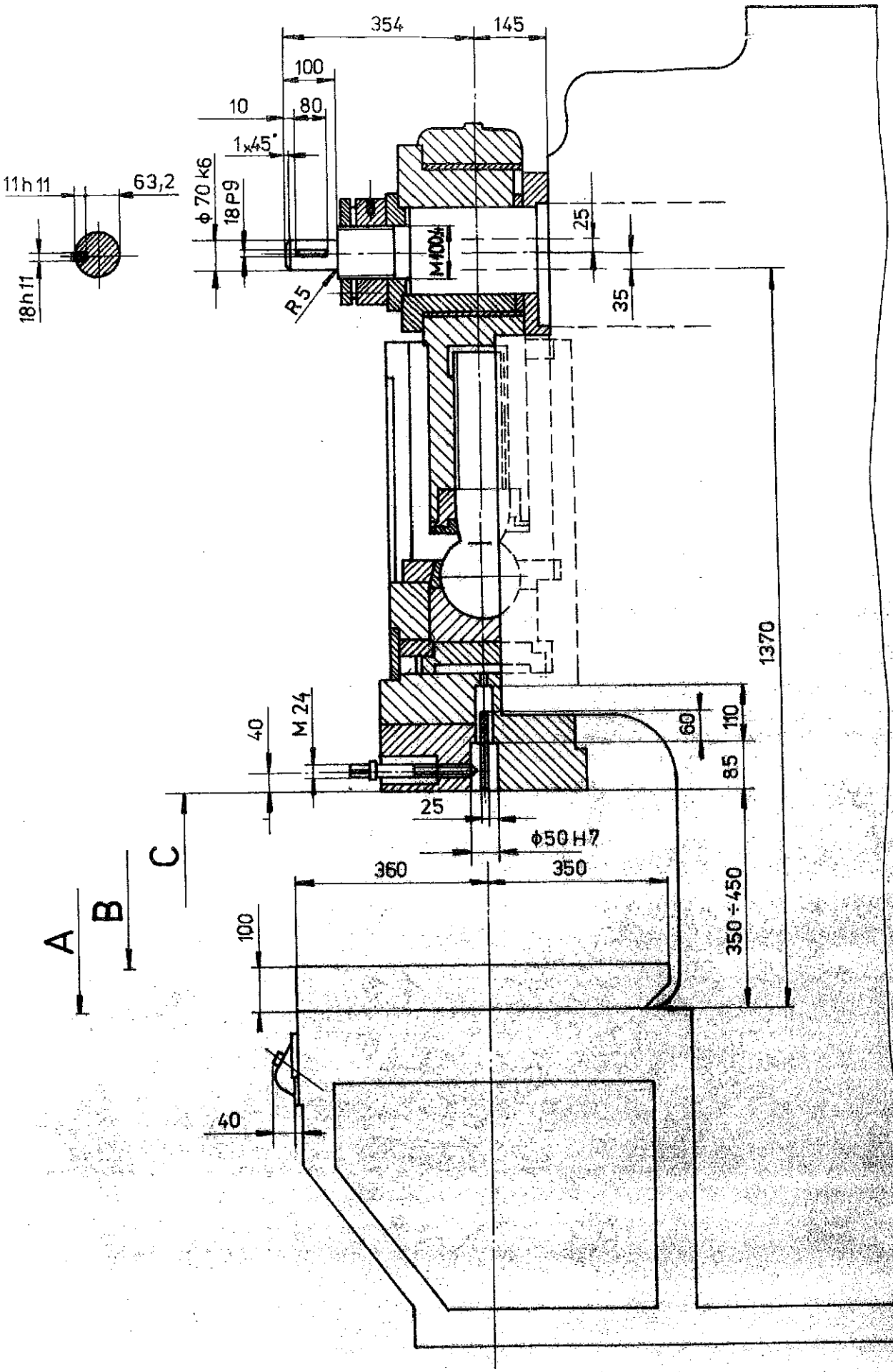
Spares whose name and drawing number are not known to the user may be ordered according to position number and figure number of the Operating Manual, where the respective spare part is shown.

4.25. List of spare parts

Name of the spare part, No.	Unit (Position No.) Fig. No.	Standard or Drawing No.	Material Dimension	Life	Weight 1 Pc (kg)	Number of pieces per press
Safety insert x 513.0.10 5395.47	Ram (18) No. 10	3-21-3520-012	42 2425 Ø 230/t+50	eventual exchange	9.3	1x
Lining x 513.0.10 1309.47	clutch-brake (30) No. 14	3-21-1225-041	FAVORIT 510x350x07	5 000 000	0.42	12x
Lining x 513.0.10 1310.47	clutch-brake (31) No. 14	3-21-1225-040	FAVORIT 800x600x07	5 000 000 strokes	0.5 0.01	12x 126x
Rivet	clutch-brake No. 14	ČSN 022381.1	423005.2 Ø 6x20	5 000 000 strokes	0.01	126x
Compression spring 513.0.10 1302.47	clutch-brake (35) No. 14	4-21-2150-090	14260.07	5 000 000 strokes	0.86	12x
Compression spring 513.0.10 1303.47	clutch-brake (36) No. 14	4-21-2150-089	14260-07	5 000 000 strokes	0.18	3x
Membrane x 513.0.10 1311.47	clutch-brake (32) No. 14	3-21-2065-033	Rubber No. 7645 t3; Ø 845	3 000 000 strokes	1.8	1x
Membrane 513.0.10 1400.47	air inlet (6) No. 27	3-21-2065-017	Rubber No. 7645 t4; Ø 195	3 000 000 strokes	0.16	1x

1		2	3	4	5	6	7
Packing U	x	air inlet (13) No. 27	ČSN 02 9261.2	U 28x48	3 000 000 strokes	0.02	1x
Safety insert		electric outfit	ČSN 34 4710	No. 2420 T-35	eventual exchange	0.10	3x
Clutch	x	lubrication	ČSN 13 7730	ID 5	eventual exchange		7x
Clutch T	x	lubrication	ČSN 13 7732	ID 5	eventual exchange		2x
Tank screen		lubrication	Mars	Ø 70	eventual exchange		1x
Control push-button		Distribution box	1/1	T6H green	eventual exchange	0.05	2x
Control push-button		Distribution box	0/1	T6H red	eventual exchange	0.05	1x
Relay		Distribution box		RP 300C 220 V, 50 Hz	10.10^6	0.30	6x

List of Figures for LE 160 C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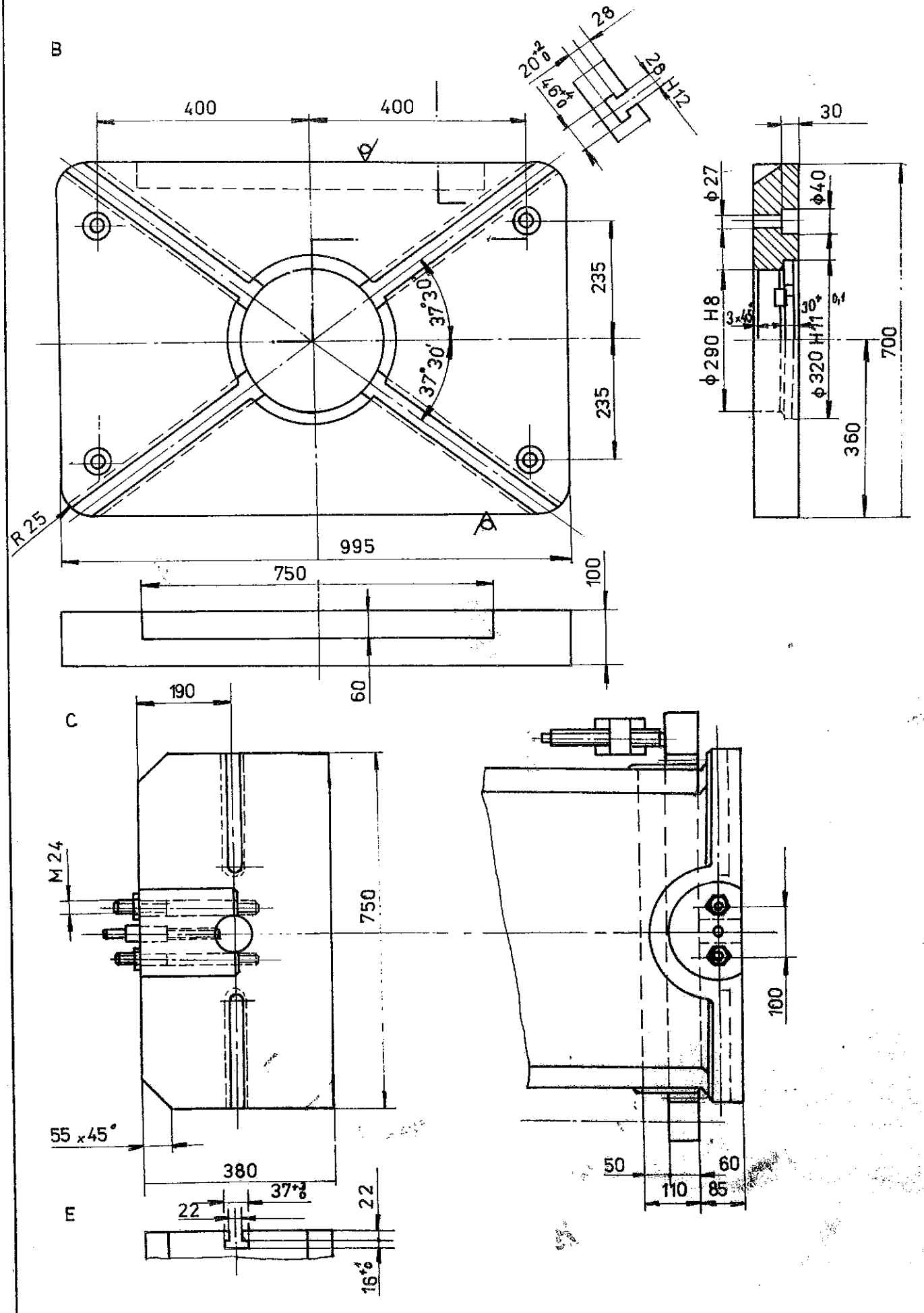
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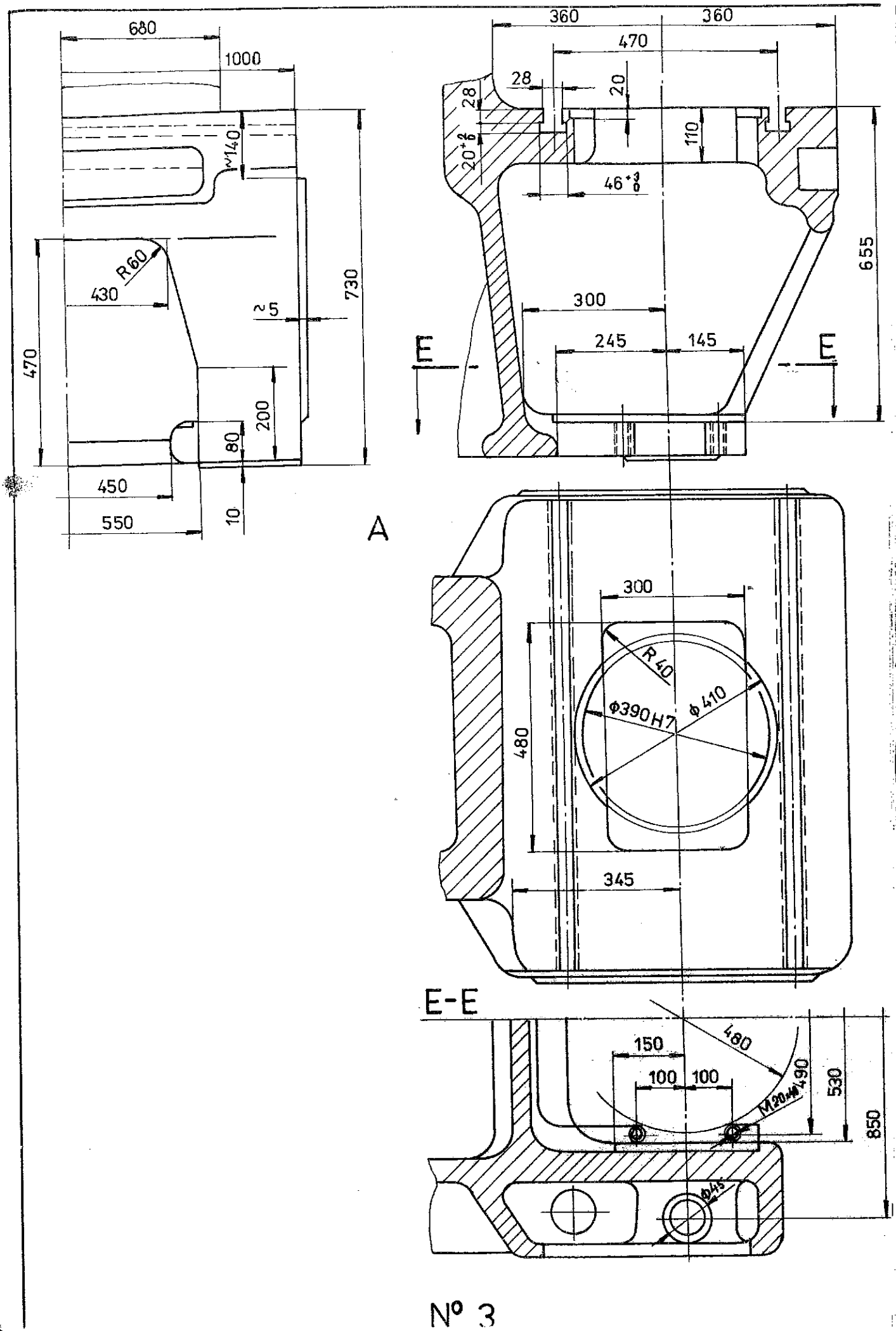
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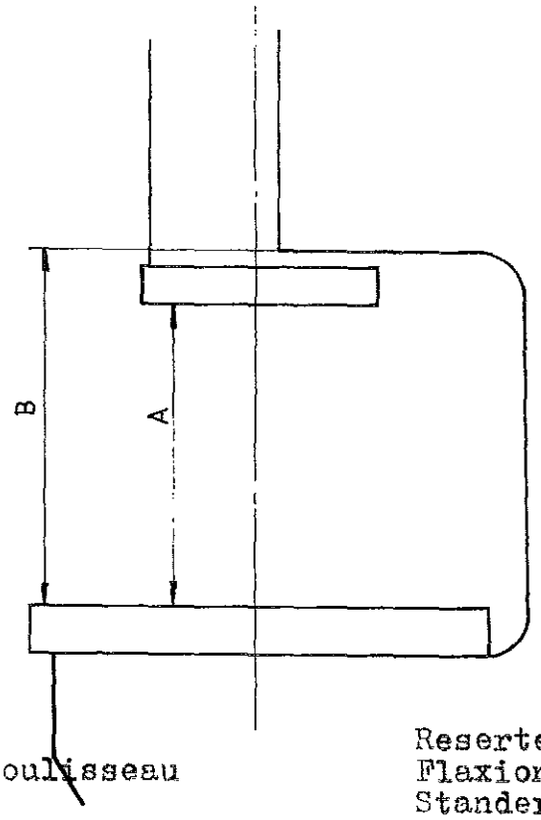
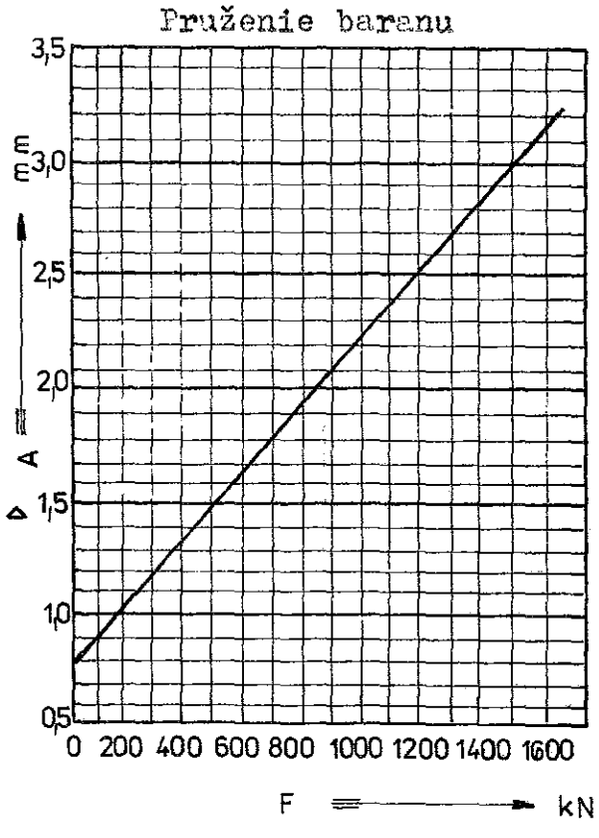
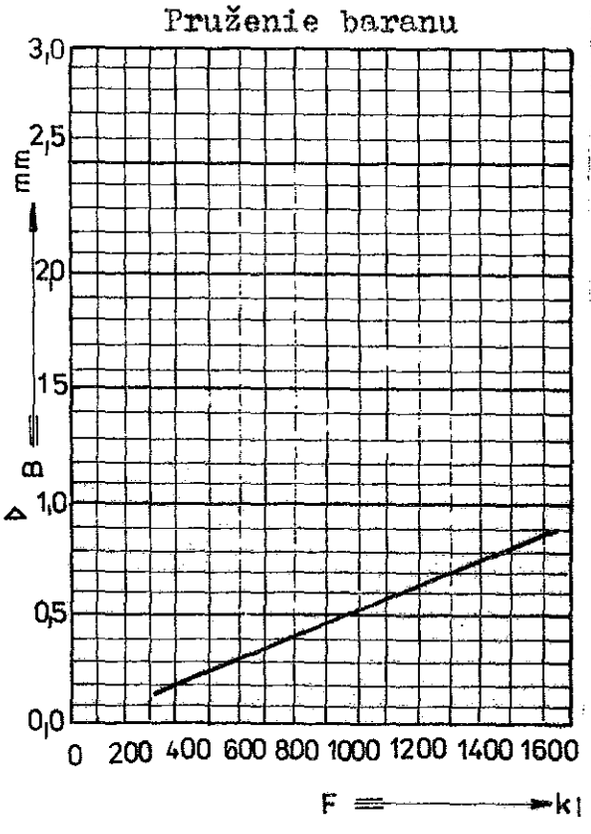
LE 160-C



