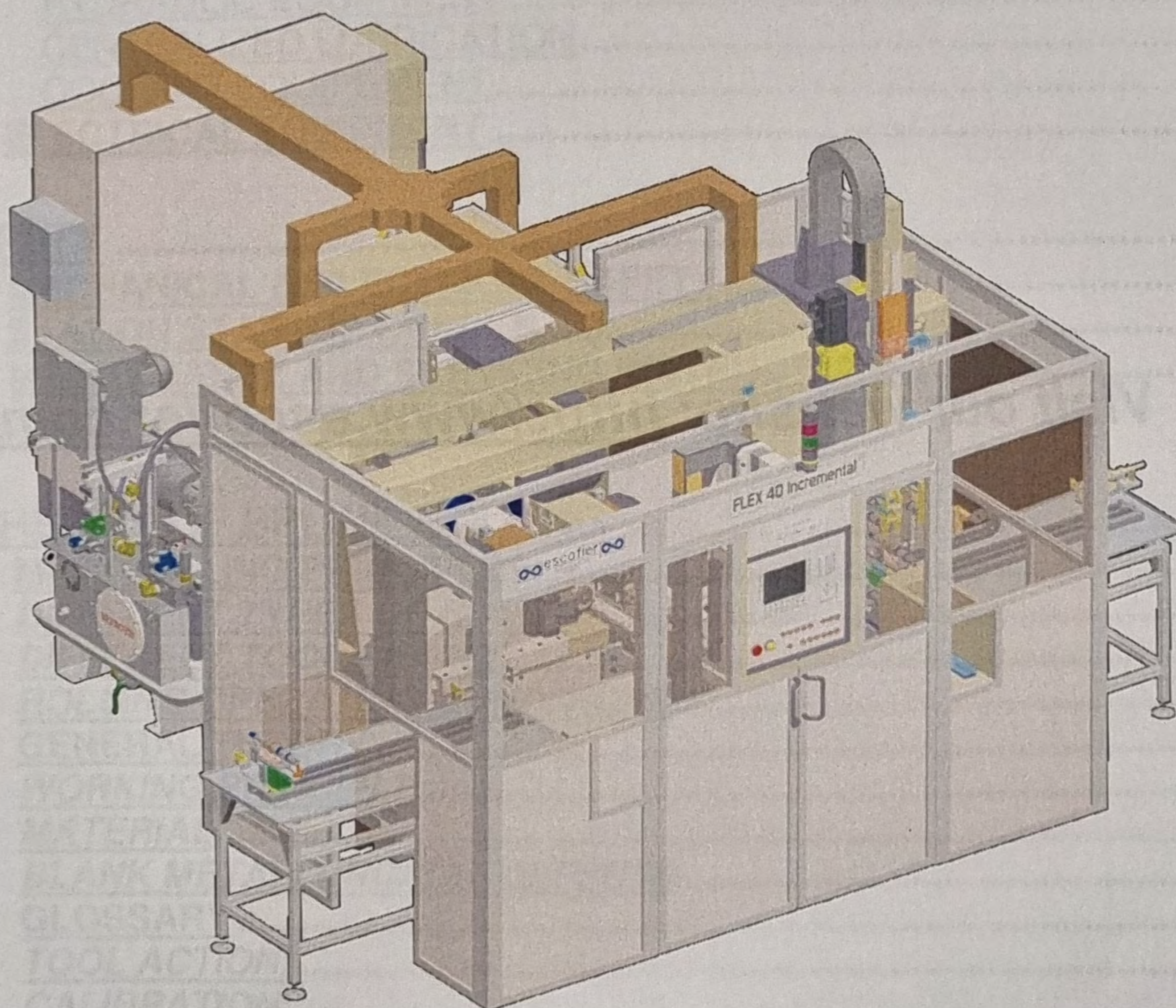


USER MANUAL

FLEX40 INCREMENTAL



ZC 33-20 – OUPUT SHAFT

1. GENERAL PRESENTATION

1.1. SPECIFICATIONS

MANUFACTURER	ESCOFIER TECHNOLOGIE
DATE OF MANUFACTURE:	2007
MACHINE No.:	HMMC No.: ZC33-20 ESCOFIER No.: 40 054
CUSTOMER:	HYUNDAI MOTOR COMPANY
ORDER No.:	ESCOFIER No : 07M4622

SUB-ASSEMBLY	MANUFACTURER
H40Z basic machine	Escofier
Hydraulic axis and proportional valve	Bosch Rexroth
Hydraulic power unit	Bosch Rexroth
Cooling equipment filter	MONNET ASCO
Pneumatic equipment	SMC
Centralized lubrication	WILLY VOGEL
Electrical equipment	OP Siemens MP 277 PLC : Siemens S7 CNC : HNC 100 Rexroth
Gantry CNC	GUDEL
Protective guard – Exchange tables	ELCOM

CHARACTERISTICS.

MACHINE FLEX 40 INCREMENTAL	
Tool holding shaft diameter	120 mm
Mini tool diameter	280 mm
Maxi tool diameter	300 mm
Part fixture travel distance	900 mm
Tool shaft holding length	200 mm
Maxi tool width	60 mm
Tool mini center-to-center distance	290 mm
Tool maxi center-to-center distance	490 mm
Tool phasing adjustment accuracy	$\pm 0.005^\circ$
Tool rotation speed	0.1 to 55 rpm
Workpiece maxi length	500 mm
Workpiece maxi outside diameter	100 mm
Main hydraulic cylinder force	10 to 250 kN / (400 kN in option)
Carriages slow advance speed	0.01 to 10 mm/s
Carriages fast advance & backward speed	10 to 20 mm/s
Roll dies motor	10 HP / 7.5 kW
Overall dimensions Lxwxh (basic machine)	3950 x 2430 x 2680 (mm)
Weight (basic machine)	7 tons (7.000 daN)

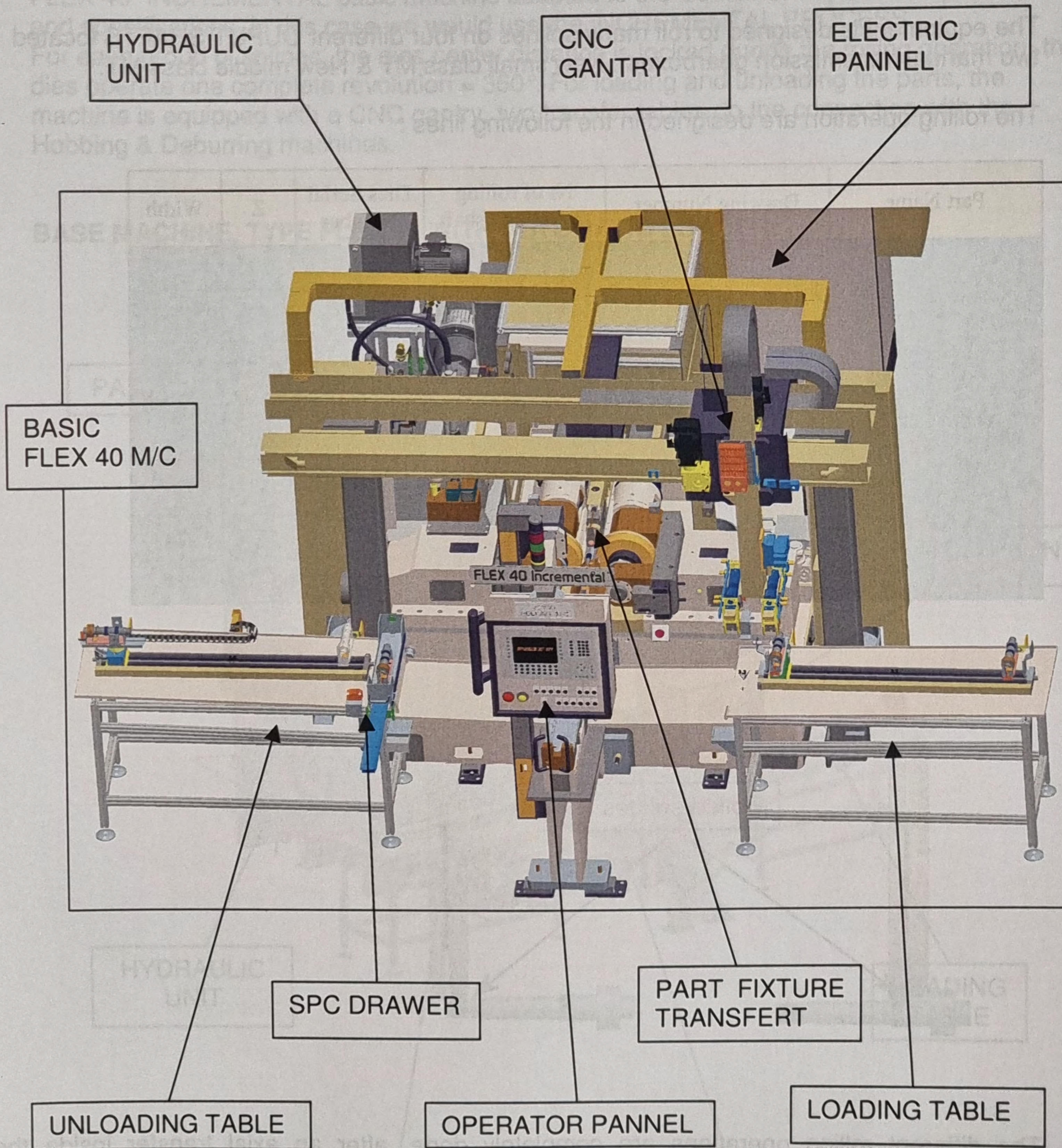
HYDRAULIC UNIT	
Tank capacity	160 liters
Pump 1 flow	40 L/min
Pump 1 pressure	70/120 bar (200 b maxi)
Pump 2 flow	20 L/min
Pump 2 pressure	3 bar
Motor power / rotation speed	11 kW / 950 rpm

COOLANT UNIT	
Tank capacity	200 liters
Coolant Pump Flow	20 liters / min
Pump power	0.37 kW
Magnetic Epuration	50 microns
Bag Filtration	20 microns

CENTRALIZED LUBRICATION	
Tank capacity	6 liters
Volume lost per cycle (15 points)	7.6 cm ³

