OMRON

# NJ-series Machine Automation Controller Database Connection CPU Unit

## NJ501-1□20 / NJ101-□□20

### Aiming for zero defect, non-stop production


- Direct access to databases
- Real-time data collection and analysis
- Reliable traceability

**See the Database Connection CPU Unit in the video**

You can watch the promotional video by scanning the 2D code using the bar code reader on your smartphone or tablet.

SYSMAC
always in control

http://www.fa.omron.co.jp/njdb_e/

# Facts visualized using data bring changes

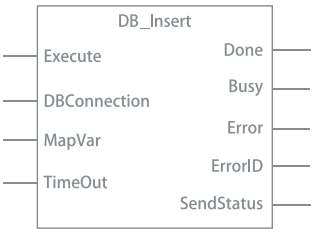
## Productivity Improvement

### Visualized quality and productivity

Operating status can be displayed in real time using familiar software such as Microsoft® Excel.

### Easily leveraging big data

The CPU Unit can directly access databases without a separate computer.
Function Blocks allow PLC engineers to smoothly introduce the CPU Unit.

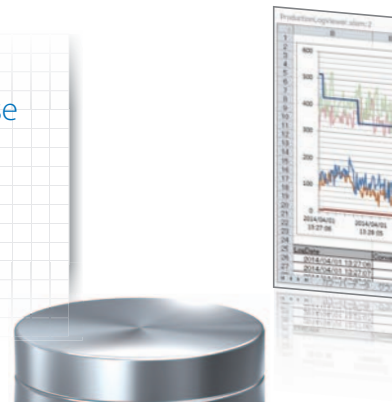



### New entry model NJ101 with database connection NEW

The database connection model is added to the NJ101 that is ideal for machines with or without a low number of axes.
Real-time data collected from various machines and production lines helps improve the quality and productivity.

### Supported database

- Microsoft SQL server
- Oracle Database
- IBM DB2
- MySQL
- PostgreSQL
- Firebird



