



BSI Standards Publication

Digital addressable lighting interface

Part 209: Particular requirements
for control gear — Colour control
(device type 8)

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National foreword

This British Standard is the UK implementation of EN 62386-209:2011. It is identical to IEC 62386-209:2011.

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.

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English version

**Digital addressable lighting interface -
Part 209: Particular requirements for control gear -
Colour control (device type 8)
(IEC 62386-209:2011)**

Interface d'éclairage adressable
numérique -
Partie 209: Exigences particulières pour
les appareillages de commande -
Commande de la couleur (Type de
dispositif 8)
(CEI 62386-209:2011)

Digital adressierbare Schnittstelle für die
Beleuchtung -
Teil 209: Besondere Anforderungen an
Betriebsgeräte -
Farbsteuerung (Gerätetyp 8)
(IEC 62386-209:2011)

This European Standard was approved by CENELEC on 2011-07-29. 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.

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CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

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Foreword

The text of document 34C/964/FDIS, future edition 1 of IEC 62386-209, 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 62386-209 on 2011-07-29.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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) 2012-04-29
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2014-07-29

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 62386-209:2011 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:

- [1] IEC 60598-1 NOTE Harmonized as EN 60598-1.
 - [2] IEC 60669-2-1 NOTE Harmonized as EN 60669-2-1.
 - [3] IEC 60921 NOTE Harmonized as EN 60921.
 - [4] IEC 60923 NOTE Harmonized as EN 60923.
 - [5] IEC 60929 NOTE Harmonized as EN 60929.
 - [6] IEC 61347-1 NOTE Harmonized as EN 61347-1.
 - [7] IEC 61347-2-3 NOTE Harmonized as EN 61347-2-3.
 - [8] IEC 61547 NOTE Harmonized as EN 61547.
 - [9] IEC 62384 NOTE Harmonized as EN 62384.
 - [10] CISPR 15 NOTE Harmonized as EN 55015.
-

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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
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
CIE	1931	Commission internationale de l'Eclairage - Proceedings	-	-
CIE 17.4	1987	International Lighting Vocabulary	-	-

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INTRODUCTION

This first edition of IEC 62386-209 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, specifies 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 the 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 209.

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 209: Particular requirements for control gear – Colour control (device type 8)

1 Scope

This International Standard specifies a protocol and test procedures for the control by digital signals of electronic control gear that can change their light colour.

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*

CIE (1932), *Commission internationale de l'Eclairage proceedings, 1931. Cambridge University Press, Cambridge.*

CIE 17-4:1987, *International lighting vocabulary, ISBN 978 3 900734 07 7*

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 apply, with the following additional definitions.

3.1

colour type

mechanism to set a colour in an appropriate way

3.2

xy chromaticity

colour type, representing the colour matching functions of a standard observer according to the Commission Internationale de L'Eclairage (CIE) basis for colorimetry of 1931

3.3

colour temperature

T_c

colour type, representing the colour of a light source that matches the temperature of a black body radiator according to Planck's law

3.4**correlated colour temperature****CCT**

colour temperature of the Planckian radiator whose perceived colour most closely resembles that of the given stimulus at the same brightness and under specified viewing conditions (from CIE 17-4:1987)

3.5**primary N**

colour type, representing a single output channel of the gear

3.6**RGBWAF**

colour type, in which the output channels of the control gear can be associated with red (R), green (G), blue (B), white (W), amber (A) or freecolour (F)

3.7**RGBWAF dimlevel**

term that specifies the set of red dimlevel, green dimlevel, blue dimlevel, white dimlevel, amber dimlevel and freecolour dimlevel

3.8**colour value**

number or a set of numbers interpreted in the context of a colour type to specify a colour

3.9**TY**

number that represents the brightness or luminance of a colour in the xy colour space

NOTE x and y are the chromaticity coordinates calculated from the tristimulus values XYZ. TY is identical to the tristimulus value Y

3.10**colour setting**

combination of colour type and colour value

3.11**total output light intensity**

visible optical output of the control gear depending on its arc power level and colour

3.12**control type**

processing method of arc power control commands for colour type RGBWAF

3.13**colour space**

plane scaled in such a way that any colour within it may be identified with two coordinates x and y, where x and y are both in the range 0 to 1

3.14**attainable colour space**

part of the colour space that a control gear / lamp combination is able to render

3.15**temporary colour setting**

combination of temporary colour type and temporary colour value, used for control gear internal processing only

NOTE The temporary colour setting has no visible effect on light output

3.16**temporary colour type**

a mechanism to set a colour in an appropriate way, used for control gear internal processing only

NOTE The temporary colour type has no visible effect on light output

3.17**temporary colour value**

number or a set of numbers interpreted in the context of a temporary colour type to specify a colour, used for control gear internal processing only

NOTE The temporary colour value has no visible effect on light output

3.18**report colour setting**

combination of report colour type and report colour value, only used for querying control gear status

NOTE The report colour setting has no visible effect on light output

3.19**report colour type**

colour type only used for querying a stored or the actual colour type

NOTE The report colour type has no visible effect on light output

3.20**report colour value**

number or a set of numbers interpreted in the context of a report colour type to specify a colour

NOTE The report colour value has no visible effect on light output

3.21**colour transition**

change from a colour setting to another in a specified time

3.22**temporary RGBWAF dimlevel**

shorthand for temporary R dimlevel, temporary G dimlevel, temporary B dimlevel, temporary W dimlevel, temporary A dimlevel and temporary F dimlevel

4 General

The requirements of Clause 4 of IEC 62386-101:2009 and of Clause 4 of IEC 62386-102:2009 shall apply with the following exception.

Additional subclauses:

4.4 Colour type**4.4.1 General**

There are four colour types of which only one colour type shall be active at any moment.

If the control gear supports a colour type all commands related to that colour type (see Table 14) shall be implemented. Some of the application extended commands (see 11.3.4) are applicable to only one colour type, whereas others have a more general character. If an

application extended command is relevant or has relevant parts for a supported colour type, these parts shall be implemented.

4.4.2 Colour type: xy-coordinate

The output colour shall correspond as closely as possible to that shown in Figure 1 for the point in the colour space defined by the x and y co-ordinates. The total output light intensity shall depend on the requested x and y coordinates and the arc power level.

If the control gear has exchangeable light source(s) and does not support automatic calibration then the control gear shall also support colour type primary N.

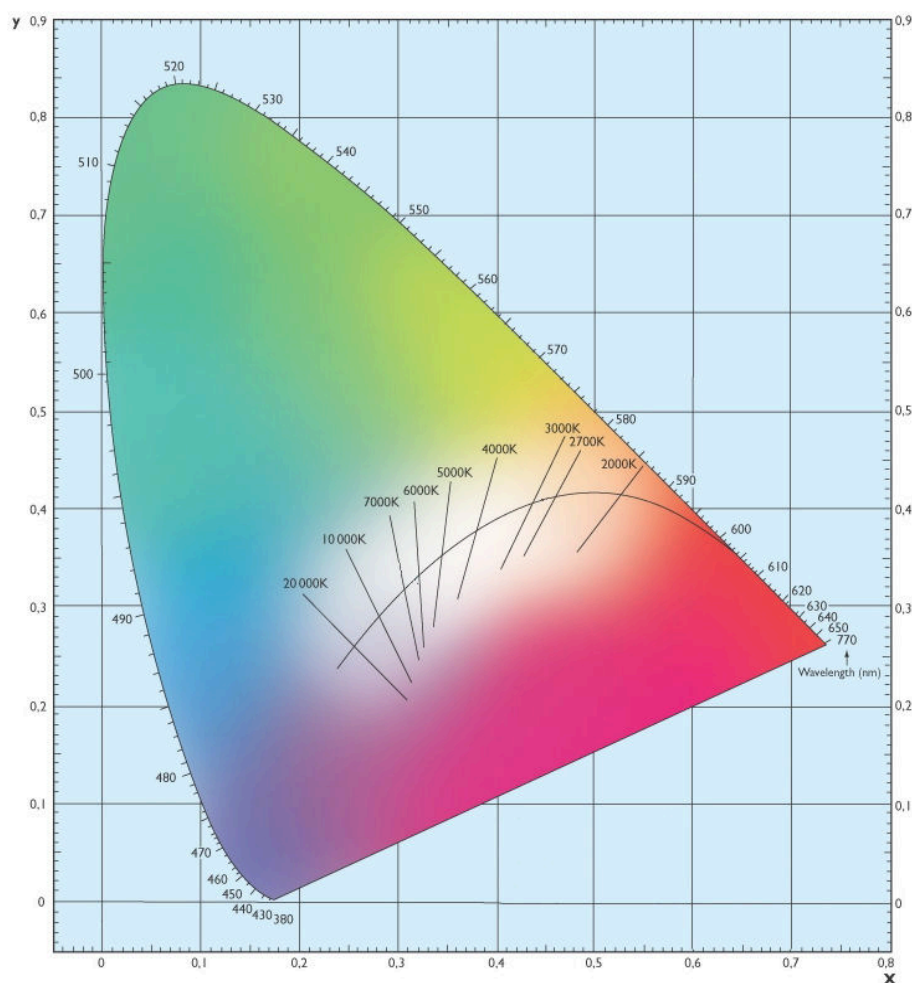


Figure 1 – The CIE color space chromaticity diagram, 1931 Cambridge University Press

4.4.3 Colour type: colour temperature T_C

A black body (perfect radiant body) changes its colour from red through yellow to white as its temperature increases (black body line – BBL). The absolute temperature T (Kelvin) of the black body is referred to as the colour temperature T_C (see Figure 1).

The total output light intensity shall depend on the requested colour temperature T_C and the arc power level.

Many light sources do not emit a light colour caused by the temperature of the light source itself, e.g. LED or fluorescent lamp versus tungsten lamp, and do not exactly follow the black body line. The colour emitted from the light source that is perceived by the human eye is

that matches closest to the black body line is called correlated colour temperature, see 3.4. The correlated colour temperature of the light output shall be as close as possible to the requested colour temperature.

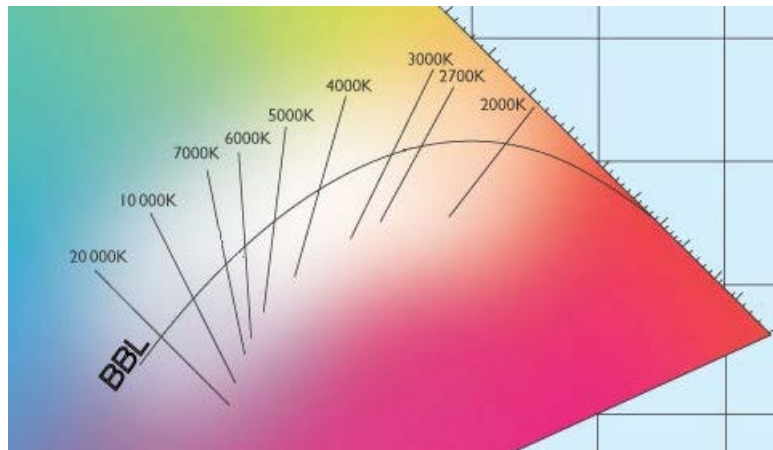


Figure 2 – Black body line

Mirek is the unit used to express the colour temperature T_C (see Figure 3). Mirek is equivalent to one million times the reciprocal value of the colour temperature T in Kelvin:

$$\text{Mirek} = \frac{1\,000\,000}{T}$$



Figure 3 – Colour temperature diagram

4.4.4 Colour type: primary N

Primary N gives direct control over the light intensity of each available output channel.

4.4.5 Colour type: RGBWAF

RGBWAF comprises a method where at least 1 output channel and maximum 6 output channels, each connected with a lamp of e.g. a different colour, can be controlled independently via arc power level.

An output channel shall be assigned to the dedicated colour R (red), G (green), B (blue), W (white), A (amber) or F (freecolour). Multiple channels can be assigned to the same or different colours. Output channels are assigned by default to a particular colour but can be reassigned to the colours red, green, blue, white, amber or freecolour.

