

# Harmonas DEO Harmonized Automation System - Dependable Open

## Introduction

The Harmonas-DEO system is a next generation automation system.

The Harmonas-DEO system uses open and standard technology bases in vision of the 21st Century, such as Windows OS for information management and Ethernet connections for control and information networking functions, in order to significantly improve the flexibility of information-sharing environments. As a field network, the system complies with the industry standard Fieldbus Foundation specifications. Regarding information sharing, DCOM, ActiveX, and OPC are used for the control software data interface to further improve coordination with general-purpose software products.

The new "Dependable Open" concept assures the level of high reliability that is generally required for process control applications while adopting these open and standardized technology bases.

## Features

### 1)Open Modular Architecture & Information on Demand

**The open and distributed functional structure implements Plug and Play solutions in the area of industrial automation systems. Furthermore, its specific feature is that any data is accessible from any location in the system.**

The Harmonas-DEO architecture combines a wide variety of applications, including field-level system components as well as production control systems, in an organized structure with open networks to form the core of the system. Any data inte-

grated in a DEO system is accessible from anywhere in the system through open networks. With this feature, all of the staff personnel, ranging from operators in actual fields to higher management people, can track the operational status of the system in real time.

### 2)Dependable

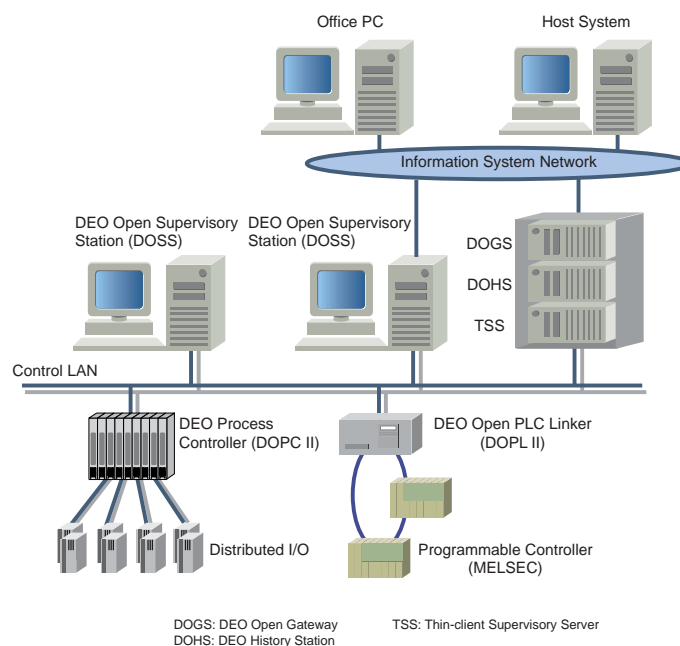
**Total reliability supports plant control environments.**

In order to assure the required level of process control reliability for obtaining customer satisfaction while using open and general purpose infrastructure, the Harmonas-DEO automation system uses technology bases that are focused on the concept of dependability. In addition to the basic reliability mechanisms, such as Ethernet redundancy and redundancy and fail-over functions of nodes, a high level of stability in overall automation system operation has been achieved with the Harmonas-DEO system, improving maintainability, operation integrity assurance, and security at the same time.

### 3)Automation Suite

**Solutions necessary for plant automation are provided.**

Harmonas-DEO can provide a wide range of software solutions that are necessary for constructing a plant automation system. "Automation Suites" is the generic name of a group of solutions that can be implemented by the Harmonas-DEO system.



**Figure 1. Example System Configuration**

## System Configuration

A Harmonas-DEO system is comprised of human-machine interface (HMI) nodes to be used for system monitoring and control operations, highly reliable process controller nodes that can be arranged in a redundant configuration, and redundant control LAN (Ethernet) systems to connect all the nodes. Windows OS is used for all HMIs as the basic operating system to provide the users with a comfortable monitoring and control operation environment as well as to provide an open data processing environment.

Furthermore, in order to establish a control system that is suited for the purpose of the system, various types of application modules, including field operation modules, remote monitoring modules, history analysis modules, batch process control modules, communication gateway modules, transient operation support modules, and alarm analysis modules are available.

### System Component Equipment

#### - DEO Supervisory Station (DOSS, DOSS\_H)

DOSS provides system construction (engineering) functions as well as HMI functions for process control and monitoring operations. DOSS\_H is implemented with the process history database (MS-SQL server) functions in addition to the basic HMI functions of DOSS.

Either a general-purpose desktop CPU type or a console type (single-stage or dual-stage) configuration is selectable for these nodes.