Database

Direct connection

Data collection

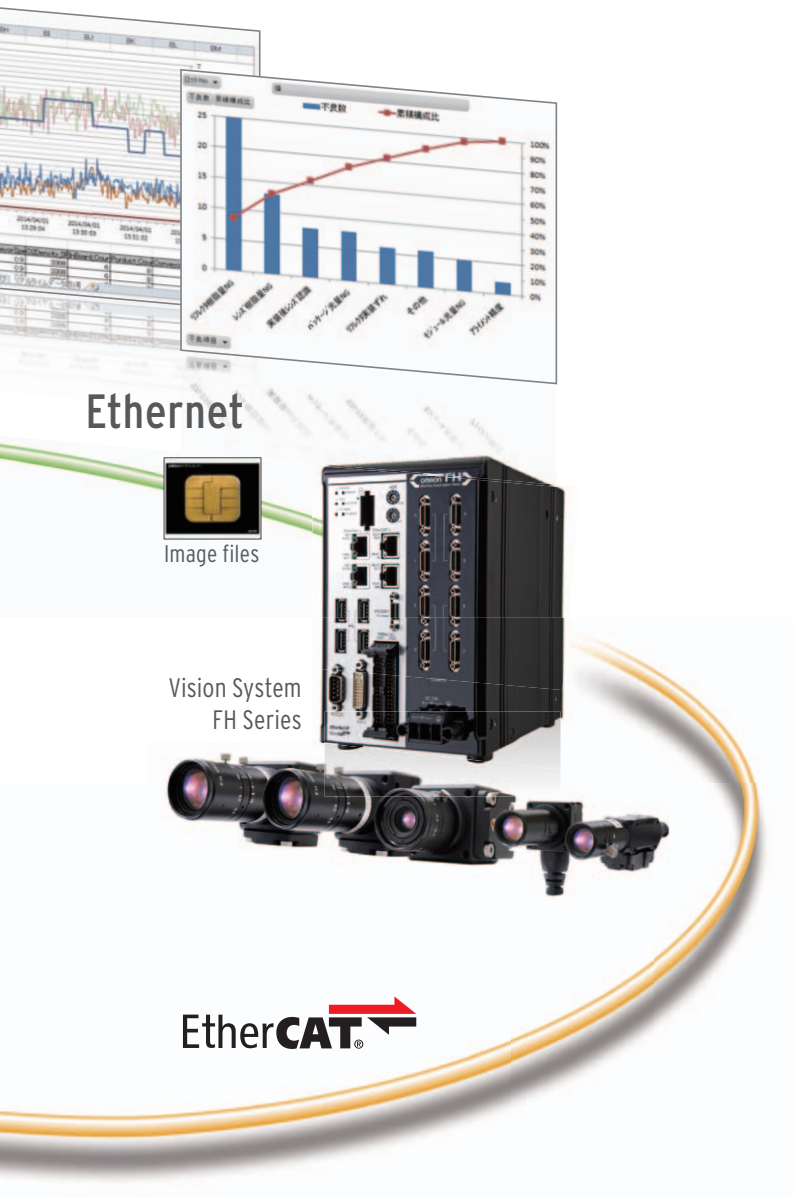
Quality

Inspection results

Production conditions


NJ-series Database Connection CPU Unit
NJ101-1020/9020 NEW
NJ501-1□20

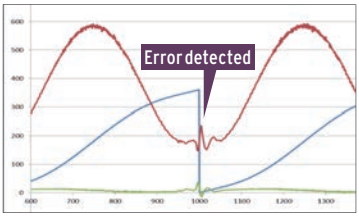
# to factories




## Predictive Maintenance

### Fast data collection

Data is sampled every millisecond and written to the database.
Machine behavior can be monitored more accurately.




## Quality Traceability

### Manufacturing traceability

Data, such as production conditions,
production results, and inspection results,
can be managed at the individual product level.

### Saving data and images together

The process data is linked to inspection images and
saved together with the images.
This improves the level of quality management.

**Application: Increased productivity by 30%**

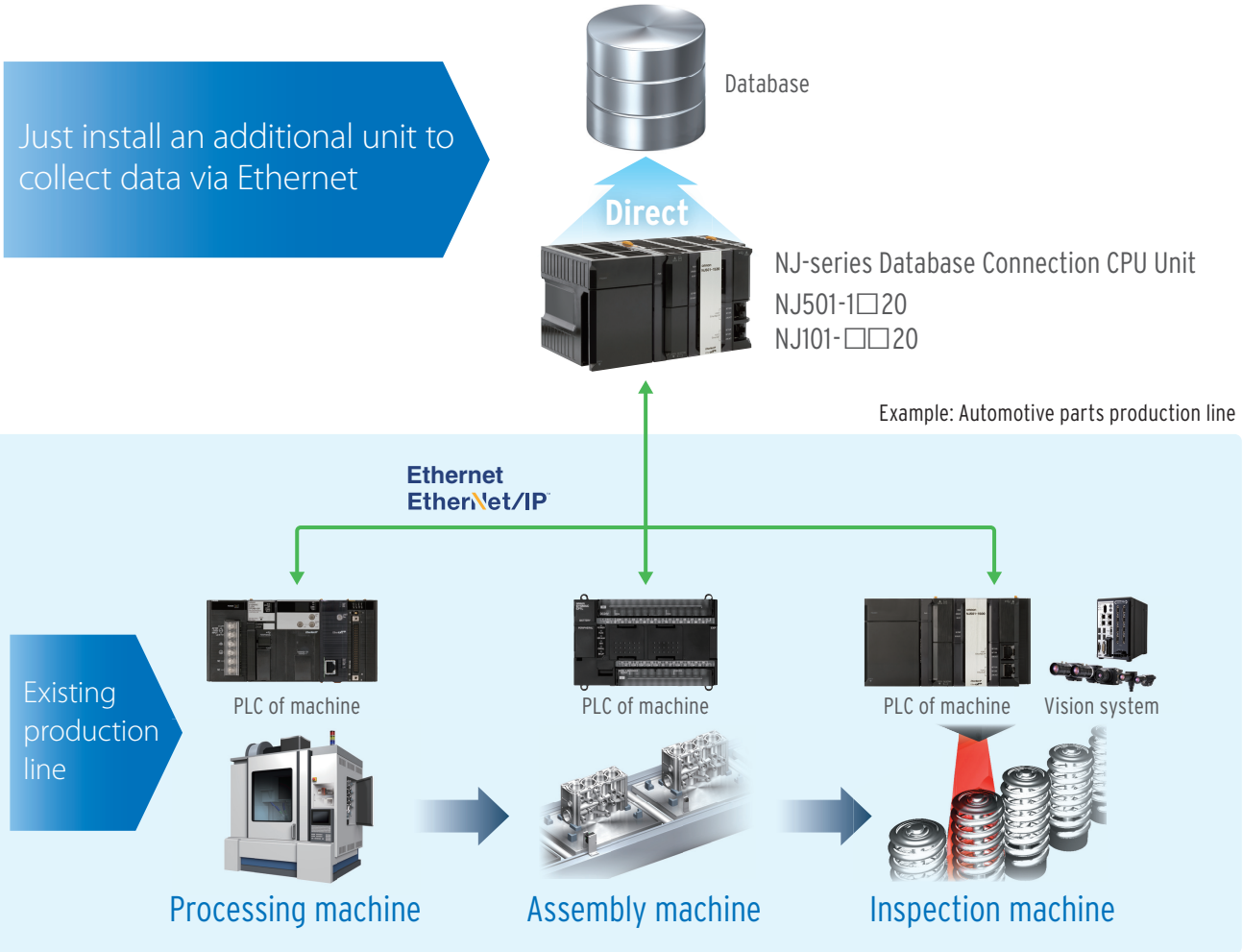
The logs, which are collected from devices on a production line and linked with each product, are consolidated into the database. Visualization of the entire process leads to effective improvements, boosting productivity by 30% a year.

