

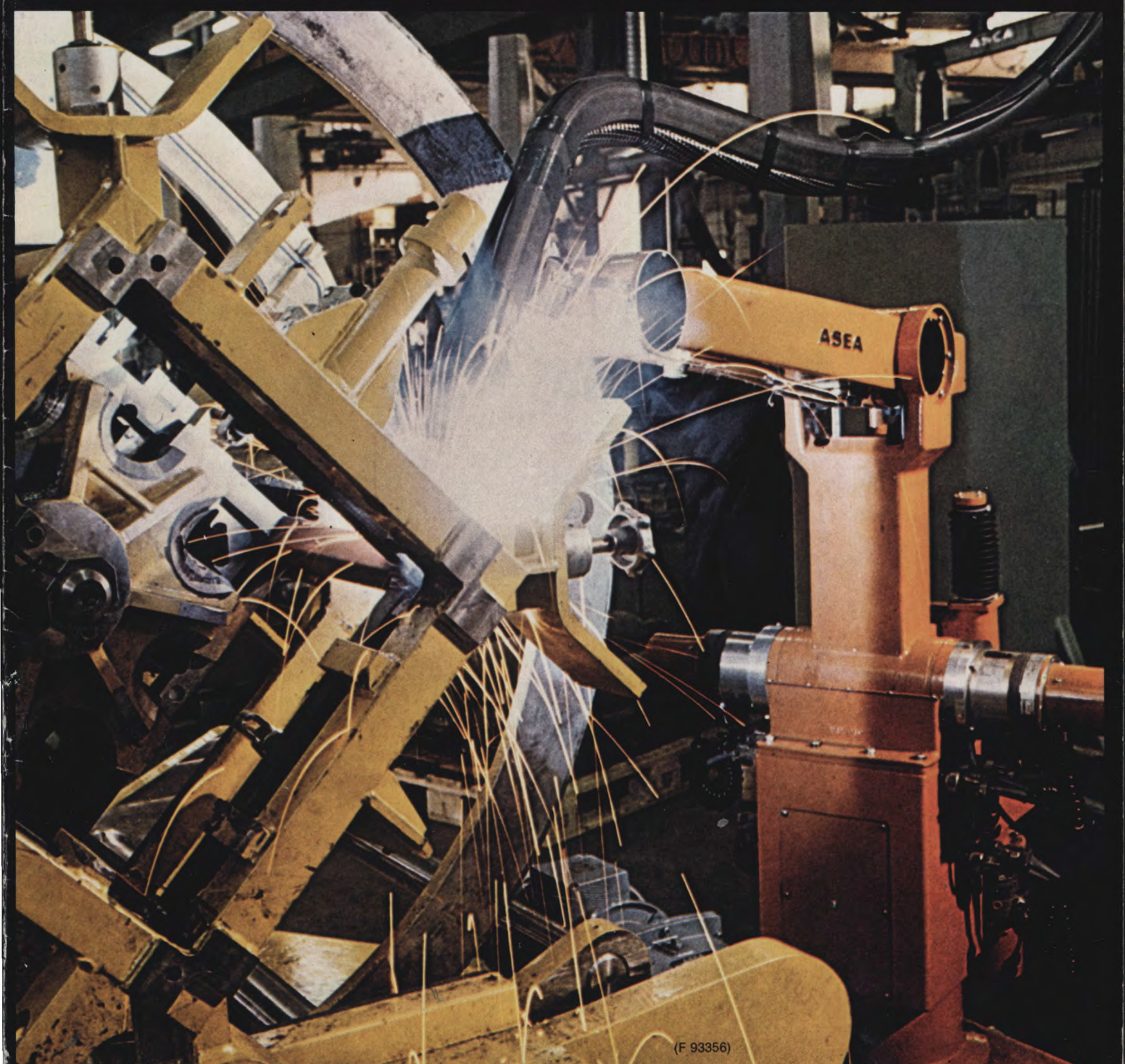
# ASEA

Pamphlet YB 11-101 E

Edition 1

LICENCE

Industrial robot system



(F 93356)



# A highly versatile heavy-duty industrial robot for precision work as well as grimy, monotonous, exhausting jobs in difficult surroundings.