ELECTRICITY	
Electrical enclosure	0.5 ton
Total power	52 kVA

MAIN COMPONENTS

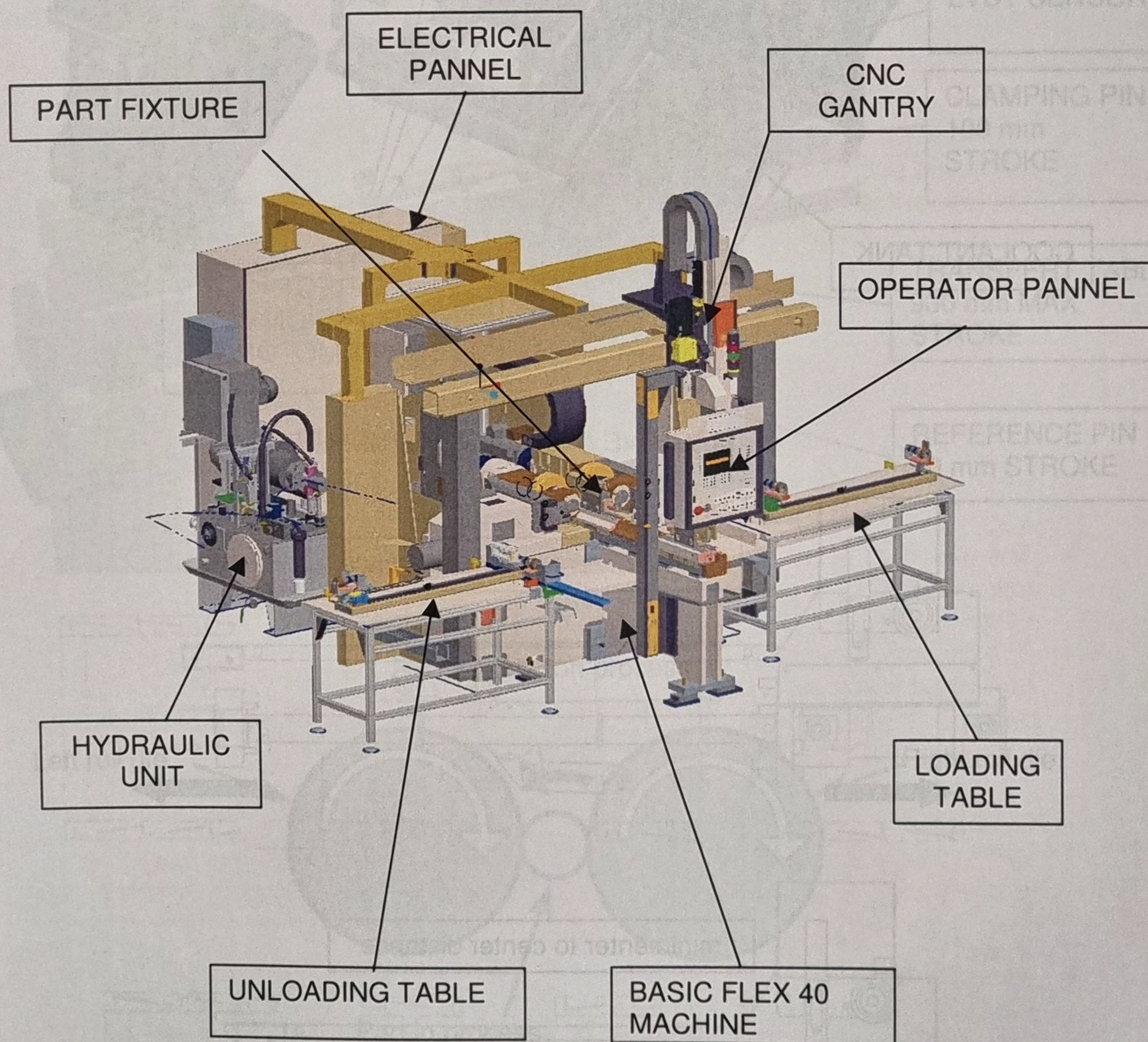


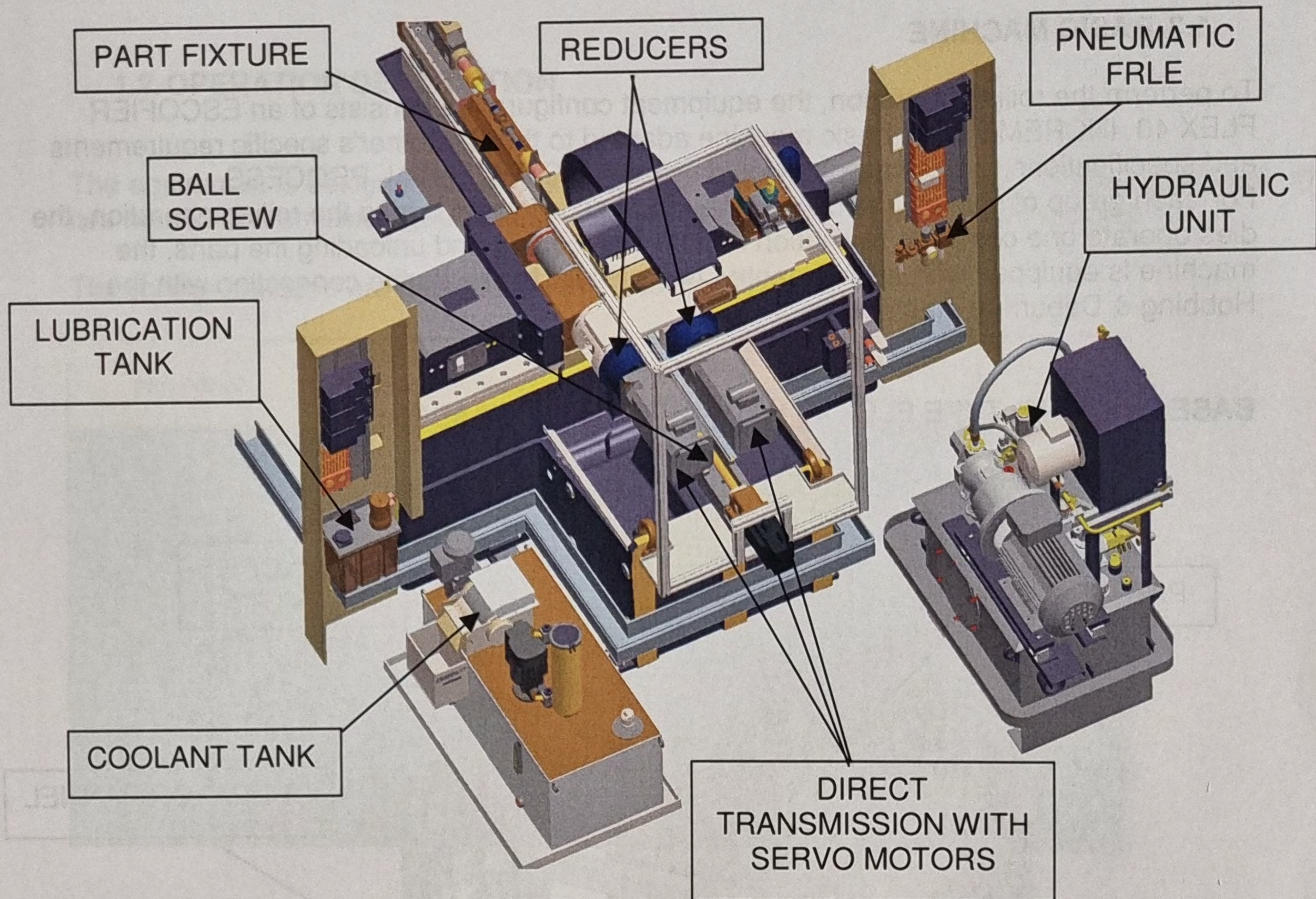
1.3. BASIC MACHINE

To perform the rolling operation, the equipment configuration consists of an ESCOFIER FLEX 40 INCREMENTAL basic machine adapted to the Customer's specific requirements and specifications, in this case we would use the INCREMENTAL PROCESS.

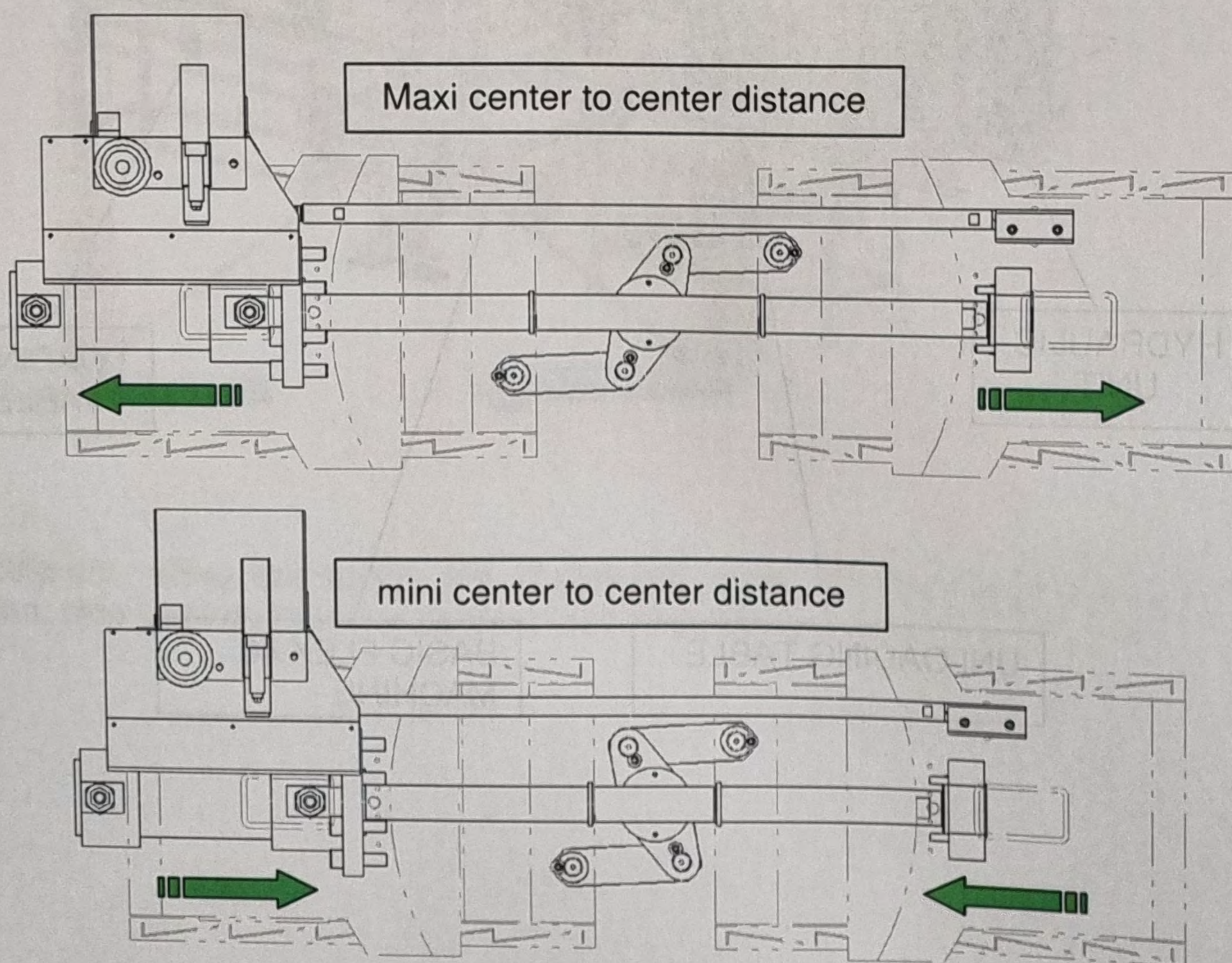
For each group of splines, the dies center distance is locked during the rolling operation, the dies operate one complete revolution = 360° . For loading and unloading the parts, the machine is equipped with a CNC gantry, two transfer tables do the connection with the Hobbing & Deburring machines.

BASE MACHINE, TYPE FLEX 40 WITH AUTOMATIC LOADER:





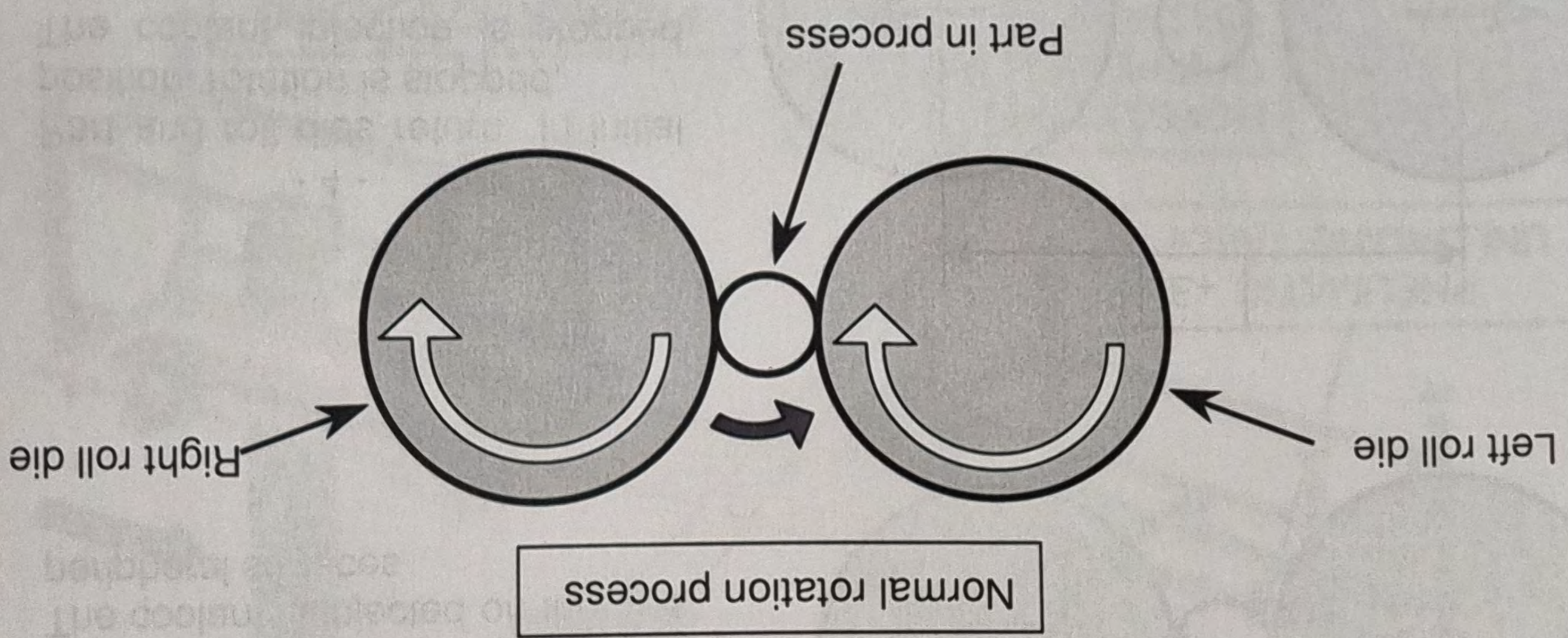
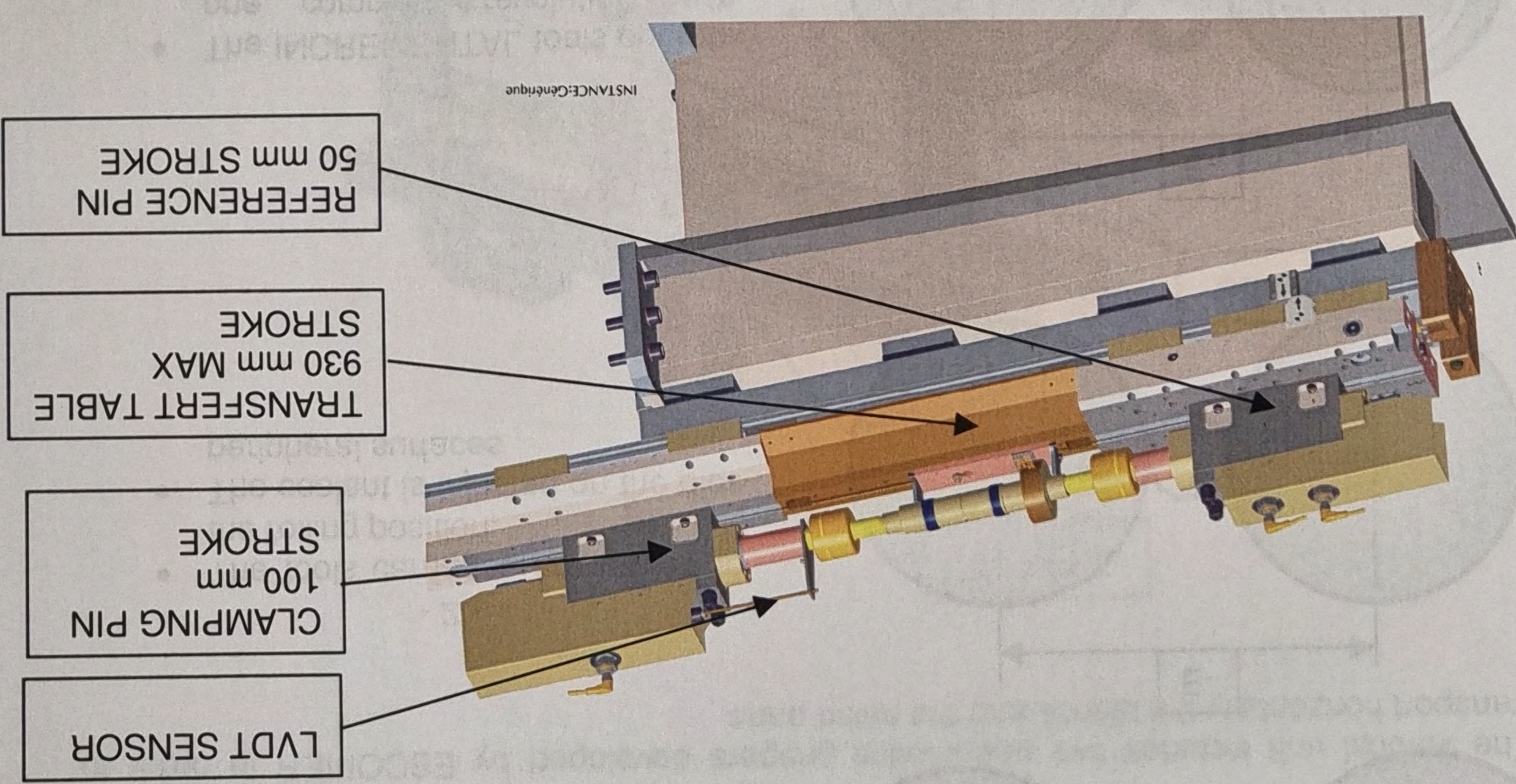
MACHINE CARRIAGES KINEMATIC



