MITSUBISHI CNC C80 Series

Author: *Kenji Kato**

We have developed the C80 Series with CNC-dedicated CPU units compatible with the MELSEC iQ-R Series. The new C80 Series optimizes overall plant operations through the coordination of various FA device groups. It improves the added value of the manufacturing line system and contributes to the reduction of TCO (total cost of ownership) in all aspects of development, manufacturing and maintenance.

1. Introduction

Various production lines, typically in automobile manufacturing, require an easily integrated automation system that leads to high productivity and stable production quality. To date, Mitsubishi Electric has suggested the "e-F@ctory" integrated FA solution, which optimizes plant operations and supports the future of manufacturing using advanced technology and information based on the main concept of TCO reduction regarding all aspects of development, production and maintenance. The integrated FA platform that forms this base is the "iQ-Platform." The C70 Series, which supports this solution, has been introduced into many production lines and is highly acclaimed.

Meanwhile, the demand for IoT-related functions is increasing. Requests from the global market including for optimization/visualization of the overall plant operations and for information linkage between the production site and the upper-level information system have advanced and diversified. To meet these requests, the computerized numerical controller (CNC) "C80 Series" supporting the MELSEC iQ-R Series was added to the product line. This paper describes the main features of the C80 Series.

2. System Configuration of C80 Series

The system configuration of the C80 Series is shown in Fig. 1. The C80 Series CNC is installed on the base unit of the MELSEC iQ-R Series. A maximum of three sets of CNC CPUs can be installed on one base unit. In total, a complicated machine with up to 21 part systems and 48 axes can be controlled. Our graphic operation terminal (GOT) is used for the display and an intuitive operation feel has been achieved for the touch panel. In addition, operation is standardized for the Mitsubishi CNC by displaying on the GOT a screen equivalent to the standard screen of the M800 Series.

3. Features of C80 Series

3.1 Productivity

The C80 Series has a uniquely developed CPU specifically for the CNC as is the case with the M800 Series and the basic performance has been greatly improved. M-code processing capability (representing the miscellaneous function command processing time of CNC machining programs and the index value of the
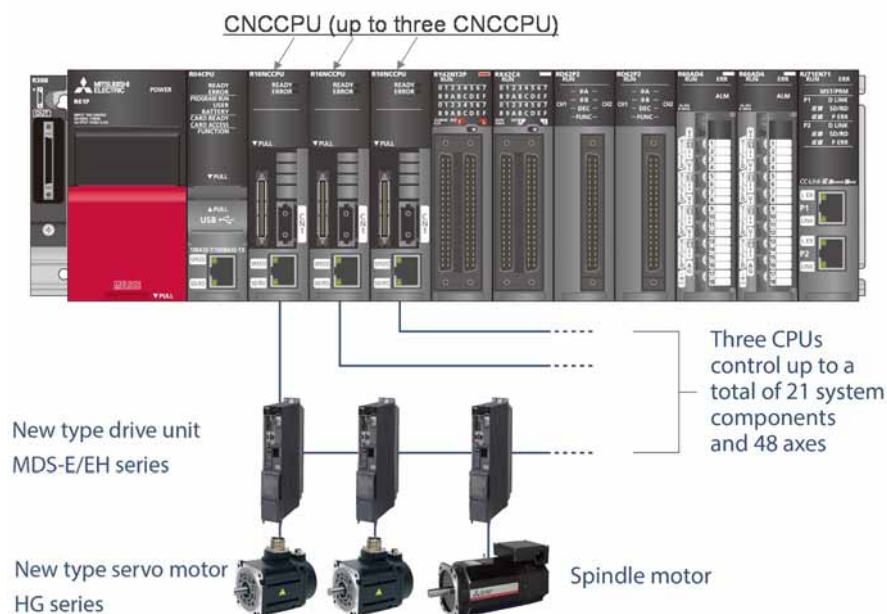

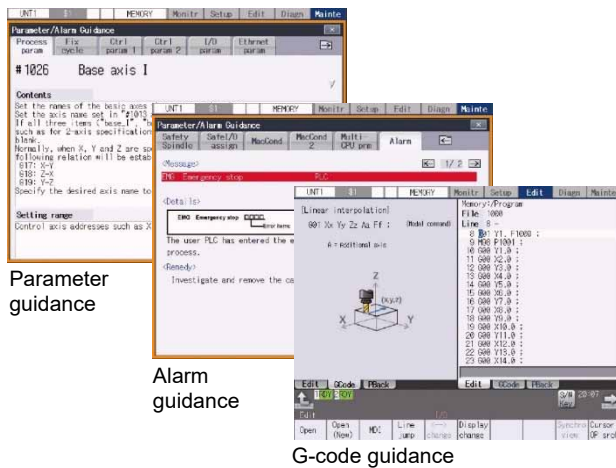Fig. 1 C80 Series system configuration

Fig. 2 CNC Monitor2

Parameter guidance

Alarm guidance

G-code guidance

Fig. 3 Screen for guidance functions

cycle time reduction) is about 1.5 times greater compared to the C70 Series.

3.2 Expandability

In the C80 Series, a diverse group of MELSEC units can be used. Devices can be selected according to the production scale and the application of the production line, thus creating a flexible system.

3.3 Usability

The C80 Series uses GOT as the display, like the C70 Series, and intuitive operation has been achieved for the touch panel. For the CNC operation screen, the newly developed CNC Monitor 2 displays a screen image equivalent to the M800 Series standard screen (Fig. 2). This CNC Monitor 2 allows touch selection of screen items, which was not possible with the C70 Series, and more intuitive operation of the screen. In addition, parameter guidance, alarm guidance and G-code guidance are installed as standard functions, significantly improving convenience for users (Fig. 3).

3.4 Maintainability

In the production line, reduction of equipment downtime is required. Thus, the C80 has the following features to improve maintainability for users.

(1) Main unit battery of CNC CPU

By using a nonvolatile SRAM for the built-in memory of the CNC CPU, it is not necessary to have a battery to hold data such as parameters and machining programs stored in the CNC CPU. This eliminates the risk of data loss due to battery replacement error or omission.

(2) Backup restore function

Data stored in the CNC CPU can be backed up to the memory card of the GOT. In the event of a problem such as CNC CPU failure, the system can be easily restored by using the backup data after replacing the CNC CPU, thus reducing downtime.

3.5 Reinforcement of function safety support

The safety monitoring function of the C80 Series conforms to "EN ISO13849-1:2015 (Cat.3, PL d)" and "EN 62061:2005/A2:2015 (SIL CL2)," which are the latest safety standards. Table 1 shows the safety monitoring function supported by the C80 Series.

Table 1 Safety observation function list

SLS (Safely limited speed)	Safety-related I/O observation
SOS (Safe operating stop)	Emergency stop observation
SBC (Safe brake control)	STO (Safe torque off)
SLP (Safely limited position)	SS1 (Safe stop 1)
SSM (Safe speed monitor)	SS2 (Safe stop 2)
SCA (Safe cam)	

In this project, a new safety signal unit was developed with a function for monitoring safety-related signals (Fig. 4). This function can ensure safety by using the duplicate control circuit of a safety-related signal such as a door signal or emergency stop in the CNC CPU with operation of the other circuit if one circuit fails.

Fig. 4 Safety signal unit

4. Conclusion

We introduced the CNC C80 Series supporting the MELSEC iQ-R Series. We will further develop this product to meet various market requirements in the future.