BS EN 62386-207:2009

BSI Standards Publication

Digital addressable lighting interface —

Part 207: Particular requirements for control gear — LED modules (device type 6)

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National foreword

This British Standard is the UK implementation of EN 62386-207:2009. It is identical to IEC 62386-207:2009.

The UK participation in its preparation was entrusted by Technical Committee CPL/34, Lamps and related equipment, to Subcommittee CPL/34/3, Auxiliaries for lamps.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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(IEC 62386-207:2009)

Interface d'éclairage adressable numérique - Partie 207: Exigences particulières pour les appareillages de commande - Modules de DEL (dispositifs de type 6) (CEI 62386-207:2009)

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This European Standard was approved by CENELEC on 2009-09-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 34C/888/FDIS, future edition 1 of IEC 62386-207, prepared by SC 34C, Auxiliaries for lamps, of IEC TC 34, Lamps and related equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62386-207 on 2009-09-01.

This standard is to be used in conjunction with EN 62386-101 and EN 62386-102, which contain general requirements for the relevant product type (control gear or control devices).

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2010-06-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2012-09-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62386-207:2009 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60598-1	NOTE	Harmonized as EN 60598-1:2008 (modified).
IEC 60669-2-1	NOTE	Harmonized as EN 60669-2-1:2004 (modified).
IEC 60921	NOTE	Harmonized as EN 60921:2004 (not modified).
IEC 60923	NOTE	Harmonized as EN 60923:2005 (not modified).
IEC 60925	NOTE	Harmonized as EN 60925:1991 (not modified).
IEC 60929	NOTE	Harmonized as EN 60929:2006 (not modified).
IEC 61347-1	NOTE	Harmonized as EN 61347-1:2008 (modified).
IEC 61347-2-3	NOTE	Harmonized as EN 61347-2-3:2001 (not modified).
IEC 61547	NOTE	Harmonized as EN 61547:1995 (not modified).
IEC 62034	NOTE	Harmonized as EN 62034:2006 (not modified).
CISPR 15	NOTE	Harmonized as EN 55015:2006 (not modified).

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 62386-101	2009	Digital addressable lighting interface - Part 101: General requirements - System	EN 62386-101	2009
IEC 62386-102	2009	Digital addressable lighting interface - Part 102: General requirements - Control gear	EN 62386-102	2009

CONTENTS

INTRODUCTION

This first edition of IEC 62386-207 is published in conjunction with IEC 62386-101 and IEC 62386-102. The division of IEC 62386 into separately published parts provides for ease of future amendments and revisions. Additional requirements will be added as and when a need for them is recognised.

This International Standard, and the other parts that make up the IEC 62386-200 series, in referring to any of the clauses of IEC 62386-101 or IEC 62386-102, specify the extent to which such a clause is applicable and the order in which the tests are to be performed. The parts also include additional requirements, as necessary. All parts that make up IEC 62386-200 series are self-contained and therefore do not include references to each other.

Where the requirements of any of the clauses of IEC 62386-101 or IEC 62386-102 are referred to in this International Standard by the sentence "The requirements of IEC 62386-1XX, clause ‘n’ apply”, this sentence is to be interpreted as meaning that all requirements of the clause in question of Part 101 or Part 102 apply, except any which are inapplicable to the specific type of lamp control gear covered by Part 207.

All numbers used in this International Standard are decimal numbers unless otherwise noted. Hexadecimal numbers are given in the format 0xVV, where VV is the value. Binary numbers are given in the format XXXXXXXXb or in the format XXXX XXXX, where X is 0 or 1; 'x' in binary numbers means 'don't care'.

DIGITAL ADDRESSABLE LIGHTING INTERFACE –

Part 207: Particular requirements for control gear – LED modules (device type 6)

1 Scope

This International Standard specifies a protocol and test procedures for the control by digital signals of electronic control gear for use on a.c. or d.c. supplies, associated with LED modules.

NOTE Tests in this standard are type tests. Requirements for testing individual control gear during production are not included.

2 Normative references

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.

IEC 62386-101:2009, *Digital addressable lighting interface – Part 101: General requirements – System*

IEC 62386-102:2009, *Digital addressable lighting interface – Part 102: General requirements – Control gear*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in Clause 3 of IEC 62386-101:2009 and Clause 3 of IEC 62386-102:2009 shall apply, with the following additional definitions.

3.1
reference measurement
process during which control gear determines the actual LED load with internal procedures and measurements

NOTE The details of this process are a matter of detailed design of control gear and are outside the scope of this standard.

3.2
detection of load decrease
recognition that the actual LED load is significantly below the load measured during a successful “reference measurement”

NOTE The criteria for regarding a load increase or decrease as significant can only be decided by the manufacturer and these criteria should be described in the manual.

3.3
detection of load increase
recognition that the actual LED load is significantly above the load measured during a successful “reference measurement”

NOTE The criteria for regarding a load increase or decrease as significant can only be decided by the manufacturer and these criteria should be described in the manual.

3.4
current protector
protective device switching off the output if the actual LED load differs by more than ΔP from the load detected during the “reference measurement”

NOTE The value ΔP can only be specified by the manufacturer of the control gear and this value should be stated in the manual.

3.5
thermal overload
scenario where the maximum permissible control gear temperature is exceeded

3.6
thermal shut down
scenario where control gear switches off the LED because of a persistent thermal overload

3.7
light level reduction due to thermal overload
reduction of light level with the objective of decreasing control gear temperature

4 General

The requirements of Clause 4 of IEC 62386-101:2009 and Clause 4 of IEC 62386-102:2009 apply.

5 Electrical specification

The requirements of Clause 5 of IEC 62386-101:2009 and Clause 5 of IEC 62386-102:2009 apply.

6 Interface power supply

The requirements of Clause 6 of IEC 62386-101:2009 and Clause 6 of IEC 62386-102:2009 apply, if a power supply is integrated with the control gear.

7 Transmission protocol structure

The requirements of Clause 7 of IEC 62386-101:2009 and Clause 7 of IEC 62386-102:2009 apply.

8 Timing

The requirements of Clause 8 of IEC 62386-101:2009 and Clause 8 of IEC 62386-102:2009 apply.

9 Method of operation

The requirements of Clause 9 of IEC 62386-101:2009 and Clause 9 of IEC 62386-102:2009 apply, except as follows:

Addition to Clause 9 of IEC 62386-102:2009:

9.9 Detection of load decrease

If the actual LED load is significantly below the load measured during a successful “reference measurement”, the gear may switch off the lamp if this is necessary for its safe operation. The flag bit ‘load decrease’ is to be set.

9.10 Detection of load increase

If the actual LED load is significantly above the load measured during a successful “reference measurement”, the gear may switch off if this is necessary for its safe operation. The flag bit ‘load increase’ is to be set.

9.11 Current protector

If the actual LED load of the control gear differs by more than a defined amount ΔP from the load detected during the reference measurement, the current protector becomes active and switches off the LED.

The current protector shall not become active until there has been a successful reference measurement.

There are two possible situations in which the current protector becomes active:

– Overload: The actual LED load is higher than the load detected during the reference measurement by at least ΔP.

– Underload: The actual LED load is lower than the load detected during the reference measurement by at least ΔP.

The current protector shall become inactive either on mains voltage interruption or on receipt of a command which causes the arc power level to be 0. If after switching on again, the situation causing the current protector to become active still remains, the current protector shall become active again.

The current protector can be enabled and disabled by the commands 225 “ENABLE CURRENT PROTECTOR” and 226 “DISABLE CURRENT PROTECTOR”.

An active current protector shall become inactive upon reception of command 226 “DISABLE CURRENT PROTECTOR”.

If the current protector is active, command 224 “REFERENCE SYSTEM POWER” shall be ignored.

9.12 LED replacement on gear with load increase/decrease or current protector feature

If a LED is replaced with one of a different wattage without a new “REFERENCE SYSTEM POWER” measurement being performed, the control gear shall detect a load increase or load decrease as appropriate.

NOTE If a LED is replaced with one of the same wattage, the user should initiate a new ‘REFERENCE SYSTEM POWER’ measurement only if this is recommended by the manufacturer.

9.13 Fast Fade Time

The Fast Fade Time is used instead of the Fade Time if the Fade Time is equal to 0. The Fast Fade Time can be set to zero or to any value in the range “Min Fast Fade Time” to 27 as defined in Table 1.

Programming the Fast Fade Time to 0 means “no fade” (change of light output as quickly as possible).

Table 1 – Fast fade time

N°	Fast fade time ms	N°	Fast fade time ms	N°	Fast fade time ms	N°	Fast fade time ms
0	< 25	7	175	14	350	21	525
1	25	8	200	15	375	22	550
2	50	9	225	16	400	23	575
3	75	10	250	17	425	24	600
4	100	11	275	18	450	25	625
5	125	12	300	19	475	26	650
6	150	13	325	20	500	27	675

The “Min Fast Fade Time” can be queried by command 253 “QUERY MIN FAST FADE TIME”.

10 Declaration of variables

The requirements of Clause 10 of IEC 62386-102:2009 apply, with the following additional variables for this device type, as indicated in Table 2:

Table 2 – Declaration of variables

Variable	Default value (control gear leaves the factory)	Reset value	Range of validity	Memory [b]
“MIN FAST FADE TIME”	factory burn-in	no change	1 – 27	1 byte ROM
“FAST FADE TIME”	0	0	0 MIN FAST FADE TIME – 27	1 byte
“GEAR TYPE”	factory burn-in	no change	0 – 255	1 byte ROM
“POSSIBLE OPERATING MODES”	factory burn-in	no change	0 – 255	1 byte ROM
“FEATURES”	factory burn-in	no change	0 – 255	1 byte ROM
“FAILURE STATUS”	???? ???? [C]	no change	0 – 255	1 byte RAM [a]
“OPERATING MODE”	0000 ???? [C]	no change except bit 4 is reset to 0	0 – 255	1 byte RAM [a]
“DIMMING CURVE”	0	0	0 – 1	1 byte
“EXTENDED VERSION NUMBER” (See command 255)	1	no change	0 – 255	1 byte ROM
"DEVICE TYPE"	6	no change	0 – 254	1 byte ROM

? = undefined

[a] Bit 7 of “FAILURE STATUS” and bit 4 of “OPERATING MODE” shall be stored in persistent memory.

[b] Persistent memory (storage time indefinite) if not stated otherwise.

[c] Power up value, except bit 7 of “FAILURE STATUS” and bits 4-7 of “OPERATING MODE”

11 Definition of commands

The requirements of Clause 11 of IEC 62386-102:2009 apply, except as follows:

11.3.1 Queries related to status information

Command 146: YAAA AAA1 1001 0010 "QUERY LAMP FAILURE"

Replacement:

Ask if there is a lamp problem at the given address. Answer shall be 'Yes' or 'No'.

"Yes" means either open circuit or short circuit or load increase or load decrease or current protector active.

"No" does not necessarily imply that no lamps have failed.

Command 153: YAAA AAA1 1001 1001 "QUERY DEVICE TYPE"

Replacement:

The answer shall be 6.

11.3.4 Application extended commands

Replacement:

Application extended commands shall be preceded by command 272 "ENABLE DEVICE TYPE 6". For device types other than 6 these commands may be used in a different way. A control gear for LED modules shall not react to application extended commands preceded by command 272 "ENABLE DEVICE TYPE X" with X ≠ 6.

11.3.4.1 Application extended configuration commands

Every configuration command (224 to 228) shall be received a second time within 100 ms before it is executed to reduce the probability of incorrect reception. No other commands addressing the same control gear shall be sent between these two commands, otherwise the first such command shall be ignored and the respective configuration sequence shall be aborted.

Command 272 shall be sent before the two instances of the respective configuration command, but not repeated between them (see Figure 1).

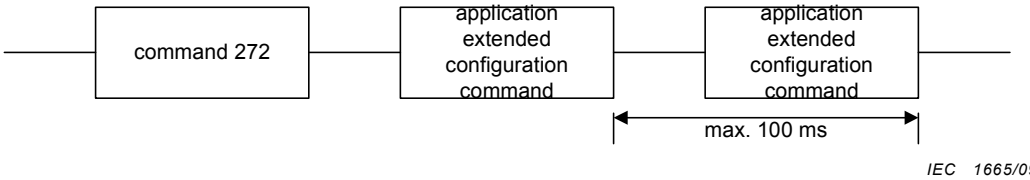


Figure 1 – Application extended configuration command sequence example

All values of DTR shall be checked against the values mentioned in Clause 10, i.e. the value shall be set to the upper / lower limit if it is above / below the valid range specified in - Clause 10.

Command 224: YAAA AAA1 1110 0000 "REFERENCE SYSTEM POWER"

The control gear shall measure and store system power levels to detect load increase or load decrease. This is an optional feature; it is up to the manufacturer to decide upon the number of system power levels each type of gear should measure.

The measured power level shall be stored in the persistent memory. Commands received during the measuring period shall be ignored except query commands and command 256.

After 15 min at most, the control gear shall finish the measurement process and shall go back to normal operation. The measurement process shall be aborted if command 256 "TERMINATE" is received.

If the current protector is active this command shall be ignored. In this case, bit 7 'reference measurement failed' in the answer to command 241 "QUERY FAILURE STATUS", shall be set and command 249 "QUERY REFERENCE MEASUREMENT FAILED" shall be answered with "Yes".

Control gear without this feature shall not react (see command 240).

Command 225: YAAA AAA1 1110 0001 "ENABLE CURRENT PROTECTOR"

Enables the current protector of the control gear. The current protector can become active after a successful reference measurement started by command 224.

The default configuration of the gear is "current protector enabled". The status of the current protector (enabled / disabled) shall be stored in the persistent memory of the control gear.

The current protector is an optional feature. Control gear without this feature shall not react (see command 240).

Command 226: YAAA AAA1 1110 0010 "DISABLE CURRENT PROTECTOR"

Disables the current protector of the control gear.

The current protector is an optional feature. Control gear without this feature shall not react in any way. (see command 240).

Command 227: YAAA AAA1 1110 0011 "SELECT DIMMING CURVE"

The dimming curve of the control gear shall be set in accordance with the value of DTR.

DTR = 1 sets the dimming curve to linear. In this case the light output shall be a linear function of the light level given by any of the arc power control commands in accordance with the formula

$$X(n) = \frac{n}{254} \cdot 100\ [\%]$$

DTR = 0 sets the dimming curve to the standard logarithmic output characteristics.

All other values of the DTR are reserved for future needs and shall not change the dimming curve.

When the dimming curve is changed, the PHYSICAL MINIMUM LEVEL shall also be adjusted to correspond to the physical minimum light output, which shall not be affected by the choice of dimming curve.

NOTE 1 There is no requirement for recalculating the programmable arc power levels when changing the dimming curve.

NOTE 2 It is recommended that the dimming curve be selected before arc power levels such as scenes, min level, max level, etc. are programmed.

Command 228: YAAA AAA1 1110 0100 "STORE DTR AS FAST FADE TIME"

If the content of DTR is zero or lies in the range MIN FAST FADE TIME to 27, it shall be stored as fast fade time. If the content of the DTR is greater than zero but less than MIN FAST FADE TIME then MIN FAST FADE TIME shall be stored as fast fade time. If the content of the DTR is greater than 27 then 27 shall be stored as fast fade time.

The control gear uses the fast fade time only if the standard fade time is 0.

Command 229: YAAA AAA1 1110 0101

Reserved for future needs. The control gear shall not react in any way.

Commands 230-231: YAAA AAA1 1110 011X

Reserved for future needs. The control gear shall not react in any way.

Commands 232-235: YAAA AAA1 1110 10XX

Reserved for future needs. The control gear shall not react in any way.

11.3.4.2 Application extended query commands

Commands 236: YAAA AAA1 1110 1100

Reserved for future needs. The control gear shall not react in any way.

Command 237: YAAA AAA1 1110 1101 "QUERY GEAR TYPE"

Answer shall be the following GEAR TYPE byte:

bit 0	LED power supply integrated	'0' = No
bit 1	LED module integrated	'0' = No
bit 2	a.c. supply possible	'0' = No
bit 3	d.c. supply possible	'0' = No
bit 4	unused	'0' = default value
bit 5	unused	'0' = default value
bit 6	unused	'0' = default value
bit 7	unused	'0' = default value

Command 238: YAAA AAA1 1110 1110 "QUERY DIMMING CURVE"

Answer shall be the dimming curve currently in use:

– 0 means standard logarithmic dimming curve;

– 1 means linear dimming curve.