#### - DEO Open History Station (DOHS)

A DOHS node is implemented with a process history data server (MS-SQL server) and is dedicated to history data collection functions.

#### - DEO Process Controller (DOPC II, DOPC)

DOPC II and DOPC are multi-functional process controllers that can be used for implementing process input/output control, loop control, logic control, and sequence control functions. High density and redundantly configurable process I/O modules are connected to DOPC and DOPC II. DOPC II is a controller with redundant control CPUs and communication modules. DOPC is a small capacity controller; its non-redundant configuration is also available.

#### - DEO Open PLC Linker (DOPL II)

DOPL II is a multi-functional and redundantly configurable controller to be used for integrating and controlling Mitsubishi MELSEC devices through MELSECNET/10 (or MELSECNET/H) networks. By using DOPL II, all link devices of MELSECNET are handled as I/O devices for enabling loop control, logic control, and sequence control functions, as well as the operations with DOPC II. The control database of DOPL II is constructed in common with DOPC II.

#### - Thin-client Supervisory Server (TSS)

TSS server nodes provide client PCs installed in remote fields and offices with a DCS operations environment. DOSS-like control operations can be made from client PCs. Display applications of TSS are constructed in common with DOSS.

#### - DEO Open Gateway (DOGS)

A DOGS general-purpose communications gateway connects the Harmonas-DEO system to information system networks for enabling data communication with host computers. DOGS uses OPC, a general-purpose protocol, as the communications protocol to function as an OPC server.

## System Specification

Table 1. Outline Specifications for the Harmonas-DEO System

| Item                                   |   | Specification   |
|--|---|---|
| Number of nodes                        | Total nodes per system                          | 126 nodes   |
|  | Total number of HMI nodes <sup>(Note 1)</sup>   | 32 nodes  |
|  | Total number of controllers <sup>(Note 2)</sup> | 96 nodes  |
| Number of control tags                 | Graphic tag                                     | 60,000 tags per SS node                                     |
|  | Controller tag                                  | 100,000 tags per system                                     |
| Network                                | Control bus                                     | 10 Mbps/100 Mbps Ethernet, up to 2.5 km (2 km for 100 Mbps) |
|  | Data Control System LAN                         | 10Mbps/100Mbps/1Gbps Ethernet                               |
| Redundancy functions                   | Redundant control bus (Ethernet)                | Standard  |
|  | Redundant controller                            | DOPC II, DOPL II  |
|  | Non-redundant controller                        | DOPC, DOPL II   |
| Maximum number of nodes per node       | DOSS  | 28 nodes  |
|  | DOSS_H, DOHS                                    | 5 nodes   |
|  | Number of clients <sup>(Note 3)</sup>           | 50 nodes  |
|  | TSS server                                      | 20 nodes  |
|  | Number of TSS clients <sup>(Note 4)</sup>       | 100 nodes   |
|  | DOGS  | 5 nodes   |
| Maximum number of nodes per controller | Number of DOGS clients <sup>(Note 5)</sup>      | 50 nodes  |
|  | DOPC II, DOPC                                   | 96 nodes  |
|  | DOPL II   | 96 nodes  |
| History capacity                       | Number of history points                        | Up to 6400 points   |
|  | History period                                  | 1, 5, 10, or 30 seconds, 1, 2, 5, or 10 minutes             |

Note 1: Total number of HMI nodes, including DOSS, DOSS\_H, TSS, DOHS, and DOGS.

Note 2: Total number of controller nodes, including DOPC II, DOPC, FLC, and DOPL II.

Note 3: The maximum number of history clients for DOSS\_H and DOHS is 10 nodes per server. The number of clients includes the DOSS nodes that are remote trend client nodes.

Note 4: The maximum number of clients is 5 nodes per TSS server.

Note 5: The maximum number of DOGS clients is 10 nodes per server.