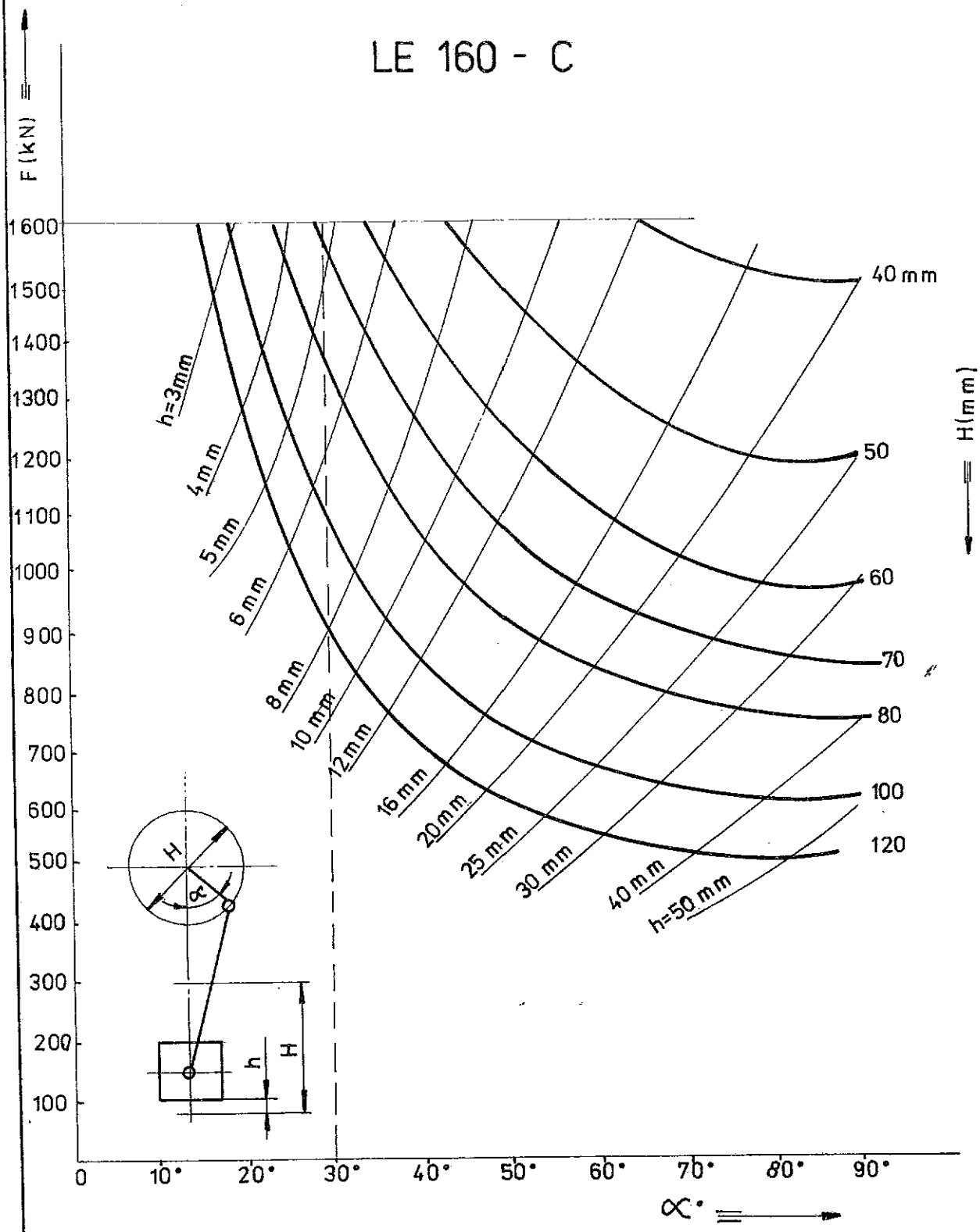
Reserte del pison
Flaxion élastique du coulisseau
Stösselfederung
Ram-springing

Reserte del soporte
Flaxion élastique du ba
Standerfederung
Frame-springing





LE 160 - C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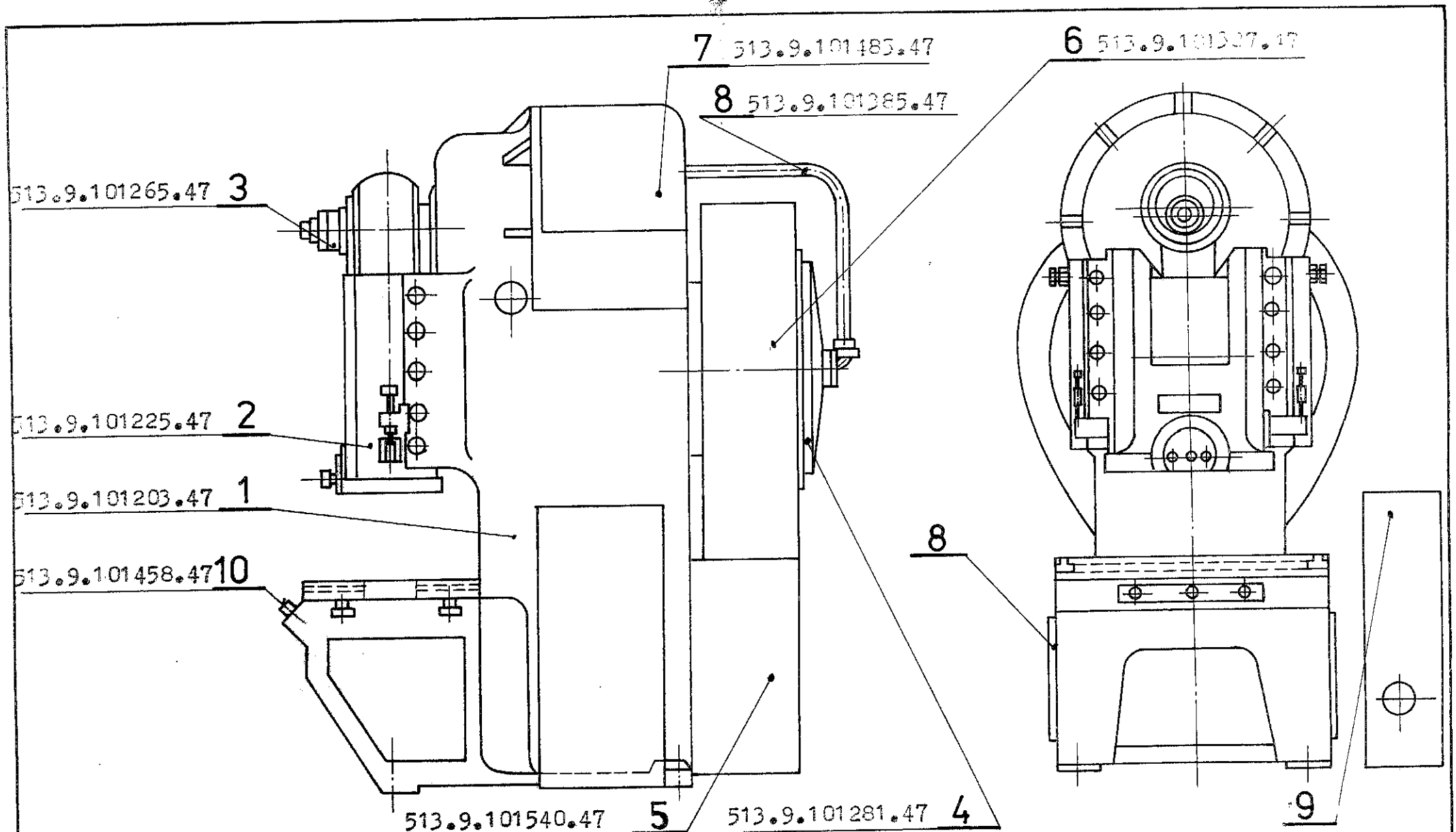
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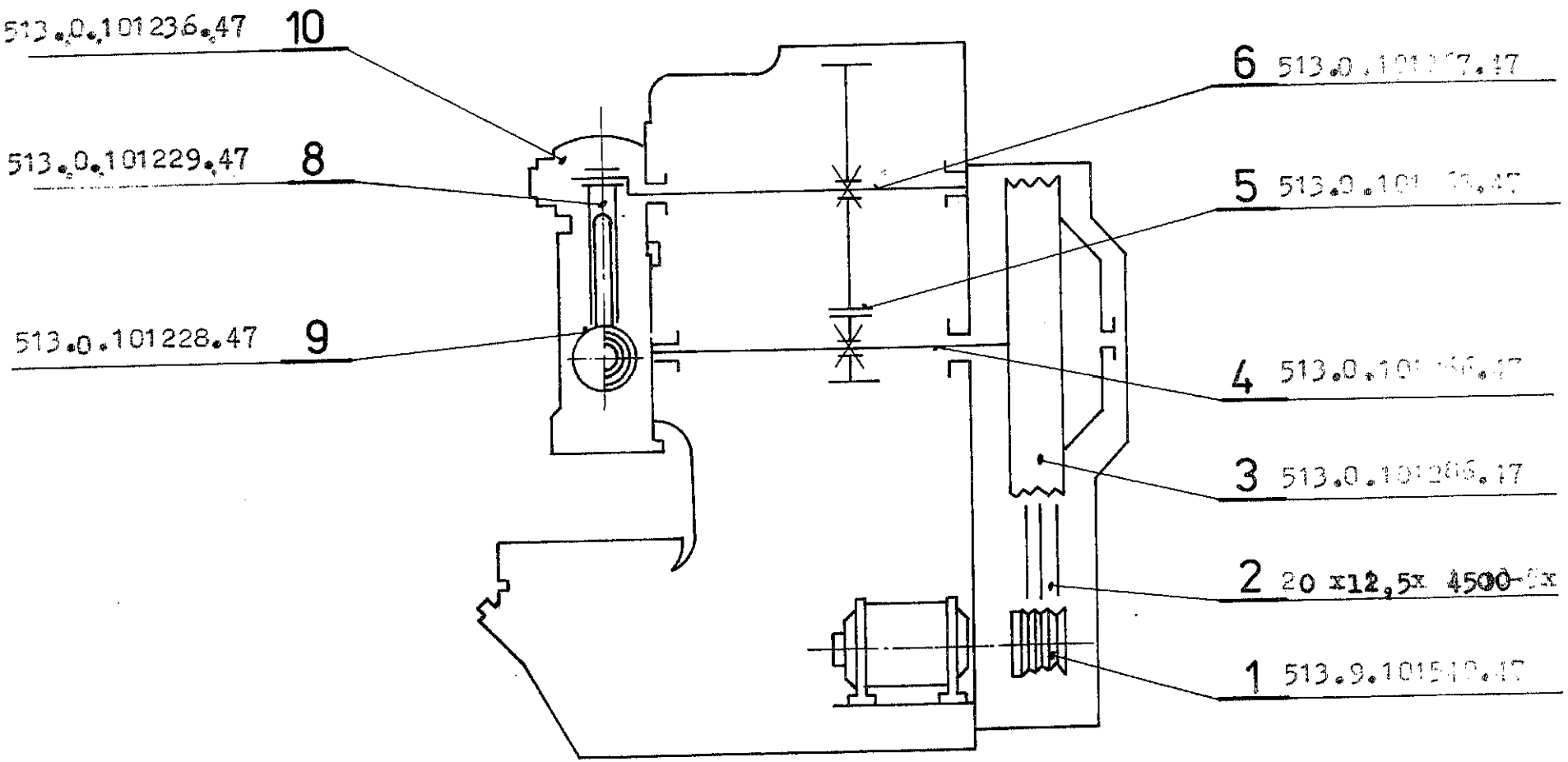
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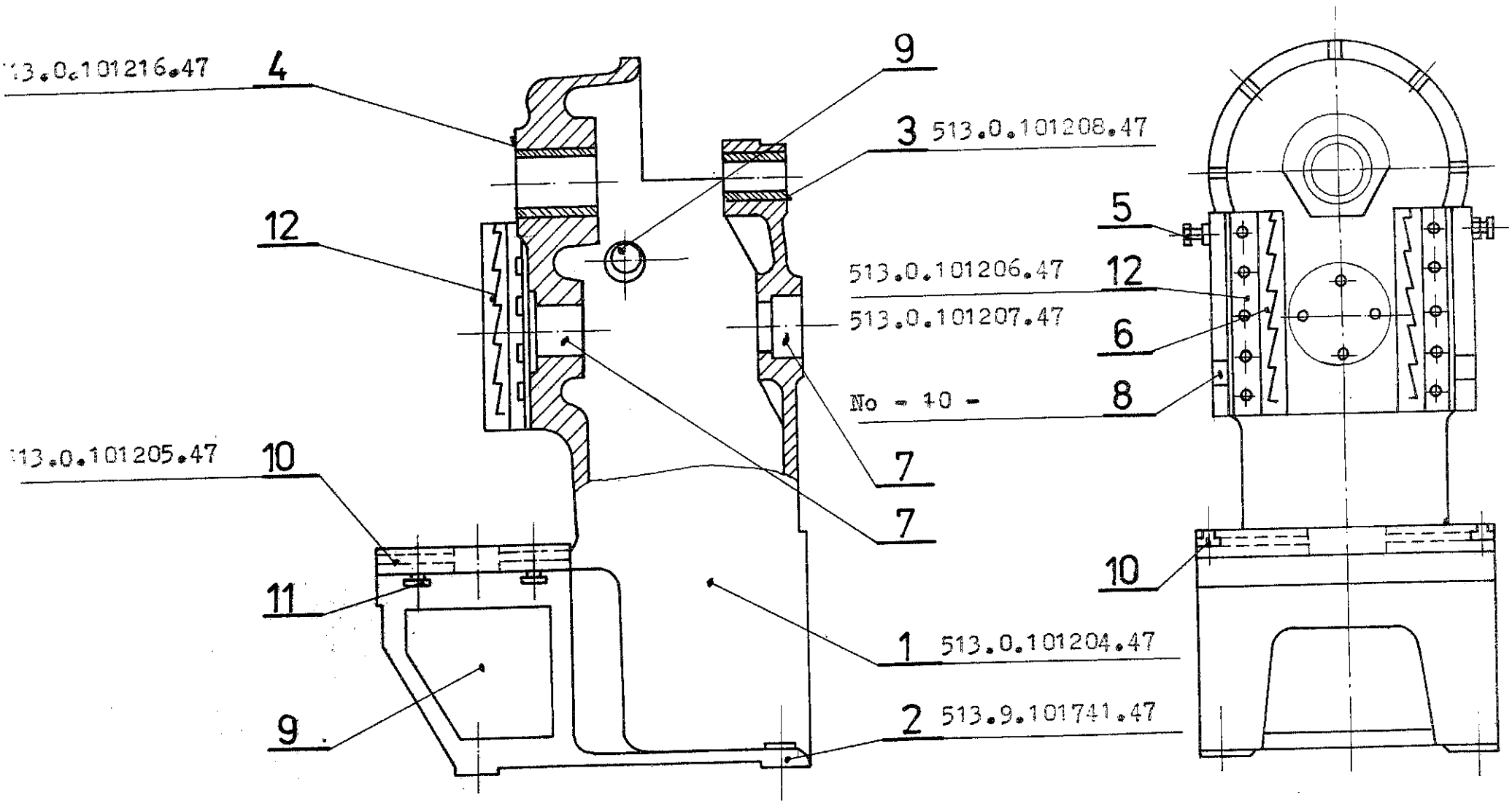
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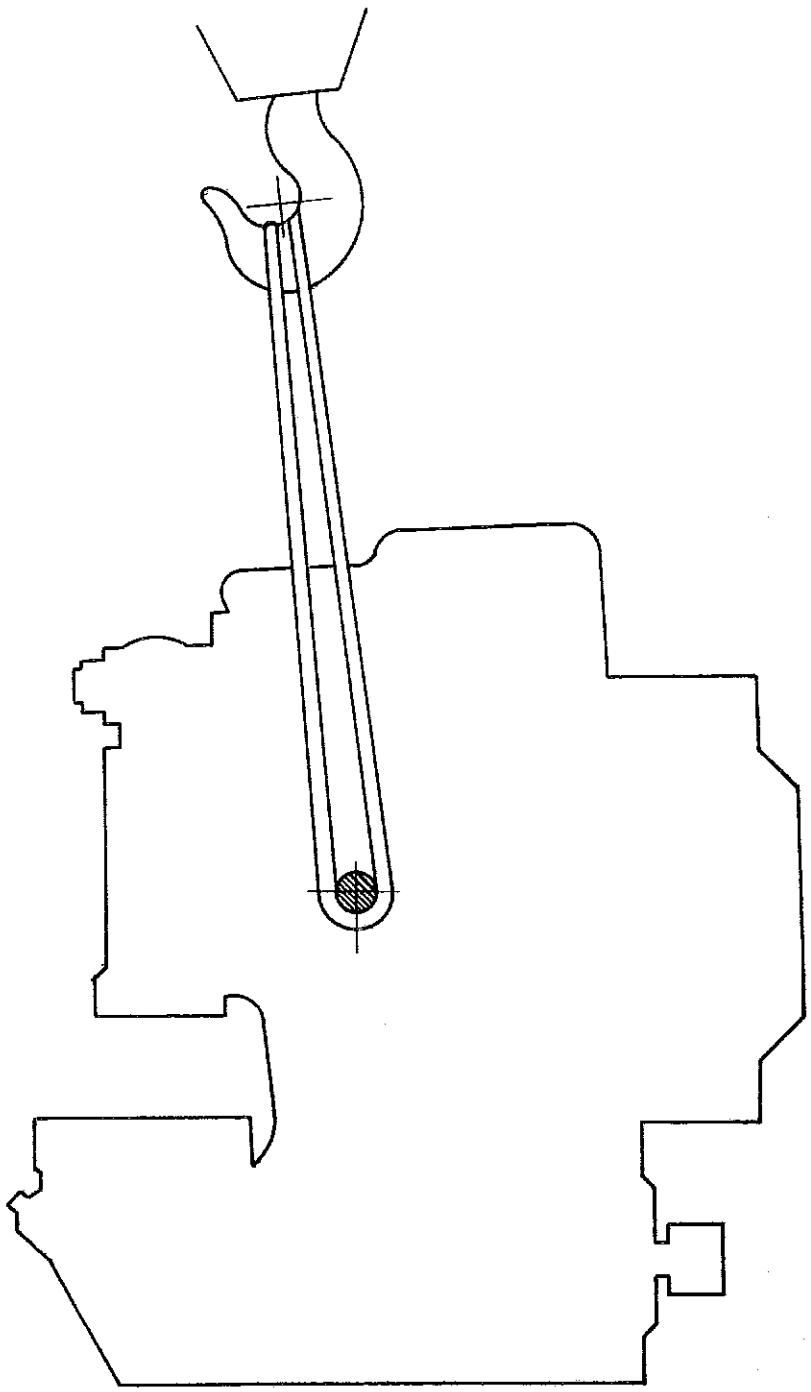

