



Test Report No IE-ITE-171114

PRIME Certification Tests Cases for Service Nodes

EQUIPMENT UNDER TEST	Poly-phase energy METER with integrated PRIME Power Line Communication
MODEL	5CTDE2F60B4P4UE
FIRMWARE VERSION	2.2.0.6
CERTIFICATION SCOPE	Electricity Meter based on reference design

Author: M. Luz Soriano Reviewer: José Fernández

NOTE: This test report shows the detailed information associated with the Test Report Summary no. IE-ITE-171114

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1.- EQUIPMENT UNDER TEST IDENTIFICATION

Unit:	Poly-phase energy METER with integrated PRIME Power Line Communication
Model:	5CTDE2F60B4P4UE
Trade Mark:	ZIV
Serial Number:	M1: 45480017 M2: 35620000
Manufacturer:	ZIV METERING SOLUTIONS, S.L.



The sample was selected and delivered by the applicant.

In the document "20130708_5CTM_ATcommands_RevD-RevE_v1.pdf", ZIV explains how to set the sample configured for the different PRIME certification tests. ZIV declares the device to be considered as revision E





Device type	Poly-phase energy METER with integrated PRIME Power Line Communication
BaudRate	9600 baud
MAC	M1: 40:40:02:b5:f8:51 M2: 40:40:22:1f: 84:a0
Firmware version	2.2.0.6
Applicable Optional tests	No
Recertification	Yes





2.- SUMMARY OF TEST RESULTS

	PHY LAYER	
	2.2 PHY Test Cases: Functional Category	
2.2.1	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. D8PSK	NA
2.2.2	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV,PPDU length 256 bytes. D8PSK+CC	NA
2.2.3	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. DBPSK	NA
2.2.4	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120dBuV, PPDU length 256 bytes. DBPSK+CC	NA
2.2.5	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. Modulation type: DQPSK	NA
2.2.6	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. QPSK+CC	NA
2.2.7	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec (20hm) and output level 120 dBuV, PPDU length 256 bytes.DBPSK	NA
2.2.8	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec (20hm) and output level 120 dBuV, PPDU length 256 bytes. D8PSK+CC	NA
2.2.9	Verify error free communication (0.2% FER) (checking the complete frame payload) when receiving input signal of 122 dBuV. (DUT is in reception state). Modulation type: D8PSK	NA
	2.4 PHY Test Cases: Signal Quality category	
2.4.1	Verify that the EVM of the received signal at output level is above 17dB.	PASS
2.4.2	Verify that the EVM of the transmitted signal output level is above 17dB.	PASS
0.5.4	2.5 PHY Test Cases: Regulatory category	DAGO
2.5.1	PHY Test Cases: Regulatory category	PASS
	MAC LAYER	
	3.2 MAC Test Cases: Service Node Start-up	

3.2.1	Service node start-up (forcing the reception of beacons).	NA
3.2.2	Service node start-up (No PNPDUs are transmit when DUT receives BPDUs).	NA





3.2.3	Service node start-up (Tx rate of PNPDUs reduced by factor of received PNPDUs).	NA
3.2.4	Service node start-up (PNPDU generation latency and transmission parameters).	NA
3.2.5	Service Node start-up (RANDOMness in the transmission of PNPDUs)	NA
3.2.6	Service Node start-up (seeking promotion of DUT).	NA
	3.3 MAC Test Cases: Channel Access	
3.3.1	Channel access- Shared Contention Period. Channel is idle	NA
3.3.2	Channel access- Shared Contention Period. Channel is occupied.	NA
3.3.3	Channel access- Contention Free Period.	NA
3.3.4	Channel access-Adaptation to frame structure change (FRA)	NA
	3.4 MAC Test Cases: Service Node MAC specific procedures	
3.4.1	Registration accepted (Base Node available when DUT powers up).	NA
3.4.2	Registration accepted (Base Node not available when DUT powers up).	NA
3.4.3	Registration accepted (DUT connected to a Switch node and the Switch node is connected to the Base Node).	NA
3.4.4	Unregistering process initiated by a terminal node.	NA
3.4.5	Unregistering process initiated by the Base node.	NA
3.4.6	Promotion process initiated by the base node.	NA
3.4.7	Promotion process initiated by the service node DUT.	NA
3.4.8	Switching process: 2 levels of switching (DUT1 as a level 1 switch).	NA
3.4.9	Switching process: 2 levels of switching (DUT as a level 2 switch).	NA
3.4.10	Switching functions: BPDU transmisión	NA
3.4.11	Switching functions: BPDU updates from FRA control packet	NA
3.4.12	Promotion rejected by the base node.	NA
3.4.13	Demotion process initiated by the base node.	NA
3.4.14	Keep-Alive process (response from DUT).	NA
3.4.15	Keep-Alive process (timeout and disconnect).	NA
3.4.16	Keep-Alive process (changes in Keep Alive timeout).	NA
3.4.17	Connection establishment initiated by the Base node.	NA
3.4.18	Connection establishment initiated by the Service node.	NA
3.4.19	Connection establishment rejected by the Base node.	NA
3.4.20	Connection closing initiated by the Base node.	NA
3.4.21	Connection closing initiated by the Service node.	NA
3.4.22	File transfer process (unicast).	NA
3.4.23	File transfer process (multicast).	NA
3.4.24	Error in the firmware upgrade process.	NA