Command 239: YAAA AAA1 1110 1111 "QUERY POSSIBLE OPERATING MODES"

Answer shall be the following POSSIBLE OPERATING MODES byte:

bit 0	PWM mode is possible	'0' = No
bit 1	AM mode is possible	'0' = No
bit 2	output is current controlled	'0' = No
bit 3	high current pulse mode	'0' = No
bit 4	unused	'0' = default value
bit 5	unused	'0' = default value
bit 6	unused	'0' = default value
bit 7	unused	'0' = default value

Command 240: YAAA AAA1 1111 0000 "QUERY FEATURES"

Answer shall be the following FEATURES byte, giving information about implemented optional features whose status can be queried from the control gear:

bit 0	short circuit detection can be queried	'0' = No
bit 1	open circuit detection can be queried	'0' = No
bit 2	detection of load decrease can be queried	'0' = No
bit 3	detection of load increase can be queried	'0' = No
bit 4	current protector is implemented and can be queried	'0' = No
bit 5	thermal shut down can be queried	'0' = No
bit 6	light level reduction due to over temperature can be queried	'0' = No
bit 7	physical selection supported	'0' = No

Bits 2, 3 and 4: If any of these features is available, command 224 "REFERENCE SYSTEM POWER", command 249 "QUERY REFERENCE RUNNING" and command 250 "QUERY REFERENCE MEASUREMENT FAILED" are mandatory.

NOTE The fact that a thermal overload protection is implemented and whose actual status can be queried does not relieve the user from the obligation to comply with the safety relevant information for installation given by the manufacturer. A note to this effect should be included in the manual.

Command 241: YAAA AAA1 1111 0001 "QUERY FAILURE STATUS"

Answer shall be the following "FAILURE STATUS" byte:

bit 0	short circuit	'0' = No
bit 1	open circuit	'0' = No
bit 2	load decrease	'0' = No
bit 3	load increase	'0' = No
bit 4	current protector active	'0' = No
bit 5	thermal shut down	'0' = No
bit 6	thermal overload with light level reduction	'0' = No
bit 7	reference measurement failed	'0' = No

The "FAILURE STATUS" shall be available in the RAM of the control gear and shall be updated regularly by the control gear in accordance with the actual situation.

Bit 0, short-circuit, means either a severe short circuit or a physical control gear overload (> 100 % of nominal load).

If any of bits 0 to 4 is set, the answer to command 146 "QUERY LAMP FAILURE" shall be "Yes" and bit 1 in the answer to command 144 "QUERY STATUS" shall be set.

Bit 7 shall be set if the reference measurement of the system power failed for any reason, or if there has been no reference measurement at all. It shall be stored in the persistent memory.

If reference measurement is not supported, this bit shall always be "0".

Command 242: YAAA AAA1 1111 0010 "QUERY SHORT CIRCUIT"

Ask if there is a short circuit detected at the given address. Answer shall be "Yes" or "No".

If there is a short circuit detected, the answer to command 146 "QUERY LAMP FAILURE" shall be "Yes" and bit 1 in the answer to command 144 "QUERY STATUS" shall be set.

Control gear without this feature shall not react (see command 240).

Command 243: YAAA AAA1 1111 0011 "QUERY OPEN CIRCUIT"

Ask if there is an open circuit detected at the given address. Answer shall be "Yes" or "No".

If there is an open circuit detected, the answer to command 146 "QUERY LAMP FAILURE" shall be "Yes" and bit 1 in the answer to command 144 "QUERY STATUS" shall be set.

Control gear without this feature shall not react (see command 240).

Command 244: YAAA AAA1 1111 0100 "QUERY LOAD DECREASE"

Ask if there is a significant load decrease (compared to the system reference power) detected at the given address. Answer shall be "Yes" or "No".

If there is a significant load decrease, the answer to command 146 "QUERY LAMP FAILURE" shall be "Yes" and bit 1 in the answer to command 144 "QUERY STATUS" shall be set.

Control gear without this feature shall not react (see command 240).

Command 245: YAAA AAA1 1111 0101 "QUERY LOAD INCREASE"

Ask if there is a significant load increase (compared to the system reference power) detected at the given address. Answer shall be "Yes" or "No".

If there is a significant load increase, the answer to command 146 "QUERY LAMP FAILURE" shall be "Yes" and bit 1 in the answer to command 144 "QUERY STATUS" shall be set.

Control gear without this feature shall not react (see command 240).

Command 246: YAAA AAA1 1111 0110 "QUERY CURRENT PROTECTOR ACTIVE"

Ask if current protection is active at the given address. Answer shall be "Yes" or "No".

If current protection is active, the answer to command 146 "QUERY LAMP FAILURE" shall be "Yes" and bit 1 in the answer to command 144 "QUERY STATUS" shall be set.

Control gear without this feature shall not react (see command 240).

Command 247: YAAA AAA1 1111 0111 "QUERY THERMAL SHUT DOWN"

Ask if there is a thermal shut down detected at the given address. Answer shall be "Yes" or "No".

Control gear without this feature shall not react (see command 240).

Command 248: YAAA AAA1 1111 1000 "QUERY THERMAL OVERLOAD"

Ask if there is a thermal overload with light level reduction detected at the given address. Answer shall be "Yes" or "No".

Control gear without this feature shall not react (see command 240).

Command 249: YAAA AAA1 1111 1001 "QUERY REFERENCE RUNNING"

Ask if there is the REFERENCE SYSTEM POWER measurement running at the given address. Answer shall be "Yes" or "No".

Control gear without this feature shall not react (see command 240).

Command 250: YAAA AAA1 1111 1010 "QUERY REFERENCE MEASUREMENT FAILED"

Ask if the reference measurement started by command 224 "REFERENCE SYSTEM POWER" failed. Answer shall be "Yes" or "No".

Control gear without this feature shall not react (see command 240).

Command 251: YAAA AAA1 1111 1011 "QUERY CURRENT PROTECTOR ENABLED"

Ask if the current protector is enabled. Answer shall be "Yes" or "No".

The current protector is an optional feature. Control gear without this feature shall not react in any way (see command 240).

Command 252: YAAA AAA1 1111 1100 "QUERY OPERATING MODE"

Answer shall be the following OPERATION MODE byte:

bit 0	PWM mode active	'0' = No
bit 1	AM mode active	'0' = No
bit 2	output is current controlled	'0' = No
bit 3	high current pulse mode is active	'0' = No
bit 4	non-logarithmic dimming curve active	'0' = No
bit 5	unused	'0' = default value
bit 6	unused	'0' = default value
bit 7	unused	'0' = default value

Command 253: YAAA AAA1 1111 1101 "QUERY FAST FADE TIME"

Answer shall be the Fast Fade Time as an 8-bit value.

Command 254: YAAA AAA1 1111 1110 "QUERY MIN FAST FADE TIME"

Answer shall be the Minimum Fast Fade Time as an 8-bit value.

Commands 255: YAAA AAA1 1111 1111 "QUERY EXTENDED VERSION NUMBER"

Answer shall be 1.

11.4.4 Extended special commands

Amendment:

Command 272: 1100 0001 0000 0110 "ENABLE DEVICE TYPE 6"

The device type for control gears for LED modules is 6.

11.5 Summary of the command set

The commands listed in 11.5 of IEC 62386-102:2009 apply with the following additional commands for device type 6 listed in Table 3.

Table 3 – Summary of the application extended command set

Command Number	Command Code	Command Name
224	YAAA AAA1 1110 0000	REFERENCE SYSTEM POWER
225	YAAA AAA1 1110 0001	ENABLE CURRENT PROTECTOR
226	YAAA AAA1 1110 0010	DISABLE CURRENT PROTECTOR
227	YAAA AAA1 1110 0011	SELECT DIMMING CURVE
228	YAAA AAA1 1110 0100	STORE DTR AS FAST FADE TIME
229	YAAA AAA1 1110 0101	[a]
230 – 231	YAAA AAA1 1110 011X	[a]
232 – 235	YAAA AAA1 1110 10XX	[a]
236	YAAA AAA1 1110 1100	[a]
237	YAAA AAA1 1110 1101	QUERY GEAR TYPE
238	YAAA AAA1 1110 1110	QUERY DIMMING CURVE
239	YAAA AAA1 1110 1111	QUERY POSSIBLE OPERATING MODES
240	YAAA AAA1 1111 0000	QUERY FEATURES
241	YAAA AAA1 1111 0001	QUERY FAILURE STATUS
242	YAAA AAA1 1111 0010	QUERY SHORT CIRCUIT
243	YAAA AAA1 1111 0011	QUERY OPEN CIRCUIT
244	YAAA AAA1 1111 0100	QUERY LOAD DECREASE
245	YAAA AAA1 1111 0101	QUERY LOAD INCREASE
246	YAAA AAA1 1111 0110	QUERY CURRENT PROTECTOR ACTIVE
247	YAAA AAA1 1111 0111	QUERY THERMAL SHUT DOWN
248	YAAA AAA1 1111 1000	QUERY THERMAL OVERLOAD
249	YAAA AAA1 1111 1001	QUERY REFERENCE RUNNING
250	YAAA AAA1 1111 1010	QUERY REFERENCE MEASUREMENT FAILED
251	YAAA AAA1 1111 1011	QUERY CURRENT PROTECTOR ENABLED
252	YAAA AAA1 1111 1100	QUERY OPERATING MODE
253	YAAA AAA1 1111 1101	QUERY FAST FADE TIME
254	YAAA AAA1 1111 1110	QUERY MIN FAST FADE TIME
255	YAAA AAA1 1111 1111	QUERY EXTENDED VERSION NUMBER
272	1100 0001 0000 0110	ENABLE DEVICE TYPE 6

[a] Reserved for future needs. The control gear should not react in any way.

12 Test procedures

The requirements of Clause 12 of IEC 62386-102:2009 apply, except as follows:

12.4 Test sequence “Physical address allocation”

Amendment:

Physical selection is an optional feature of control gears of device type 6. Therefore this test sequence is not mandatory.

Additional subclause:

12.7 Test sequences "APPLICATION EXTENDED COMMANDS FOR DEVICE TYPE 6"

The application extended commands defined for device type 6 are tested using the following test sequences. The sequences also check for possible reaction of the commands on other device types.

12.7.1 Test sequence "APPLICATION EXTENDED QUERY COMMANDS"

The following test sequences (see Figure 2 to Figure 11) check the application extended query commands 238 to 250.

12.7.1.1 Test sequence "QUERY FEATURES"

Command 240 "QUERY FEATURES" as well as command 272 "ENABLE DEVICE TYPE 6" are tested. The test sequence "QUERY FEATURES" is shown in Figure 2.

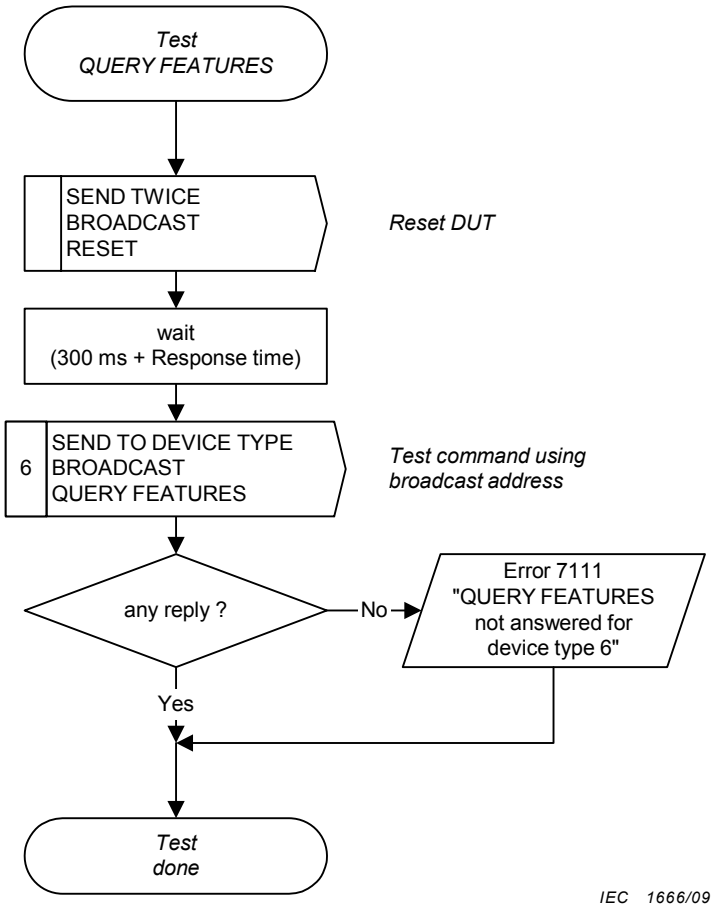


Figure 2 – "QUERY FEATURES"

12.7.1.2 Test sequence "QUERY SHORT CIRCUIT"

Command 242 "QUERY SHORT CIRCUIT", bit 0 of the answer of command 241 "QUERY FAILURE STATUS", bit 1 and bit 2 of the answer of command 144 "QUERY STATUS" and the correct function of the commands 146 "QUERY LAMP FAILURE", 147 "QUERY LAMP POWER ON" and 160 "QUERY ACTUAL LEVEL" during short circuit conditions are tested. The test sequence "QUERY SHORT CIRCUIT" is shown in Figure 3.