Channels can be linked or unlinked, see 9.1 for more details.

Direct and indirect arc power control commands can be processed by means of the following control types:

- channel control (arc power control commands are processed to linked output channels)

- colour control (arc power control commands are processed to output channels assigned to linked colours);
- normalised colour control (arc power control commands are used for intensity control, whereas the colour stays constant).

NOTE Only “Normalised colour control” RGBWAF can be used to achieve a constant colour output.

5 Electrical specification

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

6 Interface power supply

The requirements of Clause 6 of IEC 62386-101:2009 and Clause 6 of IEC 62386-102:2009 shall 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 shall apply.

8 Timing

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

9 Method of operation

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

9.1 Logarithmic dimming curve, arc power levels and accuracy

Addition:

9.1.1 Colour light output versus arc power level

The colour output can change automatically on most commands that affect the arc power level. Alternatively the colour change can be triggered using the “ACTIVATE” command. The automatic activation bit determines whether activation is automatic or explicit. The concept is explained further in this clause. See Table 5 and Table 6 for an overview of the system reaction to a change in arc power level and the relation to colour.

9.1.2 Direct arc power level

The light output depends on the colour type being used and the value given by the arc power level.

A “DIRECT ARC POWER CONTROL” command with a value of 255 (“MASK”) shall ‘STOP FADING’ for all colour types.

A “DIRECT ARC POWER CONTROL” command with a value of 0 shall turn off the light for all colour types.

A “DIRECT ARC POWER CONTROL” command with a value of 1-254 shall turn on the light and the light output created by the 4 colour types shall further be affected by arc power level as follows:

- xy-coordinate: The arc power level controls the intensity of the light output.
- T_C : The arc power level controls the intensity of the light output.
- primary N: The intensity of the light output is independent of the arc power level.
- RGBWAF shall first update the RGBWAF control type based on the TEMPORARY RGBWAF CONTROL byte, then depending on the resulting RGBWAF control type:
 - control type ‘Channel control’ and ‘Colour control’
 - linked channels/colours: The requirements of Clause 9.1 of IEC 62386-102 apply. The linked channels shall not react to RGBWAF dimlevels.
 - unlinked channels/colours: The light output is independent of the arc power level. The unlinked channels shall react to RGBWAF dimlevels.
 - control type ‘Normalised colour control’
 - linked colours: The requirements of Clause 9.1 of IEC 62386-102 apply. The linked colours shall not react to RGBWAF dimlevels.
 - unlinked colours: The light output shall be scaled according to the following formula:

$$\begin{pmatrix} C_R \\ C_G \\ C_B \\ C_W \\ C_A \\ C_F \end{pmatrix} = \begin{cases} \begin{pmatrix} R \\ G \\ B \\ W \\ A \\ F \end{pmatrix} \cdot \frac{ArcPowerLevel}{MAX(R, G, B, W, A, F)} & \text{when } MAX(R, G, B, W, A, F) \neq 0 \\ \begin{pmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{pmatrix} \cdot ArcPowerLevel & \text{when } MAX(R, G, B, W, A, F) = 0 \end{cases}$$

NOTE 1 MAX (R,G,B,W,A,F) is the maximum value of the RGBWAF Dimlevel.

NOTE 2 C_X is the value processed to the output channel(s) assigned to the colour X.

NOTE 3 R,G,B,W,A,F represent a dimlevel

9.1.3 Indirect arc power levels

For indirect arc power levels the control gear shall react as with the direct arc power level command, except that a level of 255 (“MASK”) shall now mean “DON’T CHANGE”.

9.2 Power on

9.2.1 General

A control gear shall react according to Clause 9.2 of IEC 62386-102 with the following additions:

The power on colour setting shall be used as described below. In addition, if the “POWER ON LEVEL” is triggered, the power on colour setting shall be activated (see 9.12.5).

When the “POWER ON COLOUR VALUES” are “MASK”, the colour setting of the power on level shall be the most recent colour.

When not all “POWER ON COLOUR VALUES” are “MASK”, the colour setting for the colour values that are “MASK” shall be the most recent value, and the colour values that are set shall change to the requested value.

9.2.2 Store power on colour

The power on colour setting shall be stored on receipt of command 45 (STORE THE DTR AS POWER ON LEVEL).

The following data shall be stored (see Table 1):

- “POWER ON COLOUR TYPE” (colour type that shall be used);
- “POWER ON COLOUR VALUE” (colour value that shall be used);
- “POWER ON LEVEL” (DTR).

The temporary colour type (see 9.12.4) shall be automatically derived from the last temporary colour value that has been changed.

Table 1 – Power on

“TEMPORARY COLOUR TYPE”	“POWER ON COLOUR TYPE”	“POWER ON COLOUR VALUE”	“POWER ON LEVEL” (part 102)
xy-coordinate	xy-coordinate	“TEMPORARY xy-COORDINATE”	DTR value (intensity)
colour temperature T_C	colour temperature T_C	“TEMPORARY COLOUR TEMPERATURE T_C ”	DTR value (intensity)
primary N	primary N	“TEMPORARY PRIMARY N DIMLEVEL”	DTR value
RGBWAF	RGBWAF	“TEMPORARY RGBWAF DIMLEVEL” and “TEMPORARY RGBWAF CONTROL”	DTR value
255 (“MASK”)	No change	No change	DTR value

NOTE 1 When the “TEMPORARY COLOUR TYPE” is “MASK” the colour setting of the power on level is not changed.

NOTE 2 To attain the effect that the power on colour setting uses the most recent colour, the “POWER ON COLOUR VALUES” should be set to “MASK”.

9.2.3 Query power on colour

The colour setting of “SYSTEM FAILURE” shall be copied to the report colour type and the corresponding report colour values when receiving command 164 (QUERY SYSTEM FAILURE LEVEL). The “REPORT COLOUR TYPE” and the “REPORT COLOUR VALUE” can be queried using command 250 (QUERY COLOUR VALUE).

9.3 Interface-failure

9.3.1 General

A control gear shall react according to Clause 9.3 of IEC 62386-102 with the following additions:

The system failure colour setting shall be used as described below. In addition, if the “SYSTEM FAILURE LEVEL” is triggered, the system failure colour setting shall be activated (see 9.12.5).

When the “SYSTEM FAILURE COLOUR VALUES” are “MASK” the control gear shall not change the colour.

When not all “SYSTEM FAILURE COLOUR VALUES” are “MASK”, the colour setting for the colour values that are “MASK” shall not change and the colour values that are set shall change to the requested value.

9.3.2 Store system failure colour

The system failure colour setting shall be stored on receipt of command 44 (STORE THE DTR AS SYSTEM FAILURE LEVEL).

The following data shall be stored (see Table 2):

- “SYSTEM FAILURE COLOUR TYPE” (colour type that shall be used);
- “SYSTEM FAILURE COLOUR VALUE” (colour value that shall be used);
- “SYSTEM FAILURE LEVEL” (DTR).

The temporary colour type (see 9.12.4) shall be automatically derived from the last temporary colour value that has been changed.

Table 2 – Interface failure

“TEMPORARY COLOUR TYPE”	“SYSTEM FAILURE COLOUR TYPE”	“SYSTEM FAILURE COLOUR VALUE”	“SYSTEM FAILURE LEVEL” (part 102)
xy-coordinate	xy-coordinate	“TEMPORARY xy-COORDINATE”	DTR value (intensity)
colour temperature T_c	colour temperature T_c	“TEMPORARY COLOUR TEMPERATURE T_c ”	DTR value (intensity)
primary N	primary N	“TEMPORARY PRIMARY N DIMLEVEL”	DTR value
RGBWAF	RGBWAF	“TEMPORARY RGBWAF DIMLEVEL” and “TEMPORARY RGBWAF CONTROL”	DTR value
255 (“MASK”)	No change	No change	DTR value

NOTE 1 When the “TEMPORARY COLOUR TYPE” is “MASK” the colour setting of the system failure level is not changed.

NOTE 2 To attain the effect that the colour does not change on an interface failure, the “SYSTEM FAILURE COLOUR VALUES” should be set to “MASK”.

9.3.3 Query system failure colour

The colour setting of “SYSTEM FAILURE” shall be copied to the report colour type and the corresponding report colour values when receiving command 164 (QUERY SYSTEM FAILURE LEVEL). The “REPORT COLOUR TYPE” and the “REPORT COLOUR VALUE” can be queried using command 250 (QUERY COLOUR VALUE).

9.4 Min and max level

The impact of “MIN LEVEL” and “MAX LEVEL” as described for the arc power level in Clause 9.4 of IEC 62386-102 shall depend on the active colour type (see Table 3).

Table 3 – Min and Max level

Active colour type	Impact
xy-coordinate	restricts the arc power level
colour temperature T_c	restricts the arc power level
primary N	no impact
RGBWAF	restricts the arc power level of every output channel/colour

9.5 Fade time and fade rate

A control gear shall handle a change in colour in the same way as a change in arc power level. A fade shall change colour value and/or arc power level simultaneously. On reception of a direct arc power command with a value of MASK, the fade process shall be stopped. See also Table 5 and Table 6.

NOTE There is only one fade per control gear at the same time.

9.6 Reaction to commands during error state

If the control gear is in an error state where operation of one or more lamps is not possible (e.g. lamp failure) it shall react to commands in the following way:

- For the lamp(s) whose operation is not possible, the control gear shall calculate “virtual” arc power levels and reactions in accordance with the appropriate definitions, and it shall establish the actual “virtual” level when the failure is repaired (lamp operation is possible).
- For the lamp(s) that function normally the gear shall react in a normal way.
- If one or more lamps fail, this shall be indicated in the “STATUS” byte as a lamp failure.

Additional subclauses:

9.9 16 Bit data transfer for the application extended control commands

The data transfer method shall be the same for forward and backward frames.

The 16-bit data transferred shall be split into two bytes. The most significant byte (MSB) shall be placed in DTR1 and the least significant byte (LSB) shall be placed in the DTR.

Queries shall use this data transfer method and shall be answered with the value of DTR1.

The data shall be transferred as described above unless explicitly defined otherwise.

NOTE A control device could decide to put a fixed value in the DTR and only change DTR1 values to emulate 8 bit data. The control device should take into account that some commands change the content of the DTR.

9.10 Multi colour type control gear

A control gear shall support at least 1 colour type and up to 4 colour types. The colour types supported can be queried by command 249 (QUERY COLOUR TYPE FEATURES). Each colour type has its own colour setting.

The 4 colour types are defined as follows:

- xy-coordinate;

- colour temperature T_c ;
- primary N;
- RGBWAF.

9.11 Colour scenes

9.11.1 General

Colour scenes shall be stored and recalled in the same way as described in Clause 11 of IEC 62386-102 with the following additions.

9.11.2 Store colour scene XXXX

Colour scenes shall be stored on reception of commands 64-79 (STORE THE DTR AS SCENE). The following data shall be stored (see Table 4):

- “SCENE 0-15 COLOUR TYPE” (colour type that shall be used)
- “SCENE 0-15 COLOUR VALUE” (colour value that shall be used)
- “SCENE 0-15” (DTR)
- The temporary colour type shall be automatically derived from the last temporary colour value that has been changed.

Table 4 – Colour scenes

“TEMPORARY COLOUR TYPE”	“SCENE 0-15 COLOUR TYPE”	“SCENE 0-15 COLOUR VALUE”	“SCENE 0-15” (part 102)
xy-coordinate	xy-coordinate	“TEMPORARY xy-COORDINATE”	DTR value (intensity)
colour temperature T_c	colour temperature T_c	“TEMPORARY COLOUR TEMPERATURE T_c ”	DTR value (intensity)
primary N	primary N	“TEMPORARY PRIMARY N DIMLEVEL”	DTR value
RGBWAF	RGBWAF	“TEMPORARY RGBWAF DIMLEVEL” and “TEMPORARY RGBWAF CONTROL”	DTR value
255 (“MASK”)	No change	No change	DTR value

NOTE 1 When storing a new scene with commands 64-79, the colour belonging to that scene will also be overwritten with the temporary colour setting.