For details visit http://www.fa.omron.co.jp/dbo_e/

# Data can further improve manufacturing

Facts visualized using data can change manufacturing.
Demand for leveraging manufacturing data is increasing.

## Start small with big data for your system




### Add to existing system

The data in the PLC used for each machine can be stored in a database. Even if you are using other company's PLC, consult your Omron representative.

### Simple configuration

Direct access eliminates the need to connect a separate computer. Function Blocks allow PLC engineers to smoothly access the database from the CPU Unit.

### Data visualization

Data collected in the database can be visualized using familiar software such as Microsoft® Excel. You can easily identify improvement points, quickly making improvements.

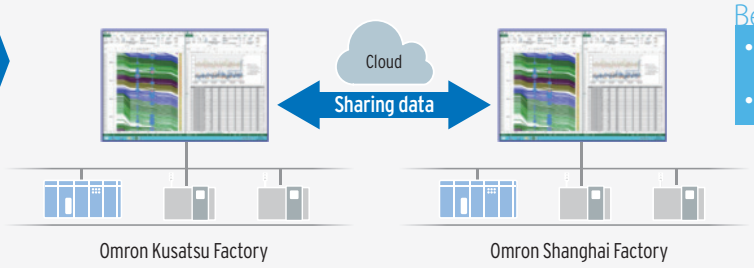
# Omron factories have proven the benefits of using big data

## Productivity Improvement

- Omron Kusatsu Factory
- Omron Shanghai Factory

### Improving operating efficiency thanks to high-speed data collection

The system to visualize the productivity of the PCB surface mounting line in time series was built in Kusatsu Factory, and overseas factories are also using this system. The systems in each factory are connected via the cloud to share the data. This will help share the know-how between factories and improve productivity and