1.4. PART FIXTURE & ROLLING PROCESS

This sub assembly consists of two centering pins with an internal hydraulic clamping. Both head centers are fixed on a moving table in order to transfer the part in the rolling area, after been loaded on a centering V. The front reference pin ensures the axial positioning and centering, while the rear binding pin is used for centering, clamping and measuring.

The clamping pin use a LVDT sensor in order to measure the real stroke and recognize the type of part by measuring the center distance (each part could be differentiated after clamping).



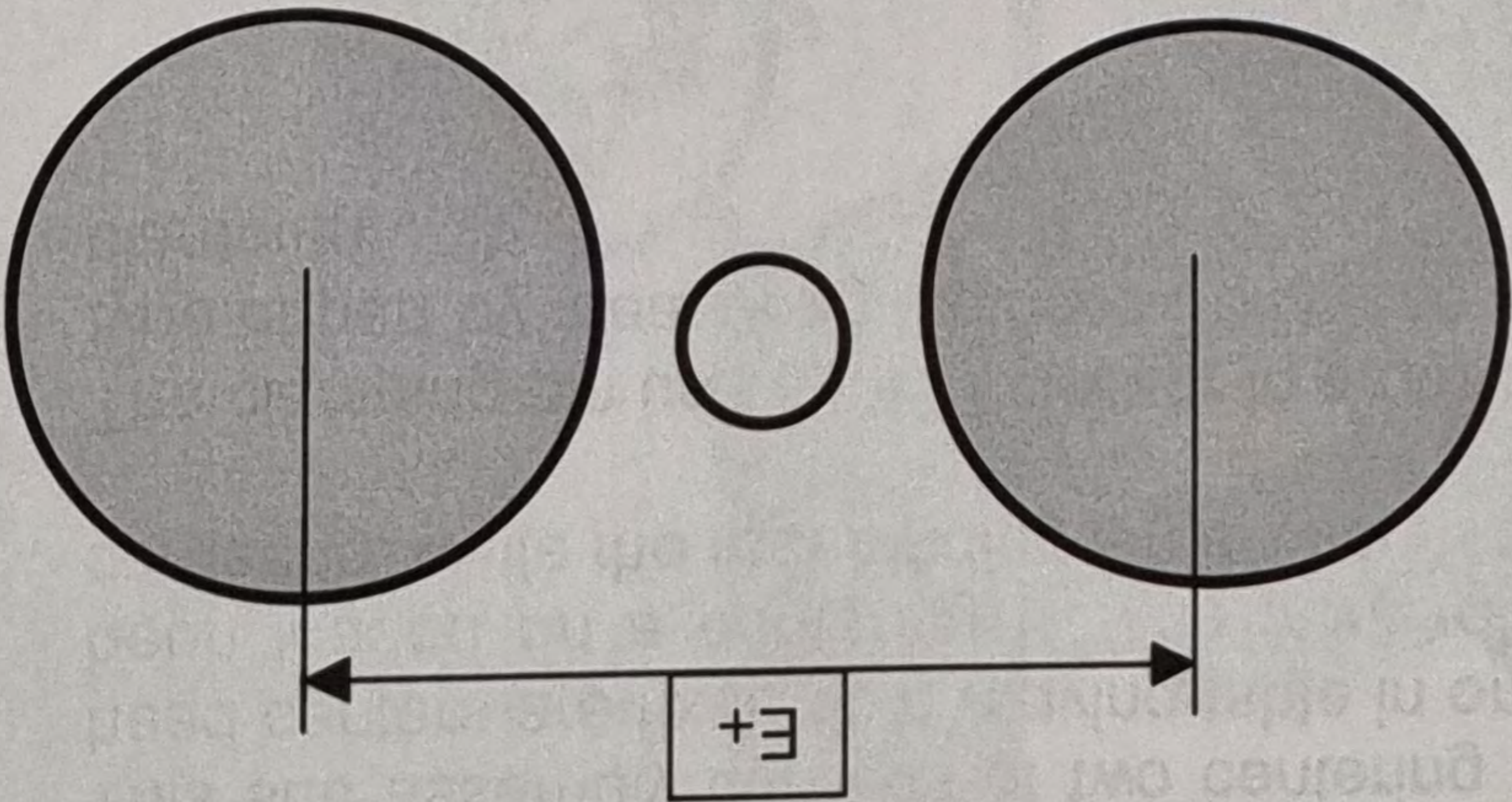
The rotation direction of the roll dies cannot be reversed automatically, the INCREMENTAL TOOLS operate only in clock rotation direction (see the above picture), the counter clock direction is used only to reset the start position without strength..



SIMPLIFIED DESCRIPTION OF THE PART ENGAGEMENT OPERATION:

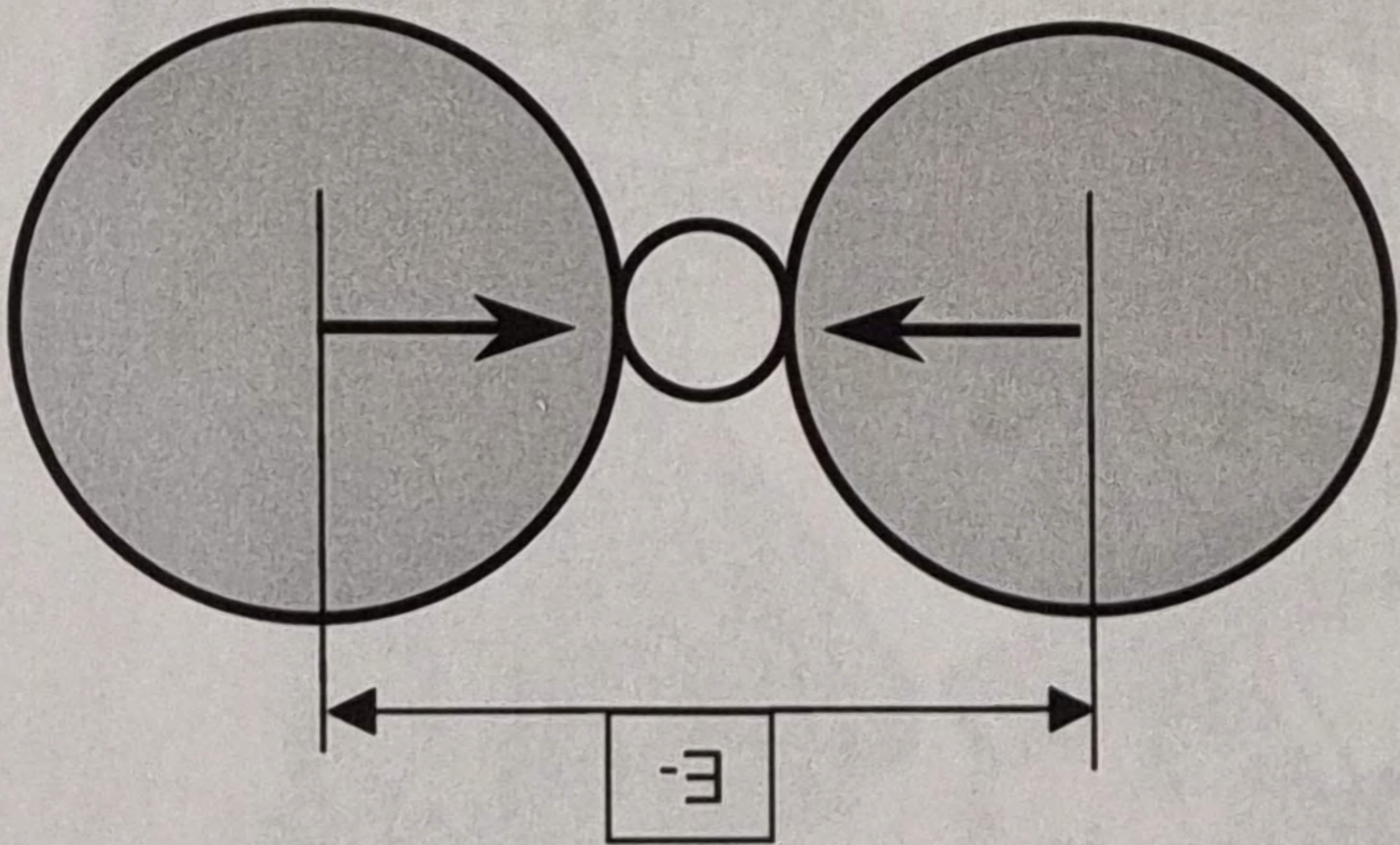
- Part and roll dies are in initial position

