


Test Report

No B41-19-AP-I1

PRIME Certification Tests Cases for Service Nodes

| | |
|-----------------------------|---|
| EQUIPMENT UNDER TEST | THREE-PHASE INDIRECT METER WITH INTEGRATED PRIME Power Line Communications |
| MODEL | CX2500-9 |
| FIRMWARE VERSION | 6.35.0.20 |
| CERTIFICATION SCOPE | Prime v1.3.6 Profile 4 – Electricity Meter with PRIME PHY and PRIME MAC <ul style="list-style-type: none"> • PRIME 1.3.6 PHY Layer |

| | |
|-------------------------|---|
| Responsible for tests | Smart Data & Protocol Laboratory Manager |
| |  |
| Ibone García-Borreguero | Marta Castro |



Author: Ibone García-Borreguero. Responsible for tests
 Reviewer: Marta Castro. Smart Data & Protocol Laboratory Manager

NOTE: This test report shows the detailed information associated with the Test Report Summary no. B41-19-AP-I1 summary

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1.- EQUIPMENT UNDER TEST IDENTIFICATION

| | |
|-----------------------|--|
| Unit: | THREE-PHASE INDIRECT METER WITH INTEGRATED PRIME Power Line Communications |
| Model: | CX2500-9 |
| Trade Mark: | Sagemcom |
| Serial Number: | M1: SN SAG1021902190218 |
| Manufacturer: | Sagemcom |



The sample was selected and delivered by the applicant.

Equipment characteristics declared by the applicant:

| | |
|----------------------------------|--|
| Device type | ENERGY METER WITH PRIME COMMUNICATION |
| BaudRate | 57600 |
| Firmware version | 6.35.0.20 |
| Previous certificates | E-16-I-132-FL and E-16-I-133-FL dated on September 26 th , 2016 by DET NORSKE VERITAS ESPAÑA SL to CX2000-9 / 6.35.0.20 (See Annex II) According to the manufacturer the PLC solution integrated in the CX2500-9 is the same as the one used for the 3-phase direct meter CX2000-9 : <ul style="list-style-type: none"> • Same hardware including same electronic board • Same firmware V6.35.0.20 |
| Applicable Optional tests | PHY layer test cases |

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 | PASS* |
| 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 | PASS* |
| 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 | PASS* |
| 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 | PASS* |
| 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 | PASS* |
| 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 | PASS* |
| 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 | PASS* |
| 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 | PASS* |
| 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 | PASS* |
| 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* |
| 2.5 PHY Test Cases: Regulatory category | | |
| 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 PNPDU's are transmit when DUT receives BPDUs). | NA |
| 3.2.3 | Service node start-up (Tx rate of PNPDU's reduced by factor of received PNPDU's). | 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 PNPDU) | 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 | NA |
| 4.3 CL Test Cases: DLMS traffic over 4-32 connection | | |
| 4.3.1 | CS4-32 is able to pass valid DLMS payload between the meter and the test system. | NA |
| 4.3 CL Test Cases: 4-32 parameter integrity | | |
| 4.4.1 | Test that CS4-32 integrity parameter is verified at the DUT. | NA |

** Remarks: PIB management access of PHY layer tests is performed with vendor specific SW "Zero Configuration GUI" v2.105 (Texas Instruments), instead of using the official PRIME testing tool. The protocol used is a proprietary protocol not according to PRIME 1.3.6 management plane specification.*

The management plane does not affect to the normal functioning of the meter in field.

For more detailed information about the test results see Annex I

2.- APPLICANT

Frederic GEHENIAU

SAGEMCOM

250 route de l'Empereur, 92848 RUEIL MALMAISON Cedex

3.- PLACE OF RECEPTION AND EXECUTION OF THE TESTS

The reception of the equipment took place in the Smart Data & Protocol Laboratory of TECNALIA, in Derio (Spain).

The performing of the test took place in Smart Data & Protocol Laboratory of TECNALIA, in Derio (Spain).

