

SENSORS DESIGN OF FIXTURE SYSTEM AT THE INTELLIGENT ASSEMBLY MANUFACTURING CELL

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Abstract

In this contribution is presented a complex sensors design of fixture system, which is situated in the workplace of Cartesian robot and is used for clamping parts. Fixture equipment is consisted from pairs of jaws and is situated in the jaws buffer. The Cartesian robot is one of the intelligent manufacturing and assembly cell subsystem. This manufacturing cell is situated at the Institute of Production System and Applied Mechanics. The sensors design of fixture system is going out intelligent manufacturing systems and bionic manufacturing system knowledge.

Key words

system, cell, production, buffer, intelligent

Introduction

At the Institute of Production System and Applied Mechanics is situated flexible manufacturing cell. This flexible cell consisted of two subsystems:

1. Cartesian robot
2. Shelf storage system.

Five working phases is integrated in the flexible manufacturing cell:

- storage (storage of semi products, final products before its expedition),
- transport and manipulation (transport and manipulation with semi products and final products),
- manufacture (manufacturing of single semi products to the final product),
- assembly (assembly of single parts in to the one final product),
- expedition.

Following to the conclusions and knowledge, which are coming from intelligent systems studies, were in the flexible manufacturing cell designed special sensors for each device in the work place. On the Fig.1a is possible to see location of individual devices at the workplace of manufacturing cell and on the Fig. 1b, Fig. 1c specific workplace of manufacturing cell.

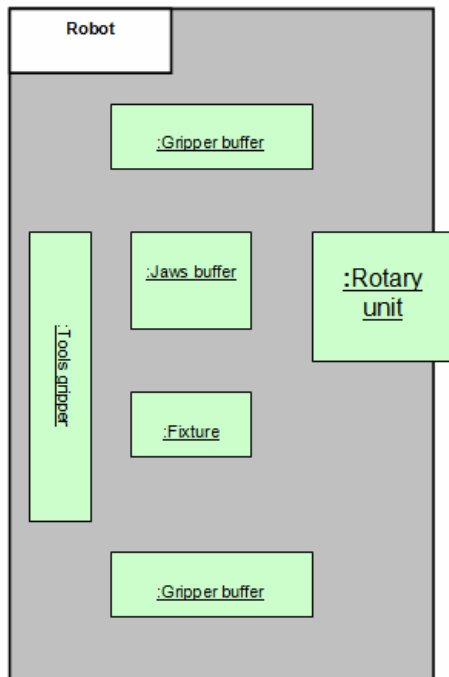


Fig. 1a. Location of devices at the workplace of manufacturing cell

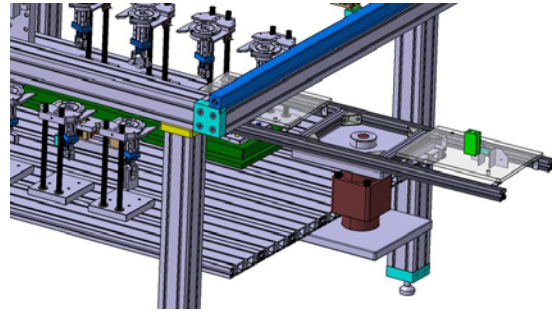


Fig. 1b. Workplace of manufacturing cell

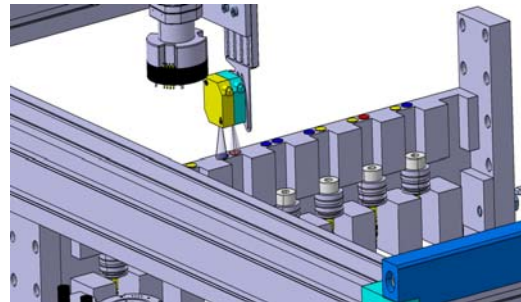


Fig. 1c. Workplace of manufacturing cell

At the workplace of Cartesian robot are situated these devices: pneumatic parts fixture, Jaws buffer, Gripper buffer, Rotary unit, AHC unit, Tools buffer.

Sensors design of fixture system

At the fixture system was needed to resolve following sensors placement by required activities:

- check of clamping jaws presence,
- check of part in the fixture presence,
- check of jaws end position,
- check of clamping power size.

Sensors design for check of clamping jaws presence in the fixture

Exchange of jaws is assured through flanges connection with pins at the pneumatic fixture. Flanges are fixed at the individual parts through screws. Pins are used at flanges connection for assurance of exact position by exchange.

For the fixture was resolved sensors, which are assured check of clamping jaws presence at the fixture. At the flanges connection are designed mechanic pressure sensors – electrical microswitch with number **S-3-BE-SW**. Microswitch is located at flutes of flanges and are fixed through screws or glue. On the Fig. 2a, b is possible to see location microswitch at the flanges connection and sketch of used microswitch.

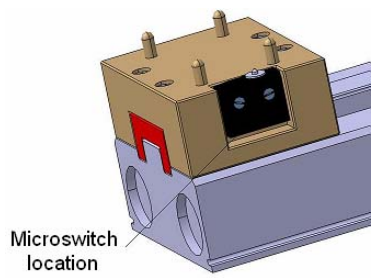


Fig. 2a. Location of microswitch

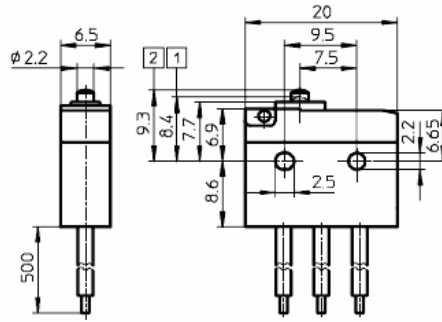


Fig. 2b. Sketch of used microswitch

Advantages of used sensors are reliability, ease, low price. Microswitch is ideal for applications, where are required size and weight.