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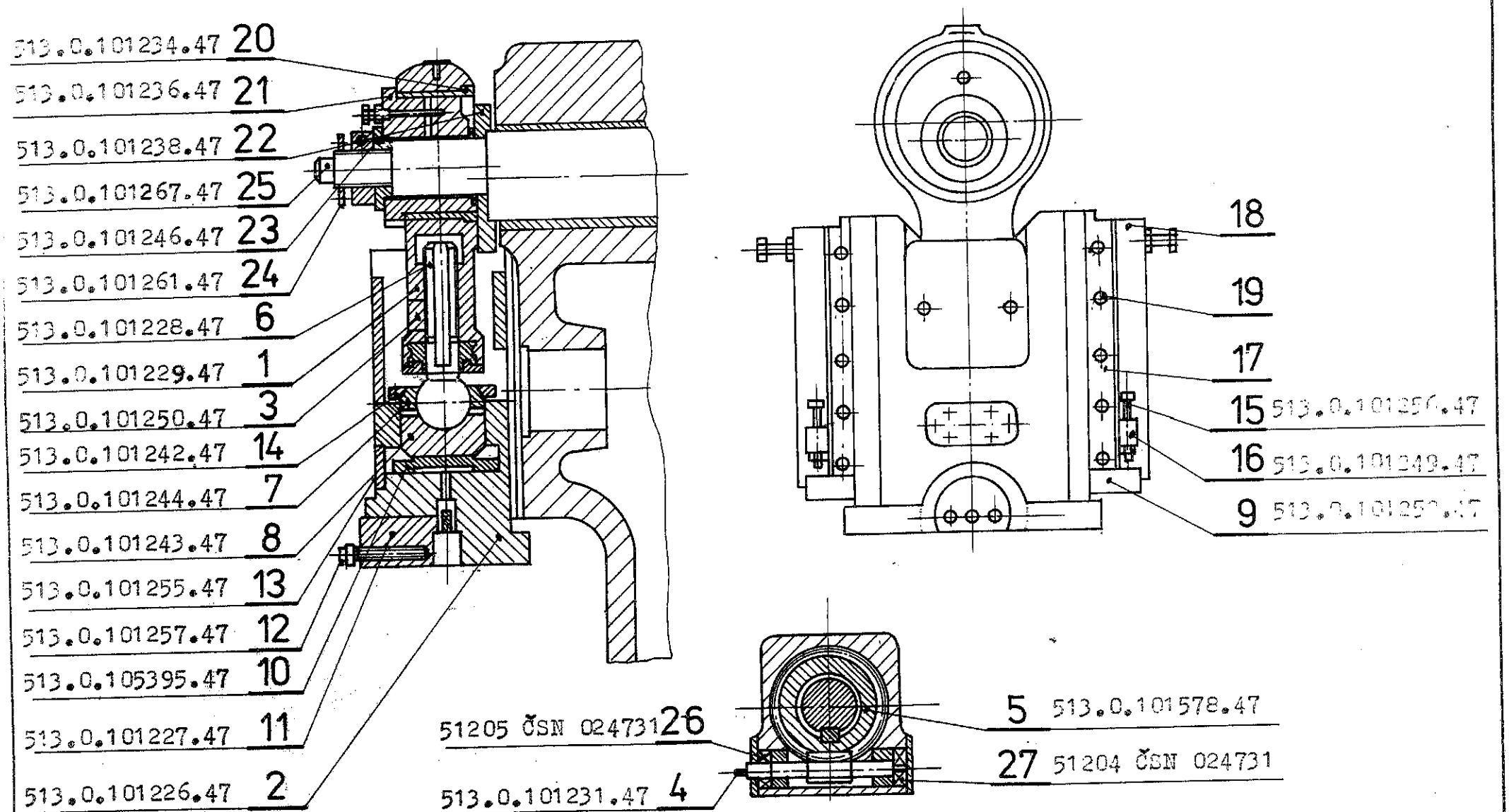
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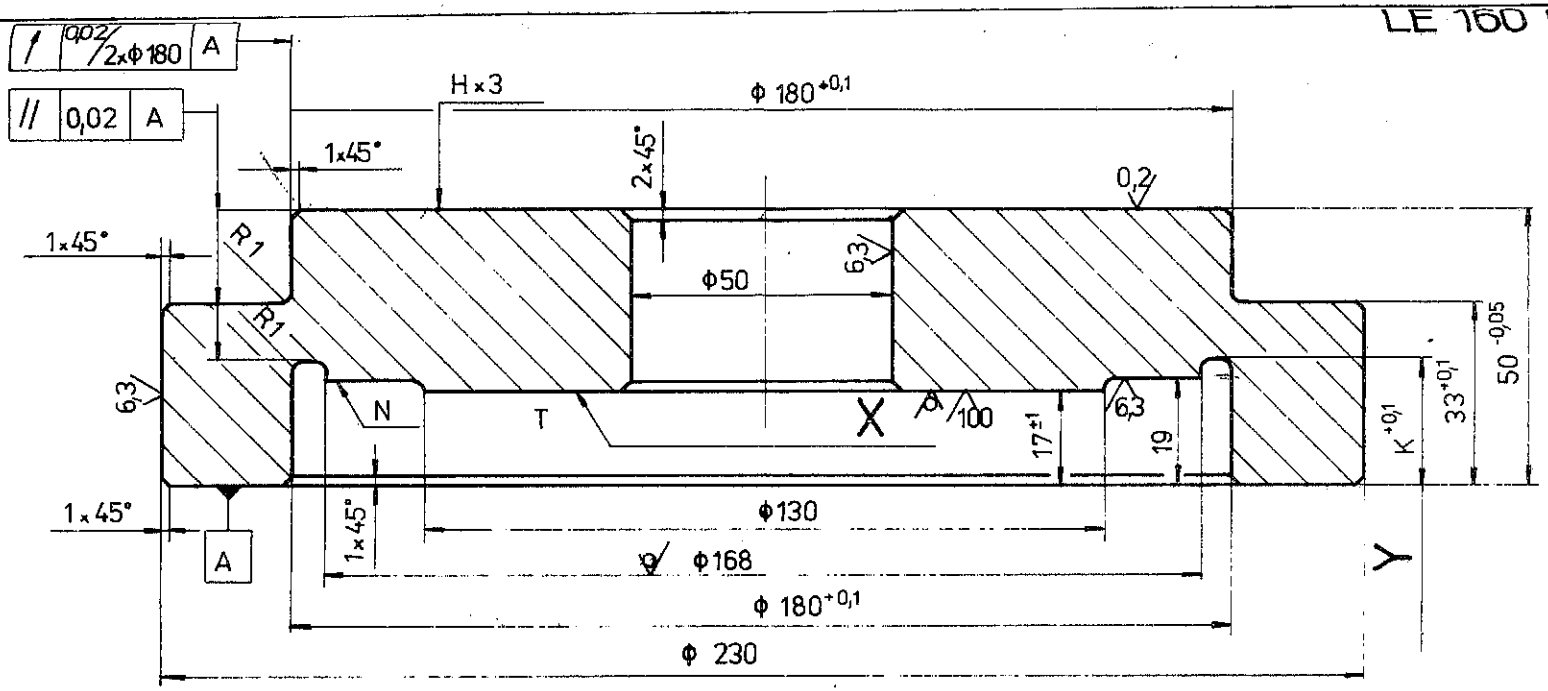
16 513.0.101249.47
9 513.0.101252.47
51205 ČSN 024731 26
513.0.101231.47 4
5 513.0.101578.47
27 51204 ČSN 024731

Nº10



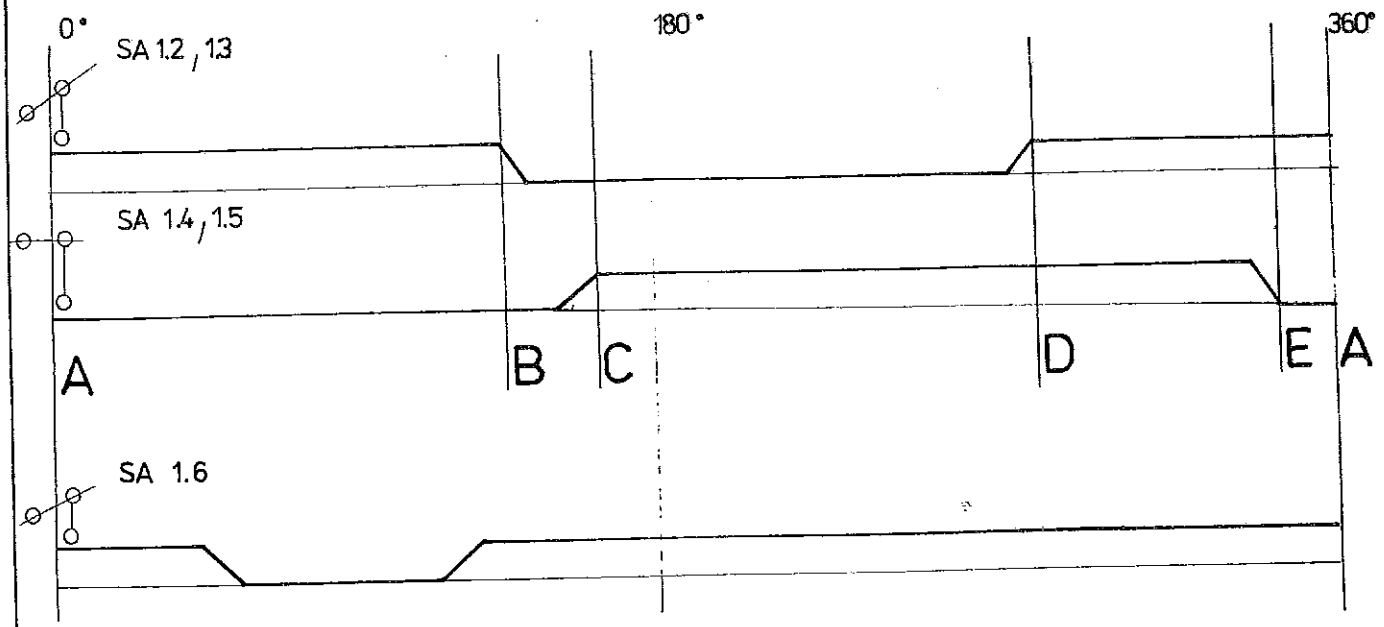
HB	„K+0,1“
170	21,80
171	21,85
172	21,90
173	21,95
174	22,00
175	22,05
176	22,10
177	22,15
178	22,20
179	22,25
180	22,30

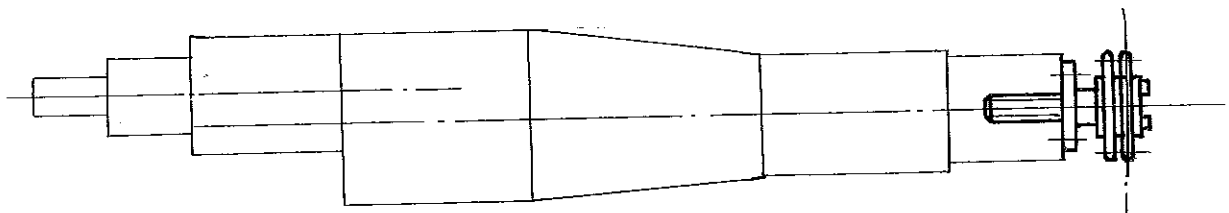
HB	„K+0,1“
181	22,35
182	22,40
183	22,45
184	22,50
185	22,55
186	22,60
187	22,65
188	22,70
189	22,75
190	22,80
191	22,85

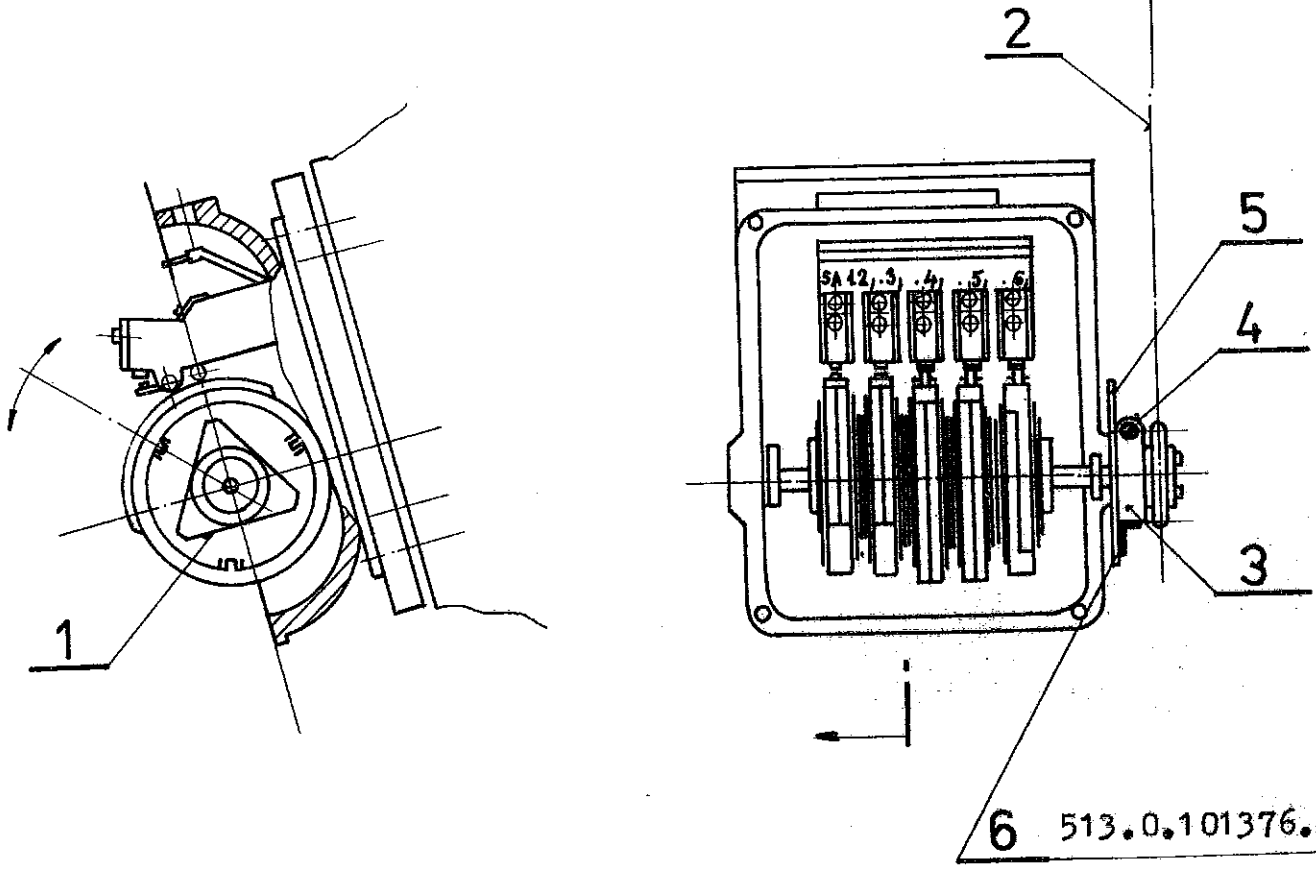
HB	„K+0,1“
192	22,90
193	22,95
194	23,00
195	23,05
196	23,10
197	23,15
198	23,20
199	23,25
200	23,30

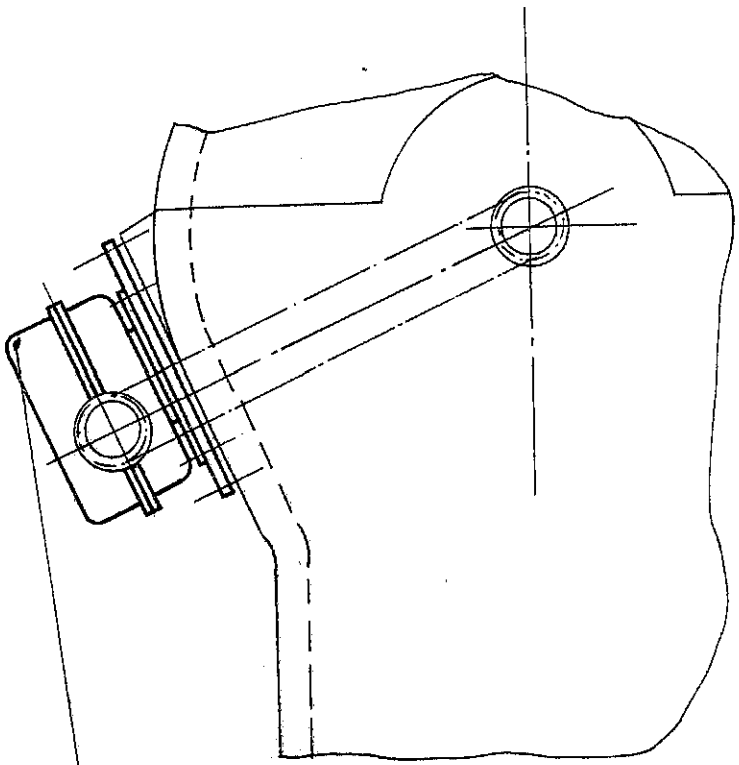
„X“ „Y“

Vyliate číslo tavby a text LE 160 C, písmo 1	Podľa tabuľky
Melt number and wording LE 160 C, lettering 10 mm	According to the table
Ausgegosene Nummer der Schmelze und der Text LE 160C, Schrift 10 mm	Gemäss der Tabel
Numéro coulé de la fonte et le texte LE 160 C, lettres 10 mm	Selon la table
Número colado de la hornada y el texto LE 160 C, escritura 10 mm	Según la tabla