CONVERGENCE LAYER

4.2 CL Test Cases: 4-32 Connection establishment

4.2.1 Correct establishment and disconnection of 4-32 link

PASS

NA

4.3 CL Test Cases: DLMS traffic over 4-32 connection

131	CS4-32 is able to pass valid DLMS payload between the meter and the test
4.5.1	system.





4.3 CL Test Cases: 4-32 parameter integrity

4.4.1	Test that CS4-32 integrity parameter is verified at the DUT.
	root and oo roe mogney parameter to ronmou at the born

NA

For more detailed information about the test results see Annex I





3.- APPLICANT

Name: Cristina Martínez

Company Name: ZIV METERING SOLUTIONS, S.L.

Address: Parque Tecnológico de Bizkaia, edif.210 - 48170 Zamudio (Bizkaia)-Spain

4.- PLACE OF RECEPTION AND EXECUTION OF THE TESTS

Laboratory Name: Instituto Tecnológico de la Energía (ITE)

Address Av. Juan de la Cierva, 24.- 46980 PATERNA (VALENCIA), SPAIN

5.- STANDARDS AND TEST PROCEDURES EMPLOYED

Standards:

- Draft Specification for Powerline Intelligent Metering Evolution. PRIME-Specification v.1.3.6.
- EN 50065-1 (2001): "Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz. Part 1: General requirements, frequency bands and electromagnetic disturbances".
- EN 50065-2-3 (2003) + A1 (2005): "Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz. Part 2-3: Immunity requirements for mains communications equipment and systems operating in the range of frequencies of 3 kHz to 95 kHz and intended for use by electricity suppliers and distributors".
- EN 50065-7 (2001): "Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz. Part 7: Equipment impedance".

Testing procedures:

• PRIME Certification. Test Cases version 1.2





6.- CONCLUSIONS

In view of the results and in the test conditions expressed in the present report, <u>the tested</u> <u>sample of</u>:

	Unit:	Poly-phase energy METER with integrated PRIME Power Line Communication
	Model:	5CTDE2F60B4P4UE
	Trade Mark:	ZIV
	Serial Number:	M1: 45480017 M2: 35620000
	Manufacturer:	ZIV METERING SOLUTIONS, S.L.
√	COMPLIES with	the tests cases defined by PRIME Alliance in its PRIME
	Certification. Tes	t Cases version 1.2 based on PRIME-Specification v.1.3.6.

- This test report is granted on account of tests made at location of LABORATORY in City, Country.
- The results of the present report apply only to the samples tested and the moment and conditions under which the measurements were performed.
- The complete results, including remarks and limitations, are laid down in ANNEX I of this report.





ANNEX I. TEST RESULTS

Place:	Instituto Tecnológico de la Energía

Climatic conditions: $23^{\circ} \pm 5^{\circ}$

Responsible: M. Luz Soriano

Used instruments:

	Measurement instruments		
X	SW		
	\checkmark	SW CURRENT CURRENT PRIME audition v1.2.3ct	
	\checkmark	Atmel PRIME Manager v2.0.7	
X	HW		
	\checkmark	Beacon Transmitter device. (labeled BASE NODE).	
		MAC: 00:80:E1:02:68:DB	
	\checkmark	CURRENT PRIME examine device. (SNIFFER)	
		MAC: 00:80:E1:02:64:64	
	\checkmark	Auxiliary 1 device. (labeled AUX 1)	
		MAC: 00:80:E1:02:66:C0	
	\checkmark	Auxiliary 2 device (labeled AUX 2)	
		MAC: 00:80:E1:02:66:19	
	\checkmark	CURRENT enabled HP Laptot with its power supply	
	\checkmark	4976– LISN	
	\checkmark	1194– LISN PRIME	
	\checkmark	FILTERS WITH VARIABLE ATENUATION	
	\checkmark	2 AISOLATING TRANSFORMERS	
	\checkmark	ZIV DATA CONCENTRATOR	
	✓	Data registers storage place	
		Data registers storage place	
		/home/conftester/CLIENTES/ZIV_Trifasico/Results/2206	