## Rapid returns on investments

The profitability of modern industries depends on rapid turnover of the invested capital.

This implies a high rate of production per invested monetary unit.

ASEA now introduces a robot system which, due to its versatility and programmability, provides new possibilities of minimising machine investments and the capital tied down in raw materials and work in progress.

## Higher production for each working hour. Production in difficult environments

Two important demands made of modern industry are that satisfactory work-places be provided for its employees and that productivity can be increased to keep step with market requirements. Here the ASEA industrial robot provides new opportunities for working in the most difficult environments — around the clock.

## Some examples:

**A robot-controlled production group including one or more robots.** Does away with the need for buffer storage between the machines and considerably reduces the through-put time. Furthermore, it often increases the capacity of the production group so any waiting ahead of the group is eliminated. The high precision, compact design and large program memory of ASEA's robot are vital factors here.

**Result:** Reduction of capital tied down in machine tools and work in progress, higher rate of production.

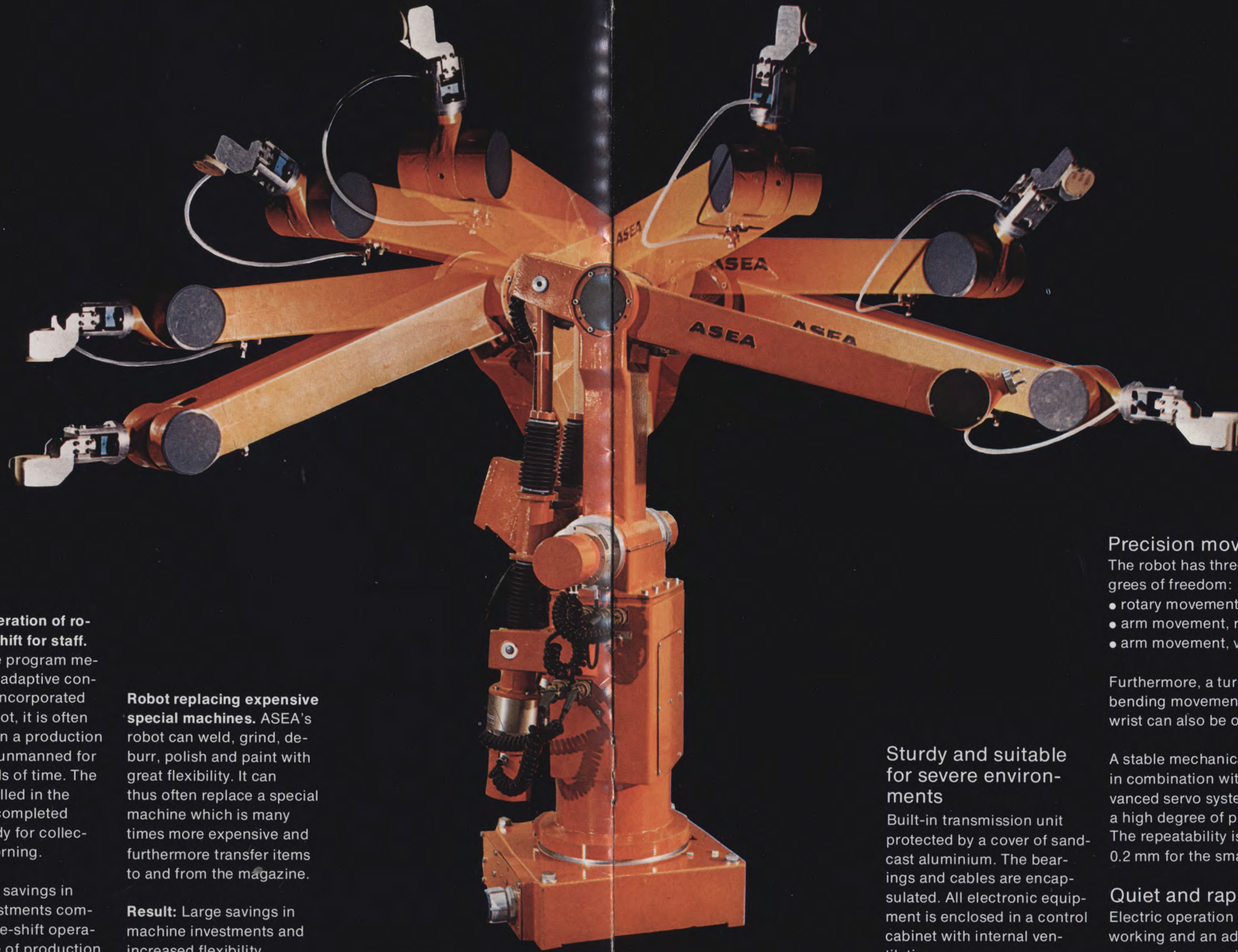
## Four-shift operation of robots, single shift for staff.