4.- 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:

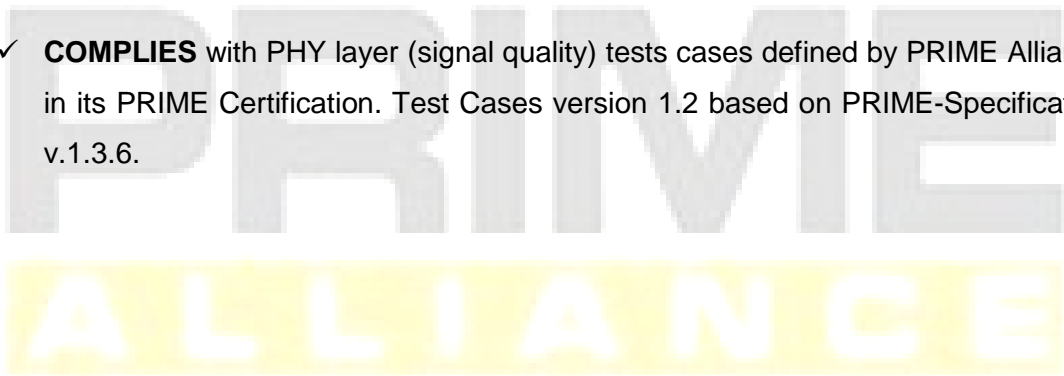
- PRIME Certification. Test Cases version 1.2

5.- CONCLUSIONS

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

| | |
|-----------------------|--|
| Unit: | THREE-PHASE INDIRECT METER WITH INTEGRATED PRIME Power Line Communications |
| Model: | CX2500-9 |
| Trade Mark: | Sagemcom |
| Serial Number: | M1: SN SAG1021902190218 |
| Manufacturer: | Sagemcom |

- ✓ **COMPLIES** with PHY layer (signal quality) tests cases defined by PRIME Alliance in its PRIME Certification. Test 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 TECNALIA, in Derio (Spain).
- 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: Smart Data & Protocol Laboratory in TECNALIA
Electronic devices Laboratory in TECNALIA

Climatic conditions: 19 °C 44% H.R. 1014 mbar

Responsible: Ibone García-Borreguero Melero

Used instruments:

| Measurement instruments | |
|------------------------------|--|
| X | SW CURRENT CURRENT PRIME audition v1.2.3ct ✓ PRIME AUDITION TOOL |
| X | HW CURRENT ✓ BASE NODE (MAC 00:80:E1:00:00:57) ✓ AUX1 (MAC 00:80:E1:00:00:5D) ✓ AUX1 (MAC 00:80:E1:00:00:63) ✓ AUX2 (MAC 00:80:E1:00:00:5F) ✓ SNIFFER |
| X | EL092142 – LISN |
| X | EL092017 – LISN PRIME |
| X | FILTERS WITH VARIABLE ATENUATION |
| X | EL052008 - CLIMATIC CHAMBER |
| X | EL022011 - DIGITAL OSCILLOSCOPE |
| X | EL082055 – AISOLATING TRANSFORM |
| Data registers storage place | |
| PRIME laptop | /home/conftester/Resultados/CLIENTES/Sagem_Pv136/ |

Results:

A1. 1. PHY layer

A1. 1.1. Test setup

DUT connections:

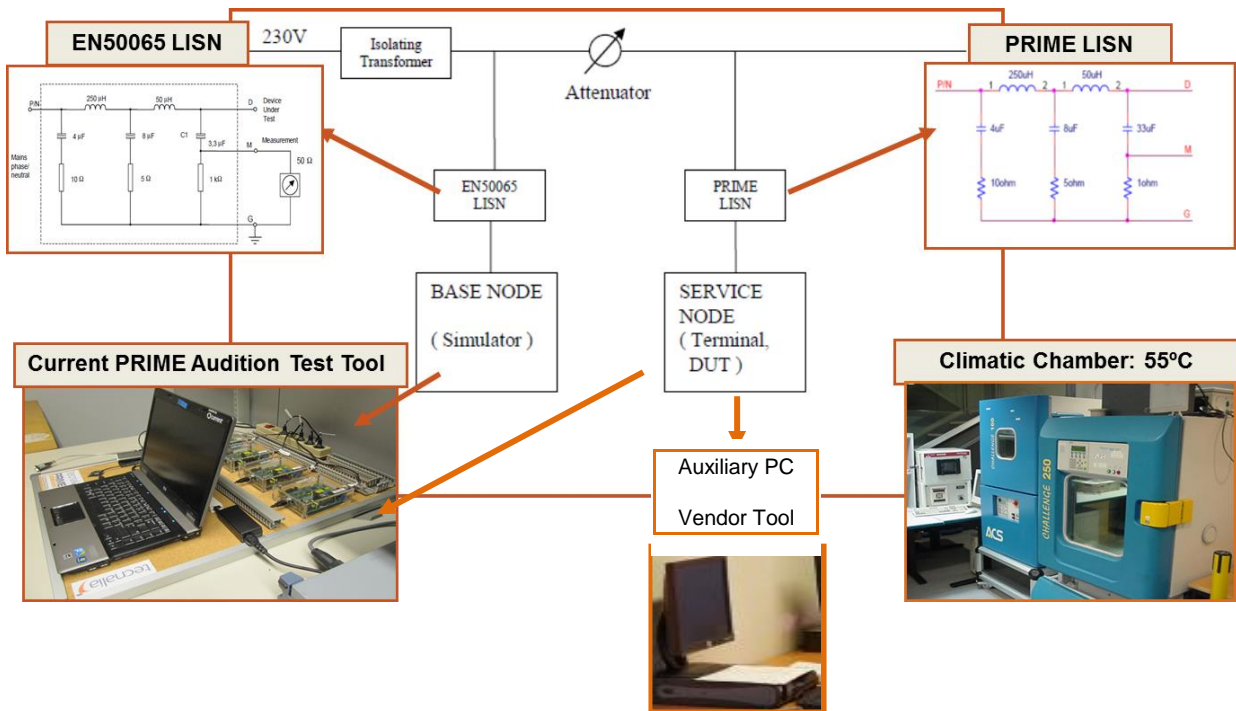
- Serial Port:
 - to manage the DUT
 - connected to auxiliary PC to configure the DUT in different modes (PHY tx, PHY rx)
 - to access to PIB values with Vendor Tool in auxiliary PC

Auxiliary PC with the following Software:

- Vendor Tool called “Zero Configuration GUI” v2.105 (Texas Instruments): to manage and configure the DUT through the serial port in PHY mode.



The setup of the PHY layer tests is the following one:

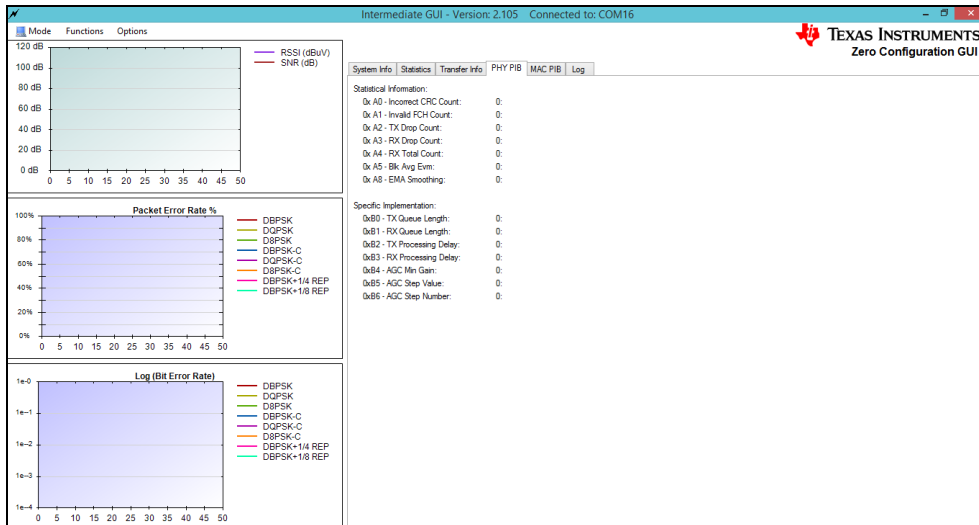


DUT has to be configured in PHY reception and PHY transmission mode.

PHY reception mode:

- Connect serial port to the auxiliary PC: configure the DUT with vendor specific SW “Zero Configuration GUI” v2.105 (Texas Instruments) in PHY reception mode
- Start the test with “Current PRIME Audition Test Tool”

- Read the PIB Rx Total Count with the Vendor Tool



PHY transmission mode:

- Connect serial port to the auxiliary PC: configure the DUT with vendor specific SW “Zero Configuration GUI” v2.105 (Texas Instruments) in PHY transmission mode
- Start the test with “Current PRIME Audition Test Tool”
- Trigger the transmission with the Vendor Tool