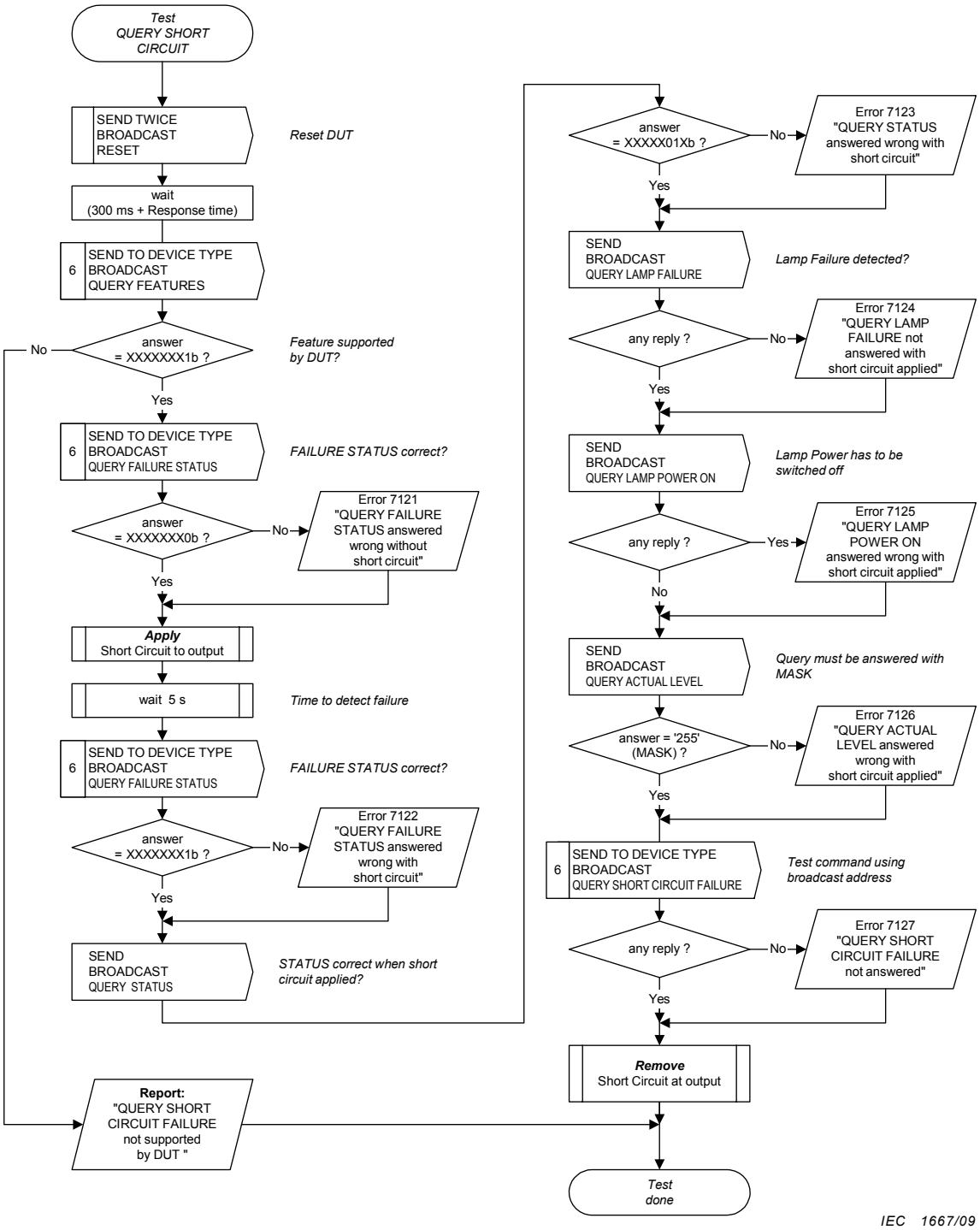
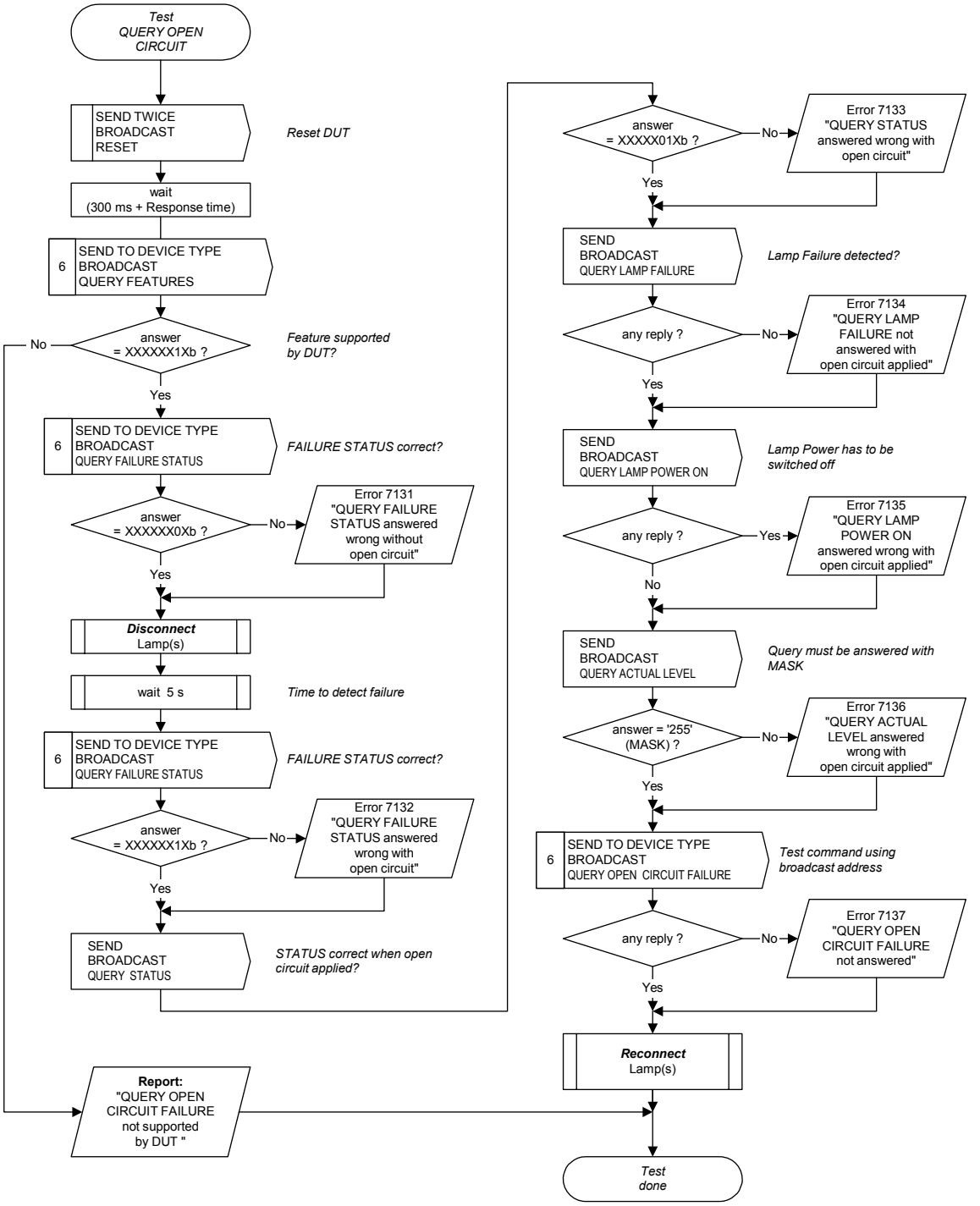


Figure 3 – "QUERY SHORT CIRCUIT"

12.7.1.3 Test sequence “QUERY OPEN CIRCUIT”

Command 243 “QUERY OPEN CIRCUIT” as well as bit 1 of the answer of command 241 “QUERY FAILURE STATUS” and the correct answer of command 160 “QUERY ACTUAL LEVEL” is tested. The test sequence “QUERY OPEN CIRCUIT” is shown in Figure 4.

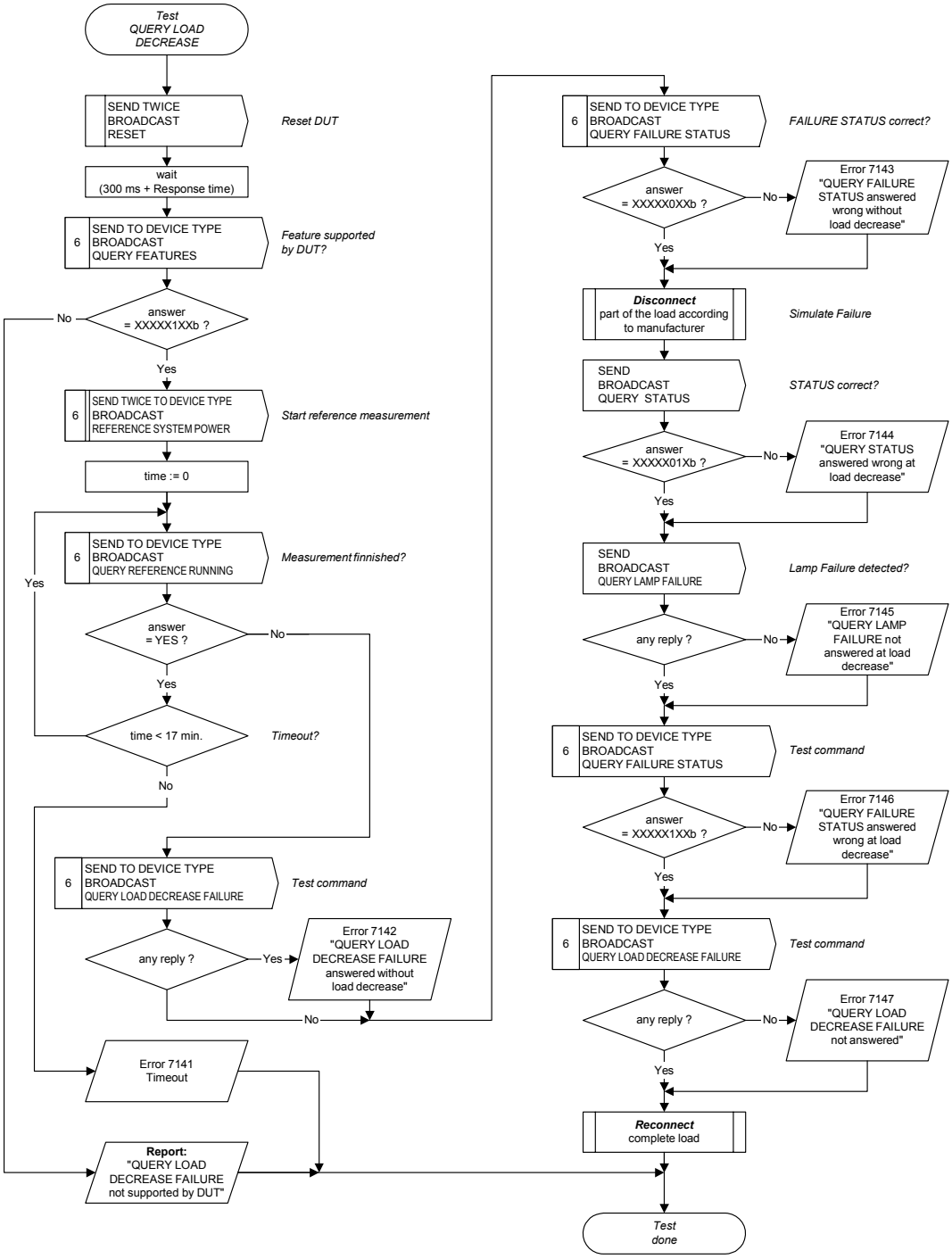


IEC 1668/09

Figure 4 – “QUERY OPEN CIRCUIT”

12.7.1.4 Test sequence "QUERY LOAD DECREASE"

Command 244 "QUERY LOAD DECREASE" as well as bit 2 of the answer for command 241 "QUERY FAILURE STATUS" are tested. The correct function of the command 224 "REFERENCE SYSTEM POWER" and command 241 "QUERY FAILURE STATUS" shall be ensured using the test sequence 12.7.2.1. The test sequence "QUERY LOAD DECREASE" is shown in Figure 5.



IEC 1669/09

Figure 5 – "QUERY LOAD DECREASE"

12.7.1.5 Test sequence “QUERY LOAD INCREASE”

Command 245 “QUERY LOAD INCREASE” as well as bit 3 of the answer of command 241 “QUERY FAILURE STATUS” are tested. The correct function of the command 224 “REFERENCE SYSTEM POWER” and command 241 “QUERY FAILURE STATUS” has to be ensured using the test sequence 12.7.2.1. The test sequence “QUERY LOAD INCREASE” is shown in Figure 6.

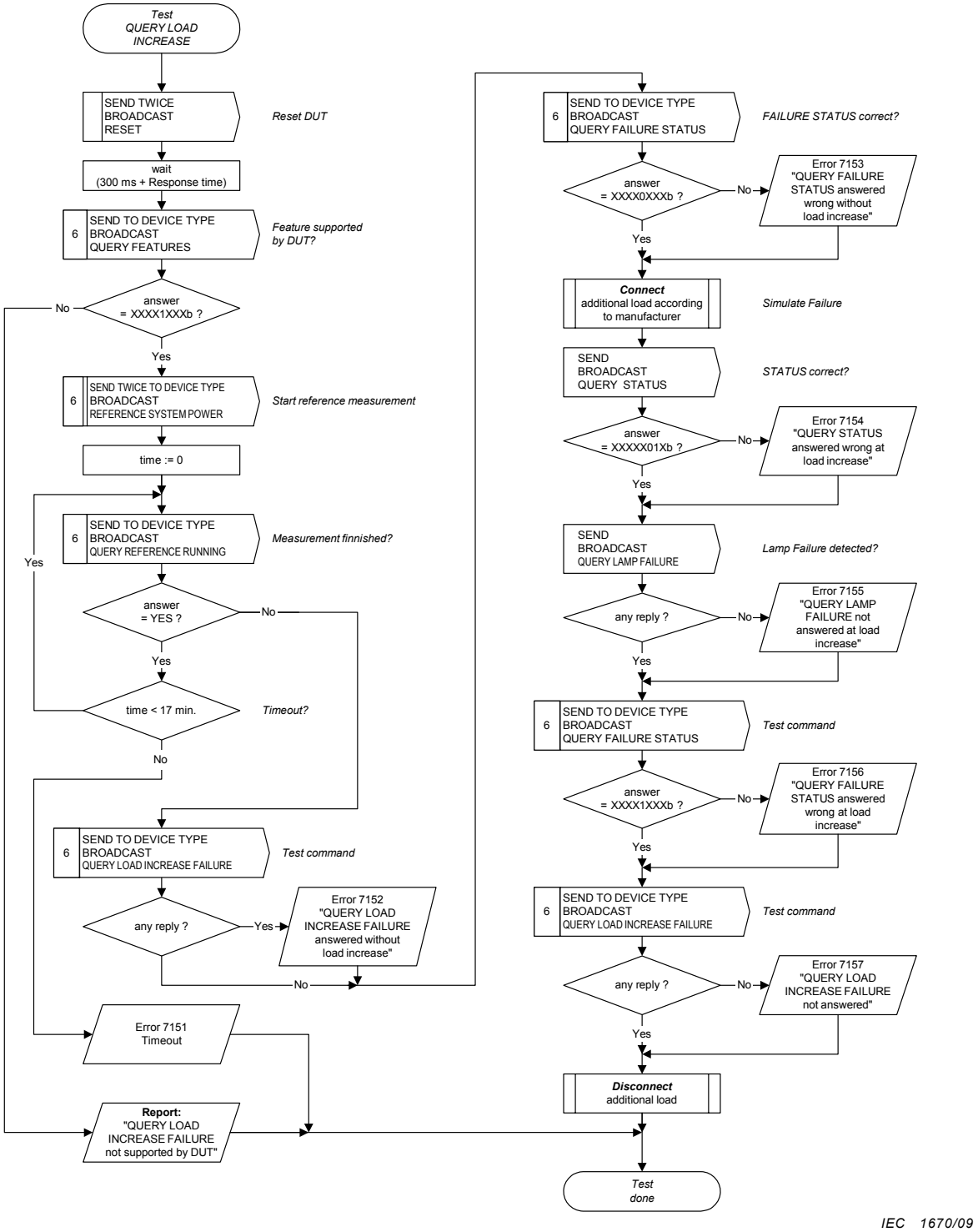


Figure 6 – “QUERY LOAD INCREASE”

12.7.1.6 Test sequence "QUERY CURRENT PROTECTOR ACTIVE: Underload"

Command 246 "QUERY CURRENT PROTECTOR ACTIVE" as well as bit 4 of the answer of command 241 "QUERY FAILURE STATUS" are tested in case of underload condition. The correct function of the command 224 "REFERENCE SYSTEM POWER" and command 241 "QUERY FAILURE STATUS" shall be ensured using the test sequence 12.7.2.1. The test sequence "QUERY CURRENT PROTECTOR ACTIVE: Underload" is shown in Figure 7.

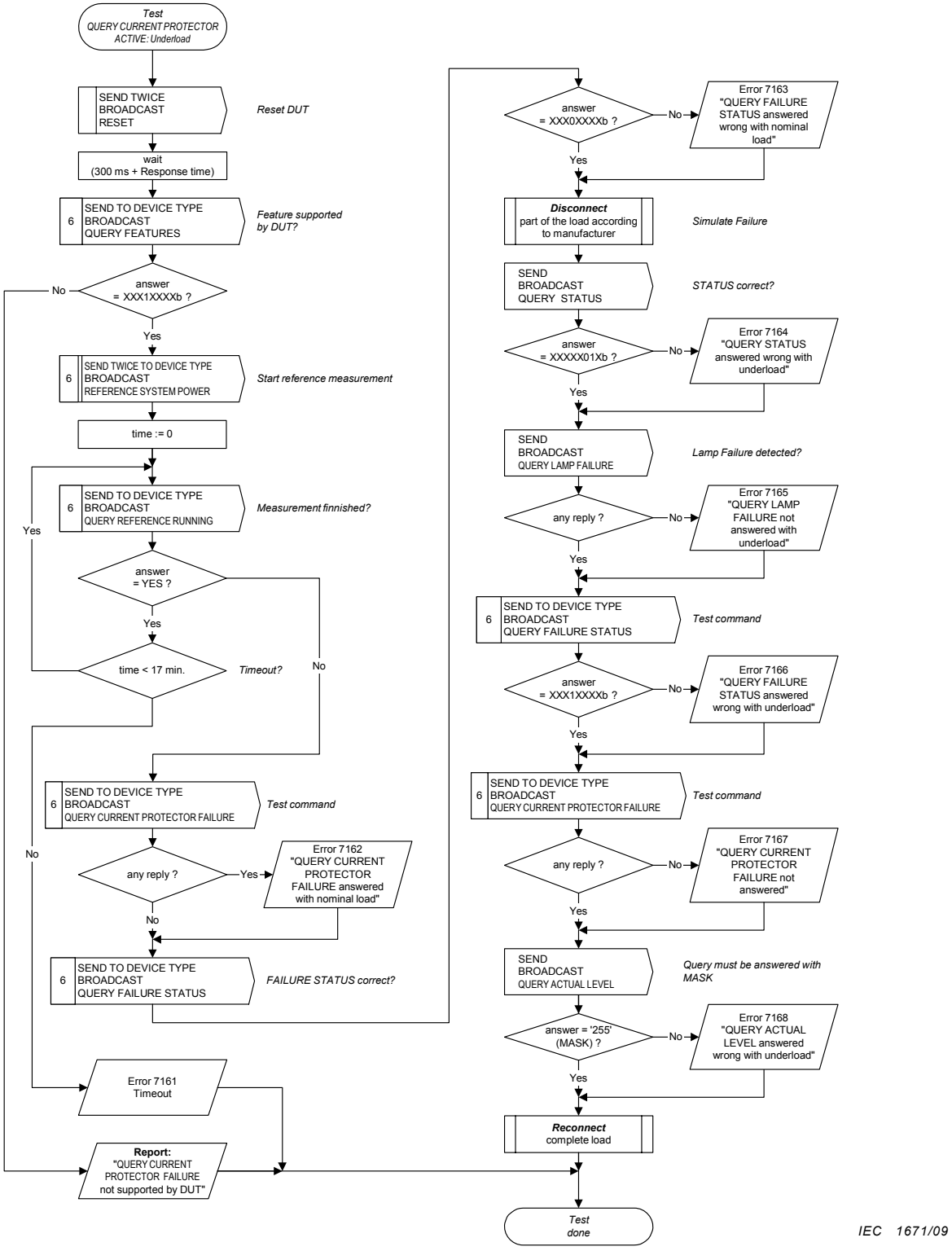


Figure 7 – "QUERY CURRENT PROTECTOR ACTIVE: Underload"

12.7.1.7 Test sequence "QUERY CURRENT PROTECTOR ACTIVE: Overload"

Command 246 "QUERY CURRENT PROTECTOR ACTIVE" as well as bit 4 of the answer of command 241 "QUERY FAILURE STATUS" are tested in case of overload condition. The correct function of the command 224 "REFERENCE SYSTEM POWER" and command 241 "QUERY FAILURE STATUS" shall be ensured using the test sequence 12.7.2.1. The test sequence "QUERY CURRENT PROTECTOR ACTIVE: Overload" is shown in Figure 8.