NOTE 2 When storing “MASK” in scene register XXXX the temporary colour setting is stored in the colour scene. Such a scene will change the colour but not the arc power level.

NOTE 3 When the “TEMPORARY COLOUR TYPE” is “MASK” the colour setting of the scene is not changed.

9.11.3 Remove colour scene XXXX

Colour scenes shall be removed on reception of commands 80-95 (REMOVE FROM SCENE). “MASK” shall be placed in “SCENE 0-15” and in “SCENE 0-15 COLOUR TYPE”.

Data stored in the corresponding “SCENE 0-15 COLOUR VALUE” shall consequently be invalid.

9.11.4 Go to colour scene XXXX

The reception of commands 16-31 (GO TO SCENE) shall copy the colour setting belonging to the scene to the temporary colour setting, then recall the “SCENE 0-15” value. The colour scene activation depends on the “Automatic Activation” bit (see 9.12.5).

If the arc power level stored for scene register XXXX contains “MASK” the colour scene shall be recalled if the “SCENE 0-15 COLOUR TYPE” does not contain “MASK”.

If the “SCENE 0-15 COLOUR TYPE” contains “MASK”, the arc power level belonging to that scene shall be recalled.

If both the “SCENE 0-15 COLOUR TYPE” and the arc power level stored for scene register XXXX contain “MASK” the control gear does not belong to this scene and it shall stay in the state it is.

9.11.5 Query colour scene XXXX

The colour setting of a colour scene shall be copied to the report colour type and corresponding report colour values when receiving command 176-191 (QUERY SCENE LEVEL (SCENES 0-15)). The “REPORT COLOUR TYPE” and the “REPORT COLOUR VALUE” can be queried using command 250 (QUERY COLOUR VALUE).

9.12 Colour change

9.12.1 Colour type xy-coordinate

The change from the current xy-coordinate to a new xy-coordinate shall be along a straight line in the colour space (shortest distance between the two points) while the colour is within the attainable colour space.

9.12.2 Colour type colour temperature T_c

The change from the current colour temperature T_c to a new colour temperature T_c shall follow the black body line as close as possible using the CCT lines if needed.

9.12.3 Colour type change

When changing from the active colour type to another colour type the change in colour shall be done according to the method of operation of the new colour type. If the control gear is not capable of recalculating the current colour value for the active colour type to a colour value for the new colour type, the control gear shall adjust to the new colour type with the new colour value without fading.

9.12.4 Temporary colour setting

To achieve a consistent colour transition for all colour types, the colour values shall be stored in temporary values. This allows the control gear to prepare a combined colour and arc power level fade, and ensures consistency with scenes.

The “TEMPORARY COLOUR TYPE” shall be set according to the most recently set “TEMPORARY COLOUR VALUE”, and shall be set to “MASK” after activation or use.

“TEMPORARY COLOUR VALUES” shall be set to “MASK” after activation or use. If a temporary colour value for a supported colour type is set all temporary colour values for all other supported colour types shall be set to “MASK”.

On changing a “TEMPORARY COLOUR VALUE” the control gear shall change the “TEMPORARY COLOUR TYPE” as follows:

- TEMPORARY x-COORDINATE or TEMPORARY y-COORDINATE
 - The “TEMPORARY COLOUR TYPE” shall be set to xy.
 - If colour type xy is not supported, the TEMPORARY COLOUR TYPE shall be set to primary N.
- TEMPORARY COLOUR TEMPERATURE T_c
 - The “TEMPORARY COLOUR TYPE” shall be set to T_c .

- TEMPORARY PRIMARY N DIMLEVEL
 - The “TEMPORARY COLOUR TYPE” shall be set to primary N.
- TEMPORARY RGBWAF DIMLEVEL or TEMPORARY RGBWAF CONTROL:
 - The “TEMPORARY COLOUR TYPE” shall be set to RGBWAF.

If the resulting “TEMPORARY COLOUR TYPE” is an unsupported colour type, the “TEMPORARY COLOUR VALUES” and the “TEMPORARY COLOUR TYPE” shall be set to “MASK”.

9.12.5 Activate colour settings

Once the temporary values are set the transition shall be activated in one of the following ways:

- If the ‘Automatic Activation’ bit is set, any Arc Power Control command except “ENABLE DAPC SEQUENCE” shall stop a running fade and activate a colour change combined with the requested arc power change. The fading for the transition shall be according to the Arc Power Control command. This shall be seen as “ACTIVATE” followed by the Arc Power Control command, in the same fade.
- Command “ACTIVATE”; this command shall stop a running fade and start a new fade that only changes colour.

During activation the “TEMPORARY COLOUR VALUE” shall be used as the requested colour value, causing the control gear to set its output to the requested colour value using the actual fade time if applicable. During fading bit 4 of the ‘STATUS INFORMATION’ shall indicate “fade is running”.

A value of “MASK” in one of the “TEMPORARY COLOUR VALUES” means no change for the corresponding value.

A value of “MASK” in “TEMPORARY COLOUR TYPE” means no colour change on any command that uses this variable. Any other value shall update the “COLOUR STATUS” to reflect the active colour type.

A value of “MASK” for the arc power level means no change in arc power level and “STOP FADING” if a fade is running. If the “TEMPORARY COLOUR VALUES” are set in combination with an arc power level “MASK”, a new colour only fade shall start. In case the “TEMPORARY COLOUR TYPE” and the arc power level both contain “MASK” no new fade shall be started.

Table 5 and Table 6 give an overview of the system reaction.

Table 5 – System reaction on DAPC and TEMPORARY COLOUR TYPE

'Automatic Activation' bit	TEMPORARY COLOUR TYPE ^a	DAPC	
		0-254	"MASK"
set ("1")	0x10, 0x20, 0x40, 0x80	Set colour target point, then DAPC 0-254 and colour fade (single fade). All temporaries set to "MASK".	STOP FADING, then start colour fade only. All temporaries set to "MASK".
	"MASK"	DAPC 0-254, no colour change	STOP FADING, no colour change
not set ("0")	0x10, 0x20, 0x40, 0x80	DAPC 0-254, no colour change no change in temporaries	STOP FADING, no colour change no change in temporaries
	"MASK"	DAPC 0-254, no colour change	STOP FADING, no colour change
^a Colour type supported control gear: 0x10: xy-coordinate 0x20: colour temperature T_c 0x40: primary N 0x80: RGBWAF			

Table 6 – System reaction on commands and colour type

'Automatic Activation' bit	Action/command	Temporary or stored colour type	Colour type	
			0x10, 0x20, 0x40, 0x80	"MASK"
not set	Any arc power control command except GO TO SCENE	-	No colour change	No colour change
	GO TO SCENE	Stored	No colour change Temporaries set to SCENE colour setting	GO TO SCENE with fading, no colour change
set	OFF	Temp	Set colour target point, then OFF without fading. Temporaries set to "MASK"	OFF without fading.
	UP	Temp	Set colour target point, then 200 ms fade UP. Temporaries set to "MASK"	200 ms fade UP, no colour change
	DOWN	Temp	Set colour target point, then 200 ms fade DOWN. Temporaries set to "MASK"	200 ms fade DOWN, no colour change
	STEP UP	Temp	Set colour target point, then STEP UP without fading. Temporaries set to "MASK"	STEP UP without fading, no colour change
	STEP DOWN	Temp	Set colour target point, then STEP DOWN without fading. Temporaries set to "MASK"	STEP DOWN without fading, no colour change
	RECALL MAX LEVEL	Temp	Set colour target point, then RECALL MAX LEVEL without fading. Temporaries set to "MASK"	RECALL MAX LEVEL without fading, no colour change
	RECALL MIN LEVEL	Temp	Set colour target point, then RECALL MIN LEVEL without fading. Temporaries set to "MASK"	RECALL MIN LEVEL without fading, no colour change
	STEP DOWN AND OFF	Temp	Set colour target point, then STEP DOWN AND OFF without fading. Temporaries set to "MASK"	STEP DOWN AND OFF without fading, no colour change
	ON AND STEP	Temp	Set colour target point, then	ON AND STEP UP without fading

'Automatic Activation' bit	Action/command	Temporary or stored colour type	Colour type	
			0x10, 0x20, 0x40, 0x80	"MASK"
	UP		ON AND STEP UP without fading. Temporaries set to "MASK"	fading, no colour change
	GO TO SCENE	Stored	Temporaries set to SCENE colour setting, then GO TO SCENE with fading. Temporaries set to "MASK"	GO TO SCENE with fading, no colour change
don't care	Trigger POWER ON LEVEL	Stored	Set colour target point, then go to POWER ON LEVEL without fading. Temporaries set to "MASK"	Not applicable
	Trigger SYSTEM FAILURE LEVEL	Stored	Set colour target point, then go to SYSTEM FAILURE LEVEL without fading. Temporaries set to "MASK"	Not applicable
	STORE DTR AS SCENE	Temp	No visible effects. Colour scene updated Temporaries set to "MASK"	No visible effects, no change in colour scene
	STORE POWER ON LEVEL	Temp	No visible effects. POWER ON COLOUR settings updated Temporaries set to "MASK"	No visible effects, no change in POWER ON COLOUR setting
	STORE SYSTEM FAILURE LEVEL	Temp	No visible effects. SYSTEM FAILURE COLOUR setting updated Temporaries set to "MASK"	No visible effects, no change in SYTEM FAILURE COLOUR setting
	ASSIGN COLOUR TO LINKED CHANNEL	Temp	Assign colour to linked channel. Temporaries set to "MASK"	No change

Based on the "TEMPORARY COLOUR TYPE" the following action shall take place on activation:

- "TEMPORARY COLOUR TYPE" xy :
 - The 'Colour type xy -coordinate active' bit, bit 4 of the 'COLOUR STATUS', shall be set and bits 1, 5, 6 and 7 of the 'COLOUR STATUS' shall be reset.
 - If during or after a colour transition the colour value that should have been reached is outside the attainable colour space, this shall be indicated by the 'xy-coordinate colour point out of range' bit, bit 0 of the 'COLOUR STATUS'. Bit 0 shall always represent the actual status when in xy mode.
- "TEMPORARY COLOUR TYPE" T_C :
 - The 'Colour type colour temperature T_C active' bit, bit 5 of the 'COLOUR STATUS', shall be set and bits 0, 4, 6 and 7 of the 'COLOUR STATUS' shall be reset.
 - If during or after a colour transition the colour value that should have been reached is outside the attainable colour space, this shall be indicated by the 'Colour temperature T_C out of range' bit, bit 1 of the 'COLOUR STATUS'. Bit 1 shall always represent the actual status when in T_C mode.
- "TEMPORARY COLOUR TYPE" primary N:
 - The 'Colour type primary N active' bit, bit 6 of the 'COLOUR STATUS' shall be set. Bits 0, 1, 4, 5 and 7 of the 'COLOUR STATUS' shall be reset.
 - A value of '0' in one of the 'PRIMARY N DIMLEVEL(s)' shall cause this primary to be switched OFF.
- "TEMPORARY COLOUR TYPE RGBWAF":

- The ‘Colour type RGBWAF active’ bit, bit 7 of the ‘COLOUR STATUS’ shall be set. Bits 0, 1, 4, 5 and 6 of the ‘COLOUR STATUS’ shall be reset.
- The ‘TEMPORARY RGBWAF CONTROL’ shall be processed.
- Each ‘RED-, GREEN-, BLUE-, WHITE-, AMBER-, and FREECOLOUR- DIM LEVEL’ shall be processed to all output channels assigned to the corresponding colour.
- Each ‘RED-, GREEN-, BLUE-, WHITE-, AMBER-, and FREECOLOUR- DIM LEVEL’ represents a direct arc power control level according to the active dimming curve, and shall be processed according to the ‘RGBWAF CONTROL’ status, see Claus 9.1.