With the large program memory and the adaptive control facilities incorporated in ASEA's robot, it is often possible to run a production group totally unmanned for certain periods of time. The magazine is filled in the evening and completed items are ready for collection in the morning.

**Result:** Large savings in machine investments compared with one-shift operation, high rate of production, faster capital turnover.

**Robot replacing expensive special machines.** ASEA's robot can weld, grind, deburr, polish and paint with great flexibility. It can thus often replace a special machine which is many times more expensive and furthermore transfer items to and from the magazine.

**Result:** Large savings in machine investments and increased flexibility.



## Simple to program

The movements of the robot are programmed in a portable programming unit. Step by step, each position is stored in a memory. One programming unit can be utilised for several robots.

In addition to actual position instructions, it is also possible to store instructions for manoeuvring the gripper, switching on and off a number of outputs, testing a number of interlocking inputs, time delays and repeats.

## Simplified servicing

The electronic section is built up of plug-in units and this, together with the fully electrical drive and control system, simplifies servicing procedures.

## 6 or 60 kg handling capacity

The basic system includes robots for 6 or 60 kg handling capacity, control equipment and equipment for programming the operation of the robot. Furthermore, a battery is included as a standby source of supply should the main supply be interrupted. This battery can maintain the contents in the program memory for up to 45 minutes after failure of the main power supply.

## Many first-rate accessories

- Tape recorder for transmitting and receiving of programs.
- Additional memory cards increase the capacity of the memory by 100 %
- Pneumatic unit for installation in the robot arm when a pneumatic gripper is used
- Pneumatic equipment for controlling the travel between two end positions
- Test panel for fault tracing and servicing purposes.

## Precision movements

The robot has three main degrees of freedom:

- rotary movement
- arm movement, radial
- arm movement, vertical

Furthermore, a turning and bending movement of the wrist can also be obtained.

A stable mechanical design in combination with an advanced servo system gives a high degree of precision. The repeatability is better than 0.2 mm for the smaller robot.

## Quiet and rapid

Electric operation gives quiet working and an advanced servo system provides optimum speed control.

## Sturdy and suitable for severe environments

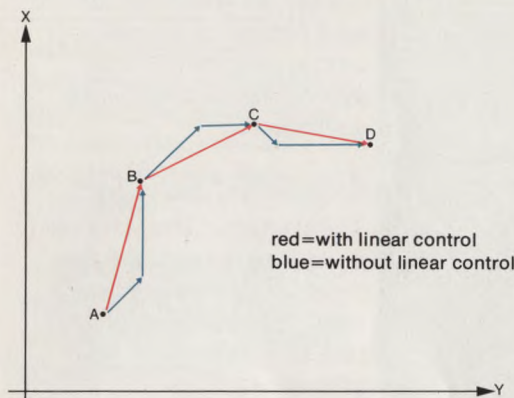
Built-in transmission unit protected by a cover of sand-cast aluminium. The bearings and cables are encapsulated. All electronic equipment is enclosed in a control cabinet with internal ventilation.