**Table 2. Control Capacity of DOPC II and DOPC**

| Item  |                                    | Specification   |                              |                      |
|---|------------------------------------|---|------------------------------|----------------------|
|   |                                    | DOPC II   | DOPC                         |                      |
| Number of nodes per system                    |                                    | Up to 96 units  |                              |                      |
| Number of distributed I/O modules/controllers |                                    | Number of redundant I/O pairs × 2<br>+ Number of non-redundant I/O nodes<br>≤ 120 nodes | Non-redundant I/O ≤ 40 nodes |                      |
| Remote I/O extension length                   |                                    | Electrical repeater   | Up to 100 m                  |                      |
|   |                                    | Optical repeater  | Up to 1 km                   |                      |
| I/O Point                                     | Analog input module                | 4 to 20 mA  | 16 points per module         |                      |
|   |                                    | Thermocouple  | 16 points per module         |                      |
|   |                                    | Resistance temperature detector   | 16 points per module         |                      |
|   |                                    | Analog output module  |                              | 4 to 20 mA           |
|   | Digital input module               |   | 24 V dry contact             | 32 points per module |
|   | Digital output module              |   | Solid-state                  | 32 points per module |
|   |                                    |   | Relay                        | 32 points per module |
|   | Pulse input module                 |   | 8 points per module          |                      |
| Serial communication module                   |                                    | RS232C  | 2 ports per module           |                      |
|   |                                    | High speed RS232C   | 1 port per module            | -                    |
| Control point                                 | Regulatory control point (RegCtrl) |   | 640 points                   | 160 points           |
|   | Regulatory PV Point (RegPV)        |   | 320 points                   | 80 points            |
|   | Logic point (Logic)                |   | 320 points                   | 80 points            |
|   | Digital composite point (DegiComp) |   | 1024 points                  | 255 points           |
|   | Sequence point (PMDP)              |   | 512 points                   | 160 points           |
|   | Function block point (FBD)         |   | 511 points                   | -                    |
|   | Internal variable point            | Numeric variable (NN)   |                              | 8192 points          |
| Flag variable (FL)                            |                                    | 8192 points   | 1023 points                  |                      |
| Timer variable (TM)                           |                                    | 256 points  | 64 points                    |                      |
| Control capacity                              | PU value (performance capacity)    | I/O points  | 1520PU                       | Total: 560 PU        |
|   |                                    | Control points  | 1520PU                       |                      |
|   | MU value (sequence capacity)       |   | 48000MU                      | 24000MU              |
|   | Control cycle                      | I/O points  |                              | 100ms, 200ms, 500ms  |
| Control points other than for sequencing      |                                    | 1000ms  | 1000ms                       |                      |
| Sequence                                      |                                    | 100msec, 1sec   | 1sec                         |                      |

**Table 3. Control Capacity of DOPL II**

| Item  |   | Specification                                |                                 |             |
|---|---|--|---------------------------------|-------------|
| Number of nodes per system                                | Non-redundant DOPL II                               | 96 nodes                                     |                                 |             |
|   | Redundant DOPL II                                   | 96 pairs                                     |                                 |             |
| Network   | Control network                                     | Redundant Ethernet or non-redundant Ethernet |                                 |             |
|   | I/O network   | MELSECNET/10 or MELSECNET/H                  |                                 |             |
| Number of MELSEC nodes that can be connected to MELSECNET | Non-redundant DOPL II                               | 63 nodes                                     |                                 |             |
|   | Redundant DOPL II                                   | 62 nodes                                     |                                 |             |
| Capacity of I/O points                                    | Maximum number of virtual I/O modules               |  | 240 modules <sup>(Note 1)</sup> |             |
|   | Number of points per module                         | Analog input module                          | 16 points per module            |             |
|   |   | Analog output module                         | 16 points per module            |             |
|   |   | Pulse input module                           | 8 points per module             |             |
|   |   | Digital input module                         | 32 points per module            |             |
|   |   | Digital output module                        | 32 points per module            |             |
|   |   | Value input module                           | 8 points per module             |             |
|   |   | Value output module                          | 8 points per module             |             |
| Number of link devices to be occupied per I/O point       | Input points  | Analog input point                           | One word of input W device      |             |
|   |   | Digital input point                          | One bit of input B device       |             |
|   |   | Pulse input point                            | Two words of input W device     |             |
|   |   | Value input point                            | Two words of input W device     |             |
|   | Output points <sup>(Note 2)</sup>                   | Analog output point                          | One word of output W device     |             |
|   |   | Digital output point                         | One bit of output B device      |             |
|   |   | Value output point                           | Two words of output W device    |             |
| Capacity of control points                                | Regulatory control points (number of control loops) |  | 160 points                      |             |
|   | Regulatory PV point                                 |  | 320 points                      |             |
|   | Logic point   |  | 480 points                      |             |
|   | Digital composite point                             |  | 1600 points                     |             |
|   | Sequence point                                      |  | 512 points                      |             |
|   | Function block FB point                             |  | 511 points                      |             |
|   | Internal variable point                             | Numeric variable (NN)                        |                                 | 8192 points |
|   |   | Flag variable (FL)                           |                                 | 8192 points |
| Timer variable  |   | 256 points                                   |                                 |             |
| Control capacity  | PU value (performance capacity)                     | I/O points                                   | 1520PU                          |             |
|   |   | Control points                               | 6000PU                          |             |
|   | MU value (sequence capacity)                        |  | 48000MU                         |             |
|   | Control cycle                                       | I/O points                                   | 100ms, 200ms, 500ms, 1000ms     |             |
|   |   | Control points other than for sequencing     | 100msec, 1sec                   |             |
|   | Sequence point                                      | 100msec, 1sec                                |                                 |             |

Note 1: The total number of modules, including analog input, analog output, pulse input, digital input, digital output, value input, and value output modules must be within 240 modules.