After activation the temporary colour setting shall be set to “MASK”.

9.12.6 Reporting colour settings

A set of report colour values and a report colour type is available to report colour settings. These values shall be set on reception of the following commands:

- Command 33 (“STORE ACTUAL LEVEL IN THE DTR”)
- Command 160 (“QUERY ACTUAL LEVEL”)
- Command 163 (“QUERY POWER ON LEVEL”)
- Command 164 (“QUERY SYSTEM FAILURE LEVEL”)
- Command 176-191 (“QUERY SCENE LEVEL (SCENES 0-15)”)

The “REPORT COLOUR TYPE” shall be set according to the queried colour setting:

bit 0..3	Reserved;	'0' = No
bit 4	Colour type xy-coordinate;	'0' = No
bit 5	Colour type colour temperature T_C ;	'0' = No
bit 6	Colour type primary N;	'0' = No
bit 7	Colour type RGBWAF;	'0' = No

The “REPORT VARIABLES” shall only be valid for the “REPORT COLOUR TYPE”, all “REPORT VARIABLES” not belonging to the “REPORT COLOUR TYPE” shall be set to “MASK”.

9.12.7 Copy from report to temporary variables

The report colour settings shall be copied to the temporary colour settings on reception of command 238 (“COPY REPORT TO TEMPORARY”).

9.13 Colour temperature T_C limits

The physical T_C range shall be set by “COLOUR TEMPERATURE T_C PHYSICAL WARMEST” and “COLOUR TEMPERATURE T_C PHYSICAL COOLEST”. These variables are intended to set the actual physical parameters. If they are used otherwise, unexpected results might occur.

The rendered T_C range shall be limited by “COLOUR TEMPERATURE T_C WARMEST” and “COLOUR TEMPERATURE T_C COOLEST”.

Their mathematical relationship is: “COLOUR TEMPERATURE T_C PHYSICAL WARMEST” $\geq$ “COLOUR TEMPERATURE T_C WARMEST” $\geq$ “COLOUR TEMPERATURE T_C COOLEST” $\geq$ “COLOUR TEMPERATURE T_C PHYSICAL COOLEST”.

From this it becomes clear that changing one of the limits may impact the others. Their relationship is described in Table 7.

Table 7 – T_C limit change behaviour

Limit	Up/Down change	Limit	Possibly affects	Impact
"COLOUR TEMPERATURE T_C PHYSICAL WARMEST"	Up	65534	None	None
	Down	1	All others	If the set value is lower than one or more of the others, these shall become the set value
"COLOUR TEMPERATURE T_C WARMEST"	Up	"COLOUR TEMPERATURE T_C PHYSICAL WARMEST"	None	None
	Down	"COLOUR TEMPERATURE T_C PHYSICAL COOLEST"	"COLOUR TEMPERATURE T_C COOLEST"	If the set value is lower than the "COLOUR TEMPERATURE T_C COOLEST" then "COLOUR TEMPERATURE T_C COOLEST" shall become the set value
"COLOUR TEMPERATURE T_C COOLEST"	Up	"COLOUR TEMPERATURE T_C PHYSICAL WARMEST"	"COLOUR TEMPERATURE T_C WARMEST"	If the set value is higher than the "COLOUR TEMPERATURE T_C WARMEST" then "COLOUR TEMPERATURE T_C WARMEST" shall become the set value
	Down	"COLOUR TEMPERATURE T_C PHYSICAL COOLEST"	None	None
"COLOUR TEMPERATURE T_C PHYSICAL COOLEST"	Up	65534	All others	If the set value is higher than one or more of the others, these shall become the set value
	Down	1	None	None

A value of "MASK" for "COLOUR TEMPERATURE T_C PHYSICAL COOLEST" or "COLOUR TEMPERATURE T_C PHYSICAL WARMEST" shall mean that the physical values are uncalibrated. If one of the values is set to "MASK" the other value shall also be set to "MASK" by the control gear.

If the "COLOUR TEMPERATURE T_C PHYSICAL WARMEST" is changed from "MASK" to a new value, "COLOUR TEMPERATURE T_C WARMEST" shall become this new value.

If the "COLOUR TEMPERATURE T_C PHYSICAL COOLEST" is changed from "MASK" to a new value, "COLOUR TEMPERATURE T_C COOLEST" shall become this new value.

"COLOUR TEMPERATURE T_C PHYSICAL WARMEST" and "COLOUR TEMPERATURE T_C PHYSICAL COOLEST" shall be limited to the attainable colour space when a control gear is using the 'stored xy-coordinate primary N' to define its colour space.

If the actual colour temperature T_C is out of range after changing the limits, it shall be set immediately to the closest boundary without fading.

10 Declaration of variables

The requirements of Clause 10 of IEC 62386-102:2009 shall apply, with the following additional variables for this device type, as indicated in Table 8:

Table 8 – Declaration of variables

VARIABLE	Used with COLOUR TYPE ^a	DEFAULT VALUE (control gear leaves the factory) ^{d)}	RESET VALUE	RANGE OF VALIDITY	MEMORY ^{b d}
"TEMPORARY x-COORDINATE"	0,2	65535 ("MASK")	65535 ("MASK")	0 – 65534, 65535 ("MASK")	2 bytes RAM
"REPORT x-COORDINATE"	0	65535 ("MASK")	65535 ("MASK")	0 – 65534, 65535 ("MASK")	2 bytes RAM
"x-COORDINATE"	0	?	no change	0 – 65534, 65535 ("MASK")	2 bytes RAM
"TEMPORARY y-COORDINATE"	0,2	65535 ("MASK")	65535 ("MASK")	0 – 65534, 65535 ("MASK")	2 bytes RAM
"REPORT y-COORDINATE"	0	65535 ("MASK")	65535 ("MASK")	0 – 65534, 65535 ("MASK")	2 bytes RAM
"y-COORDINATE"	0	?	no change	0 – 65534, 65535 ("MASK")	2 bytes RAM
"TEMPORARY COLOUR TEMPERATURE T_c "	1	65535 ("MASK")	65535 ("MASK")	1 – 65534, 65535 ("MASK")	2 bytes RAM
"REPORT COLOUR TEMPERATURE T_c "	1	65535 ("MASK")	65535 ("MASK")	1 – 65534, 65535 ("MASK")	2 bytes RAM
"COLOUR TEMPERATURE T_c "	1	?	no change	1 – 65534, 65535 ("MASK")	2 bytes RAM
"COLOUR TEMPERATURE T_c COOLEST"	1	?	COLOUR TEMPERATURE T_c PHYSICAL COOLEST	COLOUR TEMPERATURE T_c PHYSICAL COOLEST - COLOUR TEMPERATURE T_c WARMEST, 65535 ("MASK")	2 bytes
"COLOUR TEMPERATURE T_c WARMEST"	1	?	COLOUR TEMPERATURE T_c PHYSICAL WARMEST	COLOUR TEMPERATURE T_c COOLEST – COLOUR TEMPERATURE T_c PHYSICAL WARMEST, 65535 ("MASK")	2 bytes
"COLOUR TEMPERATURE T_c PHYSICAL COOLEST"	1	?	no change	1 – COLOUR TEMPERATURE T_c PHYSICAL WARMEST, 65535 ("MASK")	2 bytes
"COLOUR TEMPERATURE T_c PHYSICAL WARMEST"	1	?	no change	COLOUR TEMPERATURE T_c PHYSICAL COOLEST – 65534, 65535 ("MASK")	2 bytes
"TEMPORARY PRIMARY N DIMLEVEL"	2	65535 ("MASK")	65535 ("MASK")	0 – 65534, 65535 ("MASK")	up to 12 bytes RAM
"REPORT PRIMARY N DIMLEVEL"	2	65535 ("MASK")	65535 ("MASK")	0 – 65534, 65535 ("MASK")	up to 12 bytes RAM
"PRIMARY N DIMLEVEL"	2	?	no change	0 – 65534, 65535 ("MASK")	up to 12 bytes RAM
"x-COORDINATE PRIMARY N"	0,2	?	no change	0 – 65534, 65535 ("MASK")	up to 12 bytes
"y-COORDINATE PRIMARY N"	0,2	?	no change	0 – 65534, 65535 ("MASK")	up to 12 bytes
"TY PRIMARY N"	0,2	?	no change	0 – 65534, 65535 ("MASK")	up to 12 bytes
TEMPORARY RED DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM

VARIABLE	Used with COLOUR TYPE ^a	DEFAULT VALUE (control gear leaves the factory) ^{d)}	RESET VALUE	RANGE OF VALIDITY	MEMORY ^{b d}
"REPORT RED DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM
"RED DIMLEVEL"	3	?	no change	0 – 254, 255 ("MASK")	1 byte RAM
"TEMPORARY GREEN DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM
"REPORT GREEN DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM
"GREEN DIMLEVEL"	3	?	no change	0 – 254, 255 ("MASK")	1 byte RAM
"TEMPORARY BLUE DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM
"REPORT BLUE DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM
"BLUE DIMLEVEL"	3	?	no change	0 – 254, 255 ("MASK")	1 byte RAM
"TEMPORARY WHITE DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM
"REPORT WHITE DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM
"WHITE DIMLEVEL"	3	?	no change	0 – 254, 255 ("MASK")	1 byte RAM
"TEMPORARY AMBER DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM
"REPORT AMBER DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM
"AMBER DIMLEVEL"	3	?	no change	0 – 254, 255 ("MASK")	1 byte RAM
"TEMPORARY FREECOLOUR DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM
"REPORT FREECOLOUR DIMLEVEL"	3	255 ("MASK")	255 ("MASK")	0 – 254, 255 ("MASK")	1 byte RAM
"FREECOLOUR DIMLEVEL"	3	?	no change	0 – 254, 255 ("MASK")	1 byte RAM
"TEMPORARY RGBWAF CONTROL"	3	255 ("MASK")	255 ("MASK")	0 – 255	1 byte RAM
"REPORT RGBWAF CONTROL"	3	255 ("MASK")	255 ("MASK")	0 – 255	1 byte RAM
"RGBWAF CONTROL"	3	63 ^c	no change	0 – 255	1 byte RAM
"ASSIGNED COLOUR" channel 0 channel 1 channel 2 channel 3 channel 4 channel 5	3	0x0102 0304 0506 Red Green Blue White Amber Freecolour	0x0102 0304 0506 Red Green Blue White Amber Freecolour	0x0000 0000 0000 – 0x0606 0606 0606 (0 – 6 per channel)	6 bytes (3 bits per channel)
"TEMPORARY COLOUR TYPE"	0,1,2,3	255 ("MASK")	255 ("MASK")	0x10, 0x20, 0x40, 0x80, 0xFF ("MASK")	1 byte RAM
"REPORT COLOUR TYPE"	0,1,2,3	255 ("MASK")	255 ("MASK")	0x10, 0x20, 0x40, 0x80, 0xFF ("MASK")	1 byte RAM

VARIABLE	Used with COLOUR TYPE ^a	DEFAULT VALUE (control gear leaves the factory) ^{d)}	RESET VALUE	RANGE OF VALIDITY	MEMORY ^{b d}
"SCENE 0-15 COLOUR TYPE"	0,1,2,3	65535 ("MASK")	65535 ("MASK")	0x10, 0x20, 0x40, 0x80, 0xFF ("MASK")	16 bytes
"SCENE 0-15 COLOUR VALUE"	0,1,2,3	65535 ("MASK")	65535 ("MASK")	0 – 65534, 65535 ("MASK")	32 up to 192 bytes
"POWER ON COLOUR TYPE"	0,1,2,3	factory burn-in ^e	factory burn-in ^e	0x10, 0x20, 0x40, 0x80	1 byte
"POWER ON COLOUR VALUE"	0,1,2,3	factory burn-in ^e	factory burn-in ^e	0 – 65534, 65535 ("MASK")	2 up to 12 bytes
"SYSTEM FAILURE COLOUR TYPE"	0,1,2,3	factory burn-in ^e	factory burn-in ^e	0x10, 0x20, 0x40, 0x80	1 byte
"SYSTEM FAILURE COLOUR VALUE"	0,1,2,3	factory burn-in ^e	factory burn-in ^e	0 – 65534, 65535 ("MASK")	2 up to 12 bytes
"GEAR FEATURES/STATUS"	0,1,2,3	??00 0001	??00 0001	??000000b, ??000001b	1 byte RAM
"COLOUR STATUS"	0,1,2,3	?	no change	0 – 255	1 byte RAM
? = undefined ^a Mandatory for colour type supported control gear: 0: xy-coordinate 1: colour temperature T_c 2: primary N 3: RGBWAF ^b Persistent memory (storage time indefinite) if not stated otherwise. ^c Supported output channels shall be linked ^d For MEMORY type RAM the power up value shall be the DEFAULT VALUE ^e The factory burn-in colour setting shall use a supported colour type					

11 Definition of commands

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

11.1 Arc power control commands

11.1.1 Direct arc power control command

Amendment:

Command -: YAAA AAA0 XXXX XXXX "DIRECT ARC POWER CONTROL"

In addition to subclause 11.1.1 of IEC 62386-102, this command activates the colour transition if the 'Automatic Activation' bit is set, see 9.12.5.