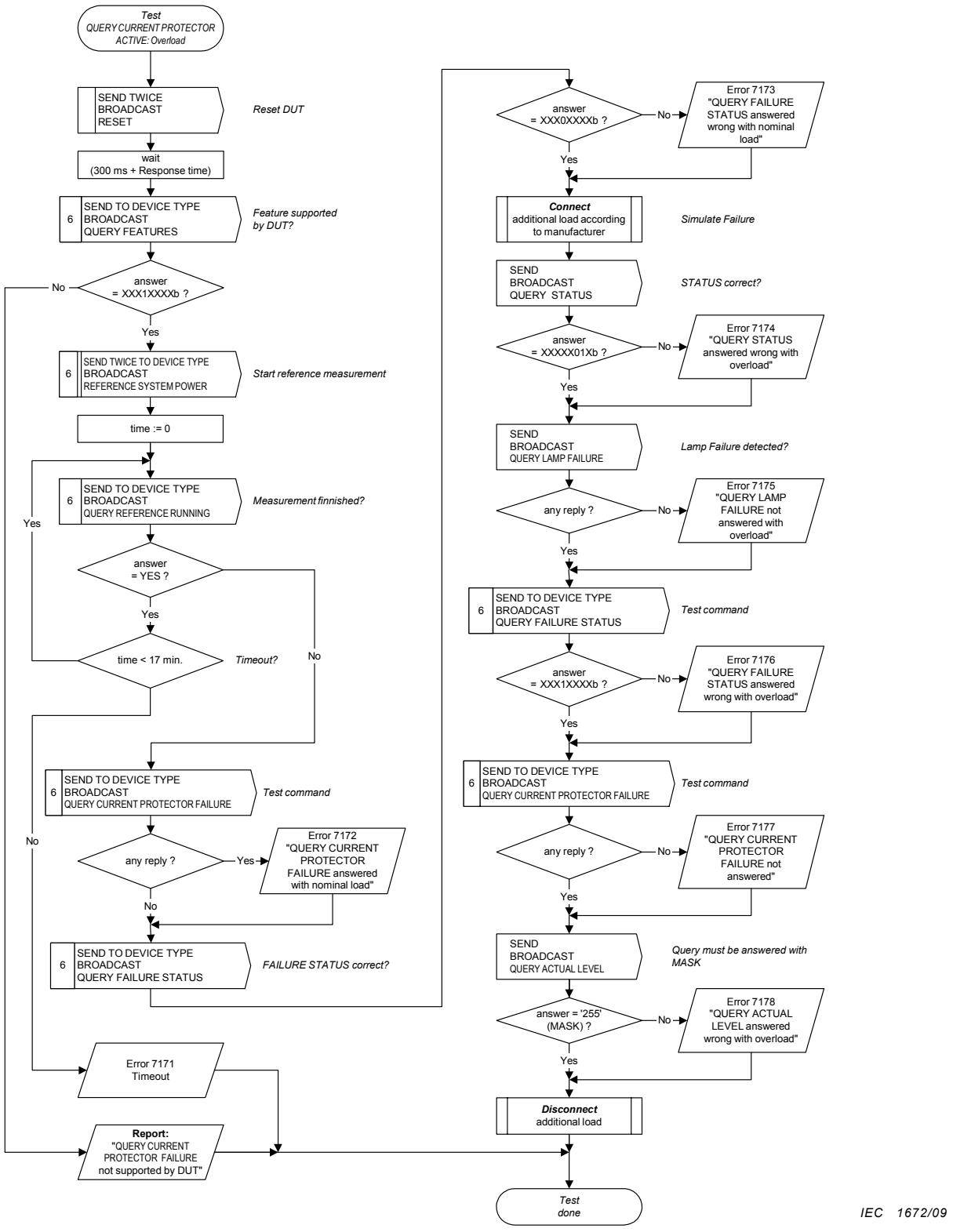


Figure 8 – "QUERY CURRENT PROTECTOR ACTIVE: Overload"

12.7.1.8 Test sequence "QUERY THERMAL SHUT DOWN"

Command 247 "QUERY THERMAL SHUT DOWN" as well as bit 5 of the answer of command 241 "QUERY FAILURE STATUS" are tested. The correct answer to the commands 144 "QUERY STATUS", 146 "QUERY LAMP FAILURE", 147 "QUERY LAMP POWER ON" and 160 "QUERY ACTUAL LEVEL" will be test with this test sequence. The test sequence "QUERY THERMAL SHUT DOWN" is shown in Figure 9.

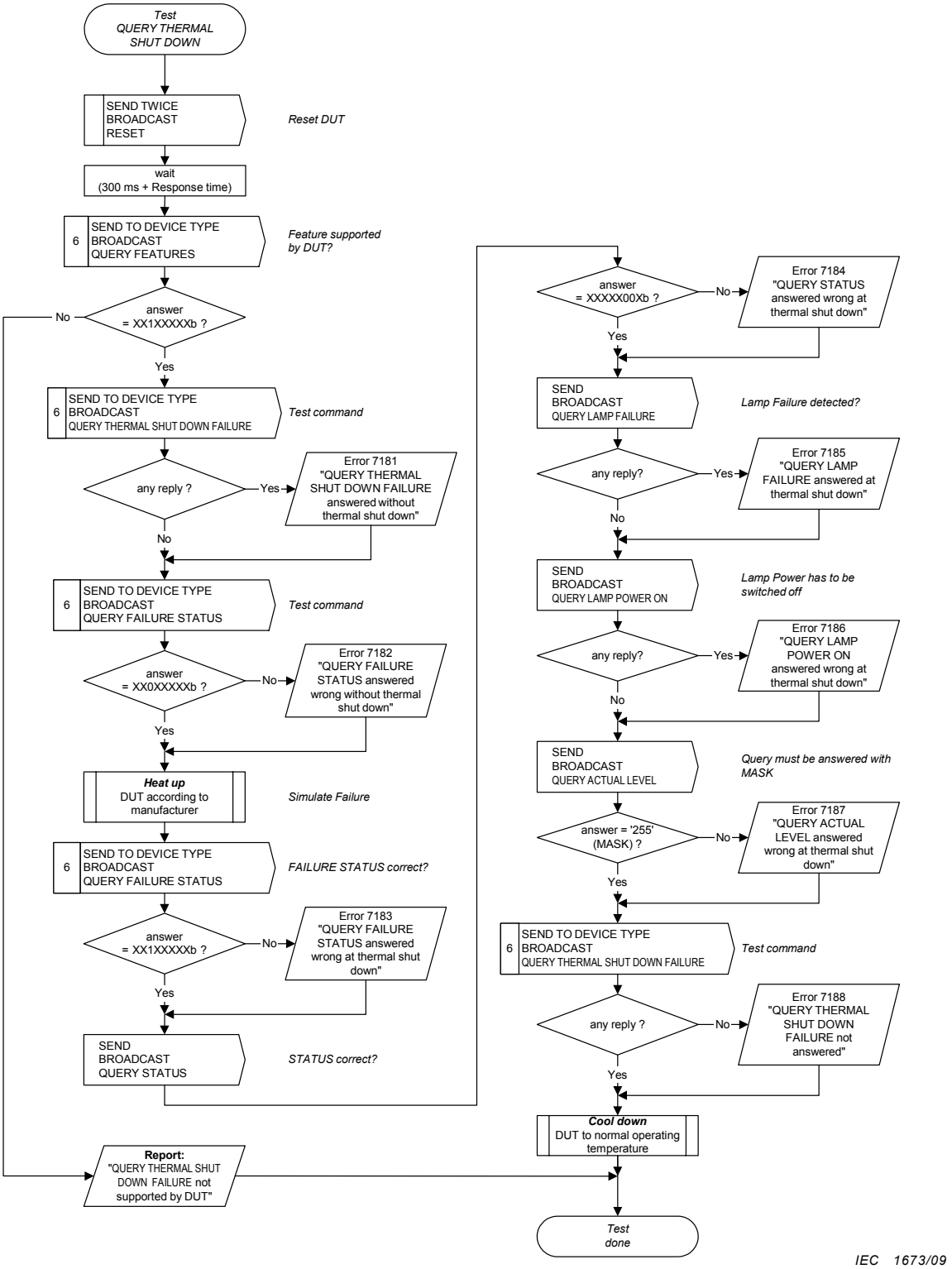


Figure 9 – "QUERY THERMAL SHUT DOWN"

12.7.1.9 Test sequence “QUERY THERMAL OVERLOAD”

Command 248 “QUERY THERMAL OVERLOAD” as well as bit 6 of the answer of command 241 “QUERY FAILURE STATUS” is tested. Due to reduction of the light level command 160 “QUERY ACTUAL LEVEL” shall be answered with 'MASK'. The test sequence “QUERY THERMAL OVERLOAD” is shown in Figure 10.

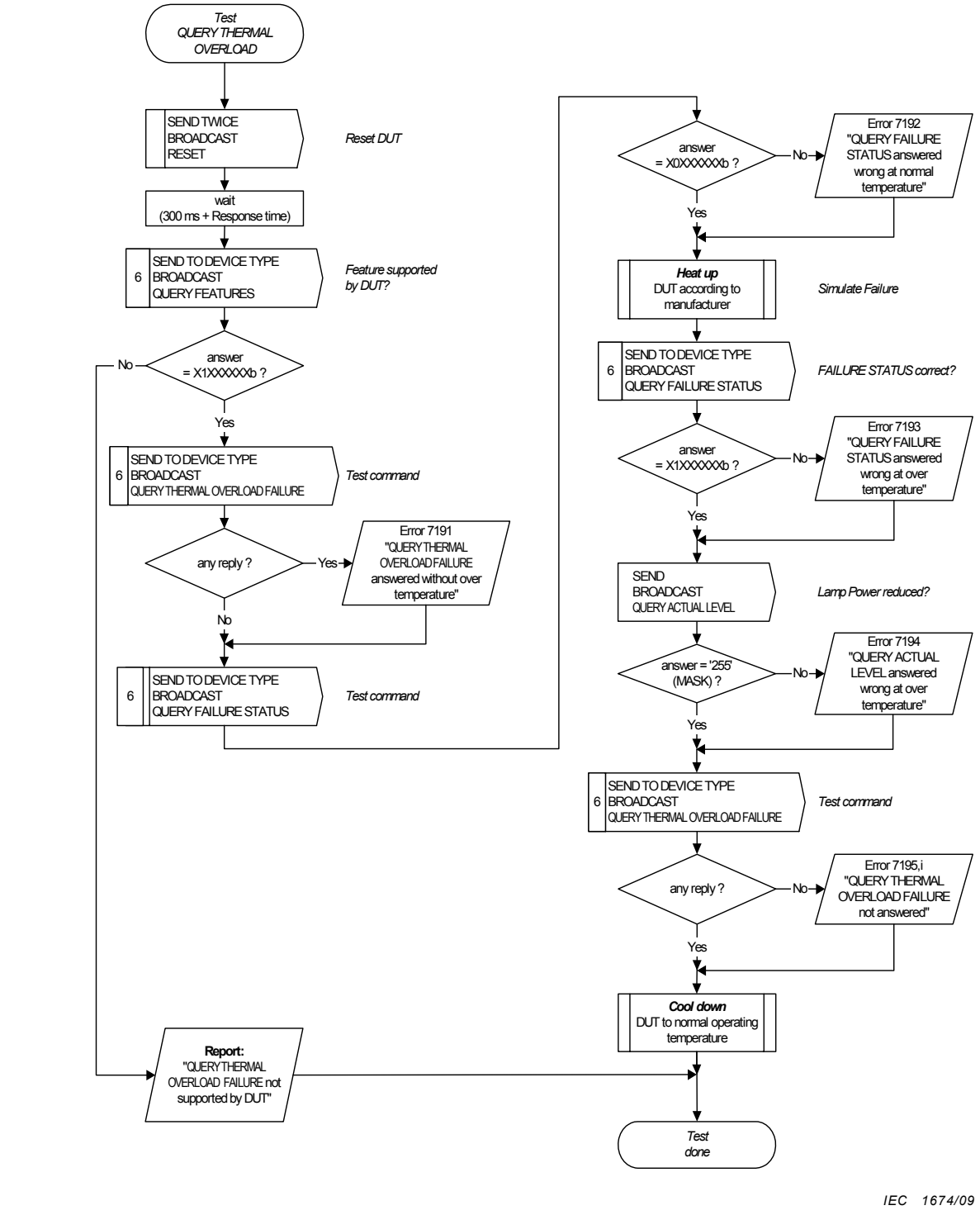


Figure 10 – “QUERY THERMAL OVERLOAD”

12.7.1.10 Test sequence “Query control gear information”

Command 237 “QUERY GEAR TYPE”, command 239 “QUERY POSSIBLE OPERATING MODES” and command 252 “QUERY OPERATING MODE” are tested.

If the control gear supports more than one operating mode this test shall be repeated for all possible operating modes to ensure correct answers to command 252 “QUERY OPERATING MODE”. The test sequence “Query control gear information” is shown in Figure 11.

