

Integration Test Summary SE03

Schneider Electric Modicon M580 and EtherNet/IP plus
PROFIBUS PA for Mining Industry



Supported by:



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1 Document Information

1.1 Purpose and Scope

This document provides a brief summary of Open Integration tests for Reference Topology SE03. All content of this document is jointly developed, reviewed and approved by Schneider Electric and Endress+Hauser as a common deliverable of Open Integration.

1.2 Document History

This is version 1.00.00 of this document. Version history:

Version	Released	Description
1.00.00	2021-03	Initial version

1.3 Related Documents

Please refer to related documents as listed below:

Document	Description
SD02678S/04/EN/01.20	Reference Topology SE03
SD02679S/04/EN/01.20	Integration Tutorial SE03
SD02681S/04/EN/01.20	List of Tested Devices and Versions SE03

2 Preface

Open Integration focuses on complementary system tests to verify integration and interoperability using practical test conditions. This is done by testing the system versus a reference test network with a relevant variety of components and field devices for defined target applications, and asking questions like this:

Is the system prepared to handle a necessary variety of compliant device implementations? How does it deal with multiple device revisions and device replacements? Does it apply reasonable bus settings to share access with other masters? How can field devices be accessed for configuration or asset health monitoring? Is this path stable and performing? ...

Open Integration does not test field devices, field network components or systems as such. All parts of a reference topology under test are released and have passed mandatory integration and interoperability tests as defined by technology foundations upfront.

3 General Introduction

This chapter provides a short introduction to Open Integration testing in general:

3.1 Reference Test Network

Open Integration verifies systems versus a reference test network: Figure 1 shows the principle as applied for EtherNet/IP and PROFIBUS:

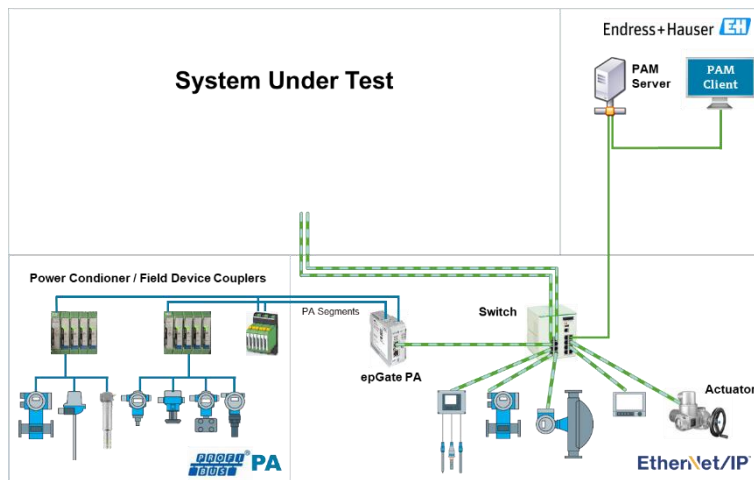


Figure 1: Open Integration Reference Test Network for EtherNet/IP and PROFIBUS

3.2 Integration Test Scenarios

Open Integration verifies supported means for integration into the system and interoperability with other tools. Figure 2 and Figure 3 show the main test scenarios as considered for EtherNet/IP and PROFIBUS:

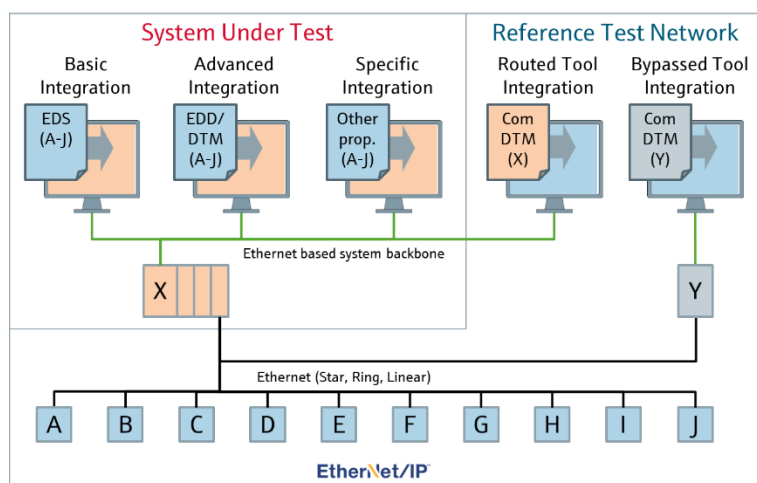


Figure 2: Open Integration Test Scenarios for EtherNet/IP

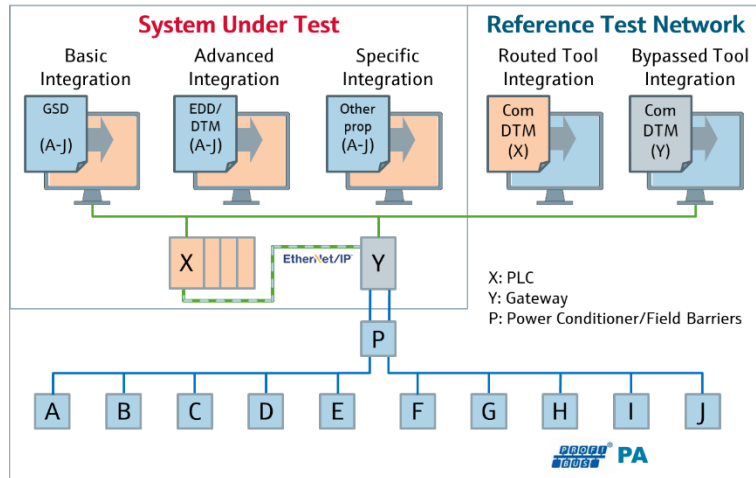


Figure 3: Open Integration Test Scenarios for PROFIBUS PA

3.2.1 Basic Integration

This scenario deals with integration of EtherNet/IP field devices by means of EDS and integration of PROFIBUS field devices by means of GSD. As a result, cyclic communication is established and field device process values with status information are available for further processing within the control strategy of the system. Test cases related to this scenario are mandatory.

3.2.2 Advanced Integration

This scenario deals with integration of field devices also for acyclic communication by means of EDD, DTM or FDI. As a result, the system is enabled to access additional information from field devices, e.g. for an integrated asset management solution. Test cases related to this scenario are mandatory, if the system under test supports such means.

3.2.3 Specific Integration

This scenario considers proprietary means for integration which may be requested by a specific system, e.g. to simplify commissioning or to provide preconfigured elements for visualization. This is optional and not supported by standard test cases. If relevant, a specific set of additional test cases must be defined.

3.2.4 Routed Tool Integration

Vice versa, this scenario deals with integration of system components under test as access path for plant asset management software provided by Endress+Hauser. Test cases related to this scenario are mandatory if the system under test supports such means.

3.2.5 Bypassed Tool Integration

This scenario focuses on interoperability to access field devices independently from routing support provided by the system under test. Test cases related to this scenario are optional. Test results may serve to complement a missing routing support, or as performance reference for routing support provided by a system under test.

4 Relevant Test Scenarios for SE03

Schneider Electric supports Basic Integration of EtherNet/IP devices by means of EDS. This is relevant for all EtherNet/IP field devices as well as the EtherNet/IP to PROFIBUS gateways provided by Softing. Underlying PROFIBUS field devices can be indirectly integrated: In a first step, the PROFIBUS field devices have to be integrated with the Softing epGate by means of GSD. Afterwards, the epGate itself has to be integrated with the control system by means of an application specific EDS representing the underlying PROFIBUS network. This shall be tested.

Advanced Integration of field devices by means of DTMs is not yet in the scope of this reference topology. If requested by customer projects, it may be considered and tested in future.

The control system allows implementation of device specific function blocks. This feature shall be verified and validated by example of reading and resetting the totalizer of a flow device.

Bypassed Tool Integration shall be considered for device configuration of PROFIBUS devices by means of DTMs, as well as EtherNet/IP devices by means of DTMs and integrated web servers, if applicable.

5 Summary of Test Results for SE03

5.1 Basic Integration

5.1.1 Drivers for EtherNet/IP

- All EDS files have been successfully imported in Control Expert device catalog.
- Control Expert does not support properly multiple EDS file revision. We do not recommend installing several EDS file revisions of a field device. This issue has been reported to Schneider Electric development.

5.1.2 Drivers for PROFIBUS

- All Endress+Hauser GSD drivers have been successfully imported in the Softing epGate PB gateway.

5.1.3 Field Network Configuration

Network Configuration

- Two different IP network have been configured, one for the Control Network and another one for the I/O network. The Schneider Electric BMENOC0311 module separates both networks.
- All IP addresses must be configured adequately before connecting the network. This can be done by different means as supported by different system components and field devices. Please refer to the Integration Tutorial for further details.

epGate PB Gateway

- The epGate PB web server IP address has been successfully configured with the Softing tool "Search and Configure".
- epGate PB configuration workflow via embedded Web server has been successfully tested.
- Once the PROFIBUS mapping configured, it is strongly recommended to save the configuration. If the epGate PB is restarted, the configuration is not lost but:
 - The PROFIBUS and E/IP mappings don't appear anymore in the epGate PB configuration view of the embedded web server.
 - The export of the *.XDB function blocks, used for data decoding in Control Expert, is not complete. Some parts, like derived FB Type of Input/Outputs are missing in the package and this will lead to an unsuccessful implementation in Control Expert. This issue has been reported to Softing development.

Schneider Electric Switch

- The Schneider Electric DRS switch has been configured as a Ring Manager.