11.1.2 Indirect arc power control commands

In addition to subclause 11.1.2 of IEC 62386-102, all indirect arc power control commands except command 9 ("ENABLE DAPC SEQUENCE") shall activate the colour transition if the 'Automatic Activation' bit is set, see 9.12.5. The temporary colour setting shall be set to "MASK".

Command 1: YAAA AAA1 0000 0001 “UP”

In addition to subclause 11.1.2 of IEC 62386-102, this command shall activate the colour transition if the ‘Automatic Activation’ bit is set. The number of steps to take shall be calculated using the fade rate. The colour fade should use the number of calculated steps, but is allowed to use fewer steps in case it cannot keep up with the given fade rate. The temporary colour setting shall be set to “MASK”.

Command 2: YAAA AAA1 0000 0010 “DOWN”

In addition to subclause 11.1.2 of IEC 62386-102, this command shall activate the colour transition if the ‘Automatic Activation’ bit is set. The number of steps to take shall be calculated using the fade rate. The colour fade should use the number of calculated steps, but may use fewer steps with a minimum of one if it cannot keep up with the given fade rate. The temporary colour setting shall be set to “MASK”.

NOTE The number of steps can be calculated by dividing the set fade rate (steps/s) by five, since we fade only 200 ms; then round up to the closest whole number.

Command 9: YAAA AAA1 0000 1001 “ENABLE DAPC SEQUENCE”

This command shall be handled according to subclause 11.1.2 of IEC 62386-102. There shall be no change of the temporary colour setting.

NOTE The first DAPC command triggers the correct colour transition with the correct fade time.

Command 16-31: YAAA AAA1 0001 XXXX “GO TO SCENE”

This command shall copy the colour setting belonging to scene XXXX to the temporary colour setting, and shall then act as defined in subclause 11.1.2 of IEC 62386-102.

If the ‘Automatic Activation’ bit is set, the command shall activate the colour setting using the actual fade time. The temporary colour setting shall be set to “MASK”.

If the “Automatic Activation” bit is not set, the temporary colour setting shall not be changed (i.e. the colour setting belonging to scene XXXX).

11.2 Configuration commands**11.2.1 General configuration commands**

Amendment:

Command 33: YAAA AAA1 0010 0001 “STORE ACTUAL LEVEL IN THE DTR”

In addition to subclause 11.2.1 of IEC 62386-102, this command shall copy the actual colour type and corresponding colour values to the “REPORT COLOUR TYPE” and the “REPORT COLOUR VALUE”.

11.2.2 Arc power parameters settings

Amendment:

Command 44: YAAA AAA1 0010 1100 “STORE THE DTR AS SYTEM FAILURE LEVEL”

In addition to subclause 11.2.2 of IEC 62386-102, this command shall copy the temporary colour type and corresponding temporary colour values to the “SYSTEM FAILURE COLOUR TYPE” and the “SYSTEM FAILURE COLOUR VALUE”. The temporary colour setting shall be set to “MASK”.

Command 45: **YAAA AAA1 0010 1101** **"STORE THE DTR AS POWER ON LEVEL"**

In addition to subclause 11.2.2 of IEC 62386-102, this command shall copy the temporary colour type and corresponding temporary colour values to the "POWER ON COLOUR TYPE" and the "POWER ON COLOUR VALUE". The temporary colour setting shall be set to "MASK".

Command 46: **YAAA AAA1 0010 1110** **"STORE THE DTR AS FADE TIME"**

In addition to subclause 11.2.2 of IEC 62386-102, the fade time shall also be used for colour transitions. A fade shall change the arc power level and colour simultaneously.

The new fade time shall be valid after the reception of the next arc power control command or the next colour activation. If a new fade time is stored during a running fade process, this process shall be finished before the new value is used.

Command 64-79: **YAAA AAA1 0100 XXXX** **"STORE THE DTR AS SCENE"**

In addition to subclause 11.2.2 of IEC 62386-102, this command shall copy the temporary colour type and corresponding temporary colour values to the "SCENE 0-15 COLOUR TYPE" and the "SCENE 0-15 COLOUR VALUE". The temporary colour setting shall be set to "MASK".

11.2.3 System parameters settings

Amendment:

Command 80-95: **YAAA AAA1 0101 XXXX** **"REMOVE FROM SCENE"**

In addition to IEC 62386-102, Clause 11.2.3 this command shall remove the colour scene.

Removing the colour scene from scene XXXX means storing "MASK" in "SCENE 0-15 COLOUR TYPE".

11.3 Query commands

11.3.1 Queries related to status information

Command 144: **YAAA AAA1 1001 0000** **"QUERY STATUS"**

In addition to subclause 11.3.1 of IEC 62386-102, this command shall set bit 1 of the "STATUS INFORMATION BYTE" if one or more lamps fail.

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

In addition to subclause 11.3.1 of IEC 62386-102, this command shall answer if there are multiple lamp problems at the given address. The answer shall be "Yes" or "No".

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

The answer shall be 8 or, if the control gear supports more than one device type, 255 ("MASK").

11.3.2 Queries related to arc power parameters settings

Command 160: **YAAA AAA1 1010 0000** **"QUERY ACTUAL LEVEL"**

If the active colour type is xy-coordinate, colour temperature T_C , primary N or RGBWAF with only one output channel linked or RGBWAF with 'Normalised colour control' active the answer shall be the actual arc power level according to subclause 11.3.2 of IEC 62386-102, otherwise the answer shall be "MASK".

Based on the "COLOUR STATUS" the active colour type shall be set in the "REPORT COLOUR TYPE" and the corresponding colour values shall be copied to the "REPORT COLOUR VALUE".

Command 163: YAAA AAA1 1010 0011 “QUERY POWER ON LEVEL”

In addition to subclause 11.3.2 of IEC 62386-102, this command shall copy the stored POWER ON COLOUR TYPE and the stored POWER ON COLOUR VALUE to the “REPORT COLOUR TYPE” and corresponding “REPORT COLOUR VALUE”.

Command 164: YAAA AAA1 1010 0100 “QUERY SYSTEM FAILURE LEVEL”

In addition to subclause 11.3.2 of IEC 62386-102, this command shall copy the SYSTEM FAILURE COLOUR TYPE and the SYSTEM FAILURE COLOUR TYPE to the “REPORT COLOUR TYPE” and corresponding “REPORT COLOUR VALUE”.

11.3.3 Queries related to system parameter settings**Command 176-191: YAAA AAA1 1000 XXXX “QUERY SCENE LEVEL (SCENES 0-15)”**

In addition to , subclause 11.3.3 of IEC 62386-102, this command shall copy the stored scene XXXX colour type and the stored SCENE XXXX COLOUR TYPE to the “REPORT COLOUR TYPE” and corresponding “REPORT COLOUR VALUE”.

11.3.4 Application extended commands*Replacement:*

Application extended commands shall be preceded by command 272 (ENABLE DEVICE TYPE X) with X = 8. For device types other than 8, these commands may be used in a different way.

The data transfer for all application extended commands is described in 9.9.

11.3.4.1 Application extended control commands**Command 224: YAAA AAA1 1110 0000 “SET TEMPORARY x-COORDINATE”**

The value shall be stored as ‘TEMPORARY x-COORDINATE’.

The value is expressed in units of 1/65536.

The maximum x-coordinate value is 0,99997.

Command 225: YAAA AAA1 1110 0001 “SET TEMPORARY y-COORDINATE”

The value shall be stored as ‘TEMPORARY y-COORDINATE’.

The value is expressed in units of 1/65536.

The maximum y-coordinate value is 0,99997.

Command 226: YAAA AAA1 1110 0010 “ACTIVATE”

This command shall stop a running fade if a fade is running, and start a new fade for colour only. See 9.12.5 for details.

Command 227: YAAA AAA1 1110 0011 “x-COORDINATE STEP UP”

This command shall only be executed when ‘Colour type xy-coordinate active’ bit, bit 4 of the ‘COLOUR STATUS’, is set.

The ‘x-COORDINATE’ shall be set 256 steps higher (256/65536) immediately without fading. If the new colour value does not correspond to a colour attainable by the control gear, this shall be indicated by the ‘xy-coordinate colour point out of range’ bit, bit 0 of the ‘COLOUR STATUS’.

Command 228: YAAA AAA1 1110 0100 “x-COORDINATE STEP DOWN”

This command shall only be executed when ‘Colour type xy-coordinate active’ bit, bit 4 of the ‘COLOUR STATUS’, is set.

The ‘x-COORDINATE’ shall be set 256 steps lower (256/65536) immediately without fading. If the new colour value does not correspond to a colour attainable by the control gear, this shall be indicated by the ‘xy-coordinate colour point out of range’ bit, bit 0 of the ‘COLOUR STATUS’.

Command 229: YAAA AAA1 1110 0101 “y-COORDINATE STEP UP”

This command shall only be executed when ‘Colour type xy-coordinate active’ bit, bit 4 of the ‘COLOUR STATUS’, is set.

The ‘y-COORDINATE’ shall be set 256 steps higher (256/65536) immediately without fading. If the new colour value does not correspond to a colour attainable by the control gear, this shall be indicated by the ‘xy-coordinate colour point out of range’ bit, bit 0 of the ‘COLOUR STATUS’.

Command 230: YAAA AAA1 1110 0110 “y-COORDINATE STEP DOWN”

This command shall only be executed when ‘Colour type xy-coordinate active’ bit, bit 4 of the ‘COLOUR STATUS’, is set.

The ‘y-COORDINATE’ shall be set 256 steps lower (256/65536) immediately without fading. If the new colour value does not correspond to a colour attainable by the control gear, this shall be indicated by the ‘xy-coordinate colour point out of range’ bit, bit 0 of the ‘COLOUR STATUS’.

Command 231: YAAA AAA1 1110 0111 "SET TEMPORARY COLOUR TEMPERATURE T_C "

The value shall be stored as ‘TEMPORARY COLOUR TEMPERATURE T_C ’.

The value is expressed in units of 1 Mirek.

A value of 0 for T_C shall be ignored and therefore not stored in memory.

NOTE Colour temperature T_C can vary from 1 Mirek (1 000 000 K) to 65 534 Mirek (15,26 K).

Command 232: YAAA AAA1 1110 1000 "COLOUR TEMPERATURE T_C STEP COOLER"

This command shall only be executed when ‘Colour type colour temperature T_C active’ bit, bit 5 of the ‘COLOUR STATUS’ is set.

The ‘COLOUR TEMPERATURE T_C ’ shall be set 1 Mirek lower immediately without fading. No change shall occur if ‘COLOUR TEMPERATURE T_C ’ is already at ‘COLOUR TEMPERATURE T_C COOLEST’. If the new colour value does not correspond to a colour temperature attainable by the control gear, this shall be indicated by the ‘Colour temperature T_C out of range’ bit, bit 1 of the ‘COLOUR STATUS’.