0°
180°
360°
SA 1.2 / 1.3
SA 1.4 / 1.5
SA 1.6
A
B
C
D
E
A



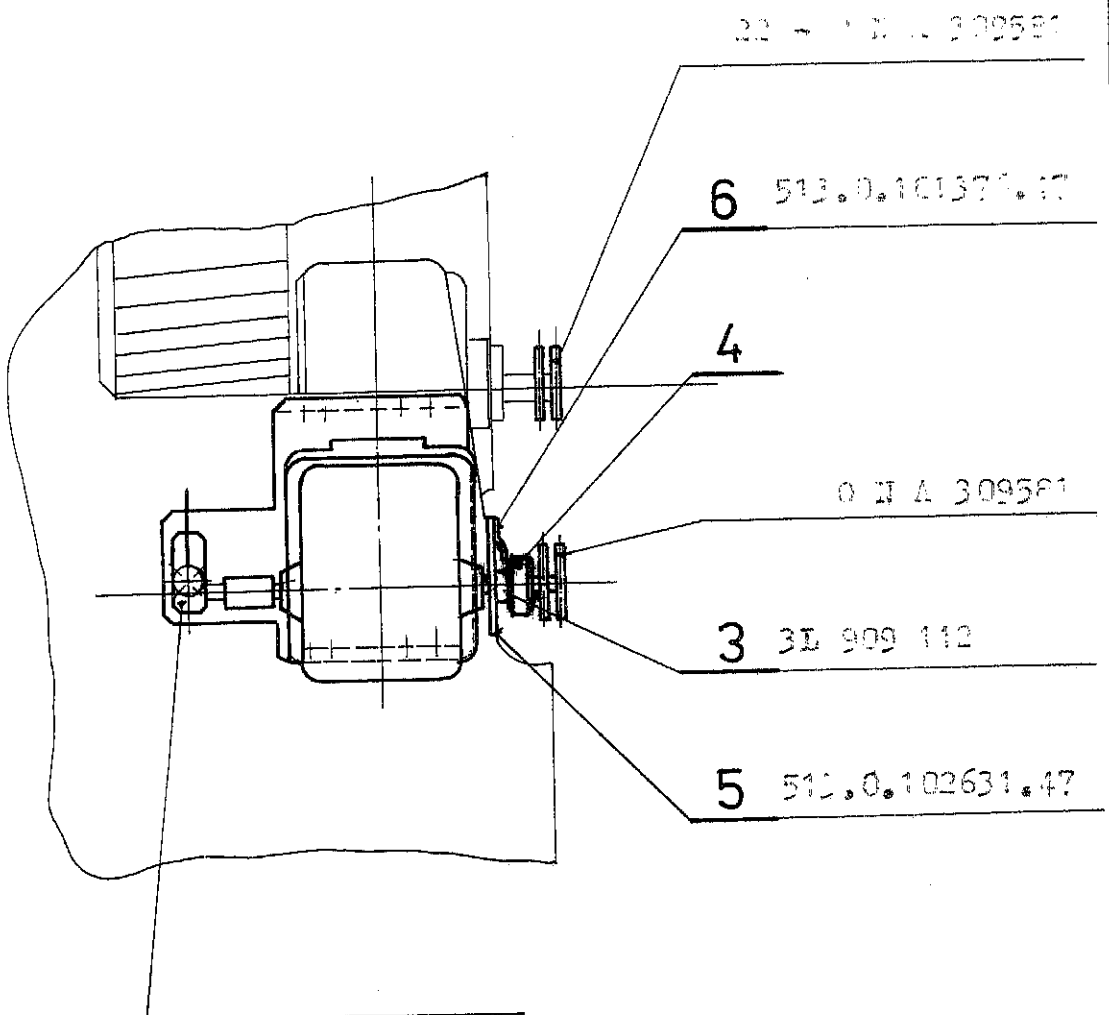

2
1
5
4
3
6
SA 1.2 . 3 . 4 . 5 . 6
513.0.101376.47



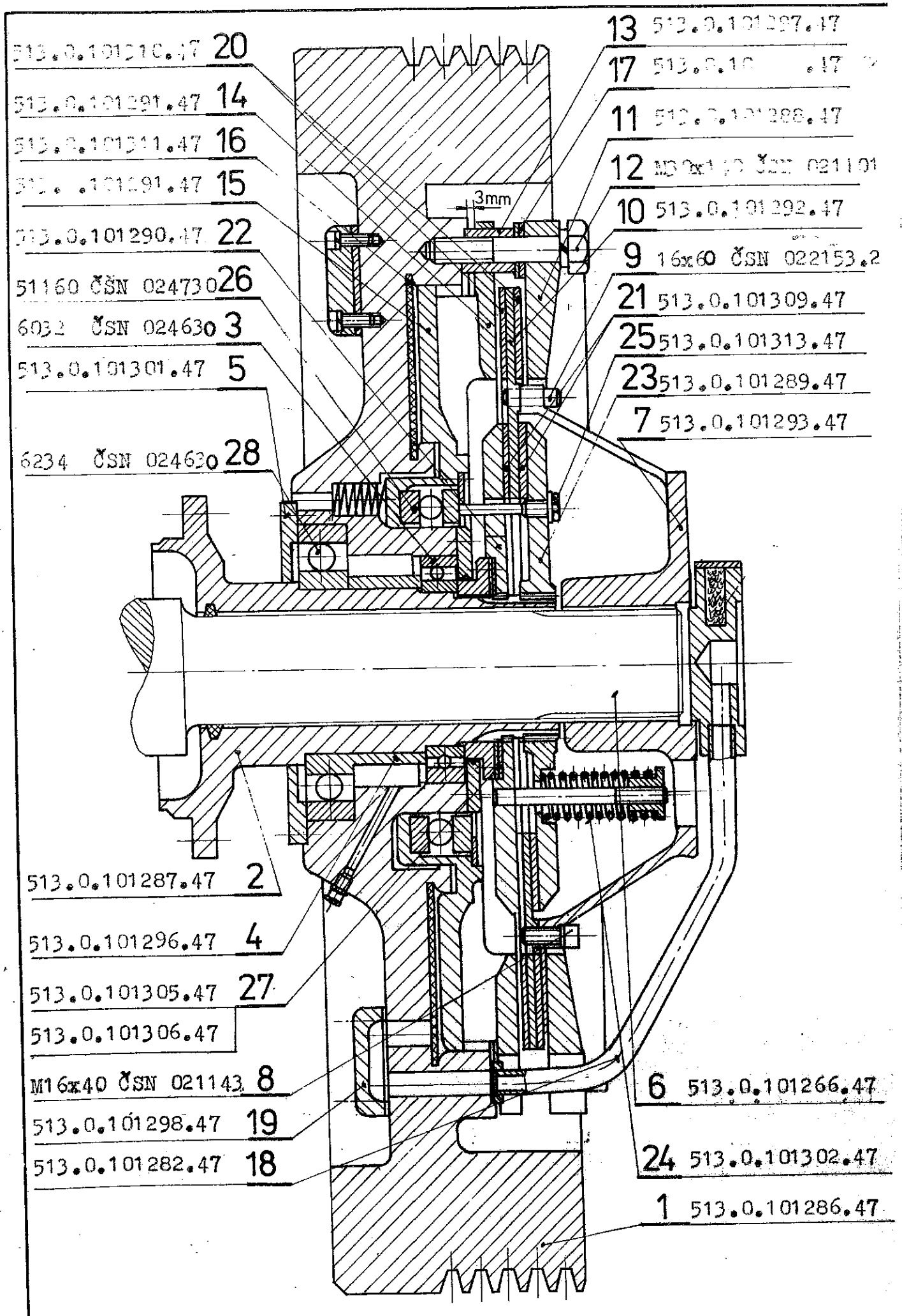
VH1 F05

ČSN 02 3311

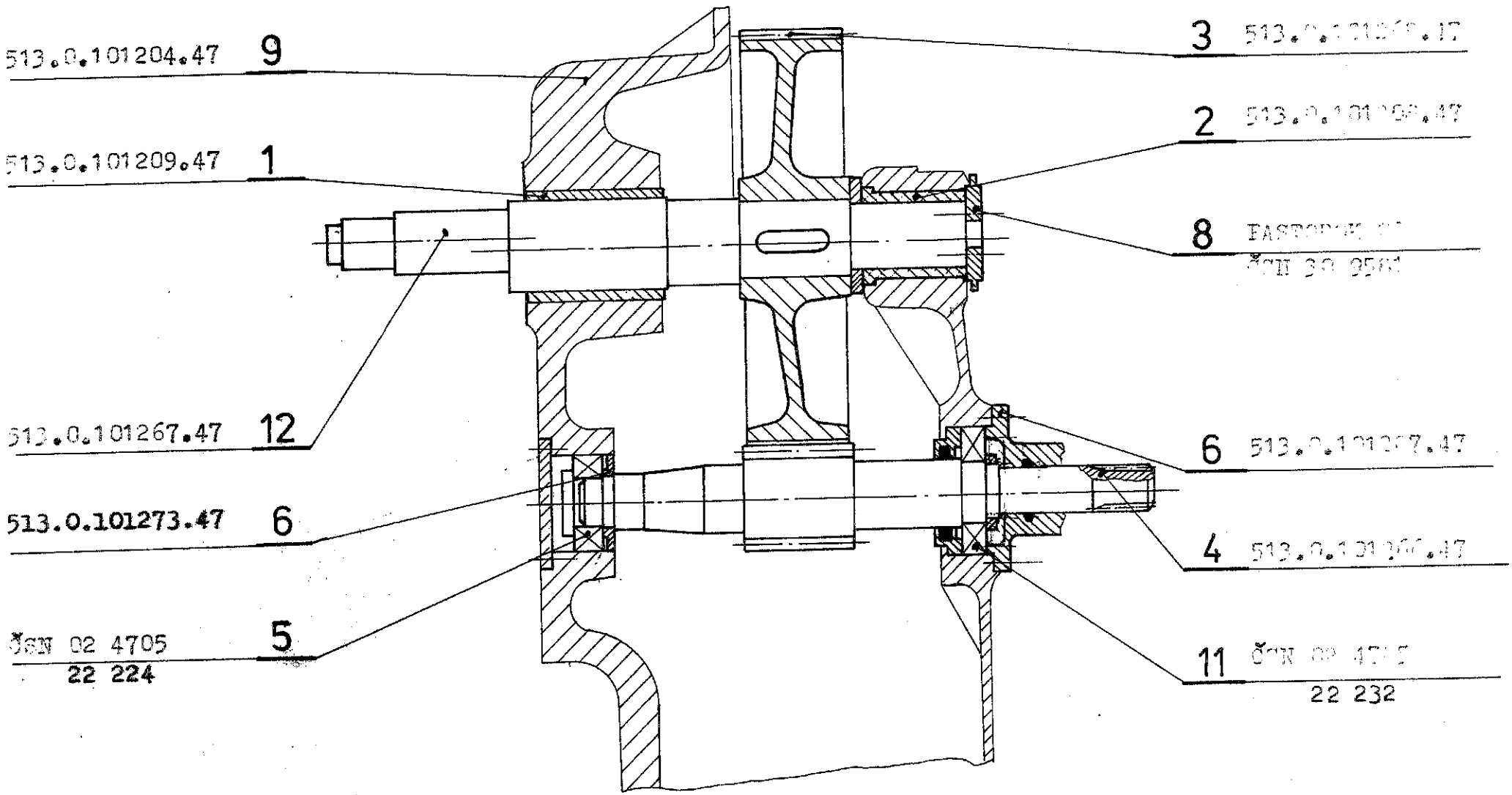
1 x 12,7 x 3,3



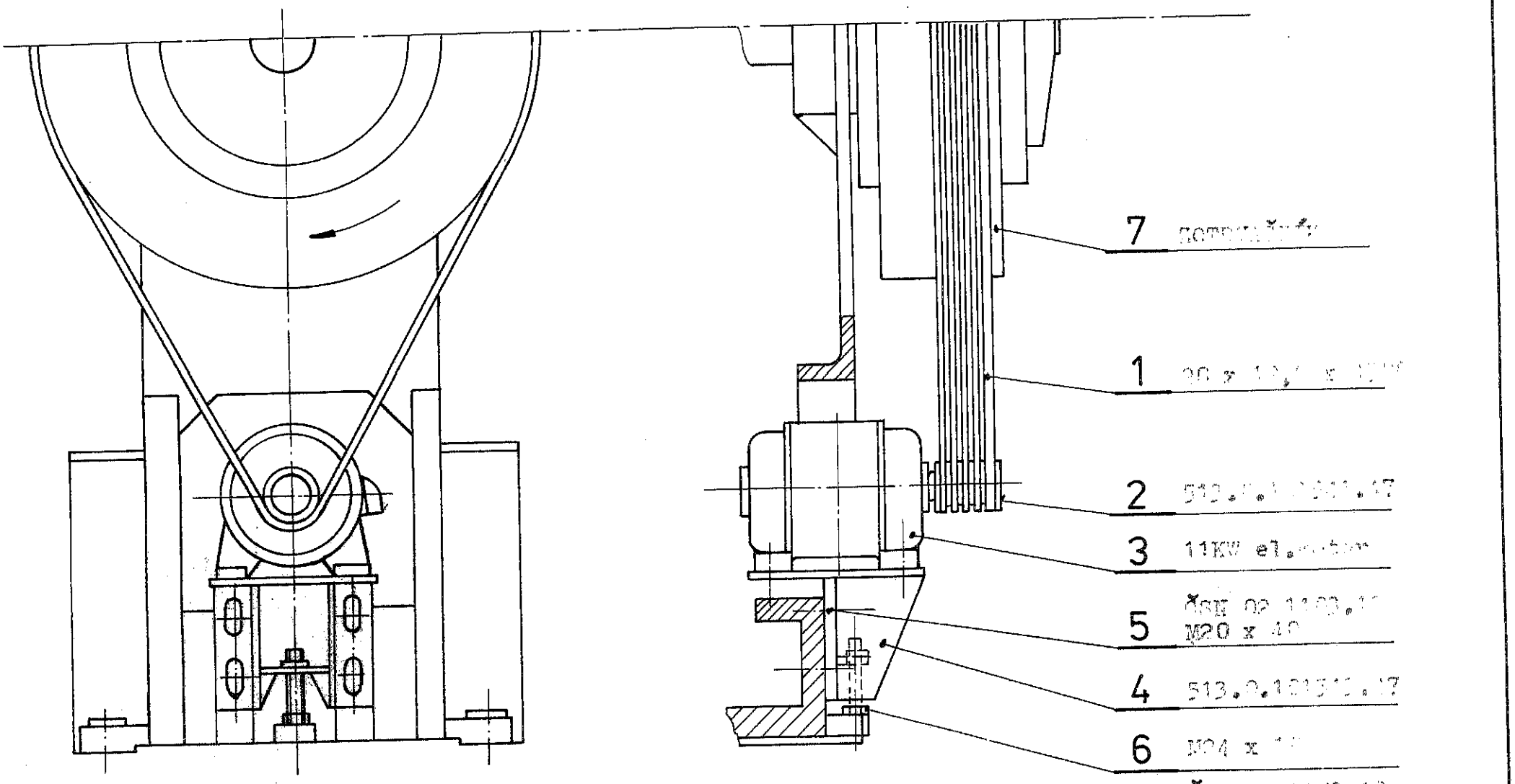
ON 12 C 6522


513.0.101310.47 20
513.0.101291.47 14
513.0.101311.47 16
513.0.101291.47 15
513.0.101290.47 22
51160 ČSN 024730 26
6032 ČSN 024630 3
513.0.101301.47 5
6234 ČSN 024630 28
513.0.101287.47 2
513.0.101296.47 4
513.0.101305.47 27
513.0.101306.47
M16x40 ČSN 021143 8
513.0.101298.47 19
513.0.101282.47 18
13 513.0.101297.47
17 513.0.10 .47
11 513.0.101288.47
12 M 2x1 ČSN 021101
10 513.0.101292.47
9 16x60 ČSN 022153.2
21 513.0.101309.47
25 513.0.101313.47
23 513.0.101289.47
7 513.0.101293.47
3mm
6 513.0.101266.47
24 513.0.101302.47
1 513.0.101286.47

