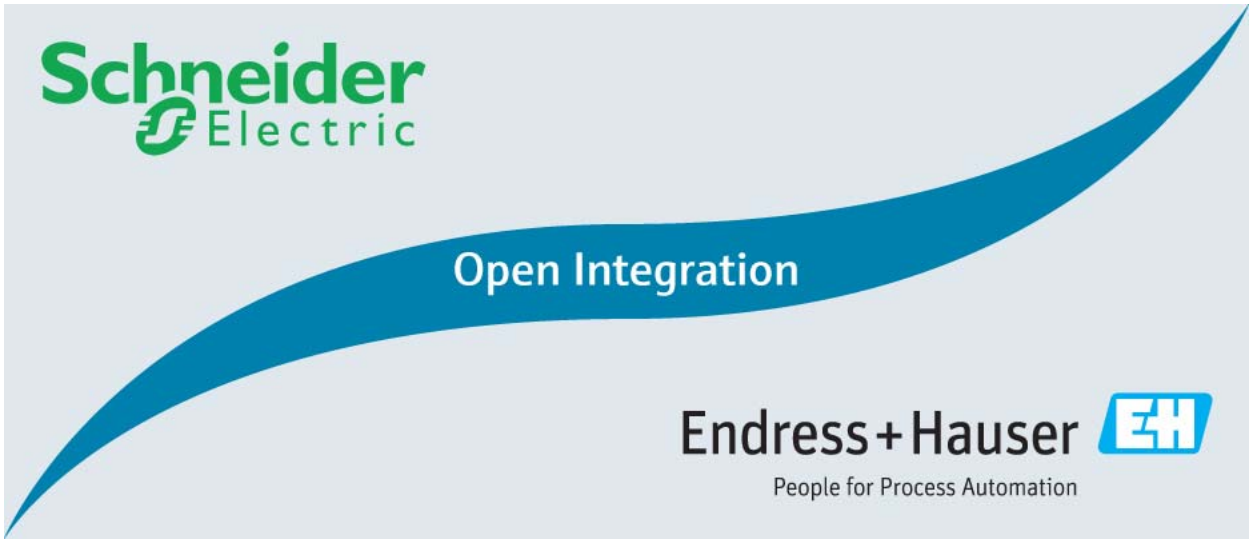
Integration Test Summary SE01

Schneider Electric Modicon M580 and PROFIBUS for Primaries & Metal Industry



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1 Document Information

1.1 Purpose and Scope

This document specifies the Open Integration Reference Topology SE01. 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	2015-12	Initial version

1.3 Related Documents

Please refer to related documents as listed below:

Document	Description
SD01462S/04/EN/01.15	Reference Topology SE01
SD01463S/04/EN/01.15	Integration Tutorial SE01
SD01465S/04/EN/01.15	List of Tested Devices and Versions SE01

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 PROFIBUS:

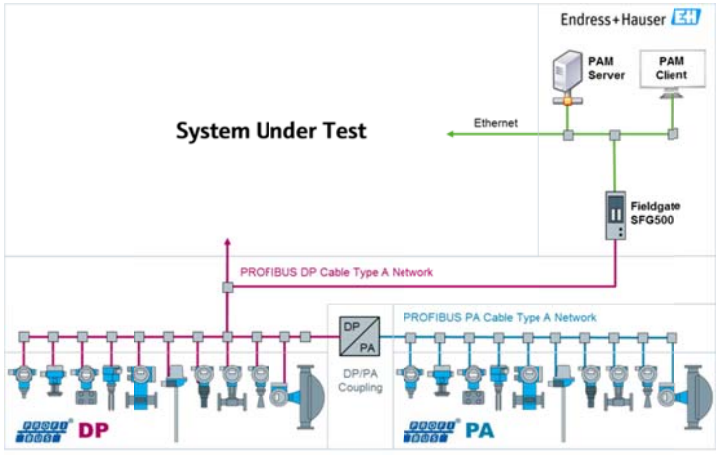

Figure 1: Open Integration Reference Test Network for PROFIBUS

3.2 Integration Test Scenarios

Open Integration verifies supported means for integration into the system and interoperability with other tools. Figure 2 shows the main test scenarios as considered:

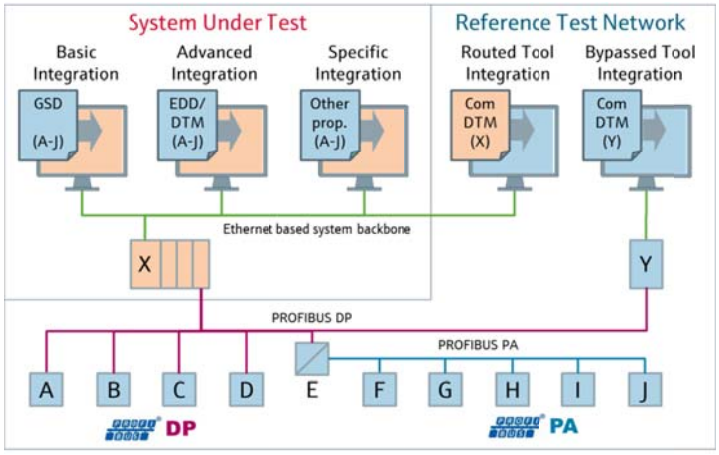

Figure 2: Open Integration Test Scenarios

3.2.1 Basic Integration

This scenario deals with integration of field devices for commissioning of the PROFIBUS network and cyclic communication of process values by means of GSD. As a result, 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 with other masters connected to the PROFIBUS network to access field devices independently from routing support provided by the system under test. Test cases related to this scenario are mandatory. 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 SE01

Schneider Electric M580 utilizes Basic Integration by means of GSDs for PROFIBUS as well as Advanced Integration by means of DTM. This has to be tested. Specific Integration is not required.

Schneider Electric M580 supports Routed Tool Integration by means of Communication DTMs. This has to be tested.

Schneider Electric M580 shall also be tested whether to share access with other PROFIBUS master devices for Bypassed Tool Integration.

5 Summary of Test Results for SE01

5.1 Basic Integration

The basic integration workflow for integration of PROFIBUS devices by means of GSD with Schneider Electric M580 has been successfully tested for a variety of devices at different baud rates as follows:

PROFIBUS devices		PROFIBUS ID	Baudrate Baud									
			9.6k	19.2k	31.25k	45.45k	93.75k	187.5k	500k	1.5M	3M	6M	12M
Master	PRM		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Cerabar S	0x1541	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Cerabar M	0x1553	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Deltabar S	0x1542	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Promag 50	0x1525	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Levelflex	0x1558	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Prosonic M	0x152C	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Deltapilot M	0x1555	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Micropilot	0x1559	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Deltabar M	0x1554	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	iTHERM	0x1551	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Prowirl 200	0x1564	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
DP Slave	Promag 53	0x1526	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
DP Slave	Promag 100	0x1560	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Legend

✓	Available Baud rate
✗	Unavailable Baud rate
	Baudrate not testable with complete topology
	OK with defaults
	OK with adjustments
	Not OK

Device Type Library

- All required GSD files can be successfully imported into the Unity Pro DTM Catalog.
- GSD drivers are not sorted according to their slave family structure as defined in the GSD, but reasonably assigned to predefined folders and sub-folders.
- Multiple GSD versions for same device type can be handled by appropriate renaming.

Field Network Configuration

- All slave devices can be successfully manually integrated into a network configuration.
- We don't recommend using the "Field bus discovery" tool for network scanning.
- All slave modules are configured automatically according to slot definitions as specified in GSD. However, Unity Pro does not check for valid module assignments when the configuration is changed manually, in case of module replacement. Invalid assignments will not allow cyclic communication with that slave.
- Invalid Baud rates which are not supported by some devices in a topology can be configured.
- Bus parameters settings are updated automatically according to configured slaves and the defined baud rate.
- The parameter "Default Devices Watchdog" must be manually adjusted for all baud rates other than 45.45 kBaud.
- The parameter "MAX_TSDR" needs to be manually adjusted for baud rates 45.45 kBaud and 93.75 kBaud.
- The calculated timing parameters allowed access also with a secondary master.
- In the Diagnosis menu of the PRM Gateway, wrong indication of diagnostic messages is displayed for DP devices which do not have any diagnostics. Such warnings appear for baud rates of 1.5 MBaud and higher.
- Warnings can be avoided by increasing of calculated PROFIBUS cycle time for baud rates of 1,5 MBaud or higher.
- The DPV1 support option is selected by default, but without further use. This does not work for one tested device. (Prosonic M). Data exchange mode can be established if DVP1 support is disabled.

Control Strategy

- A data structure is created automatically as soon as a new device is added into the field network. However, the default type of the data structure is "ByteArray". Data type modification must be done manually according to GSD.
- Unnecessary free bytes are added in the data structure by Unity Pro. This has no influence on the other data.