# A large number of programming alternatives and even more applications

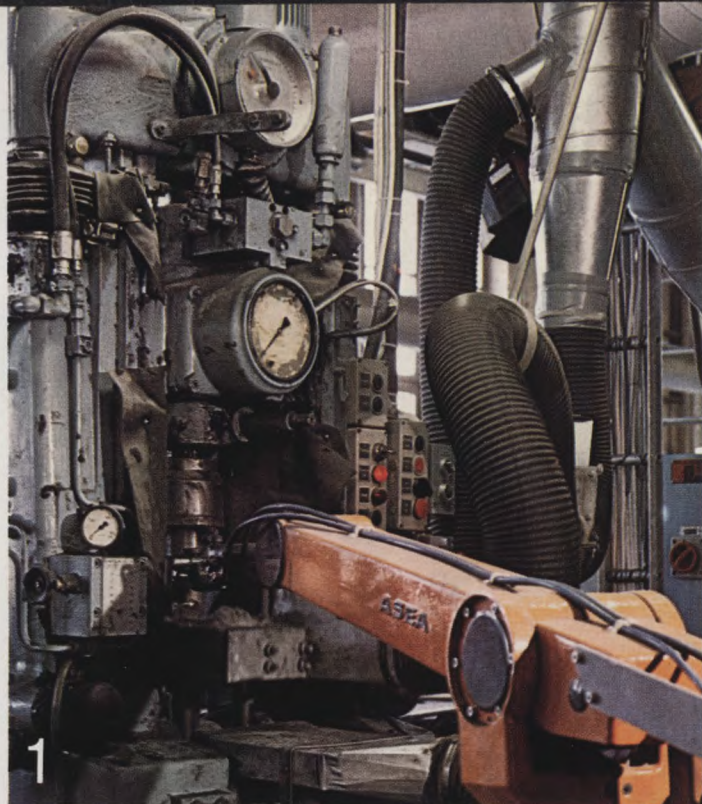
The robot's programming possibilities provide a good illustration of its versatility:

- **Point-to-point position control** at a programmable speed
- **Linear control** permits the programming of curves at a programmable speed



With linear control and sufficiently close programmed points, a curved movement can be programmed. The figure shows the difference between the path of the robot with point-to-point position control, with and without linear control.

- **Linear control search function** allows picking from racks of varying heights
- **Jump function** permits simultaneous tending of machines that are not synchronized. Jumps can be made both within the same program and to another program
- **Repeat function** makes it possible to repeat a section of a program for a predetermined number of times
- **Pattern function** simplifies programming for pattern picking and positioning
- **Correction function** facilitates alterations, cancellations and additions in existing programs
- **Control of attended machines and equipment.** Sixteen signal inputs and fourteen outputs can be manoeuvred.



There are many possible applications. A few examples:

1 The robot tends a powder press. Items are picked out of the press and positioned in neat rows, layer upon layer, on a pallet. (F 93370)