Sensors design for check of parts presence in the fixture

Check of parts presence in the fixture is needed that pneumatic fixture could to clamp concrete part. For presence part check in the fixture is used reflex optic sensor of type: **SOEG-RTH-M18-PS-K-2L**. Reflex optic sensor is located on the side through assembly pad on the mount. The mount is glued to fixture. The location of reflex sensor is on the Fig. 3a and sketch of sensor is on the Fig. 3b.

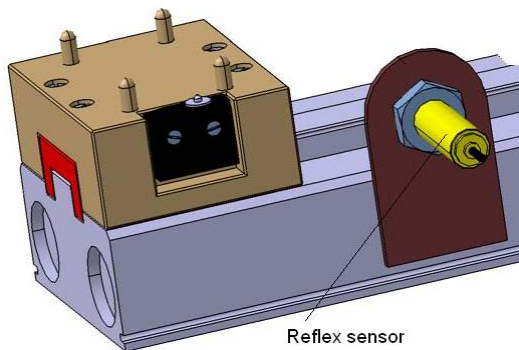


Fig. 3a. Location of reflex sensor

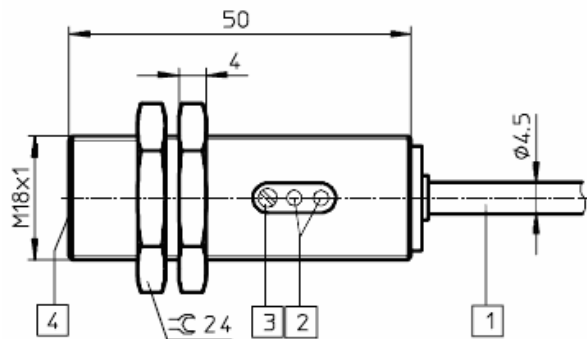


Fig. 3b. Sketch of reflex sensor

Reflex sensors work through light output comparison. These sensors compare set value with actual value of output. The part is located between clamping jaws, optical jet is broken and light output will be lower. The sensor evaluates output difference of light jet and send signal to control unit. Reflex optical sensors can scan various complex parts, but only to distance by type used sensor.

Sensors design of basic position check

Check of jaws position has to work for location of part to fixture. If jaws are open in basic position, parts are can put to fixture. The drive of clamping fixture is assured through double - pneumatic actuators. The position of these pneumatic actuators is possible to scan with

different approach sensors types. Concrete type is sensor **DM9-BL**. Magnetic sensors (Fig. 4) are located in flute on sides of fixture and fixed through screw.

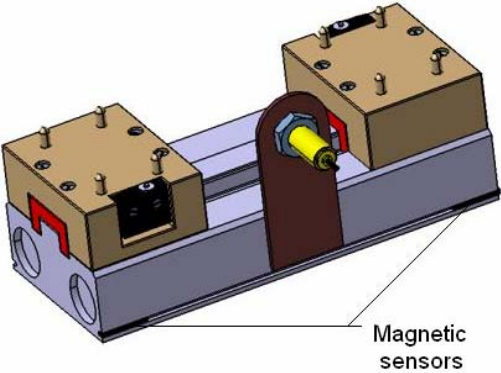


Fig. 4. Location of magnetic sensors on the side of fixture

Sensors check clamped part in jaws or position of open jaws. Advantages of clamping jaws sensor are: immediate alert, simple handling, simple location on the side of fixture, electronic regulation of switching points, high precision scanning.

Sensors design for check of clamping power

Clamped part cant not release during work. High clamping power assure sufficient rigidity of fixture clamping. Pressure sensors are used for scanning of clamping power size today. Pneumatic fixture has worked press from 0,1 to 0.7 MPa. This press is for using of press sensor optimal. For check of clamping power is used press sensor of type **PSE510-M5**. Press sensor has on the clamping side thread and is fixed at pneumatic fixture in axis of pneumatic actuators. His diagnostics can evaluate interruption of contact between sensor and control unit, high press or high current. On the Fig.5 is possible to see of press sensor fixing to fixture.

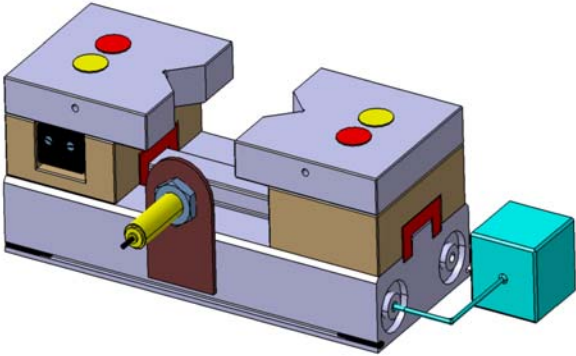


Fig. 5. Fixing of press sensor to fixture

Advantages of press sensor are: simple assembly, strong structure, evaluation of clamping power size.

Conclusion

Design of sensor system for fixture is going out of intelligent manufacturing systems knowledge. Individual sensors were design for each device at the workplace of Cartesian robot on the basis requirements for intelligent systems.

Intelligent manufacturing systems as systems of new generation are gradually loaded in to the mechanical production, when they are removing human operation out of production process and they also short production times.

This paper was realised by feasibility study **VEGA 1/0206/09 Intelligent assembly cell.**

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