5.2 Advanced Integration

The advanced integration workflow for integration of PROFIBUS devices by means of DTM with Schneider Electric M580 has been tested for a variety of devices at different baud rates as follows:

PROFIBUS devices		PROFIBUS ID	Baudrate Baud									
			9.6k	19.2k	31.25k	45.45k	93.75k	187.5k	500k	1.5M	3M	6M	12M
Master	PRM		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Cerabar S	0x1541	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Cerabar M	0x1553	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Deltabar S	0x1542	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Promag 50	0x1525	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Levelflex	0x1558	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Prosonic M	0x152C	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Deltapilot M	0x1555	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Micropilot	0x1559	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Deltabar M	0x1554	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	iTHERM	0x1551	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
PA Slave	Prowirl 200	0x1564	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
DP Slave	Promag 53	0x1526	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
DP Slave	Promag 100	0x1560	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Legend

✓	Available Baud rate
✗	Unavailable Baud rate
	Baudrate not testable with complete topology
	OK with defaults
	OK with adjustments
	Not OK

In general, the advanced integration workflow is more user friendly and convenient, but it cannot be applied for a majority of relevant device types today. The reason is a compatibility issue between Endress+Hauser Classic DTMs and Unity Pro. The advanced integration workflow may only be applied for Endress+Hauser field devices with CoDIA DTMs.

Please refer to the list of Endress+Hauser devices with Classic or CoDIA DTM in chapter 7.

Device Type Library

- All required device DTMs can be successfully imported into the Unity Pro DTM Catalog.
- All imported device DTMs are reasonably assigned to predefined folders.
- Multiple DTM revisions for same device type can be handled within the DTM Catalog.

Field Network Configuration

- Classic DTMs cannot be instantiated in Unity Pro as necessary for a field network configuration.
- CoDIA DTMs can be instantiated in Unity Pro as necessary for a network configuration.
- Prowirl 200 requires at least firmware version 01.01.00 and DTM version 1.7.0.135 for successful integration.
- Micropilot with firmware version 01.00.00 and DTM 1.4.0.126 cannot be successfully integrated by means of DTM. We recommend using GSD until newer version is available.
- The “Field bus discovery” tool fails for scanning the correct DTM for most of the connected devices.
- Slave modules are configured automatically according to slot definitions as specified in the device DTM.
- Invalid Baud rates which are not supported by some devices in a topology can be configured.
- Bus parameters settings are updated automatically according to configured slaves and the defined baud rate.
- The parameter “Default Devices Watchdog” must be manually adjusted for all baud rates other than 45.45 kBaud.
- The parameter “MAX_TSDR” needs to be manually adjusted for baud rates 45.45 kBaud and 93.75 kBaud.
- The calculated timing parameters allowed access also with a secondary master.
- In the Diagnosis menu of the PRM Gateway, wrong indication of diagnostic messages is displayed for DP devices which do not have any diagnostics. Such warnings appear for baud rates of 1.5 MBaud and higher.
- Warnings can be avoided by increasing of calculated PROFIBUS cycle time for baud rates of 1,5 MBaud or higher.
- The DPV1 support option is selected by default, but without further use. This does not work for one tested device. (Prosonic M). Data exchange mode can be established if DVP1 support is disabled.

Control Strategy

- A data structure is created automatically as soon as a new device is added into the field network. For the tested CoDIA DTMs, all data structure was automatically created with the correct data type defined in the device DTM.
- Unnecessary free bytes are added in the data structure in Unity Pro. This has no influence on the other data.

Device Configuration

- All Endress+Hauser CoDIA DTMs can be connected in Online mode in Unity Pro.

5.3 Routed Tool Integration

In combination with FieldCare, the Schneider Electric CommDTM "PRM Comm" allows establishing connections to the devices with all Endress+Hauser device DTMs. However, the Schneider Electric CommDTM "PRM Comm" does not provide long time functionality. If a connection is disconnected, the commDTM is not able to reconnect it automatically.

This does not match requirements for plant wide device configuration and asset health monitoring. Therefore we do not recommend applying this in customer projects today.

5.4 Bypassed Tool Integration

The Schneider Electric PRM Gateway and Fieldgate SFG500 showed no issues in sharing access to the same PROFIBUS network. The default bus timing parameters as calculated by Unity Pro were adequate to allow access also for SFG500. Increase of target rotation time may be used to improve performance for device configuration.

It must be considered that the SFG500 adapts to the current bus parameters only at time when connected. If the network configuration is changed e.g. by adding or removing slaves via Unity Pro, the SFG500 needs to be disconnected from the PROFIBUS or rebooted to adapt accordingly.