Command 233: YAAA AAA1 1110 1001 "COLOUR TEMPERATURE T_C STEP WARMER"

This command shall only be executed when ‘Colour type colour temperature T_C active’ bit, bit 5 of the ‘COLOUR STATUS’ is set.

The ‘COLOUR TEMPERATURE T_C ’ shall be set 1 Mirek higher immediately without fading. No change shall occur if ‘COLOUR TEMPERATURE T_C ’ is already at ‘COLOUR TEMPERATURE T_C WARMEST’. If the new colour value does not correspond to a colour temperature attainable by the control gear, this shall be indicated by the ‘Colour temperature T_C out of range’ bit, bit 1 of the ‘COLOUR STATUS’.

Command 234: **YAAA AAA1 1110 1010** **"SET TEMPORARY PRIMARY N DIMLEVEL"**

The value shall be stored as 'TEMPORARY PRIMARY N DIMLEVEL'.

The value is expressed in units of 1/65536.

The maximum 'PRIMARY N DIMLEVEL' value is 0,99997 and shall be interpreted on a linear scale.

N depends on DTR2 and shall be in the range from 0 to 5 depending upon the available number of primaries. For any other value of DTR2 the command shall be ignored.

Command 235: **YAAA AAA1 1110 1011** **"SET TEMPORARY RGB DIMLEVEL"**

The data in the DTR shall be set as 'TEMPORARY RED DIMLEVEL'. The data in DTR1 shall be set as 'TEMPORARY GREEN DIMLEVEL'. The data in DTR2 shall be set as 'TEMPORARY BLUE DIMLEVEL'.

Command 236: **YAAA AAA1 1110 1100** **"SET TEMPORARY WAF DIMLEVEL"**

The data in the DTR shall be set as 'TEMPORARY WHITE DIMLEVEL'. The data in DTR1 shall be set as 'TEMPORARY AMBER DIMLEVEL'. The data in DTR2 shall be set as 'TEMPORARY FREECOLOUR DIMLEVEL'.

Command 237: **YAAA AAA1 1110 1101** **"SET TEMPORARY RGBWAF CONTROL"**

The data in the DTR shall be stored as 'TEMPORARY RGBWAF CONTROL'.

The data in the DTR shall be interpreted as:

bit 0	output channel 0/Red;	'0' = Unlinked, '1' = Linked
bit 1	output channel 1/Green;	'0' = Unlinked, '1' = Linked
bit 2	output channel 2/Blue;	'0' = Unlinked, '1' = Linked
bit 3	output channel 3/White;	'0' = Unlinked, '1' = Linked
bit 4	output channel 4/Amber;	'0' = Unlinked, '1' = Linked
bit 5	output channel 5/Freecolour;	'0' = Unlinked, '1' = Linked
bits 7..6	control type;	'00' = Channel control '01' = Colour control '10' = Normalised colour control '11' = reserved

Bit 0 to bit 5 sets the appropriate output channel(s)/colour(s) linked or unlinked.

Bit 6 and bit 7: The control type defines how the gear shall react to Arc Power Commands. See 9.1 for details.

The linked channels shall all be set to unlinked on any colour activation with colour type xy-coordinate, colour temperature T_C or primary N.

NOTE More than one channel can be linked at the same time.

Command 238: **YAAA AAA1 1110 1110** **"COPY REPORT TO TEMPORARY"**

The report colour settings shall be copied to the temporary colour settings.

11.3.4.2 Application extended configuration commands

Every configuration command (239 to 246) shall be received a second time within 100 ms before it is executed in order 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 4).

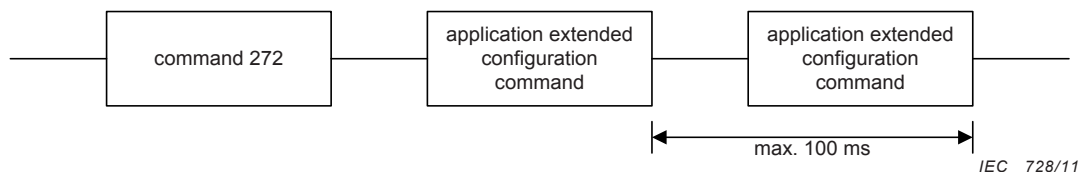


Figure 4 – Application extended configuration command sequence example

All values of DTRx 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 defined in Clause 10.

Command 239: **YAAA AAA1 1110 1111**

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

Command 240: **YAAA AAA1 1111 0000 "STORE TY PRIMARY N"**

The value shall be stored as 'TY PRIMARY N'.

The value is expressed in units of 0,5 lumen resulting in a possible range of $TY_{min} = 0$ lumen, to $TY_{max} = 32767$ lumen. A value of 65535 ("MASK") means unknown.

N depends on DTR2 and shall be in the range from 0 to 5 depending upon the available number of primaries. For any other value of DTR2 the command shall be ignored.

A value of "MASK" means that this primary is undefined and calibration is needed.

Command 241: **YAAA AAA1 1111 0001 "STORE xy-COORDINATE PRIMARY N"**

The 'TEMPORARY x-COORDINATE' and the 'TEMPORARY y-COORDINATE', given by command 224 and command 225 shall be stored as 'x-COORDINATE PRIMARY N' respectively 'y-COORDINATE PRIMARY N' of primary N given by the value of DTR2, and shall be in the range from 0 to 5 depending upon the available number of primaries. For any other value of DTR2 the command shall be ignored.

A value of "MASK" in one of the "temporary colour value" values shall be stored which means that this primary is undefined and calibration is needed.

NOTE 1 The intended use of this command is to store the actual xy-coordinate belonging to the primary. Any other use can lead to unexpected results (colours).

NOTE 2 xy-coordinates outside the CIE 1931 colour space chromaticity diagram (4.4.2) are not meaningful.

Command 242: **YAAA AAA1 1111 0010 "STORE COLOUR TEMPERATURE TC LIMIT"**

The value shall be stored in a variable defined by column 'LIMIT' of Table 9, depending on the value stored in DTR2. For any other value of DTR2 the command shall be ignored.

Table 9 – Store colour temperature T_c limit

DTR2 value	LIMIT	Description (values in Mirek)
0000 0000	COLOUR TEMPERATURE T_c COOLEST	lowest possible value but always equal to or warmer than the lowest possible physical value
0000 0001	COLOUR TEMPERATURE T_c WARMEST	highest possible value but always equal to or cooler than the highest possible physical value
0000 0010	COLOUR TEMPERATURE T_c PHYSICAL COOLEST	lowest possible physical value
0000 0011	COLOUR TEMPERATURE T_c PHYSICAL WARMEST	highest possible physical value

See 9.13 for additional explanation.

Command 243: YAAA AAA1 1111 0011 "STORE GEAR FEATURES/STATUS"

The data in the DTR shall be interpreted as follows:

bit 0 Automatic Activation; '0' = No

bit 1..7 reserved; '0' = No

If bit 0, the 'Automatic Activation' bit, is set to 1, all arc power control commands except "ENABLE DAPC SEQUENCE" shall automatically trigger a colour transition. See ;.5.

If the 'Automatic Activation' bit is set, bit 0 of the "GEAR FEATURES/STATUS" byte shall be set.

Command 244: YAAA AAA1 1111 0100

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

Command 245: YAAA AAA1 1111 0101 "ASSIGN COLOUR TO LINKED CHANNEL"

The data held in the DTR in the range 0 to 6 shall be used to assign any/all linked output channel(s) to the given colour (see Table 10). For any other value of the DTR the command shall be ignored.

The linked channels are given by bit 0 to bit 5 held in "TEMPORARY RGBWAF CONTROL". If "TEMPORARY RGBWAF CONTROL" holds "MASK" the channel assignment shall not be changed.

The "TEMPORARY COLOUR SETTINGS" are set to "MASK" after use of this command.

Table 10 – Assign channel to colour

DTR		assign channel to colour
0000 0000	0	No colour assigned
0000 0001	1	Red
0000 0010	2	Green
0000 0011	3	Blue
0000 0100	4	White
0000 0101	5	Amber
0000 0110	6	Freecolour

Command 246 YAAA AAA1 1111 0110 "START AUTO CALIBRATION"

The command shall start or re-trigger a 15 min timer. Bit 2 of "COLOUR STATUS" shall be set to "1" whilst this timer is running. When the timer stops the most recent colour type, colour value and arc power level shall be restored immediately.

Whilst the timer is running the control gear shall run a calibration procedure in order to measure the x-coordinate, y-coordinate and the T_C -value of all supported primaries and bit 3 of "COLOUR STATUS" shall be set to "0". While the calibration procedure is running, the control gear shall not react to any command except "TERMINATE", "QUERY COLOUR STATUS" and "START AUTO CALIBRATION".

The "TERMINATE" command shall cause the procedure to be aborted and the timer to be stopped.

If the calibration is successful then bit 3 of "COLOUR STATUS" shall be set to "1" and the timer shall be stopped.

If the calibration is not successful (bit 3 of "COLOUR STATUS" is "0") and the control gear is capable of recovering the last successful calibration data it shall do so. In this case bit 3 of "COLOUR STATUS" shall be set to "1". The capability to recover the last successful calibration data is a gear feature; see command 247.

Auto calibration is a gear feature; see command 247. If this feature is not supported the control gear shall not react in any way.

NOTE Due to the fact that the calibration process may take longer than 15 min, the control device should check the status of the auto calibration by command 248 'QUERY COLOUR STATUS' periodically and re-trigger the calibration process timer by command 246 (START AUTO CALIBRATION) if necessary

11.3.4.3 Application extended query commands

Command 247: YAAA AAA1 1111 0111 "QUERY GEAR FEATURES /STATUS"

The answer shall be the 8-bit 'GEAR FEATURES/STATUS' information byte:

bit 0	Automatic Activation;	'0' = No
bit 1..5	Reserved;	'0' = default value
bit 6	Auto calibration supported;	'0' = No
bit 7	Auto calibration recovery supported	'0' = No

If the control gear supports Auto Calibration bit 6 shall be set and command 246 shall be supported. Bit 7 shall be set if both auto-recovery and auto calibration are supported.

Command 248: YAAA AAA1 1111 1000 "QUERY COLOUR STATUS"

The answer shall be the 8-bit 'COLOUR STATUS' information byte:

bit 0	xy-coordinate colour point out of range;	'0' = No
bit 1	Colour temperature T_C out of range;	'0' = No
bit 2	Auto calibration running;	'0' = No
bit 3	Auto calibration successful;	'0' = No
bit 4	Colour type xy-coordinate active;	'0' = No
bit 5	Colour type colour temperature T_C active;	'0' = No
bit 6	Colour type primary N active;	'0' = No
bit 7	Colour type RGBWAF active;	'0' = No

Command 249: YAAA AAA1 1111 1001 "QUERY COLOUR TYPE FEATURES"

The answer shall be the 8-bit 'COLOUR TYPE FEATURES' information byte concerning the colour type(s) supported by the control gear:

bit 0	xy-coordinate capable;	'0' = No
bit 1	Colour temperature T_C capable;	'0' = No
bit 2..4	Number of primaries;	'0'..'6'
bit 5..7	Number of RGBWAF channels;	'0'..'6'

NOTE A value of "0" for number of primaries or number of RGBWAF channels means that these colour types are not supported.

Command 250: YAAA AAA1 1111 1010 "QUERY COLOUR VALUE"

The answer depends on the value of the DTR (see Table 11).

Answers corresponding to the DTR values related to an active colour type are only valid if the colour type of the requested colour value is active (see command 248) or if the control gear is capable of recalculating the requested colour value from the active colour type into a colour value of another colour type. If recalculation is not possible this shall be indicated by a value of "MASK" as answer.

Querying the number of primaries, the x-coordinate, y-coordinate and TY of primary N shall be independent of the implemented colour type. If the control gear does not know the coordinates, or the primary is not there, the answer shall be "MASK".

