



Horizontally articulated (SCARA type) precision assembly robot

Repetition Accuracy:  $\pm 0.015$  mm

(SSR-H253-H model)

Maximum operating speed: 2000 mm/sec

(SSR-H414 model)

\*8 speed selections possible

Robot programming / teaching language: SPEL

### Product Features

The SSR-H series, released in May 1983, was the first horizontally articulated (also known as a selective compliant articulated robot arm, or SCARA) precision assembly robot in Epson's\* factory automation systems business. The SSR-H series of industrial robots was widely used for assembling precision instruments such as watches and printers and for packaging semiconductors. The robots were developed by pulling together several of the company's existing competencies—primarily the precision machining technology used in watch production machinery, the electronics technology from the personal computer business, and the know-how gained through the automation of watch assembly. It had outstanding features that far exceeded the robot industry standards of the time: a compact size that enabled smooth integration of the robot into existing assembly lines; high repeatability of  $\pm 30$   $\mu\text{m}$  for the standard type and  $\pm 15$   $\mu\text{m}$  for the high-precision type; and a maximum operating speed of 2 m/second.

Epson's hand-held HX-20 computer served as a pendant for teaching the robot operational sequences and positions. This teach pendant was a key factor in helping Epson reduce the size of the robot to only a fraction that of other robots on the market. The robot was also equipped with an originally developed BASIC support robot programming language called SPEL, which was dedicated for assembly operation. In addition, various self-diagnosis and safety functions were included — a system program check function for preventing trouble, and functions for detecting power supply malfunctions, short circuits, overruns and disconnections. These features, coupled with the robot's ease of use, evoked a huge market response.

### Background

Epson's factory automation systems business stems from a robot development project that was established in 1981. The aim of the project was to improve manufacturing efficiency within the company by developing a robot capable of automatically assembling watches. At the start of the 1980s, manufacturers, responding to society's needs, entered a time of high-mix, low-volume production and began building flexible production systems with industrial robots at the core. In other words, efficient production systems that could respond flexibly to changes in the quantity and types of items produced were attracting attention. In response Epson developed, in 1983, the SSR-H series, a horizontally articulated (SCARA type) precision-assembly robot that had four simultaneous control servo-axes (axes capable of being controlled by a motor) and that was capable of being taught new routines with software.

### Impact

The SCARA robot was received favorably in the market, and unit sales steadily grew. In the year following the robot's release, Epson started up operations on the TAF-M line, an automated watch assembly line outfitted with this SCARA robot series. As well as being awarded the 1986 Nikkei Superior Trend-Setting Office Award (Factory Automation Award), the line played an active part in supporting the high-mix, low-volume production of Epson's Watch Operations Division. Taking advantage of the SSR-H series release, Epson's factory automation systems business shifted into high gear.

The SCARA robot was constructed as a factory automation system that combined a parts feeder, conveyer belt, end-effector, communication software, peripheral equipment controllers, and more. It has gained wide use in the car, biotechnology, electronics, medical, optics, and communication industries, making Epson one of the leading manufacturers of small, high-precision SCARA robots.

\*Then known as Suwa Seikosha Co., Ltd.