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**Compliance Test Specification – Entity Type H – POS to
Security Module Interface Supporting DKGA=01, DKGA=02,
DKGA=04, EA=07, and EA=11**

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Revision History

Revision	Clause	Date	Change details from previous Edition
1.3		Sept 2015	Initial revision. Changed revision to match document set.
1.4	General	Oct 2015	Various typographical errors. Various tokens corrected.
1.5	4.2 CTSH01 Step2 4.3 CTSH02 Step2 4.4 CTSH03 Step2	April 2016	Second Token Table – Tokens were generated at 01:00, changed them to 01:45 as per the test requirement. Changed to the new logo
1.6	General	June 2016	Only Edition number changed from 1.5 to 1.6 to match the document suite
1.7	General	Nov 2016	Only Edition number changed from 1.6 to 1.7 to match the document suite
1.8			Not published
1.8.1	Table1	Sept 2017	VUDK ₁₂ corrected to show VDDK ₂
	CTSH01-04 Step 2		Incorrect TID shown for the generated tokens – changed time to 01:45:00 from 00:01:45
	CTSH10		Steps 1-6 should read Steps 1-9
	4.19		Removed repeated clause number
1.8.2	General	Jan 2018	Only Edition number changed from 1.8.1 to 1.8.2 to match the document suite
1.9	Annexure C	May 2018	Changed test overviews to a table.
			Reformatted document
1.9.1	4.1.3	March 2019	Added note to 4.1.3 regarding token combinations
	general		Added foreword
1.9.2	CTSH18	July 2019	Added test for credit function for manufacturing module using DITK
1.9.3	General	Jan 2020	Only Edition number changed to match the document suite
1.9.4	Foreword	Jan 2021	Added note on voting
1.9.5	CTSH19, CTSH20	Apr 2022	Added negative test cases for DKGA01
1.9.6	general	April 2023	Updated edition to match document suite

STANDARD TRANSFER SPECIFICATION ASSOCIATION

STANDARD TRANSFER SPECIFICATION –

Compliance Test Specification – Entity Type H – POS to Security Module Interface
Supporting DKGA=01, DKGA=02, DKGA=04, EA=07, and EA=11

FOREWORD

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Standard Transfer Specification STS 531-8-2 has been prepared by working group 8.

The text of this standard is based on the following documents:

FDS	Report on voting
STS531-8-2/CD	See note1

Note1: due to the large number of documents in the test set, member voting is not performed prior to publication. However, corrections will be made to the document set if errors are reported.

This publication has been drafted in accordance with STSA Directive STS 2100-1 with the exception of Note1

1 Scope

1.1 General

This document provides the compliance criteria and test descriptions for security modules designed to generate tokens that comply with the STS using POS systems designed to produce STS-compliant tokens.

2 Normative references

2.1 General

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

[1] IEC 62051 – *ELECTRICITY METERING – Glossary of terms*

[2] IEC 62055-41 Ed3 – *ELECTRICITY METERING – PAYMENT SYSTEMS – Part 41: Standard Transfer Specification – Application layer protocol for one-way token carrier systems*

[3] STS531-0 *Compliance Test Specification – Quality plan*

3 Terms and definitions

3.1 Definitions

For the purposes of this test specification, the definitions given in the normative references identified in paragraph 2 apply.

SM – Security Module

UUT – Unit Under Test

DRN – Decoder Reference Number

API - Application programmer interface

3.2 Terms

For the purposes of this test specification, the terms given in the normative references identified in paragraph 2 apply.

4 Test requirements and specifications

4.1 Entity type H: SM to POS Interface – Application Layer Protocol

4.1.1 General

Each test comprises a number of steps with associated recordings and expected results. Any deviation from these shall be interpreted as non-compliance and a failure recorded against that step.

The tests below indirectly test the following,

- token generation;
- conformance to [2];

in addition to the specific test in question.

4.1.2 Equipment to be submitted

The following equipment is required for certification:

1 SM (UUT) loaded with the following keys (or a method of loading the keys):

Table 1- SM Loaded Vending Keys

KEY	KEY VALUE	SGC	KRN	KT	BDT	KEN	DKGA	REG
VUDK ₁	ABABABABABABAB94949494949494949401234567	123457	1	2	1993	255	04	13
VUDK ₂	ABABABABABABAB94949494949494949401234567	123457	2	2	1993	255	04	14
VUDK ₃	9494949494949401234567ABABABABABABAB	123457	3	2	1993	255	04	15
VUDK ₄	ABABABABABABAB94949494949494949401234567	123457	4	2	2014	255	04	16
VUDK ₅	ABABABABABABAB94949494949494949401234567	123457	5	2	2035	255	04	17
VDDK ₁	BABABABABABABA94949494949494949401234567	123458	1	1	1993	255	04	18
VCDK ₁	4949494949494949ABABABABABABAB01234567	123459	1	3	1993	255	04	19
VUDK ₆	ABABABABABABAB94949494949494949401234567	123460	1	2	1993	85	04	20
VUDK ₇	ABABABABABABAB94949494949494949401234567	123457	6	2	1993	255	04	21
VUDK ₈	ABABABABABABAB94949494949494949401234567	123461	1	2	1993	255	04	22
DITK ₀	020202020202020202020202020202020202			0			04	Note1
VUDK ₉	ABABABABABABAB	123456	1	2	N/A	255	02	01
VUDK ₁₀	ABABABABABABAB	123456	2	2	N/A	255	02	02
VUDK ₁₁	9494949494949494	888888	1	2	N/A	255	02	03
VUDK ₁₂	BABABABABABABA	234567	1	1	N/A	255	02	04
VUDK ₁₃	4949494949494949	345678	1	3	N/A	255	02	05
DITK ₁	0202020202020202			0	N/A			Note1
VCDK ₂	4949494949494949	100702	1	3	N/A	85	02	06
VCDK ₃	4949494949494949	990400	1	3	N/A	85	02	07
VCDK ₄	4949494949494949	990401	1	3	N/A	85	02	08
VCDK ₅	4949494949494949	990402	1	3	N/A	85	02	09
VCDK ₆	4949494949494949	990403	1	3	N/A	85	02	10
VCDK ₇	4949494949494949	990404	1	3	N/A	85	02	11
VCDK ₈	4949494949494949	990405	1	3	N/A	85	02	12

Note1: only required for manufacturing modules

4.1.3 Test equipment required

The following test equipment is required:

- Secure Module API or means to send commands to the UUT in order to generate tokens as defined in this document
- Communications port to suit the UUT as specified in Annexure A1

Note: Not all tests in this document are mandatory. Please read the instructions before each test carefully before commencing the test.

Note: The tests in this document do not test all combinations of tokens. It is the manufacturer's responsibility to ensure that all the required tokens for the entity type, as specified in IEC62055-41, are supported.

4.1.4 Summary of tests performed

The following tests will be performed on the SM by the test software:

- Generation of Credit tokens, management tokens, keychange tokens
- Random Number (RND) field
- Decoder Key Generation Algorithms (DKGA)
- Key Type management
- Encryption Algorithms (EA)
- Error responses
- Token Identifier Field (TID)

4.2 CTSH01 – TransferCredit (Electricity)

Overview: This test verifies general compliance with respect to the generation of a TransferCredit token, tests boundary conditions for exponents, and TID generation.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK ₁	ABABABABABABAB94949494949401234567
Base Date	1993

Step Number	TokenIssueDate	TransferAmount
1	1993-01-01 00:00:00	0.1 kWh
2	1993-01-01 00:01:45	819.2 kWh
3	1993-03-25 13:55:22	1638.3 kWh
4	1996-03-25 13:55:22	1638.4 kWh
5	2005-11-01 00:01:55	9011.1 kWh
6	2015-12-01 00:01:05	18022.3 kWh
7	2024-11-24 20:15:00	18022.4 kWh
8	2004-04-20 10:00:00	90931.1 kWh
9	2004-04-20 11:00:00	181862.3 kWh
10	2004-04-20 12:00:00	181862.4 kWh
11	2004-04-20 13:00:00	910081.1 kWh
12	2004-04-20 14:00:00	1820162.4 kWh

Step	Instruction	Expected Result
1 – 12	<p>According to the manufacturer's instructions provided in Table 5, generate TransferCredit tokens with the information in the APDU above, and for each of the steps indicated above.</p> <p>If the manufacturer's instructions provided in Table 5 indicate that the module is a manufacturing module, then do only step 1.</p>	<p>The token must be identical to one of the tokens specified in the token tables below corresponding to the step number. i.e. step 1 corresponds to the First Token Table.</p> <p>If the manufacturer's instructions provided in Table 5 indicate that the module is a manufacturing module, then this step must fail.</p>

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	1247 6894 7895 5249 6622	0	0258 9602 8312 4466 0275
1	2329 9995 9520 8140 1335	1	0326 0764 4169 8411 8507
2	2436 4462 3125 9908 3015	2	0327 4165 0226 2278 4128
3	2653 6685 0221 2103 1320	3	0872 3572 1913 2374 2926
4	3078 6840 1287 8647 4283	4	0988 4092 6822 1379 7565
5	3311 0021 2451 2156 8034	5	1636 5979 6294 6536 5831
6	3825 4271 3084 7077 9424	6	1808 8697 3711 1046 5170
7	5178 3909 5090 0602 0447	7	2114 5411 2945 0835 1337
8	5456 7064 8293 5587 7879	8	2306 1088 3634 5862 0897
9	5623 4993 5539 1076 1507	9	2315 6644 6507 8375 8388
10	6171 1969 5834 8900 9962	10	2331 5619 3749 5789 3536
11	6722 2206 4748 9607 7414	11	2728 2462 1963 7197 4855
12	6858 2005 8741 8104 8900	12	3131 4409 5487 9315 2189
13	6935 6018 1489 6006 2815	13	5198 7411 9453 7610 7831
14	7196 6408 8484 0055 5462	14	5505 0559 5203 6148 0839
15	7337 5646 3535 9846 5317	15	7166 6684 6893 6364 3007

Third Token Table		Fourth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0105 7360 7849 6633 4119	0	0485 4937 1220 2549 6919
1	0456 3997 2663 1630 7454	1	1300 6567 3084 3604 3434
2	0944 4267 5404 0614 8915	2	1642 7329 9494 4686 8817
3	1522 3731 3864 3843 1228	3	1677 8220 9607 3275 7533
4	1691 5460 5744 4974 7797	4	2068 3342 6560 1415 9460
5	2199 9648 7929 6795 0503	5	2161 1216 5523 4392 4703
6	2228 5440 3036 5722 6750	6	2456 1497 9734 2688 3434
7	3564 3226 6836 3408 7196	7	3176 4895 6391 7469 1583
8	3608 7719 7870 8988 3049	8	3259 7072 4381 3085 8404
9	3612 4646 7460 1974 3401	9	3525 7285 9341 1562 2411
10	4009 2753 6144 3548 6106	10	4373 0251 6669 2565 1907
11	5002 0153 6870 7894 2539	11	5879 9999 7220 7432 4057
12	5104 9241 9504 9227 2887	12	6229 8717 8829 9417 8724
13	5161 0252 8980 6890 0162	13	6720 8303 9948 7690 4569
14	6713 1685 8960 9783 3133	14	7138 1796 6067 8056 0115
15	6789 0510 7106 8887 4386	15	7279 3547 1005 3850 4160

Fifth Token Table		Sixth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	02187581215827839070	0	04534487125848920146
1	02774607079695244213	1	04535070296434383899
2	06241637453552166471	2	05178644622223517138
3	13204557571472374998	3	09797355709824207803
4	13264470629957672780	4	17881169724592437692
5	20802282749413755358	5	21901791675605853848
6	38261668097948170050	6	26724750429134927109
7	38863546758246097007	7	38544921031092171895
8	40317162752748011794	8	46057519541808377662
9	43820990633585159153	9	47542954761239500436
10	51748938918836784349	10	55013998065786507494
11	54582619803364327248	11	67558670014505018361
12	59649606078229280090	12	69047294150647465120
13	63307574067867162051	13	70061549127637206101
14	63585455746124739698	14	70076746421109017583
15	65371560481793957139	15	73484994623161126594

Seventh Token Table		Eighth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	01882314918378276914	0	03679752959962426086
1	03017765461384889853	1	10489067577410035136
2	09390086967630904844	2	12151654204506477884
3	19096614275089355138	3	17148304127260968065
4	19794119781345069194	4	24650559260373146231
5	20530613027377325822	5	30453655053202091830
6	23750498533979960792	6	31412209682171496421
7	35356195847281890194	7	38102621759335719306
8	41364841311229124562	8	41717713630165676719
9	44517330201871100435	9	41822186078977421254
10	44717591762212871481	10	53176224914346979357
11	47586328604052514330	11	56535357813405906927
12	55793747414038657246	12	57790482177286186873
13	60123080157397667949	13	60440022507046963529
14	71084936195537869016	14	69833452288976100155
15	73216595824150204545	15	72702024439329823223

Ninth Token Table		Tenth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits

0	04120529284046157792	0	00503846905311174182
1	07904568982560119138	1	01990227879184221769
2	09781846619874021873	2	06308162743173232845
3	13503013199048317611	3	08361169107061640869
4	18292323266812194587	4	30040308768521877297
5	19126540919412103686	5	35799621130565538963
6	25710735553677303012	6	38313891294093857881
7	27680273833343455054	7	38704011009728648941
8	28746778937573329625	8	43630380141256570773
9	32072566790700492299	9	45983040272294563616
10	49321770685154331600	10	46427695413609675982
11	55887985645572365755	11	49666955771084772119
12	56596822521819634578	12	62185121554631570400
13	60847630620343695213	13	68229874708282504937
14	68794074366250355094	14	69464815916997293686
15	71381564278685257774	15	70233828416589416698

Eleventh Token Table		Twelfth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	01679222567696573371	0	00807839698741949875
1	02136877437258008501	1	00843514961388367479
2	14941707062489446622	2	04321016259259271244
3	21295813503965152059	3	10913472985717349202
4	29605546147551099584	4	28405917533484894027
5	29798085545795779590	5	32631279644496576851
6	32253460119251500983	6	35635063886767487332
7	33976789670944311903	7	41045753828990293598
8	34172860580815768246	8	41525668755068839823
9	36391132663780842680	9	42950143613377276240
10	47146967200577251173	10	43536022896103348849
11	53006005818002680148	11	44627783935914560069
12	54507906584382687005	12	50153284383132346808
13	56762388944505356377	13	55199402364698022605
14	59269306589977480979	14	62477216658365172161
15	65092304632524326999	15	66437645516716064452