**Benefits**

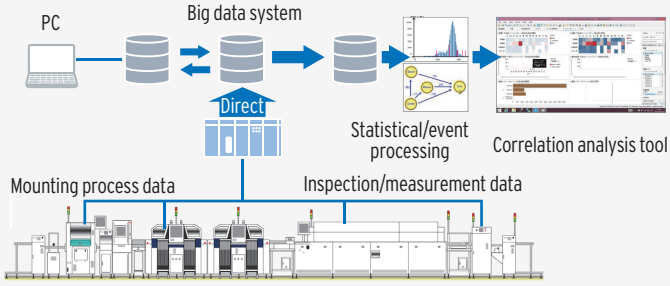
- 6 times faster to identify improvement points*
- Increased productivity by 30%*

## Quality Innovation

- Omron Kusatsu Factory

### Improving analysis accuracy aiming for a failure rate of 1 ppb

The system implemented in the PCB surface mounting line obtains the inspection data in addition to the object passing time and analyzes the correlation between the process and causes of failure. This system will obtain more data and increase the analysis accuracy, aiming for extraordinary quality innovation.




**Benefits**

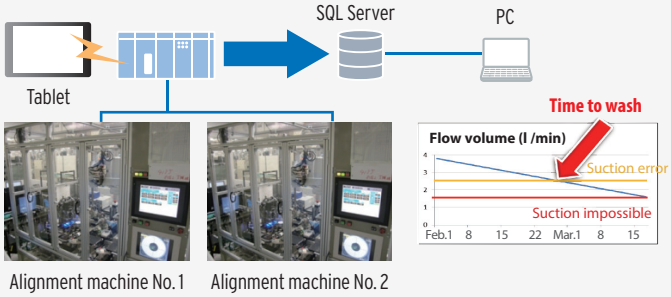
- Collected about 6 times the amount of data*
- Failure rate of 1 ppm*

## Predictive Maintenance

- Omron Ayabe Factory

### Improving maintenance by leveraging big data

The system to collect machine data and visualize operating status was built for the high-efficiency coupling element alignment machines. The workflow where the vacuum nozzle is washed when a measured value exceeds the specified threshold is achieved by collecting the data from the process and analyzing it. Efficient and timely, not periodic, checks will lead to improvement of operating efficiency.




**Benefits**

- Improved productivity by avoiding intermittent stops
- Reduced cost due to timely parts replacement

* In-house comparison. Based on Omron investigation in November 2015.

NJ-series Database Connection CPU Units

# NJ501-1□20/NJ101-□□20

## Controller Directly Connectable to Database

The NJ-series Machine Automation Controller supports the Database Connection function.
Machine data can be quickly stored in a database by connecting the Controller directly to the database.

NJ501-1□20

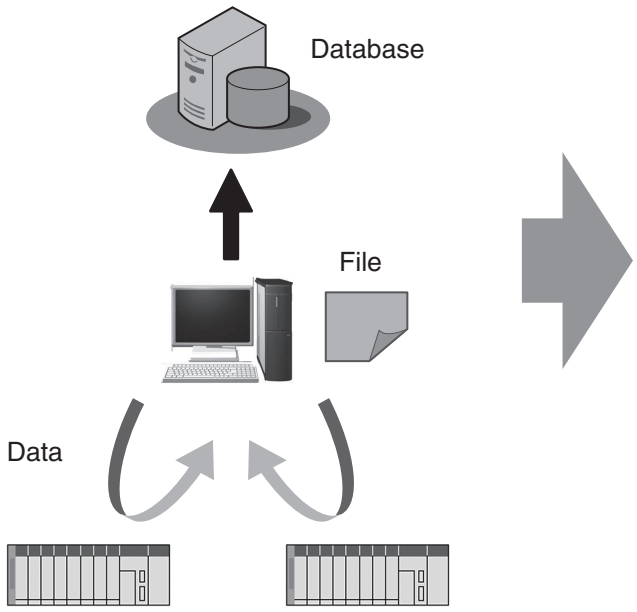
NJ101-□□20

## Features

- The Controller can be directly connected to a database. No special Unit, software, nor middleware is required.
- Special instructions (function block) in the Controller make access to the database easy.
- Various functions (Spool function and Operation Log function) are available when an error occurred.