- 1 -



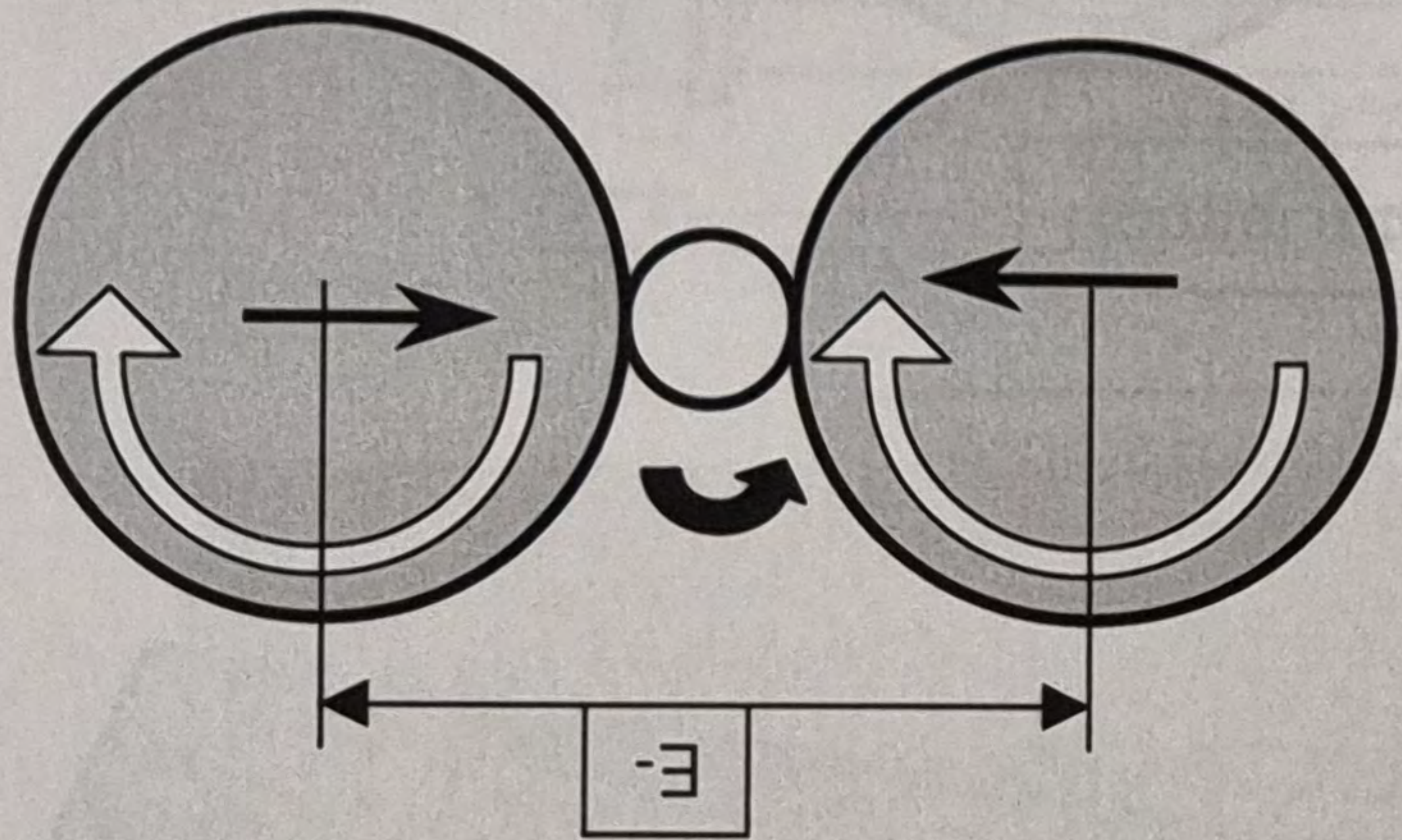
- The tools carriages are closed to the rolling position,
- The coolant is injected on the dies peripheral surfaces

- 2 -



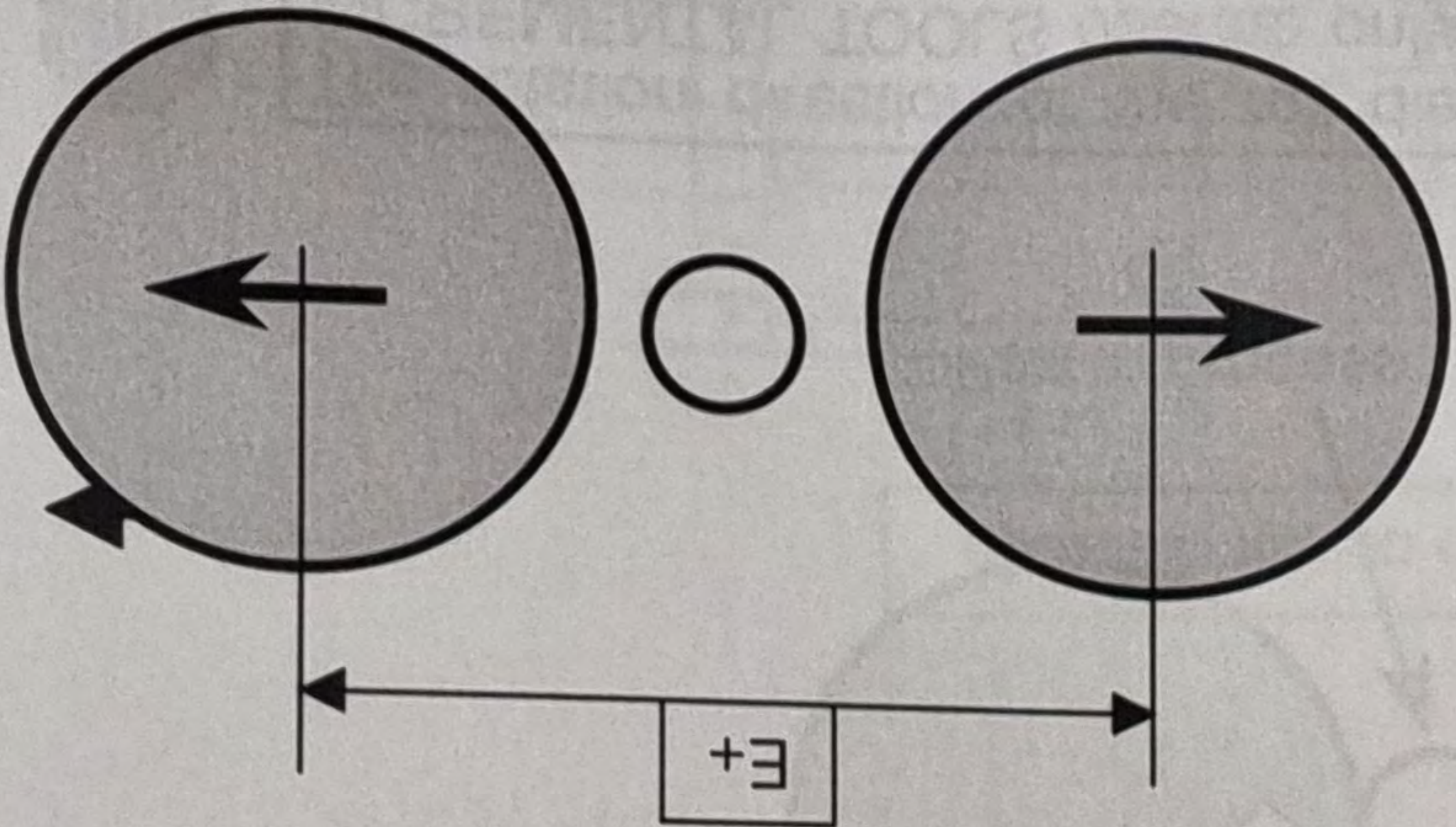
- The INCREMENTAL tools operate one complete revolution with variable speed,
- The coolant is injected on the dies peripheral surfaces

- 3 -



- Part and roll dies return in initial position, rotation is stopped,
- The coolant injection is stopped also in order to avoid splashing the proximity gears,

- 4 -



1.7. MAIN HYDRAULIC CYLINDER

The FLEX 40 INCREMENTAL machine is equipped with a REXROTH proportional valve connected to a REXROTH NC card, type HNC 100 enabling the roll die support carriages to be moved using one main operating mode and in a second time a process control mode:

- **POSITIONING MODE = MAIN OPERATING MODE:**
The machine undergoes a center distance cycle (speeds + positioning) using the nominal force capacities of the control cylinder regardless of the blanks and dies dimensions, in an attempt to ensure that the final rolled part characteristics are identical.

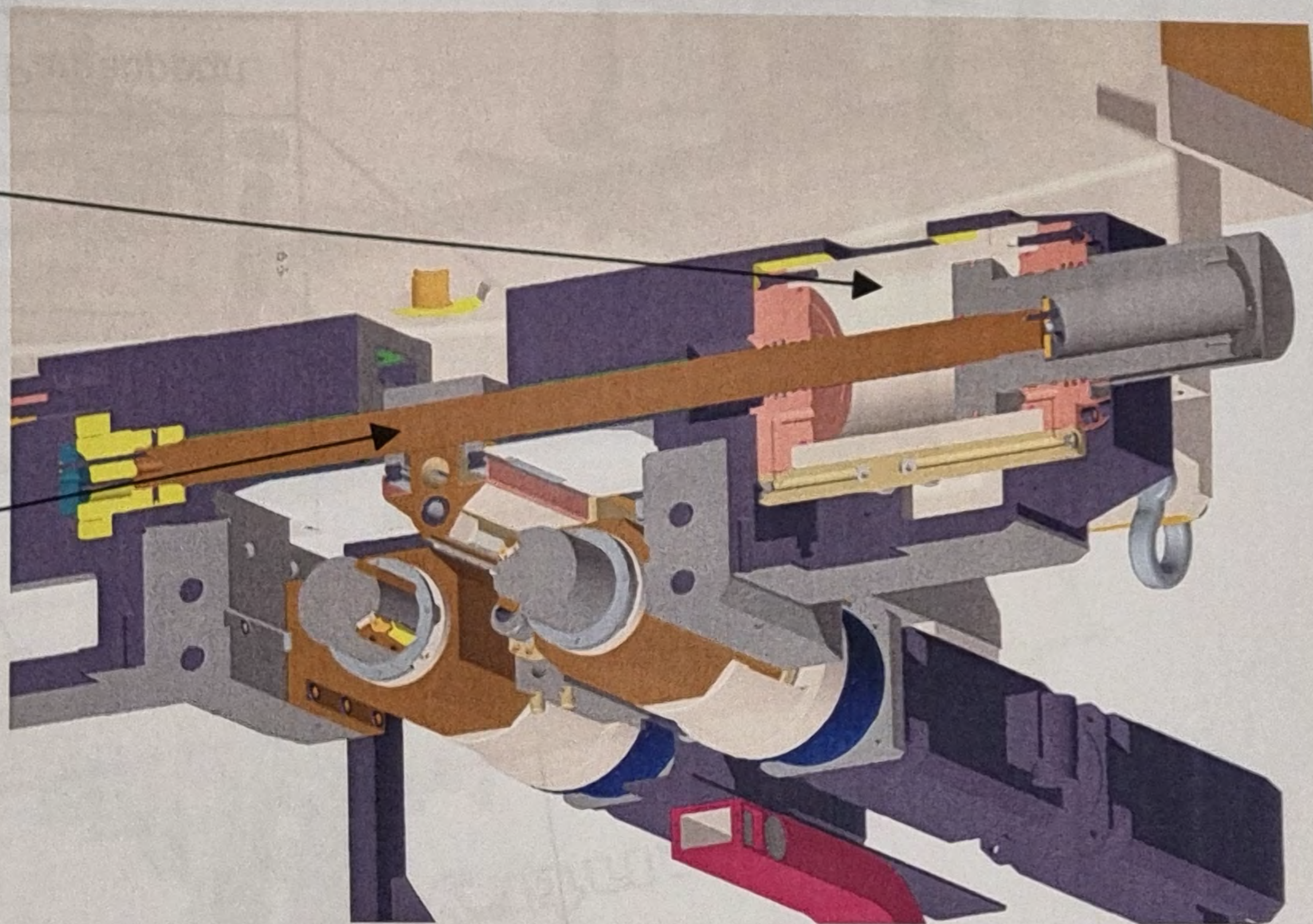
- **PROCESS CONTROL MODE**

The machine, during the constant center distance cycle, watches the rolling effort using the force capacities of the control cylinder. A comparison is done between the cycle effort and a reference effort, either nominal capacities or limited capacities. In these cases:

- if the final effort is under the nominal value : the machine adjustments are NOK or the blank diameter is too small, an error message is going to the operator panel,
- if the final effort rise the nominal value + X %, the machine don't finish the cycle and the carriages open automatically an error message is going to the operator panel