Table 11 – Query colour value

DTR		VARIABLE or command	active colour type related
0000 0000	0	"x-COORDINATE"	yes
0000 0001	1	"y-COORDINATE"	yes
0000 0010	2	"COLOUR TEMPERATURE TC"	yes
0000 0011	3	"PRIMARY N DIMLEVEL" 0	yes
0000 0100	4	"PRIMARY N DIMLEVEL" 1	yes
0000 0101	5	"PRIMARY N DIMLEVEL" 2	yes
0000 0110	6	"PRIMARY N DIMLEVEL" 3	yes
0000 0111	7	"PRIMARY N DIMLEVEL" 4	yes
0000 1000	8	"PRIMARY N DIMLEVEL" 5	yes
0000 1001	9	"RED DIMLEVEL"	yes
0000 1010	10	"GREEN DIMLEVEL"	yes
0000 1011	11	"BLUE DIMLEVEL"	yes
0000 1100	12	"WHITE DIMLEVEL"	yes
0000 1101	13	"AMBER DIMLEVEL"	yes
0000 1110	14	"FREECOLOUR DIMLEVEL"	yes
0000 1111	15	"RGBWAF CONTROL"	yes
0100 0000	64	"x-COORDINATE PRIMARY N" 0	no
0100 0001	65	"y- COORDINATE PRIMARY N" 0	no
0100 0010	66	"TY PRIMARY N" 0	no
0100 0011	67	"x-COORDINATE PRIMARY N" 1	no
0100 0100	68	"y- COORDINATE PRIMARY N" 1	no
0100 0101	69	"TY PRIMARY N" 1	no
0100 0110	70	"x-COORDINATE PRIMARY N" 2	no
0100 0111	71	"y- COORDINATE PRIMARY N" 2	no
0100 1000	72	"TY PRIMARY N" 2	no
0100 1001	73	"x-COORDINATE PRIMARY N" 3	no

DTR		VARIABLE or command	active colour type related
0100 1010	74	"y- COORDINATE PRIMARY N" 3	no
0100 1011	75	"TY PRIMARY N" 3	no
0100 1100	76	"x-COORDINATE PRIMARY N" 4	no
0100 1101	77	"y- COORDINATE PRIMARY N" 4	no
0100 1110	78	"TY PRIMARY N" 4	no
0100 1111	79	"x-COORDINATE PRIMARY N" 5	no
0101 0000	80	"y- COORDINATE PRIMARY N" 5	no
0101 0001	81	"TY PRIMARY N" 5	no
0101 0010	82	"NUMBER OF PRIMARIES"	no
1000 0000	128	"COLOUR TEMPERATURE TC COOLEST"	no
1000 0001	129	"COLOUR TEMPERATURE TC PHYSICAL COOLEST"	no
1000 0010	130	"COLOUR TEMPERATURE TC WARMEST"	no
1000 0011	131	"COLOUR TEMPERATURE TC PHYSICAL WARMEST"	no
1100 0000	192	"TEMPORARY x-COORDINATE"	no
1100 0001	193	"TEMPORARY y-COORDINATE"	no
1100 0010	194	"TEMPORARY COLOUR TEMPERATURE TC"	no
1100 0011	195	"TEMPORARY PRIMARY N DIMLEVEL" 0	no
1100 0100	196	"TEMPORARY PRIMARY N DIMLEVEL" 1	no
1100 0101	197	"TEMPORARY PRIMARY N DIMLEVEL" 2	no
1100 0110	198	"TEMPORARY PRIMARY N DIMLEVEL" 3	no
1100 0111	199	"TEMPORARY PRIMARY N DIMLEVEL" 4	no
1100 1000	200	"TEMPORARY PRIMARY N DIMLEVEL" 5	no
1100 1001	201	"TEMPORARY RED DIMLEVEL"	no
1100 1010	202	"TEMPORARY GREEN DIMLEVEL"	no
1100 1011	203	"TEMPORARY BLUE DIMLEVEL"	no
1100 1100	204	"TEMPORARY WHITE DIMLEVEL"	no
1100 1101	205	"TEMPORARY AMBER DIMLEVEL"	no
1100 1110	206	"TEMPORARY FREECOLOUR DIMLEVEL"	no
1100 1111	207	"TEMPORARY RGBWAF CONTROL"	no
1101 0000	208	"TEMPORARY COLOUR TYPE"	no
1110 0000	224	"REPORT x-COORDINATE"	no
1110 0001	225	"REPORT y-COORDINATE"	no
1110 0010	226	"REPORT COLOUR TEMPERATURE T _c "	no
1110 0011	227	"REPORT PRIMARY N DIMLEVEL" 0	no
1110 0100	228	"REPORT PRIMARY N DIMLEVEL" 1	no
1110 0101	229	"REPORT PRIMARY N DIMLEVEL" 2	no
1110 0110	230	"REPORT PRIMARY N DIMLEVEL" 3	no
1110 0111	231	"REPORT PRIMARY N DIMLEVEL" 4	no
1110 1000	232	"REPORT PRIMARY N DIMLEVEL" 5	no
1110 1001	233	"REPORT RED DIMLEVEL"	no
1110 1010	234	"REPORT GREEN DIMLEVEL"	no
1110 1011	235	"REPORT BLUE DIMLEVEL"	no
1110 1100	236	"REPORT WHITE DIMLEVEL"	no
1110 1101	237	"REPORT AMBER DIMLEVEL"	no

DTR		VARIABLE or command	active colour type related
1110 1110	238	"REPORT FREECOLOUR DIMLEVEL"	no
1110 1111	239	"REPORT RGBWAF CONTROL"	no
1111 0000	240	"REPORT COLOUR TYPE"	no

If, for colour type RGBWAF, more output channels are assigned to one colour (Red, Green, Blue, White, Amber or Freecolour) and the actual levels of these output channels are different the answer to that query shall be "MASK".

For all other DTR values and for unsupported colour types no answer shall be sent and neither DTR1 nor the DTR shall be changed.

NOTE 1 The actual level of an output channel can be queried by linking only this output channel and sending QUERY ACTUAL LEVEL.

NOTE 2 A control device should always use command 160 ("QUERY ACTUAL LEVEL") to update the report colour setting before querying it.

NOTE 3 A value of "MASK" for any of "x-COORDINATE PRIMARY N", "y-COORDINATE PRIMARY N" or "TY PRIMARY N" means that this primary is undefined and calibration is needed.

Command 251 YAAA AAA1 1111 1011 "QUERY RGBWAF CONTROL"

The answer shall be the 8-bit "RGBWAF CONTROL" byte:

bit 0	output channel 0/Red;	'0' = Unlinked, '1' = Linked
bit 1	output channel 1/Green;	'0' = Unlinked, '1' = Linked
bit 2	output channel 2/Blue;	'0' = Unlinked, '1' = Linked
bit 3	output channel 3/White;	'0' = Unlinked, '1' = Linked
bit 4	output channel 4/Amber;	'0' = Unlinked, '1' = Linked
bit 5	output channel 5/Freecolour;	'0' = Unlinked, '1' = Linked
bits 7..6	control type;	'00' = Channel control '01' = Colour control '10' = Normalised colour control '11' = Reserved

If an output channel/colour is not supported the appropriate bit shall read '0'.

Command 252 YAAA AAA1 1111 1100 "QUERY ASSIGNED COLOUR"

The answer shall be the number of the assigned colour (see Table 12) of the output channel given by the DTR. The DTR shall contain one of the channel numbers 0 to 5 (see command 237). For all other values of DTR and unsupported channel numbers the answer shall be "MASK".

Table 12 – Query assigned colour

answer		channel assigned to colour
0000 0000	0	not assigned to a colour
0000 0001	1	Red
0000 0010	2	Green
0000 0011	3	Blue
0000 0100	4	White
0000 0101	5	Amber
0000 0110	6	Freecolour

Command 253: YAAA AAA1 1111 1101

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

Command 254: YAAA AAA1 1111 1110

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

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

The answer shall be 2.

11.4 Special commands

11.4.4 Extended special commands

Command 272: 1100 0001 0000 1000 "ENABLE DEVICE TYPE 8"

Addition:

The device type for control gears for colour control is 8.

11.5 Summary of the command set

Addition:

The commands listed in 11.5 of IEC 62386-102 apply with the following additional commands for device type 8 listed in Table 13.

11.5.1 Summary of the extended application command set

Table 13 gives a summary of the extended application command set.

Table 13 – Summary of the extended application command set

Command Number	Command Code	Command Name
224	YAAA AAA1 1110 0000	SET TEMPORARY x-COORDINATE
225	YAAA AAA1 1110 0001	SET TEMPORARY y-COORDINATE
226	YAAA AAA1 1110 0010	ACTIVATE
227	YAAA AAA1 1110 0011	x-COORDINATE STEP UP
228	YAAA AAA1 1110 0100	x-COORDINATE STEP DOWN
229	YAAA AAA1 1110 0101	y-COORDINATE STEP UP
230	YAAA AAA1 1110 0110	y-COORDINATE STEP DOWN
231	YAAA AAA1 1110 0111	SET TEMPORARY COLOUR TEMPERATURE T_c
232	YAAA AAA1 1110 1000	COLOUR TEMPERATURE T_c STEP COOLER

Command Number	Command Code	Command Name
233	YAAA AAA1 1110 1001	COLOUR TEMPERATURE T_c STEP WARMER
234	YAAA AAA1 1110 1010	SET TEMPORARY PRIMARY N DIMLEVEL
235	YAAA AAA1 1110 1011	SET TEMPORARY RGB DIMLEVEL
236	YAAA AAA1 1110 1100	SET TEMPORARY WAF DIMLEVEL
237	YAAA AAA1 1110 1101	SET TEMPORARY RGBWAF CONTROL
238	YAAA AAA1 1110 1110	COPY REPORT TO TEMPORARY
239	YAAA AAA1 1110 1111	a)
240	YAAA AAA1 1111 0000	STORE T_y PRIMARY N
241	YAAA AAA1 1111 0001	STORE x_y -COORDINATE PRIMARY N
242	YAAA AAA1 1111 0010	STORE COLOUR TEMPERATURE T_c LIMIT
243	YAAA AAA1 1111 0011	STORE GEAR FEATURES/STATUS
244	YAAA AAA1 1111 0100	a)
245	YAAA AAA1 1111 0101	ASSIGN COLOUR TO LINKED CHANNEL
246	YAAA AAA1 1111 0110	START AUTO CALIBRATION
247	YAAA AAA1 1111 0111	QUERY GEAR FEATURES/STATUS
248	YAAA AAA1 1111 1000	QUERY COLOUR STATUS
249	YAAA AAA1 1111 1001	QUERY COLOUR TYPE FEATURES
250	YAAA AAA1 1111 1010	QUERY COLOUR VALUE
251	YAAA AAA1 1111 1011	QUERY RGBWAF CONTROL
252	YAAA AAA1 1111 1100	QUERY ASSIGNED COLOUR
253	YAAA AAA1 1111 1101	a)
254	YAAA AAA1 1111 1110	a)
255	YAAA AAA1 1111 1111	QUERY EXTENDED VERSION NUMBER
272	1100 0001 0000 1000	ENABLE DEVICE TYPE 8
a) Reserved for future needs. The control gear shall not react in any way.		

11.5.2 Command versus colour type cross-reference

Table 14 gives a command versus colour type cross-reference.