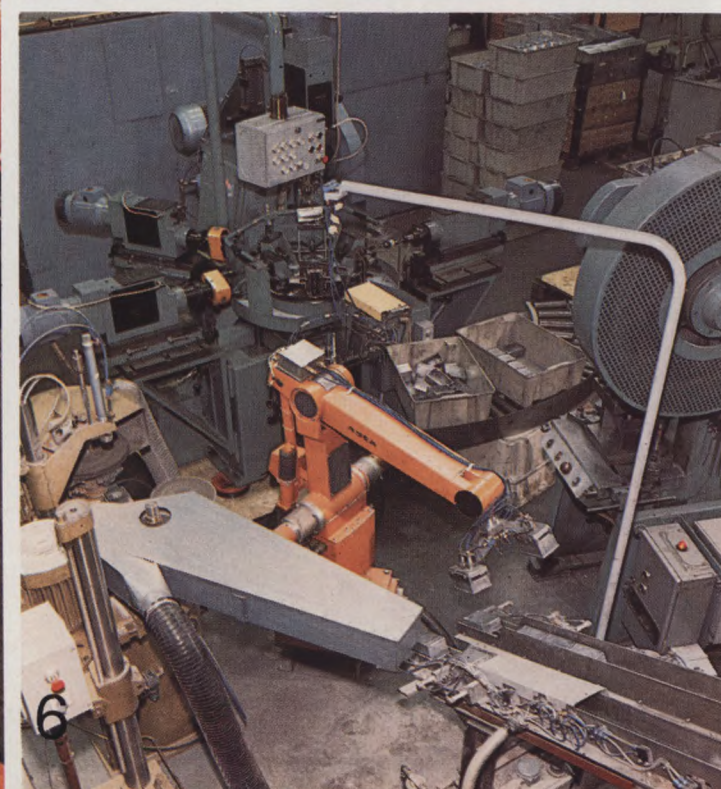
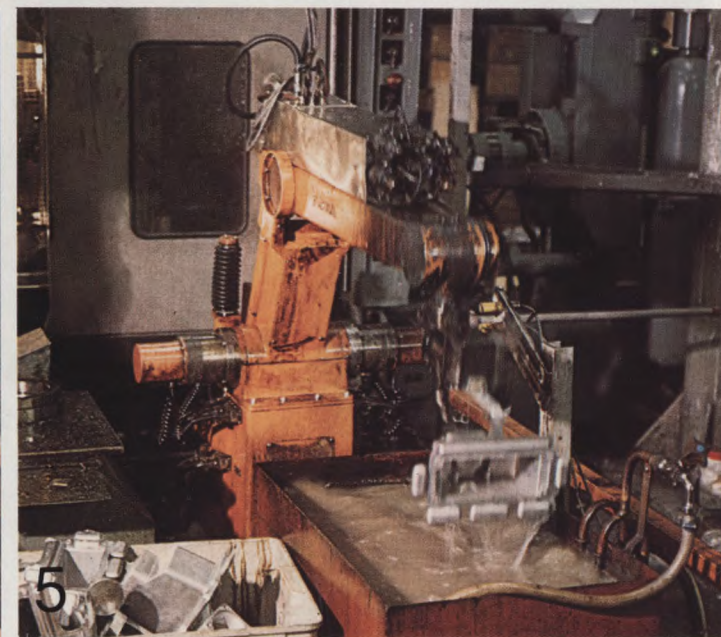
2 A robot picking castings from a die-casting machine. In this case, the robot is fitted with additional equipment for lubricating the dies. (F 93361)

3 The robot is also a competent grinder. Stainless steel pipe fittings are here being polished. (F 93661)

4 Welding represents no problem for an ASEA robot. Arc-welding of a motor frame. (F 93354)

5 Machines for final machining of aluminium castings are being looked after here. (F 93363)

6 This robot attends to final machining of aluminium products: it drills, taps, punches and grinds. (93357)





# The robot is constructed according to advanced techniques

ASEA's industrial robot system consists of three main parts:

- control equipment
- measuring and servo system
- mechanical system

The control equipment is built up on the basis of modern semiconductor technology, giving comprehensive programming facilities. Advanced control functions reduce the need for expensive peripherals.

The control electronics are installed and totally enclosed in a sheet-steel cabinet. The electronic equipment consists of p.c. boards which are grouped to form function packages such as computer, memories, inputs and outputs for manoeuvring the robot, and functions for controlling the servo system of the robot. A master board, with etched conductor pattern, electrically interconnects the p.c. boards with each other. Thus there are no connecting leads. The internal ventilation of the cabinet is arranged with a forced draught system, the air being cooled down between the double walls of the control cabinet. Impurities are effectively prevented from entering the cabinet.

The p.c. boards are given a coat of varnish to protect them against dirt and moisture. Each item is designed to withstand hostile workshop environments. The robot is equipped with a mechanical system and a drive unit which provide rapid operation with great precision and stability. The electrical drive system makes for quiet operation of the robot and keeps the surroundings clean.