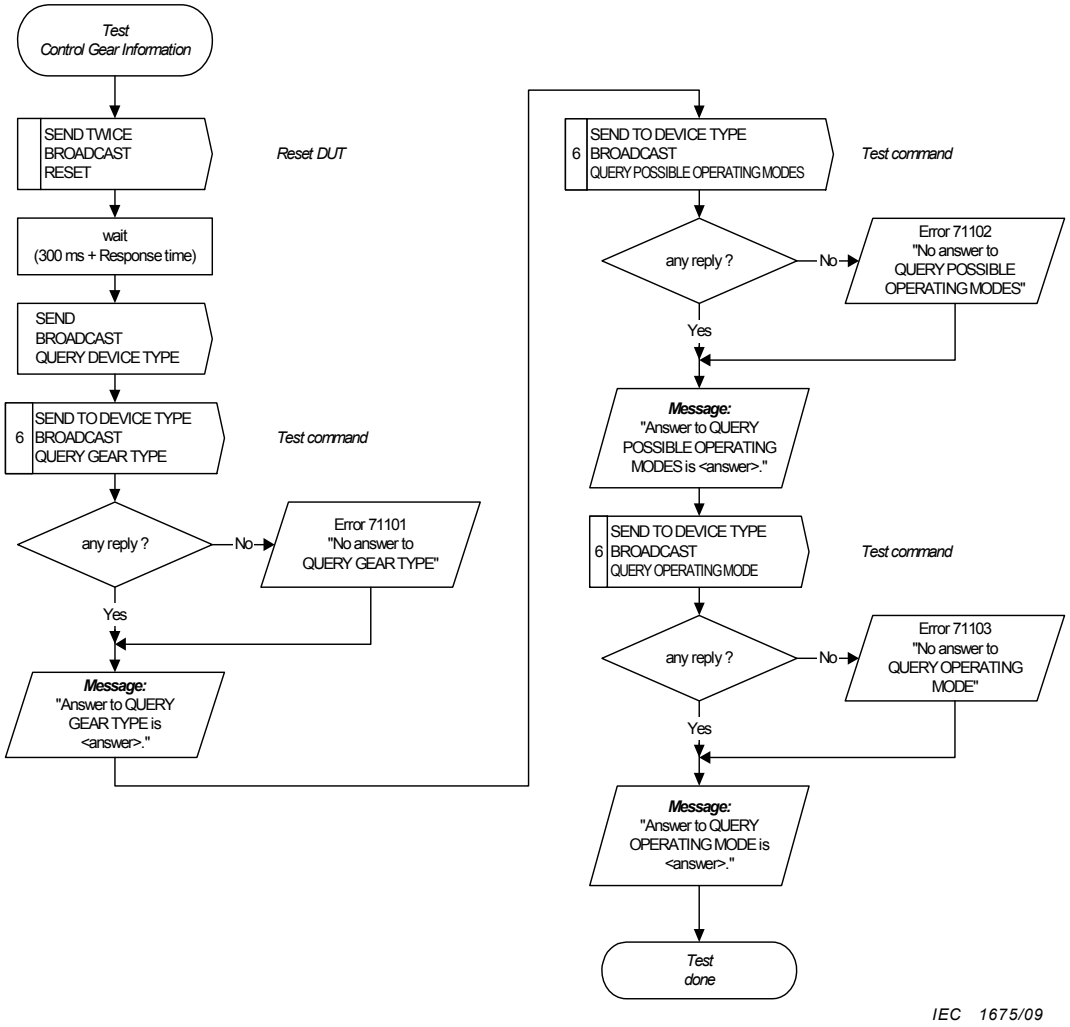


Figure 11 – “Query control gear information”

12.7.2 Test sequence "APPLICATION EXTENDED CONFIGURATION COMMANDS"

Use the following test sequences (see Figures 12 to 20) to check the application extended configuration commands 224 to 228.

12.7.2.1 Test sequence "REFERENCE SYSTEM POWER"

Command 224 "REFERENCE SYSTEM POWER" as well as command 249 "QUERY REFERENCE RUNNING" is tested. The test sequence "REFERENCE SYSTEM POWER" is shown in Figure 12.

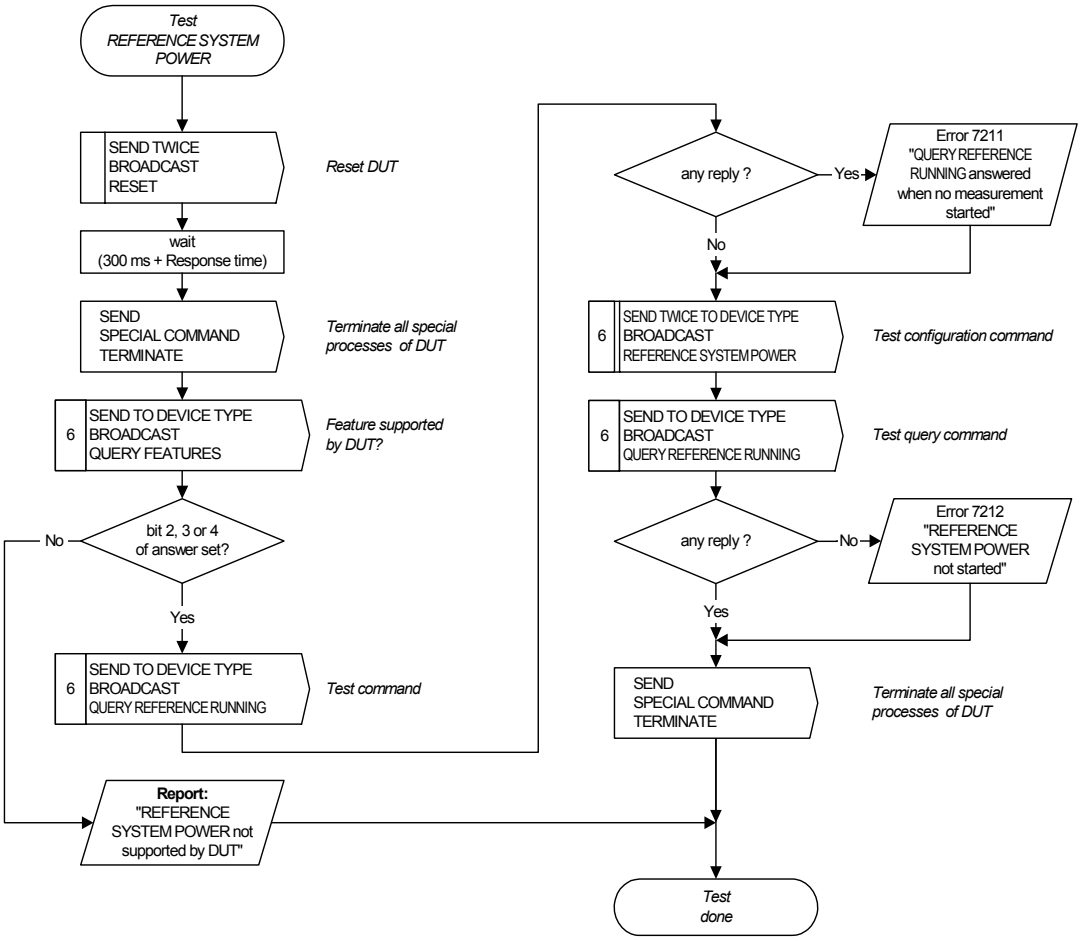


Figure 12 – "REFERENCE SYSTEM POWER"

12.7.2.2 Test sequence "REFERENCE SYSTEM POWER: 100 ms-timeout"

In this sequence the reference measurement is started with the configuration command 224 "REFERENCE SYSTEM POWER" sent twice with a timeout of 150 ms. Also the reaction if command 256 "TERMINATE" stops the reference measurement has to be controlled. The test sequence "REFERENCE SYSTEM POWER: 100 ms-timeout" is shown in Figure 13.

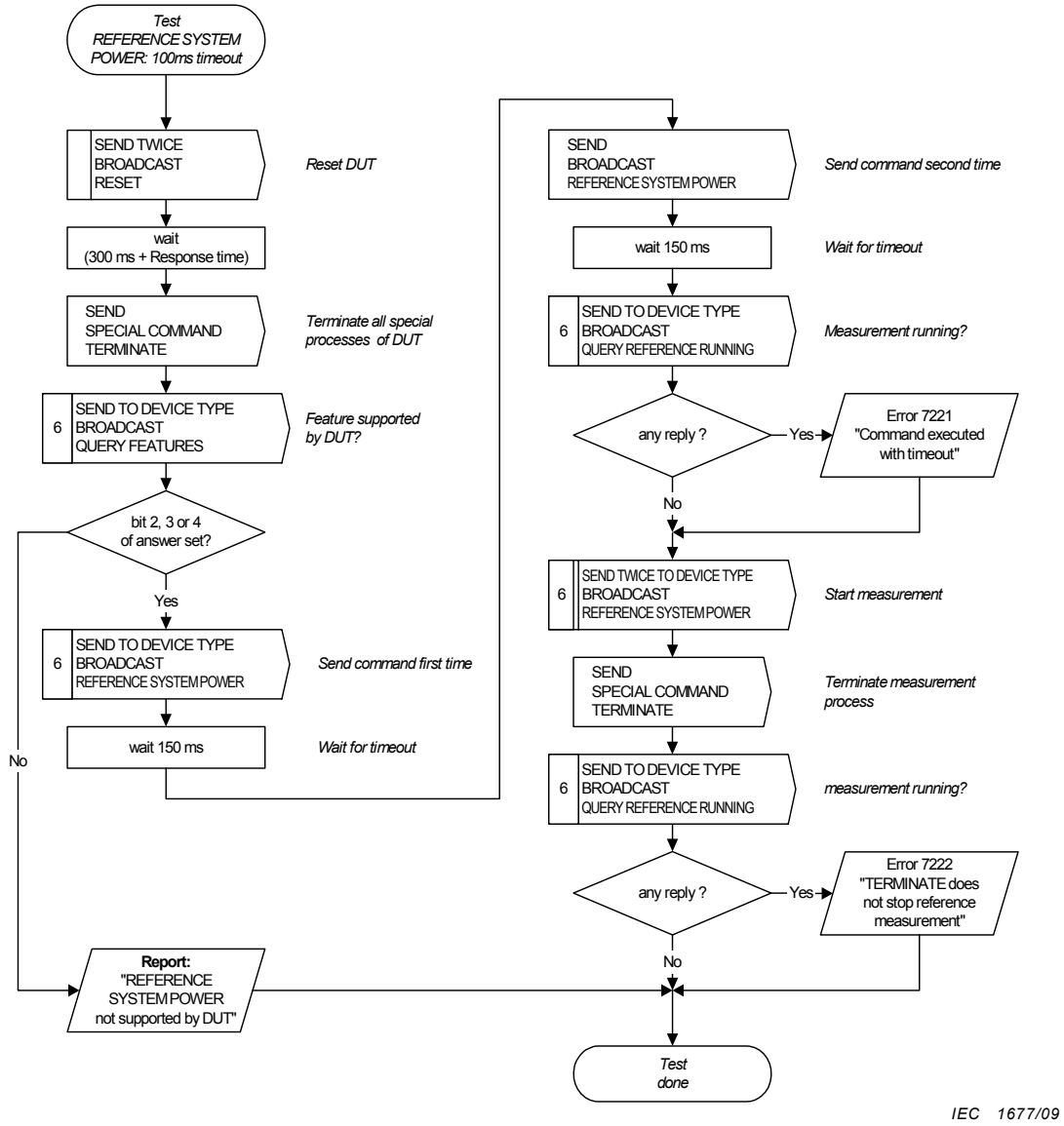


Figure 13 – "REFERENCE SYSTEM POWER: 100 ms-timeout"

12.7.2.3 Test sequence "REFERENCE SYSTEM POWER: Command in-between"

In this sequence the reference measurement is started with commands in-between the two commands 224 "REFERENCE SYSTEM POWER". The two commands 224 and the command in-between shall be sent within 100 ms. The test sequence "REFERENCE SYSTEM POWER: Command in-between" is shown in Figure 14 and the parameters for the test are given in Table 4.

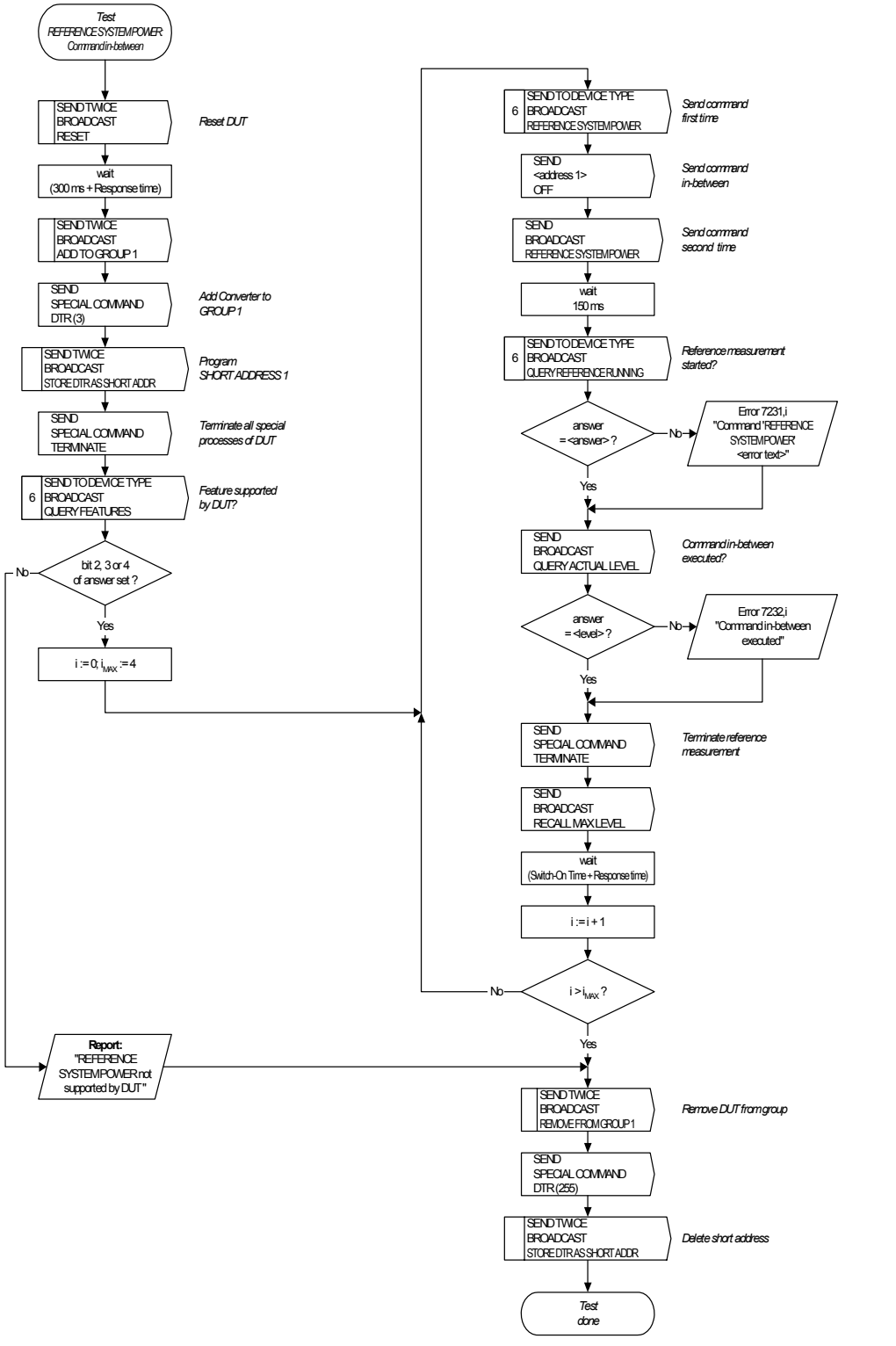


Figure 14 – "REFERENCE SYSTEM POWER: Command in-between"

Table 4 – Parameters for the test "REFERENCE SYSTEM POWER: Command in-between"

i	<address 1>	<answer>	<level>	<error text>
0	Short Address 1	'No'	254	executed
1	GROUP 1	'No'	254	executed
2	BROADCAST	'No'	254	executed
3	Short Address 2	'Yes'	≠ 0	not executed
4	GROUP 2	'Yes'	≠ 0	not executed

12.7.2.4 Test sequence "REFERENCE SYSTEM POWER: 15 minutes timer"

Not later than 15 min after receiving command 224 "REFERENCE SYSTEM POWER" the measurement shall be finished and the control gear shall return to normal operation. The test sequence "REFERENCE SYSTEM POWER: 15 minutes timer" is shown in Figure 15.