4.3 CTSH02 – TransferCredit (Water)

Overview: This test verifies general compliance with respect to the generation of a TransferCredit token, tests boundary conditions for exponents, and TID generation.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK ₁	ABABABABABABAB94949494949401234567
Base Date	1993

Step Number	TokenIssueDate	TransferAmount
1	1993-01-01 00:00:00	0.1 kL
2	1993-01-01 00:01:45	819.2 kL
3	1993-03-25 13:55:22	1638.3 kL
4	1996-03-25 13:55:22	1638.4 kL

5	2005-11-01 00:01:55	9011.1 kL
6	2015-12-01 00:01:05	18022.3 kL
7	2024-11-24 20:15:00	18022.4 kL
8	2004-04-20 10:00:00	90931.1 kL
9	2004-04-20 11:00:00	181862.3 kL
10	2004-04-20 12:00:00	181862.4 kL
11	2004-04-20 13:00:00	910081.1 kL
12	2004-04-20 14:00:00	1820162.4 kL

Step	Instruction	Expected Result
1 – 12.	<p>According to the manufacturer's instructions provided in Table 5, generate TransferCredit tokens with the information in the APDU above, and for each of the steps indicated above.</p> <p>If the manufacturer's instructions provided in Table 5 indicate that the module is a manufacturing module, then do only step 1.</p>	<p>The token must be identical to one of the tokens specified in the token tables below corresponding to the step number. i.e. step 1 corresponds to the First Token Table.</p> <p>If the manufacturer's instructions provided in Table 5 indicate that the module is a manufacturing module, then this step must fail.</p>

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0197 1998 1267 3465 7759	0	0655 6368 6723 7415 1443
1	0317 2068 1733 7111 0173	1	1178 0504 0955 2525 3555
2	0541 0281 0502 4075 3674	2	1238 5797 8974 6210 1118
3	0892 1939 7945 3648 1952	3	1697 0296 8652 6696 7808
4	1568 3186 7675 8730 5414	4	2324 5946 2925 9064 4150
5	1692 1022 5566 6863 4383	5	2625 1809 9689 6300 0482
6	1910 0096 2527 7775 8766	6	2963 8967 1903 0512 4336
7	2644 2885 3797 3336 3040	7	4012 9549 1698 9282 8756
8	2919 4197 5112 5745 1911	8	4874 5239 9435 9846 8300
9	3485 1698 3542 6150 2480	9	5335 5114 0248 6747 1748
10	3684 4619 7239 5289 0497	10	5679 1748 4915 4913 9108
11	3731 6655 9797 0868 9700	11	5949 0811 2481 3110 4725
12	4352 5495 3406 3342 2025	12	6253 5347 2067 2940 5776
13	4534 5744 6357 4341 6258	13	6519 8324 9521 2237 0744
14	4869 3346 3153 2383 8553	14	6597 1804 7395 2946 7583
15	5776 5868 4658 5716 6873	15	7192 7021 5126 6710 7158

Third Token Table		Fourth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0254 0057 9858 5240 4687	0	0237 2228 4333 5089 2377
1	0966 8062 2214 2123 5458	1	0535 4231 2733 4004 8838
2	1129 9213 6644 4418 3009	2	1989 7166 9436 6697 1817
3	1146 8032 0601 3786 5996	3	2548 5315 3107 0512 6248
4	1693 3638 6230 3444 0406	4	2625 4396 6096 9411 2580
5	1996 7793 5512 9534 7575	5	3049 5880 6305 4286 2996
6	2650 0868 4571 0069 7437	6	3077 7494 9860 1745 6542
7	2869 7520 6668 4320 0116	7	3229 6489 0483 3728 7635
8	2992 3657 1432 4523 0776	8	4279 6297 0494 1399 3169
9	3945 2497 7322 7771 1435	9	4616 5274 5428 5481 5865
10	4020 0317 9870 9866 2901	10	5566 6387 3759 8306 5072
11	4390 4340 8938 7492 5163	11	5800 3050 8595 4271 9370
12	5775 0742 5215 0782 9850	12	5827 7438 6006 0194 5957
13	6204 2740 8859 6463 0908	13	5894 2787 2810 6146 9563
14	6338 5403 6432 2723 8989	14	5906 2273 4816 8170 8651
15	6816 0327 9635 0669 3104	15	6826 3009 9338 1863 5207

Fifth Token Table		Sixth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0357 2727 6276 2922 1873	0	0422 9554 3251 0471 8678
1	0785 7873 0067 0321 5707	1	0942 7212 9130 1975 7366
2	1695 5731 9858 7704 2850	2	1601 1761 0316 0292 9792
3	2094 6709 5604 1111 8072	3	1640 5475 6021 1247 3808
4	2572 0735 7654 4784 1403	4	2238 0830 0225 3694 7852
5	2640 6722 2596 5489 5651	5	2301 7915 4777 4136 4772
6	3116 0259 6872 4638 9825	6	2607 5711 0382 2238 4850
7	3352 0419 6504 5435 4503	7	2767 5510 6046 3178 8659
8	3701 8085 4337 7732 7873	8	3078 1749 2793 8995 2396
9	3814 9352 7140 5502 1502	9	4270 5520 7627 2810 7798
10	4703 3038 6355 6525 1525	10	4834 3892 6251 1157 3396
11	4868 4842 4272 0153 3260	11	5235 6385 1022 6778 1572
12	5574 7079 4692 6058 1427	12	5504 9515 1695 3666 1836
13	6450 4505 2010 3414 4789	13	7091 1507 5959 0158 4012
14	6886 0743 9700 0856 8869	14	7207 9287 2805 4016 1681
15	7216 2081 9696 4127 7160	15	7228 0403 9684 0865 5019

Seventh Token Table		Eighth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0868 6963 5909 3462 5876	0	0043 1154 5617 9524 6201
1	0887 7986 3577 2148 8245	1	0987 4115 0323 9058 2524
2	0937 7440 4729 6316 3719	2	2442 5710 6567 0374 0878
3	2302 9699 0384 0624 1367	3	2595 6553 0166 6467 6506
4	2524 0114 3876 7982 2210	4	2720 0649 9891 0792 8120
5	3310 8378 7932 5573 4897	5	2915 1869 5954 8244 3200
6	3904 2367 6582 0148 1485	6	3092 2459 4893 9262 3778
7	4195 5167 7255 6922 9497	7	3270 4405 6352 9076 1584
8	4313 4207 8716 8308 3899	8	3427 3270 2423 6288 8681
9	4890 7383 1881 7321 2567	9	4581 1076 9129 9043 3248
10	5360 9368 3508 8622 5757	10	4820 7420 8311 7356 4816
11	5650 9807 7234 5782 5073	11	4874 5663 6657 3659 8917
12	5968 5629 9252 5214 1962	12	5387 7894 7673 8666 2139
13	5997 1204 0665 5451 1333	13	5859 9014 1021 6806 2589
14	6177 5664 3591 7520 3291	14	6309 6125 2848 4634 6539
15	6491 2008 7763 5621 1274	15	6611 5090 4030 3359 2116

Ninth Token Table		Tenth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0106 2718 7410 7081 0048	0	0656 2524 6312 6821 1206
1	0709 4220 4862 1694 9360	1	1318 1629 3566 5759 6693
2	1331 9879 0866 8965 3129	2	1414 1640 9507 8452 9208
3	1398 6228 7295 4028 5519	3	1569 8194 8650 6860 8953
4	2293 4452 3441 9591 2176	4	1764 8946 6792 1304 0583
5	3308 2416 2711 1827 6635	5	1802 8370 8123 1466 9881
6	3386 4592 9623 9691 6675	6	2696 3142 4202 4055 7498
7	3786 5870 0038 5514 3866	7	3887 8905 1988 8679 3387
8	4178 0587 2515 3752 5922	8	4188 9347 7425 8858 7276
9	5162 3299 6342 5305 2736	9	4241 2962 3635 7424 2889
10	5359 7403 2258 8643 9698	10	5840 3766 3835 1391 4754
11	5514 7828 1198 2057 2950	11	6208 6042 3789 3041 6781
12	5675 9104 6623 9839 9064	12	6457 6684 7854 5817 3640
13	5850 8823 0675 9780 1283	13	6574 2010 5652 3386 2095
14	5931 8347 1820 4585 2431	14	6935 7558 5212 5624 0040
15	6458 4742 8280 9624 1462	15	7033 3940 0428 0413 3652

Eleventh Token Table		Twelfth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0385 6555 9962 8092 2998	0	0802 4324 6445 9329 0744
1	0398 9504 0411 4998 3127	1	0883 3736 1707 3449 3758
2	0958 9538 4279 3904 2589	2	1552 0253 4031 4584 7566
3	1611 1157 8039 8325 6552	3	1747 2255 9809 3182 7006
4	1721 8207 6319 8312 9609	4	1755 2041 9386 8874 5707
5	2346 4105 4836 2828 9663	5	1921 5400 7519 8162 4310
6	2369 6385 1500 8884 4364	6	1969 3133 4990 0027 2270
7	3035 0320 3379 3465 4164	7	2368 1136 5424 4016 2061
8	3145 7967 9807 4776 2606	8	3936 3556 9729 2275 7602
9	3534 6723 9373 7868 6620	9	4771 5536 7793 8500 5684
10	4050 5549 3803 3801 3101	10	5363 7085 8595 5257 4345
11	4165 5463 8054 4422 6938	11	5464 9954 1966 8025 2752
12	4720 0208 4629 3164 5992	12	5822 0105 5927 7340 3082
13	5664 0497 6882 7343 0313	13	5869 3109 6249 5692 7565
14	5966 2109 3663 5605 8878	14	5936 3920 7080 8524 7682
15	6307 2963 6112 9047 4422	15	6089 1896 2927 2665 0279

4.4 CTSH03 – TransferCredit (Gas)

Overview: This test verifies general compliance with respect to the generation of a TransferCredit token, tests boundary conditions for exponents, and TID generation.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK ₁	ABABABABABABAB9494949494949401234567
Base Date	1993

Step Number	TokenIssueDate	TransferAmount
1	1993-01-01 00:00:00	0.1 m ³
2	1993-01-01 00:01:45	819.2 m ³
3	1993-03-25 13:55:22	1638.3 m ³
4	1996-03-25 13:55:22	1638.4 m ³
5	2005-11-01 00:01:55	9011.1 m ³
6	2015-12-01 00:01:05	18022.3 m ³
7	2024-11-24 20:15:00	18022.4 m ³
8	2004-04-20 10:00:00	90931.1 m ³
9	2004-04-20 11:00:00	181862.3 m ³
10	2004-04-20 12:00:00	181862.4 m ³
11	2004-04-20 13:00:00	910081.1 m ³
12	2004-04-20 14:00:00	1820162.4 m ³

Step	Instruction	Expected Result
1 – 12	<p>According to the manufacturer's instructions provided in Table 5, generate TransferCredit tokens with the information in the APDU above, and for each of the steps indicated above.</p> <p>If the manufacturer's instructions provided in Table 5 indicate that the module is a manufacturing module, then do only step 1.</p>	<p>The token must be identical to one of the tokens specified in the token tables below corresponding to the step number. i.e. step 1 corresponds to the First Token Table.</p> <p>If the manufacturer's instructions provided in Table 5 indicate that the module is a manufacturing module, then this step must fail.</p>

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	1357 7022 6016 9919 4800	0	0306 5498 4459 0070 9081
1	1374 2849 2306 7432 9882	1	0444 5584 9346 4173 6214
2	1645 1994 9265 1514 8499	2	0516 0708 8151 2769 7310
3	2040 0085 1524 4868 9153	3	1672 8854 6011 6222 1500
4	2422 0175 1143 1272 9901	4	1860 6275 5326 9205 3240
5	2699 7878 9341 1631 4480	5	1880 5120 0399 8690 7586
6	2825 1299 3415 8148 9751	6	2088 8036 4776 7577 4140
7	3228 1997 4593 0277 3874	7	3055 6764 0028 2678 9856
8	3766 6755 1702 2990 5284	8	3109 6734 0650 7707 7596
9	4203 0311 0453 0256 4414	9	3170 4833 8361 8703 4954
10	4747 4207 6087 7300 3992	10	5342 9654 7789 0346 1259
11	5131 1392 7167 7493 3630	11	5723 2574 0171 7530 4880
12	5214 0151 8132 4330 7978	12	5825 2065 3619 5438 8018
13	5817 0544 7077 6573 2908	13	6342 0035 8028 1081 2020
14	5956 3063 9947 8718 8963	14	6348 0843 6614 8195 2541
15	7245 1500 5468 9980 9567	15	6969 1629 7786 6881 7799

Third Token Table		Fourth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0923 8289 6803 1039 5679	0	0565 2615 5040 9088 6247
1	1108 0972 6048 5628 1810	1	1025 7623 9666 9124 4884
2	2242 7154 6646 4792 7897	2	2090 2230 8587 1651 7209
3	2843 5103 5199 0591 8953	3	2191 7137 4450 9914 7829
4	3407 1199 2513 6534 9859	4	2917 7301 5517 8632 7197
5	3620 1614 7010 3080 0075	5	3662 1531 4201 8137 0496
6	3699 9267 9322 2655 3003	6	3685 6887 3478 3135 7803
7	3792 3968 9762 5291 4461	7	3743 3789 7526 3374 6371
8	3996 4624 7697 6102 4655	8	3782 1285 5847 4715 8176
9	4493 6951 6875 4361 5456	9	3827 0722 6685 7397 5774
10	4611 6354 4003 5169 1317	10	3912 8205 0191 6618 4232
11	4868 6856 8226 4643 1185	11	4266 0564 3431 6157 1605
12	5914 9542 5602 6132 6023	12	4715 1892 8875 4252 7320
13	6227 3093 3388 6494 8021	13	6211 4220 3660 3930 1813
14	7096 1200 3831 0667 6211	14	7060 8619 7139 3519 4592
15	7323 2771 0559 5957 8677	15	7069 4600 1564 1703 4203

Fifth Token Table		Sixth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0231 9658 3331 1029 3387	0	0238 0276 5147 4828 4382
1	0312 2577 3022 8914 7126	1	0501 6403 8163 2435 9162
2	0321 7398 9289 2600 6872	2	0748 4178 8796 4776 9012
3	1217 7394 4132 3942 4267	3	1577 3561 6459 9997 2805
4	1801 2990 1854 1202 1575	4	2258 0799 0058 6880 8705
5	2695 2922 0425 4793 2808	5	3550 0936 1403 7307 1717
6	3053 5913 8091 8508 4245	6	3621 5853 3051 4725 4837