The drive system consists of three main parts:

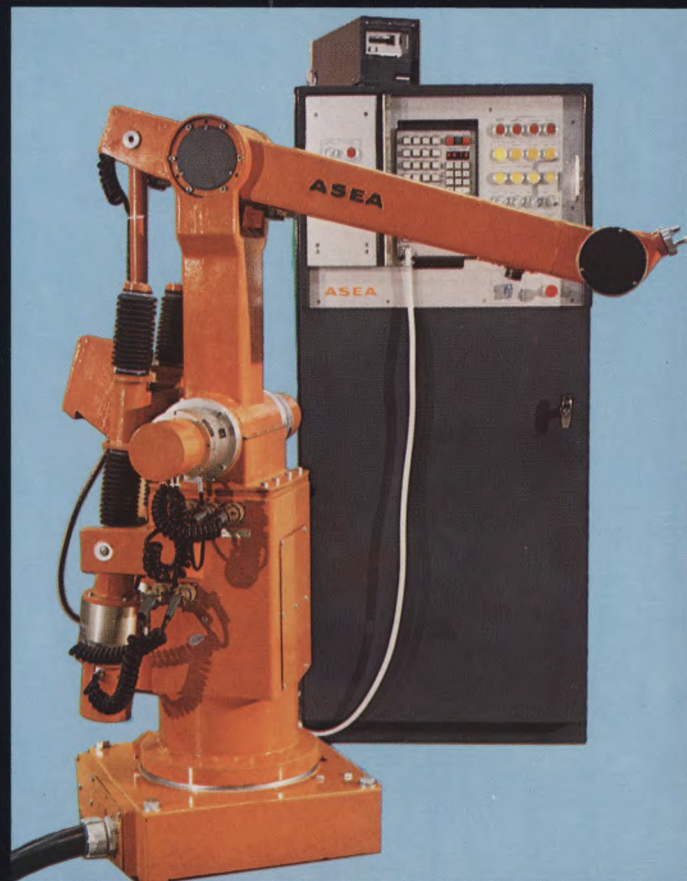
- motor unit
- mechanical transmission
- servo amplifier

The motor unit includes a complete servo with d.c. motor, resolver for position indication and a tachometer for controlling the speed. The motor unit for the wrist can, if so desired, be replaced with a pneumatic turning cylinder.