Note 2: The maximum value of output link devices is 2000 bytes (1000 words).

**Table 4. Outline Specifications for DOSS/DOSS\_H Applications**

| Item                        |                           | Specification              |   |
|-----------------------------|---------------------------|----------------------------|---|
| Hardware                    | Monitor                   | LCD monitor                | 17", 19"  |
|                             |                           | Display resolution         | SXGA (1280× 1024)   |
|                             | Operation devices         | Keyboard                   | JIS keyboard (standard)<br>Operator keyboard (option)                     |
|                             |                           | Pointing device            | Mouse (standard), touch screen (option)                                   |
| DOSS basic software package | Standard online functions | System status              | Standard  |
|                             |                           | Online change              | Standard  |
|                             |                           | Area status                | Standard  |
|                             |                           | Point detail               | Standard  |
|                             |                           | Alarm summary              | Standard  |
|                             |                           | Unit alarm summary         | Standard  |
|                             |                           | Message summary            | Standard  |
|                             |                           | Online manual              | Standard  |
|                             |                           | Trend graph                | Standard (8 pens × 400 screens)   |
|                             |                           | User graphic               | Standard (400 screens)  |
|                             |                           | Group instrumentation      | 400 screens (8 instruments per group)                                     |
|                             |                           | Smart ID handler           | Standard (user authentication function)                                   |
|                             |                           | Optional online functions  | Brand control   |
|                             | Open report               |                            | Daily, monthly, and annual reports (100 reports per type in Excel format) |
|                             | Engineering functions     | Control point editor       | Standard (RTC Editor)   |
|                             |                           | Control point monitor      | Standard (RTC Runtime)  |
|                             |                           | Virtual simulator function | Option (operates on DOSS/DOSS_H)  |
|                             |                           | Graphics creation function | Standard for the universal personality version                            |
|                             |                           | Report creation function   | Standard (Excel)  |

**Table 5. Outline Specifications for TSS Server/TSS Client Applications**

| Item                        |                           | TSS Server Specification              | TSS Client Specification   |   |
|-----------------------------|---------------------------|---------------------------------------|--|---|
| Hardware                    | Monitor                   | LCD monitor                           | 17" or 19" type  |   |
|                             |                           | Display resolution                    | SXGA(1280×1024)  |   |
|                             | Operation devices         | Keyboard                              | keyboard   |   |
|                             |                           | Pointing device                       | Mouse  |   |
| OS etc.                     | OS                        | -                                     | Windows 2000 Professional SP4, Windows XP Professional SP1   |   |
|                             | IE                        | -                                     | - 5.01 SP4 or later<br>- 6.0 SP1 or later<br>- Either 5.5 SP1 or 5.5 SP2 or later<br>Note that its Update Versions field must show "Q323759" <sup>(Note)</sup> .<br>Note:<br>If the update field of IE does not list "Q323759," apply the "Cumulative Patch for Internet Explorer (323759)(MS02-Q47)". |   |
|                             | Windows Media Player      | -                                     | 6.4 or later<br>If any buzzer is to be sounded, it is necessary to set the client PC to generate sounds.   |   |
| DOSS basic software package | Standard online functions | System status                         | Standard   |   |
|                             |                           | Online change                         | Standard   |   |
|                             |                           | Area status                           | Standard   |   |
|                             |                           | Point detail                          | Standard   |   |
|                             |                           | Alarm summary                         | Standard   |   |
|                             |                           | Unit alarm summary                    | Standard   |   |
|                             |                           | Message summary                       | Standard   |   |
|                             |                           | Online manual                         | Standard   |   |
|                             |                           | Trend graph                           | Standard (8 pens× 400 screens)   |   |
|                             |                           | User graphic                          | Standard (400 screens)   |   |
|                             | Group instrumentation     | 400 screens (8 instruments per group) |  |   |
|                             | Engineering functions     | Control point editor                  | Standard (RTC Editor)  | - |
|                             |                           | Control point monitor                 | Standard (RTC Runtime)   | - |
|                             |                           | Virtual simulator function            | Optional   | - |
|                             |                           | Graphics generation function          | Optional   | - |