7	3957 0127 6679 6737 4985	7	3648 5605 5642 9501 1579
8	4818 1716 8273 9392 2636	8	3994 1531 4601 8347 4496
9	4868 1603 0351 4096 5313	9	4655 0168 6909 1518 9299
10	5889 7142 0876 5588 9907	10	5031 5713 3965 7618 8959
11	6268 9573 4409 3020 1695	11	5109 4055 0755 5027 2530
12	6914 0554 5030 4719 2086	12	5607 8952 5945 5770 9131
13	6924 6113 7942 8087 5547	13	5951 8401 3208 2662 6034
14	7174 3025 0840 8357 3184	14	7218 5804 2948 5492 6246
15	7246 2056 8490 4633 7345	15	7269 3019 5003 0079 5176

Seventh Token Table		Eighth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0446 0645 1994 4676 5407	0	1191 8531 1466 3956 3104
1	1117 5547 5302 5687 9545	1	1319 9757 1325 7746 2916
2	1375 1461 6364 8317 0693	2	1964 5798 7063 5448 4091
3	1735 8663 7457 1599 7085	3	2367 4328 0738 2293 8529
4	2252 8446 6026 2757 0825	4	2594 2406 5207 4272 6961
5	3451 7829 2133 3807 7857	5	2646 1266 7488 2480 8298
6	3932 5931 3881 0629 6767	6	3399 3571 8793 9661 6492
7	3992 5679 3747 4731 2733	7	3889 7214 3115 9573 5167
8	4074 6297 3618 3963 3876	8	4371 9382 5961 4906 0014
9	4122 5141 9969 7555 2891	9	5427 9342 5671 2641 7856
10	4175 4838 3014 6452 0887	10	5654 9336 0513 1495 5688
11	4409 4893 3027 5319 9163	11	6298 1395 0449 2463 7252
12	5352 3244 6229 6400 1511	12	6433 8608 2563 8665 6820
13	6102 8826 3054 2191 3367	13	6619 3365 3772 6822 7814
14	6147 4967 9145 0112 9818	14	6783 4593 3240 5663 6727
15	7041 5590 7421 4023 6818	15	7020 3942 7493 8415 7560

Ninth Token Table		Tenth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0362 6020 1465 9587 1759	0	1222 4320 7084 2486 9230
1	0750 0385 0727 1355 7826	1	1490 9797 2184 9235 8061
2	0858 7112 9752 0880 8023	2	1656 8265 6908 1155 4352
3	1048 4488 8127 3859 5865	3	2234 5340 3554 6182 4742
4	1862 4476 2102 5818 1187	4	2564 3286 2039 6417 5030
5	3788 7270 0848 0628 1611	5	4201 8953 5819 2440 1737
6	4006 1295 3335 8430 7135	6	4309 0648 2284 8811 9360
7	4131 4153 8724 5547 0041	7	4339 1709 6632 8361 7055
8	4653 0381 6214 3561 8176	8	4461 6728 0775 6476 3109
9	5054 6929 4100 9207 7329	9	4904 2497 2844 3063 1944
10	5887 0148 7190 9791 4955	10	5011 3553 3612 8511 7913
11	6038 8179 9314 0669 9487	11	5433 4471 1702 2487 7977
12	6110 6428 3007 3623 2702	12	6049 9467 1511 2052 0529
13	6465 6031 9692 5744 2499	13	6513 3903 7256 6062 1709
14	7170 9492 2129 1002 5395	14	7087 8773 0860 6540 5518
15	7225 1183 4359 0842 9036	15	7244 1094 9287 9766 5470

Eleventh Token Table		Twelfth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0472 2445 4581 4250 2382	0	0230 6110 7349 4992 0806
1	0598 8107 8829 2097 7604	1	0350 2952 6267 6287 6311
2	1250 6325 9701 7148 5677	2	0975 5629 8689 2798 8482
3	1622 5389 3058 9050 2273	3	1127 7142 4115 3787 2707
4	2502 3343 2714 7133 9133	4	1324 2149 5083 2986 0669
5	2578 6291 1649 8092 5931	5	2290 1045 0550 5606 1202
6	3162 4896 5012 9466 0324	6	2293 3375 6425 6034 1535
7	4034 5788 7982 9720 7828	7	2754 1902 5799 6815 2542

8	4651 6441 3946 5396 0107	8	3199 3403 6661 4984 8889
9	4927 1112 1557 4181 5047	9	3623 7212 9490 0370 9429
10	5156 7342 6856 6299 3997	10	4754 4721 6785 3954 6060
11	5269 4120 9589 1037 3181	11	4838 4002 7722 2102 0908
12	6060 8991 0903 1000 1459	12	5167 3061 7632 2061 5226
13	6137 0081 9221 2747 0299	13	5648 1811 6217 4851 4983
14	6181 6769 9594 8734 9740	14	5728 8551 8490 6502 9504
15	6692 0303 6867 1197 8009	15	7301 7285 5867 1408 3274

4.5 CTSH04 – TransferCredit (Time)

Overview: This test verifies general compliance with respect to the generation of a TransferCredit token, tests boundary conditions for exponents, and TID generation.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK ₁	ABABABABABABAB9494949494949401234567
Base Date	1993

Step Number	TokenIssueDate	TransferAmount
1	1993-01-01 00:00:00	0.1 min
2	1993-01-01 00:01:45	819.2 min
3	1993-03-25 13:55:22	1638.3 min
4	1996-03-25 13:55:22	1638.4 min
5	2005-11-01 00:01:55	9011.1 min
6	2015-12-01 00:01:05	18022.3 min
7	2024-11-24 20:15:00	18022.4 min
8	2004-04-20 10:00:00	90931.1 min
9	2004-04-20 11:00:00	181862.3 min
10	2004-04-20 12:00:00	181862.4 min
11	2004-04-20 13:00:00	910081.1 min
12	2004-04-20 14:00:00	1820162.4 min

Step	Instruction	Expected Result
1 – 12	<p>According to the manufacturer's instructions provided in Table 5, generate TransferCredit tokens with the information in the APDU above, and for each of the steps indicated above.</p> <p>If the manufacturer's instructions provided in Table 5 indicate that the module is a manufacturing module, then do only step 1.</p>	<p>The token must be identical to one of the tokens specified in the token tables below corresponding to the step number. i.e. step 1 corresponds to the First Token Table.</p> <p>If the manufacturer's instructions provided in Table 5 indicate that the module is a manufacturing module, then this step must fail.</p>

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0971 4053 3367 3942 3953	0	0011 6440 6544 8496 3860
1	1164 9022 3787 4542 9471	1	0054 4499 6426 4896 2484
2	1312 8244 4136 7974 1064	2	0192 0575 6923 3817 4156
3	1572 8792 0520 9289 1156	3	0213 8183 8391 1426 3531
4	1825 3631 0967 6972 6119	4	0923 2392 7406 3238 7435

5	2193 7570 0863 2020 4201	5	1382 6645 3998 0901 8663
6	2566 7455 2685 5142 5152	6	1510 7330 6403 5309 8104
7	2617 6538 7895 9494 0688	7	1593 4108 4159 2639 7292
8	3095 5336 5599 2154 7634	8	2135 2170 1326 2575 0364
9	3704 6649 7027 8342 4781	9	2506 8765 2387 5722 1933
10	4448 0100 3692 7216 6412	10	2994 6111 1453 2510 7784
11	4926 6527 6233 7239 6124	11	4050 0642 4784 1681 5155
12	5277 9936 2368 0464 5333	12	4737 1108 0526 9622 7309
13	6091 4047 5124 6057 7288	13	6105 4121 6904 1645 7672
14	6319 5908 4529 7389 4570	14	6655 7825 2123 9921 2634
15	6560 5694 2094 2515 9812	15	7019 3737 5887 6764 8265

Third Token Table		Fourth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0300 0433 6185 1513 0967	0	0159 0826 3526 7598 7113
1	0646 7969 4262 8296 4586	1	0992 7917 9997 4028 4047
2	0718 8252 5159 3086 0682	2	3320 0141 7251 5024 3980
3	0845 1643 2556 4942 2351	3	3466 6721 7053 2356 7850
4	1032 3007 8472 6725 7641	4	3815 2173 9684 8509 5321
5	2428 9410 8987 3978 7668	5	3870 3704 3588 0717 1539
6	2719 2668 7528 9345 6788	6	4156 4435 5603 9644 4280
7	2792 6480 1208 4864 7065	7	4650 3908 3402 3024 6265
8	2871 0990 9770 9786 5950	8	4897 1366 9358 2111 6740
9	3401 2791 9063 9166 8012	9	5516 4748 0790 7537 0156
10	4185 8427 7919 5239 5865	10	5647 0864 5340 4916 8198
11	4593 5796 4437 4859 8276	11	5934 6658 6074 2709 5789
12	4654 0142 4044 2789 9961	12	6276 9420 5808 7721 4728
13	5229 7119 0853 3967 9167	13	6909 0442 7771 1647 2124
14	7088 3465 6250 7971 5966	14	7000 0113 2078 4642 2250
15	7220 1825 9863 5955 7459	15	7335 7780 0771 5366 5680

Fifth Token Table		Sixth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0261 3067 6276 1549 0323	0	0929 9589 2702 7358 6753
1	0433 9754 3318 3461 8965	1	1412 5208 9529 8688 9975
2	1423 9667 9330 4272 7070	2	1596 4499 5346 0896 8315
3	3266 4857 0524 6896 7989	3	2145 4623 6692 0505 1403
4	4196 9689 0883 8775 3123	4	2407 0052 5151 9271 3759
5	4856 1270 0682 6505 8381	5	3246 6337 0686 3372 9951
6	5161 3943 2580 2914 0459	6	3407 7259 9194 7285 3671
7	5336 5748 1218 2734 4175	7	4064 2322 8038 9608 7399
8	5370 3379 5570 2559 9036	8	4844 7129 0456 7079 8875
9	5466 8380 1110 9065 1705	9	5051 9939 6497 4458 1983
10	5572 6827 4932 0568 6145	10	5298 7713 2817 7193 5567
11	6834 0884 7389 2142 8258	11	5400 2271 3959 2778 3616
12	6967 6962 1393 5549 7149	12	6728 1457 0284 5814 9460
13	6976 0952 4803 0842 0882	13	6764 6192 9419 3274 5131
14	7156 9897 8075 5454 2875	14	7013 5730 7627 6929 9538
15	7354 4174 4250 5193 4161	15	7043 5981 7705 1493 4025

Seventh Token Table		Eighth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0258 9972 2817 2415 0870	0	0441 6872 5785 4515 9161
1	0707 0820 5326 1750 6069	1	0667 7812 3112 3870 8777
2	0926 0996 6751 6525 1088	2	1094 8695 8498 8388 9475
3	1508 9839 8295 0487 4918	3	1103 3526 3609 6363 8059
4	1909 1958 7403 8282 4491	4	1188 5529 0532 5508 2632

5	1922 1599 9525 2657 4228	5	2016 8343 7366 8072 5346
6	2940 9034 6546 4228 8011	6	2383 5996 3472 2699 7739
7	3006 4171 8806 8941 5878	7	3721 9747 0349 4816 0342
8	3008 8527 5755 1627 3127	8	5159 7819 3822 0743 6531
9	5408 6110 8153 9433 3013	9	5367 0158 1106 2406 5740
10	5897 6938 3538 1517 7611	10	5487 9144 5194 6365 9012
11	6065 1237 0688 7285 0504	11	5710 0457 4612 9459 3757
12	6257 5678 0201 6550 9908	12	6065 6799 0766 9882 5401
13	6586 5376 7889 4879 9744	13	6322 4667 4460 9538 4277
14	6894 6724 1498 5824 3215	14	6902 6136 1699 0423 5413
15	6956 5851 4089 5613 3318	15	7136 4248 1264 3337 4407

Ninth Token Table		Tenth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0373 9587 3137 8769 7154	0	0126 1368 8721 1377 8315
1	0414 0842 0971 6818 2463	1	0347 9600 5588 0623 2560
2	0582 9753 3384 1510 6162	2	0423 2798 9457 9836 2543
3	0939 3441 2205 3306 0965	3	0739 0795 4978 8187 1753
4	0975 3416 0371 8962 1701	4	2632 3563 6376 1485 9247
5	2202 5417 6481 0991 9894	5	3004 8986 1781 9355 5214
6	2388 5570 4016 1197 0845	6	3250 2168 1881 8204 1451
7	3444 4864 1673 3590 3772	7	3620 1111 1268 1331 9108
8	3888 9151 6524 5720 5331	8	4197 0649 3872 4459 9279
9	4412 3551 7646 2305 2885	9	4317 2384 2737 5068 5639
10	5543 5906 4735 3843 0425	10	4366 3314 5758 6617 4145
11	6174 3527 2523 8316 9283	11	4504 7286 0081 9389 0844
12	6693 4044 2088 6568 2769	12	6148 0525 5173 2620 9207
13	6788 3205 4239 2946 6839	13	6619 4948 4774 2537 3424
14	6964 5152 4906 7812 6548	14	6733 9771 0615 4712 4064
15	7367 2069 6058 2948 5827	15	6842 7687 7014 1785 3295

Eleventh Token Table		Twelfth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0811 4620 0398 1409 2791	0	0538 3258 3459 6231 1689
1	0989 0470 4187 3379 9112	1	0873 4838 2807 8248 7650
2	1740 0066 2152 1183 6803	2	1095 4244 8122 8914 4759
3	1797 2957 6692 9988 8111	3	2841 8047 9658 2900 1465
4	3000 1359 7512 8766 0055	4	3271 9735 2031 2085 2289
5	3254 6632 2166 2878 0071	5	3362 0156 0045 2822 3453
6	3364 2680 0837 4638 6824	6	3509 1315 7297 0872 9031
7	3893 0680 2786 2128 6590	7	3711 0384 9977 4608 2450
8	4065 0372 2238 4689 7806	8	3899 1219 3555 1955 5427
9	4500 9080 6178 4271 5751	9	3983 6897 5425 5160 8624
10	4562 4948 2082 7502 4919	10	4252 8640 5082 8539 9165
11	5252 9938 1873 6140 0675	11	4331 5725 4265 2698 1463
12	5617 0087 2709 8284 2076	12	6236 7125 6251 1775 3576
13	5874 6927 8146 4229 2507	13	6448 9729 2448 9461 6536
14	6133 1785 5933 1720 0229	14	6707 2409 5165 1880 3311
15	7341 4540 3103 9867 4074	15	6953 4425 3910 6857 7712

4.6 CTSH05 – TransferCredit (Currency)

Overview: This test verifies general compliance with respect to the generation of a TransferCurrency token, and tests exponent value calculation.