Bypassed Tool Integration of Schneider Electric M580 and Fieldgate SFG500 can be recommended for device configuration and asset health monitoring in projects.

6 Open Integration Result

Reference Topology ME01	Recommended	Not Recommended	Not Applicable
Basic Integration	X		
Advanced Integration		X	
Specific Integration			X
Routed Tool Integration		X	
Bypassed Tool Integration	X		

7 Appendix: Classic or CoDIA DTMs

List of Endress+Hauser PROFIBUS devices in production, Status October 2015:

7.1 PROFIBUS PA devices

7.1.1 Classic DTMs

Family	Dev. Type	Firmware	Rel. Date	Meas. Princ.	Product Roots
Cerabar M	0x1553	1.00.01	30.11.2013	Pressure Process	PMC51, PMP51, PMP55
Cerabar M	0x1553	1.00.00	28.02.2011	Pressure Process	PMC51, PMP51, PMP55
Cerabar S	0x1541	4.01.00	07.10.2013	Pressure Process	PMC71, PMP71, PMP72, PMP75
Deltabar M	0x1554	1.00.01	30.11.2013	Pressure Differential	PMD55
Deltabar M	0x1554	1.00.00	28.02.2011	Pressure Differential	PMD55
Deltabar S	0x1542	4.01.00	07.10.2013	Pressure Differential	FMD76, FMD77, FMD78, PMD70, PMD75
Deltapilot M	0x1555	1.00.01	30.11.2013	Pressure Hydrostatic	FMB50, FMB51, FMB52, FMB53
Deltapilot M	0x1555	1.00.00	28.02.2011	Pressure Hydrostatic	FMB50, FMB51, FMB52, FMB53
Deltapilot S	0x154F	4.01.00	07.10.2013	Pressure Hydrostatic	FMB70
Display	0x1569	1.00.00	29.11.2013	Display Counter	RID14
Display	0x156A	01.00.00	29.11.2013	Display Counter	RID16
Gammapilot M	0x1548	1.03.08	10.08.2015	Level Radiometric	FMG60
Gammapilot M	0x1548	1.03.06	30.10.2010	Level Radiometric	FMG60
iTEMP	0x1549	1.01.03	01.08.2011	Temperature Transmitter	TMT162, TMT162C, TMT162R
iTEMP	0x1551	1.01.04	15.07.2014	Temperature Transmitter	TMT84
Liquiphant	0x152B	1.3	20.01.2004	Level Vibronic Liquid	FTL50, FTL50H, FTL51, FTL51C, FTL51H, FTL51K,
Liquisys M	0x1515c	2.37	14.12.2012	Analysis Conductive Cond.	CLM223, CLM253
Liquisys M	0x1515i	2.36	14.12.2012	Analysis Conductive Ind.	CLM223, CLM253
Liquisys M	0x1516	2.73	14.12.2012	Analysis pH/ORP	CPM223, CPM253
Liquisys M	0x1517	2.36	14.12.2012	Analysis Turbidity	CUM223, CUM253
Liquisys M	0x1518	2.49	14.12.2012	Analysis Oxygen	COM223, COM223F, COM253, COM253F
Liquisys M	0x1519	2.34	14.12.2012	Analysis Chlorine	CCM223, CCM253
Mycom S	0x1535	1.22.06	16.12.2013	Analysis Conductive Cond.	CLM153
Mycom S	0x1537	1.22.06	16.12.2013	Analysis Conductive Ind.	CLM153
Mycom S	0x1539	1.61.01	16.12.2013	Analysis pH/ORP	CPM153
Promag	0x1525	3.06.01	11.11.2010	Flow Electro-Magnetic	50D, 50E, 50H, 50L, 50P, 50W
Promag	0x1527a	3.06.01	11.11.2010	Flow Electro-Magnetic	53E, 53H, 53L, 53P, 53W
Promag	0x1527b	3.06.01	11.11.2010	Flow Electro-Magnetic	55H, 55S
Promass	0x1528	3.06.01	11.11.2010	Flow Coriolis	80A, 80E, 80F, 80H, 80I, 80M, 80P, 80S
Promass	0x152A	3.06.01	11.11.2010	Flow Coriolis	83A, 83E, 83F, 83H, 83I, 83M, 83O, 83P, 83S, 83X
Prosonic Flow	0x1530	3.06.01	11.11.2010	Flow Ultrasonic	93C, 93P, 93W
Prosonic Flow	0x154C	1.01.04	26.07.2012	Flow Ultrasonic	92F
Prosonic M	0x152C	1.04.00	07.08.2006	Level Ultrasonic	FMU40, FMU41, FMU41K, FMU42, FMU43, FMU4
Prowirl	0x153B	1.03.02	28.03.2011	Flow Vortex	72F, 72W
Prowirl	0x153C	1.03.02	28.03.2011	Flow Vortex	73F, 73W
Smartec S	0x153E	1.57.00	10.09.2013	Analysis Conductivity	CLD132, CLD134
t-mass	0x1550	3.06.01	01.02.2011	Flow Thermal	65F, 65I