A1. Test results

| CODE | DESCRIPTION | RESULT | EXPECTED | STAT. | COMMENTS |
|--|--|--------|----------------------|-------|-------------------------|
| 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 | 2000 | at least 1996 frames | PASS | Sample: M1 Remarks * |
| 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 | 2000 | at least 1996 frames | PASS | Sample: M1 Remarks * |

| | | | | | |
|-------|--|------|----------------------|------|-------------------------|
| 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 | 2000 | at least 1996 frames | PASS | Sample: M1 Remarks * |
| 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 | 2000 | at least 1996 frames | PASS | Sample: M1 Remarks * |
| 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 | 2000 | at least 1996 frames | PASS | Sample: M1 Remarks * |
| 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 | 2000 | at least 1996 frames | PASS | Sample: M1 Remarks * |
| 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 | 2000 | at least 1996 frames | PASS | Sample: M1 Remarks * |
| 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 | 2000 | at least 1996 frames | PASS | Sample: M1 Remarks * |
| 2.2.9 | Verify error free communication (0.2% FER) (checking the complete frame payload) when receiving input signal of 122 | 2000 | at least 1996 frames | PASS | Sample: M1 Remarks * |

dBuV. (DUT is in reception state). Modulation type: D8PSK

2.4 PHY Test Cases: Signal Quality category

| | | | | | |
|-------|---|----------|--------|------|-------------------------|
| 2.4.1 | Verify that the EVM of the received signal at output level of 120 dBuV is above 17dB. | 17.96 dB | >17 dB | PASS | Sample: M1 Remarks * |
| 2.4.2 | Verify that the EVM of the transmitted signal output level of 120 dBuV is above 17dB. | 17.95 dB | >17 dB | PASS | Sample: M1 Remarks * |

** Remarks: PIB management access of PHY layer tests is performed with vendor specific SW “Zero Configuration GUI” v2.105 (Texas Instruments), instead of using the official PRIME testing tool. The protocol used is a proprietary protocol not according to PRIME 1.3.6 management plane specification.*

The management plane does not affect to the normal functioning of the meter in field

A1. 1.3. PHY Test Cases: Regulatory category

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

- According to Test report No. B41-19-AO-I1 of the Electronic Devices Laboratory of TECNALIA. DUT identification

And the tested sample of:

Unit: THREE-PHASE INDIRECT METER WITH INTEGRATED PRIME Power Line Communications
Brand: Sagemcom
Model: CX2500-9
Manufacturer: Sagemcom

PRIME version: 6.35.0.20
Serial number: SN SAG1021902190217

- **COMPLIES** with EN 50065-1:2011.
- **COMPLIES** with EN 50065-2-3:2003+A1:2005.
- **COMPLIES** with EN 50065-7:2001.

ANNEX II. PRIME CERTIFICATION V1.3.6 OF THREE-PHASE SERVICE NODE



Test Report Summary
No E-16-I-133-FL

PRIME Certification Tests Cases for Service Nodes

| | |
|--|--|
| EQUIPMENT UNDER TEST | Three-phase service node (Electricity meter) |
| MODEL/FW VERSION | CX2000-9 / 6.35.0.20 |
| CERTIFICATION SCOPE¹ | MAC and Convergence layers |
| MANUFACTURER | Sagemcom Energy and Telecom SAS |
| APPLICANT | Nicolas de Cicco 250 Route de l'Empereur, 92848 RUEIL MALMAISON, France |
| DATE OF RECEPTION | August 26 th , 2016 |
| PRIME SPECIFICATION VERSION/TEST CASE VERSION | PRIME-Specification V1.3.6 / PRIME Certification SN Tests Cases R1.3 |
| DATE OF EXECUTION | From August 29 till 16 September 2016 |
| DATE OF ISSUE OF REPORT | Brussels, September 26 th , 2016 |

Responsible for tests

Fernando Lobo

Head of Laboratory

Juan Ignacio Sánchez

PRIME Alliance Vice President

Oscar Márquez

* This test report summary is granted on account of tests made at location of DET NORSKE VERITAS ESPAÑA SL in Madrid, Spain.
 * 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 our complete test report no. E-16-I-132-FL which can be obtained at DET NORSKE VERITAS ESPAÑA SL. The certificate and the test report are indivisible.
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¹ IMPORTANT: Remarks apply to the implementation of this function. See complete test report no. E-16-I-132-FL (ANNEX I) for full details