This test shall only be performed if the manufacturer has indicated that the UUT supports the generation of TransferCredit (Currency) tokens, otherwise this test may be omitted.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK _i	ABABABABABABAB9494949494949401234567
Base Date	1993

Step Number	TokenIssueDate	TransferAmount	Currency Type
1	2004-04-21 10:01:00	1	electricity
2	2004-05-21 10:02:00	16383	electricity
3	2005-04-21 10:03:00	16384	electricity
4	2005-04-22 10:04:00	180224	electricity
5	2005-04-22 11:00:00	1818624	electricity
6	2005-04-22 11:01:00	18202624	electricity
7	2005-04-22 11:02:00	182042624	electricity
8	2005-04-22 11:03:00	1820442624	electricity
9	2005-04-22 11:04:00	18204442624	electricity
10	2005-04-22 11:05:00	1.82044E+14	electricity
11	2005-04-22 20:10:00	1.82044E+20	electricity
12	2005-04-22 20:11:00	1.82044E+29	electricity
13	2005-04-22 20:12:00	-1	electricity
14	2005-04-22 20:14:00	-180224	electricity
15	2005-05-12 20:15:00	-1.82044E+14	electricity
16	2006-05-21 11:00:00	100	water
17	2006-05-21 11:00:00	5000	gas
18	2006-05-21 11:00:00	10000	time

Step	Instruction	Expected Result
1 – 18	<p>According to the manufacturer's instructions provided in Table 5, generate TransferCurrency tokens with the information in the APDU above, and for each of the steps indicated above.</p> <p>If the manufacturer's instructions provided in Table 5 indicate that the module is a manufacturing module, then do only step 1.</p>	<p>The token for each step must be identical to the token corresponding to the step number specified in the token table below.</p> <p>If the manufacturer's instructions provided in Table 5 indicate that the module is a manufacturing module, then this step must fail.</p>

Token Table	
Step	Token Decimal Digits
1	3401 4974 3392 2634 8300
2	3047 1644 8586 6696 4824
3	5793 4654 2972 9765 1275
4	1976 8627 3332 3965 6831
5	6706 6620 9216 4803 1343
6	6717 5686 1605 0301 8781
7	2875 9186 2756 6677 7248
8	0643 3836 5189 8755 6061

9	3071 2140 2601 5534 8578
10	7323 1555 7009 6732 3838
11	5633 7119 9654 1741 3752
12	2866 2736 4424 1907 6206
13	4357 4659 7459 0561 8282
14	3866 3989 8151 2742 6845
15	7028 9553 6969 2062 5883
16	6304 9079 1397 6700 5684
17	6293 7780 1635 9555 7361
18	3990 8133 9743 7339 6350

4.7 CTSH06 – KeyChange

Overview: This test verifies general compliance with respect to the generation of a Keychange token. Note: this test may be omitted if the UUT is a manufacturing module, and this functionality is not supported.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
EA	11
Initial DKG _A	04
Initial SGC	123457
Initial TI	01
Initial KRN	1
Initial KT	2
Initial KEN	FF
Initial VUDK ₁	ABABABABABABAB9494949494949401234567
Base Date	1993

Step	Old Value	New Value
1	TI = 01 (VUDK ₁)	TI = 02 (VUDK ₁)
2	KT = 2 (VUDK ₁)	KT = 1 (VDDK ₁) (123458)
3	SGC = 123457 (VUDK ₁)	SGC = 123461 (VUDK ₈)
4	KEN = 0XFF (VUDK ₁)	KEN = 0X55 (VUDK ₆)

Step	Instruction	Expected Result
1 – 4	According to the manufacturer's instructions provided in Table 5, generate Keychange tokens with the information in the APDU above, and for each of the steps indicated above.	The token for each step must be identical to the token corresponding to the step number specified in the token table below.

Token Table				
Step	Token1 Decimal Digits	Token2 Decimal Digits	Token3 Decimal Digits	Token4 Decimal Digits
1	3481 2744 9152 1113 3004	4690 3925 2085 2367 4737	7146 4563 8470 8861 0152	6790 4239 4026 1764 3990
2	6512 1392 8610 0623 5839	5428 3478 6960 6875 3213	5132 8304 0889 6665 5235	3409 0853 4209 5616 6411
3	1445 9740 1226 9178 5207	1608 4994 5600 5693 1733	3860 3700 6115 9718 3668	0792 6972 4610 9466 9048
4	5846 8177 8982 5406 1980	2384 5621 7492 9053 5252	4200 6367 3614 8339 0349	5290 7924 4558 3171 6557

4.8 CTSH07 – Tokens Generated for 4 Digit Manufacturer Codes

Overview: This test verifies general compliance with respect to the generation of a TransferCredit token for a 4 digit manufacturer code (13 digit DRN) as well as the handling of a non-zero DRN.

APDU information to be used for this test:

MeterPAN	000001234567890078
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VJDK ₁	ABABABABABABABAB94949494949401234567
Token Issue Date	2004-04-24 11:00:00
Register to Clear	0
Base Date	1993

Step	Instruction	Expected Result
1	According to the manufacturer's instructions provided in Table 5, generate a 100 kWh TransferCredit token with the information in the APDU above.	The token must be identical to one of the tokens specified in the First TokenTable below. If the manufacturer's instructions provided in Table 5 indicate that the module is a manufacturing module, then this step must fail.
2	According to the manufacturer's instructions provided in Table 5, generate a ClearCredit token with the information in the APDU above.	The token must be identical to one of the tokens specified in the Second TokenTable below.

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0039 5138 7913 8400 8098	0	0859 5554 2505 0155 2994
1	0389 0029 7445 4980 9257	1	0909 4386 1704 7684 4741
2	0449 9560 5284 9327 4062	2	1641 4278 3515 9346 2540
3	1743 6246 9661 2365 9044	3	1861 5982 3560 7010 0910
4	1804 3388 8419 4561 2158	4	2040 4841 3930 1133 8494
5	2487 6452 3738 4697 2454	5	2174 5318 4507 2875 1781
6	3257 0412 7686 9551 3898	6	2320 4499 3354 8369 7708
7	3311 5903 5410 2017 7897	7	2389 6335 8801 5283 0529
8	4117 5521 7555 5340 8697	8	2843 6112 9807 4336 4354
9	4137 8638 6934 7352 4407	9	5497 9906 0508 1664 1997
10	4265 0665 7035 4142 3918	10	5761 1653 9663 7370 2133
11	4857 2539 2609 2364 7301	11	5860 7682 2344 2933 5956
12	5366 0810 7831 7078 9719	12	6134 0000 9169 0801 9629
13	5495 2472 6480 1582 3062	13	6411 0802 5497 2235 8420
14	6587 8540 8099 5670 5936	14	6416 2706 0269 7660 4779
15	6741 3759 6165 3832 9131	15	6475 3380 7136 3726 2226

4.9 CTSH08 – MaximumPowerLimit

Overview: This test verifies general compliance with respect to the generation of a MaximumPowerLimit token, and TID generation.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK ₁	ABABABABABABAB9494949494949401234567
Base Date	1993

Step Number	TokenIssueDate	TransferAmount
1	2004-04-21 10:01:00	100
2	2004-04-21 10:04:00	16384
3	2004-04-21 10:05:00	90111
4	2004-04-21 10:08:00	909311
5	2004-04-21 10:11:00	9100811
6	2004-04-21 10:12:00	18201624

Step	Instruction	Expected Result
1 – 6	According to the manufacturer’s instructions provided in Table 5, generate maximumPowerLimit tokens with the information in the APDU above, and for each of the steps indicated above.	The token must be identical to one of the tokens specified in the token tables below corresponding to the step number. i.e. step 1 corresponds to the First Token Table.

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0865 8067 3238 7230 6083	0	0669 2050 2242 2395 5534
1	1254 4200 3229 6661 7162	1	0780 9074 1452 1477 1164
2	1481 7109 1100 9810 2269	2	0823 5052 5025 3584 3036
3	1507 6636 9199 7207 6279	3	1281 2114 9514 6269 0697
4	1998 3399 7575 9929 2984	4	1899 1458 8746 2050 6952
5	2302 8882 3898 9332 2843	5	2132 9576 7349 9251 6061
6	2539 9333 2675 8882 3146	6	2735 8094 4941 1337 5959
7	2820 3459 3187 1039 5127	7	3557 2532 5610 3098 6553
8	3420 9091 6436 5570 2352	8	3954 0039 5136 6501 4416
9	3445 8288 7788 2363 6501	9	3992 3224 7394 9257 2891
10	3938 4970 7003 3582 5784	10	5231 2279 5508 7968 7457
11	4740 2323 8576 1891 0122	11	5257 6100 0553 6168 9706
12	5770 5616 4283 4775 7274	12	5811 8097 5668 9477 7846
13	6306 1692 6777 6850 8456	13	5932 3701 1559 5867 9897
14	6652 5698 2779 1757 7819	14	6257 9721 0347 6557 7093
15	7145 3510 1151 5914 9792	15	7354 7218 5699 2330 0233

Third Token Table		Fourth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits

0	0218 4879 9414 6504 9250	0	0014 0302 3768 1948 2438
1	1779 2767 4014 1197 2220	1	0113 3535 0570 6311 6246
2	2139 4264 5602 7171 0308	2	1490 0168 0744 2786 3108
3	2575 0820 4536 2914 6271	3	2596 5827 7710 5744 5005
4	2978 1837 8618 2039 6064	4	2796 5937 5046 2344 2675
5	3206 7353 1763 4735 7397	5	4568 4113 5053 2948 7777
6	3238 8483 9130 2565 9073	6	4958 6249 8817 1153 0366
7	3329 5590 5097 2693 2457	7	4984 7962 3572 0606 2803
8	4489 0926 4414 6748 2764	8	5607 1485 7055 3800 0212
9	5419 3165 7859 4599 2657	9	5747 7698 3864 7953 9535
10	6051 5797 0894 5925 5685	10	6021 6193 5299 3068 6089
11	6154 6110 7322 8299 0197	11	6162 2175 3493 8425 1848
12	6268 1774 5412 9584 0767	12	6638 3517 1861 4757 2249
13	6276 2083 9792 8978 1327	13	6745 3362 9185 5899 2442
14	6372 6866 5814 6809 0406	14	6911 4434 1195 9702 5385
15	6893 3019 8286 4698 7752	15	7007 6794 7875 5655 4164

Fifth Token Table		Sixth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0327 8251 3604 5894 3721	0	0047 3398 3335 1278 5286
1	0624 7412 0743 8840 1397	1	1015 4640 2622 4153 8017
2	0876 6661 0343 3093 0282	2	1528 4180 8190 3584 1310
3	0973 7827 5991 6371 5017	3	1672 6971 2239 0459 2205
4	1482 8827 1574 8233 6488	4	1826 3059 2025 1791 8287
5	2726 4387 7319 6815 5522	5	2034 8324 3822 3372 7893
6	3024 4677 4270 5185 4454	6	2336 4360 5115 2885 7735
7	4220 3557 7232 7286 1040	7	3952 8714 1031 6704 7486
8	4291 6818 8753 4797 0980	8	4912 5107 2929 8285 8685
9	4440 1315 7442 6959 2692	9	4960 0698 6825 5119 4954
10	4461 1568 6398 1681 3355	10	4983 7433 8311 4003 2681
11	5253 5099 9888 6833 6555	11	5999 9764 3855 3711 7178
12	5410 8045 2389 6761 6462	12	6009 5706 1536 0810 6559
13	5512 1381 2073 0552 8265	13	6264 3571 4396 4242 4541
14	5885 9360 8169 4443 5825	14	6829 1784 4084 0513 7509
15	6281 4883 2336 3023 2801	15	7299 6710 8688 6597 1609

4.10 CTSH09 – MaximumPhasePowerUnbalanceLimit

Overview: This test verifies general compliance with respect to the generation of a MaximumPhasePowerUnbalanceLimit token, and TID generation.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK ₁	ABABABABABABAB94949494949401234567
Base Date	1993

Step Number	TokenIssueDate	TransferAmount
1	2004-04-21 10:01:00	100

2	2004-04-21 10:04:00	16384
3	2004-04-21 10:05:00	90111
4	2004-04-21 10:08:00	909311
5	2004-04-21 10:11:00	9100811
6	2004-04-21 10:12:00	18201624

Step	Instruction	Expected Result
1 – 6	According to the manufacturer’s instructions provided in Table 5, generate MaximumPhasePowerUnbalanceLimit tokens with the information in the APDU above, and for each of the steps indicated above.	The token must be identical to one of the tokens specified in the token tables below corresponding to the step number. i.e. step 1 corresponds to the First Token Table.