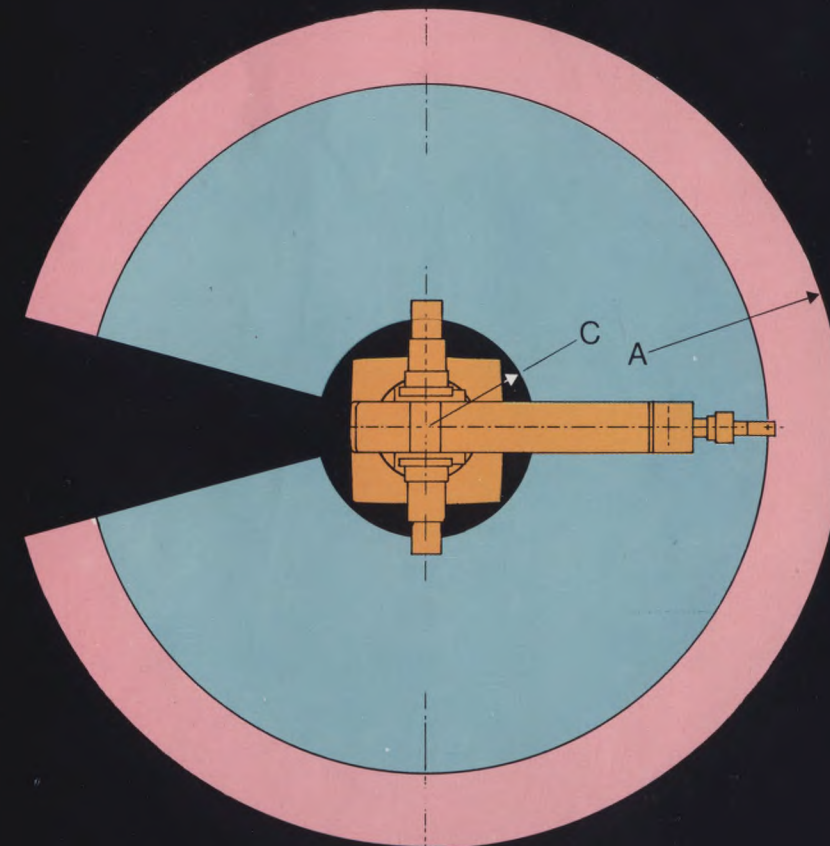
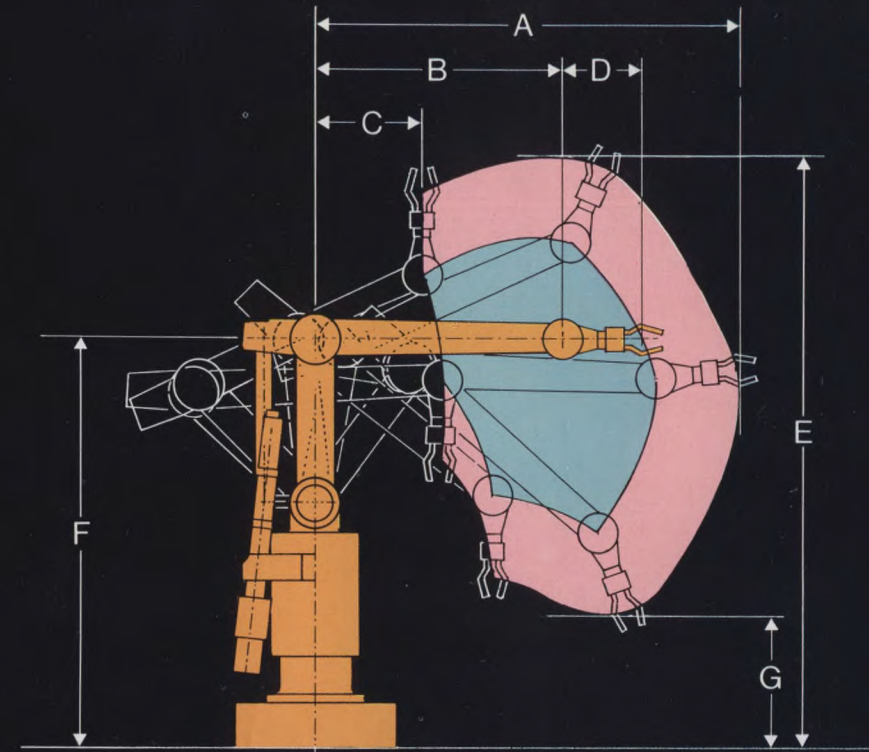
Upper: Tape recorder unit (F 92136)

Centre: Operating panel of the control system (F 90791)

Lower: ASEA's industrial robot with a handling capacity of 6 kg (F 92212)



# Dimensions and operating range



Robot with handling capacity	A	B	C	D	E	F	G
6 kg	1159	670	289	200	1620	1150	414
60 kg	2288	1280	989	400	2150	1600	0

## Points of interest

**Control equipment**  
Permitted ambient temp. 0 to 40 °C

Total power consumption, incl. robot approx. 2 kW

Programming capacity of basic version min. 250 positions

Max. distance between control cabinet and robot 15 m

Number of programs in program memory 4 (can be extended with cassette type tape recorder)