Results:





4.1. PHY layer

4.1.1. Test setup

230 V



4.1.2. Test results

CODE	DESCRIPTION	RESULT	EXPECTED	STAT.	COMMENTS
	2.2 PHY Test Case	es: Functio	onal Category		
2.2.1	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. D8PSK	-	At least 1996 frames received	NA	*
2.2.2	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV,PPDU length 256 bytes. D8PSK+CC	-	At least 1996 frames received	NA	*





2.2.3	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. DBPSK	-	At least 1996 frames received	NA	*
2.2.4	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120dBuV, PPDU length 256 bytes. DBPSK+CC	-	At least 1996 frames received	NA	*
2.2.5	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. Modulation type: DQPSK	-	At least 1996 frames received	NA	*
2.2.6	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec and output level 120 dBuV, PPDU length 256 bytes. DQPSK+CC	-	At least 1996 frames received	NA	*
2.2.7	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec (20hm) and output level 120 dBuV, PPDU length 256 bytes.DBPSK	-	At least 1996 frames received	NA	*
2.2.8	Verify error free communication (0.2% FER) checking the complete frame payload when communicating directly over the LISN stated in the PRIME PHY Spec (20hm) and output level 120 dBuV, PPDU length 256 bytes. D8PSK+CC	-	At least 1996 frames received	NA	*
2.2.9	Verify error free communication (0.2% FER) (checking the complete frame payload) when receiving input signal of 122 dBuV. (DUT is in reception state). Modulation type: D8PSK	-	At least 1996 frames received	NA	*
	2.4 PHY Test Cases	s: Signal Q	uality category		
2.4.1	Verify that the EVM of the received signal at output level of 120 dBuV is above 17dB.	25.4 dB	EVM>17dB	PASS	Sample: M2 A vendor tool is needed to perform this test
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Verify that the EV 2.4.2 signal output leve above 17dB.	M of the transmitted I of 120 dBuV is	17.46 dB	EVM>17dB	PASS	A vendor tool is needed to perform this test	
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PHY Test Cases: Regulatory category

DUT is EN50065-1, EN50065-2-3 and EN50065-7 compliant in order to be PRIME compliant.

- Test report identification: B41-15-BB-I1
- DUT identification: THREE-PHASE ENERGY METER WITH INTEGRATED PLC, model 5CTD Fusion (Sample No. 1 Serial Number: - (Prototype), Sample No. 1 Serial Number: -(Prototype))





4.2. MAC layer

4.2.1. Test setup

• For test code 3.2.1, 3.2.2, 3.2.4, 3.2.5, 3.3.4, 3.4.1, 3.4.2, 3.4.4, 3.4.5, 3.4.14, 3.4.15, 3.4.16, 3.4.17, 3.4.18, 3.4.19, 3.4.20, 3.4.21, 3.4.22, 3.4.23, 3.4.24



• For test code 3.2.3



• For test code 3.2.6, 3.4.6, 3.4.7, 3.4.12







• For test code 3.3.1, 3.3.3



• For test code 3.3.2



• For test code 3.4.3







• For test code 3.4.8



• For test code 3.4.9







• For test code 3.4.10, 3.4.11, 3.4.13



4.2.2. Test results

CODE	DESCRIPTION	RESULT	EXPECTED	STAT.	COMMENTS		
3.2 MAC Test cases: Service Node Start-up							
3.2.1	Service node start-up (forcing the reception of beacons).	-	Successful service node start-up	NA	*		
3.2.2	Service node start-up (No PNPDUs are transmit when DUT receives BPDUs).	-	No PNPDUs	NA	*		
3.2.3	Service node start-up (Tx rate of PNPDUs reduced by factor of received PNPDUs).	-	x <= macMaxProm otionPdu y <= x/2 z <= x/3	NA	*		
3.2.4	Service node start-up (PNPDU generation latency and transmission parameters).	-	Successful registration process	NA	*		
3.2.5	Service Node start-up (RANDOMness in the transmission of PNPDUs)	-	RANDOMnes s in the transmission of PNPDUs	NA	*		
3.2.6	Service Node start-up (seeking promotion of DUT).	-	Successful registration process	NA	*		
	3.3 MAC Test Ca	ses: Channe	el Access				
3.3.1	Channel access- Shared Contention Period. Channel is idle	-	Data transmission only in SCP time	NA	*		
3.3.2	Channel access- Shared Contention Period. Channel is occupied.	-	MacCSMACh BusyCount > MacCSMAFail Count	NA	*		
3.3.3	Channel access- Contention Free Period.	-	No data transmission during CFP time	NA	*		