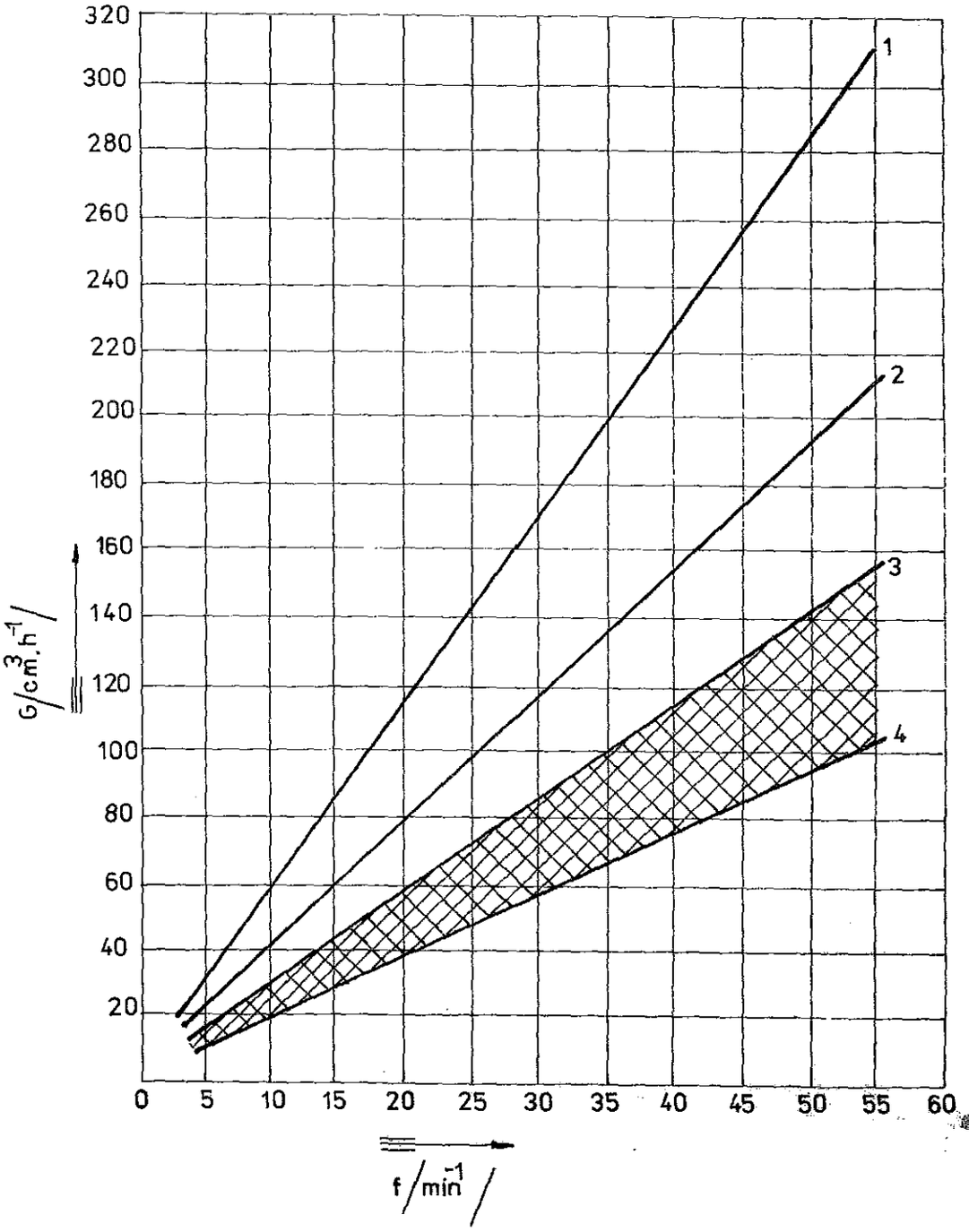
Nº 14

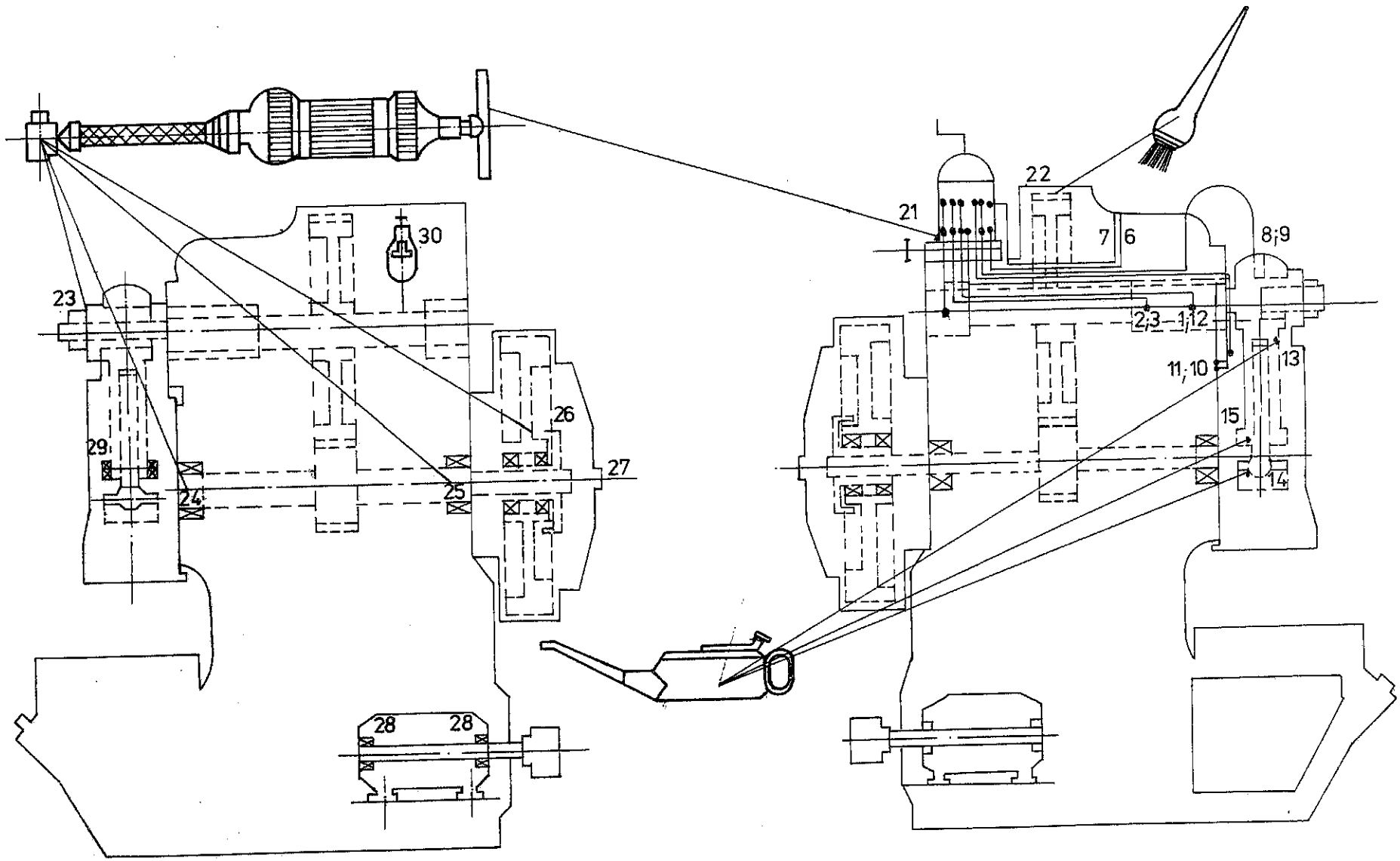

513.0.101204.47 9
513.0.101209.47 1
513.0.101267.47 12
513.0.101273.47 6
ČSN 02 4705 5
22 224
3
2
8
6
4
11
22 232

N°15

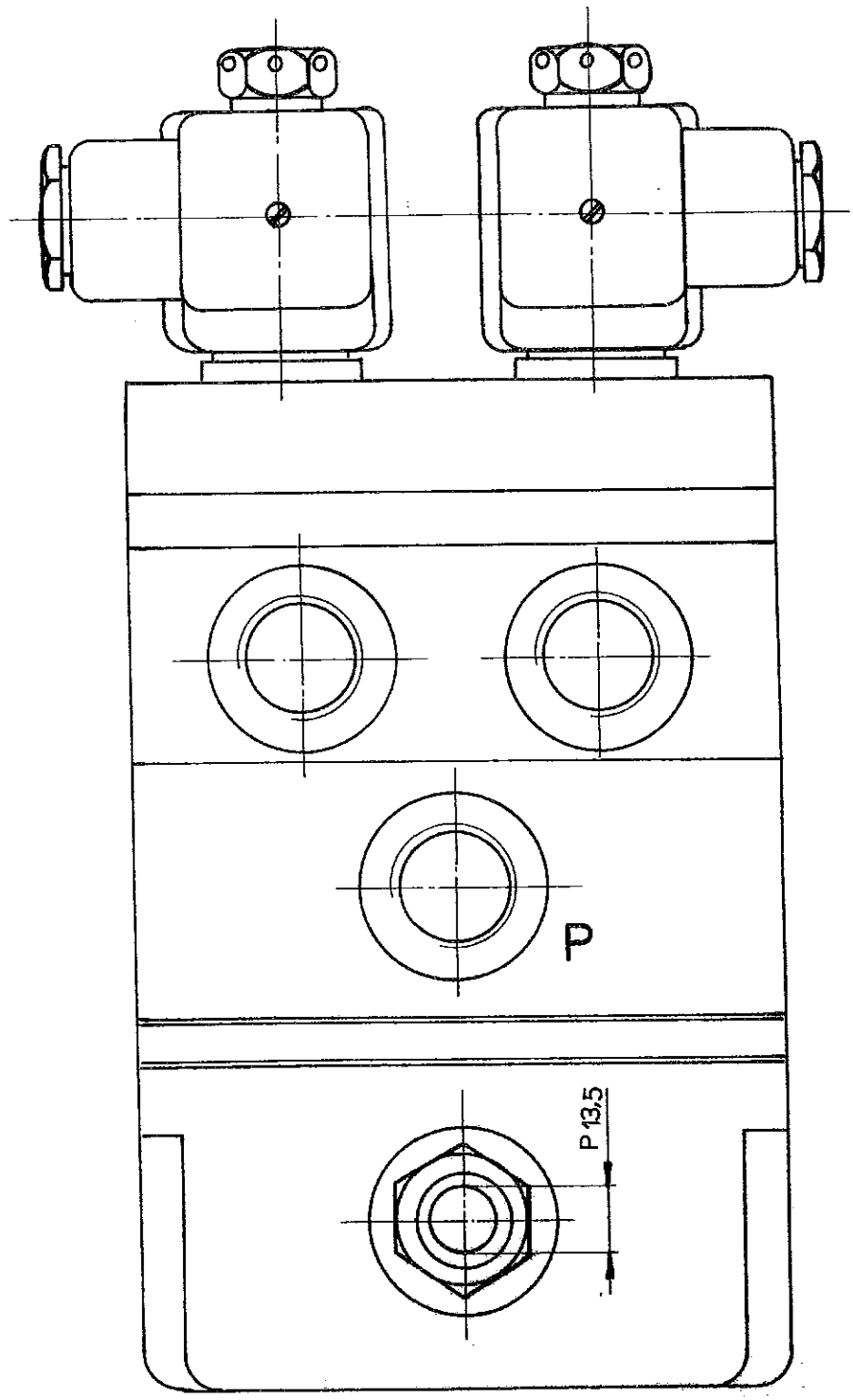


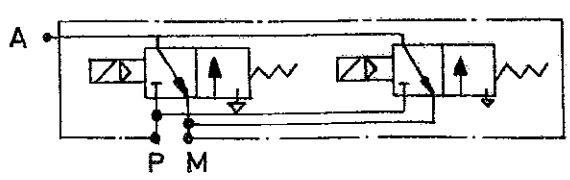
Nº 16


320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
5
10
15
20
25
30
35
40
45
50
55
60
1
2
3
4
G/cm³.h⁻¹
f/min⁻¹

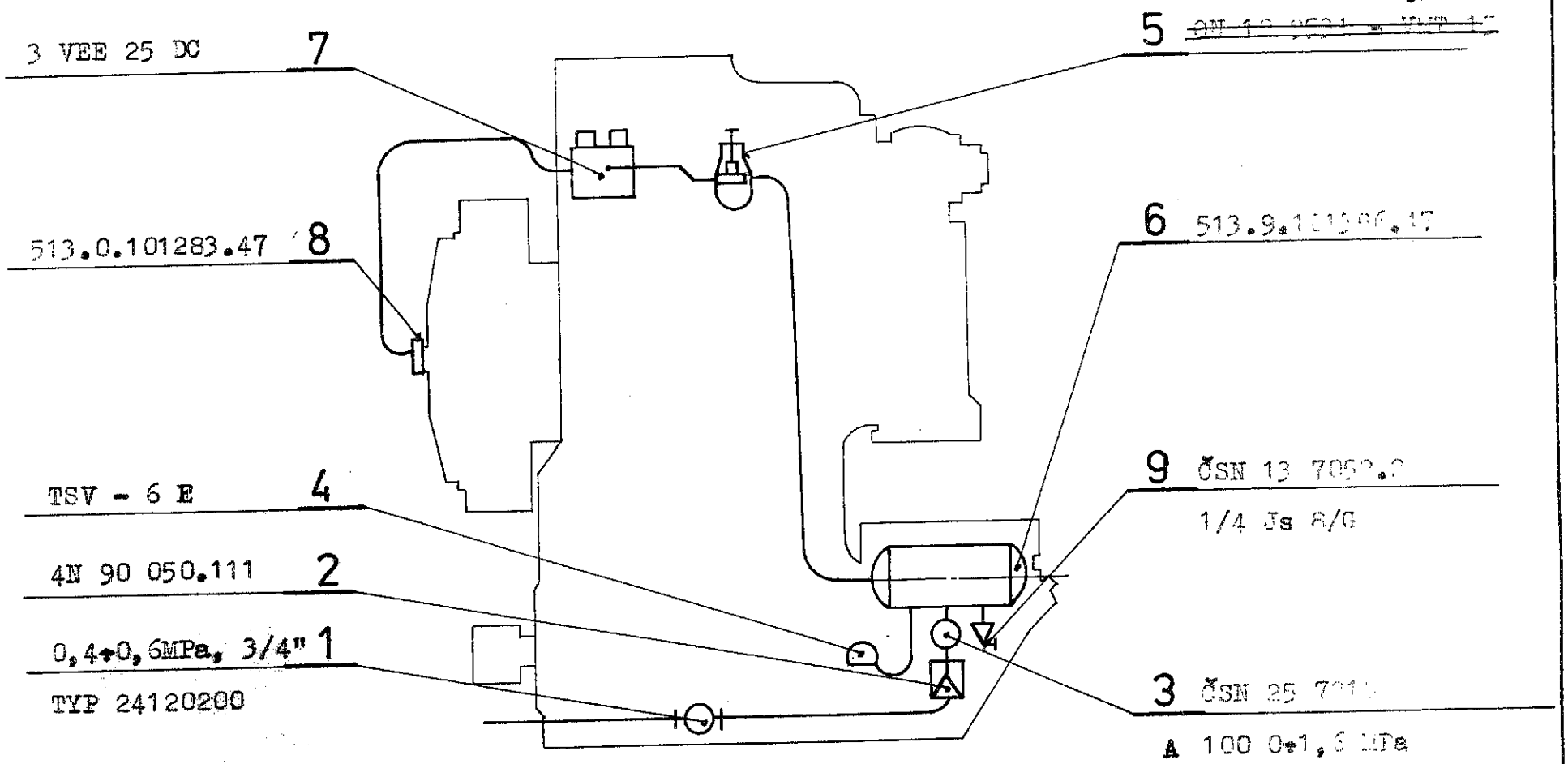


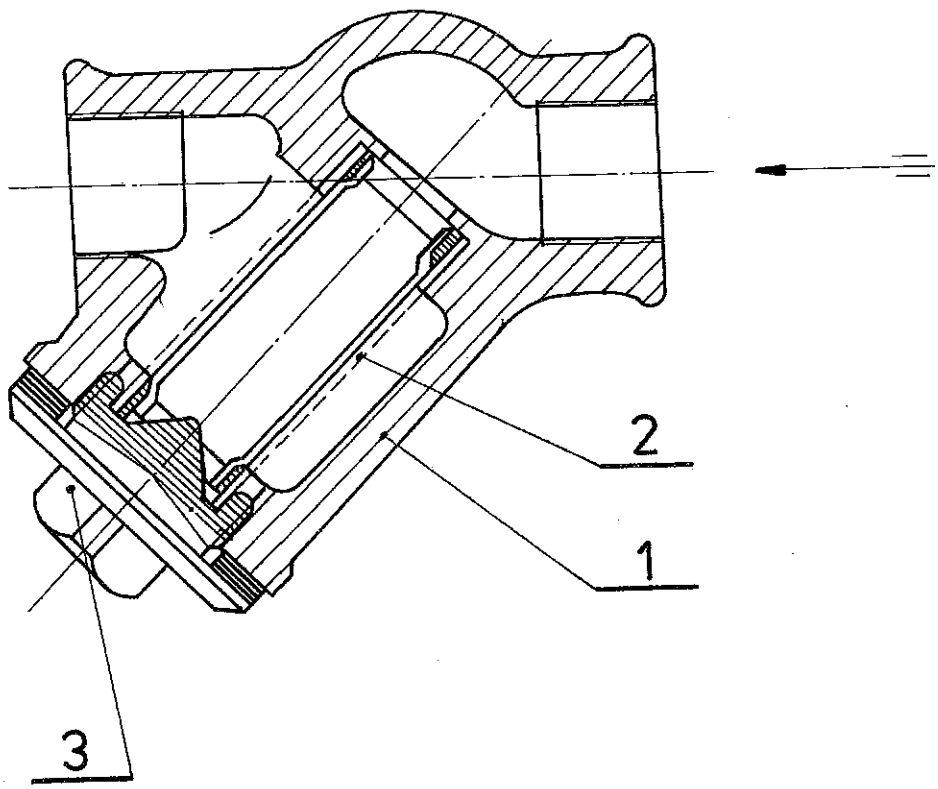
Nº 18

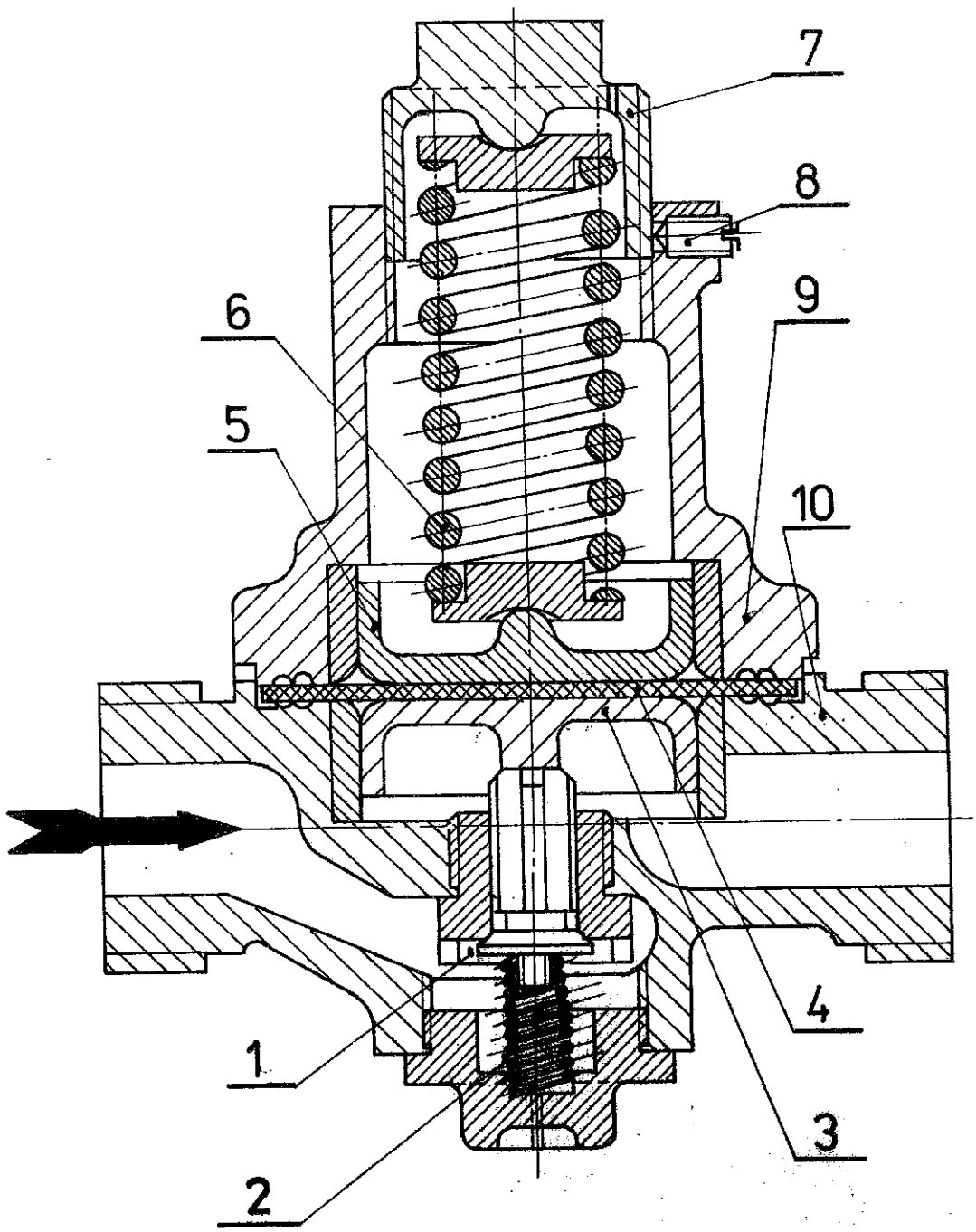

P
P 13,5


A
P
M

OP 16

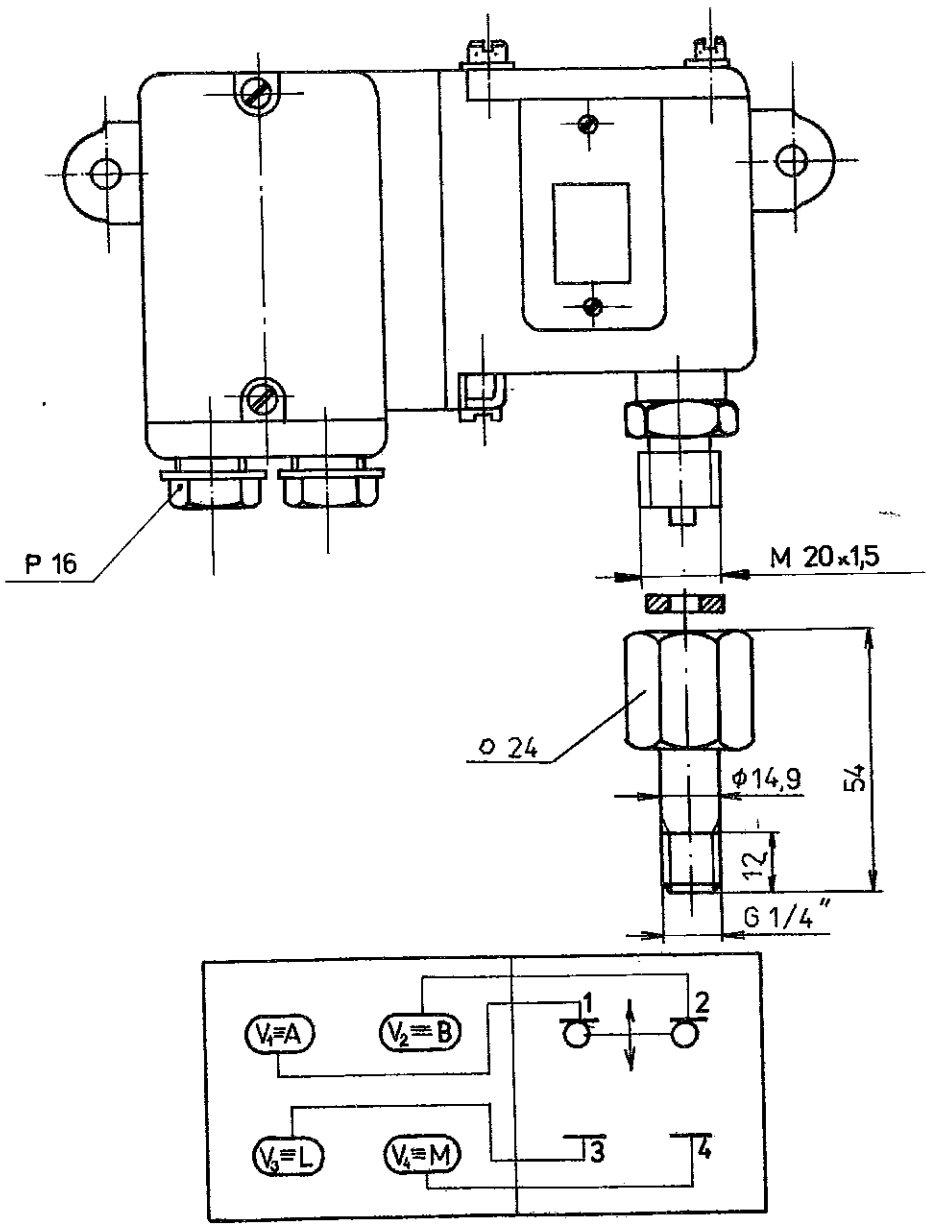

3 VEE 25 DC
7
5
513.0.101283.47
8
6
TSV - 6 E
4
9 ČSN 13
1/4 Js 6/G
4N 90 050.111
2
0,4÷0,6MPa, 3/4"
1
TYP 24120200
3 ČSN 25
A 100 0÷1,6 MPa