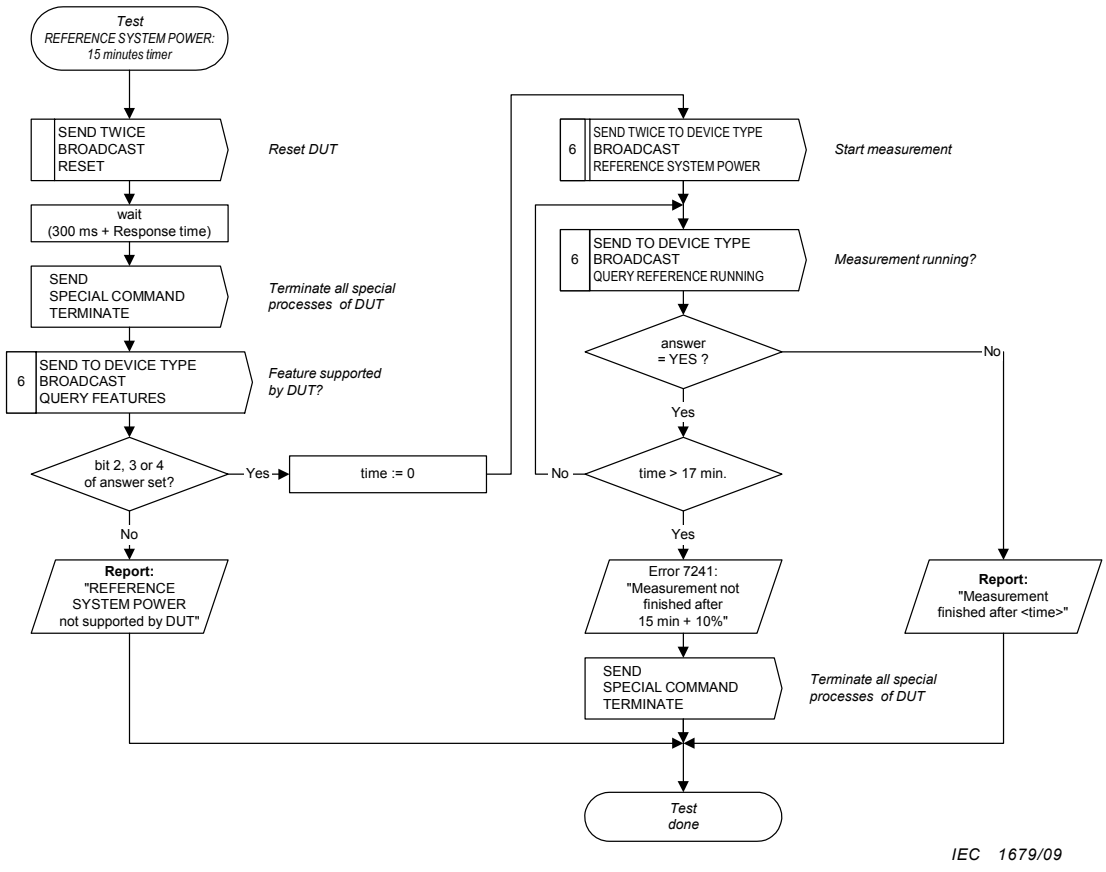


Figure 15 – "REFERENCE SYSTEM POWER: 15 minutes timer"

12.7.2.5 Test sequence “REFERENCE SYSTEM POWER: failed”

Check bit 7 in the answer of command 241 “QUERY FAILURE STATUS” and command 250 “QUERY REFERENCE MEASUREMENT FAILED” is checked. The test sequence “REFERENCE SYSTEM POWER: failed” is shown in Figure 16.

The reference measurement is caused to fail by e.g. under voltage.

NOTE Advice on how to cause measurement failures may be provided by the manufacturer.

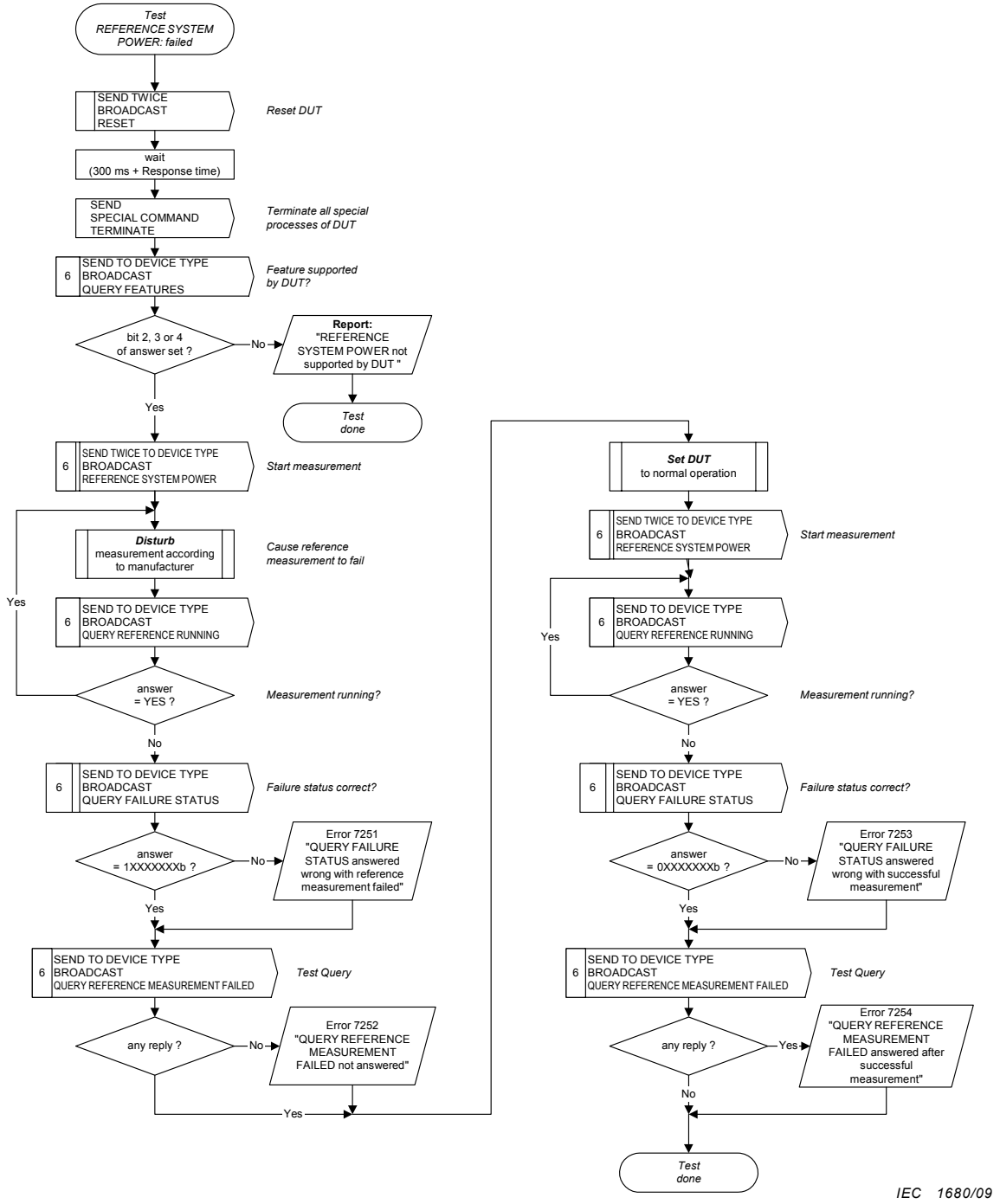


Figure 16 – “REFERENCE SYSTEM POWER: failed”

12.7.2.6 Test sequence "ENABLE / DISABLE CURRENT PROTECTOR"

Command 225 "ENABLE CURRENT PROTECTOR", command 226 "DISABLE CURRENT PROTECTOR" and command 251 "QUERY CURRENT PROTECTOR ENABLED" are tested. The storage of the configuration in the persistent memory is also tested by this sequence. After the reference measurement the current protector is caused to become active with additional load. Ensure that the total load does not exceed the maximum output load of the control gear. The test sequence "ENABLE / DISABLE CURRENT PROTECTOR" is shown in Figure 17.

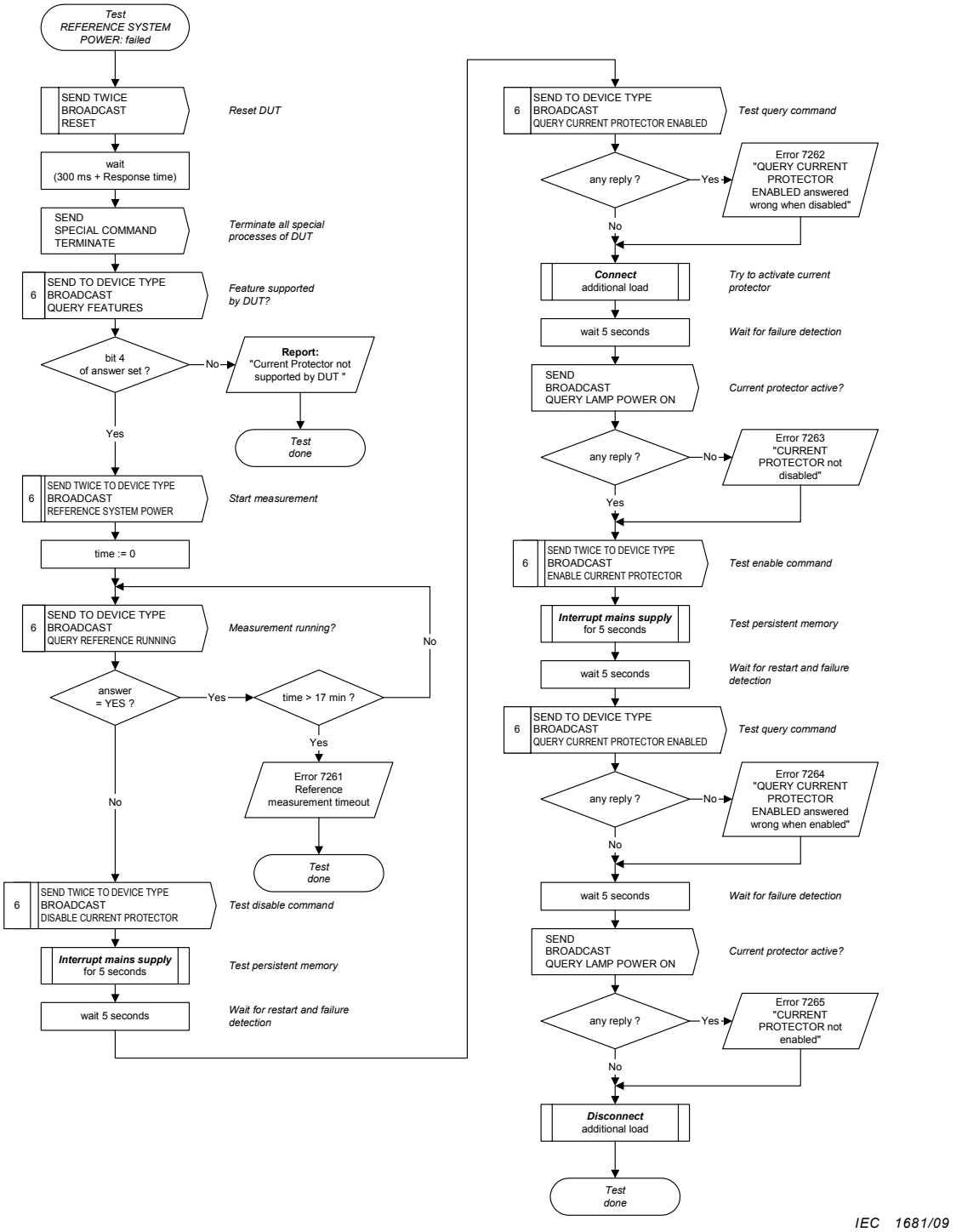


Figure 17 – "ENABLE / DISABLE CURRENT PROTECTOR"

12.7.2.7 Test sequence “SELECT DIMMING CURVE”

Command 227 “SELECT DIMMING CURVE”, bit 4 in the answer of command 252 “QUERY OPERATING MODE” and command 238 “QUERY DIMMING CURVE” are tested in this sequence. Also check the linear dimming curve . The test sequence “SELECT DIMMING CURVE” is shown in Figure 18 and the parameters for the test are given in Table 5.

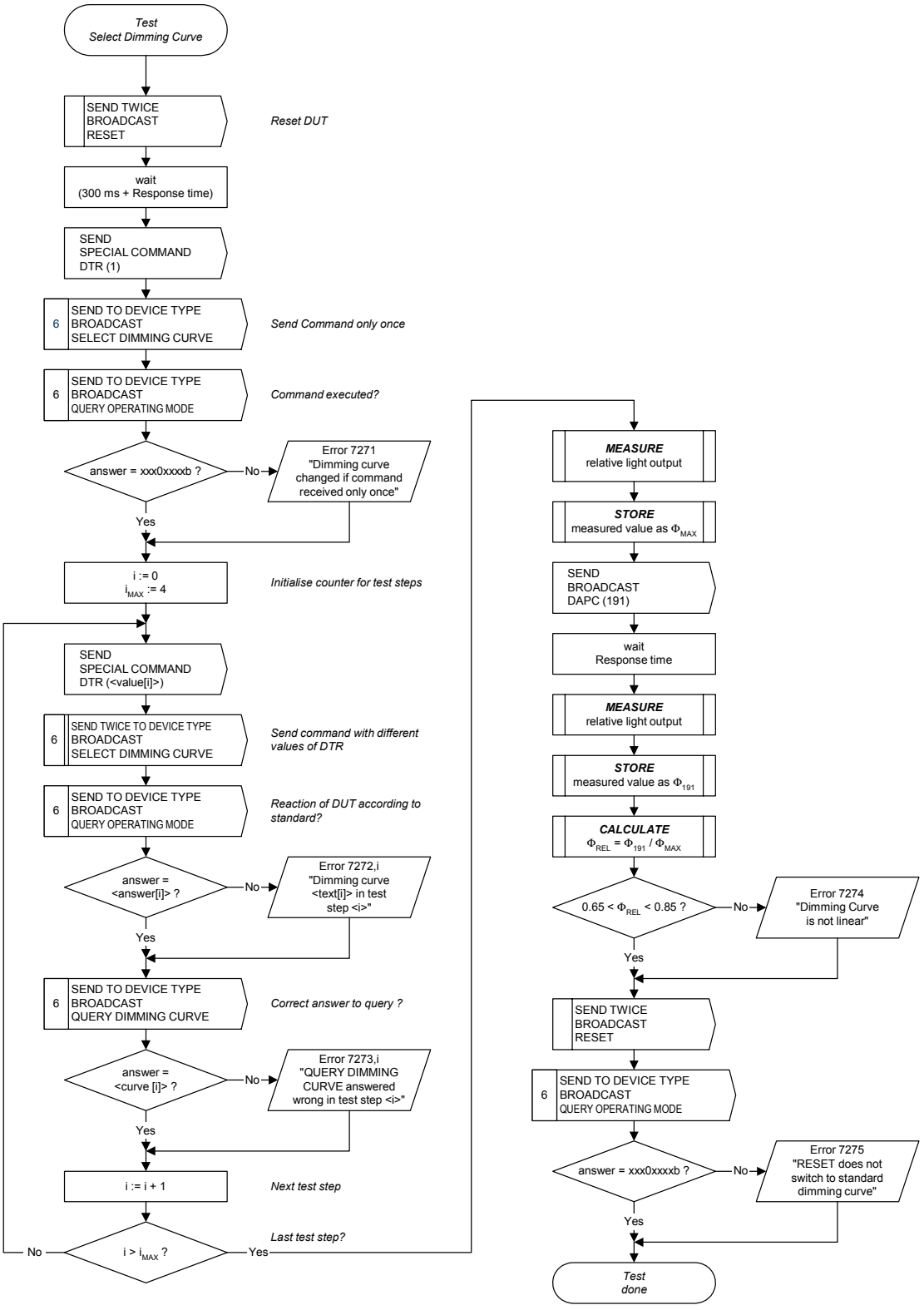


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Figure 18 – “SELECT DIMMING CURVE”

Table 5 – Parameters for test "SELECT DIMMING CURVE"

i	<value (i)>	<answer (i)>	<curve (i)>	<text (i)>
0	1	xxx1 xxxxb	xxx1 xxxxb	not changed
1	255	xxx1 xxxxb	xxx1 xxxxb	changed
2	0	xxx0 xxxxb	xxx0 xxxxb	not changed
3	255	xxx0 xxxxb	xxx0 xxxxb	changed
4	1	xxx1 xxxxb	xxx1 xxxxb	not changed

12.7.2.8 Test sequence "FAST FADE TIME"

Command 228 "STORE DTR AS FAST FADE TIME" and command 253 "QUERY FAST FADE TIME" is tested in this sequence. The test sequence "FAST FADE TIME" is shown in Figure 19 and the parameters for the test are given in Table 6.

