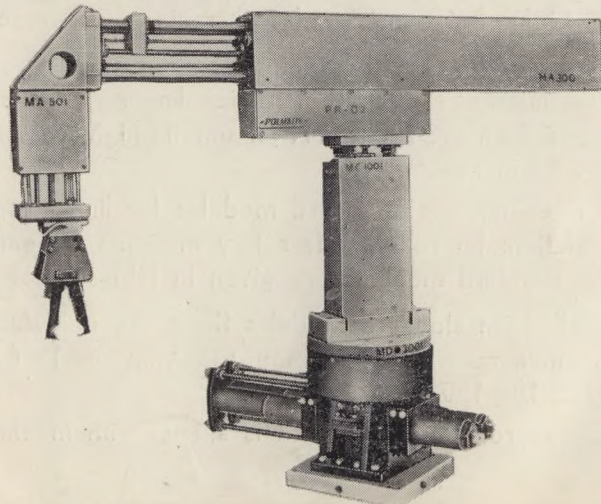
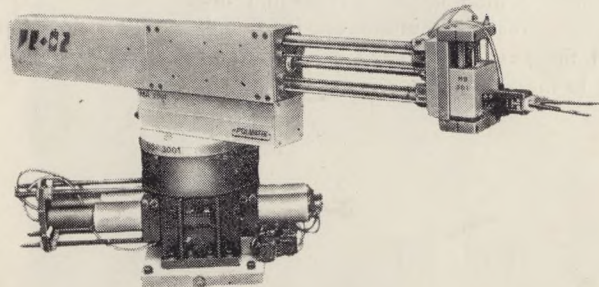
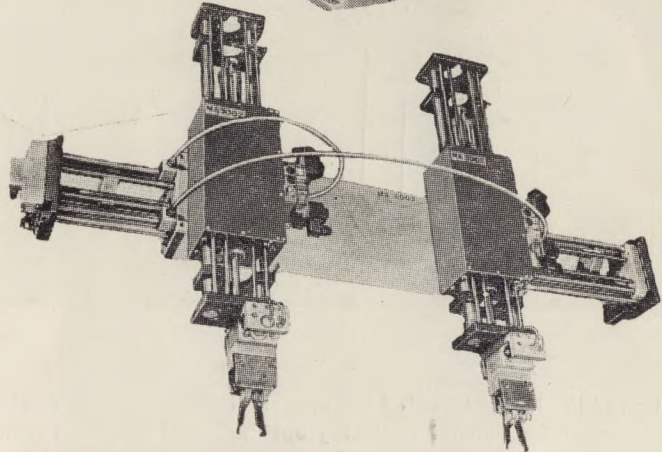
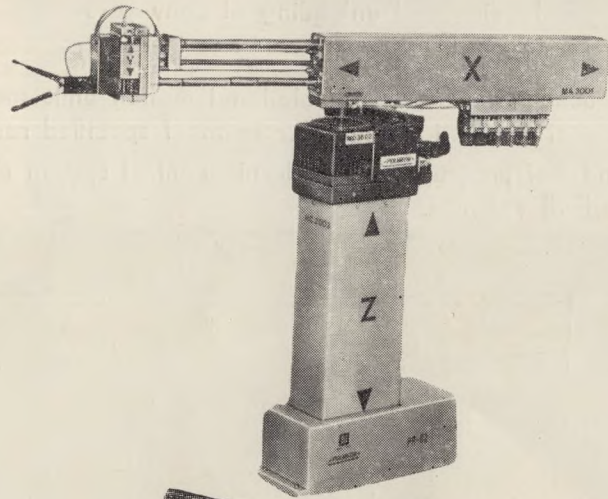




PRZEMYSŁOWY
INSTYTUT
AUTOMATYKI
I POMIARÓW
MERA - PIAP
Al. Jerozolimskie 202
02-222 Warszawa
Poland

Industrial robots

PR-02



POLISH AUTOMATION AND MEASUREMENTS SYSTEM **POLMATIK**

MOTOROBOT - industrial robots

POLMATIK System is Polish Realisation of Universal International System of Automatic Control (URS)