### 6 kg robot

Rotating arm movement  
max. sweep 340°  
max. speed 95 °/s

Radial arm movement  
max. range (see figure)  
max. speed 0.75 m/s

Vertical arm movement  
max. range (see figure)  
max. speed 1.1 m/s

Bending movement, wrist  
max. range ±90°  
max. speed 115 °/s

Turning movement, wrist  
max. range ±180°  
max. speed 195 °/s

Degrees of freedom excl. grip function 3 to 5

Individual gripping functions (optimum) 2

Handling capacity incl. gripper (max. length of gripper as shown in fig.) 6 kg

Repeatability ±0.20 mm  
Drive system fully electric

### 60 kg robot

Rotating arm movement  
max. sweep 330°  
max. speed 90 °/s

Radial arm movement  
max. range (see figure)  
max. speed 1.0 m/s

Vertical arm movement  
max. range (see figure)  
max. speed 1.5 m/s

Bending movement, wrist  
max. range ±75°  
max. speed 90 °/s

Turning movement, wrist  
max. range ±180°  
max. speed 150 °/s

Degrees of freedom excl. grip functions 3 to 5

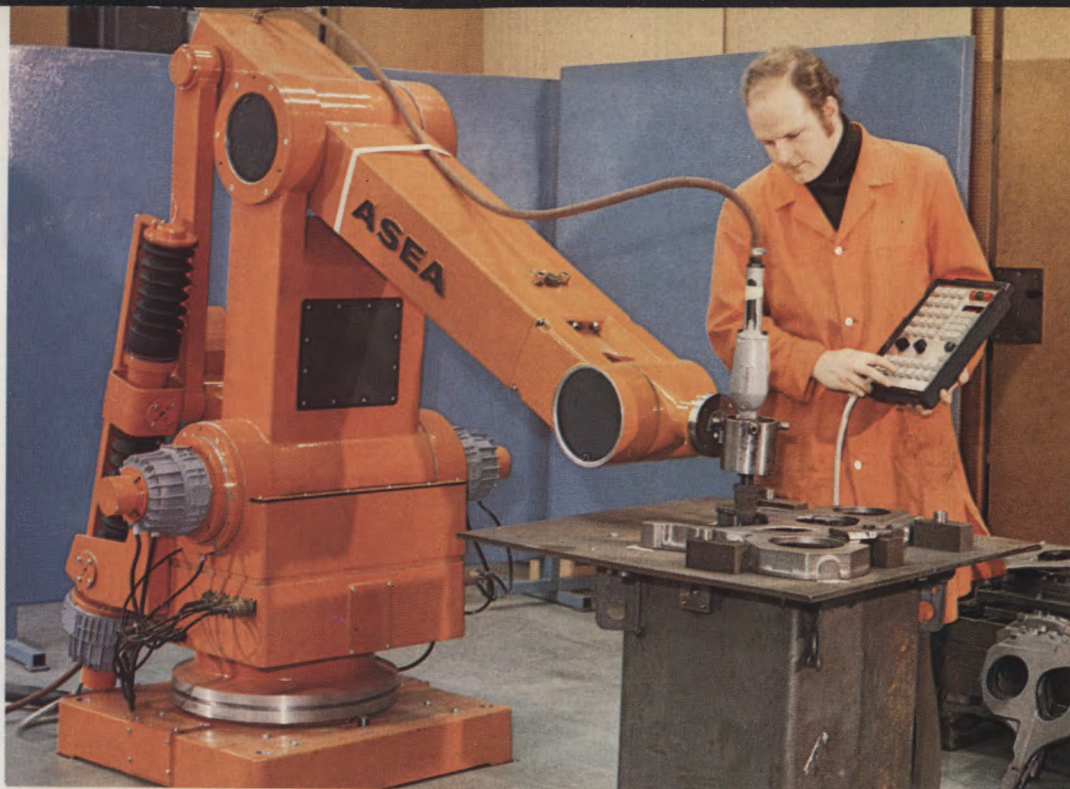
Individual gripping functions (optimum) 2

Handling capacity incl. gripper 60 kg<sup>1)</sup>

Repeatability ±0.40 mm  
Drive system fully electric

<sup>1)</sup> At weights exceeding 30 kg, the speed is reduced by 25%.





Programming a robot for a handling capacity of 60 kg (F 92213)



Example of pattern laying. The pattern-laying function includes: a program for picking items from a press common for all items. A separate program section for each put-down position. (F 93373)



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