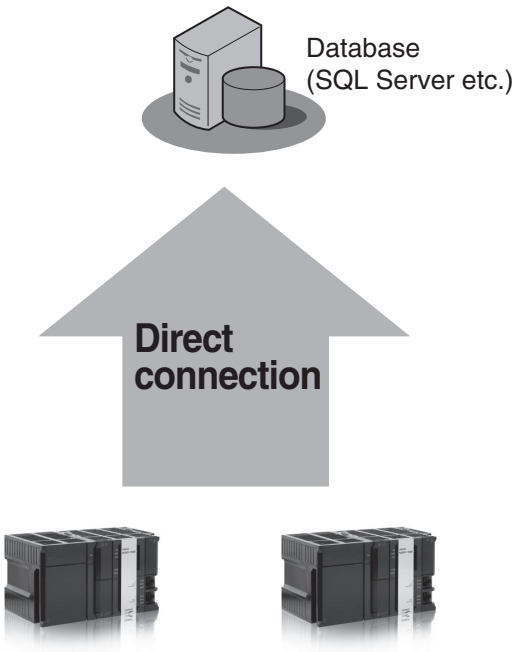
### From <Via gateway>

●Connection via computer




### To <Direct connection>

●High-speed direct connection between Controller and database

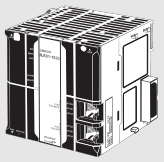


# Ordering Information

**International Standards**

- The standards are abbreviated as follows: U: UL, U1: UL (Class I Division 2 Products for Hazardous Locations), C: CSA, UC: cULus, UC1: cULus (Class I Division 2 Products for Hazardous Locations), CU: cUL, N: NK, L: Lloyd, and CE: EU Directives, RCM: RCM mark and KC: KC Registration.
- Contact your OMRON representative for further details and applicable conditions for these standards.

## NJ-series CPU Units

| Product Name | Specifications | | | | Current consumption (A) | | Model | Standards |
|---|---|---|---|---|---|---|---|---|
| | I/O capacity / maximum Model Standards number of configuration Units (Expansion Racks) | Program capacity | Memory capacity for variables | Number of motion axes | 5 VDC | 24 VDC | | |
| NJ-series CPU Units  | 2,560 points / 40 Units (3 Expansion Racks) | 20 MB | 2 MB: Retained during power interruption 4 MB: Not retained during power interruption | 64 | 1.90 | – | **NJ501-1520** | UC1, N, L, CE, RCM, KC |
| | | | | 32 | | | **NJ501-1420** | |
| | | | | 16 | | | **NJ501-1320** | |
| | | 3 MB | 0.5 MB: Retained during power interruption 2 MB: Not retained during power interruption | 2 | | | **NJ101-1020** | |
| | | | | 0 | | | **NJ101-9020** | |

### Automation Software Sysmac Studio

Please purchase a DVD and required number of licenses the first time you purchase the Sysmac Studio. DVDs and licenses are available individually. Each model of licenses does not include any DVD.

| Product name | Specifications | Number of licenses | Media | Model | Standards |
|---|---|---|---|---|---|
| **Sysmac Studio Standard Edition Ver.1.□□** | The Sysmac Studio provides an integrated development environment to set up, program, debug, and maintain NJseries Controllers and other Machine Automation Controllers, as well as EtherCAT slaves.<br><br>Sysmac Studio runs on the following OS.<br>Windows XP (Service Pack 3 or higher, 32-bit version)/Windows Vista(32-bit version)/Windows 7(32-bit/64-bit version)/Windows 8(32-bit/64-bit version)/Windows 8.1(32-bit/64-bit version)/Windows 10(32-bit/64-bit version)<br><br>The Sysmac Studio Standard Edition DVD includes Support Software to set up EtherNet/IP Units, DeviceNet slaves, Serial Communications Units, and Support Software for creating screens on HMIs (CX-Designer).<br>For details, refer to the Sysmac Integrated Catalogue (P072). | – (Media only) | DVD | **SYSMAC-SE200D** | – |
| | | 1 license ✻ | – | **SYSMAC-SE201L** | – |

✻ Multi licenses are available for the Sysmac Studio (3, 10, 30, or 50 licenses).