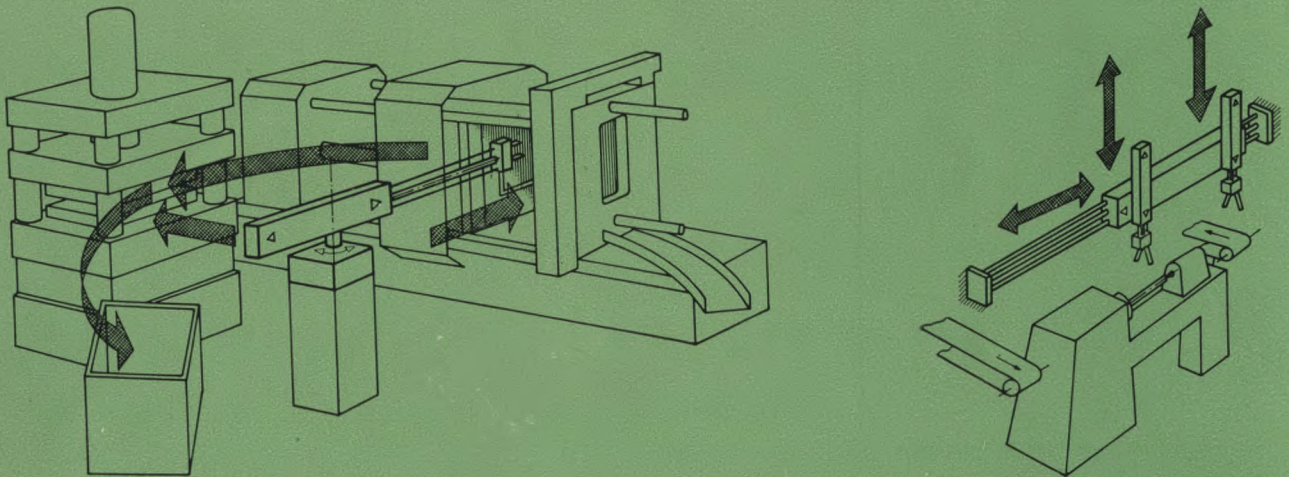
Application

Industrial robots PR-02 are destined for material and detail handling in automatic operation of machines and installations, especially for:

- ▶ loading and unloading of lathes
- ▶ loading and unloading of presses
- ▶ unloading of injection moulding machines
- ▶ loading and unloading of conveyors
- ▶ automatic assembly

Modular design of linear and rotational motion units makes possible to optimize the construction of various robot realizations in order to meet specified requirements.

Easily and fast programmed electronic control system enables the application of PR-02 robots in production of all volumes.



Application of the industrial robot for operation of a casting machine. Functions: picking out the casting from a casting mould; positioning the casting in the press for cutting off feedhead; picking out the casting from the press; putting the casting to the container.

Application of the industrial robot for operation of a lathe. Functions: taking off a shaft from a conveyor before machining with simultaneous positioning the first shaft on the lathe and the second already machined shaft on another conveyor.

Construction. Operation

PR-02 industrial robot consists of two main parts: mechanical part and electric control system.

Mechanical part of PR-02 robot contains standard modules chosen adequately for the required application. Standard modules of PR-02 robot realize linear motion or rotation. Modules, manufactured in several sizes, are based on MOTPNEDYN pneumatic high-pressure drive units of Polish Automation and Measurements System POLMATIK.

There are three types of standard modules for linear motion (MA, MB and MC units) and two types realizing rotation: for robot body rotary motion (MD unit) and for wrist turn (ME unit). Main technical data of the standard modules are given in tables below.

Independently from standard modules there are manufactured four units realizing powering of gripper jaws. Their maximum load carrying capability is 1–6 kg and the maximum diameter of handled workpieces is 10–150 mm.

Range of standard modules motion is set up with mechanical limit position stops.