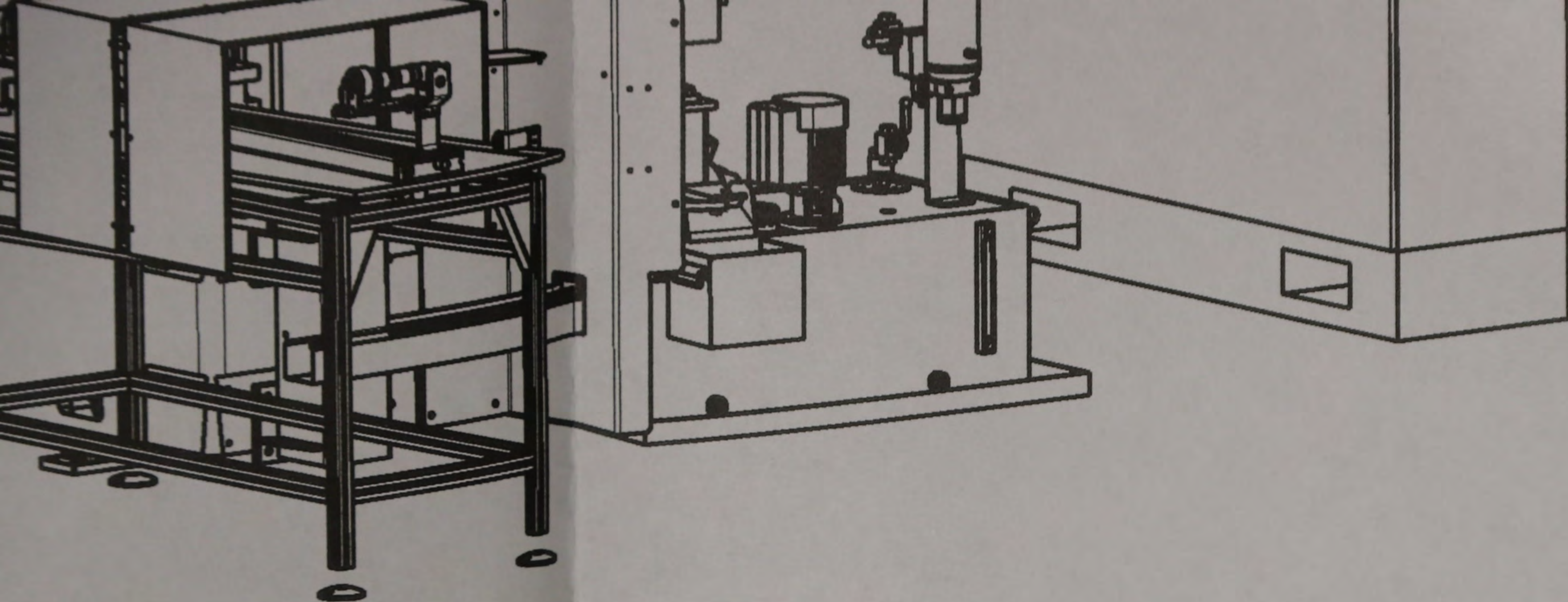
Note: During the fast closing and opening movements, an effort limitation is used also in order to protect the dies life and the machine against some mechanical crush.

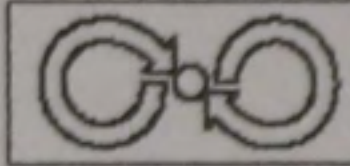
In order to protect against chips or ambient temperature variations the center distance control of the roll dies, the recopy rod is located in one carriage, in this configuration, all possible cylinder rod elongation could be compensated automatically.



Main cylinder
Rod – Ø63 mm

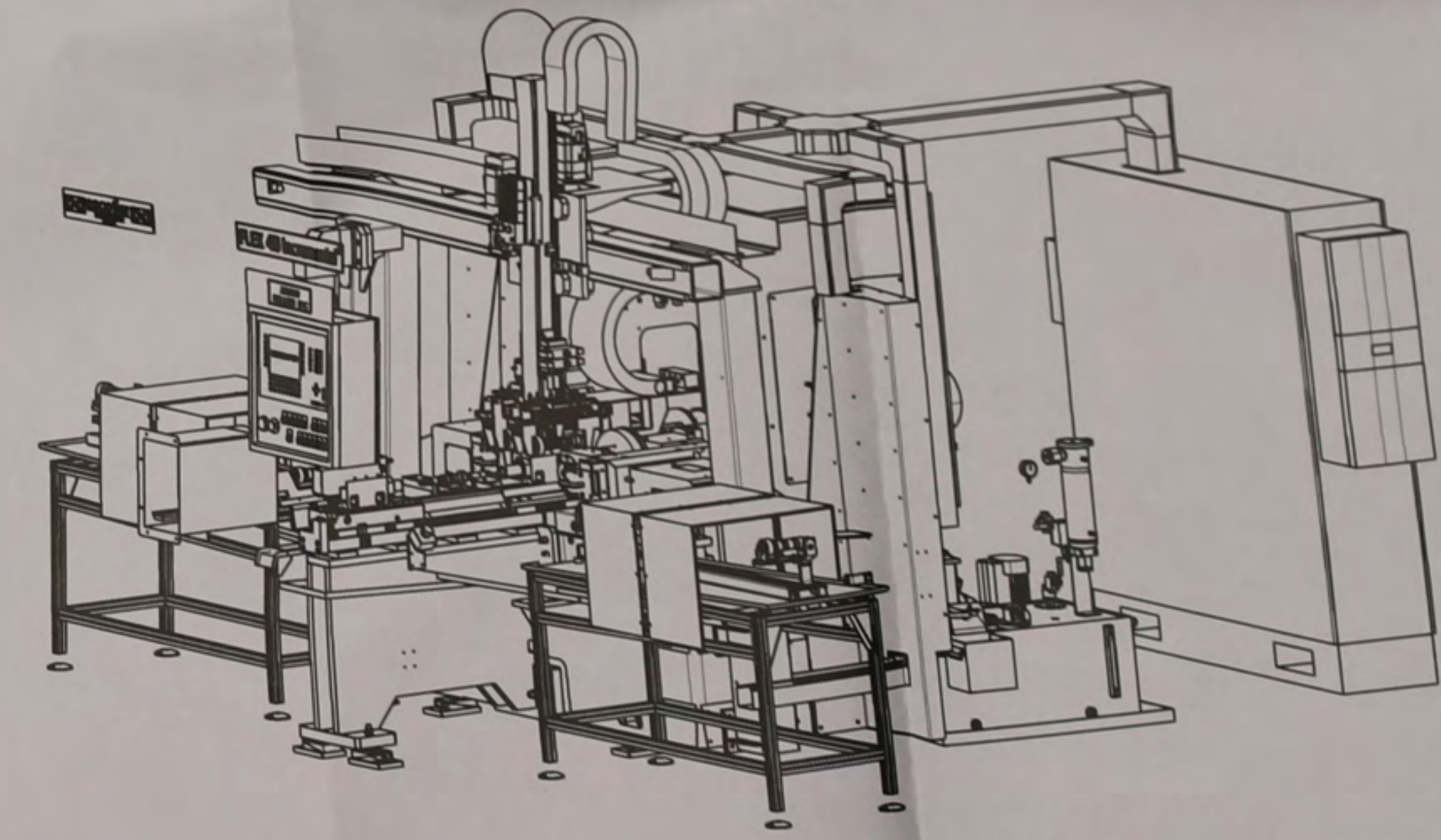
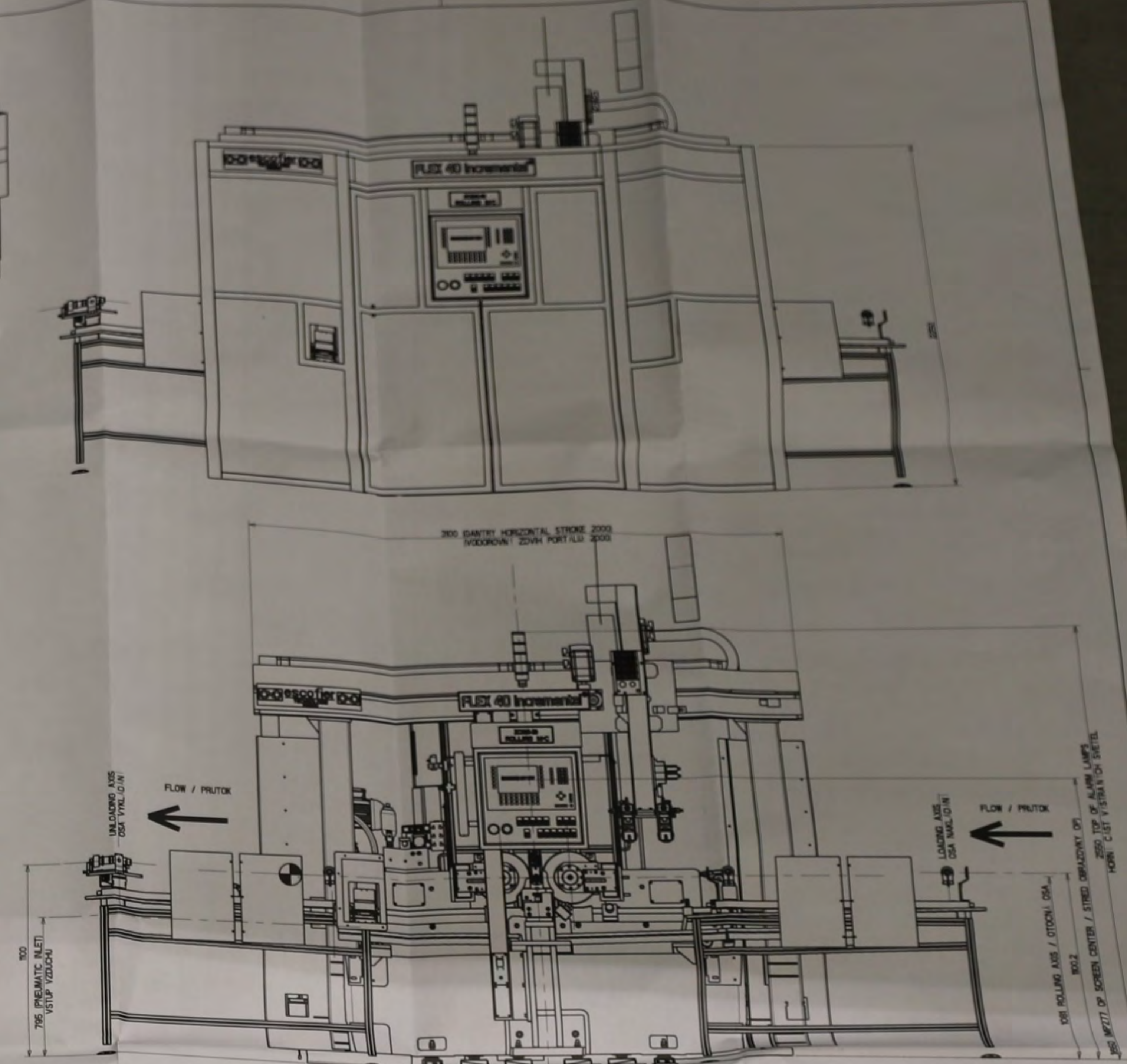
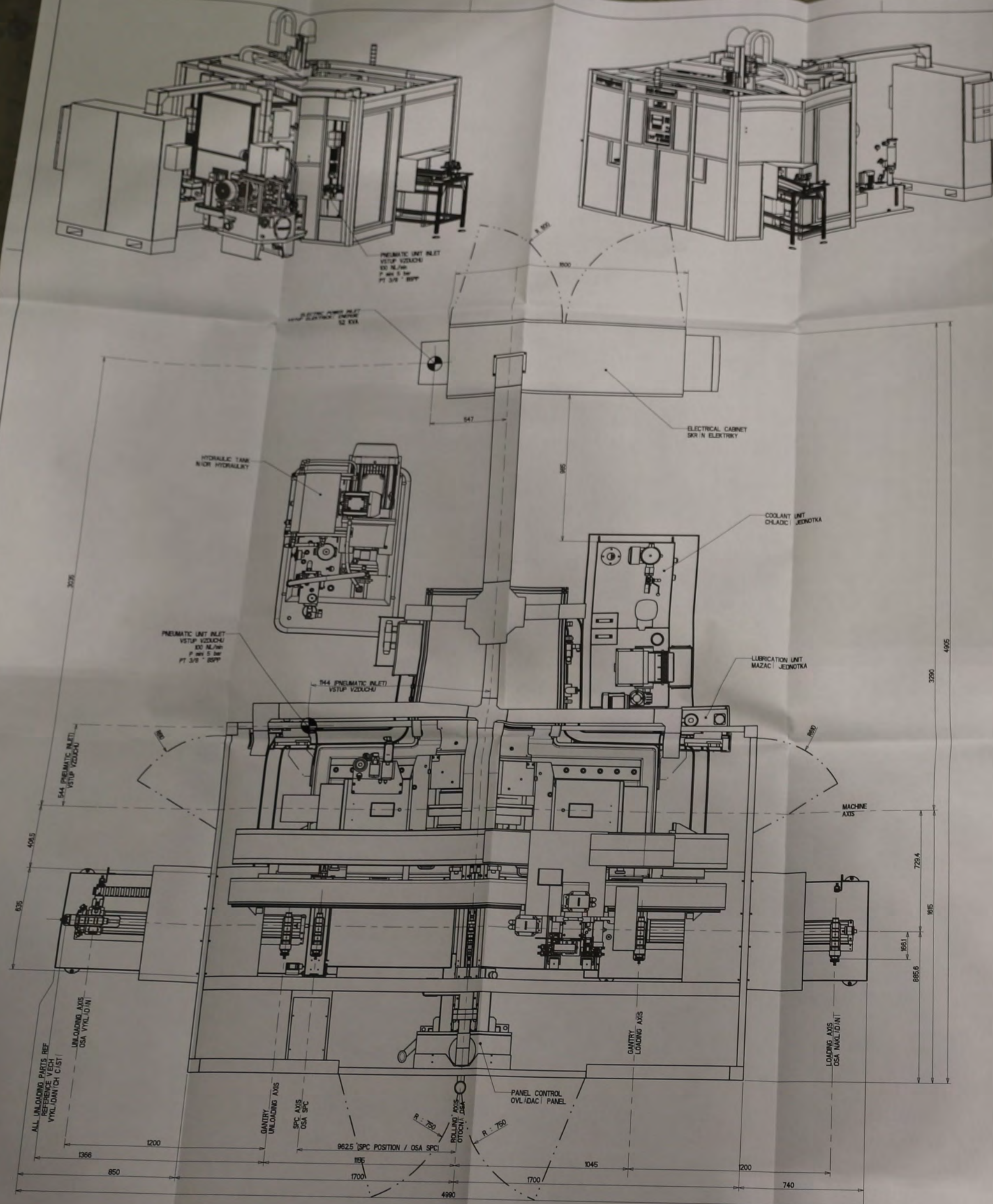
Main cylinder – Double
rooms 250 mm stroke:
S = 315.19 cm²
s = 176.71 cm²