3.3.4	Channel access-Adaptation to frame structure change (FRA)	-	Data transmission only in SCP time	NA	*
	3.4 MAC Test Cases: Service	Node MA	C specific proced	lures	
3.4.1	Registration accepted (Base Node available when DUT powers up).	-	Successful registration process	NA	*
3.4.2	Registration accepted (Base Node not available when DUT powers up).	-	Successful registration process	NA	*
3.4.3	Registration accepted (DUT connected to a Switch node and the Switch node is connected to the Base Node).	-	Successful unregistering process	NA	*
3.4.4	Unregistering process initiated by a terminal node.	-	Successful unregistering process	NA	*
3.4.5	Unregistering process initiated by the Base node.	-	Successful unregistering process	NA	*
3.4.6	Promotion process initiated by the base node.	-	Successful promotion process	NA	*
3.4.7	Promotion process initiated by the service node DUT.	-	Successful promotion process	NA	*
3.4.8	Switching process: 2 levels of switching (DUT1 as a level 1 switch).	-	Successful switching process	NA	*
3.4.9	Switching process: 2 levels of switching (DUT as a level 2 switch).	-	Successful switching process	NA	*
3.4.10	Switching functions: BPDU transmisión	-	Successful BPDU transmission	NA	*
3.4.11	Switching functions: BPDU updates from FRA control packet	-	Successful BPDU update	NA	*





3.4.12	Promotion rejected by the base node.	-	Successful promotion rejection	NA	*
3.4.13	Demotion process initiated by the base node.	-	Successful demotion	NA	*
3.4.14	Keep-Alive process (response from DUT).	-	Successful keep alive process	NA	*
3.4.15	Keep-Alive process (timeout and disconnect).	-	Successful keep alive process	NA	*
3.4.16	Keep-Alive process (changes in Keep Alive timeout).	-	Successful keep alive process	NA	*
3.4.17	Connection establishment initiated by the Base node.	-	Successful conection establishme nt	NA	*
3.4.18	Connection establishment initiated by the Service node.	-	Successful conection establishme nt	NA	*
3.4.19	Connection establishment rejected by the Base node.	-	Successful connection rejected	NA	*
3.4.20	Connection closing initiated by the Base node.	-	Successful connection closing	NA	*
3.4.21	Connection closing initiated by the Service node.	-	Successful connection closing	NA	*
3.4.22	File transfer process (unicast).	-	Successful file transfer (unicast)	NA	*
3.4.23	File transfer process (multicast).	-	Successful file transfer (multicast)	NA	*
3.4.24	Error in the firmware upgrade process.	-	Successful file transfer recovering missing pages	NA	*





4.3. CL layer

4.3.1. Test setup

• For test code 4.2.1



• For test code 4.3.1

Base Node	DU	Т

4.3.2. Test results

CODE	DESCRIPTION	RESULT	EXPECTED	STAT.	COMMENTS
	4.2 CS Test Cases: 4	-32 Connection	establishmen	nt	
4.2.1	Correct establishment and disconnection of 4-32 link	Successful 4-32 connection establishment and closure	Successful 4-32 connection establishme nt and closure	PASS	Sample: M1
	4.3 CS Test Cases: DI	MS traffic over	4-32 connecti	on	
4.3.1	CS4-32 is able to pass valid DLMS payload between the meter and the test system.	Valid DLMS payload	-	NA	*
	4.4 CS Test Case	es: 4-32 paramet	er integrity		
4.4.1	Test that CS4-32 integrity parameter is verified at the DUT.			NA	*

*ZIV stated by "2169_001.pdf" file that service node used for single-phase 5CTM PRIME meters is the same as service node used for poly-phase 5CTD PRIME meters connected in phase C. Same hardware and software. Based on the previous PRIME certification of version 2.2.0.6 for single-phase meter, model 5CTMP2C47730CSF (report IE-ITE-170224), the current PRIME certification will be made using certification profile 3, and these tests doesn't apply (they are marked as NA).