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0547 2305 3399 6883 6155	0	0786 8963 6496 9340 6932
1	1216 8593 1231 0220 8598	1	1295 1541 6823 7115 9661
2	1418 8931 3095 5670 1575	2	1750 7643 3995 3682 6602
3	2246 7211 9598 0718 5276	3	3355 0713 0337 9836 6303
4	3106 2842 2307 9926 7808	4	3702 7375 0982 7159 6049
5	3216 2141 2996 6248 7503	5	3927 2657 0102 3008 0921
6	3327 3436 0515 6140 7459	6	4288 6556 9663 6043 1125
7	3350 9727 4037 3915 4935	7	4332 5417 3464 2992 7700
8	4398 2717 8029 4756 8501	8	4938 8643 6579 5500 2346
9	4455 9597 5110 4617 5346	9	5749 1199 9366 6726 3012
10	4466 2322 2765 1147 4399	10	5952 1366 0886 6256 8335
11	4673 3371 5224 8656 9607	11	6004 5069 0566 4924 4404
12	5756 7886 3640 9699 3009	12	6390 3842 5321 5551 4023
13	5923 5788 3541 2669 9564	13	6524 4493 9127 9480 7049
14	6412 9357 7474 3994 5544	14	6904 1388 4183 9256 8950
15	7070 3252 1052 4602 6282	15	7034 2064 2572 8502 1830

Third Token Table		Fourth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0388 4690 7429 5595 3962	0	0898 7032 3279 3385 4738
1	1143 1764 2312 9747 1447	1	2602 2741 4866 1164 4418
2	2280 1322 0027 9531 0488	2	3029 8357 6978 8419 3451
3	3032 1720 7426 3397 7589	3	3056 0552 8316 4472 8279
4	3410 2561 3847 8631 3717	4	3262 3800 7452 4533 2836
5	3631 5715 7838 7574 0051	5	3536 9184 5877 8787 1541
6	3895 3835 6657 3730 3863	6	4316 1931 1423 5483 3700
7	4505 0631 2065 5044 0749	7	4813 0904 0880 5973 9730
8	4538 0909 9051 4696 2955	8	4842 3462 7137 3135 1883
9	4541 2162 4709 2868 6281	9	5288 3663 0629 2449 2019
10	4591 0411 6776 7417 6041	10	5606 1033 9885 4952 4421
11	5900 6249 5714 9801 6111	11	6001 9536 9111 7076 6272
12	5997 4581 3402 9066 1347	12	6397 9120 6386 4222 3204
13	6065 9928 4142 9487 6180	13	6547 9244 7439 7503 1570
14	6433 9016 9486 5295 8432	14	6986 3468 3581 3991 0466
15	7194 8733 1631 6129 4732	15	7046 0825 3358 2211 3798

Fifth Token Table		Sixth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits

0	0424 5983 4879 7393 1068	0	0919 5375 3981 1256 0344
1	1493 6777 4651 3552 4662	1	1069 3533 6404 8972 9433
2	2001 5105 9583 5552 3769	2	1663 6838 1602 1915 5772
3	2436 9647 7197 4545 6805	3	1830 0909 2422 4350 6640
4	2701 4452 6945 4913 1619	4	2044 1399 3005 3462 5732
5	2799 0815 8073 3539 7602	5	2066 9527 5713 6351 5128
6	3151 0017 3572 3160 6708	6	3366 8832 6192 9634 1564
7	3452 9531 0489 7945 4900	7	3917 2798 1116 9312 3629
8	3888 5832 7183 6075 7735	8	4252 4399 8038 9422 3790
9	4191 5732 9112 9196 8033	9	5547 4117 4609 8151 2523
10	4249 0121 0948 5921 1045	10	5789 6256 8114 9814 1737
11	4651 6222 2952 0762 6371	11	5835 8928 0166 7035 0243
12	5117 7657 7788 2517 8809	12	5911 3845 2641 9465 5124
13	6213 2527 6198 2841 9474	13	5995 2118 7912 9761 6595
14	6698 6417 0704 2760 5568	14	6424 6790 9306 4531 3233
15	7346 2795 0783 9955 1828	15	7098 8224 1720 3513 3309

4.11 CTSH10 – ClearCredit

Overview: This test verifies general compliance with respect to the generation of a ClearCredit token.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK ₁	ABABABABABABAB94949494949401234567
Base Date	1993

STEP	REGISTER TO CLEAR	TID DATE
1	0	2004-04-25 11:00:00
2	1	2004-04-25 11:00:00
3	2	2004-04-25 11:00:00
4	3	2004-04-25 11:00:00
5	4	2004-04-25 11:00:00
6	5	2004-04-25 11:00:00
7	6	2004-04-25 11:00:00
8	7	2004-04-25 11:00:00
9	0xffff	2004-04-25 11:00:00

Step	Instruction	Expected Result
1 – 6	According to the manufacturer’s instructions provided in Table 5, generate ClearCredit tokens with the information in the APDU above, and for each of the steps indicated above.	The token must be identical to one of the tokens specified in the token tables below corresponding to the step number. i.e. step 1 corresponds to the First Token Table.

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0318 0824 5671 9345 4547	0	0604 0833 2173 1220 2578

1	0796 5646 1686 9011 5600	1	1511 4799 2215 9766 1254
2	2023 6616 5285 1186 9662	2	1709 9753 7741 8111 4482
3	2356 1612 2280 9626 4394	3	2550 2777 2800 3732 0121
4	2413 2435 4357 8624 0975	4	2857 4786 1473 2493 6201
5	2436 2669 8865 8527 6795	5	3049 5948 5251 1740 7052
6	2640 7369 1926 4675 1924	6	4318 7823 7165 7841 0187
7	2869 7808 9770 5778 6450	7	4339 6029 9427 1929 5155
8	3054 3857 7192 2466 9285	8	4549 9846 9835 4842 9966
9	3762 2454 2841 7589 7597	9	4620 5941 6470 7753 3608
10	4371 7737 9132 8452 9485	10	4766 1214 2024 0656 8873
11	4406 0053 3990 2630 5506	11	4898 1416 8615 8810 1291
12	4438 2258 3134 7293 0703	12	6102 0206 0980 2905 5595
13	4732 8496 8047 1801 8461	13	6180 7035 0121 5394 1975
14	5239 3341 5706 1450 7876	14	6821 7105 4035 6478 9771
15	6188 7885 0307 4674 8439	15	6940 4320 3311 5920 5666

Third Token Table		Fourth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0418 2002 4027 4207 5047	0	0854 0237 1301 1453 7458
1	0618 7185 0692 3217 3886	1	2155 7951 1965 9713 6205
2	0725 8098 0211 1320 6850	2	2972 2761 5433 7994 6574
3	1300 8471 3873 4186 8696	3	3007 4116 8486 5851 2447
4	3345 3030 3194 7488 8690	4	3332 8344 6238 9413 2043
5	3362 0548 7097 7523 6301	5	4120 1854 4880 7047 2395
6	3632 0761 9656 5254 9651	6	4324 3012 2102 4760 3281
7	3819 8276 1338 7144 9963	7	4655 9184 2984 1340 6603
8	3919 4354 8097 8113 4985	8	4982 6992 1894 9365 1049
9	4083 5523 3889 4551 6772	9	5597 1173 9757 0946 5560
10	4146 2070 5691 1318 8691	10	6055 1258 6023 9369 1313
11	4804 9847 7412 4832 8302	11	6279 4877 8246 3935 4186
12	4836 6131 5896 3970 1993	12	6996 4922 8595 9072 3700
13	5234 4573 8759 3421 7517	13	7154 1115 1859 0345 4206
14	6933 1309 9244 9754 5971	14	7353 6725 9229 1616 3053
15	7134 6838 4456 2034 6065	15	7358 9611 9098 4641 3805

Fifth Token Table		Sixth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0394 4822 9951 8527 1239	0	0055 2488 9091 0820 2768
1	0827 6419 5161 1211 1863	1	0871 3279 8602 0618 7949
2	0846 5110 1795 3013 2794	2	1365 5092 5634 2001 9923
3	1378 1573 6310 2317 4269	3	1411 2964 8159 0971 3646
4	1746 5510 5880 0901 2660	4	1460 4364 9021 0746 2938
5	1798 5149 7116 1861 8820	5	1511 4895 0669 6309 6373
6	2364 1262 7868 6210 6757	6	1529 7989 0422 4663 0483
7	2601 3972 1317 8667 2006	7	1997 9130 3554 9792 8762
8	4228 9803 2183 8163 5824	8	2629 4770 2340 5400 7837
9	4546 6599 2766 2185 7477	9	3077 1868 1479 3764 9630
10	4843 0503 0030 8233 7983	10	4096 4409 6220 7001 0051
11	5064 7854 7996 6143 0316	11	4785 9326 3592 6497 6054
12	5235 3484 6221 0247 7652	12	4796 0634 8017 7901 9627
13	5820 9169 3821 9275 3137	13	6490 2544 2025 8206 5997
14	5918 2151 9795 2018 2222	14	6701 9814 0505 4200 8501
15	5970 6911 5131 8444 9147	15	7293 5068 6741 3777 5300

Seventh Token Table		Eighth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0360 5779 2669 1447 5292	0	0348 6822 3002 2606 0761

1	0399 6070 9583 6114 5232	1	0922 4515 6302 7590 1932
2	0931 7107 2046 6873 8530	2	1159 9628 3229 8455 5459
3	1076 0492 2090 7189 7880	3	1332 3519 4367 4634 2457
4	1740 2026 0359 1754 8273	4	1900 8982 2247 0758 6127
5	2418 9516 4756 7541 4471	5	2845 7098 4932 3604 7317
6	2437 3721 9762 4049 8680	6	2973 3750 4997 1291 8970
7	2552 1273 0654 7983 1058	7	3039 5929 5746 3365 5587
8	2681 5801 2508 7739 9175	8	3813 7040 1828 1406 6425
9	3058 1794 3831 4536 3247	9	3939 5198 2119 6866 6099
10	3985 7990 0408 0310 1640	10	5142 2979 0623 7720 3483
11	6848 1663 9000 0203 3532	11	5155 3561 4790 6466 9588
12	7141 1521 2049 3530 8588	12	5605 0660 8693 6339 1012
13	7264 7389 7266 7959 0337	13	6219 9441 3061 0009 9321
14	7316 5328 2777 9762 3914	14	6524 9700 2570 3301 9357
15	7325 2790 7480 7627 3875	15	7258 2567 1719 2240 6950

Ninth Token Table	
Ordinal	Token Decimal Digits
0	0304 0543 6113 6398 5369
1	0432 0929 6827 0928 0280
2	0754 1551 1587 5764 2751
3	1143 5907 5449 0836 3351
4	1959 6340 2528 8377 6051
5	2120 3912 6282 2080 1534
6	2250 9971 5878 8577 9130
7	2324 3426 8822 0783 8593
8	2561 0477 9239 7325 3787
9	3966 6471 3309 1928 7661
10	4054 9133 5903 7879 2320
11	4174 1260 0321 3727 7032
12	4866 6911 4597 7287 8679
13	5712 4957 5699 7422 5563
14	6192 5452 9974 0950 1642
15	6224 3443 2986 5896 7161

4.12 CTS11 – ClearTamper

Overview: This test verifies general compliance with respect to the generation of a ClearTamper token.

APDU information to be used for this test:

MeterPAN	600727234567890177
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK ₁	ABABABABABABAB949494949494949401234567
Token Issue Date	2004-04-21 11:00:00
Base Date	1993

Step	Instruction	Expected Result
1	According to the manufacturer's instructions provided in Table 5, generate a ClearTamper token with the information in the APDU above.	The token must be identical to one of the tokens specified in the token table below.

First Token Table	
Ordinal	Token Decimal Digits
0	1071 4331 0532 0684 6823
1	1188 5501 1234 2897 8940
2	1313 1763 3504 4466 8200
3	1839 4855 6577 4325 7601
4	1868 0620 8858 2591 4163
5	1984 2455 6727 5807 0415
6	2602 2542 7105 7533 8541
7	2813 8676 9231 2369 6985
8	3302 1269 1059 3894 2683
9	4715 3594 2275 3395 4040
10	4823 7054 0538 7125 4864
11	5153 9820 5177 3798 4406
12	5914 5494 7025 3779 5721
13	6282 1013 1832 6981 0019
14	6663 3202 9032 8448 0601
15	6834 3953 9673 3944 2826

4.13 CTSH12 – SetTariffRate

Overview: This test verifies general compliance with respect to the generation of a SetTariffRate token.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK ₁	ABABABABABABAB9494949494949401234567
Base Date	1993
Token Issue Date	2004-04-21 11:00:00
Tariff Value	100

Step	Instruction	Expected Result
1	According to the manufacturer's instructions provided in Table 5, generate a SetTariffRate token with the information in the APDU above.	The token must be identical to one of the tokens specified in the token table below.

First Token Table

Ordinal	Token Decimal Digits
0	0517 0940 8663 3158 2874
1	0662 2375 2139 2977 6328
2	1767 2963 2551 4274 1312
3	2178 2659 7956 6194 8358
4	2353 4802 9900 3999 2321
5	3151 0814 5949 2999 5885
6	3197 3140 7510 2428 3144
7	3781 3902 6296 9543 2513
8	3891 9647 9053 7402 9215
9	4023 5936 8511 5005 4265
10	4913 2166 2714 3627 1266
11	4996 0269 2548 1155 4418
12	5513 3232 1811 9058 9676
13	5869 0620 4628 8568 7914
14	6915 7177 6211 3862 7561
15	7271 1098 5768 9921 8436

4.14 CTSH13 – SetWaterMeterFactor

Overview: This test verifies general compliance with respect to the generation of a SetWaterMeterFactor token.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK _i	ABABABABABABAB94949494949401234567
Base Date	1993
Token Issue Date	2004-04-21 11:00:00
Water Meter Factor	100

Step	Instruction	Expected Result
1	According to the manufacturer's instructions provided in Table 5, generate a SetWaterMeterFactor token with the information in the APDU above.	The token must be identical to one of the tokens specified in the token table below.

First Token Table	
Ordinal	Token Decimal Digits
0	0115 1927 4310 3469 0936
1	0225 6161 7978 9774 0478
2	0276 6795 8589 2991 3995
3	0331 5476 1915 6242 3702
4	0781 7669 6085 4838 0263
5	0888 2256 9186 4391 5647
6	1487 0236 2406 8009 8970
7	1541 9670 0753 7403 0029
8	1594 5472 2902 2017 2096
9	2718 3432 9236 2682 7036
10	3119 9452 1681 7965 6944
11	3270 4290 0618 0957 8606

12	3361 2459 9033 1299 0392
13	5493 2084 6340 4533 4582
14	5772 5753 0233 5695 1040
15	6444 5502 6526 6691 1697

4.15 CTSH14 – STSReserved

Overview: This test verifies general compliance with respect to the generation of a STSReserved token.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK _i	ABABABABABABAB949494949494949401234567
Base Date	1993
RES Data	100
Token Issue Date	2004-04-21 11:00:00

Step	Instruction	Expected Result
1	According to the manufacturer's instructions provided in Table 5, generate STSReserved tokens with the information in the APDU above.	The token must be identical to one of the tokens specified in the token table below.

First Token Table	
Ordinal	Token Decimal Digits
0	0486 6154 9031 0142 9463
1	1602 6299 5767 2884 6450
2	1981 2726 3664 9756 0299
3	2147 5877 2179 5783 6677
4	2421 0194 0174 4271 7664
5	2978 2494 5688 4230 1176
6	3857 9973 0835 7995 7032
7	4103 2959 9936 1564 2544
8	4372 4074 0493 5480 8603
9	4913 4859 9545 7675 0652
10	5121 8445 4504 9678 8228
11	5614 3653 3280 9625 1655
12	5647 8186 8156 6910 1289
13	6002 6587 1890 6450 5968
14	6442 5427 7998 9499 9725
15	6837 6194 1522 7299 6597

4.16CTSH15 – ReservedForProprietaryUse

Overview: This test verifies general compliance with respect to the generation of a ReservedForProprietaryUse token.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK ₁	ABABABABABABAB9494949494949401234567
Base Date	1993
Data	100

STEP	SubClass	TID DATE
1	11	2004-04-21 11:00:00
2	12	2004-04-21 11:00:00
3	13	2004-04-21 11:00:00
4	14	2004-04-21 11:00:00
5	15	2004-04-21 11:00:00

Step	Instruction	Expected Result
1 – 5	According to the manufacturer’s instructions provided in Table 5, generate ReservedForProprietaryUse tokens with the information in the APDU above, and for each of the steps indicated above.	The token must be identical to one of the tokens specified in the token tables below corresponding to the step number. i.e. step 1 corresponds to the First Token Table.