# Example System Configuration

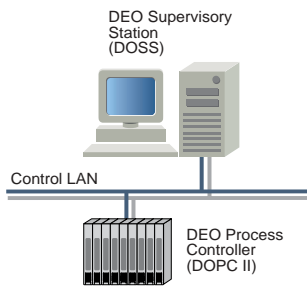


Figure 2. Harmonas-DEO Minimum Configuration (example)

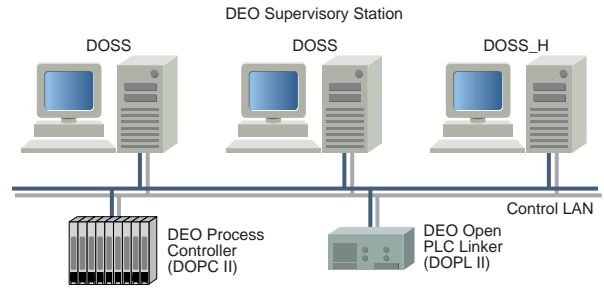


Figure 3. Harmonas-DEO Multiple Node Configuration (example)

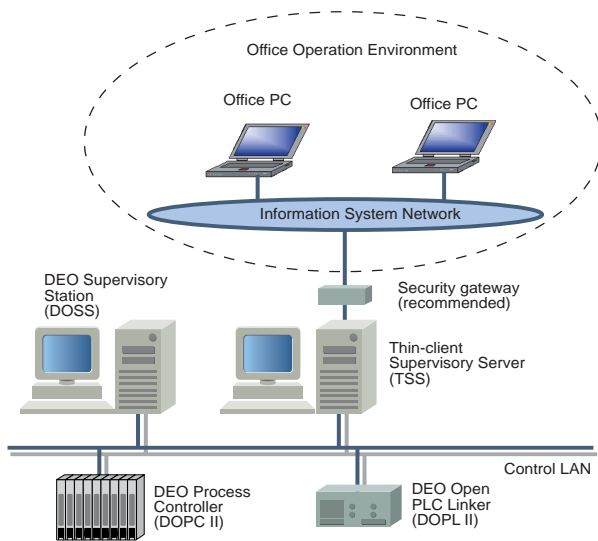


Figure 4. Office Operation Configuration (example)

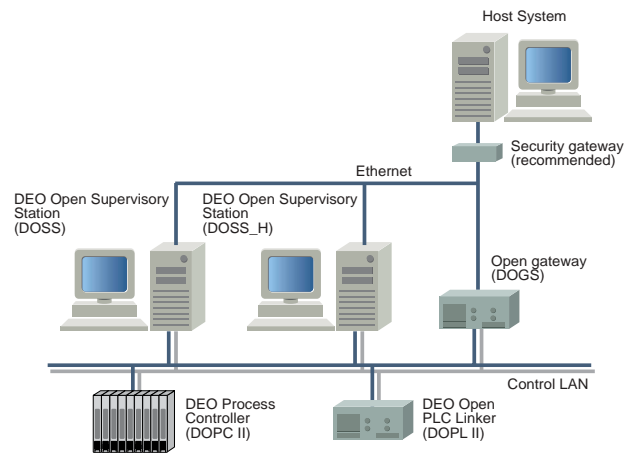


Figure 5. Host System Connection Configuration (example)

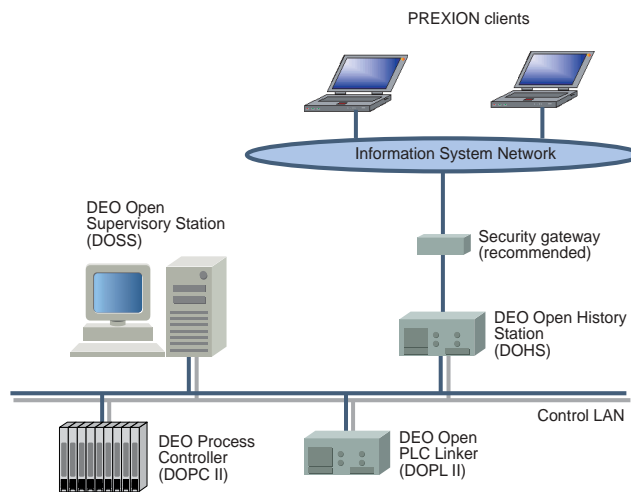


Figure 6. Example Process Data Analysis System (PREXION clients)

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*Specifications are subject to change without notice.*

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**Yamatake Corporation**  
**Advanced Automation Company**

1-1-32 New Stage Yokohama, Shin-urashima-cho,  
Kanagawa-ku, Yokohama, Kanagawa-ken 221-0031, Japan  
Tel : +81-45-461-8800

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