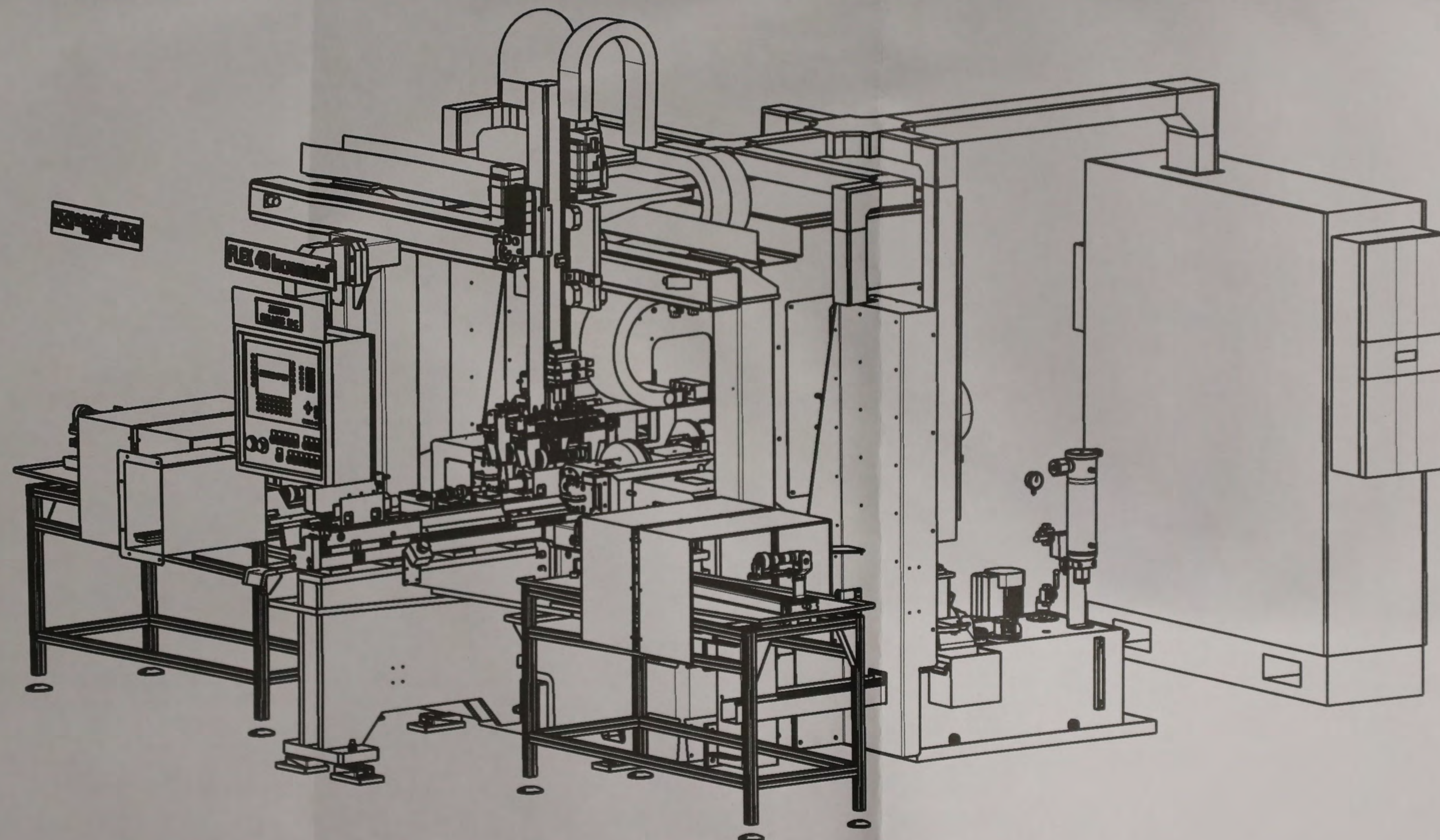
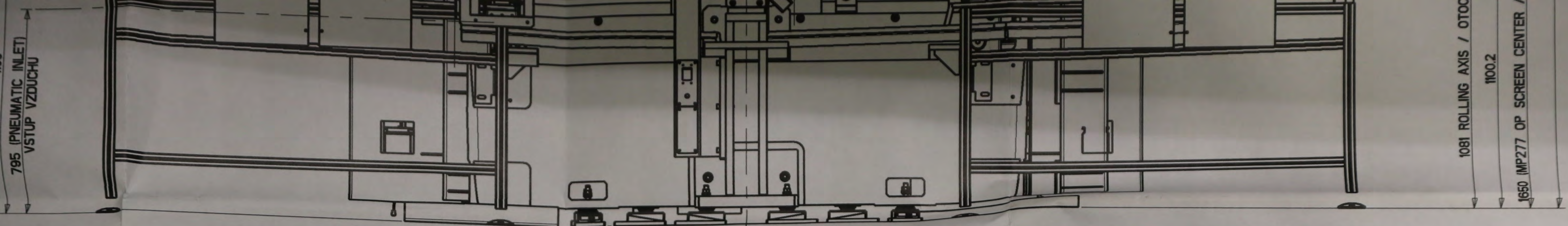
Indice	N°	Nom	Date	Description
Machine: LAY OUT / USPORÁDÁNÍ : ZC33G-20				
Ensemble: FLEX-40-INCREMENTAL_HYUNDAI-3				
escofier TECHNOLOGIE FRANCE  www.escofier.com				
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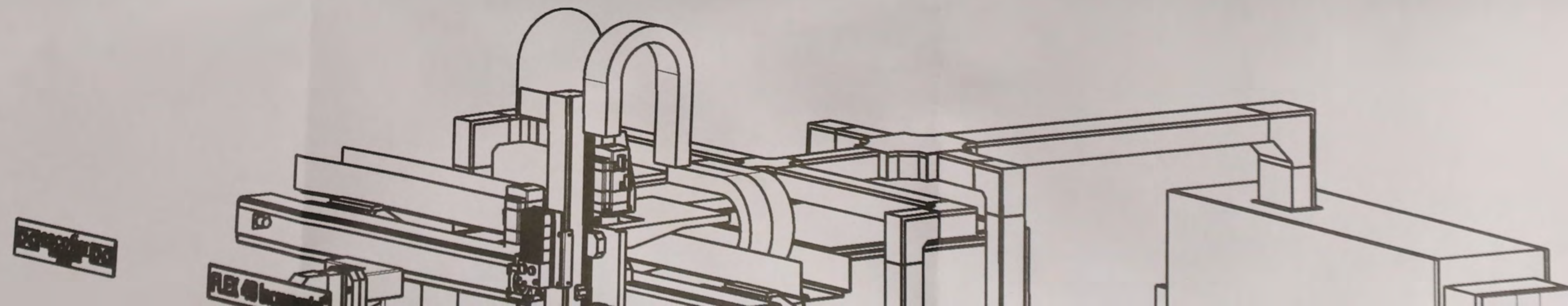
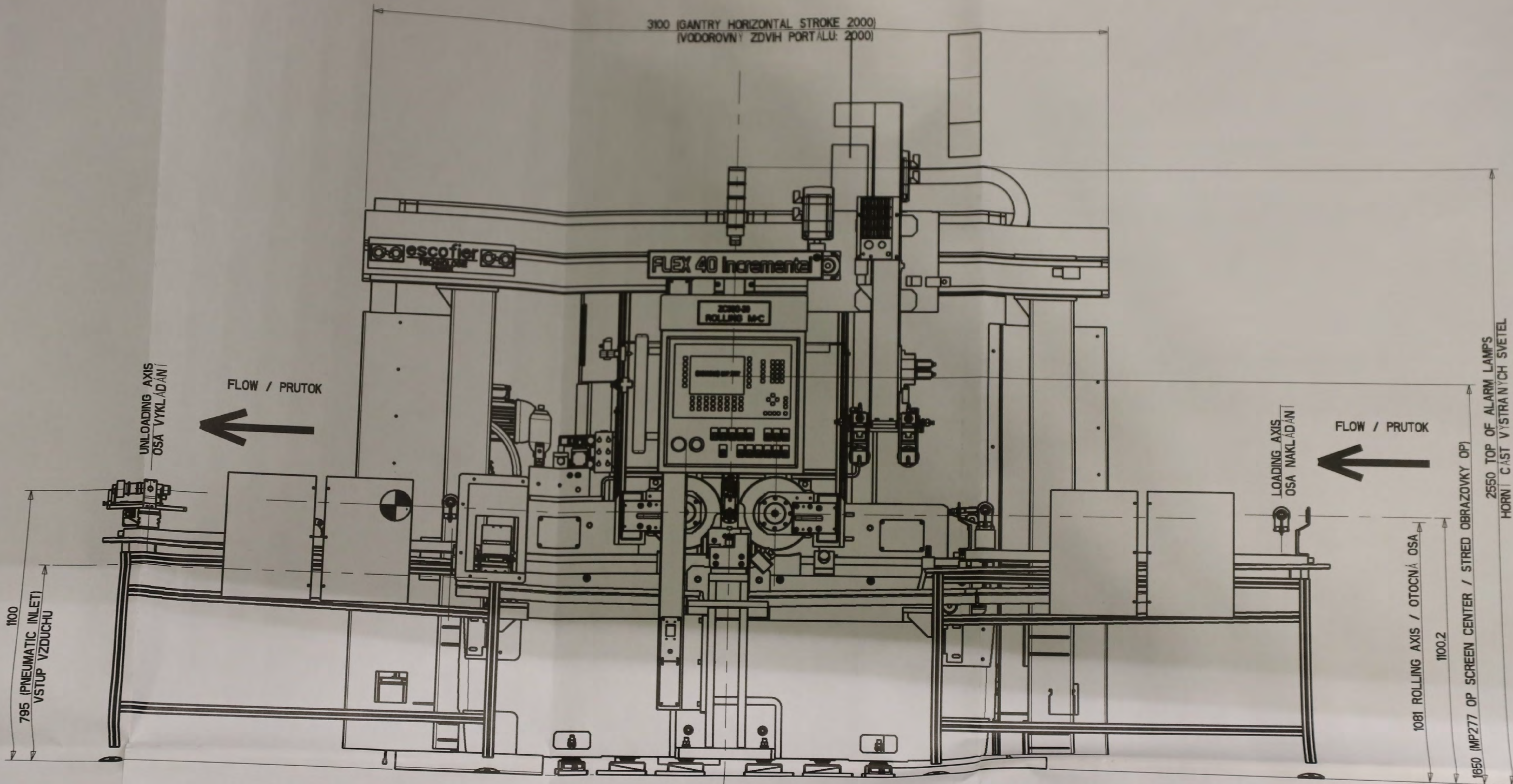
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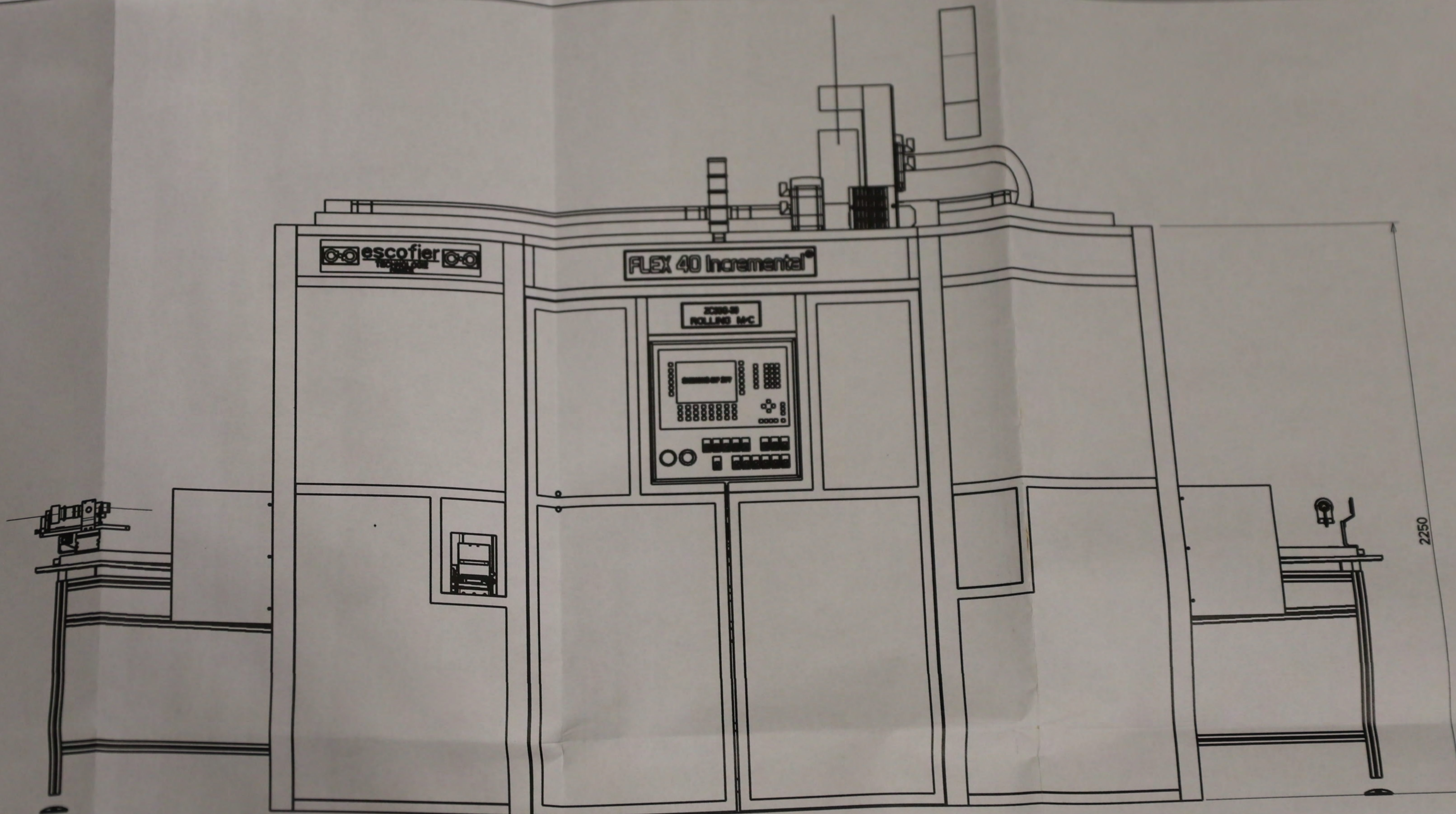
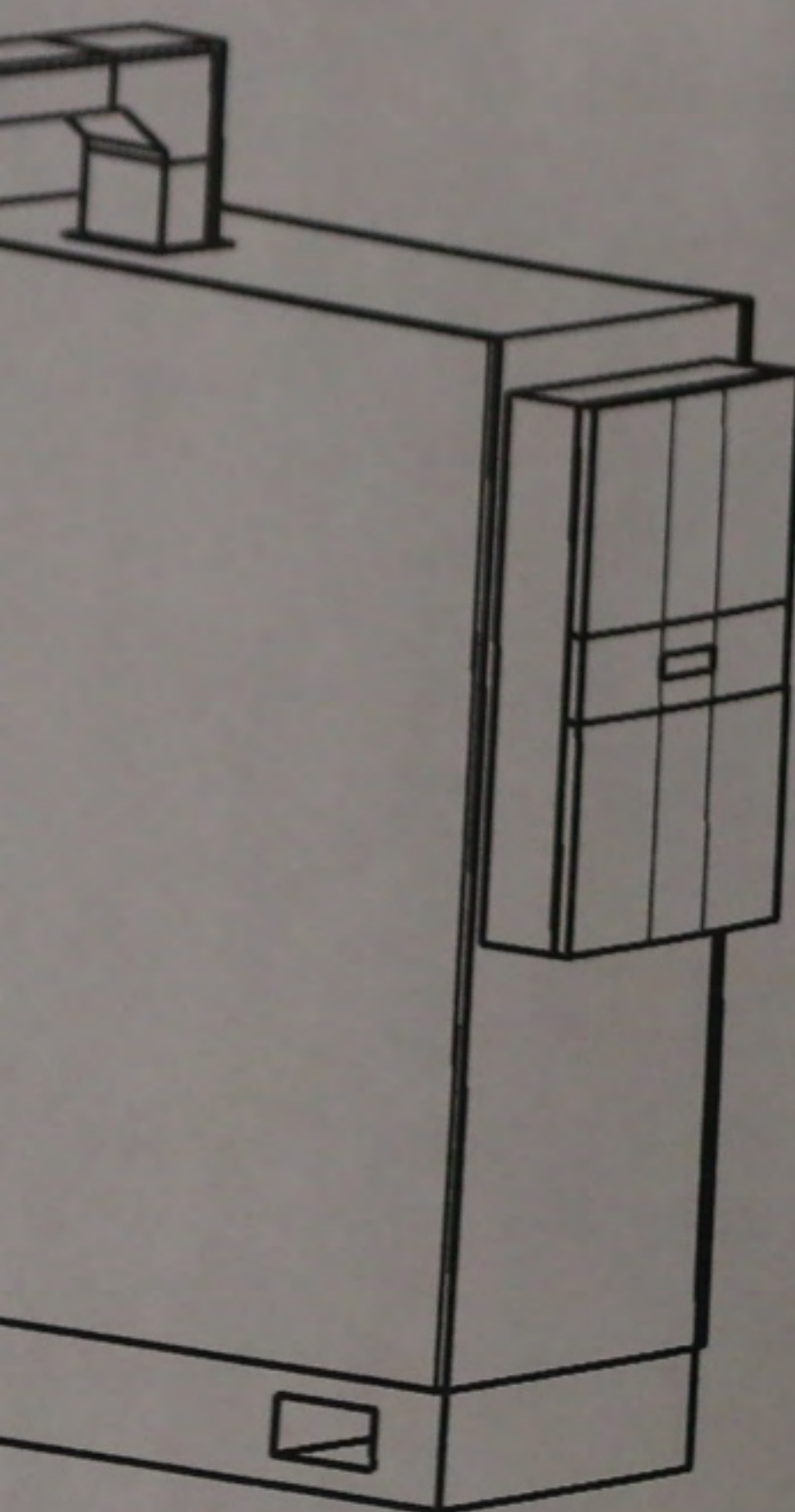