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0086 0410 0728 3151 5394	0	0673 2064 9619 2239 2818
1	0112 8777 6013 4611 7608	1	0863 5288 5112 7496 2341
2	0549 7897 1146 2460 4733	2	0922 5808 5323 9881 3905
3	1252 2660 1875 0422 3343	3	1600 6966 7676 6101 5743
4	1324 2981 2258 8279 5970	4	1657 9740 9218 3252 9960
5	1424 3336 8967 1787 7370	5	2012 6393 7450 5468 0562
6	1996 7028 0096 3900 5977	6	2054 8277 8866 3170 8810
7	2076 5011 5378 0621 7163	7	2504 6924 5276 4447 3837
8	2706 5044 0270 3088 9715	8	2788 1732 1432 2328 6858
9	3776 0061 3480 0328 7462	9	5335 7987 9515 0900 3537
10	4699 8445 3832 6018 6950	10	5594 0533 6672 3530 9061
11	5209 5882 1693 7391 2317	11	5954 9391 1609 8370 2789
12	6010 1971 4570 5635 3054	12	6124 3601 2767 3671 5659
13	6761 4338 1264 7713 1324	13	6376 8049 1368 2699 3362
14	6929 8826 5408 2343 2702	14	6790 7296 3912 3709 1218
15	7093 0936 1508 0421 6484	15	7110 1842 7225 6415 3716
Third Token Table		Fourth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0020 7856 0711 6961 7678	0	0032 5251 7270 1573 7347
1	0389 0722 8925 0267 9878	1	0231 3022 0435 7206 1860
2	0693 3698 9882 1198 7990	2	0234 5135 4136 8940 4262
3	1109 6599 2379 8544 0485	3	0751 4688 1854 7217 0935
4	1658 1019 4810 8379 6673	4	1243 1811 6557 1895 2989
5	2049 1848 1925 9422 0283	5	1850 5525 1360 7198 7874

6	2630 3962 9877 1412 5223	6	2046 2413 4292 3963 0899
7	3560 7251 6087 8954 1969	7	2173 4727 4581 2059 9198
8	3760 1128 4809 8563 5053	8	2461 9955 5356 2800 8331
9	3922 7524 1561 1422 1636	9	3420 1449 0747 0916 5848
10	4316 4829 0136 6660 3024	10	4351 0342 3387 6730 8273
11	4473 1533 1618 1035 1526	11	4658 1243 8130 9671 9604
12	5002 8875 2787 9044 8011	12	5898 6977 0165 1747 3902
13	5172 4099 8208 3441 2501	13	6206 5776 3597 2676 3309
14	6061 6128 3984 5348 1144	14	6945 2947 1933 6971 5949
15	7062 0611 2623 3765 8819	15	7348 3202 5296 0629 5587

Fifth Token Table	
Ordinal	Token Decimal Digits
0	0336 8372 5556 5096 3261
1	0364 6610 0735 3519 2764
2	1067 7213 6812 0362 5304
3	2383 3633 4121 6055 6742
4	2566 8328 3765 8342 9561
5	3180 5038 7494 3819 3934
6	3656 2487 5740 9824 1051
7	3774 8944 9510 5079 8982
8	3805 5679 5795 8927 9172
9	5029 7987 0896 7720 5626
10	5165 4403 9847 3074 3234
11	5508 9342 6731 8520 1829
12	6875 7328 6819 8234 1106
13	7013 0962 8673 0166 0887
14	7148 8052 2549 1259 4689
15	7238 1506 8674 2975 0495

4.17 CTS16 – RandomNumber

For this test, ensure that in the preceding tests (CTS1 -15), at least 4 different ordinals are generated in the results. It should be noted that some of the tests in the range CTS1-15 do not create ordinals . If 4 ordinals are not created within this range, then more tokens must be generated until such time that 4 ordinals are created.

4.18 CTS17 – Keychange under various KeyTypes

Overview: This test verifies general compliance with respect to the generation of a KeyChangeToken under various keytypes in order to test the rules shown in Table 2 above.

If the manufacturer’s instructions provided in Table 5 indicate that the module is a manufacturing module, and this functionality is not supported, then this test may be omitted.

APDU information to be used for this test:

Meter PAN	600727000000000009
TCT	02
EA	11
DKGA	04
Initial VUDK ₁	ABABABABABABAB94949494949401234567
Initial SGC	123457
Initial TI	01
Initial KRN	1
Initial KT	1
Initial KEN	FF
Initial RO bit	0

Table 2 - KeyType Rules

Key Type	DITK0	DDTK1	DUTK2	DCTK3
DITK0 to	Allowed	Allowed	Allowed	Allowed
DDTK1 to	Not Allowed	Allowed	Allowed	Allowed
DUTK2 to	Not Allowed	Allowed	Allowed	Not Allowed
DCTK3 to	Not Allowed	Allowed	Allowed	Allowed
Encrypt Credit	Allowed	Not Allowed	Allowed	Allowed

STEP	OLD VALUE	NEW VALUE	VENDING KEY	RESULT
1	KT = 1, TI = 01	KT = 1, TI = 02	VDDK ₁ -VDDK ₁	Tokens generated
2	KT = 1, TI = 01	KT = 2, TI = 02	VDDK ₁ ->VUDK ₁	Tokens generated
3	KT = 1, TI = 01	KT = 3, TI = 02	VDDK ₁ ->VCDK ₁	Tokens generated (for TCT=01)
4	KT = 2, TI = 01	KT = 1, TI = 02	VUDK ₁ ->VDDK ₁	Tokens generated
5	KT = 2, TI = 01	KT = 2, TI = 02	VUDK ₁ ->VUDK ₁	Tokens generated
6	KT = 2, TI = 01	KT = 3, TI = 02	VUDK ₁ ->VCDK ₁	Key-type error
7	KT = 3, TI = 01	KT = 1, TI = 02	VCDK ₁ ->VDDK ₁	Tokens generated
8	KT = 3, TI = 01	KT = 2, TI = 02	VCDK ₁ ->VUDK ₁	Tokens generated
9	KT = 3, TI = 01	KT = 3, TI = 02	VCDK ₁ ->VCDK ₁	Tokens generated (for TCT=01)

Step	Instruction	Expected Result
1 - 9	According to the manufacturer's instructions provided in Table 5, and the key register values supplied in Table 1, generate Keychange tokens with the information in the APDU above, and for each of the steps indicated above.	The token must be identical to one of the tokens specified in the token tables below corresponding to the step number. i.e. step 1 corresponds to the First Token Table.

Token Table				
Step	Token1 Decimal Digits	Token2 Decimal Digits	Token3 Decimal Digits	Token4 Decimal Digits
1	4480 3785 7033 5435 7121	3581 0193 4097 5683 8747	1153 2763 6509 1369 9881	2278 2125 2718 2042 7336
2	7152 5891 6050 1861 2583	6841 6387 9460 7149 3803	3591 9088 2607 1623 3517	0447 0861 8209 4862 4165
3	5464 4159 0019 2359 0661	6252 5350 7941 5175 6831	4385 0131 0785 4084 6192	5158 0919 5955 9602 5571
4	0016 7064 5531 8951 7393	3307 2642 3892 8365 3381	1988 2667 6299 5221 4286	4953 3844 0725 5181 9392
5	3481 2744 9152 1113 3004	4690 3925 2085 2367 4737	7146 4563 8470 8861 0152	6790 4239 4026 1764 3990
6	KEY TYPE ERROR	KEY TYPE ERROR	KEY TYPE ERROR	KEY TYPE ERROR
7	3801 8634 4623 6927 5800	3473 5956 7856 5850 0204	2879 9355 3091 8335 9459	0062 2783 5570 7402 7896
8	2793 2291 4223 0479 2379	0622 4948 5235 1924 0939	0933 6551 4433 8857 9297	4127 6017 3156 9864 8460
9	0906 3506 0772 0152 7487	1564 9100 0181 0350 5319	2326 9858 7648 8505 9819	0257 1564 3318 0632 5916

4.19 CTSH18 – Generation of an Electricity Credit Token under various KeyTypes

Overview: This test verifies general compliance with respect to the generation of a TransferCredit token under different key types.

APDU information to be used for this test:

MeterPAN	600727123456789030
TCT	01/02
DKGA	04
EA	11
SGC	various
TI	01
KRN	1
KT	See tests below
KeyExpiryNumber	FF
Initialization key (KT=0)	DITK ₁ (see Table 1)
Vending Keys for KT=1	VDDK ₁ (see Table 1)
Vending Keys for KT=2	VUDK ₁ (see Table 1)
Vending Keys for KT=3	VCDK ₁ (see Table 1)

Step	Instruction	Expected Result
1	According to the manufacturer's instructions provided in Table 5, and the key register values supplied in Table 1, generate a 100kWh Electricity TransferCredit token with the information in the APDU above, and a keytype of KT = 1 (VDDK ₁), and a token issue date of 2004-04-21 10:00:00.	No token must be generated. The response must be a KeyType Error.
2	Generate a 100kWh Electricity TransferCredit token with the information in the APDU above, and a keytype of KT = 2 (VUDK ₁), and a token issue date of 2004-04-21 10:00:00.	If the module is a manufacturing module, no token shall be generated. The response ,must be a KeyType Error. If the module is not a manufacturing module, the token must be identical to one of the tokens specified in the first token table below.
3	Generate a 100kWh Electricity TransferCredit token with the information in the APDU above, and a keytype of KT = 3 (VCDK ₁), and a token issue date of 2004-04-21 10:00:00.	If the module is a manufacturing module, no token shall be generated. The response ,must be a KeyType Error. If the module is not a manufacturing module, the token must be identical to one of the tokens specified in the second token table below.
4	Generate a 100kWh Electricity TransferCredit token with the information in the APDU above, and a keytype of KT = 0 (DITK ₁), and a token issue date of 2004-04-21 10:00:00.	If the module is a manufacturing module, the token must be identical to one of the tokens specified in the third token table below. If the module is not a manufacturing module, no token shall be generated. The response ,must be a KeyType Error.

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0892 1246 6620 9544 8444	0	0034 0553 4222 5378 9992
1	0930 7275 5577 3093 0242	1	0214 9667 2293 3363 3461
2	1112 6187 1632 6644 8415	2	0791 1398 3692 0684 0677
3	1678 1465 1352 3241 3779	3	1044 5937 0127 9719 6985

4	1803 8916 8501 0955 1912	4	1281 5883 4446 0328 6373
5	2253 1881 5811 4119 4092	5	1843 4656 5894 9797 4922
6	2562 3847 5518 3725 5886	6	2268 7603 7411 6271 5199
7	2613 3100 0889 3275 2805	7	2878 2891 8719 8612 5240
8	2685 5257 6145 3012 6927	8	3022 7337 7944 9591 7748
9	4221 0322 0345 2326 9096	9	3131 7209 5132 1427 6674
10	4985 4223 8108 9971 5834	10	3666 6318 0553 8546 5865
11	5280 0319 8869 2352 0103	11	4262 2537 5187 2189 9179
12	6343 1799 6435 6334 1363	12	4541 3291 0764 3858 3736
13	7061 2728 4573 8653 1950	13	6311 2266 3614 0211 9216
14	0892 1246 6620 9544 8444	14	6318 8210 7940 4782 3932
15	0930 7275 5577 3093 0242	15	6638 2289 3749 7511 0467

Third Token Table	
Ordinal	Token Decimal Digits
0	0484 6046 2191 3397 5533
1	0985 0670 7634 6964 7626
2	1605 1401 1020 7402 2306
3	2168 3107 1450 9778 4337
4	2348 2973 6824 4983 3755
5	2385 5460 3192 0945 4029
6	2407 4346 8017 5598 4063
7	2475 5868 0766 9646 4740
8	3332 3006 7105 1342 2559
9	3378 5718 5708 0815 5806
10	4244 2830 2657 6902 8918
11	4571 7104 7353 8538 2988
12	5338 0436 9410 2957 0639
13	5788 5852 3495 6957 6310
14	6757 3319 4350 9821 3044
15	6888 9203 8223 6622 9243

4.20 CTSH19 – Tokens Generated Using Algorithm DKGA01 for special DRN Values

This test is only to be done if the UUT supports Algorithm DKGA01.

Overview: This test verifies general compliance with respect to the generation of keychange tokens using Decoder Key Generation Algorithm DKGA01 for specific DecoderReferenceNumbers as specified in IEC62055-41, and as listed below in Table 3.