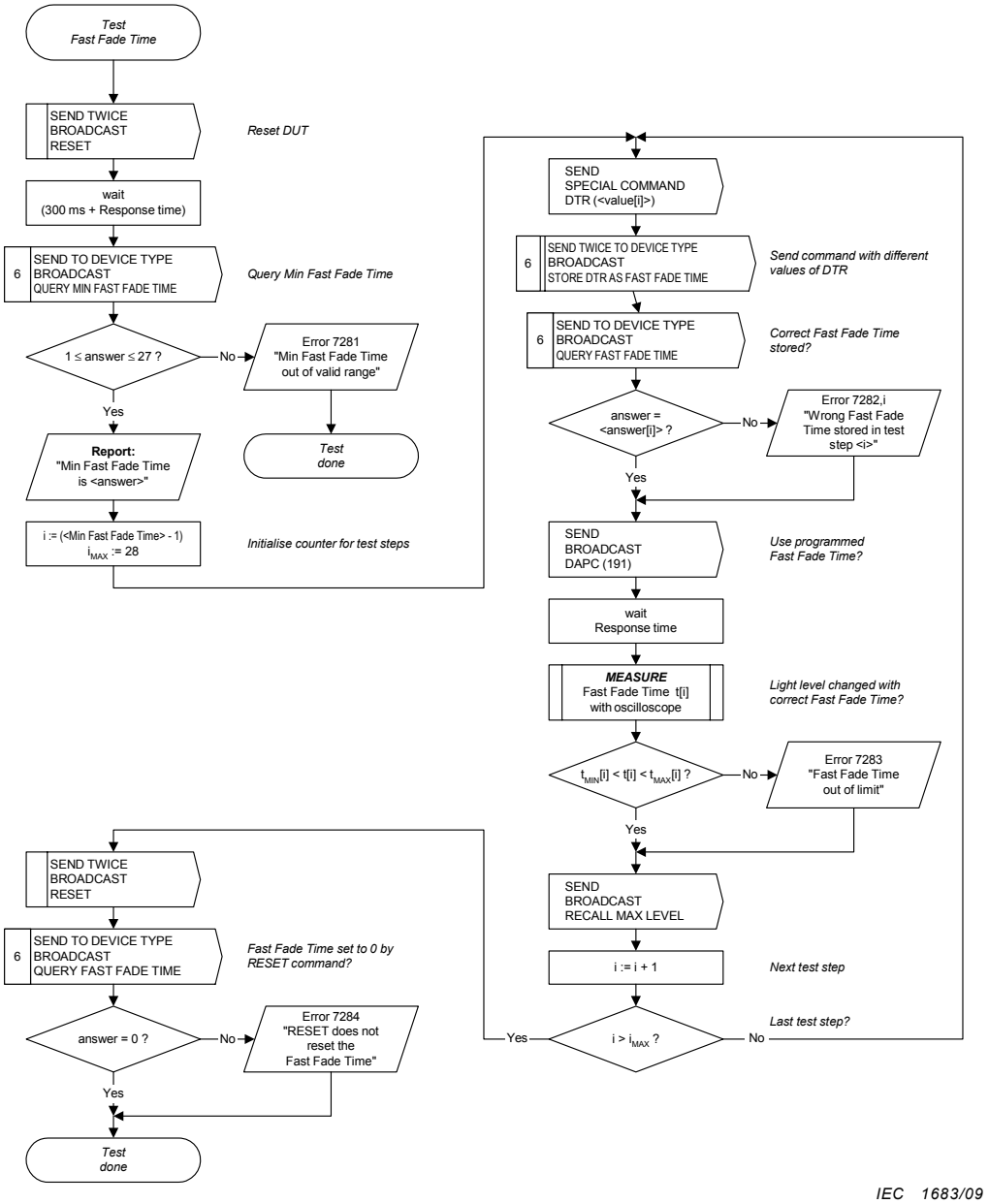


Figure 19 – "FAST FADE TIME"

Table 6 – Parameters for test "FAST FADE TIME"

i	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<value>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<answer>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
t_{MIN} (ms)	13	38	63	88	113	138	163	188	213	238	263	288	313	338	363
t_{MAX} (ms)	37	62	87	112	137	162	187	212	237	262	287	312	337	362	387

i	15	16	17	18	19	20	21	22	23	24	25	26	27	28
<value>	16	17	18	19	20	21	22	23	24	25	26	27	0	254
<answer>	16	17	18	19	20	21	22	23	24	25	26	27	0	27
t_{MIN} (ms)	388	413	438	463	488	513	538	563	588	613	638	663	0	663
t_{MAX} (ms)	412	437	462	487	512	537	562	587	612	637	662	687	26	687

12.7.2.9 Test sequence "Reset State / Persistent Memory"

The correct answering of command 144 "QUERY STATUS" and command 149 "QUERY RESET STATE" with programmed FAST FADE TIME or linear dimming curve is tested. The test sequence "Reset State / Persistent Memory" is shown in Figure 20.

The storage of the FAST FADE TIME and the dimming curve selection in the persistent memory is also tested in this sequence.

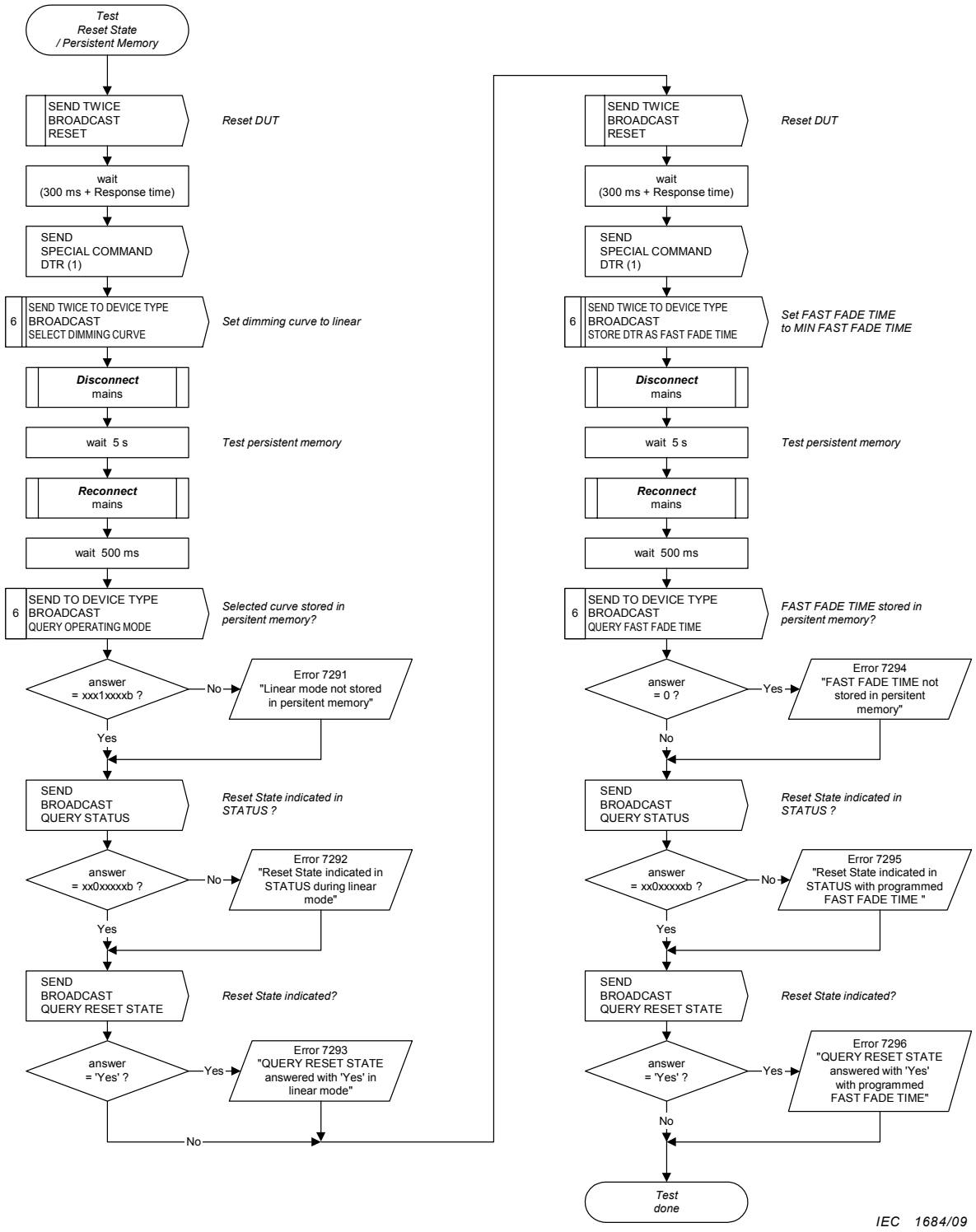


Figure 20 – "Reset State / Persistent Memory"

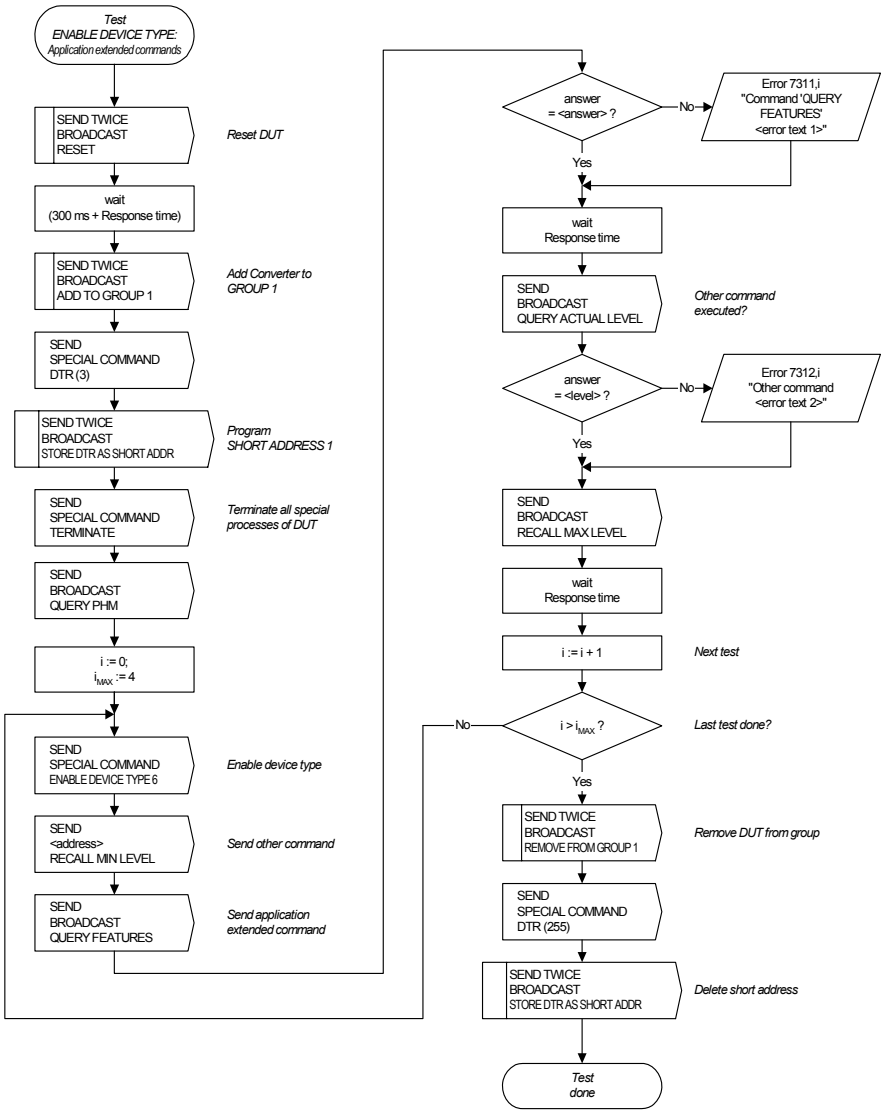
12.7.3 Test sequences "ENABLE DEVICE TYPE"

The correct function of command 272 "ENABLE DEVICE TYPE" is tested with the following sequences (see Figures 21 to 23)

12.7.3.1 Test sequence "ENABLE DEVICE TYPE: Application extended commands"

An application extended command shall be executed if command 272 "ENABLE DEVICE TYPE 6" precedes. If there is a command in between command 272 and the application extended command, the application extended command has to be ignored except if the

command in between is addressed to another control gear. The test sequence uses command 6 “RECALL MIN LEVEL” as command in between and command 240 “QUERY FEATURES” as application extended command. The test sequence “ENABLE DEVICE TYPE: Application extended commands” is shown in Figure 21 and the parameters for the test are given in Table 7.



IEC 1685/09

Figure 21 – “ENABLE DEVICE TYPE: Application extended commands”

Table 7 – Parameters for test “ENABLE DEVICE TYPE: Application extended commands”

i	<address>	<answer>	<level>	<error text 1>	<error text 2>
0	BROADCAST	'No'	PHM	executed	not executed
1	Short Address 1	'No'	PHM	executed	not executed
2	Short Address 2	XXXXXXXXb	254	not executed	executed
3	GROUP 1	'No'	PHM	executed	not executed
4	GROUP 2	XXXXXXXXb	254	not executed	executed

12.7.3.2 Test sequence "ENABLE DEVICE TYPE: Application extended configuration commands 1"

An application extended configuration command shall be executed if command 272 "ENABLE DEVICE TYPE 6" precedes and the application extended configuration command is received twice within 100 ms. If there is a command in between command 272 and the application extended configuration command addressed to the same control gear, the application extended configuration command has to be ignored. The test sequence uses command 6 "RECALL MIN LEVEL" as command in between and command 224 "REFERENCE SYSTEM POWER" as application extended configuration command. The test sequence "ENABLE DEVICE TYPE: Application extended configuration commands 1" is shown in Figure 22 and the parameters for the test are given in Table 8.

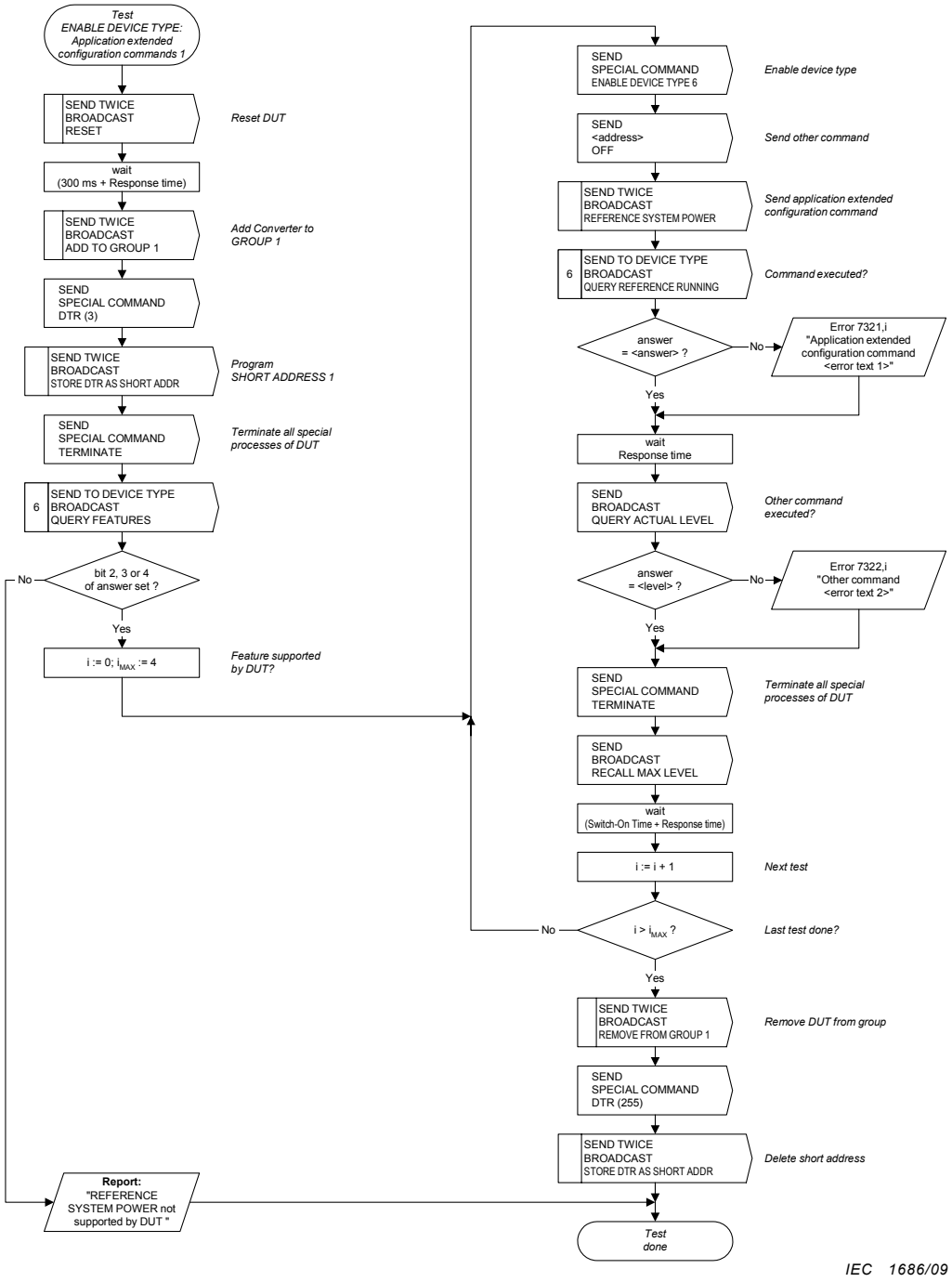


Figure 22 – "ENABLE DEVICE TYPE: Application extended configuration commands 1"

Table 8 – Parameters for test "ENABLE DEVICE TYPE: Application extended configuration commands 1"

i	<address>	<answer>	<level>	<error text 1>	<error text 2>
0	BROADCAST	'No'	0	executed	not executed
1	Short Address 1	'No'	0	executed	not executed
2	Short Address 2	'Yes'	≠ 0	not executed	executed
3	GROUP 1	'No'	0	executed	not executed
4	GROUP 2	'Yes'	≠ 0	not executed	executed

12.7.3.3 Test sequence "ENABLE DEVICE TYPE: Application extended configuration commands 2"

An application extended configuration command shall be executed if command 272 "ENABLE DEVICE TYPE 6" precedes and the application extended configuration command is received twice within 100 ms. The application extended configuration command has to be ignored if a second command 272 "ENABLE DEVICE TYPE" is received in between the two application extended configuration commands. The two application extended configuration commands are to be sent within 100 ms. The test sequence "ENABLE DEVICE TYPE: Application extended configuration commands 2" is shown in Figure 23.

