

CS-1 TWO-ARM INDUSTRIAL ROBOT

The first two-arm industrial robot which can work in metallurgical production in harmful conditions, developed by the Robotics Research Centre of the Central South University of Technology is planned for use in Shui-koushan Mining Bureau of Hunan Province. The robot has two arms whose task is to agitate the smelting alloy of copper beryllium at 1,800–1,900 °C by its left hand and then to scoop up with the other hand the slag floating continuously to the surface of the smelting alloy. Both hands can fetch different work tools in turn to finish automatically the whole programmed movements when necessary. This robot can make workers get rid of the environment of high temperature, poisonous working conditions and contaminated atmosphere and take the place of the worker's heavy manual labour when it is in application. It can also carry out those operations, such as handling, loading and unloading and so on. Furthermore, both hands can work cooperatively to finish more complex operations.

The CS-1 two-arm industrial robot has seven degrees of freedom with the shoulder elevator for both hands. Both arms and wrists can rotate around their joints and move up and down with the shoulders. This robot is driven by A. C servo motors directly through harmonic reducers or ball screw. The opening and closing of the gripper, the balance of the shoulder and the rotation of the tool frames are done by pneumatic system. The robot is controlled by two computers. The master-computer, which is the nervous centre of the robot is mainly used for movement planning, path calculation, system management and

supervision of its movement stage. The servo-computer is used for the position of the robot's joints whose tasks are to execute the orders given by the master-computer and to take closed loop control of the motors and their controlling module. The soft system of the CS-1 two-arm industrial robot has its own distinguishing feature. Based on microsoft C5.0 and 8088 a self-developed robot language has been developed which can conveniently execute the programming of off-line and compiling on-line so as to realize the control of the movements and operations of the robot in the movement and operation stage. Therefore it not only can meet the demand of the maneuverability in operation but also provide the necessary safety. On December 20, 1991, the technical appraisalment on CS-1 two-arm industrial robot was carried out by the Appraisalment Committee Composed of our famous experts in this field. By careful testing in-situ, the committee reached a consensus that the successful development of CS-1 two-arm industrial robot provides a new kind of robot for the robot family of our country. Considering its design, mechanical structure, the technology of driving and controlling hardware and software, the technology of CS-1 two-arm industrial robot has reached an internationally advanced level in the middle of the 1980's and has filled the blank of the application of robot in the fields of nonferrous metals smelting in China. It will also find new application fields for the development of industrial robots.

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