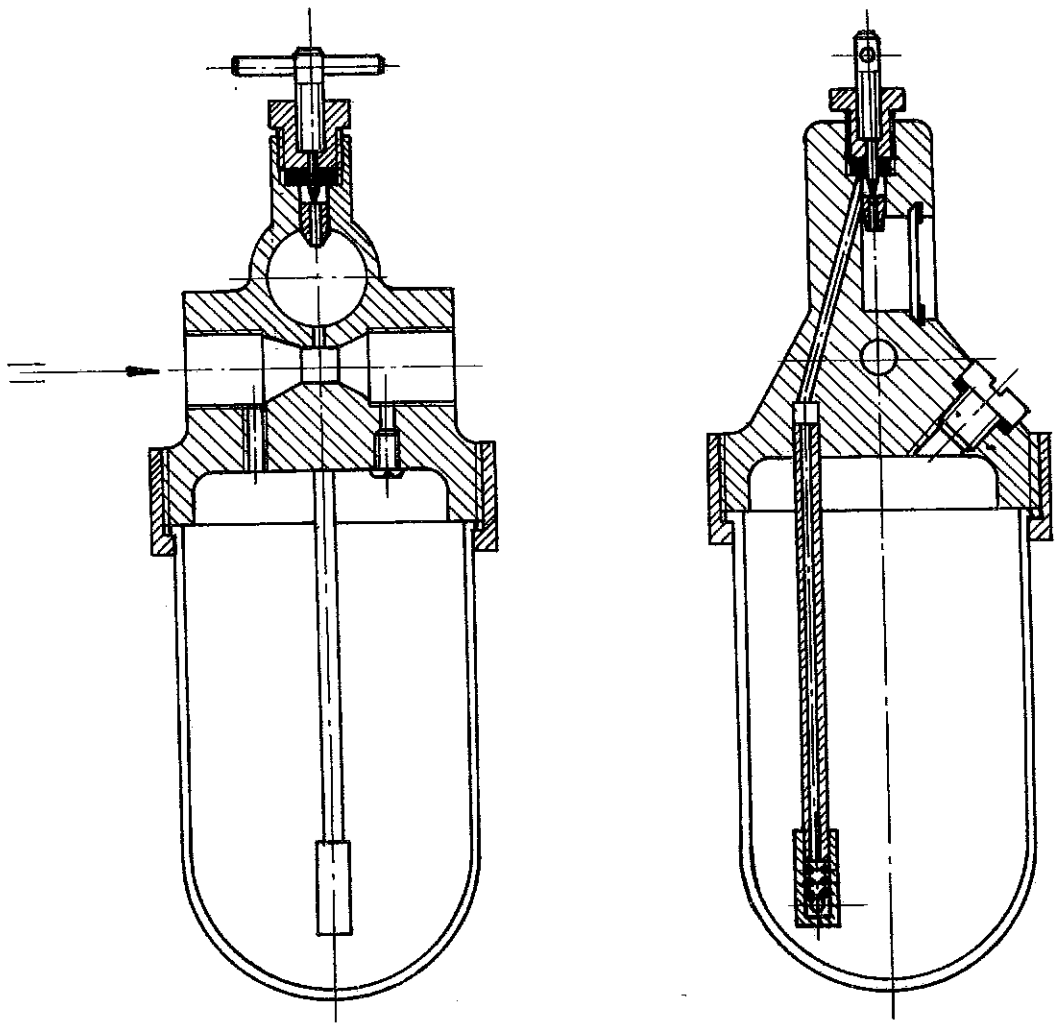

2
1
3

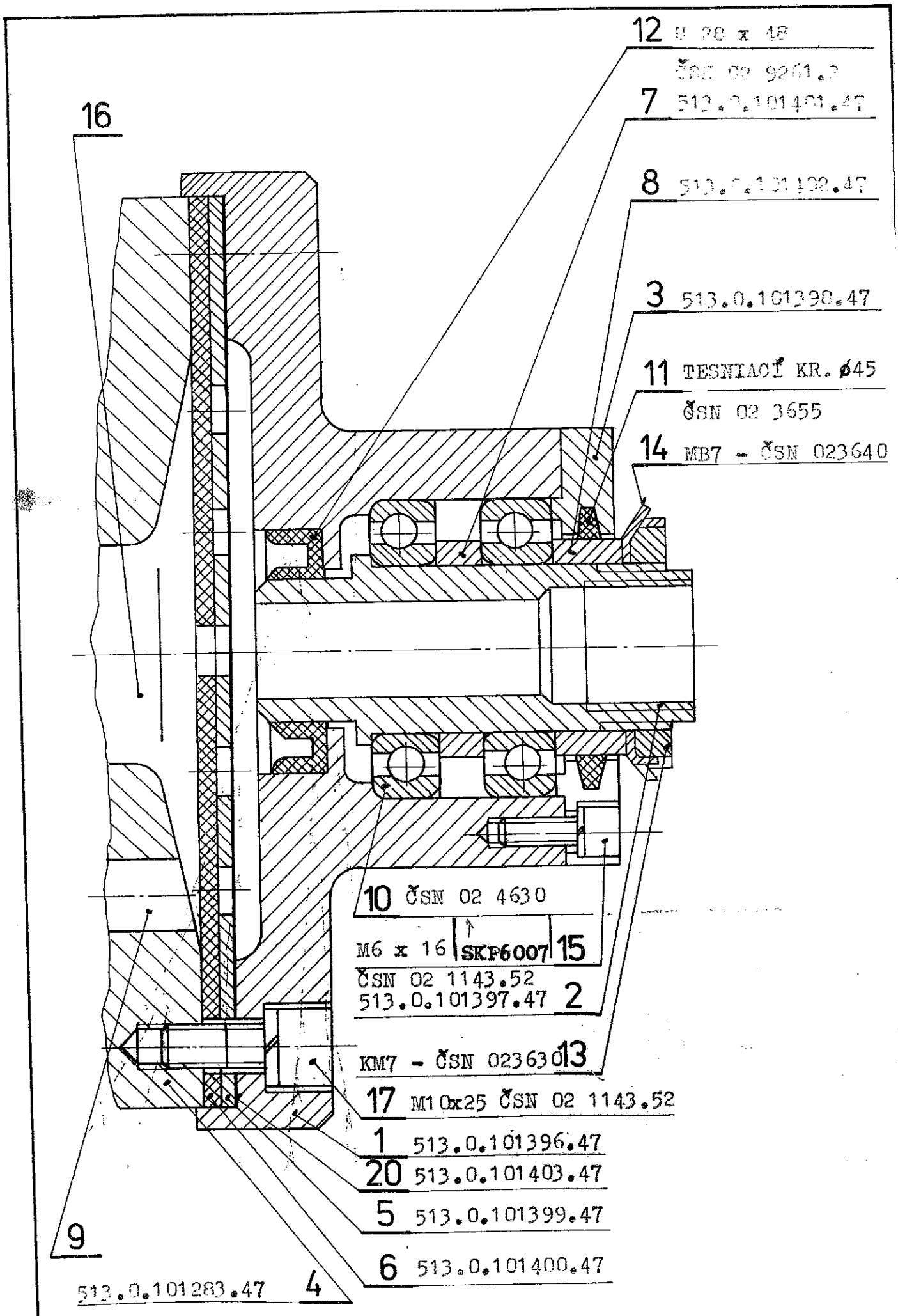


N° 24

TSV – 6E

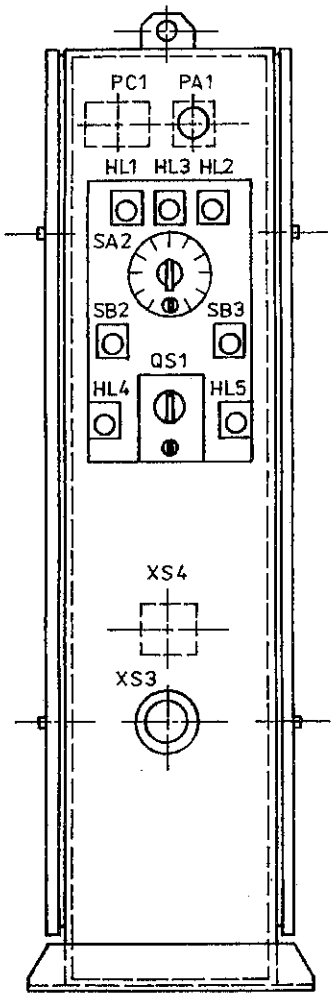


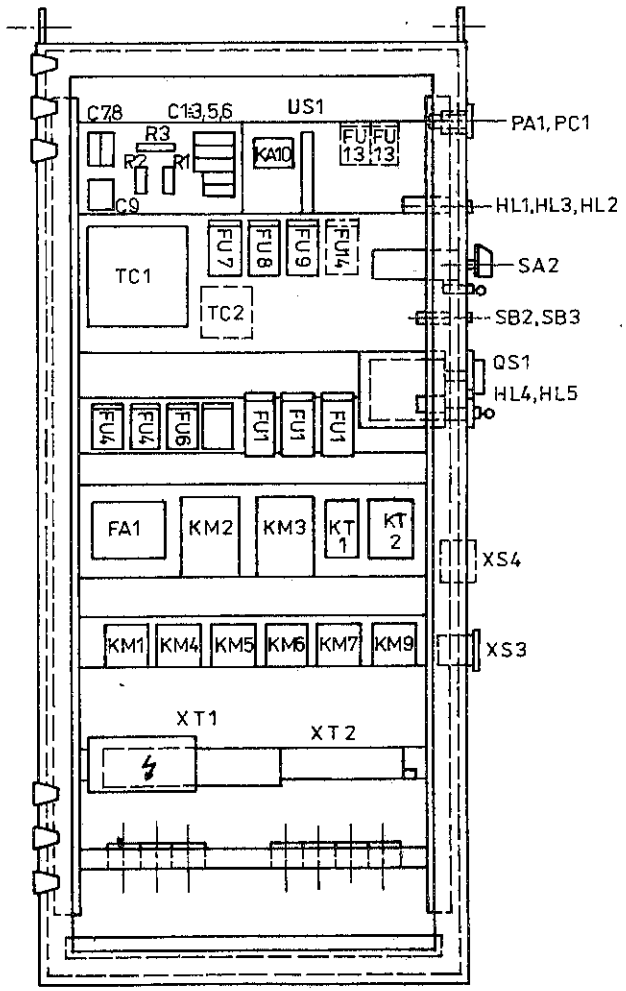


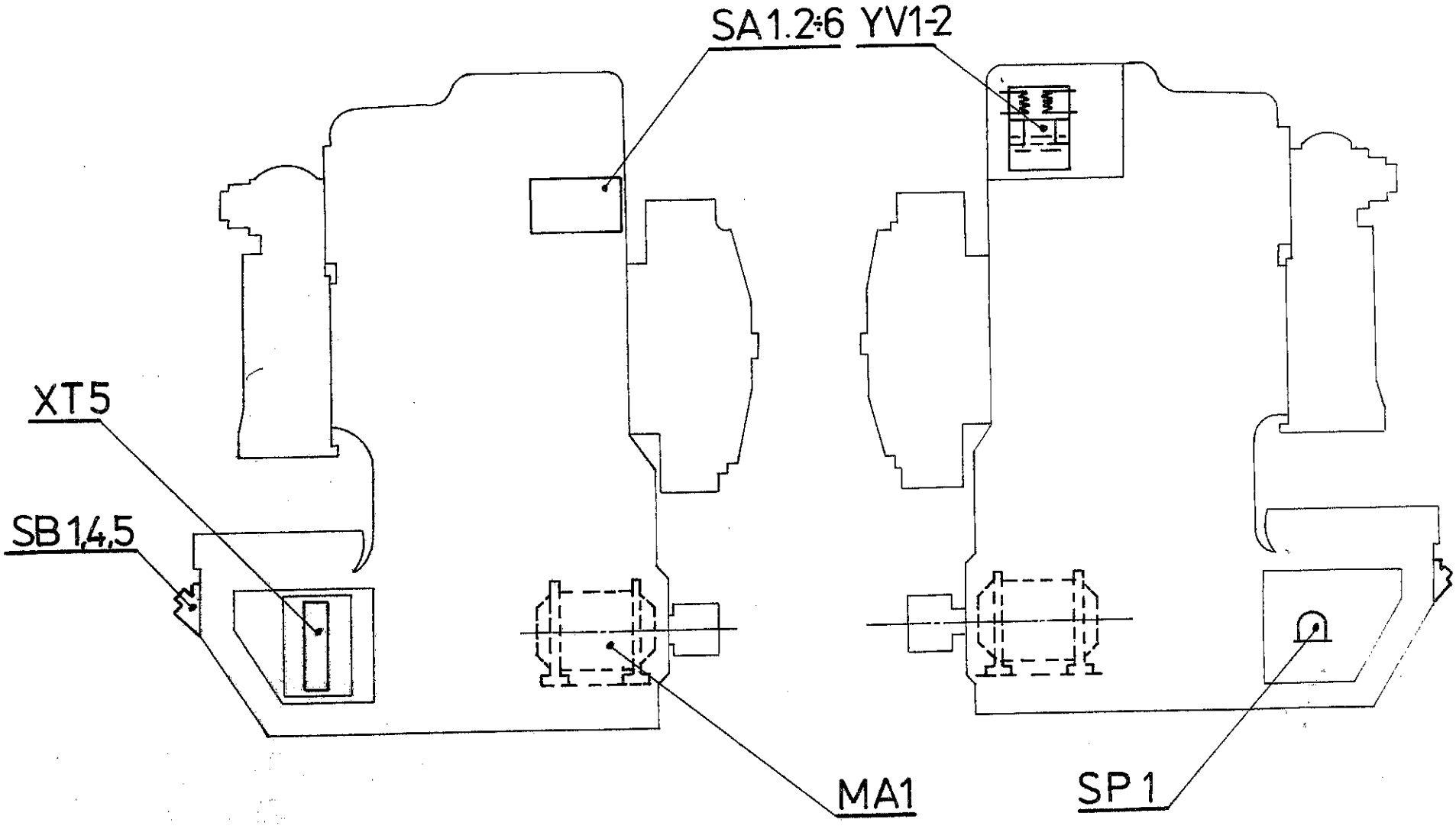

12 U 28 x 18
ČSN 02 9201.2
7 513.0.101401.47
16
8 513.0.101402.47
3 513.0.101398.47
11 TESNIACI KR. ø45
ČSN 02 3655
14 MB7 - ČSN 023640
10 ČSN 02 4630
M6 x 16
SKF6007
15
ČSN 02 1143.52
513.0.101397.47
2
KM7 - ČSN 023630
13
17 M10x25 ČSN 02 1143.52
1 513.0.101396.47
20 513.0.101403.47
5 513.0.101399.47
6 513.0.101400.47
9
513.0.101283.47
4