APDU information to be used for this test:

MeterPAN	60072700000000009
TCT	02
DKGA	01
EA	07
SGC	123456, 234567 (steps 37,38,53,54)
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK ₉	ABABABABABABABAB
Vending Key VDDK	BABABABABABABABA (steps 37,38,53,54)

Table 3 – Special DRN Values

STEP	Meter PAN	Old Value	New Value
1	600727010900000090	TI = 1	TI = 2
2	600727010900049931	TI = 1	TI = 2

3	600727010000000081	TI = 1	TI = 2
4	600727010049999996	TI = 1	TI = 2
5	600727030000000048	TI = 1	TI = 2
6	600727031140000070	TI = 1	TI = 2
7	600727040000000021	TI = 1	TI = 2
8	600727040599999971	TI = 1	TI = 2
9	600727060100000051	TI = 1	TI = 2
10	600727060399999971	TI = 1	TI = 2
11	600727064000000039	TI = 1	TI = 2
12	600727064199999975	TI = 1	TI = 2
13	600727066600000087	TI = 1	TI = 2
14	600727066999999980	TI = 1	TI = 2
15	600727069900000179	TI = 1	TI = 2
16	600727069900099924	TI = 1	TI = 2
17	600727070000000051	TI = 1	TI = 2
18	600727070209999962	TI = 1	TI = 2
19	000001010900000074	TI = 1	TI = 2
20	000001010900049915	TI = 1	TI = 2
21	000001010000000065	TI = 1	TI = 2
22	000001010049999970	TI = 1	TI = 2
23	000001030000000022	TI = 1	TI = 2
24	000001031140000054	TI = 1	TI = 2
25	000001040000000005	TI = 1	TI = 2
26	000001040599999955	TI = 1	TI = 2
27	000001060100000036	TI = 1	TI = 2
28	000001060100000036	TI = 1	TI = 2
29	000001064000000013	TI = 1	TI = 2
30	000001064199999959	TI = 1	TI = 2
31	000001066600000061	TI = 1	TI = 2
32	000001066999999964	TI = 1	TI = 2
33	000001069900000153	TI = 1	TI = 2
34	000001069900099908	TI = 1	TI = 2
35	000001070000000036	TI = 1	TI = 2
36	000001070209999947	TI = 1	TI = 2
37 (note1)	000001010900000074	TI = 1	TI = 2
38 (note1)	000001010900049915	TI = 1	TI = 2
39	000001010899999955	TI = 1	TI = 2
40	000001010900050061	TI = 1	TI = 2
41	000001010050000015	TI = 1	TI = 2
42	000001031140000138	TI = 1	TI = 2
43	000001040600000074	TI = 1	TI = 2
44	000001060099999917	TI = 1	TI = 2
45	000001060400000074	TI = 1	TI = 2
46	000001063999999995	TI = 1	TI = 2
47	000001064200000078	TI = 1	TI = 2
48	000001066599999943	TI = 1	TI = 2
49	000001067000000081	TI = 1	TI = 2
50	000001069900000070	TI = 1	TI = 2
51	000001069900100060	TI = 1	TI = 2
52	000001070210000081	TI = 1	TI = 2
53 (note1)	000001010899999955	TI = 1	TI = 2
54 (note1)	000001010900050061	TI = 1	TI = 2

Note1: for steps 37, 38, 53, 54 above, use VDDK = BABABABABABABABA, SGC = 234567

Step	Instruction	Expected Result
1	According to the manufacturer's instructions provided in Table 5, generate a Keychange token pair with the information in the APDU above, and the values for each step given in Table 3 above.	The tokens generated must be: 3592 7668 9428 9733 7448 0072 7946 8337 3014 7810
2	As above for Step 2 of Table 3.	The tokens generated must be: 6108 6856 4479 5843 6817 0283 2015 1107 7521 5085

Step	Instruction	Expected Result
3	As above for Step 3 of Table 3.	The tokens generated must be: 4161 9910 2092 4876 2695 5316 2942 7438 4417 9250
4	As above for Step 4 of Table 3.	The tokens generated must be: 5638 3205 9622 8710 6298 1797 2297 3039 5145 6163
5	As above for Step 5 of Table 3.	The tokens generated must be: 1782 7529 9803 9202 0012 1715 2993 1918 0608 4745
6	As above for Step 6 of Table 3.	The tokens generated must be: 2733 2656 2300 7161 1462 0394 2274 4888 4275 8958
7	As above for Step 7 of Table 3.	The tokens generated must be: 0757 2007 2868 1522 8784 5630 8108 3049 7440 4616
8	As above for Step 8 of Table 3.	The tokens generated must be: 5886 3169 7953 5335 7222 2488 1931 0359 2504 2657
9	As above for Step 9 of Table 3.	The tokens generated must be: 2038 3880 9669 2314 9493 1910 9566 8330 8604 4789
10	As above for Step 10 of Table 3.	The tokens generated must be: 2196 1132 8178 0361 9328 0658 7768 0446 9975 4637
11	As above for Step 11 of Table 3.	The tokens generated must be: 0281 5459 9784 4531 5828 1609 8177 3393 6252 2661
12	As above for Step 12 of Table 3.	The tokens generated must be: 5105 3359 3072 9580 0926 6395 9618 6190 9334 4464

Step	Instruction	Expected Result
13	As above for Step 13 of Table 3.	The tokens generated must be: 7008 7355 4677 8873 8485 3108 9163 6324 6322 5851
14	As above for Step 14 of Table 3.	The tokens generated must be: 1824 9125 4110 8794 1196 5115 3633 7117 1194 8368
15	As above for Step 15 of Table 3.	The tokens generated must be: 4988 2844 3619 1068 7239 6674 6540 1189 9684 0413
16	As above for Step 16 of Table 3.	The tokens generated must be: 1638 9749 3031 4770 6911 6062 0750 9273 2238 1344
17	As above for Step 17 of Table 3.	The tokens generated must be: 6874 9651 5337 0684 1306 0421 0312 0322 5012 2390
18	As above for Step 18 of Table 3.	The tokens generated must be: 1059 1438 8877 5053 1328 1311 3060 8708 7323 3102
19	As above for Step 19 of Table 3.	The tokens generated must be: 0658 6699 3811 1799 1238 1445 2339 3329 6788 9446
20	As above for Step 20 of Table 3.	The tokens generated must be: 6100 4878 7137 0954 8239 5785 2010 0889 9432 4078
21	As above for Step 21 of Table 3.	The tokens generated must be: 0633 1779 3684 1735 2466 2134 4877 7320 4813 0119
22	As above for Step 22 of Table 3.	The tokens generated must be: 4745 6187 6818 9595 7889 4581 4167 6737 7614 6119

Step	Instruction	Expected Result
23	As above for Step 23 of Table 3.	The tokens generated must be: 4442 9599 3226 4323 9356 5591 5044 6549 5164 7558
24	As above for Step 24 of Table 3.	The tokens generated must be: 0413 7852 2773 1051 7528 6105 3310 7455 0756 4402
25	As above for Step 25 of Table 3.	The tokens generated must be: 2700 9097 8807 0588 7279 4240 1568 0535 3110 4797
26	As above for Step 26 of Table 3.	The tokens generated must be: 44772789443083642397 05435281014048624022
27	As above for Step 27 of Table 3.	The tokens generated must be: 04357129714739604615 29363890658509914644
28	As above for Step 28 of Table 3.	The tokens generated must be: 3065 7172 8174 2393 0700 3328 8561 7602 6693 2236
29	As above for Step 29 of Table 3.	The tokens generated must be: 6527 0936 7754 8909 1947 3496 3875 6348 3428 8805
30	As above for Step 30 of Table 3.	The tokens generated must be: 3864 2791 2683 0822 4590 1889 5683 7248 7680 0487
31	As above for Step 31 of Table 3.	The tokens generated must be: 0678 3351 4868 6437 4923 4630 8531 8109 5382 7663
32	As above for Step 32 of Table 3.	The tokens generated must be: 6278 0696 0783 3967 8844 4640 6807 0798 8835 1245

Step	Instruction	Expected Result
33	As above for Step 33 of Table 3.	The tokens generated must be: 4928 1789 2745 5597 9090 7087 0980 5543 0601 2085
34	As above for Step 34 of Table 3.	The tokens generated must be: 0089 7788 6498 3298 6229 3268 4228 6625 7024 3579
35	As above for Step 35 of Table 3.	The tokens generated must be: 4953 7844 2773 6592 4596 7078 2669 5568 2832 6739
36	As above for Step 36 of Table 3.	The tokens generated must be: 2956 0772 3786 0732 9221 3965 3245 8015 9550 8367
37	As above for Step 37 of Table 3. But using VDDK = BABABABABABABABA and SGC = 234567	The tokens generated must be: 3505 9143 7572 4912 1081 2414 0071 5644 0334 7632
38	As above for Step 38 of Table 3. But using VDDK = BABABABABABABABA and SGC = 234567	The tokens generated must be: 1139 4666 1689 5596 3502 6527 4265 0074 3357 5688
39	As above for Step 39 of Table 3.	The tokens generated must be: 5507 5870 2460 9360 7384 5510 9598 9147 8050 3395
40	As above for Step 40 of Table 3.	The tokens generated must be: 4418 0160 1790 4749 6207 3132 1669 6093 8301 4266
41	As above for Step 41 of Table 3.	The tokens generated must be: 4540 9284 2211 2710 3323 1889 3694 5462 7658 3856
42	As above for Step 42 of Table 3.	The tokens generated must be: 6315 9007 1748 7754 6240 2484 7516 2752 9728 1753

Step	Instruction	Expected Result
43	As above for Step 43 of Table 3.	The tokens generated must be: 3397 3502 9336 4982 6369 6635 7269 5962 5713 3868
44	As above for Step 44 of Table 3.	The tokens generated must be: 4998 9018 6453 4555 9849 5136 6880 1580 8535 6419
45	As above for Step 45 of Table 3.	The tokens generated must be: 3293 3770 7908 9991 7130 4497 1626 6548 3047 8656
46	As above for Step 46 of Table 3.	The tokens generated must be: 5803 7275 1971 9877 4833 5995 0033 3247 1350 9653
47	As above for Step 47 of Table 3.	The tokens generated must be: 3615 5558 9842 0751 6583 3221 3079 1913 6021 2126
48	As above for Step 48 of Table 3.	The tokens generated must be: 1564 6927 3863 3735 4399 4524 7274 4394 3218 6934
49	As above for Step 49 of Table 3.	The tokens generated must be: 4883 8883 9023 7135 4400 4742 1382 7234 0728 7663
50	As above for Step 50 of Table 3.	The tokens generated must be: 2267 4611 6677 3688 5082 0872 8168 4379 2402 8441
51	As above for Step 51 of Table 3.	The tokens generated must be: 0520 2623 7298 2543 7071 1339 6813 0026 7948 2705
52	As above for Step 52 of Table 3.	The tokens generated must be: 5508 0565 7202 0769 3633 2924 5725 4904 4070 6310

Step	Instruction	Expected Result
53	As above for Step 53 of Table 3. But using VDDK = BABABABABABABABA and SGC = 234567	The tokens generated must be: 7319 8175 1033 0427 9927 6513 6582 4149 7180 6316
54	As above for Step 54 of Table 3. But using VDDK = BABABABABABABABA and SGC = 234567	The tokens generated must be: 3984 6023 5780 1608 8169 1511 3957 1078 8809 6620

4.21 CTSH20 – Tokens Generated Using Algorithm DKG A01 for Special SGC Values

Overview: This test verifies general compliance with respect to the generation of ClearTamper tokens using Decoder Key Generation Algorithm DKG A01 for specific SupplyGroupCodes as specified in IEC62055-41, and as listed in Table 4 below.

Note: This test is only to be done if the UUT supports Algorithm DKG A01.

APDU information to be used for this test:

MeterPAN	600727000000000009 (steps 1-7) 000001030008352094 (steps 8-15)
TCT	02
DKGA	01
EA	07
SGC	Various
TI	01
KRN	1
KT	3
KeyExpiryNumber	FF
Vending Key VCDK ₂₋₈	4949494949494949

Table 4 - Special SGC Values

STEP	SGC	Control Field	Issue Date
1	100702	0	1995-04-21 11:00:00
2	990400	0	1995-04-21 11:00:00
3	990401	0	1995-04-21 11:00:00
4	990402	0	1995-04-21 11:00:00
5	990403	0	1995-04-21 11:00:00
6	990404	0	1995-04-21 11:00:00
7	990405	0	1995-04-21 11:00:00
8	100702	0	1995-04-21 11:00:00
9	990400	0	1995-04-21 11:00:00
10	990401	0	1995-04-21 11:00:00
11	990402	0	1995-04-21 11:00:00
12	990403	0	1995-04-21 11:00:00
13	990404	0	1995-04-21 11:00:00
14	990405	0	1995-04-21 11:00:00
15	345678	0	1995-04-21 11:00:00

Step	Instruction	Expected Result
1	According to the manufacturer's instructions provided in Table 5, generate a ClearTamper token with the information in the APDU above, and the values for each step given in Table 4 above.	The token must be identical to one of the tokens specified in the first token table below.

Step	Instruction	Expected Result
2	As above for Step 2 of Table 4.	The token must be identical to one of the tokens specified in the second token table below.
3	As above for Step 3 of Table 4.	The token must be identical to one of the tokens specified in the third token table below.
4	As above for Step 4 of Table 4.	The token must be identical to one of the tokens specified in the fourth token table below.
5	As above for Step 5 of Table 4.	The token must be identical to one of the tokens specified in the fifth token table below.
6	As above for Step 6 of Table 4.	The token must be identical to one of the tokens specified in the sixth token table below.
7	As above for Step 7 of Table 4.	The token must be identical to one of the tokens specified in the seventh token table below.
8	As above for Step 8 of Table 4.	The token must be identical to one of the tokens specified in the eighth token table below.
9	As above for Step 9 of Table 4.	The token must be identical to one of the tokens specified in the ninth token table below.
10	As above for Step 10 of Table 4.	The token must be identical to one of the tokens specified in the tenth token table below.
11	As above for Step 11 of Table 4.	The token must be identical to one of the tokens specified in the eleventh token table below.
12	As above for Step 12 of Table 4.	The token must be identical to one of the tokens specified in the twelfth token table below.
13	As above for Step 13 of Table 4.	The token must be identical to one of the tokens specified in the thirteenth token table below.
14	As above for Step 14 of Table 4.	The token must be identical to one of the tokens specified in the fourteenth token table below.