Control system: PR-02 industrial robots are equipped with electric control system designed as free standing control console which can be installed in distance of some meters from mechanical robot. The operational part of control system consists of pinboard, pushbuttons and signal lamps.

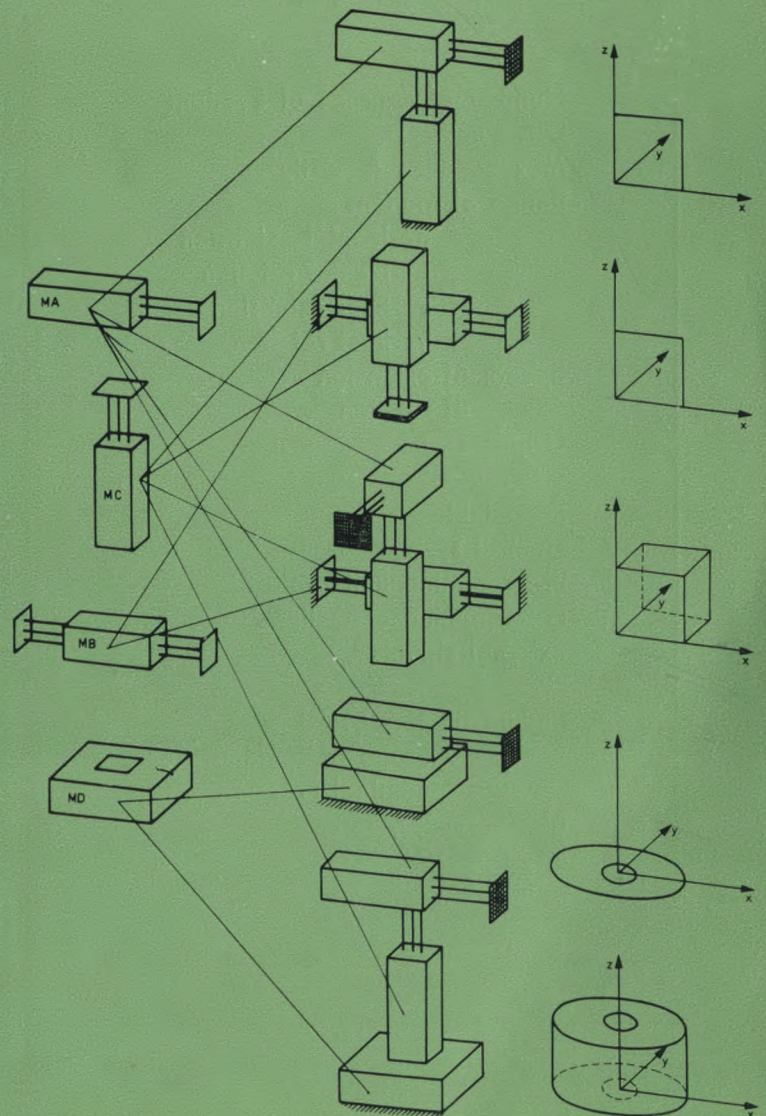
The sequence of robot operation is programmed on a programming pinboard by inserting of diode pins. The control system enables: ► manual control of mechanical system modules by pushbuttons ► automatic control after programming board instruction, (the robot can work continuously or step-by-step) ► cooperation with external equipment in automatic mode of control, remote control and interlock.

Programming: The sequence of industrial robot operation is programmed by diode pins inserted on the programming pinboard.