Table 14 – Command versus colour type cross-reference

command		supported colour type			
		xy-coordinate	T_c	primary N	RGBWAF
224	SET TEMPORARY x-COORDINATE	X		X	
225	SET TEMPORARY y-COORDINATE	X		X	
226	ACTIVATE	X	X	X	X
227	x-COORDINATE STEP UP	X			
228	x-COORDINATE STEP DOWN	X			
229	y-COORDINATE STEP UP	X			
230	y-COORDINATE STEP DOWN	X			
231	SET TEMPORARY COLOUR TEMPERATURE T_c		X		
232	COLOUR TEMPERATURE T_c STEP COOLER		X		
233	COLOUR TEMPERATURE T_c STEP WARMER		X		
234	SET TEMPORARY PRIMARY N DIMLEVEL			X	
235	SET TEMPORARY RGB DIMLEVEL				X
236	SET TEMPORARY WAF DIMLEVEL				X
237	SET TEMPORARY RGBWAF CONTROL				X
238	COPY REPORT TO TEMPORARY	X	X	X	X
239	a)				
240	STORE TY PRIMARY N			X	
241	STORE xy-COORDINATE PRIMARY N			X	
242	STORE COLOUR TEMPERATURE T_c LIMIT		X		
243	STORE GEAR FEATURES/STATUS	X	X	X	X
244	a)				
245	ASSIGN COLOUR TO LINKED CHANNEL				X
246	START AUTO CALIBRATION	$x^{b)}$	$x^{b)}$	$x^{b)}$	$x^{b)}$
247	QUERY GEAR FEATURES/STATUS	X	X	X	X
248	QUERY COLOUR STATUS	X	X	X	X
249	QUERY COLOUR TYPE FEATURES	X	X	X	X
250	QUERY COLOUR VALUE	X	X	X	X
251	QUERY RGBWAF CONTROL				X
252	QUERY ASSIGNED COLOUR				X
253	a)				
254	a)				
255	QUERY EXTENDED VERSION NUMBER	X	X	X	X
a) Reserved for future needs. The control gear shall not react in any way.					
b) Optional					

11.5.3 Command versus the DTR, DTR1 and DTR2 cross-reference table

Table 15 gives a command versus the DTR, DTR1 and DTR2 cross-reference.

Table 15 – Command versus the DTR, DTR1 and DTR2 cross-reference

Command		forward			backward		
		DTR	DTR1	DTR2	DTR	DTR1	return
224	SET TEMPORARY x-COORDINATE	LSB	MSB				
225	SET TEMPORARY y-COORDINATE	LSB	MSB				
226	ACTIVATE						
227	x-COORDINATE STEP UP						
228	x-COORDINATE STEP DOWN						
229	y-COORDINATE STEP UP						
230	y-COORDINATE STEP DOWN						
231	SET TEMPORARY COLOUR TEMPERATURE T_c	LSB	MSB				
232	COLOUR TEMPERATURE T_c STEP COOLER						
233	COLOUR TEMPERATURE T_c STEP WARMER						
234	SET TEMPORARY PRIMARY N DIMLEVEL	LSB	MSB	primary N			
235	SET TEMPORARY RGB DIMLEVEL	Red	Green	Blue			
236	SET TEMPORARY WAF DIMLEVEL	White	Amber	Freecolour			
237	SET TEMPORARY RGBWAF CONTROL	control					
238	COPY REPORT TO TEMPORARY						
239	a)						
240	STORE TY PRIMARY N	LSB	MSB	primary N			
241	STORE xy-COORDINATE PRIMARY N			primary N			
242	STORE COLOUR TEMPERATURE T_c LIMIT	LSB	MSB	limit type			
243	STORE GEAR FEATURES/STATUS	options					
244	a)						
245	ASSIGN COLOUR TO LINKED CHANNEL	control					
246	START AUTO CALIBRATION						
247	QUERY GEAR FEATURES/STATUS						features
248	QUERY COLOUR STATUS						status
249	QUERY COLOUR TYPE FEATURES						colour type features
250	QUERY COLOUR VALUE	command			LSB	MSB	MSB
251	QUERY RGBWAF CONTROL						control
252	QUERY ASSIGNED COLOUR						assigned colour
253	a)						
254	a)						
255	QUERY EXTENDED VERSION						2
a) Reserved for future needs. The control gear shall not react in any way.							

12 Test procedures

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

12.2 Test sequences 'Configuration commands'

12.2.1 Test sequences 'General configuration commands'

12.2.1.1 Test sequence 'RESET'

Replacement:

This test verifies that after power on, all relevant values are according to the specification, starting with the variables that are not colour type dependent. The test sequence is shown in Figure 5.

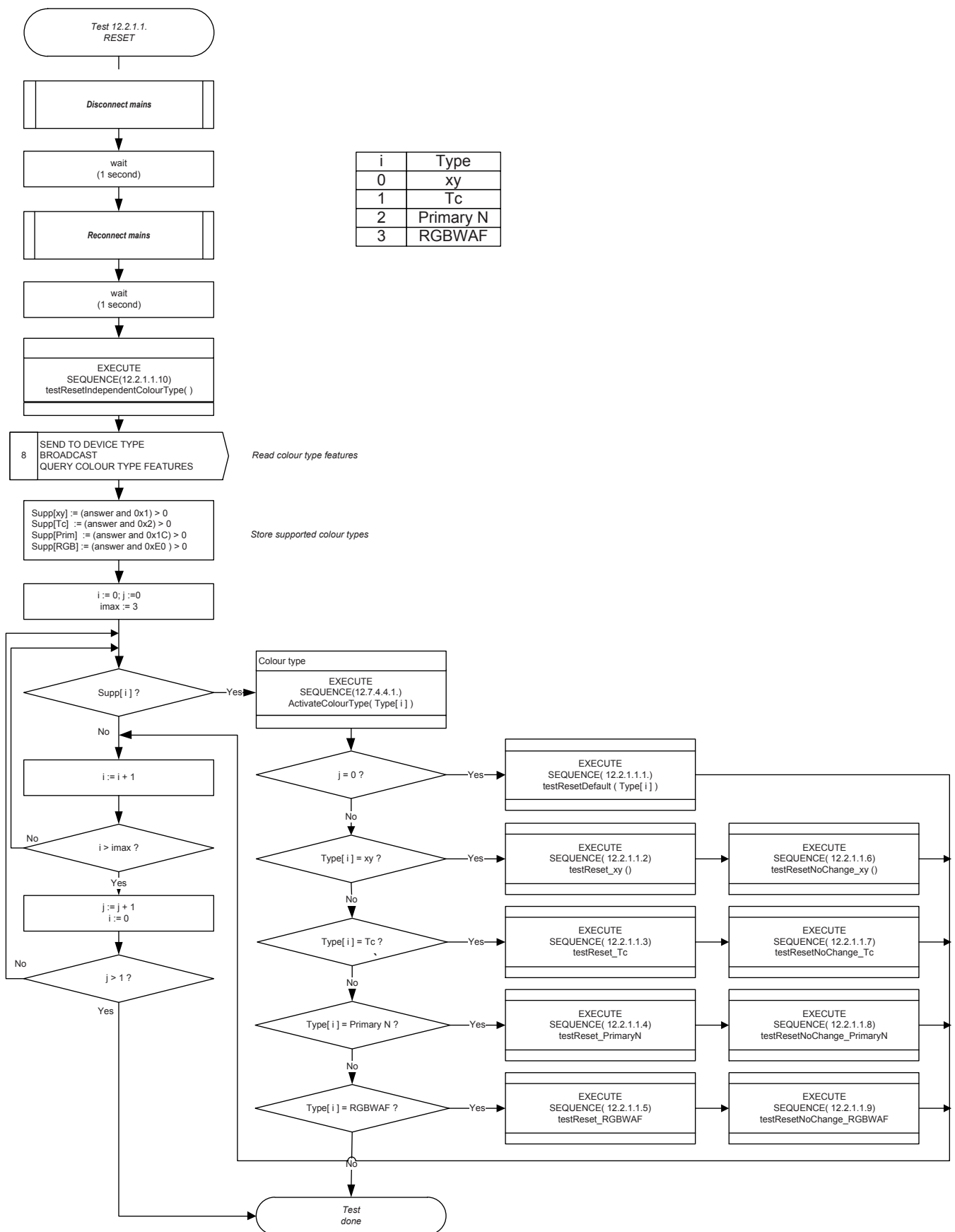


Figure 5 – Test sequence “RESET”

12.2.1.1.1 Test sequence "testResetDefault (ColourType)"

This subsequence checks the reset values for the active colour type. The test sequence is shown in Figure 6.

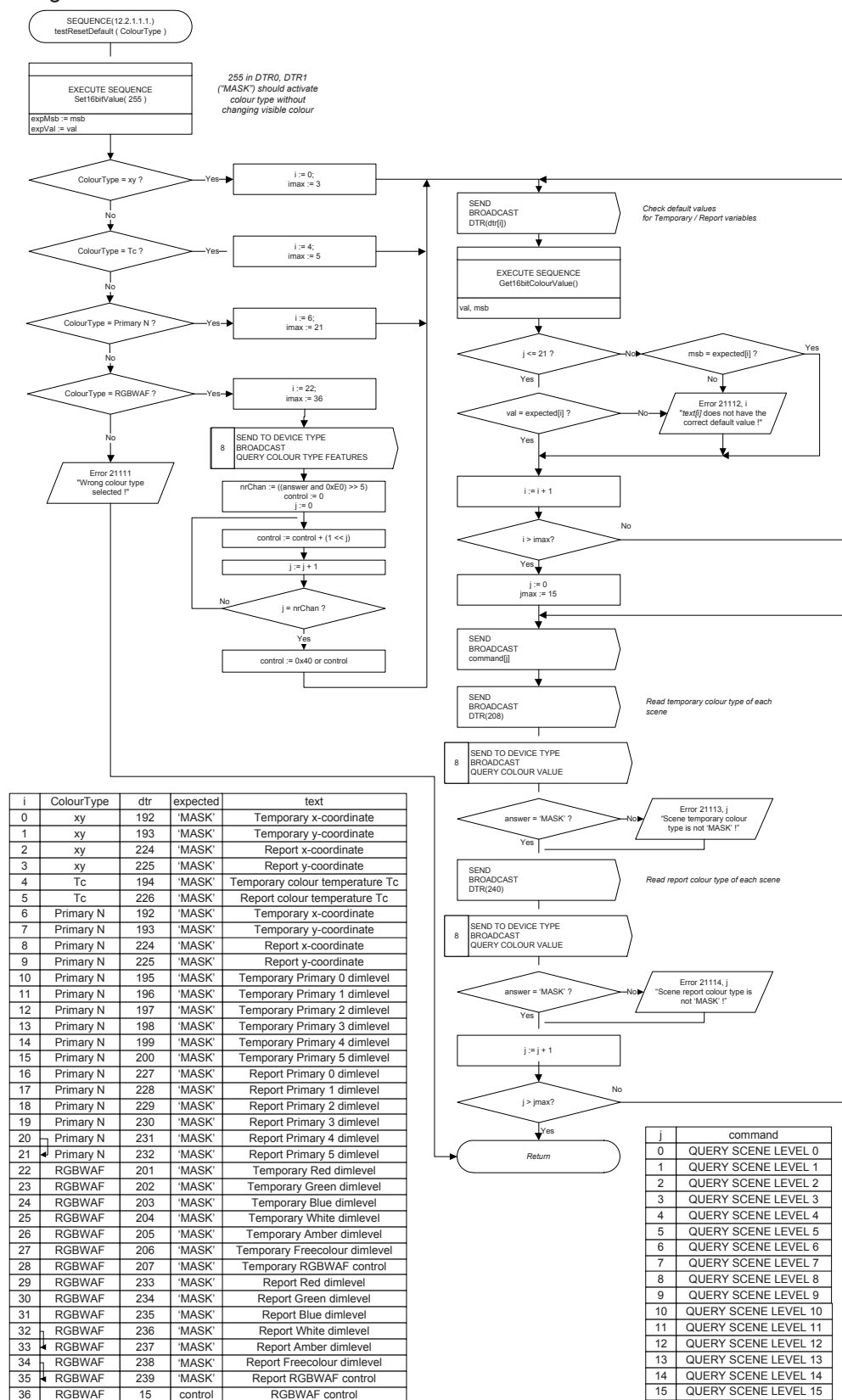


Figure 6 – Test sequence "testResetDefault (Colour Type)"