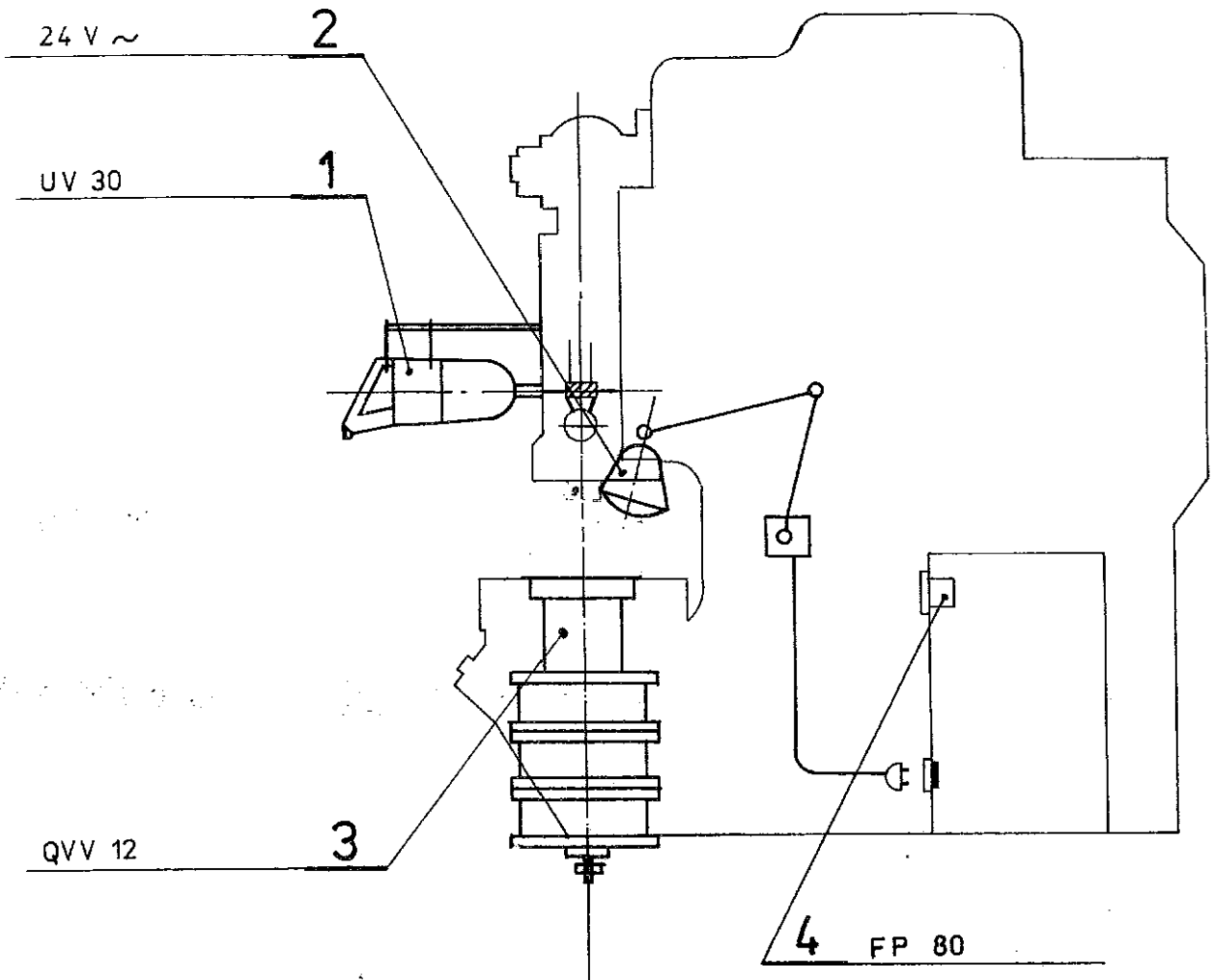
N° 27

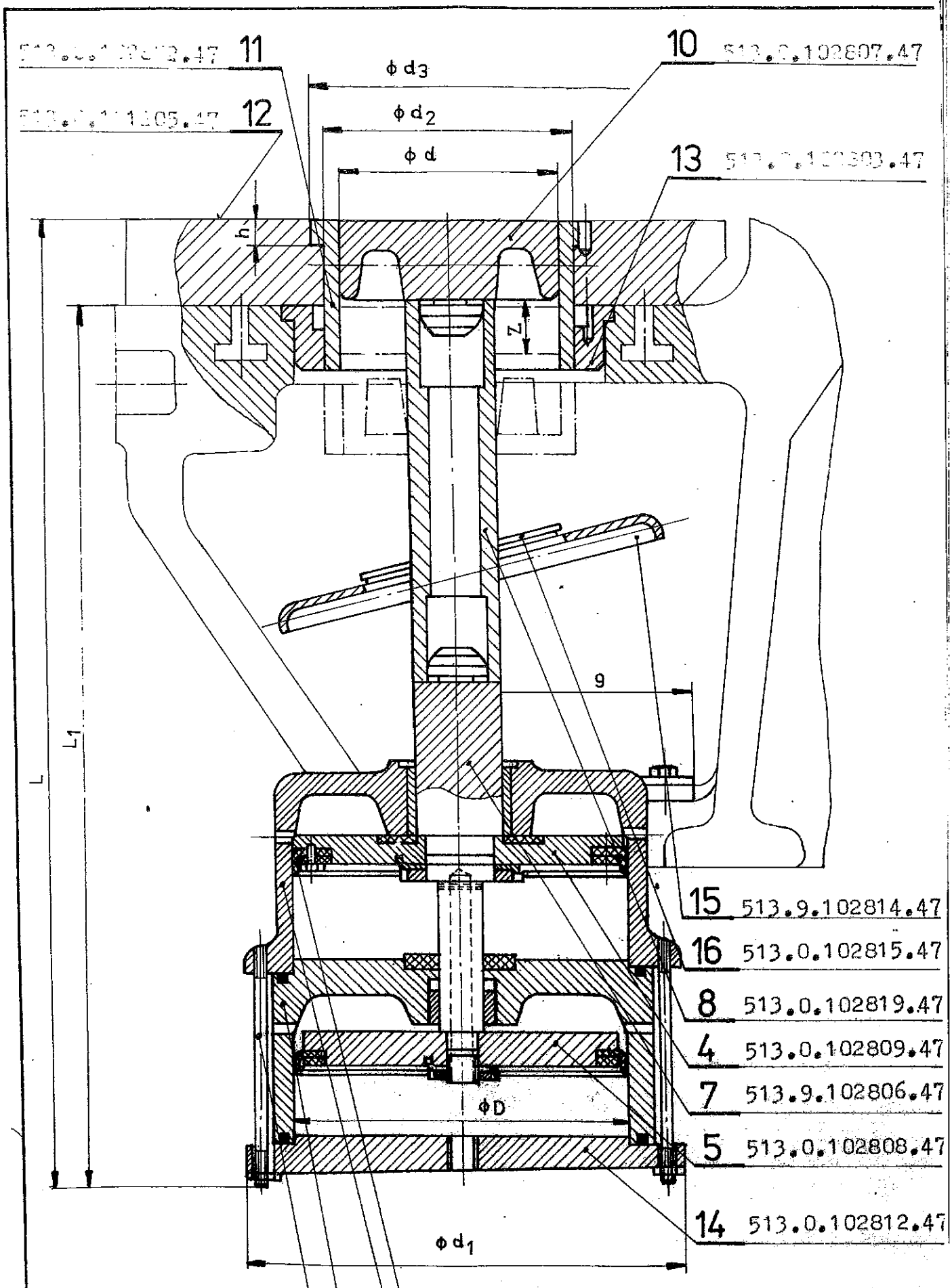
ZVLÁŠTNE PRÍSLUŠENSTVO



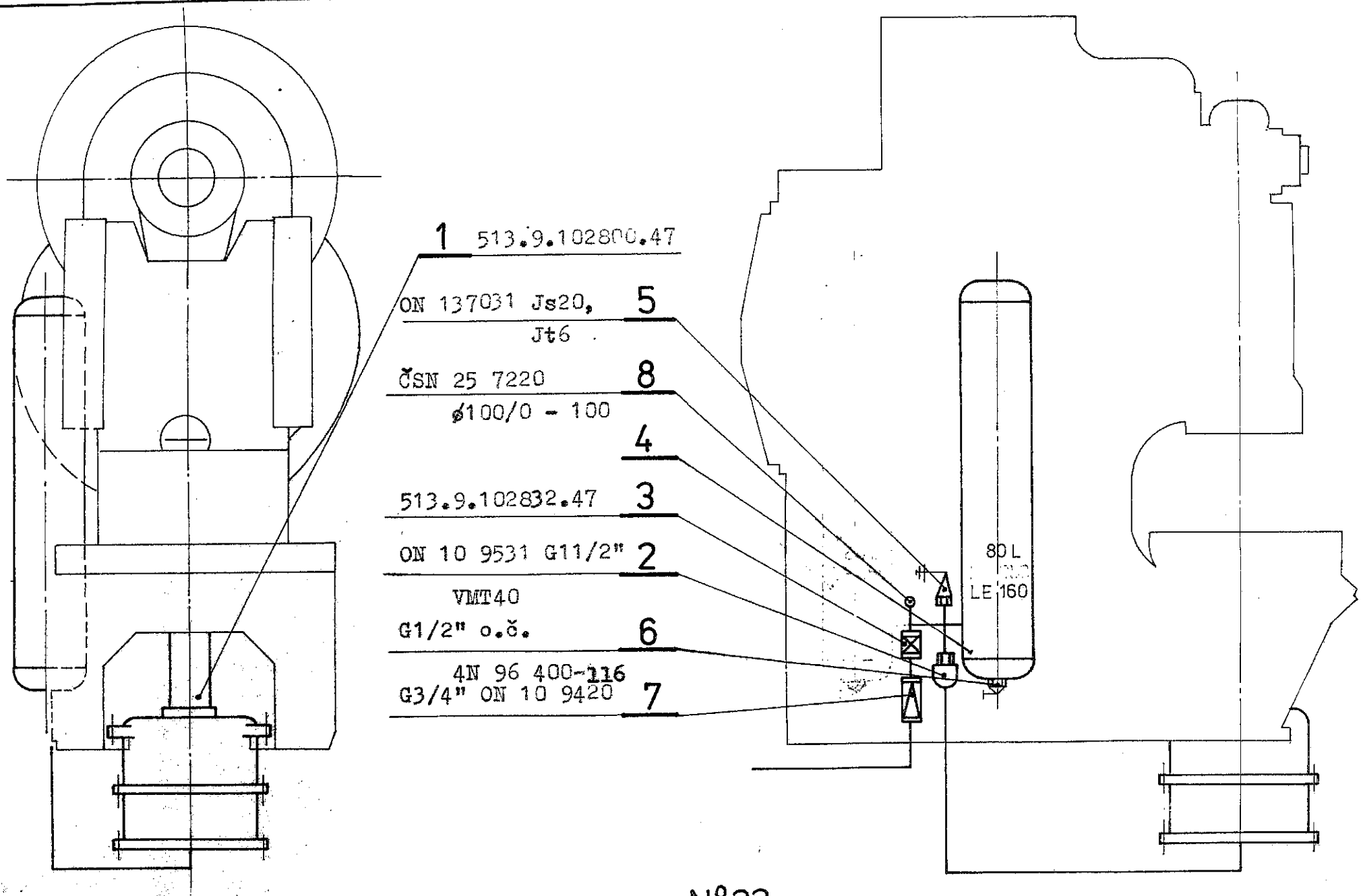


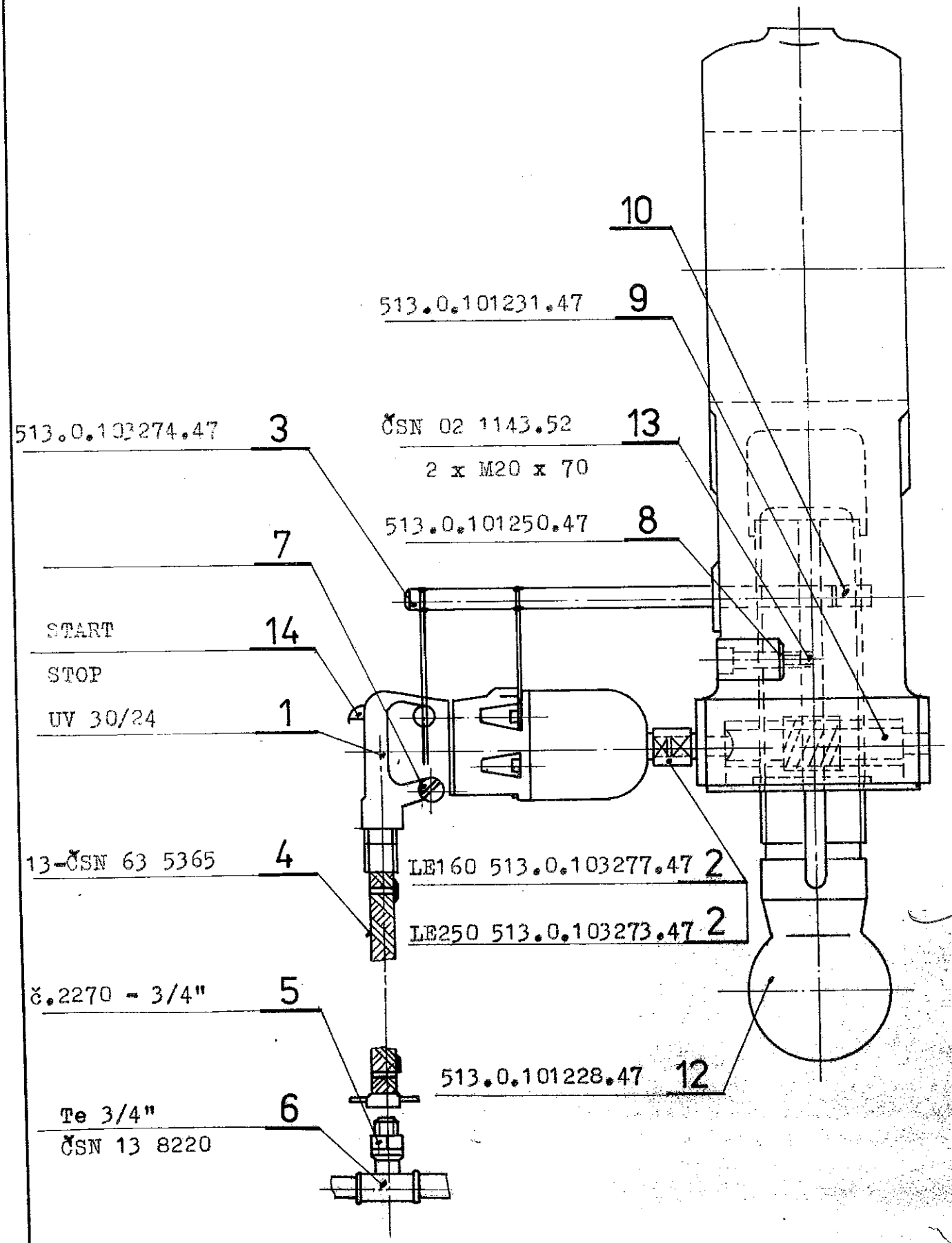

SA1.2÷6
YV1-2
XT5
SB1,4,5
MA1
SP1


24 V ~
2
UV 30
1
QVV 12
3
4
FP 80


11
513.0.102812.47
12
513.0.111105.47
10
513.0.102807.47
13
513.0.102803.47
φ d3
φ d2
φ d
h
Z
9
L
L1
φD
φ d1
15
513.9.102814.47
16
513.0.102815.47
8
513.0.102819.47
4
513.0.102809.47
7
513.9.102806.47
5
513.0.102808.47
14
513.0.102812.47
513.0.102820.47
3
6
513.0.102822.47
513.0.102804.47
2
1
513.0.102805.47

Nº 31


1 513.9.102800.47
ON 137031 Js20, 5
Jt6
ČSN 25 7220 8
ø100/0 - 100
4
513.9.102832.47 3
ON 10 9531 G11/2" 2
VMT40
G1/2" o.č. 6
4N 96 400-116
G3/4" ON 10 9420 7
80 L
LE 160


10
513.0.101231.47 9
513.0.103274.47 3
ČSN 02 1143.52 13
2 x M20 x 70
513.0.101250.47 8
7
START 14
STOP
UV 30/24 1
13-ČSN 63 5365 4
LE160 513.0.103277.47 2
LE250 513.0.103273.47 2
č.2270 - 3/4" 5
513.0.101228.47 12
Te 3/4" 6
ČSN 13 8220

ZTS n.p. KOŠICE

Kreslil: ŠTOFANIKOVÁ

Preskúšal: ING. KOROSEC

Schválil:

Názov

SCHÉMA OVLÁDANIA

Typ LE 160,250,400-C

Dátum 30. 5. 1985

C. výkresu 3-21-9001-005

Zmena: zapojenie vč. 229 202-8, 230 871-5, 231 364-6

Skupina

List/Počet 1/5

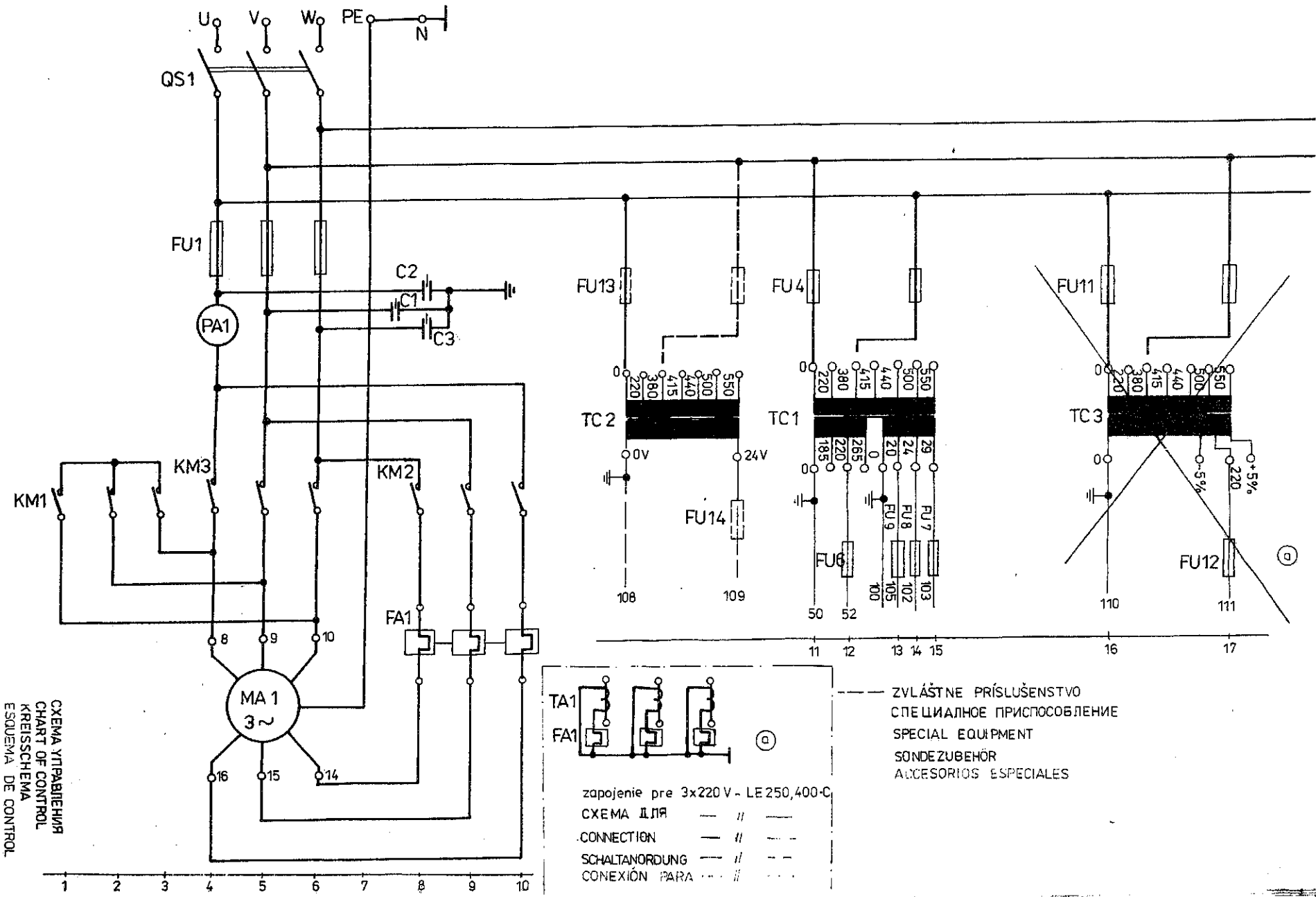
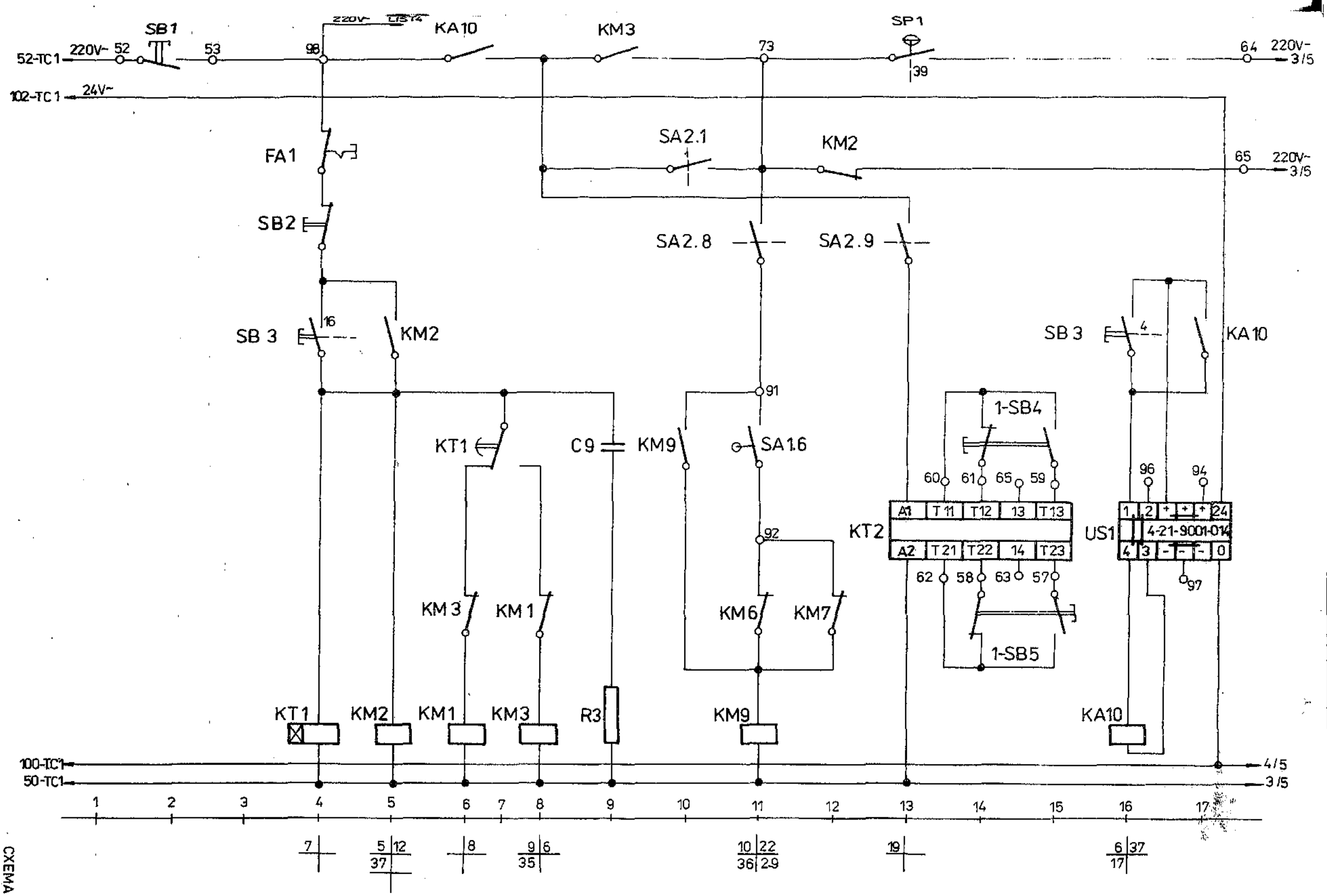