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0260 4663 5961 3444 3631	0	0301 0549 8456 9892 0164
1	0838 1939 4939 6475 0664	1	0334 7726 4932 9059 9583
2	1636 0533 3808 6267 9444	2	1373 1547 4486 7851 6205
3	1906 6024 7193 3178 1617	3	1830 7464 5080 1397 9983
4	2000 1851 1029 8392 0689	4	2287 4583 5985 7444 3928
5	2257 7962 3380 9297 0110	5	2614 6239 8979 8632 2196
6	2532 8199 4474 6445 3219	6	2872 3188 7661 4701 5239

7	2793 9877 9650 0674 6967	7	3216 1593 4153 3961 5662
8	3219 6778 3189 5314 7662	8	4650 2619 4352 7226 0758
9	3270 4848 0000 9636 6000	9	4943 5240 6063 9701 0895
10	3655 2164 9256 3383 2001	10	5195 9631 4061 6078 3118
11	4023 7129 1942 4001 9541	11	5233 5565 5379 7261 3920
12	4341 3487 9211 6019 1754	12	5749 6571 7205 5235 4788
13	4387 7827 9391 9940 2242	13	6680 3982 4762 4822 8804
14	5694 2303 7686 1430 1445	14	6734 4583 0604 8390 8040
15	7077 3043 4334 5618 7175	15	7187 9510 6061 6756 6362

Third Token Table		Fourth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0003 9056 6355 4445 6423	0	0814 8215 7821 4694 4778
1	0036 4204 9302 6394 3014	1	1395 9513 8227 1858 6519
2	1502 3678 3700 9363 0562	2	1643 5655 1613 2337 2465
3	1731 3217 0762 3780 2807	3	2261 3132 0332 8189 9751
4	2486 3889 0289 0425 7694	4	3253 6255 7116 8279 7689
5	2575 3987 3692 2578 7115	5	4178 9919 9130 0044 9287
6	3211 2866 3590 6100 2184	6	4408 2596 9442 2422 9081
7	4412 3404 2504 7146 9876	7	4501 2332 6980 4548 5075
8	4451 1260 9327 5399 3256	8	4581 7075 2334 3651 3769
9	5033 6926 0324 6719 9257	9	5092 7802 0662 0797 2057
10	5188 4899 9061 9973 2262	10	5693 9939 9925 7325 6128
11	5416 7398 0829 5663 0267	11	5724 6892 8113 1124 7918
12	6107 9661 0151 9316 8867	12	5952 3965 9890 8232 3733
13	6238 4390 1354 5679 7229	13	6076 5329 4097 6943 4702
14	6245 8094 0065 8347 3545	14	6170 1140 0250 0439 6983
15	6749 0299 5519 9721 0448	15	6361 0368 5076 4139 6077

Fifth Token Table		Sixth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0142 2004 9823 3355 5853	0	0812 9629 9441 9675 1965
1	0304 6325 1461 8768 7048	1	0829 4081 6822 1705 2307
2	0775 2028 8148 8555 5239	2	0899 4602 5873 8961 5615
3	0909 6763 1970 4027 1147	3	1112 7805 9941 4515 7272
4	0959 5471 0278 0355 3259	4	1446 0508 2201 1491 7565
5	0996 0355 4559 1644 5611	5	3021 0389 1275 0780 9876
6	1773 3655 3708 6231 4395	6	3498 6539 8948 4801 4934
7	2296 3378 0950 1933 7395	7	3706 2367 0956 1460 6220
8	3744 2743 7299 9796 5595	8	3997 0132 4557 0168 4228
9	4640 4087 1941 8327 2461	9	4513 9540 5584 0840 8173
10	5363 4513 1813 9512 8553	10	4781 9531 5282 4030 3313
11	5512 7945 5209 3321 4398	11	5269 8893 0281 5139 2388
12	5698 0087 8742 6142 9599	12	5843 9217 3391 3568 6638
13	6392 8171 0925 4601 6376	13	6636 7979 0301 1544 5910
14	6781 5390 4128 1560 7726	14	6923 2441 4405 8877 8486
15	6937 6778 7868 2749 9815	15	7071 7037 0936 9444 2656

Seventh Token Table	
Ordinal	Token Decimal Digits
0	0899 4266 4364 5068 3030
1	1621 8252 0461 3323 0314
2	3062 4167 8084 4282 1074
3	3066 5825 7205 4830 2359
4	3165 8002 6974 2219 7288
5	4233 9847 4052 2513 7826
6	4798 4250 4626 0988 6416
7	4803 0052 9350 3432 1708

8	5022 3134 6154 0885 2973
9	5069 2450 7255 3287 3034
10	5363 0874 1983 9057 4416
11	5490 3945 3670 7299 8565
12	5797 2634 5327 4658 5087
13	6247 3453 7110 4475 2448
14	7036 4996 6429 2034 9134
15	7344 7236 3166 4513 1393

Eighth Token Table		Ninth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0260 4663 5961 3444 3631	0	0301 0549 8456 9892 0164
1	0838 1939 4939 6475 0664	1	0334 7726 4932 9059 9583
2	1636 0533 3808 6267 9444	2	1373 1547 4486 7851 6205
3	1906 6024 7193 3178 1617	3	1830 7464 5080 1397 9983
4	2000 1851 1029 8392 0689	4	2287 4583 5985 7444 3928
5	2257 7962 3380 9297 0110	5	2614 6239 897986322196
6	2532 8199 4474 6445 3219	6	2872 3188 7661 4701 5239
7	2793 9877 9650 0674 6967	7	3216 1593 4153 3961 5662
8	3219 6778 3189 5314 7662	8	4650 2619 4352 7226 0758
9	3270 4848 0000 9636 6000	9	4943 5240 6063 9701 0895
10	3655 2164 9256 3383 2001	10	5195 9631 4061 6078 3118
11	4023 7129 1942 4001 9541	11	5233 5565 5379 7261 3920
12	4341 3487 9211 6019 1754	12	5749 6571 7205 5235 4788
13	4387 7827 9391 9940 2242	13	6680 3982 4762 4822 8804
14	5694 2303 7686 1430 1445	14	6734 4583 0604 8390 8040
15	7077 3043 4334 5618 7175	15	7187 9510 6061 6756 6362

Tenth Token Table		Eleventh Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0003 9056 6355 4445 6423	0	0814 8215 7821 4694 4778
1	0036 4204 9302 6394 3014	1	1395 9513 8227 1858 6519
2	1502 3678 3700 9363 0562	2	1643 5655 1613 2337 2465
3	1731 3217 0762 3780 2807	3	2261 3132 0332 8189 9751
4	2486 3889 0289 0425 7694	4	3253 6255 7116 8279 7689
5	2575 3987 3692 2578 7115	5	4178 9919 9130 0044 9287
6	3211 2866 3590 6100 2184	6	4408 2596 9442 2422 9081
7	4412 3404 2504 7146 9876	7	4501 2332 6980 4548 5075
8	4451 1260 9327 5399 3256	8	4581 7075 2334 3651 3769
9	5033 6926 0324 6719 9257	9	5092 7802 0662 0797 2057
10	5188 4899 9061 9973 2262	10	5693 9939 9925 7325 6128
11	5416 7398 0829 5663 0267	11	5724 6892 8113 1124 7918
12	6107 9661 0151 9316 8867	12	5952 3965 9890 8232 3733
13	6238 4390 1354 5679 7229	13	6076 5329 4097 6943 4702
14	6245 8094 0065 8347 3545	14	6170 1140 0250 0439 6983
15	6749 0299 5519 9721 0448	15	6361 0368 5076 4139 6077

Twelfth Token Table		Thirteenth Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0142 2004 9823 3355 5853	0	0812 9629 9441 9675 1965
1	0304 6325 1461 8768 7048	1	0829 4081 6822 1705 2307
2	0775 2028 8148 8555 5239	2	0899 4602 5873 8961 5615
3	0909 6763 1970 4027 1147	3	1112 7805 9941 4515 7272
4	0959 5471 0278 0355 3259	4	1446 0508 2201 1491 7565
5	0996 0355 4559 1644 5611	5	3021 0389 1275 0780 9876
6	1773 3655 3708 6231 4395	6	3498 6539 8948 4801 4934
7	2296 3378 0950 1933 7395	7	3706 2367 0956 1460 6220
8	3744 2743 7299 9796 5595	8	3997 0132 4557 0168 4228

Step	Instruction	Expected Result
2	According to the manufacturer's instructions provided in Table 5, generate Keychange tokens with the information in the APDU above from DITK to DCTK.	The tokens generated must be: 0404 1855 6802 2441 4109 2551 3218 8770 2935 2668 3715 6514 1193 0290 8681 2947 1664 6315 5092 0643
3	According to the manufacturer's instructions provided in Table 5, generate Keychange tokens with the information in the APDU above from DITK to DDTK.	The tokens generated must be: 5413 0434 3864 5785 2616 2768 2638 7521 6223 9762 5742 3952 6094 5868 0531 6432 1577 7107 0031 7871

4.23 CTSH22 – Generation of ClearCredit tokens using various base dates

Overview: This test verifies general compliance with respect to the generation of a ClearCredit token, and tests the base date parameter in the generation of the decoder key.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	11
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUDK _{4&5}	ABABABABABABAB9494949494949401234567
Register to clear	0

Step Number	TokenIssueDate	Base Date
1	2014-01-01 10:00:00	2014 (VUDK ₄)
2	2035-01-01 10:00:00	2035 (VUDK ₅)

Step	Instruction	Expected Result
1 – 2	According to the manufacturer's instructions provided in Table 5, generate ClearCredit tokens with the information in the APDU above, and for each of the steps indicated above.	The token must be identical to one of the tokens specified in the token tables below corresponding to the step number. i.e. step 1 corresponds to the First Token Table.

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0267 4016 3007 6599 9092	0	0755 4068 2391 2323 0889
1	0707 6512 4860 0929 1224	1	0820 3705 0777 0796 7854
2	0789 9654 7032 6115 4271	2	2617 6140 7027 4691 1276
3	1314 6466 9916 5973 2820	3	2767 3819 4039 8125 2124
4	1403 6252 1660 9884 5909	4	3236 1991 1868 8008 1950
5	1716 4579 6166 9426 7718	5	3715 3166 8644 7599 3661
6	2466 6651 1523 4611 7660	6	3809 9664 5603 5964 6131
7	2879 3950 7386 3891 2461	7	3993 6171 5806 3723 0684
8	3522 0712 7856 9424 6220	8	4622 5956 9334 6054 0976

9	3718 1050 8637 2497 4562	9	5423 1693 3402 1117 8065
10	3955 4428 7262 5561 7850	10	5796 3262 8416 9778 2019
11	5744 8340 9440 1328 6873	11	6598 2505 3045 4204 2463
12	6390 1164 5781 4122 3460	12	6826 9339 8240 9542 6615
13	6626 7899 9929 2952 4677	13	7232 4962 7027 7748 7987
14	6727 6840 7629 4160 8481	14	7244 3096 4294 7324 2050
15	7112 8800 1782 1399 3433	15	7276 6813 4666 7043 4139

4.24 CTSH23 – Generation of various tokens using DKGA=04 and EA=07

Overview: This test verifies general compliance with respect to the generation of various tokens using DKGA04 and EA=07. Tests the correct generation of the EA=07 decoder key using the DKGA=04.

APDU information to be used for this test:

MeterPAN	600727000000000009
TCT	02
DKGA	04
EA	07
SGC	123457
TI	01
KRN	1
KT	2
KeyExpiryNumber	FF
Vending Key VUUDK _i	ABABABABABABAB9494949494949401234567
Register to clear	0
Base Date	1993

Step Number	TokenIssueDate	Token Type
1	2014-01-01 10:00:00	1kWh Electricity Credit Token
2	2014-01-02 10:00:00	Clear Credit

Step	Instruction	Expected Result
1 – 2	According to the manufacturer’s instructions provided in Table 5, generate tokens with the information in the APDU above, and for each of the steps indicated above.	The token must be identical to one of the tokens specified in the token tables below corresponding to the step number. i.e. step 1 corresponds to the First Token Table.

First Token Table		Second Token Table	
Ordinal	Token Decimal Digits	Ordinal	Token Decimal Digits
0	0148 9930 8262 2634 2618	0	0118 5366 6596 7433 4554
1	0149 9220 8393 6725 8502	1	0363 0512 6391 4985 8683
2	0764 4953 4513 2567 7708	2	0752 4099 8965 7777 3373
3	1372 7253 3197 2343 9956	3	2298 1859 9309 3130 7485
4	1489 8091 2347 6900 7262	4	2373 4811 6391 4778 1368
5	1934 7303 6132 9900 8824	5	2671 4316 8865 1778 4588
6	2076 5784 6327 7106 1100	6	3170 7221 0662 7327 5984
7	2211 3165 5587 4173 7117	7	3291 7474 6026 2153 7206
8	2725 0454 8904 8985 3242	8	4010 1171 2867 1841 7653
9	2974 7709 2011 1482 6649	9	4670 0801 8610 8033 0516
10	3383 8336 3643 9304 9070	10	5852 9127 6455 7446 4470
11	3708 4192 5702 3162 3652	11	6402 9213 6421 4741 4295
12	5507 7092 3604 9172 2761	12	6447 3397 6405 8727 2659
13	6232 1139 4608 1293 7215	13	6690 7826 8627 7387 7929

14	6706 0991 3475 8241 4448	14	6911 1030 2318 1011 8003
15	6839 1287 6361 7733 9142	15	7321 4208 7482 2381 8689

5 Annexure A – Compliance Verification Request

1.	Manufacturer:	
2.	Product Name/Model:	
3.	Product Firmware Version:	
4.	Contact Name:	
5.	Manufacture Date:	
6.	Mobile Number:	
	Phone Number:	
	Facsimile Number:	
	Email Address:	
7.	Physical and Postal Address	
8.	Date:	

6 Annexure B – Additional Information

Table 5 - Supplier Submitted Information

1.	Manufacturer:		Submission Date:		
2.	Name/Model:		Firmware Version :		
3.	Allocated Manufacturer Code:				
4.	Serial Communications Port:	Yes	No	(Tick what is applicable)	
5.	TCP/IP Communications Port:	Yes	No	(Tick what is applicable)	
6.	Is the UUT a manufacturing Module	Yes	No	(Tick what is applicable)	
7.	Manufacturer has supplied all information for the generation of: a) Credit Tokens b) Keychange Tokens c) Management Tokens d) API or Test Harness	Yes	No	(Tick what is applicable)	
8.	State which Utility is Supported	Electricity	Water	Gas	Time
9.	State which Currency is Supported	Electricity	Water	Gas	Time

7 Annexure C – Entity Type H Test Overviews

Test No	Description	IEC62055-41 ED3 Applicable Clause	Other implementations tested
CTSH01	electricity credit token using KT=02	6.2.2, 6.3.3 - 6.3.7	
CTSH02	water credit token using KT=02	6.2.2, 6.3.3 - 6.3.7	
CTSH03	gas credit token using KT=02	6.2.2, 6.3.3 - 6.3.7	
CTSH04	time credit token using KT=02	6.2.2, 6.3.3 - 6.3.7	
CTSH05	currency credit token using KT=02	6.2.2, 6.3.3 - 6.3.7	
CTSH06	DUTK to DUTK key change	6.2.7, 6.2.8	
CTSH07	currency credit token using KT=02 and 4 digit manufacturer code	6.2.7, 6.2.8	
CTSH08	maximum power load token	6.2.4, 6.3.9	
CTSH09	phase power unbalance limit token	6.2.10, 6.3.10	
CTSH10	clear credit token	6.2.5, 6.3.13	
CTSH11	clear tamper token	6.2.9	
CTSH12	set tariff rate token	6.2.6, 6.3.11	
CTSH13	set water factor token	6.3.12	
CTSH14	STS reserved token	6.2.12	
CTSH15	reserved for proprietary use token	6.2.13	
CTSH16	Random Number Test	6.6.2 - 6.2.13	
CTSH17	Key type Rules	6.5.2.4	
CTSH18			
CTSH19	Decoder Key Generation Algorithm DKGA01	6.5.3.3	
CTSH20	DKGA01, with special SGC values	6.5.3.3	
CTSH21	DITK to DUTK key change	6.2.7, 6.2.8	
CTSH22	ClearCredit tokens using various base dates	6.3.5.1	