EtherNet/IP Field Device Configuration

- All E/IP field devices are connected in Star on the managed switch.
- Field Device Configuration workflow has been successfully tested with EDS drivers.
- Adding a new Liquiline in the project produces a DTM message popup window with tens of warnings. Some Timing data types of the Liquiline EDS are not supported by Control Expert. The message indicates that these unsupported data types will be converted in bytes array. Clicking once on the button "OK" of the message window continues the instantiation of the device in the project. This has no influence on the cyclic communication. Issue has been sent to Schneider Electric development.
- Two workflows are possible to integrate the epGate PB gateway in Control Expert, either by using the generated EDS file (exported from the embedded Web server) or with the Schneider Electric Advanced Generic DTM (which is per default installed in Control Expert). Both workflows lead to a successful cyclic communication. Please refer to the Integration tutorial for more details.

5.1.4 Online Monitoring and Control Strategy

epGate PB

- epGate received E/IP data are available via the animation table in a byte array format (with both integration workflow).
- Using the Softing function block in Control Expert decodes the E/IP mapping and provides automatically the user the process values and status of the PROFIBUS PA field devices. However, there are some limitations. The implementation only works successfully if the epGate PB has been integrated with the Advanced Generic DTM and if the function block input array size definition has been manually increased to 256 bytes after the function block import (Otherwise a compilation error occurs)
- We do not recommend using the Softing function block if the epGate PB gateway is integrated with the gateway EDS file due to a byte shift issue. This problem has been reported to Softing and Schneider Electric and might be fixed in future.
- We recommend to use the Advanced Generic DTM from Schneider Electric until issues with Softing gateway EDS file workflow is fixed.

E/IP Ring

- Opening the ring does not disturb the cyclic communication.

E/IP Field Devices

- Cyclic communication has been successfully established with all E/IP field devices.
- The Schneider Electric BMENOC0311 module separates both networks. No online connection with EDS devices is possible. This is a limitation for explicit messaging if the user wants to online configure E+H E/IP field device from the Control Expert DTM browser.
- An issue has been detected with the Liquiline E/IP and its web server. The access to the device is working while cyclic communication is running but the "refresh" of the web browser disconnects shortly the device from the cyclic data exchange mode. This error has been reported to Endress+Hauser development and will be fixed.
- NAMUR status and diagnostics events are available in the input telegrams for E+H E/IP devices.

PROFIBUS PA devices

- If a PROFIBUS device is disconnected from the bus, the "DeviceFailure" and "DeviceStatus" fields of the cooked function block are updated adequately. Pay attention that it is not the case for the field device, which still indicates process values with correct status.

5.2 Specific Tool Integration

- Control Expert supports developing function block for Explicit Messages communication. This can be achieved by using the function block "DATA_EXCH".
- Two function blocks have been implemented and tested:
 - "readTotalizer1_Promass300" used to read the totalizer 1 value of the Promass300.
 - "resetTotalizer1_Promass300" used to reset the totalizer 1 value of the Promass300.
- Further specific Explicit Message function blocks may be implemented based on this concept.

5.3 Bypassed Tool Integration

5.3.1 Plant Asset Management for Device Configuration

EtherNet/IP

- A CommDTM is required to access EtherNet/IP devices with FieldCare. The "EtherNet/IP Comm Adapter" provided by Schneider Electric has been successfully configured and used.
- Endress+Hauser Promag500 and Promass300 have been successfully scanned, connected and operated.
- After a device Upload with FieldCare, the device tag is successfully written in the Offline view but not updated in the FieldCare Network Tag view. This issue has been reported to development team and will be fixed in a future FieldCare version.

PROFIBUS

- The Softing package "PROFIdtm V2.23" has been successfully installed on the Client machine.
- A driver interface must be created with the Softing tool "PROFIBUS Control Panel" tool for each PROFIBUS PA segment before starting FieldCare. This configuration has been successfully performed by using the interfaces "pnGate PB / mbGate PB". Please refer to the Integration tutorial for further details.
- The Softing CommDTM "PROFIdtm DPV1" must be instantiated in FieldCare and configured with the dedicated driver interface for each PROFIBUS PA segment. In this example, two CommDTMs have been used as the SE03 Topology is composed of two PROFIBUS PA segments.
- The FieldCare Create Network function is working for both PROFIBUS PA segments.
- All field devices have been successfully connected and operated.

5.3.2 EtherNet/IP Field Device Integrated Web server

- Embedded web server of Softing epGate PB is relevant for the gateway configuration.
- Embedded web server of Endress+Hauser E/IP devices provide a very convenient way to configure and operate individual field devices online.
- Embedded web server may only be used if this function is enabled in the field device and if the network topology allows to access it with a web browser running on a web client station.
- Endress+Hauser Memograph Web server uses another IP address as for the E/IP integration. This shall be configured directly on the device display.
- We recommend planning EtherNet/IP I/O networks with free ports for at least temporary connection of web client stations to take advantage of embedded web servers during commissioning and for maintenance.

6 Open Integration Result

Reference Topology SE03	Recommended	Not Recommended	Not Applicable
Basic Integration (EDS for E/IP devices and GSD for PROFIBUS PA devices)	X		
Advanced Integration			X
Specific Integration	X		
Routed Tool Integration			X
Bypassed Tool Integration (Integrated Web Server of E/IP devices and PAM for E/IP device configuration)	X		
Bypassed Tool Integration (PAM for PROFIBUS device configuration)	X		

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