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Machine	LAY OUT / USPORADANI	ZC336-20	TECHNOLOGIE	FRANCE
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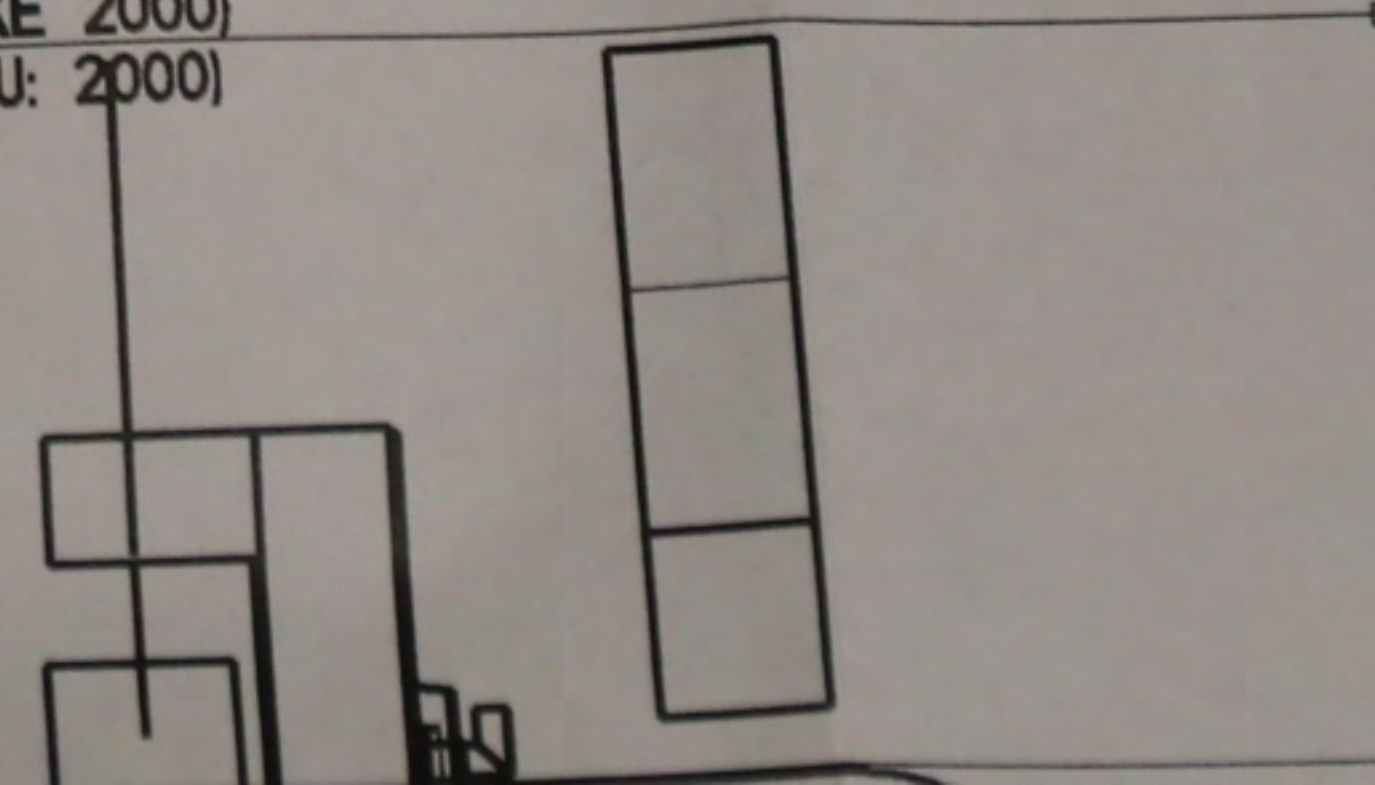