7.1.2 CoDIA DTMs

Family	Dev. Type	Firmware	Rel. Date	Meas. Princ.	Product Roots
Levelflex	0x1558	1.01.00	07.04.2015	Level Guided Radar	FMP50, FMP51, FMP52, FMP53, FMP54, FMP55,
Liquiline M	0x1565	2.01.00	23.02.2015	Analysis pH/ORP	CM42
Liquiline M	0x1566	2.01.00	23.02.2015	Analysis Conductivity	CM42
Liquiline M	0x1567	2.01.00	23.02.2015	Analysis Oxygen	CM42
Micropilot	0x1559	1.01.00	07.04.2015	Level Radar	FMR50, FMR51, FMR52, FMR53, FMR54, FMR56,
Promass 200	0x155F	1.01.01	07.07.2015	Flow Coriolis	8E2B, 8F2B
Prowirl 200	0x1564	1.01.01	06.05.2015	Flow Vortex	7C2B, 7D2B, 7F2B, 7O2B, 7R2B

7.2 PROFIBUS DP

7.2.1 Classic DTMs

Family	Dev. Type	Firmware	Rel. Date	Meas. Princ.	Product Roots
EnergyManager	0x153F	3.06.02	13.02.2012	n.a.	RMC621, RMS621
Liquisys M	0x151D	2.34	14.12.2012	Analysis Chlorine	CCM223, CCM253
Liquisys M	0x151E	2.49	14.12.2012	Analysis Oxygen	COM223, COM223F, COM253, COM253F
Liquisys M	0x151F	2.36	14.12.2012	Analysis Turbidity	CUM223, CUM253
Liquisys M	0x1520	2.73	14.12.2012	Analysis pH/ORP	CPM223, CPM253
Liquisys M	0x1521c	2.37	14.12.2012	Analysis Conductive Cond.	CLM223, CLM253
Liquisys M	0x1521i	2.36	14.12.2012	Analysis Conductive Ind.	CLM223, CLM253
Memograph M	0x1552	2.11.08	28.01.2015	Registration Recorder	RSG40
Promag	0x1526a	3.06.10	25.08.2011	Flow Electro-Magnetic	53E, 53H, 53L, 53P, 53W
Promag	0x1526b	3.06.10	25.08.2011	Flow Electro-Magnetic	55H, 55S
Promag	0x1546	3.06.10	25.08.2011	Flow Electro-Magnetic	50D, 50E, 50H, 50L, 50P, 50W
Promass	0x1529	3.06.10	25.08.2011	Flow Coriolis	83A, 83E, 83F, 83H, 83I, 83M, 83O, 83P, 83S, 83X
Prosonic Flow	0x1531	3.06.10	25.08.2011	Flow Ultrasonic	93C, 93P, 93W
Prosonic S	0x1540	2.01.05	15.08.2014	Flow Ultrasonic	FMU90
Prosonic S	0x154E	1.01.05	15.08.2014	Flow Ultrasonic	FMU95
Smartec S	0x153D	1.57.00	10.09.2013	Analysis Conductivity	CLD132, CLD134
t-mass	0x1545	3.06.10	25.08.2011	Flow Thermal	65F, 65I

7.2.2 CoDIA DTMs

Family	Dev. Type	Firmware	Rel. Date	Meas. Princ.	Product Roots
Liquiline	0x155D	1.05.03	30.06.2015	Analysis Multiparameter	CM442, CM442R, CM444, CM444R, CM448, CM44
Liquistation	0x155C	1.05.03	30.06.2015	Analysis Water Sampler	CSF34, CSF48
Promag 100	0x1560	1.01.02	07.05.2015	Flow Electro-Magnetic	5E1B, 5H1B, 5P1B
Promag 400	0x1562	1.00.05	28.07.2015	Flow Electro-Magnetic	5D4C, 5L4C, 5W4C
Promass 100	0x1561	1.01.05	06.05.2015	Flow Coriolis	8A1B, 8C1B, 8E1B, 8F1B, 8G1B, 8H1B, 8I1B, 8O1

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