## Recommended EtherCAT and EtherNet/IP Communications Cables

For the Recommended EtherCAT and EtherNet/IP Communications Cables, refer to the Machine Automation Controller NJ/NX-Series Datasheet.

# Accessories

The following accessories come with the CPU Unit.

| Item | Specifications |
|---|---|
| **Battery** | CJ1W-BAT01 |
| **End Cover** | CJ1W-TER01 (necessary to be connected to the right end of the CPU Rack.) |
| **End Plate** | PFP-M (2 pcs) |
| **SD Memory Card (Flash Memory 2 GB)** | HMC-SD291 |

# NJ501-1□20/NJ101-□□20

## General Specification

For the common specifications of the NJ-series, refer to the Machine Automation Controller NJ/NX-Series Datasheet.

## Performance Specifications

| Item | | | NJ501- | | | NJ101- | |
|---|---|---|---|---|---|---|---|
| | | | 1520 | 1420 | 1320 | 1020 | 9020 |
| Programming | Memory for CJ-Series Units (Can be Specified with AT Specifications for Variables.) | EM Area | 32,768 words × 25 banks ✻ (E0_0 to E18_32767) | | | 32,768 words × 4 banks ✻ (E0_0 to E3_32767) | |

✻ When the Spool function of the NJ501-1□20 is enabled, the DB Connection Service uses E9_0 to E18_32767.
When the Spool function of the NJ101-□□20 is enabled, the DB Connection Service uses E1_0 to E3_32767.

Furthermore, for the common specifications of the NJ-series, refer to to the Machine Automation Controller NJ/NX-Series Datasheet.
Refer to the specifications of the NJ501-□5□0 for those of the NJ501-1520, the NJ501-□4□0 for the NJ501-1420, the NJ501-□3□0 for the NJ501-1320, the 101-1020 for the NJ101-1□□0 and the 101-9020 for the NJ101-9□□0.

## Function Specifications

| Item | | | NJ501-1□20 | | NJ101-□□20 |
|---|---|---|---|---|---|
| | | | Ver.1.07 or ealier | Ver.1.08 or later | |
| Debugging | Data Tracing | Maximum number of simultaneous data traces | 4 | 2 | 2 |

Furthermore, for the common specifications of the NJ-series, refer to the Machine Automation Controller NJ/NX-Series Datasheet.

## Functions Supported by NJ501-□□20 or NJ101-□020

Besides functions of the NJ501-1□00 or NJ101-□□00, functions supported by the NJ501-□□20 or NJ101-□020 are as follows.

| Item | | Description | |
|---|---|---|---|
| | | NJ501-1□20 | NJ101-□□20 |
| Supported port | | Built-in EtherNet/IP port | |
| Supported DB | | Microsoft Corporation: SQL Server 2008/2008 R2/2012/2014 ✻1<br>Oracle Corporation: Oracle Database 10g /11g/12c ✻1<br>MySQL Community Edition 5.1/5.5/5.6 ✻2<br>International Business Machines Corporation (IBM):<br>DB2 for Linux, UNIX and Windows 9.5/9.7/10.1/10.5<br>Firebird Foundation Incorporated: Firebird 2.1/2.5<br>The PostgreSQL Global Development Group: PostgreSQL 9.2/9.3/9.4 ✻1 | |
| Number of DB Connections (Number of databases that can be connected at the same time) | | 3 connections max. ✻3 | 1 |
| Instruction | Supported operations | The following operations can be performed by executing DB Connection Instructions in the NJ-series CPU Units.<br>Inserting records (INSERT), Updating records (UPDATE), Retrieving records (SELECT), and Deleting records (DELETE) | |
| | Number of columns in an INSERT operation | SQL Server: 1,024 columns max.<br>Others: 1,000 columns max. | |
| | Number of columns in an UPDATE operation | SQL Server: 1,024 columns max.<br>Others: 1,000 columns max. | |
| | Number of columns in a SELECT operation | SQL Server: 1,024 columns max.<br>Others: 1,000 columns max. | |
| | Number of records in the output of a SELECT operation | 65,535 elements max., 4 MB max. | |
| Run mode of the DB Connection Service | | Operation Mode or Test Mode<br>• Operation Mode: When each instruction is executed, the service actually accesses the DB.<br>• Test Mode: When each instruction is executed, the service ends the instruction normally without accessing the DB actually. | |
| Spool function | | Used to store SQL statements when an error occurred and resend the statements when the communications are recovered from the error.<br>Spool capacity: 1 MB ✻2 | |
| | Spool capacity | 1 MB ✻4 | 192 KB ✻4 |
| Operation Log function | | The following three types of logs can be used.<br>• Execution Log: Log for tracing the executions of the DB Connection Service.<br>• Debug Log: Detailed log for SQL statement executions of the DB Connection Service.<br>• SQL Execution Failure Log: Log for execution failures of SQL statements due to a DB-caused factor. | |
| DB Connection Service shutdown function | | Used to shut down the DB Connection Service after automatically saving the Operation Log files into the SD Memory Card. | |