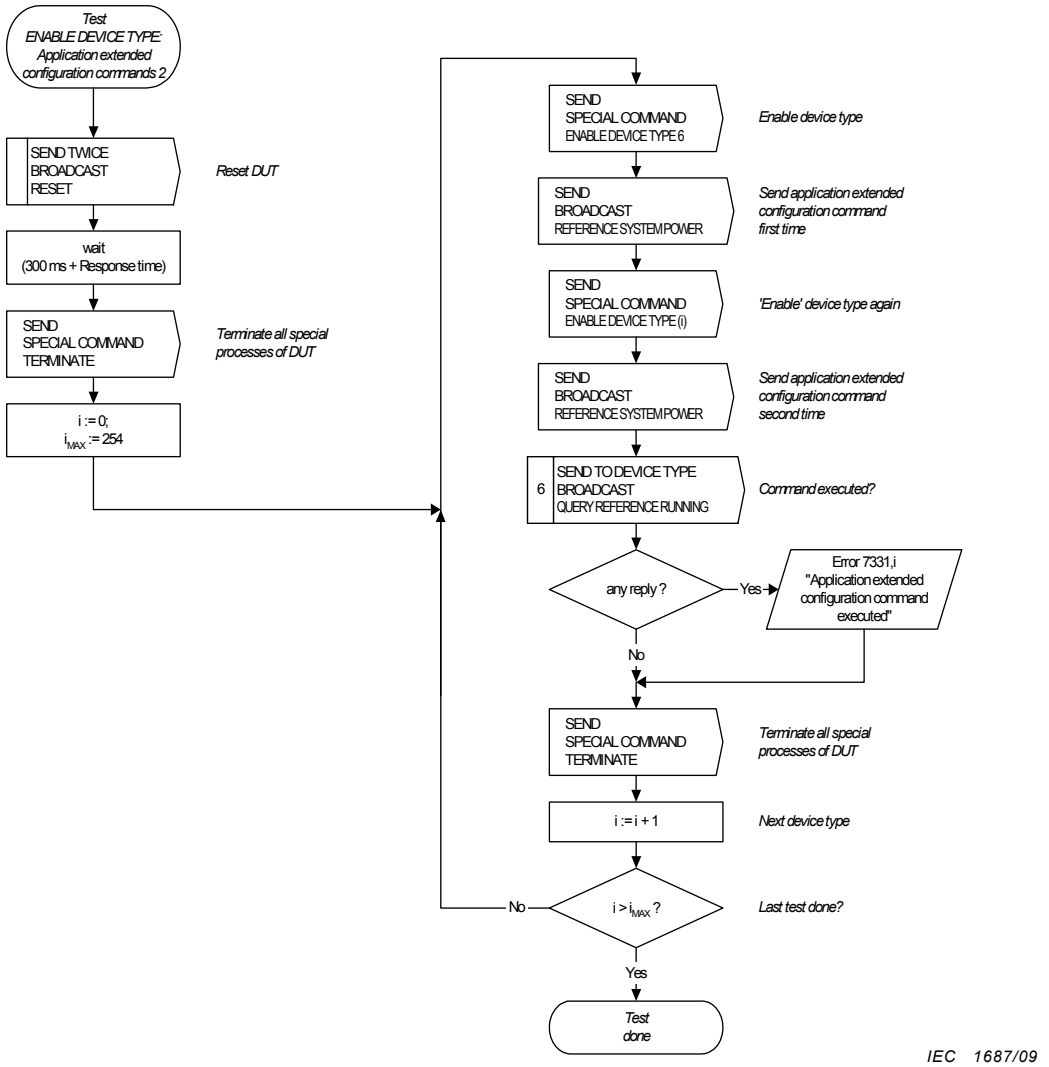


Figure 23 – "ENABLE DEVICE TYPE: Application extended configuration commands 2"

12.7.4 Test sequences for standard application extended commands

12.7.4.1 Test sequences "QUERY EXTENDED VERSION NUMBER"

Test the command 255 "QUERY EXTENDED VERSION NUMBER" for all possible values of X in command 272 "ENABLE DEVICE TYPE X" . The test sequence "QUERY EXTENDED VERSION NUMBER" is shown in Figure 24.

NOTE A control gear belonging to more than one device type will also answer to the query for X not equal to 6.

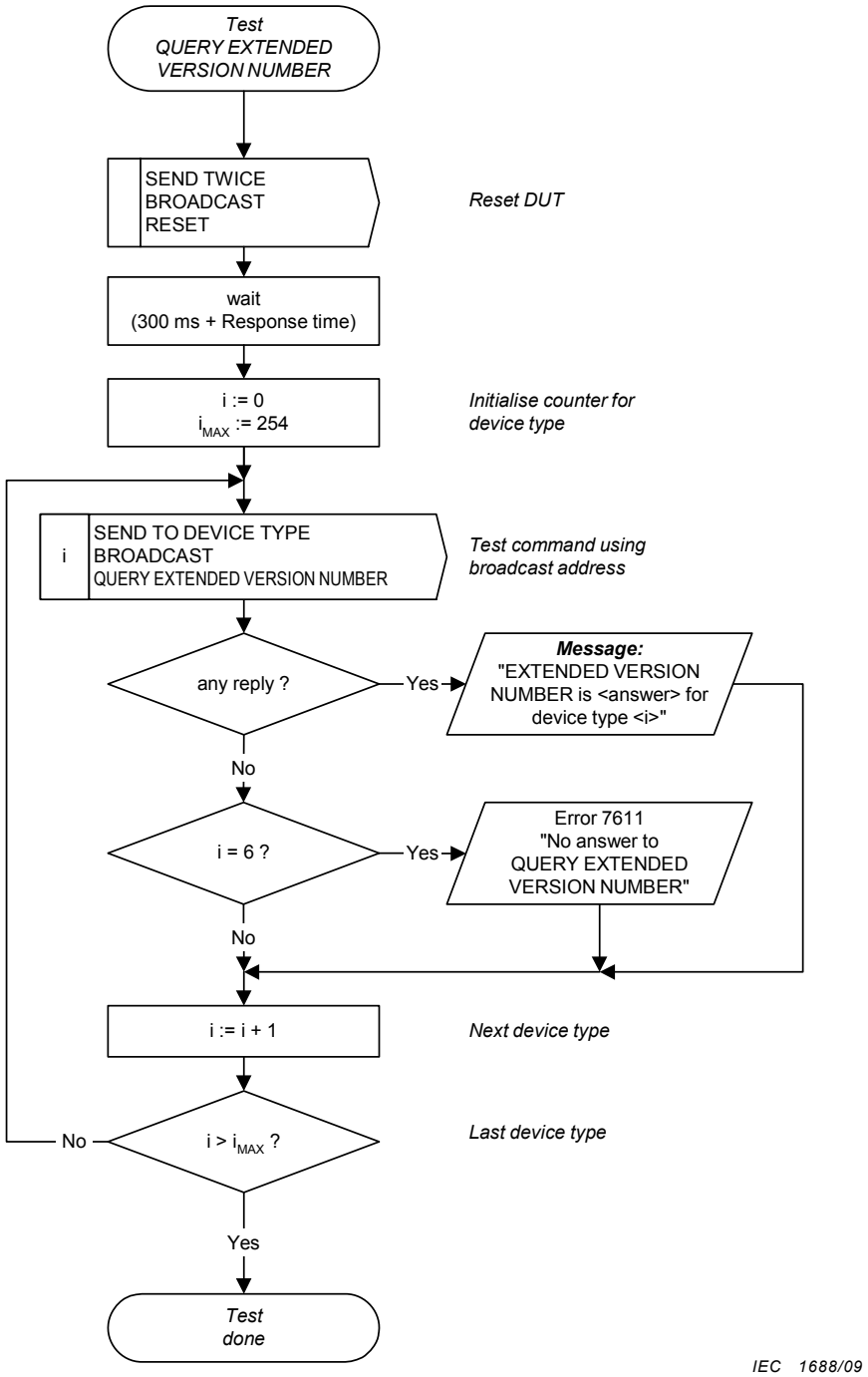


Figure 24 – "QUERY EXTENDED VERSION NUMBER"

12.7.4.2 Test sequence “RESERVED APPLICATION EXTENDED COMMANDS”

The following test sequence checks the reaction to reserved application extended commands. The control gear shall not react in any way. The test sequence “RESERVED APPLICATION EXTENDED COMMANDS” is shown in Figure 25.

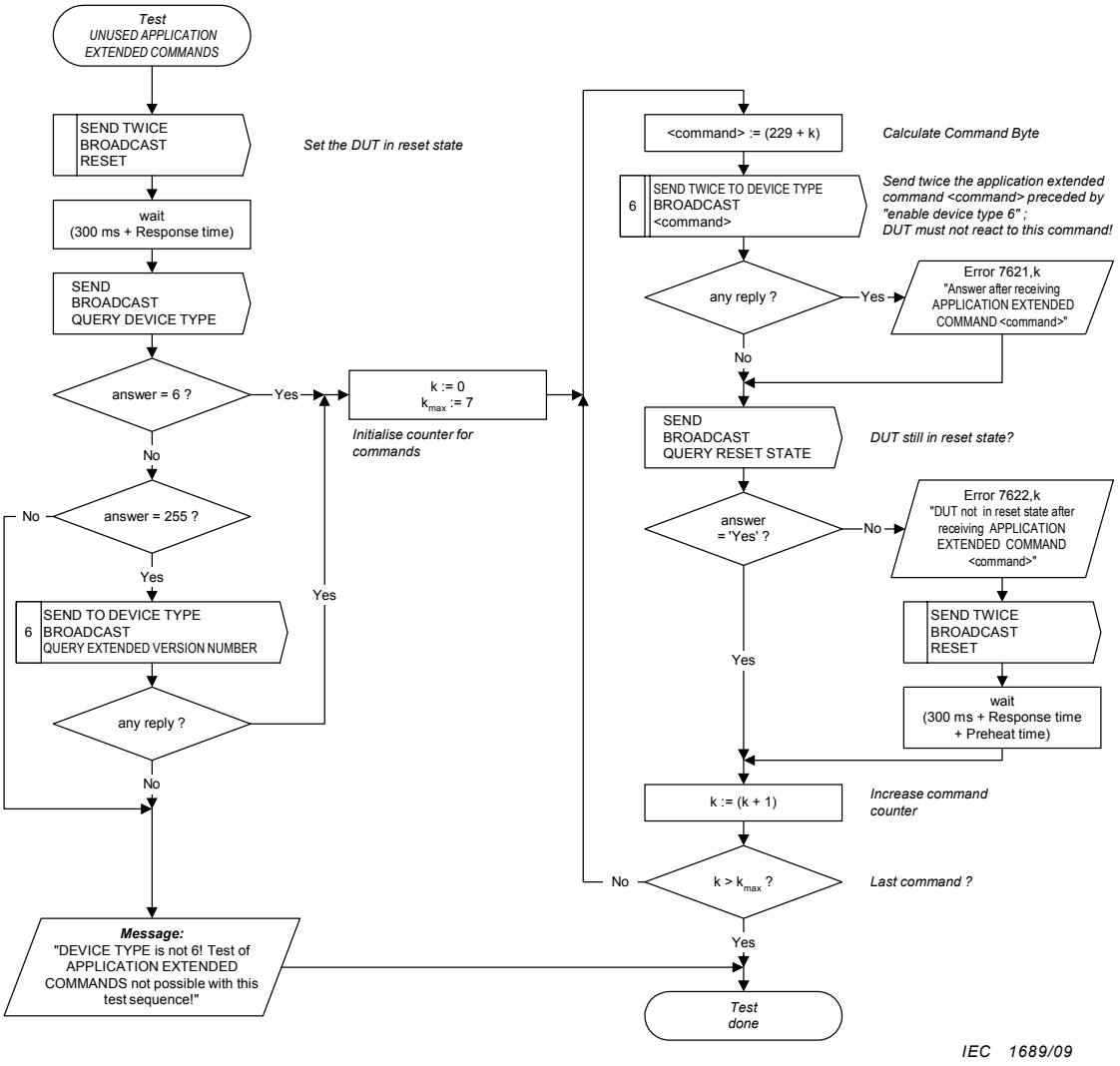


Figure 25 – “RESERVED APPLICATION EXTENDED COMMANDS”

Annex A
(informative)

Examples of algorithms

The requirements of IEC 62386-102, Annex A apply with the following exceptions:

A.3 Address allocation by physical selection

Addition:

Address allocation by physical selection is only recommended if all control gears in the system support this feature.

Additional clause:

A.5 Reference system power measurement

A reference system power measurement is carried out by the following steps :

a) The control device sends command 224 “REFERENCE SYSTEM POWER” to start the measurement;
b) The control gears now measure and store system power levels due to an individual algorithm. The measurement procedure should not take more than 15 min;
c) Meanwhile the control device periodically sends command 249 “QUERY REFERENCE RUNNING”;
d) When the control device no longer receives an answer, all the control gears should have finished their measurements and should be back in normal operation;
e) The control device can use command 250 “QUERY REFERENCE MEASUREMENT FAILED” to check whether the measurement was successful.

Bibliography

[1] IEC 60598-1, *Luminaires – Part 1: General requirements and tests*

[2] IEC 60669-2-1, *Switches for household and similar fixed electrical installations – Part 2-1: Particular requirements – Electronic switches*

[3] IEC 60921, *Ballasts for tubular fluorescent lamps – Performance requirements*

[4] IEC 60923, *Auxiliaries for lamps – Ballasts for discharge lamps (excluding tubular fluorescent lamps) – Performance requirements*

[5] IEC 60925, *DC-supplied electronic ballasts for tubular fluorescent lamps –Performance requirements*

[6] IEC 60929, *AC-supplied electronic ballasts for tubular fluorescent lamps – Performance requirements*

[7] IEC 61347-1, *Lamp controlgear – Part 1: General and safety requirements*

[8] IEC 61347-2-3, *Lamp controlgear – Part 2-3: Particular requirements for a.c. supplied electronic ballasts for fluorescent lamps*

[9] IEC 61547, *Equipment for general lighting purposes – EMC immunity requirements*

[10] IEC 62034, *Automatic test systems for battery powered emergency escape lighting*

[11] CISPR 15, *Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment*

[12] GS1, *General Specification: Global Trade Item Number,* Version 7.0, published by the GS1, Avenue Louise 326; BE-1050 Brussels, Belgium; and GS1, 1009 Lenox Drive, Suite 202, Lawrenceville, New Jersey, 08648 USA.

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