СХЕМА УПРАВЛЕНИЯ
CHART OF CONTROL
KREISSCHEMA
ESQUEMA DE CONTROL



ZTS n.p. KOŠICE

Kreslil	
Preskúšal	ŠTOPKA
Schválil	ING. KÖRÖSI

Názov

SCHÉMA OVLÁDANIA

СХЕМА УПРАВЛЕНИЯ
CHART OF CONTROL
KREISSCHEMA
ESQUEMA DE CONTROL

Zmena, prekreslený, platnosť: 229120-28, 230871÷5, 231364÷6		Skupina 6806
Typ LE 180,250,400 C	Dátum 6.1987	
Č. výkresu 3-21-9001-005		List/Poč.l. 2/5

ZTS n.p. KOŠICE

Kresil: STOFANIK
Přeskúšal: ING. KÓROS
Schválil:

NÁZOV

SCHÉMA OVLÁDANIA

SCHEMA УПРАВЛЕНИЯ, CHART OF CONTROL, KREISSCHEMA, ESQUEMA DE CONTROL

Zmena: Ⓑ Prekreslený výkres 6. 1987

Typ LE 160, 250, 400 C

Č. výkresu 3-21-9001-005

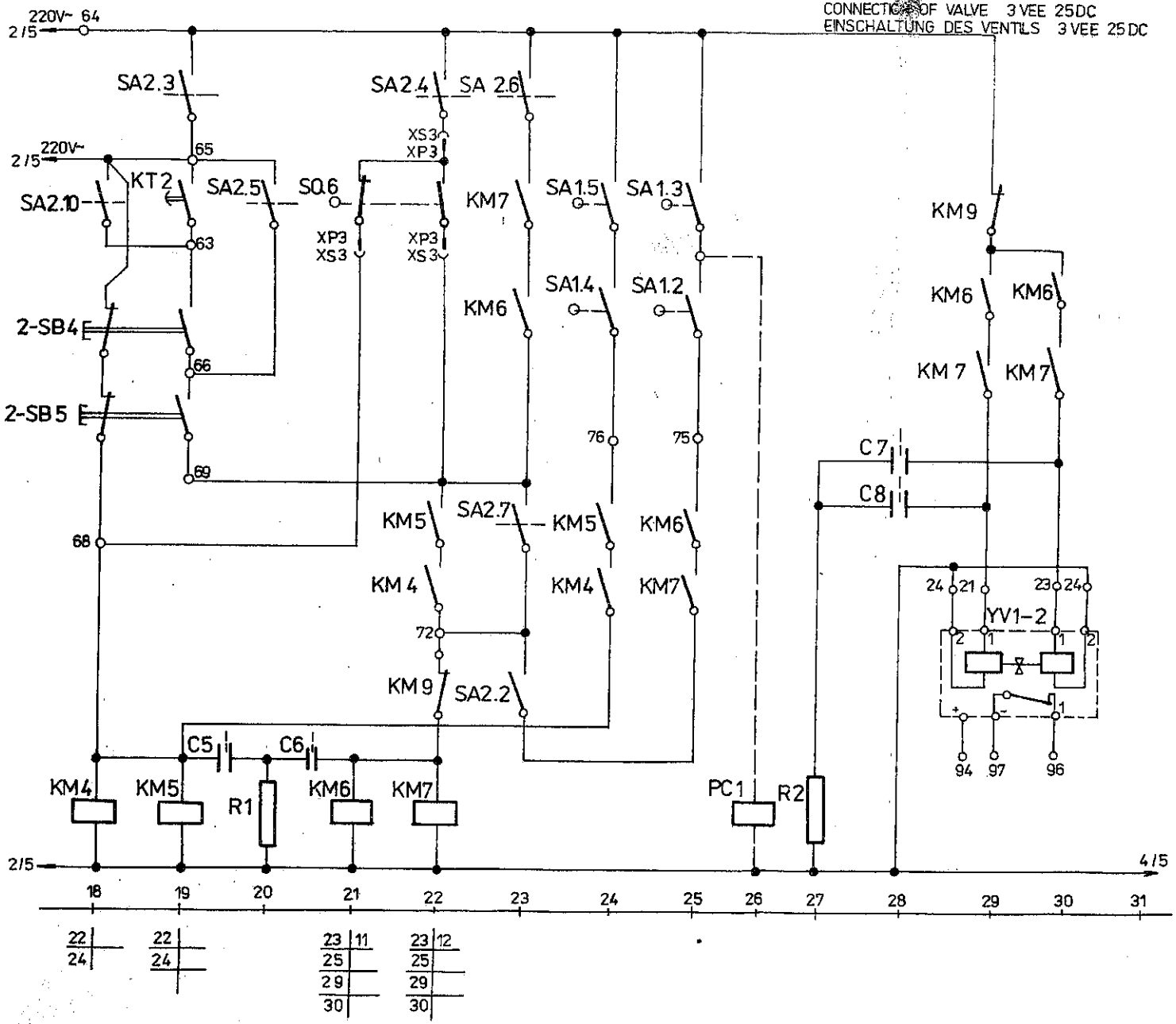
Dátum: 6. 1987

Platnosť vž. 2291208 230 871-5 231 364-6

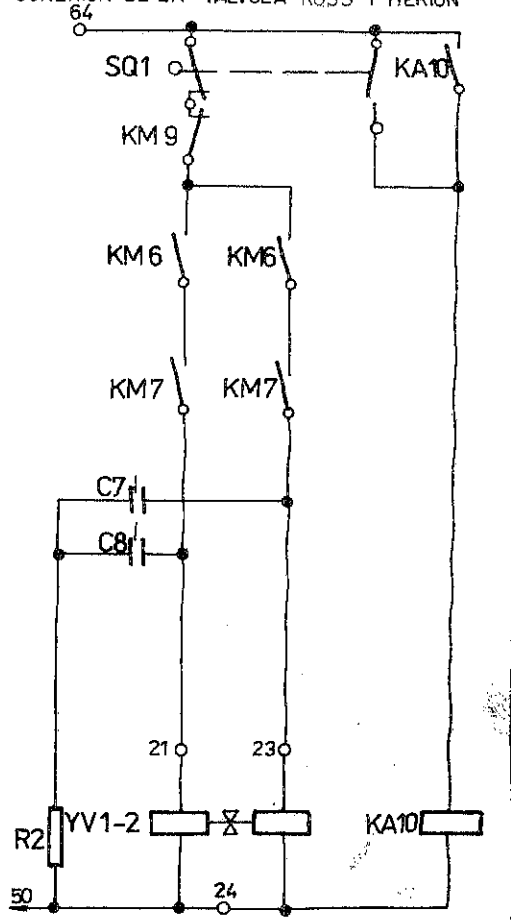
Skupina

List / Počet listov 3/5

ZAPOJENIE VENTILA 3VEE 25DC
ВКЛЮЧЕНИЕ ВЕНТИЛЯ 3VEE 25DC
CONNECTION OF VALVE 3VEE 25DC
EINSCHALTUNG DES VENTILS 3VEE 25DC
CONEXIÓN DE LA VÁLVULA 3VEE 25DC



ZAPOJENIE VENTILA FY ROSS A HERION
ВКЛЮЧЕНИЕ ВЕНТИЛЯ РОСС И ХЕРИОН
CONNECTION OF VALVE ROSS AND HERION
EINSCHALTUNG DES VENTILS ROSS UND HERION
CONEXIÓN DE LA VÁLVULA ROSS Y HERION



Kreslil		ZTS n.p. KOŠICE
Preskúšal		
Schválil	ING. KÓRO	

Názov

SCHÉMA OVLÁDANIA

Zmena: zapojenia od vč 229 1141 LE160C 230 841 LE250C 231 358 LE400C ⓓ

Typ LE 160,250,400–C

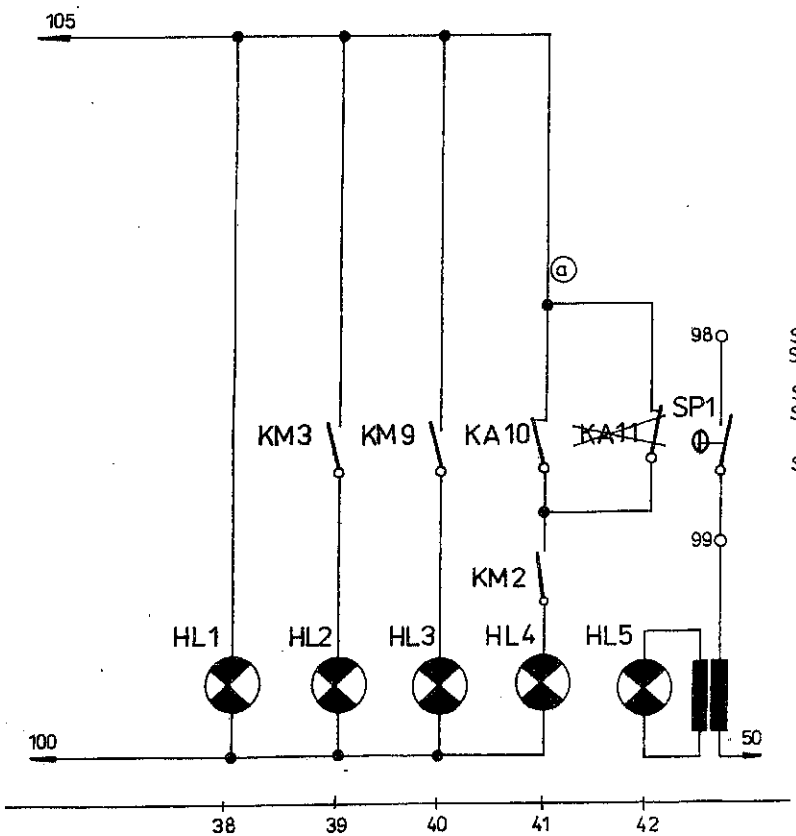
Č. výkresu 3–21–9001–005

Dátum 30. 5. 1985

Skupina

List/Počet 4/5

SCHÉMA УПРАВЛЕНИЯ
CHART OF CONTROL
KREISSCHEMA
ESQUEMA DE CONTROL



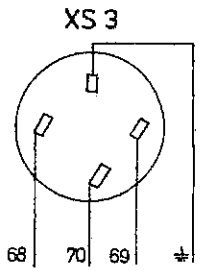
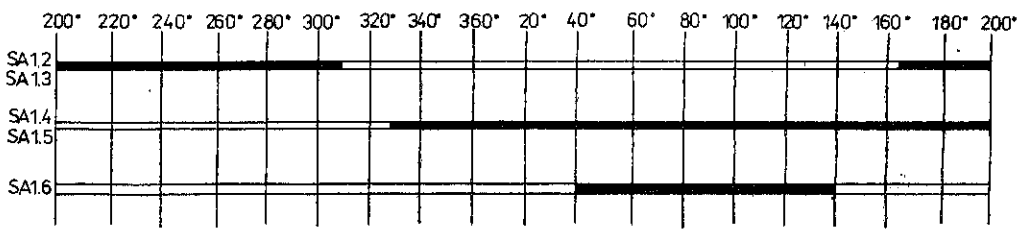


SCHÉMA SPÍNANIA PROGRAMOVÉHO SPÍNAČA SA1

ПЕРЕКЛЮЧАТЕЛЬ ПРАБРАММЫЙ
SEQENCE OF PROGRAM SWITCH OPERATION
VERLAUFSCHALTUNG DES NOCKENUMSCHALTERS
ESQUÉMA DE CONMUTACIÓN DEL INTERRUPTOR DE PROGRAMA



ZOPNUTÝ KONTAKT
СОЕДИНЕННЫЙ КОНТАКТ
JOINET CONTACT
EINGESCHALTETER KONTAKT
CONTACTO CERRADO

SCHÉMA SPÍNANIA REŽIMOVÉHO SPÍNAČA SA2

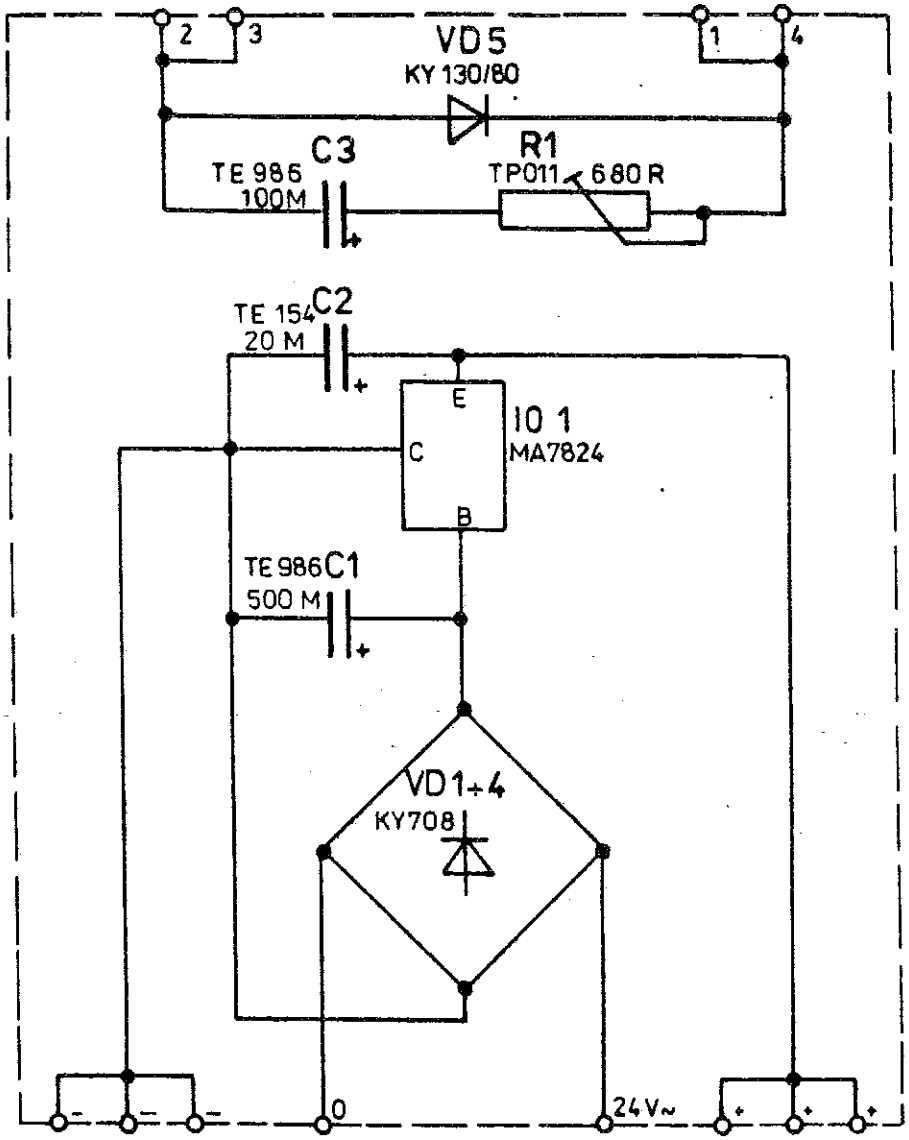
СХЕМА ВКЛЮЧЕНИЯ ПЕРЕКЛЮЧАТЕЛЯ РЕЖИМ
CHART OF SWITCHING CAM SWITCH
SCHALTPLAN DES NOCKENSCHALTERS
ESQUÉMA DE CONMUTACIÓN DEL INTERRUPTOR ACCIONADO POR LEVA

REŽIM STROJA РЕЖИМ СТАНКА REGIME OF MACHINE MASCHINENREGIME MODO DE OPERACIÓN DE LA MÁQUINA		OVL. PRVOK УПРАВЛ. ЭЛЕ. CONTROL. ELE. BETÄTINGUN. ELEMENT ELEMENTO DE CONTROL	ZOPNUTÉ KONTAKTY ВКЛЮЧЕННЫЕ КОНТАКТЫ JOINET CONTACTS EIGESCHALTETE KONTAKTE CONTACTOS CERRADOS										
			1–2 SA2.1	3–4 SA2.2	5–6 SA2.3	7–8 SA2.4	9–10 SA2.5	11–12 SA2.6	51–52 SA2.7	53–54 SA2.8	55–56 SA2.9	57–58 SA210	
JEDNOTLIVÉ ZDVIHY ОТДЕЛЬНЫЕ ХОДЫ SINGLE STROKES EINZELHÜBE MIT CARRERA UNICA	JEDNOU RUKOU ОДНОЙ РУКОЙ ONE-HAND CONTROL RECHTER HAND	~~SB 5~~											ⓐ
	DVOMA RUKAMI ДВУМА РУКАМИ TWO HAND CONTROL BEIDEN HÄNDEN A DOS MANOS	SB4, SB5		X	X					X	X		
	NOHOU НОГОЙ FOOT CONTROL FUSS, A PIÉ	SQ6		X		X				X			
ZORADENIE ~~JEDNOU RUKOU~~ DVOMA RUKAMI НАПАДКА ~~ОДНОЙ РУКОЙ~~ ДВУМА РУКАМИ ~~ONE HAND~~ SETTING UP TWO HAND EINRICHTEN ~~MIT HAND~~ BEIDEN HÄNDEN A JUSTE A DOS MANOS		SB 4 SB 5		X					X			X	
TRVALÝ CHOD ПОСТОЯННЫЙ ХОД CONTINUOUS RUN AUTOMATISCHER DAUERLAUF MIT OPERACIÓN CONTINUA	NOHOU, A PIÉ НОГОЙ FOOT CONTROL BEIDEN HÄNDEN	SQ6		X		X				X			
	DVOMA RUKAMI ДВУМА РУКАМИ TWO-HAND CONTROL BEIDEN HÄNDEN A DOS MANOS	SB4, SB5		X	X					X	X		
OPAKOVANÉ ZDVIHY ПОВТОРЯЕМЫЕ ХОДЫ REPEATER STROKES DAUERLAUF MIT CARRERAS REPETIDAS	NOHOU, A PIÉ НОГОЙ FOOT CONTROL FUSS	SQ6		X		X				X			
	JEDNOU RUKOU ОДНОЙ РУКОЙ ONE-HAND CONTROL RECHTER HAND A UNA MANO	SB5		X	X					X	X		

СХЕМА УПРАВЛЕНИЯ
CHART OF CONTROL
KREISSCHEMA
ESQUÉMA DE CONTROL

ZTS n.p. KOŠICE	Názov SCHÉMA OVLÁDANIA	Zmena: režimov od v.č. 229 1141 LE160C 230 841 LE250C ⓐ 231 356 LE400C	Skupina
Kreslil STOLÁR Preskúšal Schválil		Typ LE 160,250,400–C	Dátum 30.5.1985
		Č. výkresu 3–21–9001–005	List/Počet 5/5

ZTS n.p. KOŠICE	SCHÉMA ZAPOJENIA US1 СХЕМА ЦЕПИ US1 CIRCUIT SCHEMA US1 KREISSCHEMA US1 4-21-9001-014	List/Počet listov 1/1



Vypracoval	Schválil					
Preskúšal	Dňa 6.86	zmena		dátum	podpis	index