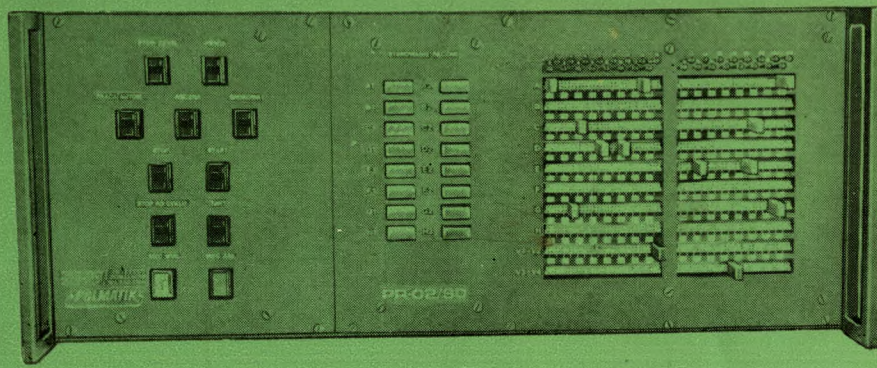
The standard pinboard has 640 sockets forming the rectangular net of 32 columns corresponding to successive steps of program and of 20 rows, 16 of them serve to code the motions of mechanical system and the rest represents the external cooperation signals. When the diode pin is inserted in a socket in intersection of one of rows and one of columns the motion corresponding to named row shall be executed in the sequence step represented by named column. The position is memorized by logic circuit during next sequence steps. Every column is extended by the lamp indicating the actually executed program step.

Type	Symbol	Max stroke mm	Number of stop positions	Load N (kG)
MA	501	50	2	200 (20)
	3001	300		200 (20)
	3002	300		700 (70)
	6002	600		700 (70)
MB	201	20	2	200 (20)
	2003	200		1500 (150)
	4003	400		1500 (150)
	6003	600		1500 (150)
MC	321	32	2	200 (20)
	502	50		300 (30)

Type	Symbol	Maximum angle deg (°)	Number of stop positions
MD	3001	300	2
	3603	360	3
ME	1801	180	2
	1603	360	



Schematic diagram of combining standard modules into different configurations of PR-02 industrial robot. Gripper can be mounted directly on the black-signed part of MA unit or it can be fixed on ME wrist rotating unit. Mechanical part of the robot can be hung up to the floor or to the bracket of operated machine. The drawing shows only some main possibilities of modules connection.



Control functions

Manual control: Every motion of mechanical system can be operated manually using pushbuttons placed in elongation of corresponding rows of programming board.

Automatic control: The industrial robot is performing the sequence of its operations after the program set on the pinboard. The following step is generated by the logic circuit after complementing of all movements of the actually realized step.

Automatic step-by-step control: The sequence of operation is followed after the program set on the pinboard, but each step must be generated manually using adequate pushbutton. Return of the sequence to previous steps is also possible. The automatic step-by-step control serves to check the program set on the pinboard and enables programming the operating sequence by step-by-step mode.

Main technical data

Number of degrees of freedom	2...7
Drive units	air operated
Max handling capacity	1...6 kg
Range of motions	
horizontal extension	max 600 mm
horizontal rotation	max 360°
vertical extension	max 400 mm
vertical rotation	max 360°
Speed: of extension	300...500 mm/s
of rotation	90°...180°/s
Grippers	mechanical, vacuum electromagnetic
Repeatability	±0,1...±0,5 mm
Control system	electric
Programming unit	pinboard
Programming capacity	16 or 32 steps
External signals	number of outputs 1...4 number of inputs 2...8
Pneumatic supply:	
range of working pressure	0.4...0.7 MPa (4...7 kG/cm ²)
nominal pressure	0.6 MPa (6 kG/cm ²)
Electric supply	220 V; 50 Hz, 120 VA

The possibility of changes is reserved

TECHNICAL INFORMATION: Przemysłowy Instytut Automatyki i Pomiarów MERA-PIAP, Ośrodek Automatyki Mechanicznej, Al. Jerozolimskie 202, 02-222 Warszawa, Poland, Telephone: 23-83-68, Telex: 813726 PL; **PRODUCER:** Przemysłowy Instytut Automatyki i Pomiarów MERA-PIAP, Zakład Doświadczalny, Al. Jerozolimskie 202, 02-222 Warszawa, Poland, Telephone: 23-76-16, Telex: 813726 PL; **EXPORTER:** Przedsiębiorstwo Handlu Zagranicznego METRONEX, Al. Jerozolimskie 44, 00-024 Warszawa, Telephone: 26-74-41, Telex: 814471 PL