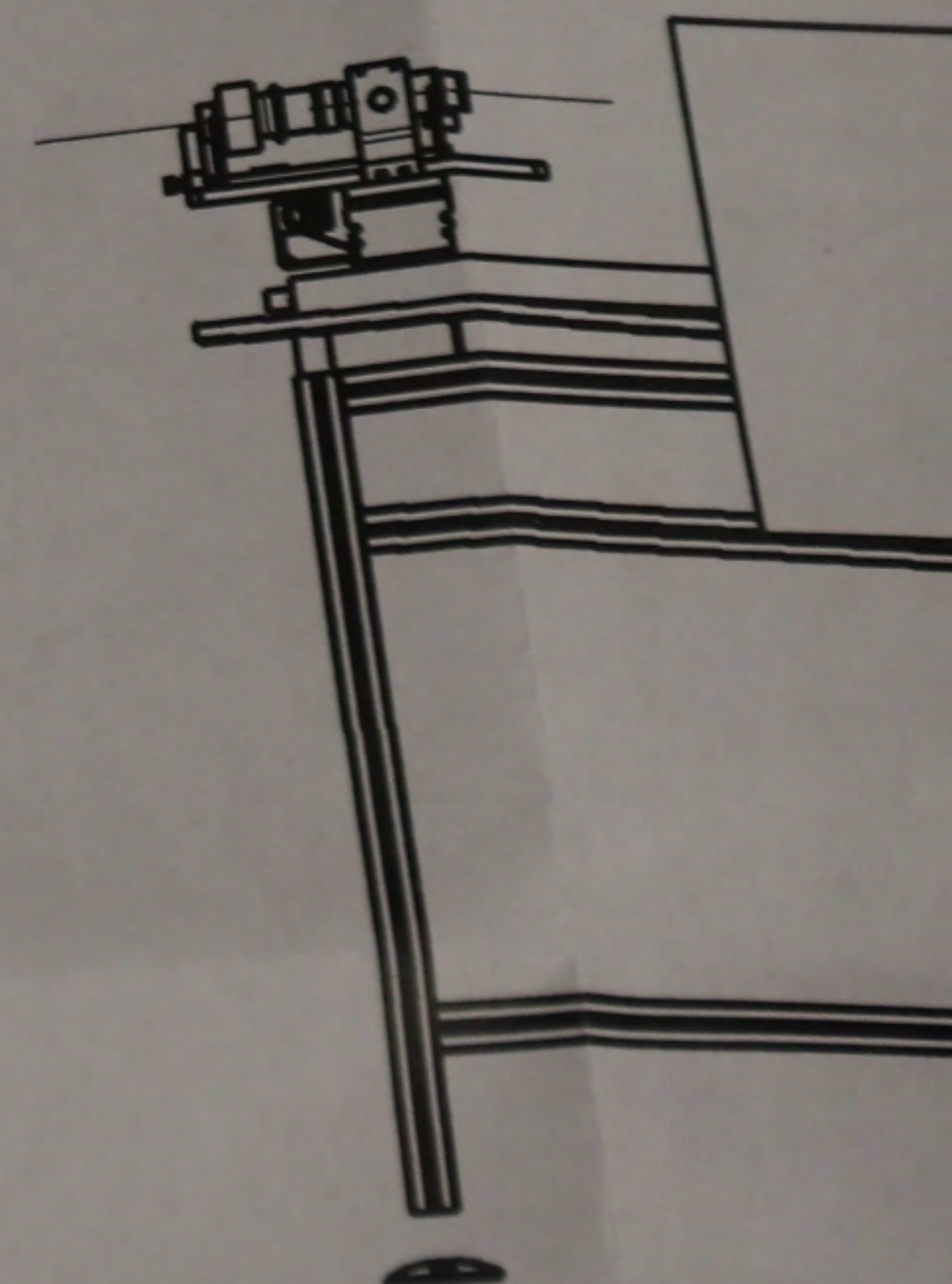
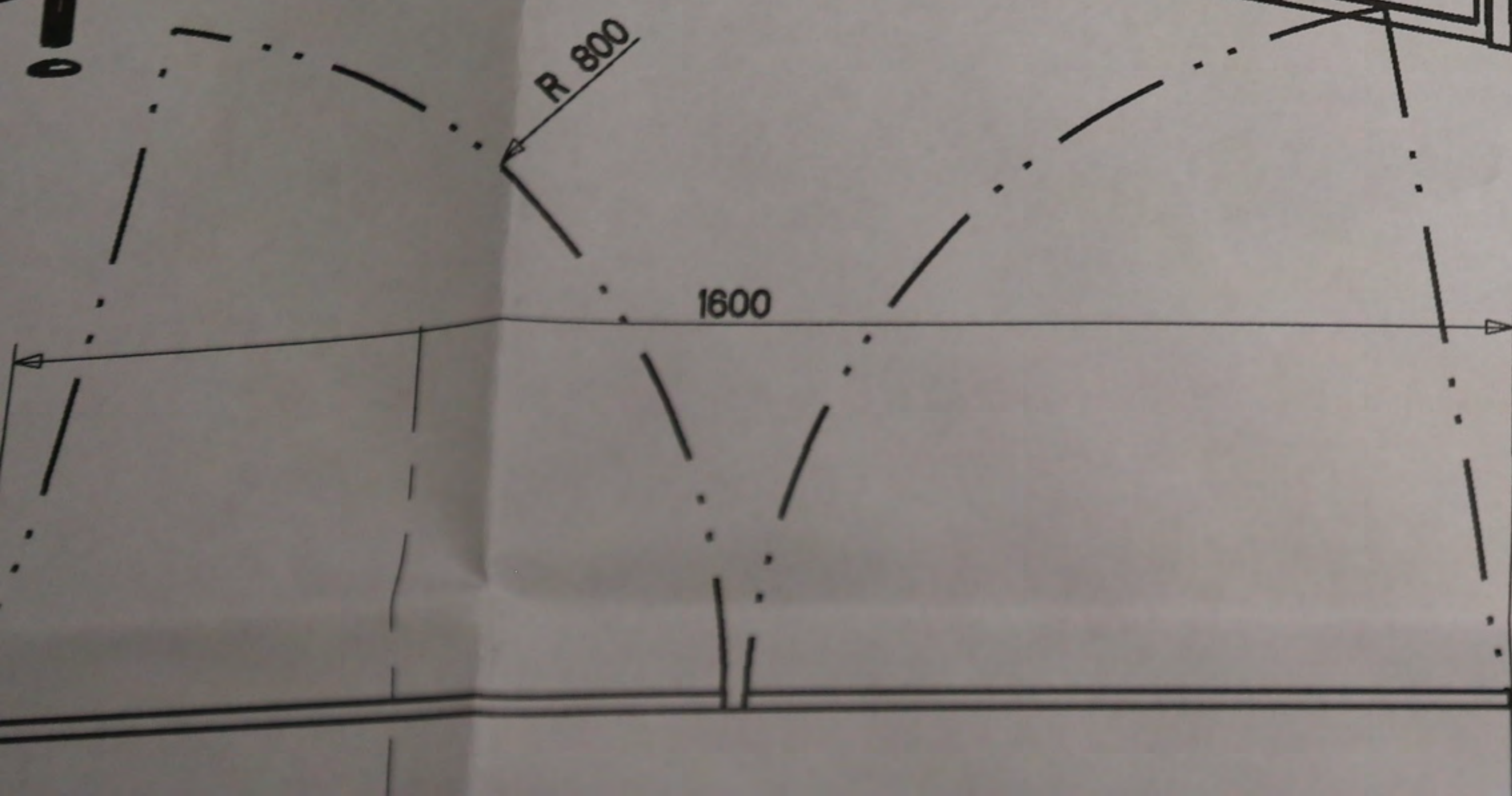
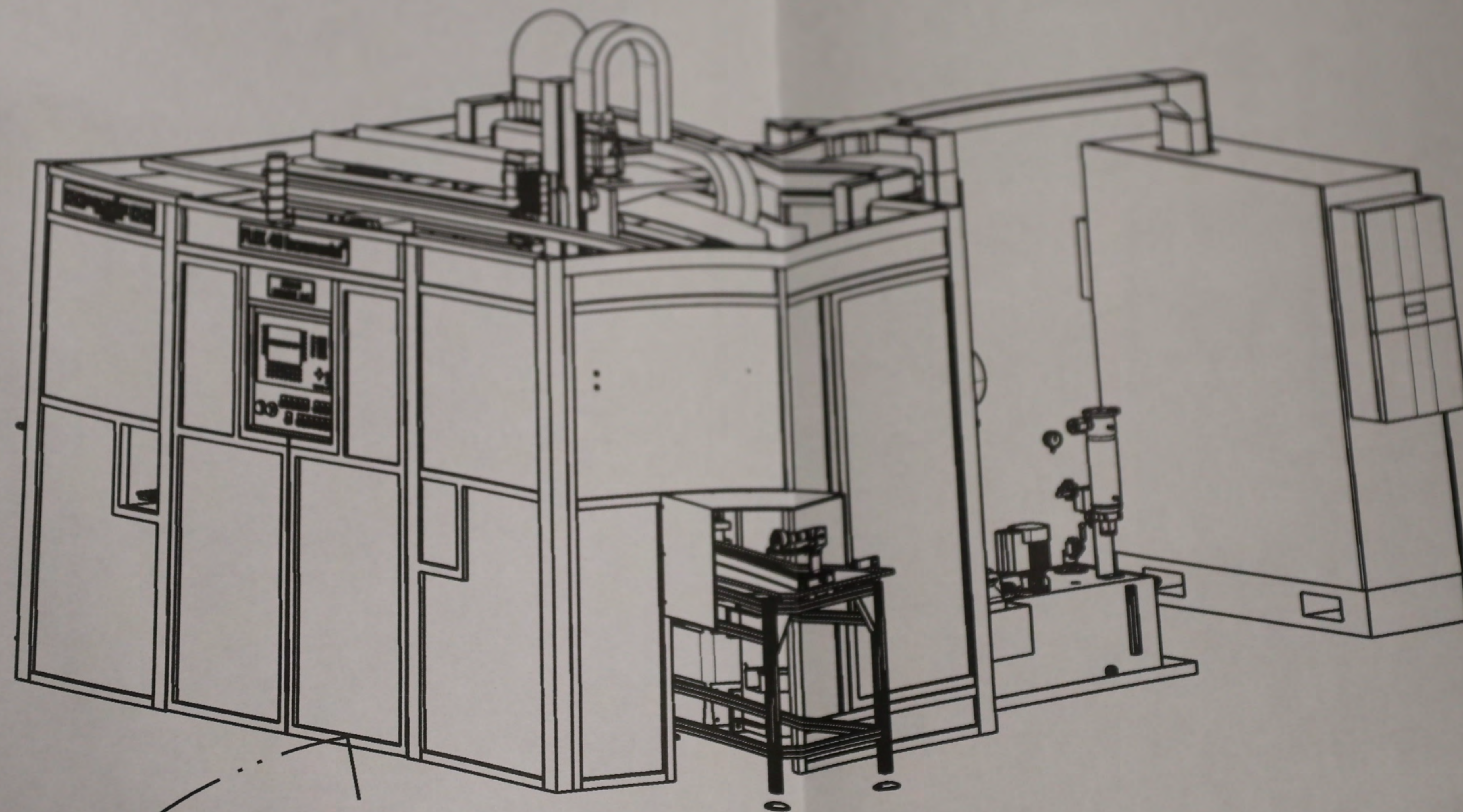
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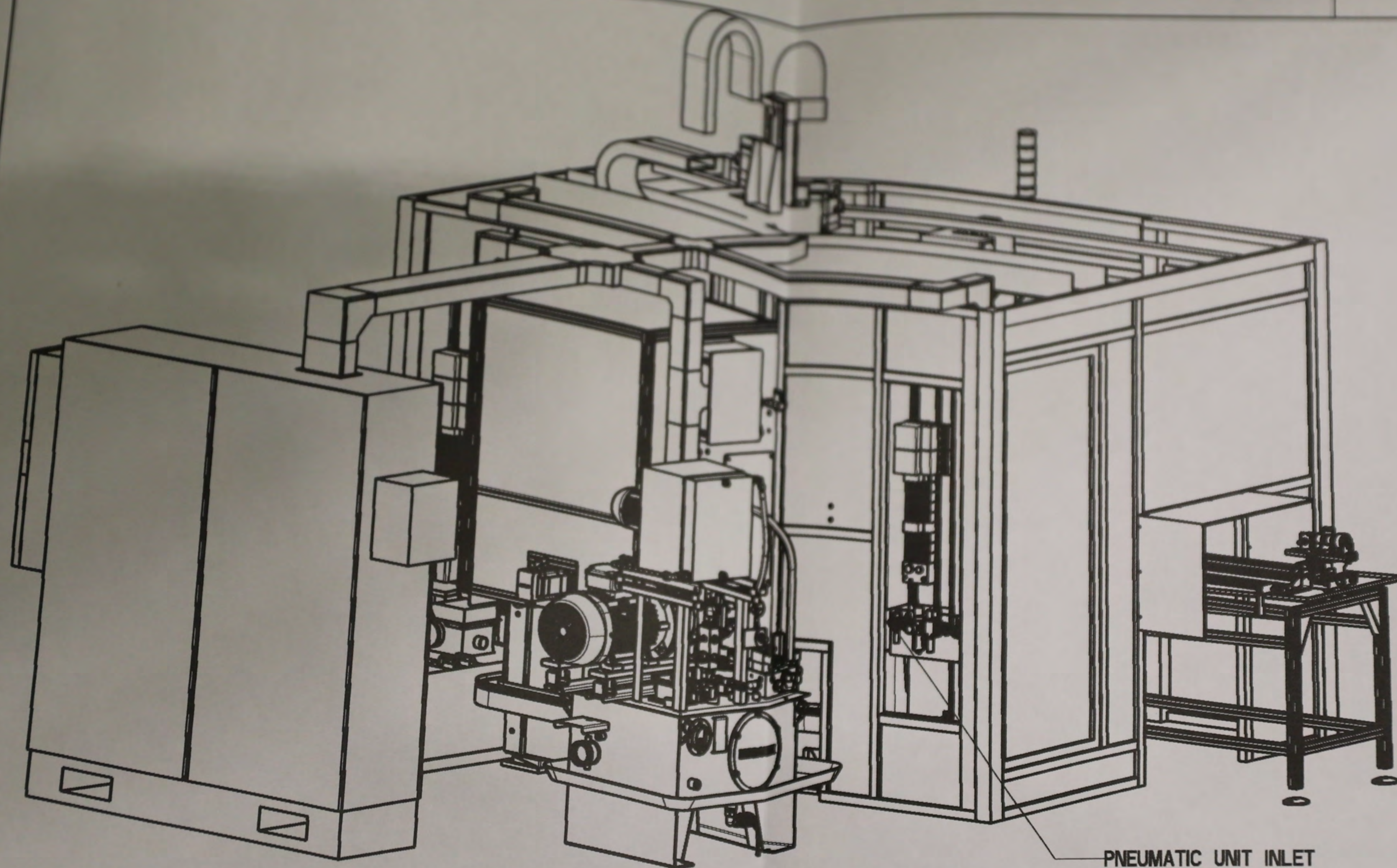




3100 (GANTRY HORIZONTAL STROKE 2000)
(VODOROVNÝ ZDVIH PORTÁLU: 2000)







PNEUMATIC UNIT INLET
VSTUP VZDUCHU
100 NL/min
P mini 5 bar
PT 3/8 " BSPP

ELECTRIC POWER INLET
VSTUP ELEKTRICKÉ ENERGIE
52 KVA

R 800

1600