✻**1.** SQL Server 2014, Oracle Database 12c and PostgreSQL 9.2/9.3/9.4 are supported by DBCon version 1.02 or higher.
✻**2.** The supported storage engines of the DB are InnoDB and MyISAM.
✻**3.** When two or more DB Connections are established, the operation cannot be guaranteed if you set different database types for the connections.
✻**4.** Refer to "NJ-series Database Connection CPU Units User's Manual(W527)" for the information.

## Unit Versions

| Units | Models | Unit Version | DBCon Version |
|---|---|---|---|
| NJ-series Database Connection CPU Units | NJ501-1□20 | Unit version 1.11<br>Unit version 1.10 | DBCon Ver.1.03<br>DBCon Ver.1.02<br>DBCon Ver.1.01 |
| | | Unit version 1.09<br>Unit version 1.08 | DBCon Ver.1.01 |
| | | Unit version 1.07<br>Unit version 1.05 | DBCon Ver.1.00 |
| | NJ101-□□20 | Unit version 1.10 | DBCon Ver.1.02 |

## Unit Versions, DBCon Versions and Programming Devices

The following table gives the relationship between unit versions of CPU Units and the corresponding Sysmac Studio versions.

| Unit version of CPU Unit | DBCon Version | Corresponding version of Sysmac Studio |
|---|---|---|
| 1.11 | 1.02 | 1.15 |
| 1.10 ✻ | | 1.14 |
| | 1.01 | 1.13<br>1.12 |
| 1.09 | | 1.11<br>1.10 |
| 1.08 | | 1.09 |
| 1.07 | 1.00 | 1.08 |
| 1.05 | | 1.07<br>1.06 |

✻ For NJ101-□□20, Supported only by the Sysmac Studio version 1.14 or higher.

## Functions That Were Added or Changed for Each Unit Version and Sysmac Studio Version

For the common specifications of the NJ-series, refer to the Machine Automation Controller NJ/NX-Series Datasheet.

## External Interface

For the External Interface, refer to the Machine Automation Controller NJ/NX-Series Datasheet.

## Dimensions

For the Dimensions, refer to the Machine Automation Controller NJ/NX-Series Datasheet.

## Related Manuals

The following manuals are related to the DB Connection Service. Use these manuals for reference.

| Manual name | Cat. No. | Model numbers | Application | Description |
|---|---|---|---|---|
| NJ-series Database Connection CPU Units User's Manual | W527 | NJ501-□□20<br>NJ101-□□20 | Learning about the functions and application procedures of the NJ-series DB Connection Service. | Describes the functions and application procedures of the NJ-series DB Connection Service. |
| Sysmac Studio Version 1 Operation Manual | W504 | SYSMAC -SE2□□□ | Learning about the operating procedures and functions of the Sysmac Studio. | Describes the operating procedures of the Sysmac Studio. |

For the Related Manuals about the common specifications of the NJ-series, refer to the Machine Automation Controller NJ/NX-Series Datasheet.

Note: Do not use this document to operate the Unit.

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